

# Direct Vent (Sealed Combustion) Forced Air Gas Furnaces

## Installation Instructions

### M3RL Series 90+ Downflow Condensing Furnace

For installation in:

1. Manufactured Homes
2. Park Models and Manufactured Buildings
3. Modular Homes/Buildings



#### **WARNING:**

##### **FIRE OR EXPLOSION HAZARD**

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

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

##### **– WHAT TO DO IF YOU SMELL GAS**

- Do not try to light any appliance.
  - Do not touch any electrical switch; do not use any phone in your building.
  - Leave the building immediately.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.



#### **ADVERTISSEMENT:**

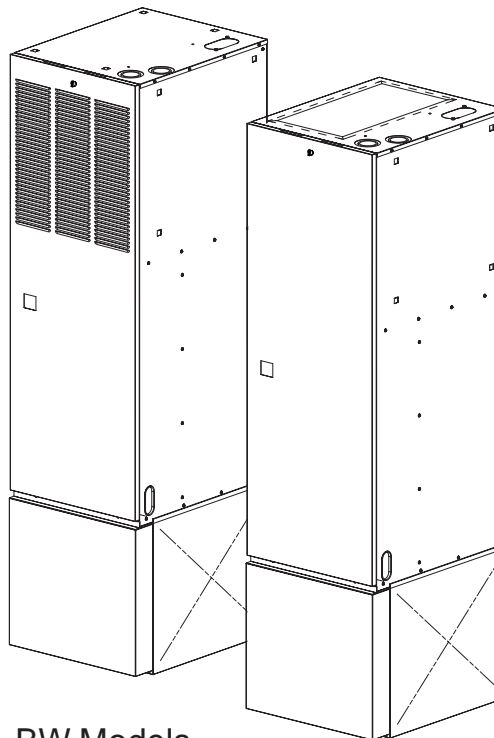
##### **RISQUE D'INCENDIE OU D'EXPLOSION**

Le non-respect des avertissements de sécurité pourrait entraîner des blessures graves, la mort ou des dommages matériels.

– Ne pas entreposer ni utiliser de l'essence ni d'autres vapeurs ou liquides inflammables dans le voisinage de cet appareil, ni de tout autre appareil

##### **– QUE FAIRE S'IL Y A UNE ODEUR DE GAZ**

- Ne pas tenter d'allumer aucun appareil.
  - Ne toucher à aucun interrupteur électrique; n'utiliser aucun téléphone dans le bâtiment.
  - Évacuer l'immeuble immédiatement.
  - Appeler immédiatement le fournisseur de gaz en employant le téléphone d'un voisin. Respecter à la lettre les instructions du fournisseur de gaz.
  - Si personne ne répond, appeler le service des incendies.
- L'installation et l'entretien doivent être effectués par un installateur qualifié, un organisme de service ou le fournisseur de gaz.



BW Models

BWT Models



#### **WARNING:**

Should overheating occur, or the gas supply fail to shut off, shut off the manual gas valve to the appliance before shutting off the electrical supply.

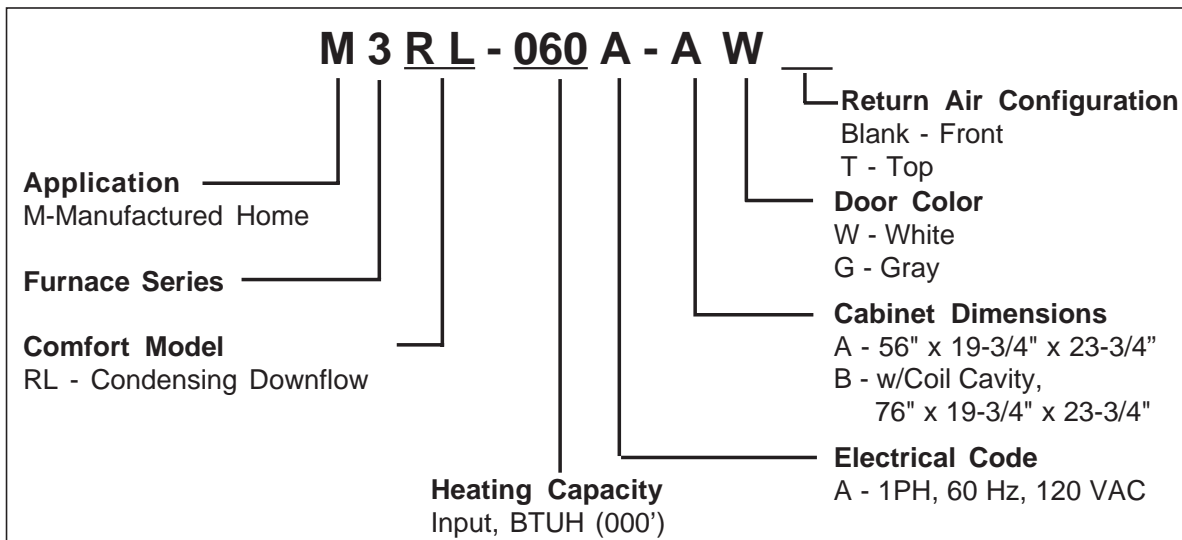
**Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency or the gas supplier.**

**LEAVE THESE INSTRUCTIONS WITH THE HOMEOWNER.**



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**Table 1. Model Identification**

# GENERAL

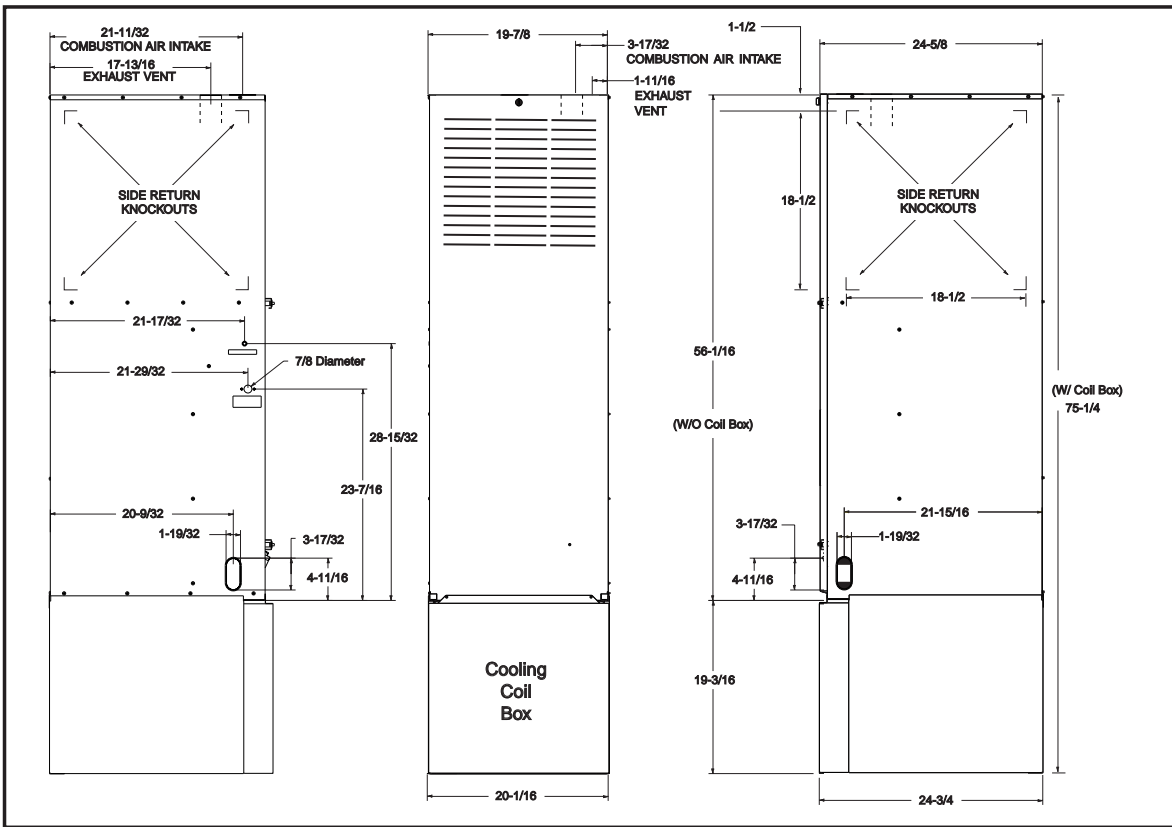
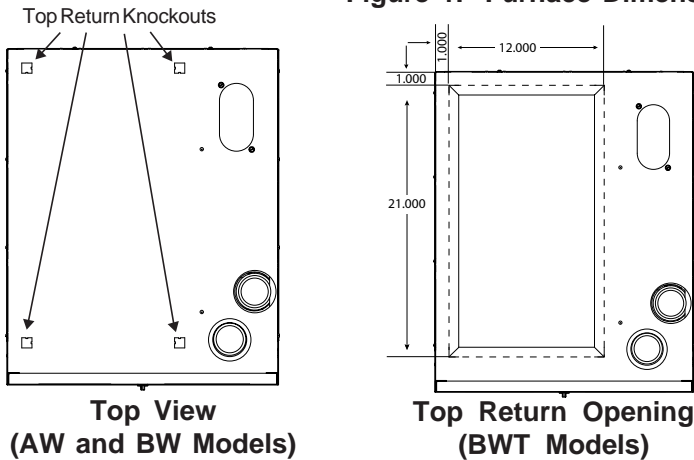


Figure 1. Furnace Dimensions



Furnace Model	Shipping Weight (lbs)
M3RL 060A AW	150
M3RL 060A BW*	170
M3RL 080A AW	155
M3RL 080A BW*	175

\* May include suffix - T

Table 2. Shipping Weight

## Furnace Specifications / Airflow Data

Furnace Model No.	Furnace Input Btuh	Furnace Output Btuh	Temp. Rise @ .3"WC °F	Motor HP	Motor Speed	External Static Pressure (Inches Water Column)					Recommended A/C Ton
						0.1 CFM	0.2 CFM	0.3 CFM	0.4 CFM	0.5 CFM	
M3 RL-060	60,000	54,000	35 - 65	1/2	High*	1660	1599	1544	1474	1410	4
					Med-High	1512	1467	1416	1363	1304	3
					Med-Low	1340	1304	1261	1217	1158	2.-1/2
					Low**	1176	1142	1108	1025	966	2
M3 RL-080	80,000	72,000	35 - 65	1/2	High*	1660	1599	1544	1474	1410	4
					Med-High	1512	1467	1416	1363	1304	3
					Med-Low**	1340	1304	1261	1217	1158	2.-1/2
					Low	1176	1142	1108	1025	966	2

Note: Data is for Operation with Filter.

\* Factory Wired Cooling Tap

\*\* Factory Wired Heating Tap

Table 3. Furnace Specifications/Airflow Data

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 **WARNING:**

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**Do not use this appliance if any part has been submerged under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control that has been submerged underwater.**

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## NOTICE TO INSTALLER

Installer is advised to follow carefully all instructions and warnings in this manual to insure maximum performance, safety, and operating efficiency of these appliances. Improper installation may create hazardous conditions, and will void the appliance warranty.

## GENERAL

### General Description

The M3 series gas furnaces are listed direct vent (sealed combustion) forced air furnaces for use with both natural and propane gases. The M3 series is a Category IV and type FSP furnace. The M3 furnace series has been certified to the ANSI Z21.47/CSA2.3-2001 for use in the United States and Canada and to the UL307B —1995 for use in the United States.

These furnaces may be installed in:

1. Manufactured Homes.
2. Park Models and Manufactured buildings
3. Modular Homes/Buildings

The following are safety guidelines with references to their specific sections or pages in the manual.

1. Use only type of gas approved for this furnace. Refer to the furnace rating plate.
2. Install this furnace only in location and position as specified in pages 7 - 13 of these instructions.
3. Provide adequate combustion and ventilation air to the furnace space as specified in pages 13 - 20 of these instructions.
4. Combustion products must be discharged outdoors, connect this furnace to an approved vent system only, as specified in pages 14-19 of these instructions.

5. Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leak to check all connections.
6. Always install furnace to operate within the furnace's intended temperature rise range with a duct system that has an external static pressure within the allowable range, as specified in page 4 of these instructions. See furnace rating plate.
7. 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 duct(s) sealed to the furnace casing and terminating outside the space containing the furnace. Note: This section only applies to furnaces installed with side or top return air.
8. A gas-fired furnace for installation in a residential garage must be installed as specified in page 7 of these instructions.
9. The furnace is not to be used for temporary heat of buildings or structures under construction.

M3 series furnaces are air conditioning ready as shipped. The furnace cooling capacities of the blower motor speed taps are shown in Table 3. Table 2 lists the shipping weights for the M3 series furnaces.

## OWNER INFORMATION

NORDYNE has been involved in the design of products for the manufactured home industry since the first manufactured home or trailer was built.

NORDYNE originated the sealed combustion system, which separates the furnace combustion system from the living area of the home, now a standard for the manufactured home industry.

NORDYNE engineers developed the first central heating system and the first central air conditioner for manufactured homes.

NORDYNE is dedicated to bringing to its customers the finest heating and cooling comfort possible. NORDYNE constantly seeks to further refine its products to continuously provide exceptional comfort.

Follow the instructions in this booklet carefully and this appliance will provide many years of superior performance.

If you wish to cool your home automatically with a central air conditioning system investigate the excellent NORDYNE cooling systems available from your heating and cooling contractor. These systems are designed to work best with your NORDYNE furnace and have been carefully engineered to deliver optimum performance when mated with NORDYNE manufactured home furnaces.

NORDYNE also offers water heaters, fireplaces and ventilating systems specifically designed for manufactured housing applications. Check with your manufactured home retailer, your heating and cooling contractor or your distributor for information. Write directly to the factory (PO Box 8809, O'Fallon, MO 63366) if you are not able to locate a source for NORDYNE manufactured housing products in your area.

#### **MANUFACTURER WARRANTY, OWNER'S RESPONSIBILITIES**

It is the sole responsibility of the homeowner to make certain the gas furnace has been correctly set up and converted to the proper fuel (L.P. gas or Natural gas) and adjusted to operate properly. All gas furnaces are manufactured for Natural gas and must be field converted when using L.P. gas.

A warranty certificate with full details is included with these instructions. However, NORDYNE will not be responsible for any costs found necessary to correct problems due to improper setup, improper installation, furnace adjustments, improper operating procedure on the part of the user, etc.

Some specific examples of service calls which cannot be included in warranty payments are:

1. Converting the furnace to use another type of gas.
2. Repairing duct work in the home found to be faulty.
3. Correcting wiring problems in the electrical circuit supplying the furnace.
4. Resetting circuit breakers, blown fuses or other switches.
5. Correcting problems due to improper gas supply pressure to the furnace.

6. Providing instructional training on how to light and operate the furnace.
7. Furnace problems caused by installation of an air conditioner, heat pump or other air comfort devices.
8. Revising installation of the furnace flue assembly.
9. Adjusting or calibrating of thermostat.
10. Any construction debris which falls into the flue system.

