Installation Manual: Two-Stage Standard ECM Residential Gas Furnace Model: BGK80 Non-Condensing Multi-Position/ Low-NOx

Bosch Thermotechnology Corp. 50 Wentworth Avenue Londonderry, NH 03053

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About the unit

These high efficiency, compact units employ induced combustion, reliable hot surface ignition, and high heat transfer aluminized steel tubular heat exchangers. The units are factory-shipped for installation in upflow or horizontal applications and may be converted for downflow applications.

These furnaces are designed for residential installation in a basement, closet, alcove, attic, recreation room, or garage and are also ideal for commercial applications. All units are factory-assembled, wired, and tested to ensure safe, dependable, and economical installation and operation.

These units are Category I listed and may be common vented with another gas appliance in accordance with the National Fuel Gas Code.

Certification

AHRI CERTIFIED™ www.ahridirectory.org Residential Furnaces DOE 10 CFR Part 430

Assembled at a facility with an ISO 9001:2015-certified Quality Management System

DESIGN CERTIFIED

5 YEAR COMPLETE ASSURANCE LIMITED WARRANTY PLEDGE

Safety

It is important to understand the safety symbols used in this manual. Read safety information carefully and follow all safety requirements.

Understanding safety symbols and instructions

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**, as well as the **NOTICE**, **Important**, and **Note** alerts.

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 only property damage.

NOTICE indicates information considered important, but not hazard-related, such as messages relating to property damage.

Important indicates information that is essential to complete a task or may result in damage to the device if not followed.

Note indicates something of special interest or importance. Notes can contain any type of information except safety information.

Safety requirements

WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage. Improper installation, adjustment, alteration, service, or maintenance can cause injury or property damage. **Failure to carefully read and follow all instructions in this manual can result in furnace malfunction, death, personal injury, and/or property damage.** Only a qualified contractor, installer, or service agency should install this product.

WARNING

Personnel must be qualified according to local, state, and national building and safety codes and regulations. Incorrect installation could cause leaks, electric shock, fire or explosion. Additionally, in N.A., the US EPA regulations (40 CFR Part 82, Subpart F) under Section 608 of the Clean Air Act requires that technicians who maintain, service, repair, or dispose of equipment that could release refrigerants into the atmosphere must be certified.

WARNING

Perform the test run in its entirety to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts. Clean up the site when finished, remembering to check that no metal scraps or bits of wiring have been left inside the unit being installed. After installation work for the system has been completed, explain the Safety Precautions, use, and maintenance of the unit to the customer according to the information in all manuals that accompanied the system. All manuals and warranty information must be given to the user or left near the Indoor Unit.

WARNING

• Check that the ground wire is securely connected. Do not connect ground wiring to gas piping, water piping, lighting conductor, or telephone ground wiring.

• If a circuit breaker, fuse or safety sensor is frequently activated, i.e. rapid red flashes, shut down the system and contact your service contractor. Please follow all instructions provided in this manual. Any disregard of the steps outlined in this manual is taken at the user’s own risk.

⚠ WARNING

Unauthorized modifications to Bosch Home Comfort Group products are prohibited as they:

- may create hazards which could result in death, serious injury or equipment damage.

- will void product warranties.

- may invalidate product regulatory certifications.

- may violate OSHA standards.

⚠ WARNING

Use appropriate personal protective equipment, such as gloves and protective goggles and, where appropriate, have a gas mask nearby. Also, use electrical protection equipment and tools suited for electrical operation purposes. Do not touch or adjust any safety devices inside the indoor or outdoor units. All safety features, disengagement, and interlocks must be in place and functioning correctly before the equipment is put into operation. If these devices are improperly adjusted or tampered with in any way, a serious accident can occur. Never bypass or wire around any safety device.

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Adhere to the following:

- Only use natural gas or propane (LP) gas with this furnace.
- Only install the furnace in a location and position as specified in this manual.
- Only install a gas-fired furnace in a residential garage as specified in this manual.
- Provide adequate combustion and ventilation air to the furnace space as specified in this manual.
- Only discharge combustion products outdoors. Only connect the furnace to an approved vent system, as specified in this manual.
- Test for gas leaks as specified in this manual.

⚠ WARNING

FIRE OR EXPLOSION HAZARD

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

Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury, or loss of life.

- Always install the furnace to operate within the intended temperature rise range of the furnace. Only connect the furnace to a duct system that has an external static pressure within the allowable range, as specified on the furnace rating plate.
- When installing a furnace so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, handle the return air with ducts that are sealed to the furnace casing and terminate outside the space containing the furnace.
- It is permitted to use the furnace to heat buildings or structures under construction where the application and use comply with all installation instructions in this manual, and the following conditions are met:
  - There is adequate vent installation.
  - The furnace is operating under thermostatic control.
  - The return air duct is sealed to the furnace.
  - The air filters are in place.
  - The furnace input rate and temperature rise are set according to the rating plate marking.
  - There is a means for providing the outside air required for combustion.
  - The return air temperature is maintained between 55ºF (13ºC) and 80ºF (27ºC).
  - The air filter is replaced after substantial completion of the construction process.
  - The furnace, ductwork, and components are cleaned after substantial completion of the construction process.
  - The furnace operating conditions are verified, including ignition, input rate, temperature rise, and venting.
- When installing the furnace in a non-HUD-Approved Modular Home or building constructed on-site, do not supply combustion air from occupied spaces.
- Base the size of the unit on an acceptable heat loss calculation for the structure. Use ACCA Manual J or another approved method.
- When moving or handling the furnace before installation, always leave the doors on the furnace to provide support and prevent damage or warping of the cabinet. When lifting the furnace by the cabinet, support the ends of the furnace rather than lifting by the cabinet flanges at the bottom or side return air openings or supply air opening.
- When lifting the furnace, you can use the primary heat exchanger tubes as a lifting point provided that you lift the tubes at the front of the heat exchangers where they are attached to the vestibule panel. Do not use the top return bend of the heat exchangers as lifting points as the tubes may shift out of position.

➤ **Important:** During installation, the doors must remain on the furnace when moving or lifting the furnace.

⚠ 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.

- Refer to the unit rating plate for the furnace model number and then see for return air plenum dimensions. You must install the plenum according to the instructions.
- Provide clearances from combustible materials as listed under Table 2.
- Provide clearances for servicing. Ensure to allow service access for both the burners and the blower.
- These models **are not** CSA listed or approved for installation into a **HUD Approved Modular Home** or a **Manufactured (Mobile) Home**.
- This furnace is not approved for installation in trailers or recreational vehicles.
- Do not install furnaces on combustible flooring directly on carpeting, tile, or other combustible material, other than wood flooring.

- Check the rating plate and power supply to be sure that the electrical characteristics match. All models use nominal 115 VAC, single-phase, 60 Hz power supply. **Do not connect this appliance to a 50 Hz power supply or a voltage above 130 V.**
- Install the Furnace so that 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 licensed personnel must install, repair, or service gas heating equipment. Unlicensed service personnel can perform basic maintenance functions such as cleaning and 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 apply.

Avoiding contaminants for combustion air

Adhere to the following:

- The furnace requires **outdoor air** for combustion when locating the furnace in any of the following environments:
  - Buildings with indoor pools
  - Areas where there is chemical exposure
  - Commercial buildings
  - Hobby or craft rooms
  - Laundry rooms
  - Near chemical storage areas
  - Restricted environments
- The furnace requires **outdoor air** for combustion when the furnace is located in an area where the furnace is exposed to the following substances or chemicals:
  - Antistatic fabric softeners for clothes dryers
  - Carbon tetrachloride
  - Cements and glues
  - Chlorine based swimming pool chemicals
  - Chlorinated waxes and cleaners
  - Cleaning solvents such as perchloroethylene
  - De-icing salts or chemicals
  - Halogen type refrigerants
  - Hydrochloric acid
  - Masonry acid washing materials
  - Permanent wave solutions
  - Printing inks, paint removers, varnishes, and similar substances
  - Water softening chemicals
- When using outdoor air for combustion, you must locate the combustion air intake duct system termination external to the building and in an area where there is no exposure to the substances listed above.

⚠ WARNING

The furnace area must not 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:

Spray or aerosol cans, rags, brooms, dust mops, vacuum cleaners or other cleaning tools.

Soap powders, bleaches, waxes or other cleaning compounds, plastic items or containers, gasoline, kerosene, cigarette lighter fluid, dry cleaning fluids or other volatile fluid.

Paint thinners and other painting compounds.

Paper bags, boxes or other paper products.

Never operate the furnace with the blower door removed. To do so could result in serious personal injury and/or equipment damage.

Following codes and standards

Follow all national and local codes and standards in addition to this installation manual. The installation must comply with regulations of the serving gas supplier, local building, heating, plumbing, and other codes. In the absence of local codes, the installation must comply with the national codes listed below and all authorities having jurisdiction.

In the United States, follow all codes and standards for the following, using the latest edition available:

Safety

- National Fuel Gas Code (NFGC) NFPA 54/ANSI Z223.1 and the Installation Standards, Warm Air Heating and Air Conditioning Systems ANSI/NFPA 90B

General installation

- Current edition of the NFGC and NFPA 90B. For copies, contact the
  National Fire Protection Association Inc.
  Batterymarch Park
  Quincy, MA 02269
  or for only the NFGC, contact the
  American Gas Association,
  400 N. Capital, N.W.
  Washington DC 20001
  or http://www.NFPA.org

Combustion and ventilation air

- Section 5.3 of the NFGC, air for Combustion and Ventilation

Duct systems

- Air Conditioning Contractors Association (ACCA) Manual D, Sheet Metal and Air Conditioning Contractors Association National Association (SMACNA), or American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) 1997 Fundamentals Handbook Chapter 32.

Acoustical lining and fibrous glass duct

Consult the current edition of SMACNA and NFPA 90B as tested by UL Standard 181 for Class I Rigid Air Ducts.

Gas piping and gas pipe pressure testing

- NFGC, Chapters 2, 3, 4, and 9, and National Plumbing Codes

Electrical connections

- National Electrical Code (NEC) ANSI/NFPA 70

These instructions cover minimum requirements and conform to existing national standards and safety codes. In some instances, these instructions exceed certain local codes and ordinances, especially those that do not reflect changing residential and non-HUD modular home construction practices. These instructions are required as a minimum for a safe installation.

For 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 above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. **Installation of carbon monoxide detectors** - At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter 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 back-up may be installed on the next adjacent floor level.
   b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.
2. **Approved carbon monoxide detectors** - Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and 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 above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "**GAS VENT DIRECTLY 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.

Installation

Complete all installation steps. You may not need to perform some tasks outlined, depending on the specific installation.

Preparing for installation

Complete the necessary preparation before you begin the installation.

Selecting a location for installation

Before starting the installation, you must select a suitable location for the unit. For residential applications, you can install the unit in a basement, closet, alcove, attic, recreation room, garage, or crawl space.

⚠ WARNING

Improper installation in a room with an ambient temperature below 32°F (0.0°C) such as a garage or attic, could create a hazard, resulting in damage, injury, or death.

Choose a location to install the furnace using the following guidelines:

1. Where a minimum amount of air intake or vent piping and elbows is required.
2. As centralized with the air distribution as possible.
3. Where adequate combustion air is available, particularly when the appliance is not using outdoor combustion air.
4. Where the furnace does not interfere with adequate air circulation in the confined space.

Select a location for the unit that meets any requirements that are specific to the type of installation as outlined in Table 1.

Table 1: Additional location requirements for each type of installation

Type of installation	Additional location requirements
Installation in freezing temperatures	Install the furnace in an area where ventilation facilities provide for safe limits of ambient temperature under normal operating conditions. ➤ **Important:** Do not allow the return air temperature to be below 55° F (13°C) for extended periods. To do so may cause condensation to occur in the main heat exchanger, leading to premature heat exchanger failure.
Installation in a residential garage	When installing a gas-fired furnace in a residential garage, ensure the burners and the ignition source are at least 18 in. (46 cm) above the floor and the furnace is in a location that avoids physical damage by vehicles.
Installation in an attic	The location of the unit has floor support for required service access.

Providing the required clearances

You must provide all required clearances, for example, for combustible materials and unit access and service.

Clearances for access or service:

Provide ample clearances for easy access to the unit. The following are the minimum clearances required:

- 24 in. (61 cm) between the front of the furnace and an adjacent wall or another appliance, to provide access for servicing and cleaning
- 18 in. (46 cm) at the side where access is required for passage to the front when servicing, or for inspection or replacement of flue or vent connections

In all cases, accessibility clearances take precedence over clearances for combustible materials where accessibility clearances are greater.

Table 2: Unit clearances to combustibles

Application	Top	Front	Rear	Left side	Right side	Flue	Floor or bottom	Closet	Alcove	Attic	Line contact
	in. (cm)	in. (cm)	in. (cm)	in. (cm)	in. (cm)	in. (cm)	in. (cm)				
Upflow	1 (2.5)	1 (2.5)	0	0	0	6 (15.2)	Combustible	Yes	Yes	Yes	No
Upflow B-Vent	1 (2.5)	1 (2.5)	0	0	0	1 (2.5)	Combustible	Yes	Yes	Yes	No
Downflow	1 (2.5)	1 (2.5)	0	0	0	6 (15.2)	1 (25.4)	Yes	Yes	Yes	No
Downflow B-Vent	1 (2.5)	1 (2.5)	0	0	0	1 (2.5)	1 (25.4)	Yes	Yes	Yes	No
Horizontal	1 (2.5)	1 (2.5)	0	0	0	6 (15.2)	Combustible	No	Yes	Yes	Yes
Horizontal B-Vent	1 (2.5)	1 (2.5)	0	0	0	1 (2.5)	Combustible	No	Yes	Yes	Yes

ⓘ **Note:**
1. Combustion floor base accessory or air conditioning coil required for use on combustible floor.
2. Line contact only permitted between lines formed by the intersection of the rear panel and side panel (top in horizontal position) of the furnace jacket and building joists, studs, or framing.

Inspection

ⓘ **Note:** There are no shipping or spacer brackets that need to be removed from the interior of the unit.

To inspect the unit, do the following:

1. Inspect the unit immediately after receiving it for possible damage during transit.
2. If damage is evident, do the following:
   a. Note the extent of any damage on the carrier’s receipts.
   b. Make a separate written request for the carrier's agent to inspect the unit.
   c. Contact the local distributor for more information.

Transporting and handling the unit

➤ **Important:** During installation, doors must remain on the furnace when moving or lifting.

- Leave the doors on the furnace when moving or handling this furnace to provide support and to prevent damage or warping of the cabinet.
- When lifting the furnace, support the ends of the furnace rather than lifting by the cabinet flanges at the return air openings, bottom or sides, or supply air opening.
- You can use the primary heat exchanger tubes as a lifting point, if the tubes are lifted at the front of the heat exchangers where attached to the vestibule panel.

  ➤ **Important:** Do not use the top return bend of the heat exchangers as lifting points, as the tubes may shift out of position or their location brackets or baffles.
- Check the unit for any screws or bolts that may have loosened in transit.

Becoming familiar with the unit dimensions

Make sure that you are familiar with the unit dimensions before you begin the installation. See Figure 1 and Table 3.

Figure 1: Dimensions

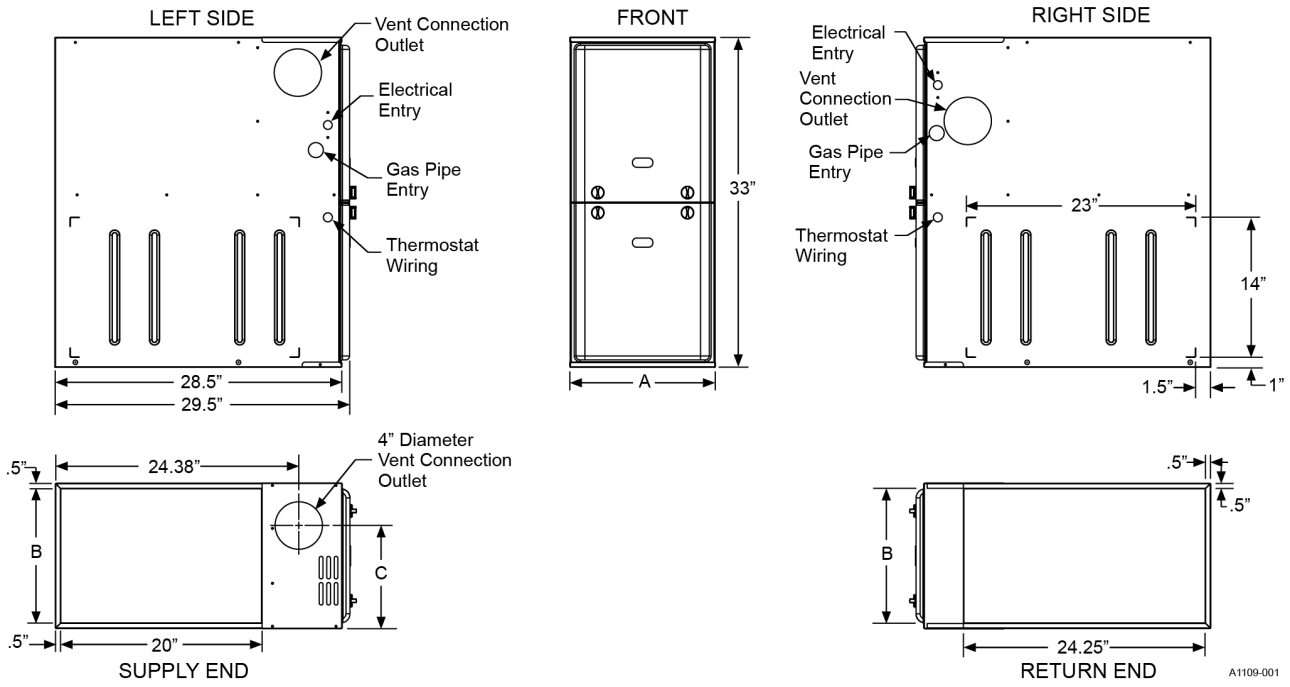


Table 3: Cabinet and duct dimensions

Btu/h (kW) input	Nominal CFM (m^3/min)	Cabinet size	Cabinet dimensions					
			A (in.)	A (cm)	B (in.)	B (cm)	C (in.)	C (cm)
60 (17.6)	1200 (34.0)	A	14 1/2	36.8	13 3/8	34.0	10.3	26.2
80 (23.4)	1200 (34.0)	B	17 1/2	44.4	16 3/8	41.6	11.8	29.9
80 (23.4)	1600 (45.3)	C	21	53.3	19 7/8	50.5	13.6	34.5
100 (29.3)	1600 (45.3)	C	21	53.3	19 7/8	50.5	13.6	34.5
100 (29.3)	2000 (56.6)	C	21	53.3	19 7/8	50.5	13.6	34.5
120 (35.1)	2000 (56.6)	C	21	53.3	19 7/8	50.5	13.6	34.5

Installing the unit

You can install the unit in upflow or horizontal applications, and it may be converted for downflow applications.

