INSTALLATION MANUAL

DOWNFLOW ONLY GAS FURNACE
SIZES 60, 70, 77, 90
MODELS: G18D SERIES

For installation only in HUD manufactured homes per Construction Safety 24 CFR Part 3280

LIST OF SECTIONS

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CONTACT INFORMATION

Manufactured and Distributed by:

Mortex Products Inc
501 Terminal Rd
Fort Worth, TX 76106

www.mortx.com

The following list includes important facts and information regarding this gas furnace.

1. Furnace is rated at 115 VAC at 60 Hz.
2. Furnace is available in "Heating Only" or "A/C Ready" configurations.
3. Furnace is designed for use with cooling only or heat pump systems when a cooling coil cabinet and indoor coil is used. A/C ready models are furnished with a cooling coil cabinet. The appropriate indoor coil must be selected and ordered separately.
4. A hold-down strap is furnished with furnace.
5. This furnace is designed for downflow applications only.
6. This furnace must not be operated with the control box cover or front access panels removed.
7. This furnace is certified by ETL for use in the United States only.

SAVE THIS MANUAL FOR FUTURE REFERENCE

SECTION 1: SAFETY

This is a safety alert symbol. When this symbol is seen on labels or in manuals, be alert to the potential for personal injury. Understand and pay particular attention to the signal words **DANGER, WARNING, or CAUTION.**

DANGER: Indicates an imminently hazardous situation, which if not avoided, **will result in death or serious injury.**
WARNING: Indicates a potentially hazardous situation, which if not avoided, **could result in death or serious injury.**
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 property damage.

⚠ DANGER

USE ONLY NATURAL GAS OR HD-5 PROPANE FUEL IN THIS FURNACE.

DO NOT USE "COMMERCIAL GRADE PROPANE" OR ANY PROPANE BLEND OTHER THAN HD-5.

IF A FUEL OTHER THAN NATURAL GAS OR HD-5 PROPANE IS USED IN THIS FURNACE, YOUR WARRANTY WILL BE VOID.

SPECIFIC SAFETY RULES AND PRECAUTIONS

1. Only natural gas or propane (LP) gases are approved for use with this furnace. Refer to the furnace data plate or **Section 4** of these instructions.
2. Install this furnace only in a location and position as specified in **Section 2** of these instructions.
3. A gas fired furnace for installation in a residential garage must be installed as specified in **Section 1** of these instructions.
4. Provide adequate combustion and ventilation air to the furnace space as specified in **Section 6** of these instructions.
5. Combustion products must be discharged outdoors. Connect this furnace to an approved vent system as specified in **Section 6** of these instructions.
6. Tests for gas leaks as specified in **Section 9** of these instructions.
7. Always install furnace to operate within the furnaces intended rise range. Only connect the furnace to a duct system that has an external static pressure within the allowable range, as specified on the furnace data plate.

⚠ WARNING

FIRE OR EXPOLSION HAZARD

Failure to follow the safety warnings exactly could result in a fire or explosion causing property damage, personal injury, or loss of life.

Never test for gas leaks with an open flame. Check all gas piping connections with a commercially available soap solution made specifically for detection of leaks.

8. When the furnace supply ducts carry the air circulated by the furnace to areas outside the space containing the furnace, the return air must also be handled by ducts sealed to the furnace casing and terminating outside the space containing the furnace except when the combustion air and vent system have been installed as a Two-Pipe Sealed Combustion System and when a return air duct system is not required by state, local or regional codes. Refer to the sealed combustion systems section in ANSI 223.1 (NFPA 54) (latest edition).
9. It is acceptable to use the furnace for heating buildings or structures under construction as long as the installation complies with all of the manufacturer's instructions including:
   - Proper vent installation.
   - Means are provided for outdoor air required for combustion.
   - Furnace must be operating under thermostatic control.
   - Return air ducts must be sealed to the furnace.
   - Air filters must be in place.
   - Furnace input rate and temperature rise are set per the markings on the furnace data plate.
   - Proper furnace ignition and operation is verified according to the manufacturer's instructions.
   - Return air is maintained between 55°F (13°C) and 80°F (27°C).
   - The air filter must be replaced upon substantial completion of the construction process.
   - Furnace supply and return air ducts must be cleaned to assure the duct system is free of saw dust, dirt, dust and debris.
   - All furnace components must be cleaned upon substantial completion of the of the construction process.
10. The heating capacity of the furnace shall be based on an acceptable heat loss calculation for the structure such as ACCA Manual J or other approved methods.
11. Flue products from the furnace must be vented to the outdoors. Do not operate the furnace unvented.
12. If an existing furnace is being replaced, it may be necessary to replace the roof jack venting system. Improperly sized or the wrong roof jack venting system can result in flue gas leakage or the formation of condensate. Refer to the National Fuel Gas Code ANSI Z223.1 or CAN/CGA B149.1/B149.2 (latest editions). Failure to follow these instructions can result in property damage, personal injury, or death.
13. To reduce the risk of condensation in the vent system, the minimum sea level input to the furnace as indicated on the data plate must not be less than 8% below the rated input.
14. Verify the supply voltage to the furnace that is shown on the data plate is not 10% lower or greater than the rated voltage.
15. Manufactured (Mobile) Home Definition: Factory-built home constructed, transported and installed under the federal

building code, administered by the U.S. Department of Housing and Urban Development (HUD Code), rather than building codes at their destination. The home is built, transported and installed on a non-removable chassis.

16. Manufactured (Mobile) Home Furnace Installation: The combustion air shall not be supplied from the occupied spaces. This furnace must be installed and maintained as a two-pipe sealed combustion configuration. The combustion air pipe must terminate in the same atmospheric zone as the vent pipe and they must both terminate external to the building.
17. Modular Home Definition: Factory-built home constructed to the state, local, or regional codes where the house is located. The home is transported in one or more modules and joined at the home site.
18. Modular Home Furnace Installation: This furnace may be installed in one of the following configurations:
    a. Two-Pipe Sealed Combustion Configuration: This configuration has a combustion air pipe and a vent pipe that terminates in the same atmospheric zone and is external to the building (See Figure 26).
    b. Single Pipe Vent With Ambient Combustion Air Configuration: This configuration has no combustion air pipe connected to the burner box. The vent pipe terminates external to the building.
    c. Single Pipe With Ventilated Combustion Air Configuration: This configuration has the combustion air pipe connected to the burner box and terminating in the attic or a crawl space. The vent pipe terminates external to the building. The vent pipe and the combustion air pipe do not terminate in the same atmospheric zone.

GENERAL SAFETY REQUIREMENTS

1. This furnace should be installed in accordance with all national and local building/safety codes and requirements, local plumbing or waste water codes, and other applicable codes. In the absence of local codes, install in accordance with the National Fuel Gas Code ANSI Z223.1/NFPA 54, National Fuel Gas Code. Furnaces have been certified to standard UL 307B (latest edition).
2. All installation and service of these furnaces must be performed by a qualified installation and service agency only as described by ANSI Z223.1 (latest edition).
3. Refer to the furnace data plate for the furnace model number the dimensions on page 6 of these instructions. Optional duct connector dimensions are shown in Figures 3 - 5. The optional duct connectors must be installed according to their instructions.
4. Provide clearances to combustible materials as listed under Clearances to Combustibles in these instructions.
5. Provide clearances for service access to the furnace controls, burners and blower.
6. This furnace is ETL listed or approved for installation in Manufactured (Mobile) Homes, Modular Homes, trailers, and recreational vehicles only.
7. Failure to carefully read and follow all instructions in this manual may result in furnace malfunction, personal injury, and death.
8. Furnaces approved for installation on combustible flooring shall not be installed directly on carpeting, tile, or other combustible materials other than wood.
9. Check the data plate and the power supply to be sure that the electrical characteristics match. All models use nominal 115 VAC, 1 Phase, and 60 Hertz power supply. Do not connect this furnace to a 50 Hertz power supply or a power supply where the voltage exceeds 132 VAC.
10. This furnace must be installed so the components are protected from water.
11. This furnace is certified with the controls furnished. Order replacement parts according to the replacement parts list located in the back of the User Information, Service and Maintenance Manual. Refer to the data plate to obtain the model and serial numbers so the correct parts can be ordered.
12. The furnace supply air blower is designed for correct performance with this furnace. Do not attempt alter or use a different type the fan or fan motor with this furnace.
13. Installing and servicing heating equipment can be hazardous due to the electrical and gas fired components. Only trained and qualified personnel should install, repair, or service gas heating equipment. Untrained service personal can perform basic maintenance functions such as cleaning exterior surfaces and replacing the air filters. When servicing gas heating equipment, observe precautions in the manuals and on the labels attached to the furnace and other safety precautions that may apply.
14. These instructions cover the minimum requirements and conform to existing national standards and safety codes. In some case, these instructions may exceed certain local codes and ordinances, especially those that have not kept up with changing residential construction practices. These instructions are the minimum for a safe installation.

⚠ WARNING

This furnace must not be installed where it may be exposed to potentially explosive or flammable atmosphere.

Installing this furnace in an explosive or flammable atmosphere may result in a fire or explosion causing property damage, personal injury, or death.

⚠ WARNING

HEALTH HAZARD

Improper installation, adjustment, alteration, service, or maintenance may cause property damage, personal injury, and/or death.

Incomplete combustion caused by improper installation, improper adjustment, alteration, service, or maintenance can result in exposure to substances which have been determined by various state agencies to cause cancer, birth defects, or other reproductive harm.

Read the installation manual, user information, and service/maintenance manual thoroughly before installing or servicing this furnace.

SAFETY REQUIREMENTS – INSTALLATION CODES

1. A manufactured (mobile) home installation must conform with the Manufactured Construction and Safety Standard, Title 24 CFR, Part 3280, or when such standard is not applicable, the standard for Manufactured Home Installations (Manufactured Home Sites, Communities, and Setups) ANSI/NCS A225.1, Series M92 Mobile Homes. The furnace has been safety certified to UL307B.
2. Additional installation codes that may apply are as follows:
   - National Fuel Gas Code – ANSI Z223.1 / NFPA -54.
   - National Electrical Code ANSI / NFPA -70
   - Manufactured Housing – NFPA-501 and Fire Safety Criteria for Mobile Home Installations – NFPA 501A
   - Recreational Vehicles – ANSI – 119 / NFPA-501C
   - All local, State, City, and Township Codes
3. All applicable codes take precedence over any recommendation made in these instructions.

SAFETY PRECAUTIONS

1. Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage.
2. Furnace must be wired strictly in accordance with wiring diagram furnished with the furnace. Any wiring different from the wiring diagram could result in a hazard to persons and property.
3. Any original factory wiring that is replaced must be replaced with wires having a temperature rating of at least 105°C.
4. When servicing or repairing this furnace, use only manufacturer approved service replacement parts. A replacements parts list can be found in the **User Information/Service/ Maintenance Manual** or may be obtained by contacting the manufacturer. Refer to the furnace data plate for the model number, serial number, and manufacturer's address. Substitution of parts or controls not approved by the manufacturer will be at the owner's risk.

⚠ WARNING

FIRE OR ELECTRICAL HAZARD

Failure to follow the safety warnings could result in a fire or electrical hazard which may cause property damage, personal injury, or death.

COMBUSTION AIR QUALITY (LIST OF CONTAMINANTS)

The furnace requires outdoor air for combustion when the furnace is located in any of the following environments:

- Restricted environments
- Buildings with indoor pools
- Furnaces installed in laundry rooms
- Furnaces installed in hobby or craft rooms
- Furnace installed in chemical storage areas
- Chemical exposure

The furnace requires outdoor air for combustion when the furnace is located in an area where the furnace is being exposed to the following substances and/or chemicals.

- Permanent wave solutions
- Chlorinated waxes or cleaners
- Chlorine based swimming pool chemicals
- Water softening chemicals
- De-icing salts or chemicals
- Carbon tetrachloride
- Halogen type refrigerants
- Cleaning solvents such as perchloroethylene
- Printing inks, paint removers, varnishes, ECT
- Hydrochloric acid
- Cements and glues
- Antistatic fabric softeners
- Masonry acid washing materials

When outdoor air is used for combustion, the combustion air intake pipe termination must be located external to the building and in an area where there is no exposure to the substances listed above.

⚠ CAUTION

This product must be installed in strict compliance with the installation instructions and any applicable local, state, and national codes including but not limited to building, electrical, and mechanical codes.

⚠ WARNING

This furnace area must never be used as a broom closet or for any other storage purposes, as a fire hazard may be created. Never store the following items on, near, or in contact with the furnace.

1. **Spray or aerosol cans, rags, brooms, dust mops, vacuum cleaners, or other cleaning tools**
2. **Soap powders, bleaches, waxes, or other cleaning compounds**
3. **Plastic items or containers**
4. **Gasoline, kerosene, cigarette lighter fluid, dry cleaning fluids, or other volatile fluids**
5. **Paper bags, boxes, or other paper products**

⚠ WARNING

Any attempt to relocate or bypass a safety control or replace safety incompatible controls with a control that is not approved or is may result in personal injury, property damage, or death.

⚠ WARNING

Because of potential odorant fade, it may not be possible to detect a gas leak by smell. It is recommended that black iron pipe be used from the gas valve to outside the home in order to prevent gas leaks inside the home. Copper tubing and brass fittings (except tin lined) shall not be used if the gas contains more than a trace (0.3 grains per 100 cubic ft.) of hydrogen sulfide gas. Consult the gas supplier for gas content and a gas leak detector.

⚠ CAUTION

1. **Turn off gas supply before installing furnace.**
2. **When leak testing the gas piping system, the furnace gas control valve must be isolated from pressures exceeding 14" W.C. (3.5 kPa).**
3. **Check the gas inlet pressure ahead of the gas control valve and make sure the pressure is:**
   4.5" – 10.5" W.C. (1.744 – 2.615 kPa) for natural gas.
   11" – 13" W.C. (2.74 – 3.24 kPa) for propane (LP)
4. **Purging air from the gas supply line should be performed per ANSI Z223.1 (latest edition) "National Fuel Gas Code", or in Canada, CAN/CGA-B149.1 or B149.2 codes.**
5. **Do not attempt to reuse any mechanical or electronic ignition control that has been wet. Replace a defective ignition control.**
6. **Servicing or repairing of this furnace must be performed by a qualified service agency.**

⚠ WARNING

HAZARD OF ASPHYXIATION: Negative pressure inside a closet with closet door closed and the furnace blower operating must not be more than 0.05" W.C.

⚠ WARNING

Do not store chemicals or volatile fluids around the furnace.

Storing chemicals around the furnace can lead to heat exchanger corrosion and premature heat exchanger failure which may result in personal injury, significant property damage, or death.

Storing volatile fluids around the furnace can also result in an explosion which may result in significant property damage, personal injury, or death.

G 18 D 0XX A A x B A-Z

G - Gas - Fired Product

18 - 1st Series 80% (HSI)

D - Downflow/Mobile home/Modular

Heating Capacity
060 - 60,000
070 - 70,000
077 - 77,000
090 - 90,000

Cabinet Height
A -56″
B - 72″
C - 77.5″

Furnace Configuration
A - A/C Ready
H - Heating Only

Blower Motor HP/Speed
3 - ⅓ HP 5 Speed
4 - ¾ HP 5 Speed

Blower Motor Type
A - PSC
B - Constant Torque Motor

Revision Letter *
A - Revision "A"
B - Emerson Control Board
C - Endura Pro Motor

Table 1: Model Number Nomenclature

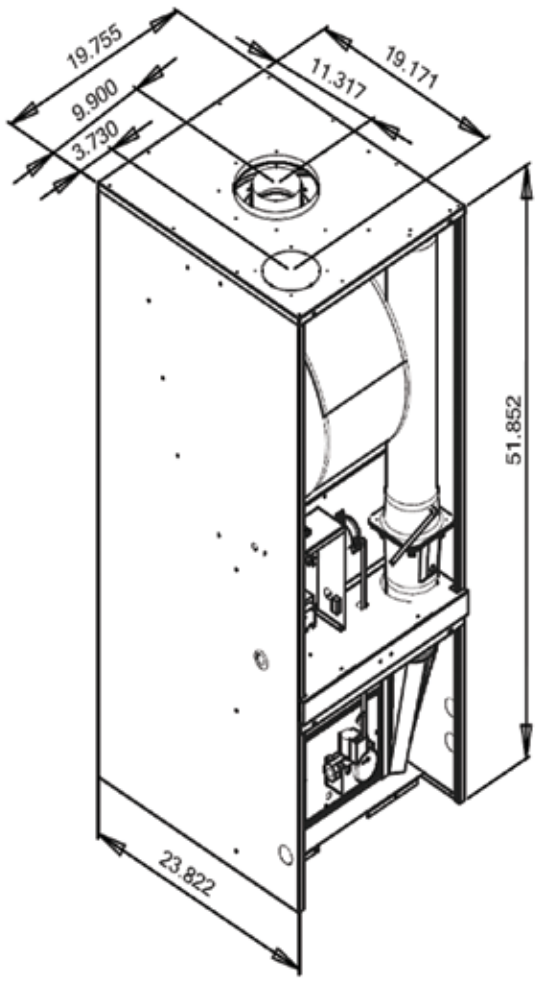


Figure 1: Furnace Dimensions

NOTE: Coil cabinet or insulated cabinet is not shown in Figure 1. Add 4 inches to the height for the insulated base cabinet on heating only (AH3BB) models and 25.5 inches for the coil cabinet on the A/C ready models (CA3BB and CA4BB).

Furnace Total Height
Heating Only Models: 51.852″ + 4″ = 55.852″
A/C Ready Models: 51.852″ + 25.5″ = 77.352″

Furnace Weights
Heating Only Models: 152 lbs (68.95 kg)
A/C Ready Models: 175 lbs (79.38 kg)

INSPECTION

As soon as the furnace is received, it should be inspected for possible damage that has occurred during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. Before installation, the furnace should be checked for screws or bolts which may have loosened in transit. There are no shipping or spacer brackets which need to be removed before startup.

