

# Counterflow Gas or Oil Heating Appliance

## INSTALLATION INSTRUCTIONS

**CMF2 80-PG CONVERTIBLE (65, 75, & 85 KBTU/H INPUTS)**

**CMF2 80-PO CONVERTIBLE (65, 75, & 85 KBTU/H INPUTS)**



### For installation in:

- Manufactured Homes
- Recreational Vehicles, Park Models, & Manufactured Buildings
- Modular Homes/Buildings

### ATTENTION INSTALLERS:

It is your responsibility to know this product better than your customer. This includes being able to install the product according to strict safety guidelines and instructing the customer on how to operate and maintain the equipment for the life of the product. Safety should always be the deciding factor when installing this product and using common sense plays an important role as well. Pay attention to all safety warnings and any other special notes highlighted in the manual. Improper installation of the furnace or failure to follow safety warnings could result in serious injury, death, or property damage.

These instructions are primarily intended to assist qualified individuals experienced in the proper installation of this appliance. Some local codes require licensed installation/service personnel for this type of equipment. Please read all instructions carefully before starting the installation. Return these instructions to the customer's package for future reference.

## **⚠ WARNING:**

### **FIRE OR EXPLOSION HAZARD**

- Failure to follow safety warnings exactly could result in serious injury or property damage.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

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

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a neighbors phone. Follow the gas suppliers instructions.
- If you cannot reach your gas supplier, call the fire department.

**DO NOT DESTROY. KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.**

## TABLE OF CONTENTS

<b>Important Safety Information .....</b>	<b>3</b>	<b>Startup &amp; Adjustments .....</b>	<b>20</b>
<b>Requirements &amp; Codes .....</b>	<b>3</b>	Important Safety Information .....	20
Minimum Installation Clearances .....	4	Pre-Start Checklist .....	20
<b>Combustion Air &amp; Venting Requirements .....</b>	<b>5</b>	Refrigerant Charging .....	20
General Information .....	6	Operating Instructions - PG Direct Ignition .....	20
Combustion Air Quality .....	6	Shutting Off the Gas Supply .....	20
Direct Vent Furnaces .....	7	Checking the Input of the Furnace .....	21
Manufactured Housing Installations .....	7	Checking the Inlet Gas Line Pressure .....	21
Residential Installations .....	7	Checking the Manifold Pressure .....	21
Venting through a Chimney .....	8	Adjusting the Manifold Pressure .....	21
Ventiaire III or IV Air Quality Package .....	8	Installing the Pressure Gauge .....	21
<b>Circulating Air Requirements .....</b>	<b>9</b>	Adjusting the Burner .....	21
Plenums & Air Ducts .....	9	Operating Instructions - PO Oil Burners .....	22
Supply Air Connections .....	9	Start-up Procedure .....	22
Dampers .....	9	Air Bleed-Single Pipe Installation .....	22
Unconditioned Spaces .....	9	Oil Burner Shutdown Procedure .....	22
Closet Installations .....	9	Flame Adjustment .....	22
Furnace Filter .....	10	Electrode Setting .....	22
<b>Furnace Installation .....</b>	<b>10</b>	Switching from Interrupted to Intermittent Ignition Control .....	22
General Information .....	10	Firing Rate Conversion .....	23
Before You Install this Furnace .....	10	<b>Operating Sequence .....</b>	<b>23</b>
Locating the Unit .....	10	PG Gas Furnaces .....	23
MA-200 Base Installation .....	11	PO Oil Furnaces .....	23
Installing the furnace on an MA-200 Base .....	12	<b>Troubleshooting .....</b>	<b>24</b>
MA-100 Universal Base Installation .....	12	PG Direct Ignition - Gas Gun .....	24
Installing the furnace on an MA-100 Base .....	12	PO Oil Furnace .....	25
Combustion Air Duct / Pipe Installation .....	13	Control Module Status Indicator .....	26
SRJ Roof Jack Installation .....	13	<b>Component Functions .....</b>	<b>26</b>
Damper Installation .....	14	<b>Unit Maintenance .....</b>	<b>27</b>
CB-200A Cottage Base Installation .....	14	<b>Figures &amp; Tables .....</b>	<b>28</b>
<b>Fuel Connections .....</b>	<b>15</b>	Figure 18. CMF2 Physical Dimensions .....	28
Gas Piping - PG Series Only .....	15	Figure 19. CMF2 Wiring Diagram .....	29
Leak Check .....	15	Figure 20. Furnace Component Location .....	30
High Altitude Application .....	16	<b>Installation / Performance Checklist .....</b>	<b>32</b>
Converting to LP Gas .....	16		
Oil Piping - PO Series Only .....	17		
Fuel Line Hook-up: Single Line System .....	17		
Fuel Line Hook-up: Two Line System .....	17		
Hook-up Procedure .....	17		
Eliminating Air Leaks .....	17		
Fuel Oil Type .....	17		
<b>Electrical Connections .....</b>	<b>18</b>		
Pre-Electrical Checklist .....	18		
Line Voltage .....	18		
Wiring Connections .....	18		
Grounding .....	18		
Thermostat Connections .....	19		
Heat Anticipator .....	19		
Blower Speed .....	19		
Constant Blower Operation .....	19		

## IMPORTANT SAFETY INFORMATION

INSTALLER: Please read all instructions before servicing this equipment. Pay attention to all safety warnings and any other special notes highlighted in the manual. Safety markings are used frequently throughout this manual to designate a degree or level of seriousness and should not be ignored. **WARNING** indicates a potentially hazardous situation that if not avoided, could result in personal injury or death. **CAUTION** indicates a potentially hazardous situation that if not avoided, may result in minor or moderate injury or property damage.

### **WARNING:**

#### **ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**

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

**Improper servicing could result in dangerous operation, serious injury, death or property damage.**

- **Before servicing, disconnect all electrical power to air handler.**
- **When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.**
- **Verify proper operation after servicing.**

### **WARNING:**

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

### **WARNING:**

**PROPOSITION 65 WARNING: This product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.**

## REQUIREMENTS & CODES

### **WARNING:**

**This unit must be installed in accordance with instructions outlined in this manual during the installation, service, and operation of this unit. Unqualified individuals should not attempt to interpret these instructions or install this equipment. Failure to follow safety recommendations could result in possible damage to the equipment, serious personal injury or death.**

- All manufactured and residential housing installations must be installed in accordance with these instructions, all applicable local building codes and the current revision of the National Fuel Gas Code (ANSI Z223.1 / NFPA54), Installation of Oil Burning Equipment (ANSI/NFPA31) or the National Electric Code (ANSI/NFPA 70), the Manufactured Home Construction & Safety Standard, Title 24 CFR, Part 3280, or when this standard is not applicable, the Standard for Manufactured Home Installation Manufactured Home Sites, Communities and Setups (ANSI 225.1). Residential installations must also conform to the standard for Chimney's, Fireplaces, Vents, & Solid Fuel Burning Appliances (NFPA 211).
- Use only with type of gas or oil approved for this furnace. Refer to the furnace rating plate.
- Install this furnace only in a location and position as specified on page 4.
- Provide adequate combustion and ventilation air to the furnace space as specified on pages 5 - 8.
- Provide adequate clearances around the vent air intake terminal as specified in Figure 1 (page 8).
- Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified on pages 7 - 8.
- Never test for gas leaks with an open flame. Use a commercially available soap solution to check all connections. See pages 15 - 16.
- This furnace is designed to operate with a maximum external pressure rise of 0.5 inches of water column. Consult Table 6 (page 19), and the rating plate for the proper circulating air flow and temperature rise. It is important that the duct system be designed to provide the correct flow rates and external pressure rise. An improperly designed duct system can result in nuisance shutdowns, and comfort or noise issues.
- When supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating in the conditioned space. See pages 9 - 10.
- This furnace may not be used for temporary heating of buildings or structures under construction.

- The Commonwealth of Massachusetts requires compliance with regulation 248 CMR 4.00 and 5.00 for installation of through – the – wall vented gas appliances as follows:

1. For direct-vent appliances, mechanical-vent heating appliances or domestic hot water equipment, where the bottom of the vent terminal and the air intake is installed below four feet above grade the following requirements must be satisfied:

- a.) A carbon monoxide (CO) detector and alarm shall be placed on each floor level where there are bedrooms. The detector shall comply with NFPA 720 (2005 Edition) and be mounted in the living area outside the bedroom(s).
- b.) A (CO) detector shall be located in the room that houses the appliance or equipment and shall:
  - Be powered by the same electrical circuit as the appliance or equipment. Only one service switch shall power the appliance and the (CO) detector;
  - Have battery back-up power;
  - Meet ANSI/UL 2034 Standards and comply with NFPA 720 (2005 Edition); and Approved and listed by a Nationally Recognized Testing Laboratory as recognized under 527 CMR.
- c.) A Product-approved vent terminal must be used, and if applicable, a product-approved air intake must be used. Installation shall be in strict compliance with the manufacturer's instructions. A copy of the installation instructions shall remain with the appliance or equipment at the completion of the installation.
- d.) A metal or plastic identification plate shall be mounted at the exterior of the building, four feet directly above the location of vent terminal. The plate shall be of sufficient size, easily read from a distance of eight feet away, and read "Gas Vent Directly Below".

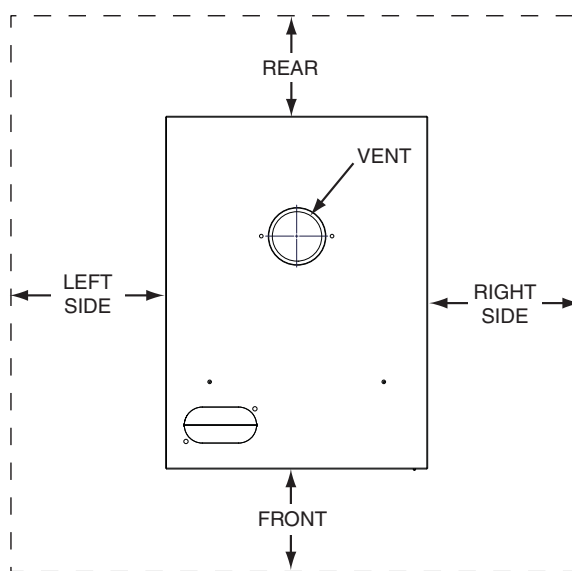
2. For direct-vent appliances, mechanical-vent heating appliances or domestic hot water equipment where the bottom of the vent terminal and the air intake is installed above four feet above grade the following requirements must be satisfied:

- a.) A (CO) detector and alarm shall be placed on each floor level where there are bedrooms. The detector shall comply with NFPA 720 (2005 Edition) and be mounted in the living area outside the bedroom(s).
- b.) The (CO) detector shall:
  - Be located in the room that houses the appliance or equipment;
  - Be hard-wired or battery powered or both.
  - Shall comply with NFPA 720 (2005 Edition).
- c.) A product-approved vent terminal must be used, and if applicable, a product-approved air intake must be used. Installation shall be in strict compliance with the manufacturer's instructions. A copy of the installation instructions shall remain with the appliance or equipment at the completion of the installation.

## Minimum Installation Clearances

- Access for positioning and servicing the unit must be considered when locating unit. The need to provide clearance for access to panels or doors may require clearance distances over and above the requirements.
- This appliance must be installed in accordance with clearances listed in Table 1. The furnace must be installed with ample clearance for easy access to the air filter, blower assembly, burner assembly, controls, and vent connections.
- Locate and install this unit in position as specified on pages 10 & 11. This unit is designed only for Indoor installations and should be located with consideration of minimizing the length of the supply and return ducts.