Designing and installing the ductwork

It is vital to the success of an installation to design and install the ductwork correctly. If the duct system is incorrectly sized, the unit does not operate correctly.

⚠ WARNING

The duct system must be correctly sized to obtain the correct airflow for the furnace size that is being installed.

Refer to the furnace rating plate for the correct rise range and static pressures or to Table for the correct rise range.

If the ducts are undersized, the result will be high duct static pressures 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.

The design and installation of the duct system must adhere to the following:

- The duct system must handle an air volume appropriate for the served space and within the operating parameters of the furnace specifications.
- The duct system must be installed in accordance with the National Fire Protection Association as outlined in NFPA standard 90B (latest editions) or applicable national, provincial, state, and local fire and safety codes.
- The duct system must be a closed duct system. For residential and non-HUD modular home installations, when installing a furnace so that the supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, handle the return air with ducts sealed to the furnace casing and terminating outside the space containing the furnace.
- The duct system must complete a path for heated or cooled air to circulate through the air conditioning and heating equipment, and to and from the conditioned space.
- Be aware of the following for installations with an indoor coil:
  - You must install the indoor coil parallel with, or on the supply air side of the furnace to avoid condensation in the primary heat exchanger. When using a parallel flow arrangement, dampers or other means used to control airflow must be adequate to prevent chilled air from entering the unit. If manually operated, equip the damper with means to prevent the furnace or the air conditioner from operating unless the damper is in full heat or cool position.
  - If using a matching cased indoor coil, it is possible to place it directly on the furnace outlet and seal it to prevent leakage. If installing an uncased indoor coil with a thermoplastic drain pan in the upflow/horizontal configuration, then provide an extra 2 in. (5.1 cm) minimum spacing to ensure against drain pan distortion.
- On all installations without a coil, use a removable access panel in the outlet duct so that smoke or reflected light are observable inside the casing, which indicates the presence of leaks in the heat exchanger. Attach this access panel securely to prevent leaks.
- When replacing an existing furnace, if the existing plenum is not the same size as the new furnace, then remove the existing plenum and install a new plenum that is the correct size for the new furnace. If the plenum is shorter than 12 in. (30.5 cm), the turbulent airflow may cause the limit controls not to operate as designed or the limit controls may not operate at all.
- Make sure that the ducts attached to the furnace plenum are of sufficient size so that the furnace operates at the specified external static pressure and within the air temperature rise specified on the nameplate.

  ➤ **Important:** The minimum plenum height is 12 in. (30.5 cm). The furnace does not operate correctly on a shorter plenum height. The minimum rectangular duct height is 4 in. (10.2 cm) attached to the plenum.

Using an existing duct system

Check that the ductwork meets requirements and is correctly sized, and adjust the ductwork if needed. See Designing and installing the ductwork for more information about requirements.

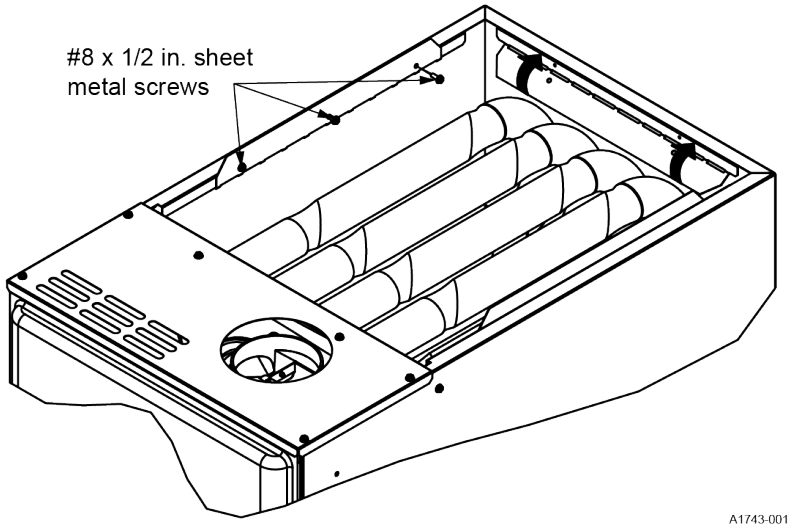
Using the duct flanges

Three duct flanges are part of the furnace casing. To use these duct flanges, do the following:

1. Fold the flanges upward along the slots until the flanges contact the casing flange.
2. Secure each flange to the casing using #8 x 1/2 in. screws (not provided) in the holes provided.

If not using the flanges, they must remain in the down position as shipped.

Figure 2: Duct attachment



Installing an indoor coil

⚠ CAUTION

You must install the indoor coil in the supply air duct, downstream of the furnace. Do not pass cooled air over the heat exchanger.

ⓘ **Note:** For downflow applications, make sure that the indoor coil cabinet part number is specifically intended for downflow applications. If a matching indoor coil is used, it may be placed directly on the furnace outlet and sealed to prevent leakage. For details of the coil cabinet dimensions and installation requirements, refer to the installation instructions supplied with the coil cabinet.

To install the indoor coil, do the following:

- Follow the installation instructions in the *Installation Manual* for the indoor coil. Mount the indoor coil on the supply side of the furnace as shown in Figure 3.

Figure 3: Vertical upflow applications with furnaces

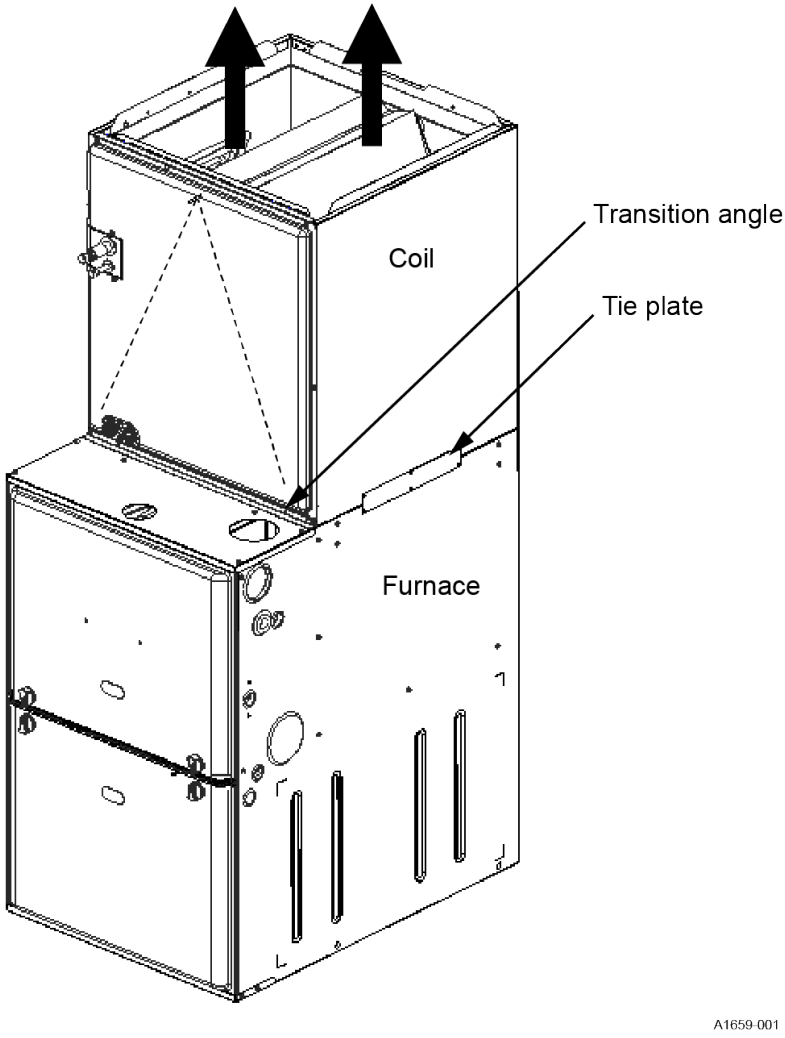


Figure 4: Vertical downflow applications with furnaces

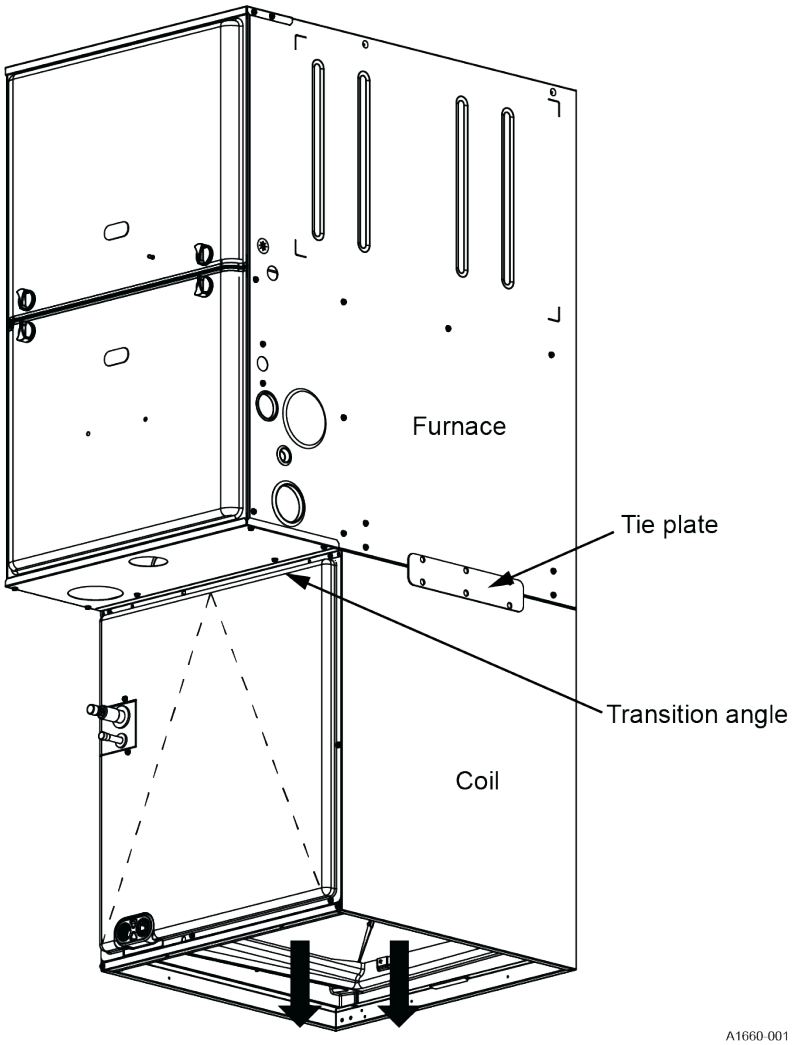


Figure 5: Horizontal right application of coil with furnace

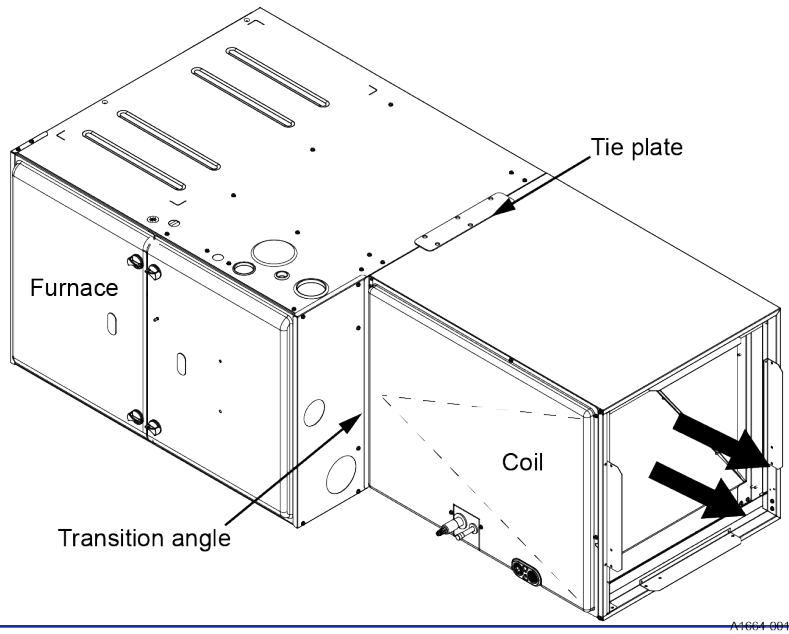
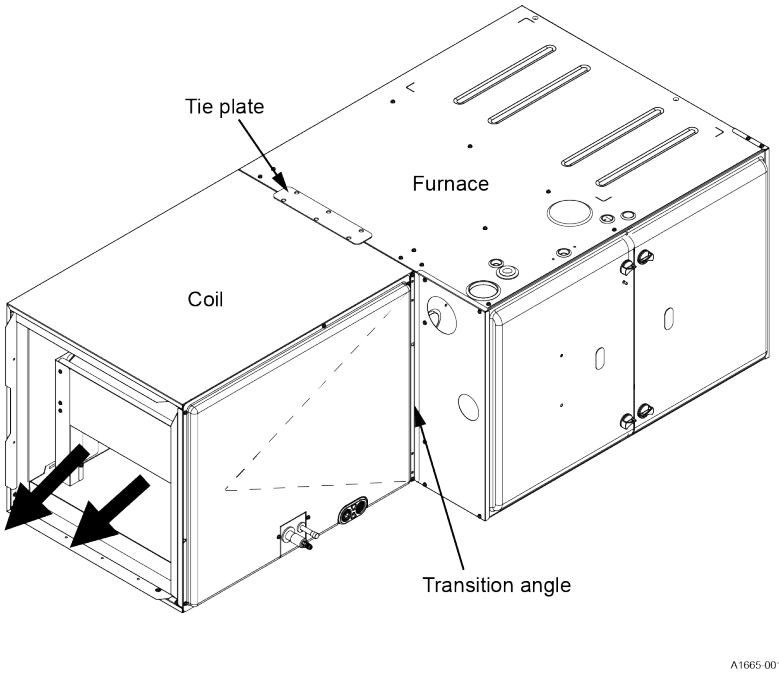


Figure 6: Horizontal left application of coil with furnace



Installing a removable access panel in the outlet duct

This task applies only for applications without an indoor coil.

- Install a removable access panel in the outlet duct so that any smoke or reflected light is observable inside the casing to indicate the presence of leaks in the heat exchanger. Attach the access panel securely to prevents leaks.

Positioning the unit

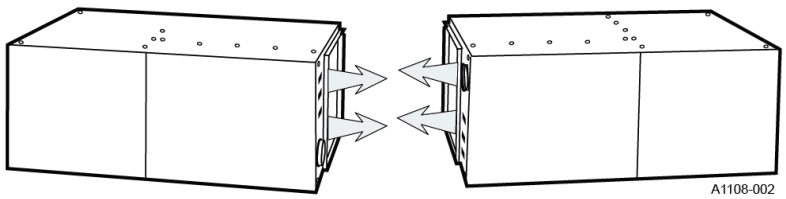
Make sure that the location you have selected for the unit is suitable and you can provide the required clearances. See Selecting a location for installation and Providing the required clearances.

How you position the unit varies depending on the type and place of installation. You can install the unit in an upflow or horizontal application, or convert it for downflow applications. These furnaces are designed for residential installation in a basement, closet, alcove, attic, recreation room, or garage. You can also install the unit in commercial applications.

- **For horizontal applications,** install the furnace in a horizontal position on either side as shown in Figure 7.

  Important: Do not install the furnace on its back.

Figure 7: Horizontal application



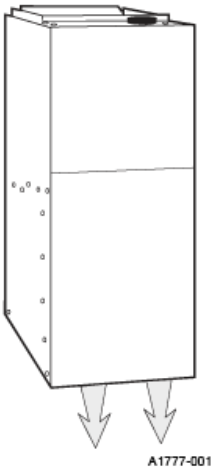
- **For upflow applications,** install the furnace in an upflow position as shown in Figure 8.