Carefully review these responsibilities with your manufactured housing dealer, service company or gas supplier so there will be no misunderstanding at a later time.



### **CAUTION:**

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- **Never attempt to alter or modify this furnace or any of its components.**
  - **Never attempt to repair damaged or inoperable components. Such action could cause unsafe operation, explosion, fire and/or asphyxiation.**
  - **If a malfunction has occurred, or if you feel that the furnace is not operating as it should, contact a qualified service agency or gas utility for assistance.**
- 

#### **INSTALLATION STANDARDS**

Installer shall be familiar with and comply with all codes and regulations applicable to the installation of these heating appliances and related equipment. In lieu of local codes, the installation shall be in accordance with the current provisions of one or more of the following standards.

- a. Federal Manufactured Home Constructions & Safety Standard (H.U.D. Title 24, Part 3280.707[a][2])
- b. The Standard for Manufactured Home Installations (Manufactured Home Sites, Communities, and Set-Ups) ANSI A225.1 and/or CAN/CSA-2240 MH Series).
- c. American National Standard (ANSI-119.2/NFPA-501C) for all recreational vehicle installations.
- d. American National Standard (ANSI-Z223.1/NFPA-54) and/or CAN/CGA B149 for all gas-fired furnace models.
- e. American National Standard (ANSI-C1/NFPA-70) and/or CSA 22.1 Canadian Electric Code Part 1 for all electrical field wiring.

CE générateur d'air chaud doit être installé conformément aux instructions du fabricant et aux codes locaux. En l'absence de code local, respecter la norme ANSI Z223.1, intitulé National Fuel Gas Code ou les codes d'installation CAN/GCA-B149.

The National Fuel Gas Code is available by writing:

American National Standards Institute, Inc.  
1430 Broadway  
New York, NY 10018

NFPA publications are available by writing:

National Fire Protection Association  
Batterymarch Park  
Quincy, ME 02269

## LOCATION

The furnace must be installed on a level surface, and as close to the center of the air distribution system as possible. See Figure 1 for overall dimensions to determine the required clearances in hallways, doorways, stairs, etc. to allow the furnace to be moved to the installation point. The furnace must be installed so that all electrical components are protected from water.

Minimum clearances to combustible materials are listed in Table 4. Access for positioning and servicing must be considered when locating the unit.

This furnace is certified for use on wood flooring. The furnace must be installed on a solid surface and must be level front-to-back and side-to-side. This furnace must not be installed directly on carpeting, tile, or any com-

ALL MODELS	CLOSET	ALCOVE
	Inches	Inches
Front	1*	1*
Back	0	0
Sides	0	0
Vent	0	0
Top	6	6
Duct (Plenum)		
w/ Coil Box	0	0
w/o Coil Box	1/4	1/4
(within 3 feet)		

\*Note: For 1" clearance, use a fully louvered door with at least 400 square inches of free airflow area.

**Table 4. Minimum Clearances**

combustible material other than wood flooring. The furnace may be installed on combustible flooring when installed on a Nordyne duct connector (see Table 5).

The ductwork within 3 feet of the furnaces without the A/C coil box must be installed such that surfaces are at least 1/4" from combustible materials.

When installed in a residential garage, the furnace must be positioned so the burners and the source of the ignition are located no less than 18 inches above the floor and protected from physical damage by vehicles.

## CIRCULATING AIR SUPPLY

### WARNING:

**Products of combustion must not be allowed to enter the return air openings of the furnace or the circulating air supply. Failure to prevent products of combustion from being circulated into the living space can create potentially hazardous conditions including carbon monoxide poisoning that could result in personal injury or death.**

**The floor or platform on which the furnace is mounted must provide sound physical support of the furnace with no gaps, cracks, or sagging between the furnace and the floor or platform.**

**The circulating air ductwork must not be connected to any other heat producing device such as a fireplace insert, stove, etc.**

## GENERAL

Plenums and air ducts must be installed in accordance with the Standard for the Installation of Air Conditioning and Ventilating Systems (NFPA No. 90A) or the Standard for the Installation of Warm Air Heating and Air Conditioning Systems (NFPA No. 90B).

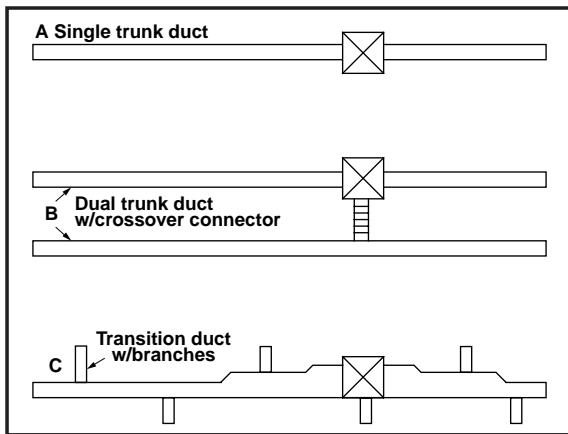
## RETURN AIR PROVISIONS

U.S.A. home manufacturers shall comply with all of the following conditions to have acceptable return air systems for closet installed forced air heating appliances:

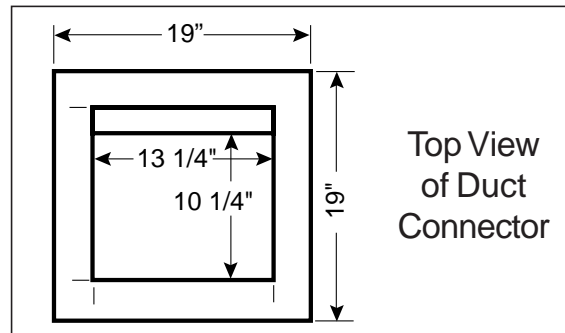
- a. Regardless of the location, the return air opening into the closet shall not be less than specified in the appliance's listing.
- b. Means shall be provided to prevent inadvertent closure by a flat object placed over the return air opening when it is located in the floor of the closet (versus the vertical front or side wall).
- c. Closet installations must use a louvered door having a minimum free area of 235 sq. in. when located 6" from furnace. For clearance between 1" and 6" from furnace, requirements are a louvered door with minimum of 235 sq. in. free area, with the openings in closet door directly inline with the louvered openings in the furnace door. For 1" clearance from furnace, use a fully louvered door with at least 400 sq. in. of free airflow area.
- d. The cross-sectional area of the return duct system leading into the closet, when located

in the floor or ceiling shall not be less than 235 square inches.

- e. The total free area of openings in the floor or ceiling registers serving the return air duct system must be at least 352 sq. in. At least one register should be located where it is not likely to be covered by carpeting, boxes and other objects.
- f. Materials located in the return duct system must have a flame spread classification of 200 or less. This includes a closet door if the furnace is in a closet.
- g. Noncombustible pans having 1" upturned flanges are located beneath openings in a floor duct system.
- h. Wiring materials located in the return duct system shall conform to Articles 300-22 of the National Electrical Code (ANSI C1/ NFPA-70).



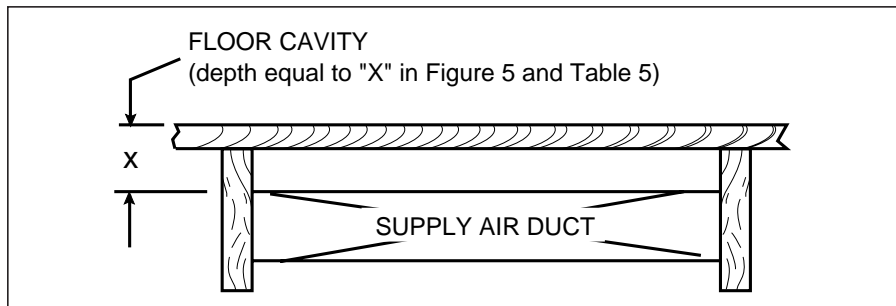
**Figure 2. Non-Platinum Supply Duct System**



**Figure 4.**

If "X" (Floor Cavity) is:		Use Duct Connector Model Part Number:	
English	Metric (mm)	Finger Tab	Screw Down
7/8"	22	901987	904008
2"	51	901988	904009
4 1/4"	108	901989	904010
6 1/4"	150	901990	904011
8 1/4"	210	901991	904012
10 1/4"	260	901992	904013
12 1/4"	311	901993	904014

**Table 5. Duct Connectors**



**Figure 3.**



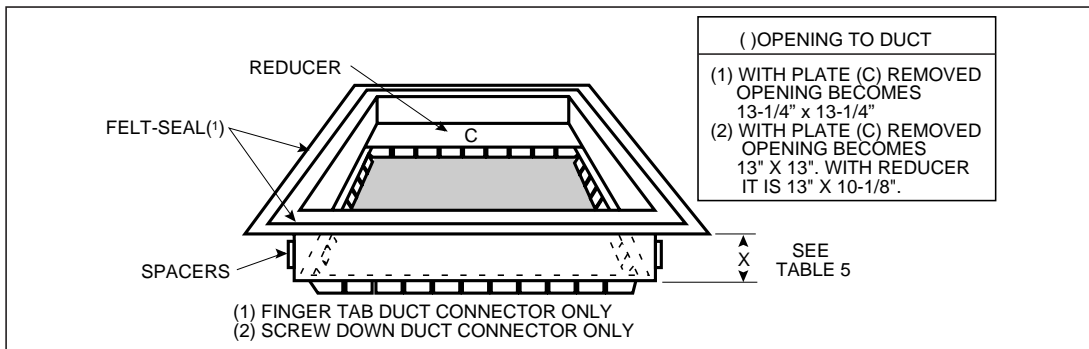


Figure 5.

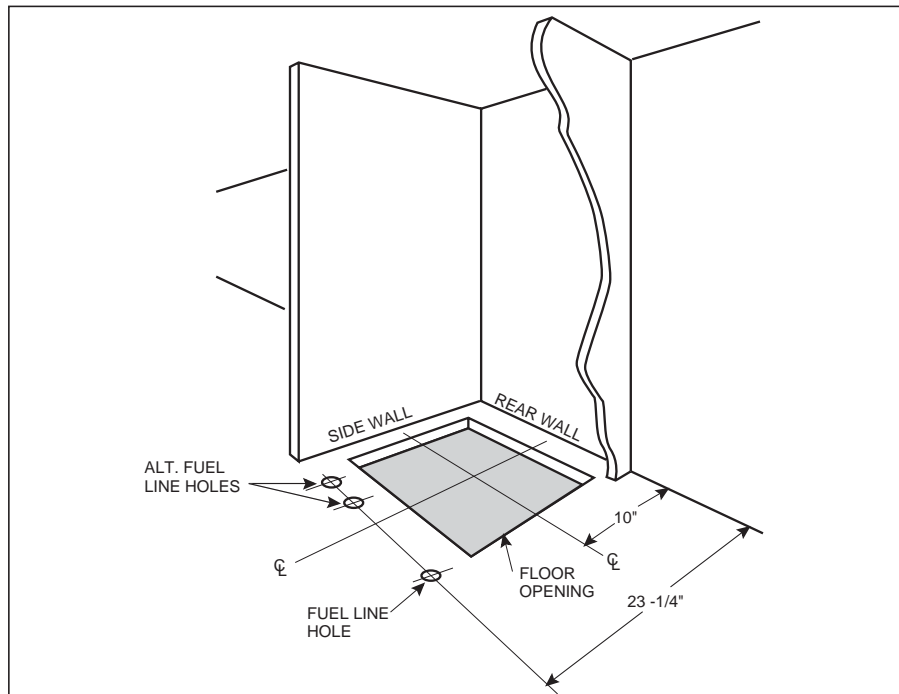


Figure 6. Closet or Alcove

- i. Gas piping is not run in or through the return duct system.
- j. Test the negative pressure in the closet with the air-circulating fan operating at high speed and the closet closed. The negative pressure is to be no more negative than minus 0.05 inch water column.
- k. For floor return systems, the manufactured home manufacturer shall affix a prominent marking on or near the appliance where it can be easily read when the closet door is open. The marking shall read:

**CAUTION:**

**HAZARD OF ASPHYXIATION: Do not cover or restrict return air opening.**

- l. Air conditioning systems may require more duct register and open louver area to ob-

tain necessary airflow. Use NORDYNE's certiduct program to determine proper duct size for A/C.

**DUCTED RETURN AIR**

M3 furnaces with model numbers ending in AW or BW are factory configured for the return air to flow through the front louvered door. The return air may also be attached to either side or the top of the furnace cabinet using a field installed kit. Refer to Table 12 for the NORDYNE ducted return kit P/N number. The location and size of the side and top return air connections are shown in Figure 1. The filter size for the side return air is 20" x 20" x 1". For top return the filter size is 24" x 16" x 1".

M3 furnaces with model numbers ending in BWT are factory configured for the return air to enter the top of the furnace.

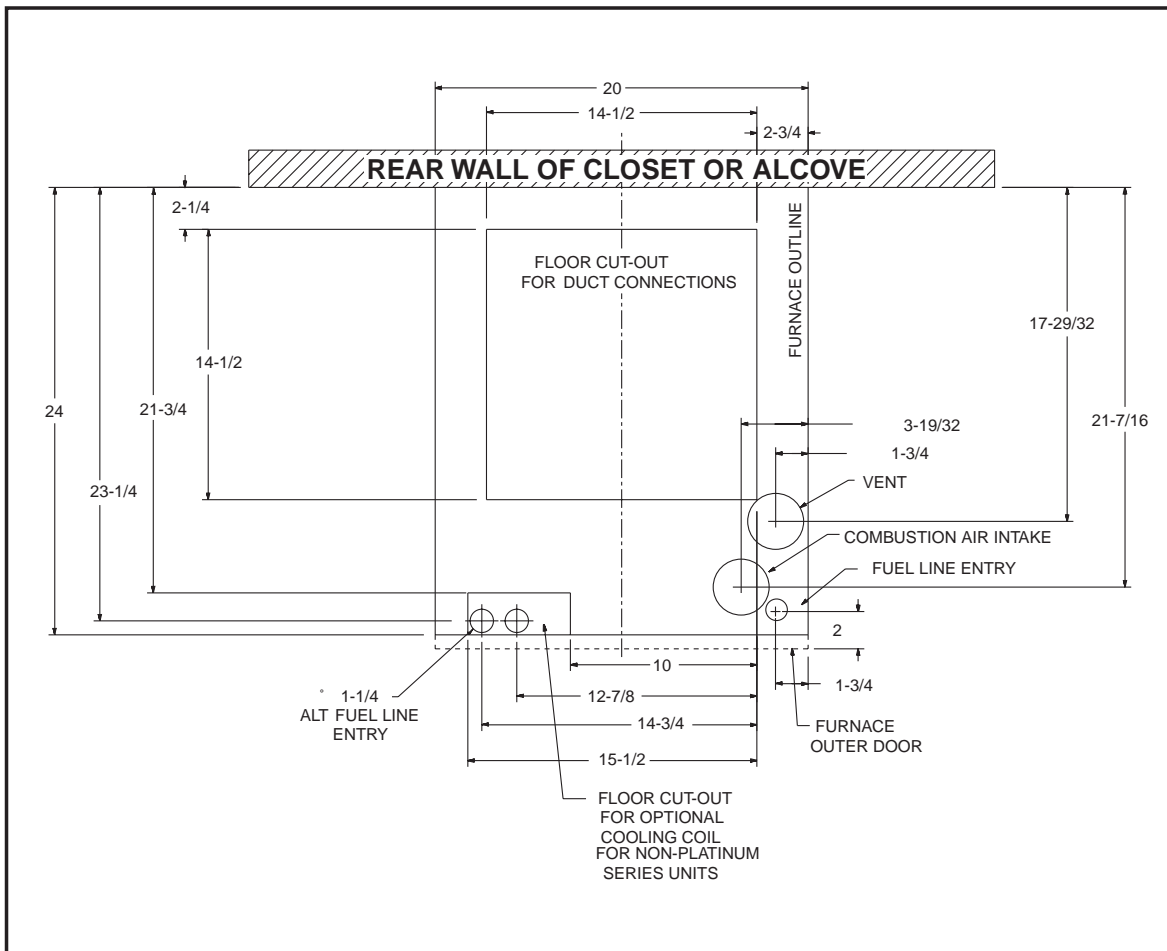


Figure 7. Cut-Out Locations

## AIR DISTRIBUTION SYSTEMS

For proper air distribution, the supply duct system must be designed so that the static pressure measured external to the furnace does not exceed the listed static pressure rating shown on the furnace rating plate.

