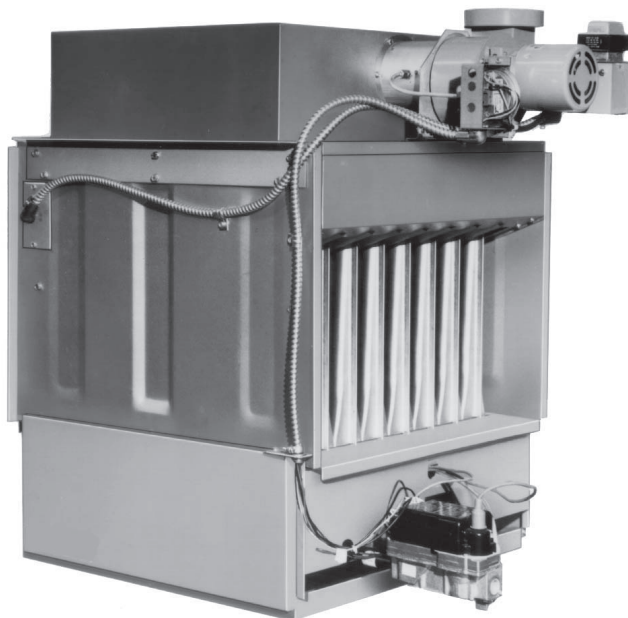


POWER-VENTED INDOOR GAS-FIRED DUCT FURNACE INSTALLATION, OPERATION, AND MAINTENANCE

MODEL EEDU



⚠ 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.

TABLE OF CONTENTS

GENERAL INFORMATION	3
Important Safety Information	4
Warranty	4
Certification	4
Installation Codes	5
Unit Location	5
Combustion Air Requirements	5
Halogenated Hydrocarbons	6
Dimensions	7
Clearances	8
Weights	8
INSTALLATION	9
Unpacking and Inspection	9
Pre-Installation Checklist	9
Pre-Installation Modifications	10
High CFM Conversion	10
Reverse Airflow Conversion	12
Coupling Additional Furnaces Together	13
Mounting Furnace	15
Suspension-Mounting	16
Base-Mounting	16
Vent Connections	18
Specific Venting Requirements	18
Rotating Venter Outlet	19
Vent Termination (Vent Pipe and Vent Cap)	20
Vent Termination Clearances	24
Duct Connections	25
Ductwork Requirements	25
Discharge Air Temperature Sensor Installation	26
Duct Furnace Airflow	29
Duct Furnace Blower Connections	29
Bypass Duct Construction	31
Ductwork-to-Furnace Connections	32
Piping Connections	33
Gas Supply Pressure	33
Gas Supply Piping	33
Supply Piping Connections	34
Condensate Drain Kit (Option CS1) Installation	35
Electrical Connections	35
Electrical Connections for Field-Installed Options	36
Thermostat Installation	36

TABLE OF CONTENTS—CONTINUED

CONTROLS	37
Standard Controls	37
Combustion Air Proving Switch	37
Limit Switch	37
Fan Control	38
Combination Gas Valve	39
Pilot and Ignition System	40
Optional Controls	41
Two-Stage Heating Control (Option AG2)	41
Two-Stage Makeup Air Control (Options AG3 and AG15)	41
Electronic Modulation (Options AG7, AG8, AG9, and AG21)	42
OPERATION	43
Pre-Startup Checklist	44
Startup	44
Post-Startup Checklist	45
ADJUSTMENTS	45
Measure and Adjust Manifold (Outlet) Gas Pressure	45
High Elevation Conversion	46
Gas Conversion	48
Burner Air Adjustment (Propane Units Only)	48
MAINTENANCE	49
Service Checklist	49
Maintenance Procedures	49
Combination Gas Valve Maintenance	50
Burner Rack and Pilot Maintenance	50
Heat Exchanger Cleaning	52
Venter Maintenance	53
TROUBLESHOOTING	53
INSTALLATION RECORD (TO BE COMPLETED BY INSTALLER)	56

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.

GENERAL INFORMATION—CONTINUED

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.

WARNING

For your safety, read the warning labels on the unit.

NOTES:

- Installation should be done by a qualified agency in accordance with the instructions in this manual and in compliance with all codes and requirements of authorities having jurisdiction.
- The instructions in this manual apply only to the model EEDU duct furnace.

Warranty

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

- Furnaces are used in atmospheres containing flammable vapors or atmospheres containing chlorinated or halogenated hydrocarbons or any contaminant (silicone, aluminium oxide, etc.) that adheres to the spark ignition flame sensing probe.
- Wiring is not in accordance with the diagram provided with the unit.
- Unit is installed without proper clearances to combustible materials or is located in a confined space without proper ventilation and air for combustion (refer to **Combustion Air Requirements** and **Clearances** sections).
- Furnace air throughput is not adjusted within the range specified on the rating plate.

Certification

The unit is design-certified by the Canadian Standards Association for commercial/industrial use in both the United States and Canada. The unit is approved for use with either natural gas or propane. The type of gas for which the furnace is equipped, the correct firing rate, and electrical characteristics are shown on the unit rating plate.

Installation Codes

- These units must be installed in accordance with local building codes. In the absence of local codes, in the United States, the unit must be installed in accordance with the *National Fuel Gas Code* (ANSI Z223.1, latest edition). A Canadian installation must be in accordance with the *Natural Gas and Propane Installation Code* (CSA B149, latest edition). This code is available from CSA Information Services, 1-800-463-6727. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements.
- Clearances from the heater and vent to construction or material in storage must conform with the *National Fuel Gas Code* (ANSI Z223.1, latest edition) pertaining to gas-burning devices and such material must not attain a temperature over 160°F (71°C) by continued operation of the heater.
- Installations in aircraft hangars should be in accordance with the *Standard for Aircraft Hangars* (ANSI/NFPA 409, latest edition). Installations in public garages should be in accordance with the *Standard for Parking Structures* (ANSI/NFPA 88A, latest edition). Installations in repair garages should be in accordance with the *Standard for Repair Garages* (NFPA 88B), which has been incorporated into the *Code for Motor Fuel Dispensing Facilities and Repair Garages* (NFPA 30A, latest edition). In Canada, installations in aircraft hangars and public garages should be in accordance with CSA B149.
- If the heater is being installed in the Commonwealth of Massachusetts, installation must be performed by a licensed plumber or licensed gas fitter.

Unit Location

⚠ CAUTION ⚠

Do not locate the unit where it may be exposed to liquid spray, rain, or dripping water.

- A duct furnace is designed for connection to an inlet and an outlet duct and depends on an external air handler. Location must be in accordance with **Clearances** section.
- There are a variety of factors such as system application, building structure, dimensions, and weight that contribute to selecting the location. Read the installation information in this manual and select a location that complies with the requirements.
- The furnace may be suspended or base-mounted. When the furnace is base-mounted on combustible material, a minimum clearance of 12 inches (305 mm) is required. The base or legs used for base-mounting must be made of non-combustible material.

Combustion Air Requirements

⚠ WARNING ⚠

The unit is designed to take combustion air from the space in which it is installed and is not designed for connection to an outside combustion air intake duct. Connecting this furnace to an outside combustion air intake duct voids the warranty and could cause hazardous operation.

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

- The unit is designed to take combustion air from the space in which it is installed. The air that enters into the combustion process is vented to the outdoors. Sufficient air must enter the equipment location to replace the air exhausted through the vent system.
- Modern construction methods involve a greater use of insulation, improved vapor barriers, and weather-stripping. The result is that buildings are generally much tighter structurally than they have been in the past. The combustion air supply for gas-fired equipment can be affected by these construction conditions because infiltration that would have existed in the past may not be adequate. Extensive use of exhaust fans aggravates the situation. In the past the filtration of outside air assumed in heat loss calculations (one air change per hour) was assumed to be sufficient. However, current construction methods may now require the introduction of outside air into the room or building through wall openings or ducts.
- Under all conditions, enough air must be provided to ensure there will not be a negative pressure condition within the equipment room or space. A positive seal must be made in all return-air connections and ducts.

GENERAL INFORMATION—CONTINUED

Combustion Air Requirements—Continued

- 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 BTU/h of the installed appliance input rating. An **unconfined** space is defined as a space whose volume is ≥50 cubic feet per 1,000 BTU/h of the installed appliance input rating.
- Even a slight leak can create a negative pressure condition in a confined space and can affect combustion. Do not install a unit in a confined space without providing wall openings leading to and from the space. Depending on the combustion air source, provide openings near the floor and ceiling for ventilation and air for combustion as shown in **Figure 1** and as listed in **Table 1**.

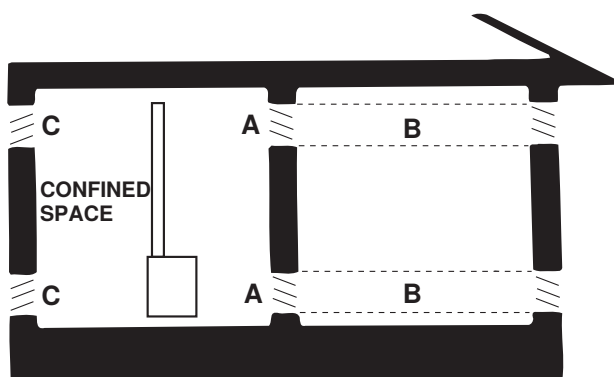


Figure 1. Confined Space Combustion Air Openings (Refer to **Table 1**)

Table 1. 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 BTU/h	Add total BTU/h 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 BTU/h	
C	Direct outside air	1 square inch free area per 4000 BTU/h	

*See **Figure 1**.

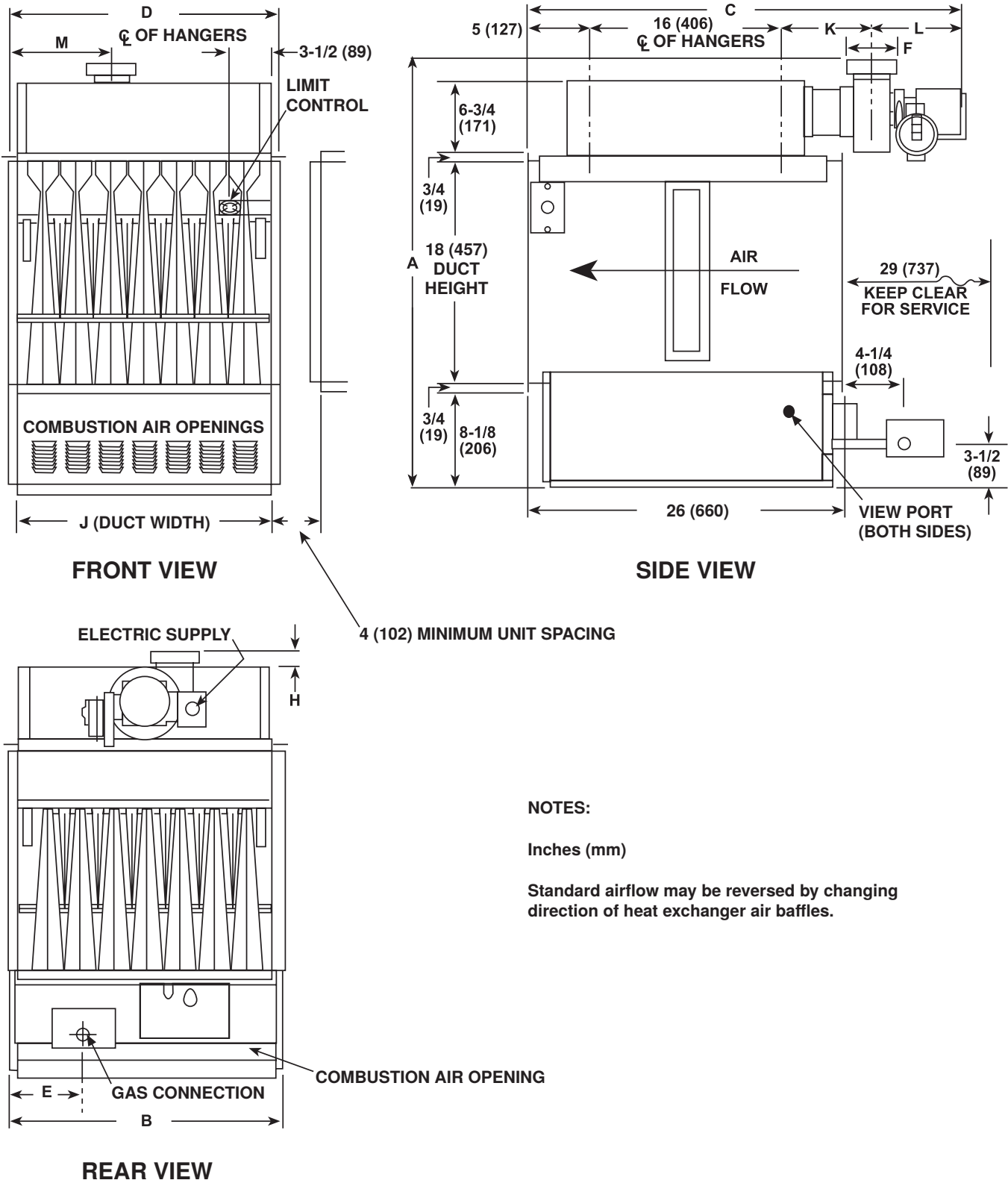
Halogenated Hydrocarbons

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.

Dimensions



NOTES:

Inches (mm)

Standard airflow may be reversed by changing direction of heat exchanger air baffles.

Figure 2. Dimensions (Refer to [Table 2](#))

GENERAL INFORMATION—CONTINUED

Dimensions—Continued

Table 2. Dimensions									
Dimension (See Figure 2)	Unit Size (MBTUh)								
	75, 100	125, 140	170	200	225	250	300	350	400
	Inches (mm)								
A	35 (889)				35-3/4 (908)		36 (914)		
B	14-1/4 (362)	17 (432)	19-3/4 (502)	22-1/2 (572)	25-1/4 (641)	28 (711)	33-1/2 (851)	39 (991)	44-1/2 (1130)
C	35-11/16 (906)						38-1/8 (968)		
D	14-5/8 (371)	17-3/8 (441)	20-1/8 (511)	22-7/8 (581)	25-5/8 (651)	28-3/8 (721)	33-7/8 (860)	39-3/8 (1000)	44-7/8 (1140)
E	4-3/8 (111)					7-1/8 (181)	9-7/8 (251)	12-5/8 (321)	15-3/8 (391)
F	4 (102)				5 (127)		6 (152)		
H	5/8 (16)				1-3/8 (35)		1-5/8 (41)		
J	12-1/2 (318)	15-1/4 (387)	18 (457)	20-3/4 (527)	23-1/2 (597)	26-1/4 (667)	31-3/4 (806)	37-1/4 (946)	42-3/4 (1086)
K	7-1/4 (184)						9-9/16 (243)		
L	7-7/16 (189)						7-5/8 (194)		
M	4-5/8 (117)	6 (152)	7-3/8 (187)	8-3/4 (222)	10-1/8 (257)	11-1/2 (292)	13-7/8 (352)	16-5/8 (422)	19-3/8 (492)

Clearances

The unit must be installed so that clearances are provided for combustion air space, for service and inspection, and for proper spacing from combustible construction. Clearance to combustibles is defined as the necessary minimum distance from the heater to a surface or object that ensures that a surface temperature does not exceed 90°F (50°C) above the surrounding ambient temperature. **Table 3** lists required clearances.

NOTE: The required service clearance is shown in **Figure 2**.

Table 3. Clearances	
Unit Surface	Minimum Clearance (Inches (mm))
Front, top, and flue connector	6 (152)
Sides and bottom	12 (305)
Rear	29 (737)

Weights

Table 4. Weights									
Unit Size (MBTUh)									
75, 100	125	140	170	200	225	250	300	350	400
Net Weight (Pounds (kg))									
104 (47)	126 (57)	128 (58)	150 (68)	172 (78)	194 (88)	216 (98)	262 (119)	306 (139)	328 (149)

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.

⚠ CAUTION ⚠

Ensure that EXCESSIVE shipping vibration has not caused the burner rack assembly to drop off the support rails into the bottom pan.

- Remove the panel from the bottom rear of the furnace (refer to [Burner Rack and Pilot Maintenance](#) section) and check the burner rack assembly. The burner rack drawer should be setting level with each side on a support rail. If the burner rack assembly is positioned properly, close the back panel.
- If the burner rack has fallen, remove the screws holding the burner rack assembly and pull out the burner rack drawer. Reassemble by sliding the burner rack drawer into the heater, ensuring that both sides are resting on the support rails. Reattach to the support brackets underneath the burners, reinsert the burner rack screws, and close the back panel.

Pre-Installation Checklist

- ☐ Check the rating plate for the gas specifications and electrical characteristics of the furnace to ensure that they are compatible with the gas and electric supplies at the installation site.
- ☐ Read this booklet and become familiar with the installation requirements of your particular furnace.
- ☐ 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 5](#)) that need to be assembled/installed prior to unit installation. Ensure that all options ordered are at the installation site.

Table 5. Field-Installed Options

Option	Description
AG7	Electronic modulation with room thermostat
AG9	Electronic modulation with 2:1 turndown ratio and remote temperature selector
CC1	Vent cap
CE1	Manual gas shutoff valve, natural gas
CE2	Manual gas shutoff valve, propane
CL1	Single-stage thermostat
CL9	Electronic modulating room override
CL22	Two-stage thermostat
CL33	Two-stage digital thermostat
CL52	Single-stage digital thermostat
CM1	Locking thermostat cover
CM1B	Large locking thermostat cover
CK3	Hanger kit for suspension from 1-inch threaded pipe
CR1	Coupling kit for two furnaces
CR2	Coupling kit for three furnaces
CR3	Coupling kit for four furnaces
CR4	Coupling kit for five furnaces
CQ1	Adjustable fan control
CS1	Condensate drain flange kit
—	Base-mounting kit (PN 1034022)

INSTALLATION—CONTINUED

Pre-Installation Modifications

High CFM Conversion

This unit was factory assembled with the air throughput range listed on the rating plate. If the application requires a higher CFM than listed on the rating plate, the unit may be converted for lower temperature rise and higher CFM. The conversion will change the air throughput range as specified in [Table 6](#). Verify the unit size on the heater rating plate and, after confirming that this conversion is correct for the unit, perform the following procedure:

Table 6. High Air Throughput											
Minimum or Maximum	Unit Size (MBTUh)										
	75	100	125	140	170	200	225	250	300	350	400
	CFM										
Minimum	855	1140	1425	1595	1937	2279	2564	2849	3175	3704	4233
Maximum	2778	3704	4630	5185	6296	7407	8333	9259	11,111	12,963	14,815

⚠ DANGER ⚠

- This conversion shall be done by a qualified service agency in accordance with the manufacturer's instructions and all applicable codes and requirements of the authority having jurisdiction. If the information in these instructions is not followed exactly, a fire, an explosion, or the production of carbon monoxide may cause property damage, personal injury, or loss of life. The qualified service agency performing this work assumes responsibility for the conversion of this appliance to provide for higher CFM.
- These instructions are designed to prepare the duct furnace for increased air throughput conversion prior to installation. If your duct furnace is already installed, for your safety, turn OFF the gas and electric supply before servicing.

NOTE: Before performing this conversion, determine if airflow is being reversed or if other field-installed options apply. Perform desired procedure in accordance with [Pre-Installation Modifications](#) section.

1. Remove heat exchanger baffles (see [Figure 3](#)):
 - a. Remove support bracket screws and slide entire baffle assembly out of heat exchanger.
 - b. Reinstall screws to plug holes.
 - c. For unit sizes 75 and 100, conversion is complete. Proceed to step 3.

