

INSTALLATION MANUAL



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

CATEGORY I MOBILE HOME GAS FURNACE

LIST OF SECTIONS

1 – Safety	1	6 – Combustion Air and Vent System	19
2 – General Information	5	7 – Furnace Startup, Diagnostics and Sequence of Operation	27
3 – Furnace Duct connections and Duct System	8	8- Blower Performance	32
4 – Gas Supply and Valve Connections	10	9 – Wiring Diagrams	33
5 – Line and Low Voltage Wiring	14		

LIST OF FIGURES

1 - Furnace Dimensions	7	18 – Typical Single Stage Heat / Cool Digital T' stat 2 Stage Furnace	18
2 – Duct Connector Dimensions	8	19 – Typical 2 Stage Heating/Cooling Digital T' stat Connections	18
3 – Duct Connector and Floor Base Installation	8	20 – Roof Jack Mounting Collars – Top of Furnace	20
4 – Air Distribution System – Single Trunk Duct	9	21 – Roof Jack Indoor Extension Pipes	20
5 – Air Distribution System – Double Trunk Duct	9	22 – Roof Jack Outdoor Extension Pipes	20
6 – Air Distribution Systems – Graduated trunk duct	9	23 – Roof Jack Assembly (Slope Saddle)	21
7 – Furnace Base Openings, Fuel, Electric & A/C Line Penetrations	9	24 – Roof Jack Crown Assembly	21
8 – Duct Connector Depths	9	25 – Combustion Air Path thru the Roof Jack & Thru the Pipes	22
9 - Outdoor Fresh Air Intake Knockout	10	26 – Outside Ambient Combustion Air Openings and Ducts	23
10 – White Rodgers 36J29 Gas valve	11	27 – Home Layout and Vent Clearances	24
11 – Supply Gas Piping	11	28 – Outside Combustion Air and Vent Safety Check Procedure	25
12- Furnace Component Locations	16	29 – Typical Roof Jack Installation	26
13 – Separate T'stat, Furnace & Cooling Unit WD	17	30 – Reading the Inlet (Supply) Gas Pressure (INP)	29
14 – Separate T'stat, furnace, Cooling Unit & Trans W.D.	17	31 – Reading the Outlet (Manifold) Gas Pressure	29
15 – Same T'stat, Separate Furnace, Cooling Unit & Trans W.D.	17	32 – Integrated Control Board	30
16 – Same T'stat Separate Furnace, Heat Pump and Transformers	18	33 – Wiring Diagram A/C Ready Furnace	33
17 – Same T'stats Separate Furnace, Cooling Unit and Transformers	18	34 - Wiring Diagram Heating Only	34

LIST OF TABLES

1 – Furnace Clearances to Combustibles	6	10 – Recommended Thermostat Wire Colors & Connections	19
2 – Model Nomenclature	7	11 – Estimated Free Area	22
3 – High Altitude Gas Orifice Chart	13	12 – Vent Clearances	24
4 – Gas Pipe Capabilities	14	13 – Roof Jack Specifications	26
5 – Ratings and Physical Electrical Data	14	14 – Input Calculations for a cu-ft Gas Meter	28
6 – Heating Only Models 1/3 HP Blower and Motor Rating	15	15 – Input calculations for a Mj/m ³ Gas Meter	28
7 – A/C Ready Models 1/3 HP Blower & Motor Rating	15	16 – Inlet (Supply) Gas Pressure Range	29
8 – A/C Ready Models 3/4 HP Blower & Motor Rating	15	17 – Blower Performance	32
9 – Low Voltage, Wire Gage and Max Lengths	16		

SECTION I: SAFETY

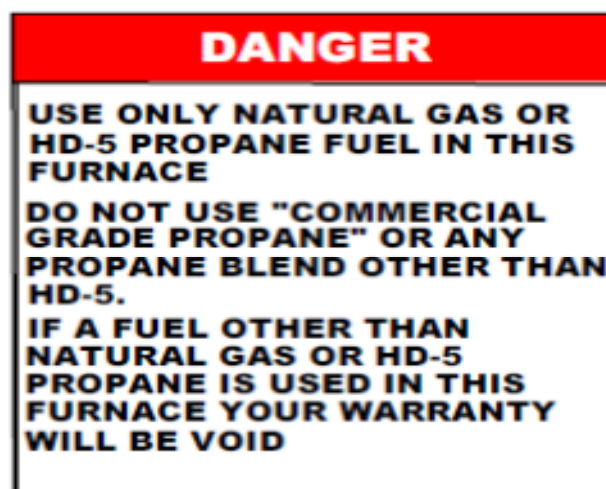
This is a safety alert symbol. When you see this symbol on labels or in manuals be alert to the potential for personal injury. Understand and pay particular attention to the signal words **DANGER**, **WARNING**, or **CAUTION**.

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.

SAVE THIS MANUAL FOR FUTURE REFERENCE



SPECIFIC SAFETY RULES AND PRECAUTIONS

1. Only Natural gas or Propane (LP) gases are approved for use with this furnace. Refer to the furnace rating plate or SECTION IV of these instructions.
2. Install this furnace only in a location and position as specified in SECTION II of these instructions.
3. A gas fired furnace for installation in a residential garage must be installed as specified in SECTION I of these instructions.
4. Provide adequate combustion and ventilation air to the furnace space as specified in SECTION VI of these instructions.
5. Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified in SECTION VI of these instructions.

WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warnings exactly could result in serious injury, death or property damage. A fire or explosion may result 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.

6. Tests for gas leaks as specified in section IX of these instructions. Never test for gas leaks with an open flame.
7. Always install furnace to operate within the furnaces intended rise range with a duct system that has an external static pressure within the allowable range, as specified in these instructions. See furnace rating plate.
8. When a furnace is installed so that the supply duct(s) carry the air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.
9. The return air duct system is not required by the manufacturer provided the combustion air and vent system have been installed as a Two Pipe Sealed Combustion System and provided a return air duct system is not required by state, local or regional codes. Refer to sealed combustion systems section in ANSI 223.1 (NFPA 54) – latest edition.
10. It is permitted to use the furnace for heating of buildings or structures under construction. Installation must comply with all of the manufacturer's instructions including:
 - Proper vent installation.
 - Furnace must be operating under thermostatic control.
 - Return air duct must be sealed to the furnace.
 - Air filters must be in place.
 - Set furnace input rate and temperature rise per the rating plate marking.
 - Means for providing outdoor air required for combustion.
 - Return air maintained between 55°F (13°C) and 80°F (27°C).

- The air filter must be replaced upon substantial completion of the construction process.
- Clean furnace supply and return air duct work making sure the duct system is free of saw dust, dirt, dust and debris. Clean all of the furnace components upon substantial completion of the of the construction process.
- Verify furnace operating conditions including:
 - Ignition
 - Input rate
 - Temperature rise
 - Venting system
- Verify the furnace is operating according to the manufacturer's instructions.

11. **When installed in a Manufactured (Mobile) Home:** The combustion air shall not be supplied from occupied spaces.
12. The size of the furnace shall be based on an acceptable heat loss calculation for the structure. ACCA Manual "J" or other approved methods may be used.
13. Gas fired heating equipment must be vented - do not operate unvented
14. If you are replacing an existing furnace, it may be necessary to replace the roof jack venting system. Improperly sized or the wrong roof jack venting system can result in vent gas leakage or the formation of condensate. Refer to the National Fuel Gas Code ANSI Z223.1 or CAN/CGA B149.1 or .2 latest editions. Failure to follow these instructions can result in injury or death.
15. To reduce the opportunity for condensation, the minimum sea level input to the appliance, as indicated on the rating plate, must not be less than 8% below the rated input.
16. Ensure that the supply voltage to the appliance, as indicated on the rating plate, is not 5% greater than the rated voltage.
17. **Manufactured (Mobile) Home Installation:** This appliance 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 terminate external to the building.
18. **Roof Jack Sizes:**
 - Mortex is a 4" Vent Pipe with a 7" Combustion Air Pipe.
 - Coleman is a 5" Vent Pipe with a 8" Combustion Air Pipe.
 - Nordyne is a 5" Vent Pipe with a 8" Combustion Air Pipe.If you replace a Coleman or Nordyne furnace with a Mortex and do not change the vent the furnace will fire up for around 5 seconds to a minute and the flame will extinguish,
19. **Modular Homes:** This appliance can be installed in one of the following configurations:
 - a. 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. Refer to Figures 19 – 25.
 - b. A One 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. A One Pipe 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. Refer to Figure

20. **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.

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 21. At their destination. The home is built, transported and installed on a non-removable chassis.

GENERAL SAFETY REQUIREMENTS

- 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, and/or CAN/CGA B149.1 Natural Gas and Propane Installation Code (latest editions). Furnaces have been certified to the latest edition of standard UL 307B
- 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 or in Canada by a licensed gas fitter.
- Refer to the furnace rating plate for the furnace model number, and then refer to the dimensions, page 6 of these instructions. Optional duct connector dimensions are shown in Figures 2 thru 8. The optional duct connectors must be installed according to the instructions.
- Provide clearances to combustible materials as listed under Clearances to Combustibles.
- Provide clearances for servicing ensuring that service access is allowed for both the burners and blower.
- These models are ETL listed or approved for installation into Manufactured (Mobile) Home, Modular Homes or in Residential downflow applications.
- Failure to carefully read and follow all instructions in this manual can result in furnace malfunction, death, personal injury and/or death.
- Furnace for installation on combustible flooring shall not be installed directly on carpeting, tile, or other combustible materials other than wood flooring.
- Check the rating 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 appliance to a 50 Hertz power supply or a power supply where the voltage exceeds 132 VAC.**
- This furnace must be installed so the components are protected from water.
- 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 personnel can perform basic maintenance functions such as cleaning exterior surfaces or replacing the air filters. When working on heating equipment, observe precautions in the

manuals and on the labels attached to the unit and other safety precautions that may apply.

- These instructions cover minimum requirements and conform to existing national standards and safety codes. In some instances these instructions may exceed certain local codes and ordinances, especially those who have not kept up with changing residential construction practices. These instructions are required as a minimum for a safe installation.

WARNING

Appliances must not be installed where they may be exposed to potentially explosive or flammable atmosphere. Installing this appliance in an explosive or flammable atmosphere will result in a fire or explosion causing personal injury, property damage and/or death.

WARNING

HEALTH HAZARD

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Incomplete combustion because of 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, users information and service and maintenance manual thoroughly before installing or servicing this equipment

SAFETY REQUIREMENTS – INSTALLATION CODES

- ❖ A manufactured (Mobile) Home installation must conform with the *Manufactured Home Construction and Safety Standard*, Title 24 CFR, Part 3280, or when this standard is not applicable, the standard for Manufactured Home Installations (*Manufactured Home Sites, Communities, and Setups*) ANSI/NCS A225.1, and/or *MH Series Mobile Homes*, CAN/CSA Z240
- ❖ The appliance has been safety certified to UL307B.
- ❖ Additional Installation Codes that may apply for your installation are:
 - a. National Fuel Gas Code – ANSI Z223.1 / NFPA -54.
 - b. National Electrical Code ANSI / NFPA -70
 - c. Manufactured Housing – NFPA-501 and Fire Safety Criteria for Mobile Home Installations – NFPA 501A
 - d. Recreational Vehicles – ANSI – 119 / NFPA-501C
 - e. In Canada, Installation Code for “Natural Gas Burning Appliances and Equipment” CAN/CGA-B149.1 and CAN/CGA-B149.2 Installation Code for “Propane Burning Appliances and Equipment”.
 - f. Canadian Electrical Code, Part I (CSA C22.1)
 - g. All local, State, City, Township and Provincial Codes.

- ❖ These models are ETL Listed and approved for installation into a Modular Home, Manufactured (Mobile) Home, Trailers and Recreational Vehicles.

NOTE: All applicable codes take precedence over any recommendation made in these instructions.

- ❖ Refer to the unit rating plate for the model number.
- ❖ Refer to the dimensions page for the supply air and duct connector connections and dimensions.
- ❖ Provide clearances from combustible materials as listed in Clearances to Combustibles Table.
- ❖ Failure to carefully follow the all instructions in this manual can result in furnace malfunction, death, personal injury and/or property damage.
- ❖ Furnaces for installation on combustible flooring shall not be directly installed on carpeting, tile, or other combustible material other than wood flooring.
- ❖ Check rating plate and power supply to be sure the electrical characteristics match. All models require 115 VAC, single (1) phase, 60 hertz power supply. Do not connect this appliance to a 50 hertz voltage supply or a voltage supply that has a voltage greater than 130 VAC.
- ❖ The furnace shall be installed so the electrical components are protected from water.
- ❖ Installing and servicing heating equipment can be hazardous due to the electrical components and the gas fired components. Only trained and qualified personnel can install, repair, maintain, and /or service gas heating equipment. Untrained service personnel can perform basic maintenance functions such as cleaning the exterior panels or replacing the air filters. When working on heating equipment, observe the precautions in the manuals and on the labels attached to the appliance. Observe any safety precautions that may apply.
- ❖ These instructions cover the minimum installation requirements and conform to existing national standards and safety codes. In some instances these instructions may exceed certain local codes and ordinances, especially those who have not kept up with changing Modular Home and Manufactured (Mobile) Home construction practices. These instructions are required as a minimum for a safe installation.
- ❖ This furnace is certified with the controls furnished. For replacement parts, please order according to the replacement parts list located in the back of the Service and Maintenance Manual. Refer to the rating plate to obtain the model and serial numbers so the correct parts can be ordered.
- ❖ 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 appliance.

SAFETY PRECAUTIONS

1. Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage.
2. All appliances must be wired strictly in accordance with wiring diagram furnished with the appliance. Any wiring different from the wiring diagram could result in a hazard to persons and property.
3. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature

rating of at least 105°C.

4. When servicing or repairing this equipment, use only factory-approved service replacement parts. A complete replacements parts list may be obtained by contacting the factory. Refer to the rating plate on the appliance for complete appliance model number, serial number, and company address. Any substitution of parts or controls not approved by the factory will be at the owner's risk.

WARNING

FIRE OR ELECTRICAL HAZARD

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

A fire or electrical hazard may result causing property damage, personal injury or loss of life.

COMBUSTION AIR QUALITY (LIST OF CONTAMINANTS)

Excessive exposure to contaminated combustion air will result in safety and performance related problems.

The furnace will require 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 will require 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 items such as the following 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 controls with a control that is not approved or incompatible may result in personal injury, substantial property damage or death.

WARNING

DO NOT wet electronic components or wire connections during the leak test. Wetting electronic components may damage to the circuitry and corrode the wire connections which can cause a hazardous situation.

Dry any moisture from all leads and terminals if wetting occurs. Wait at least 12 hours for the electronic components and wire connections to fully dry before energizing the system.

Furnace Weights

Heat Only Models –152 lbs (68.95 kg)
A/C Ready Models -175 lbs (79.38 kg)

WARNING

Because of the potential of odorant fade, a gas leak may not be detected 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 or under 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. Check with your gas supplier about gas content and for a gas leak detector.

CAUTION

1. Turn off all gas lines before installing appliance.
2. When leak testing the gas piping system; the appliance gas control valve must be isolated from pressures exceeding 14 inwc (1/2 psia) (3.5 kPa).
3. Check the gas inlet pressure before the gas control valve to insure the pressure is:
 - a. 7 inwc (1.744 kPa) for natural gas.
 - b. 11 inwc (2.74 kPa) for propane gas
4. Purging of air from gas supply line should be performed as described in ANSI Z223.1 - latest edition "National Fuel Gas Code", or in Canada in CAN/CGA-B149.1 or B149.2 codes.
5. Do not attempt to reuse any mechanical or electronic ignition controllers which have been wet. Replace defective controller.
6. Servicing or repairing of this equipment must be performed by a qualified service agency.
7. Do not install unit outdoors.

WARNING

HAZARD OF ASPHYXIATION: Negative pressure inside the closet with closet door closed and the furnace blower operating cannot be more negative than minus 0.05 inwc.