INSTALLATION CLEARANCES		
	CLOSET	ALCOVE
Front *	6"	18"
Rear	0"	0"
Sides	0"	0"
Top	17"	17"
Duct w/in 3ft of furnace	1/4"	1/4"
Vent	6"	6"
Plenum	1"	1"
Roof Jack Barrel	0"	0"

†NOTES:

\* Service Clearance

Alcove Installations - Allow 18 in. minimum clearance from front of unit to nearest wall or partition for servicing.

Closet installations - Require a return air grill installed in the door or a partially louvered door across the opening for proper air circulation. For clearances 6" or greater, the closet must have an open free area of 235 in<sup>2</sup> minimum. For special clearances between 1" - 5", requirements are a louvered door with a minimum of 250 in<sup>2</sup> (1613 cm<sup>2</sup>) free area. A fully louvered closet door is strongly recommended for both installation types.

**Table 1. Minimum Clearance Requirements**

- Sufficient clearance for unobstructed airflow through a louvered door must be maintained in order to achieve rated performance. Air return to the furnace must have the minimum required total free area:  
200 in<sup>2</sup> (1290 cm<sup>2</sup>) for furnace only. May also include return air grille and frame assembly P/N 902989 or wall mount grille P/N 902999).  
235 in<sup>2</sup> (1516 cm<sup>2</sup>) with 4 ton A.C. or H.P. installed.  
250 in<sup>2</sup> (1613 cm<sup>2</sup>) with 4 ton A.C. or H.P. installed & 1" special clearance.  
390 in<sup>2</sup> (2516 cm<sup>2</sup>) with up to 5 ton A.C. or H.P. installed.

The information listed below is for reference purposes only and does not necessarily have jurisdiction over local or state codes. Always consult with local authorities before installing any gas appliance.

#### **Duct Systems**

- US and CANADA: Air Conditioning Contractors Association (ACCA) Manual D, Sheet Metal and Air Conditioning Contractors National Association (SMACNA), or American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Fundamentals Handbook

#### **Electrical Connections**

- US: National Electrical Code (NEC) ANSI/NFPA 70
- CANADA: Canadian Electrical Code CSA C22.1

#### **General Installation**

- US: Current edition of the NFGC and the NFPA 90B. For copies, contact the National Fire Protection Association Inc., Batterymarch Park, Quincy, MA 02269; or American Gas Association, 400 N. Capitol, N.W., Washington DC 20001 or [www.NFPA.org](http://www.NFPA.org)
- CANADA: NSCNGPIC. For a copy, contact Standard Sales, CSA International, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario, M9W 1R3 Canada

#### **Safety**

- US: (NFGC) NFPA 54–1999/ANSI Z223.1 and the Installation Standards, Warm Air Heating and Air Conditioning Systems ANSI/NFPA 90B.
- CANADA: CAN/CGA-B149.1 and .2–M00 National Standard of Canada. (NSCNGPIC)

## **COMBUSTION AIR & VENTING REQUIREMENTS**

### **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 with each individual appliance connected to the venting system being placed in operation, while all other appliances connected to the venting system are not in operation:**

1. Seal any unused openings in the venting system.
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or the CSA B149.1, Natural Gas and Propane Installation Codes and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. As far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Close fireplace dampers.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously.
7. Test for spillage from draft hood equipped appliances at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.
8. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Codes.
9. After it has been determined that each appliance connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-fired burning appliance to their previous conditions of use.

## General Information

### **WARNING:**

This furnace must be installed by a qualified installing agency and in accordance with applicable local codes and ordinances that govern this type of equipment. Failure to properly install the furnace, base assembly, and venting system as described herein may damage the equipment and/or the home, can create a fire or asphyxiation hazard, violates U.S. listing requirements, and will void the warranty. This furnace is **NOT** approved for installation with split system air conditioning. Use a NORDYNE packaged air conditioning system.

- Instructions for determining the adequacy of combustion air for an installation can be found in the current revision of the NFGC (ANSI Z223.1 / NFPA54). **Consult local codes for special requirements.** These requirements are for US installations as found in the NFGC.
- The requirements in Canada (B149.1) are structured differently. Consult with B149.1 and local code officials for Canadian installations.

Depending on the type of installation (See Table 1), the CMF2 Series furnace can draw combustion air from outside the home (direct vent) or from the space being conditioned. These high quality, direct vent furnaces are used for manufactured housing, recreational vehicle, and residential applications. They are certified to the UL307 standards (UL307-A for oil models; UL307-B for gas models), and can be installed in a variety of applications, as shown in Table 2.

The CMF2 furnace is available in power gas (PG models) or power oil (PO models) and can be converted from power oil to power gas, and vice versa. The power gas models are designed for operation with either natural or propane

(LP) gas. The firing rate of the CMF2 80 Convertible Series can be field-installed using a certified NORDYNE conversion kit by a qualified service technician. Refer to page 6 for conversion information.

### **CAUTION:**

Exhaust fans, clothes dryers, fireplaces and other appliances that force air from the house to the outdoors can create a negative pressure inside the house, resulting in improper furnace operation or unsafe conditions such as flame roll out. It is imperative that sufficient air exchange with the outdoors is provided to prevent depressurization. Additional information about how to test for negative pressure problems can be found in the NFGC.

## Combustion Air Quality

### **CAUTION:**

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

Provisions for adequate combustion air and ventilation air must be in accordance with the ANSI Z223.1/NFPA 54, (National Fuel Gas Code), ANSI/NFPA 31 (Installation of Oil Burning Equipment), and all applicable local codes.

The installation of the furnace must allow for adequate supply of fresh air for combustion. Air openings on top of the furnace and openings in closet doors or walls must never be restricted. The combustion air opening of the furnace must be designed and located to prevent blockage by snow.

If the furnace is operated without adequate air for combustion, the flame roll-out switch will open and shut off the gas supply to the burners. **NOTE:** This safety device

TYPE OF INSTALLATION	FURNACE BASE	TYPE OF EXHAUST	DUCTED APPLICATION	DIRECT VENT SYSTEM REQUIRED
Manufactured Housing or Recreational Vehicle	MA-100 or MA-200 Universal Base	NORDYNE SRJ Roofjack Only	Yes	Yes
Residential†	MA-100 or MA-200 Universal Base	NORDYNE SRJ Roofjack or an Existing Chimney*	Yes	Yes
Residential†	CB-200A Cottage Base	NORDYNE SRJ Roofjack or an Existing Chimney*	Yes	Yes
Residential†	CB-200A Cottage Base	NORDYNE SRJ Roofjack or an Existing Chimney*	No	No

† Residential is defined as a single-story non-manufactured housing installation.

\* Consult the Venting Requirements section (page #) for more details on properly venting this appliance through an existing chimney.

**Table 2. CMF2 Installation Types**

is a manually reset switch. DO NOT install jumper wires across these switches to defeat their function or reset a switch without identifying and correcting the fault condition. If a switch must be replaced, use only the correct sized part specified in the Replacement Parts List provided online.

The combustion air from the outside needs to be clear of chemicals that can cause corrosion. Excessive exposure to contaminated combustion air will result in safety and performance related problems. The list below are examples of chemical contaminants found in a wide variety of some common commercial and household products:

- Permanent wave solutions
- Chlorinated waxes and cleaners
- Chlorine based swimming pool chemicals
- Water softening chemicals
- De-icing salts or chemicals
- Carbon Tetrachloride
- Cleaning solvents (perchloroethylene)
- Printing inks, paint removers, varnishes, etc.
- Hydrochloric Acid
- Cements and glues
- Antistatic fabric softeners
- Masonry acid washing materials

When drawing combustion air from underneath the home, a vent or duct of at least 18 in<sup>2</sup> of free area should be installed outside and completely unobstructed. When using the combustion air duct, make sure it extends through the floor. When using the direct vent kit, the combustion air opening must be located in the same pressure zone as the flue exit of the roof jack or chimney. Refer to the instructions provided with the kit for more information.

### Direct Vent Furnaces

Direct Vent furnaces draw combustion air directly from the outdoors and then vent the combustion products back outside, isolating the entire system from the indoor space. It is important to make sure that the whole system is sealed and clearances to combustibles are maintained regardless of the installation being in a confined or unconfined space.

For direct vent applications, either the combustion air duct provided with the MA Series base kit or the direct vent kit can be used. The direct vent kit must be ordered separately. Only for a special CB-200A cottage base installation can the CMF2 draw the combustion air from the conditioned space. The CB-200A cottage base kit must be ordered separately. Refer to the replacement parts listing provided with the furnace to order the direct vent kit or the cottage base kit. Follow the instructions provided with the kits for proper installation.

When unsure about combustion air supply availability, a direct vent system should be used. For small rooms, confined spaces, tight construction or similar situations in which the combustion air requirements of the furnace might not be met, a direct vent system must be used.

### Manufactured Housing Installations

For all manufactured housing applications, the CMF2 furnace must be vented using the SRJ series roofjack. The instructions for selecting the proper roofjack for your installation are detailed later in these instructions.

### Residential Installations

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## WARNING:

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**This furnace must never be connected to a chimney flue serving a separate appliance designed to burn solid fuel.**

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For residential applications (See Table 2), the CMF2 furnace may be vented through the SRJ series roofjack or through an existing chimney. Figure 10 (page 14) displays instructions for selecting the proper roofjack for your installation. If venting through an existing chimney, the venting system must be in accordance with these instructions, all applicable local building codes, the National Fuel Gas Code (ANSI Z223.1/NFPA 54), the Installation of Oil-Burning Equipment standard (ANSI/NFPA 31), and the standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances (NFPA 211).

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## WARNING:

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**When venting through a chimney, check the chimney for soot, leaks, obstructions, and proper installation.**

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The materials used to construct the venting system must be capable of withstanding exposure to temperatures of at least 700° F. The existing chimney servicing this furnace must be vertical. Horizontal distances to an existing chimney must be as short as possible, and the connecting pipe must slope upward to the chimney at not less than a 45° angle. The total length of the sloping pipe must not exceed 6 ft. The venting system must have no obstructions or sharp bends where soot and other foreign matter can accumulate.

If an inspection determines that the chimney is obstructed, the chimney must be cleaned and the connecting flue pipe must be cleaned or replaced.

If venting a CMF2 power oil furnace into an existing chimney, a barometric damper can be installed at the vent connection of the furnace to regulate the draft. The barometric damper must be properly installed per the manufacturer's instructions. Refer to all applicable codes to determine whether or not a barometric damper can be used for your CMF2 power oil furnace installation. The barometric damper used must be installed such that air from the conditioned space can only enter the flue passageway. Do not use a double acting barometric

damper. All flue pipe joints should be fastened with sheet metal screws for rigidity.

The chimney height, required draft, and number of appliances served by the chimney must be in accordance with all applicable codes. To prevent down draft, the chimney should extend at least 2 feet above the peak of the roof. See Figure 1.

It is recommended that the furnace flue serve no other appliances. When the chimney serves only the furnace, the flue area must be sized according to all applicable codes. The minimum internal area of the flue must be equal to at least the area of the furnace flue exit. When two or more appliances must vent through a common flue, the area of the common flue should be sized in accordance with all applicable codes.

When an existing furnace is removed or replaced in a venting system, the venting system may not be properly sized to vent the attached appliances. The venting system must be checked to ensure proper venting. Improperly sized venting systems can result in the formation of condensate, leakage, spillage, etc. Refer to the National Fuel Gas Code (ANSI Z223.1/NFPA 54), and the Installation of Oil Burning Equipment standard (ANSI/NFPA 31) for correcting improper venting systems.