Figure 8: Upflow application



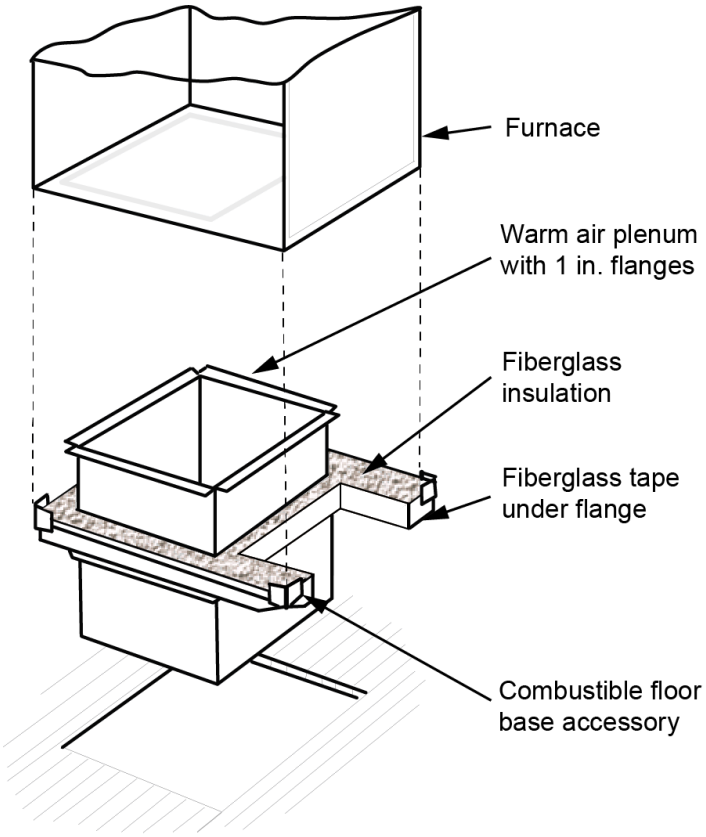
- **For downflow applications where the unit is installed on a combustible material or directly on a floor,** use the following approach:

Figure 9: Floor base and ductwork installation - downflow



- Use a combustible floor base for installations on combustible material or directly on any floors, as shown in Figure 10.
- Follow the instructions supplied with the combustible floor base accessory.
- It is possible to replace this combustible floor base with a matching indoor coil, correctly sealed to prevent leaks.
- Follow the instructions supplied with the indoor coil cabinet for installing the cabinet to the duct connector.
- Plug intake and vent pipe holes in the bottom panel and move the grommet to the required vent side exit.

Figure 10: Combustible floor base accessory

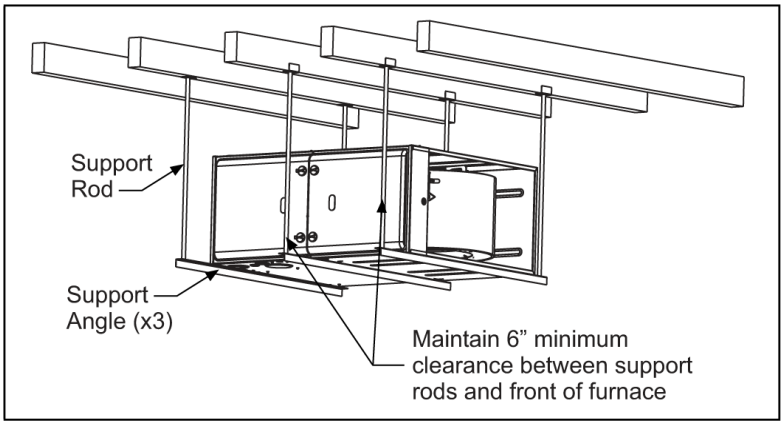


Attach the indoor coil cabinet to the duct connector, and then position the furnace on top of the coil cabinet. The connection to the furnace, coil cabinet, duct connector, and supply air duct must be sealed to prevent air leakage.

For applications where the unit is suspended, for example, in attic or crawl space installations where the unit is suspended from rafters or floor joists, use rods, pipe angle supports, or straps as follows:

- Support the furnace with rods, pipe angle supports or straps at three locations. Place one support at the supply end of the furnace, place the second support approximately in the center of the furnace near the blower shelf, and place the third support at the return end of the furnace.
- Maintain a 6 in. (15.2 cm) minimum clearance between the front of the furnace and the support rods or straps.
- Make sure that all six suspension points are level to ensure correct and quiet furnace operation.
- Use a secure platform constructed of plywood or other building materials secured to the floor or ceiling joists. See Figure 11.

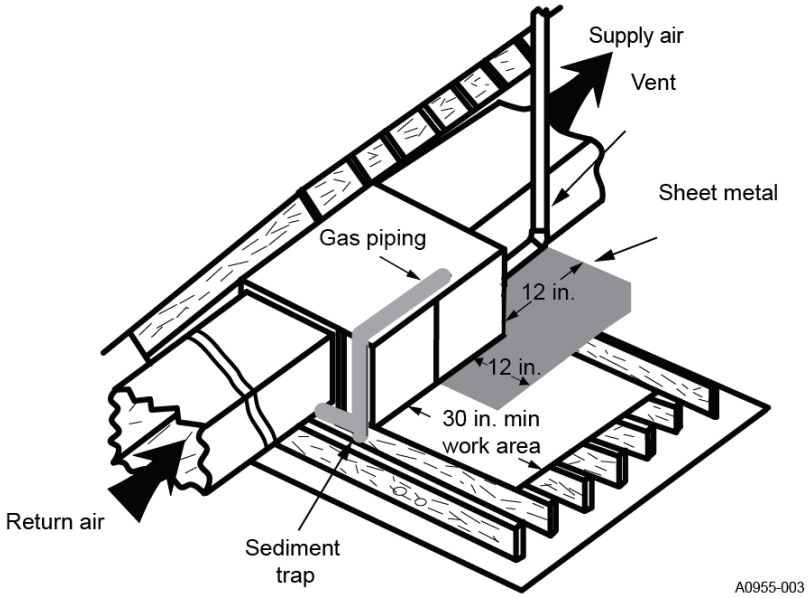
Figure 11: Typical suspended furnace or crawl space installation



For applications where the unit is installed on blocks or pads, make sure that the blocks or pads are suitable and provide adequate height to ensure that the unit is not subject to water damage.

For applications in an attic, be aware that the unit is certified for line contact when installing in the horizontal left or right position. The line contact is only permissible between lines that are formed by the intersection of the top and two sides of the furnace and the building joists, studs, or framing. This line may be in contact with combustible material. The filter rack must be a minimum distance of 18 in. (45.7 cm) from the furnace. Maintain required clearances to combustibles. See Positioning the unit.

Figure 12: Typical attic installation



⚠ WARNING

When a furnace is installed in an attic or other insulated space, keep all insulating materials at least 12 in. (30.5 cm) away from furnace and burner combustion air openings.

Connecting the unit to the ductwork

How you connect the unit to the ductwork varies depending on the type of application.

To connect the unit to the ductwork, follow the guidance for your specific application:

For upflow or horizontal applications, attach the supply plenum to the furnace outlet. Use an approved flexible duct connector and seal the connection to prevent air leakage. Make sure that the sheet metal is crosshatched to eliminate any popping of the sheet metal when the indoor fan is energized.

For all applications, when connecting the return plenum, be aware that return air may enter the furnace through the sides or bottom depending on the type of application. Do not connect return air into the rear panel of the furnace.

For downflow applications, the furnace must be turned upside-down so that the circulating air enters at the top and exits the furnace at the bottom. The combustion air blower must be rotated 90° as shown in Figure 21. **Do not block combustion air inlet openings**.

For side return applications, return air is pulled through an opening cut in the side of the furnace casing. See Figure 13. Leave the bottom blockoff panel that is supplied with the furnace in place. If the furnace is installed on a flat, solid surface, the bottom blockoff panel provides an adequate seal to prevent air leakage through the unused bottom opening. However, if the furnace is installed on a surface that is uneven or if the furnace is installed on blocks or otherwise raised off the floor, seal the edges of the bottom blockoff panel to the casing using tape or other appropriate gasket material to prevent air leakage.

For bottom return applications, return air is usually pulled through a base platform or return air plenum. Make sure the return platform structure or return air plenum is suitable to support the weight of the furnace. Remove the internal bottom panel.

Installing the air filter

You must install a field-supplied air filter for all applications. Install the air filter external to the furnace cabinet. Do not attempt to install the air filter inside the furnace. See Table 4 for recommended air filter sizes. Depending on the specific application, you may install side return, horizontal, or downflow air filters. When installing side return air filters, you need to make a cutout in the furnace side panel as shown in Figure 13.

⚠ CAUTION

All installations must have a filter installed. All filters and mounting provision must be field-supplied. Unauthorized modifications to Bosch Home Comfort Group products are prohibited as they may create hazards which could result in equipment damage.

All applications require the use of a field installed filter. All filters and mounting provision must be field supplied.

Install filters external to the furnace cabinet. **Do not attempt to install filters inside the furnace.**

Table 4: Recommended minimum filter sizes (high velocity 600 FPM)

CFM (m^3/min)	Cabinet size	Side (in.)	Bottom (in.)
1200 (34.0)	A	16 x 25	14 x 25
1200 (34.0)	B	16 x 25	16 x 25
1600 (45.3)	C	16 x 25	20 x 25

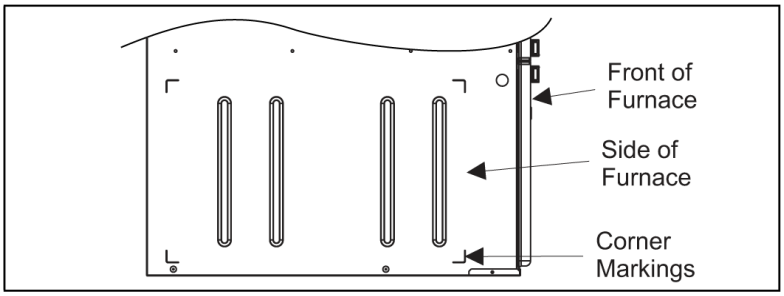
Table 4: Recommended minimum filter sizes (high velocity 600 FPM)

CFM (m^3/min)	Cabinet size	Side (in.)	Bottom (in.)
2000 (56.6)	C	(2) 16 x 25	20 x 25
2000 (56.6)	D	(2) 16 x 25	22 x 25

1. Air velocity through throwaway type filters may not exceed 300 ft/min (91.4 m/min). All velocities over this require the use of high velocity filters.
2. Do not exceed 1800 CFM using a single side return and a 16x25 filter. For CFM greater than 1800, you may use two side returns or one side and the bottom or one side return with a transition to allow use of a 20x25 filter.

Note: Single side return above 1800 CFM is approved as long as the filter velocity does not exceed filter manufacturer's recommendation and a transition is used to allow use on a 20x25 filter.

Figure 13: Side return cutout markings



To install the air filter, do the following:

- Install the air filter as outlined for the specific type of filter installation in Table 5.

Table 5: Installing the air filter

Type of filter installation	Approach
Side return	1. Locate the L-shaped corner locators. 2. Use the L-shaped corner locators to determine the size of the cutout to be made in the furnace side panel. See Figure 13. 3. Install the side return filter rack accessory kit using the instructions provided with the kit. ⓘ **Note:** If an air filter is provided at another location in the return air system, the ductwork may be directly attached to the furnace side panel. ⓘ **Note:** Some accessories such as electronic air cleaners and pleated media may require a larger side opening. Follow the instructions supplied with the accessory for side opening requirements. Do not cut the opening larger than the dimensions shown in Figure 1.
Horizontal	• Note that any branch duct (rectangular or round duct) attached to the plenum must attach to the vertical plenum before the filter. • Use straps and/or supports to support the weight of the external air filter box. • Make sure that the air filter is located a minimum of 18 in. from the return air inlet of the furnace.
Downflow	**Typical approach** • Locate the air filter above the furnace, extending into the return air plenum or duct. Make sure that the air filter is located a minimum of 12 in. from the return air inlet of the furnace. • Note that any branch duct (rectangular or round duct) attached to the plenum must attach to the vertical plenum above the air filter height. • Use straps and/or supports to support the weight of the external air filter box.
	Alternative approach • Locate the air filter in the duct system external to the furnace using an external duct filter box attached to the furnace plenum or at the end of the duct in a return air filter grille. Make sure that the air filter is located a minimum of 12 in. from the return air inlet of the furnace. • Use straps and/or supports to support the weight of the external air filter box.

Connecting the gas supply

Follow all requirements when connecting the gas supply.

Converting the unit for operation with propane gas

This furnace is constructed at the factory for natural gas-fired operation. To convert the furnace for operation with propane gas, you must use a factory-supplied propane (LP) conversion kit.

⚠ WARNING

PROPANE AND HIGH ALTITUDE CONVERSION KITS

The installer must take every precaution to insure that the furnace has been converted to the proper gas orifice size when the furnace is installed. It is very important to choose the correct kit and/or gas orifices for the altitude and the type of gas for which the furnace is being installed.

High altitude conversions are required in order for the appliance to satisfactory meet those applications. Only use natural gas in furnaces designed for natural gas. Only use propane (LP) gas for furnaces that have been properly converted to use propane (LP) gas. Do not use this furnace with butane gas.

Incorrect gas orifices or a furnace that has been improperly converted creates an extremely dangerous condition that results in premature heat exchanger failure, excessive sooting, high levels of carbon monoxide, personal injury, property damage, and potential for fire hazard and/or death.

An authorized distributor or dealer must make all gas conversions. In Canada, a certified conversion station or other qualified agency, using factory specified and/ or approved parts, must perform the conversion.

Do not attempt to drill out any orifices to obtain the proper orifice size. Drilling out a gas orifice will cause misalignment of the burner flames, causing premature heat exchanger burnout, high levels of carbon monoxide, excessive sooting, a fire hazard, personal injury, property damage and/or death.

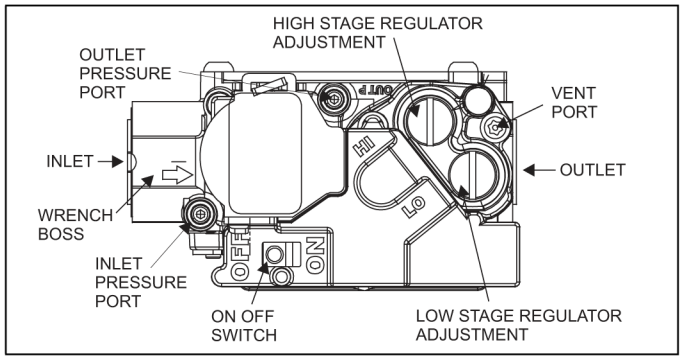
To convert the unit for operation with propane gas, do the following:

- Follow the installation procedure in the *Installation Manual* for the propane (LP) conversion kit.

Installing the gas piping

See Figure 14 for the gas valve components.

Figure 14: Gas valve



⚠ WARNING

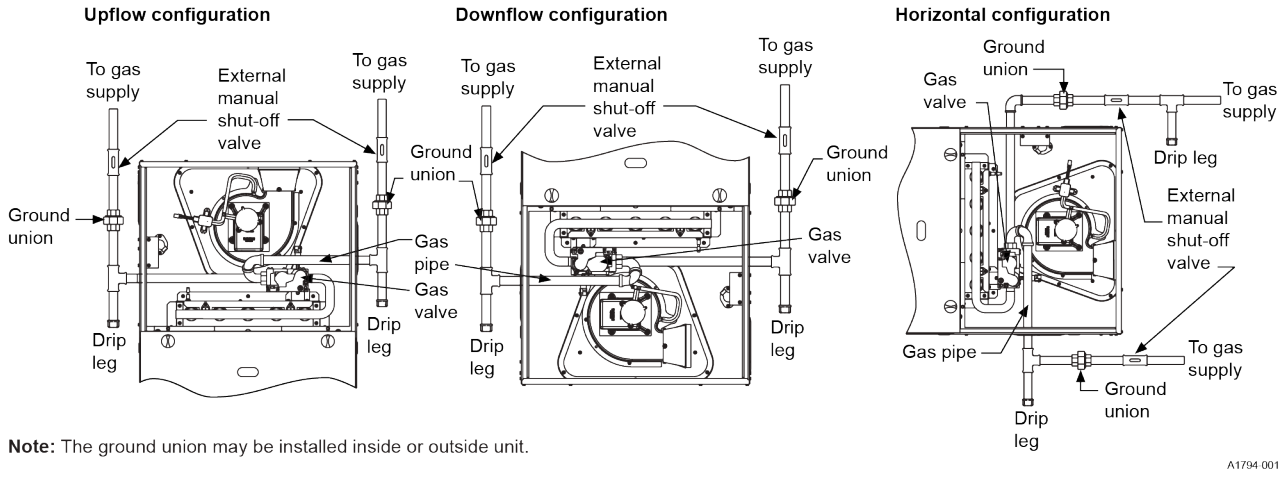
An overpressure protection device, such as a pressure regulator, must be installed in the gas piping system upstream of the furnace and must act to limit the downstream pressure to the gas valve so it does not exceed 0.5 psig (14 in. W.C., 3.48 kPa). Pressures exceeding 0.5 psig (14 in. W.C., 3.48 kPa) at the gas valve will cause damage to the gas valve, resulting in a fire or explosion or will cause damage to the furnace or some of its components leading to possible gas related fire, explosion, property damage and loss of life.

Important: Plan the gas supply routing before determining the correct gas pipe entry. Use 90° conventional elbows and short pipe nipples to enter through the cabinet access holes.

To install the gas piping, do the following:

- Use correctly sized wrought iron or approved flexible or steel pipe when making gas connections to the unit. If local codes allow the use of a flexible gas appliance connection, always use a new listed connector. Do not use a connector that has previously serviced another gas appliance.
- Be aware that some utility companies or local codes require pipe sizes larger than the minimum sizes listed in these instructions and in the codes.
- Use only a gas type that is approved for the furnace as specified on the unit nameplate and in these instructions.
- For right side supply gas pipe arrangement, two 1/2 in. elbows and two 1/2 in. x 1 1/2 in. pipe nipples must be used. The arrangement shown in Figure 15 aligns entrance hole in furnace casing with supply gas pipe. Furnace casing does not support installations completed using street-elbows.

Figure 15: Gas piping



Note: The ground union may be installed inside or outside unit.

Important: You must install an accessible manual shutoff valve upstream of the furnace gas controls and within 6 ft (1.8 m) of the furnace.

Isolate the furnace from the gas supply piping system by closing its individual external manual shutoff valve during any pressure testing of the gas supply piping system at pressures equal to or less than 0.5 psig (3.5 kPa).