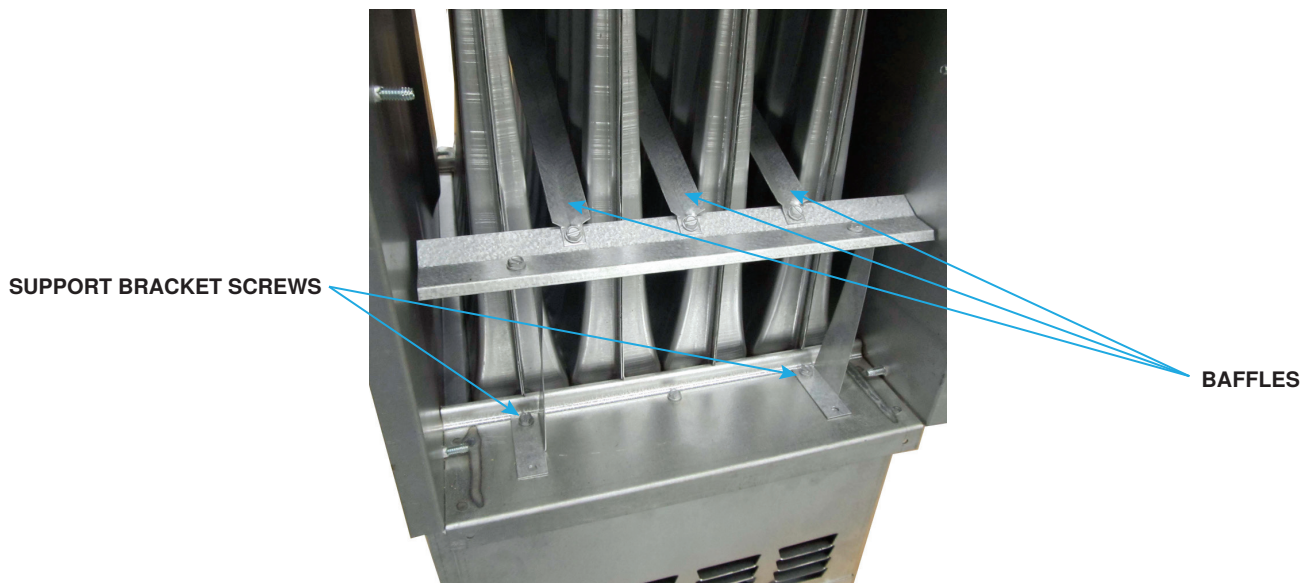


Figure 3. Heat Exchanger Baffle Removal

2. Remove side finger baffles on unit sizes 125–400 (see [Figure 4](#)):

NOTE: DO NOT remove the side finger baffles on unit sizes 75 and 100.

- a. At entering air side of heat exchanger, locate side finger baffles and remove two side finger baffle screws from each baffle.
- b. Remove both side finger baffles.

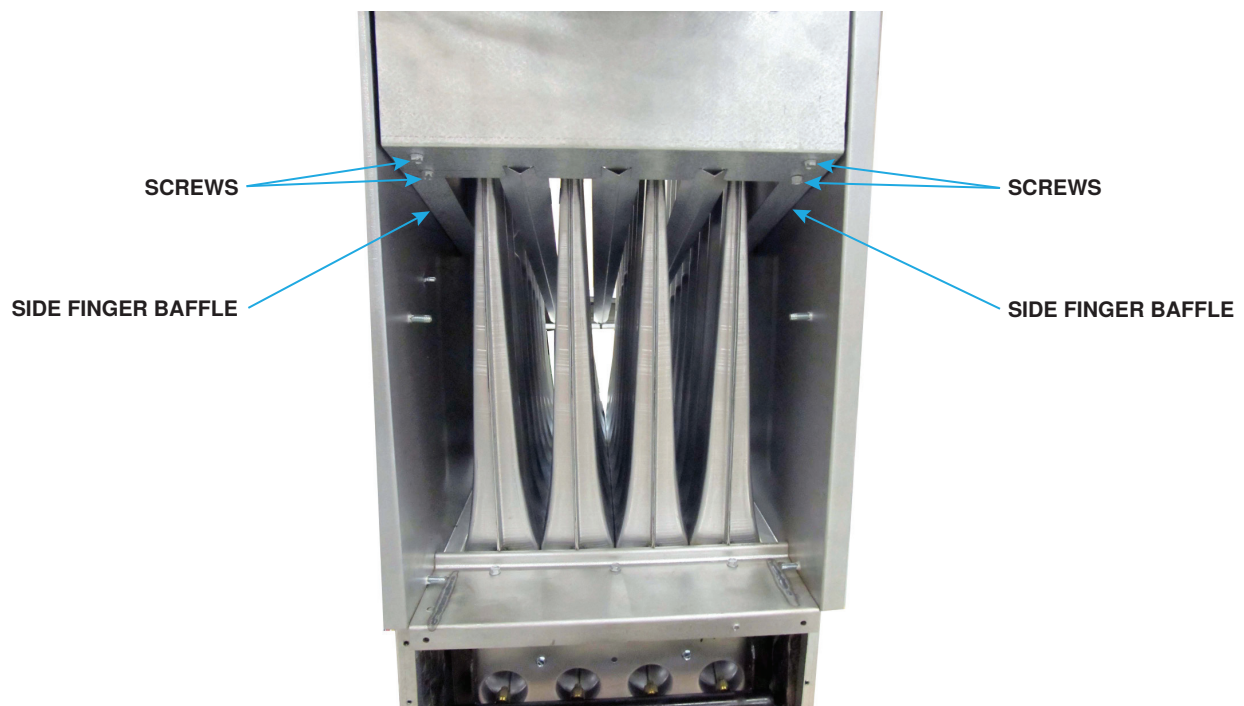


Figure 4. Side Finger Baffle Removal

3. Install field conversion label (see [Figure 5](#)):
 - a. Fill in field conversion label (PN 263310) from literature bag.
 - b. Adhere label to unit on clean dry surface adjacent to rating plate.
4. Test unit for proper operation ensuring that air throughput is in accordance with [Table 6](#).

INSTALLATION—CONTINUED

Pre-Installation Modifications—Continued

High CFM Conversion—Continued

IMPORTANT	
This appliance has been converted on _____	
Cet appareil a été converti _____	(date)
to _____	cfm maximum throughput
au _____	pi ³ /min consommation maximum
to _____	cfm minimum throughput
au _____	pi ³ /min consommation minimum
by / par _____ (name & address of company making this conversion) ,	
with kit no. / avec la kit no _____	263308
which accepts the responsibility that this conversion has been properly made.	
qui accepte la responsabilité que cette conversion a été correctement faite.	
263310	

Figure 5. Field Conversion Label

Reverse Airflow Conversion

Duct furnaces are equipped with directional air baffles between the heat exchanger tubes. Facing the control compartment of the furnace, the standard direction of airflow is from the rear of the furnace (gas valve location) toward the front of the furnace. If the installation site requires airflow from the front to the rear, the unit may be field-adapted by relocating the limit control and reversing the position of the directional air baffles as follows:

NOTE: When reversing airflow, the limit control MUST be relocated to the discharge end of the heat exchanger.

1. Remove limit control (see [Figure 6](#), DETAIL A):
 - a. If unit has optional outer side panels, locate limit control and remove outer side panel on that side of furnace.
 - b. Remove limit control bracket screws and remove limit control/bracket assembly. Do not disconnect limit control wires.
 - c. Carefully pull limit control/bracket assembly through hole.
2. Reverse direction of airflow baffles (see [Figure 6](#), DETAIL B):
 - a. Remove baffle screws and lift each airflow baffle slightly and slide forward. Remove all baffles from heat exchanger.
 - b. Remove top baffle support screws and remove top baffle support. Reposition and secure support on opposite end of heat exchanger using screws.
 - c. Remove bracket screws and remove bottom baffle support and bracket assembly. Reinstall bracket screws to plug holes in heat exchanger bottom. Reposition bottom baffle support and bracket assembly on opposite end of heat exchanger and secure using field-supplied sheet metal screws.
 - d. Reinstall airflow baffles removed in step 2a and secure using baffle screws.
3. Reinstall limit control removed in step 1:
 - a. Measure down 4-1/2 inches (114 mm) and across 1-11/16 inches (43 mm) at discharge end on same side of heat exchanger. Using that center point, punch 2-1/4-inch (57-mm) diameter hole in side panel.
 - b. With limit control on heat exchanger side of bracket, slide limit control/bracket assembly through hole and secure bracket using two sheet metal screws.

NOTE: If cable connections need to be moved, after the limit control is installed, secure them using field-supplied sheet metal screws. Reinstall screws to plug all holes in the side panel.

- c. Cover all original factory-made limit control holes using field-supplied sheet metal plate. Do not leave any open holes in side panel or heat exchanger bottom. Unit is now ready for installation with airflow from front to rear (gas valve side).

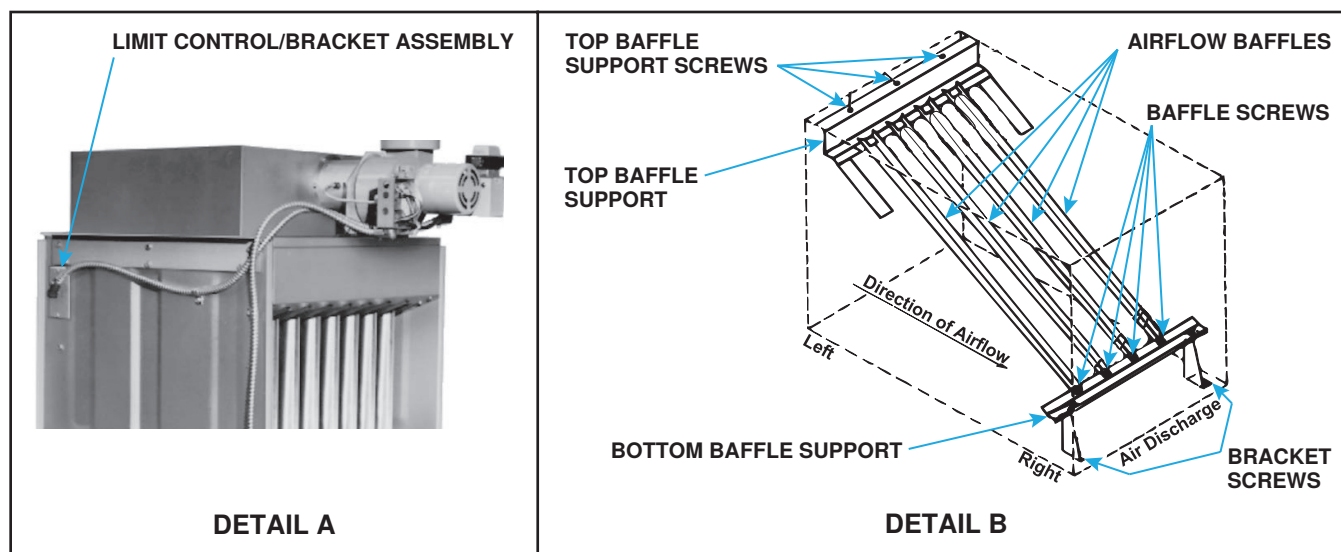


Figure 6. Limit Control and Airflow Baffles

Coupling Additional Furnaces Together

Coupling of furnaces is done using optional coupling kits, which are listed in [Table 7](#). Couple two, three, four, or five furnaces together as follows. Item numbers in parentheses refer to [Figure 7](#) and [Table 8](#).

Table 7. Optional Furnace Coupling Kits		
Option	For Number of Units	PN
CR1	2	57963
CR2	3	82654
CR3	4	82655
CR4	5	82656

1. Position tie plate (1) below hanger angle (2) and secure tie plate to first furnace using threaded socket assemblies (3). Tighten threaded socket assemblies firmly.

NOTE: The tie plate (1) MUST be under both hanger angles (2).

2. Position second furnace next to first furnace so that tie plate (1) is below hanger angle (2). Secure tie plate to hanger angle using bolts (4), lockwashers (5), and nuts (6).
3. Position filler plates (7) as shown in [Figure 7](#), DETAIL B. Using filler plate as template, drill 1/8-inch diameter holes and secure filler plates using sheet metal screws (8). Offset of filler plate allows alignment with unit duct flanges (see [Figure 8](#), DETAIL A).

NOTES:

- Coupled units require access panels (see [Figure 8](#), DETAIL B) in the top or bottom of the outlet ductwork for limit control service and observation of coupled units (refer to [Duct Connections](#) section).
- Refer to [Figure 8](#), DETAIL B and [Table 9](#) for coupled furnace front view dimensions.

INSTALLATION—CONTINUED

Pre-Installation Modifications—Continued

Coupling Additional Furnaces Together—Continued

Table 8. Coupling Kit Components

Item No.	Component	Description	PN	Quantity*
1	Plate	Tie	57965	1
2	Angle	Hanger	—	2
3	Socket assembly	Threaded	9557	2
4	Bolt	Hex head, 3/8-16 × 1-1/4-inch-long	5095	2
5	Lockwasher	Split ring	5197	2
6	Nut	Spotweld	—	2
7	Plate	Filler	57964	2
8	Screw	Sheet metal, #10 × 1/2-inch-long	11813	20

*Quantities listed are for option CR1 coupling kit (PN 57963) for two furnaces.

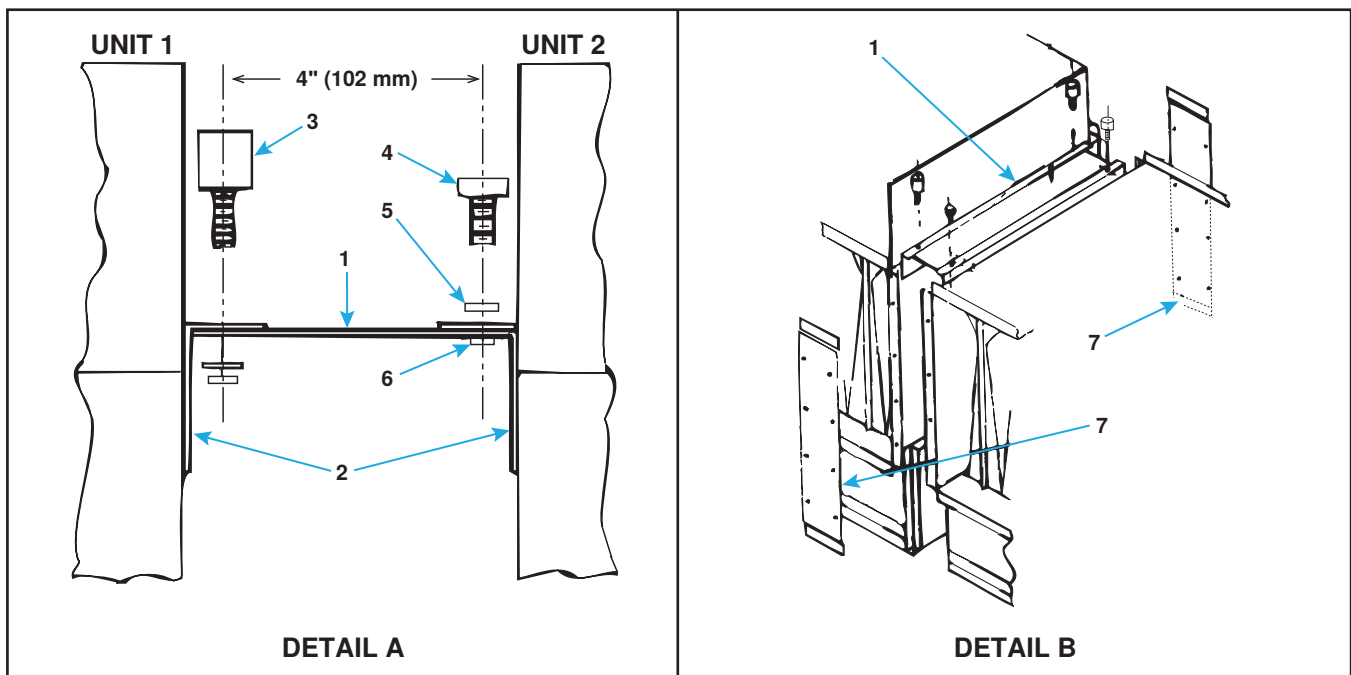


Figure 7. Coupling Kit Installation

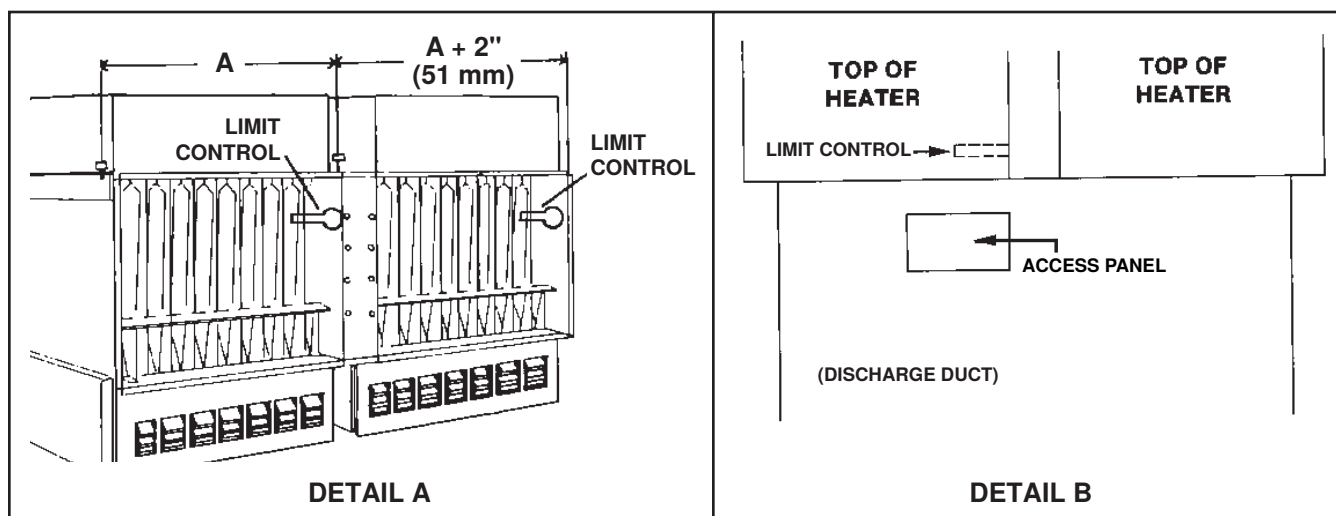


Figure 8. Front and Top Views of Coupled Furnaces

Table 9. Coupled Furnace Front View Dimensions			
Unit Size (MBTUh)	Dimension A*		
	Inches	Millimeters	
75, 100	14-5/8	371	
125, 140	17-3/8	441	
170	20-1/8	511	
200	22-7/8	581	
225	25-5/8	651	
250	28-3/8	721	
300	33-7/8	860	
350	39-3/8	1000	
400	44-7/8	1140	

*See [Figure 8](#), DETAIL A.

Mounting Furnace

⚠ WARNING ⚠

- Before installing the furnace, check the supporting structure to be used to verify that it has sufficient load-carrying capacity to support the weight (refer to [Weights](#) section) of the unit.
- Service and combustion air clearances (refer to [Clearances](#) section) apply to both suspended and mounted furnaces.
- The furnace must be level for proper operation. DO NOT place or add additional weight to a suspended furnace.

INSTALLATION—CONTINUED

Mounting Furnace—Continued

Suspension-Mounting

- The furnace is provided with four 15/32-inch (12 mm) diameter holes for mounting using four-point suspension as shown in [Figure 9](#).
- To determine the center line for the hangers, refer to dimension A listed in [Table 9](#).
- The hardware required is shown in [Figure 9](#), DETAIL A and includes four 7/16-16 threaded rods, four split ring lockwashers, and eight 7-16 nuts.
- A hanger adapter kit (option CK3, PN 57959) with four free-turning threaded sockets (PN 9557) for 1-inch pipe (see [Figure 9](#), DETAIL B) is available.
 - a. Remove lockwasher and nut from swivel connector.
 - b. Install bolt down through hole in hanger bracket and secure using lockwasher and nut.
 - c. Repeat steps b and c for all hanger brackets.

