18-DE01D1-8

AVAILABLE IN FRENCH CANADIAN (FC)

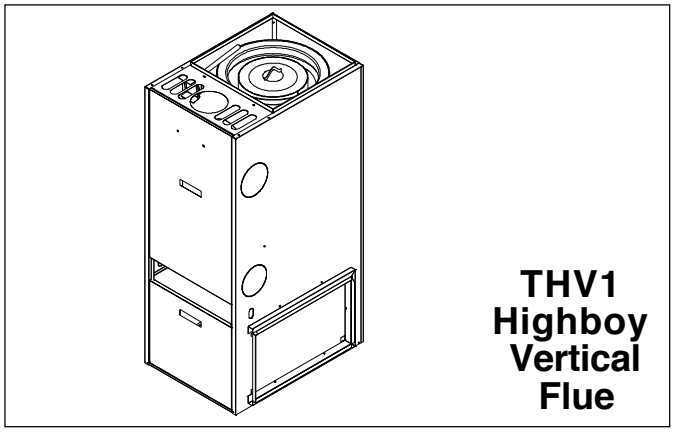
Installer's Guide

OIL FIRED CENTRAL FURNACE

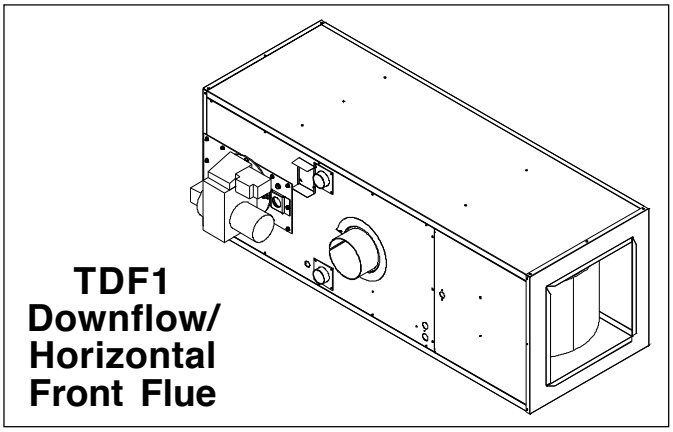
THV1M087A936, 948, 9V3, 9V5SA - Highboy
TLF1M087A936, 948, 9V3, 9V5SA- Lowboy Front Flue
TLR1M087A936, 948, 9V3, 9V5SA - Lowboy Rear Flue
TDF1M087A936, 948, 9V3, 9V5SA - Downflow/ Horizontal

ALL phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES

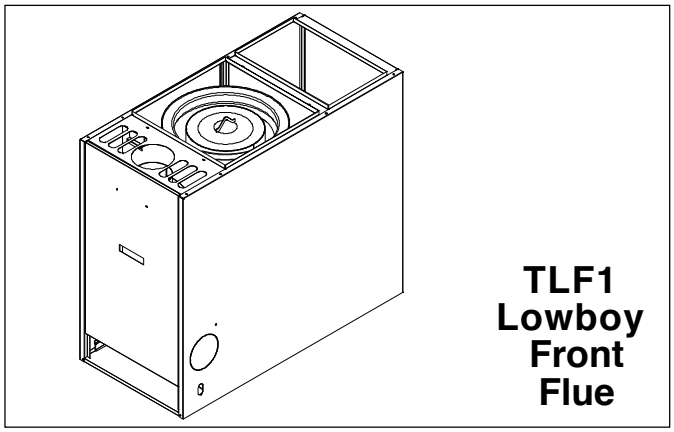
IMPORTANT — This Document is **customer property** and is to remain with this unit.
Please return to service information pack upon completion of work.



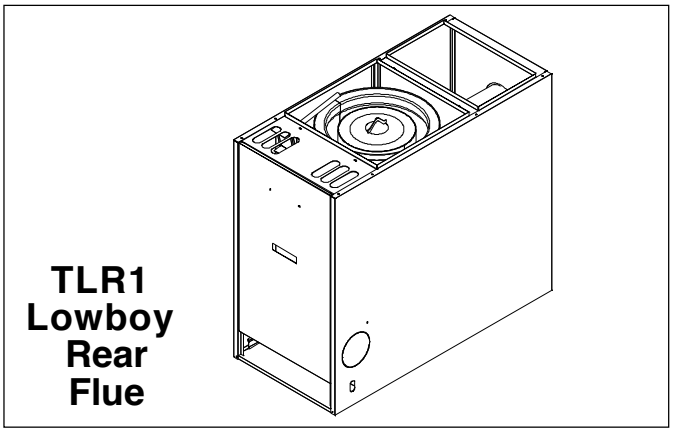
THV1 Highboy Vertical Flue



TDF1 Downflow/ Horizontal Front Flue



TLF1 Lowboy Front Flue



TLR1 Lowboy Rear Flue

Safety signal words are used to designate a degree or level of seriousness associated with a particular hazard. The signal words for safety markings are **WARNING**, and **CAUTION**.

a. **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
b. **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It is also used to alert against unsafe practices and hazards involving only property damage.

⚠ WARNING

EXPLOSION HAZARD

Do NOT store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

Improper installation, adjustment, alteration, service, or maintenance can cause a fire or explosion resulting in property damage, personal injury, or loss of life.

For assistance or additional information consult a qualified installer or service agency.

Notice to the Installer:

Installation of this oil-fired furnace **must** be performed by a qualified installer in accordance with all local codes and authorities having jurisdiction. In the absence of local governing codes, installation shall conform to these instructions and to the regulations of the National Fire Protection Association's Standard for the Installation of Oil-Burning Equipment, NFPA 31-2001, and the National Electrical Code, ANSI/NFPA 70-2002, or the latest editions thereof.

A qualified installer, also referred to in this instruction manual as a "qualified heating contractor", **is an individual, or agency, properly licensed and experienced to install and service oil-burning equipment in accordance with all local codes and ordinances.**

MATERIAL AND WORKMANSHIP

This furnace was built with the highest quality materials and attention to workmanship. However, omissions and defects occasionally occur. Before installing the furnace, inspect the furnace thoroughly. If missing parts, defective material, or poor workmanship are evident, report the **model** and **serial numbers** imprinted on the furnace rating label to the seller for adjustment.

PACKAGING

A complete furnace is contained within a single package. The factory completed all feasible assembly. However certain components including draft regulator and, if supplied, door handle, air filter(s), and air filter rack(s), must be assembled to the furnace, or the venting system, in the field.

SHIPPING DAMAGE

Material in this shipment has been inspected at the factory and released to the transportation agency without known damage. Inspect exterior of carton for evidence of rough handling in shipment. Unpack carefully after moving equipment to approximate location. If damage to contents is found, report the damage immediately to the delivering agency.

If this furnace was damaged during transit, please immediately request the transportation company inspect the furnace and issue a **concealed damage report**. The party receiving the furnace should file the claim for shipping damage. **Report any shipping damage immediately.**

It is absolutely essential that a damage report be obtained. If a concealed damage report is not obtained, we cannot provide assistance in recovering your claim against the transportation company.

SAFETY CONSIDERATIONS

The following safety practices and precautions must be followed during the installation, servicing, and operation of this furnace.

1. Use only with the type of fuel oil approved for this furnace. Refer to the furnace rating plate.
2. Install this furnace only in a location and position as specified in these instructions.
3. Provide adequate combustion and ventilation air to the furnace space as specified in "Air for Combustion and Ventilation" (page 9), of these instructions.
4. Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified in Standard for the Installation of Oil-Burning Equipment, NFPA 31-2001.
5. Always install the furnace to operate within the furnace's intended temperature-rise range with a duct system which has an external static pressure within the allowable range, as specified on the unit rating plate. Airflow with temperature rise for cfm versus static is shown in the Service Facts accompanying this furnace.
6. When a furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by a duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.
7. An oil-fired furnace for installation in a residential garage must be installed as specified in "Installation Location" section (page 3), of these instructions.

© 2009 Trane All Rights Reserved

8. The furnace may be used for temporary heating of buildings or structures under construction only when the following conditions have been met:
   a. The furnace venting system must be complete and installed per manufacturers instructions.
   b. The furnace is controlled only by a room thermostat (no field jumpers).
   c. The furnace return air duct must be complete and sealed to the furnace and clean air filters are in place.
   d. The furnace input rate and temperature rise must be verified to be within nameplate marking.
   e. 100% of the furnace combustion air requirement must come from outside the structure.
   f. The furnace return air temperature range is between 70 and 100 degrees Fahrenheit.
   g. Clean the furnace, duct work, and components upon substantial completion of the construction process, and verify furnace operating conditions including ignition, input rate, temperature rise and venting, according to the manufacturer's instructions.

⚠ WARNING

The manufacturer of this equipment assumes no liability for any damages resulting from unauthorized modifications made to the furnace, or any components thereof, or improper installation of the furnace in the field. Furthermore, any such field modifications VOID THE WARRANTY and place responsibility for safe and reliable operation of the furnace on those who performed the modification(s).

INSTALLATION GUIDELINES CODES

All local codes and regulations take precedence over the instructions in this manual and shall be followed accordingly. In the absence of local codes, this installation must conform to these instructions and to the regulations of the National Fire Protection Association (NFPA) publications, the Standard for the Installation of Oil-Burning Equipment, NFPA 31-2001, and the National Electrical Code, ANSI/NFPA 70-2002, or the latest editions thereof.

INSTALLATION LOCATION

⚠ CAUTION

To prevent shortening its service life, the furnace should not be used as a "Construction Heater" during the finishing phases of construction until the requirements listed in item 8, a-g of the safety section of this publication have been met. Condensate in the presence of chlorides and fluorides from paint, varnish, stains, adhesives, cleaning compounds, and cement create a corrosive condition which may cause rapid deterioration of the heat exchanger.

Contents

CONTENTS

INSTALLATION GUIDELINES	2
Location	2
Clearances	4
Downflow/ Horizontal Furnace Setup	4
Air for Combustion and Ventilation	5
Chimney Inspection	13
Chimney Sizing	13
Chimney Height	13
Flue/ Chimney/ Vent Connector	14
Draft Regulator	16
Power (Side-Wall) Venting	16
Duct Work and Air Conditioning	17
Air Filter Mounting	17
Oil Burner and Oil Nozzle Installation	18
Fuel System Installation	19
Electrical Connections	20

⚠ WARNING

SUPPORT FURNACE PROPERLY

DO NOT hang the downflow/ horizontal furnace from a structure, or surface, by any integral part or fastener of the furnace. The furnace was not designed to support itself in this manner.

In as much as practical, the furnace should be positioned near a chimney or vent and should be centralized with respect to the air distribution system.

For a utility room installation, the entrance door must be wide enough to permit the largest part of the furnace to pass through the doorway or allow sufficient clearance to permit the replacement of another appliance, e.g. a water heater, in the room.

If the furnace is installed in a residential garage, it must be installed so the burner is located higher than 18 inches above the floor. Also, the furnace must be located or protected to avoid physical damage from impacts by vehicles.

Highboy and lowboy furnace models must rest on sturdy, stable, and level surfaces.

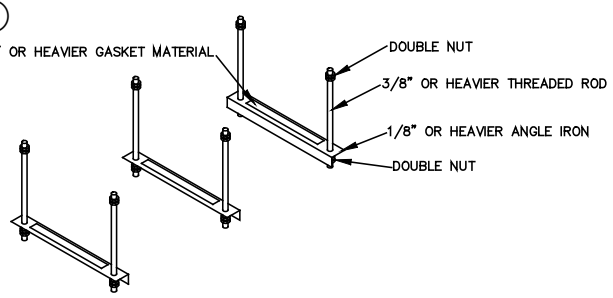
The downflow/ horizontal model may be mounted on a level surface, as described above, or it may be suspended from an overhead structure or surface. If this model is suspended from hanger rods, **support the furnace from the bottom casing surface at three (3) places**, across both ends of the casing and across the casing, near the middle of the furnace.

Generally, a simple support frame for the furnace can be fabricated from structural steel angle, threaded steel rod, and fastener hardware, refer to Figure 1. Adjust the height of the support angles to level the unit in position.