Three typical distribution systems are illustrated in Figure 2. Location, size, and number of registers should be selected on the basis of best air distribution and floor plan of the home.

## DUCT CONNECTOR SELECTION

### PLATINUM SERIES

- For Platinum ready construction use the 14" round plenum, p/n: 903896.

### NON-PLATINUM SERIES

- Determine depth of floor cavity from surface of floor to top of supply air duct (See Figure 3).
- Select appropriate model from Table 5 which matches X-dimension of the floor

cavity. To maximize air delivery, remove reducer "C" (see Figure 5) to obtain the largest open area that will fit the duct/floor construction.

## DUCT INSTALLATION

Required floor, ceiling, and roof cut-out openings must be carefully located to avoid misalignment of the furnace (see Figures 6 & 7). Installation procedures are suggested for typical furnace installations and need not be followed in the exact listed sequence.

### CUT OUT FLOOR OPENING & FUEL LINE HOLE

- Determine center of closet or alcove (Figures 7 & 8).
- Locate center of the floor opening, measured 10" from the rear wall, and mark cut-out measuring approximately 14-1/2" by 14-1/2" ( $\pm 1$ ") for model duct connector used (refer to Figures 4 & 5).
- Locate center of gas line hole, measured 23-1/4" from the rear wall and 6-5/8" to the left of center of the floor cut-out (See Figure 6) or

5-1/4" to the left of center of the floor cut-out, or for entry through right-side of furnace measured 9" to the right of center of the floor cut-out.

d. Cut out floor opening and one gas line hole.

### CUT DUCT OPENING (FINGER TABBED ONLY)

- Place duct connector through the floor opening with bottom tabs resting on top of the supply air duct.
- Center duct connector and push back against rear edge of floor opening.
- Mark cut-out location (tab area) and remove duct connector.
- Cut out duct opening 1/16" larger than area marked.

### INSTALL FURNACE MOUNTING PLATE

- Place mounting plate (supplied within duct connector) at rear of the floor opening (See Figure 9).

### INSTALLING PLATINUM SERIES 14" ROUND DUCT CONNECTOR

- Place duct connector through the floor opening. (See Figure 9).
- Secure duct connector to floor.

### INSTALLING SCREW DOWN DUCT CONNECTOR

- Apply a bead of caulking, mastic, or other approved sealant around bottom side of 1/2" flange and restrictor plate, when applicable.
- Locate the duct connector over duct and carefully lower screw down duct connector into place.
- Once duct connector is located on duct, temporarily hold in place while fastening duct connector to the floor using flat head screws or nails. Be sure flanges of duct connector stay in contact with the duct.
- Screw plenum to duct making sure a seal is made between the duct and the duct con-

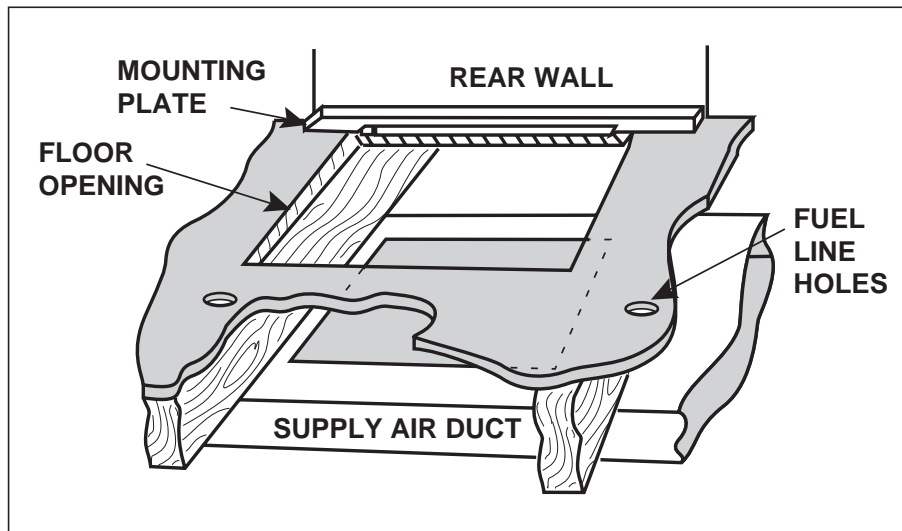


Figure 8. Mounting Plate

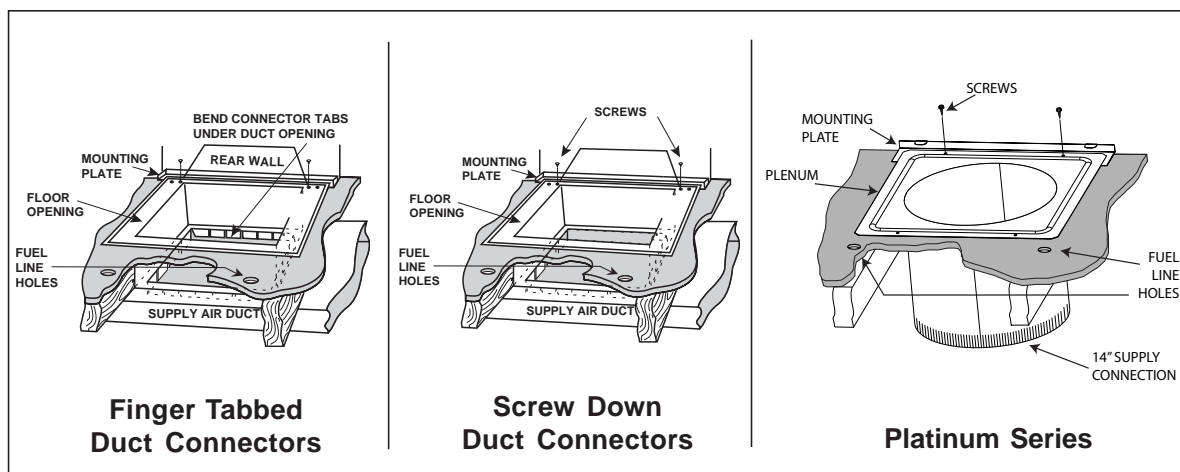


Figure 9. Duct Connector

nector. Additional screws may be added if required.

- e. Cut away along edge of flange allowing the center to drop into the duct. Remove section of duct with caution, as edges will be sharp.

### INSTALLING FINGER TABBED DUCT CONNECTORS

- a. Place duct connector through the floor opening with bottom tabs extending through the duct opening. (See Figure 9)
- b. Secure duct connector to floor.
- c. Bend bottom tabs under and up tightly against the supply air duct (See Figure 10).

NOTE: The duct connector is designed for use on ducts 12" in width. When using the connector on 12" wide ducts, there may be insufficient clearance to bend the tabs on two sides of the duct connector. In such cases the tabs may be

attached to the sides of the duct by using sheet metal screws or other suitable fasteners. (See Figure 11).

If sealant, mastic, or tape is used to provide a better seal, it should be approved by applicable national or local codes.

### ALTERNATE ATTACHMENT METHODS

This procedure may also be used to install a furnace duct connector to narrow metal ductwork where insufficient clearance prevents bending of the duct connector tabs at the side(s) of the duct. (See Figure 12).

1. Score and cut the top of the metal duct as indicated in Step 1 or Step 2. With Step 1 choice, also cut out the metal from the shaded area "A".
2. Fold the duct flap "B" up, (See Step 3).

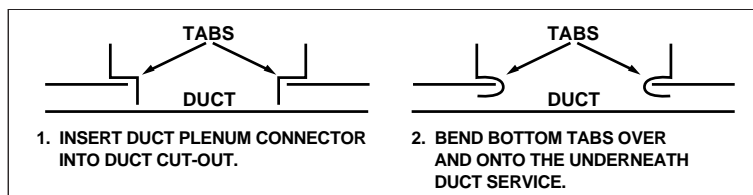


Figure 10. Installation of Duct Connector

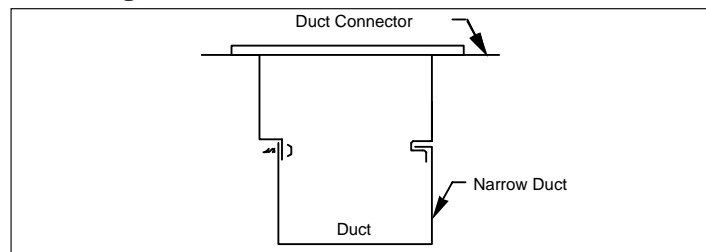


Figure 11. Narrow Duct Installation

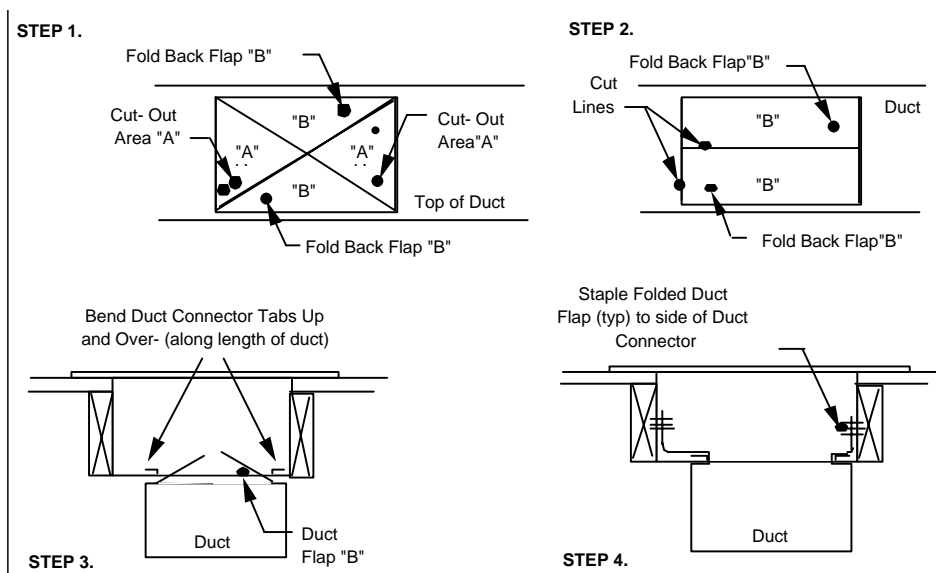
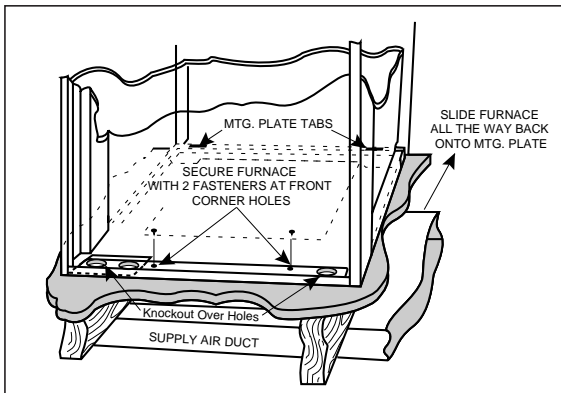
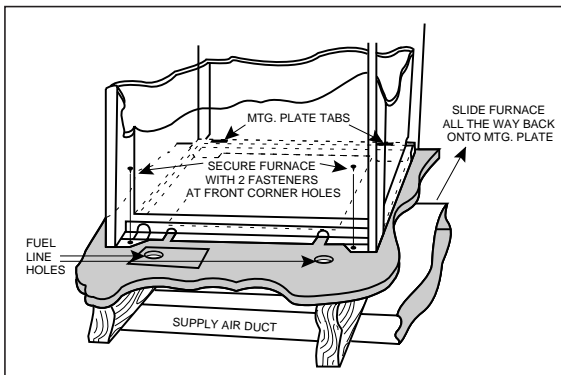


Figure 12. Alternate Installation



**Figure 13. "A", "B", & Platinum Cabinet Furnaces**



**Figure 14. "A" Cabinet Furnace on 911969 Coil Cabinet (Non-Platinum Series)**

3. At the front-to-back of duct run (Area "A"), bend the duct tabs and secure them directly to the duct.
4. At Area "B", bend the duct tabs up and back over, around the duct connector, (See Step 3).
5. Fold/form the duct flap against the side of the duct connector and attach as shown, (See Step 4). Use three (3) staples (minimum) on each duct flap OR, if a 2X block/joist is not provided, use two (2) sheet metal screws (minimum) on each duct flap. An alternate attachment method is acceptable, as long as the plenum is securely attached.
6. Tape the duct flap edges with an approved tape for a leak-free joint.

#### **INSTALL FURNACE**

- a. Remove furnace outer door(s) and bottom fuel line knockout.
- b. Place furnace onto duct connector and center with floor opening.
- c. Slide onto mounting plate. (Bottom rear slots on furnace should engage with mounting plate tabs.)
- d. Secure front with one (1) fastener at each corner (See Figure 13 or 14).

**NOTE:** Additional fasteners may be used at rear, sides or through door frame, as desired, to secure furnace to closet or alcove framing.

## **VENTING AND COMBUSTION AIR REQUIREMENTS**

### **! CAUTION:**

**Snow must not be allowed to restrict or block the combustion air intake or vent pipes.**

#### **General**

NORDYNE condensing furnaces must be installed with outdoor combustion air piped directly to the furnace. Codes refer to this type of installation as direct vent, or two pipe installation.

Provisions must be made for adequate supply of air for combustion and ventilation. For United States installations, the adequacy of air provisions can be determined by consulting the current version of the National Fuel Gas Code (ANSI Z223.1/NPFA-54). For Canadian installations, requirements are specified in the National Standard of Canada (CAN/CGA B149.1 & .2). Consult local codes for special requirements.