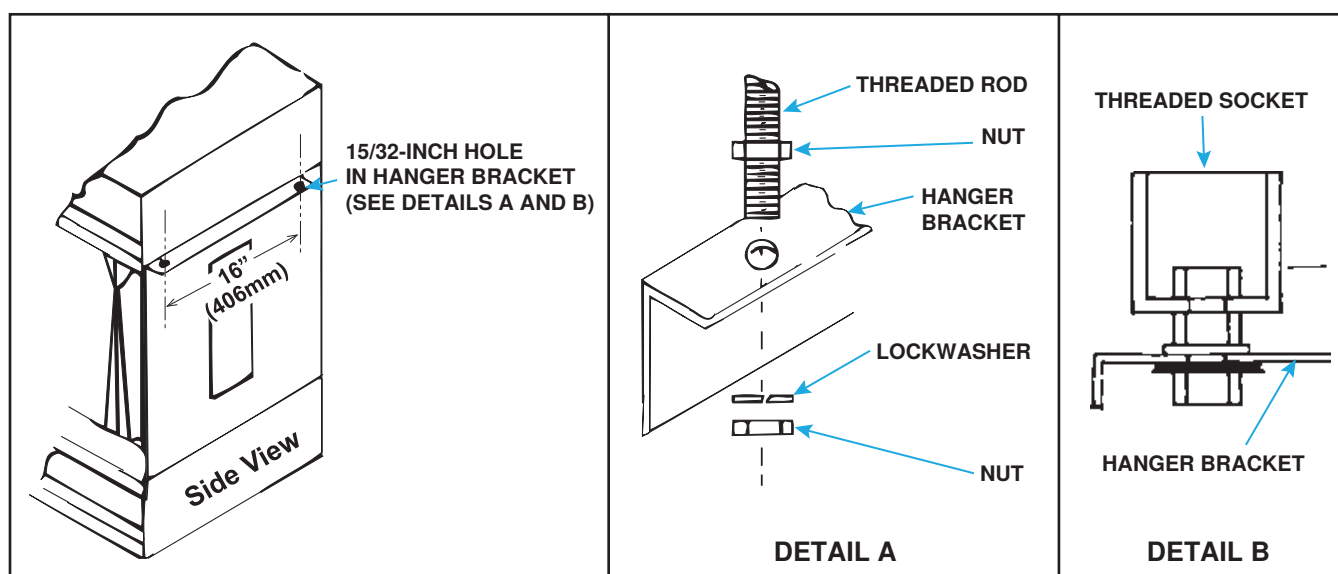


Figure 9. Suspension-Mounting of Single Furnace

Base-Mounting

⚠ DANGER ⚠

When the furnace is base-mounted on combustible material, a minimum clearance of 12 inches (305 mm) is required. The base or legs used for base-mounting must be made of non-combustible material.

Base-mount the furnace as follows:

1. Remove two hanger brackets from their standard positions and install them at their base-mounting positions as shown in [Figure 10](#), DETAIL A.
2. Install four leg brackets (see [Figure 10](#), DETAIL B) from base-mounting kit (PN 1034022). Secure leg brackets with screws provided in existing holes in front. Drill new leg bracket holes in rear.

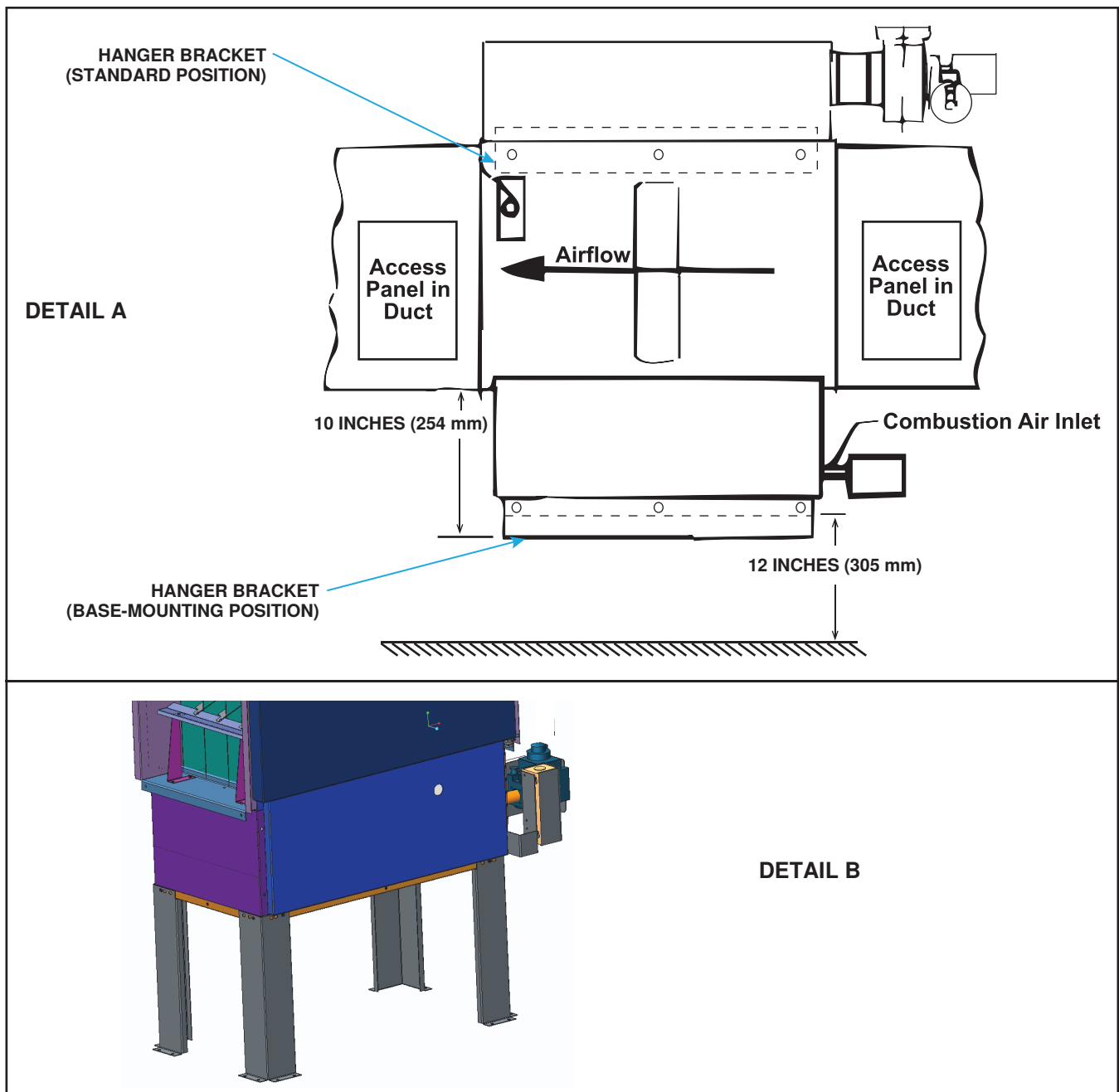


Figure 10. Base-Mounting Single Furnace

INSTALLATION—CONTINUED

Vent Connections

⚠ DANGER ⚠

- **Failure to provide proper venting could result in death, serious injury, and/or property damage. Unit must be installed with a flue connection and proper vent to the outside of the building. Follow installation codes and all venting instructions. Safe operation of any gas-fired equipment requires a properly operating vent system, correct provision for combustion air, and regular maintenance and inspection.**
- **Units installed in multiples require individual vent pipe runs and vent caps. Manifolding of vent runs is not permitted due to possible recirculation of combustion products into the building and possible back pressure effects on the combustion air proving switch.**

- Venting must be in accordance with the *National Fuel Gas Code* (ANSI/Z223.1, latest edition) or the *Natural Gas and Propane Installation Code* (CSA B149.1, latest edition) and all local codes. Local requirements supersede national requirements.
- These power-vented units are designed to operate safely and efficiently with either a horizontal or vertical vent. For maximum fuel savings, a horizontal vent run is recommended.
- If a vent cap is shipped with the unit, it is packaged attached to the venter housing. Detach the vent cap from the housing.

Specific Venting Requirements

Read all of the following before installing venting:

- **Type of vent pipe:** use either vent pipe approved for a category III heater or appropriately sealed single-wall pipe—if at least half of the equivalent length of the vent system is vertical, vent pipe approved for a category I heater may be used. Single-wall pipe or double-wall (type B) vent pipe are suitable for use with a category I heater.
- **Vent pipe diameter:** Use only one of the flue pipe diameters listed in [Table 10](#) for the furnace size being installed. The standard venter (flue) outlet diameters are 4-inch for unit sizes 75–200, 5-inch for unit sizes 225 and 250, or 6-inch for unit sizes 300–400. If the pipe used in the vent run is larger than the diameter of the venter outlet (refer to [Table 10](#)), make the transition at the venter outlet.

Table 10. Maximum Permissible Vent Lengths

Vent Pipe Diameter (Inches)	Unit Size (MBTUh)	Feet (Meters)		
		Maximum Vent Length*	Reduced Length for Each Elbow Used**	
			90-Degree Elbow	45-Degree Elbow
Standard Vent Pipe Diameters				
4	75	40 (12.2)	6 (1.8)	3 (0.9)
	100–200	50 (15.2)	7 (2.1)	3.5 (1.1)
5	225, 250	50 (15.2)	9 (2.7)	4.5 (1.4)
6	300–400	50 (15.2)	11 (3.4)	5.5 (1.7)
Optional (Increased) Vent Pipe Diameters				
5	170	60 (18.3)	9 (2.7)	4.5 (1.4)
	200	70 (21.3)	9 (2.7)	4.5 (1.4)
6	225	70 (21.3)	11 (3.4)	5.5 (1.7)
	250	70 (21.3)	12 (3.7)	6 (1.8)
7	300	70 (21.3)	13 (4.0)	6.5 (2.0)
	350	80 (24.3)	13 (4.0)	6.5 (2.0)
	400	90 (27.4)	14 (4.3)	7 (2.1)

*If the system contains all vertical pipe or a combination of vertical and horizontal vent pipe, the length may be increased 1 foot for each foot of vertical pipe—up to a maximum increase of 10 feet for unit sizes 75–125 or 20 feet for unit sizes 140–400.

**Reduce the maximum vent length by the amount indicated for each elbow used.

- **Vent system joints:** vent system joints depend on the installation and the type of pipe being used:
 - a. **If installed as a category III heater (required if more than half of the equivalent length of the vent system is horizontal) and single-wall vent pipe is being used:** use at least two non-corrosive screws per vent pipe joint and seal all joints to prevent leakage of flue gases into the building. For sealing joints, tape suitable for 550°F (288°C) is recommended (required in California).
 - b. **If installed as a category III heater (required if more than half of the equivalent length of the vent system is horizontal) and vent pipe specifically approved for category III vent systems is being used:** follow the pipe manufacturer's instructions for proper sealing.
 - c. **If installed with a category I vent system (allowed only if at least half of the equivalent length of the vent system is vertical):** use at least two non-corrosive screws per vent pipe joint on single-wall pipe or follow the pipe manufacturer's instructions for joining double-wall pipe. Refer to the **Vent Termination (Vent Pipe and Vent Cap)** section for installing a vent cap to double-wall pipe.
- **Vent terminal (pipe and vent cap):** terminate the vent system with a vent cap (option CC1):
 - a. In most cases the vent cap is the same size as the vent run. Units installed in the United States that are ordered with an optional vent cap and all units ordered for Canada have a vent cap packaged with the heater. If the standard size vent pipe listed in **Table 10** is used, install the vent cap provided.
 - b. If a vent cap is not included or if an optional (increased) size vent pipe listed in **Table 10** is used, install an option CC1 vent cap in the appropriate size.
 - c. Refer to the **Vent Termination (Vent Pipe and Vent Cap)** section for vertical or horizontal vent termination requirements. The vent terminal section may be either single-wall or double-wall (type B) vent pipe.
 - d. If double-wall pipe is used in the vent terminal, follow the instructions in the **Vent Termination (Vent Pipe and Vent Cap)** section to attach the vent cap and to connect the double-wall pipe to the single-wall or category III vent pipe run.
 - e. If the vent run is 7-inch vent pipe, install an 8-inch vent cap using a tapered enlarger.
- **Vent system support:** support lateral runs every 6 feet (1.8M), using a non-combustible material such as strap steel or chain. Do not rely on the heater for support of either horizontal or vertical vent pipe.
- **Condensation:** single-wall vent pipe exposed to cold air or run through unheated areas must be insulated. Where extreme conditions are anticipated, install a means of condensate disposal.

Rotating Venter Outlet

⚠ WARNING ⚠

Only the venter housing may be rotated. The motor and combustion air proving switch MUST remain as received from the factory. Unsafe or improper operation will result if the standard position is varied (refer to **Combustion Air Proving Switch section).**

NOTE: A minimum of 12 inches (305 mm) of straight pipe is required at the venter outlet (or transition fitting) before installing an elbow in the vent system. An elbow should never be attached directly to the venter.

INSTALLATION—CONTINUED

Vent Connections—Continued

Rotating Venter Outlet—Continued

The venter is factory-installed as shown in **Figure 11**, DETAIL A. If required, the venter housing may be rotated as shown in **Figure 11**, DETAIL B. The vent may be run in one of three directions (1, 2, or 3) as shown. Rotate the venter housing as follows:

1. Remove three screws (save for reinstallation) that secure venter housing to outlet duct (pipe from furnace to venter). Ensure that venter housing assembly remains in place.
2. Remove three screws that secure motor plate to venter housing.
3. While holding motor, rotate venter housing to alternate position (1, 2, or 3) as shown in **Figure 11**, DETAIL B and reinstall motor plate to housing using three screws. To ensure correct venter wheel alignment, holes are provided in motor plate.
4. Using holes in venter housing as template, drill three 1/8-inch diameter holes in outlet duct and secure venter housing in its rotated position to outlet duct using three screws removed in step 1.

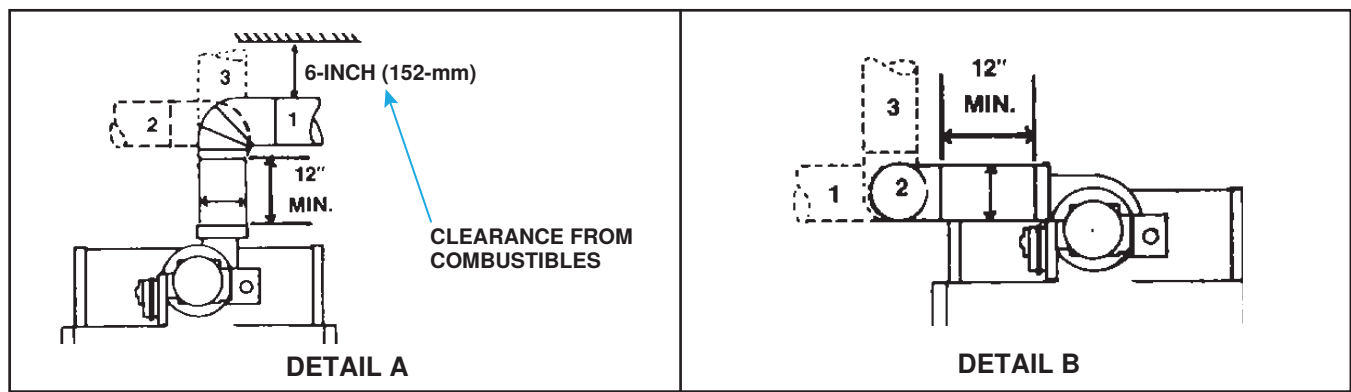


Figure 11. Rotating Venter Outlet

Vent Termination (Vent Pipe and Vent Cap)

Requirements for both vertical and horizontal vent termination are shown in **Figure 12**, **Figure 13**, **Figure 14**, and **Figure 15**. Instructions follow for connecting double-wall (type B) pipe to a vent cap or to a single-wall or category III vent pipe.

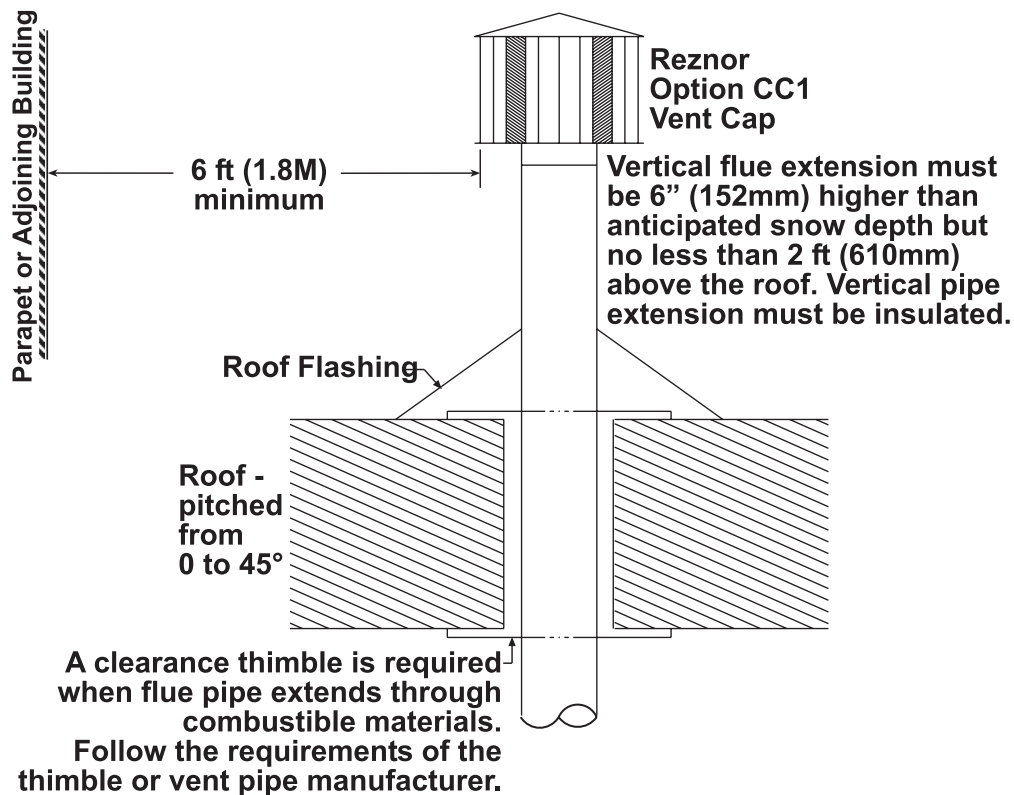


Figure 12. Vertical Vent Termination—Single-Wall Vent Run and Single-Wall Terminal End