IMPORTANT

1. 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 Section I COMBUSTION AIR

SECTION II: GENERAL INFORMATION

INSPECTION

As soon as the furnace is received, it should be inspected for possible damage 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. Also, 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 AND CLEARANCES

The furnace shall be located using the following guidelines

1. Where a minimum amount of air intake/vent piping (smallest roof jack) will be required.
2. As centralized with the air distribution as possible.
3. Where adequate combustion air will be available (particularly when appliance is not using outdoor air for combustion air).
4. Where it will not interfere with proper air circulation in the confined space.
5. Where the outdoor combustion air/ vent terminal will not be blocked or restricted. Refer to combustion air/ vent instructions located in Section VI. These minimum clearances must be maintained throughout the installation.
6. Where the appliance will be installed in a level position with no more than ¼" (0.6 cm) slope side to side and front to back to provide proper condensate drainage.

INSTALLATION IN FREEZING TEMPERATURES

1. Furnace shall be installed in an area where ventilation facilities provide for safe limits of ambient temperature 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 allow the return air temperature to be below 55°F (13°C) for extended periods. To do so may cause condensate to occur in the main heat exchanger, leading to premature heat exchanger failure.

INSTALLATION IN A RESIDENTIAL GARAGE

A gas-fired furnace for installation in a residential garage must be installed as specified in these instructions. For installation in a residential garage, the furnace 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 appliance must be located or protected to avoid physical damage by vehicles.

WARNING

DO NOT store any chemicals or volatile fluids around the appliance. This is a very dangerous practice that must be avoided.

Storing chemicals around the appliance can lead to heat exchanger corrosion which will cause premature heat exchanger failure, which may result in personal injury, substantial property damage or death.

Storing volatile fluids around the appliance can lead to an explosion which can cause substantial property damage that may result in personal injury, or death.

WARNING

LOW AMBIENT TEMPERATURE HAZARD

Improper installation in an ambient temperature that is consistently below 55°F (13°C) could result in a hazard resulting in premature heat exchanger failure, a fire, property damage, personal injury or loss of life.

CLEARANCES FOR ACCESS

Ample clearances should be provided to permit easy access to the appliance. The following minimum clearances are recommended.

1. Twenty-four (24) inches (61 cm) between the front of the furnace and an adjacent wall or other appliance, when access is required for servicing or cleaning.
2. Eighteen (18) inches (46 cm) at the side where access is required for passage to the front when servicing or for inspection or replacement of the flue/vent connections.

TOP	LEFT SIDE	RIGHT SIDE	BACK	FRONT	FRONT	DUCT	ROOF JACK
				ALCOVE	CLOSET		
6 in	0 in	0 in	0 in	18 in	6 in	0 in	6 in

Table 1: Furnace Clearances to Combustibles

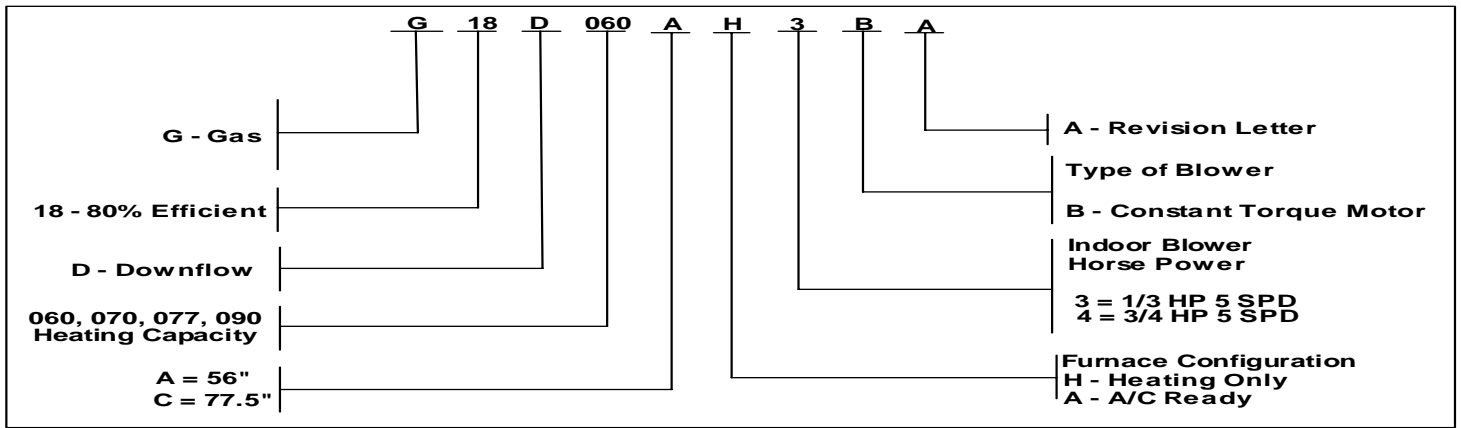


Table 2: Model Nomenclature

FURNACES INSTALLED IN THE COMMONWEALTH OF MASSACHUSETTS ONLY

For all side wall horizontally vented gas fueled equipment installed in every dwelling, building, or structure used in whole or in part for residential purposes, including those owned or operated by the commonwealth and where the side wall exhaust vent termination is less than seven 7 feet (2.1336 m) above a finished grade in the area of the venting. This is including but not limited to decks and porches and the flowing requirements must be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS.

- The installing plumber or pipe fitter shall observe that a hard wired carbon monoxide detector with a battery backup shall be installed on the same floor level where the gas fired appliance is being installed with the horizontal vent system. In addition, the installing plumber or pipe fitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building, or structure served by the side wall horizontal vented gas fueled equipment. 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.
- a. In the event that the side wall horizontally vented gas fueled equipment 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.
 - b. In the event that the requirements of this subdivision cannot be met at the time of completion of the installation, the owner shall have thirty (30) days to comply with the above 48 requirements; provided; that during the said thirty (30) day period, a battery operated carbon monoxide detector with an alarm be installed.

2. APPROVED CARBON MONOXIDE DETECTORS

Each of the carbon monoxide detectors are required by in accordance with the above provisions and shall comply with NFPA 720, be ANSI/UL 2034 listed and are 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 eight (8) feet (2.438 m) above the grade directly in line with the gas fired appliance or equipment horizontal exhaust vent terminal. The sign shall be in print of no less than one-half (1/2)

inch (12.7 mm) in size 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 equipment 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.

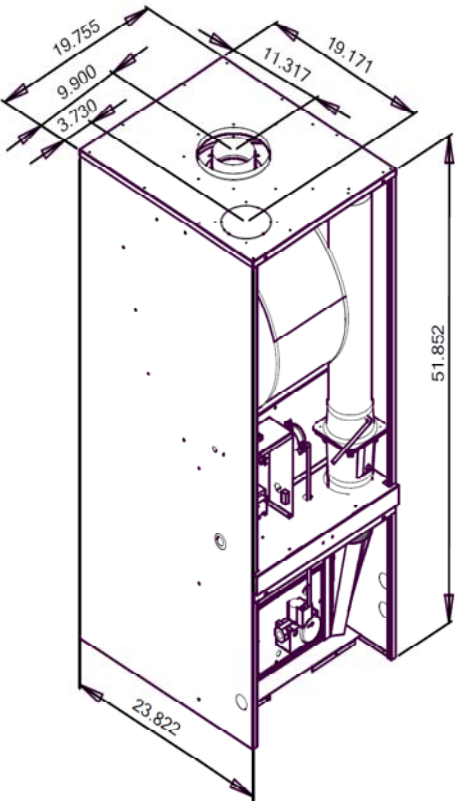


Figure 1: Furnace Dimensions

Coil cabinet or insulated cabinet is not shown in Figure 1. Add 4 inches to the height for a heating only (AH3) models for the insulated cabinet and 25.5 inches to the A/C Ready (CA3 and CA4) models for the coil cabinet.

Total Height
 Heating Only 51.852" + 4" = **55.852"**
 A/C Ready 51.852" + 25.5" = **77.352"**

SECTION III: FURNACE DUCT CONNECTIONS AND DUCT SYSTEM

General Information

1. The duct system's design and installation must handle an air volume appropriate for the space being heated and must allow the furnace to operate within the rating plate specifications.
2. The duct system's 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. The duct system's design and installation must create a closed duct system. Manufactured (Mobile) Home or Modular Home installations. The furnace must be installed so the supply ducts carry air circulated by the furnace to areas outside the space containing the furnace. The return air is handled with a louvered filter door attached to the furnace casing. The return air duct(s) are not required by the manufacturer providing the combustion air and vent system have been installed and maintained as a two (2) pipe sealed combustion configuration and provided the return air duct system is not required by state, local, provincial, or regional codes.
4. The duct systems design and installation must consist of a properly sized duct system that provides a complete path for heated or cooled air to circulate through the air conditioning and heating equipment and to and from the conditioned space.

CAUTION

The cooling coil must be installed in the coil cabinet, or in the supply air duct, downstream of the heat exchanger. Cooled air may not be passed over the heat exchanger.

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 air flow 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 full heating or full cooling position.

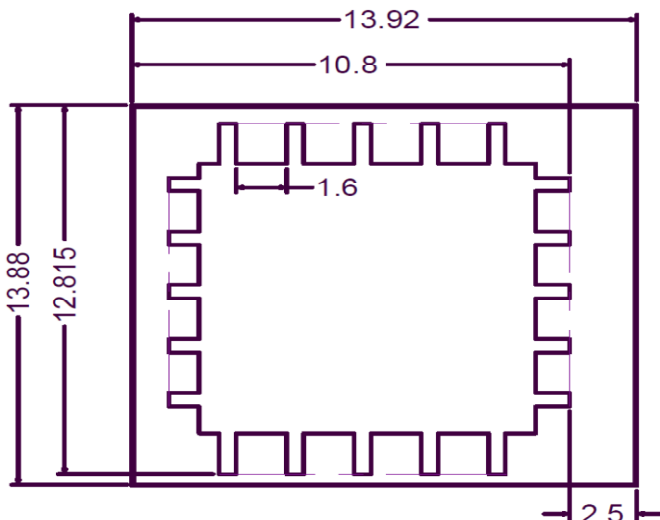


Figure 2: Duct Connector Dimensions

WARNING

The duct system must be properly sized to obtain the correct airflow for the furnace size that is being installed. Refer to the furnace rating plate for the correct rise and static pressures.

If the ducts are undersized, the result will be high duct static pressure, and/or high temperature rises which can result in a heat exchanger **overheating** condition. This condition can result in premature heat exchanger failure, which can result in personal injury, property damage, or death.

Floor Base Installation and Duct Connection

Downflow combustible floor base is used for installations on combustible material or floors. The combustible floor base is recommended by not required because the furnace base is insulated. The combustible floor base is shown in Figure 3. Follow the instructions supplied with the combustible floor base accessory to be sure it is properly installed.

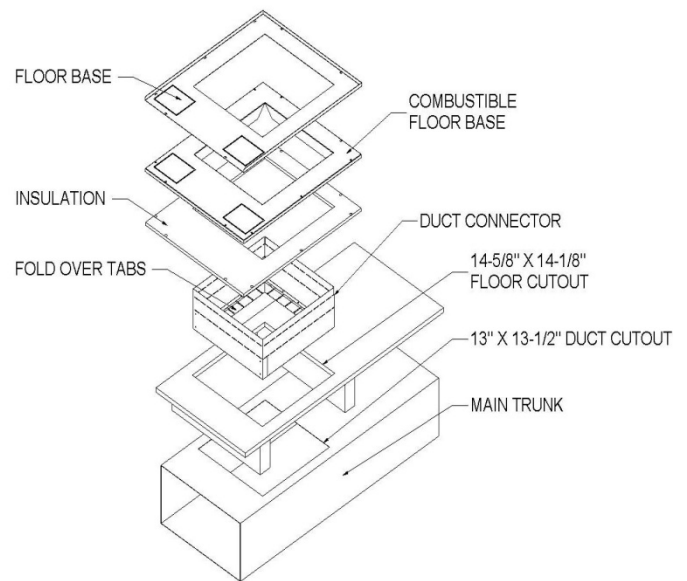


Figure 3: Duct Connector and Floor Base Installation

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" located in the Users Information Manual / Service and Maintenance Manual.

When replacing an existing furnace the duct connector must be checked to determine if the furnace will properly fit the duct connector so all of the holes in the furnace base line up with the holes in the duct connector. If the holes do not line up then, the duct connector must be replaced.

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 work for the building, refer to the ASHRAE Fundamentals Handbook, Chapter on Duct Design or a company that specializes in Manufactured (Mobile) Home, Modular Home and HUD Home duct designs.



Figure 4: Air Distribution System – Single Trunk Duct



Figure 5: Air Distribution System – Double Trunk Duct

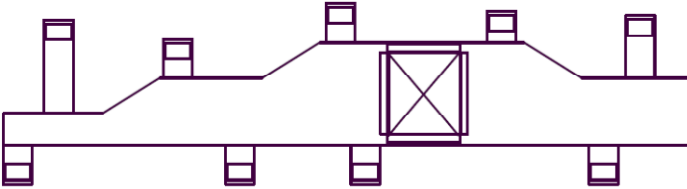


Figure 6: Air Distribution System – Graduated Trunk Duct

Important: If the supply air duct is being connected to the appliance without the use of an accessory duct connector, then 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 appliance. The transition duct must have insulation between the duct and any combustible material. The transition duct must be the same dimensional size as the supply air opening in the base of the appliance.

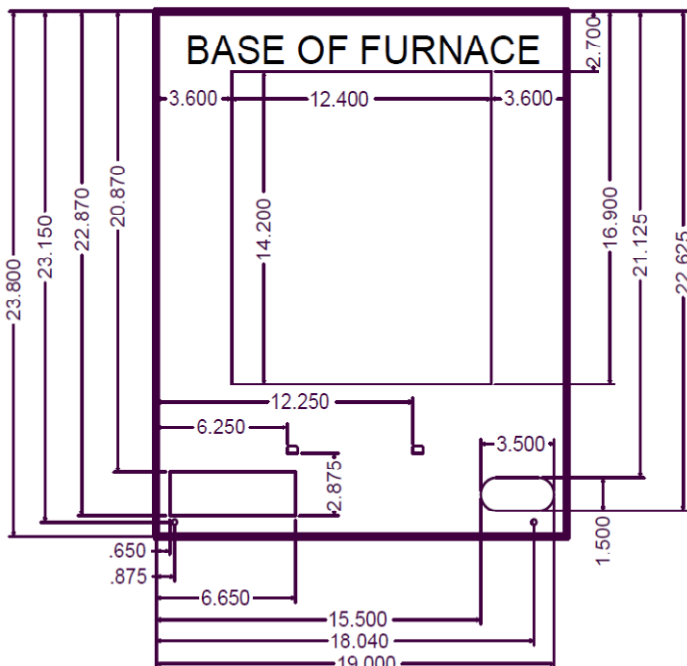


Figure 7: Furnace Base Openings for Fuel, Electrical and A/C Line Penetrations

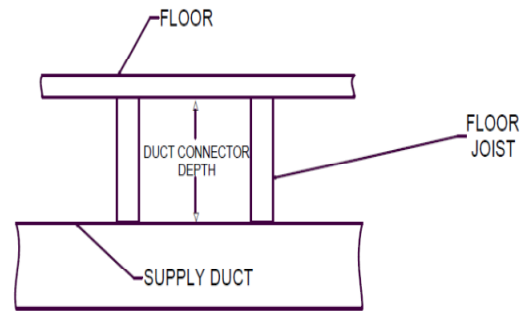


Figure 8: Duct Connector Depth

Alcove Installation

This furnace is approved for use in an alcove with both the heating only (without an air conditioning coil) and the A/C ready models. A minimum of 24 inches (61 cm) front clearance to a face wall or partition 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, the electrical wiring is in place, the thermostat wiring and the condenser control wiring is in place.