FURNACE LOCATION

The furnace must be located using the following guidelines.

1. A location where a minimum amount of air intake/vent piping (smallest roof jack) will be required.
2. A location centralized with the air distribution as possible.
3. A location where adequate combustion air will be available when not using outdoor air for combustion air.
4. A location where the furnace will not interfere with proper air circulation in the confined space.
5. A location where the outdoor combustion air/vent terminal will not be blocked or restricted. Refer to combustion air/ vent instructions located in Section 6. These minimum clearances must be maintained throughout the installation.
6. A location where the furnace can be installed level with no more than ¼" (0.6 cm) slope side to side.

⚠ IMPORTANT

To prevent premature heat exchanger failure, do not locate any gas-fired appliances in area where corrosive vapors are present in the atmosphere. Refer to the section on COMBUSTION AIR QUALITY.

INSTALLATION IN AREAS WITH LOW TEMPERATURES

1. Furnace shall be installed in an area where ventilation provides safe ambient temperatures under normal operating conditions. Ambient temperatures must not fall below 32° F (0° C) unless the condensate system is protected from freezing.
2. Do not install the furnace in a location where the return air temperature can fall below 55°F (13°C) for extended periods of time to prevent condensate from forming in the furnace heat exchanger and vent system that can lead to premature heat exchanger failure.

⚠ WARNING

LOW RETURN AIR TEMPERATURE HAZARD

Applications where the return air temperature is consistently below 55°F (13°C) may result in premature heat exchanger failure, fire, property damage, personal injury, or death.

3. If the furnace is installed in an area where the ambient temperature may drop below 32° F (0° C), a UL, CUL, CSA or CGA listed self-regulating heat tape is required. A condensate pump installed on condensate lines may be required by state or local codes. Heat tape must be self-regulating with a power consumption rating of 3 watts per foot (0.92 watts per meter). Heat tape must be installed around the condensate drain lines in all unconditioned spaces and must be installed per the manufacturer's instructions. Cover the heat tape with a heat resistant insulation like fiberglass insulation or closed cell foam insulation.

   IMPORTANT: If expanding foam insulation is used to insulate the condensate drain lines, the entire drain line must be covered with at least 3 inches (7.6 cm) of foam. Fiberglass insulation, closed cell foam insulation, or other insulating material with an "R" value of at least 3.5 may also be used. Make sure to insulate both vertical and horizontal portions of the condensate drain line that may be exposed to sub-freezing temperatures. The condensate drain line must slope ¼" per foot (0.635 cm/m) away from the drain pan to assure proper drainage.

4. If the furnace is installed in an unconditioned space and an electrical power failure occurs in sub-freezing ambient temperatures, damage to the condensate trap, drain lines, and internal furnace components may occur. Following an electrical power failure in sub-freezing temperatures, do not operate the furnace until an inspection and repairs are performed.

INSTALLATION IN A RESIDENTIAL GARAGE

A gas furnace installed in a residential garage must be installed so the gas burner(s) and the ignition source are located not less than 18 inches (46 cm) above the floor. The furnace must be located or protected to avoid physical damage by vehicles.

CLEARANCES FOR ACCESS AND COMBUSIBLE MATERIALS

Ample clearances are required to permit easy access to the furnace. The following minimum clearances are recommended.

- 24 inches (61 cm) between the front of the furnace and an adjacent wall or other appliance for servicing or cleaning.
- 18 inches (46 cm) on the side of the furnace when it is needed to provide access to the front of the furnace for servicing, inspecting, or replacing flue/vent connections.

Refer to Table 2 below for the required clearances combustible materials.

Top	Left Side	Right Side	Back	Front Alcove	Front Closet	Duct	Roof Jack
6 in.	0 in.	0 in.	0 in.	18 in.	6 in.	0 in.	6 in.

Table 2: Clearances to Combustibles

REQUIREMENTS FOR FURNACES INSTALLED IN THE COMMONWEALTH OF MASSACHUSETTS

The following list are requirements for side wall horizontally vented gas fired appliances installed in a building used in whole or in part for residential purposes, including those owned or operated by the commonwealth, where the side wall exhaust vent termination is less than seven 7 feet (2.13 meters) above a finished grade. This is including but not limited to decks and porches.

1. INSTALLATION OF CARBON MONOXIDE DETECTORS

The installing plumber or pipe fitter shall confirm a hard wired carbon monoxide detector with a battery backup is installed on the same floor level where the gas fueled appliance is being installed with the horizontal vent system. The installing plumber or pipe fitter shall also confirm that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the structure served by the side wall horizontal vented gas fueled appliance. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.

If the side wall horizontally vented gas fueled appliance is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery backup may be installed on the next adjacent level.

If the battery operated carbon monoxide detector with an alarm requirement cannot be met at the time of completion of the installation, the owner has 30 days to comply with the above requirements provided that during the 30 day period, a battery operated carbon monoxide detector with an alarm is installed.

2. APPROVED CARBON MONOXIDE DETECTORS

Each carbon monoxide detector shall comply with NFPA 720, be ANSI/UL 2034 listed, and be IAS certified.

3. SIGNAGE

A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of 8 feet (2.44 meters) above the grade directly in line with the gas fueled appliance or horizontal exhaust vent terminal. The sign shall be in print of no less than 1/2 inch (12.7 mm) in height and shall read **"GAS VENT BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".**

4. INSPECTION

The state or local gas inspector of the side wall horizontally vented gas fueled appliance shall not approve the installation unless upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

SECTION 3: FURNACE DUCTWORK & FILTERS

General Information

1. The duct system design and installation must be sufficient to support an air volume appropriate for the space being heated and must allow the furnace to operate within the data plate specifications and must provide a complete path for heated or cooled air to circulate to and from the conditioned space.
2. The duct system design and installation must be in accordance with the NFPA standards pamphlets 90A and 90B (latest editions) or applicable national, provincial, state, local, fire, and safety codes.
3. For manufactured (mobile) home or modular home installations require a closed duct system. The supply ducts must carry air circulated by the furnace to areas outside the space containing the furnace. The return air may enter the furnace through a louvered filter door attached to the furnace casing as long as the combustion air and vent system is a 2 pipe sealed combustion configuration and a return air duct system is not required by state, local, provincial, or regional codes.
4. When the furnace is used in conjunction with a cooling coil, the coil must be installed parallel with or in the supply air side of the furnace to avoid condensation in the primary heat exchanger. When a parallel flow arrangement is used, dampers or other means used to control the flow of air must be adequate to prevent chilled air from entering the furnace. If manually operated, the damper must be equipped with means to prevent the furnace or the air conditioner from operating unless damper is the full heating or full cooling position.

⚠ CAUTION

The cooling coil must be installed in the coil cabinet or in the supply air duct downstream of the furnace heat exchanger. Cooled air must not be allowed to pass over the heat exchanger which could result in condensation inside the furnace primary heat exchanger.

⚠ WARNING

The duct system must be properly sized to support the required airflow for the heating and cooling capacities being installed.

Refer to the furnace data plate for the correct temperature rise and static pressures.
Undersized ducts can result in an abnormally high temperature rise and heat exchanger overheating which can cause premature heat exchanger failure, property damage, personal injury, or death.

Combustible Floor Base Installation

Although a combustible floor base is not required due to the heating only furnace base being insulated, a combustible floor base is recommended when a heating only furnace is installed on a combustible material such as a wooden floor. The combustible floor base assembly is shown in Figure 2. Follow the instructions supplied with the combustible floor base accessory to be sure it is properly installed.

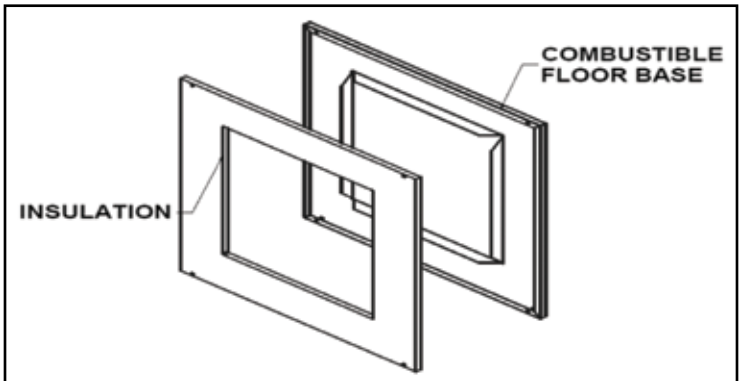


Figure 2: Combustible Floor Base Assembly

Downflow Duct Connectors

All downflow installations must use a suitable duct connector approved by the furnace manufacturer for use with this furnace. The duct connectors are designed as a transition between the furnace base and the rectangular duct system under the floor. Refer to the instructions supplied with the duct connector for proper installation. The duct connector part number can be found in the "Accessory Parts List" in the User Information, Service and Maintenance Manual.

When replacing an existing furnace, it will be necessary to determine if the furnace will properly fit the existing duct connector and all of the holes in the furnace base line up with the holes in the duct connector. If the furnace doesn't fit the existing duct connector or the holes do not line up, the existing duct connector must be replaced with the proper duct connector for the furnace.

The duct system is a very important part of the installation. If the duct system is improperly sized, the furnace will not operate properly. To properly design the duct system, Refer to the chapter on duct design in the ASHRAE Fundamentals Handbook, or contact a company that specializes in the design of manufactured (mobile) home, modular home, and HUD home duct systems.

IMPORTANT: If the supply air duct is being connected to the furnace without the use of an accessory duct connector, a transition duct must be installed with flanges or tabs that are securely attached and sealed to the supply air duct and the base of the furnace. The transition duct must have insulation between the duct and any combustible material. The transition duct must match the supply air opening dimensions of the furnace base.

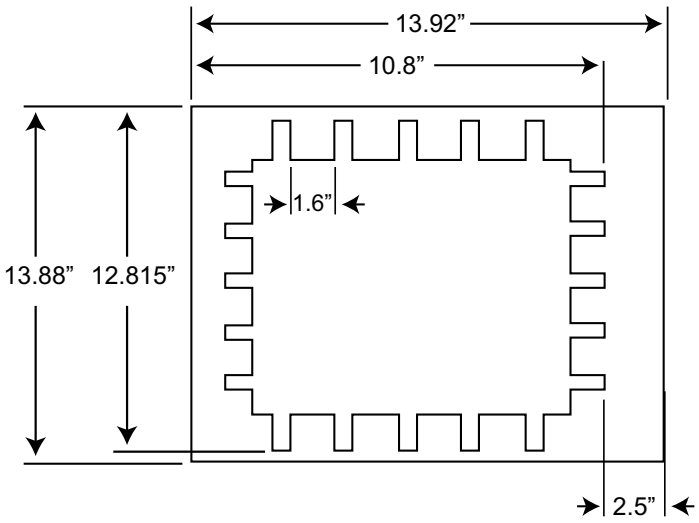


Figure 3: Duct Connector Dimensions

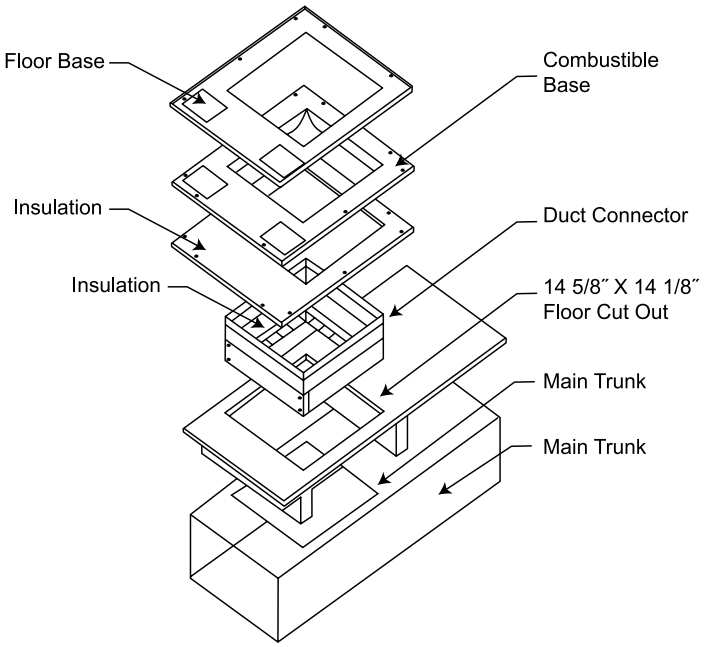


Figure 4: Duct Connector and Floor Base Assembly

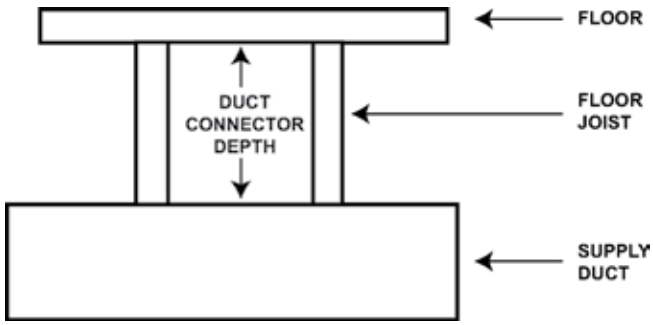


Figure 5: Duct Connector Depth

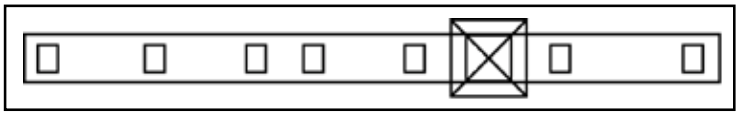


Figure 6: Air Distribution System – Single Trunk Duct

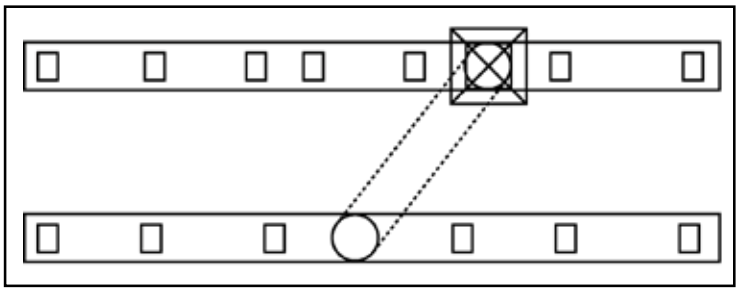


Figure 7: Air Distribution System – Double Trunk Duct

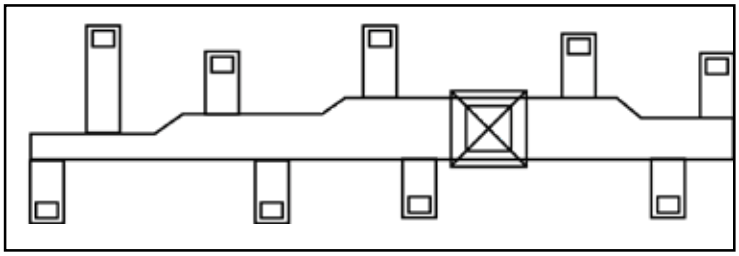


Figure 8: Air Distribution System – Graduated Trunk Duct

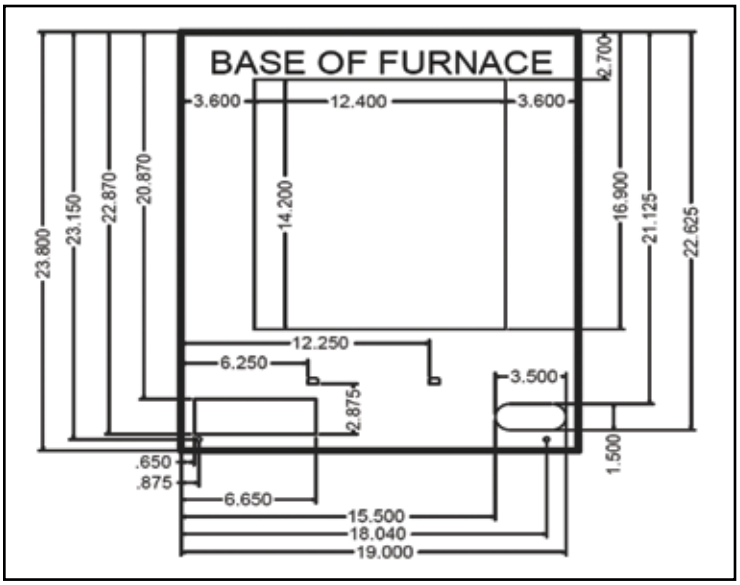


Figure 9: Furnace Base Openings for Gas, Electrical and Refrigerant Lines

Furnace Installation

Both the heating only models (without an air conditioning coil) and the A/C ready models are approved for use in an alcove or closet. For alcove installations, a minimum of 24 inches (61 cm) of front clearance to a facing wall or partition is needed for service access and return air clearances. For closet installations, a minimum of 6" front clearance to a facing closet door is needed for service access and return air clearances.

Prior to installing the furnace, make sure the holes are cut into the floor for the refrigerant tubing and the electrical wiring, thermostat wiring, and outdoor unit control wiring are in place. Install the furnace as follows:

Before installing the furnace, confirm there is enough clearance to install the furnace and clearance for the return air, service access, and clearance to combustibles. Refer to **CLEARANCES FOR ACCESS AND COMBUSIBLE MATERIALS** on page 7.