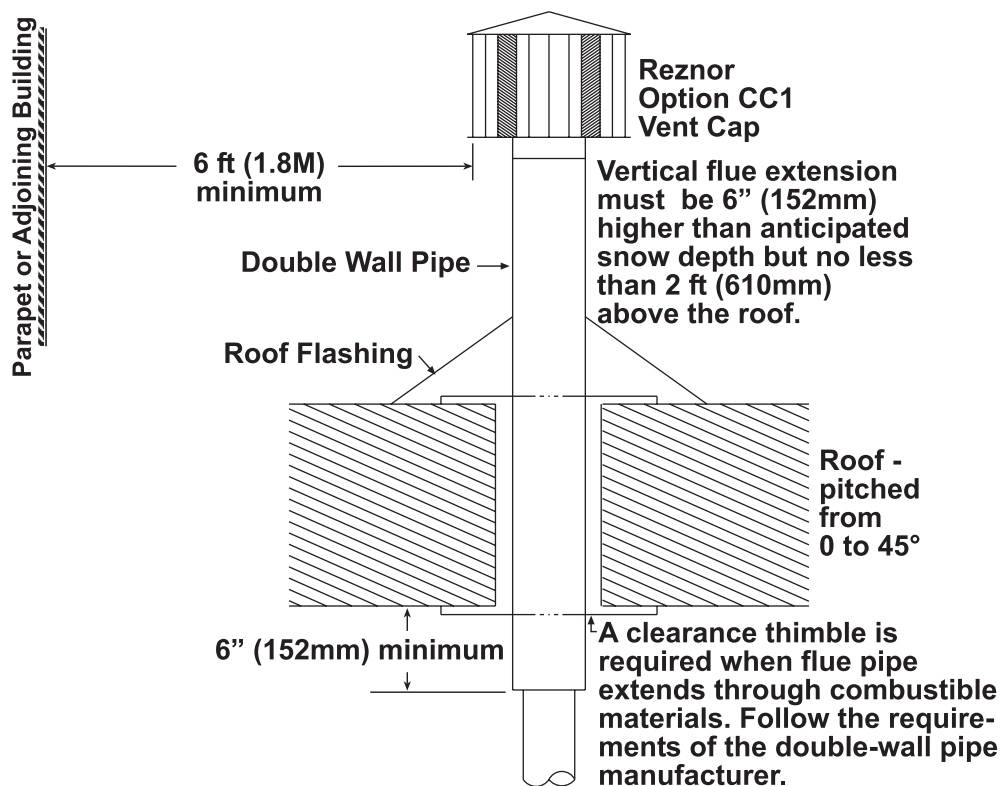
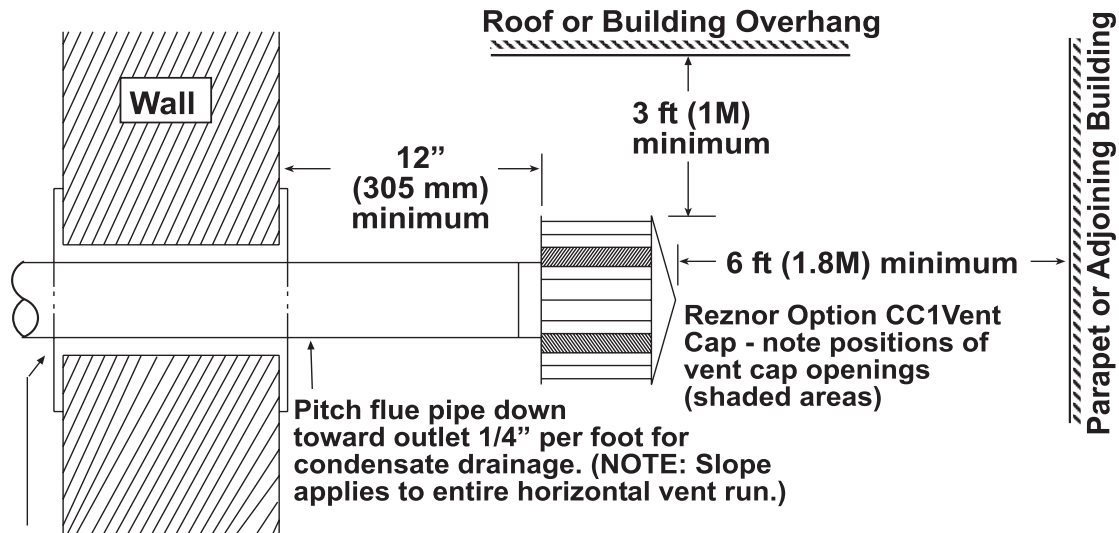


Figure 13. Vertical Vent Termination—Single-Wall Vent Run and Double-Wall Terminal End

INSTALLATION—CONTINUED

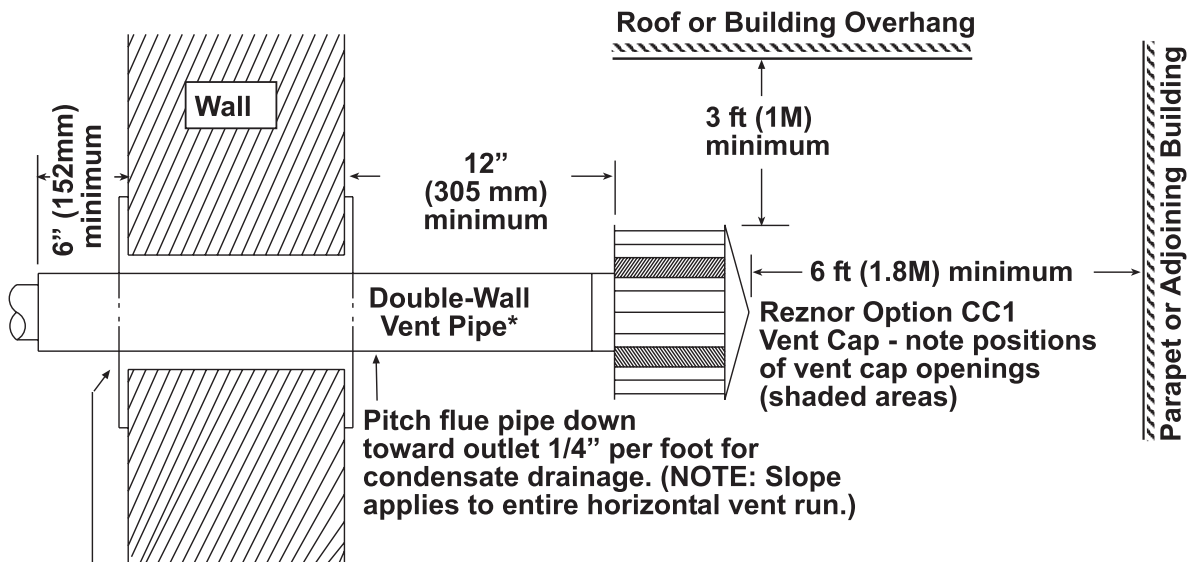
Vent Connections—Continued

Vent Termination (Vent Pipe and Vent Cap)—Continued



A clearance thimble is required when flue pipe extends through combustible materials. Follow the instructions of the thimble or vent pipe manufacturer.

Figure 14. Horizontal Vent Termination—Single-Wall Vent Run and Single-Wall Terminal End



A clearance thimble is required when flue pipe extends through combustible materials. Follow the requirements of the double-wall pipe manufacturer.

Figure 15. Horizontal Vent Termination—Single-Wall Vent Run and Double-Wall Terminal End

- **Connect double-wall (type B) pipe to a vent cap as follows:**

- Apply continual 3/8-inch bead of silicone sealant around circumference of vent cap collar (see [Figure 16](#), DETAIL A) to prevent any water inside vent cap from running down double-wall pipe.
- Before sealant has any time to dry, insert collar on vent cap as far as possible inside inner wall of double-wall pipe (see [Figure 16](#), DETAIL B).
- Apply additional silicone sealant to fully close any gaps between vent cap and double-wall pipe to prevent water from entering double-wall pipe.
- Secure vent cap to double wall pipe by drilling hole and inserting 3/4-inch-long sheet metal screw into vent cap collar (see [Figure 16](#), DETAIL C). Do not overtighten screw.

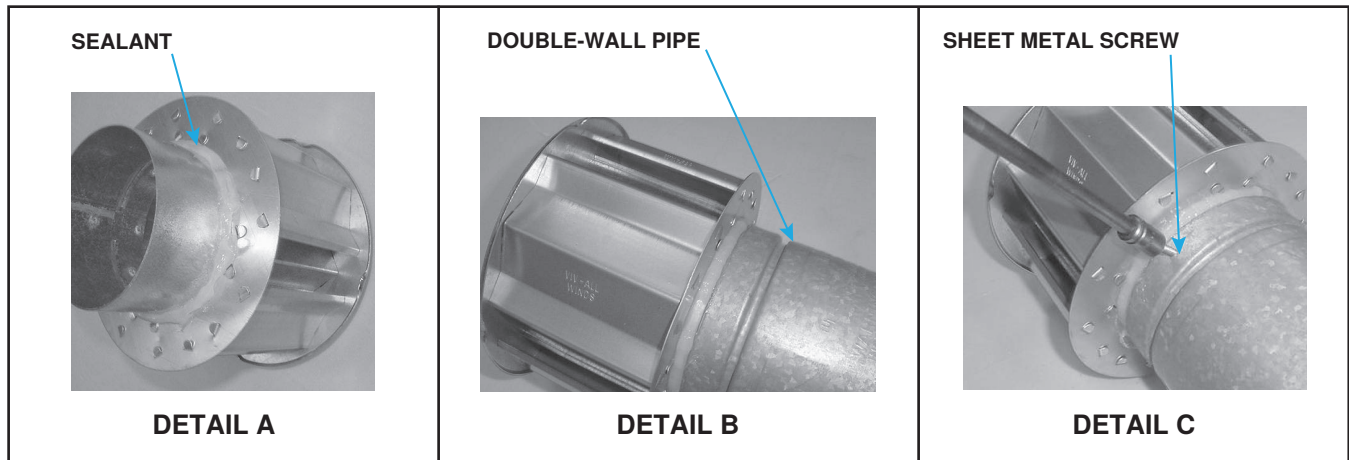


Figure 16. Connecting Double-Wall (Type B) Pipe to Vent Cap

- **Connect double-wall (type B) pipe to a single-wall or category III vent pipe as follows:**

- Apply continual 1/4-inch bead of silicone sealant (see [Figure 17](#), DETAIL A) around circumference of pipe.
- Before sealant has any time to dry, insert pipe with sealant into inner wall of double-wall pipe (see [Figure 17](#), DETAIL B) until bead of sealant contacts inner pipe to create sealed joint.
- Drill three small holes—spaced equally around double-wall pipe—below sealant ring (see [Figure 17](#), DETAIL C) and insert 3/4-inch-long sheet metal screws to secure joint. Do not overtighten screws.

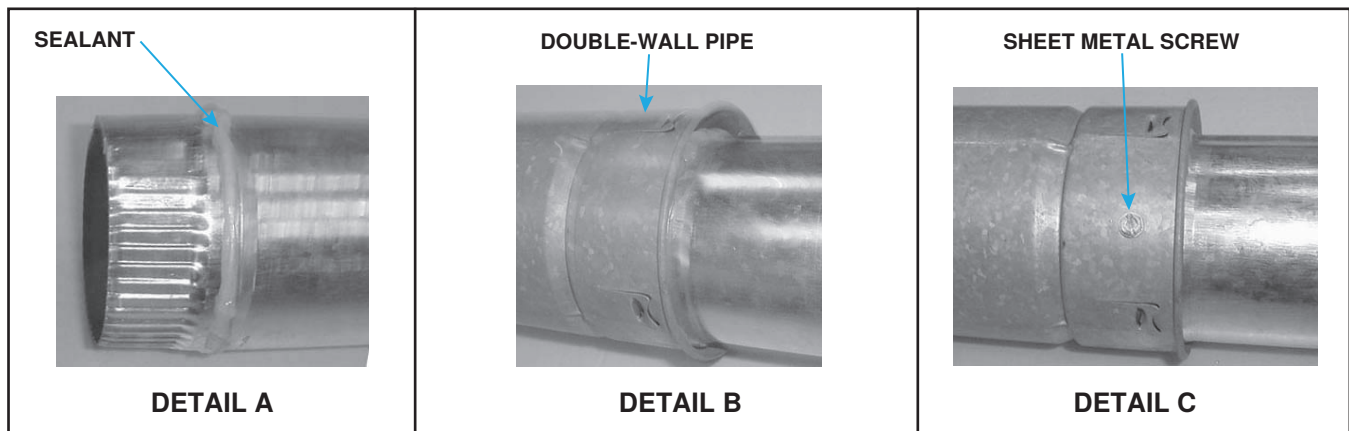


Figure 17. Connecting Double-Wall (Type B) Pipe to Single-Wall or Category III Vent Pipe

INSTALLATION—CONTINUED

Vent Connections—Continued

Vent Termination Clearances

⚠ DANGER ⚠

- 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 ⚠

- 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.

NOTE: HORIZONTAL VENT TERMINATIONS: The location of the termination of the horizontal vent system must be in accordance with *National Fuel Gas Code (Z223.1)*. Local codes supersede all provisions in these instructions and in the *National Fuel Gas Code*.

Ensure that distance of vent termination from adjacent public walkways and buildings and window and building openings complies with local codes. Absent any local codes, distance must comply with *National Fuel Gas Code (Z223.1)*. Refer to [Table 11](#) to ensure that horizontal vent terminal location complies with minimum clearance requirements.

Table 11. Minimum Clearance Requirements for 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.	

Duct Connections

⚠ CAUTION ⚠

Joints where ducts attach to furnace must be sealed securely to prevent air leakage into burner rack area. Leakage can cause poor combustion, poor performance, and pilot problems and can shorten heat exchanger life.

NOTE: Make adjustments to ductwork as necessary to obtain a temperature rise and static pressure within the ranges specified on the heater rating plate.

Ductwork Requirements

- **Type:** the type of duct installation to be used depends in part on the construction type of the roof (wood joist, steel bar joist, steel truss, or pre-cast concrete) and ceiling (hung, flush, etc.).
- **Material:** rectangular duct should be constructed of not lighter than #26 US gauge galvanized iron or #24 B&S gauge aluminum.
- **Size:** proper sizing of supply air ductwork is necessary to ensure a satisfactory heating installation. The recognized authority for such information is the Air Conditioning Contractors Association, 2800 Shirlington Road, Suite 300, Arlington, VA 22206 (www.acca.org). A manual covering duct sizing in detail may be purchased directly from them.
- **Structure:** all duct sections 24 inches (610 mm) or wider and over 48 inches (1,219 mm) in length should be cross-broken on top and bottom and should have standing seams or angle-iron braces.
- **Joints:** should be S and drive strip or locked.
- **Ductwork through masonry walls:** no warm air duct should come in contact with masonry walls. Insulate around all air ducts through masonry walls with not less than 1/2 inch (1 inch is recommended) of insulation.
- **Ductwork through unheated space:** insulate all exposed warm air ducts passing through an unheated space with at least 1/2 inch (1 inch is recommended) of insulation.
- **Supports:** suspend all ducts securely from buildings members. Do not support ducts from unit duct connections.
- **Removable panels:** ducts should have removable access panels on both upstream and downstream sides of the furnace. These openings must be accessible when the furnace is in service and should be a minimum of 6 × 10 inches in size so smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. The covers for the openings must be attached in such a manner as to prevent leakage (refer to [Ductwork-to-Furnace Connections](#) section).
- **Supply air duct/furnace horizontal connection:** the seal between the furnace and the duct must be mechanical. The connection should be made using U-type flanges on the top and bottom of the connecting duct. Slide the duct over the flanges of the heater to provide an airtight fit. Provide U-channels for the other side flanges to ensure tight joints. Use sheet metal screws to fasten ducts and U-channels to the furnace flange (refer to [Ductwork-to-Furnace Connections](#) section).

INSTALLATION—CONTINUED

Duct Connections—Continued

Ductwork Requirements—Continued

- **Connection dimensions:** connection dimensions (inches (mm)) are shown in [Figure 18](#) and listed in [Table 12](#).

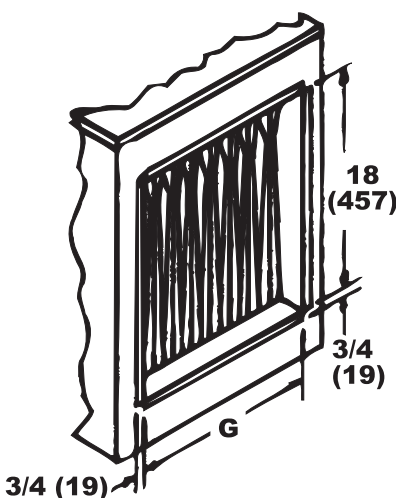


Figure 18. Ductwork Connection Dimensions (Refer to [Table 12](#))

Table 12. Ductwork Connection Dimensions		
Unit Size (MBTUh)	Dimension G*	
	Inches	Millimeters
75, 100	12-1/2	318
125, 140	15-1/4	387
170	18	457
200	20-3/4	527
225	23-1/2	597
250	26-1/4	641
300	31-3/4	806
350	37-1/4	946
400	42-3/4	1086

*See [Figure 18](#).

Discharge Air Temperature Sensor Installation

Depending on the gas control option, the discharge air temperature sensor is either factory- or field-installed. Field-installed sensors have one of two configurations: a sensor and mixing tube assembly or a sensor holder and junction box assembly. For units with the sensor holder and junction box assembly option, the sensor is normally installed on a bracket in the furnace discharge for shipping but it may be mounted in the cabinet leg (see [Figure 19](#)).

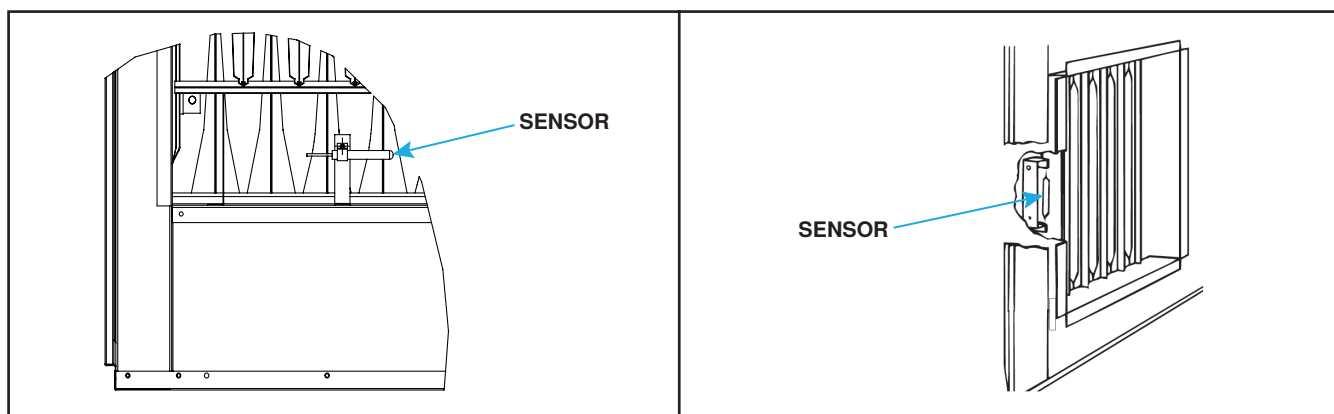


Figure 19. Shipping Locations of Capillary Sensor

NOTE: According to the latest edition of AMCA Standard 201, in straight ducts, the air is typically well mixed a minimum of five equivalent duct diameters from the discharge of the unit with equivalent duct diameter defined as equal to the square root of $4AB/3.14$ (A and B are duct cross-sectional dimensions). If the length of the discharge duct is less than 8 feet (2.4 meters), a mixing vane is recommended for mixing the discharge air. Do not mount the sensor in the ductwork after a split in the supply as this will cause loss of control in the duct that does not house the sensor.

1. Determine distance of sensor from unit:
 - a. Locate the sensor a minimum of 96 inches (2,435 mm) from the outlet of the unit. Ensure that there is sufficient distance from outlet to have good mixture of discharge air temperature.
 - b. Refer to following formula for calculating sensor placement—this assumes cross-sectional dimensions for supply ductwork of 24 × 12 inches (610 × 305 mm):

$$5 \text{ equivalent duct diameters} \times \sqrt{\frac{4 \times 12 \times 24}{3.14}} = 96 \text{ inches}$$

$$5 \text{ equivalent duct diameters} \times \sqrt{\frac{4 \times 305 \times 610}{3.14}} = 2435 \text{ millimeters}$$

2. Determine orientation of sensor:
 - a. In horizontal ductwork, position sensor in top-middle of duct with sensor probe extending vertically down into center of air stream.
 - b. In vertical ductwork, position sensor in middle of duct that corresponds with top-middle of discharge outlet.

NOTE: Position of sensor in duct is important—mixing tube is 12 inches (305 mm) long and sensor holder extends 9-3/16 inches (233 mm) into ductwork.

3. Secure sensor in ductwork:
 - a. For units with sensor and mixing tube assembly (see [Figure 20](#)), remove ductwork access panel, slide mixing tube into ductwork, and secure sensor.