Install the furnace as follows:

1. Before installing the furnace, be sure you have enough clearance to install the furnace and clearance for the return air. Refer to Table 1 CLEARANCES.
2. Remove the top shipping cover and corner posts.
3. Remove the upper access panel (door).
4. Remove the lower access panel (door).
5. Set the furnace in place on the duct connector. Make sure the supply air opening lines up with the opening in the duct connector.
6. Slide the furnace on to the floor base. Push the furnace back until the furnace casing is against the rear flange.
7. 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.
8. When any air leaks have been sealed reinstall the coil cabinet panels.
9. Remove the roof jack assembly and replace with a new roof jack. Be sure to follow the roof jack installation instructions exactly.
10. Connect the gas lines, the line voltage and low voltage wiring.
11. Remove the coil cabinet panels and seal around the duct connector and the furnace base to prevent air leakage.
12. Install the cooling coil into the coil compartment (for A/C ready models only). Replace the panels when the coil installation is complete.
13. Check for gas leaks. If no leaks are found then turn on the gas to the appliance.
14. Follow the procedure to "START THE APPLIANCE" located in the Users Information Manual.
15. Verify the furnace is operating properly and set the thermostat to the desired temperature.
16. Place the upper access panel on the furnace.

Important: Fabricate and install an inspection door in the plenum base below the appliance 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 completely covers the opening in the base.
2. The plate must be secured with screws and sealed to prevent leaks.
3. The coil cabinet doors can be removed to inspect the heat exchanger on most Manufactured (Mobile) Home Downflow Appliances.

Closet Installation

This furnace is approved for use in an alcove with both the heating only (without an air conditioning coil) and the A/C ready models. A minimum of 6" front clearance to a face wall or partition is needed for service access and return air clearances.

Air filter Size – All Models take two (2) - 16" x 20" x 1".

Prior to installing the furnace make sure the holes are cut into the floor for the refrigerant tubing, the electrical wiring is in place, the thermostat wiring and the condenser control wiring is in place. Follow the sixteen steps above for installing the furnace.

FILTERS

Alcove Installations

All applications require the use of an internal filter. All filters mounting provisions are factory supplied as part of the louvered return grille door.

Closet Installations

All furnaces are shipped with air filters located in the return air louvered door. It is permissible to remove the filters from the return air louvered door and use a return filter grille that has been installed into the wall above the furnace and has a sufficient size so it does not restrict the return airflow. The recommended filter sizes for the return air filter grille are shown below for throwaway filters that are 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.

The recommended filter sizes for the return air filter grille are shown below for pleated air filters that are 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.

IMPORTANT: Throw away air filters with a rated velocity of 300 feet per minute (91.44 m/minute) cannot be used on the furnace return air louvered door because the air velocity is too high and will destroy the filter. The filter velocity with this furnace is 400 feet per minute (121.92 m/minute). Do not use a filter that is rated for less than 400 ft/min (121.92 m/minute).

Never use a filter deeper than 1 inch (2.54 cm) or a filter that has a large pressure drop. This pressure drop will cause the appliance airflow to be reduced causing the appliance temperature rise to increase causing reduced efficiency and higher heat exchanger temperatures. If the appliance does not operate within the specified rise range on the name plate or the limit is cycling, then you must change the air filter to a bigger size or reduce the thickness in order to reduce the pressure drop across the air 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 matchup with the openings in the duct connector, especially the supply air opening. You can remove the coil cabinet doors 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.

Line up the duct openings and secure the coil cabinet to the floor before installing the cooling coil.

OUTDOOR AIR ACCESSORY

A replacement 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 appliance. There is a knockout and four screw holes are located in the top cover of the appliance for the attachment of a blend air damper or tube assembly. Refer to Figure 10 for knockout and screw hole locations.

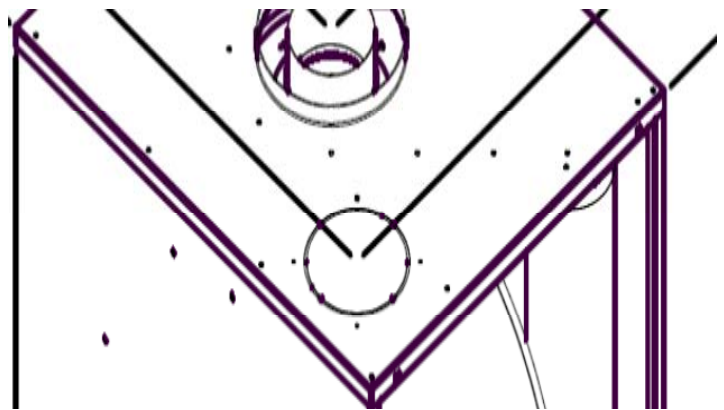


Figure 9: Outdoor Fresh Air Intake Knockout

SECTION IV: GAS SUPPLY AND VALVE CONNECTIONS

WARNING

All field installed gas piping must be pressure tested for leaks prior to operation of the appliance. 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 overpressure 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 will result in a fire or explosion that will cause property damage and loss of life.

⚠ CAUTION

1. Purging of air from gas lines should be performed as described in ANSI Z223.1 - latest edition "National Fuel Gas Code", or in Canada CAN/CGA-B149 codes.
2. When leak testing the gas supply piping system, the appliance 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 unit should 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 heater.
3. Turn off all gas before installing appliance.

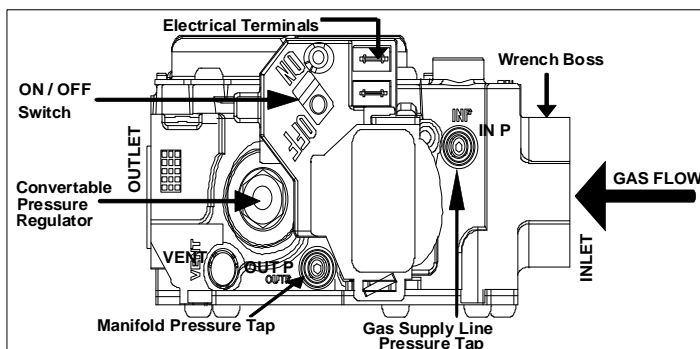


Figure 10: WR 36J29 Gas Valve

⚠ 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 will cause damage to the valve causing 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 appliance, as indicated on the serial plate, must not exceed the rated input by more than 5%.

GAS PIPING INSTALLATION

Properly sized black iron, 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 has been serviced by another gas appliance. 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.

The installation of a drip leg and a ground union is required.

IMPORTANT: Plan your gas supply piping route 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.

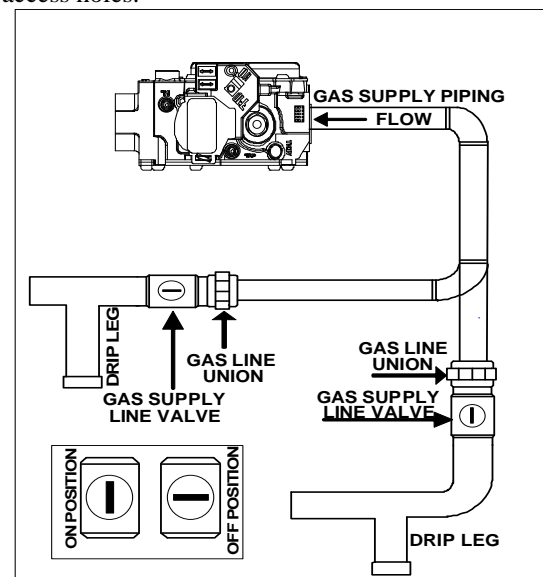


Figure 11: Supply Gas Piping

- 1 A 1/8" NPT plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas connection to the furnace.
- 2 If local codes allow the use of a flexible gas appliance connector, always use a new listed connector. So not use a connector that has previously serviced another gas appliance.
- 3 Piping to units should conform to local and national requirements for type and volume of gas handled, and pressure drop allowed in the line. Refer to Table 4 to determine the number of feet of pipe and the BTU Input to determine the proper size pipe for the unit to be installed. The length of pipe will determine the pipe diameter. Refer to Table 4. When several units are served by the same main, the total capacity, BTU/H and length of main must be considered. Avoid pipe sizes smaller than 1/2" (1.27 cm). Table 4 allows for a 0.3" W.C. (0.075 kPa) pressure drop in the

supply pressure from the building main to the unit. The inlet pressure to the unit 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 gas. When sizing the inlet gas pipe diameter make sure that the unit supply pressure can be met after the 0.3" W.C. (0.075 kPa) has been subtracted.

If the 0.3" W.C. (0.075 kPa) pressure drop is too high, refer to the National Fuel Gas Code NFPA-54 for other gas pipe capacities.

3 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.

4 Provide a sediment trap (Drip Leg) before each unit in the line at the low spot to trap any debris in the line before it reaches the gas valve. Refer to Figure 12.

5 When performing leak testing, if the test pressure is above 14" W.C. (0.50 psi (3.48 kPa)), you must close the field installed shut-off valve to disconnect the appliance and its combination gas control from the gas supply line. Plug the supply line before testing. When testing pressures 14" W.C. (0.50 psi (3.48 kPa)) or below, close the manual shut-off valve on the appliance 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 shutoff valve (gas cock) and the electrical power disconnected before proceeding with the conversion.

Converting the Unit from Natural Gas to Propane Gas

1. If the appliance has been operating, follow the procedure to properly turn off the furnace located in the Users Information Manual.
2. Turn off the gas supply at the valve in the line 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.
7. Remove the brass gas orifice from the gas valve manifold.
8. Brass Orifice location is the opposite end of the manifold from the gas valve.
9. Remove the propane orifice from the bag that is hung on the gas valve.
10. Install the propane orifice into the gas manifold pipe. Place the natural gas orifice into the bag and hang it on the gas valve.
11. Place the gas valve mounting bracket on the burner mounting plate and secure with the screws you removed in step 5.
12. Reconnect the electrical wires to the terminals on top of the gas valve.
13. Reconnect the gas supply piping to the gas valve. Remember to place the wrench only on the gas valve wrench boss, and then tighten the gas supply piping.
14. Reconnect the ground unions and tighten.
15. Remove the NATURAL GAS Tag located on the burner mounting plate and replace it with the PROPANE GAS tag that was in the bag. Place the NATURAL GAS tag in the bag that is hanging on the gas valve.
16. Turn the gas supply valve back to the "ON" position and check all of the connections for leaks.
17. Follow the procedure properly to start the appliance located in the Users Information Manual.

WARNING

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

HIGH ALTITUDE GAS ORIFICE CONVERSION

This furnace is constructed 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 installed in a location where the altitude is greater than 2,000 ft (609.6 m) Refer to Table 3 in order 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 appliance 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 appliance is located in an altitude above 6,500 ft (1,981 m) is 0.10 in-wc. (0.0249 kPa)

The recommended pressure switch setting when the appliance is located in an altitude above 8,500 ft (2,591 m) is 0.10 in-wc (0.0249 kPa).

Refer to the accessories parts list in the Users Information Manual for the correct pressure switch part number.

NATURAL GAS

ELEVATION	60,00 BTU FURNACE			70,00 BTU FURNACE			77,00 BTU FURNACE			90,00 BTU FURNACE		
	PART NO.	ORIFICE DIA.	DRILL SIZE	PART NO.	ORIFICE DIA.	DRILL SIZE	PART NO.	ORIFICE DIA.	DRILL SIZE	PART NO.	ORIFICE 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
2,000	72AG-140	0.140	28	72AG-154	0.154	23	72AG-161	0.161	20	72AG-169	0.169	18
3,000	72AG-140	0.140	28	72AG-152	0.152	24	72AG-161	0.161	20	72AG-166	0.166	19
4,000	72AG-136	0.136	29	72AG-149	0.149	25	72AG-159	0.159	21	72AG-166	0.166	19
5,000	72AG-136	0.136	29	72AG-147	0.147	26	72AG-157	0.157	22	72AG-161	0.161	20
6,000	72AG-136	0.136	29	72AG-144	0.144	27	72AG-154	0.154	23	72AG-159	0.159	21
7,000	72AG-128	0.128	30	72AG-144	0.144	27	72AG-149	0.149	25	72AG-157	0.157	22
8,000	72AG-128	0.128	30	72AG-140	0.140	28	72AG-147	0.147	26	72AG-154	0.154	23
9,000	72AG-128	0.128	30	72AG-136	0.136	29	72AG-144	0.144	27	72AG-152	0.152	24
10,000	72AG-120	0.120	31	72AG-136	0.136	29	72AG-140	0.140	28	72AG-147	0.147	26

PROPANE GAS

ELEVATION	60,00 BTU FURNACE			70,00 BTU FURNACE			77,00 BTU FURNACE			90,00 BTU FURNACE		
	PART NO.	ORIFICE DIA.	DRILL SIZE	PART NO.	ORIFICE DIA.	DRILL SIZE	PART NO.	ORIFICE DIA.	DRILL SIZE	PART NO.	ORIFICE DIA.	DRILL SIZE
SEA LEVEL	72AG-086	0.086	44	72AG-093	0.093	42	72AG-096	0.096	41	72AG-104	0.104	37
2,000	72AG-082	0.082	45	72AG-093	0.093	42	72AG-093	0.093	42	72AG-101	0.101	38
3,000	72AG-082	0.082	45	72AG-089	0.089	43	72AG-093	0.093	42	72AG-099	0.099	39
4,000	72AG-082	0.082	45	72AG-089	0.089	43	72AG-093	0.093	42	72AG-099	0.099	39
5,000	72AG-081	0.081	46	72AG-089	0.089	43	72AG-089	0.089	43	72AG-098	0.098	40
6,000	72AG-078	0.078	47	72AG-086	0.086	44	72AG-089	0.089	43	72AG-096	0.096	41
7,000	72AG-078	0.078	47	72AG-086	0.086	44	72AG-086	0.086	44	72AG-093	0.093	42
8,000	72AG-076	0.076	48	72AG-082	0.082	45	72AG-086	0.086	44	72AG-093	0.093	42
9,000	72AG-076	0.076	48	72AG-081	0.081	46	72AG-082	0.082	45	72AG-089	0.089	43
10,000	72AG-073	0.073	49	72AG-078	0.078	47	72AG-081	0.082	46	72AG-089	0.089	43

Table 3: High Altitude Gas Orifice Size Chart



PROPANE AND HIGH ALTITUDE KITS

It is very important to choose the correct kit and/or gas orifices for the altitude where the appliance will be operating. It is also very important to choose the correct kit and/or gas orifices for the type of gas the appliance will be burning. Only use Natural Gas Orifices in appliances operating on Natural Gas. Only use Propane Gas for appliances that have been converted to use HD-5 Propane (LP) Gas. Do not use this furnace with butane or butane air gases.

Incorrect gas orifices 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** resulting in **personal injury, property damage, a fire hazard and/or loss of life.**

High altitude and HD-5 propane (LP) conversions are required for the appliance to maintain proper operation. 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 insure the appliance has been properly converted by using the correct gas orifices and placing the gas valve regulator in the proper position for the gas being used.

DO NOT attempt to drill out any orifices to obtain the proper size. The orifice MUST be drilled with precision equipment ONLY. Hand drilling orifices WILL CAUSE misalignment of the burner flame causing the flame to impinge on the heat exchanger resulting in premature heat exchanger failure, dangerously high levels of carbon monoxide, personal injury, property damage and/or death.

MODEL G18D	TYPE OF GAS	LENGTH (FT)	PIPE SIZE (IN)	PIPE SIZE IN OD
		to 20	1/2	5/8
	Natural	to 60	1/2	-
60		to 70	-	3/4
		to 40	1/2	-
	Propane	to 70	-	5/8
		to 80	1/2	-
		to 20	-	5/8
		to 50	1/2	-
	Natural	to 60	-	3/4
70		to 80	3/4	-
		to 30	1/2	-
	Propane	to 60	-	5/8
		to 80	1/2	-

MODEL G18D	TYPE OF GAS	LENGTH (FT)	PIPE SIZE (IN)	PIPE SIZE IN OD
		to 20	-	5/8
		to 50	1/2	-
	Natural	to 60	-	3/4
77		to 80	3/4	-
		to 30	1/2	-
	Propane	to 60	-	5/8
		to 80	1/2	-
		to 40	1/2	3/4
	Natural	to 50	-	3/4
90		to 30	1/2	-
	Propane	to 40	-	5/8
		to 60	1/2	3/4

Table 4: Gas Pipe Capabilities

Note: capabilities up to 14" W.C. (0.50 PSI (3.48 kPa)) Gas Pressure through Schedule 40 Pipe.