1. Remove the top shipping cover and corner posts.
2. Remove the upper access panel.
3. Remove the lower access panel.
4. Set the furnace in place on the duct connector. Confirm that the supply air opening lines up with the opening in the duct connector.
5. Slide the furnace on to the floor base. Push the furnace back until the furnace casing is against the rear flange.
6. Secure the furnace to the floor by drilling two holes through the furnace base and the floor base at the right and left front inside corners of the cabinet. Use two screws to secure the furnace to the floor.
7. Seal around the duct connector and the furnace base to prevent air leakage.
8. Remove the existing roof jack and replace with a new roof jack. Follow the roof jack installation instructions exactly.
9. Connect the gas supply line, line voltage wiring, and low voltage wiring.
10. Install the cooling coil in the coil compartment (for A/C ready models only).
11. Place the upper access panel on the furnace.
12. Check for gas leaks. If no leaks are found, turn the gas to the furnace on.
13. Follow the procedure **"Starting the Furnace"** located in Section 3: Startup and Shutdown Instructions in the User Information Manual.
14. Verify the furnace is operating properly.
15. Place the lower access panel on the furnace.
16. Set the thermostat to the desired operating mode and temperature.

Important: Fabricate and install an inspection door in the plenum base below the furnace to allow an annual inspection of the heat exchangers. The inspection door can be fabricated by the following method.

1. Cut a rectangular opening in the plenum base. A sheet metal plate can be made that covers the opening in the base.
2. The plate must be secured with screws and sealed to prevent leaks.

Return Air Filters

All applications require a return air filter. Filter mounting provisions are provided in the louvered return air grille door. All furnaces are shipped from the factory with high velocity pleated disposable filters.

Factory Supplied Filter Size: 16" x 20" x 1" (2 required)

IMPORTANT: Standard velocity disposable air filters cannot be used in the furnace return air louvered door because the air velocity is too high and will destroy the filter. Standard velocity disposable filters are rated for an air velocity of 300 feet per minute (91.44 m/minute) which is less than the 400 feet per minute (121.92 m/ minute) of this furnace. Only use high velocity filters in this furnace that are rated for at least 400 ft/min (121.92 m/minute).

Optional Field Supplied Return Air Filter Grille
It is permissible to remove the factory filters from the return air louvered door and use a field supplied return filter grille that has been installed in the wall above the furnace of a sufficient size so it does not restrict the return airflow. The recommended filter sizes for the field supplied return air filter grille are shown on the next page.

For disposable filters rated for a velocity of 300 feet/minute (91.44 m/minute):
1,200 CFM requires a 20 inch x 30 inch filter size.
1,600 CFM requires a 20 inch x 40 inch filter size.
1,800 CFM requires a 25 inch x 30 inch filter size.
2,000 CFM requires a 25 inch x 40 inch filter size.

For disposable pleated air filters rated for a velocity of 500 feet/minute (152.4 m/minute):
1,200 CFM requires a 20 inch x 20 inch filter size.
1,600 CFM requires a 20 inch x 25 inch filter size.
1,800 CFM requires a 20 inch x 30 inch filter size.
2,000 CFM requires a 16 inch x 40 inch filter size.

Never use an air filter thicker than 1 inch (25.4 mm) or one smaller in size than recommended above to prevent an excessive pressure drop across the filter. Excessive pressure drop will cause the furnace airflow to be reduced resulting in increased furnace temperature rise, reduced efficiency, higher heat exchanger temperatures, and potential cycling on the auto-reset overtemperature limit switch. If the furnace does not operate within the specified temperature rise range on the rating plate or the auto-reset over-temperature limit switch is cycling due to excessive filter pressure drop, the air filter must be changed to a larger size or one with reduced thickness in order to reduce the pressure drop across the filter.

DOWNFLOW COOLING COIL CABINET
The cooling coil cabinet is supplied with the A/C ready models. The cabinet is 25.5 inches (64.77 cm) tall. The base of the cooling coil cabinet can be mounted directly to the duct connector and attached with screws. Make sure all of the openings in the furnace base match up with the openings in the duct connector, especially the supply air opening. Remove the coil cabinet door in order to confirm that all the holes in the base line up with the holes in the duct connector. A combustible floor base is not required when using a cooling coil cabinet.

OUTDOOR AIR ACCESSORY
A furnace may have a blend air accessory that supplies fresh air from outside through a 4 inch (10.16 cm) pipe that attaches to the top cover of the furnace. A knockout and four screw holes are located in the top cover of the furnace for the attachment of the blend air damper or tube assembly. Refer to Figure 10 for knockout and screw hole locations.

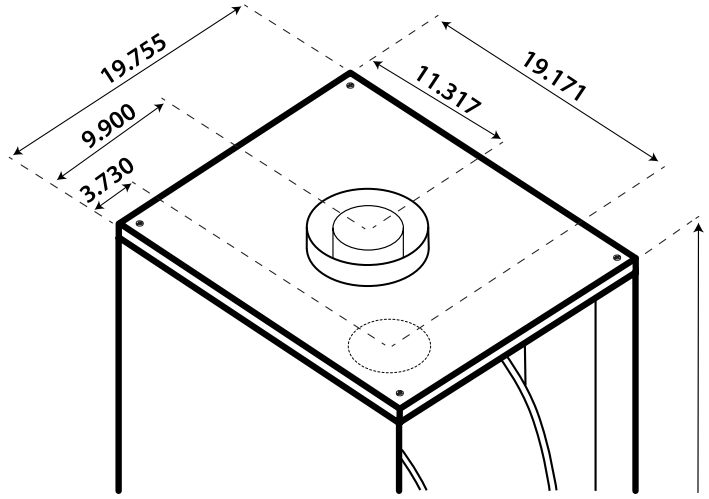


Figure 10: Outdoor Fresh Air Intake Knockout

SECTION 4: GAS SUPPLY & VALVE CONNECTIONS

⚠ WARNING

All field installed gas piping must be pressure tested for leaks prior to operation of the furnace. Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for detection of leaks. Be sure to check all connections.

Failure to properly check all connections for leaks or failure to check any connections for leaks may result in a fire or explosion causing property damage, personal injury, or loss of life.

⚠ DANGER

An over-pressure protection device such as a pressure regulator must be installed in the gas piping system upstream of the furnace and must act to limit the downstream pressure to the gas valve so it does not exceed 0.5 PSI (14" WC (3.48 kPa)). Pressures exceeding 0.5 PSI (14" WC (3.48 kPa)) at the gas valve will cause damage to the gas valve, the furnace, or some of its components. This may result in a fire or explosion that may cause property damage and loss of life.

⚠ CAUTION

1. Purging of air from gas lines should be performed as described in the latest edition of ANSI Z223.1 (National Fuel Gas Code), or in Canada CAN/CGA-B149 codes.
   2 When leak testing the gas supply piping system, the furnace and its combination gas control must be isolated during any pressure testing in excess of 14" W.C. (0.5 psi (3.48 kPa)).
2. The furnace can be isolated from the gas supply piping system by closing its field installed manual shut-off valve. This manual shut-off valve should be located within 6 ft (1.83 m) of the furnace.
3. Turn off all gas before installing the furnace.

⚠ WARNING

Never apply a pipe wrench to the body of the gas valve when installing or removing the gas pipe. The pipe wrench must be placed on the gas valve "Wrench Boss" (Refer to Figure 11).
Placing a wrench on the body of the gas valve can cause damage to the valve resulting in improper operation and/or leaking. This can result in a fire or explosion that can result in personnel injury, property damage and loss of life.

⚠ IMPORTANT

To prevent premature heat exchanger failure, the input to the furnace as indicated on the furnace data plate must not exceed the rated input by more than 5%.

GAS PIPING INSTALLATION

1. Properly sized wrought iron or approved flexible or steel pipe must be used when making the gas connections to the furnace. Check the local codes on the use of flexible pipe. Some local codes do not allow the use of flexible pipe. Always use a listed connector. Do not use a connector that is also serving another gas appliance.
2. Some utility companies may require pipe sizes larger than the minimum sizes listed in these instructions and in the codes. Some local codes may require pipe sizes that are larger than the minimum sizes listed in these instructions.
3. The installation of a drip leg and a ground union is required.

IMPORTANT: Plan the gas supply pipe routing before determining the gas entry. Use 90 degree service elbow(s), or short nipples and conventional 90 degree elbow(s) to enter through the cabinet access holes.

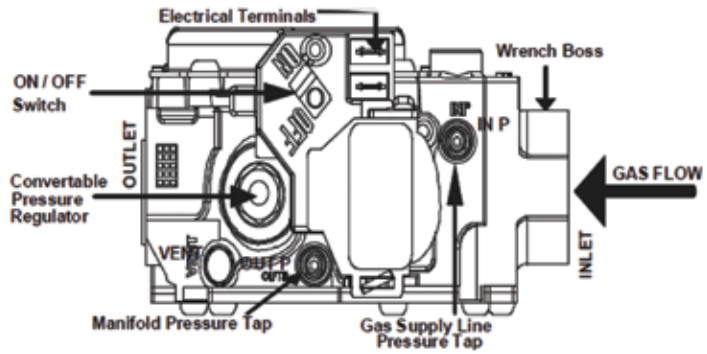


Figure 11: White Rodgers Gas Valve

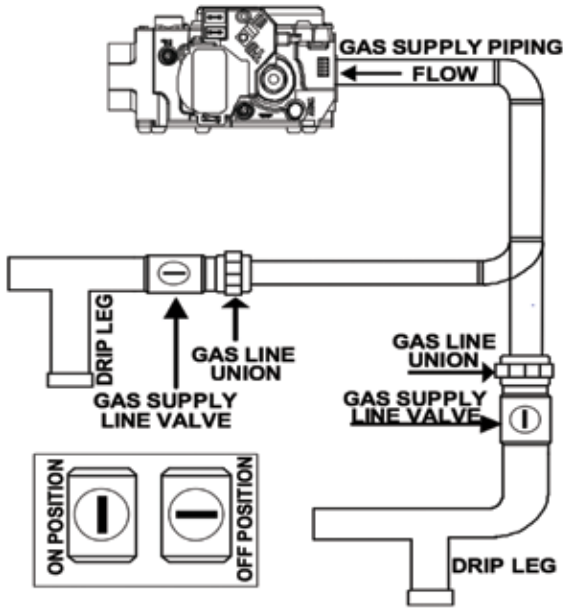


Figure 12: Gas Valve and Gas Supply Piping

4. Installation of piping must conform with local building codes, or in the absence of local codes, to the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) (latest edition). In Canada, installation must be in accordance with CAN/CGA-B149.1 for natural gas and CAN/CGA-B149.2 for propane.
5. Piping to the furnace must conform to local and national requirements for type and volume of gas and pressure drop allowed in the line. Refer to Table 4 to determine the cubic feet per hour (CFH) for the type of gas and capacity of furnace being installed. Using this CFH value and the length of pipe required, determine the pipe diameter from Table 4. Where several gas appliances are served by the same main gas supply line, the total capacity in CFH and the length of the main gas supply line must be considered. Avoid pipe sizes smaller than 1/2" (1.27 cm).
6. Table 4 allows for a 0.3" W.C. (0.075 kPa) pressure drop in the supply pressure from the building main gas supply line to the furnace. The inlet pressure to the furnace must be 6-7" W.C. (1.495-1.744 kPa) for natural gas and 11-14" W.C. (2.74-3.48 kPa) for propane. When sizing the inlet gas pipe diameter, make sure that the furnace supply pressure can be met after the 0.3" W.C. (0.075 kPa) has been subtracted. If 0.3" W.C. (0.075 kPa) pressure drop is too high, refer to the Gas Engineer's Handbook for other gas pipe capacities.

7. Install a ground joint union with brass seat and a manual shut-off valve adjacent to the unit for emergency shut-off and easy servicing of controls. A 1/8" (0.3175 cm) NPT plugged tap accessible for test gauge connection is located on the gas valve.
8. Provide a sediment trap (drip leg) before each gas appliance in the line at the low spot to trap any debris in the line before it reaches the gas valve (Refer to Figure 12).
9. When performing leak testing, if the test pressure is above 14" W.C. (0.50 psig, 3.48 kPa), it will be necessary to close the field installed shut-off valve to disconnect the furnace and its combination gas control from the gas supply line. Plug the supply line before testing. When testing pressures 14" W.C. (0.50 psig, 3.48 kPa)) or below, close the manual shut-off valve on the furnace before testing.

PROPANE CONVERSION PROCEDURE

⚠ DANGER

USE ONLY NATURAL GAS OR HD-5 PROPANE FUEL IN THIS FURNACE.

DO NOT USE "COMMERCIAL GRADE PROPANE" OR ANY PROPANE BLEND OTHER THAN HD-5.

IF A FUEL OTHER THAN NATURAL GAS OR HD-5 PROPANE IS USED IN THIS FURNACE, YOUR WARRANTY WILL BE VOID.

⚠ CAUTION

The gas supply must be turned off at the manual shut-off valve (gas cock) and the electrical power disconnected to the furnace before proceeding with the propane conversion.

1. If the furnace has been operating, follow the procedure to properly turn off the furnace that can be found in the User Information Manual.
2. Turn off the gas supply upstream of the furnace or at the gas meter.
3. Disconnect the ground union in the gas supply line.
4. Disconnect the gas piping from the gas valve.
5. Disconnect the brown wires from the gas valve electrical terminals.
6. Remove the two (2) screws that secure the gas valve manifold assembly to the burner mounting plate (Refer to Figure 13).
7. Remove the gas orifice from the gas valve manifold. Refer to Figure 13 for the orifice location.
8. Remove the propane orifice from the bag that is attached to the gas valve.
9. Install the propane orifice into the gas manifold pipe.
10. Place the gas valve mounting bracket on the burner mounting plate and secure with the screws removed in Step 6.
11. Reconnect the electrical wires to the terminals on top of the gas valve.
12. Reconnect the gas supply piping to the gas valve.
    IMPORTANT: Place the wrench only on the gas valve wrench boss when tightening the gas supply piping.
13. Reconnect and tighten the ground unions.
14. Turn the gas supply valve to the "ON" position and check all connections for leaks.
15. Follow the **"Starting the Furnace"** procedure in Section 3: **Startup and Shutdown Instructions in the User Information Manual** to properly start the furnace.

⚠ WARNING

Never use an open flame to check for leaks as a fire or explosion could occur. Since some leak solutions including soap and water may cause corrosion or stress cracking, the piping must be thoroughly rinsed with water after checking for leaks unless it has been determined that the leak solution is non-corrosive.

HIGH ALTITUDE GAS ORIFICE CONVERSION

This furnace is configured at the factory for natural gas-fired operation at 0 – 2000 ft (0 – 609.6 m) above sea level.
The gas orifice must be changed in order to operate properly when installing furnace in a location where the altitude is greater than 2,000 ft (609.6 m). Refer to Table 3 to determine the proper gas orifice size for the altitude where the furnace will be operating.

HIGH ALTITUDE PRESSURE SWITCH CONVERSION

Changing the pressure switch when the furnace is installed in a location below 6,500 ft (1,981 m) is generally not required unless the pressure switch will not stay closed. Above 6,500 ft (1,981 m), change only if switch will not stay closed.
The recommended pressure switch setting when the furnace is operating at an altitude above 6,500 ft (1,981 m) is 0.10 in. W.C. (0.0249 kPa).
The recommended pressure switch setting when the furnace is operating at an altitude above 8,500 ft (2,591 m) is 0.10 in. W.C. (0.0249 kPa).
Refer to the accessories parts list in the User Information Manual for the correct pressure switch part number.