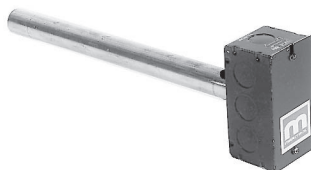


Figure 20. Sensor and Mixing Tube Assembly

INSTALLATION—CONTINUED

Duct Connections—Continued

Discharge Air Temperature Sensor Installation—Continued

NOTE: For the capillary sensor, select a ductwork location so that the minimum length of capillary tubing will be inside the ductwork. Because the sensor is larger than the tubing, a gasket and gasket retainer plate are provided to plug the hole and to protect the capillary tubing where it passes through the ductwork. Two field-supplied sheet metal screws are needed to secure the plate.

- b. For units with sensor holder and junction box assembly option (see [Figure 21](#)):

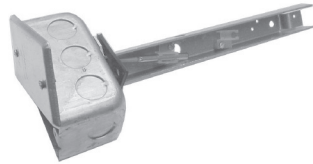


Figure 21. Sensor Holder and Junction Box Assembly

- (1) Before connecting ductwork to furnace, remove capillary sensor from its shipping position on furnace (see [Figure 19](#)).
- (2) At selected ductwork location, mark and cut 1/2-inch hole that will be sealed with gasket and retainer plate (see [Figure 22](#)). Push sensor and capillary tubing through hole.

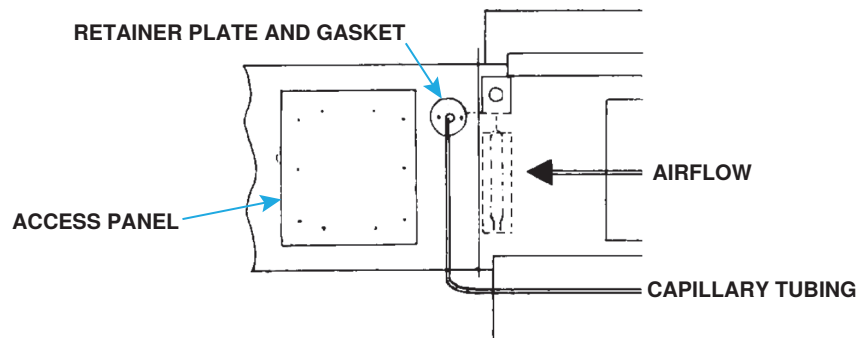


Figure 22. Capillary Sensor Installation

- (3) Remove ductwork access panel (see [Figure 22](#)) and install sensor in sensor holder so that it senses air temperature as it flows through holes in holder.
- (4) Position sensor holder and junction box assembly inside ductwork so that sensor will be shielded from direct airflow and secure junction box to ductwork using four field-supplied #6 sheet metal screws.
- (5) Slide gasket (cut slit) and retainer plate over capillary tubing. With gasket next to ductwork, install hole retaining plate and secure using field-supplied sheet metal screws.
- (6) Close ductwork access panel.

NOTE: Ensure that all sensor wires are connected in accordance with the wiring diagram provided with the unit.

4. Connect sensor wire(s)—for units with sensor holder and junction box assembly, remove junction box knockout and connect sensor wire using field-supplied cable connector secured to box.

Duct Furnace Airflow

- The duct furnace must be installed on the positive pressure side of the field-supplied blower.
- The air distribution must be even over the entire heat exchanger. Turning vanes should be employed in elbows or turns in the air inlet to ensure proper air distribution (refer to [Duct Furnace Blower Connections](#) section).
- The air throughput must be within the CFM range stated on the heater rating plate.
- If it is determined that the blower CFM is greater than allowed or desirable, refer to the [Bypass Duct Construction](#) section for instructions on determining the correct size of bypass duct required or refer to the [High CFM Conversion](#) section for instructions on converting the furnace for a higher CFM application.
- To determine temperature rise, the inlet and outlet air temperatures should be measured at points not affected by heat radiating from the heat exchanger. [Table 13](#) lists the approved temperature rise range with the required CFM and the internal pressure drop for each size of unit.

Table 13. Temperature Rise, CFM, and Internal Pressure Drop											
Temp- erature Rise	Unit Size (MBTUh)										
	75	100	125	140	170	200	225	250	300	350	400
	CFM/Pressure Drop (IN WC)										
80% Thermal Efficient											
50°F	1105/0.24	1475/0.43	1840/0.49	2065/0.65	2505/0.67	2945/0.67	3315/0.69	3685/0.67	4420/0.70	5160/0.75	5895/0.77
60°F	920/0.16	1225/0.30	1535/0.33	1720/0.43	2085/0.46	2455/0.46	2765/0.47	3070/0.45	3685/0.47	4300/0.52	4915/0.52
70°F	790/0.10	1050/0.21	1315/0.25	1475/0.32	1790/0.33	2105/0.35	2370/0.36	2630/0.34	3160/0.35	3685/0.38	4210/0.38
80°F	695/0.07	920/0.16	1150/0.20	1290/0.24	1565/0.25	1840/0.26	2070/0.27	2300/0.26	2765/0.27	3225/0.28	3685/0.28
90°F	615/0.05	815/0.12	1020/0.17	1145/0.20	1390/0.19	1635/0.20	1840/0.21	2045/0.20	2455/0.22	2865/0.23	3275/0.22
With Finger Baffles Removed											
20°F	2765/0.60	3685/1.09	4605/1.14	5160/1.50	6265/1.64	7370/1.64	8295/1.69	9215/1.67	11,060/1.64	12,900/1.64	14,745/1.64
30°F	1840/0.28	2455/0.50	3070/0.52	3440/0.66	4175/0.73	4915/0.73	5530/0.75	6140/0.72	7370/0.73	8600/0.73	9830/0.73
40°F	1380/0.16	1840/0.28	2300/0.27	2580/0.36	3130/0.38	3685/0.39	4145/0.40	4605/0.40	5530/0.39	6450/0.40	7370/0.38
50°F	1105/0.12	1475/0.18	1840/0.18	2065/0.22	2505/0.24	2945/0.24	3315/0.26	3685/0.24	4420/0.24	5160/0.25	5895/0.24
60°F	920/0.10	1225/0.13	1535/0.14	1720/0.17	2085/0.17	2455/0.17	2765/0.18	3070/0.17	3685/0.17	4300/0.18	4915/0.17
65°F	850/0.08	1130/0.11	1415/0.12	1585/0.15	1925/0.14	2265/0.14	2552/0.15	2835/0.14	3400/0.14	3970/0.15	4535/0.15
70°F	—	—	—	—	1790/0.12	2105/0.12	2370/0.13	2630/0.11	3160/0.12	3685/0.13	4210/0.13

Duct Furnace Blower Connections

⚠ WARNING ⚠

The furnace must be installed on the positive pressure side of the air-circulating blower.

- Blowers should be bottom horizontal discharge when coupled to the duct furnace.
- When a top horizontal discharge blower is connected to the duct furnace, ensure that sufficient length of duct is provided to permit even flow of air at the end of the duct. Or, baffles may be inserted between the blower and the heater to assure an even flow of air across the heat exchanger.
- Proper arrangements of blower and duct furnace with respect to angle of approach of the duct connection and the arrangement of the discharge opening of the blower are shown in [Figure 23](#).

INSTALLATION—CONTINUED

Duct Connections—Continued

Duct Furnace Blower Connections—Continued

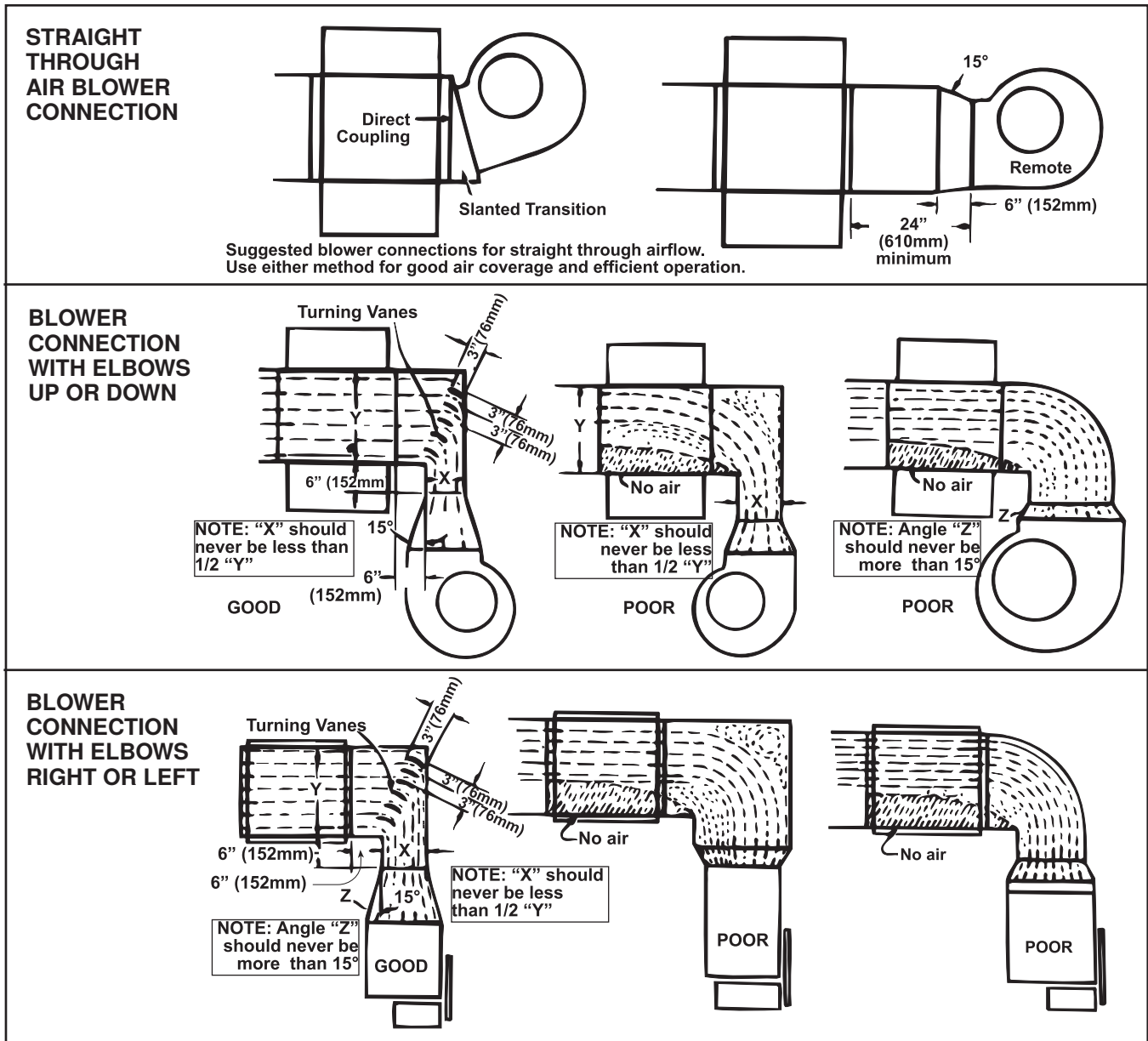


Figure 23. Duct Furnace Blower Connections

Bypass Duct Construction

When the air throughput CFM is greater than desirable or permissible for the unit, a bypass duct (see [Figure 24](#)) may be constructed. Locate the bypass duct on the side of the furnace opposite the controls and 2 inches from the heat exchanger side panel. Extend the bypass duct 18 inches (457 mm) beyond the furnace on both the inlet and outlet ends. Determine the correct size of the bypass duct as follows:

1. Refer to [Table 13](#) to determine pressure drop and allowable CFM for furnace being installed. For example: unit size **170 @ 70°F** temperature rise = pressure drop of **0.33** and CFM of **1,790**.
2. Subtract allowable CFM from blower CFM to determine how much air must be diverted through bypass duct. For example: blower CFM of **3,000** – allowable CFM of **1,790** = bypass CFM of **1,210**.
3. Refer to [Table 14](#) to determine bypass duct size as follows:
 - a. Go to column closest to pressure drop through heater.
 - b. Move down to CFM closest (round up) to CFM determined in step 2.
 - c. Move to left column to determine required bypass duct size. For example: in pressure drop column **0.35**, move down to bypass CFM row **1,520** and move left to dimension A column **5 inches**.

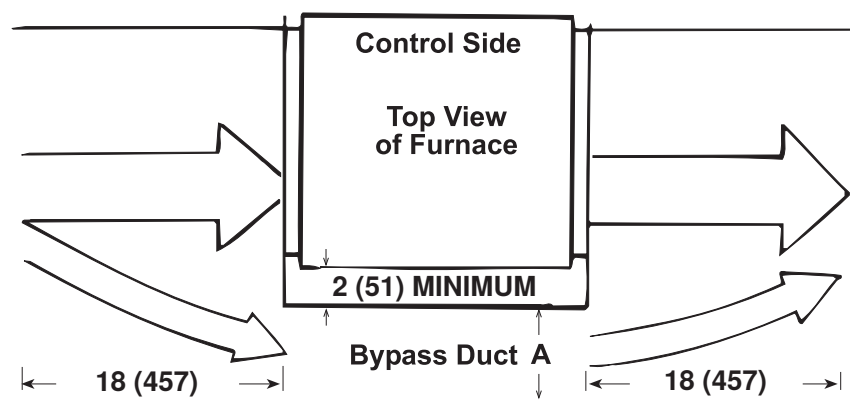


Figure 24. Bypass Duct Dimensions

Table 14. Bypass Duct Size									
Dimension A* (Inches (mm))	Pressure Drop Through Furnace								
	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50
	Bypass CFM								
3 (76)	490	530	610	700	780	830	900	960	1010
4 (102)	630	750	870	980	1090	1160	1250	1310	1400
5 (127)	850	1010	1190	1300	1410	1520	1640	1730	1810
6 (152)	1050	1290	1480	1650	1800	1940	2090	2200	2320
7 (178)	1250	1510	1760	1960	2180	2320	2500	2650	2800
8 (203)	1490	1810	2100	2350	2560	2760	2940	3110	3290
9 (229)	1700	2100	2400	2700	2970	3200	3400	3600	3800
10 (254)	1920	2350	2760	3090	3650	4020	4300	4550	4800

*See [Figure 24](#).

NOTE: Not all capacities are covered above. If your installation is not covered, consult your distributor or the factory representative to determine the appropriate size of the bypass duct.

INSTALLATION—CONTINUED

Duct Connections—Continued

Ductwork-to-Furnace Connections

See [Figure 25](#), DETAIL A for numbers that refer to the following steps to connect the ductwork to the furnace:

1. Install flanges on heater turned out as shown.
2. Shape duct connection with U-channel on top and bottom and L-channel on sides as shown.
3. Slide U-channel over heater flange to make connection as shown.
4. Form U-strips to seal ends as shown. Drill fastener holes and secure using sheet metal screws.

NOTES:

- To prevent leakage, ensure that duct joints are sealed as shown in [Figure 25](#), DETAIL B.
- The seals between the furnace and the duct must be mechanical U-channels as shown in [Figure 25](#), DETAIL C.

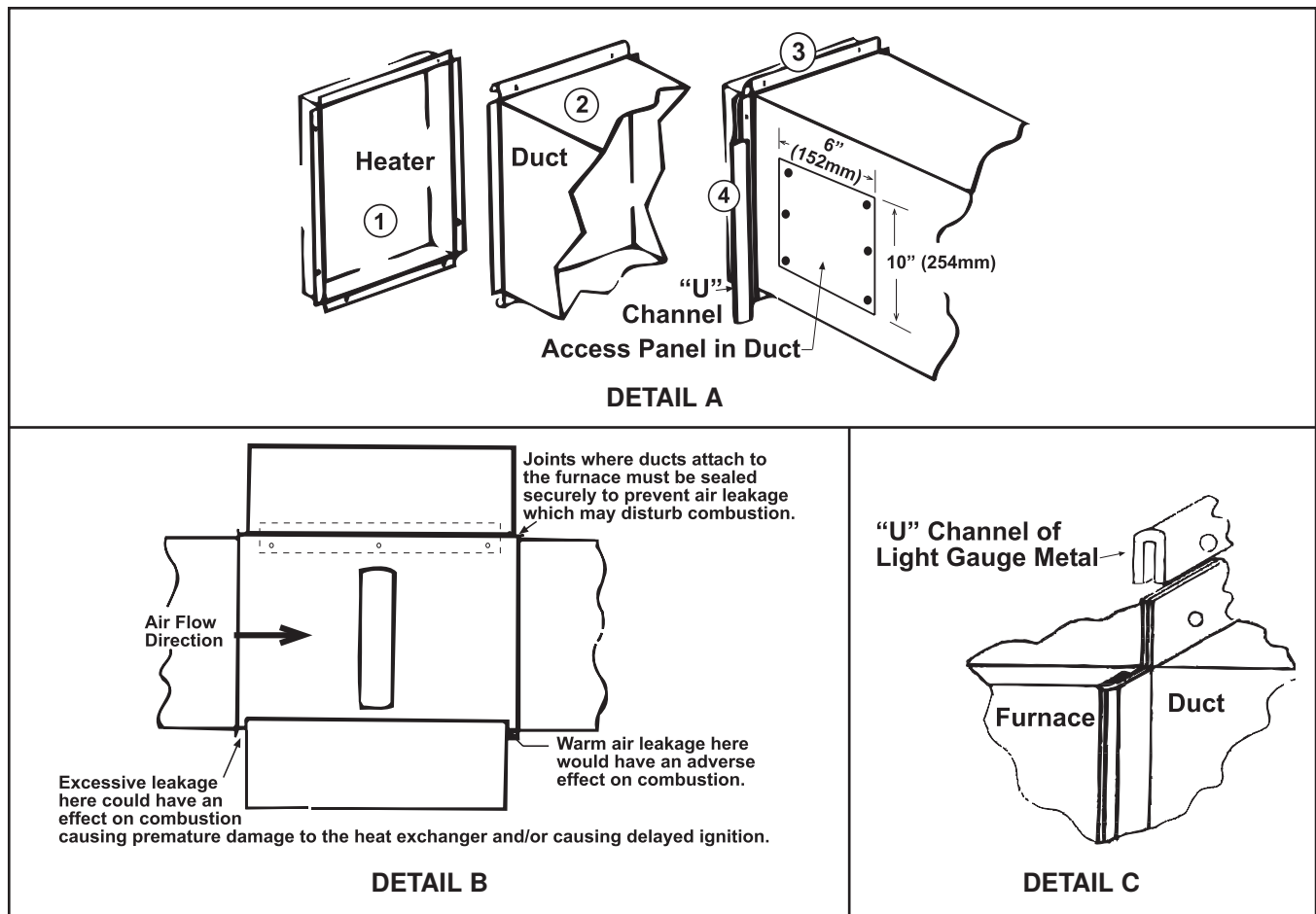


Figure 25. Connecting Ductwork to Furnace

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 (units with electronic modulation may require a minimum of 6 IN WC) 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.**

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.**
- Duct furnaces are orificed for operation with natural gas having a heating value of 1,000 (±50) BTU per cubic foot or with propane gas having a heating value of 2,500 (±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 1,000 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 15](#). When sizing supply lines, consider the possibility of future expansion and increased requirements. Refer to the *National Fuel Gas Code* for additional information on line sizing.

INSTALLATION—CONTINUED

Piping Connections—Continued

Gas Supply Piping—Continued

Table 15. 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.

Connect the gas supply piping as follows (see [Figure 26](#)):

1. Make 1/2-inch gas connection (3/4-inch for unit size 300, 350, and 400 natural gas units) at pipe nipple that extends outside cabinet using ground joint union.
2. Seal opening for gas supply pipe with grommet provided.
3. Install manual shutoff valve upstream of unit control system. Manual shutoff valve's 1/8-inch plugged tapping provides connection for supply line pressure test gauge.
4. Install minimum 3-inch sediment trap (typically 6 inches).
5. Bleed trapped air from gas lines as needed.
6. Leak test all connections using leak detecting solution.