⚠ CAUTION

The gas valve body is a very thin casting that cannot take any external pressure. Never apply a pipe wrench to the body of the gas valve when installing piping. A wrench must be placed on the octagon hub located on the gas inlet side of the valve. Placing a wrench to the body of the gas valve will damage the valve causing improper operation and/or the valve to leak.

⚠ CAUTION

Burner ignition may not be satisfactory on first startup due to residual air in the gas line or until gas manifold pressure is adjusted. The ignition control makes three attempts to light before locking out. After three trials for ignition, if the appliance does not operate, follow the instructions Turning off the appliance in the User's Information Manual and call your gas supplier to verify the quality and/or consistency of the gas supply. If the gas supply has been verified and/or other gas appliances are operating properly, and the appliance still does not ignite, call service to properly troubleshoot the unit.

Be aware that you can connect gas piping from either side of the furnace using any of the gas pipe entry knockouts on both sides of the furnace. See Figure 15.

Installing a high-altitude application conversion kit

You must install a high-altitude application conversion kit, which includes a pressure switch, in the following cases:

- If the furnace is installed in a location where the altitude is greater than 5,000 ft (1,524 m) above sea level
- If the furnace is installed in a location where the altitude is less than 5,000 ft (1,524m) above sea level but the area is subject to low pressure inversions

To install a high-altitude application conversion kit, do the following:

- Follow the installation procedure in the *Installation Manual* for the high-altitude application conversion kit.

Adjusting the manifold pressure

High fire manifold pressure must be set before adjusting low fire.

⚠ WARNING

LoNOx furnaces requiring propane (LP) gas must have the LoNOx screens removed prior to installation and operation. See propane instructions.

⚠ WARNING

Examine the burner flames to make sure they are in good adjustment. Look to a pure blue flame with a light blue cone at its center that burns full, steady and straight. If yellow or orange, or a partial, diverted, or unsteady flame is detected, then turn off gas valves and clean any debris from nozzles and pilot light. If condition still exists, then check airflow, venting, gas pressure, etc. If condition still exists, contact technical service for further instructions.

Adjusting the manifold gas pressure for high-altitude applications

This furnace is constructed at the factory for natural gas-fired operation at 0 –5,000 ft (0-m – 1,524 m) above sea level. If the furnace is installed in a location where the altitude is greater than 5,000 ft (1,524 m) above sea level, you must change the manifold gas pressure to maintain correct and safe operation.

To adjust the manifold gas pressure for high-altitude applications, refer to Table 6 and Table 7, and do the following:

1. Turn gas off at the ball valve or gas cock on gas supply line before the gas valve. Find the pressure ports on the gas valve marked Out P and In P.
2. Take the manifold pressure at the port marked OUT P.
3. Take the gas line pressure at the port marked IN P.
4. See Adjusting the manifold gas pressure and input rate for step by step instructions.

Table 6: Nominal manifold pressure - high fire

Manifold pressures (in. W.C.)				Manifold pressures (kPa)			
Gas heating value (Btu/ ft³)	Altitude (ft)			Gas heating value (MJ/m³)	Altitude (m)		
	0-7999	8000-8999	9000-9999		0-2437	2438-2742	2743-3048
800	3.5	3.5	3.5	**29.8**	0.9	0.9	0.9
850	3.5	3.5	3.5	**31.7**	0.9	0.9	0.9
900	3.5	3.5	3.5	**33.5**	0.9	0.9	0.9
950	3.5	3.5	3.3	**35.4**	0.9	0.9	0.8
1000	3.5	3.2	2.9	**37.3**	0.9	0.8	0.7
1050	3.5	2.9	2.7	**39.1**	0.9	0.7	0.7
1100	3.2	2.7	2.4	**41.0**	0.8	0.7	0.6
2500 (LP)	9.8	8.2	7.5	**93.2 (LP)**	2.4	2.0	1.9

Table 7: Nominal manifold pressure - low fire

Manifold pressures (in. W.C.)				Manifold pressures (kPa)			
Gas heating value (Btu/ ft³)	Altitude (ft)			Gas heating value (MJ/m³)	Altitude (m)		
	0-7999	8000-8999	9000-9999		0-2437	2438-2742	2743-3048
800	1.7	1.7	1.7	**29.8**	0.4	0.4	0.4
850	1.7	1.7	1.7	**31.7**	0.4	0.4	0.4
900	1.7	1.7	1.7	**33.5**	0.4	0.4	0.4
950	1.7	1.7	1.5	**35.4**	0.4	0.4	0.4
1000	1.6	1.5	1.4	**37.3**	0.4	0.4	0.3
1050	1.5	1.4	1.3	**39.1**	0.4	0.4	0.3
1100	1.3	1.2	1.1	**41.0**	0.3	0.3	0.3
2500 (LP)	4.1	3.8	3.5	**93.2 (LP)**	1.0	1.0	0.9

Connecting the electrical wiring

Follow all requirements when connecting the unit wiring and see Table 9 and Wiring diagram as needed.

Connecting the electrical power supply

⚠ CAUTION

Use copper conductors only.

Important:

- Field wiring to the unit must be grounded.
- Electric wires that are field installed must conform to the temperature limitation for 63°F (35°C) rise wire when installed in accordance with instructions.
- The residential supply must have a bonded neutral.

To connect the power supply, do the following:

1. Provide a power supply separate from all other circuits. Install overcurrent protection and a disconnect switch in accordance with local and national electrical codes.

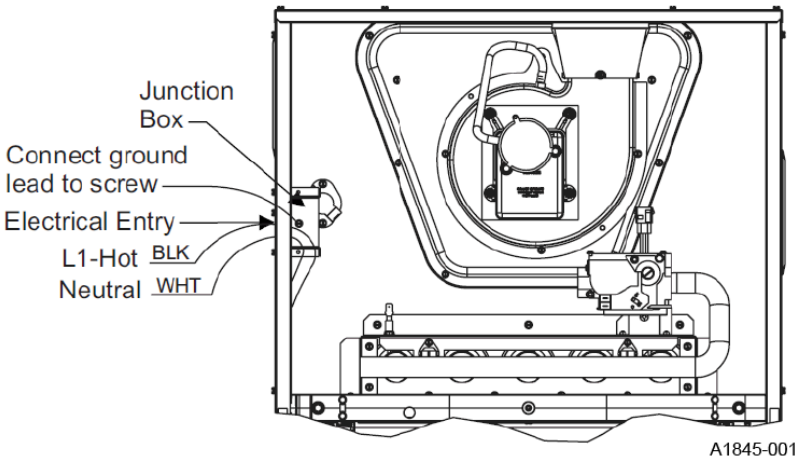
   Important: You must locate the disconnect switch close to the unit for convenience in servicing.

2. With the disconnect or fused switch in the OFF position, check all wiring against the unit wiring label. See Wiring diagram.
3. Use one of the wiring methods outlined in Table 8 to connect the power wiring.

Table 8: Connecting the power wiring

Wiring method	Approach
Using a conduit connector or other proper connection	1. Remove the screws from the wiring box cover. 2. Route the power wiring through the opening in the unit into the junction box with a conduit connector or other proper connection. 3. Observe that in the junction box there is a black wire, a white wire, and a green ground screw. 4. Connect the power supply as shown on the unit wiring label on the inside of the blower compartment door or the wiring diagram and Figure 16 as follows: a. Connect the black furnace lead to the L1 (hot) wire from the power supply. b. Connect the white furnace screw to neutral. c. Connect the power supply ground to the green screw (equipment ground). 5. When the wiring connections are complete, replace the wiring box cover and screws.
Using a field provided box and cover	1. Use a field provided 2 in. (5.1 cm) x 4 in. (10.2 cm) box and cover on the outside of the unit. 2. Route the furnace leads into the box using a protective bushing where the wires pass through the furnace panel.

Figure 16: Electrical wiring



3. Make sure that the furnace's control system has correct polarity of the power supply and a proper ground connection. See Figure 16.

Important: The power connection leads and wiring box can be relocated to the opposite side of the furnace. Remove the screws and cut wire tie holding excess wiring. Reposition on the opposite side of the furnace and fasten using the holes provided.

Table 9: Ratings and physical and electrical data

High fire input		Low fire input		High fire output		Low fire output		Nominal airflow		Recommended fuse or circuit breaker (A)	Maximum outlet air temp.	
MBH	kW	MBH	kW	MBH	kW	MBH	kW	CFM	m^3/min		°F	°C
60	17.6	39	11.4	48	14.1	31.2	9.2	1200	34.0	15	190	88
80	23.5	52	15.2	64	18.8	41.6	12.2	1200	34.0	15	190	88
80	23.5	52	15.2	64	18.8	41.6	12.2	1600	45.3	15	190	88
100	29.3	65	19	80	23.4	52	15.2	1600	45.3	15	190	88
100	29.3	65	19	80	23.4	52	15.2	2000	56.6	15	190	88
120	35.1	78	22.8	96	28.1	62.4	18.3	2000	56.6	15	190	88
High fire air temp. rise		Low fire air temp. rise		Blower		Blower size		AFUE	Total unit (A)	Gas pipe connection, NPT (in.)	Operating weight	
°F	°C	°F	°C	HP	A	in.	cm				lb	kg
30—60	17—33	20—50	11—28	1/2	6.4	11 x 8	27.9 x 20.3	80.0	9.0	1/2	94	43
30—60	17—33	20—50	11—28	1/2	6.4	11 x 8	27.9 x 20.3	80.0	9.0	1/2	103	47
30—60	17—33	20—50	11—28	1/2	6.4	11 x 10	27.9 x 25.4	80.0	9.0	1/2	114	52
30—60	17—33	20—50	11—28	1/2	6.4	11 x 10	27.9 x 25.4	80.0	8.9	1/2	118	54
30—60	17—33	20—50	11—28	3/4	8.8	11 x 11	27.9 x 27.9	80.0	11.3	1/2	122	55
35—65	19—36	20—50	11—28	3/4	8.8	11 x 11	27.9 x 27.9	80.0	11.3	1/2	129	59

Note:
- Annual Fuel Utilization Efficiency (AFUE) numbers are determined in accordance with DOE test procedures.
- Wire size and over current protection must comply with the National Electrical Code (NFPA-70-latest edition) and all local codes.
- Install the furnace so that the electrical components are protected from water.

Connecting the low voltage control wiring

Install the field-supplied thermostat wiring by following the instructions that come with the thermostat. With the thermostat set in the OFF position and the main electrical source disconnected, connect the thermostat wiring from the wiring connections on the thermostat to the low-voltage terminal block on the furnace control board, as shown in Figure 17 or Figure 18. Electronic thermostats require the common wire to be connected. Do not use power stealing thermostats. Apply strain relief to thermostat wires passing through cabinet. If air conditioning equipment is installed, use thermostat wiring to connect the Y and C terminals on the furnace control board to the proper wires on the condensing unit (unit outside).

- **Important:** Set the heat anticipator in the room thermostat to 0.4 amps. Setting it lower causes short cycles. Setting it higher causes the room temperature to exceed the set points.
- **Important:** Some electronic thermostats do not have adjustable heat anticipators. They must be set to six cycles per hour. Follow the thermostat manufacturer's instructions.

The 24 V, 40 VA transformer is sized for the furnace components only, and must not be connected to power auxiliary devices such as humidifiers and air cleaners. The transformer can provide power for a split-system air conditioner or heat pump.

Figure 17: Control wiring - standard ECM multi-stage furnace and multi-stage air conditioner - conventional wiring

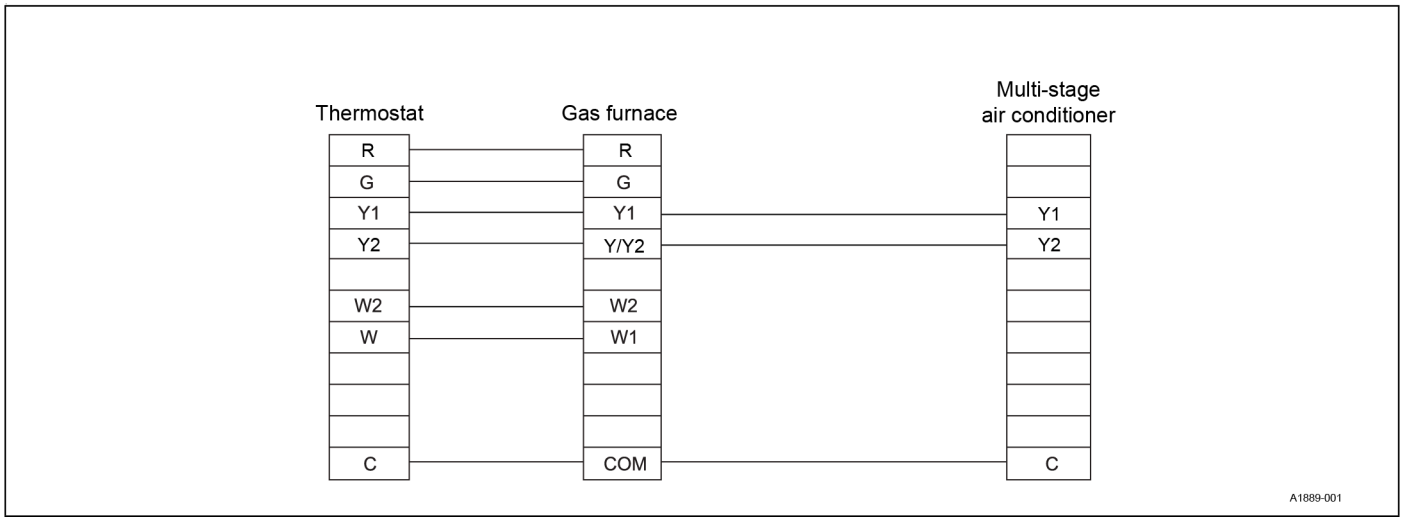
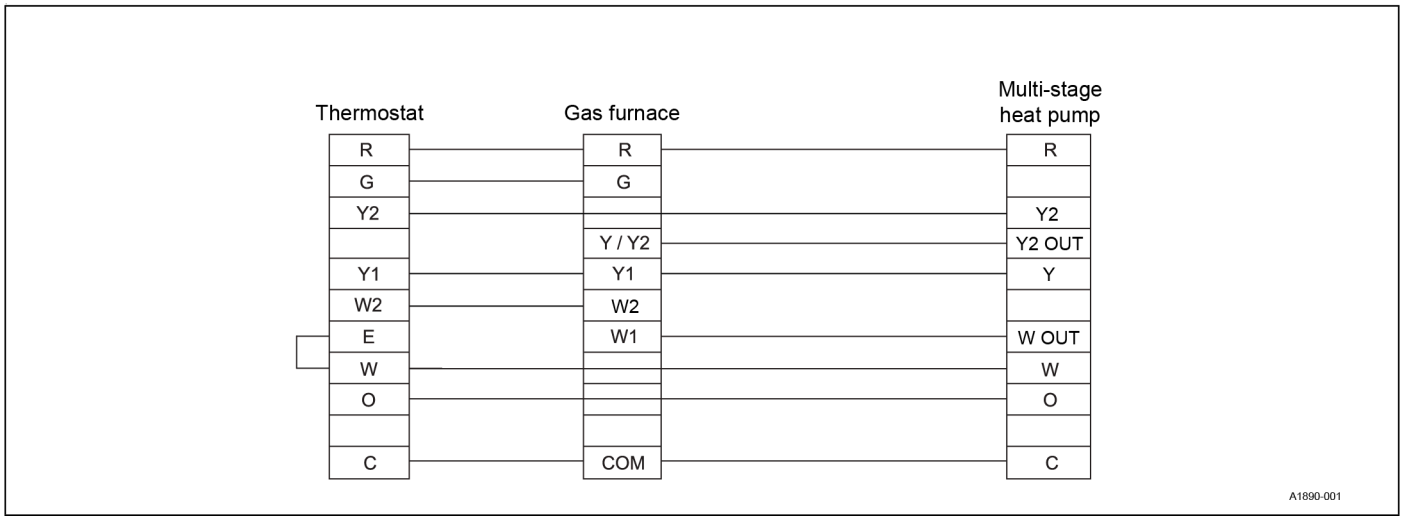


Figure 18: Control wiring - standard ECM multi-stage gas furnace and standard multi-stage heat pump - conventional wiring



- **Important:** Do not bond any of the outdoor unit W wires together. Fossil fuel operation must be controlled by room thermostat.