### Venting Through a Chimney

When venting the CMF2 through an existing chimney, the materials, sizing, and installation of the chimney must be in accordance with the ANSI Z223.1/NFPA 54, (National Fuel Gas Code), ANSI/NFPA 31 (Installation of Oil Burning Equipment), NFPA 211 (Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances) and all applicable local codes. The materials used must be capable of withstanding exposure to temperatures of at least 700° F. The CMF2 power gas units are fan-assisted.

### VentilAire III or IV Air Quality Package (Accessory)

#### **CAUTION:**

**MAINTAIN 2 1/2" MINIMUM CLEARANCE BETWEEN FLUE PIPE AND FLEX DUCT. FAILURE TO COMPLY WITH THIS RESTRICTION COULD CAUSE EQUIPMENT DAMAGE. VENTILAIRE III ILLUSTRATED OTHER LISTED VARIATIONS AVAILABLE. CHECK WITH MANUFACTURER.**

The VentilAire air quality packages are available to meet the ventilation requirements as outlined in H.U.D. Standard Part 3280.103 (b) (2). These packages introduce outdoor air into the living space during furnace blower operation. The VentilAire IV also serves to exhaust moist and/or hot air from the attic space. See Figure 2 for typical installation. Complete installation instructions are supplied with each air quality package.

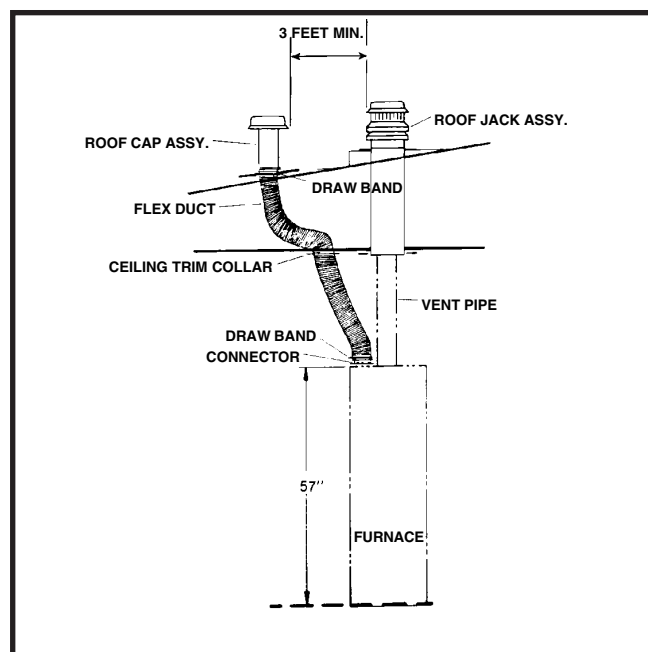


Figure 1. Typical Installation

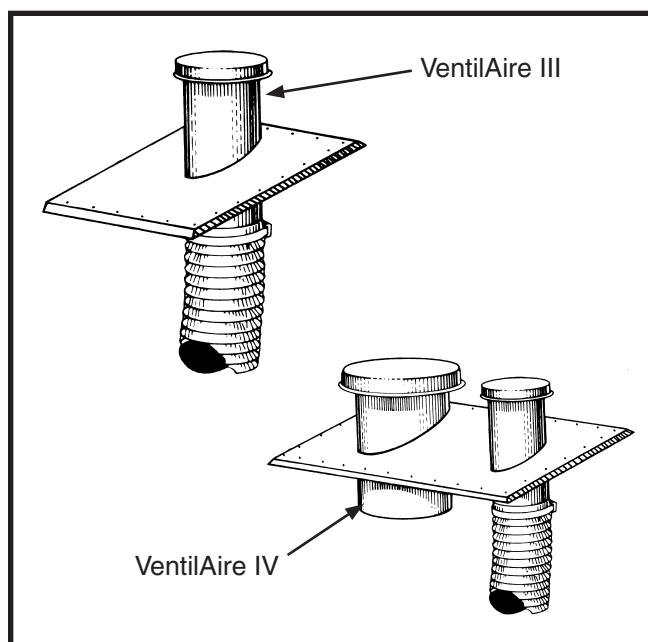


Figure 2. VentilAire III & IV

## CIRCULATING AIR REQUIREMENTS

### **WARNING:**

**All supply ducts must be secured to the furnace with sheet metal screws and adequately sealed. When supply air is provided through the bottom of the unit, the joint between the furnace and the plenum must be air tight.**

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

**Supply air ducts must not be connected to any other heat producing device such as a fireplace insert, stove, etc. This may result in fire, explosion, carbon monoxide poisoning, personal injury, or property damage.**

#### Plenums & Air Ducts

This unit is designed only for use with a bottom return supply duct and must be installed in accordance with the standards of the National Fire Protection Association Standard for Installation of Air Conditioning Systems (NFPA 90A), Standard for Installation of Residence Type Warm Air Heating and Air Conditioning Systems (NFPA 90B), and all applicable local codes. NFPA publications are available by writing to: National Fire Protection Association, Batterymarch Park, Quincy, ME 02269 or visit [www.NFPA.org](http://www.NFPA.org) on the web.

- Design the air ducts according to methods described by the Air Conditioning Contractors of America (ACCA).
- Air ducts must be aluminum, tin plate, galvanized sheet steel, or other approved materials for outlet or return air ducts. Snap-Lock or Pittsburgh-Lock seams are preferred. All other types of seams must be made tight to prevent leakage.
- It is good practice to seal all connections and joints with industrial grade sealing tape or liquid sealant. Requirements for sealing ducts vary from region to region. Consult with local codes for requirements specific to your area.
- Gas piping must not run in or through any of the air duct system.

#### Supply Air Connections

- The supply duct system must be designed so that the static pressure measured external to the furnace does not exceed the listed static pressure shown on the furnace rating plate. The supply air must be delivered to the heated space by duct(s) secured to the furnace casing, running full length and without interruption.
- Duct system must be designed so that no supply registers are located in duct system directly below the furnace.

#### Dampers

An automated shut off damper is required when the home is air conditioned by a self-contained unit. A damper is required to prevent chilled air from flowing over the furnace heat exchanger. This damper is designed to fit in the feeder duct cavity, directly under the furnace. For proper installation, refer to the instructions provided with the damper. See replacement parts list provided online.

#### Unconditioned Spaces

All duct work passing through unconditioned space must be properly insulated to minimize duct losses and prevent condensation. Use insulation with an outer vapor barrier. Refer to local codes for insulation material requirements

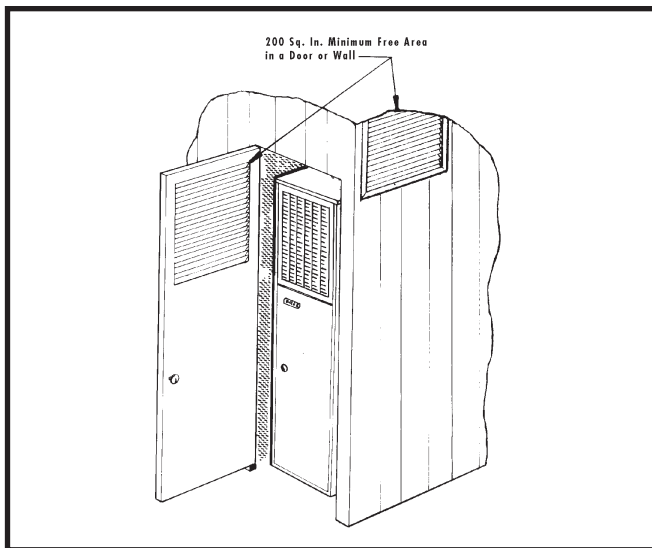
#### Closet Installations

### **WARNING:**

**Failure to comply with the the following instructions may result in fire, asphyxiation or carbon monoxide poisoning.**

For proper air circulation, closet installations require a return air grill installed in the door or side wall that exchanges with the living area of the home as shown in Figure 3 (page 10). A partially louvered door may also be used across the opening. Return air openings should not be located to draw air directly from a bathroom. Grilles placed in a side wall require a 6" clearance from the wall to the furnace so that the air may enter the front grille of the furnace. In addition, all return air systems, including the floor and ceiling systems, must meet the following conditions:

- The return air opening, regardless of its location in the closet, must not be smaller than size specified on unit data label. If located in the floor, the opening must be provided with a means of preventing its inadvertent closure by flat object(s) placed over the opening.
- The return-air opening into the closet, regardless of its location, must have an open free area of 200 in<sup>2</sup> (1290 cm<sup>2</sup>) minimum.
- The cross-sectional area of the return duct system (in floor or ceiling) leading into the closet must not be less than 200 in<sup>2</sup> (1290 cm<sup>2</sup>).
- The total free area of the openings in the floor or the ceiling registers serving the return air duct system must not be not less than 300 in<sup>2</sup> (1935 cm<sup>2</sup>).
- Materials located in the return duct system shall have a flame spread classification of 200 or less.
- Noncombustible pans having one inch upturned flanges are located beneath openings in a floor return duct system.
- Hollow spaces used as ducts or plenums for environmental air may contain mineral-insulated metal sheathed cable, aluminum sheathed cable, electrical metallic tubing, rigid metal conduit, flexible metal conduit (not to exceed 4 ft), or metal-clad cables. Wiring



**Figure 3. Closet Installation**

materials, fixtures, are to be suitable for the expected ambient temperatures to which they will be subjected.

- The negative pressure in the closet must not be less than minus 0.05 inches water column with the closet door closed and the fan operating at high speed. A reading below minus 0.05" indicates a dirty filter or a restricted return air system.
- For floor return systems, the manufactured housing manufacturer or installer shall affix a prominent marking on or near the appliance where it is easily read when the closet door is open. The marking shall read: "CAUTION, HAZARD OF ASPHYXIATION. DO NOT COVER OR RESTRICT FLOOR RETURN AIR OPENING." or equivalent. **NOTE:** This label is supplied with the instruction manual in each furnace.
- For closet installation with less than 6" front clearance, but not less than 1", a louvered door must be used having a minimum 200 in<sup>2</sup> (1290 cm<sup>2</sup>) free area opening directly in line with openings in the furnace door. A fully louvered door having the minimum free area is also permitted if the front tolerance is not less than 4". Adjust duct registers to obtain a temperature rise within the range specified on the furnace nameplate.

#### Furnace Filter

### **WARNING:**

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

- CMF2 furnaces are supplied with a single air filter when shipped from the factory. Accessing the filter does not require tools and can be easily removed from the inside of the access door. The filter is secured to the door with

a retaining bracket. It is recommended that the filter be cleaned or replaced monthly. Newly built or recently renovated homes may require more frequent changing until the construction dust has minimized.

- Replacement filters are available at most local retailers. Inspect filters frequently and replace when necessary with filter of same dimensional size. Filters designed to remove smaller particles such as pollen, may require additional maintenance.

## FURNACE INSTALLATION

**NOTE:** Since all installations are different, the sequence of these steps may differ from the actual installation. These installation procedures are suggested for typical furnace installations. **Only qualified HVAC technicians should install this furnace.**

### General Information

The CMF2 furnace is designed only for indoor installations and can be readily connected to the high static duct system of a home. Units are approved for single/multistory residential or mobile/modular/manufactured structures in freestanding/closet/alcove downflow only configurations.

This appliance will provide many years of safe and dependable comfort, providing it is properly installed and maintained. Abuse, improper use, and/or improper maintenance can shorten the life of the appliance and create unsafe hazards. Please read all instructions before installing the unit.