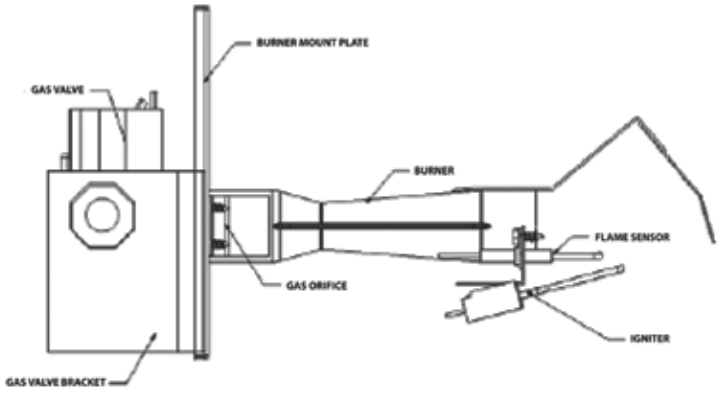


Figure 13: Burner Assembly

HIGH ALTITUDE DERATE CHART - MAIN BURNER ORIFICE SIZE

NATURAL GAS												
ELAVATION	60,000 BTU FURNACE			70,000 BTU FURNACE			77,000 BTU FURNACE			90,000 BTU FURNACE		
	PART NO	ORIF DIA	DRILL SIZE	PART NO	ORIF DIA	DRILL SIZE	PART NO	ORIF DIA	DRILL SIZE	PART NO	ORIF DIA	DRILL SIZE
SEA LEVEL	72AG-144	0.144	27	72AG-157	0.157	22	72AG-166	0.166	19	72AG-173	0.173	17
2000	72AG-1405	0.1405	28	72AG-154	0.154	23	72AG-161	0.161	20	72AG-1695	0.1695	18
2000	72AG-1405	0.1405	28	72AG-152	0.152	24	72AG-161	0.161	20	72AG-166	0.166	19
4000	72AG-136	0.136	29	72AG-1495	0.1495	25	72AG-159	0.159	21	72AG-166	0.166	19
5000	72AG-136	0.136	29	72AG-147	0.147	26	72AG-157	0.157	22	72AG-161	0.161	20
6000	72AG-136	0.136	29	72AG-144	0.144	27	72AG-154	0.154	23	72AG-159	0.159	21
7000	72AG-1285	0.1285	30	72AG-144	0.144	27	72AG-1494	0.1494	25	72AG-157	0.157	22
8000	72AG-1285	0.1285	30	72AG-1405	0.1405	28	72AG-147	70.147	26	72AG-154	0.154	23
9000	72AG-1285	0.1285	30	72AG-136	0.136	29	72AG-144	0.144	27	72AG-152	0.152	24
10000	72AG-120	0.120	31	72AG-136	0.136	29	72AG-1405	0.1405	28	72AG-147	0.147	26

PROPANE (LP) GAS												
ELAVATION	60,000 BTU FURNACE			70,000 BTU FURNACE			77,000 BTU FURNACE			90,000 BTU FURNACE		
	PART NO	ORIF DIA	DRILL SIZE	PART NO	ORIF DIA	DRILL SIZE	PART NO	ORIF DIA	DRILL SIZE	PART NO	ORIF DIA	DRILL SIZE
SEA LEVEL	72AG-086	0.086	44	72AG-0935	0.0935	42	72AG-096	0.096	41	72AG-104	0.104	37
2000	72AG-082	0.082	45	72AG-0935	0.0935	42	72AG-0935	0.0935	42	72AG-1015	0.1015	38
2000	72AG-082	0.082	45	72AG-089	0.089	43	72AG-0935	0.0935	42	72AG-0995	0.0995	39
4000	72AG-082	0.082	45	72AG-089	0.089	43	72AG-0935	0.0935	42	72AG-0995	0.0995	39
5000	72AG-081	0.081	46	72AG-089	0.089	43	72AG-089	0.089	43	72AG-098	0.098	40
6000	72AG-078	0.078	47	72AG-086	0.086	44	72AG-089	0.089	43	72AG-096	0.096	41
7000	72AG-078	0.078	47	72AG-086	0.086	44	72AG-086	0.086	44	72AG-0935	0.0935	42
8000	72AG-076	0.076	48	72AG-082	0.082	45	72AG-086	0.086	44	72AG-0935	0.0935	42
9000	72AG-076	0.076	48	72AG-081	0.081	46	72AG-082	0.082	45	72AG-089	0.089	43
10000	72AG-073	0.073	49	72AG-078	0.078	47	72AG-081	0.081	46	72AG-089	0.089	43

Table 3: High Altitude Gas Orifice Size Chart

⚠ DANGER

PROPANE AND HIGH ALTITUDE KITS

It is very important to choose the correct kit and/or gas orifice for the altitude where the appliance will be operating. It is also very important to choose the correct kit and/or gas orifice for the type of gas the appliance will be burning. Only use a natural gas orifice in a furnace operating on natural gas. Only fuel the furnace with propane if the furnace that has been converted to use HD-5 Propane (LP). Do not operate this furnace with butane or butane/air.

An incorrect gas orifice or a furnace that has been improperly converted will create an extremely dangerous condition resulting in premature heat exchanger failure, excessive sooting, **dangerously high levels of carbon monoxide** which can result in **personal injury, property damage, a fire hazard and/or loss of life.**

High altitude and/or HD-5 propane (LP) conversions are required for the furnace to maintain proper operation when operating at high altitude and/or on propane. An authorized dealer or qualified service contractor must make all gas conversions. In Canada, a certified conversion station or qualified service agency, using factory specified and/or approved parts, must perform the conversion. The installer must take every precaution to ensure the furnace has been properly converted by using the correct gas orifice and placing the gas valve regulator in the proper position for the gas being used.
Do not attempt to drill out any orifice to obtain the proper size. The orifice must only be drilled with precision equipment available only at the factory. Hand drilling orifice will likely cause misalignment of the burner flame resulting in the flame impinging on the heat exchanger which can cause premature heat exchanger failure, **dangerously high levels of carbon monoxide, personal injury, property damage and/or death.**

MODEL MGD	TYPE OF GAS	LENGTH (FT.)	PIPE SIZE (IN.)	TUBING SIZE (IN. OD)
60	Natural	to 20 to 60 to 70	1/2 1/2 -	5/8 - 3/4
	Propane	to 40 to 70 to 80	1/2 - 1/2	- 5/8 -
70	Natural	to 20 to 50 to 60 to 80	- 1/2 - 1/2	5/8 - 3/4 -
	Propane	to 30 to 60 to 80	1/2 - 1/2	- 5/8 -
77	Natural	to 20 to 50 to 60 to 80	- 1/2 - 3/4	5/8 - 3/4
	Propane	to 30 to 60 to 80	1/2 - 1/2	- 5/8 -
90	Natural	to 40 to 50	1/2 -	3/4 3/4
	Propane	to 30 to 40 to 60	1/2 - 1/2	- 5/8 3/4

Table 4: Supply Gas Pipe Sizing

NOTE: Capability up to 14" W.C. (0.50 PSI (3.48 kPa)) gas pressure through Schedule 40 Pipe
Pressure drop of 0.3" W C (0.0075 kPa)
Natural Gas – Specific Gravity – 0.60; Propane Gas – Specific Gravity – 1.50

Input	Output	Cabinet Width	Max. External Static Pressure, Duct (inches W.C.)	AFUE	Air Temp. Rise Range (°F)
60,000	48,000	19.5″	0.30	80%	40-70
70,000	56,000	19.5″	0.30	80%	40-70
77,000	61,600	19.5″	0.30	80%	40-70
90,000	72,000	19.5″	0.30	80%	45-75

Input	Maximum Outlet Air Temp	Blower Size	Maximum Overcurrent Protection Amps	Minimum Wire Size (AWG) @ 75 Ft. One Way
60,000	170	10 x 8	15	14
70,000	170	10 x 8	15	14
77,000	170	10 x 8	15	14
90,000	175	10 x 8	15	14

Table 5: Ratings, Physical and Electrical Data

Model	G18D060AH3BC	G18D070AH3BC	G18D077AH3BC	G18D090AH3BC
Blower Motor HP	1/3	1/3	1/3	1/3
Blower Motor Speeds	4	4	4	4
Blower Motor FLA	2.4	2.4	2.4	2.4
Nominal Air Flow (CFM)	1,100	1,100	1,100	1,100
24 VAC Amps	0.49	0.49	0.49	0.49
Total Unit Amps	3.89	3.89	3.89	3.89

Table 6: Heating Only Models Blower and Motor Data

Model	G18D060CA3BC	G18D070CA3BC	G18D077CA3BC	G18D090CA3BC
Blower Motor HP	1/3	1/3	1/3	1/3
Blower Motor Speeds	4	4	4	4
Blower Motor FLA	2.4	2.4	2.4	2.4
Nominal Air Flow (CFM)	1,100	1,100	1,100	1,100
24 VAC Amps	0.49	0.49	0.49	0.49
Total Unit Amps	3.89	3.89	3.89	3.89

Table 7: A/C Ready Short Cabinet Models Blower and Motor Data

Model	G18D060CA4BC	G18D070CA4BC	G18D077CA4BC	G18D090CA4BC
Blower Motor HP	3/4	3/4	3/4	3/4
Blower Motor Speeds	4	4	4	4
Blower Motor FLA	5.3	5.3	5.3	5.3
Nominal Air Flow	1,700	1,700	1,700	1,700

Table 8: A/C Ready Tall Cabinet Models Blower and Motor Data

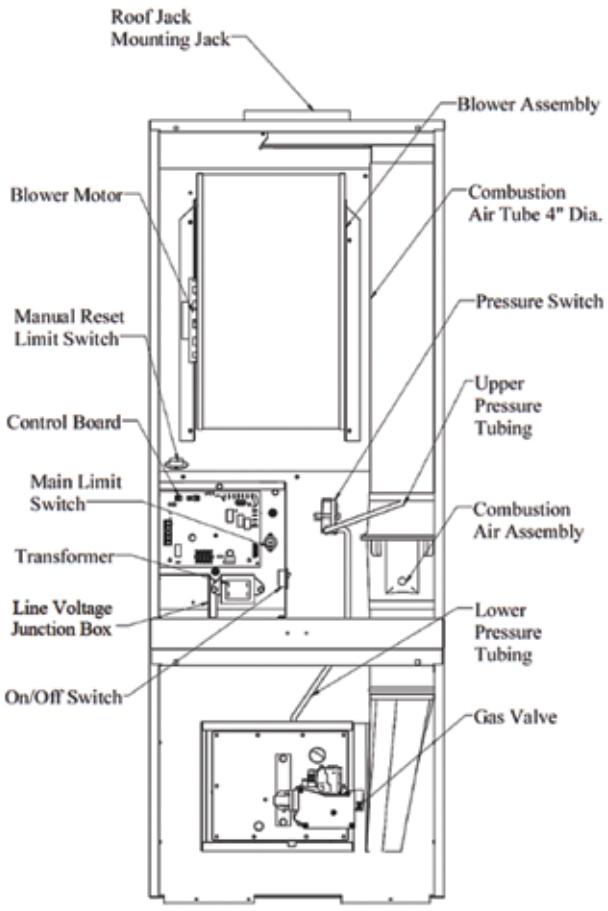


Figure 14: Component Locations

SECTION 5: LINE & LOW VOLTAGE WIRING

LINE VOLTAGE POWER SUPPLY

The furnace internal wiring is complete except for the electrical power supply and the wiring from the thermostat and condensing unit or heat pump outdoor section. See Table 5 for the maximum overcurrent protection amps (fuse or circuit breaker). The minimum supply wire size is 14 gauge and the minimum ground wire size is 14 gauge. The use of cable connectors on incoming power supply wires to relieve any strain on wiring is recommended. Follow the steps in the column to the left to connect the power supply wires.

⚠ CAUTION

USE COPPER CONDUCTORS ONLY.

⚠ WARNING

For personal safety be sure to turn the electrical power "OFF" at the main electrical control panel (circuit breaker box) and at the furnace before attempting any service or maintenance operations. Homeowners and users should never attempt to perform any maintenance which requires opening the furnace control box cover. Refer to Figure 14 for the location of the ON/OFF switch.

Line Voltage Wiring Instructions

1. Remove the control box cover.
2. Install the cable connector on the 5/8" (15.875 mm) diameter hole on the left side of the control box.
3. Strip ½" (12.7 mm) of the insulation off the end of each wire.
4. Insert the wires through the hole in the casing and through the cable connector into the Line Voltage Junction Box (See Figure 14).
5. Use a wire nut to connect the BLACK wire to the BLACK pigtail wire and tighten until the wires are securely fastened together.
6. Use a wire nut to connect the WHITE wire to the WHITE pigtail wire and tighten until the wires are securely fastened together.
7. Wrap the GREEN ground wire around the GREEN ground screw in the control box to the right of the control board and securely tighten the screw.
8. Reinstall the control box cover.

IMPORTANT - All field installed wiring must be done in accordance with the National Electrical Code ANSI/NFPA 70 (latest edition) and all local codes. Furnace must be electrically grounded according to the above codes. The line voltage wiring to the furnace must be protected with a properly sized circuit breaker or fuse (See Table 5).

⚠ WARNING

Disconnect electrical power supply before making wiring connections to prevent electrical shock and equipment damage.
If sheathed cable is used, refer to NEC National Electrical Code (NFPA 70) and local codes for additional requirements concerning supply circuit wiring.

This furnace must be field wired strictly in accordance with the wiring diagram furnished with the furnace. Any altered wiring or wiring not specified on the wiring diagram could result personal injury, property damage or death.

Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.

Ensure the supply voltage to the furnace is within 10% of the rated voltage shown on the furnace data plate.

Thermostat Installation

The thermostat should be located on an inside wall in an open area to more closely sense the average room air. The thermostat should be located upstream from the furnace return airflow if possible, not within 3 feet of from any windows, 52 to 66 inches above the floor, and where it will not be affected by heat from the furnace or other heat sources, or drafts from frequently opened doors. Do not install the thermostat within 3 feet (91.44 cm) of any the heating/cooling supply air registers

Thermostat maintenance, operation, and programming instructions are included with the thermostat and should be given to the homeowner or user.

⚠ CAUTION

Do not locate thermostat within 3 feet of any of the following items:

1. **Supply air registers**
2. **Lights or heat lamps**
3. **Aquariums**
4. **Televisions, stereo, amplifiers, surround sound systems**
5. **Stoves or any cooking appliance**
6. **Refrigerator**
7. **Washer and/or dryer**
8. **Hot water tank**
9. **Sink or near any hot water**
10. **Within 15 feet of any electric space heater**
11. **Within 2 feet of sunlight**

Thermostat Wiring

Thermostat wires are routed through left side of furnace and connect to the low voltage pigtail wires located above the control box. The thermostat wires should also be no smaller than 20 AWG. Refer to Table 9 below for recommended wire gauge and lengths.

Thermostat Wire Length	Thermostat Wire Gauge (AWG)	Thermostat Wire Max. Current
0 -70 Feet	20	1.5 Amps
0 – 120 Feet	18	2.3 Amps

Table 9: Low Voltage Wire Gauge & Maximum Wire Lengths

The furnace low voltage pigtail wires are 18 AWG and are to be connected to the low voltage wires from the thermostat. The use of a five (5) conductor cable from the thermostat to the furnace is recommended for typical heating installations with straight cooling and a seven (7) conductor cable from the thermostat to the furnace for heat pump installations. The typical thermostat wire colors and connections are listed in Table 10.

NOTE: There is a 3 amp slow-blow fuse located on the left side of the control board that protects the 24 VAC circuit. Replace this fuse only with an equivalent 3 amp fuse.

Separate Heating and Cooling Thermostats

If the heating/cooling system is a central heating and cooling system, but the furnace and the cooling unit are controlled by separate thermostats, a thermostat interlock switch is required to prevent the furnace and cooling system from operating at the same time.

⚠ CAUTION

When the furnace and cooling system are controlled by separate thermostats, a thermostat interlock system must be installed to prevent simultaneous operation of the heating and cooling which can result in equipment overheating, equipment damage, and wasted energy.

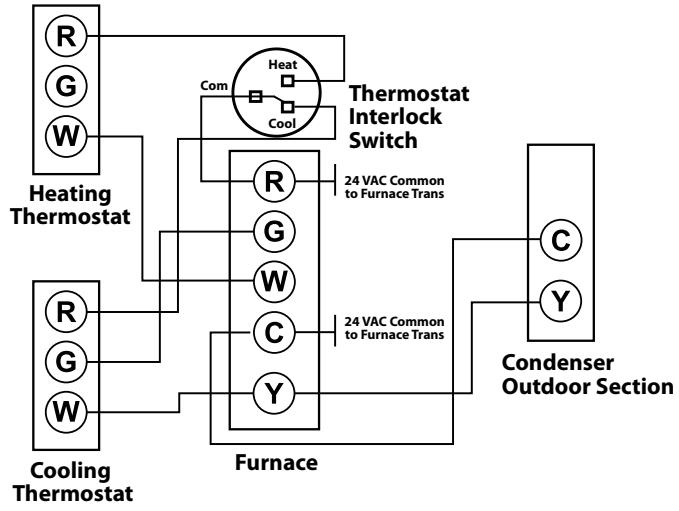


Figure 15: Low Voltage Connections - Separate Thermostats & Single Transformer for Furnace & Condensing Unit

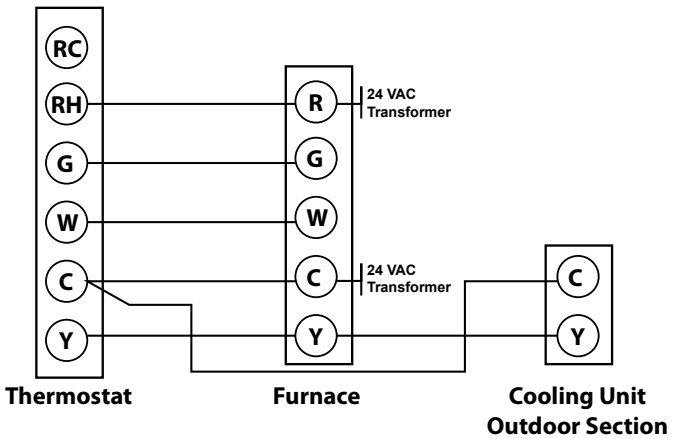


Figure 16: Low Voltage Connections - Separate Thermostats & Single Transformer for Furnace & Condensing Unit

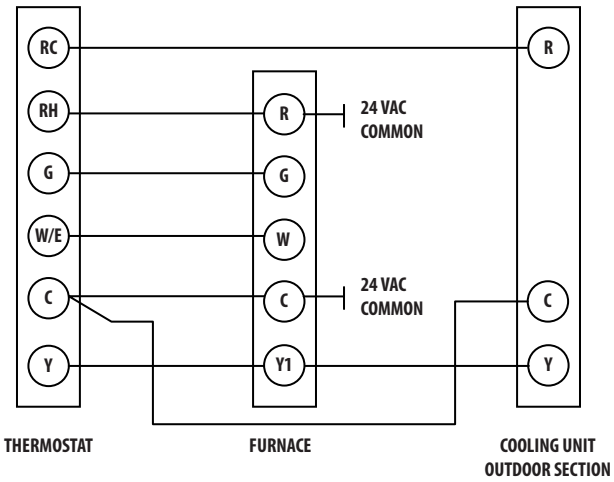


Figure 17: Low Voltage Connections - Single Thermostat & Separate Transformers for Furnace and Condensing Unit