**NOTE:** If the furnace is operated without adequate air for combustion and ventilation, it may not perform properly. Furnace components may be strained by high temperature and could fail prematurely.

### **! WARNING:**

**The combustion air piping must not be blocked or restricted in any manner.**

### **! WARNING:**

**Furnace installation using methods other than those described in the following sections must comply with the National Fuel Gas Code and all applicable local codes to provide sufficient combustion air for the furnace.**

---

 **CAUTION:**

---

Do not allow debris to fall into the furnace. This could cause unsafe operation and voids the furnace warranty.

---

## VENTING REQUIREMENTS

---

 **WARNING:**

---

**FURNACE MUST NOT BE COMMON VENTED WITH OTHER APPLIANCES.**

---

### General

This section specifies installation requirements for 2-pipe combustion air piping. The capacity table provided in this section applies to the maximum equivalent lengths of vent and combustion air intake pipe.

These condensing furnaces are classified as "Category IV" appliances, which require special venting materials and installation procedures. Category IV appliances operate with positive vent pressure and therefore require vent systems which are thoroughly sealed. They also produce combustion condensate, which is slightly acidic and can cause severe corrosion of ordinary venting materials. Furnace operation can be adversely affected by restrictive vent and combustion air piping. Therefore, *vent and combustion air piping lengths must conform completely to the requirements of Table 6.*

The furnace must be vented to the outdoors.

---

 **WARNING:**

---

### CARBON MONOXIDE POISONING HAZARD

---

1. Seal any unused openings in the venting system
2. Inspect the venting system for proper size and horizontal pitch, as required in the *National Fuel Gas Code, ANSI Z223.1* or the *CAN/CGA B149 Installation Codes* and these instructions. Determine

that there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.

3. So far as is practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so appliance shall operate continuously.
5. Turn on clothes dryers and any other appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they shall operate at maximum speed. Do not operate a summer exhaust fan.
6. Close fireplace dampers.
7. Test for spillage from draft hood equipped appliance at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.
8. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54* and/or *CSA B149.1, Natural Gas and Propane Installation Codes.*
9. After it has been determined that each appliance connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous conditions of use.

It must not be vented in common with any other appliance, even if that appliance is of the condensing type. Common venting can result in severe corrosion of other appliances or their venting and can allow combustion gases to

APPLICATION	MAXIMUM DIRECT VENT, DUAL PIPE LENGTH (ft.)*	
	Inlet/Outlet	
PVC, CPVC or ABS SCH. 40 Pipe Size	3"	3"
Model M3RL 060	50	50
Model M3RL 080	50	50

**\*NOTES**

1. Subtract 3.5 ft. for each additional 3" 90 degree elbow.
2. Two 45 degree elbows are equivalent to one 90 degree elbow.
3. One short radius elbow is equivalent to two long radius elbows.
4. Do not include termination elbows in calculation of vent length.
5. This table is applicable for elevations from sea level to 4000 ft. For higher elevations, decrease vent pipe lengths by 8% per 1000 ft. of altitude.
6. Only the above pipe materials are approved for use with these condensing furnaces.

Table 6. Vent Table

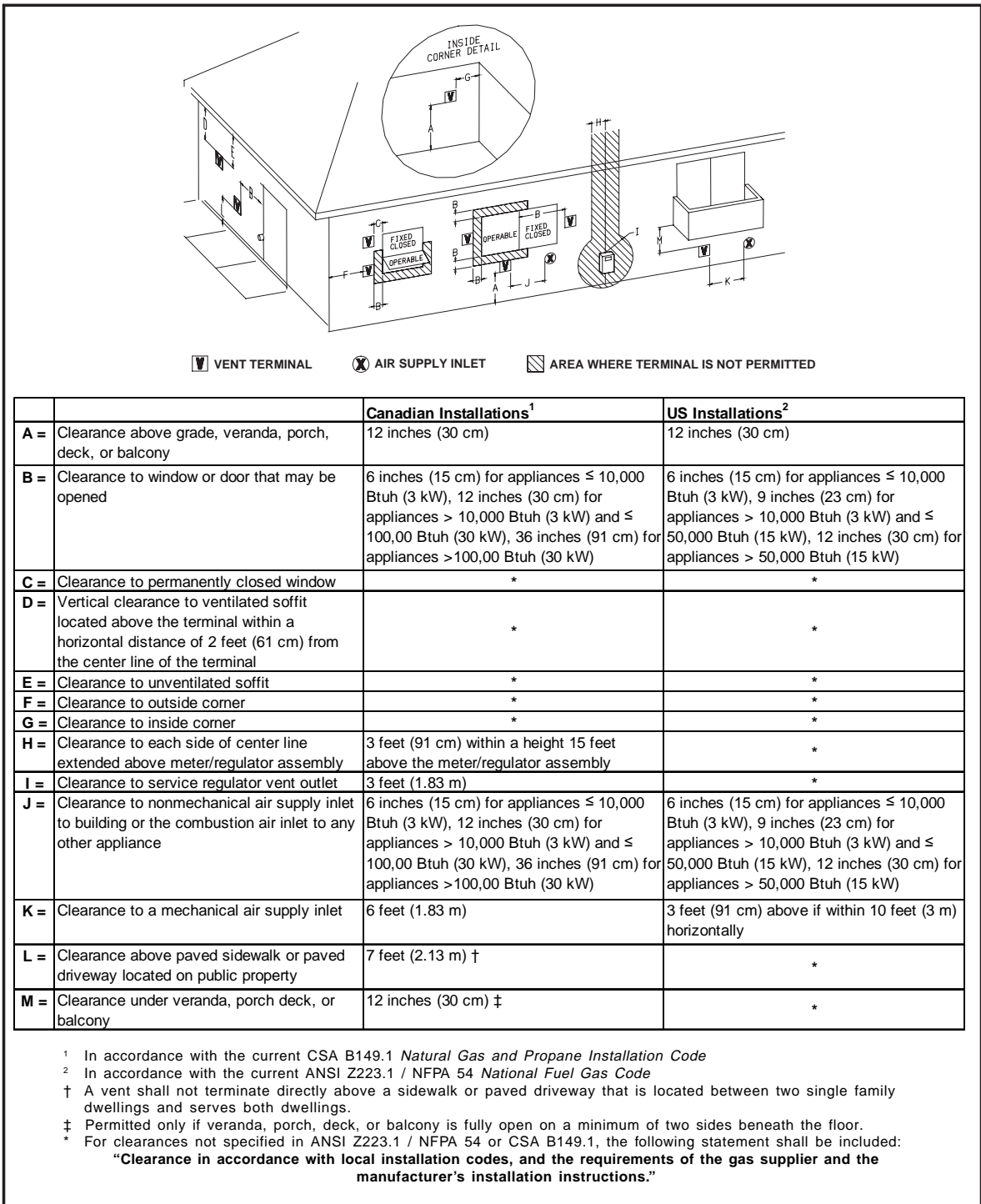


Figure 15. Vent Termination Clearances for Direct Vent Furnaces

escape through such appliances or vents. Do not vent the furnace to a fireplace chimney or building chase.

If removing an existing furnace in a venting system, the venting system may not be properly sized. To test the vent system with the remaining appliances, follow the test outlined below.

The following steps shall be followed with each appliance connected to the venting system placed in operation, while any other appliances connected to the venting system are not in operation:

### Vent Pipe Material

Vent and combustion air pipe and fittings must be one of the following materials and must conform to the indicated ANSI/ASTM standards:

Material	Standard
Schedule 40 PVC	D1785
PVC-DWV	D2665
SDR-21	D2241
& SDR-26	
ABS-DWV	D2661
Schedule 40 ABS	F628
Foam/Cellular Core PVC	F891

Cement and primer must conform to ATSM Standard D2564 for PVC and Standard D2235 for ABS. When joining PVC piping to ABS, use an appropriate solvent cement and procedure per the piping manufacturer's recommendation and ASTM Standard D3138.

### Vent Pipe Installation

#### *Pipe Routing and Support*

Route piping as directly as possible between the furnace and the outdoors and remember that routing affects pipe length limitations per Table 6. Locate the combustion air intake and the vent exhaust in the same atmospheric pressure zone - i.e. both must exit the building through the same portion of exterior wall or roof. Vent piping must be sloped upwards not less than 1/4" per foot in the direction from the furnace to the terminal. This is to ensure that any condensate flows back to the furnace where it can be disposed of through the condensate disposal system.

---

## CAUTION:

---

**Combustion air must not be drawn from occupied spaces and a corrosive atmosphere.**

---

The quality of outdoor air must also be considered. Be sure that the combustion air intake is not located near a source of solvent fumes or other chemicals which can cause corrosion of the furnace combustion system.

Piping must be mechanically supported so that its weight does not bear down on the furnace. Supports must be at intervals no greater than five feet, and at smaller intervals if necessary to ensure that there are no sagging sections to trap water (See Figures 16 & 17).

These condensing furnaces have been certified for installation with zero clearance between vent piping and combustible surfaces. However, it is good practice to allow space for convenience in installation and service.

#### ***Location of Outdoor Terminations***

Vent and combustion air intake terminations must be located to ensure proper furnace operation and to conform to applicable codes. Figure 15 illustrates necessary distances from the vent termination to windows and building air intakes. **In Canada, the Canadian Fuel Gas Code takes precedence over these instructions. Specifically, all minimum distance requirements with respect to termination of the vent piping listed below.**

The following list is a summary of vent terminal location requirements:

1. The termination must be 12 inches above snow level or grade level whichever is higher. See Figure 18 for alternate method to achieve 12" above snow level.
2. The minimum distance for a direct vent (2-pipe) installation from any door, openable window, or air gravity inlet is 1 ft. below, 1 ft. horizontally, or 1 ft. above.
3. The vent termination shall be a minimum of 3 ft. above any forced air inlet within 10 ft.
4. The vent termination shall be located at least 4 ft. horizontally from any electric meter, gas meter, regulator and any relief equipment. These distances apply **ONLY** to U.S. installations. In Canada, the Canadian Fuel Gas Code takes precedence.



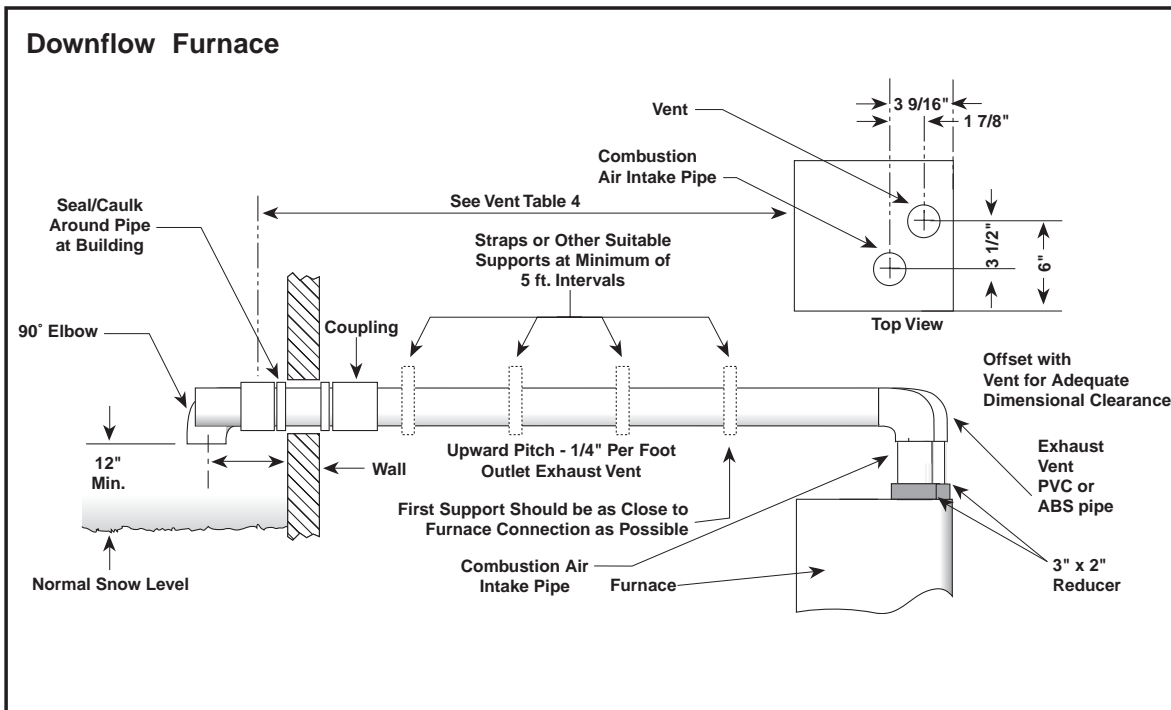


Figure 16. Horizontal Venting

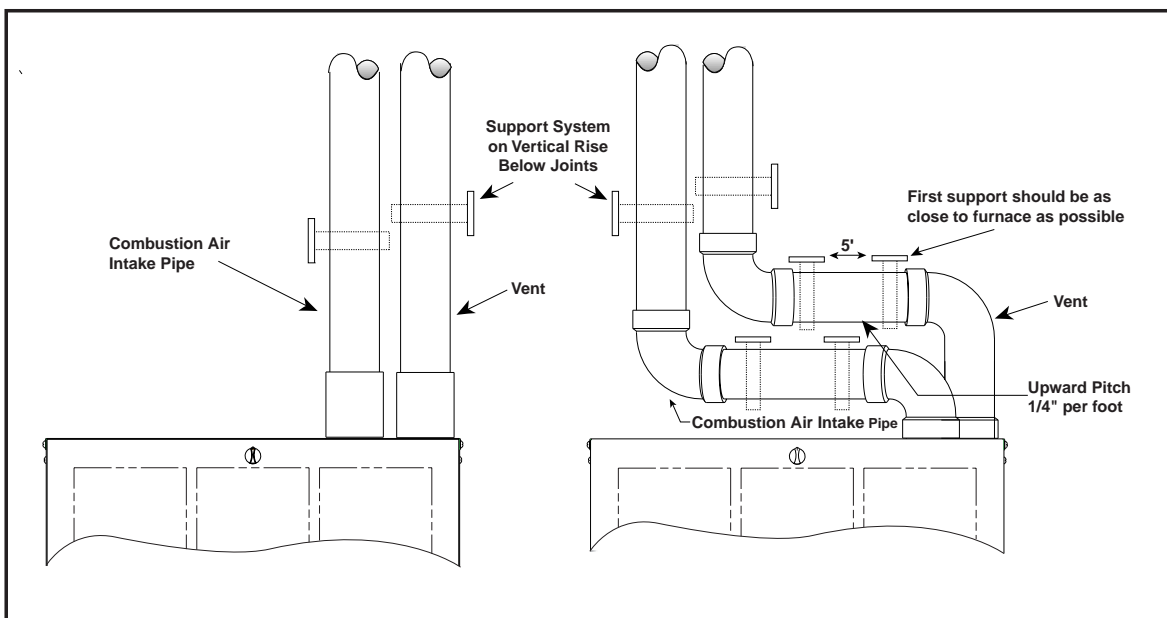


Figure 17. Vertical Venting

5. Avoid areas where condensate drainage may cause problems by dropping on planters or patios, etc. Also ensure that exhaust gases will not impinge on windows or building surfaces, which may be compromised or damaged by condensation. Do not install the vent terminal such that exhaust is directed into window wells, stairwells, under decks or into alcoves or similar recessed areas, and do not terminate above any public walkways.
6. Select the point of wall penetration where the minimum 1/4 inch per foot of slope up can be maintained.