Approved installation, operation, and maintenance of this appliance must be in accordance with the listed specifications contained in these instructions and other documents supplied with the furnace and/or optional air conditioning equipment. Unless it is noted differently in this manual, only use factory authorized kits and accessories when modifying this appliance. Refer to local authorities having jurisdiction for further information.

### Before You Install this Furnace

- ✓ This equipment is securely packaged at the time of shipment and upon arrival should be carefully inspected for damage prior to installing the equipment at the job site. Claims for damage (apparent or concealed) should be filed immediately with the carrier.
- ✓ Check the electrical supply and verify the power supply is adequate for unit operation. The system must be wired and provided with circuit protection in accordance with local building codes. If there is any question concerning the power supply, contact the local power company.
- ✓ Verify the air delivery of the furnace is adequate to handle the static pressure drop of the coil, filter, and duct work.

### Locating the Unit

- Survey the job site to determine the best location for installing the unit. Consideration should be given to availability of electric power, service access, and noise.

- The dimensions of the room or alcove must be able to accommodate the overall size of the unit and the installation clearances in Table 1 (page 4). Physical dimensions for this furnace are shown in Figure 18 (page 29).
- The unit must be leveled at installation and attached to a properly installed duct system.
- The surface that the furnace is mounted on must provide sound physical support of the unit.

### MA-200 Base Installation

The MA-200 base is designed for O.E.M. and replacement installation of the CMF2 series furnace. The warm air duct system should be designed so the duct static pressure external to the furnace does not exceed the static pressure listed on the furnace data label. Floor cut-outs must be carefully located to avoid misalignment of the furnace and air duct. **NOTE:** If using the 4" offset feeder duct, the floor opening will be offset 4" from the opening in the main duct.

1. Using the base pan (Figure 4) as a guide, locate and mark the 12 1/8" x 12 1/8" opening for the Feeder Duct. **NOTE:** If using the combustion air duct, knock out the duct opening to be used and mark the 2-1/4" x 7-1/4" opening on the floor also.
2. Cut all 4 sides of the Feeder Duct opening 1" larger than the drawn cutout. **NOTE:** Cutting the opening to 14-1/8" x 14-1/8" will allow the flanges on the underside of the base pan to fit in the opening. Cut all the way through the insulation and bottom board so that the combustion air duct is unobstructed to outside air.
3. If applicable, cut the 2 1/4" x 7 1/4" opening for the combustion air duct. **NOTE:** Cut the opening for the duct about 1/8" larger than the actual cutout drawn. This will allow some clearance when installing the Feeder Duct.
4. Drill a 1" diameter hole for the fuel line through the floor and bottom board to the outside. **NOTE:** Fuel lines are not supplied with the furnace. They should be installed to comply with all applicable codes.
5. Drop transition or offset feeder duct (Figure 5) upside down through the floor opening and center the top of the feeder duct in 14-1/8" x 14-1/8" floor opening. Using the feeder duct as a guide, mark and cut a 12" x 12" opening in the supply duct.
6. Insert the feeder tabs into the main duct and bend them over tightly so that the main duct edges are trapped between flanges and tabs. **NOTE:** Metal tape may be used to ensure an air tight connection.
7. Install the base pan around the feeder duct. Secure with 2 screws in the holes near the rear of the base pan.
8. Slit the corners of the feeder duct down to the top of the base pan (Figure 6). While the top of the distribution duct is pulled up with one hand, bend down each side of the feeder duct tightly to the base with the other hand. Trim the metal to allow a one inch flange over

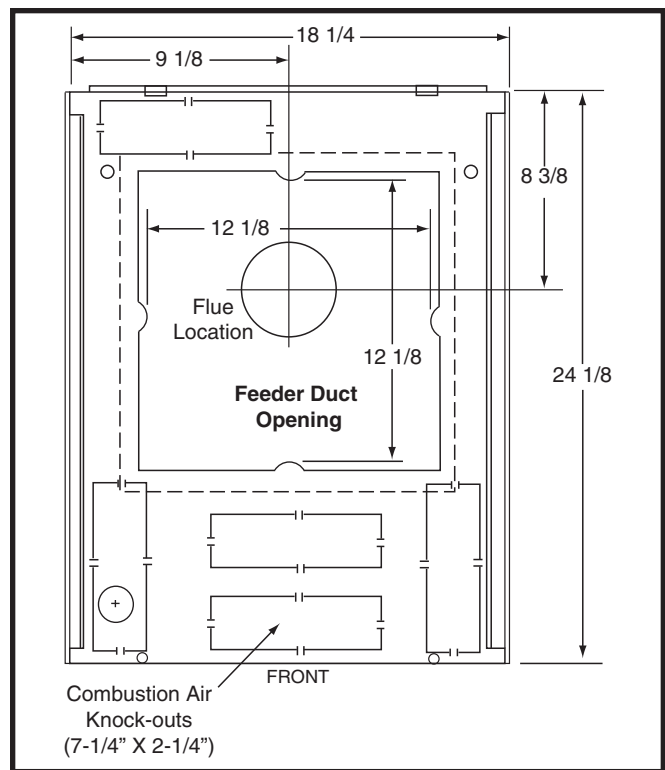


Figure 4. MA-200 Base Pan

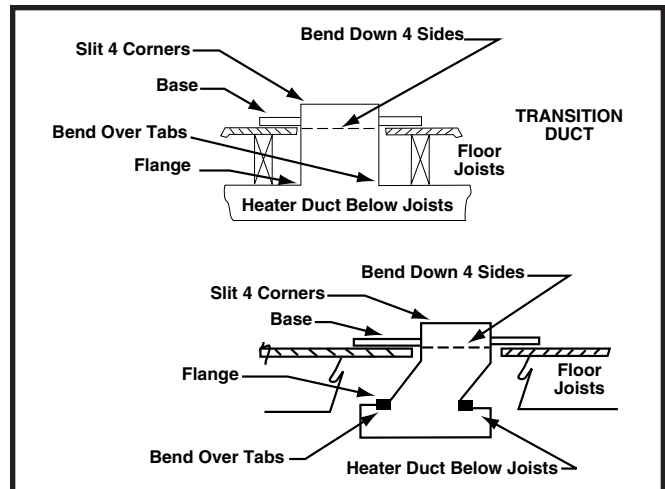


Figure 5. Transition and Offset Ducts

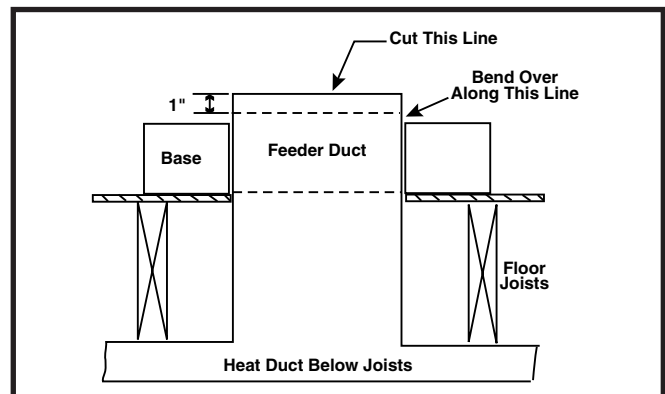


Figure 6. Feeder Duct Installation

the top of the base pan and seal that flange with metal tape. **NOTE:** If using a “V” or “U”-box crossover system, use manufacturers instructions for installation details.

### Installing the Furnace on an MA-200 Base

1. Carefully lift the furnace over the base pan and set into position. The flange on the back of the furnace should rest on the inside rails of the base.
2. Raise the front of the furnace to clear the gasket on the bottom of the furnace and slide the back until the rear flange drops into the channel at the rear of the base. **NOTE:** Do not damage the combustion air adapter, if present, while positioning the unit. Make sure the furnace engages the tabs on the rear flange of the base.
3. Open the access door and fasten the front of the furnace and the base to the floor with #8 x 1/2” sheet metal screws.
4. Using the provided hose clamp, secure the flexible combustion air tubing from the burner to the combustion air adapter.

### MA-100 Universal Base Installation

The MA-100 base is designed primarily for replacement installation of the CMF2 series furnace where the manufactured home duct system may be too small or restrictive for proper air flow. The MA-100 base provides approximately 4 inches of additional plenum space before the discharge air enters the duct system. See Figure 7.

1. Using the universal base as a guide, locate and mark the 12-1/8” x 12-1/8” opening for the Feeder Duct. **NOTE:** If using the combustion air duct, knock out the duct opening to be used. Then mark the 2-1/4” x 7-1/4” opening on the floor.

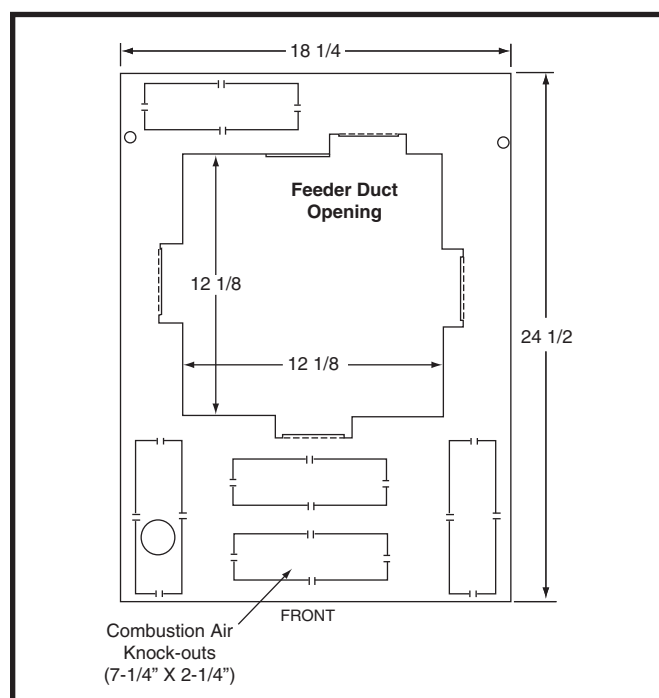


Figure 7. MA-100 Universal Base, Bottom Panel

2. Cut all 4 sides of the Feeder Duct opening 1” larger than the drawn cutout. **NOTE:** Cutting the opening to 14-1/8” x 14-1/8” will allow the four flanges on the underside of the panel to fit into the opening. Cut all the way through the insulation and bottom board so that the combustion air duct is unobstructed to outside air.
3. If applicable, cut the 2 1/4” x 7 1/4” opening for the combustion air duct. **NOTE:** Cut the opening for the duct about 1/8” larger than the actual cutout drawn. This will allow some clearance when installing the Feeder Duct.
4. Drill a 1” diameter hole for the fuel line through the floor and bottom board to the outside. **NOTE:** Fuel lines are not supplied with the furnace. They should be installed to comply with all applicable codes.
5. Set the universal base in place. Drop transition or offset feeder duct (Figure 5) upside down through the floor opening and center the top of the feeder duct in 14-1/8” x 14-1/8” floor opening.
6. Using the feeder duct as a guide, mark and cut a 12” x 12” opening in the supply duct. Remove the base and transition feeder duct; then cut the opening into the distribution duct.
7. Insert the feeder tabs into the main duct and bend them over until the main duct edges are trapped tightly between flanges and tabs. **NOTE:** Metal tape may be used to ensure an air tight connection.
8. Set the bottom base panel over the feeder duct. Slit the corners of the feeder duct down to the top of the base. While the top of the distribution duct is pulled up with one hand, bend down each side of the feeder duct tightly to the base with the other hand. Trim the metal to allow one inch flange over the top of the base and seal that flange with metal tape.
9. Secure the top panel to the floor with 2 screws through the front flange. **NOTE:** If using a “V” or “U”-box crossover system, use manufacturers instructions for installation details.