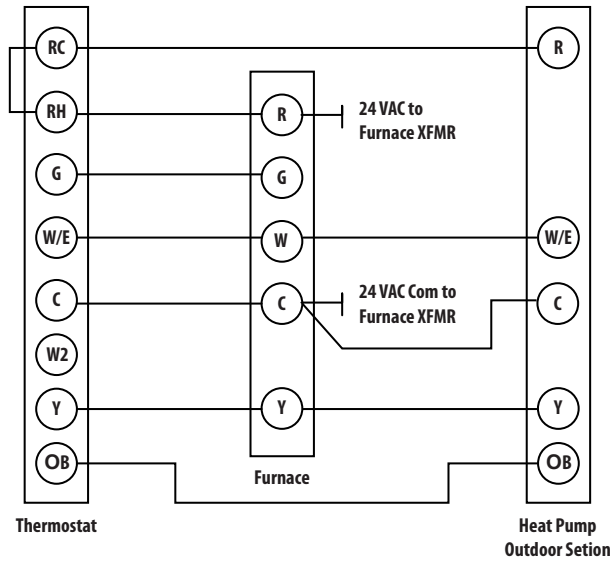


Figure 18: Low Voltage Connections - Single Thermostat and Single Transformer for Furnace and Heat Pump

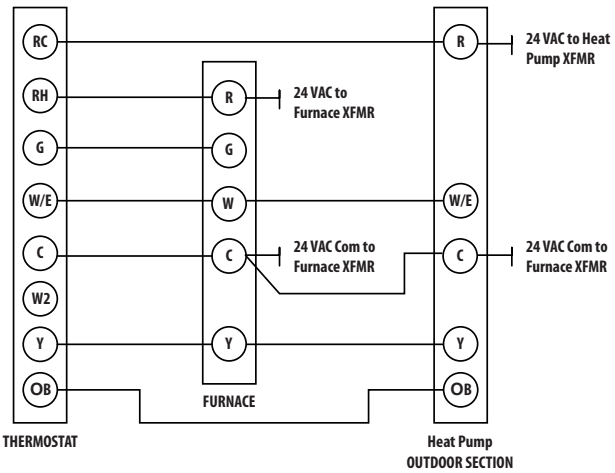


Figure 19: Low Voltage Connections - Single Thermostat and Separate Transformers for Furnace and Heat Pump

Typical Heating/Cooling Thermostat Wiring Connections

1. Remove the control box cover.
2. Insert the wires from the thermostat through the grommet in the left side of the casing next to the low voltage pigtails above the control box.
3. Strip ½" of the insulation from the end of each wire.
4. Connect the RED (24 VAC) wire from the thermostat "R" terminal to the RED furnace low voltage pigtail wire with a wire nut.
5. Connect the WHITE (heat) wire from the thermostat "W" terminal to the WHITE furnace low voltage pigtail wire with a wire nut.
6. Connect the GREEN (indoor fan) wire from the thermostat "G" terminal to the GREEN furnace low voltage pigtail wire with a wire nut.
7. Connect the YELLOW (cool) wire from the thermostat "Y" terminal with the YELLOW furnace low voltage pigtail wire and with the wire from the condensing unit "Y" terminal or low voltage pigtail with a wire nut.
8. Connect the BLUE (24 VAC common) wire from the thermostat "C" terminal with the BLACK furnace low voltage pigtail wire and with the 24 VAC common wire from the condensing unit "C" terminal or low voltage pigtail with a wire nut.
9. Reinstall the control box cover.

Typical Heat Pump Thermostat Wiring Connections

1. Remove the control box cover.
2. Insert the wires from the thermostat through the grommet in the left side of the casing next to the low voltage wire pigtails above the control box.
3. Strip ½" of the insulation from the end of each wire.
4. Connect the RED (24 VAC) wire from the thermostat "R" terminal to the RED furnace low voltage pigtail wire with a wire nut.

   NOTE: If the outdoor unit and furnace each have a transformer, remove the jumper wire between the thermostat "RC" and "RH" terminals and connect the wire that goes to the outdoor unit "R" terminal or pigtail to the "RC" terminal on the thermostat and connect the wire that goes to the "R" furnace low voltage pigtail to the "RH" terminal on the thermostat. If the thermostat does not have separate "RH" and "RC" terminals, a new thermostat with separate "RH" and "RC" terminals must be purchased and installed.
5. Connect the WHITE (heat) wire from the thermostat "W" terminal to the WHITE furnace low voltage pigtail wire and the WHITE wire from the outdoor unit "E" terminal or pigtail with a wire nut. Refer to the outdoor unit installation instructions for additional information.
6. Connect the GREEN (indoor fan) wire from the thermostat "G" terminal to the GREEN furnace low voltage pigtail wire with a wire nut.
7. Connect the YELLOW wire from the thermostat "Y" terminal to the YELLOW furnace low voltage pigtail and the wire that is connected to the outdoor unit "Y" terminal or pigtail with a wire nut.
8. Connect the BLUE (24 VAC common) wire from the thermostat "C" terminal with the BLACK furnace low voltage pigtail wire and with the 24 VAC common wire from the outdoor unit "C" terminal or pigtail with a wire nut.

9. Connect the ORANGE (reversing valve solenoid) wire from the thermostat "O" or "B" terminal with the wire from the outdoor unit "O" or "B" terminal or pigtail with a wire nut. Refer to the outdoor unit instructions on which thermostat terminal, "O" or "B" to use. Refer to the thermostat instructions on how to configure the thermostat for specific outdoor unit brands and control system operating characteristics.

Typical Heating/Cooling Connections					
Wire Color	Description	Letter Code	Furnace Pigtail Wire Connection	Thermostat Connection	Condensing Unit Connections
RED	24 VAC	R	Red	R	N/A
WHITE	Heat	W	White	W or W1	N/A
GREEN	Indoor Fan	G	Green	G	N/A
YELLOW	Cooling	Y	Yellow	Y	Y
BLUE	24 VAC Common	C	Black	C	C

Typical Heat Pump Connections					
Wire Color	Description	Letter Code	Furnace Pigtail Wire Connection	Thermostat Connection	Heat Pump Outdoor Unit Connections
RED	24 VAC	R	Red	R	N/A
WHITE	Heat	W	White	W or W1	See Outdoor Unit Instructions
GREEN	Indoor Fan	G	Green	G	N/A
YELLOW	Cooling	Y	Yellow	Y	Y
BLUE	24 VAC Common	C	Black	C	C
ORANGE	Heat Pump Reversing Valve Solenoid	O or B	N/A	O or B	O or B

Table 10: Recommended Thermostat Wire Colors and Connections

NOTE: 24 VAC common wire must be used for digital thermostats.

SECTION 6: FURNACE COMBUSTION AIR & VENT SYSTEM

For Category I furnaces, vent installations shall be in accordance with Parts 7 and 11 of the National Fuel Gas Code, ANSI Z223.1/ NFPA 54, Natural Gas and Propane Installation Codes, the local building codes, furnace and vent manufacturer's instructions. Vent connectors serving Category I furnaces must not be connected into any portion of mechanical draft systems operating under positive pressure.

IMPORTANT: Ambient combustion air is air taken from the space surrounding the furnace and from areas or rooms adjacent to the space surrounding the furnace. Ventilated combustion air is air that is taken from an attic space or a crawl space. Ambient and ventilated combustion air is not allowed for Manufactured Home or Modular Home installations which require 100% outside combustion air (Category I - Direct Vent).

ROOF JACK VENT SAFETY

This Category I direct-vent furnace is designed for Manufactured Home and Modular Home applications. It may be installed without modification in a garage, equipment room, alcove, or any other indoor location where all required clearance to combustibles and other restrictions are met.
The direct venting system must be installed in accordance with Section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code Z223.1/NFPA 54 (latest edition), or applicable provisions of the local building code and these instructions.
The furnace must be connected to the manufacturer recommended roof jack direct-vent system and must never be connected to a factory-built or masonry chimney.
The maximum vent temperature for a Category I furnace is 450°F. This temperature must be used to select the appropriate venting clearances.

IMPORTANT: The "Roof Jack Vent System" must be installed as specified in these instructions for Manufactured and Modular Homes. This furnace must not be common vented with another gas appliance and must not be connected to a chimney flue serving a separate appliance designed to burn solid fuel. Approved Manufactured (Mobile) Homes and Modular Homes must be vented with an approved roof jack that consists of a 4" diameter vent pipe and a 7" diameter outer pipe only. Do not use a roof jack provided by any other manufacturer.

VENTING

The installer must change the roof jack vent system when installing a new furnace or replacing an existing furnace.

Category I roof jack direct-venting consists of vertically venting one appliance to a roof jack vent using two single-wall metal pipes and a crown assembly. The roof jack type vent system extends in a general vertical direction and does not contain offsets. A vent system having any offset is not permitted.
The vent system consists of a 4" diameter inner pipe attached to the 4" flue collar on the top of the heat exchanger just below the top of the furnace and an outer 7" diameter pipe. The combustion air is drawn in between the inner 4" pipe and the outer 7" pipe. The 7" pipe is attached to a flange in the top cover and must be secured to the top cover with a minimum of 2 mechanical fasteners such as screws or rivets.
The furnace must not be connected to another manufacturer's factory built roof jack vent system. If the furnace is connected to another manufacturer's roof jack vent system, the furnace will not vent properly, especially if the existing roof jack consists of larger diameter pipes.

⚠ WARNING

Venting into another manufacturer's roof jack vent system equipped with larger diameter vent and combustion air pipes will cause the products of combustion to be drawn into the combustion air. This will reduce the amount of oxygen to the burner flame and will cause incomplete combustion and the production of carbon monoxide and can cause the flame to extinguish.

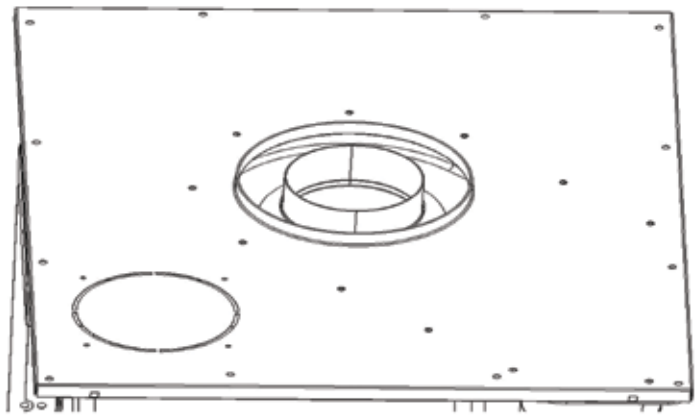


Figure 20: Roof Jack Mounting Collars – Top of Furnace -Venting Into Existing Roof Jack

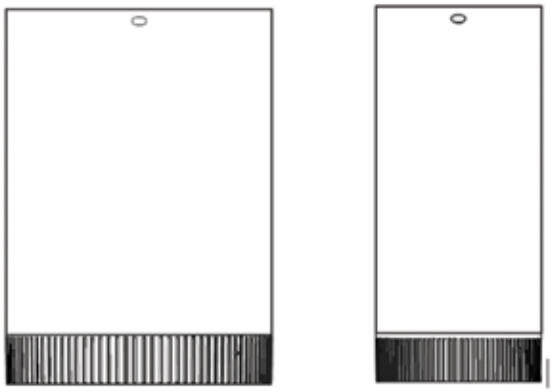


Figure 21: Roof Jack Indoor Extension Pipes

4. The outdoor extension shown in Figure 22 has a 4" diameter pipe and is fastened to the inside of the 7 inch diameter pipe. The extension is used when the roof jack crown assembly must be extended because of the snow line, the roof peak, or other obstructions. The extension is available in a 16" length. Refer to accessories parts list in the Service and Maintenance Manual.

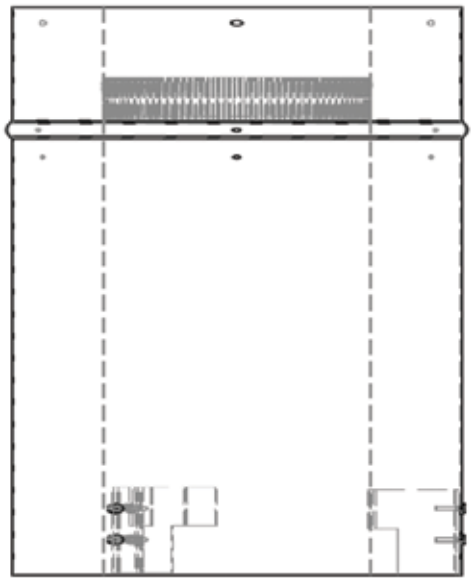


Figure 22: Roof Jack Outdoor Extension Pipes

ROOF JACK EXTENSIONS AND CROWN ASSEMBLY

1. The roof jack extensions and the crown assembly must be installed in accordance with nationally recognized building codes or standards and /or these instructions.
2. The roof jack has optional indoor and outdoor extensions. The outdoor extensions must be used to extend the crown assembly above the snow line.
3. The indoor extensions shown in Figure 21 are 7" in diameter (left pipe) and 4" in diameter (right pipe). The 4" diameter pipe is placed inside the 7" diameter pipe. The extensions are used when the roof jack is too short to extend to the furnace. The extensions are available in a 10" and 31" lengths. Refer to accessories parts list in the Service and Maintenance Manual.
5. The roof jack crown assembly must extend at least 3 feet (91.4 cm) above the highest point where it passes through a roof of a building and at least 2 feet higher than any portion of the building with a horizontal distance of 10 feet (304.8 cm).
6. The roof jack must extend at least 5 ft (152.4 cm) above the highest equipment draft hood or flue collar.

PREVENTING BLOCKAGE BY SNOW

If furnace products of combustion enter the building from outdoors through gaps in the wall adjacent to furnace vent terminal because of wind and/or snow blockage of terminal, building occupants may be exposed to carbon monoxide which can cause severe personal injury or death. Permanently seal all gaps in the wall adjacent to the vent terminal.

The Annual Mean Maximum Daily Snowfall is reported by the National Oceanic and Atmospheric Administration (NOAA) at https://ncdc.noaa.gov/maps/ncei/rsi

Permanently seal any openings where the vent terminal penetrates the roof. Instructions for proper sealing can be found in **Installing the Roof Jack Vent Assembly – Step 7.**

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow all furnace installation instructions could result in severe personal injury or death due to carbon monoxide poisoning if the products of combustion are allowed to enter the building through openings and gaps in the wall adjacent to the vent terminal.

Install the furnace vent terminal at a height at least 12 inches (30.5 cm) above the Annual Mean Maximum Daily Snowfall or Average Maximum Snow Depth as described on the next page of these instructions.

THE ROOF JACK VENT ON HI-PITCH ROOF

To install the roof jack RJS 3/12 Series on roofs which have a slope between 4.5/12 and 6/12, the roof saddle must be installed first. The combined assembly of the RJS roof jack and the roof saddle conform to the pitch of the roof. If the roof pitch is greater than 6/12, the installer will be responsible for providing a suitable field fabricated roof saddle (See Figure 23).

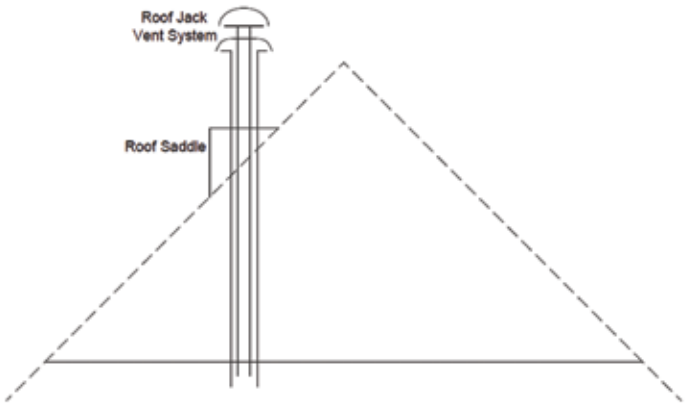


Figure 23: Roof Jack Outdoor Extension Pipes

INSTALLING THE ROOF JACK VENT ASSEMBLY

The final assembly procedure for the vent piping is listed below.

1. Proper installation of the roof jack requires that openings in the roof and ceiling be on the same vertical center line as the furnace flue collar.

2. Once the hole has been cut into the roof, insert the roof jack body into the opening in the roof.
3. Align the roof jack inner and outer pipes so the pipes line up with the inner and outer collars on the top of the furnace.
4. Pull the 4" diameter inner roof jack pipe downward seating it firmly over the furnace collar. Make sure the inner roof jack pipe lines up with the furnace collar and the pipe is not at an angle when connected to the furnace collar. If the roof jack pipe is at an angle, leaks can occur causing the furnace to malfunction.
5. Pull the 7" diameter outer roof jack pipe downward seating it firmly over the furnace collar. Make sure the outer roof jack pipe lines up with the furnace collar and the pipe is not at an angle when connected to the furnace collar. Line up the screw hole in the outer pipe with the screw hole in the furnace collar. If the roof jack pipe is at an angle, leaks can occur causing the furnace to malfunction.
6. Install the optional ceiling trim ring. Refer to the accessory part list in the Service and Maintenance Manual for the part number.
7. Caulk or use roofing tar under the flashing to seal the roof jack flashing to the roof. Use roofing nails or screws to secure the flashing to the roof. Space the nails or screws apart about by approximately 2".
8. Install roof jack crown assembly and line up the pre-punched holes in the crown assembly and the roof jack body. Secure the crown assembly by inserting the screws into the pre-punched holes and tightening the screws.

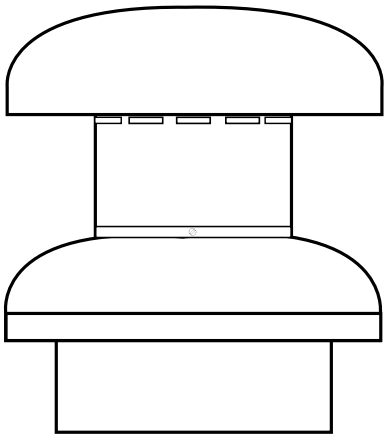


Figure 24: Roof Jack Crown Assembly

⚠ WARNING

When a Category I furnace is removed or replaced, the original roof jack venting system may no longer be correctly sized to properly vent the attached appliances.