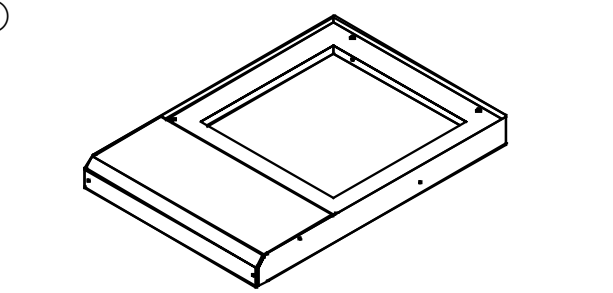
CLOSET AND ALCOVE INSTALLATION

All furnace models may be installed in a closet or alcove on combustible flooring with specified (standard) clearances to combustible construction.

The horizontal/ downflow furnace model requires an optional combustible surface-mounting base (model # BAYSUB10ABASEAA) for vertical installation (i.e., downflow configuration) directly on combustible materials, refer to Figure 2.



Recommended Support Frame for Downflow/ Horizontal Furnaces



Downflow Furnace Combustible Surface-Mounting Base

Note: See Illustration on page 24 for the dimensions of the mounting base.

STANDARD CLEARANCES

Standard clearances are mandatory minimum clearances from heated surfaces of the furnace to combustible materials to assure protection from fire hazard during furnace operation. (Refer to the Standard for the Installation of Oil-Burning Equipment, NFPA 31-2001, for definitions of combustible and non-combustible materials.)

Accessibility clearances, which are typically greater, may exceed fire protection clearances. Therefore, consider providing at least 24 inches of clearance from the front (and the rear, for lowboy furnaces) of the furnace to obstructions and surfaces for adequate service and maintenance access.

The minimum clearances from furnace casing surfaces to combustible materials are:

- 3 inches from casing sides and rear
- 8 inches from front casing of furnace to the closet door, with exception of:
  * The lowboy rear flue model only requires 3 inches from front casing of the furnace to the closet door.
  * The downflow/ horizontal furnace requires 22 inches from front casing of the furnace to the closet door.
- 9 inches from flue pipe/ vent connector.
- 3 inches from casing top.
- 3 inches from any side of supply air plenum.
- 3 inches above supply air ducts, within 6 feet of furnace.
- **For the downflow/ horizontal furnace only**, when the optional combustible surface-mounting base is used with the furnace in the downflow configuration, adequate clearances from the supply end surface of the furnace casing to combustible surfaces are provided by the design of the mounting base.

Though these are approved clearances for these furnaces, space must be provided at the front (18 inches minimum, 24 inches recommended) and at the rear of the furnace for access, service, and replacement of the oil burner, air filter(s), circulating air blower, and fan motor.

DOWNFLOW/ HORIZONTAL FURNACE SETUP

The downflow/ horizontal furnace is shipped from the factory upright for vertical installation (downflow configuration). If the furnace is to be installed lying down on the right-hand or left-hand side (horizontal configuration), the positions of the oil burner and the fan and limit control thermostat may have to be changed. See Figure 3.

The horizontal furnace may be turned end for end, or rotated, making the top into the bottom, as shown in Figure 3. Refer to the following instructions for installing the oil burner and thermostat.

1) **When the furnace is installed in the horizontal configuration,** the oil burner must be mounted in an upright position. It will be necessary to remove the burner then cutoff one (1) of the threaded burner-mounting studs before attempting to reposition the burner in the upright position. See Figure 3. Trial fit the burner to the burner mounting plate to determine which stud to remove. (A rotary tool with a cutting (abrasive) disk or a hacksaw should work well to remove the stud.)
   A machine bolt (furnished with the parts package) will substitute for the removed stud and provide a third point to secure the burner flange to the burner mounting plate. Thread the bolt through the burner-mounting flange and into the open hole within the burner mounting plate. See Figure 3.
2) Install the flange gasket and the burner on the mounting plate threaded studs. Using fasteners supplied in the parts bag with each furnace [use two (2) or three (3) 5/16 in. brass hex nuts and flat washers, as required], secure the burner to the mounting studs on the burner mounting plate.
3) Secure the electrical conduit of the wiring harness to the oil burner junction box with the hardware provided.

⚠ WARNING

POSSIBLE OVERHEATING!
When converting to horizontal, the high limit and fan control may have to be moved.
Failure to do so may result in an overheating condition leading to property damage, or loss of life.

4) **When the furnace is installed in the horizontal configuration,** the high limit and fan control must also be located in the upper position on the casing when the furnace is placed in the final installed position, refer to Figure 4.
   If the control must be relocated, remove the cover of the control to gain access to the mounting screws. Remove the mounting screws and the control. Insert the control into the alternate mounting hole in the casing and mark the screw locations. Drill pilot holes for the new screws. Install the control in the new mounting location and secure it with the mounting screws. Replace the cover of the control. A metal, snap-in cap is furnished with the furnace to close the unused hole, for the control, in the cabinet.

AIR FOR COMBUSTION AND VENTILATION

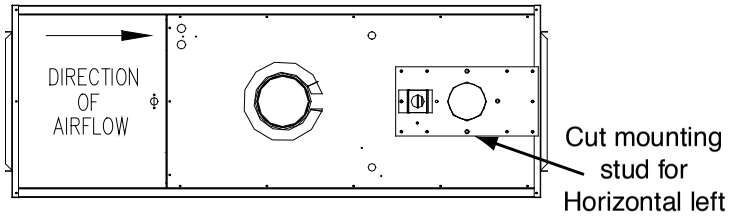
⚠ CAUTION

VENTILATION REQUIRED!
Relief openings in the front or top of the furnace casing should not be obstructed or blocked. These openings supply combustion and ventilation air to the furnace.

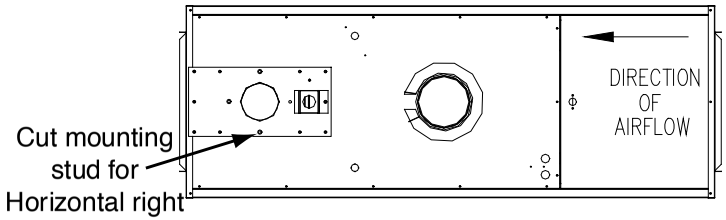
Chloride, fluoride, iodide, and bromide bearing compounds when present, even in low concentrations, in air supplied for combustion to the furnace, can result in accelerated and severe corrosion of the heat exchanger and/or the venting system. This condition can occur with less efficient furnaces, but is more likely to happen on furnaces with efficiencies of 80% or greater.

③

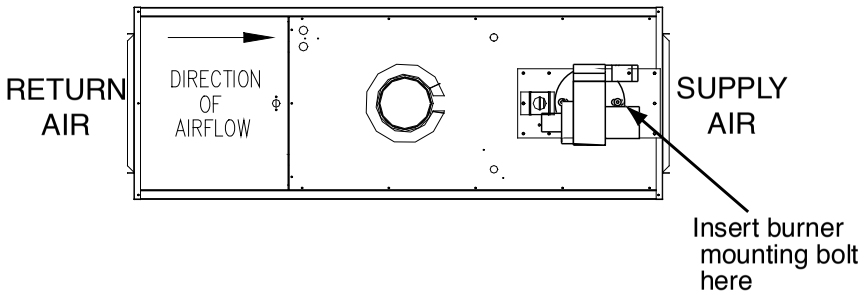
A downflow / horizontal furnace rotated 180° (or flipped end for end) to reverse airflow direction in the horizontal configuration

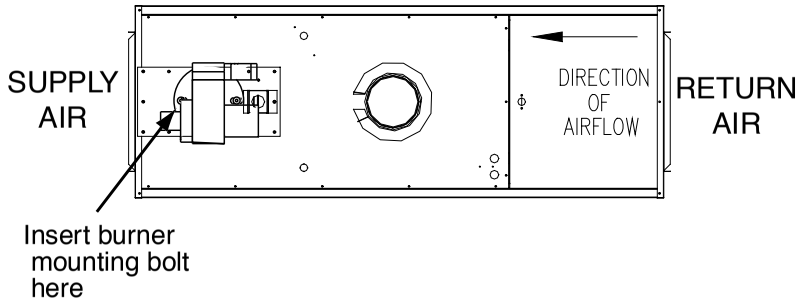


Horizontal left



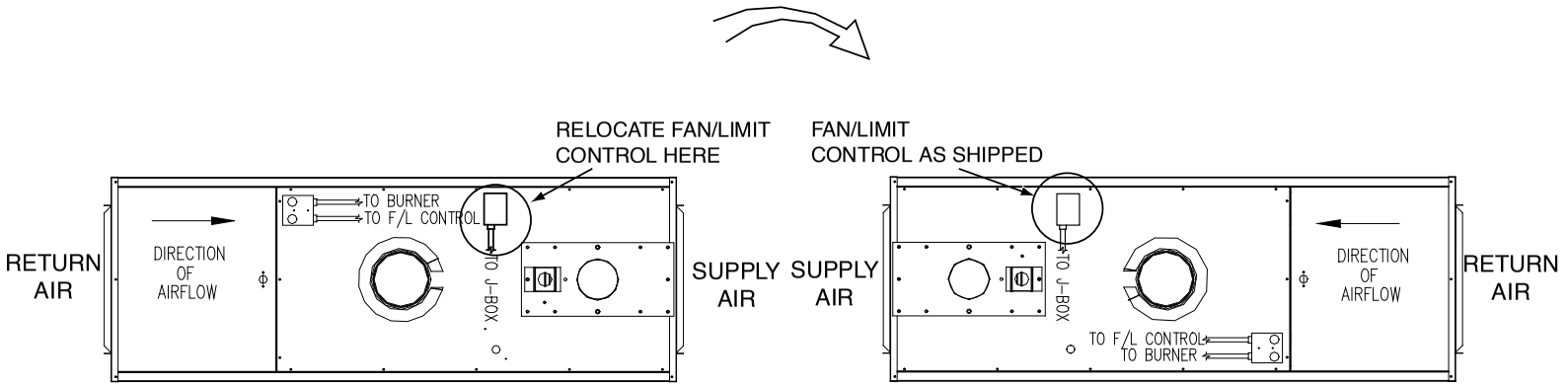
Horizontal right





④

Correct locations for the fan/limit control for horizontal left/right furnace configuration

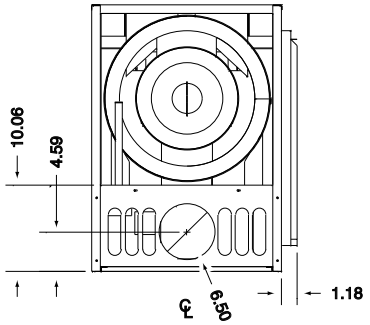


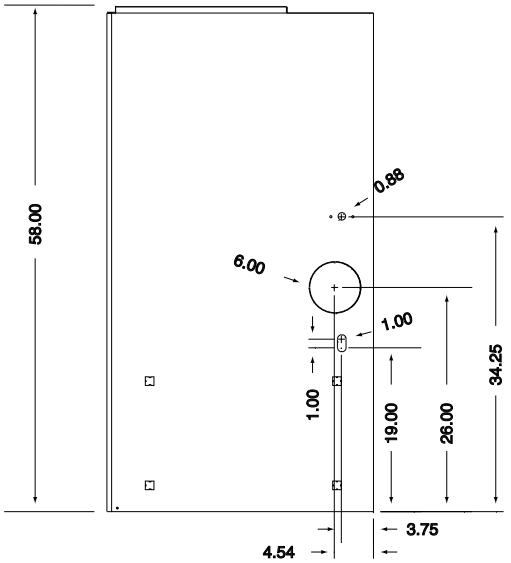
Horizontal left **Horizontal right**

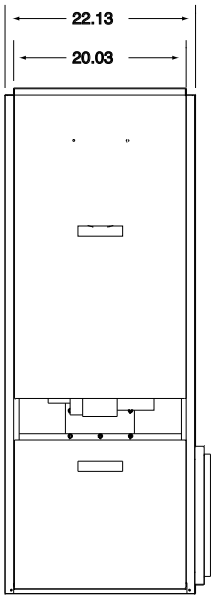
THV1MO87A936, 48, V3, V5SA OUTLINE DRAWING