### Installing the Furnace on an MA-100 Base

1. Carefully lift the furnace over the universal base pan and set into position. Avoid damaging the feeder duct assembly and combustion air adapter, if present. **NOTE:** Make sure the furnace is positioned against the back end of the base.
2. Open the furnace door and fasten the furnace to the base using #8 x 1/2” sheet metal screws.
3. Using the provided hose clamp, secure the flexible combustion air tubing from the burner to the combustion air adapter.

### Combustion Air Duct/Pipe Installation

The CMF2 furnace must draw the combustion air from outside (except for special installations) and requires using the 2"X7" rectangular combustion air duct provided in the MA series base kit or the direct vent kit. See Table 2 (page 6) for special combustion air installations. **NOTE:** If using the direct vent kit, the kit must be installed before the furnace is positioning on the base. Follow the instructions provided with the kit. If using the rectangular combustion air duct, follow the steps below:

1. Install the combustion air duct through the selected knockout in the base. For direct vent applications, the rear knock-out in the furnace base cannot be used.
2. Install the combustion air adapter (after the combustion air duct has been positioned) to transition the 2"X7" opening of the combustion air duct to the 2" diameter of the burner flexible tubing. **NOTE:** Adapter is included in the MA series base kits. For retrofit applications in which the MA series base is already installed, the combustion air adapter can be ordered as a kit. Refer to the Replacement Parts List for more details on ordering this kit.
3. Secure the adapter with wood or metal fasteners (field supplied), depending upon your installation. **NOTE:** Make sure the gasket for the adapter is positioned properly before installing the adapter.
4. Attach the flexible hose from the burner to the combustion air adapter using the provided hose clamp.

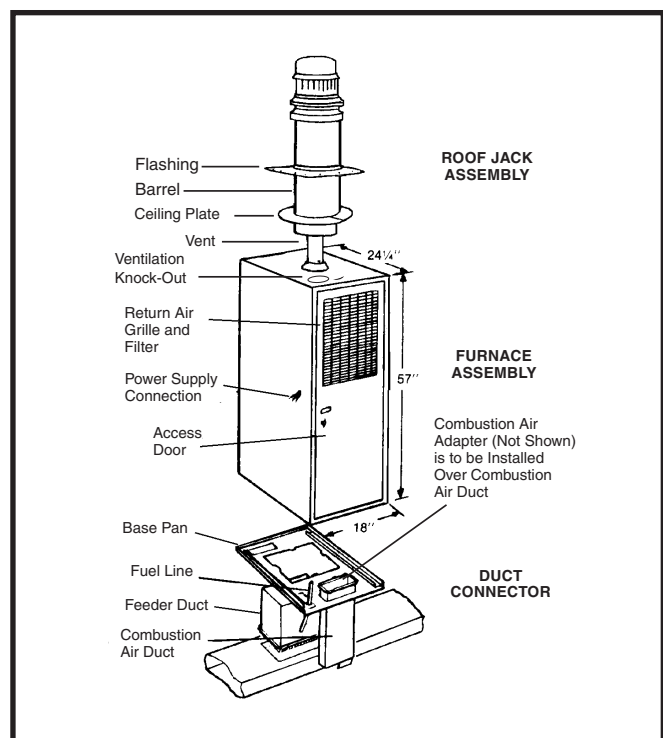
### SRJ Roof Jack Installation

Required ceiling and roof cut-out openings must be accurately located to prevent hazardous misalignment of the furnace and roof jack. Figure 8 displays a typical installation for manufactured housing applications. Refer to Figure 9 (page 14) to determine appropriate SRJ roof jack and accessories required for your installation. Install only SRJ series roof jack as specified on the furnace label. **NOTE:** A roof jack adaptor is required for sloped roofs.

### WARNING:

- The roof jack and vent pipe as determined from the chart in Figure 9 must be applied.
- The indicating line near the bottom of the roof jack must extend below the finished ceiling.
- The vent pipe must be attached to the furnace flue collar with provided sheet metal screws.
- DO NOT install any elbows (adjustable or non-adjustable) or a stack damper in the venting system.

1. Measure and cut an 8 1/4" diameter hole through the roof and ceiling that is also in direct line with the flue connection on the top of the furnace.
2. Center the adaptor opening over the roof opening. Use sealant or caulking under the adaptor. Use roofing nails or screws on wood construction or sheet metal screws on metal roofs.



**Figure 8. Typical Furnace Installation for Manufactured Housing Applications**

3. Insert the vent pipe into the bottom of the roof jack with locking slot pointed towards furnace. Slide the pipe into the roof jack to a length that allows convenient reach to the connection at the top of the furnace.
4. Ease the roof jack assembly through the openings. **NOTE:** The lower portion of the outer barrel must extend through the finished ceiling as indicated on the barrel. Use sealant or caulking on the roof or adaptor to seal under the flashing of the roof jack assembly.
5. Extend the vent pipe until the locking slot engages the screw in the top of the furnace flue pipe.
6. Twist the vent pipe to lock the two pipes together and tighten the screw. All joints and connections should be inspected before start up of the furnace. See Figures 10 & 11 (page 14).
7. Fasten the ceiling trim/fire stop plates around the upper barrel with four nails or wood screws (field supplied).

**NOTE:** The top section of roof jack models SRJ-3, -4, and -5 can be removed for dwelling transit. If the top is removed, remaining openings must be sealed from rain, debris, etc., until the top is reinstalled. A plastic accessory cap must be fastened to the lower roof jack section using the same screws securing the roof jack cap assembly.

**IMPORTANT:** When the top section of the roof jack is removed for transit, a special warning label must be attached adjacent to the fuel line connection of the gas or oil burner. The special warning label is supplied with two piece roof jack assemblies.

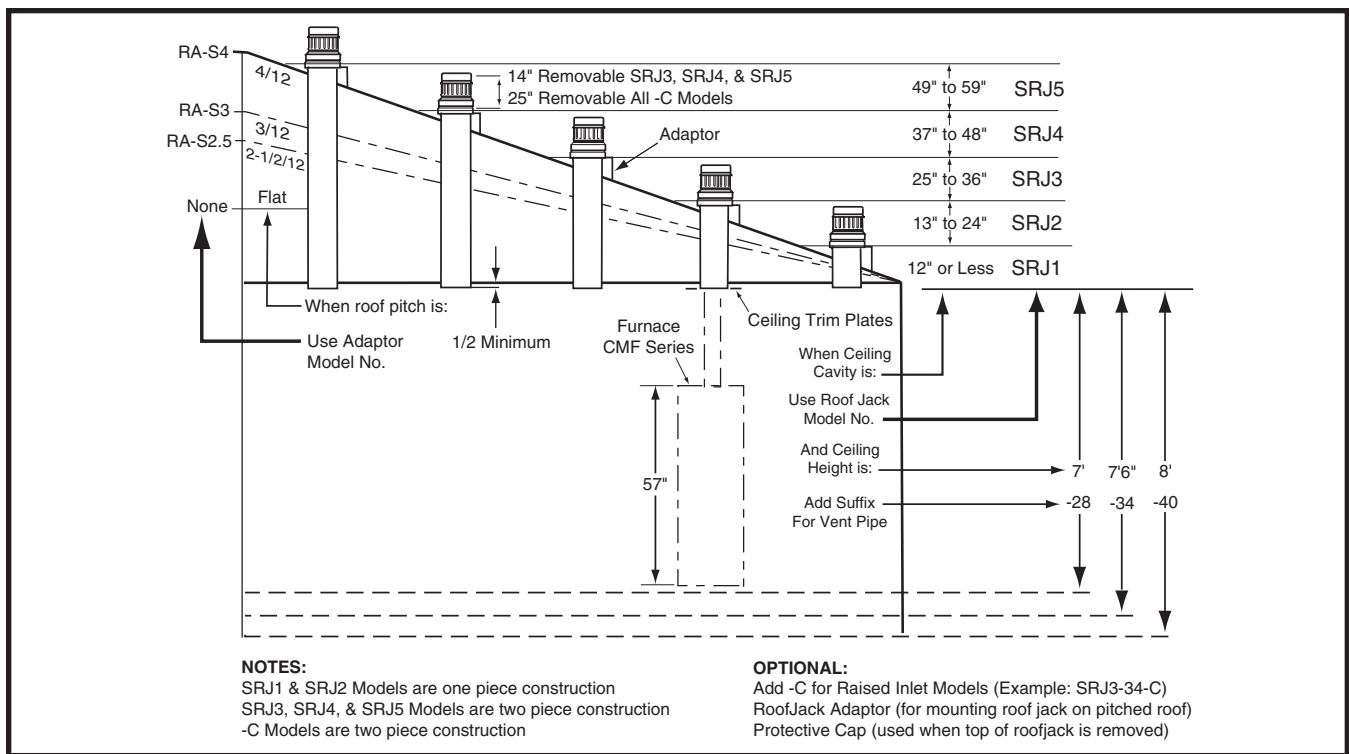


Figure 9. Selection of Roof Jack & Accessories Chart

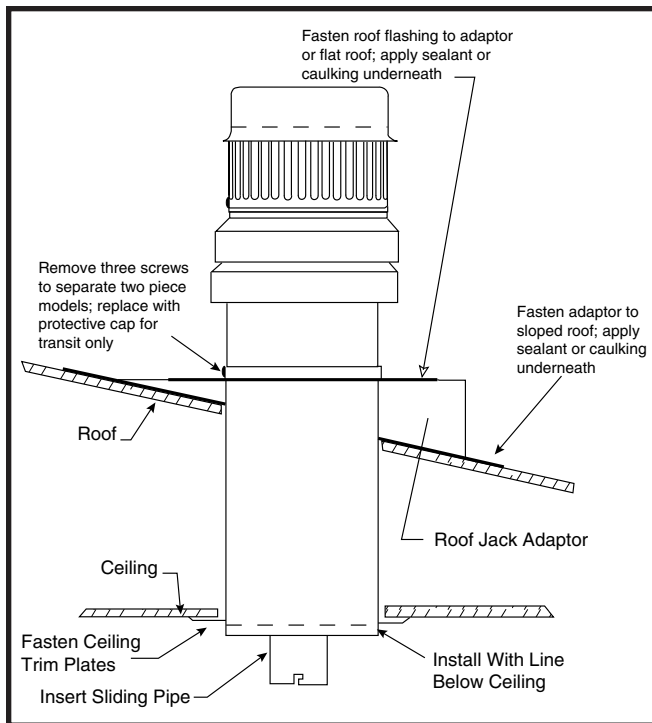


Figure 10. Roof Jack

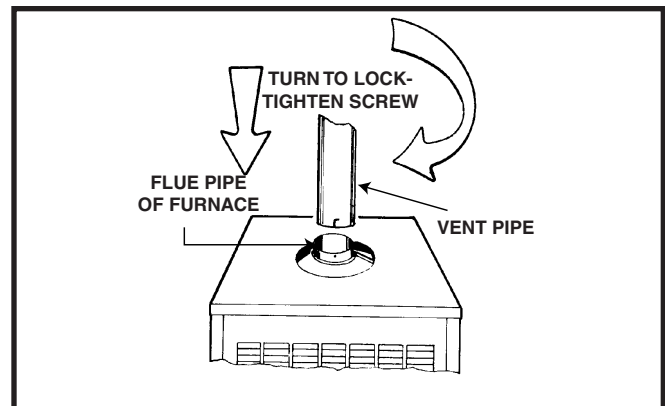


Figure 11. Vent Pipe Installation

### Damper Installation

An automatic shut-off damper is available (see replacement parts list). An automated shut off damper is required when the home is air conditioned by a self-contained unit. This damper is designed to fit in the feeder duct cavity, directly under the furnace. A damper is required to prevent chilled air from flowing over the furnace heat exchanger. For proper installation, refer to the instructions provided with the damper.