Figure 19: Control wiring - standard ECM multi-stage furnace and single-stage air conditioner - conventional wiring

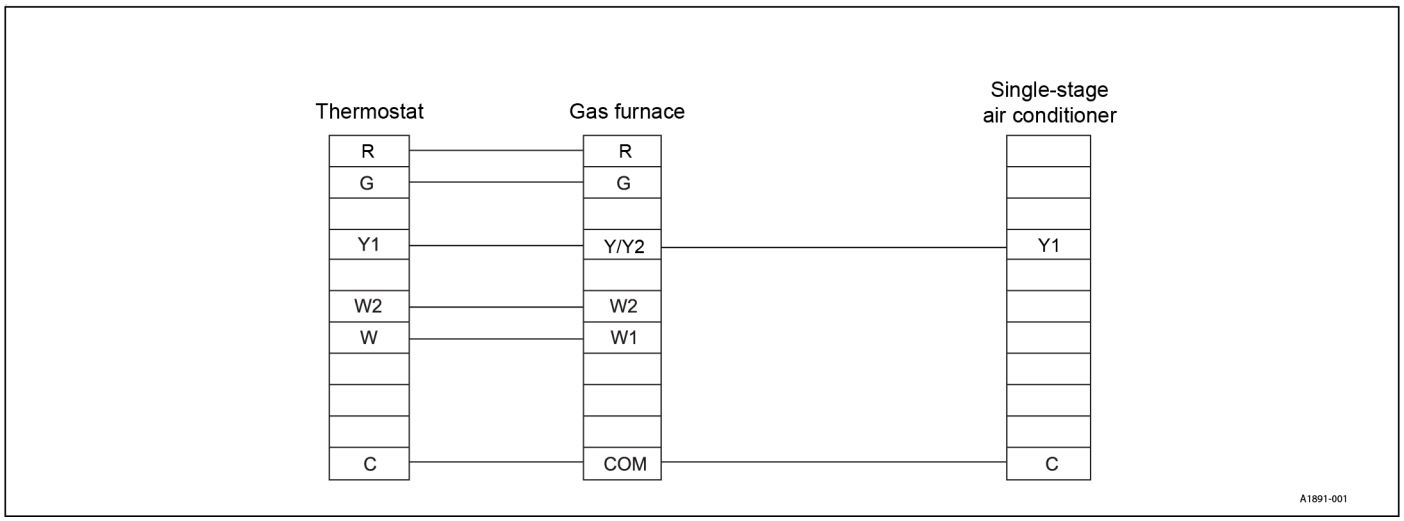
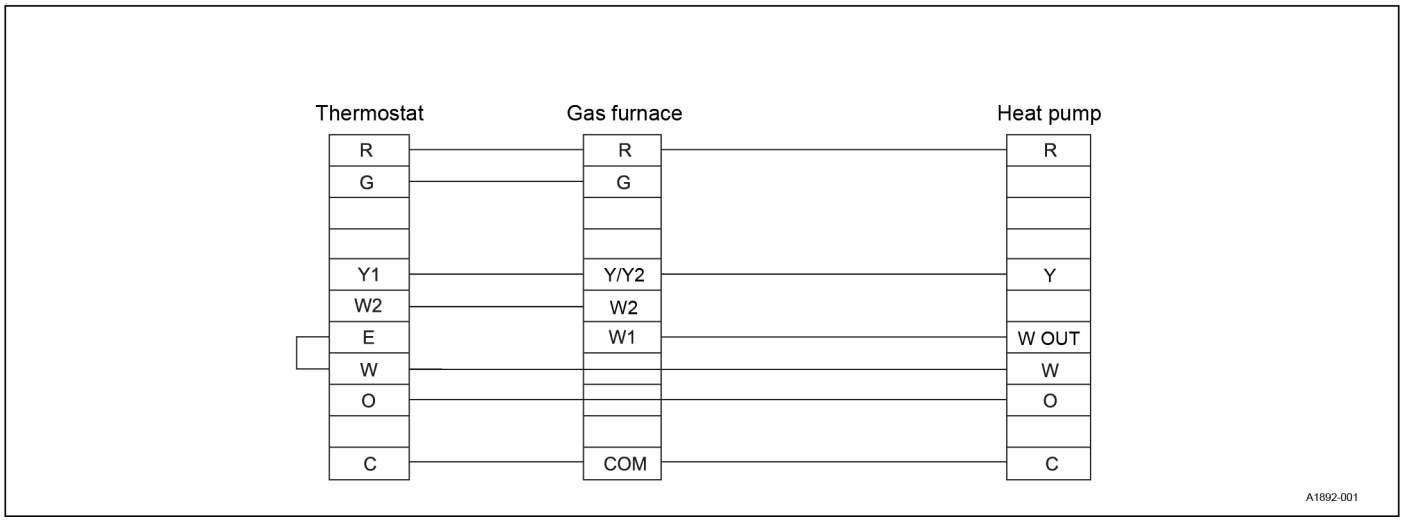


Figure 20: Control wiring - standard ECM multi-stage gas furnace and single-stage heat pump - conventional wiring



Important: Do not bond any of the outdoor unit W wires together. Fossil fuel operation **must** be controlled by room thermostat.

Accessory connections

The furnace control allows power-switching control of various accessories.

Electronic air cleaner connection

Two 1/4 in. (6.4 mm) spade terminals (EAC and EAC-N) for electronic air cleaner connections are located on the control board. The terminals provide 115 VAC (1 A maximum) during circulating blower operation.

Humidifier connection

Two 1/4 in. (6.4 mm) spade terminals for humidifier connections, HUM and HUM N, are located on the control board. The terminals provide 115 VAC (1 A maximum) during heating system operation.

Single stage thermostat (optional)

Heating operation can be controlled by a single stage heating thermostat. The heating call from the thermostat should be connected to the control board W/W1 terminal. If a single stage thermostat is used, the high/low input staging will be controlled by the furnace control board.

Using the heat staging time dipswitch settings, the control provides multiple options for furnace staging. If the staging dipswitches are set to 10 (ON/OFF) or 11 (ON/ON) position, the furnace will switch from low fire to high fire after 10 or 20 minutes respectively and will stay in high fire until the thermostat is satisfied. If the heat staging time dipswitches are set to 01 (OFF/ON) position, the furnace will automatically stage from low fire to high fire, using recent heating duty cycle information in an adaptive algorithm to determine the optimal time to energize 2nd stage operation. If the staging dipswitches are set to 00 (OFF/OFF) position and a single stage thermostat is used, the furnace will only operate at low fire.

Table 10: Two-stage heat staging time dip switch positions

Heat staging time		
0	0	Off
1	0	10 min
0	1	Auto
1	1	20 min

If the staging dipswitches are set to OFF position and a single stage thermostat is used, the furnace will only operate at low fire.

Twinning

Do not twin these furnaces. If more than one furnace is needed in an application, each furnace must have its own complete duct system and its own wall thermostat.

Connecting the vent system

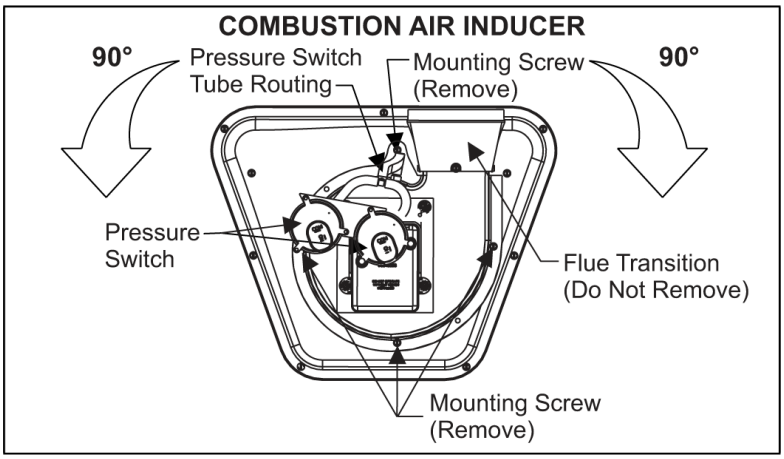
Be aware that the furnace is provided with a flue transition that is sized for 4 in. diameter vent connections. If a larger size vent connector is required, install that connection external to the furnace.

Be aware that the furnace is shipped from the factory as shown in Figure 21 and Figure 22. If you need to convert to a horizontal or downflow position, do the following:

1. Remove the four screws that secure the inducer assembly and rotate 90° being careful not to damage the gasket. Then, reinstall the four screws.

2. Remove the cap from the appropriate vent outlet location on the cabinet, cut the insulation in the cabinet to the same size as the hole provided, and reinstall the cap in the hole in the top panel.

Figure 21: Combustion air inducer



WARNING

In downflow applications, do not block the combustion air inlet. The furnace must be installed on a coil cabinet or subbase to allow combustion air to enter the burner compartment.

Category 1 - 450°F maximum vent temperature

Install the venting system 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.

Connect the furnace to any type of B, BW, or L vent connector and to a factory-built or masonry chimney. **Do not connect the furnace to a chimney flue serving a separate appliance designed to burn solid fuel.**

Install the appliance in a location where the space temperature is 32°F (0°C) or higher. If installing the appliance in a location where the ambient temperature is below 32°F (0°C), the combustion byproducts could condense, causing damage to the appliance heat exchanger.

This appliance may be common-vented with another gas appliance for residential installations as allowed by the codes and standards listed in this manual.

Non-HUD approved modular homes must be vented with an approved roof jack and may not be common-vented with other appliances.

Category 1 venting

Category I venting consists of vertically venting one or more appliances in B-vent or masonry chimney (as allowed), using single wall metal pipe or B-vent connectors. Type B-vent system extends in a general vertical direction and does not contain offsets exceeding 45°. A vent system having not more than one 60° offset is permitted.

A single, correctly sized pipe from the furnace vent connector to the outdoors must be provided.

Venting into an existing chimney

For Category I installations, connect the furnace to a factory-built chimney or vent complying with a recognized standard, or a masonry or concrete chimney lined with a material acceptable to the authority having jurisdiction.

Important: Do not vent this furnace into an unlined masonry chimney or concrete chimney.

Where use of an existing chimney is unavoidable, you must adhere to the following rules:

- The masonry chimney must be built and installed in accordance with nationally recognized building codes or standards and must be lined with approved fire-clay tile flue-liners or other approved liner material that resists corrosion, softening, or cracking from flue gases.
- Only vent this furnace into a fire-clay tile-lined masonry chimney if a source of dilution air is available, such as by common venting with a draft hood equipped water heater. If no source of dilution air is available, you must use a Type B vent or masonry chimney vent kit 7759014190. Refer to the instructions with the kit to correctly apply these masonry chimney kits.
- The chimney must extend at least 3 ft (0.91 m) above the highest point where it passes through a roof of a building and at least 2 ft (0.61 m) higher than any portion of the building with a horizontal distance of 10 ft (3.05 m).
- The chimney must extend at least 5 ft (1.5 m) above the highest equipment draft hood or flue collar.

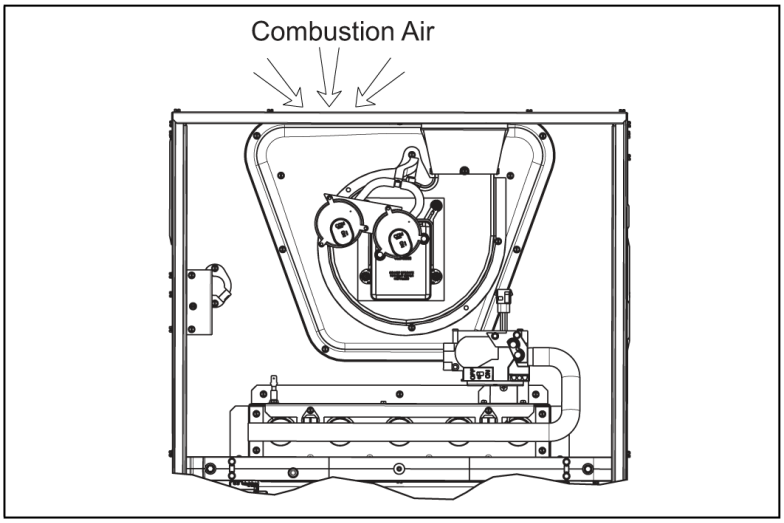
Fan-assisted combustion system

This appliance is equipped with an integral mechanical means to draw products of combustion through the heat exchanger.

Ambient combustion air supply

This type of installation will 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. This may be from within the space in a non-confined location or it may be brought into the furnace area from outdoors through permanent openings or ducts. It is not piped directly into the furnace. A single, properly sized pipe from the furnace vent connector to the outdoors must be provided. It is recommended that the supplied intake coupling and 18 in. (46 cm) of pipe be attached to the furnace to prevent accidental blockage of the combustion air intake.

Figure 22: Combustion airflow path through the furnace casing to the burner compartment



⚠ 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.

⚠ WARNING

Examine the heat exchanger, vent pipe, combustion air passages, vent connectors, and chimney to be sure they are clear and free of obstructions.

Note: Proper orientation on the heat exchanger is for the compressed heat transfer blade portion to be up and away from the burner section, towards the air leaving end of the furnace.

An **unconfined space** is not less than 50 ft^3 (1.42 m^3) per 1,000 Btu/h (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 doors are furnished with openings or louvers.

A **confined space** is an area with less than 50 ft^3 (1.42 m^3) per 1,000 Btu/h (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.

Dampers, louvers and grilles (Canada only)

- The free area of a supply air opening is calculated by subtracting the blockage area of all fixed louvers grilles or screens from the gross area of the opening.
- Apertures in a fixed louver, a grille, or screen has no dimension smaller than 0.25 in. (0.64 cm).
- A manually operated damper or manually adjustable louvers are not permitted for use.
- An automatically operated damper or automatically adjustable louvers are interlocked so that the main burner cannot operate unless either the damper or the louver is in the fully open position.

⚠ WARNING

Always verify that any pre-existing venting system previously attached to a different Category I furnace is still properly sized for safe use of this furnace.

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

Table 11: Unconfined space minimum area

Btu/h input rating	Minimum free area required for each opening
60,000	60 $in.^2$ (387 cm^2)
80,000	80 $in.^2$ (516 cm^2)

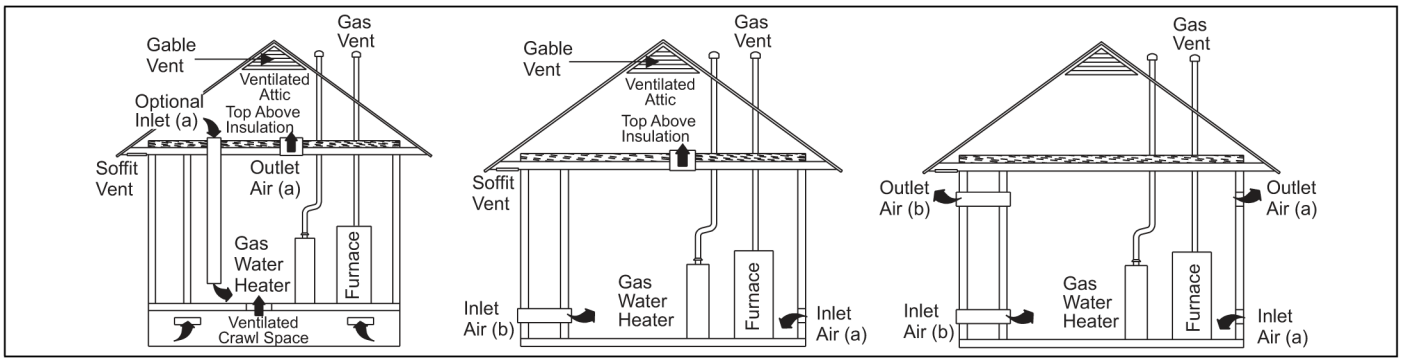
Table 11: Unconfined space minimum area

Btu/h input rating	Minimum free area required for each opening
100,000	100 in.^{2} (645 cm^2)
120,000	120 in.^{2} (742 cm^2)

Table 12: Free area

Btu/h input rating	Minimum free area required for each opening		
	Horizontal duct(2,000 Btu/h)	Vertical duct or opening to outside(4,000 Btu/h)	Round duct(4,000 Btu/h)
60,000	30 in^2 (193 cm^2)	15 in^2 (97 cm^2)	5 in. (13 cm)
80,000	40 in^2 (258 cm^2)	20 in^2 (129 cm^2)	5 in. (13 cm)
100,000	50 in^2 (322 cm^2)	25 in^2 (161 cm^2)	6 in. (15 cm)
120,000	60 in^2 (387 cm^2)	30 in^2 (193 cm^2)	7 in. (18 cm)
Example: Determining free area.			
Appliance 1 appliance 2 total input			
100,000 + 30,000 = (130,000 ÷ 4,000) = 32.5 in^2 vertical			
Appliance 1 appliance 2 total input			
100,000 + 30,000 = (130,000 ÷ 2,000) = 65 in^2 horizontal			

Figure 23: Ambient combustion air



Air supply openings and ducts

1. An opening may be used in lieu of a duct to provide to provide the outside air supply to an appliance unless otherwise permitted by the authority having jurisdiction. The opening shall be located within 12 in. (30.5 cm) horizontally from, the burner level of the appliance. See Combustion air source from outdoors and Vent and supply (outside) air safety check procedure in these instructions for additional information and safety check procedure.
2. The duct must be either metal, or a material meeting the class 1 requirements of CAN4-S110 Standard for Air Ducts.
3. The duct must be at least the same cross-sectional area as the free area of the air supply inlet opening to which it connects.
4. The duct must terminate within 12 in. (30.5 cm) above, and within 24 in. (61 cm) horizontally from, the burner level of the appliance having the largest input.
5. A square or rectangular shaped duct must only be used when the required free area of the supply opening is 9 in^2 (58.06 cm^2) or larger. When a square or rectangular duct is used, its small dimension must not be less than 3 in. (7.6 cm).
6. An air inlet supply from outdoors must be equipped with a means to prevent the direct entry of rain and wind. Such means must not reduce the required free area of the air supply opening.
7. An air supply inlet opening from the outdoors must be located not less than 12 in. (30.5 cm) above the outside grade level.

Combustion air source from outdoors

- Two permanent openings, one within 12 in. (30.5 cm) of the top and one within 12 in. (30.5 cm) of the bottom of the confined space, must communicate directly or by means of ducts with the outdoors, crawl spaces, or attic spaces.
- One permanent opening starting within 12 in. (30.5 cm) of the top of the enclosure is permitted where the equipment has clearances of at least 1 in. (2.54 cm) from the sides and back and 6 in. (15.2 cm) from the front of the appliance. The opening must communicate directly with the outdoors and have a minimum free area of:
  - 1 in^2/3,000 Btu/h (700 mm^2/kW) of the total input rating of all equipment located in the enclosure
  - Not less than the sum of all vent connectors in the confined space
- The duct must be at least the same cross-sectional area as the free area of the air supply inlet opening to which it connects.
- The blocking effects of louvers, grilles, and screens must be given consideration in calculating the free area. If the free area of a specific louver or grille is not known, see Dampers, louvers and grilles (Canada only).