Cubic Feet per Hour with a pressure drop of 0.3" W C (0.0075 kPa).

Natural Gas – Specific Gravity – 0.60

Propane Gas – Specific Gravity – 1.50

SECTION V: LINE AND LOW VOLTAGE WIRING

POWER SUPPLY

The furnace internal wiring is complete except for the power supply and the thermostat wires. See wiring diagram and/or Table 5, 6 and 7 for fuse and circuit current. The minimum circuit breaker size is 15 amps. A fused switch is recommended to be mounted on the side of the unit fused for the proper current. Multiply 1.25 to the current value shown in the tables below for the proper breaker size. 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.

The furnace must be electrically grounded in accordance with local codes or, in absence of local codes, with the National Electrical Code, ANSI/NFPA 70, and / or the Canadian Electrical Code CSA22.1, Part 1, if an external electrical source is utilized.



USE COPPER CONDUCTORS ONLY.

Proper methods for field installing electrical wiring:

- Between the furnace and devices not attached to the furnace.
- Between the separate devices that are field installed and located.
- Exterior to the furnace between the burner assembly and a limit control or a fan control.

Wiring shall conform to the temperature limitations of 63°F (35°C) rise.

The furnace shall be installed so the electrical components shall be protected from water.

Input	Output	Cabinet Width	Max. External Static Pressure, Duct inwc	AFUE	Air Temp. Rise Range
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	Max Outlet Air Temp	Blower Size	Max. Over-Circuit Protection	Min. 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 Electrical Data

Model	G18D060AH3BA	G18D070AH3BA	G18D077AH3BA	G18D090AH3BA
Blower Motor HP	1/3	1/3	1/3	1/3
Blower Mortor SPD	5	5	5	5
Blower Motor Amps FLA	6.1	6.1	6.1	6.1
Nominal Air Flow	1,100	1,100	1,100	1,100
24 VAC Current @ 60 HZ	0.49	0.49	0.49	0.49
Total Unit Amps	2.54	2.54	2.54	2.54

Table 6: Heating Only Models; Blower Motor Ratings

Model	G18D060CA3BA	G18D070CA3BA	G18D077CA3BA	G18D090CA3BA
Blower Motor HP	1/3	1/3	1/3	1/3
Blower Mortor SPD	5	5	5	5
Blower Motor Amps FLA	6.9	6.9	6.9	6.9
Nominal Air Flow	1,100	1,100	1,100	1,100
24 VAC Current @ 60 HZ	0.49	0.49	0.49	0.49
Total Unit Amps	2.54	2.54	2.54	2.54

Table 7: A/C Ready Models; Blower Motor Ratings

Model	G18D060CA4BA	G18D070CA4BA	G18D077CA4BA	G18D090CA4BA
Blower Motor HP	3/4	3/4	3/4	3/4
Blower Mortor SPD	5	5	5	5
Blower Motor Amps FLA	6.9	6.9	6.9	6.9
Nominal Air Flow	1,700	1,700	1,700	1,700
24 VAC Current @ 60 HZ	0.49	0.49	0.49	0.49
Total Unit Amps	6.7	6.7	6.7	6.7

Table 8: A/C Ready Models; Blower and Motor Ratings

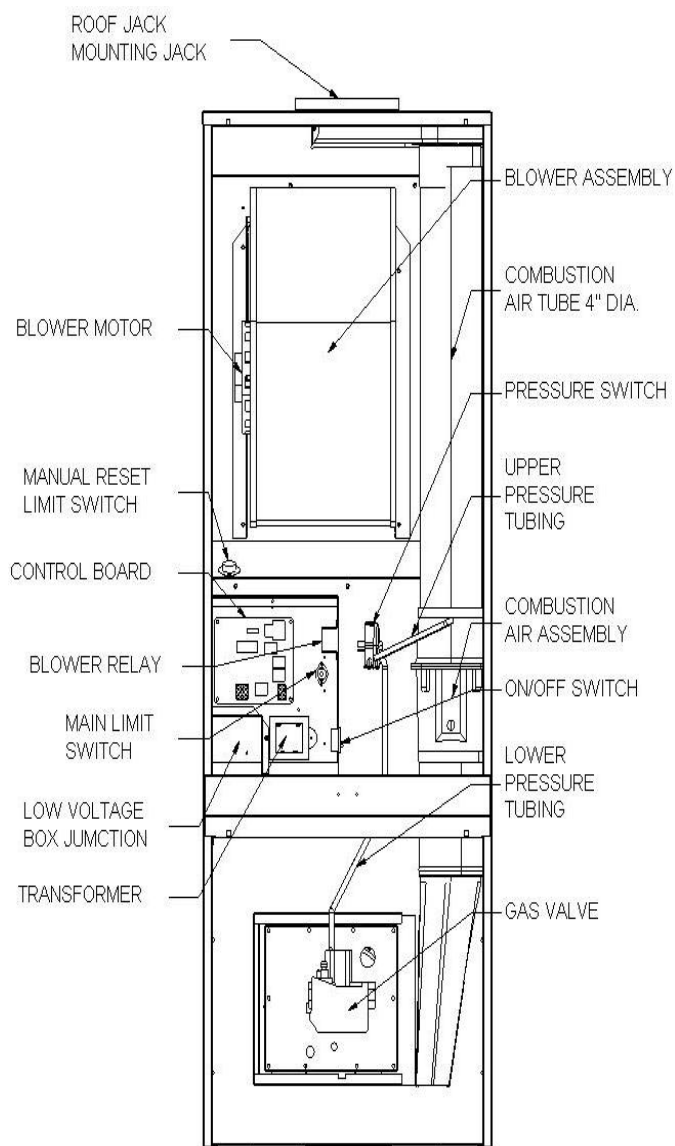


Figure 12: Furnace Component Locations

Line Wiring Connections

1. Remove the control box cover.
2. Install the cable connector on the 5/8" (15.875 mm) dia hole on the left side of the control box.
3. Strip 1/2" (12.7 mm) of the insulation on the end of each wire.
4. Insert the wires through the hole in the casing and through the cable connector.
5. Use a wire nut to connect the black wire to the black pig tail wire and tighten until the wires are securely fastened.
6. Use a wire nut to connect the white wire to the white pigtail wire and tighten until the wires are securely fastened.
7. Use a green ground wire with a ring terminal. Insert a green screw through the ring terminal and into the screw hole and tighten the screw. Make the ground wire is securely fastened to the control box. Connect the new green wire with the bare supply wire and secure with a wire nut, Ground screw hole location is in the small box with the supply voltage wires.
8. Reinstall the control box cover.

⚠ WARNING

For personal safety be sure to turn the electrical power "OFF" at the main entrance (Circuit Breaker Box) and at the appliance before attempting any service or maintenance operations. Home owners and / or furnace users should never attempt to perform any maintenance which requires opening the furnace control box door. Refer to Figure 13 for the location of the ON/OFF switch.

IMPORTANT - All field installed wiring must be done in accordance with the National Electrical Code ANSI/NFPA 70 – latest edition or Canadian Electrical Code CSA C22.1 Part 1 or all local codes. Unit must be electrically grounded according to these codes.

The supply power wires from the main circuit breaker panel to the furnace must be protected with a circuit breaker.

⚠ WARNING

Disconnect 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) or the Canadian Electrical Code, Part 1 (CSA C22.1) and local codes for additional requirements concerning supply circuit wiring.

This appliance must be field wired strictly in accordance with the wiring diagram furnished with this appliance. Any altered wiring or wiring not specified on the wiring diagram could result in a hazard to persons and /or property causing personnel 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 35°C.

Ensure the supply voltage to the appliance is not greater than 5% above or below the rated voltage shown on the appliance rating plate.

Thermostat Wiring

Thermostat wires are routed through side of furnace and connect to the pig tail wires located above the control box. The thermostat wires should also be no smaller than 22 gauges Refer to Table 9 for recommended wire gauge and lengths.

Maximum Wire Length	Thermostat Wire Gauge	Thermostat Wire Maximum Current
0 - 112 Feet	18	3.0 Amps
0 - 70 Feet	20	3.0 Amps
0 - 30 Feet	22	3.0 Amps

Table 9: Low Voltage Wire Gauge and Max Lengths

The low voltage factory wires are 18 gauge. The thermostat wires connect to the pigtail wires of the same color. The use of a five (5) conductor cable from the thermostat to the furnace is recommended for typical heating installations.

The thermostat wire colors and the typical connections are listed in Table 10.

The adjustable heat anticipator in the thermostat is pre-set at 0.40 Amps. This setting should be checked at the time of installation

In most cases the thermostat may be a "self-setting" type in which case no amp setting will be found on the thermostat, eliminating the need for any field adjustment.

Thermostat should be located on an inside wall in an open area to more closely regulate average room air, preferably, where there is air movement back to furnace. Locating height of thermostat is important. Thermostat should be located preferably upstream from the furnace return airflow, not within 3 feet of from any windows, 52 to 66 inches above the floor, where it will not be affected by heat from the unit or other sources, or drafts from frequently opened doors.

DO NOT place the thermostat within 3 feet (91.44 cm) of any the furnace supply air registers

DO NOT place the thermostat within 3 feet (91.44 cm) of any the air conditioner supply air registers

Maintenance, operating and/or programming instructions are in the envelope accompanying the thermostat. Give the envelope to the home owner after the installation is complete.

⚠ CAUTION

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

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

NOTE: There is a 3 Amp slow blow bar fuse located on the left side of the control board that protects the 24 VAC circuit.

Replace the fuse only with the equivalent 3 Amp Automotive type fuse.

Separate Heating and Cooling Thermostats

If the heating/cooling system in your house is a central heating and cooling system but the furnace and the cooling unit are controlled by separate thermostats then the use of a thermostat interlock switch is required in order to prevent the furnace and the air conditioner from operating at the same time.

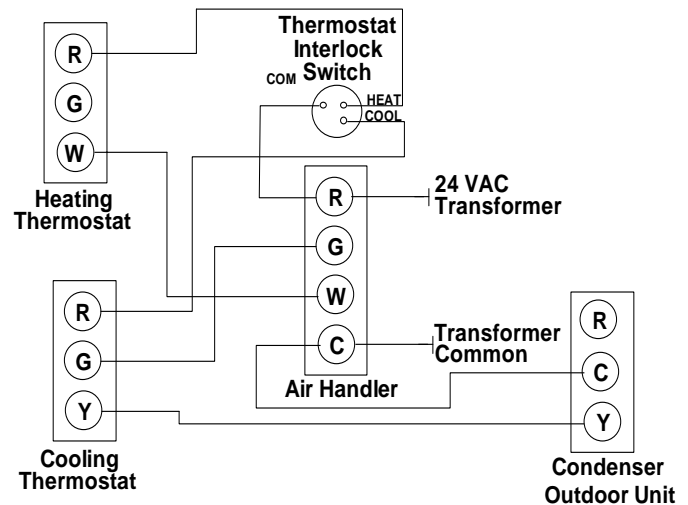


Figure 13: Separate Thermostats, Furnace and Cooling Unit

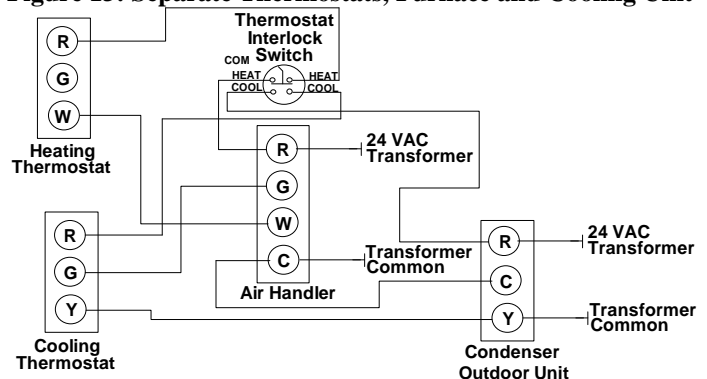


Figure 14: Separate Thermostat, Furnace, Cooling Unit and Transformers

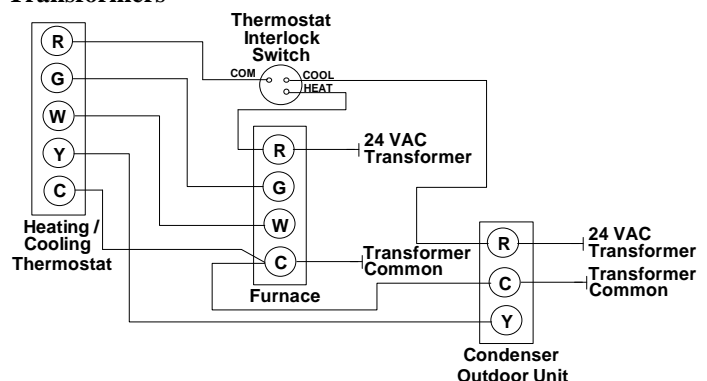


Figure 15: Same Thermostat, Separate Furnace, Cooling Unit and Transformers

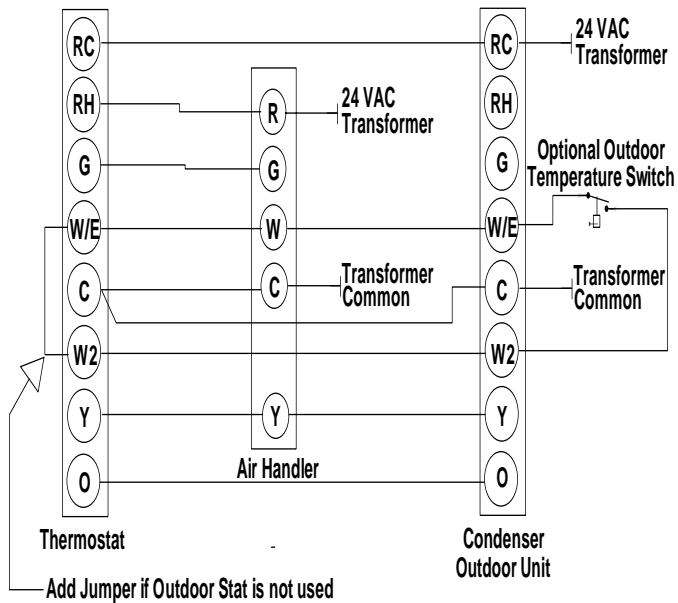


Figure 16: Same Thermostat; Separate Furnace and Heat Pump Unit with separate transformers

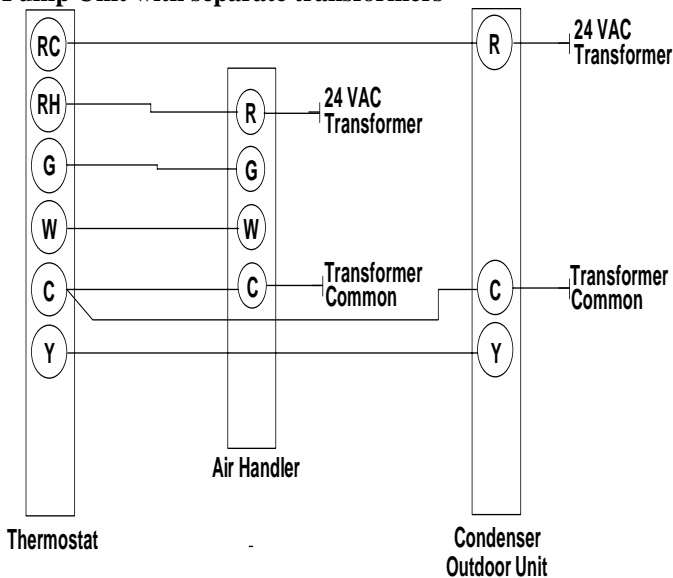


Figure 17: Same Thermostat, separate Furnace and Cooling Unit and transformers

CAUTION

When the furnace and air conditioning units are separate but they are using the same thermostat a thermostat interlock system must be provided to prevent simultaneous operation of the furnace and air conditioner. Simultaneous operation can result in equipment overheating, equipment damage, and energy wastes. Refer to Figures 14, 15 and 16.