### CB-200A Cottage Base Installation

The CMF2 can be installed on a CB-200A cottage base in certain applications, as listed in Table 2 (page 6). Refer to the Replacement Parts List for information on ordering this base. For installation, refer to the instructions that are provided with the CB-200A base kit.

## FUEL CONNECTIONS

### Gas piping - PG Series Only

#### **WARNING:**

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

- Failure to follow safety warnings exactly could result in serious injury or property damage.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

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

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

- All gas piping must be installed in compliance with local codes and utility regulations. In the absence of local codes the gas line installation must comply with the latest edition of the National Fuel Gas Code (ANSI Z223.1) or (CAN/CGA B149.1 or .2) Installation Codes.
- Some local regulations require the installation of a manual main shut-off valve and ground joint union external to the furnace. The shut-off valve should be readily accessible for service and/or emergency use. Consult the local utility or gas supplier for additional requirements regarding placement of the manual main shut-off.
- Gas piping must never run in or through air ducts, chimneys, gas vents, or elevator shafts.
- Compounds used on threaded joints of gas piping must be resistant to the actions of LP propane gas.
- The main gas valve and main power disconnect to the furnace must be properly labeled by the installer in case emergency shutdown is required.
- Flexible gas connectors are not recommended for this type of furnace but may be used if allowed by local jurisdiction. Only new flexible connectors may be used. Do not use a connector which has previously serviced another gas appliance.
- A drip leg should be installed in the vertical pipe run to the unit.

The CMF2 furnace may be installed with gas entry through the bottom of the furnace. When installing the gas line, connect a separate gas line from the gas meter to the burner with a manual shut-off valve installed in the supply line at the furnace. Always use new clean piping and route the line in an easily accessible manner. The piping and threading must be free from cutting burrs and defects. The line must be durable, substantial, and gas tight. An additional main manual shut-off valve may be installed in the gas supply line to shut-off the main fuel supply, if desired by the homeowner or required by local codes.

The proper gas supply line size can be determined using the gas piping chart, shown in Table 3. Black pipe is the most practical for natural gas, because of the larger sizes required. Copper tubing with an internal coating of tin is recommended for use with propane (LP) gas installations.

Table 3 lists the gas flow capacities for standard pipe sizes as a function of length in typical applications based on nominal pressure drop in the line.

Type of Pipe	Maximum Possible Pipe Length Required for Different Pipe Diameters			
	1/2"	5/8"	3/4"	1"
Black Iron Pipe for Natural Gas	20'	-	60'	100'
Aluminum or Copper Tubing for Natural Gas	10'	-	30'	-
Aluminum or Copper Tubing for LP Gas	-	40'	100'	-

**Table 3. Pipe Length Selection Chart**

#### Leak Check

#### **WARNING:**

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

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

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

After the gas piping to the furnace is complete, all connections must be tested for gas leaks. This includes pipe connections at the main gas valve, emergency shutoff valve and flexible gas connectors (if applicable). The soap and water solution can be applied on each

joint or union using a small paintbrush. If any bubbling is observed, the connection is not sealed adequately and must be retightened. Repeat the tightening and soap check process until bubbling ceases.

**IMPORTANT NOTE:** When pressure testing gas supply lines at pressures greater than 1/2 psig (14 inch W.C.), the gas supply piping system must be disconnected from the furnace to prevent damage to the gas control valve. If the test pressure is less than or equal to 1/2 psig (14 inch W.C.), close the manual shut-off valve.

#### High Altitude Application

Installation of this furnace at altitudes above 2,000 feet shall be in accordance with local codes, or in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 or National Standard of Canada, Natural Gas & Propane Installation Code CGA B149.1. Please consult your local code authority.

### **WARNING:**

**The reduction of input rating necessary for high altitude installation may only be accomplished with factory supplied orifices. Do not attempt to drill out orifices in the field. Improperly drilled orifices may cause fire, explosion, carbon monoxide poisoning, personal injury or death.**

The CMF2 furnace is shipped from the factory with its orifices and gas regulator setting for natural gas operation at sea level altitudes. At 2,000 feet, the NFGC requires that this appliance be derated 4% for each 1,000 feet of altitude. For example, the input needs to be reduced 8% at 2,000 feet, 12% at 3,000 feet, etc. This deration is in reference to the input rate and gas heating value at sea level.

High altitude conversion for this furnace requires reducing the orifice size or decreasing the manifold pressure. When decreasing the manifold pressure, the pressure must not be set below 3.2 in WC. If the pressure needs to be set below 3.2 in WC to achieve proper deration, then change the orifice size and raise the manifold pressure back to 3.5 in WC.

After changing the regulator pressure or the orifices, it is

required that you measure the gas input rate. This may be accomplished in the usual way, by clocking the gas meter and using the local gas heating value. To check the input of the furnace see page 21.

**IMPORTANT NOTE:** Observe the action of the burners to make sure there is no yellowing, lifting or flashback of the flame.

#### Converting to LP Gas

The CMF2 furnace is shipped from the factory for use with natural gas but can be converted to use liquid propane gas. Use the following procedure and Figure 12 (page 17) for converting the gas burner.

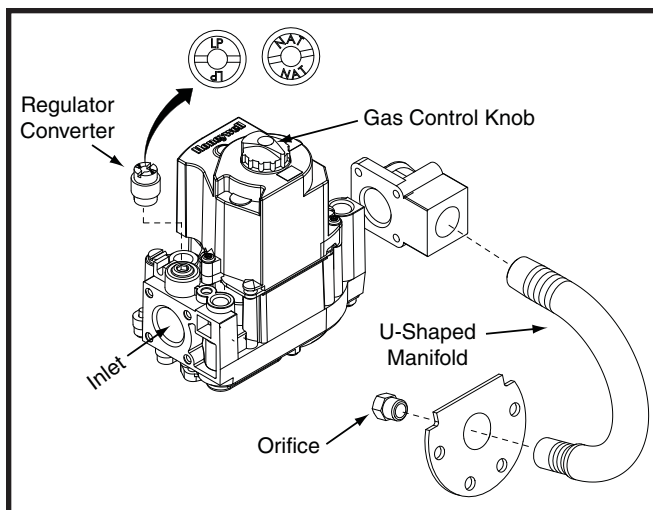
1. Set thermostat to OFF.
2. Turn off all power to the furnace.
3. Open furnace door and locate the gas valve.
4. Push in on the gas knob and turn it to OFF.
5. Shut off gas supply at meter.
6. Disconnect gas burner electric cord, gas piping to burner, and thermostat leads.
7. Remove nuts securing burner in place.
8. Disconnect inlet pipe union at burner.
9. Disconnect the two wires leading to gas control valve.
10. Remove bolts securing U-shaped manifold plate to orifice assembly.
11. Remove the main orifice and replace it with the correct LP fuel orifice as shown in Table 4. Refer to the rating plate on the furnace to determine the firing rate for your application. **NOTE:** If the firing rate of your furnace has been converted, make sure the appropriate LP orifice for the new firing rate is installed.
12. Remove the regulator converter on top of the gas valve. Invert the converter so that the red ring will be located at the bottom and the LP stamping on the converter appears up.
13. Screw converter back into the regulator, hand tight plus 1/8 turn.
14. Reinstall the burner assembly into the furnace.
15. Reconnect the gas piping and electrical wires to the gas valve.
16. Open the manual shut-off valve and follow the Operating Instructions outlined on page 20.

Burner Designation	Firing Rate Input (BTUH)	Natural Gas Orifice Number	Natural Gas Time Per Rev.* (sec)	LP Gas Orifice Number	LP Gas Time Per Rev.** (sec)
Gas Gun-65-DI-S	65,000	24	55	43	138
Gas Gun-75-DI-S	75,000	20	48	40	120
Gas Gun-90-DI-S	85,000	18	43	37	106

\* Times are based on natural gas at an average of 1,000 BTU per cubic foot, a burner manifold pressure of 3.5 in WC, and a meter dial size of 1 cubic foot.

\*\* Times are based on LP gas at an average of 2,500 BTU per cubic foot, a burner manifold pressure of 3.5 in WC, and a meter dial size of 1 cubic foot.

**Table 4. Natural & LP Gas Orifices**



**Figure 12. LP & Natural Gas Conversion**

### Oil piping - PO Series Only

The following procedures are recommended as good practice. However, requirements of local codes and ordinances, H.U.D. Manufactured Home and Safety Standards or National Fire Protection Association must be satisfied, where they apply, for an approved installation.

- Use a tank capacity suitable for the application with a weatherproof, capped fill opening and shielded vent to let air in as fuel is used. **NOTE:** The inside of the tank must be clean before filling. All water, rust, sediment, and other foreign matter must be flushed out.
- If a two pipe system is used or if oil is taken from the bottom of the tank, a filter is recommended. A manual shut-off valve may also be used on a single pipe or two pipe system. **NOTE:** Local codes may dictate the specific installation requirements.
- A fuel or tank gauge is recommended for easy checking of the fuel level. Check the gauge using a dip stick.
- Locate the storage tank conveniently near the home. For above ground fuel tank installations, the tank may rest three to four inches off the ground. Fuel tanks may also be buried if properly coated to resist corrosion. For below ground fuel tank installations, the vertical dimension from the bottom of the tank to the fuel pump must not exceed 10 feet. Keep the tank filled especially in the summer to reduce the accumulation of condensation.

#### Fuel Line Hook-Up: Single Line System

The single line system is highly recommended when vertical lift, from bottom of tank to pump, is less than 8 feet. A single line hookup has the advantage of costing less and giving quieter operation.

#### Fuel Line Hook-Up: Two Line System

Two line systems should only be used when the vertical lift exceeds 8 feet.

1. Install the oil feed line as outlined in the Hook-up Procedure.

2. Install the oil pump bypass plug in the bottom return port.
3. Run the return line up through the furnace base to the return port of the pump. Run the other end of the line to the tank, using 3/8" O.D. copper tubing or 1/4" pipe with the ends capped, and routing the line so it stays clean.
4. Insert the return line through the second opening in the duplex bushing. If the bottom of the tank is lower than the pump intake, the tube should be inserted 3 or 4 inches from the tank bottom. If the bottom of the tank is higher than the pump intake, the return line should extend not more than 8" inside the tank.

#### Hook-Up Procedure

1. Use 3/8" O.D. copper tubing for the fuel line. Cap the end with tape to keep out dirt while the line is being routed. See Figure 13 (page 18).
2. Install duplex bushing for two 3/8" lines in the top fitting of the tank.
3. Insert one end of the tubing through the duplex bushing until it is 3" to 5" from the bottom drain. Tighten the bushing.
4. Route the fuel line where it will not be subject to damage. Make all bends gradual and avoid kinks that might restrict oil flow.
5. Open the burner access door. Connect the oil line to the intake port on the pump. Tighten other port plugs on the pump.
6. Make sure the oil line is airtight! **NOTE:** Air leaks can cause the pump to lose prime and will create other problems such as nozzle failure, odors, rumbling noise, and false safety shut down.
7. Insert the short length of the copper tube level with the bottom of the duplex bushing. Tighten the bushing. Form the tube into an inverted "U" to serve as a vent.

#### Eliminating Air Leaks

To eliminate problems caused by air in the oil line, all connections in the oil supply line and all plugs, nuts, and fittings on the pump must be airtight, including the nut that covers the pressure adjustment. It is important that the hook-up be done with a good flaring tool.