Ventilated combustion air

The ventilated attic space or a crawl space from which the combustion air is taken must comply with the requirements specified in Combustion air source from outdoors in this instruction or in Section 5.3, Air for Combustion and Ventilation of the National Fuel Gas Code, ANSI Z223.1 (latest edition). This type installation requires two properly sized pipes. One brings combustion air from a properly ventilated attic space or crawl space and a second pipe that extends from the furnace vent connection (top right of unit) to the exterior of the building.

Vent and supply (outside) air safety check procedure

For Category I furnaces, vent installations are in accordance with Parts 7 and 11 of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and Section 7 and Appendix B of the CSA B149.1, Natural Gas and Propane Installation Codes, the local building codes, furnace and vent manufactures 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 the CSA B149.1, Natural Gas and Propane Installation Codes, local codes, and the manufactures instructions.

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

Horizontal portions of the venting system a supported to prevent sagging using hangers or perforated straps and must slope upwards not less than 1/4 in./ft (20.8 mm/m) from the furnace to the vent terminal.

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.

⚠ 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. Inspect the venting system for proper size and horizontal pitch. Determine that there is no blockage, restriction, leakage, corrosion or other deficiencies, which could cause an unsafe condition

2. Close all building doors and windows.

3. Turn on clothes dryers and TURN ON any exhaust fans, such as range hoods and bathroom exhausts, so they shall operate at maximum speed. Open the fireplace dampers. Do not operate a summer exhaust fan.

4. Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so the appliance shall operate continuously.

5. Test each appliance (such as a water heater) equipped with a draft hood for spillage (down-draft or no draft) at the draft hood relief opening after 5 minutes of main burner operation. Appliances that do not have draft hoods need to be checked at the vent pipe as close to the appliance as possible. Use a combustion analyzer to check the CO2 and CO levels of each appliance. Use a draft gauge to check for a downdraft or inadequate draft condition.

6. After it has been determined that each appliance properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their normal condition.

7. If improper venting is observed during any of the above tests, a problem exists with either the venting system or the appliance does not have enough combustion air (Supply Air from outside) to complete combustion. This condition must be corrected before the appliance can function safely.

Note: An unsafe condition exists when the CO reading exceeds 40 ppm and the draft reading is not in excess of -0.1 in. W.C. (-25 kPa) with all of the appliance(s) operating at the same time.

8. Any corrections to the venting system and/or to the supply (outside) air system must be in accordance with the National Fuel Gas Code Z223.1 or CAN/CGA B149.1 Natural Gas and Propane Installation Code (latest editions). If the vent system must be resized, follow the appropriate tables in Appendix G of the above codes or for this appliance.

Starting up the unit

ⓘ **Note:** When the gas supply is initially connected to the furnace, the gas piping may be full of air. In order to purge this air, loosen the ground union until you detect the odor of gas. When gas is detected, immediately retighten the ground union and check for leaks. Allow 5 min for any gas to dissipate before continuing with the start-up procedure. Ensure adequate ventilation is available to dilute and carry away any vented gas.

➤ **Important:** You must check all electrical connections made in the field and in the factory for adequate tightness.

1. Turn the gas supply ON at external valve and main gas valve.
2. Set the thermostat above room temperature to call for heat.
3. System start-up will occur as follows:
   a. The induced draft blower motor will start and come up to speed. Shortly after inducer start-up, the hot surface igniter will glow for about 17 s.
   b. After this warm up, the ignition module will energize (open) the main gas valve.

c. The furnace will light at the high-fire input rate. If the thermostat is calling for low fire, the firing rate will drop to low fire after flame is established.
d. After flame is established, the supply air blower will start in about 30 s.

⚠ WARNING

Burner ignition may not be satisfactory on first startup due to residual air in the gas line or until gas manifold pressure is adjusted. The ignition control will make three attempts to light before locking out.

With furnace in operation, check all of the pipe joints, gas valve connections and manual valve connections for leakage using an approved gas detector, a non-corrosive leak detection fluid, or other leak detection methods. Take appropriate steps to stop any leak. If a leak persists, replace the component.

Removing NOx screens

NOTICE

When using the furnace with LP(propane) gas and it is equipped with NOx screens, you must remove the screens before start-up.

1. Make sure that the electrical power to the unit is turned off and that the gas supply is turned off at the shut-off valve.
2. Remove the blower compartment and burner compartment access doors.
3. Disconnect the gas supply piping at the union to permit removal of the entire burner and gas control assembly from the vestibule panel. Use the wrench boss on the gas valve when removing or installing the piping.
4. Unplug the igniter from the wire harness. Disconnect the flame sensor wires located on top of the air shield. Unplug the gas valve from the wiring harness.
5. Remove the screws holding the burner assembly to the vestibule panel.
6. Remove the burner assembly. It should be possible to swing the burner assembly out of the way without disconnecting the remaining wires.
7. With the burner assembly out of the way, slide the NOx screens out of the heat exchanger tubes and discard the screens.
8. Replace all components in reverse order. Reconnect all wiring.

Checking the gas piping for leaks

You must do a gas piping leak check for every new furnace installation. When the gas supply is initially connected to the furnace, the gas piping may be full of air, so you must purge it by loosening the ground union before you check the gas piping for leaks.

- **Important:** The furnace and its equipment shut-off valve must be disconnected from the gas supply during any pressure testing of the system at test pressures in excess of 1/2 in. psig (3.45 kPa).
- **Important:** The furnace must be isolated from the gas supply piping system by closing the equipment shut-off valve during any pressure testing of the gas supply system.
- **Important:** Burner ignition may not be satisfactory on first start-up due to residual air in the gas line or until gas manifold pressure is adjusted. The ignition control makes three attempts to light before locking out.

To check the gas piping for leaks, do the following:

1. Make sure that correct ventilation is available to dilute and carry away any vented gas.
2. Loosen the ground union until the odor of gas is detected. When gas is detected, immediately retighten the union.
3. Allow 5 min for any gas to dissipate before proceeding to check for leaks.
4. With the unit in operation, check all of the pipe joints, gas valve connections, and manual valve connections for leakage using an approved gas detector, a non-corrosive leak detection fluid, or other leak detection methods.
5. If a leak or leaks are detected, take appropriate action to stop any leak. If a leak persists, replace the faulty component.

Calculating the furnace input rate for natural gas

NOTICE

Burner orifices are sized to provide the correct input rate using natural gas with a heating value of 1,030 Btu/cu ft (38.4 MJ/m^3). If the heating value of your gas is significantly different, it may be necessary to replace the orifices.

NOTICE

Do not set manifold pressure less than 3.2 in. W.C. or more than 3.8 in. W.C. for natural gas at sea level. If manifold pressure is outside this range, change main burner orifices.

NOTICE

If orifice hole appears damaged or it is suspected to have been redrilled, check orifice hole with a numbered drill bit of correct size. Never redrill an orifice. A burr-free and squarely aligned orifice hole is essential for proper flame characteristics.

⚠ CAUTION

Do not bottom out gas valve regulator adjusting screw. This can result in unregulated manifold pressure and result in excess overfire and heat exchanger failures.

Verify natural gas input rate by clocking the meter as follows:

1. Turn off all other gas appliances and pilots.
2. Run the furnace for a minimum of 3 min in heating operation.
3. Measure time (in seconds) for the gas meter to complete one revolution and note the reading. The 2 cu ft dial provides a more accurate measurement of gas flow.
4. See Table 13 for cubic feet of gas per hour.
5. Multiply cubic feet per hour by heating value (Btu/cu ft) to obtain input.
   If the clocked rate does not match the input rate from the unit nameplate, follow the steps in Adjusting the manifold gas pressure and input rate. Repeat Step 2 to Step 5 until the correct input is achieved.

⚠ CAUTION

Ensure to relight any gas appliances that were turned off at the start of this input check.

Gas rate

Table 13: Gas rate (ft³/hr)

Seconds for 1 revolution	Size of test dial				Seconds for 1 revolution	Size of test dial		
	1 ft³	2 ft³	5 ft³			1 ft³	2 ft³	5 ft³
10	360	720	1800		50	72	144	360
11	327	655	1636		51	71	141	355
12	300	600	1500		52	69	138	346
13	277	555	1385		53	68	136	340
14	257	514	1286		54	67	133	333
15	240	480	1200		55	65	131	327
16	225	450	1125		56	64	129	321
17	212	424	1059		57	63	126	316
18	200	400	1000		58	62	124	310
19	189	379	947		59	61	122	305
20	180	360	900		60	60	120	300
21	171	343	857		62	58	116	290
22	164	327	818		64	56	112	281
23	157	313	783		66	54	109	273
24	150	300	750		68	53	106	265
25	144	288	720		70	51	103	257
26	138	277	692		72	50	100	250
27	133	267	667		74	48	97	243
28	129	257	643		76	47	95	237
29	124	248	621		78	46	92	231
30	120	240	600		80	45	90	225
31	116	232	581		82	44	88	220
32	113	225	563		84	43	86	214
33	109	218	545		86	42	84	209
34	106	212	529		88	41	82	205
35	103	206	514		90	40	80	200
36	100	200	500		92	39	78	196
37	97	195	486		94	38	76	192
38	95	189	474		96	38	75	188
39	92	185	462		98	37	74	184
40	90	180	450		100	36	72	180
41	88	176	439		102	35	71	178

Table 13: Gas rate (ft^3/hr)

Seconds for 1 revolution	Size of test dial				Seconds for 1 revolution	Size of test dial		
	1 ft^3	2 ft^3	5 ft^3			1 ft^3	2 ft^3	5 ft^3
42	86	172	429		104	35	69	173
43	84	167	419		106	34	68	170
44	82	164	409		108	33	67	167
45	80	160	400		110	33	65	164
46	78	157	391		112	32	64	161
47	76	153	383		116	31	62	155
48	75	150	375		120	30	60	150
49	73	147	367					

Adjusting the manifold gas pressure and input rate

Measure the inlet and manifold gas pressure by connecting the **U** tube manometer to the gas valve with a piece of tubing. Follow the appropriate section in the instructions below. See Figure 24 for the locations of the pressure ports on the gas valve.

ⓘ **Note:** Turn gas off at the ball valve or gas cock on gas supply line before the gas valve. Find the pressure ports on the gas valve marked Out P and In P.

1. The manifold pressure must be taken at the port marked OUT P.
2. The gas line pressure must be taken at the port marked IN P.
3. Using a 3/32 in. (2.4 mm) hex head wrench, loosen the set screw by turning it one turn counter clockwise. **Do not remove the set screw from the pressure port.**

Read the inlet gas pressure

Connect the positive side of the manometer to the IN P tap on the gas valve. Do not connect any tubing to the negative side of the manometer, as it references atmospheric pressure. See Figure 25 for connection details.

1. Turn gas and electrical supplies on and follow the operating instructions to place the unit back in operation.

   Table 14: Inlet gas pressure range

	Natural gas	Propane (LP)
Minimum*	4.5 in. W.C. (1.12 kPa)	8.0 in. W.C. (1.99 kPa)
Maximum	10.5 in. W.C. (2.61 kPa)	13.0 in. W.C. (3.24 kPa)

   ➤ **Important:** The inlet gas pressure operating range table specifies what the minimum and maximum gas line pressures must be for the furnace to operate safely. The gas line pressure must be a minimum of:
   - 7 in. W.C. (1.74 kPA) for Natural Gas
   - 11 in. W.C. (2.74 kPA) for Propane (LP) Gas

   in order to obtain the Btu input specified on the rating plate or the nominal manifold pressure specified in these instructions and on the rating plate.
2. Once the correct gas inlet pressure has been established, see Table 14, turn the gas valve to OFF and turn the electrical supply switch to OFF; then remove the flexible tubing from the gas valve pressure tap and tighten the pressure tap plug using the 3/32 in. (2.4 mm) hex head wrench.

3. Turn the electrical and gas supplies back on, and with the burners in operation, check for gas leakage around the gas valve pressure port for leakage using an approved non-corrosive gas leak detection fluid, or other non-flammable leak detection methods.

Read the manifold gas pressure

Connect the positive side of the manometer to the adapter previously installed in the OUT P tap on the gas valve. Do not connect any tubing to the negative side of the manometer, as it will reference atmospheric pressure. See Figure 25 for connection details.

Important: The cap for the pressure regulator must be removed entirely to gain access to the adjustment screw. Loosening or tightening the cap does not adjust the flow of gas.

1. See Figure 24 for location of pressure regulator adjustment caps and adjustment screws on main gas valve.
2. Turn gas and electrical supplies on and follow the operating instructions to place the unit back in operation.

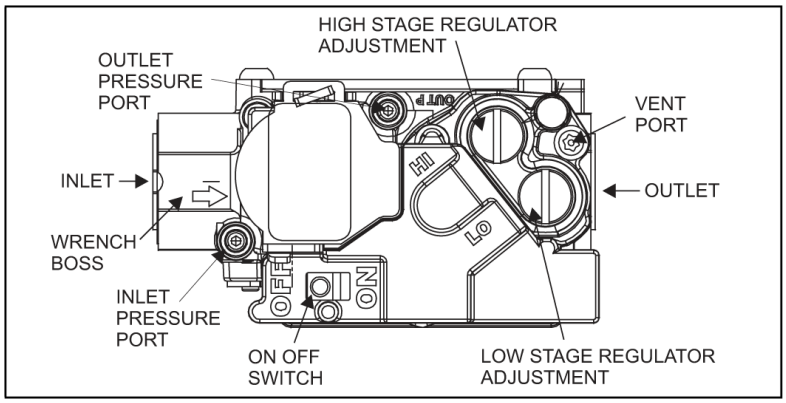
   Note: This furnace uses a two stage gas valve. The high-fire and low-fire manifold pressures can be adjusted independently.

3. Place jumper wire from W1 to W2 to R on the furnace control board for the furnace to operate HIGH fire. Once correct manifold pressure is set (HI), remove jumper from W2 for the furnace to operate on low fire. Set the manifold pressure (LO) to correct manifold pressure.

   Table 15: Nominal manifold pressure

	High fire	Low fire
Natural gas	3.5 in. W.C. (0.87 kPa)	1.6 in. W.C. (0.40 kPa)
Propne (LP)	9.8 in. W.C. (2.44 kPa)	4.0 in. W.C. (0.99 kPa)

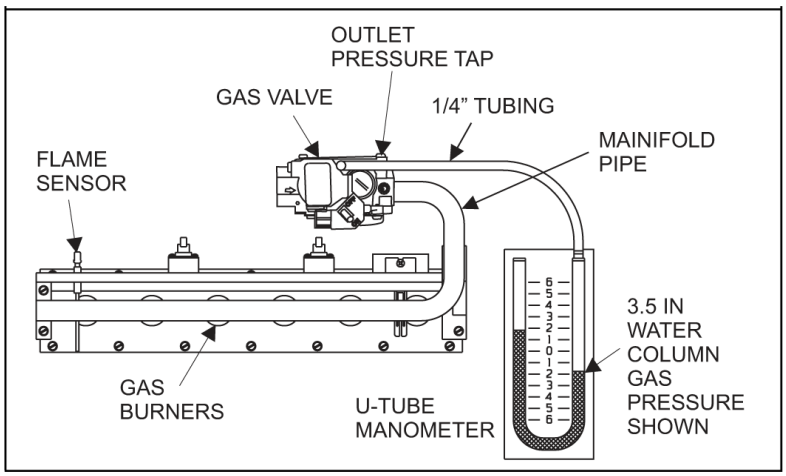
Figure 24: Gas pressure



Important: If gas valve regulator is turned in (clockwise), manifold pressure is increased. If screw is turned out (counterclockwise), manifold pressure will decrease.

4. After the manifold pressure has been adjusted, re-calculate the furnace input to make sure you have not exceeded the specified input on the rating plate.
5. Once the correct Btu (kW) input has been established, turn the gas valve to OFF and turn the electrical supply switch to OFF; then remove the flexible tubing from the gas valve pressure tap and tighten the pressure tap plug using the 3/32 in. (2.4 mm) hex head wrench.
6. Turn the electrical and gas supplies back on, and with the burners in operation, check for gas leakage around the gas valve pressure port for leakage using an approved non-corrosive gas leak detection fluid, or other non-flammable leak detection methods.

Figure 25: Reading gas pressure



Airflow settings

Adjust the airflow settings according to your heating or cooling requirements.

Cooling airflow settings

This unit is equipped with a five-speed blower motor.

The desired cooling airflow may be selected by connecting the desired motor speed tap wire to the HI COOL terminal on the control board. The speed should be selected so as to deliver approximately 350-400 CFM per ton of AC cooling capacity. Use of airflow outside of this range may result in diminished air conditioning performance and may result in lower overall energy efficiency and higher electric utility bills.

Table 16: Default blower speeds

Model number	Default blower speeds				
	HI heat	LO heat	HI cool	LO cool	Continuous fan
060A12	Medium high (4)	Medium low (2)	High (5)	Medium (3)	Low speed (1), G terminal on control board
080B12	Medium high (4)	Medium (3)	High (5)	Medium low (2)	Low speed (1), G terminal on control board
080C16	Medium high (4)	Medium low (2)	High (5)	Medium (3)	Low speed (1), G terminal on control board
100C16	Medium high (4)	Medium (3)	High (5)	Medium low (2)	Low speed (1), G terminal on control board
100C20	Medium high (4)	Medium low (2)	High (5)	Medium (3)	Low speed (1), G terminal on control board
120C20	Medium high (4)	Medium (3)	High (5)	Medium low (2)	Low speed (1), G terminal on control board

Continuous fan airflow settings

The default blower speed for continuous fan operation is G (low speed).