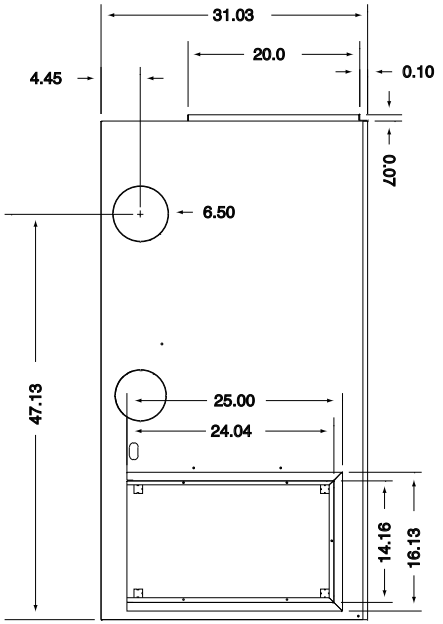
(ALL DIMENSIONS ARE IN INCHES)

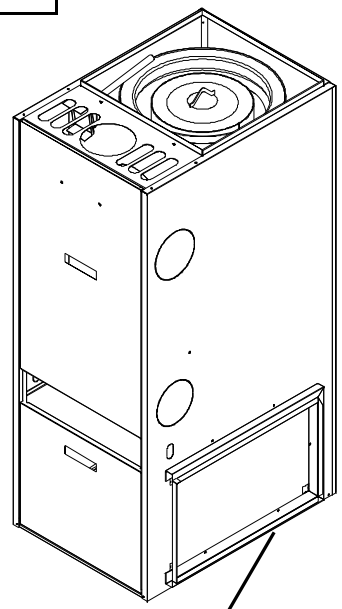
MINIMUM CLEARANCE TO COMBUSTIBLE MATERIALS	
Furnace casing sides and rear	3"
Front furnace casing to closet door1	8"
Furnace flue pipe / vent connector	9"
Furnace casing top	3"
Supply air plenum (any side)	3"
Supply air ducts within 6 feet of the furnace.	3"











* NOTE: Filter Frame Shipped unassembled & packed in blower compartment

Highboy Vertical

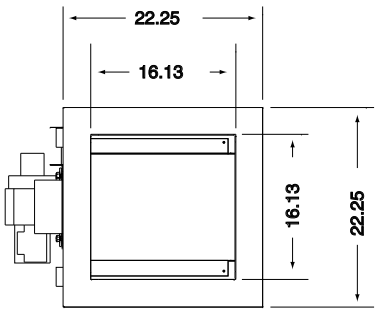
Installer's Guide

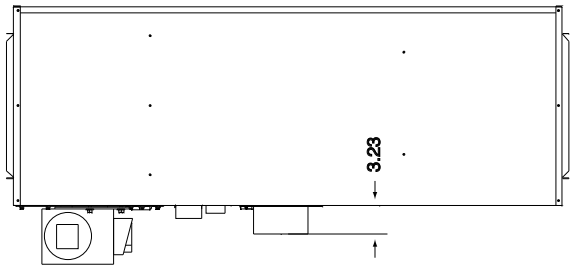
TDF1MO87A936, 48, V3, V5SA OUTLINE DRAWING

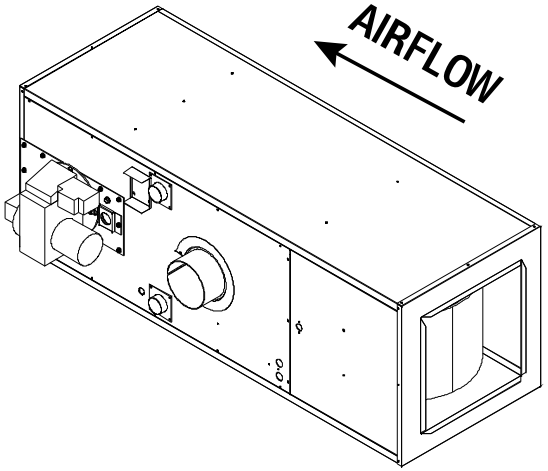
(ALL DIMENSIONS ARE IN INCHES)

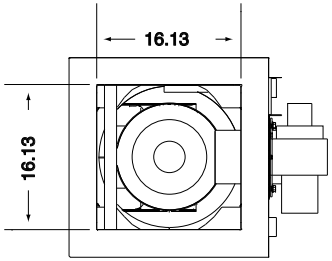
MINIMUM CLEARANCE TO COMBUSTIBLE MATERIALS	
Furnace casing sides and rear	3"
Front furnace casing to closet door1	8"
Furnace flue pipe / vent connector	9"
Furnace casing top	3"
Supply air plenum (any side)	3"
Supply air ducts within 6 feet of the furnace.	3"

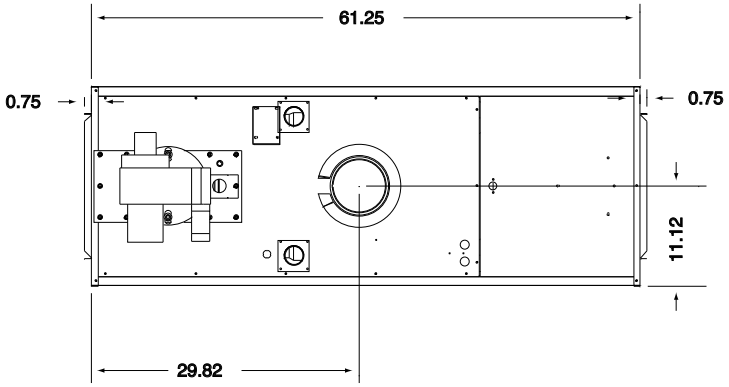
Notes:
1 The Horizontal / Downflow model requires 22" from the front casing of the furnace to the closet door.
2 Adequate clearance from the supply end surface of the furnace casing to combustible materials are provided by the design of the accessory mounting base when used with the Horizontal / Downflow furnace model applied in the Downflow configuration.









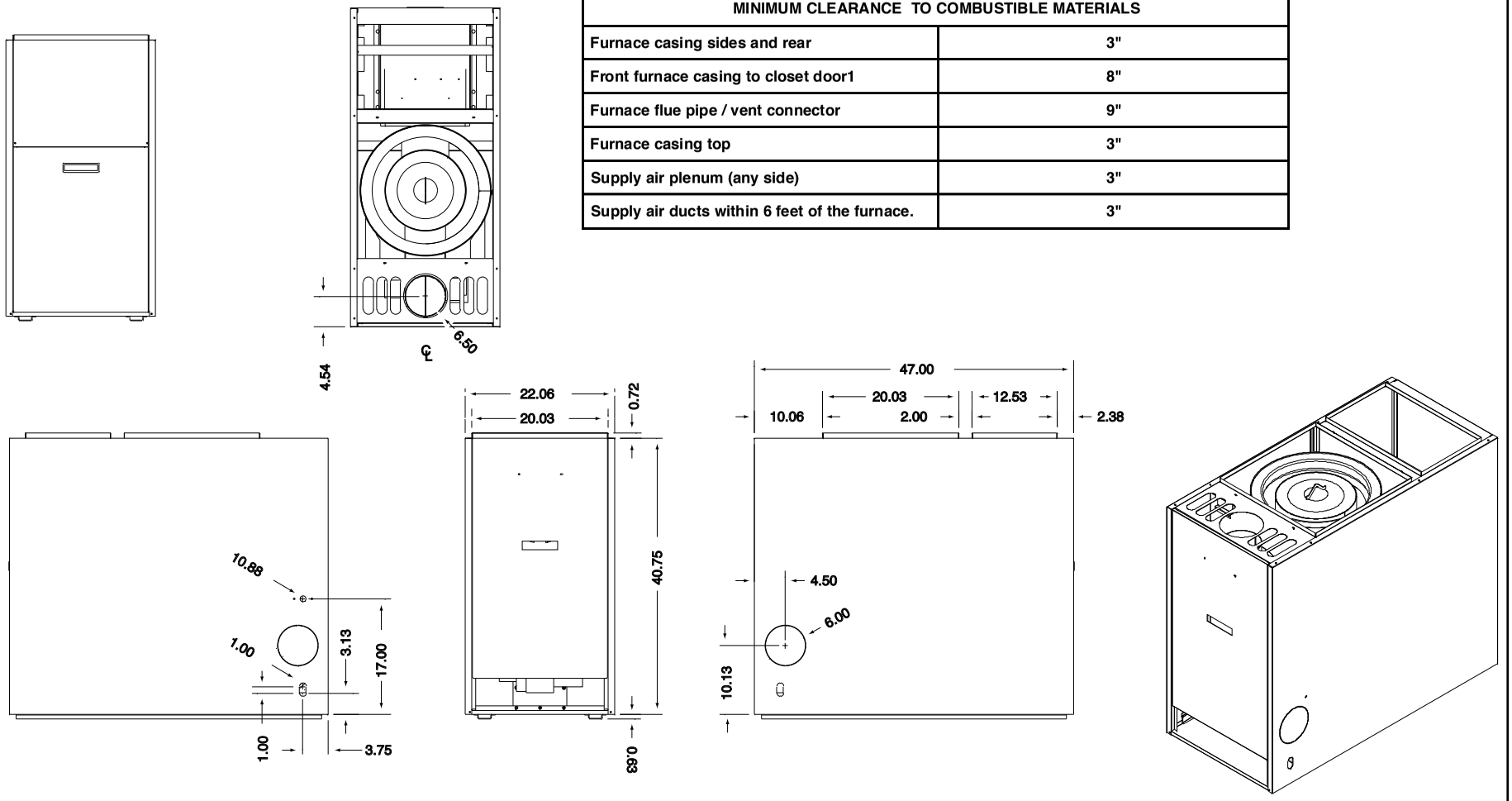


Downflow / Horizontal - Front Flue

TLF1MO87A936, 48, V3, V5SA OUTLINE DRAWING

(ALL DIMENSIONS ARE IN INCHES)

MINIMUM CLEARANCE TO COMBUSTIBLE MATERIALS	
Furnace casing sides and rear	3"
Front furnace casing to closet door1	8"
Furnace flue pipe / vent connector	9"
Furnace casing top	3"
Supply air plenum (any side)	3"
Supply air ducts within 6 feet of the furnace.	3"