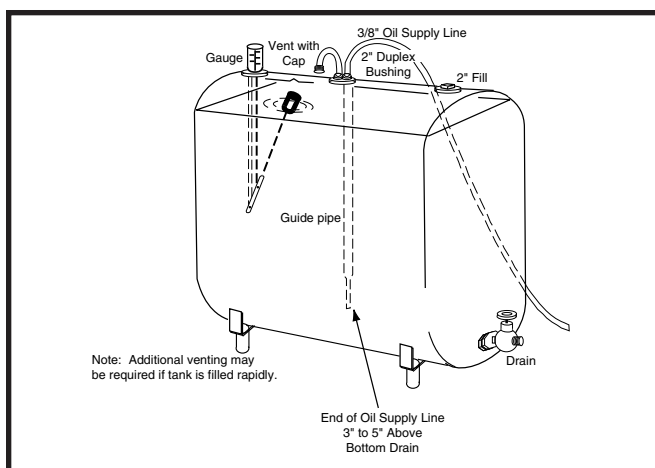
#### Fuel Oil Type

Grade No. 1 may be used where the oil supply is subject to low temperatures. Do not use fuel oil heavier than Grade No. 2. Biodiesel blends up to 5% (B5) are also acceptable.

**DO NOT USE GASOLINE, CRANKCASE OIL, OR ANY OIL CONTAINING GASOLINE.**

### **WARNING:**

**Failure to keep supply oil clean may cause failure of certain components such as the fuel pump gears, check valve, shaft seal, or burner nozzle which may result in a burner fire.**



**Figure 13. Recommended Tank Hook-Up  
200 - 300 Gallon Tank**

## ELECTRICAL CONNECTIONS

### **⚠ WARNING:**

#### **ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**

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

**Improper servicing could result in dangerous operation, serious injury, death or property damage.**

- **Before servicing, disconnect all electrical power to furnace.**
- **When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.**
- **Verify proper operation after servicing.**

- Electrical connections must be in compliance with all applicable local codes and ordinances, and with the current revision of the National Electric Code (ANSI/NFPA 70).
- For Canadian installations, the electrical connections and grounding shall comply with the current Canadian Electrical Code (CSA C22.1 and/or local codes).

#### **Pre-Electrical Checklist:**

- ✓ Verify the voltage, frequency, and phase of the supply source match the specifications on the unit rating plate.
- ✓ Verify that the service provided by the utility is sufficient to handle the additional load imposed by this equipment. Refer to the unit wiring label or Table 5 (page 19) for proper high and low voltage wiring.
- ✓ Verify factory wiring is in accordance with the unit wiring diagram (Figure 18, page 29). Make sure no connections loosened during shipping or installation.

## Line Voltage

- **An electrical disconnect must be located within sight of and easily accessible to the unit.** This switch shall be capable of electrically de-energizing the outdoor unit. See unit data label for proper incoming field wiring. Any other wiring methods must be acceptable to authority having jurisdiction.
- It is recommended that the line voltage to the unit be supplied from a dedicated branch circuit containing the correct fuse or circuit breaker for the unit. See Table 5 (page 19) for unit specifications.
- Overcurrent protection must be provided at the branch circuit distribution panel and sized as shown on the unit rating label and according to applicable local codes.
- Use only copper wire for the line voltage power supply to this unit. Use 14-2 Type NM cable or code agency listed conduit and a conduit connector for connecting the supply wires to the unit.
- If replacing any of the original wires supplied with the unit, the replacement wire must be copper wire consisting of the same gauge and temperature rating.
- Provide power supply for the unit in accordance with the unit wiring diagram, and the unit rating plate. The installer should become familiar with the wiring diagram/schematic before making any electrical connections to the unit. See Figure 18.

## Wiring Connections

1. Open the appliance door for access to the control box.
2. Remove the control box cover.
3. Connect the black wire of the furnace to the black wire of the power supply cable.
4. Connect the the white wire of the furnace to the white wire of the power supply cable.
5. Connect the ground wire of the power supply cable to the green screw in the control box of the furnace.
6. Verify all electrical connections are securely connected.
7. Replace the control box cover.

## Grounding

### **⚠ WARNING:**

**The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. Do not use gas piping as an electrical ground!**

This unit must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code (ANSI/NFPA 70) or the CSA C22.1 Electrical Code. Use the grounding lug provided in the control box for grounding the unit.

	CMF 80 PG Convertible	CMF 80 PO Convertible
Factory Set Firing Rate (btu/hr)*	75,000	75,000
Heating Capacity (btu/hr)	56,000	60,000
Kit Converted Firing Rate (btu/hr)**	65,000 or 85,000	65,000 or 85,000
AFUE Rating (%)	75+	80+
Orifice Number (Natural Gas)	20	N/A
Orifice Number (Propane Gas)	40	N/A
Burner Nozzle for Oil	N/A	0.60 gph; A; 80°
Blower D x W	10 x 7	10 x 7
Motor H.P. - Speed -Type	1/4 -3 -PSC	1/4 -3 -PSC
Motor FLA	6.0	6.0
Fuse or Breaker	15 Amps	15 Amps
Nom. Anticipator Setting	0.6	0.6
Temperature Rise Range (° F)	55° - 85°	55° - 85°

#### NOTES:

Electrical: All models are 115 volt, 60 Hz, 1 phase. Thermostat circuit is 24V, 60 Hz, 15VAC.

Gas connections: 1/2" NPT.

AFUE = Annual Fuel Utilization Efficiency

\* Ratings to 2,000 feet. Over 2,000 ft, reduce ratings by 4% for each additional 1,000 ft above sea level.

\*\* The firing rate of the CMF 80 Convertible series furnaces can be changed using an approved conversion kit.

**Table 5. CMF2 Specifications**

#### Thermostat Connections

- Thermostat connections shall be in accordance with the instructions supplied with the thermostat and the indoor equipment. The low voltage wires must be properly connected to the units low voltage terminal block. Route **R & W** from the thermostat to the burner compartment. Connect **R** to one of the low voltage terminals of the burner. Connect **W** to the burner's other low voltage terminal.
- A single stage thermostat is used with this equipment and must operate in conjunction with any installed accessories.
- The thermostat should be mounted about 5 feet above the floor on an inside wall. DO NOT install the thermostat on an outside wall or any other location where its operation may be adversely affected by radiant heat from fireplaces, sunlight, or lighting fixtures, and convective heat from warm air registers or electrical appliances. Refer to the thermostat manufacturer's instruction sheet for detailed mounting and installation information.
- The heat anticipator of the thermostat should be adjusted to .4 amps for power oil models, and .9 for power gas direct ignition models.

#### Heat Anticipator

Set the heat anticipator according to the instructions supplied by the thermostat manufacturer. To determine the heat anticipator setting:

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

#### Blower Speed

The CMF2 furnace is equipped with a 3 speed PSC motor that is pre-set at the factory for HIGH speed operation. For optimum system performance and comfort, it may be necessary to change the factory speed setting. This is accomplished by changing a wire connection at the blower motor. Refer to the wiring diagram label on the inside of the panel door or see Figure 18 (page 29) for wiring configuration. Table 6 lists the proper circulating air flow and temperature rise for the CMF2 furnace.

### CAUTION:

**To avoid personal injury or property damage, make sure the motor leads do not come into contact with any uninsulated metal components of the unit.**

- High Speed Operation:** Connect the **black** wire from the fan switch to the **black** wire of the blower motor. **NOTE:** This is the factory default setting and should not be changed if high speed operation is desired.
- Medium Speed Operation:** Connect the **black** wire from the fan switch to the **blue** wire of the blower motor.
- Low Speed Operation:** Connect the **black** wire from the fan switch to the **red** wire of the blower motor.

#### Constant Blower Operation

The FAN ON & OFF switch is located on top of the control box. This switch provides either automatic operation of the blower through the thermostat or constant blower operation.

External Static Pressure (in WC)	Airflow (CFM)		
	Low speed For 65 Kbtu/h Input	Medium Speed For 75 Kbtu/h Input	High Speed For 85 Kbtu/h Input
0.1	730	920	1000
0.2	690	880	960
0.3	650	840	900
0.4	610	780	860
0.5	560	740	810
0.6	510	690	760

**Table 6. CMF2 Airflow Data**

## START-UP & ADJUSTMENTS

### Important Safety Information

#### **WARNING:**

All safety information must be followed during the start-up and operation of the furnace. Unqualified individuals should not attempt to interpret these instructions. Improper servicing could result in dangerous operation, property damage, personal injury or death.

#### **WARNING:**

##### FIRE OR EXPLOSION HAZARD

- Failure to follow safety warnings exactly could result in serious injury or property damage.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

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

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

- This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. **Do not try to light the burner by hand.**
- BEFORE LIGHTING OR OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- Use only your hand to push in and move the gas control lever. Never use tools. If the lever will not push in by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- Should overheating occur, or the gas supply fail to shut off, turn the manual gas valve to the appliance OFF.

### Pre-Start Check List

- ✓ Verify the polarity of the connections are correct, the line voltage power leads are securely connected and the furnace is properly grounded.
- ✓ Verify the thermostat wires (**R** & **W**) are securely connected in the burner compartment.
- ✓ Verify the gas line service pressure does not exceed 10.0 inches of W.C., and is not less than 4.5 inches W.C. for natural gas. For LP gas the line service pressure must not exceed 14 in. W.C., and must not be less than 11.0 in. W.C.
- ✓ Verify the roll-out and manual reset switch is closed. If necessary, press the red button to reset a switch. **DO NOT install a jumper wire across a switch to defeat its function.** If a switch reopens on startup, DO NOT reset the switch without identifying and correcting the fault condition.
- ✓ Verify the blower door is in place, closing the door switch in the line voltage circuit.
- ✓ Verify the gas line has been purged and all connections are leak free.

### Operating Instructions for PG Direct Ignition Burner

Do not perform these steps until all of the safety checks have been completed:

1. STOP! Read all safety information on this page.
2. Set the thermostat to OFF or to its lowest setting.
3. Turn off all electric power to the appliance. **NOTE:** This appliance is equipped with an ignition device which automatically lights the burner. DO NOT try to light the burner by hand.
4. Turn the latch and open the furnace door.
5. Push in the gas control knob and turn to OFF. **IMPORTANT: DO NOT FORCE. Wait 10 minutes to clear out any gas. If you still smell gas, STOP! and read WHAT TO DO IF YOU SMELL GAS.** If you don't smell gas, go to the next step.
6. Turn the gas control knob to ON.
7. Close the furnace door and turn the latch.
8. Turn on all electric power to the appliance.
9. Turn the thermostat to ON and set to the desired setting.
10. If the appliance will not operate after one re-try, follow the instructions Shutting Off the Gas Supply below and call your service technician or gas supplier.

### Shutting Off the Gas Supply

1. Set the thermostat to OFF or to its lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Turn the latch and open the furnace door.
4. Push in the gas control knob and move to OFF. **DO NOT FORCE.**
5. Close the furnace door and turn the latch.

### Checking the Input of the Furnace

Refer to the furnace rating plate to determine the firing rate of the furnace. Using Table 4 (page 19), determine the appropriate orifice size for the firing rate and gas being used in your application. Check the burner orifice to ensure that it is the correct size. The input of this furnace can be checked using the following steps:

1. Shut off all other gas fired appliances.
2. Start the furnace run it for at least 3 minutes.
3. Measure the time (in seconds) required for the gas meter to complete one revolution. **NOTE:** One revolution equals 1 cubic foot of gas.
4. Compare the time measured with the appropriate time listed in Table 4 (page 16). If the time varies by more than 5% from the times shown in the table, then measure the inlet and gas valve manifold pressures. See Checking the Inlet Gas Pressure and Checking the Manifold Pressures sections below.