This furnace may be operated in continuous fan mode by setting the wall thermostat FAN switch to ON. To select the desired continuous fan airflow, set the FAN SPEED dip switches on the control board to the desired position. There are four options:

Table 17: Two-stage continuous fan dip switch positions

Continuous fan speed		
0	1	HI cool
1	0	Lo cool
1	1	Lo heat
0	0	G

1. With the FAN SPEED dip switches in the HI COOL positions (01 OFF/ON), the blower will run during continuous fan operation at the motor speed connected to the HI COOL terminal on the control board.
2. With the FAN SPEED dip switches in the LO COOL positions (10 ON/OFF), the blower will run during continuous fan operation at the motor speed connected to the LO COOL terminal on the control board.
3. With the FAN SPEED dip switches in the LO HEAT positions (11 ON/ON), the blower will run during continuous fan operation at the motor speed connected to the LO HEAT terminal on the control board.
4. With the FAN SPEED dip switches in the G positions (00 OFF/OFF), the blower will run during continuous fan operation at the motor speed connected to the G terminal on the control board.

The default position is with the dip switches in the G position and the LOW speed motor wire on the G terminal. In certain circumstances, it may be necessary to move the continuous fan speed to a different speed tap. However, doing so is not recommended since it will result in higher than normal electrical energy usage and higher than normal electric utility bills.

Gas heating airflow settings

The default heating blower speed is shown in Table 16.

This unit is equipped with a five-speed blower motor. The heating blower speed is set at the factory to the default blower speed, which is the blower speed that delivers the correct airflow for proper heating operation in most applications.

In certain circumstances, it may be necessary to move the heating blower speed to a different motor speed tap. Not all five motor speeds are appropriate for gas heating operation. The use of heating airflow on a speed other than the default speed results in diminished heating performance and may cause the furnace temperature limit controls to shut down the furnace.

Measuring temperature rise

⚠ WARNING

The temperature rise, or temperature difference between the return air and the supply (heated) air from the furnace, must be within the range shown on the furnace rating plate and within the application limitations for specific furnace ratings and physical/ electrical data as specified in these instructions.

The supply air temperature cannot exceed the “Maximum Supply Air Temperature” as it may cause premature heat exchanger failure, high levels of Carbon Monoxide, a fire hazard, personal injury, property damage, and/or death.

After about 5 min of operation, determine the furnace temperature rise. Measure the temperature of both the return air and the heated air in the ducts, about 6 ft (1.83 m) from the furnace where they will not be affected by radiant heat. Increase the blower speed to decrease the temperature rise; decrease the blower speed to increase the rise.

The blower speed taps are located on the furnace control board in the blower compartment. See Figure 26, and the unit-wiring label to change the blower speed. To use the same speed tap for heating and cooling, the heat terminal and cool terminal must be connected using a jumper wire and connected to the desired motor lead. Place the unused motor leads on the PARK terminal.

Figure 26: Furnace control board

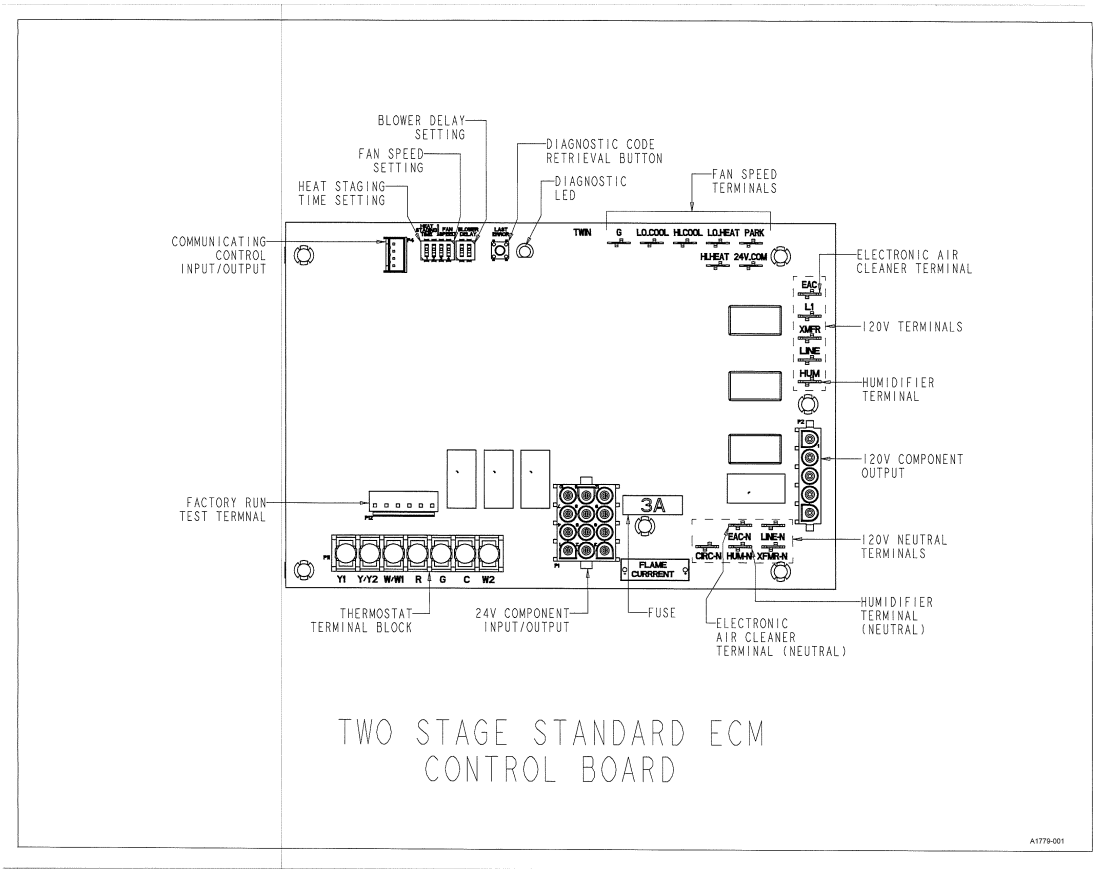


Table 18: Blower performance CFM - any position (without filter)

Models	Speed	Airflow data (SCFM) by external static pressure (in. W.C.)							
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
060A12	High	1375	1325	1300	1275	1225	1200	1175	1125
	Medium high	1050	1000	975	925	900	850	825	775
	Medium	925	875	850	800	750	725	675	625
	Medium low	850	800	750	725	675	625	550	500
	Low	675	625	575	525	450	400	350	275

Table 18: Blower performance CFM - any position (without filter)

Models	Speed	Airflow data (SCFM) by external static pressure (in. W.C.)							
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
080B12	High	1375	1325	1300	1275	1225	1200	1150	1125
	Medium high	1175	1125	1075	1050	1000	975	925	900
	Medium	1025	1000	950	925	875	825	800	750
	Medium low	925	875	850	800	750	725	675	625
	Low	700	650	600	550	500	450	400	325
080C16	High	1700	1675	1625	1600	1550	1500	1450	1425
	Medium high	1400	1375	1325	1275	1225	1200	1125	1100
	Medium	1275	1250	1200	1150	1100	1050	1000	950
	Medium low	1150	1100	1050	1000	950	900	850	775
	Low	975	925	875	825	750	700	625	575
100C16	High	1900	1850	1825	1800	1750	1725	1675	1625
	Medium high	1650	1625	1575	1550	1500	1450	1425	1375
	Medium	1250	1200	1175	1125	1075	1050	1000	950
	Medium low	1125	1050	1025	975	925	875	825	800
	Low	875	775	725	675	625	575	500	450
100C20	High	1975	1950	1900	1850	1825	1775	1725	1700
	Medium high	1825	1775	1725	1675	1650	1600	1550	1500
	Medium	1675	1600	1575	1500	1475	1425	1375	1325
	Medium low	1450	1400	1350	1300	1250	1175	1125	1050
	Low	1000	925	825	700	575	475	400	300
120C20	High	2000	1925	1875	1825	1775	1725	1675	1625
	Medium high	1725	1675	1600	1550	1500	1425	1375	1325
	Medium	1475	1400	1350	1275	1225	1175	1100	1050
	Medium low	1250	1175	1100	1025	950	875	800	725
	Low	1000	900	800	700	600	525	425	375

Note:

- Airflow expressed in standard cubic feet per minute (SCFM)
- Motor voltage at 115 V
- Do not operate at an external static pressure higher than the rating on the furnace data plate.

Note:

High = Black wire

Med High = Blue wire

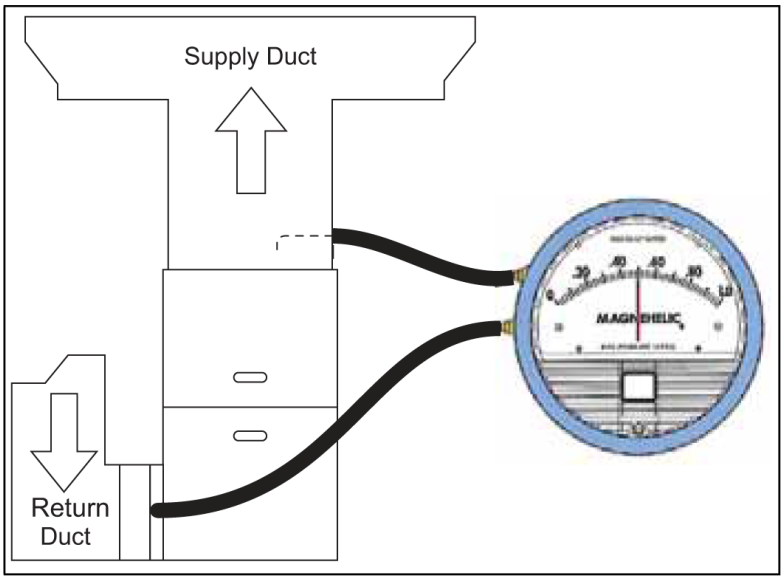
Medium = Grey wire

Med Low = Yellow wire

Low = Red wire

External static pressure setup

Figure 27: Measuring external duct static



Set appropriate airflow per temperature rise for gas heating. Set appropriate airflow per Table 18 for cooling/heat pump heating operating based on outdoor unit size.

To measure external static pressure:

- Measure the supply air static pressure.

  ⓘ **Note:** If the furnace is coupled with an indoor coil, the supply air static pressure MUST be taken between the outlet of the furnace and the inlet of the indoor coil.

- Record this positive number
- Measure the return air static pressure

  ⓘ **Note:** Return air static pressure MUST be taken after the air filter and before the blower compartment.

- Record this negative number
- Treat the negative number as a positive and add the two numbers together
- This is total system static

Safety controls

Adhere to the following safety advice.

Control circuit fuse

A 3 A fuse is provided on the control circuit board to protect the 24 V transformer from overload caused by control circuit wiring errors. This is an ATO 3 automotive type fuse and is located on the control board.

Blower door safety switch

⚠ CAUTION

Main power to the unit must still be interrupted at the main power disconnect switch before any service or repair work is to be done to the unit. **Do not rely upon the interlock switch as a main power disconnect.**

Blower and burner must never be operated without the blower panel in place.

This unit is equipped with an electrical interlock switch mounted in the blower compartment. This switch interrupts all power at the unit when the panel covering the blower compartment is removed.

Electrical supply to this unit is dependent upon the panel that covers the blower compartment being in place and correctly positioned.

Rollout switch controls

These controls are mounted on the burner assembly. If the temperature in the area surrounding burner exceeds its setpoint, the gas valve is de-energized. The operation of this control indicates a malfunction in the combustion air blower, heat exchanger, or a blocked vent pipe connection. Corrective action is required. These are manual reset controls that must be reset before operation can continue.

Pressure switches

This furnace is supplied with two pressure switches, which monitor the flow through the combustion air/vent piping. These switches de-energize the gas valve if either of the following conditions are present.

- Blockage of vent piping or terminal.
- Failure of combustion air blower motor.

Limit controls

There is a high temperature limit control located on the furnace vestibule panel. This is an automatic reset control that provides over temperature protection due to reduced airflow. This may be caused by the following:

- A dirty filter
- Indoor fan motor failure
- Too many supply or return registers closed or blocked off
- Incorrectly sized duct system

The control module locks out if the limit trips five consecutive times. If this occurs, the control resets and tries ignition again after 1 h.

Sequence of operation

The following describes the sequence of operation of the furnace. Refer to the User's Manual for component location.

Continuous blower

Cooling or heating thermostats have a fan switch that has an ON and AUTO position. In the ON position the thermostat circuit is completed between terminals R and G. The motor operates continuously on the speed tap

that is selected through dipswitches on the furnace control board. To obtain a different constant air circulation change dipswitches to assign another speed tap.

Intermittent blower - cooling

Cooling/heating thermostats have a fan switch that has an ON and AUTO position. In the AUTO position the thermostat circuit is completed between terminals R and G when there is a call for cooling. The motor will operate on the speed tap wire that is connected to the HI COOL or LO COOL cooling terminal on the control board depending on 24V thermostat input on Y1 or Y/Y2. The fan off setting is fixed at 60 s to improve cooling efficiency.

Adjusting the blower OFF delay

This furnace is equipped with a time-on/time-off heating blower control. The blower-on delay is fixed at 30 s. The blower-off delay has four settings: 60 s, 90 s, 120 s, and 180 s. The blower-off delay is factory set to 60 s.

ⓘ **Note:** The blower-off setting must be long enough to adequately cool the furnace, but not so long that cold air is blown into the heated space.

Adjust the blower-off timing by setting the blower delay DIP switches as shown in Table 19. Each DIP switch has an ON or OFF position. 0 represents the DIP switch in the off position and 1 represents the DIP switch in the on position. The factory setting is 00 or OFF/OFF.

Table 19: 2-stage blower off delay dip switch positions

Heat staging time		
0	0	60 s
1	0	90 s
0	1	120 s
1	1	180 s

Heating cycle

When the thermostat switch is set on HEAT and the fan is set on AUTO, and there is a call for heat, a circuit is completed between terminals R and W of the thermostat. When the proper amount of combustion air is being provided, the pressure switch closes, the ignition control provides a 17 s ignitor warm-up period, the gas valve then opens, the gas starts to flow, ignition occurs and the flame sensor begins its sensing function. The furnace fires on high fire for 10 s, then it switches to low fire unless there is a heating call present on W2. The circulating blower motor energizes 30 s after the gas valve opens if a flame is detected. Normal furnace operation continues until the thermostat circuit between R and W is opened, which causes the ignition system and gas valve to de-energize and the burner flames to be extinguished. The vent motor operates for 15 s, and the circulating blower motor operates for the amount of time set by the blower delay dip switches located on the control board. See Figure 26. The heating cycle is now complete and ready for the start of the next heating cycle.

If the flame is not detected within 7 s of the gas valve opening, the gas valve is shut off and a retry operation begins. During a retry operation, the vent motor starts a 15 s inter-purge and the ignitor warm-up time is extended to 27 s. If the flame is established for more than 10 s after ignition during a retry, the control clears the ignition attempt (retry) counter. If three retries occur during a call for heat, the furnace shuts down for one hour. If at the end of the one hour shut down there is a call for heat, the furnace initiates a normal start cycle. If the problem has not been corrected the furnace again lockouts after three retries.

A momentary loss of gas supply, flame blowout, or a faulty flame probe circuit results in a disruption in the flame and be sensed within 1 s. The gas valve de-energizes and the control begins a recycle operation. A normal ignition sequence begins after a 15 s inter-purge. If during the five recycles the gas supply does not return, or the fault condition is not corrected the ignition control lockouts for 60 min.

During burner operation, a momentary loss of power for 50 ms or longer de-energizes the gas valve. When the power is restored, the gas valve remains de-energized and the ignition sequence immediately restarts.

Hot surface ignition surface

⚠ WARNING

Do not attempt to light this furnace by hand (with a match or any other means). There may be a potential shock hazard from the components of the hot surface ignition system. The furnace can only be lit automatically by its hot surface ignition system.

Troubleshooting

Make the following visual checks before doing the detailed troubleshooting outlined in Furnace control diagnostics:

1. Check to see that the power to the furnace and the ignition control module is on.
2. Check if the manual shut-off valves in the gas line to the furnace are open.
3. Make sure all wiring connections are secure.
4. Review the sequence of operation. Start the system by setting the thermostat above the room temperature. Observe the system's response. Then use the Furnace control diagnostics section in this manual to check the system's operation.

⚠ WARNING

Never bypass any safety control to allow furnace operation. To do so allows furnace to operate under potentially hazardous conditions.

Do not try to repair controls. Replace defective controls with Bosch Parts.

Never adjust pressure switch to allow furnace operation.

Furnace control diagnostics

The furnace has built-in, self-diagnostic capability. A blinking LED light on the control board can flash red, green or amber to indicate various conditions. The control board continuously monitors its own operation and the operation of the system. If a fault occurs, the LED light indicates the fault code.

The SLOW flash speed is 2 s on and 2 s off. The other flash codes listed below have the following timing: LED light turns on for 1/3 s and off for 1/3 s. This pattern is repeated the number of times equal to the code. There is a 2 s pause between codes. For example, for the six red flashes code, the LED light flashes on and off six times and then remains off for 2 s.

Slow green flash: Standby, normal operation, fan only, and call for cooling.

Rapid amber flash: Amber LED light turns 1/10 s on and 1/10 s off indicating low flame signal warning.

Slow amber flash: Normal operation with call for heat.

LED steady off – If the LED light does not flash at all, check for power to the board and check for a blown fuse on the board. If the board is properly powered and the fuse is not blown, the control board may need to be replaced.

Steady on any color: Possible control failure. Remove and check the control voltage fuse. An open fuse results in a steady on red LED. Turn power to the furnace off and back on. If the fault code returns, the control board must be replaced. The control board is not field repairable.

Continuous amber flash: The flame sense current is below 0.35 µA. Check and clean the flame sensor. Check for proper gas flow. Verify that the current is greater than 0.35 µA at the flame current test pad.

Alternating red and amber flash: This indicates a refrigerant leak detected near the furnace.

1 red flash: This indicates that a flame was sensed when there was not a call for heat. The control turns on both the inducer motor and supply air blower. Check for a leaking or slow-closing gas valve.