**⚠ CAUTION:**

**For optimal performance vent furnace through wall which experiences the least exposure to winter winds.**

### **Horizontal Venting**

Vent and combustion air intake terminations must be as shown in Figure 19 unless the concentric vent termination kit is used.

---



## **WARNING:**

---

**Ensure that the combustion air vent and the exhaust vent are configured as shown in Fig. 19. Improper vent termination can cause recirculation of the flue gases. This may result in furnace vibration. In severe cases, the furnace will cycle, due to the intermittent contact between the flame and the flame sensor. If you note these oscillations occurring, check the vent configuration. Make sure that the exhaust vent does not have a 90 degree termination.**

---

For horizontal venting, either the Horizontal Exterior Vent Mounting Kit or the Concentric Vent Termination Kit may be used (See Table 12).

For Canadian installations please refer to the Canadian Installation Code (CAN/CGA-B149.1 or 2) and/or local codes.

The Horizontal Exterior Vent Mounting Kit consists of two face plates and an insulating gasket to seal the exterior surface. A hole sized closely to the pipe diameter must first be cut through the wall. A short length of pipe is then cut such that it can penetrate the wall and be held in place by closely fitting standard couplings. The face plates are retained on both sides of the wall by the couplings, and the gasket is retained against the wall by the outer face plate. Face plates must be fastened to the wall and the outside one must be flashed as appropriate to prevent entry of water.

When the above kits are not used the following steps are required:

1. Check the hole size cut through the exterior wall. Insure that the hole diameter is less than the diameter of the couplings to be used.

2. Extend the vent pipe through the wall approximately 1" and seal the area between the wall and pipe.
3. Apply couplings to the vent pipe on the interior and exterior sides of the wall to insure the pipe can not be pushed or pulled through the wall.
4. Insure the combustion air inlet pipe has a 90 degree termination elbow, and is pointing downward as shown in Figures 19 & 20.

Note that a combustion air intake must be provided with an elbow opening downward.

When the vent pipe must exit an exterior wall close to the grade or expected snow level, a riser should be provided as shown in Figure 18. Insulation is required to prevent freezing of this section of pipe.

### **Vertical Venting**

For vertical venting, either the configuration shown in Figure 20 or the Concentric Vent Termination Kit may be used. Vertical venting is one of the shortest routing methods when piping vents for furnaces. The M3 furnace operates trouble-free when the furnace is installed with a shorter vent.

- The inlet for the combustion intake pipe must be extended at least one foot above the roofline or snow accumulation level.
- The outlet of the vent must be extended at least 10 inches above the inlet of the combustion air intake pipe.
- The vent as well as the combustion air intake pipe should be located on the same side of the roof. Both pipes must not be closer than 5 inches apart. They should not be separated more than 36 inches.

The roof penetration must be properly flashed and waterproofed with a plumbing roof boot or equivalent flashing. Termination spacing requirements from the roof and from each other must be per Figure 20.

### **Concentric Vent Termination**

A concentric vent termination is approved for use with these furnaces (See Table 12). For proper installation of the concentric vent termination, follow the installation instructions provided with the kit.

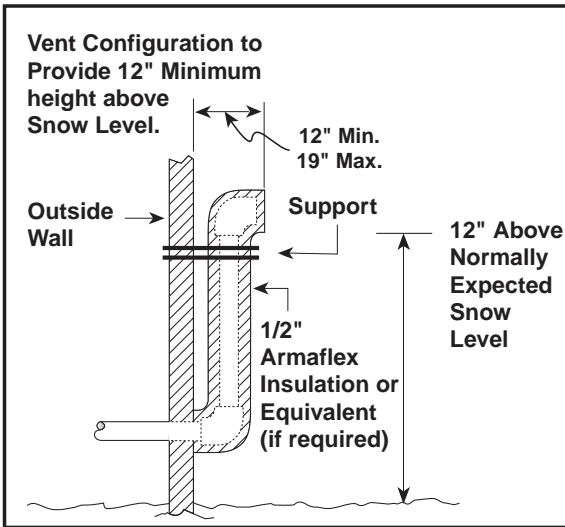


Figure 18. Alternate Horizontal Vent Installation

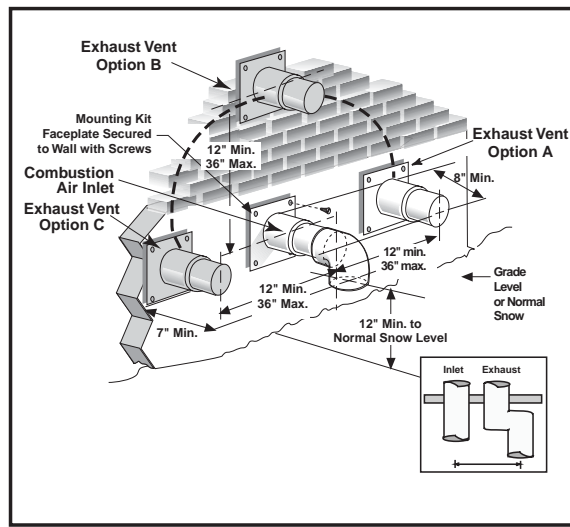


Figure 19. Exhaust and Combustion Air Pipe Clearances

## DRAINAGE OF CONDENSATE FROM FURNACE

### ! WARNING:

The condensate produced by the furnace must be drained. Do not connect a water supply to the drainage hose of the furnace.

**NOTE:** The condensate drain should be protected from freezing when in unheated spaces.

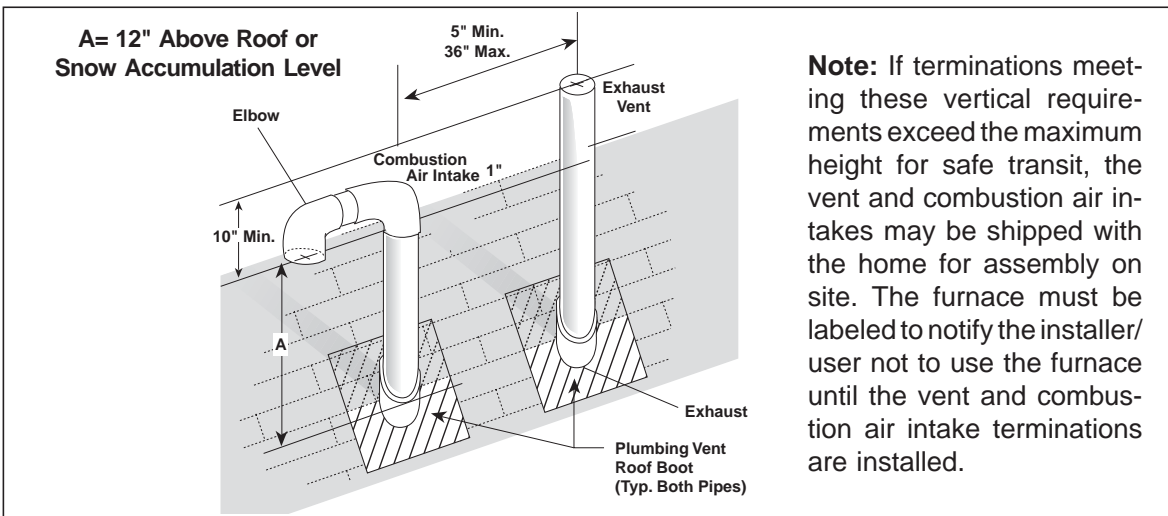
The furnace is supplied with an internal condensate drain trap.

### ! CAUTION:

Do not install additional traps in the condensate drain.

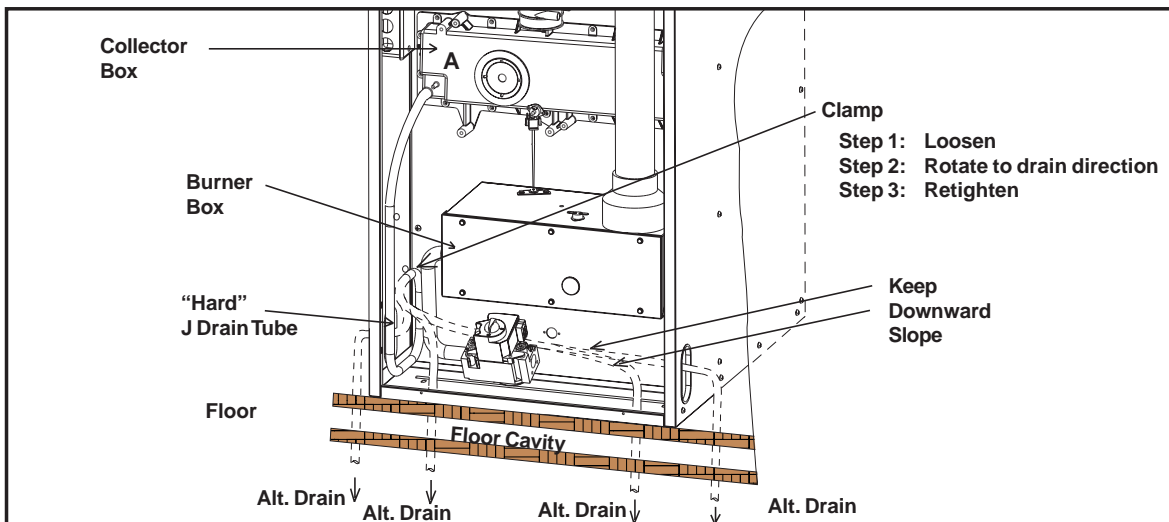
The condensate drain may exit through the left side panel, the right side panel, or through the left or right hole on the bottom panel. (See Figure 21). Ensure that the flexible drain hose is not kinked.

The condensate should drain from the plastic collector box (location A in Figure 21) as droplets or a small stream. If you notice the furnace has operated for more than 5 minutes without draining or the red status light on the control board is pulsing a 2-blink code follow the steps below.



**Note:** If terminations meeting these vertical requirements exceed the maximum height for safe transit, the vent and combustion air intakes may be shipped with the home for assembly on site. The furnace must be labeled to notify the installer/user not to use the furnace until the vent and combustion air intake terminations are installed.

Figure 20. Vertical Vent Termination



**Figure 21. Furnace with Condensate Drain Trap Assembly**

1. Remove the collector box soft tube at location A in Figure 21 and insure the exit from the collector box is clear of any debris or obstructions.
2. Replace this tube and insure the fit to the header spout is air tight. Air will be drawn into the header if this connection is not tight.
3. Check other tube connections along the drain system. Insure that all are air tight.

**NOTE:** Industry research studies indicate that when condensate is routed to an active drain, household detergents, etc., buffer its acidity. If the drain is not actively used or if codes require, obtain a neutralizer kit (See Table 12). Proper drains and connections to the condensate tubing are required as NORDYNE cannot be held responsible for water leakage which occurs due to loose hose connections or improperly sealed drain line pipes.

## GAS SUPPLY AND PIPING

### General

This furnace is equipped for bottom, left, or right side gas entry. Typical gas service hook-ups are shown in Figure 22. When making the gas connection provide clearance between the gas supply line and the entry hole in the furnace casing to avoid unwanted noise and/or damage to the furnace.

All gas piping must be installed in compliance with local codes and utility regulations. Some local regulations require the installation of a manual main shut-off valve and ground joint union external to the furnace. The shut-off valve should be

readily accessible for service and/or emergency use. Consult the local utility or gas supplier for additional requirements regarding placement of the manual main gas shut-off. In the absence of local codes, the gas line installation must comply with the provisions stated in the Federal Manufactured Home Standard (H.U.D Title 24, part 280) and the National Fuel Gas Code (ANSI Z223.1/NFPA-54) or (CAN/CGA B149) installation codes.

A drip leg should be installed in the vertical pipe run to the unit. Table 7 lists gas flow capacities for standard pipe sizes as a function of length in typical applications based on nominal pressure drop in the line.

**NOTE:** Gas piping must not be run in or through air ducts, gas vents, etc.

Compounds used on threaded joints of gas piping must be resistant to the actions of liquefied petroleum gases.

---

## ⚠ CAUTION:

---

**Do not use matches, lighters, candles, or other sources of open flame to check for gas leaks.**

---

**NOTE:** When pressure testing gas supply lines at pressures greater than 1/2 psig (14 in. water column), the furnace must be disconnected from the gas supply piping system to prevent damage to the gas control valve.

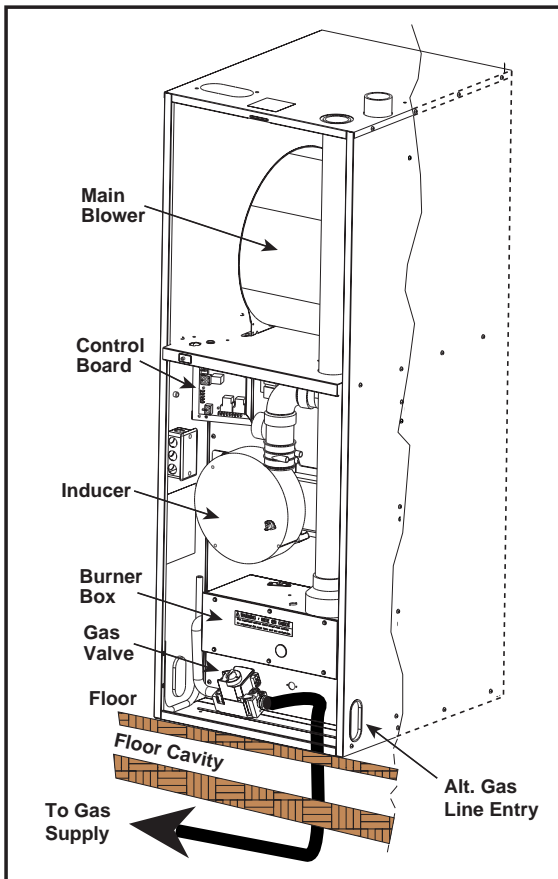


Figure 22. Typical Gas Piping

If the test pressure is less than or equal to 1/2 psig (14 in. water column), the furnace must be isolated from the gas supply line by closing the manual shut-off valve.

#### Leak Check

After the gas piping to the furnace is complete, all connections must be tested for gas leaks. To check for leaks use only a soap and water solution or other approved method.

#### High Altitude Derate

The nameplate input rating for the furnaces apply for elevations up to 4,000 feet above sea level for US and Canada. If the elevation for the furnace location is higher than 4,000 feet above sea level, the furnace input must be derated by using the appropriate orifice size listed in Table 8.