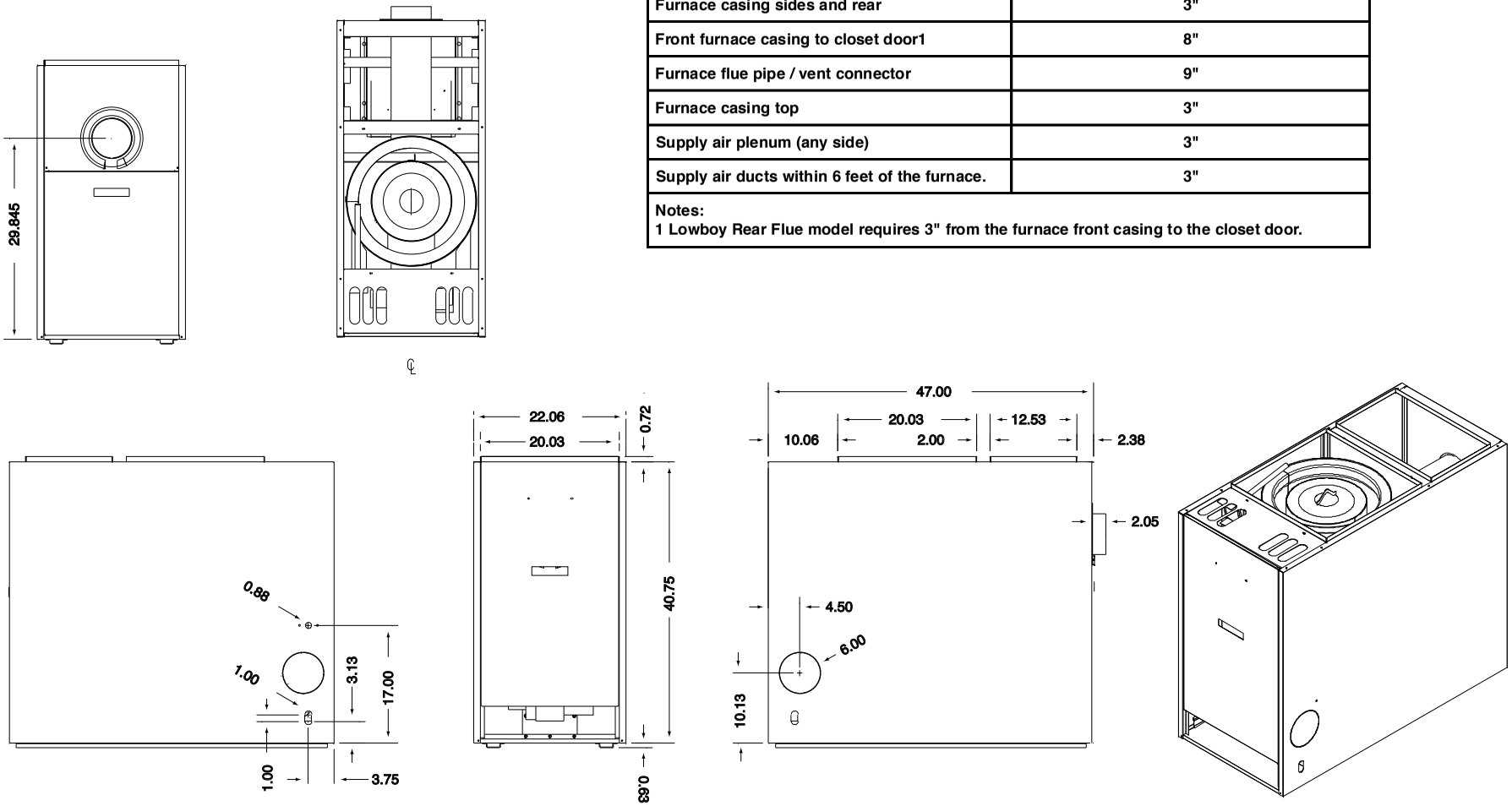


Lowboy - Front Flue

TLR1MO87A936, 48, V3, V5SA OUTLINE DRAWING

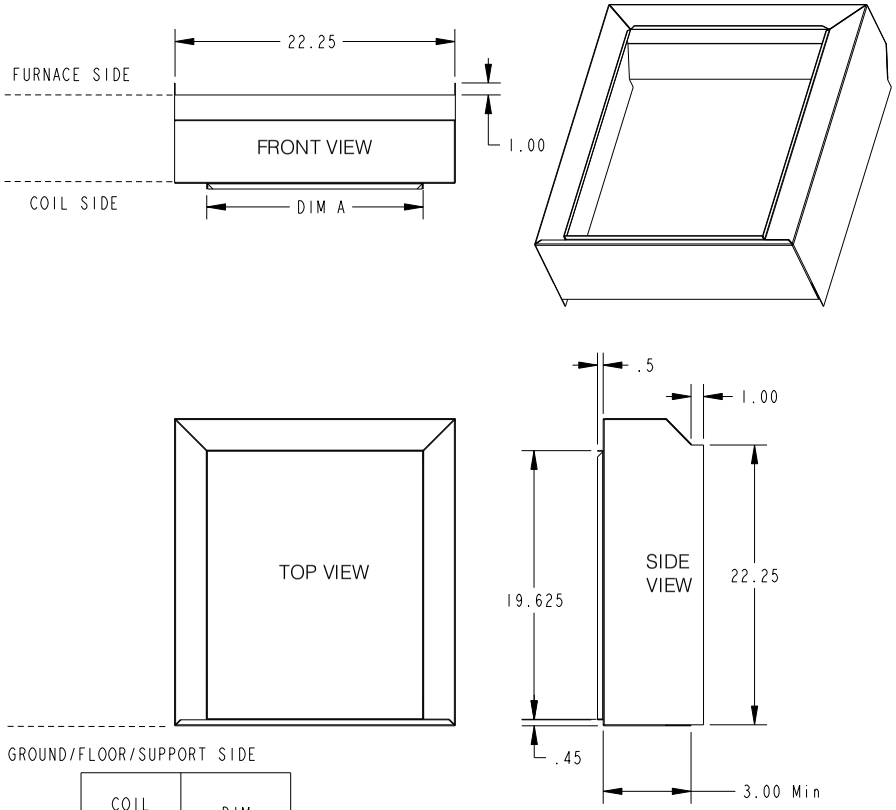
(ALL DIMENSIONS ARE IN INCHES)

MINIMUM CLEARANCE TO COMBUSTIBLE MATERIALS	
Furnace casing sides and rear	3"
Front furnace casing to closet door1	8"
Furnace flue pipe / vent connector	9"
Furnace casing top	3"
Supply air plenum (any side)	3"
Supply air ducts within 6 feet of the furnace.	3"
Notes: 1 Lowboy Rear Flue model requires 3" from the furnace front casing to the closet door.	



Lowboy Rear Flue

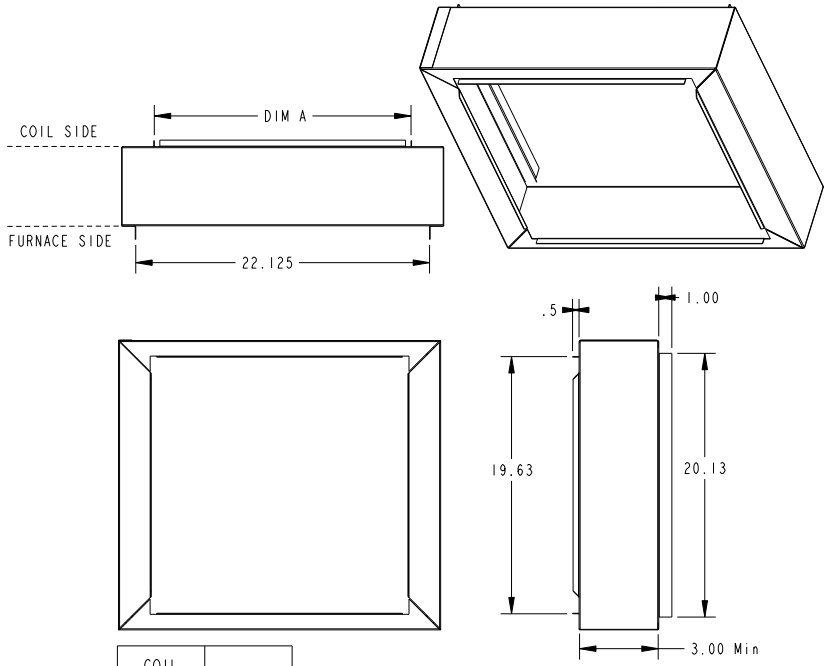
Cooling / HeatPump Coil to Oil Furnace Transition
Downflow / Horizontal ONLY



COIL CABINET WIDTH	DIM A
17.5 in.	16.25 in.
21 in.	19.75 in.
24.5 in.	23.25 in.

NOTES:
1. DIMENSIONS THAT ARE CRITICAL FOR COIL/FURNACE FIT-UP ARE THOSE IDENTIFIED IN THE PRINT. ALL OTHER DIMENSIONS ARE LEFT TO THE DISCRETION OF THE FABRICATOR.

Cooling / HeatPump Coil to Oil Furnace Transition
Highboy / Lowboy ONLY



COIL CABINET WIDTH	DIM A
17.5 in.	16.25 in.
21 in.	19.75 in.
24.5 in.	23.25 in.

NOTES:
1. DIMENSIONS THAT ARE CRITICAL FOR COIL/FURNACE FIT-UP ARE THOSE IDENTIFIED IN THE PRINT. ALL OTHER DIMENSIONS ARE LEFT TO THE DISCRETION OF THE FABRICATOR.

Often, household chemicals contain chloride-bearing compounds. There are many compounds representative of this classification of chemicals. A few common examples are listed below.

- Cleaning solvents
- Varnish and paint removers
- Bleaches
- Fabric softeners
- Water softener salt
- Tile adhesives

Avoid storing or using these chemicals within close proximity to the furnace. In addition, avoid storing or using any chemicals, of an unknown and possibly flammable nature, in close proximity to the furnace. If it is necessary to store or use chemicals in the same space as the furnace, the area should be well-ventilated and all containers should be sealed when not in use. If possible, keep chemicals in a separate, well ventilated, room closed off from the furnace with a door.

The furnace shall be installed in a location within the building that permits a satisfactory supply of air for combustion, ventilation, and proper operation of the venting system. While all forms of building construction cannot be covered in detail in this installer's guide, this requirement may usually be met by application of one of the following methods in ordinary building construction. However, applicable local installation codes **always** take precedence and shall be followed.

The content of certain pertinent passages of NFPA 31-2001 on methods to obtain and ensure adequate airflow to the furnace has been excerpted and, in some cases, paraphrased below for reference purposes. Consult the Standard for the Installation of Oil-Burning Equipment, NFPA 31-2001, for special cases and further details.

1. Utility Room (example of a confined space)
   a. In buildings of conventional construction with normal air infiltration, two (2) permanent openings connecting to a well-ventilated crawl space, attic, or another large, well-ventilated internal area shall be provided. Each opening shall have a minimum free area of one (1) square inch per 1000 BTUH of total input rate (sum of the individual appliance input rates) of all appliances to be installed in the utility room. One opening should be located near, or in, the ceiling of the room and the other should be located near, or in, the floor.
   b. In buildings of unusually tight construction (e.g. those having continuous water vapor barriers; tightly-fitting, or weather-stripped, doors and windows; and gasketed, caulked, or sealed outer wall joints and penetrations), wherein infiltration and air exchange with the outdoors is very limited (0.35 air changes per hour, or less), provision must be made to provide sufficient air for combustion. The following method will usually be adequate to ensure sufficient airflow into the space.

Provide two (2) permanent openings, one (1) located within 12 inches of the floor and one (1) within 12 inches of the ceiling, or roof, of the room. These openings shall allow for direct exchange of air between the room and outdoors. If required, ducting between the room and the outdoors shall be provided.

- For horizontally -oriented ducts, each opening shall have a minimum free area of one (1) square inch per 2000 BTUH of the total input rate (sum of the individual appliance input rates) of all appliances to be installed in the room.
- For vertically -oriented ducts, the minimum free area may be reduced to one (1) square inch per 4000 BTUH of the total input rate (sum of the individual appliance input rates) of all appliances to be installed in the room.
- The minimum dimension of any air opening shall not be less than 3-inches.
- When an opening in the outside wall must be provided, it should be furnished with properly screened metal sleeves.

2. Full Basement (example of an unconfined space)
   a. Where a furnace is installed in a full basement, in a building of conventional construction with normal air infiltration, infiltration is normally adequate to provide air for combustion and ventilation.
   b. In buildings of unusually tight construction (such as those where weather stripping and storm sash windows are used, and where basement windows are also weather-stripped), one (1) permanent opening connecting to a well-ventilated attic, or with the outdoors shall be provided, using a duct, if necessary. This opening shall have a minimum free area of one (1) square inch per 5000 BTUH of total input rate (sum of the individual appliance input rates) of all appliances to be installed in the basement.

   When an opening in the outside wall must be provided, it should be furnished with properly screened metal sleeves.

If an exhaust fan, additional air consuming machines (e.g. an air compressor), or a return air grill is present in the furnace room, there should be increased concern about providing adequate airflow to the furnace. Additional efforts may be required to assure an adequate supply of combustion and ventilation air is available to the furnace under all conditions.

CHIMNEY INSPECTION

The chimney, vent, or any passageway for the stack gases to flow to the outdoor atmosphere is a very important part of the heating system. No furnace, regardless of the efficiency of the design, can perform satisfactorily when the chimney to which it is connected is inadequate or in poor condition.

Any of the following symptoms may indicate a chimney has severe structural damage and is unsuitable for use:

- Chimney appears to be leaning to the side.
- Chimney appears to have structural damage, i.e. loose or missing blocks or bricks, or excessive deterioration at mortar joints.
- Tile liner damaged or missing.
- Flue gas leakage along the length of the chimney between the chimney connector and discharge termination.
- Excessive corrosion at the cleanout port or at the chimney connector entrance into the chimney.
- Structural debris, i.e. mortar or tile liner flakes, in base of the flue way.