2 red flashes: This indicates that the pressure switch is closed when it should be open. The control confirms that the pressure switch contacts are open at the beginning of each heat cycle and does not let the ignition sequence continue if the pressure switch contacts are closed when they should be open. Check for a faulty pressure switch or miswiring.

3 red flashes: This indicates that the pressure switch contacts are open when they should be closed. Check for faulty inducer, blocked vent pipe, broken pressure switch hose, disconnected pressure switch or inducer wires or faulty pressure switch.

4 red flashes: This indicates that the main limit switch has opened its normally closed contacts. The control operates the supply air blower and inducer while the open limit condition exists. Check for a dirty filter, improperly sized duct system, incorrect blower speed setting, incorrect firing rate, loose limit switch wiring or faulty blower motor.

If the limit switch has not closed within 5 min, the control operates as if the blower is not functioning, starts a hard lockout, and begins to flash the 11 red flashes error code. Cycle the power off and on to reset the control after the problem has been corrected. See the 11 red flashes description below.

If the main limit switch opens five times within a single call for heat, the control also indicates 4 red flashes and enters a one-hour soft lockout.

5 red flashes: This indicates that the normally closed rollout switch has opened or that the limit switch has been open longer than 15 min. The rollout control is manually reset. Check for proper combustion air, proper inducer operation, and primary heat exchanger failure or burner problem. The control enters a hard lockout. Cycle the power off and on to reset the control after the problem has been corrected.

6 red flashes: This indicates that while the unit was operating, the pressure switch opened five times during the call for heat. Check for faulty inducer, blocked vent pipe or faulty pressure switch. The furnace locks out for 1 h and then restarts.

7 red flashes: This indicates that the flame could not be established during three trials for ignition. Check that the gas valve switch is in the ON position. Check for low or no gas pressure, faulty gas valve, dirty or faulty flame sensor, faulty hot surface ignitor, loose wires or a burner problem. The furnace locks out for 1 h and then restarts.

8 red flashes: This indicates that the flame has been lost five times (four recycles) during the heating cycle. Check for low gas pressure, dirty or faulty flame sensor, or faulty gas valve. The furnace locks out for 1 h and then restarts.

9 red flashes: This indicates reversed line voltage polarity, a grounding problem, or reversed low voltage transformer wires. Both heating and cooling operations are affected. Check polarity at furnace and branch. Check furnace grounding. Check that flame probe is not shorted to chassis. The furnace will not start the ignition sequence until this problem is corrected.

10 red flashes: This indicates the gas valve is energized with no call for heat. The main blower and inducer blower run and no ignition sequence is started as long as this condition exists. Check gas valve and gas valve wiring.

11 red flashes: This indicates that the main limit switch has opened its normally-closed contacts and has remained open for more than 5 min. This condition is usually caused by a failed blower motor or blower wheel. The control

enters a hard lockout and power must be cycled off and on to reset the control after the problem has been corrected.

14 red flashes: This indicates that a low voltage of < 19.2 VAC has been reached. This prevents further relay outputs for > 2 s.

15 red flashes: This indicates that a low voltage of < 16 VAC has been reached. This stops the current relay outputs for > 2 s.

4 amber flashes: This indicates that the control is receiving a Y signal from the thermostat without a G signal. The furnace operates normally in both heating and cooling, but this fault code is displayed to alert the user that there is a wiring problem. Verify that the G wire from the thermostat is connected properly.

Soft lockout: This control includes a soft lockout that resets automatically after 1 h. This provides protection for an unoccupied structure if a temporary condition causes a furnace malfunction, for example, if a temporary interruption in the gas supply prevents the furnace from lighting. The control keeps trying to light each hour and resumes normal operation if the gas supply is restored.

Hard lockout: Some fault conditions result in a hard lockout, which requires power to the control to be turned off and then back on to reset the control. The control does not automatically restart.

IGNITION CONTROL FLAME SENSE LEVELS
Normal flame sense current is approximately 3.7 µA DC
Low flame signal warning starts at 1.5 µA DC
Low flame signal control lockout point is
0.1 µA DC

Diagnostic fault code storage and retrieval

The control in this furnace is equipped with memory that stores up to five error codes to allow a service technician to diagnose problems more easily. This memory is retained even if power to the furnace is lost. **This feature must only be used by a qualified service technician.**

If more than five error codes have occurred, only the five most recent are retained. The furnace control board has a LAST ERROR button, which is used to retrieve error codes. This function only works if there are no active thermostat signals. Any call for heating, cooling, or continuous fan must be terminated before attempting to retrieve error codes.

To retrieve the error codes, push and release LAST ERROR button. The LED on the control then flashes the error codes that are in memory, starting with the most recent. There is a 2 s pause between each flash code. After the error codes have all been displayed, the LED resumes the normal slow green flash after a 5 s pause. To repeat the series of error codes, push the button again.

If there are no error codes in memory, the LED flashes two green flashes. To clear the memory, press and hold the LAST ERROR button for more than 5 s. The LED flashes three green flashes when the memory has been cleared, then resumes the normal slow green flash after a 5 s pause.

Replacement parts list

Description
Motor
Motor, direct drive blower
Blower, combustion
Electrical
Switch, limit
Control, furnace
Igniter
Sensor, flame
Switch, pressure

Description
Switch, door
Transformer
Valve, gas
Control, temperature
Air moving
Housing, blower
Housing, blower with wheel
Wheel, blower
Fabricated parts
Baffle, flue
Burner, main gas
Bracket, igniter
Shelf, blower
Fabricated parts
Bracket, blower track (two required)
Heat exchanger assembly
Manifold, gas
Pan, bottom
Panel, top
Panel, door (two required)
Vent pan, combustion (with gasket)
Panel, blockoff
Lo-NOX screen
Miscellaneous
Orifice, burner (Natural #45)
Sight glass, oval (two required)
Gasket, foam (door) (1.5 ft required)
Gasket, intake pan
Plug, vent hole
Bracket, door
Wiring harness
Ferrule (three required)
Grommet (three required)
Motor mount
Tubing, silicon
Diagram, wiring
Knob, quarter turn (four required)

This is a generic parts list. To request a complete parts list, refer to the contact information below:

Replacement part contact information

You can contact us by mail. Just send a written request to the following address:

United States and Canada

Bosch Thermotechnology Corp.

50 Wentworth Avenue,

Londonderry, NH 03053

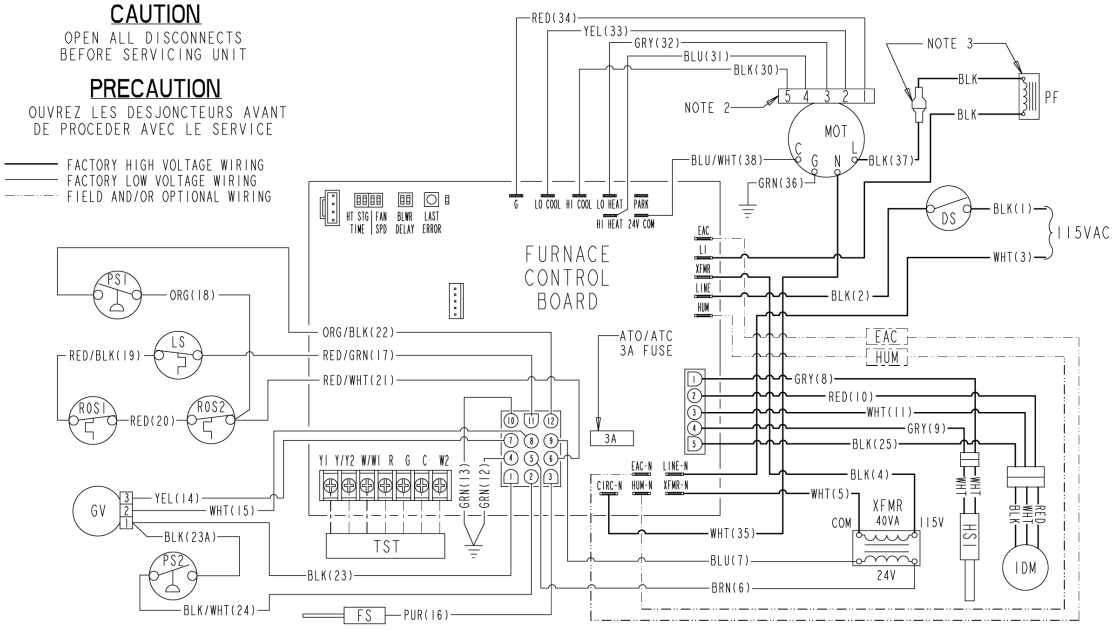
Tel: 800-283-3787

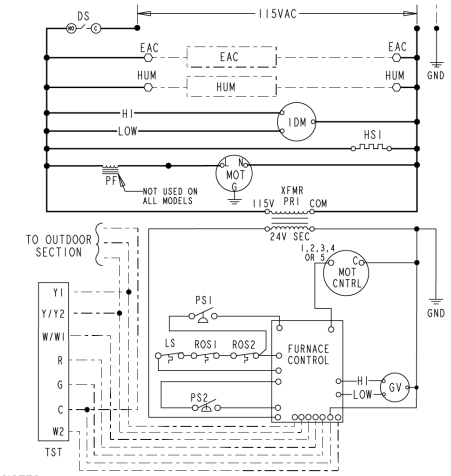
www.bosch-homecomfort.us

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Wiring diagram

WIRING DIAGRAM - TWO STAGE STD ECM NON-CONDENSING FURNACE





NOTES:

1. If any of the original wire as supplied with the furnace must be replaced, it must be replaced with wiring having a temperature rating of at least 221°F(105°C).
2. Blower motor speed connections shown are typical and may vary by model and application.
3. PF Choke installed with 3/4 - 1HP motors only. BLK(37) connects to Control "L1" when not equipped with PF Choke.
4. Connectors suitable for copper conductors only.

NOTES:

1. Si l'un des fils d'origine fourni avec ce four doit filage doit être remplacé, il doit etre remplace avec le fil ayant un degré de température d'au moins 221°F(105 °C).
2. Les connexions de vitesse du moteur de ventilateur illustrées sont typiques et peuvent varient selon le modèle et l'application.
3. PF installé avec des moteurs 3/4 - 1HP uniquement. BLK(37) se connecte pour contrôler "L1" lorsqu'il n'est pas équipé de PF.
4. Seulement des marettes pour fil de cuivre.

DIAGNOSTIC CODES

FLASHES	CONDITION
NONE	POWER OFF OR OPEN FUSE
GREEN HEARTBEAT	NORMAL OPERATION
AMBER HEARTBEAT	NORMAL OPERATION WITH CALL FOR HEAT
RAPID GREEN	CONTROL IN FACTORY TEST MODE
STEADY ON (ANY COLOR)	CONTROL FAILURE
RAPID AMBER	LOW FLAME SENSE CURRENT
ALT. RED/AMBER	REFRIGERANT LEAK DETECTED NEAR FURNACE
1 RED FLASH	FLAME PRESENT WITH GV OFF
2 RED FLASHES	PRESSURE SWITCH CLOSED WITH IDM OFF
3 RED FLASHES	PSI OPEN WITH IDM ON
4 AMBER FLASHES	"Y" T-STAT CALL WITHOUT "G" CALL
4 RED FLASHES	LS / ROS SWITCH OPEN
5 RED FLASHES	LS / ROS OPEN GREATER THAN 15 MIN.
6 RED FLASHES	PS CYCLE LOCKOUT
7 RED FLASHES	LOCKOUT DUE TO FAILED IGNITION
8 RED FLASHES	LOCKOUT DUE TO FLAME DROPOUTS
9 RED FLASHES	INCORRECT LINE POLARITY
10 RED FLASHES	GV FAULT
11 RED FLASHES	LS/ROS OPEN FROM 5 TO 15 MIN.
13 RED FLASHES	PS2 OPEN WITH IDM ON
14 RED FLASHES	LOW VOLTAGE < 19.2VAC - PREVENTS FURTHER RELAY OUTPUTS FOR > 2 SECONDS
15 RED FLASHES	LOW VOLTAGE < 16 VAC - STOPS CURRENT RELAY OUTPUTS FOR > 2 SECONDS

Refer to Installation Manual for more detailed information

FAULT CODE RETRIEVAL - Only a qualified service technician should use this feature.

LEGEND

DS - DOOR SWITCH
EAC - ELECTRONIC AIR CLEANER
FS - FLAME SENSOR
GV - GAS VALVE
HSI - HOT SURFACE IGNITOR
HUM - HUMIDIFIER
IDM - INDUCED DRAFT MOTOR
LS - LIMIT SWITCH
MOT - BLOWER MOTOR
PF - POWER FACTOR CHOKE
PSI - PRESSURE SWITCH-LOW
PS2 - PRESSURE SWITCH-HIGH
ROS - ROLLOUT SWITCH
TST - THERMOSTAT
XFMR- TRANSFORMER

LEGENDE

DS - COMMUTATEUR DE PORTE
EAC - FILTRE ELECTRIQUE
FS - CAPTEUR DE FLAMME
GV - ROBINET DE GAZ
HSI - IGNITION DE SURFACE CHAUD
HUM - HUMIDIFICATEUR
IDM - VENTILATEUR DE COMBUSTION
LS - COMMUTATEUR DE LIMITE
MOT - BLOWEUR MOTEUR
PF - TRANSFORMEUR DE FACTEUR DE PUISSANCE
PSI - PRESSOSTAT-BAS
PS2 - PRESSOSTAT-HAUT
ROS - COMMUTATEUR DE ROULEMENT
TST - THERMOSTAT
XFMR- TRANSFORMEUR

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Start-up sheet

33 in. Non-Condensing Two Stage Standard ECM Gas Furnace Start Up Sheet

Proper furnace start up is critical to customer comfort and equipment longevity

Start-Up Date

Technician Performing Start-Up | Installing Contractor Name

Owner Information

Name | Address

City | State or Province | Zip or Postal Code

Equipment Data

Furnace Model | Furnace Serial

Indoor Coil Model | Indoor Coil Serial

Outdoor Unit Model | Outdoor Unit Serial

Furnace Configuration

◯ Upflow ◯ Downflow ◯ Horizontal Left ◯ Horizontal Right

Filter, Thermostat, Accessories

Filter Type | Filter Size | Filter Location(s)

Thermostat Type | Other System Equipment and Accessories

Connections -- All Per Installation Instructions and Local Code

☐ Unit is level ☐ Gas piping is connected (including drip leg) ☐ Supply plenum and return air are connected

☐ Vent system is connected

Venting: B Vent

☐ Vertical Termination Vent Pipe Size | # of 90 Degree Ells | # of 45 Degree Ells | Total Height

Connector Size | Connector Length

☐ Horizontal Term. (with External Power Vent) Vent Pipe Size | # of 90 Degree Ells | # of 45 Degree Ells

Venting: Lined Masonry Chimney

☐ B Vent Connector ☐ Single Wall Connector Connector Size | Connector Length | Chimney Height

of 90 Degree Ells | # of 45 Degree Ells

☐ Venting system is the proper size, within the limitations of the chart in the installation instructions, properly connected to the furnace, and properly pitched

Other appliances in same common vent:

Water Heater	☐ BTUH Input		Fan Assisted? ◯ Y ◯ N
Furnace	☐ BTUH Input		Fan Assisted? ◯ Y ◯ N
Other	☐ BTUH Input		Fan Assisted? ◯ Y ◯ N

Electrical: Line Voltage

☐ Polarity is correct (black is L1 (hot), white is N (neutral) ☐ Ground wire is connected Line voltage to furnace (AC)

Electrical: Low Voltage

☐ Thermostat wiring is complete ☐ Thermostat heat anticipator set to .4 (6 cycle per hour for electronic thermostats)

Low voltage value between "R" and "C" on furnace control board (volts AC)

Thermostat:

Thermostat Staging: ◯ OFF ◯ 10 MIN ◯ 15 AUTO ◯ 20 MIN

Continued on next Page

Gas Side

Gas Type ◯ Natural Gas ◯ LP Gas (Requires LP conversion kit)

LP Gas Conversion Kit Part # Used _____ LP Conversion Kit Installed By _____

Inlet Gas Pressure (in. w.c.") _____ Low Fire Manifold Gas Pressure (in. w.c.") _____ High Fire Manifold Gas Pressure (in. w.c.") _____

Calculated input in btuh - clock the gas meter in high fire (Nat Gas Only) _____

☐ Burner flame inspected -- flames are blue and extending directly into the primary heat exchanger cells

Air Side: System External Static Pressure

Supply static before indoor coil (in w.c.") _____ Supply static after indoor coil (in w.c.") _____

Return Static (in w.c.") before filter _____ Return Static (in w.c.") after filter (furnace side) _____

Total External Static Pressure _____

Air Side: Heating (STD ECM)

Low Heat Blower Speed Selected ◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5

High Heat Blower Speed Selected ◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5

Temperature rise in degrees F measured in low fire _____

Temperature rise in degrees F measured in high fire _____

Air Side: Cooling (STD ECM)

Low Cool Blower Speed Selected ◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5

High Cool Blower Speed Selected ◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5

Cooling CFM delivery (use Blower Performance Data Chart) Hi _____ Low _____

Air Side: Continuous Fan (STD ECM)

Blower Speed Selected ◯ Lo Heat ◯ HI Heat ◯ Lo Cool ◯ Hi Cool

Cycle Test

☐ Operate the furnace through several heating cycles from the thermostat, noting and correcting any problems

☐ Operate the furnace through continuous fan cycles from the thermostat, noting and correcting any problems

☐ Operate the furnace through cooling cycles (as applicable), noting and correcting any problems

Clean Up

☐ Installation debris disposed of and furnace area cleaned up?

Owner Education

☐ Give owner the owner's manual provided

☐ Explain operation of system to equipment owner

☐ Explain the importance of regular filter replacement and equipment maintenance

☐ Explain thermostat use and programming (if applicable) to owner

Additional Job Detail

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