Do Not connect the Yellow wire to the thermostat unless an outdoor unit is installed.

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 wire pigtails above the control box.
3. Strip ½" of the insulation on the end of each wire.
4. Connect the Red (24 VAC) supply thermostat wire to the Red low voltage pigtail wire and secure with a wire nut.
5. Connect the White (heating) thermostat wire to the White low voltage pigtail wire and secure with a wire nut.
6. Connect the Green (indoor fan) thermostat wire to the Green low voltage pigtail wire and secure with a wire nut.
7. Connect the Yellow (air conditioning) wire from the thermostat with the Yellow low voltage pigtail wire on the furnace and with the wire that goes to the "Y" terminal on the condenser unit. Fasten the three wires together securely with a wire nut.
8. Connect the Black (24 VAC Common) wire from the thermostat with the Black low voltage pigtail wire on the furnace and with the (Common) wire that is connected to the "C" terminal on the outdoor unit. Fasten the three wires together securely with a wire nut.
9. Reinstall the control box cover.

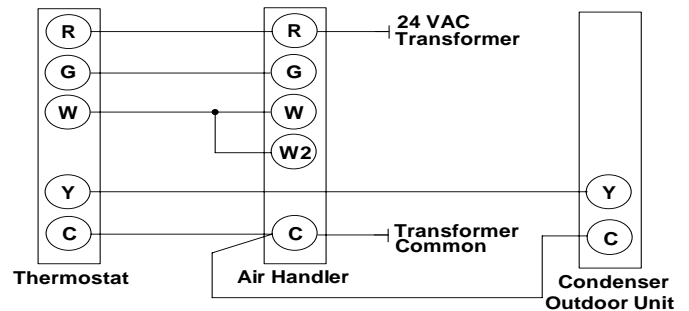


Figure 18: Typical Single Stage Heating/Cooling Digital Thermostat with Two Stage Furnace

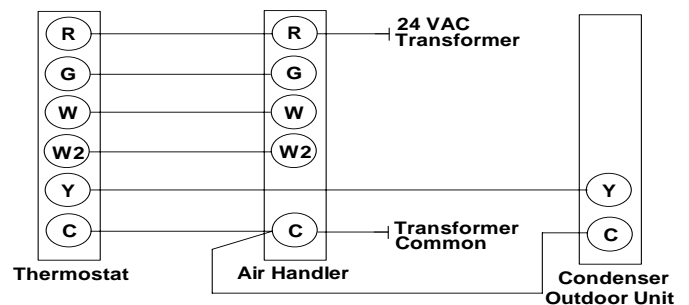


Figure 19: Typical Two Stage Heating/Cooling Digital Thermostat Connections

Typical Heat Pump - 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 wire pigtails above the control box.
3. Strip ½" of the insulation on the end of each wire.
4. Connect the Red (24 VAC) supply thermostat wire to the Red low voltage pigtail wire and secure with a wire nut.

NOTE: If the cooling unit is separate from the furnace and each have a transformer then remove the Red jumper wire on the “RC” and “RH” terminals on the thermostat and connect the wire that goes to the “R” terminal the outdoor unit to the “RC” terminal on the thermostat and connect the wire that goes to the “R” terminal on the furnace to the “RH” terminal on the thermostat. If you do not have the “RH” and “RC” terminals on the thermostat you must buy a new thermostat or a thermostat interlock switch.

1. Connect the White (heating) wire from the thermostat to the White low voltage pigtail wire on the furnace and the White wire from the “E” terminal on the outdoor unit. Fasten the three wires together securely with a wire nut.
2. Connect the Green (indoor fan) wire from the thermostat to the Green low voltage pigtail wire on the furnace and securely fasten the two wires together with a wire nut.

3. Connect the Yellow wire from the thermostat to the yellow wire on the furnace and the wire that is connected to the “Y” terminal on the outdoor unit. Fasten the three wires together securely with a wire nut.
4. Connect the Black (24 VAC Common) wire from the thermostat with the Black low voltage pigtail wire on the furnace and with the (Common) wire from the “C” terminal on the outdoor unit. Fasten the three wires together securely with a wire nut.
5. Connect the Orange (Reversing Valve Solenoid) wire from the thermostat with the wire from the “O” terminal on the outdoor unit. Fasten the two wires together securely with a wire nut.
6. Connect the Brown (2nd Stage Heating) wire from the thermostat with the wire from the “W2” terminal on the outdoor unit. Fasten the two wires together securely with a wire nut.

Heating / Cooling Thermostat Wire Color Code

Wire Color	Description	Letter Code	Furnace Pig Tail Wire Connection	Thermostat Connection	Condenser Connections
RED	24 VAC	R	Red	R	N/A
WHITE	Heat (1st Stage Heat)	W	White	W or W1	N/A
GREEN	Indoor Fan	G	Green	G	N/A
YELLOW	Cooling - Stage 1	Y	Yellow	Y or Y1	Y or Y1
BLACK	24 VAC Common	BLK	Black	C	C

Heat Pump - Heating / Cooling Thermostat Wire Color Code

Wire Color	Description	Letter Code	Furnace Pig Tail Wire Connection	Thermostat Connection	Condenser Connections
RED	24 VAC	R	Red	R	N/A
WHITE	Heat (1st Stage Heat)	W	White	E	N/A
GREEN	Indoor Fan	G	Green	G	N/A
YELLOW	Cooling - Stage 1	Y	Yellow	Y or Y1	Y or Y1
BLACK	24 VAC Common	BLK	Black	C	C
BROWN	Heat (Optional 2nd Stage Heat)	BRN	N/A	W2	W2
ORANGE	Heat Pump Reversing Valve Solenoid	O	N/A	O	O
BLUE	Cooling - (Optional 2nd Stage Cooling)	BLU	N/A	Y2	Y2

Table 10: Recommended Thermostat Wire Colors and Connections.

Note: 24 VAC Common wire must be used for digital thermostats.

SECTION VI: COMBUSTION AIR AND VENT SYSTEM

ROOF JACK VENT SAFETY

Category I — a central furnace that operates with a non-positive vent static pressure and with a flue loss not less than 17 percent. The combustion system is fan assisted.

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.

CATEGORY 1 - 450 F MAX VENT TEMP.

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 Sections 7.2, 7.3 or 7.4 of CSA B149.1, National Gas and Propane Codes

(latest edition) or applicable provisions of the local building code and these instructions.

The furnace shall be connected to the manufacturer recommended roof jack direct vent system, and shall never be connected to a factory-built or masonry chimney.

The furnace shall not be connected to a chimney / vent serving a separate appliance designed to burn solid fuel.

When replacing a competitor’s furnace with a Mortex Furnace the installer MUST change the Roof Jack. The Mortex Roof Jack pipes are smaller. This will cause leaking between the vent and the combustion air if the installer tries to use a Coleman or Nordyne Roof Jack on a Mortex Furnace. The Roof Jack Sizes are shown below:

**Coleman has an 8” Outer Pipe and a 5” Inner Pipe.
Nordyne has an 8” Outer Pipe and a 5” Inner Pipe**

Mortex has a 7" Outer Pipe and a 4" Inner Pipe.

Using a Coleman or Nordyne Roof Jack on a Mortex Furnace will cause vented combustion products to get drawn into the combustion air causing the flame to extinguish within 10 seconds because the flame is running out of oxygen.

These instructions list the maximum vent gas temperature. This temperature must be used to select the appropriate venting clearances.

It is recommended that the appliance is installed in a location where the space temperature is 32 °F (0°C) or higher. If the appliance is installed in a location where the ambient temperature is below 32 °F (0°C), the combustion by-products could condense causing damage to the appliance heat exchanger.

IMPORTANT: The "ROOF JACK VENT SYSTEM" must be installed as specified in these instructions for Manufactured and Modular Homes.

This appliance **cannot be** common vented with another gas appliance.

Combustion air **cannot be supplied** from occupied spaces. The Mortex roof jack vent system **must be used** with this furnace. 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

Category I roof jack direct venting consists of vertically venting one appliance in 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 four inch (4") inner pipe attached to the flue collar (4" collar) on the top of the heat exchanger just below the top of the furnace and an outer seven inch (7") pipe. The combustion air is drawn between the inner four inch (4") pipe and the outer seven inch (7") pipe. The seven inch (7") pipe is attached to a flange in the top cover and must be secured to the top cover with a minimum of two (2) mechanical fasteners, such as screws or rivets.

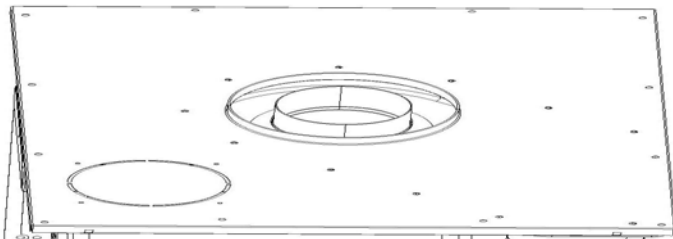


Figure 20: Roof Jack Mounting Collars – Top of Furnace

VENTING INTO AN EXISTING ROOF JACK

The furnace shall not be connected to another manufacturers 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 manufacturers roof jack vent system that is equipped with larger diameter vent and combustion air pipes will cause combustion products being vented to be drawn into the combustion air. This will result in a reduced amount of oxygen to the burner flame and will cause the flame to extinguish within the first 5 to 15 seconds or less.

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

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 inches in dia (Left Pipe) and 4 inches in dia (Right Pipe). The 4 inch dia pipe is placed inside the 7 inch dia pipe. The extensions are used when the roof jack is too short to extend to the furnace. The extensions are available in a 10 inch length and a 31 inch length. Refer to accessories parts list in the Service and Maintenance Manual.

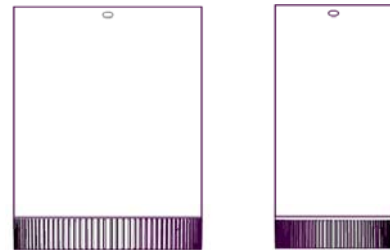


Figure 21: Roof Jack Indoor Extension Pipes

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

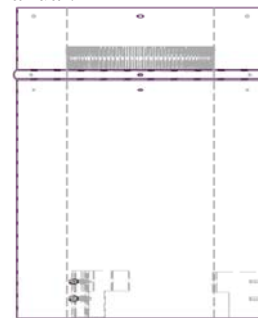


Figure 22: Roof Jack Outdoor Extension Pipes

5. The roof jack crown assembly must extend at least three (3) ft (0.91 cm) above the highest point where it passes through a roof of a building and at least two (2) feet higher than any

portion of the building with a horizontal distance of ten (10) feet.

6. The roof jack must extend at least five (3) ft (0.9 m) above the highest equipment draft hood or flue collar.

PREVENTING BLOCKAGE BY SNOW

If furnace combustion products enter the building from outdoors through wall openings adjacent to furnace vent (and air intake) terminal(s) because of wind and/or snow blockage of terminal(s), exposure to carbon-monoxide could cause severe personal injury or death due to carbon monoxide poisoning. Permanently seal such wall openings.

WARNING

CARBON-MONOXIDE POISONING HAZARD

Failure to follow the furnace instructions could result in severe personal injury or death due to carbon-monoxide poisoning, if combustion products infiltrate into the building.

Install the furnace vent at a height of at least 12 inches (30.5 mm) above the Annual Mean Maximum Daily Snowfall or Average Maximum Snow Depth as described below.

BLOCKAGE BY SNOW

If furnace combustion products enter the building from outdoors through wall openings adjacent to furnace vent and air intake because of wind/or snow blockage of vent terminal, exposure to carbon-monoxide could cause severe personal injury or death due to carbon-monoxide poisoning.

The area and the spaces where roof jack pipe penetrates the roof must be permanently sealed to prevent water leakage and to prevent entry of combustion products into the living space

The Annual Mean Maximum Daily Snowfall or Average Maximum Snow Depth can be found at one of the following websites.

- The Annual Mean Maximum Daily Snowfall is reported by the National Oceanic and Atmospheric Administration (NOAA) at <https://ncdc.noaa.gov/maps/ncei/rsi>
- The Average Maximum Snow Depth is reported by National Resources Canada (NRC) at <https://www.currentresults.com/Weather/Canada/Cities/snowfall-annual-average.php>

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.**

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 you must first install roof saddle. 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, then the installer will be responsible for providing a suitable field fabricated roof saddle. Refer to Figure 22:

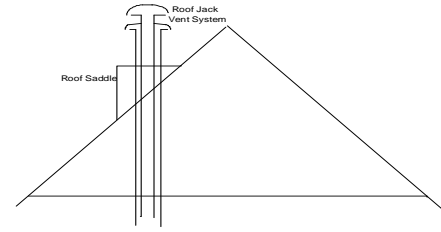


Figure 23: Roof Jack Slope Saddle

INSTALLING THE ROOF JACK VENT ASSEMBLY

The final assembly procedure for the vent piping is as follows:

1. A 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 down the 4" diameter inner roof jack pipe 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, leaking can occur, causing the furnace to malfunction.
5. Pull down the 7" diameter outer roof jack pipe 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. Be sure to 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, leaking can occur, causing the furnace to malfunction.
6. Install the optional ceiling trim ring. Refer to accessory part list in the Service and Maintenance Manual for the part number.
7. Caulk or use roof 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 about 2" apart.

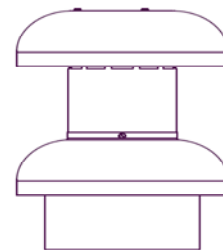


Figure 24: Roof Jack Crown Assembly

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.

Ambient Combustion Air Supply

This type installation will not draw the air required for combustion from within the space surrounding the appliance and from areas or rooms adjacent to the space surrounding the appliance.

An **unconfined space** is not less than 50 cu-ft (1.42 m³) per 1,000 Btu hr. (0.2928 kW) input rating for all of the appliances installed in that area.

Rooms communicating directly with the space containing the appliances are considered part of the unconfined space, if openings are not furnished with doors.

A **confined space** is an area with less than 50 cu-ft (1.42 m³) per 1,000 Btu hr. (0.2928 kW) input rating for all of the appliances installed in that area. The following must be considered to obtain proper air for combustion and ventilation in confined spaces.

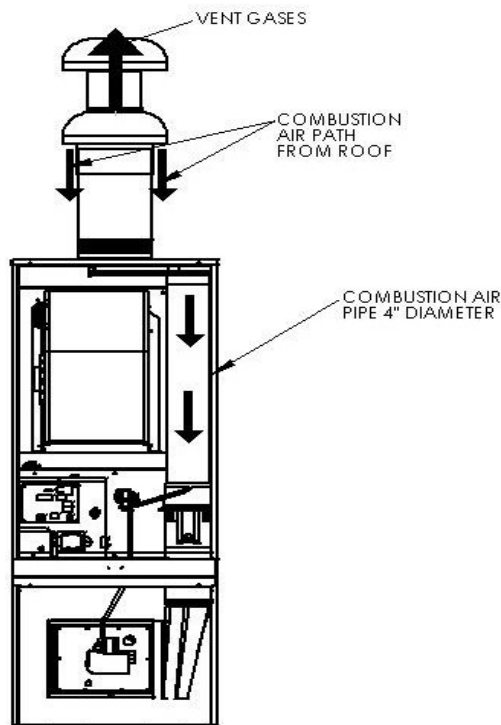


Figure 25: Combustion Air Path through the Roof Jack & Combustion Air Pipes

⚠ WARNING

This type of installation requires that the supply air to the appliance(s) be of a sufficient amount to support all of the appliance(s) in the area. Operation of a mechanical exhaust, such as an exhaust fan, kitchen ventilation system, clothes dryer or fireplace may create conditions requiring special attention to avoid unsatisfactory operation of gas appliances. A venting problem or a lack of supply air will result in a hazardous condition, which can cause the appliance to soot and generate dangerous levels of CARBON MONOXIDE, which can lead to serious injury, property damage and / or death.