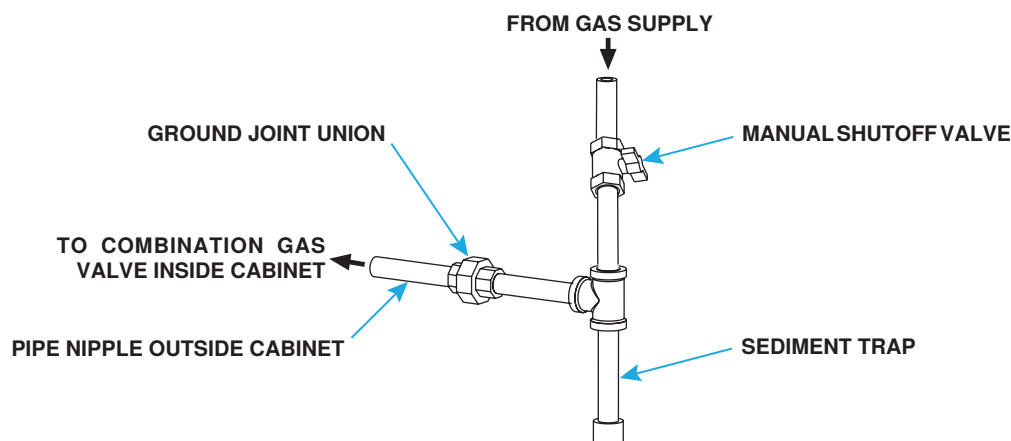


Figure 26. Gas Connections

Condensate Drain Kit (Option CS1) Installation

A furnace installed downstream from a refrigeration or makeup air system requires a condensate drain to dispose of any condensation that may form. Install the condensate drain kit as follows:

1. Using waste nut (see [Figure 27](#)) as template, drill three holes—one 3/4-inch drain hole and two 1/4-inch fastener holes in furnace cabinet's bottom pan.

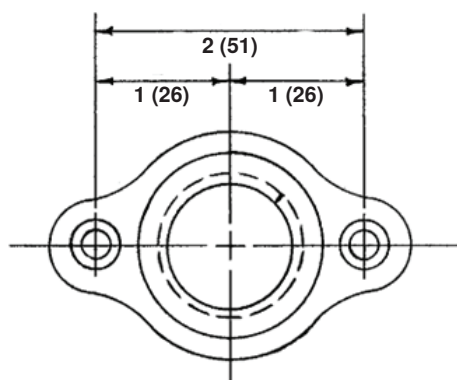


Figure 27. Waste Nut

2. Apply RTV sealant from kit to waste nut and bottom pan and secure waste nut to bottom pan using two machine screws and hex nuts from kit.

NOTE: A 4-inch (102-mm) minimum clearance is required under the furnace if a 90-degree elbow is used.

3. Thread 3/4-inch field-supplied PVC drain pipe into waste nut and terminate drain outside of building. Provide trap to prevent air from entering combustion zone.
4. Seal drain pipe and corners and openings in bottom pan using RTV sealant.

NOTE: Periodic cleaning of the condensate collector and disposal system is required.

Electrical Connections

⚠ WARNING ⚠

- If you turn OFF the electrical power supply, turn OFF the gas.
 - All electrical wiring and connections, including electrical grounding, **MUST** be completed in accordance with local, state, and national codes and regulations and with the *National Electric Code* (ANSI/NFPA 70) or in Canada with the *Canadian Electrical Code* (Part 1 CSA C.22.1).
 - The installer should be aware of any local ordinances or gas company requirements that might apply.
-

⚠ CAUTION ⚠

If any of the unit's original wire must be replaced, it must be replaced with wiring material having a temperature rating of at least 220°F (105°C), except for sensor lead wires, which must be 302°F (150°C).

NOTE: Specific wiring diagrams that include standard and factory-installed options are provided with the unit. Ensure that all wiring is in accordance with these wiring diagrams.

INSTALLATION—CONTINUED

Electrical Connections—Continued

- Check the rating plate on the heater for the supply voltage and current requirements.
- A separate line voltage supply with fused disconnect switch should be run directly from the main electrical panel to the furnace, making connection to leads in the junction box.
- The disconnect switch is a required part of this installation. Switches are available, as options or parts, or may be purchased locally. When ordered as an optional component, the disconnect switch is shipped separately.
- The disconnect switch may be fusible or non-fusible. When installing the disconnect switch, ensure that the conduit and switch housing are clear of furnace panels and inspection plates. Allow at least 4 feet (1.2 meters) of service room between the switch and removable panels.
- All external wiring must be within approved conduit and have a minimum temperature rise rating of 140°F (60°C). Conduit from the disconnect switch must be run so as not to interfere with the service panels of the furnace.

Electrical Connections for Field-Installed Options

⚠ WARNING ⚠

If you turn OFF the electrical power supply, turn OFF the gas.

For field-installed options that require electrical connections in the electrical box (see [Figure 28](#)), refer to the instruction sheet and wiring diagram provided in the option package.

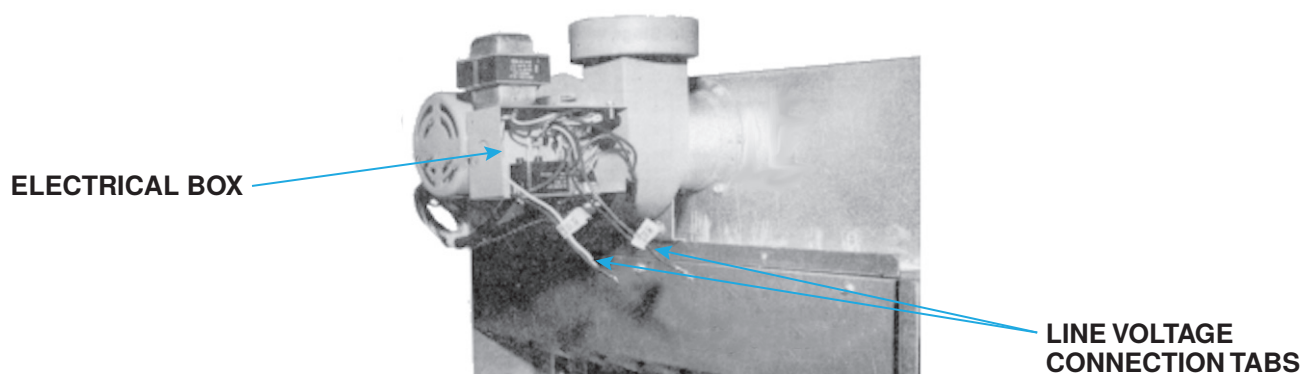


Figure 28. Wiring Field-Installed Options

Thermostat Installation

⚠ CAUTION ⚠

If applicable, ensure that the thermostat has an adequate VA rating for the total requirements. Add the coil ratings of all relays and match the thermostat rating.

- A thermostat is not standard equipment but is an installation requirement. Use either an optional thermostat available with the heater or a field-supplied thermostat. Install according to the thermostat manufacturer's instructions.
- A 24-volt thermostat must be used to actuate low voltage gas controls. If line voltage from the thermostat to the unit is desired, consult the factory representative.
- Labeled thermostat leads are provided in the heater junction box for connection of thermostat wiring.
- Thermostats should be located 5 feet (1.5 meters) above the floor on an inside wall—not in the path of warm or cold air currents and not in corners where air may be pocketed.

- DO NOT install thermostat on cold air walls. For specific connection details, refer to instructions with the thermostat.
- If more than one unit is cycled from one thermostat, separately-activated relays must be substituted at unit thermostat connections.
- If using a low voltage thermostat with a heat anticipator, set the anticipator at full load control amps.

CONTROLS

Standard Controls

Combustion Air Proving Switch

⚠ DANGER ⚠

Safe operation of this unit requires proper venting flow. NEVER bypass the combustion air proving switch or attempt to operate the unit without the venter running and proper flow in the vent system. Hazardous conditions could result.

- The combustion air proving switch is a pressure-sensitive switch that monitors air pressure to ensure that proper combustion airflow is available. The switch is a single-pole normally-open device that closes when a decreasing pressure is sensed in the outlet duct of the flue gas collection box.
- At startup when the heater is cold, the sensing pressure is at the most negative level. As the heater and flue system warm up, the sensing pressure becomes less negative. After the system has reached equilibrium (about 20 minutes), the sensing pressure levels off.
- If a restriction, excessive flue length, or turns cause the sensing pressure to become less than the switch setpoint, the pressure switch will function to shut off the main burners. The main burners will remain off until the system has cooled and/or the flue system resistance is reduced. [Table 16](#) lists the approximate water column negative pressure readings and switch setpoints for sea level operating conditions.

Table 16. Pressure Switch Sea Level Operating Conditions	
Operating Condition	Pressure Reading (IN WC)
Startup cold	-1.00
Equilibrium	-0.60
Setpoint OFF	-0.48
Setpoint ON	-0.65

Limit Switch

- A non-adjustable high limit switch mounted at the outlet air side of the heat exchanger acts to shut off the gas supply in the event of air handler motor failure, lack of correct airflow (refer to [Duct Furnace Airflow](#) section), or restriction due to filters and/or duct design.
- Depending on accessibility, the limit switch may be serviced from either outside the unit or inside through the access panel in the discharge duct (see [Figure 29](#)). When units are installed side by side, the service access panel must be in either the top or bottom of the ductwork for limit switch service (refer to [Coupling Additional Furnaces Together](#) and [Ductwork Requirements](#) sections).

CONTROLS—CONTINUED

Standard Controls—Continued

Limit Switch—Continued

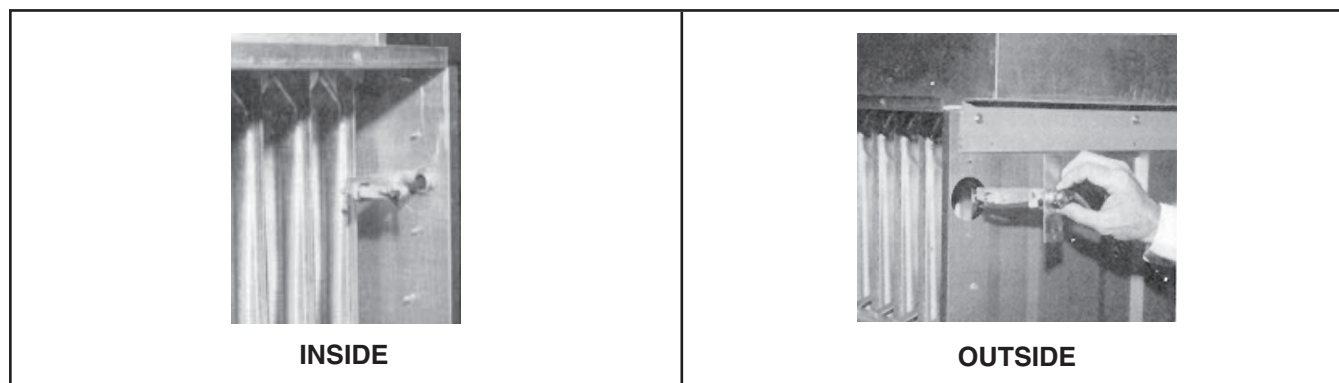


Figure 29. Limit Switch Access

Fan Control

- The fan control is a field-installed option that is required with makeup air gas control options.
- The fan control provides delay of fan operation preventing circulation of cold air and fan operation as long as the unit is hot. The fan control provides additional safety by keeping the fan in operation in the event that the gas valve fails to close when the thermostat is satisfied.
- To ensure that the fan can continue to operate, the power supply to the heater **MUST NOT** be interrupted except when servicing the heater.
- Install the fan control as follows (see [Figure 30](#), DETAIL A):

⚠ WARNING ⚠

If you turn OFF the electrical power supply, turn OFF the gas.

- a. Drill four 1/8-inch (3-mm) mounting holes and one 13/16-inch (20.6-mm) hole for element.
 - b. Install gasket provided supplied in fan option kit between fan control and duct.
 - c. Secure fan control using four screws.
- See [Figure 30](#), DETAIL B for the installation of option CQ1 fan control kit (PN 57960):
 - a. Fan control is Honeywell #L4064A1347 (PN 147611).
 - b. Larger motors or 3PH require use of contactor or starter.
 - c. Recommended dial setting for most conditions is 130°F (54.44°C) ON and 100°F (37.78°C) OFF.
 - d. Conduit is field-supplied for wiring fan control to field-supplied blower.
 - For proper operation, ensure that fan control wiring is in accordance with [Figure 31](#) and the [Electrical Connections for Field-Installed Options](#) section.
 - If the heater is to be turned off at night, the gas valve circuit **SHOULD BE OPENED** by a single-pole switch wired in series with the thermostat. Some thermostats are provided with this feature. Multiple units controlled from a single thermostat are turned off in the same manner.

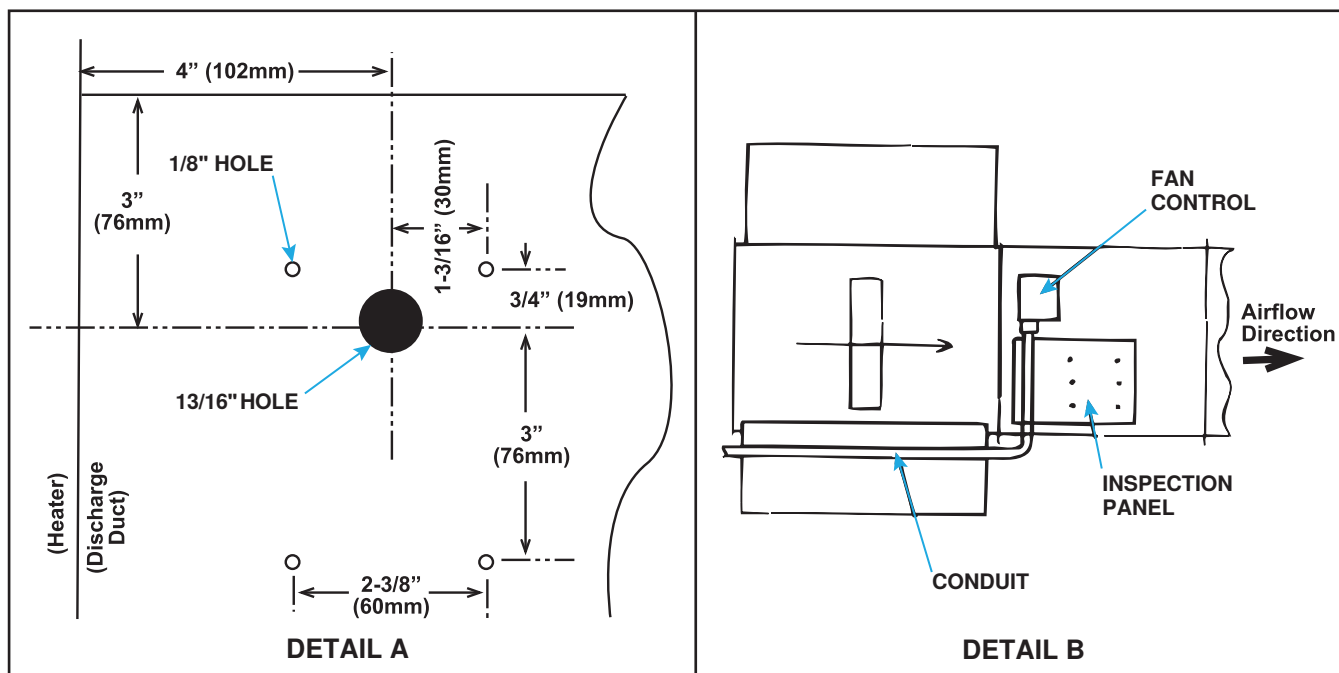


Figure 30. Fan Control Installation

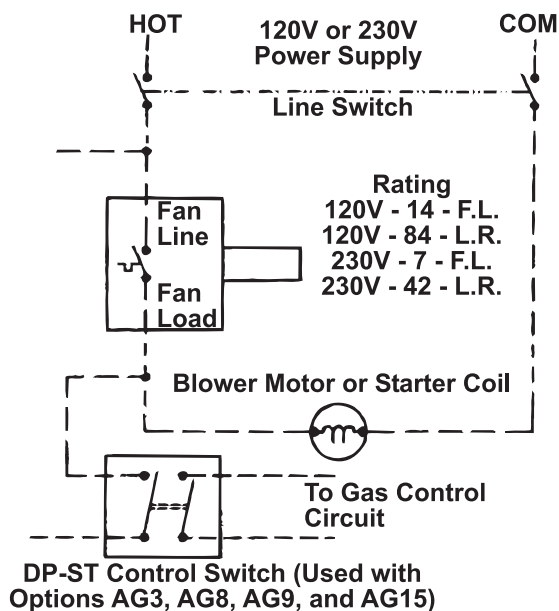


Figure 31. Typical Fan Control Wiring Diagram

Combination Gas Valve

⚠ WARNING ⚠

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

All furnaces are equipped with a 24V combination gas valve that includes an automatic electric ON-OFF valve controlled by the room thermostat, a pressure regulator, and a manual shutoff valve. The standard combination gas valve allows for single-stage control from a single-stage, 24V thermostat.

CONTROLS—CONTINUED

Standard Controls—Continued

Pilot and Ignition System

- **Gas-fired intermittent pilot is standard:** The vertical pilot is located under the aeration panel on the control end of the burner tray and is accessible only after the burner rack has been removed. Remove the pilot for maintenance or service, such as checking the wiring and cleaning (refer to **Burner Air Adjustment (Propane Units Only)** section). Pilot is target type with lint-free feature. Pilot gas pressure should be the same as supply line pressure (refer to **Gas Supply Pressure** section). If required, adjust the pilot adjustment screw in the control valve body so that pilot flame length is approximately 1-1/4 inches.
- **Intermittent spark ignition safety pilot system:** There are two types of intermittent spark pilots: one type shuts off the pilot gas flow between the cycles and the other not only shuts off the pilot gas flow between cycles but also has a lockout device that stops the gas flow to the pilot if the pilot fails to light in 120 seconds. The lockout feature has a 1-hour retry or requires manual reset by interruption of the control circuit. Propane units require the spark ignition with lockout.
- **Ignition controller:** As part of the intermittent safety pilot systems, the ignition controller provides the high voltage spark to ignite the pilot gas and also acts as the flame safety device. After ignition of the pilot gas, the ignition controller electronically senses the pilot flame. A low voltage DC electrical signal is imposed on the separate metal probe in the pilot assembly. The metal probe is electrically insulated from ground. The pilot flame acts as a conduction path to ground that completes the DC circuit and proving pilot flame. With pilot flame proven, the ignition controller energizes the main gas valve.

WARNING

Do not touch pilot spark wire and pilot electrode when energized due to high voltage.

NOTE: When checking for spark with the pilot burner removed from the burner rack, the pilot assembly must be grounded to the heater for proper spark.

- **If no spark, check the following:**
 - a. Using microammeter, measure voltage between terminals TH and 7 on ignition controller. Voltage should be at least 20V and no higher than 32V. Refer to **TROUBLESHOOTING** section if no voltage is observed.
 - b. Check for short to ground in high tension lead and/or ceramic insulator.
 - c. Verify that pilot spark gap (see **Figure 32**) is approximately 0.100 inch (2.5 mm).
 - d. If the above conditions are normal and no spark occurs, replace the ignition controller.

NOTE: If replacing an obsolete ignition controller (see **Figure 33**), order a replacement kit: PN 257472 for a unit with option AH2 (UTEC MODEL 1003-638A, PN 257009) or PN 257473 for a unit with option AH3 (UTEC MODEL 1003-514, PN 257010). Option codes are listed on the unit wiring diagram.