**NOTE:** The density of air decreases with increasing elevation above sea level. This reduces the quantity of combustion air drawn into the furnace under normal operation and requires the unit be derated by using smaller gas orifices or lower manifold pressure.

## CONVERSION

This furnace can be converted from the factory-equipped gas to either natural gas (for LP gas ready models), or LP gas (for natural gas ready models). Conversions must be made by qualified service personnel, using only factory authorized or approved parts. The required conversion orifices are supplied with the furnace.

### **! WARNING:**

**DO NOT REMOVE OR DEFACE THE ORIGINAL RATING PLATE.**

### **! CAUTION:**

**The gas supply shall be shut off prior to disconnecting the electrical power, before proceeding with the conversion.**

#### To Turn Off Fuel Supply to the Appliance:

1. Set the room thermostat to "OFF" or its lowest temperature setting.
2. Turn OFF the main gas supply to the appliance at the manual valve, outside of the appliance casing.
3. Remove the control access panel / louvered door.
4. Move the appliance gas valve lever/knob to the "OFF" position.
5. Turn OFF the electrical power to the appliance.

CAPACITY OF BLACK IRON GAS PIPE (CU. FT. PER HOUR) FOR NATURAL GAS (SPECIFIC GRAVITY - 0.60)								
NOMINAL BLACK IRON PIPE DIAMETER (in.)	LENGTH OF PIPE RUN (feet)							
	10	20	30	40	50	60	70	80
1/2	130	90	75	65	55	50	45	40
3/4	280	190	150	130	115	105	95	90
1	520	350	285	245	215	195	180	170
1 1/4	1050	730	590	500	440	400	370	350
1 1/2	1600	1100	890	760	670	610	560	530

The cubic feet per hour listed in the table above must be greater than the cubic feet per hour of gas flow required by the furnace.

To determine the cubic feet per hour of gas flow required by the furnace, divide the input rate of the furnace by the heating value of the gas:

$$\text{Cubic Feet Per Hour Required} = \frac{\text{Input To Furnace (Btu/hr)}}{\text{Heating Value of Gas (Btu/Cu. Ft.)}}$$

**Table 7. Capacity of Black Iron Gas Pipe (cu. ft. per hour) for Natural Gas (specific gravity = .60)**

**To Remove the Burner Assembly:**

1. Follow the instructions "To Turn Off the Fuel Supply to the Appliance."
2. Disconnect the flame sensor wire from the burner box.
3. Disconnect the ignitor wires at the 2 pin plug. This is a locking quick connect and both sides of the lower section must be depressed in order to be separated.
4. Remove the wires from the terminals of the gas valve.
5. Disconnect the rubber pressure tubes from the gas valve and the burner box.
6. Remove the burner access cover plate from the burner box.
7. Remove supply gas piping from the gas valve.
8. Carefully remove the burner assembly fasteners and remove the burner assembly from the appliance. Keep the fasteners that were removed. Note that the burner box may have hooks near the top and on the right and left hand sides. To remove this type of burner box, lift the burner box upwards and then remove the box from the unit.

**To Remove the Burner Orifices:**

1. Remove the four (4) fasteners that secure the gas manifold to the burner box, as shown in Figure 25. Carefully remove the gas manifold assembly from the burner box. Note that the gas manifold assembly consists of the gas valve, the gas manifold, and the orifices.
2. Carefully remove the burner orifices from the gas manifold, as shown in Figure 25.

---

 **CAUTION:**

---

**Caution: Do not re-drill the burner orifices. If the orifice size must be changed, use only new orifices.**

---

**Note: The size of the new orifices that will be installed into the unit will depend upon the type of conversion (sea level or high altitude; natural gas or LP gas).**

**To Convert the Unit to the Alternate Gas**

1. Remove the orifice bag from the manifold of the unit.
2. Install the appropriate gas burner orifices into the gas manifold. Remember if installing at altitudes above 4,000 feet to install the proper orifices, shown in Table 8. When installing the new orifices, **DO NOT** use pipe joint compound on the orifice threads. Screw the orifices into the manifold by hand until snug to eliminate cross threading, then tighten with a wrench. Before installing an orifice, check the face or side of the orifice for the drill number to ensure that it is the appropriate size.
3. For the conversion to the alternate fuel, the gas valve regulator cap must be turned over, as shown in Figure 23. You will unscrew the cap and reinstall for your installation. After reinstalling the cap, you will be able to read "NAT" for the conversion to natural gas or "LP" for the conversion to LP gas.

Furnace Model Number M3RL -	Furnace Rating Plate Input (Btuh)	No. of Burners	Elevation 0 - 2000		Elevation 2000-4000		Elevation 4000-6000		Elevation 6000-8000		Elevation 8000-10000	
			Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP
060A-A/BW	60,000	4	50	57	50	57	51	58	51	58	52	59
080A-A/BW	80,000	5	49	1.15 mm	49	1.15 mm	50	57	50	57	51	58

**Table 8. Approximate Orifice Size for Natural and LP Gases**

## Reinstalling the Burner Assembly:

1. Reinstall the gas manifold assembly to the burner box with the four (4) fasteners, which were removed earlier.
2. Carefully reinstall the burner box into the unit. After installing the burner, inspect the alignment of the burners with the heat exchanger tubes. The center of the burners should be aligned with the center of the tubes.
3. Reconnect the gas piping to the gas valve.
4. Reconnect the wires to the gas valve terminals.
5. Reconnect the rubber pressure tubes to the gas valve and the burner box. Reinstall the burner access cover plate.
6. Reconnect the ignitor at the 2 position plug.
7. Reconnect the flame sensor wire to the burner box.

## Pressure Gauge Installation

**NOTE:** For natural gas installations, the incoming gas line pressure at the gas valve inlet must be between 4.5" WC and 10.0" WC. For LP gas installations, the incoming gas line pressure at the gas valve inlet must be between 11.0" WC and 14.0" WC. This pressure can be checked at the inlet end of the gas valve using a pressure gauge or U-tube manometer, which must be installed according to the manufacturer's supplied instructions.

## LIGHTING AND ADJUSTMENT OF THE APPLIANCE

1. Turn ON the gas at the manual valve, outside of the unit.
2. Check all gas connections for leaks with a soap and water solution. If the solution bubbles there is a gas leak which must be corrected. Do NOT use an open flame to check for gas leaks.
3. Turn ON the electrical power to the appliance.
4. Move the gas valve lever/knob to the "ON" position. The lever/knob must be moved to the end of its range of motion to insure the valve is completely open. Use only your hand to push in or turn the gas control valve. Never use tools.

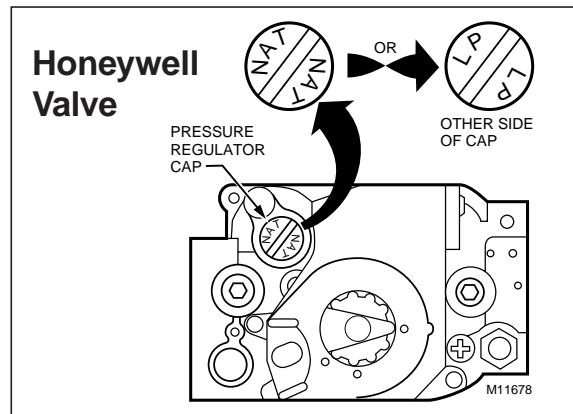


Figure 23. Convertible Pressure Regulator Cap

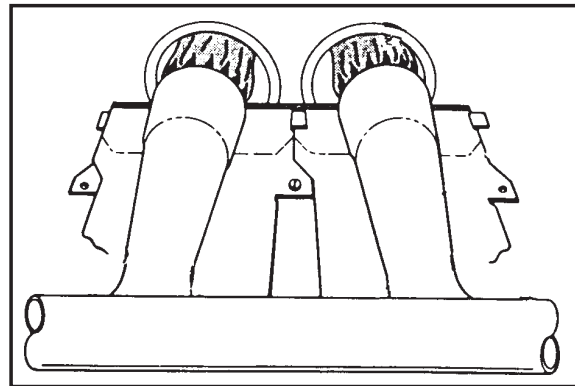


Figure 24. Burner Inspection

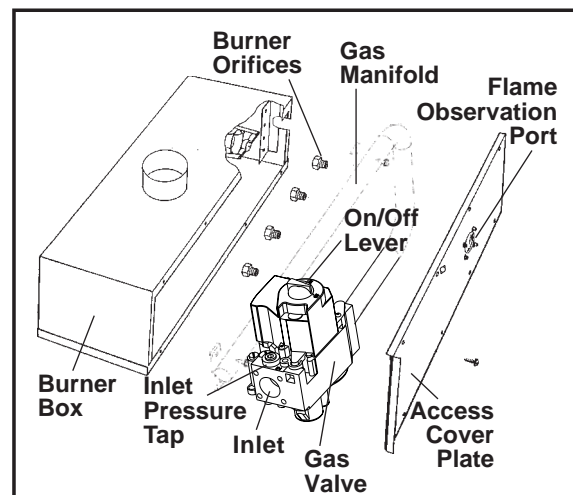


Figure 25. Typical Installation For Sealed Burner Box With Access Cover Plate

5. Set the room thermostat to a point above room temperature to begin the heating cycle of the unit.
6. Check that the unit ignites and operates properly. Refer to the installation instructions provided with your unit for the normal operating sequence.

- After the flame ignites, visually inspect the burner assembly to ensure that the flame is drawn directly into the center of the heat exchanger tube, as shown in Figure 23. The end of the flame will be out of sight around the bend of the heat exchanger tube. In a properly adjusted burner assembly, the flame color should be blue with some light yellow streaks near the outer portions of the flame.

**NOTE:** Until all of the air is bled out of the gas line, the hot surface ignitor may not ignite the gas. If the ignition control locks out, turn the thermostat to its lowest setting and wait one minute then turn the thermostat to a point above room temperature and the ignitor will try again to ignite the main burners. This process may have to be repeated several times before the burners will ignite. Once the burners are lit, check all gas connections for leaks again with the soap and water solution. If the solution bubbles there is a gas leak which must be corrected. Do not use an open flame to check for gas leaks.

### Manifold Pressure

The gas valve for the M3 furnace series is equipped with a special conversion pressure regulator cap. The pressure regulator cap is factory set. If the gas valve is converted from natural gas to propane gas or vice versa, the manifold pressure of the gas valve will be set to pressure listed in Table 9.

Type of Fuel	Manifold Pressure In. WC
Natural Gas:	3.5
Propane (LP) Gas:	10.0

**Table 9. Manifold Pressure**

### COMPLETING THE CONVERSION

- Affix the gas valve conversion label found in the package with the orifices to the unit rating plate.
- Run the appliance through a complete cycle to assure proper operation.

---

## CAUTION:

---

**To avoid electric shock, personal injury, or death, turn off the power at the disconnect or the main service panel before making any electrical connections.**

---

### ELECTRICAL WIRING

#### General

Electrical connections must be made in accordance with all applicable local codes and ordinances, and with the current revision of the National Electric Code (ANSI/NFPA 70).

For Canadian installations electrical connections and grounding must be done in accordance with the current Canadian Electrical Code (CSA C22.1 Part 1) and/or local codes. If any of the original wire as supplied with the furnace must be replaced, it must be replaced with wire having a minimum temperature rating of 105°C. Refer to the furnace nameplate and Table 8 for electrical requirements.

#### Line Voltage Wiring

The line voltage (115 volt) to the furnace must be supplied from a dedicated branch circuit containing the correct fuse or circuit breaker for the furnace. See Table 10. An electrical switch should be readily accessible from and within sight of the furnace. See the Wiring Diagram label in the furnace for more details.

The furnace cabinet must have an uninterrupted, unbroken ground to minimize injury should an electrical fault condition occur. The controls used in this furnace require an earth ground to operate properly. Acceptable methods for grounding are electrical wire or conduit approved for electrical ground service. Do not use gas piping as an electrical ground.

**NOTE:** Proper line voltage polarity must be maintained in order for the control system to operate correctly. Verify that the incoming neu-



tral line is connected to the white wire and the incoming "hot" line is connected to the black wire in the furnace junction box. The furnace will not operate unless polarity and ground are properly connected. See Figure 26.

**CAUTION:**

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

Verify proper operation after servicing.

**ATTENTION:**

Lors des opérations d'entretien des commandes, étiqueter tous les fils avant des les déconnecter. Toute erreur de câblage peut être une source de danger et de panne.

S'assurer du bon fonctionnement de l'appareil après tout entretien.

**Low Voltage Wiring**

Install the thermostat per the manufacturer's instructions. The low voltage (24 volt) connections from the thermostat are made at the terminal strip on the control board in the furnace. See Figure 28 for the proper connections for heating only (two-wire) and heating/cooling (four-wire) applications. The recommended minimum wire gauge for thermostat wiring is shown in Table 10.

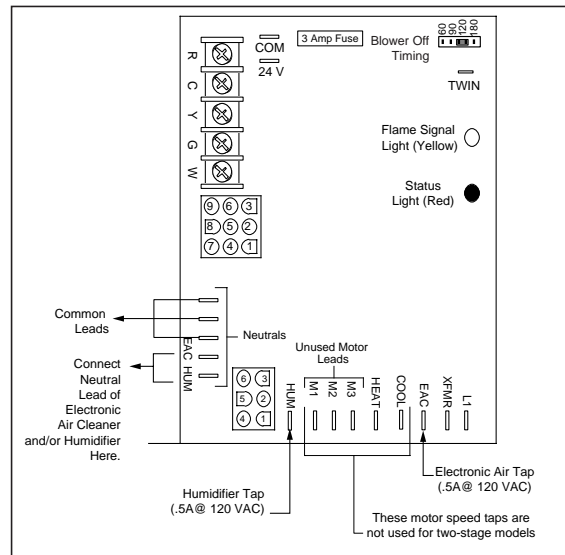


Figure 27. Blower Speed Tap Location

Furnace Input (Btuh)	Cabinet Width (in.)	Nominal Electrical Supply	Maximum Operating Voltage	Minimum Operating Voltage	Maximum Furnace Amperes	Minimum Wire Gauge	Maximum Fuse or Circuit Breaker Amps*
60,000	19.75	115-60-1	127	103	9.7	14	15
80,000	19.75	115-60-1	127	103	9.7	14	15

Thermostat Wire Gauge	Recommended Thermostat Wire Length	
	2-wire (heating)	4 or 5-wire (cooling)
24	55 ft.	25 ft.
22	90 ft.	45 ft.
20	140 ft.	70 ft.
18	225 ft.	110 ft.

\* Time-delay fuses or HACR-type circuit breakers are required.