Combustion Air Source from Outdoors

The blocking effects of louvers, grilles and screens must be given consideration in calculating free area. If the free area of a specific louver or grille is not known, refer to Table 11, to estimate free area.

Wood or Metal Louvers or Screens	Wood 20% - 25% * Metal 60% - 70% *
Screens +	1/4" (0.635 cm) Mesh or larger 100%

Table 11: Estimated Free Area

+ Do not use less than 1/4" (0.635 cm) mesh screen.

* Free area of louvers and grille varies widely; the installer should follow louver or grille manufacturer's instructions

FREE AIR CALCULATION FOR COMBUSTION AND VENTILATION

To calculate the amount of free area required for combustion and ventilation you can use the following calculation.

- Determine the available room volume:
Room volume is 15 ft x 20 ft with an 8 ft ceiling = **2400 ft³**
- Determine the total required volume: The standard method to determine combustion air will be used to calculate the required volume. The combined input of all of the gas appliances is calculated as follows:
BTU Input appliance 1 + BTU Input appliance 2 = Total BTU Input for all appliances.
Ex if appliance 1 = 40,000 and appliance 2 = 40,000 the total BTU Input will be **80,000**
- The standard method requires that the required volume be determined based on 50 cubic ft per 1000 BTU/hr. The calculation would be the 50 cubic ft per 1000 BTU/hr by the **80,000 BTU** Input of all appliances (50 x 80 = **4000 ft³**)
- Determine ratio of the available volume to the required volume:
2400 ft³ available room volume from step 1
4000 ft³ required volume from step 3
= **0.60**
- Determine the reduction factor to be used to reduce the full outdoor air opening size to minimum required based on ratio of indoor spaces.
1.00 - **0.60** (from step 4) = **0.40**
- Determine the single outdoor combustion air opening size as if all combustion air is to come from outdoors.
80,000 Btu/hr = **26.67 in²**
3,000 Btu/in²
- Determine the minimum outdoor combustion air opening area:
Outdoor air opening = **0.40** (from step 5) x **26.67** (from step 6) = **10.668 in²**

NOTE: The gas furnace is not included in the calculation because the roof jack vent system is a direct vent system that gets its combustion from outside and does not require any ambient/ room air for combustion.

⚠ 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, and or death.

Ventilated Combustion Air

The ventilated combustion air is air that is taken from an attic space or a crawl space. Ventilated combustion air practice is not allowed for Manufactured Home or Modular Home installations.

VENT CLEARANCES

IMPORTANT: The vent must be installed with the following minimum clearances as shown in Figure 26 and Table 12, 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.

Vent shall 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.

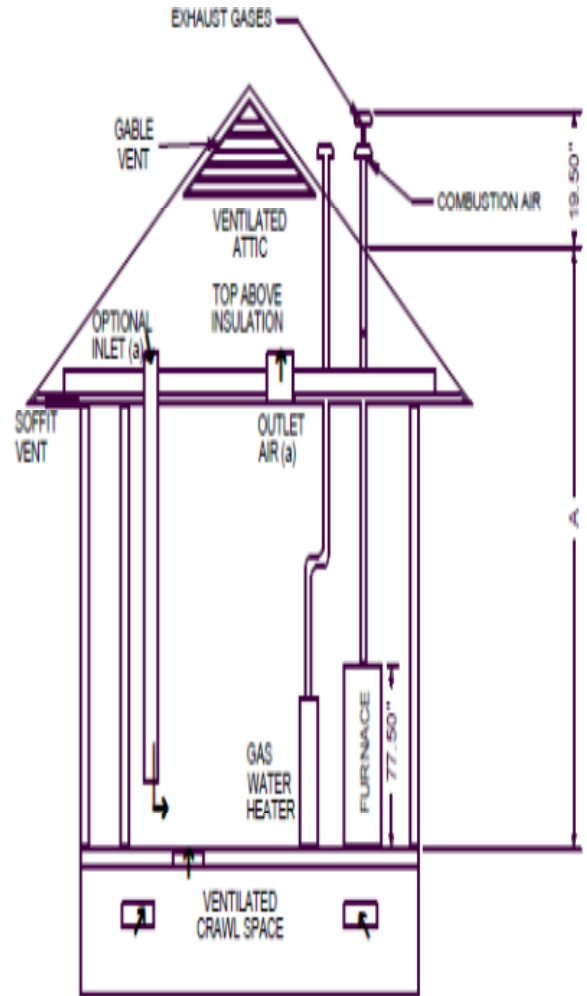


Figure 26: Outside Ambient Combustion Air Openings and Ducts

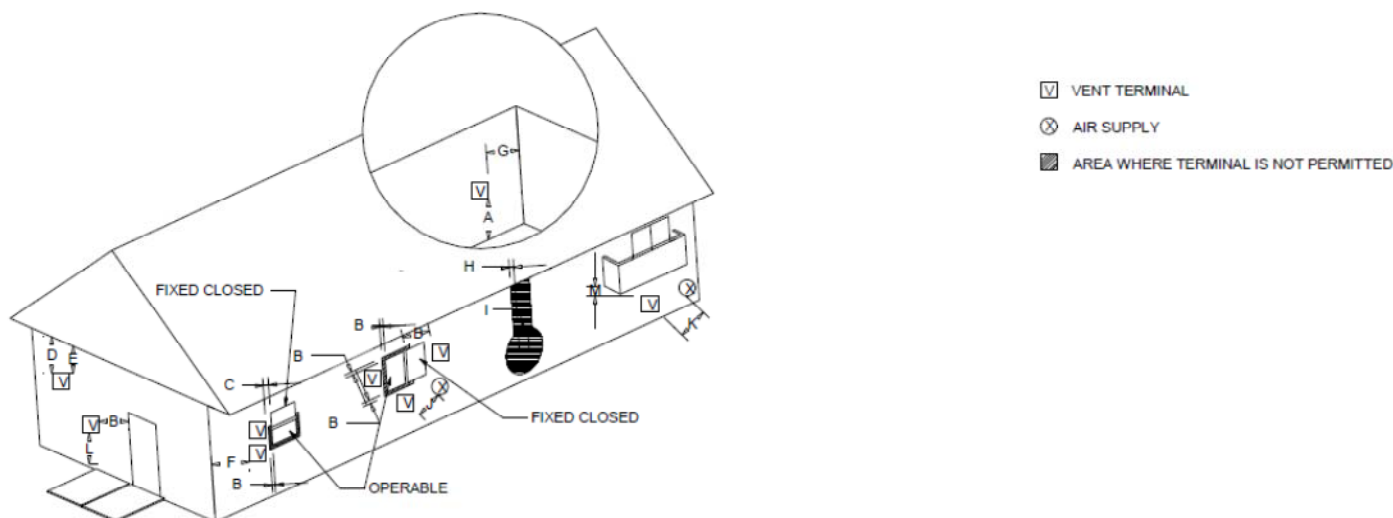


Figure 27: Home Layout and Vent Clearances

	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 extended above 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 m) horizontally
L Clearance above paved sidewalk 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 12: Vent Clearances

1. In accordance with the current CSA B149.1-00, Natural Gas and Propane Installation Code.

2. In accordance with the current ANSI Z223.1 / NFPA 54, National Gas Code.

† 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 or CSA B149.1-00

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

Any fresh air or make up inlet for dryer or furnace area is considered to be forced air inlet.

Avoid areas where condensate drainage may cause problems, such as above planters, patios, or adjacent to windows where steam may cause fogging.

A terminus of a vent shall be either:

- Fitted with cap accordance with the vent manufacturer's Installation Instructions
- Or in accordance with the Installation Instructions for a special venting system.

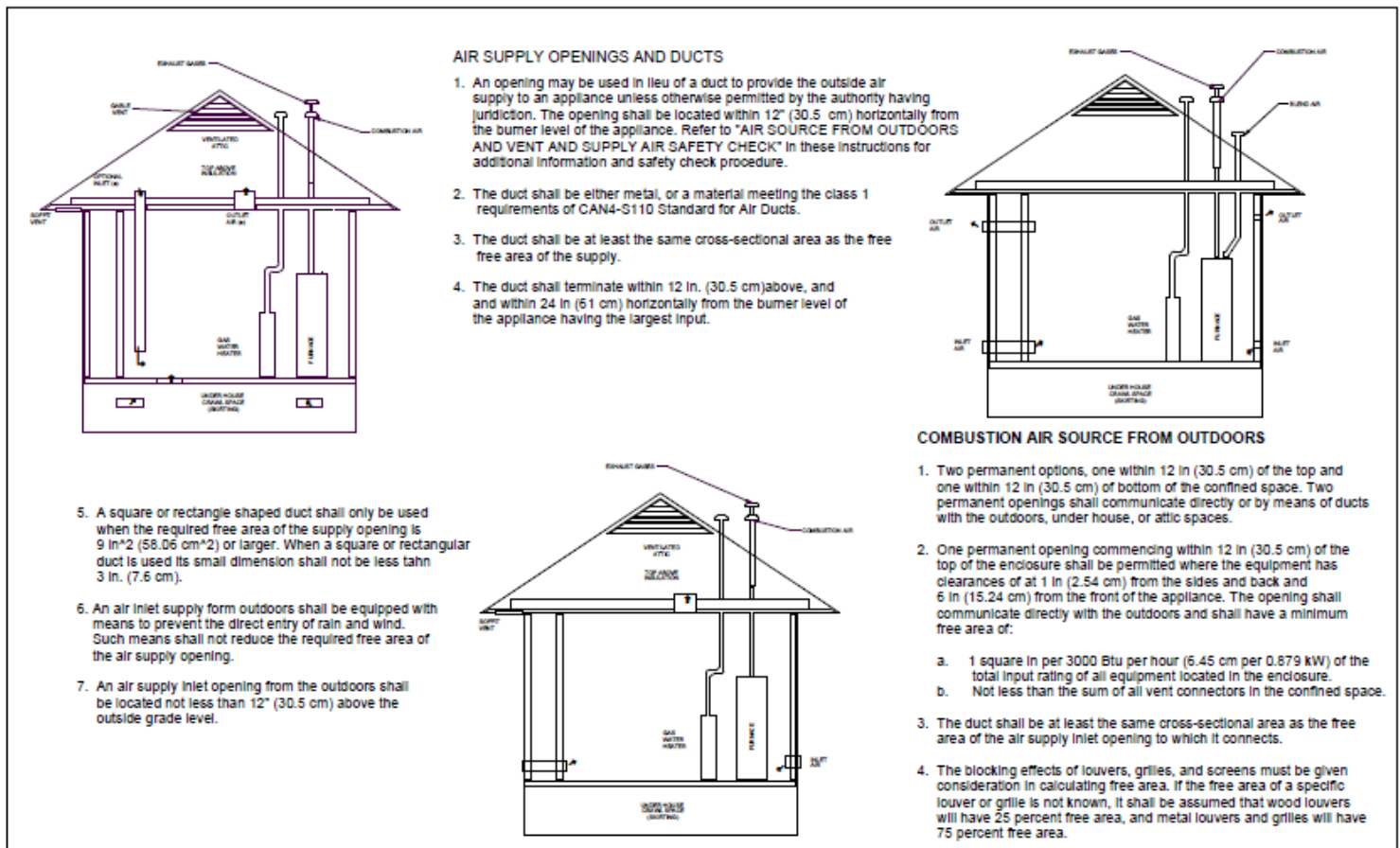


Figure 28: Outside Combustion Air and Vent Safety Check Procedure

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, and or Section 7 and Appendix B of the CSA B149.1, Natural Gas and Propane Installation Codes, the local building codes, furnace and vent manufacturer's instructions.

Multi-story or common venting systems are permitted and must be installed in accordance with the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 and / or the CSA B149.1, Natural Gas and Propane Installation Codes, local codes, and the manufacturer's instructions.

Vent connectors serving Category I furnaces shall not be connected into any portion of mechanical draft systems operating under positive pressure.

It is recommended that you follow the venting safety procedure below.

This procedure is designed to detect an inadequate ventilation system that can cause the appliances in the area to operate improperly causing unsafe levels of Carbon Monoxide or an unsafe condition to occur.

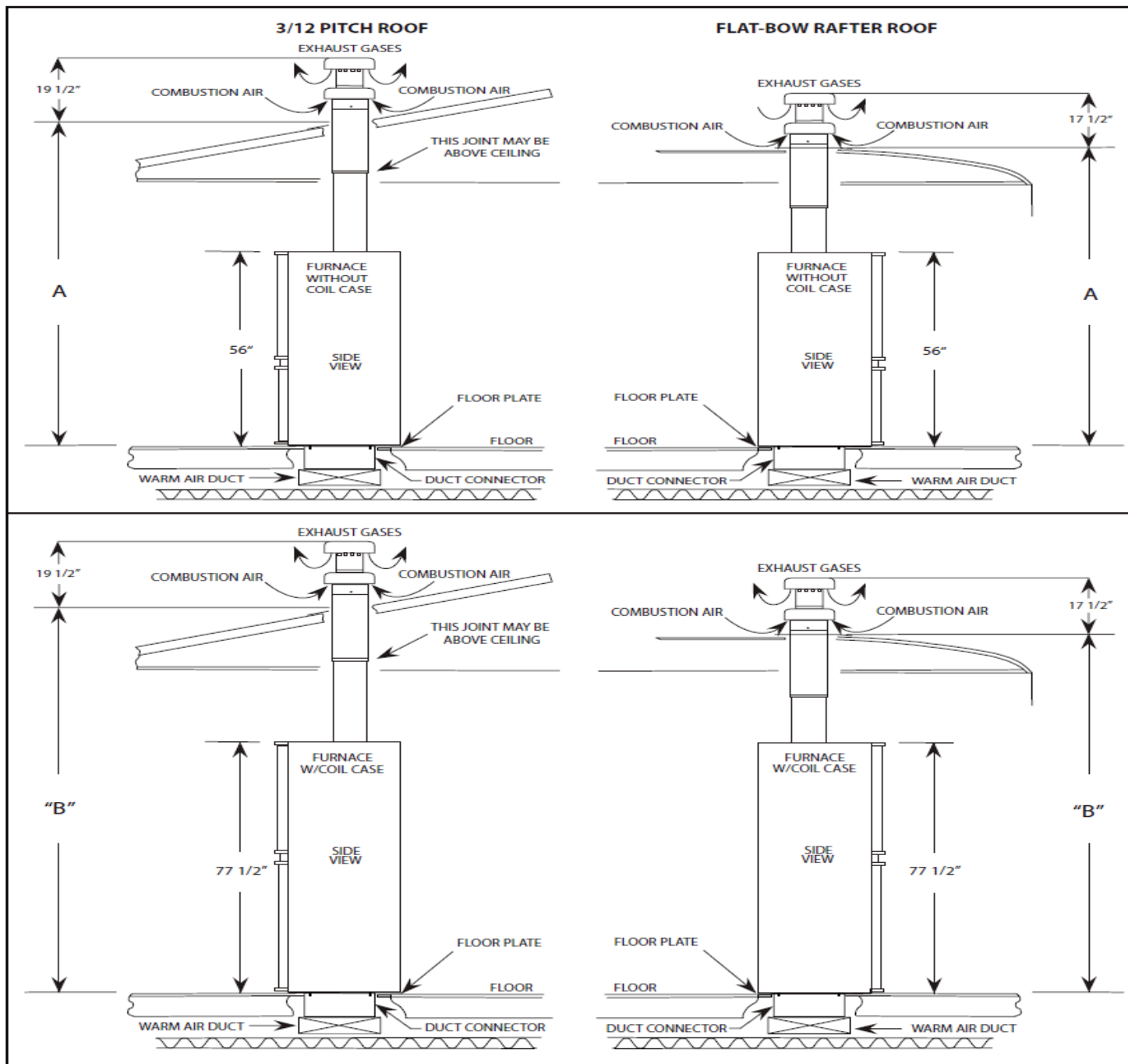


Figure 29: Typical Roof Jack Installation

THE SEALED COMBUSTION VENT SYSTEM CONSISTS OF: ROOF JACK BODY AND ROOF JACK CROWN ASSEMBLY			FURNACE SERIES G18D BH 56"	FURNACE SERIES G18D BC 77.5"
PART NUMBER ROOF JACK BODY	TELESCOPING RANGE	FOR FLAT OR SLOPED ROOF	"A" ADJUSTABLE HEIGHT	"C" ADJUSTABLE HEIGHT
90-RJF1729-AL	17" - 29"	FLAT	73" - 85"	94.5" - 106.5"
90-RJF2551-AL	25" - 51"	FLAT	81" - 107"	102.5" - 128.5"
90-RJS1729-AL	17" - 29"	3/12	73" - 85"	94.5" - 106.5"
90-RJS2551-AL	25" - 51"	3/12	81" - 107"	102.5" - 128.5"
90-RJS3868-AL	38" - 68"	3/12	94" - 124"	115.5" - 145.5"
90-RJS6399-AL	63" - 99"	3/12	119" - 155"	140.5" - 176.5"

Table 13: Roof Jack Specifications

WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death.