A qualified person shall inspect the chimney to confirm it is correctly sized for the application, properly constructed, and in sound condition. Refer to the Standard for the Installation of Oil-Burning Equipment, NFPA 31-2001, for details on proper chimney sizing and construction. If needed, the chimney should be cleaned before installing the furnace. Any accumulation of dirt or debris at the bottom of the flue should be removed.

CHIMNEY SIZING:

The furnace must be connected to an adequate chimney or an approved vent in accordance with these instructions. An adequate chimney is one that is sealed and lined with the capability of producing a (-).04" WC flue draft and having the capacity to handle the amount of stack gases that are introduced into it. A chimney with an internal construction of corrosion resistant tile, stainless steel, or some other material that will withstand flue gas temperatures up to 900°F is required.

The following are common chimney requirements necessary for the furnace to operate correctly: A masonry chimney serving an oil fired furnace must comply with local codes and NFPA Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances (NFPA211-1996 or latest edition).

All installations and services must be performed by qualified service personnel.

The **inside area of the chimney liner** should equal, at minimum, the area of the vent pipe exiting the furnace-

EXAMPLE: π x r^2 = Area of Pipe (sq. in.)

r = radius of pipe

π = 3.1417

Flue Pipe Diameter = 6" [Radius of pipe = ½ diameter of pipe = ½ ((6 in.) = 3in.]

π x 3^2 = 28 sq. in.

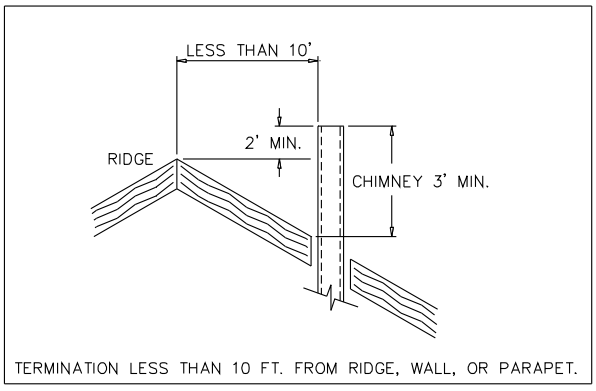
NOTE: This formula calculates the minimum inside area of the chimney. If more than one appliance vent connector pipe is connected to the chimney, the minimum inside area of the chimney should be equal to the area of the largest vent pipe plus one half the area of any additional vent pipes. If the chimney is too large or condensation has been a problem in the past refer to the NFPA Standard for the Installation of Oil Burning Equipment (NFPA31-1997 or latest edition) Appendix E for proper liner sizing.

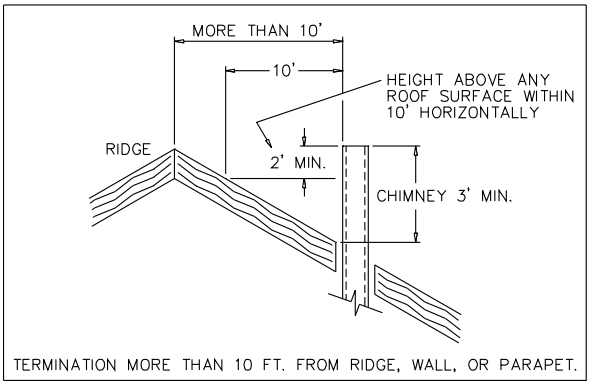
CHIMNEY HEIGHT:

The chimney shall terminate at least 3 feet above the highest point where it passes through the roof of a building and at least 2 feet higher than any portion of a building within a horizontal distance of 10 feet. (See Fig. 5a).

If the chimney penetrates a roof more than 10 feet from a ridge, wall or parapet, a minimum of 3 feet above roof or exit point must be maintained. See Figure 5b.

5





Proper chimney termination height for pitched roofs

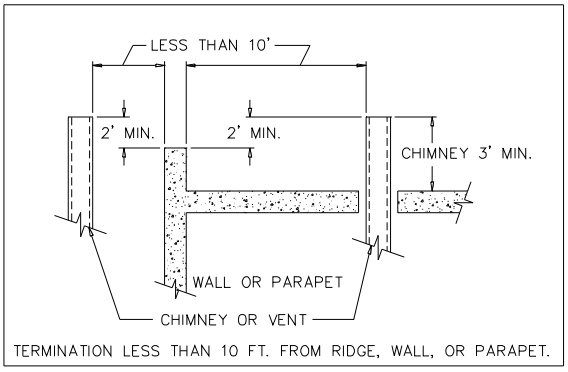
If the roof is flat rather than the normal residential Pitched roof, refer to Figure 6 for proper clearances.

FLUE/ CHIMNEY/ VENT CONNECTOR

⚠ CAUTION

PROPER VENTING REQUIRED!
DO NOT install a manual damper in the chimney or vent connector.
Thermally-activated type vent dampers are NOT ALLOWED for use on these furnaces.

It is desirable to install the shortest vent connector (also referred to as a flue or chimney connector) possible with the fewest number of fittings, i.e. transitions and elbows.



Proper chimney termination height for flat roofs.

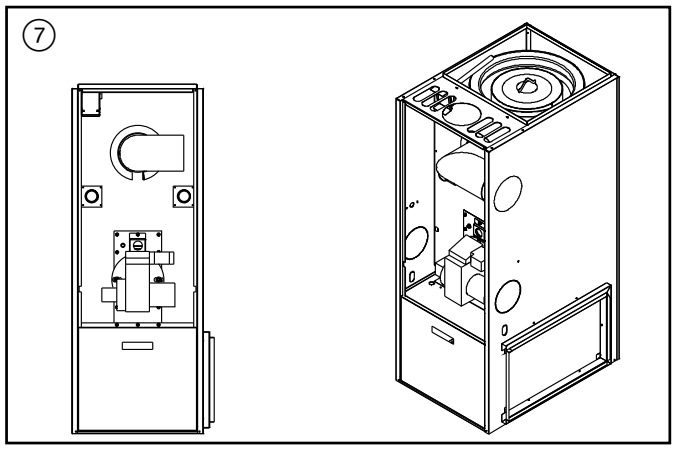
Generally, 6-inch diameter, 24 Ga. or heavier, single wall, lock seam-type, galvanized steel vent pipe and fittings are satisfactory materials for the fabrication of a vent connector.

However, always consult local codes and authorities for specific minimum requirements.

For some installations, it may be prudent to turn the furnace flue elbow 90 degrees clockwise, with respect to the front of the furnace, such that the elbow is open to the right-hand side of the unit, rather than upward. Turning the flue elbow may better facilitate connection of the vent connector piping to the flue elbow on the highboy. See Figure 7. Due to the presence of the fan and limit control and the wiring harness, **the elbow may not be rotated 90 degrees counterclockwise.** The installer must remove the upper right hand knockout to allow the vent connector to pass through the cabinet.

If desired, with the furnace flue elbow turned to the right, the standard furnace top front panel may be replaced with a BAYTRM10AVENTAA. It includes top front panel and a vent trim ring. Contact your distributor to purchase this part.

All horizontal sections of the vent connector must slope upward not less than ¼ inch per foot from the furnace to the vent termination. Long horizontal sections of the

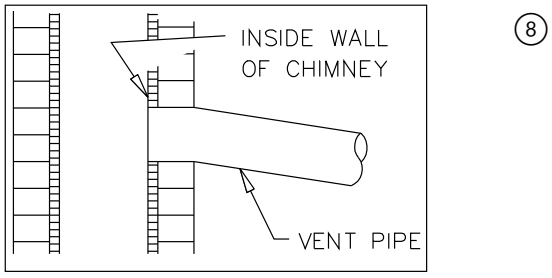


venting system must be supported at least every five (5) feet with metal straps to prevent sagging of the vent piping.

Secure all joints in the vent connector with sheet metal screws or equivalent fasteners.

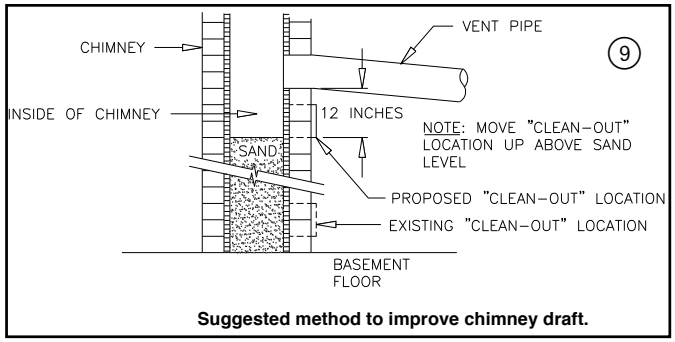
The vent connector pipe should extend only to (and not beyond) the inside wall of the chimney (See Fig. 8).

A thimble should be used to connect the vent connector pipe to the chimney so that the vent connector pipe may be readily removed in case of inspection or replacement.



Proper insertion of the vent connector in chimney.

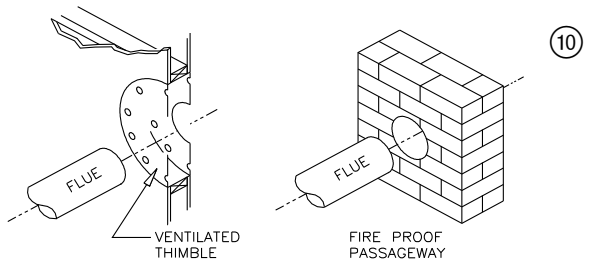
In cases where the chimney extends to the basement floor, the draft can usually be improved by filling the base of the chimney with sand to within 12 inches of the vent connector pipe after relocating the clean-out door. (See Fig. 9).



Suggested method to improve chimney draft.

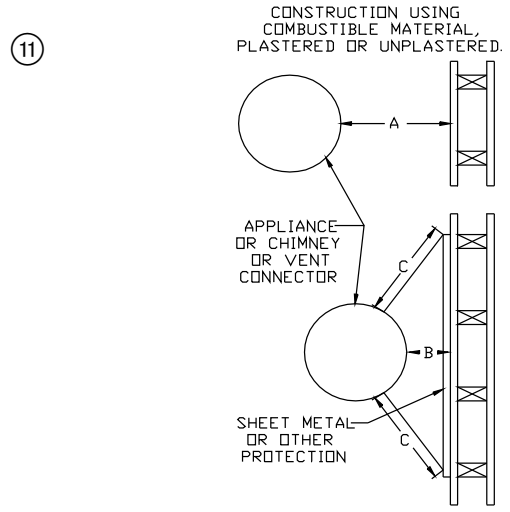
All joints of the chimney must be tightly sealed. The inside of the chimney should be free of any obstructions, such as loose brick, broken pieces of tile, or corroded metal.

All chimney clean-out doors and flue connections must fit tightly so they will seal to avoid air leaks.
If chimney flues are divided or there are multiple flues within one chimney, make sure there are no openings in the partition separating the divided or individual flues.
The vent connector pipe must not pass through a combustible wall or partition unless adequate protection is provided at the passageway. An acceptable passageway could be either an approved, ventilated metal thimble which is at least 12 inches larger in diameter than the vent connector pipe, or brick work which is at least 8 inches thick constructed into the wall and surrounding the vent connector pipe. (See Fig. 10).



Suggested method to acommodate vent connector passage through a wall composed of combustible material.

The vent connector pipe between the furnace and chimney shall be of equal diameter as the flue outlet of the furnace.
The vent connector pipe must be made of 24 gauge (or thicker) corrosion-resistant steel.
The vent connector pipe should be as short as possible and installed so that it has a continuous rise from the furnace to the chimney. The horizontal length of a connector to a natural draft chimney or vent serving a single appliance shall not be more than 75 percent of the height of the vertical portion of the chimney or vent above the connector. Elbows should be minimized and the pipe should be joined with metal screws and supported by straps. All horizontal runs of vent connector pipe should be pitched upward a minimum of 1/4 inch per foot of run.
A thimble should be used to connect the vent connector pipe to the chimney so the pipe may be readily removed in case of inspection or replacement. See Fig. 10.



Alternate construction that allows reduced clearances to combustible materials.