Table 10. Electrical Data

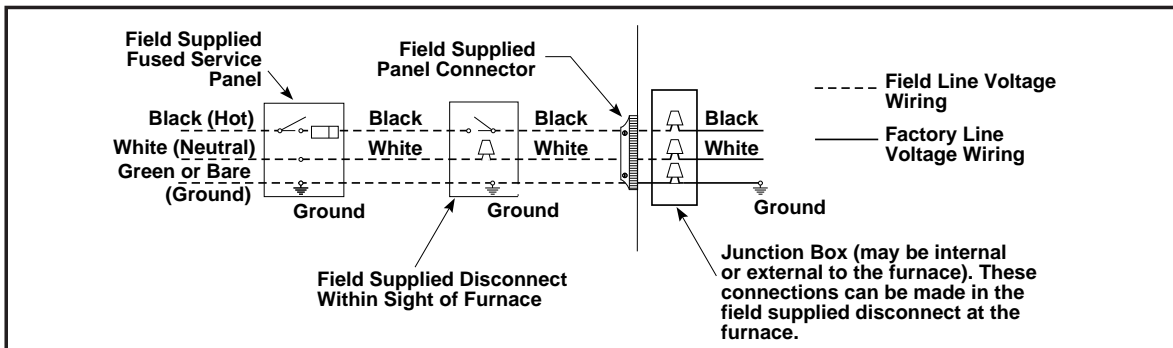


Figure 26. Line Voltage Field Wiring

The thermostat must not be installed on an outside wall or any other location where its operation may be adversely affected. Adverse affects include radiant loading from fireplaces, sunlight, or lighting fixtures, and convective loading from warm air registers or electrical appliances.

To check the heat anticipator setting either:

1. Add the current draw of the system components; or
2. Measure the current flow on the thermostat R-W circuit after the circulating blower motor has started.

Set the heat anticipator according to the thermostat manufacturer's instructions for heat anticipator settings.

## VENTILATION

Ventilation must be provided for homes built to HUD Manufactured Homes Safety and Construction Standards. This ventilation can be supplied by the VentilAire III or VentilAire IV accessories. (See Table 12). Alternate means to provide the ventilation air must meet the requirements of all applicable local and federal codes.

For installation of the VentilAire III or IV, follow the instructions provided with the VentilAire kit.

## START-UP AND ADJUSTMENTS

### General

Prior to start-up, verify that:

1. The line voltage power leads are securely connected, that the polarity of the connections is correct, and that the furnace is properly grounded.
2. The thermostat wires (R, W, Y, and G) are securely connected to the correct leads on the terminal strip of the circuit board.
3. The natural gas line service pressure must not exceed 10.0 in. water column (0.36 psig), and must not be less than 4.5 in. water column (0.16 psig). For LP gas the line service pressure must not exceed 14 in. water column (0.51 psig), and must not be less than 11.0 in. W.C. (0.40 psig).

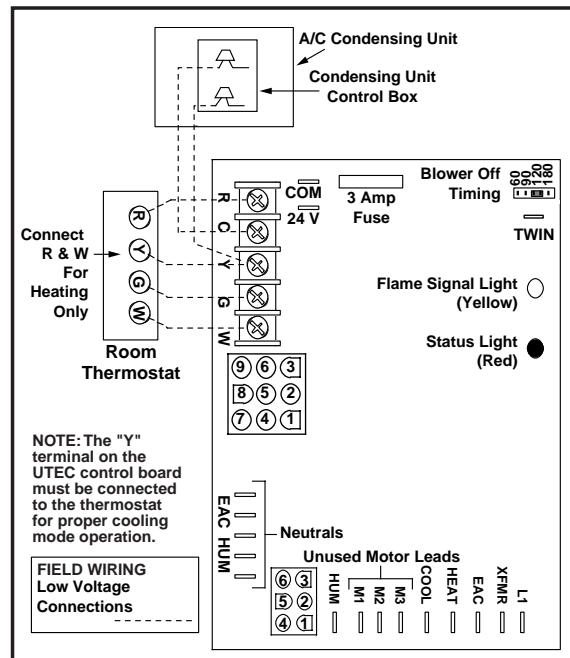


Figure 28. Low Voltage Field, Four-wire Heating/Cooling Applications

4. The roll-out and vent safety manual reset switches are closed. If necessary, press the red button to reset a switch. See Figure 26 for location. DO NOT install a jumper wire across a switch to defeat its function. If a switch reopens on start-up, DO NOT reset the switch without identifying and correcting the fault condition which caused the switch to trip.
5. The blower door is in place, closing the door switch in the line voltage circuit.
6. The gas line has been purged and all connections are leak tight.

### Start-Up Procedure

1. Set the thermostat to the lowest setting.
2. Close the disconnect(s) to provide line voltage to the furnace.
3. Follow the procedures given on the operating instructions label attached to the furnace.
4. Set the thermostat above room temperature and verify the sequence of operation. (See the **SEQUENCE OF OPERATION**.)

5. After the furnace has run for approximately five minutes, set the thermostat below room temperature and verify steps 9 - 11 of the **SEQUENCE OF OPERATION**.

### Shut Down Procedure

In the event that the furnace must be shut down, follow this procedure:

1. Set the room thermostat to "OFF" or its lowest temperature setting.
2. Turn OFF the main gas supply to the appliance at the manual valve outside of the appliance casing.
3. Remove the control access panel / louvered door.
4. Move the appliance gas valve lever/knob to the "OFF" position.
5. Turn OFF the electrical power to the appliance.

### Verifying Firing Rate

The firing rate must be verified for each installation to prevent over-firing the furnace.

**NOTE: The firing rate must not exceed the rate shown on the furnace rating plate. At altitudes above 4000 ft. it must not exceed that on the rating plate less 4% for each 1000 ft.**

Use the following procedure to determine the firing rate:

1. Shut off all other gas fired appliances.
2. Start the furnace and allow it to run for at least three minutes.
3. Measure the time (in seconds) required for the gas meter to complete one revolution.
4. Convert the time per revolution to cubic feet of gas per hour using Table 11.
5. Multiply the gas flow rate in cubic feet per hour by the heating value of the gas in Btu per cubic foot to obtain the firing rate in Btuh. Example:
  - Time for 1 revolution of a gas meter with a 1 cubic foot dial = 60 seconds.
  - From Table 11 read 60 cubic feet per hour of gas.
  - Heating value of the gas (obtained from gas supplier) = 1000 Btu per cubic foot.
  - Firing rate = 1000 x 60 = 60,000 Btuh.

6. See the "High Altitude Derate" section for additional information on firing rate at elevations above 4,000 ft.

The gas valve regulator is set at a nominal value of 3.5 in. water column for use with natural gas. The manifold pressure must be set at 10.0 in. water column for use with LP gas.

### Verifying and Adjusting Temperature Rise

Verify that the temperature rise through the furnace is within the range specified on the furnace rating plate. Temperature rises outside the specified range could result in premature heat exchanger failure.

Place thermometers in the return and supply air stream as close to the furnace as possible. The thermometer on the supply air side must be shielded from direct radiation from the heat exchanger to avoid false readings. Adjust all registers and duct dampers to the desired position and run the furnace for fifteen minutes before taking any temperature readings. The temperature rise is the difference between the supply and return air temperatures.

For typical duct systems, the temperature rise will fall within the range specified on the rating plate with the blower speed at the factory recommended setting. If the temperature rise measured is outside the range specified, it may be necessary to change the blower speed. Lower blower speeds will increase the temperature rise and higher blower speeds will decrease the temperature rise.

The furnace is equipped with a multispeed motor. Heating and cooling speed selection is made by moving the leads on the integrated control board located in the furnace. The wiring diagram on the furnace and Figure 30 show the speed taps for adjusting motor speed.

If it is desired that the blower operate at the same speed for heating and cooling, tape off the terminal of the unused blower wire. Install the jumper wire, found in the plastic instruction bag, across the HEAT and COOL taps on the control board. Reconnect the desired blower tap to the piggyback quick connect.

The blower control is designed to start the circulating air blower 30 seconds after the gas valve is opened. The blower control is factory wired to turn the blower motor off 120 seconds

GAS FLOW RATE (CUBIC FEET PER HOUR)							
TIME FOR ONE REVOLUTION (SECONDS)	CUBIC FEET PER REVOLUTION OF METER			TIME FOR ONE REVOLUTION (SECONDS)	CUBIC FEET PER REVOLUTION OF METER		
	1	5	10		1	5	10
24	150	750	1500	80	45	225	450
26	138	692	1385	82	44	220	439
28	129	643	1286	84	43	214	429
30	120	600	1200	86	42	209	419
32	113	563	1125	88	41	205	409
34	106	529	1059	90	40	200	400
36	100	500	1000	92	39	196	391
38	95	474	947	94	38	191	383
40	90	450	900	96	38	188	375
42	86	429	857	98	37	184	367
44	82	409	818	100	36	180	360
46	78	391	783	102	35	176	353
48	75	375	750	104	35	173	346
50	72	360	720	106	34	170	340
52	69	346	692	108	33	167	333
54	67	333	667	110	33	164	327
56	64	321	643	112	32	161	321
58	62	310	621	114	32	158	316
60	60	300	600	116	31	155	310
62	58	290	581	118	31	153	305
64	56	281	563	120	30	150	300

**Table 11. Gas Flow Rate**

after the gas valve is closed. This timing can be changed using the BLOWER OFF timing switch opposite the terminal block on the control board (See Figure 27).

**Verifying Burner Operation**

To verify operation of the burners, remove front door and ensure that the door switch is in the “on” position (see Figure 29). Set the thermostat above room temperature and observe the ignition sequence. The flame can be observed through the small clear window on the burner box. The burner flame should carry over between all burners. The flames should be blue, without yellow tips. Flames should extend from each burner without lifting, curling, or floating. After verifying ignition, set the thermostat below room temperature and verify that the burner flame extinguishes completely. Replace the front door.

**Verifying Operation of the Supply Air Limit Switch**

To verify operation of the supply air limit switch, make sure that the blower door is in place and that there is power to the furnace. Completely block the return airflow to the furnace by installing a close-off plate in place of or upstream of the filter(s). Set the thermostat above room

temperature and verify that the Sequence of Operation is as described in these instructions. The supply air limit switch should function to turn off the gas valve within approximately five minutes. The circulating air and combustion blowers should continue to run when the supply air limit switch opens. Remove the close-off plate immediately after the supply air limit switch opens. If the furnace operates for more than five minutes with no return air, set the thermostat below room temperature, shut off the power to the furnace, and replace the supply air limit switch.

**DESCRIPTION OF COMPONENTS**

Figure 29 shows the location of each of the functional components described below. If any component of the furnace must be replaced, use only factory authorized replacement parts. Contact your distributor for the approved replacement parts.

**Flame Sensor** – The flame sensor acts to prove that flame has carried over from the ignitor to the opposite end burner. If no flame is sensed, the furnace will be shut down automatically.

## FURNACE ACCESSORY KITS

Kit	Order Number
A/C Coil Box	911969A
Side Return Air Kit	904003
Top Return Air Kit	904015
Sloped Roof VentilAire III Kit	914098
Sloped Roof VentilAire IV Kit	914229
Soffit VentilAire Kit	917201
Concentric Vent Termination Kit (for horizontal and vertical venting)	903578
Horizontal Exterior Vent Mounting Kit 3"PVC	902375
Neutralizer Kit - All Models	902377

Table 12. Accessory Kits

**Gas Valve** – The gas valve controls the flow of gas to the burners. When the gas valve is energized it automatically opens and regulates the gas pressure in the manifold.

**Pressure Switch** – The pressure switch verifies that the inducer is drawing the combustion gases through the heat exchanger. It also senses a blocked condensate drain condition.

**Deck Limit Switch (Auxiliary Limit)** – The deck limit protects the furnace filter temperature from overheating when the motor has malfunctioned. If the deck switch opens, the power for the furnace will shut down (see Figure 29).

**Supply Air Limit Switch** – The supply air limit switch prevents the air temperature leaving the furnace from exceeding the maximum outlet air temperature.

**Vent Safety Switch** – The vent safety switch shuts the furnace down if the outlet flue gas temperature increases above 145°F. This switch protects the plastic flue system and the inducer from over-temperature conditions.

**Flame Roll-Out Switch** – This switch provides flame roll-out protection to the furnace and combustion air inlet pipe.

## MAINTENANCE

It is recommended that the furnace be checked yearly. At a minimum, this check should include the following items:

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### **WARNING:**

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**To avoid electric shock, personal injury, or death, turn off the power at the disconnect or the main service panel before performing any maintenance.**

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### **WARNING:**

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**Holes in the vent pipe or heat exchanger can cause products of combustion to enter the occupied space. Replace the vent pipe or heat exchanger if leaks are found. Failure to prevent products of combustion from being circulated into the occupied space can create potentially hazardous conditions, including carbon monoxide poisoning, that could result in personal injury or death.**

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#### Combustion Air and Vent System

Check the combustion air and vent pipe to ensure that it is not damaged, corroded or blocked by debris. Any damaged section of vent pipe must be replaced, and any obstruction or blockage must be removed prior to operating the furnace.

#### Air Filter

An air filter is supplied with the furnace as shipped from the factory. Filters should be changed or cleaned monthly during the heating season. New or newly renovated homes may require more frequent changing until the construction dust has been removed.

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 **WARNING:**

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**Never operate the furnace without a filter in place. Dust and lint in the return air can build up on internal components, resulting in loss of efficiency, equipment damage, and possible fire.**

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### Lubrication

The bearings in the circulating air blower motors are pre-lubricated and sealed at the factory. No further oiling of the bearings is required for the life of the motor.

### Condensate Drain Assembly

Be sure the condensate lines are free and open (i.e. avoid kinking hoses). Also make sure all hose clamps are tight to avoid drawing air into the system.

### Blower Compartment

The blower compartment should be cleaned monthly during the heating and cooling seasons to remove any dirt and lint that may have accumulated in the compartment or on the blower and motor. Dirt and lint can create excessive loads on the motor resulting in higher than normal operating temperatures and shortened service life.

### Heat Exchanger and Burner Maintenance

The furnace should operate for many years without excessive soot buildup in the flue passageways, however, the flue passageways, the vent system, and the burners should be inspected and cleaned (if required) by a qualified service technician annually to ensure continued safe operation. Particular attention must be given to identify deterioration from corrosion or other sources.

## SYSTEM OPERATION INFORMATION

### GENERAL

Proper maintenance is most important to achieve the best performance from a furnace. Follow these instructions for years of safe, trouble free operation.

- Do not place combustible materials on or against the furnace cabinet or the vent pipe.

- Do not store gasoline or any other flammable vapors and liquids in the vicinity of the furnace.
- Change or replace the air filters monthly during any period when the circulating blower is operating regularly.
- Always replace the doors on the furnace after servicing. Do not operate the furnace without all doors and covers in place.
- Avoid operating the furnace when windows and doors are open.
- **Be sure that the thermostat is properly installed and is not being affected by drafts or heat from lamps or other appliances.**

### Sequence of Operation

Operating sequences for the heating, cooling, and fan modes are described below. Refer to the wiring diagrams (Figures 30) and the low voltage field wiring diagram (Figure 26) for more details.