An improperly sized roof jack vent system can cause CARBON MONOXIDE to spill into the living space causing personal injury or death to the occupants.

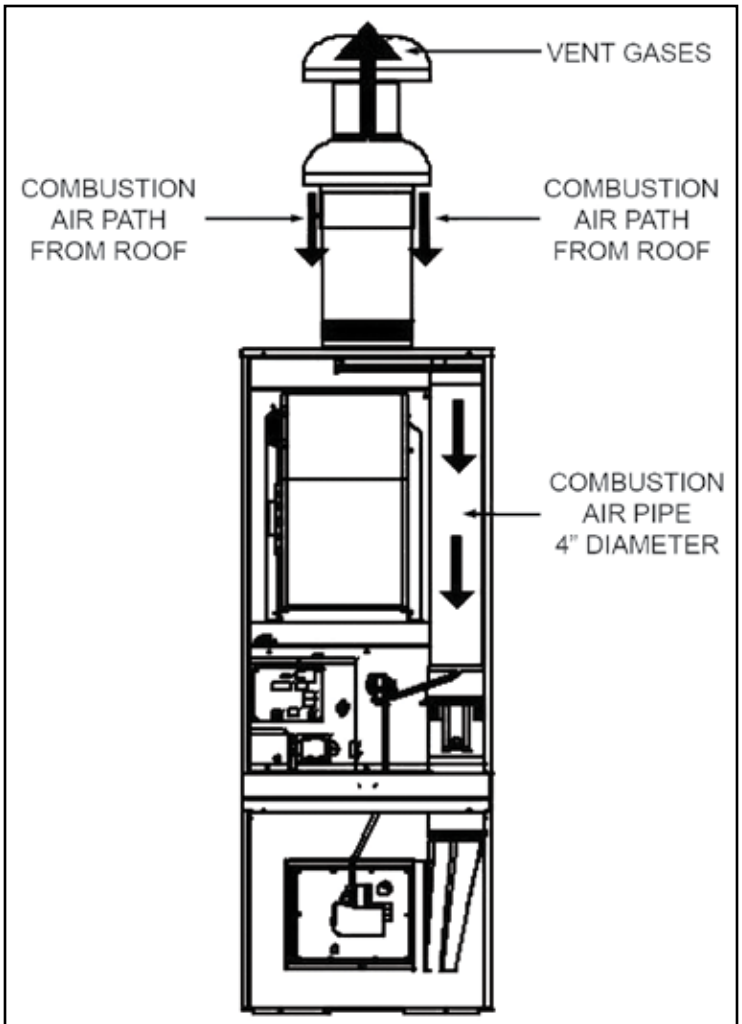


Figure 25: Combustion Air Path Through Furnace Casing

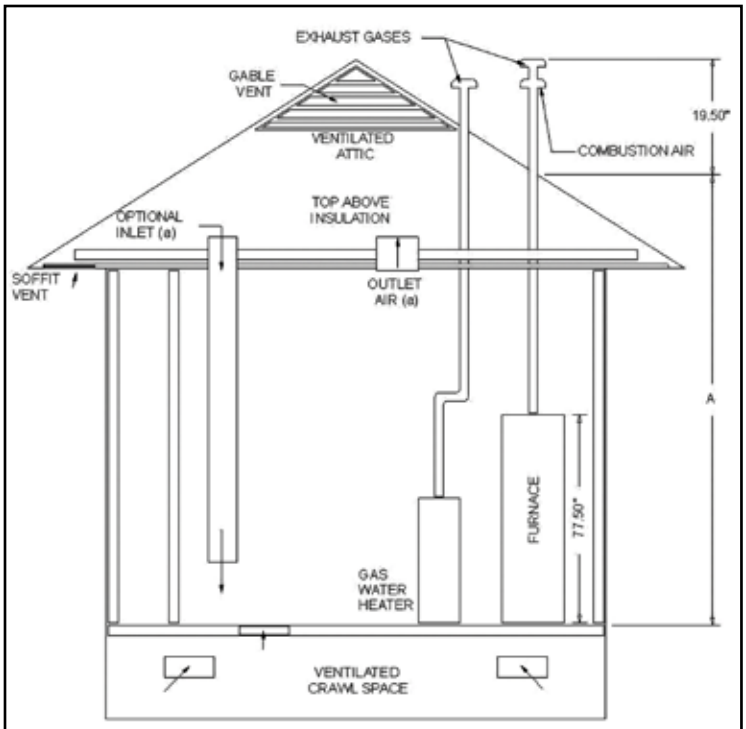


Figure 26: Flue Vent and Outside Combustion Air for Furnace Casing

VENT CLEARANCES

IMPORTANT: The vent must be installed with the following minimum clearances as shown in Figure 27 and Table 11 and must comply with local codes and requirements.

NOTE: The roof jack venting system is considered a special venting system.

IMPORTANT: Consideration must be given for degradation of building materials by flue gases. Sidewall termination is not permitted with a roof jack vent system. Responsibility for the provision of proper adequate venting and air supply for application shall rest with the installer. The vent must extend high enough above building or a neighboring obstruction so that wind from any direction will not create a positive pressure in the vicinity of the vent.

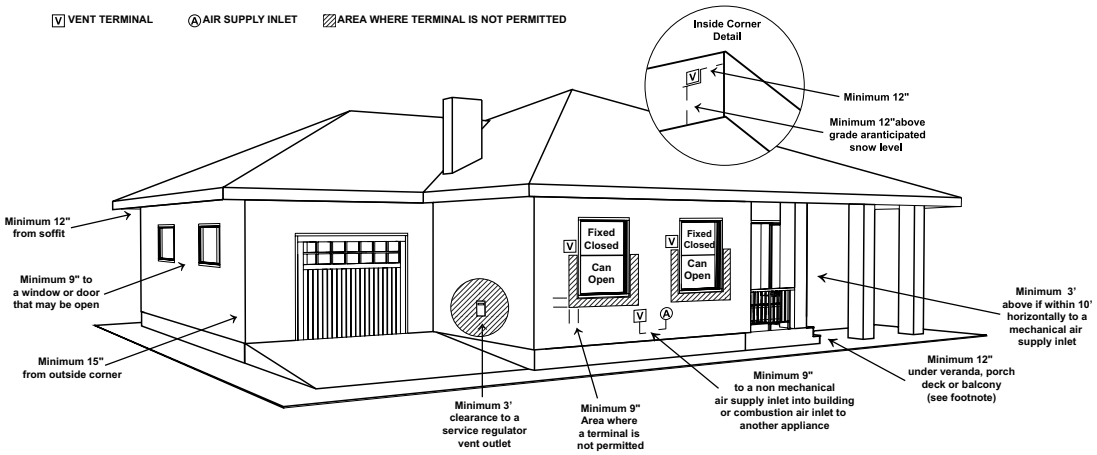


Figure 27: Home Layout and Vent Clearances

		Canadian Installations[1]	US Installation[2]
A	Clearance above grade,veranda,porch, deck, or balcony	12 inches (30 cm)	12 inches (30 cm)
B	Clearance to window or door that may be opened	"12 inches (30 cm) for models <100,000 BTUH (30 kW), 36 inches (91 cm) for models > 100,000 BTUH (30 kW) "	4 Feet (1.22 m)
C	Clearance to permanently closed window	12 inches (30 cm)	12 inches (30 cm)
D	"Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (61 cm) from the center line of the terminal"	4 Feet (1.22 m)	4 Feet (1.22 m)
E	Clearance to unventilated soffit	12 Inches	12 Inches
F	Clearance to outside corner	12 Inches	12 Inches
G	Clearance to inside corner 6 feet	6 feet (1.83 m)	6 feet (1.83 m)
H	"Clearance to each side of center line meter/regulator assembly"	"3 feet (91 cm) within a height 15 feet (4.5 m) above the meter/regulator assembly"	"3 feet (91 cm) within a height 15 feet (4.5 m) above the meter/regulator assembly"
I	Clearance to service regulator vent outlet	3 feet (91 cm)	3 feet (91 cm)
J	"Clearance to non mechanical air supply inlet to building or the combustion air inlet to any other appliance"	"12 inches (30 cm) for models <100,000 BTUH (30 kW), 35 inches (91 cm) for models >100,000 BTUH (30 kW)"	4 Feet (1.22 m)
K	Clearance to a mechanical supply inlet	6 feet (1.83 m)	3 feet (91 cm) above if within 10 feet (3 cm) horizontally
L	"Cleance above paved siewalk or paved driveway located on public property "	7 feet (2.13 m)	7 feet (2.13 m)
M	Clearance under veranda, porch, deck, or balcony	12 inches (30.4 cm)	12 inches (30.4 cm)
	Vent Termination from any Building Surface	12 inches (30.4 cm)	12 inches (30.4 cm)
	Above anticipated snow depth	12 inches (30.4 cm)	12 inches (30.4 cm)

Table 11: Vent Clearances

1. In accordance with the current ANSI Z223.1 / NFPA 54, National Gas Code.
2. Any fresh air or make up inlet for dryer or furnace area is considered to be forced air inlet.
3. Avoid areas where dripping condensate may cause problems, such as above planters, patios, or adjacent to windows or where steam may cause fogging.
4. A terminus of a vent shall be either:
   a. Fitted with cap accordance with the vent manufacturer's installation instructions
   b. Or in accordance with the installation instructions for a special venting system.

† A vent shall not terminate directly above a side walk or paved driveway that is located between two single family dwellings and serves both dwellings.

‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor. For clearance not specified in ANSI Z223.1 / NFPA 54

** Clearance in accordance with local installation codes, the requirements of the gas supplier and the manufacturer's Installation Manual.

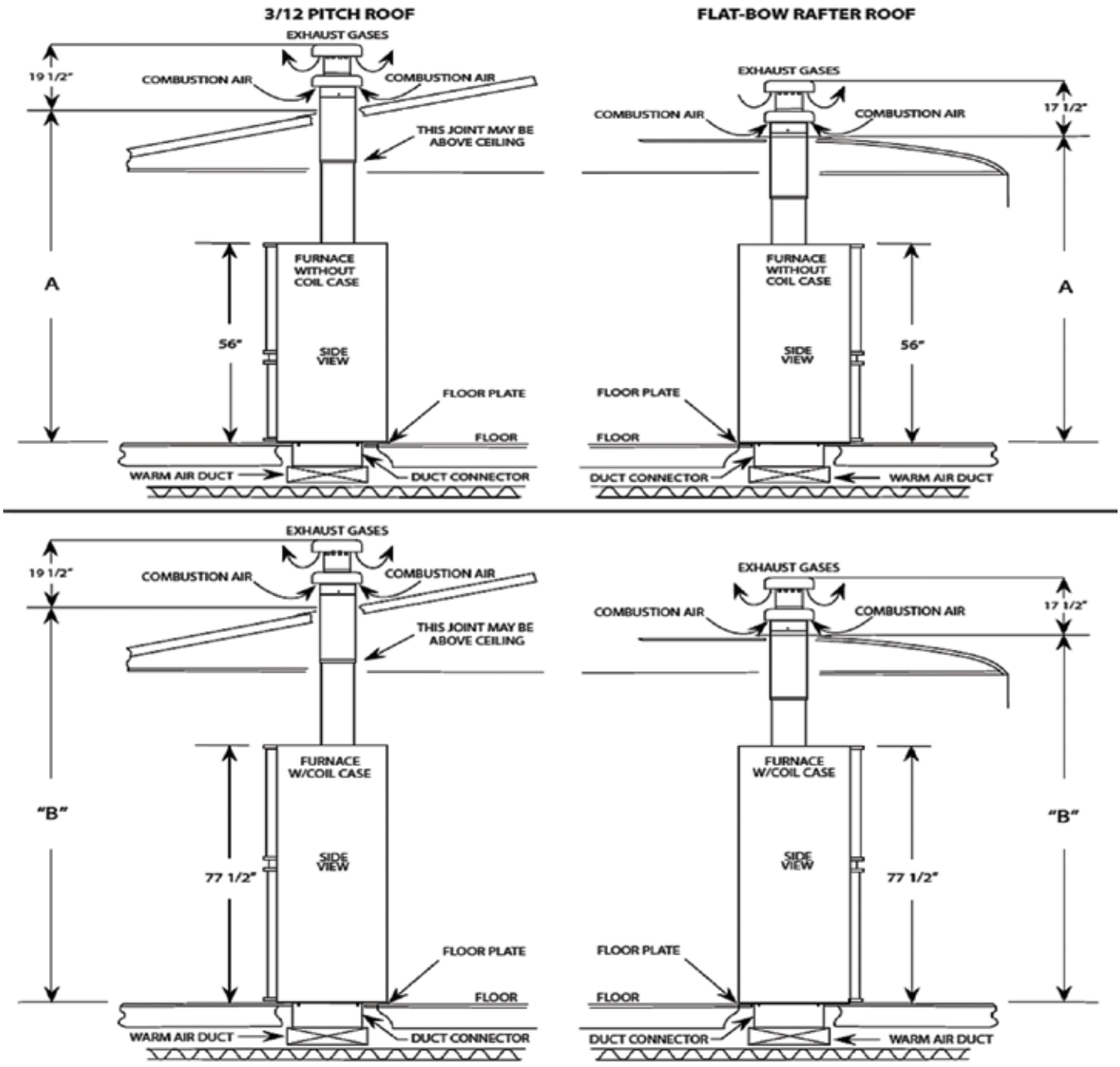


Figure 28: Typical Roof Jack Installation

The Sealed Combustion Vent System Consists of: Roof Jack Body and Roof Jack Crown			Furnace Series G18D – A, 56" H	Furnace Series G18D – C, 77 ½" H
Part # Roof Jack Body	**Telescoping Range**	**For: Flat or Sloped Roof**	**"A" Adjustable Height**	**"C" Adjustable Height**
90-RJF1729-AL	17" – 29"	FLAT	73" – 85"	94 ½" – 106 ½"
90-RJF2551-AL	25" – 51"	FLAT	81" – 107"	102 ½" – 128 ½"
90-RJS1729-AL	17" – 29"	3/12	73" – 85"	94 ½" – 106 ½"
90-RJS2551-AL	25" – 51"	3/12	81" – 107"	102 ½" – 128 ½"
90-RJS3868-AL	38" – 68"	3/12	94" – 124"	115 ½" – 145 ½"
90-RJS6399-AL	63" – 99"	3/12	119" – 155"	140 ½" – 176 ½"
Part # Roof Jack Crown	MUST USE WITH ROOF JACK BODY			
90-RJCRWN-AL				

Table 12: Roof Jack Specifications

SECTION 7: FURNACE STARTUP, DIAGNOSTICS, & SEQUENCE OF OPERATION

⚠ WARNING

To avoid personal injury or property damage, make sure that the motor leads cannot come into contact with non-insulated metal components of the unit.

⚠ CAUTION

Check the gas inlet pressure at the furnace upstream of the combination gas control. The inlet pressure should be 6-7" W.C. (1.494-1.743 kPa) for natural gas or 10-12" W.C. (2.49-2.988 kPa) for propane (LP). If inlet pressure is too high, install an additional pressure regulator upstream of the combination gas control.

Tools Required to Perform Furnace Startup Procedure

1. A thermometer or portable digital thermometer to measure the supply and return air temperatures.
2. A "U" tube monometer or portable pressure gauge that measures 0"-15" W.C. (0-3.735 kPa) to measure the gas inlet pressure and the manifold pressure.
3. A 3/32" (2.4 mm) Allen wrench to open and close the gas valve pressure port plugs.
4. Two (2) pieces of 1/8" (3.175 mm) ID flexible tubing, 12" (304.8 mm) long.

Startup Sequence

1. Turn the gas supply line valve to the "ON" position.
2. Set the thermostat above the room temperature to obtain a call for heat.
3. System startup will occur as follows:
   a. The induced draft blower will start and come up to speed.
   b. This will cause the negative air pressure in the induced draft blower housing to close the pressure switch contacts when the pressure reaches - 0.55" W.C. (0.137 kPa) +/- .05" W.C. (0.01245 kPa).
   c. Once the pressure switch is closed, the hot surface ignitor is energized. There is a 17 second warm up period to allow the ignitor time to reach its operating temperature.
   d. After the 17 second ignitor warm up period, the gas valve opens and allows gas to flow into the gas manifold and burner orifice. Ignition then occurs and the flame sensor senses the flame. 30 seconds after flame is sensed, the circulating blower motor is energized by the control board speed tap terminal labeled "HEAT".
   e. If the flame sensor does not sense a flame within a few seconds, the gas valve closes and the blower will not be energized. The ignition sequence is repeated 2 additional times before the control board will enter the lock-out mode. The furnace will attempt the ignition sequence after one hour or after electrical power is cycled to the furnace.
   f. Refer to the **Normal Heating Mode Sequence** on page 30 of these instructions for additional details.

CHECKING AND ADJUSTING THE GAS INLET PRESSURE

1. Follow the procedure for "Shutting The Furnace Off" located in Section 3: Startup and Shutdown Instructions in the User Information Manual.
2. Turn the switch on the gas valve to the "OFF" position. Refer to Figure 29 for switch location.
3. Turn off the gas supply at the ball valve or gas cock upstream of the gas valve.
4. Locate the furnace gas control.
5. Find the gas valve pressure ports labeled "IN P" which is the inlet or line pressure tap (See Figure 29) and remove the pressure port cap.
6. Use a 3/32" (2.4 mm) Allen wrench to loosen the "IN P" port set screw by turning it counter clockwise one (1) turn only. **DO NOT REMOVE THE SET SCREW.**
7. Connect the 1/8" (3.175 mm) ID flexible tubing to the positive side of the "U" tube monometer or pressure gauge and the other end of the tubing to the port marked "IN P" on the gas valve as shown in Figure 30.
8. Turn the ON/OFF switch on the gas control to the "ON" position.
9. Follow the "Starting the Furnace" instructions located in **Section 3: Startup and Shutdown Instructions in the User Information Manual** to properly start the furnace.
10. Check the line pressure. If the pressure is at the pressure specified in Table 13, go to step 10. If the pressure is not at the correct pressure, adjust the pressure at the regulator upstream of the gas valve while the furnace is operating until the correct pressure is measured at the gas valve pressure port.
11. Follow the procedure to "Shutting the Furnace Off" instructions located in Section 3: Startup and Shutdown Instructions in the User Information Manual.
12. Turn the switch on the gas valve to the "OFF" position.
13. Turn off the gas supply at the ball valve or gas cock upstream of the gas valve.
14. Remove the "U" tube monometer or pressure gauge from "IN P" and tighten the set screw. Replace the pressure port cap.
15. After the correct inlet pressure has been confirmed, follow the instructions on the next page for checking the manifold pressure.