Reduction of Clearances with Specified Forms of Protection

Type of Protection	Allowable Clearance with Specified Protection (in.)	
Applied to and covering all surfaces of combustible material within the distance specified as the required clearance with no protection. See Figure 11.	Where the required clearance with no protection from the appliance or chimney connector is: ***9 inches***	
	Above	Sides & Rear
a. 3 -1/2" thick masonry wall without ventilation air space.....	---	6
b. 1/2" insulation board over 1" glass fiber or mineral wool batts.....	6	5
c. 0.024 (24 gauge) sheet metal over 1" glass fiber or mineral wool batts reinforced with wire on rear face with ventilated air space.....	5	3
d. 3 - 1/2" thick masonry wall with ventilation air space.....	---	6
e. 0.024 (24 gauge) sheet metal with ventilated air space.....	5	3
f. /2" insulation board with ventilated air space....	5	3
g. 0.024 (24 gauge) sheet metal with ventilated air space over 0.024 (24 gauge) sheet metal with ventilated air space.....	5	3
h. 1" glass fiber or mineral wool batts sandwiched between two sheets 0.024 (24 gauge) sheet metal with ventilated air space	5	3

A. Equal the required clearance with no protection.
B. Equals the reduced clearance permitted in accordance with the preceeding clearance chart.
C. The protection applied to the construction that covers the combustible material should extend far enough in each direction to make C equal to A.

PREVENTION OF CHIMNEY CONDENSING:

⚠ WARNING

PROPER VENTING REQUIRED!

Improper venting may lead to condensation in the chimney. This may result in property damage, injury, or loss of life. To prevent condensation refer to NFPA 31 Section 6 and Appendix E.

Stack gas may do one of two things as it escapes up the chimney:

A. Remain entirely in a gaseous state if the internal chimney wall temperature is above the dew point, or

B. Condense water vapor on the chimney walls if they are chilled below the dew point.

Condensing will always occur on chimney walls whose temperatures are below the dew point, but the condensate may evaporate when the walls warm above the dew point. If the chimney wall temperature does not exceed the dew point during the heating cycle of the furnace, the moisture may accumulate in large enough quantities to cause problems such as corrosion of a metal chimney (especially plain steel or galvanized steel), erosion and break up of a tile liner in a masonry chimney and, in severe cases, corrosion of the heat exchanger. Condensate also could enter the home through cracks or joints in the chimney in a worse case situation.

Condensation most likely will not occur at the bottom of the chimney because the stack gas heats the chimney walls as it rises and the bottom will be heated first. This heating of the walls will cause the stack gas temperature to drop, which in turn may reduce the stack gas temperature below dew point, causing condensation to appear on the upper part of the chimney first. This condensation may then run down inside the chimney and drip back as far as the flue pipe and heat exchanger, where corrosion may occur, if not treated.

To prevent condensation, it is necessary that the internal chimney wall temperature always be kept above the dew point. If the chimney is a masonry type, it may have to be fitted with a flue liner, when the temperature loss is too great for the furnace. If the chimney is a metal type, then an "all fuel" chimney must be used, such as a Class "A" triple wall or insulated metal chimney. A liner will act as an insulator and reduce the stack gas temperature loss. Insulation may be added around the liner for further temperature stability. If the chimney is on the home's exterior or passes through a sizable, unheated area of the building, such as a porch, high ceiling attic, etc., and condensing occurs, the chimney must be insulated around its exterior to help the flue hold its temperature. Also, check to see if the chimney is too large for the furnace and other appliances connected to it. If so, reduce to proper size (see Appendix E of NFPA31) by lining. Be sure to use stainless steel liners, such as stainless types 430, 304, or for the toughest corrosion problems, type 316. If the chimney is the correct size for the unit and condensing still occurs, then insulating the vent connector and/or reducing the efficiency of the furnace may have to be done to raise the chimney temperature.

More detailed information may be obtained from the latest edition of the ASHRAE HVAC Systems and Equipment Handbook.

Should the previous recommendations and the information obtained from the ASHRAE Handbook fail to resolve a condensation problem, another alternative to consider is power side wall venting.

DRAFT REGULATOR

A barometric-type, draft regulator is supplied with the furnace. Installation or operating conditions that produce excess amounts of draft can reduce the heating efficiency of the furnace. The purpose of the regulator is to adjust and control the flow of flue gases from the furnace by stabilizing the amount of chimney draft to which the furnace is subjected.

Generally, install the barometric draft regulator in the vent connector as close as possible to the flue outlet collar of the furnace. However, always refer to the draft regulator manufacturer's installation instructions for application specific recommendations.

POWER (SIDE-WALL) VENTING

⚠ CAUTION

The manufacturer will NOT assume responsibility for damage to, and deterioration of, exterior building materials, e.g. brick, siding, clapboards, and etc., in close proximity to the vent terminal due to operation of a power vented, oil furnace. This policy is applicable regardless of the cause of sooting.

Two (2) problems typically arise when power venting any oil fired appliance:

1) Soot buildup may occur at an accelerated rate on critical components of the furnace oil burner, e.g. the primary control flame sensor ("cad cell"), the burner head, and oil nozzle.
2) Severe damage may occur to external surfaces of the structure in the event the furnace continually produces a high level of smoke in the flue gases. Excess smoke and soot can be produced for many reasons, some of which cannot be successfully controlled by the installer and the appliance manufacturer.

NOTICE: The manufacturer recommends the use of a chimney to vent residential oil furnaces. If a power venter must be used, it is the responsibility of the installer and power venter manufacturer to design, assemble, and demonstrate proper operation of the power venting system with the furnace.

DUCT WORK AND AIR CONDITIONING

Air duct systems should be installed in accordance with standards for air conditioning systems, National Fire Protection Association Pamphlet No. 90. They should be sized in accordance with ACCA Manual D or whichever is applicable.

All furnaces are tested over a range of external static pressure that simulates the airflow resistance of the ductwork, fittings, and diffusers connected to the furnace for a typical (average) duct system. The furnace blower and blower motor have been selected to work successfully against the following range of duct system resistance.

Recommended range of duct system resistance for all models: 0.2 to 0.5 in. W.G. external static pressure.

Due to the need to maintain an adequate supply of combustion and ventilation air, the furnace shall not be installed in a small room without a return air duct system.

A duct the full size of the furnace return air opening shall extend to a location outside the furnace room.

If the furnace is used in connection with cooling/ heat pump systems, a 3 " minimum long transition must be installed between the furnace supply air outlet and the evaporator coil supply air inlet to prevent overheating of the evaporator coil drain pan. See page 10 for specific layout and dimensions.

⚠ WARNING

OVERHEATING HAZARD!

Failure to maintain a minimum of 3" separation from the furnace heat exchanger and the evaporator coil drain pan may cause drain pan damage.

If the furnace is used in connection with summer air conditioning (cooling), the furnace should be installed in parallel with, or on the upstream side of, the evaporator coil to avoid water vapor condensation in the furnace heat exchanger.

If the cooling unit is installed in a parallel flow arrangement, dampers (or other means used to control airflow) should be provided to prevent chilled air from entering the furnace. If such a damper is manually operated, it must be equipped with a means to prevent operation of either unit, unless the damper is placed in either the full heat or full cool position.

NOTICE: Return air grilles and supply registers in the air distribution system should never be obstructed.

AIR FILTER MOUNTING

⚠ CAUTION

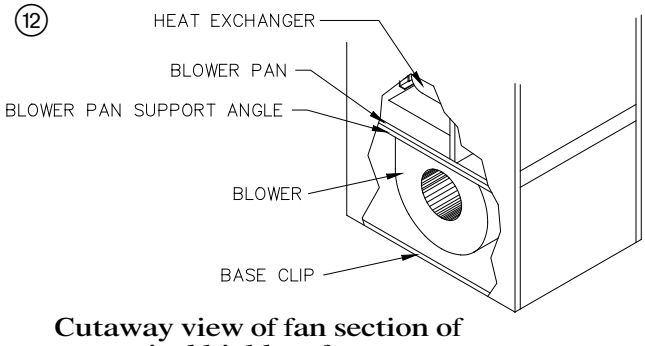
POSSIBLE CASING DAMAGE!

If cutting openings in the furnace casing is required, DO NOT cut any supporting clips or angles. Cut as close to the scribed line as possible, but DO NOT cut the base clip or blower pan support angle.

Lowboy furnaces are factory-equipped with cleanable-type, air filters located above the blower compartment, in the rear of the furnaces. Highboy furnaces ship with an external filter rack & cleanable-type filter.

NOTICE: Downflow/ horizontal furnaces are not factory-equipped with an air filter or filter rack.

Furthermore, the furnace blower compartment does not contain enough free space to permit an air filter to be mounted within the furnace casing. The installer should supply, or fabricate, a filter rack and mount an air filter in the return air plenum above, or upstream of, the furnace blower compartment.



Cutaway view of fan section of a typical highboy furnace.

On the highboy furnace, it is necessary to cut the return air opening in the lower side, or rear, of the casing depending upon the needs of the specific installation, refer to Figure 12.

The side casings have each been pre-punched with four (4), square, knockout openings for use in locating the proper position for the return air filter rack. On the side of the furnace, where the return air duct will attach, scribe a line connecting the outside edges of the knockout openings to form a rectangle.

Using a punch, or a large screwdriver, and a hammer, remove the knockouts and cut the return air opening in the casing.

Sheet metal shears, or a power metal cutting tool, will be required to cut the casing.

Position the open end of the filter rack to the front of the furnace to permit access for filter replacement. Align the filter rack with the rectangular hole and mark the locations on the casing of the pre-punched mounting holes in the filter rack flange. Drill pilot holes in the casing and permanently attach the filter rack to the furnace with screws, or pop-rivets (these fasteners are **not** included). Connect the return air plenum to the filter rack and slide the air filter into position.

OIL BURNER AND NOZZLE INSTALLATION

⚠ CAUTION

FUEL REQUIREMENT!

This oil furnace is designed to use No. 2 distillate fuel (home heating) oil only.

This furnace is designed to utilize the following specially modified, oil burner:

- R.W. Beckett Corp. model AF burner, specification #EFL-101.

NOTICE: NO other burners may be used in this application.

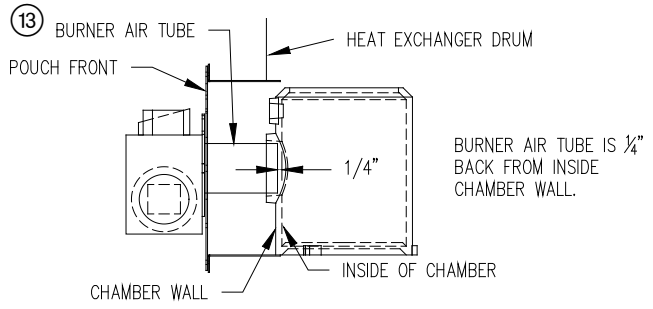
The heat output from the furnace is fixed, based on the size of nozzle installed in the oil burner. Four (4) heat input rates are permissible: 84,000, 105,000, 119,000, and 140,000 BTUH.

Nozzle selection (i.e. heating capacity of the furnace) shall be based on a rate of heat loss (heating load) calculation for the building. These calculations should be made according to the manuals provided by the Air Conditioning Contractors of America (ACCA) or the American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE).

Refer to the Residential Load Calculation, Manual J, from the ACCA, and the ASHRAE Handbook Fundamentals volume, from ASHRAE, for the recommended procedure to compute the design heating load of a residence.

The oil burner was installed in the furnace at the factory. In the field, if it is necessary to adjust the heating capacity of the furnace by changing the oil burner nozzle, refer to the following instructions. Also, consult the oil burner manufacturer's operating instructions (included with the burner) for detailed instructions on this procedure.