#### *Heating Mode:*

1. On a call for heat the thermostat closes, applying 24 VAC to the W terminal on the control board.
2. The control board checks for continuity on the 24 VAC limit control circuit (over-temperature limit switch, flame rollout switches and blocked vent switch in series). If an open limit is detected the control board will energize the inducer and the conditioned air blower. All other system functions will be inoperable until the limit circuit closes. While the limit is open, the red LED will pulse at a rate of 1 blink per unit time.
3. The furnace control checks for continuity across the pressure switch (24 VAC). If the pressure switch is closed the heat mode sequence will not continue. If it remains closed for 10 seconds the red LED will blink 3 times repetitively until the fault condition clears.
4. The inducer is energized.
5. The pressure switch will close. If the pressure switch does not close after 10 seconds the fault LED will blink 2 times repetitively and the inducer will continue to run until the switch is closed.
6. The inducer will pre-purge for 30 seconds and then the igniter will start its warm-up as follows:

Initial Power up: After 30 seconds of igniter warm-up the gas valve (24 VAC) will then open. The igniter circuit will stay energized for 3 seconds after the gas valve opens.

After Initial Power up: The control has a programmed adaptive ignition feature which varies the warm-up period as follows: If ignition is successful the warm-up is reduced by 3-seconds on each subsequent call for heat until ignition failure occurs. Upon ignition failure, the warm-up is increased by 3-seconds on the next try. If successful, the timing remains fixed at this level. In general, whenever ignition failure occurs the warm-up interval is increased by 3-seconds on the next try. And if successful, it remains there. Minimum and maximum warm-up time limits are set at 6 and 54-seconds, respectively.

7. The furnace control must prove flame via the flame sensor 5 seconds after the gas valve opens. If flame is sensed, all burners are on and the ignitor cools off. If no flame is sensed, the gas valve closes immediately and the inducer continues to run. A second trial for ignition (step 6) begins if no flame is sensed. On the fifth try for ignition, the furnace control is locked out and the red LED will blink 4 times repetitively. The thermostat must be opened for at least ten seconds to reset the furnace control after a lock out. Otherwise, the furnace will attempt another ignition sequence in 1 hour.
8. The furnace control energizes the circulating air blower on the heating speed 30 seconds after the gas valve circuit is energized .
9. When the thermostat has been satisfied, gas valve is de-energized.
10. The inducer is de-energized after a 30-second postpurge.
11. The furnace control keeps the circulating air blower energized for 120 seconds (factory set) or 60, 90, or 180 seconds (field adjustable). (See Figure 27.)
12. Abnormal conditions: If a limit opens during operation, the inducer and circulating air blower continue to operate. The gas valve is de-energized immediately. The blowers continue to operate until the limit closes. When the limit closes the inducer blower is de-energized immediately. The circulating air blower continues to operate for the specified delay (factory set at 120 seconds).

#### *Cooling Mode:*

1. On a call for cooling the thermostat closes, applying 24 VAC to the G and Y terminals on the furnace control. This closes the compressor contactor.
2. The furnace control energizes the circulating blower (115 VAC) on the cooling speed.
3. When the thermostat is satisfied, the G and Y terminals on the control board are de-energized opening the compressor contactor.
4. The circulating air blower is de-energized after a 90-second delay.

#### *Fan Mode:*

1. On a call for fan operation, the thermostat applies 24 VAC to the G terminal on the furnace control board.
2. The circulating air blower is energized immediately on the **heating** speed.
3. If the furnace is operated in the continuous ON position at the thermostat and is then switched to AUTO, the circulating blower will operate for a specified delay (factory set at 120 seconds).

#### **Furnace Fails to Operate**

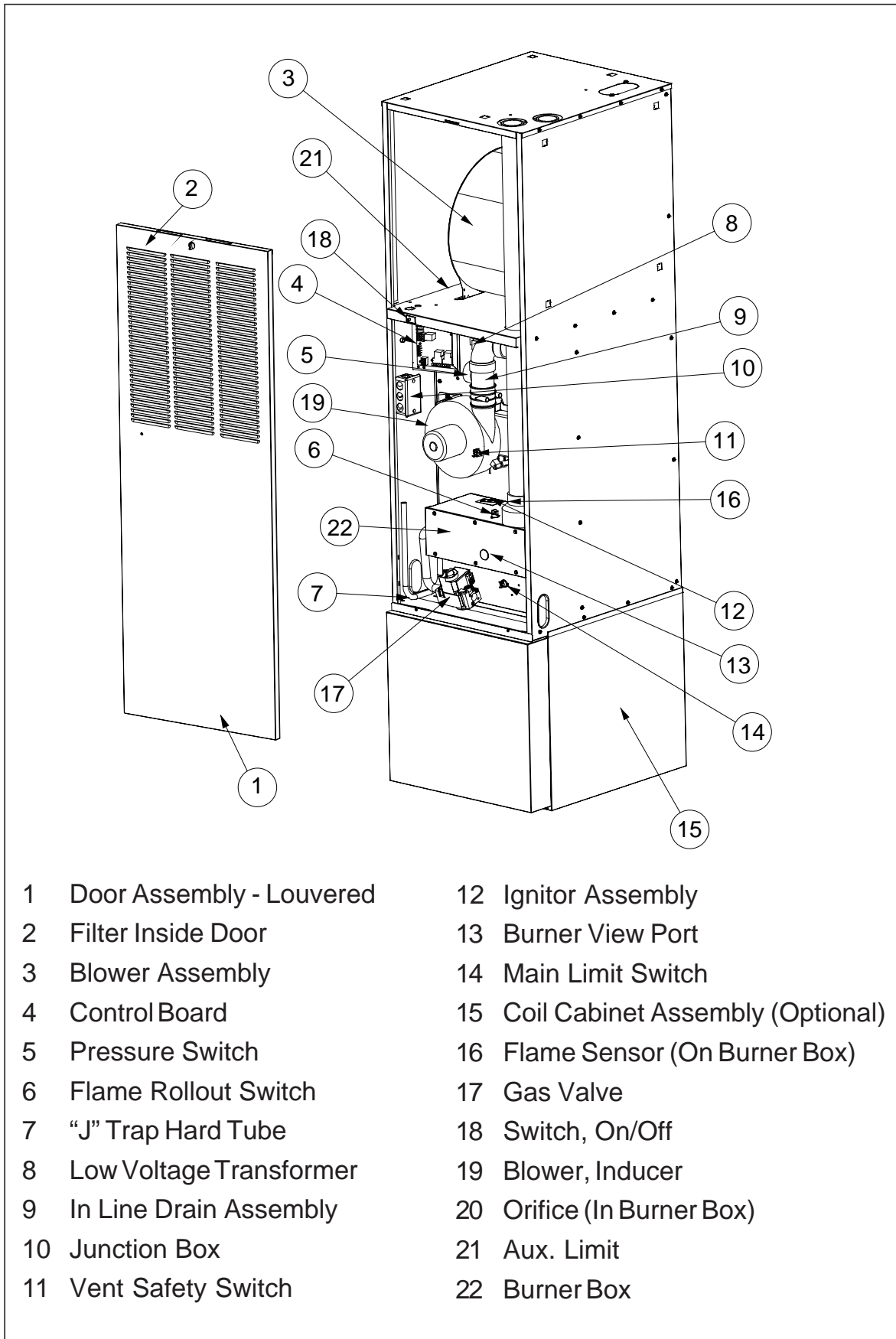
If the furnace does not operate check the following:

1. Is the thermostat operating properly?
2. Is the front door in place?
3. Is the furnace disconnect closed?
4. Has the circuit breaker tripped or the control board fuse burned open?
5. Is the gas turned on?
6. Are any manual reset switches open?
7. Is the filter dirty or plugged?
8. Is the flame sensor coated? (Remove and clean with emery cloth.)
9. Is the deck switch open?

If the furnace locks out after 5 attempts for ignition, it will try again every hour if a call for heat remains. If the inducer and circulating air blowers are operating, and items 1 through 8 have been checked, press the red reset button on the vent safety switch. (See Figure 29.) If the furnace operates after depressing the reset button, contact a qualified service technician to identify and repair the problem.

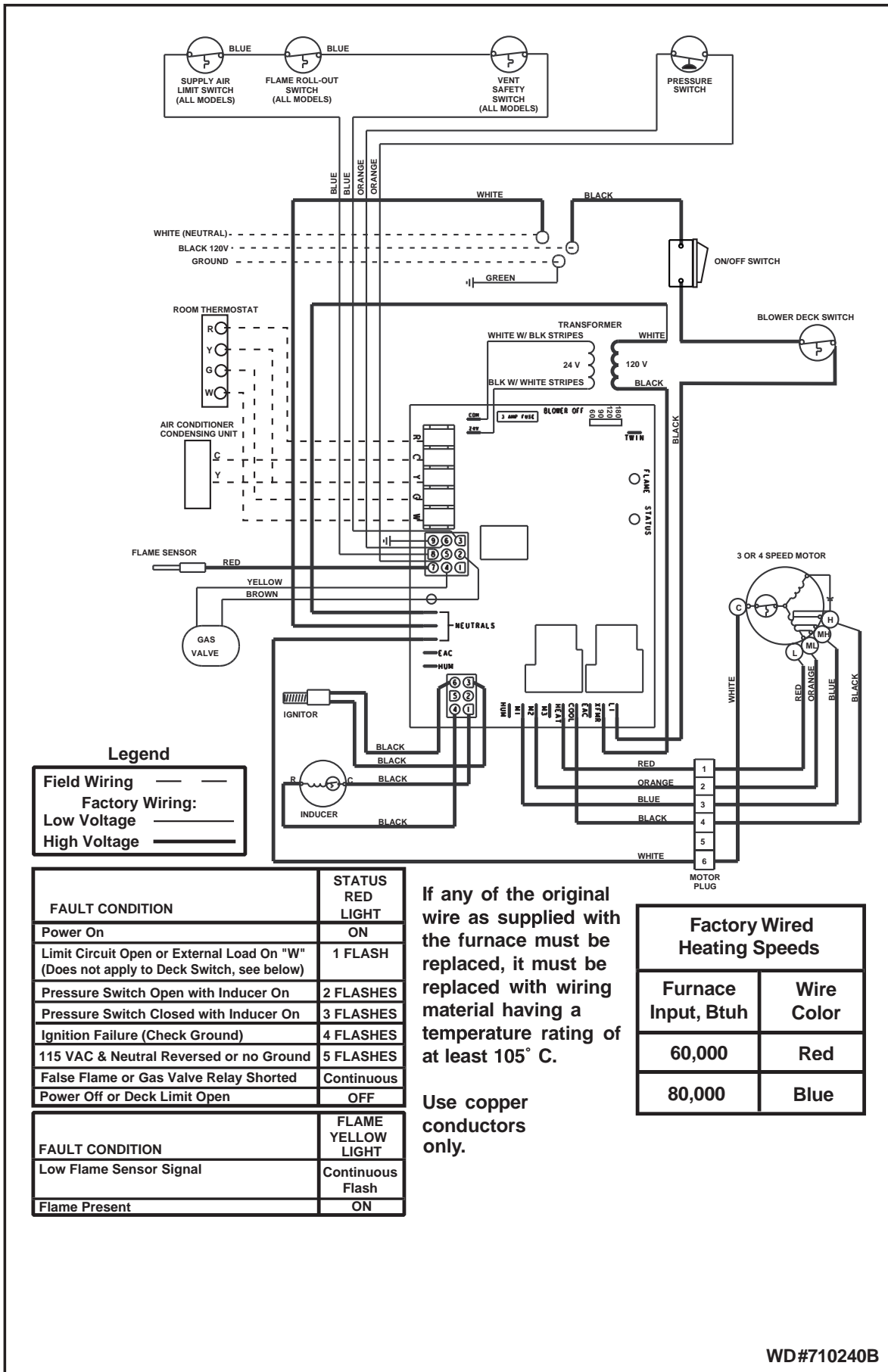
If furnace still fails to operate, depress the red reset buttons on the flame roll-out switch. If the furnace operates after depressing the reset button, contact a qualified service technician to identify and repair the problem.

## M3 Downflow Furnace



**Figure 29. Location of Major Components**





**Legend**

Field Wiring ———  
 Factory Wiring: ———  
 Low Voltage ———  
 High Voltage ———

FAULT CONDITION	STATUS RED LIGHT
Power On	ON
Limit Circuit Open or External Load On "W" (Does not apply to Deck Switch, see below)	1 FLASH
Pressure Switch Open with Inducer On	2 FLASHES
Pressure Switch Closed with Inducer On	3 FLASHES
Ignition Failure (Check Ground)	4 FLASHES
115 VAC & Neutral Reversed or no Ground	5 FLASHES
False Flame or Gas Valve Relay Shorted	Continuous
Power Off or Deck Limit Open	OFF

FAULT CONDITION	FLAME YELLOW LIGHT
Low Flame Sensor Signal	Continuous Flash
Flame Present	ON

If any of the original wire as supplied with the furnace must be replaced, it must be replaced with wiring material having a temperature rating of at least 105° C.

Use copper conductors only.

Factory Wired Heating Speeds	
Furnace Input, Btuh	Wire Color
60,000	Red
80,000	Blue

WD#710240B

Figure 30. Downflow Furnace Wiring Diagram



# INSTALLATION/PERFORMANCE CHECK LIST

LOCATION \_\_\_\_\_ CITY \_\_\_\_\_ STATE \_\_\_\_\_

INSTALLER \_\_\_\_\_ CITY \_\_\_\_\_ STATE \_\_\_\_\_

UNIT MODEL NUMBER \_\_\_\_\_ UNIT SERIAL NUMBER \_\_\_\_\_

Minimum Clearances per Table 3? \_\_\_\_\_ Are Flue Connections tight? \_\_\_\_\_

Electrical Connections tight? \_\_\_\_\_ Is there Proper Draft? \_\_\_\_\_

Line Voltage Polarity correct? \_\_\_\_\_ Is Vent free from restrictions? \_\_\_\_\_

Supply Voltage: \_\_\_\_\_ Volts

Blower Motor HP: \_\_\_\_\_ Is the Filter(s) secured in place? \_\_\_\_\_

Is the Filter(s) clean? \_\_\_\_\_

## FUEL TYPE:

Natural Gas \_\_\_\_\_ LP/Propane \_\_\_\_\_ Has the Thermostat been calibrated? \_\_\_\_\_

Gas Piping Connections leak-tested? \_\_\_\_\_ Is the Thermostat level? \_\_\_\_\_

Gas Line Pressure: \_\_\_\_\_ Is the Heat Anticipator Setting correct? \_\_\_\_\_  
(in. water column, with furnace operating)

Manifold Pressure: \_\_\_\_\_

(in. water column, with furnace operating)

Is there adequate fresh air supply for combustion and ventilation? \_\_\_\_\_

Has the Owner's Information been reviewed with the home-owner? \_\_\_\_\_

Has the Literature Package been left near the furnace? \_\_\_\_\_

Furnace Input: \_\_\_\_\_ (Btuh)

Supply Air Temperature: \_\_\_\_\_ (° F)

Return Air Temperature: \_\_\_\_\_ (° F)

Temperature Rise: \_\_\_\_\_ (° F)

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