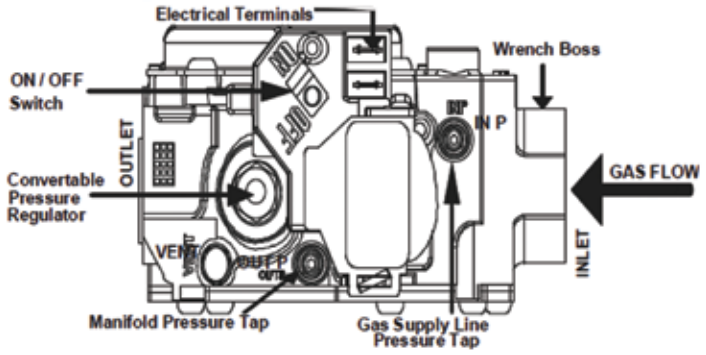


Figure 29: White Rodgers Gas Valve

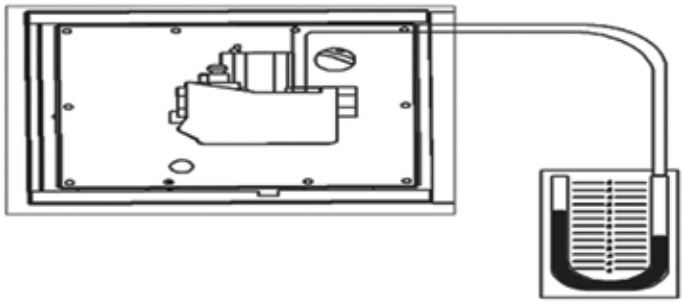


Figure 30: Measuring Inlet (Supply) Gas Pressure (IN P)

INLET GAS PRESSURE RANGE		
	NATURAL GAS	PROPANE (LP)
MINUMUM	4.5" W.C. (1.12 kPa)	11.0" W.C. (2.74 kPa)
MAXIMUM	10.5" W.C. (2.21 kPa)	13.0" W.C. (3.24 kPa)

Table 13: Inlet (Supply) Gas Line Pressure Range

Checking the Manifold Pressure

1. Find the gas valve pressure ports labeled "OUT P" (See Figure 18). OUT P is the manifold pressure tap.
2. Use a 3/32" (2.4 mm) Allen wrench to loosen the set screw by turning it counter clockwise one (1) turn only on the "IN P" port. **DO NOT REMOVE THE SET SCREW.**
3. Connect the 1/8" (3.175 mm) ID flexible tubing to the positive side of the "U" tube monometer or pressure gauge and the other end of the tubing to the port marked "IN P" on the gas valve as shown in Figure 20.
4. Follow the **"Starting the Furnace"** instructions located in **Section 3: Startup and Shutdown Instructions in the User Information Manual** to properly start the furnace.
5. With the furnace operating, read the manifold pressure. The pressure should be between 3.3" W.C. and 3.6" W.C. for natural gas and 9.8" W.C. and 10.2" W.C. for propane (LP). Check the input using the calculations in Table 3 or Table 4. page. If the input is not within 8% of the input listed on the furnace data plate, replace the gas valve.
6. Turn the switch on the gas valve to the "OFF" position.
7. Remove the pressure hose from the pressure port and tighten the set screw.
8. Follow the **"Starting the Furnace"** instructions located in **Section 3: Startup and Shutdown Instructions in the User Information Manual** to properly start the furnace.
9. Proceed to Temperature Rise Check and Adjustment.

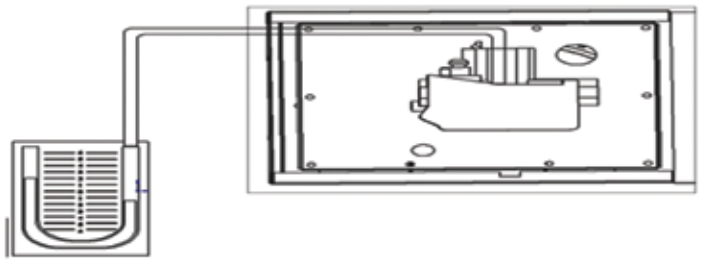


Figure 31: Measuring Outlet (Manifold) Gas Pressure (OUT P)

NOMINAL MANIFOLD PRESSURE	
NATURAL GAS	3.5" W.C. (0.87 kPa)
PROPANE (LP) GAS	10.0" W.C. (2.49 kPa)

Table 14: Nominal Manifold Gas Pressure

Checking the Furnace Input Rate

The gas pressure regulator in the combination gas control is adjusted at the factory for average gas conditions. It is important that gas be supplied to the furnace in accordance with the input rating listed on the furnace data plate. Actual input should be checked and necessary adjustments made after the furnace is installed. Over-firing, a result of excessive gas input, reduces the life of the furnace and increases maintenance. Under no circumstances should the input exceed that shown on the data plate.

Input can be determined by the meter-timing method as long as all other gas burning appliances connected to the meter are off during the test. If this is not possible, use the pressure method.

"IMPORTANT": Inlet pressure and manifold pressure must be checked with the furnace operating when making final adjustments.

Meter Timing Method

1. Shut off all other gas-burning appliances served by the gas meter, including those with pilot lights.
2. Start the furnace and determine the number of seconds it takes to consume 2 cu. ft. or 0.1 cu. meter of natural gas or 1 cu. ft. or 0.05 cu. meter of propane gas. Refer to Table 3 or Table 4 for the procedure for calculating heating input.

The heating value of gas may be obtained from the local utility or gas dealer. If the utility or gas dealer does not know the heating value of the gas you may use the values shown below:

Use 1030 BTU/cu. ft. (38.4 Mj/m^3) for natural gas
Use 2500 BTU/cu. ft. (93.15 Mj/m^3) for propane gas

BTU/cu. ft. or Mj/m^3 = heating value of gas

Input Calculations For Cubic Foot Gas Meters

Formula: BTU/hr = BTU/ft^3 x number of cu. ft. of gas x 3600 ÷ time to consume the number of cu. ft. of gas

Example: Calculating the input for a furnace operating on **natural gas** is as follows:
1030 x 2 x 3600 ÷ 164 = 45,220 BTU/hr

Example: Calculating the input for a furnace operating on **propane (LP)** is as follows:
2500 x 1 x 3600 ÷ 200 = 45,000 BTU/hr

NOTE: Do not use Mj/m^3 number in the above calculations. If the heating value is in Mj/m^3, convert to English units by dividing Mj/m^3 by 0.0372816 to obtain the BTU/ft^3.

Table 15: Input Calculations For Cubic Foot Gas Meters

Input Calculations For Cubic Foot Gas Meters

Formula: Mj/hr = Mj/m^3 x number of m^3 of gas x 3600 ÷ time to consume the number of m^3 of gas

Example: Calculating the input for a furnace operating on **natural gas** is as follows:
38.4 X 0.1 x 3600 ÷ 291 = 47.51 Mj/hr

Then multiply Mj/hr by 0.2778 to get kW as follows:
47.51 x 0.2778 = 13.20 kW/hr

If BTU/hr is desired, multiply kW by 3412 to get BTU/hr as follows:
13.20 x 3412 = 45,038 BTU/hr

Example: Calculating the input for a furnace operating on **propane gas** is as follows:
93.15 X 0.05 x 3600 ÷ 353 = 47.50 Mj/hr

Then multiply Mj/hr by 0.2778 to get kW as follows:
47.50 x 0.2778 = 13.20 kW

If BTU/hr is desired, multiply kW by 3412 to get BTU/hr as follows:
13.20 x 3412 = 45,038 BTU/hr

Table 16: Input Calculations For Cubic Meter Gas Meters

Temperature Rise Measurement and Adjustment

The temperature rise is the supply air temperature minus the return air temperature. The temperature rise must be within the range specified on the furnace data plate. To determine the temperature rise, the furnace must operate continuously for approximately 20 minutes. Measure the temperature of the return air (air entering the furnace) and the supply air (air leaving the furnace). The supply air temperature can be taken either at the plenum or at the closest register to the furnace. The return air temperature can be taken at the furnace return air louvers or in the return air duct. Do not try to read the temperature directly above the heat exchangers because the radiant heat from the heat exchangers will result in incorrect reading. The manufacturer recommends taking the supply air temperature approximately 6 ft (1.83 m) from the furnace. The temperature rise can be changed by increasing the blower speed to reduce the temperature rise or reducing the blower speed to increase the temperature rise.

⚠ DANGER

The temperature rise or the temperature difference between the return air and the supply air temperature must be within the range specified on the furnace data plate.

The supply air temperature must never exceed the Maximum Supply Air Temperature on the furnace data plate. The furnace must never be allowed to operate above the Maximum Supply Air Temperature.
Operating the furnace above the Maximum Supply Air Temperature will cause rapid premature heat exchanger failure that can lead to holes being burnt through the heat exchanger causing high levels of carbon monoxide to enter the living space and/or a fire. This condition can result in carbon monoxide poisoning, personal injury, property damage, and death.

⚠ DANGER

The limit switch must never be changed to a different temperature setting. The limit switch is designed to protect the heat exchanger from exceeding the maximum allowable outlet temperature and to prevent nuisance tripping of the limit. Changing the temperature of the limit switch can cause either premature heat exchanger failure which can cause personal injury, property damage, a fire, and death.

Integrated Control Board Diagnostic Codes

1 Flash - System Lockout. Ignition Retries Exceeded

Failure to sense flame is often caused by carbon deposits on the flame sensor, a disconnected or shorted flame sensor lead, or a poorly grounded furnace. Carbon deposits can be cleaned with emery cloth or steel wool. Verify the sensor is not contacting the burner and is located in a good position to sense flame.
The ignitor must be positioned to light the gas when the valve opens. If the ignitor has been replaced, verify the position has not changed.
Check sensor lead for shorting and verify the furnace is grounded properly. Verify the gas supply to gas valve, the gas valve is in the "ON" position and is furnace lighting properly. Verify flame engulfs the flame sensor during ignition attempts and gas pressures are correct.

2 Flashes - Pressure Switch Stuck Closed
Check the pressure switch function and verify the combustion air motor is off.

3 Flashes - Pressure Switch Stuck Open
Check pressure switch function and tubing. Verify the combustion air motor is running and pulling sufficient vacuum to engage pressure switch.

4 Flashes - Open Limit Switch
Verify continuity through the main limit switch located in the control box and the manual reset limit switch located next to the blower.

5 Flashes - Flame Sensed More Than 4.24 seconds After Gas Valve is De-Energized.

Verify the gas valve is opening and shutting down properly. Flame in burner assembly should extinguish promptly at the end of the cycle. Check orifice and gas pressure.

6 Flashes – Flame Rollout Switch Open
The furnace does not have a rollout switch. The 12 pin plug has a purple jumper wire in place of the switch. Check the jumper wire to be sure it is securely inserted into the plug.

7 Flashes - Low Flame Sense Signal
Low flame sense current is often caused by carbon deposits on the flame sensor, a poorly grounded furnace or a mis-aligned flame sense probe. Carbon deposits can be cleaned with emery cloth or steel wool. Check furnace and control board grounding. Verify the flame sensor is located in the flame. The minimum current for proper operation is 0.5 DC micro amps.

8 Flashes - Ignitor Relay Fault
The ignitor relay on the control board has failed. Replace the control board.

9 Flashes - Twinning Fault
If twinning is used, verify field installed wiring is connected correctly. Verify both control boards are the same model.

10 Flashes - Open Fuse
Verify the 3 amp fuse on the control board has opened. Verify there are no shorted circuits and replace the fuse.

11 Flashes - Ignitor Open (External to the Control)
Verify the ignitor is operating correctly and has not failed by checking to see if it glows during the ignition cycle. If it does not glow during the ignition cycle, replace the ignitor.

12 Flashes - Combustion Air Blower Relay Error
The relay built into the control board has failed. Replace the control board.

Rapid Flash - Reverse Polarity
Reverse the incoming power wires connected to the control board "L1" and "Neutral" terminals.

Continuous On - Normal Operation - No Fault

Off - Control Failure / No Power / Internal Fault / IEQ Loss
Verify there is 115 VAC across the control board "L1" and "Neutral" terminals. Replace control if power is at the control and the LED is off.

Fault Code Retrieval: The control will flash the last 5 fault codes that occurred when the push button is pressed to give the service tech more troubleshooting capability. The last fault code is flashed first.

Flame Sense Current
Normal flame sense current is approximately 2.8 micro amps DC. Minimum flame sense current threshold is 0.5 micro amps DC.

Cooling Mode Dip Switch Settings (SW1)											
Motor Speed Tap Number											
T1 Factory Setting			T2			T3			T4		
SW1 Dip Switch Number and Setting			SW1 Dip Switch Number and Setting			SW1 Dip Switch Number and Setting			SW1 Dip Switch Number and Setting		
1	2	3	1	2	3	1	2	3	1	2	3
Off	Off	Off	On	Off	Off	On	On	Off	Off	On	Off

Heating Mode Dip Switch Settings (SW2)							
Motor Speed Tap Number							
T1		T2 Factory Setting		T3		T4	
SW2 Dip Switch Number and Setting		SW2 Dip Switch Number and Setting		SW2 Dip Switch Number and Setting		SW2 Dip Switch Number and Setting	
1	2	1	2	1	2	1	2
Off	Off	On	Off	On	On	Off	On

Constant Circulation Dip Switch Settings (SW2)					
Motor Speed Tap Number					
T1 Factory Setting		T2		T4	
SW2 Dip Switch Number and Setting		SW2 Dip Switch Number and Setting		SW2 Dip Switch Number and Setting	
3	4	3	4	3	4
Off	Off	On	Off	Off	On

Heating Blower Off Delay Dip Switch Setting (SW1)	
150 Seconds (Factory Setting)	100 Seconds
SW1 Dip Switch Number and Setting	SW1 Dip Switch Number and Setting
4	4
On	Off

Table 17: Dip Switch Settings For Circulating Blower Motor Speeds and Heating Blower Off Delay

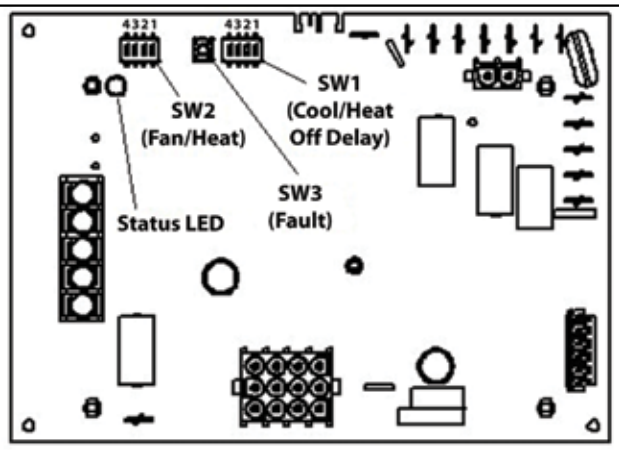


Figure 32: Integrated Furnace Control Board

Integrated Furnace Control Board Wiring Connections
W = Heat - 24 VAC from the thermostat "W" terminal
G = Continuous Fan - 24 VAC from the thermostat G terminal
C = 24 VAC common - Connects to the thermostat "C" terminal (required on digital thermostats).
R = 24 VAC supply - Connects to the thermostat "R" terminal.
Y = Cool - 24 VAC from the thermostat "Y" terminal
NEUTRAL = 115 VAC neutral terminal - Connects to the transformer primary, circulating blower motor, and incoming neutral wire.
XFMR = 115 VAC connection to the transformer primary
L1 = 115 VAC incoming power supply connection

Normal Heating Mode Sequence of Operation
1. Thermostat Call for Heat: The thermostat calls for heat by energizing the "W" terminal.
2. Pressure Switch Proving: The control board checks to see the pressure switch is open. If the pressure switch is closed when the call for heat occurs, the control will lockout and begin to flash a "2" fault code on the Status LED. If the pressure switch contacts are open, the control board energizes the induced draft blower and waits for the pressure switch contacts to close. If the pressure switch contacts do not close within 60 seconds, the control board will lockout, de-energize the induced draft blower, and will flash a "3" fault code on the Status LED.
3. Pre-Purge: If the pressure switch contacts close, the control board continues to energize the induced draft blower for a 25 second pre-purge period during which the pressure switch contacts must remain closed.
4. Igniter Warm-Up: The control board energizes the hot surface ignitor output for 25 seconds to allow the ignitor to warm up to operating temperature. The induced draft blower remains energized and the pressure switch must remain closed.
5. Ignition Activation Period: The control board energizes the main gas valve for 5 seconds. The induce draft blower and ignitor outputs remain energized.
6. Flame Proving Period and Blower On-Delay: The control board de-energizes the hot surface igniter. The gas valve and induced draft blower outputs remain energized. If flame is sensed at the flame sensor 2 seconds after the igniter is de-energized, the control board energizes the circulating blower motor on the heating speed after a 30 seconds on-delay. The gas valve and inducer outputs remain energized. If flame is not sensed, the control board de-energizes the gas valve and initiates an ignition retry as described in **Ignition Re-Try** below.
7. Steady-State Operation: The heating inputs are continuously monitored by the control board to ensure the limit switch and pressure switch contacts are closed, flame is present, and the thermostat call for heat remains.
8. Post-Purge: When the thermostat call for heat is satisfied, the control board de-energizes the gas valve. The induced draft blower output remains energized for a 15-second post-purge period.
9. Blower Off-Delay: The circulating blower motor is de-energized after the selected heating blower off-delay (100 or 150 seconds) is completed. The blower off-delay timing begins when the thermostat is satisfied.