The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

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

SECTION VII FURNACE STARTUP, DIAGNOSTICS AND SEQUENCE OF OPERATION

WARNING

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

CHECKING THE INPUT RATE

CAUTION

Check the gas inlet pressure at the unit upstream of the combination gas control. The inlet pressure should be 6-7" W.C. (1.494-1.743 kPa) on natural gas or 10-12" W.C. (2.49-2.988 kPa) on propane. 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 temperatures.
2. A "U" tube monometer or portable pressure gauge that measures 0-15 in-wc. (0-3.735 kPa) to measure the line 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 motor will start and come up to speed.
 - b. This will cause the air pressure in the induced draft housing to increase closing the pressure switch contacts once 0.55" w.c (0.137 kPa) +/- .05" w.c (0.01245 kPa) has been reached.
 - c. Once the pressure switch is closed the ignitor is energized. There is a 17 second warm up to give the ignitor time to reach its operating temperature.
 - d. After the 17 second ignitor warm up the gas valve is energized. Gas starts to flow, ignition occurs and flame sensor begins sensing the flame.
 - e. 65 seconds after flame sense begins the blower motor will start on the control board speed tap terminal labeled "HEAT". The 115 VAC will energize the blower relay coil closing the normally open contacts #2 and #4 sending 24 VAC to the selected blower motor speed tap that is connected to terminal #4 on the blower relay. Factory default is the Medium speed tap wire is placed on terminal #4 on the blower relay. If the sensor does not sense a flame the blower will not start.

Input Adjustments

The gas pressure regulator (part of the gas control) is adjusted at the factory for average gas conditions. It is important that gas be supplied to the heater in accordance with the input rating printed on the serial plate. Actual input should be checked and necessary adjustments made after the heater is installed. Over-firing, a result of too high an input, reduces the life of the unit, and increases maintenance. Under no circumstances should the input exceed that shown on the rating plate.

Input can be determined by the meter-timing method provided other gas equipment connected to the meter is off during the test. If this is not possible, use the pressure method.

Important – Inlet pressure and manifold pressure must be checked with unit in operation when making final adjustments.

Meter Timing Method

- 1 Shut off all other gas-burning equipment, including other pilot lights served by the gas meter.
- 2 Start the heater and determine the number of seconds it takes to consume 2 cu. ft. (0.0566 cu m) of natural gas or 1 cu. ft. (0.02831 cu. m) of propane gas. Three basic formulas are useful in determining the appliance input:

The heating value of gas may be determined 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 (38.4 MJ/m³) for natural gas
Use 2500 (93.15 MJ/m³) for propane gas

T = Time to consume 1 or 2 cu-ft. of gas.

BTU = Heating Value of the gas. The formula for the input calculation using a cubic foot gas meter:

BTU/ft³ x No of cu-ft. x 0.960 x 3600 ÷ time in seconds to consume the cu-ft of gas.

Example: Calculating the input for an appliance operating on natural gas is as follows:

$$1030 \times 2 \times 0.960 \times 3600 \div 158.0 = 45,059$$

Note: **158.0** in above calculation is in seconds

Example: Calculating the input for an appliance operating on propane (LP) gas is as follows:

$$2500 \times 1 \times 0.960 \times 3600 \div 192.0 = 45,000$$

Note: **192.0** in above calculation is in seconds

Note: Do not use MJ/m³ number in the above calculations. If you're heating value is in MJ/m³ convert to imperial measurement by dividing the MJ/m³ value by 0.0372816 to get BTU ft³

Table 14: Input Calculations for a CU-FT Gas Meter

The formula for the input calculation of the appliance if you're heating value is in MJ/m³, you using a cubic meter gas meter. Example, calculating the input for an appliance operating on **natural gas** is as follows:

$$\text{MJ/m}^3 \times \text{m}^3 \times 0.960 \times 3600 \div \text{time to consume the m}^3 \text{ of gas.}$$
$$38.4 \times 0.0566 \times 0.960 \times 3600 \div 279 = 47.54 \text{ MJ/H}$$

Then multiply MJ/H value by 0.2777 to get kW/H as shown below

$$47.54 \times 0.2777 = 13.201$$

If BTU/H value is desired, then multiply kW/H value by 3412.14 to get BTU/H as shown below

$$13.201 \times 3412.14 = 45,047$$

Example, calculating the input for an appliance operating on **propane gas** is as follows:

$$\text{MJ/m}^3 \times \text{m}^3 \times 0.960 \times 3600 \div \text{time to consume the m}^3 \text{ of gas.}$$
$$93.15 \times 0.02831 \times 0.960 \times 3600 \div 338.5 = 47.47 \text{ MJ/H}$$

Then multiply MJ/H value by 0.2777 to get kW/H as shown below

$$47.47 \times 0.2777 = 13.18$$

If BTU/H value is desired, then multiply kW/H value by 3412.14 to get BTU/H as shown below

$$13.18 \times 3412.14 = 44,980$$

Table 15: Input Calculations for an MJ/m³ Gas Meter

ADJUSTMENT OF LINE PRESSURE

If the appliance input is more or less than 5% of the name plate input for model being tested, locate the gas control.

Find the gas valve pressure ports labeled "IN P".

IN P is the inlet or line pressure tap.

- 1 Follow the procedure to "shut off the furnace" located in the Users Information Manual.
- 2 Turn the switch on the gas valve to the "OFF" position.
- 3 Turn off the gas supply at the ball valve or gas cock upstream of the gas valve.
- 4 Use the 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.
- 5 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 29.
- 6 Follow the Operating Instructions located in the Users Information Manual to properly start the appliance.
- 7 Turn the ON/OFF switch on the gas control to the "ON" position. Refer to Figure 13 for switch location.
- 8 Check the line pressure. If the pressure is at the pressure specified in Table 16 then, go to the step 9. If the pressure is not at the correct pressure then keep the appliance operating and adjust the pressure at the regulator upstream of the gas valve until the correct pressure is measured at the gas valve pressure port, then, go to step 9.
- 9 Follow the procedure to "shut off the furnace" located in the Users Information Manual.

- 10 Turn the switch on the gas valve to the “OFF” position.
- 11 Turn off the gas supply at the ball valve or gas cock upstream of the gas valve.
- 12 Remove the “U” tube monometer or pressure gauge from “IN P” and tighten the set screw. Replace the pressure port cap.
- 13 Follow the Operating Instructions located in the Users Information Manual to properly start the appliance.
- 14 Recheck the appliance input. If the appliance is not within 5% of the name plate input rating then, follow the instructions to check the manifold pressure.

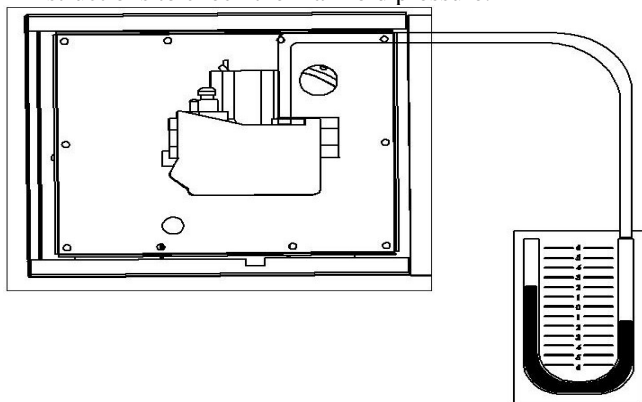


Figure 30: Reading the Inlet (Supply) Gas Pressure (INP)

INLET GAS PRESSURE RANGE		
	NATURAL GAS	PROPANE (LP) GAS
MINIMUM	4.5" W.C. (1.12 kPa)	8.0" W.C. (1.99 kPa)
MAXIMUM	10.5" W.C. (2.61 kPa)	13.0" W.C. (3.24 kPa)

Table 16: Inlet Gas Pressure Range

Table 16 specifies the minimum and maximum gas line pressures that can be supplied to the gas valve. The recommended gas supply line pressures to the gas valve are:

7" W.C. (1.74 kPa) for Natural Gas

11" W.C. (2.74 kPa) for Propane (LP) Gas

CHECKING THE MANIFOLD PRESSURE

Find the gas valve pressure ports labeled “OUT P”.

OUT P is the manifold pressure tap. Refer in Figures 11 and 13 for gas valve pressure port locations.

- 1 Use the 3/32" (2.4 mm) Allen wrench to loosen the set screw by turning it counter clockwise one (1) turn only on the “OUT P” port. **DO NOT REMOVE THE SET SCREW.**
- 2 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 “OUT P” on the gas valve as shown in Figure 30.
- 3 Follow the Operating Instructions located in the Users Information Manual to properly start the appliance.
- 4 With the appliance operating, read the manifold pressure. The pressure should be between 3.3 in-wc and 3.6 in-wc for Natural Gas and 9.8 in-wc and 10.2 in-wc for propane gas. Check the input using the calculations above. If the input is not within 5% of the name plate input then replace the gas valve. Follow the procedure to “shut off the furnace” located in the Users Information Manual.
- 5 Turn the switch on the gas valve to the “OFF” position.

- 6 Turn off the gas supply at the ball valve or gas cock upstream of the gas valve.
- 7 Follow the procedure to “shut off the furnace” located in the Users Information Manual.
- 8 Turn the switch on the gas valve to the “OFF” position.
- 9 Turn off the gas supply at the ball valve or gas cock upstream of the gas valve.
- 10 Remove the pressure hose from the pressure port and tighten the set screw.
- 11 Follow the Operating Instructions located in the Users Information Manual to properly start the appliance.
- 12 Proceed to Temperature Rise Check and Adjustment.

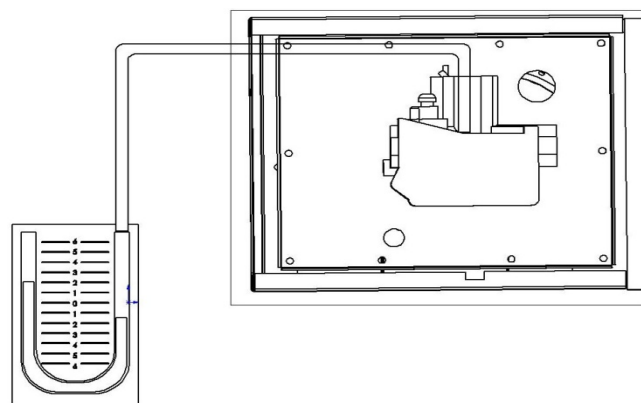


Figure 31: Reading the Outlet (Manifold) Gas Pressure (OUTP):

TEMPERATURE RISE MEASUREMENT AND ADJUSTMENT

⚠ DANGER

The temperature rise, or the temperature difference the return air and the supply air temperature must be within the range specified on the furnace rating plate and within the application limitations shown in Table 5.

The supply air temperature cannot exceed the Maximum Supply Air temperature specified in these instructions and on the furnace rating plate. Under NO circumstances can the furnace 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 one or more holes being burnt through the heat exchanger, causing extremely high levels of carbon monoxide to filter into the living space and / or a fire.

This condition will result in carbon monoxide poisoning, personal injury, property damage and / or death.

To determine the temperature rise you must operate the furnace for approximately 20 minutes. Take the temperature readings 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 return air louvers, before the fan or in the return air duct. Do not try to read the temperature directly above the heat exchangers because the reading will be increased by the radiant heat from the heat exchangers. The manufacturer recommends taking the supply air temperature approximately 6 ft (1.83 m) from the furnace, where applicable.

To change the temperature rise you can increase the blower speed to reduce the temperature rise or you can reduce the blower speed to increase the temperature rise.

⚠ DANGER

Under NO circumstances can the limit control be changed to a different temperature setting. The limit control is designed to protect the heat exchanger from exceeding the maximum allowable temperature and / or preventing the furnace from nuisance tripping.

Changing the temperature of the limit control will cause either premature heat exchanger failure which will cause personal injury, property damage, a fire, and / or death.

CONTROL BOARD FAN ADJUSTMENT SETTINGS

This furnace is equipped with a time ON pin jumper and time OFF pin jumper to change the indoor blower on and off delays. Blower timing select

Jumper is provided to select between 3 heat blower off delay times: 120, 150 and 180 seconds. The control is configured with the jumper in the "150" position. The control defaults to 150 seconds if the jumper is not attached. The control board is labeled; **OFF 120 150 180**

Jumper is provided to select between 3 heat blower on delay times: 60, 75 and 90 seconds. The control is configured with the jumper in the "60" position. The control defaults to 90 seconds if the jumper is not attached. The control board is labeled; **ON 60 75 90**

The fan setting must be long enough to adequately cool the furnace but not so long that the furnace is blowing cool air into the heated space. The fan/blower setting can be adjusted by repositioning the jumper on two of the other pins as shown in Figure 31.

The wiring connections are as follows

COM = 24 VAC Common from transformer

SEC = 24 VAC Line from transformer

W = 24 VAC from the W terminal on the thermostat

G = 24 VAC from the G terminal on the thermostat

C = 24 VAC Common connection to the C terminal on the thermostat (required on digital thermostats)

R = 24 VAC supply connection to the R on the thermostat

Y = 24 VAC from the Y terminal on the thermostat

NEUTRALS = 120 VAC Neutrals terminal connections the transformer, blower motor and the incoming neutral wire are

connected to these terminals.

HEAT = 120 VAC Blower speed tap connection for heating speed

COOL = 120 VAC Blower speed tap connection for cooling speed

XFMR = 120 VAC connection to the transformer.

L1 = 120 VAC incoming power supply to the board.

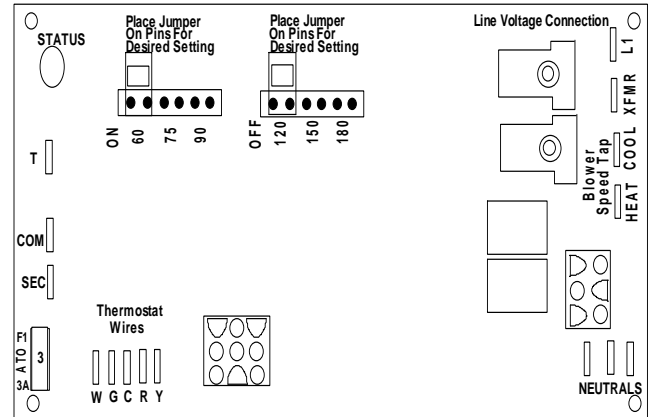


Figure 32: Integrated Control Board – Top View

INTEGRATED CONTROL DIAGNOSTICS

The control board has built-in diagnostic capability. If a problem occurs, a blinking LED shows a fault code. The LED can be viewed through the sight glass in the control box cover.

The control continuously monitors its own operation and the operation of the system. If a failure occurs, the green LED will indicate the failure code by the number of flashes.