1) The oil nozzle is factory installed in the oil burner. The gun/electrode assembly with nozzle may be removed from the rear of the burner assembly without removing the oil burner from the furnace.
   To access the gun/ electrode assembly, loosen two (2) machine screws and clamps holding the burner ignition transformer in position. Rotate the transformer forward and out of the way.
2) Install an appropriate replacement nozzle of the correct size, spray angle, and spray type.
3) The furnace may have been handled roughly while in transit. Under some conditions, the combustion chamber can shift out of position. Check for proper alignment of the burner air tube with the circular opening in the combustion chamber and trial fit the burner to check the insertion depth of the oil burner into the combustion chamber.
   The end of the burner air tube should be inserted no farther than 1/4 inch back from the inside surface of the combustion chamber, refer to Figure 13 . Do not allow the burner tube/ end cone to physically touch or protrude into the chamber.
   High temperatures in the combustion chamber can result in damage to the tube, the end cone, or both. A distance greater than 1/4 inch back from the inside chamber wall may cause flame impingement on the combustion chamber wall and subsequent sooting or carbon char buildup.



Side view of correct burner insertion into combustion chamber.

The oil burner provided with this furnace requires initial inspection, set-up, and proper adjustment. Refer to this manual and the oil burner manufacturer's operating instructions for detailed information on the following items:

- Initial firing of burner
- Adjusting the burner combustion air

- Adjusting the fuel pump pressure
- Setting the draft control

NOTICE: This oil furnace must be installed and adjusted by qualified oil heating dealers using calibrated combustion test instruments to ensure safe and reliable operation of the furnace.

FUEL SYSTEM INSTALLATION

In situations where the oil storage tank is installed at the same level with, or above, the burner, a single oil supply line run from the oil tank to the burner will usually be adequate. No return line will be required. If the oil tank is installed below the burner and the lift exceeds approximately 8-ft., an oil supply line and an oil return line are necessary. See Figure 14 and 15.

Refer to the Standard for the Installation of Oil-Burning Equipment, NFPA 31-2001, and the oil burner operating instructions for detailed information on oil storage tank & oil supply/ return line installation.

NOTICE: We recommend installing a high efficiency oil filter, in the oil supply line, capable of filtering 10 to 20 micron diameter (or preferably smaller) particles from the fuel.

If available, **the use of ultra-low or low sulfur (less than 0.0015% S and 0.0015 - 0.05% S, by weight, respectively), no. 2 fuel oil is highly recommended.** Low sulfur fuel oil can help to significantly reduce instances of blockage and corrosion of the oil burner fuel delivery system (especially the nozzle), the furnace heat exchanger, and the flue gas venting system. Air pollutants emitted by the furnace and the typical malodorous smell of oil combustion will be reduced.

Connect fuel lines

Carefully follow the fuel unit manufacturer's literature and the latest edition of NFPA 31 for oil supply system specifications.

Fuel units with automatic bypass do not require a bypass plug. The burner fuel unit is shipped without the bypass plug installed. You must install this plug on two-pipe oil systems.

⚠ WARNING

DO NOT install the bypass plug in the fuel unit if connected to a one-pipe oil system.
Failure to comply could cause fuel unit seal failure, oil leakage and potential fire and injury hazard.

Fuel supply level with or above burner –

The burner is factory equipped with a single-stage fuel unit. Connect the fuel supply to the burner with a single supply line if you want a one-pipe system **(making sure the bypass plug is NOT installed in the fuel unit.)**

Manual venting of the fuel unit is required on initial start-up. If connecting a two-pipe fuel supply, install the fuel unit bypass plug.

The oil supply inlet pressure to the fuel unit cannot exceed 3 psi. Install a pressure-limiting device in accordance with NFPA 31. Example: Burner is at same level or below the level of the oil tank.

Fuel supply below the level of the burner –

When the fuel supply is below the level of the burner, a two-pipe fuel supply system is required. See Figure 15. Depending on the fuel line diameter and horizontal and vertical length, the installation may also require a two-stage pump. Consult the fuel unit literature for lift and vacuum capability.

Fuel line installation –

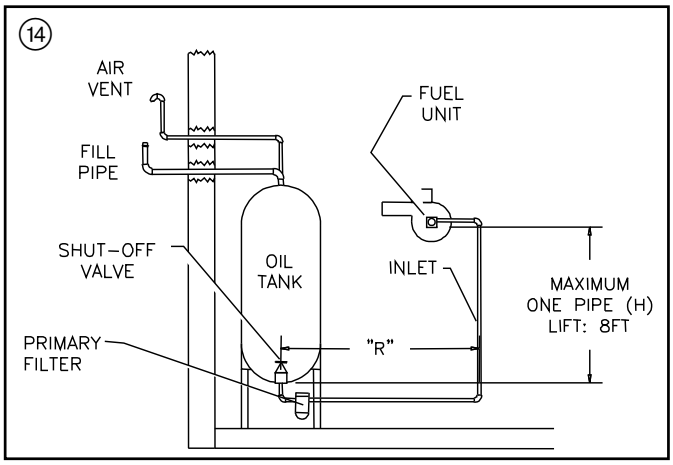
- Continuous lengths of heavy wall copper tubing are recommended. **Always use flare fittings. Never use compression fittings.**
- Always install fittings in accessible locations. Fuel lines should not run against the appliance or the ceiling joists (to avoid vibration noise).

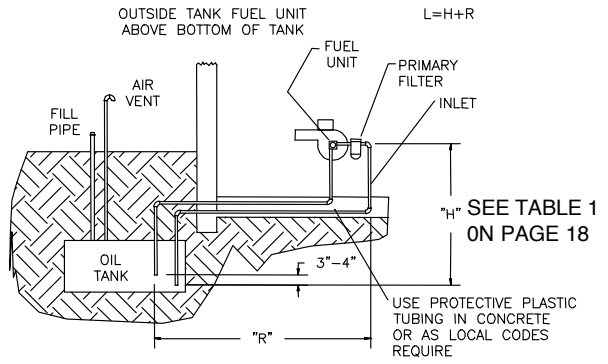
Never use Teflon tape on any fuel fitting. Tape fragments can lodge in fuel line components and fuel unit, damaging the equipment and preventing proper operation.

Fuel line valve and filter –

- Install two high quality **shutoff valves** in accessible locations on the oil supply line. Locate one close to the tank and the other close to the burner, upstream of the filter.

Some states require these valves to be fusible-handle design for protection in the event of fire. We recommend this as good industry practice for all installations.





TWO-PIPE SYSTEM

- Install a generous capacity filter inside the building between the fuel tank shutoff valve and the burner, locating both the filter and the valve close to the burner for ease of servicing. Filter should be rated for 50 microns or less.

TABLE 1

SINGLE STAGE, TWO PIPE MAXIMUM LINE LENGTH (H + R)

Lift "H"	3450 RPM			
	3/8" Tubing		1/2" Tubing	
	3 GPH	7 GPH	3 GPH	7 GPH
0'	84'	71'	100'	100'
1'	78'	66'	100'	100'
2'	73'	62'	100'	100'
3'	68'	57'	100'	100'
4'	63'	53'	100'	100'
5	57'	48'	100'	100'
6'	52'	44'	100'	100'
7'	47'	39'	100'	100'
8'	42'	35'	100'	100'
9'	36'	31'	100'	100'
10'	31'	27'	100'	100'
11'	26'	22'	100'	87'
12'	21'	18'	83'	70'
13'	-	-	62'	52'
14'	-	-	41'	35'

ELECTRICAL CONNECTIONS

NOTICE: All field wiring must conform to local, state, and national installation codes.

A disconnect switch equipped with overcurrent protection (e.g. a time delay-type fuse or inverse time, circuit breaker) should be installed in the service line for shutting down and protecting the furnace and electrical system.

Since the furnace is entirely pre-wired at the factory, it is only necessary to connect the building electrical service lines to the two (2) pigtail wires extending from the fan center junction box. The fan center is mounted inside the furnace burner compartment or mounted on the front exterior of the furnace, in the case of the downflow / horizontal model. The service lines to the furnace should be no smaller than 14 Ga., insulated copper wire with a temperature rating of 60ºC, or greater.

Connect an equipment ground wire to the furnace at the fan center junction box. If wiring is run through metal electrical conduit, it may not be necessary to run a separate equipment ground wire. Consult local codes and authorities for specific minimum requirements.

VARIABLE SPEED DIP SWITCH SETTING FOR COOLING

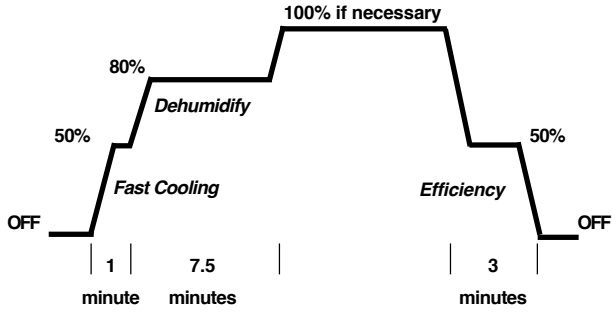
The following table and graph explain the delay-off settings:

COOLING OFF - DELAY OPTIONS

SWITCH SETTINGS		SELECTION	NOMINAL AIRFLOW
5 - OFF	6 - OFF	NONE	SAME
5 - ON	6 - OFF	1.5 MINUTES	100% *
5 - OFF	6 - ON	3 MINUTES	50%
5 - ON	6 - ON	**	50 - 100%

**** - This setting is equivalent to BAY24X045 relay benefit.***

***** - This selection provides ENHANCED MODE, which is a ramping up and ramping down of the blower speed to provide improved comfort, quietness, and potential energy savings. See Service Facts for cooling and heating air flow dip switch settings 1,2,3,4,7,8. The graph which follows, shows the ramping process.***

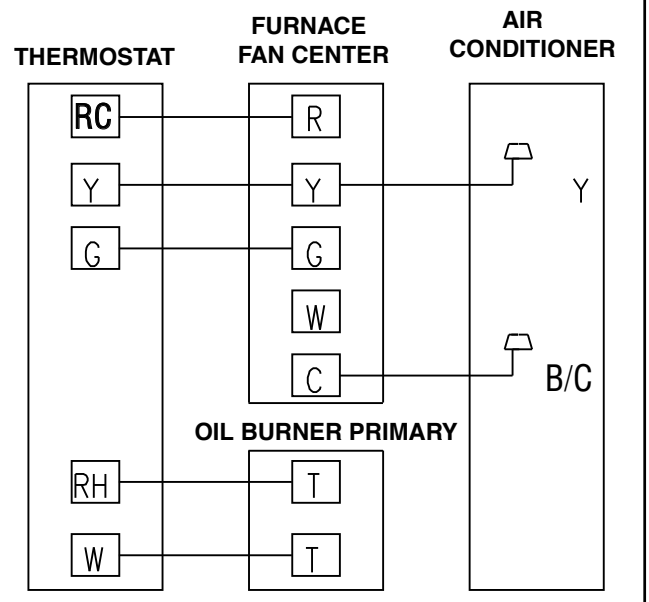


See Service Facts for dip switch setting for complete setup for Enhanced Mode.

Using 18 gauge control wire, connect control wiring to thermostat as shown in the following illustrations. If the thermostat does not have an isolated heating circuit (RH), then install a pilot duty rated, 24 volt, relay (RLY00975, field supplied). This relay is shown as R1 in the illustrations. Consult the National Electrical Code, ANSI/NFPA 70-2002, for guidelines for proper wiring methods and materials for this circuit.

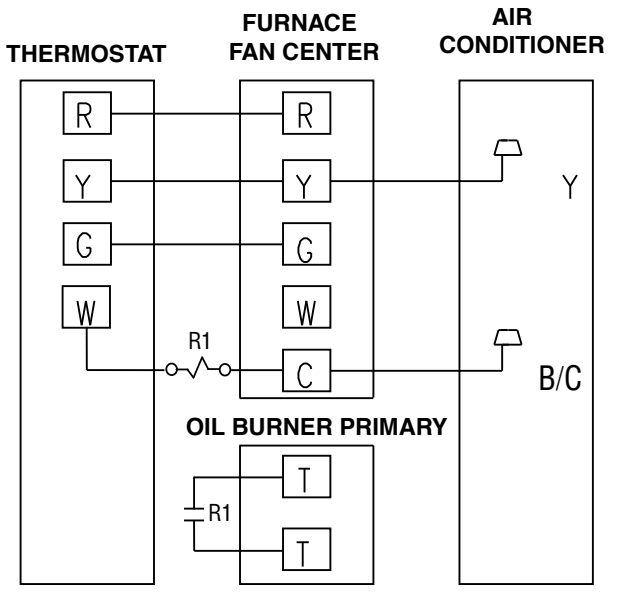
LOW VOLTAGE HOOK UP DIAGRAMS FOR OIL FURNACE WITH PSC MOTOR (SINGLE STAGE COOLING)

⑯ **SINGLE STAGE HEAT/ COOL WITH RH/ RC CIRCUIT**



NOTE:
Thermostat "R" terminal may be labeled as "RC" or "RH".