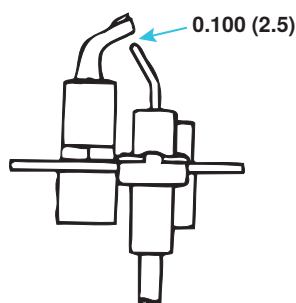


Figure 32. Pilot Spark Gap

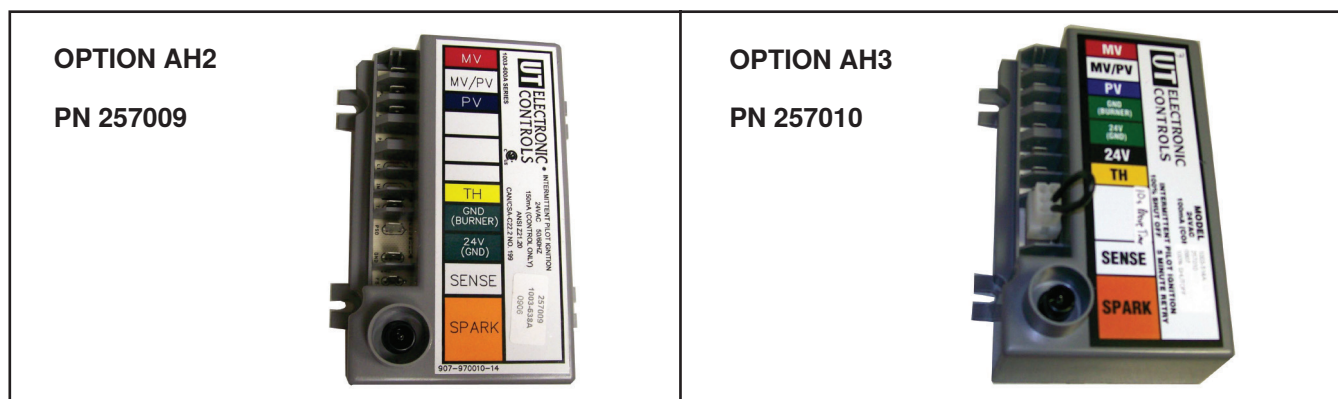


Figure 33. Obsolete Ignition Controllers

Optional Controls

Two-Stage Heating Control (Option AG2)

NOTE: Option AG2 is not available on unit size 75 propane models.

The standard combination gas valve is replaced with a two-stage combination gas valve that provides for low fire or high fire operation controlled by a two-stage thermostat. First stage (low fire) is factory-set (not field-adjustable). Both high and low stages are controlled by a Servo regulator, that maintains a constant gas input under wide variations in gas supply pressure. Refer to the instructions provided with the unit for specific gas valve specifications, wiring, and operating instructions.

Two-Stage Makeup Air Control (Options AG3 and AG15)

NOTE: The makeup air option requires a field-installed fan control (refer to [Fan Control](#) section). Options AG3 and AG15 are not available on unit size 75 propane models.

Two-stage makeup air units are equipped with a two-stage gas valve, but instead of control from a two-stage room thermostat, the outlet air temperature is monitored and controlled by a two-stage ductstat. When discharge air temperature drops to the setpoint, low fire is energized. If low fire cannot satisfy the ductstat setting, high fire is energized. Makeup air applications are usually adjusted to maintain discharge air temperature between 65°F (18.3°C) and 75°F (23.9°C). In all applications, the allowable temperature rise of the furnace in the installation dictates the limits of the ductstat temperature setting. Depending on the option selection, the sensor is either connected by capillary tubing to the unit-mounted ductstat or electrically-connected to a remote temperature selector. Refer to the [Discharge Air Temperature Sensor Installation](#) section for instructions on locating the sensor in the ductwork.

CONTROLS—CONTINUED

Optional Controls—Continued

Two-Stage Makeup Air Control (Options AG3 and AG15)—Continued

- **Ductstat with capillary tubing (option AG3):** The unit-mounted ductstat (see [Figure 34](#)) has an adjustable range of 0°F to 100°F (–17.8°C to 37.8°C) with a fixed differential of 3°F (1.7°C). The sensor is factory-set at 70°F (21.1°C). Due to different CFM settings and outside air temperatures, the average downstream outlet temperature may not match the ductstat setting exactly. After the installation is complete, adjust the setpoint of the ductstat to achieve the desired average outlet air temperature..

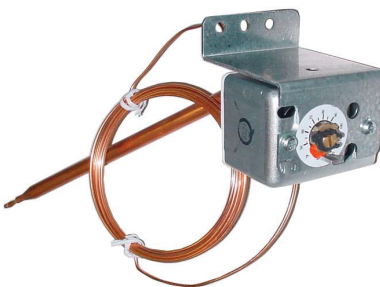


Figure 34. Unit-Mounted Ductstat

⚠ CAUTION ⚠

DO NOT wire the remote temperature selector to the control transformer on the furnace.

- **Ductstat with electronic remote temperature selector (option AG15):** Follow the wiring diagram provided with the unit and the manufacturer's instructions for wiring and installing the WiFi-capable remote temperature selector (see [Figure 35](#)). An expansion module is available as needed. After the installation is complete, adjust the selector to achieve the desired average outlet air temperature.



Figure 35. Remote Temperature Selector

Electronic Modulation (Options AG7, AG8, AG9, and AG21)

NOTE: These options require the option CQ1 field-installed fan control (refer to [Fan Control](#) section).

The type and capability of the electronic modulation system, depends on the option selected. Depending on the heat requirements as established by the thermistor sensor, the burner modulates between 100% and 50% firing. The thermistor is a resistor that is temperature sensitive in that as the surrounding temperature changes, the ohms resistance changes through the thermistor. This change is monitored by the solid state control center (amplifier) (see [Figure 36](#)) that furnishes varying DC current to the modulating valve to adjust the gas input. The amplifier is shipped separately for field-mounting. Each modulating valve is basically a regulator with electrical means of raising and lowering the discharge pressure. When no DC current is fed to this device, it functions as a gas pressure regulator, supplying 3.5 IN WC pressure to the main operating valve.

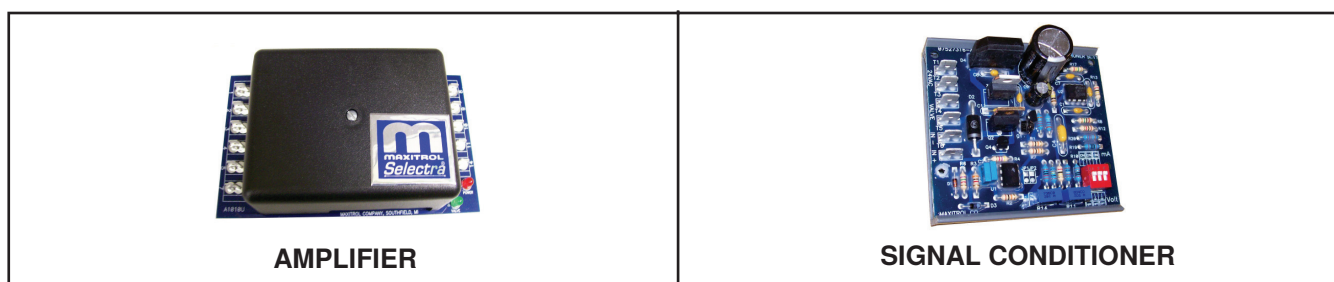


Figure 36. Maxitrol Amplifier and Signal Conditioner

- **Electronic modulation between 50% and 100% firing rate (option AG7):** Electronic modulation for heating that is controlled by a specially-designed room thermostat (60–85°F (15.6–29.4°C)).
- **Electronic modulation between 50% and 100% firing rate (option AG8):** Electronic modulation for makeup air application that is controlled by a duct sensor and temperature selector (55–90°F (12.8–32.2°C)). The temperature selector setting for option AG8 is on the amplifier (see [Figure 36](#)). Option AG8 is available with an override thermostat.

NOTE: Control wires connected to a Selectrstat, a discharge air sensor, a remote temperature selector or sensor, an amplifier, or the valve must not be run close to or inside conduit with power or ignition wires. Doing so may cause the unit to function erratically or may destroy the amplifier. If shielded wires are used, shield must be insulated and grounded at the amplifier location only.

- **Electronic modulation between 50% and 100% firing rate (option AG9):** Electronic modulation for makeup air application that is controlled by a duct sensor and temperature selector (55–90°F (12.8–32.2°C)). Option AG9 has a remote temperature selector and an override thermostat.
- **Electronic modulation between 50% and 100% firing rate (option AG21):** With option AG21, the furnace is equipped with a Maxitrol signal conditioner (see [Figure 36](#)) that operates much the same way as the amplifier above to control the regulator valve. The conditioner accepts an input signal of either 4–20 milliamps or 0–10 volts from a customer-supplied control device such as a computer. With the dip switches on the conditioner in the ON positions, the conditioner accepts a 4–20 milliamp signal. In the OFF positions, the conditioner accepts a 0–10V signal. The conditioner converts the signal to the 0–20 volt DC current required to control the modulating valve.

OPERATION

⚠ DANGER ⚠

- The gas burner in this gas-fired equipment is designed and equipped to provide safe, 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 in the installation codes and in the [Combustion Air Requirements](#) section. 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.** Indoor units installed in a confined space must be supplied with air for combustion as required by code and in the [Combustion Air Requirements](#) section. **MAINTAIN THE VENT SYSTEM IN A STRUCTURALLY-SOUND AND PROPERLY-OPERATING CONDITION.**

OPERATION—CONTINUED

Pre-Startup Checklist

- ☐ Check suspension—unit must be secure and level.
- ☐ Ensure that electrical supply matches voltage rating of furnace as listed on unit rating plate.
- ☐ Ensure that all field wiring is in accordance with wiring diagram.
- ☐ Ensure that wire gauges are as required for electrical load.
- ☐ Ensure that fuses or circuit breakers are in place and are sized correctly.
- ☐ Ensure that clearances from combustibles are in accordance with [Clearances](#) section.
- ☐ If installed in confined space, ensure that furnace has adequate combustion air supply (refer to [Combustion Air Requirements](#) section).
- ☐ Ensure that vent system is installed in accordance with [Vent Connections](#) section.
- ☐ Check piping for proper gas line pressure and for leaks as follows:
 - a. Turn manual shutoff valve OFF.
 - b. Turn gas supply ON.
 - c. Observe gas meter for movement or attach pressure gauge (readable to 0.1 IN WC) and, after turning gas ON for 10 seconds, turn gas supply OFF. No change in pressure should occur over a 3-minute period.
 - d. If leak is indicated, locate leak by brushing leak-detecting solution on all fittings. Bubbles will appear at leak. Repair and repeat test.
- ☐ Bleed gas lines of trapped air (refer to [Supply Piping Connections](#) section).

Startup

Turn ON the electric and gas supply to the furnace. Adjust the thermostat or ductstat so that a call for heat exists. Observe operating sequence listed in [Table 17](#) for complete sequencing of safety pilot and ignition.

Table 17. Operating Sequence	
Operation	Result
1. Set thermostat to lowest setting	—
2. Turn ON power to unit	
3. Turn ON main and pilot manual gas valves	
4. Set thermostat to desired setting	Thermostat calls for heat, which energizes venter motor
	Pressure switch closes, which energizes pilot gas valve and spark gap to produce pilot flame on each operating cycle
	Sensing probe proves presence of pilot flame and energizes safety switch portion of control
	Switch action deenergizes spark gap and energizes main gas valve
	On units with optional fan control, fan control senses heat exchanger temperature, which energizes fan or blower motor of air handler
	If pilot flame is extinguished during main burner operation, sensing probe detects absence of flame and causes safety switch to close main valve
	On units with standard intermittent spark pilot systems, spark gap recycles
	On units with optional spark ignition with lockout, if pilot is not established within timing cycle (approximately 120 seconds), unit locks out and must be reset by interrupting power to control circuit

Post-Startup Checklist

- ❑ With unit in operation, measure manifold gas pressure—pressure for natural gas should be 3.5 IN WC and 10 IN WC for propane gas (refer to [Measure and Adjust Manifold \(Outlet\) Gas Pressure](#) section).
- ❑ Turn unit OFF and ON, pausing two minutes between each cycle—observe for smooth ignition.
- ❑ On two-stage or modulating burner systems, manipulate temperature adjustment slowly up and down to see if control is sequencing or modulating properly—raising temperature setting drives burner ON or to full fire.
- ❑ Observe burner flame at full fire—natural gas flame should be about 1-1/2 inches in height with blue coloring.
- ❑ Propane gas flame at full fire should be about 1-1/2 inches in height with blue coloring. Yellow tipping may appear on propane gas. If yellow extends beyond 1/2 to 3/4 inch, adjust air shutters (refer to [Burner Air Adjustment \(Propane Units Only\)](#) section).
- ❑ Check limit control—with heater on, completely block off distribution air—limit control should open within few minutes, shutting off gas supply to main burners.
- ❑ Place owner's envelope that contains Limited Warranty Card, this manual, and any optional information in accessible location near heater—follow instructions on envelope.

ADJUSTMENTS

The adjustments described in the following paragraphs can be accomplished only after the heater is in operation.

Measure and Adjust Manifold (Outlet) Gas Pressure

NOTE: Always check the rating plate for minimum gas supply pressure.

Minimum supply pressure requirements vary based on the size of the burner and the gas control option. Most units require a minimum of 5 IN WC, but units with electronic modulation may require a minimum of 6 IN WC.

- **For natural gas:** When the heater leaves the factory, the combination valve is set so that the outlet gas pressure of a single-stage valve or high fire of a two-stage valve is regulated to 3.5 IN WC. Low fire on a two-stage valve is set to 1.8 IN WC. Inlet supply pressure to the valve must be a minimum of 5 IN WC or as noted on the rating plate and a maximum of 14 IN WC.
- **For propane gas:** When the heater leaves the factory, the combination valve is set so that the outlet gas pressure of a single-stage valve or high fire of a two-stage valve is 10 IN WC. Low fire on a two-stage valve is set to 5 IN WC. Inlet pressure to the valve must be a minimum of 11 IN WC and a maximum of 14 IN WC.

WARNING

- **Manifold gas pressure must never exceed 3.5 IN WC for natural gas or 10 IN WC for propane gas.**
 - **Before attempting to measure or adjust manifold gas pressure, the inlet (supply) pressure must be within the specified range for the gas being used, both when the heater is in operation and when on standby. Incorrect inlet pressure could cause excessive manifold gas pressure immediately or at some future time.**
-

NOTE: A manometer (fluid-filled gauge) with an inches water column scale is recommended.

ADJUSTMENTS—CONTINUED

Manifold Gas Pressure Measurement and Adjustment—Continued

1. With manual valve (on combination valve) positioned to prevent flow to main burners, connect manometer to outlet pressure tap (see [Figure 37](#)) on valve.

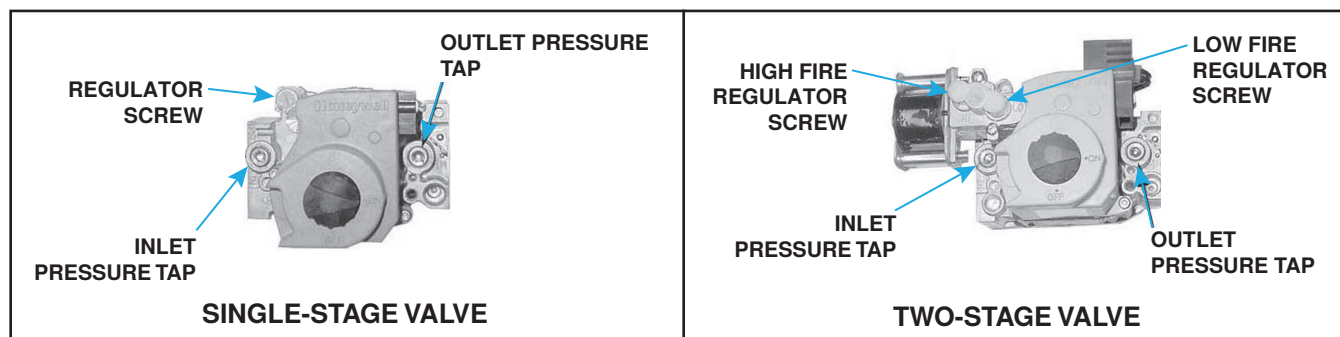


Figure 37. Combination Gas Valves

2. To measure low stage pressure on units equipped with two-stage valve, disconnect wire from HI terminal on valve. Open valve and operate heater and observe manometer reading. Be sure to reconnect wire.

⚠ CAUTION ⚠

Do not bottom out the gas valve regulator adjusting screw. This can result in unregulated manifold pressure, which may cause overfire and heat exchanger failure.

3. Normally, adjustments to factory-preset regulator should not be necessary. If adjustment is necessary, set pressure to correct settings by turning regulator screw (see [Figure 37](#)) IN (clockwise) to increase pressure or OUT (counterclockwise) to decrease pressure. Consult valve manufacturer's literature provided with furnace for more detailed information.
4. When manometer reading indicates that outlet pressure is correct, disconnect manometer and install cap(s) on regulator screw(s).

High Elevation Conversion

NOTES:

- High elevation (>2,000 feet (>609 meters)) application with this unit depends on the installation elevation and the heating value of the gas. At high elevations, the heating value of natural gas is always lower than the heating value at sea level.
- Deration is necessary to compensate for low atmospheric pressure at high elevations. Generally this will require obtaining the gas heating value from the local gas utility and replacing the burner orifices.

For high elevation (>2,000 feet (>609 meters)) installations that require orifice replacement, replace the burner orifices as follows:

1. Determine model number and rated input (BTUh) from unit's rating plate.
2. Determine appropriate orifice replacement (refer to [Table 18](#)) for installation elevation.