If the LED is on steady, the control is operating normally. If the LED is off, this indicates the power to the control is off, the 3 amp fuse on the control board has blown or the control board is defective. Check the power and the fuse. If there is 120 VAC to the control board on the L1 and NEUTRAL terminals and there is 24 VAC on the "SEC" and COM terminals but, the STATUS LED is not on and the board will not operate. If you do not have 24 VAC on the "R" terminal check the fuse. If the fuse is good then, the board is defective and must be replaced.

Flash codes 1 – 5 are as follows. A Green LED labeled "STATUS" is provided to indicate system faults.

1 Flash - Lockout due to failed ignition.

2 Flashes - Pressure switch fault, pressure switch stuck open

3 Flashes - Pressure switch fault, pressure switch stuck closed

4 Flashes - Limit switch is open, or limit switch fault (5 limit cycles during single call for heat, or limit open for more than 5 minutes)

5 Flashes - Flame sense or gas valve fault

Rapid Flash - L1/Neutral reversed or voltage not present on L1

Normal Heating Mode Sequence

Thermostat Call for Heat: The thermostat calls for heat by energizing the "W" terminal. The control 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 "3" on the Status LED after 60 seconds.

Pressure Switch Proving: The control energizes the induced draft motor and waits for the pressure switch to close. If the pressure switch does not close within 60 seconds of the inducer energizing, the control will lockout, de-energize the inducer, and begin to flash "2" on the Status LED.

Pre-Purge: The control runs the inducer for a 25 second pre-purge time, during which the pressure switch must remain closed.

Igniter Warm Up: The control energizes the HSI output for 25 seconds. The inducer remains energized, and the pressure switch must remain closed.

Ignition Activation Period: The control energizes the main gas valve for 5 seconds. The inducer and ignitor outputs remain energized.

Flame Proving Period: The control de-energizes the hot surface igniter. The gas valve and inducer outputs remain energized. If flame is present 2 seconds after the ignitor de-energizes, the control goes to blower on delay. If flame is not present, the control de-energizes the gas valve and proceeds with ignition re-try. There are 3 retries then the control goes into hard lockout.

Blower on Delay: If flame is present, the control energizes the blower on HEAT speed after the selected blower on delay following flame being proven. The gas valve and inducer outputs remain energized.

Steady State Heating Control inputs are continuously monitored to ensure limit and pressure switches are closed, flame is established, and the thermostat call for heat remains.

Post Purge: When the thermostat demand for heat is satisfied, the control de-energizes the gas valve. The inducer output remains on for a 15 second post-purge period.

Blower off Delay: The indoor blower motor is de-energized after the selected blower off delay. Blower off delay timing begins when the thermostat is satisfied.

Interrupted Thermostat

If the thermostat demand for heat is removed before the flame recognition period, the control will run the inducer for the post purge period and de-energize all outputs.

If the thermostat demand for heat is removed after the flame recognition period (successful ignition), the induced draft motor will run through a post purge and the indoor blower motor will run on heat speed for the selected delay off time.

Ignition Re-try

If flame is not established on the first trial for ignition period, the gas valve is de-energized and the inducer remains energized for an inter-purge period of 25 seconds. The ignitor is then re-

energized for a warm up period, and the control 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 de-energizes the gas valve, flashes "1" on the Status LED, and lockouts out heat operation for 1 hour.

Ignition Re-cycle

Flame must not be sensed for 2 seconds before the control responds to a loss of flame. If flame is established and maintained during the trial for ignition period and then flame is lost, the gas valve is de-energized within 0.8 seconds, the induced draft motor continues to run, and the control begins timing the 25 second inter-purge delay. The indoor blower motor will be energized and/or remain energized on heat speed for the selected delay off time.

When the inter-purge delay is over, the ignitor is re-energized, and the control initiates another ignitor warm-up and ignition activation period. The control will re-cycle up to 6 flame losses (5 re-cycles) within a single call for heat before going to lockout.

Call for Fan

When the thermostat calls for continuous fan (G) without a call for heat, the indoor fan is energized on the COOL speed after a 0.25 second delay.

If a call for heat (W) occurs during continuous fan, the blower will de-energize.

When the thermostat removes the call for fan ("G"), the control de-energizes the cooling speed fan after a fan off delay period of 20 seconds.

Limit Switch Operation

Any time the limit switch opens, the gas valve and ignitor will be de-energized, the indoor blower motor will run on heat speed, the induced draft motor will run continuously, and the Status LED will flash a fault code of "4".

Limit Switch Re-Closes

If the switch re-closes after being open for less than 6 minutes, the induced draft motor will run through a post-purge delay, and the indoor blower will run through the selected blower off delay. The control will then attempt another 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 in less than 6 minutes each time, the control will enter a 1 hour lockout period, and, continuing to flash "4" 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, the control will enter a fan failure mode routine. The inducer and indoor blower will be de-energized after the limit switch has been open for 6 minutes, and the control will be locked out, until the thermostat is reset, or power is removed.

When the control has entered this lockout mode, after the limit switch has reclosed, all outputs remain off for 15 minutes. Following the 21 minute delay, the control attempts an ignition trial. After flame is established, the control will operate for 25 seconds, and then de-energize the gas valve and the inducer after a post purge period. All outputs will then remain off for another 15 minute period. The sequence is then continually repeated, with the LED flashing a fault code of "4", until the lockout condition is reset.

Pressure Switch

If the pressure switch opens for more than 2 seconds after flame has been established, the control shall de-energize the gas valve, run through a normal 15 second post-purge and selected heat blower off delay. When the blower off delay is complete, the control shall start an ignition sequence if the thermostat is still calling for heat.

The control shall ignore pressure switch openings of less than 2 seconds (the gas valve will momentarily de-energize while the pressure switch is open, this may cause a loss of flame and the control will respond to the lost flame).

If the pressure switch opens for more than 2 seconds during a pre-purge or inter-purge, the control shall 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 will lockout, de-energize the inducer, and begin to flash "2" on the Status LED.

Undesired Flame

If flame is sensed longer than 4 seconds while the gas valve is de-energized, the control shall keep the induced draft motor energized, the indoor blower motor on heat speed, the other outputs will be kept off, and the control will display a LED fault code of "5". When flame is no longer sensed, the induced draft motor will run through post-purge and the indoor heat speed blower motor will run through the selected blower off delay time. The control will not be locked out. It will continue with normal operation following the blower off delay.

Lockout

Soft Lockout: The control shall not initiate an ignition attempt or continuous fan operation while in lockout. The control will still respond to an open limit and undesired flame. Lockout shall automatically reset after 1 hour. Lockout may be manually reset by removing power from the control for more than 1 seconds 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, or the limit switch open for more than 5 minutes has occurred, the control will be in a hard lockout condition. To reset the lockout, power must be removed from the control for more than 1 second, or the thermostat call must be removed for more than 2 seconds.

SECTION VIII: Blower Performance

G18DxxxAH3BA - 10 x 8 WHEEL 1/3 HP 5 SPD CONSTANT TORQUE MOTOR						
Configuration	SPD Tap	0.1	0.2	0.3	0.4	0.5
CFM - NO COIL	1	635	463	194		
	2	754	671	549	400	204
	3	964	901	814	734	630
	4	1134	1078	1007	943	857
	5	1286	1217	1157	1094	1026

G18DxxxCA3BA - 10 x 8 WHEEL 1/3 HP 5 SPD CONSTANT TORQUE MOTOR						
Configuration	SPD Tap	0.1	0.2	0.3	0.4	0.5
CFM - NO COIL	1	635	463	194		
	2	754	671	549	400	204
	3	964	901	814	734	630
	4	1134	1078	1007	943	857
	5	1286	1217	1157	1094	1026

G18DxxxCA4BA - 10 x 8 WHEEL 3/4 HP 5 SPD CONSTANT TORQUE MOTOR						
Configuration	SPD Tap	0.1	0.2	0.3	0.4	0.5
CFM - NO COIL	1	694	517	137		
	2	1114	986	839	642	289
	3	1405	1308	1201	1087	949
	4	1697	1599	1486	1378	1255
	5	1829	1739	1648	1552	1467

Table 17: Blower Performance

SECTION IX: Wiring Diagram

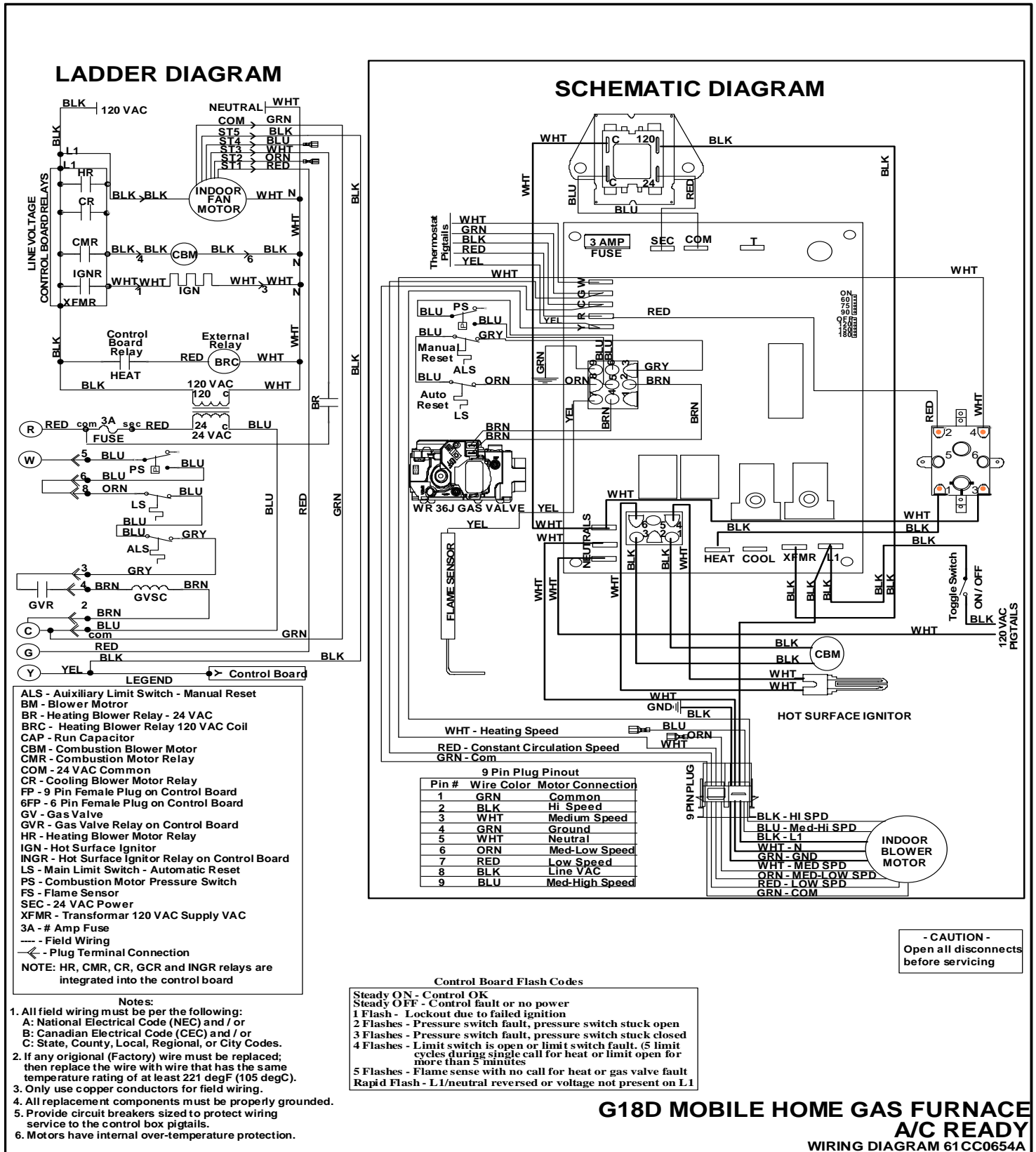


Figure 33: Wiring Diagram A/C Ready Models

NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THIS UNIT MUST BE REPLACED. IT MUST BE REPLACED WITH TYPE 105°C THERMOPLASTIC OR ITS EQUIVALENT.

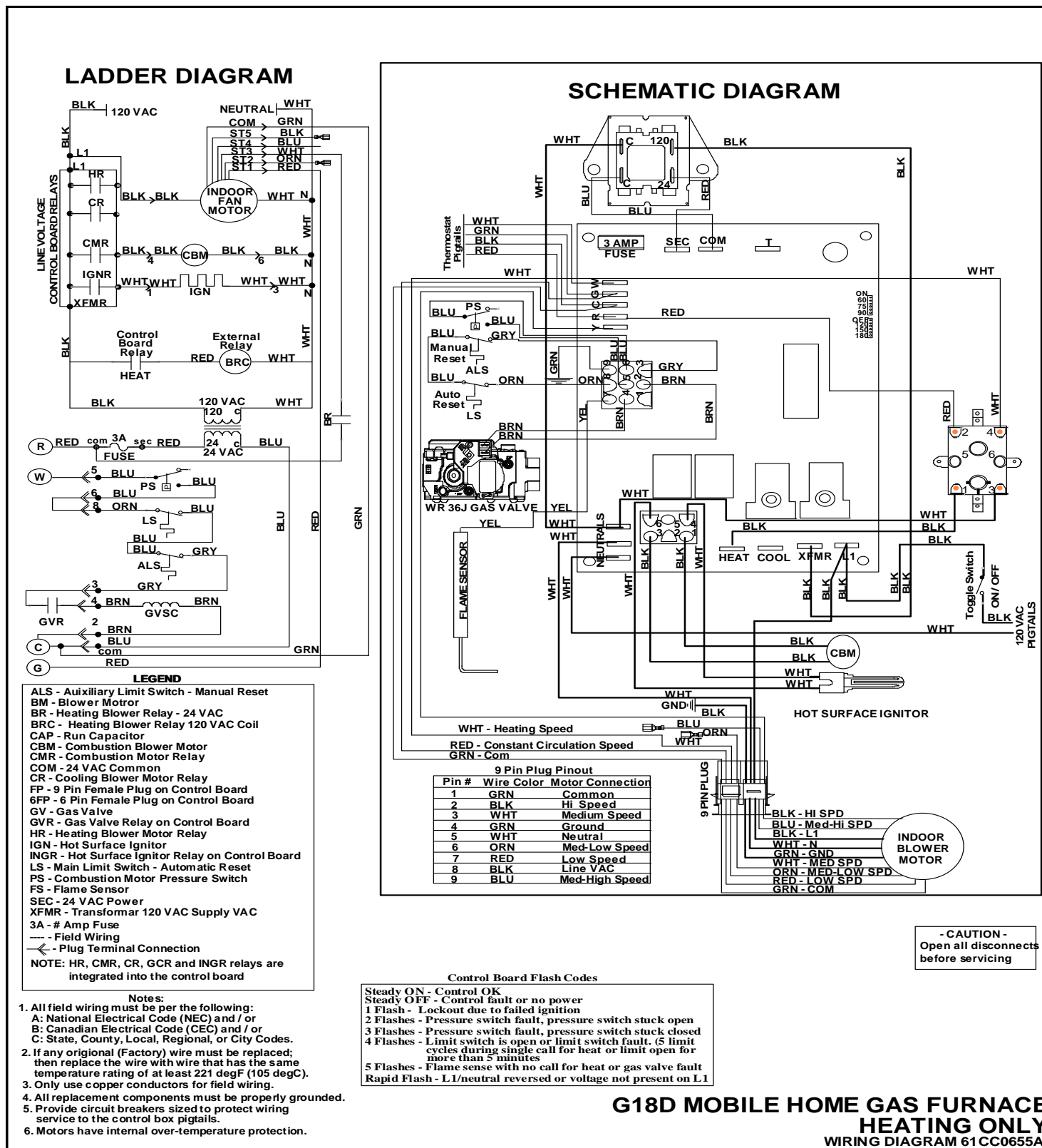


Figure 34: Wiring Diagram Heating Only Models

NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THIS UNIT MUST BE REPLACED. IT MUST BE REPLACED WITH TYPE 105°C THERMOPLASTIC OR ITS EQUIVALENT.