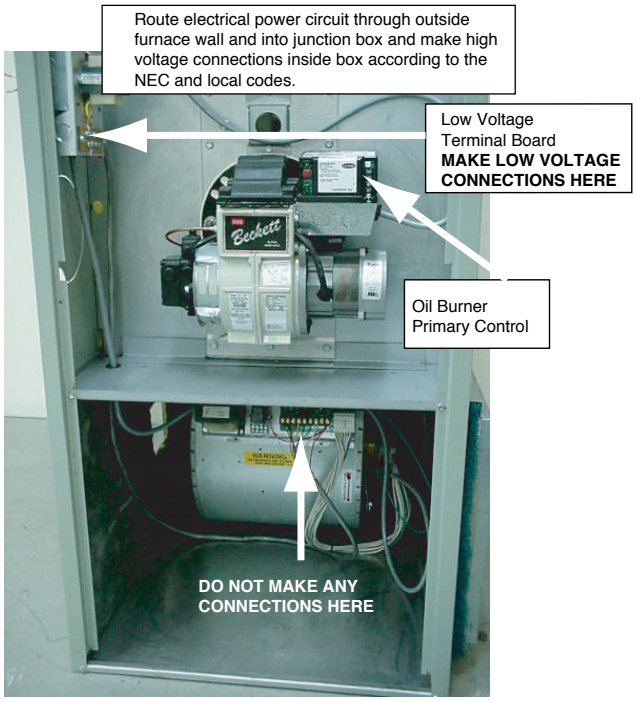
⑰ **SINGLE STAGE HEAT/ COOL WITH 24V RELAY**



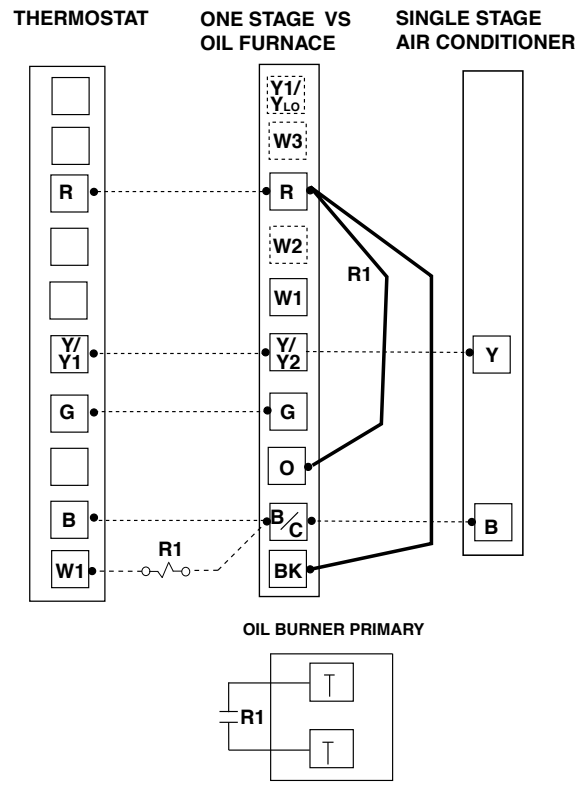
NOTE:
Thermostat "R" terminal may be labeled as "RC" or "RH".

VARIABLE SPEED OIL FURNACE CONNECTION LOCATIONS AND LOW VOLTAGE HOOK UP DIAGRAMS (SINGLE STAGE COOLING) WITH 24V RELAY

VARIABLE SPEED V3, V5 LOW VOLTAGE WIRING CONNECTIONS LOCATIONS



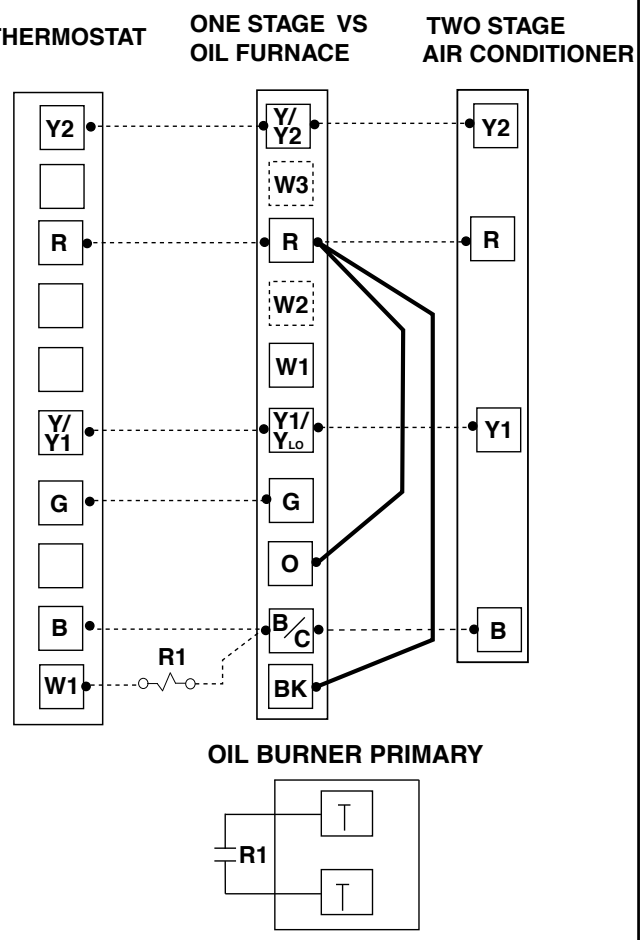
VARIABLE SPEED OIL FURNACE SINGLE STAGE COOLING



"R" to "O" and "R" to "BK" are Factory Installed Jumpers

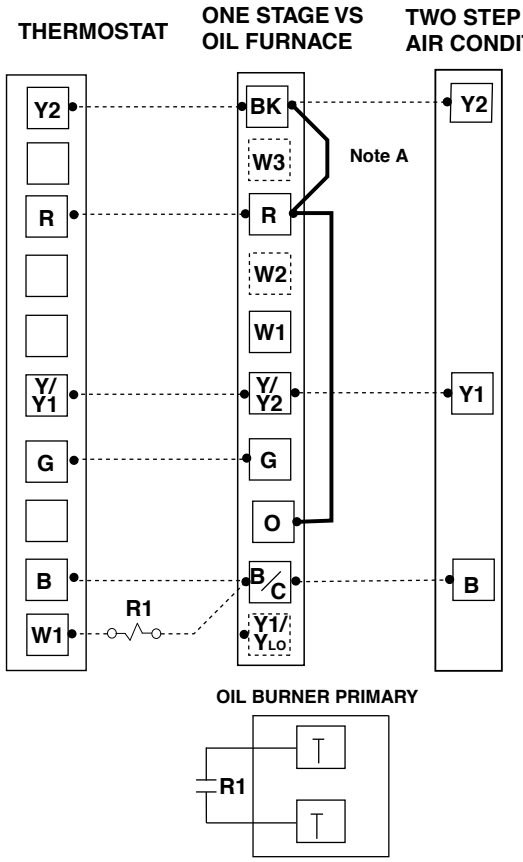
LOW VOLTAGE HOOK UP DIAGRAMS FOR VARIABLE SPEED OIL FURNACE (TWO STAGE/ STEP COOLING)

VARIABLE SPEED OIL FURNACE TWO STAGE COOLING WITH 24V RELAY



"R" to "O" and "R" to "BK" are Factory Installed Jumpers

VARIABLE SPEED OIL FURNACE TWO STEP COOLING WITH 24V RELAY

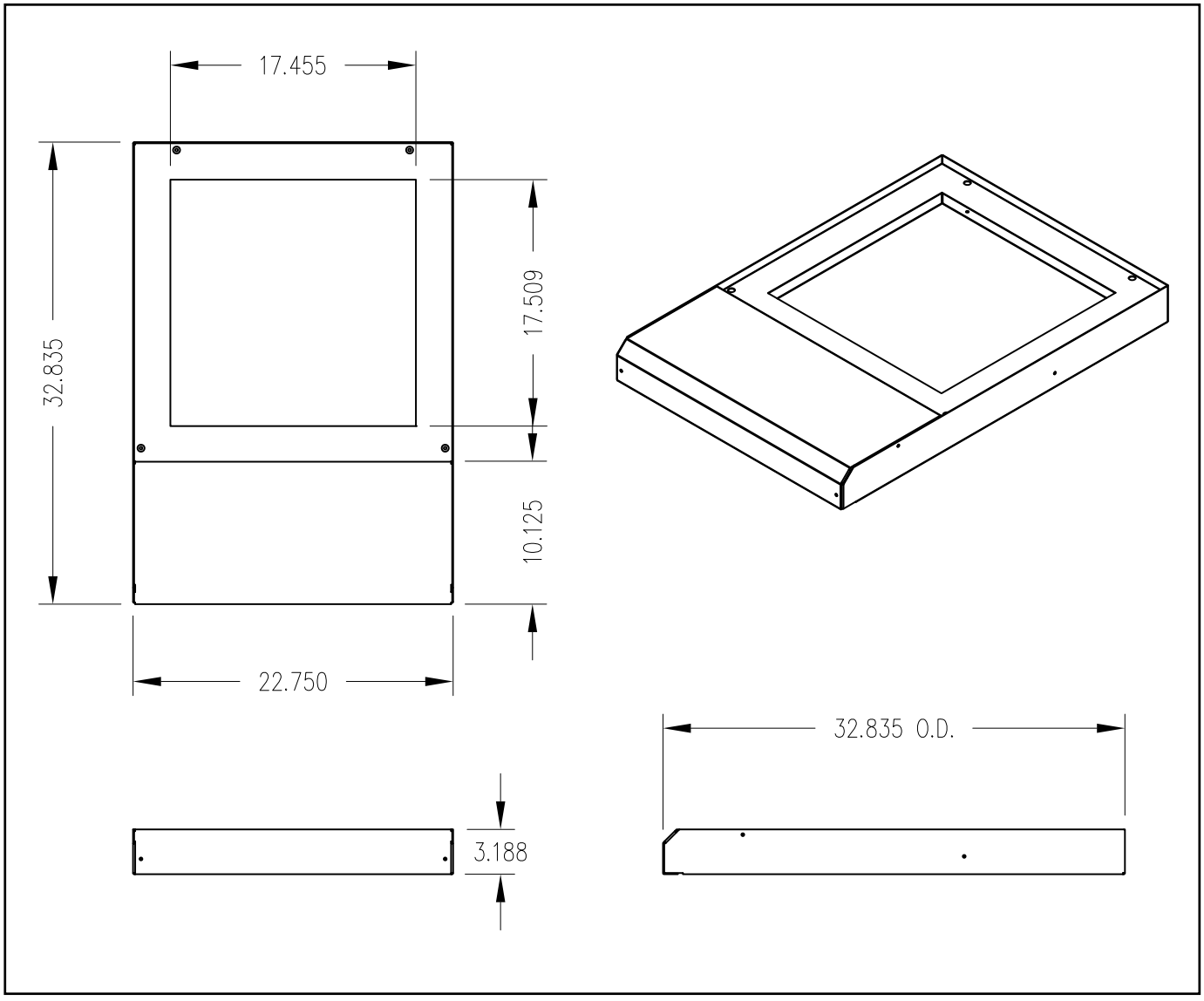


Note A - Cut/remove the factory installed "R" to "BK" jumper at the indoor unit.

"R" to "O" and "R" to "BK" are Factory Installed Jumpers

BAYSUB10ABASEAA DIMENSIONS

Downflow Furnace Combustible
Surface-Mounting Base



Trane
6200 Troup Highway
Tyler, TX 75707

For more information contact your local dealer (distributor)

02/09

Since the manufacturer has a policy of continuous product and product data improvement, it reserves the right to change design and specifications without notice.