Interrupted Thermostat Call
If the thermostat demand for heat is removed before the flame recognition period has ended, the control board will continue to energize the induced draft blower for the post-purge period and de-energize all outputs.

If the thermostat demand for heat is removed after the flame recognition period has ended (successful ignition), the induced draft blower will continue to operate through a post-purge period and the circulating blower motor will continue to operate on the heating speed for the heating blower off-delay off period.

Ignition Retry
If flame is not established on the first trial for ignition period, the gas valve is de-energized and the induced draft blower remains energized for an inter-purge period. The ignitor is then re-energized for an ignitor warm up period and the control board initiates another trial for ignition. This sequence repeats for up to 3 trials for ignition.

If flame is not established on the third trial for ignition (initial try + 2 re-tries), the control board de-energizes the gas valve, flashes a "1" fault code on the Status LED, and lockouts out heat operation for 1 hour and will then repeat the trial for ignition process.

Ignition Recycle
If flame is established for 10 seconds or longer and the flame is then lost, the gas valve is de-energized, the induced draft blower continues to operate, and an inter-purge period is initiated. The circulating blower motor will remain energized on the selected heating speed as long as there is a successful ignition and flame is sensed prior to the end of the heating blower off-delay. When the inter-purge period has ended, the ignitor is re-energized and the control board initiates another ignitor warm-up and trial for ignition. The control board will recycle up to 6 flame losses (5 re-cycles) within a single call for heat before entering the lockout mode.

Call for Continuous Fan
When the thermostat calls for continuous fan (G) without a call for heating or cooling, the control board energizes the circulating blower motor on the continuous speed.

If a call for heat (W) occurs during continuous fan operation, the circulating blower motor will be de-energized until after a successful ignition and blower on-delay at which point the circulating blower motor will be energized on the selected heating speed.

When the thermostat FAN switch is moved to the OFF position, the control board de-energizes the circulating blower motor.
Call for Cooling – Intermittent Blower
When the thermostat calls for cooling (Y), the circulating blower motor is energized on the selected cooling speed. When the call for cooling is satisfied, the control board de-energizes the circulating blower motor after the 45 second cooling blower off-delay.

Limit Switch Open
Any time the limit switch contacts open, the gas valve and ignitor will be de-energized, the circulating blower motor will continue to operate on the selected HEAT speed, the induced draft blower will run continuously, and the Status LED will flash a "4" fault code.

Limit Switch Re-Closes
If the limit switch contacts close after being open for less than 6 minutes, the induced draft blower will continue to operate through a post-purge delay and the circulating blower will continue to operate through the selected heating blower off-delay. The control board will then attempt an ignition cycle beginning with the pressure switch check.

Limit Switch Lockout
If the limit switch opens 3 times during the same call for heat and re-closes each time, the control will enter a 1 hour lockout period and will continuing to flash a "4" fault code on the Status LED during the lockout period.

Limit Switch Remains Open
If the limit switch opens and remains open for more than 6 minutes and there is no flame sensed, the control board will enter the fan failure lockout mode. The induced draft blower and circulating blower motor will be de-energized and the control board will enter the fan failure lockout mode until the thermostat is reset or power to the furnace is cycling off and back on.

Pressure Switch Opens
If the pressure switch opens after flame has been established, the control board de-energized the gas valve and initiates a normal post-purge and blower heating off-delay. When the blower heating off-delay is complete, the circulating blower motor is de-energized. If the pressure switch closes, the control board begins an ignition sequence if the thermostat is still calling for heat.

The control board will ignore a pressure switch opening of less than 2 seconds, but the gas valve will be de-energized momentarily while the pressure switch is open which may cause a loss of flame. If there is a loss of flame, the control board will initiate the **Ignition Recycle** procedure.

If the pressure switch opens for more than 2 seconds during a pre-purge or inter-purge period, the control board will wait for the pressure switch to re-close. The purge time re-starts when the pressure switch closes. If the pressure switch remains open for 60 seconds, the control board will enter the lockout mode, de-energize the induced draft blower, and begin to flash a "2" fault code on the Status LED.

Undesired Flame
If flame is sensed while the gas valve is de-energized, the control board will energize the induced draft blower and circulating blower motor on heating speed. All other outputs will remain off and the Status LED will flash a "5" fault code. When flame is no longer sensed, the induced draft blower will enter a post-purge period and the circulating blower motor will continue to operate until selected heating blower off-delay is completed. The control will not be locked out and continue with normal operation following the blower
off-delay.

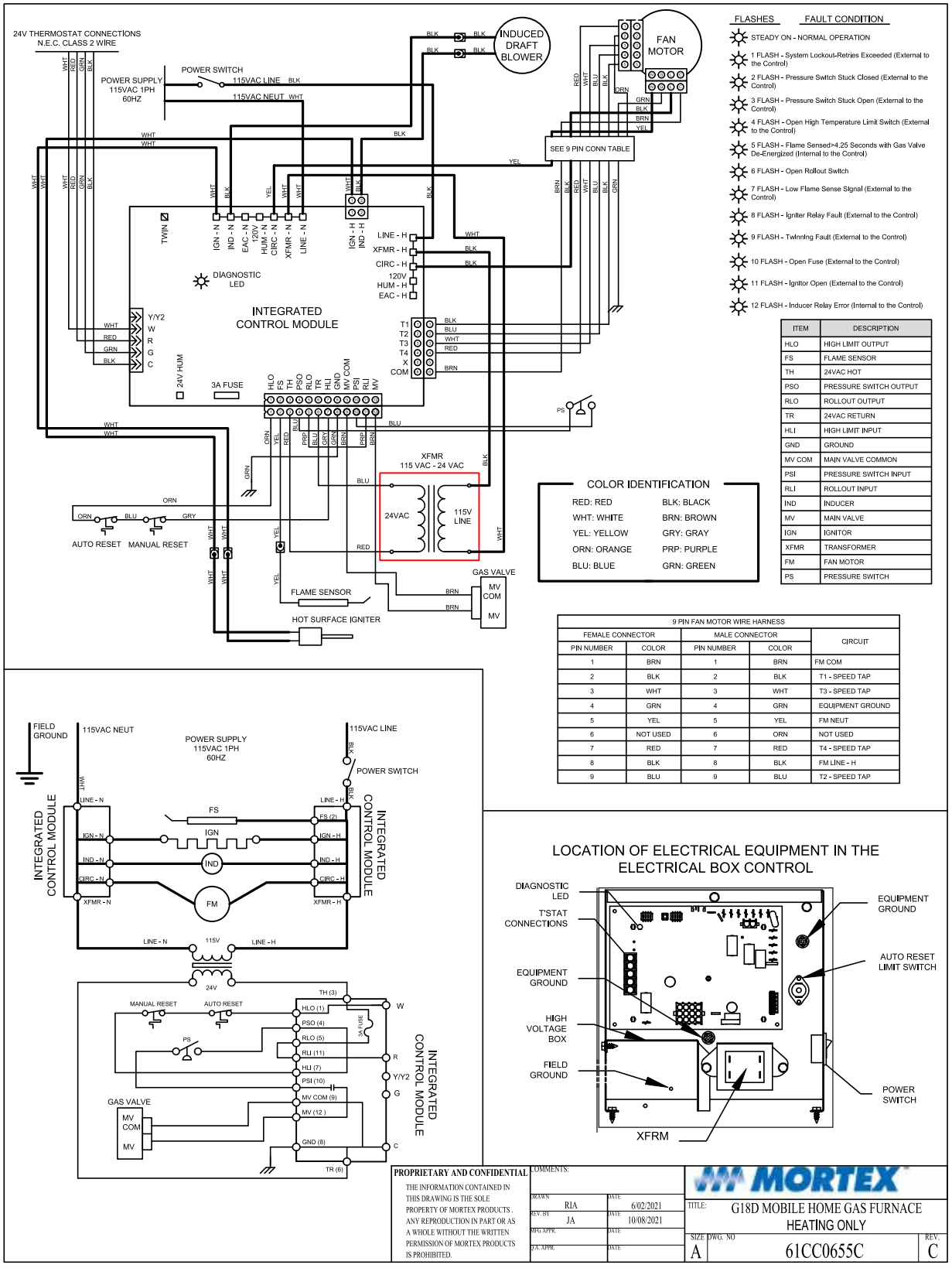
Lockout
Soft Lockout: The gas valve will be de-energized and the control board will not initiate an ignition attempt. The control board will still respond to an open limit switch and undesired flame by energizing the induced draft blower and circulating blower motor. The control board will automatically exit the lockout mode after 1 hour. The control can be manually forced to exit the lockout mode by cycling the electrical power to the furnace off and then back on or removing the thermostat call for heat for more than 2 seconds.

Hard Lockout: If a gas valve hardware fault, a flame sense hardware fault has occurred or if the limit switch is open for more than 5 minutes, the control board will enter a hard lockout condition. To exit a hard lockout, electrical power to the furnace must be cycled off and then back on or the thermostat call for heat must be removed.

SECTION 8: BLOWER PERFORMANCE

Furnace Model Number	Mtr HP	Speed Tap	CFM @ 0.10" W.C. E.S.P	CFM @ 0.20" W.C. E.S.P	CFM @ 0.30" W.C. E.S.P	CFM @ 0.40" W.C. E.S.P	CFM @ 0.50" W.C. E.S.P	CFM @ 0.60" W.C. E.S.P	CFM @ 0.70" W.C. E.S.P	CFM @ 0.80" W.C. E.S.P	CFM @ 0.90" W.C. E.S.P	CFM @ 1.00" W.C. E.S.P
G18D---AH3BC G18D---CA3BC	1/3	T4 *	635	463	194	--	--	--	--	--	--	--
		T3	964	901	814	734	630	516	361	109	--	--
		T2	1134	1078	1007	943	857	778	680	566	422	--
		T1	1286	1217	1157	1094	1026	957	880	756	593	299
G18D---CA4BC	3/4	T4 *	884	678	485	360	333	258	136	--	--	--
		T3	1337	1280	1221	1145	1089	1018	955	890	823	629
		T2	1553	1485	1415	1347	1258	1125	979	973	802	535
		T1	1650	1537	1454	1366	1227	1166	1035	1021	853	578

Table18: Blower Performance Chart – With Filters – Without Cooling Coil
*** Speed tap T4 should only be used for the constant circulation mode.**

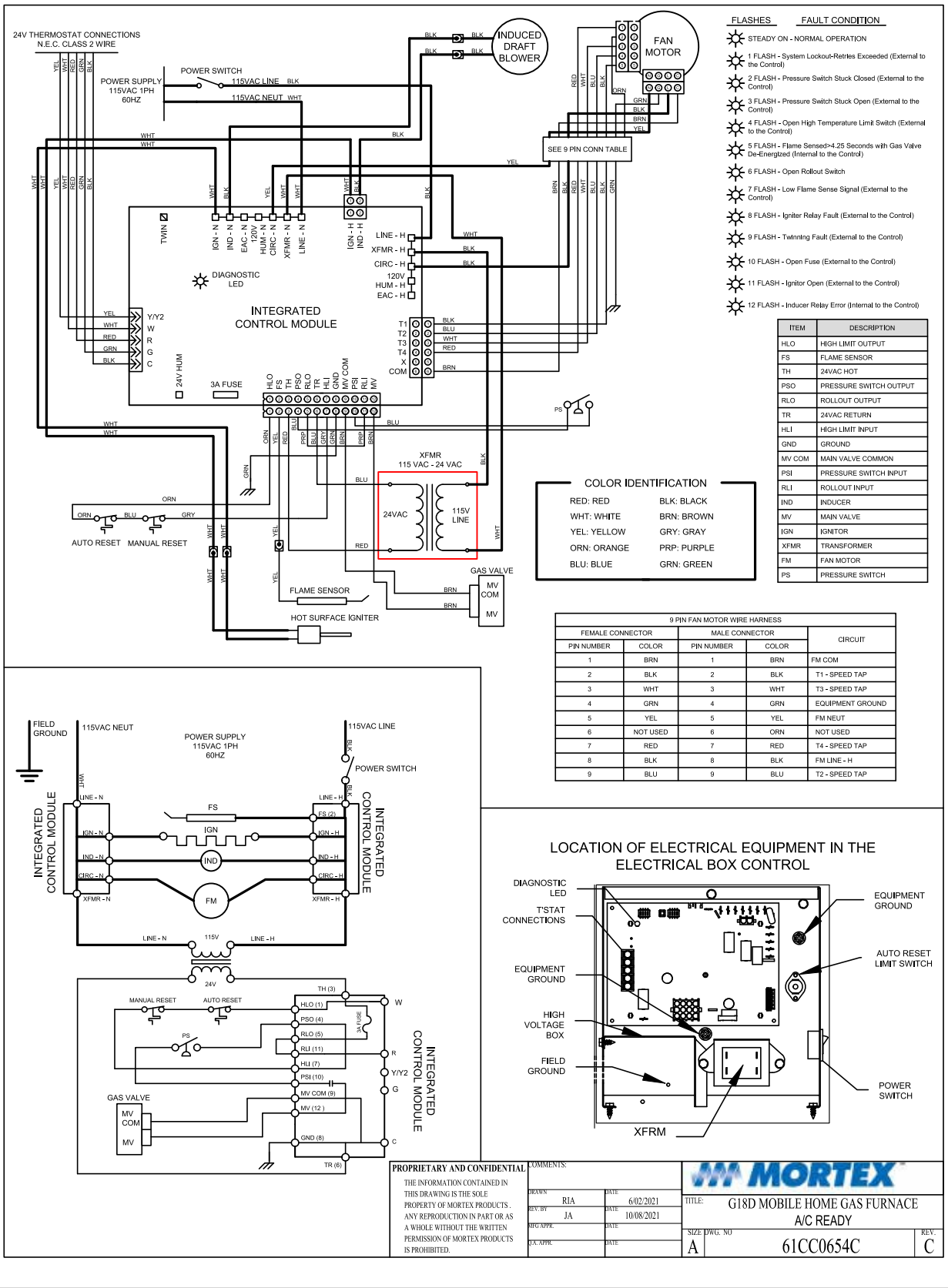


ITEM	DESCRIPTION
HLO	HIGH LIMIT OUTPUT
FS	FLAME SENSOR
TH	24VAC HOT
PSO	PRESSURE SWITCH OUTPUT
RLO	ROLLOUT OUTPUT
TR	24VAC RETURN
HLI	HIGH LIMIT INPUT
GND	GROUND
MV COM	MAIN VALVE COMMON
PSI	PRESSURE SWITCH INPUT
RLI	ROLLOUT INPUT
IND	INDUCER
MV	MAIN VALVE
IGN	IGNITOR
XFMR	TRANSFORMER
FM	FAN MOTOR
PS	PRESSURE SWITCH

9 PIN FAN MOTOR WIRE HARNESS				
FEMALE CONNECTOR		MALE CONNECTOR		CIRCUIT
PIN NUMBER	COLOR	PIN NUMBER	COLOR	
1	BRN	1	BRN	FM COM
2	BLK	2	BLK	T1 - SPEED TAP
3	WHT	3	WHT	T3 - SPEED TAP
4	GRN	4	GRN	EQUIPMENT GROUND
5	YEL	5	YEL	FM NEUT
6	NOT USED	6	ORN	NOT USED
7	RED	7	RED	T4 - SPEED TAP
8	BLK	8	BLK	FM LINE - H
9	BLU	9	BLU	T2 - SPEED TAP

Figure 33: Wiring Diagram – Heating Only Models

NOTE: If any of the original wires supplied with this furnace must be replaced, replace with Type 105°C thermoplastic or equivalent wire.



ITEM	DESCRIPTION
HLO	HIGH LIMIT OUTPUT
FS	FLAME SENSOR
TH	24VAC HOT
PSO	PRESSURE SWITCH OUTPUT
RLO	ROLLOUT OUTPUT
TR	24VAC RETURN
HLI	HIGH LIMIT INPUT
GND	GROUND
MV COM	MAIN VALVE COMMON
PSI	PRESSURE SWITCH INPUT
RLI	ROLLOUT INPUT
IND	INDUCER
MV	MAIN VALVE
IGN	IGNITOR
XFMR	TRANSFORMER
FM	FAN MOTOR
PS	PRESSURE SWITCH

9 PIN FAN MOTOR WIRE HARNESS				
FEMALE CONNECTOR		MALE CONNECTOR		CIRCUIT
PIN NUMBER	COLOR	PIN NUMBER	COLOR	
1	BRN	1	BRN	FM COM
2	BLK	2	BLK	T1 - SPEED TAP
3	WHT	3	WHT	T3 - SPEED TAP
4	GRN	4	GRN	EQUIPMENT GROUND
5	YEL	5	YEL	FM NEUT
6	NOT USED	6	ORN	NOT USED
7	RED	7	RED	T4 - SPEED TAP
8	BLK	8	BLK	FM LINE - H
9	BLU	9	BLU	T2 - SPEED TAP

Figure 34: Wiring Diagram – A/C Ready Models

NOTE: If any of the original wires supplied with this furnace must be replaced, replace with Type 105°C thermoplastic or equivalent wire.