Table 18. Burner Orifices

Installation Location	Installation Elevation (Feet (Meters))	Gas Type	Unit Size (MBTUh)										
			75	100	125	140	170	200	225	250	300	350	400
			PN, Drill Size (Quantity)										
US, Canada	0–2001 (0–610)	NG	38678, #45 (4)	11792, #41 (4)	11792, #41 (5)	45870, #38 (5)	45870, #38 (6)	45870, #38 (7)	45870, #38 (8)	45871, #39 (9)	45871, #39 (11)	45871, #39 (13)	45871, #39 (15)
		LP	63003, 1.20 mm (4)	61652, 1.45 mm (4)	61652, 1.45 mm (5)	61653, 1.55 mm (5)	61653, 1.55 mm (6)	61653, 1.55 mm (7)	61653, 1.55 mm (8)	61653, 1.55 mm (9)	9789, #53 (11)	9789, #53 (13)	9789, #53 (15)
US	2001–3000 (611–915)	NG	16590, #46 (4)	84437, #42 (4)	84437, #42 (5)	45871, #39 (5)	45871, #39 (6)	45871, #39 (7)	45871, #39 (8)	87391, #40 (9)	87391, #40 (11)	87391, #40 (13)	87391, #40 (15)
		LP	39658, #56 (4)	11834, #54 (4)	11834, #54 (5)	9789, #53 (5)	9789, #53 (6)	9789, #53 (7)	9789, #53 (8)	9789, #53 (9)	11834, #54 (11)	11834, #54 (13)	11834, #54 (15)
Canada	2001–4500 (611–1373)	NG	84853, #47 (4)	84437, #42 (4)	84437, #42 (5)	11792, #41 (5)	11792, #41 (6)	11792, #41 (7)	11792, #41 (8)	11792, #41 (9)	11792, #41 (11)	11792, #41 (13)	11792, #41 (15)
		LP	63922, 1.15 mm (4)	11834, #54 (4)	11834, #54 (5)	61652, 1.45 mm (5)	61652, 1.45 mm (6)	61652, 1.45 mm (7)	61652, 1.45 mm (8)	61652, 1.45 mm (9)	11834, #54 (11)	11834, #54 (13)	11834, #54 (15)
US	3001–4000 (916–1220)	NG	84853, #47 (4)	84437, #42 (4)	84437, #42 (5)	87391, #40 (5)	87391, #40 (6)	87391, #40 (7)	87391, #40 (8)	11792, #41 (9)	11792, #41 (11)	11792, #41 (13)	11792, #41 (15)
		LP	63922, 1.15 mm (4)	11834, #54 (4)	11834, #54 (5)	9789, #53 (5)	9789, #53 (6)	9789, #53 (7)	9789, #53 (8)	9789, #53 (9)	11834, #54 (11)	11834, #54 (13)	11834, #54 (15)
	4001–5000 (1221–1525)	NG	84853, #47 (4)	84437, #42 (4)	84437, #42 (5)	11792, #41 (5)	11792, #41 (6)	11792, #41 (7)	11792, #41 (8)	11792, #41 (9)	11792, #41 (11)	11792, #41 (13)	11792, #41 (15)
		LP	63922, 1.15 mm (4)	11834, #54 (4)	11834, #54 (5)	61652, 1.45 mm (5)	61652, 1.45 mm (6)	61652, 1.45 mm (7)	61652, 1.45 mm (8)	61652, 1.45 mm (9)	11834, #54 (11)	11834, #54 (13)	11834, #54 (15)
	5001–6000 (1526–1830)	NG	84853, #47 (4)	11828, #43 (4)	11828, #43 (5)	11792, #41 (5)	11792, #41 (6)	11792, #41 (7)	11792, #41 (8)	84437, #42 (9)	84437, #42 (11)	84437, #42 (13)	84437, #42 (15)
		LP	63922, 1.15 mm (4)	97360, 1.35 mm (4)	97360, 1.35 mm (5)	61652, 1.45 mm (5)	61652, 1.45 mm (6)	61652, 1.45 mm (7)	61652, 1.45 mm (8)	61652, 1.45 mm (9)	11834, #54 (11)	11834, #54 (13)	11834, #54 (15)
	6001–7000 (1831–2135)	NG	40414, #48 (4)	11828, #43 (4)	11828, #43 (5)	84437, #42 (5)	84437, #42 (6)	84437, #42 (7)	84437, #42 (8)	84437, #42 (9)	84437, #42 (11)	84437, #42 (13)	84437, #42 (15)
		LP	40416, #57 (4)	97360, 1.35 mm (4)	97360, 1.35 mm (5)	61652, 1.45 mm (5)	61652, 1.45 mm (6)	61652, 1.45 mm (7)	61652, 1.45 mm (8)	61652, 1.45 mm (9)	11834, #54 (11)	11834, #54 (13)	11834, #54 (15)
	7001–8000 (2136–2440)	NG	40414, #48 (4)	11833, #44 (4)	11833, #44 (5)	84437, #42 (5)	84437, #42 (6)	84437, #42 (7)	84437, #42 (8)	11828, #43 (9)	11828, #43 (11)	11828, #43 (13)	11828, #43 (15)
		LP	40416, #57 (4)	11830, #55 (4)	11830, #55 (5)	11834, #54 (5)	11834, #54 (6)	11834, #54 (7)	11834, #54 (8)	11834, #54 (9)	11834, #54 (11)	11834, #54 (13)	11834, #54 (15)
	8001–9000 (2441–2745)	NG	39651, #49 (4)	11833, #44 (4)	11833, #44 (5)	11828, #43 (5)	11828, #43 (6)	11828, #43 (7)	11828, #43 (8)	11828, #43 (9)	11828, #43 (11)	11828, #43 (13)	11828, #43 (15)
		LP	40416, #57 (4)	11830, #55 (4)	11830, #55 (5)	11834, #54 (5)	11834, #54 (6)	11834, #54 (7)	11834, #54 (8)	11834, #54 (9)	11830, #55 (11)	11830, #55 (13)	11830, #55 (15)

3. Unthread existing burner orifices from gas manifold.

ADJUSTMENTS—CONTINUED

Manifold Gas Pressure Measurement and Adjustment—Continued

High Elevation Conversion—Continued

⚠ 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.**
4. Thread replacement burner orifices into gas manifold—to prevent cross-threading, hand-tighten orifices into gas manifold until snug and then tighten one-and-one-half to two turns using wrench.

⚠ DANGER ⚠

DO NOT use an open flame to check for gas leaks.

5. Check all connections for gas leaks using commercial leak-detecting fluid or rich soap and water solution. Leaks are indicated by presence of bubbles. If leak is detected, tighten connection. If leak cannot be stopped by tightening connection, replace part(s).

Gas Conversion

⚠ DANGER ⚠

Gas conversion must be performed by qualified service personnel using a factory-supplied conversion kit. Failure to use the proper conversion kit can cause fire, explosion, property damage, carbon monoxide poisoning, personal injury, or death.

If gas conversion (natural gas to propane or propane to natural gas) is required, convert the unit in accordance with the gas conversion manual found at www.reznorhvac.com. When conversion is complete, verify that the input rate is correct.

Burner Air Adjustment (Propane Units Only)

⚠ DANGER ⚠

Failure to install and/or adjust air shutters according to directions could cause property damage, personal injury, and/or death.

NOTE: During regular service, check the main burner ports, the carryover assemblies, and the orifices for cleanliness.

This duct furnace has individually-formed steel burners with accurately die-formed ports to provide controlled flame stability with either natural gas or propane without lifting or flashback. The burners are lightweight and are factory-mounted in an assembly that permits them to be removed as a unit for inspection or service. All burners are equipped with two flash carryover systems that receive a supply of gas simultaneously with the main burner. Burner air shutters are not normally required on natural gas furnaces. Air shutters are supplied on propane gas units and may require adjustment as follows:

1. Operate heater for about 15 minutes with air shutters open.

NOTE: When making the adjustment, close the air shutters no more than is necessary to eliminate the problem condition.

2. Turn slotted screw that moves air shutters and adjusts all burners simultaneously on end manifold bracket—clockwise to open shutters or counterclockwise to close shutters. Close air shutters and observe flame for yellow-tipping.

NOTE: A limited amount of yellow-tipping is permissible for propane gas. Other fuels should not display any yellow-tipping.

3. Open air shutters until yellow disappears.

MAINTENANCE

WARNING

If you turn OFF the electrical power supply, turn OFF the gas.

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.

Service Checklist

CAUTION

Eye protection is recommended when cleaning the unit.

- ☐ Under normal conditions, inspect furnaces at beginning of each heating season and once every 4 months. If furnace is located where an unusual amount of dust, soot, or other impurities are contained in the air, more frequent inspection is recommended.
- ☐ Clean heat exchanger inside and out (annually at minimum).
- ☐ Clean all dirt and grease from combustion air openings (annually at minimum).
- ☐ Check combination gas valve to ensure that gas flow is being shut off completely (annually at minimum).
- ☐ Check pilot burner and main burners for scale, dust, or lint accumulation and clean as necessary (annually at minimum).
- ☐ Check soundness of vent system and replace parts as necessary (annually at minimum).
- ☐ Check wiring for damage and replace as necessary (annually at minimum).

Maintenance Procedures

CAUTION

Use only factory-authorized replacement parts.

MAINTENANCE—CONTINUED

Maintenance Procedures—Continued

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, 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 1/8-inch inlet pressure tap on combination gas valve (see [Figure 37](#)).
3. Observe manometer for 2 to 3 minutes—no gas pressure should be indicated.
 - a. If manometer indicates any gas pressure, manual shutoff valve must be replaced or repaired before combination gas valve can be checked.
 - b. If manometer does not indicate gas pressure, slowly open manual shutoff valve.
4. Close manual shutoff valve and observe manometer— no loss of gas pressure should be indicated. If loss of pressure is indicated, replace combination gas valve before furnace is restored to operation as follows:
 - a. Install/replace bushing and compression nut as necessary before installing replacement valve.
 - b. Use pipe joint compound that is resistant to liquefied petroleum gas.
 - c. Adjust field-supplied gas supply piping as necessary.
 - d. Leak test all joints using leak-testing solution.

Burner Rack and Pilot Maintenance

1. Remove burner rack assembly:
 - a. Turn OFF gas supply.
 - b. Turn OFF electric supply.
 - c. Remove two screws from each side of bottom rear panel located on manifold side of furnace and remove panel.
 - d. Disconnect valve's electric leads and mark for correct reconnection.
 - e. Uncouple gas supply union.
 - f. Remove two sheet metal screws in bottom of burner rack assembly and pull drawer-type burner rack out of furnace.
2. Disassemble burner rack:
 - a. Remove screws at rear of burner drawer and remove flash carryover system.
 - b. Remove burner hold-down clamp under pilot inside burner drawer.
 - c. Pull main burners away—horizontally—from injection opening and lift out.

3. Clean pilot:

⚠ CAUTION ⚠

- Do not ream the orifice.
 - If pilot flame is short and/or yellow, check pilot orifice for blockage caused by lint or dust accumulation.
-

NOTES:

- The pilot is located (see [Figure 38, DETAIL A](#)) under the aeration panel on the control end of the burner tray and is accessible only after the burner rack assembly has been removed.
 - When re-installing a vertical spark pilot, be sure to include the pilot hole cover plate (see [Figure 38, DETAIL B](#)).
-

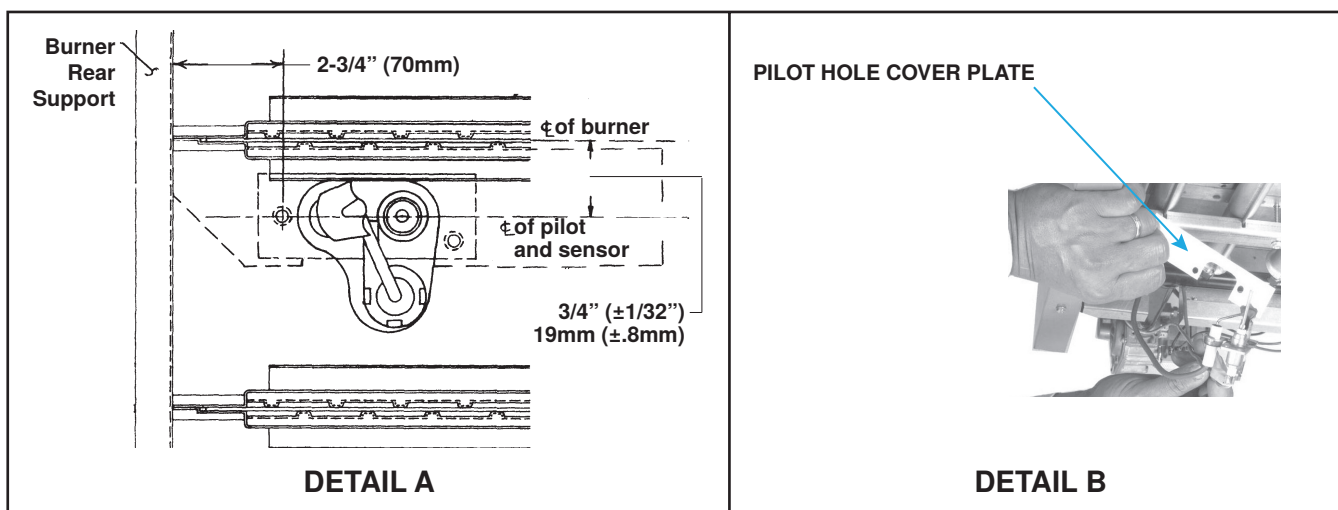


Figure 38. Pilot Location and Installation

- Remove the pilot orifice and clean with air pressure.
- Check and clean the aeration slot in the pilot burner.
- Clean metal sensing probe and pilot hood with emery cloth and wipe off ceramic insulator.
- Check spark gap and ensure that gap is maintained to be 0.100 inch (2.5 mm) as shown in [Figure 32](#).
- After pilot is cleaned, blow away any dirt using compressed air.
- Adjust pilot flame to approximately 1-1/4 inches by removing capscrew from combination valve adjustment screw and turning screw.

⚠ WARNING ⚠

Do not touch pilot spark wire and pilot electrode when energized due to high voltage.

NOTE: No periodic maintenance of the ignition control box is required. However, each season the lead wires should be checked for insulation deterioration and good connections. Proper operation of the electronic spark ignition system requires a minimum flame signal of 0.2 microamps as measured by a microammeter. Do not attempt to disassemble the ignition controller. There are no field-replaceable components in the control enclosure.

MAINTENANCE—CONTINUED

Maintenance Procedures—Continued

Burner Rack and Pilot Maintenance—Continued

- g. Check electronic spark ignition wire leads to ensure good connections and no insulation damage.

NOTE: Normally it not necessary to clean the main burners, but during the annual cleaning of the heat exchanger tubes, it is wise to inspect the burners for plugged ports.

4. Clean main burners as necessary:
 - a. Using air pressure, blow out scale and dust accumulation from burner ports.
 - b. Blow air pressure through burner ports and venturi.
 - c. Use fine wire to dislodge any stubborn particles. Do not use anything that might change orifice port size (refer to [Table 18](#)).
5. Clean burner rack flash carryover systems using air pressure.
6. Reassemble burner rack and replace burner rack assembly by reversing steps 2 and 1, being careful not to create any unsafe conditions.

Heat Exchanger Cleaning

1. Clean heat exchanger outer surfaces (circulating air side):
 - a. Gain access by removing inspection panels in ductwork or remove ductwork.

NOTE: If the heater has been converted to high CFM in accordance with [High CFM Conversion](#) section, the baffles will have already been removed.

- b. Remove baffles between heat exchanger tubes in accordance with [Reverse Airflow Conversion](#) section.
- c. Remove accumulated dust and grease deposits from heat exchanger tubes and baffles using brush and/or air hose.
- d. Re-install baffles in accordance with [Reverse Airflow Conversion](#) section.
- e. Secure ductwork as necessary.

NOTE: For cleaning the inner surfaces of the heat exchanger, an air hose, a long (18- to 24-inch) stiff brush of 1/2-inch diameter or heavy wire with steel wool securely attached, a flashlight, and a mirror are needed. The required procedure depends on the size of the furnace and the date of manufacture.

2. Clean heat exchanger inner surfaces (combustion gas side):
 - a. Remove burner rack assembly in accordance with [Burner Rack and Pilot Maintenance](#) section.

NOTE: Unit sizes 75, 100, and 125 DO NOT have heat exchanger V-baffles. Unit sizes 140–400 manufactured *after* OCT 1995 have heat exchanger V-baffles. Unit sizes 140–400 manufactured *before* NOV 1995 DO NOT.

- b. For all unit size 75, 100, and 125 models and for unit size 140–400 models manufactured *before* NOV 1995, clean inner surfaces using furnace brush or piece of heavy wire to which piece of steel wool is attached. Brush up and down within tubes until all soot is removed. Clean outside space between lower portions of heat exchanger tubes to remove any accumulated dust or light deposits using air hose or brush.

- c. For unit sizes 140–400 manufactured **after** OCT 1995, ensure that flue pipe is supported and remove three screws that secure venter housing to outlet duct—pipe from furnace to venter—venter assembly will remain in place. Remove six screws used to secure flue collection box to top of furnace and remove flue collection box to expose heat exchanger tubes. V-shaped tube baffles on top of heat exchanger can now be removed and cleaned using brush and air hose.
- d. Install burner rack assembly in accordance with **Burner Rack and Pilot Maintenance** section.

3. Check furnace for proper operation.

Venter Maintenance

Remove dirt from the outer surface of the venter motor, which is permanently lubricated so no oiling is required. Check the venter relay, which controls the venter motor, to ensure that its contacts are connected properly. Contact failure will cause the venter motor to not run or, if the contacts fail to open, the venter motor will not shut off.

TROUBLESHOOTING

Table 19. Troubleshooting		
Symptom	Probable Cause	Remedy
A. Venter motor will not start	1. No power to unit	Turn on power Check supply fuses or circuit breaker
	2. No 24V power to venter relay	Turn up thermostat Check control transformer output Check and tighten all wiring connections as necessary
	3. Venter relay defective	Replace relay
	4. Defective motor or capacitor	Replace motor or capacitor
B. Pilot will not light (venter operating)	1. Manual valve not open	Open manual valve
	2. Air in gas line	Bleed gas line
	3. Dirt in pilot orifice	Remove and clean with compressed air or solvent (do not ream)
	4. Gas pressure too high or too low	Adjust supply pressure (refer to Measure and Adjust Manifold (Outlet) Gas Pressure section)
	5. Kinked pilot tubing	Replace tubing
	6. Pilot valve does not open	If 24V is available at valve, replace valve
	7. No spark	
	a. Loose wire connections	Check and tighten all wiring connections as necessary
	b. Transformer failure	Ensure that 24V is available
	c. Incorrect spark gap	Maintain spark gap at 0.1 inch
	d. Spark cable shorted to ground	Replace worn or grounded spark cable
	e. Spark electrode shorted to ground	Replace pilot if ceramic spark electrode is cracked or grounded
	f. Drafts affecting pilot	Ensure that all panels are in place and are tightly secured to prevent draft at pilot
	g. Ignition control not grounded	Ensure that ignition control is grounded to furnace chassis
	h. Faulty ignition controller	If 24V is available to ignition controller and all other causes have been eliminated, replace ignition control
	8. Optional lockout device interrupting control circuit by above causes	Reset lockout by interrupting control at thermostat
	9. Faulty combustion air proving switch	Replace combustion air proving switch

TROUBLESHOOTING—CONTINUED

Table 19. Troubleshooting—Continued		
Symptom	Probable Cause	Remedy
C. Pilot lights but main valve will not open	1. Manual valve not open	Open manual valve
	2. Main valve not operating	
	a. Defective valve	If 24V is measured at valve connections and valve remains closed, replace valve
	b. Loose wire connections	Check and tighten all wiring connections as necessary
	3. Ignition control does not power main valve	
	a. Loose wire connections	Check and tighten all wiring connections as necessary
	b. Flame sensor grounded while pilot lights and spark continues	Ensure that flame sensor lead is not grounded or insulation or ceramic is not cracked; replace as necessary
	c. Gas pressure incorrect	Adjust supply pressure (refer to Measure and Adjust Manifold (Outlet) Gas Pressure section)
	d. Cracked ceramic at sensor	Replace sensor
D. No heat (heater operating)	e. Faulty ignition controller	If all checks indicate no other cause, replace ignition controller Do not attempt to repair ignition controller, which has no field-replaceable components
	1. Dirty filter(s)	Clean or replace filter(s)
	2. Incorrect manifold pressure or orifices	Check manifold pressure (refer to Measure and Adjust Manifold (Outlet) Gas Pressure section)
	3. Cycling on limit control	Check air throughput (refer to Duct Furnace Blower Connections section)
	4. Improper thermostat location or adjustment	Refer to thermostat manufacturer's instructions
E. Cold air delivered	5. Belt slipping on blower	Adjust belt tension
	1. Fan control improperly located or adjusted	Relocate or adjust fan control (refer to Fan Control section)
F. Cold air delivered at startup	1. Defective fan control	Replace fan control
G. Cold air delivered during operation	1. Blower set for too low temperature rise	Slow down blower or increase static pressure
	2. Incorrect manifold pressure	Check manifold pressure (refer to Measure and Adjust Manifold (Outlet) Gas Pressure section)
H. Motor will not run	1. Circuit open	Check and tighten all wiring connections as necessary
	2. Fan control inoperative	Replace fan control
	3. Defective motor or capacitor	Replace motor or capacitor
I. Motor turns ON and OFF while burner is operating	1. Fan control improperly located or adjusted	Relocate or adjust fan control (refer to Fan Control section)
	2. Defective fan control	Replace fan control
	3. Motor overload device cycling ON and OFF	Check motor load against motor rating plate Replace motor as necessary
	4. Three-phase motor rotating in opposite direction	Interchange two legs on supply connections
J. Blower motor cuts out on overload	1. Improper motor pulley and/or adjustment	Check air throughput (refer to Duct Furnace Blower Connections section)
	2. Improper static pressure in the duct system	Adjust duct system dampers
	3. Low voltage	Check power supply

NOTES

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 manuals and additional consumer materials found at www.reznorhvac.com