## ⚠ WARNING:

**Do not attempt to drill the gas orifices. Use only factory supplied orifices. Improperly drilled orifices may cause fire, explosion, carbon monoxide poisoning, personal injury or death.**

5. If the inlet gas pressure and the manifold pressure are both properly set, then check the burner orifice to ensure that it is properly sized. Further gas problems should be referred to the local gas supplier.

### Checking the Inlet Gas Line Pressure

The inlet gas line pressure can be checked at the port located on the inlet end of the gas valve. See Installing the Pressure Gauge or U-Tube Manometer section.

- **Natural gas installations:** The inlet gas line pressure at the gas valve must be between 5 in. W.C. & 7 in. W.C.
- **LP gas installations:** The inlet gas line pressure at the gas valve must be between 11 in. W.C. & 13 in. W.C.

### Checking the Manifold Pressure

The manifold pressure can be checked at the port located on the gas outlet end of the gas valve using a pressure gauge or U-tube manometer. If the manifold pressure is not equal to the values below, then it must be adjusted. See Installing the Pressure Gauge or U-Tube Manometer.

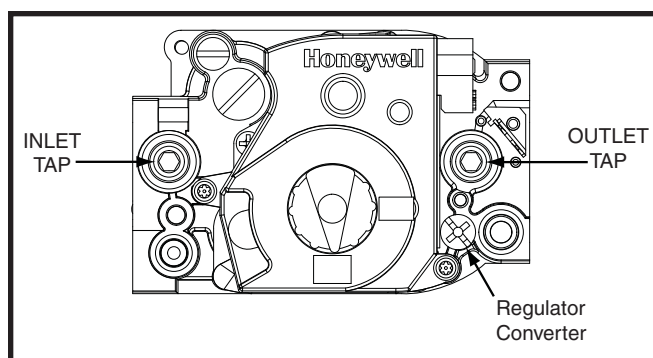
- **Natural gas installations:** The manifold pressure must be set at 3.5 in. W.C.
- **LP gas installations:** The manifold pressure must be set at 10.0 in. W.C.

### Adjusting the Manifold Pressure

1. Remove the regulator converter from the gas valve, See Figure 14.
2. Turn the adjusting screw clockwise to increase the pressure or counterclockwise to reduce the pressure.
3. After setting the manifold pressure, replace the regulator converter in the same manner it was removed earlier.

### Installing the Pressure Gauge or U-Tube Manometer

1. Determine which type of pressure (inlet gas or manifold pressure) needs to be measured.
2. Using a 3/16" Allen wrench, remove the appropriate tap plug located on the gas valve. See Figure 14. **NOTE:** To measure the inlet gas pressure, remove the tap plug on the inlet side of the gas valve. To measure the manifold pressure, remove the tap plug on the outlet side of the gas valve.
3. Install a fitting that has a 1/8" NPT pipe thread and is compatible with the pressure gauge or U-tube manometer on the valve.
4. Connect the pressure gauge or U-tube manometer to the gas valve. Refer to the gauge manufacturer's supplied instructions for proper hookup and usage.
5. After measuring the pressure, remove the pressure gauge or U-tube manometer from the gas valve and replace the tap plug. **NOTE:** Make sure the tap plug is tight and isn't cross-threaded.



**Figure 14. Direct Ignition Gas Valve**

### Adjusting the Burner

The air shutter of the gas gun burner is pre-set at the factory and should not be adjusted unless the firing rate of the furnace needs to be converted. The burner should run quietly. Verify the air shutter setting is correct as shown in Table 7. **NOTE:** It is very important that there is an ample supply of combustion air without decreasing burner efficiency. An inadequate amount of fresh air can cause carbon monoxide (CO) production. The carbon dioxide (CO<sub>2</sub>) content of the flue products should be in the range of 8.0% to 9.0% for natural gas and 9.0% to 10.0% for LP gas.

Input (BTU/H)	Natural Gas Setting	LP Gas Setting	Oil Setting
65,000	3.7	3.75	3.75
75,000	4.5	4.5	4.0
85,000	5.5	5.5	5.0

**Table 7. Air Shutter Setting for Different Fuels**

## **WARNING:**

**Do not attempt to drill the gas orifices. Use only factory supplied orifices. Improperly drilled orifices may cause fire, explosion, carbon monoxide poisoning, personal injury or death.**

At 2,000 feet, the NFGC requires that this appliance be derated 4% for each 1,000 feet of altitude. For example, the input needs to be reduced 8% at 2,000 feet, 12% at 3,000 feet, etc. This furnace can be derated by reducing the orifice size or decreasing the manifold pressure. When decreasing the manifold pressure, the pressure must not be set below 3.2 in. W.C.. **NOTE:** If the pressure needs to be set below 3.2 in. W.C. to achieve the proper derate, then change the orifice size and raise the manifold pressure back to 3.5 in. W.C..

### **Operating Instructions for PO OIL Burners**

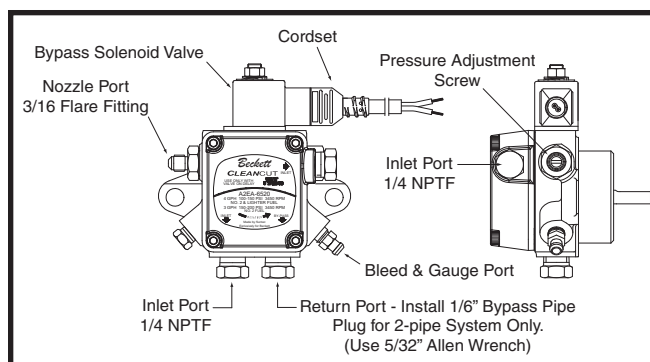
Oil burners in PO series furnaces are factory equipped with a primary control capable of either intermittent or interrupted ignition.

#### Start-Up Procedure

1. Open all manual shut-off valves in the oil supply line from the tank to the burner.
2. Turn ON the electrical supply to the furnace.
3. Set the room thermostat to the desired temperature.

#### Air-Bleed Procedure - Single Pipe Installation

1. Open the door to the furnace.
2. Attach 1/4" I.D. plastic tube over the end of the airbleed valve on the oil pump as shown in Figure 15. Place the other end of the tube in a large container.
3. Pull the door interlock switch out to start the burner.
4. Turn the airbleed valve open not more than 1/2 turn to get a fast flow of oil into the container.
5. To assure continuous operation, use a wire to jump terminals T-T on the primary control while burner is running. If furnace is equipped with the Honeywell R7184 or Beckett 7505 primary control, perform the next 3 steps to prime the oil pump:
  - a. While the ignition is on, press the reset button for 1/2 second or less and release the reset button. The lockout time will be extended to 4 minutes.
  - b. If prime is not established within the 4 minutes, the control will lock out. Press the reset button to reset the control and go back to step "a".
  - c. Repeat steps "a" & "b", if needed, until the pump is fully primed.
6. When oil flow is clear of air bubbles, close air-bleed valve and tighten. **NOTE:** Air bleed out time will vary depending on length of oil line, number of bends, etc.
7. Remove the jumper wire on the primary control.



**Figure 15. Oil Pump**

**NOTE:** If furnace is equipped with the Beckett 7505 primary control, prime the oil pump using the following steps:

1. After the burner starts, press and hold the reset button for 15 seconds until the yellow light turns on. This indicates that the button has been held long enough.
2. Release the reset button. The yellow light will turn off and the burner will start up again.
3. At burner start up, click the reset button while the igniter is still on. **NOTE:** This will transition the control to a dedicated pump prime mode, during which the motor, igniter and valve are powered for 4 minutes. The yellow light will be on. **NOTE:** If the prime is not established during the 4 minute pump prime mode, repeat step 3 until the pump is fully primed.

#### Oil Burner Shutdown Procedure

Set the room thermostat to "OFF" or its lowest setting.

#### Flame Adjustment

1. Set the thermostat below room temperature to start the furnace.
2. Allow the furnace to operate for about 10 minutes.
3. Adjust the air shutter setting until 11% CO<sub>2</sub> with zero smoke or less is achieved. **NOTE:** The draft over the fire must be at least negative 0.02 in. W.C. The factory set air shutter settings are shown in Table 7 (page 21).

#### Electrode Setting

The electrode setting is carefully set at the factory. However, during transit, the setting of the electrodes may become improper. Before attempting to start the oil burner, check the positioning of the electrodes to ensure that they are properly positioned, as shown in Figure 16 (page 23). Improperly adjusted electrodes can result in poor ignition. Do not permit the electrodes to be closer than 1/4" to any grounded surface.

#### Switching from Interrupted to intermittent Ignition Control

Honeywell and Beckett oil primary controls can be switched between interrupted and intermittent ignition control. To switch from interrupted duty (Factory set) to intermittent duty, remove the blue ignitor wire from the quick-connect terminal. Attach the burner motor and igniter wire to the

burner motor (orange) control terminal by splicing or adding tab adapters. Seal and isolate any bare wires. See Figure 16.

### Firing Rate Conversion

The rated firing rates of the CMF2 80 convertible furnaces (PO & PG) can be adjusted from the factory setting of 75,000 BTU/hr. The firing rate can be changed to either 65,000 BTU/hr or to 85,000 BTU/hr using the appropriate certified NORDYNE conversion kit installed by a NORDYNE distributor or Service PRO. See the Replacement Parts Listing for the appropriate kit number to order.

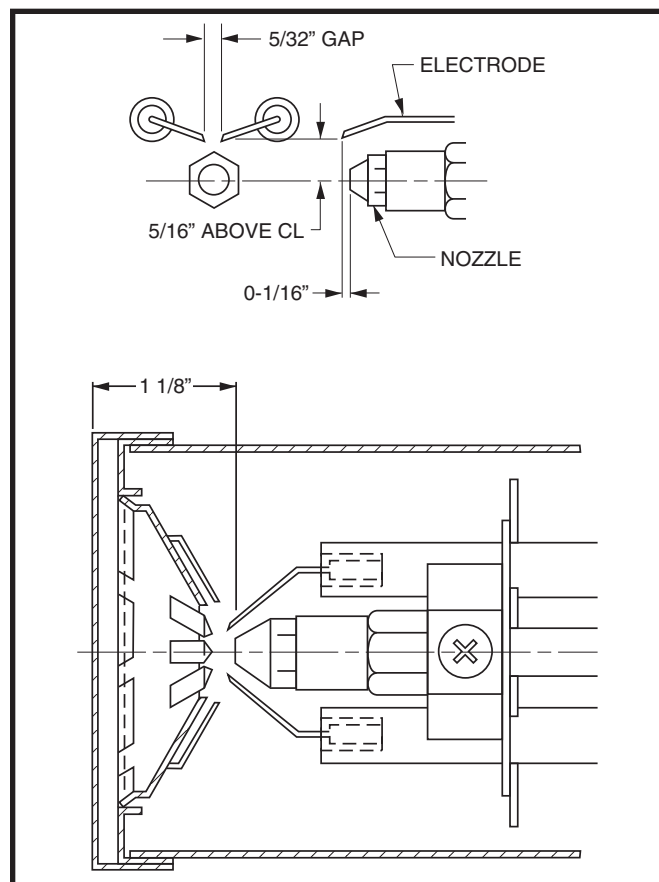


Figure 16. PO Oil Burner Electrode Settings

## OPERATING SEQUENCE

### PG Gas Furnaces

1. The thermostat calls for heat by energizing the **W** terminal with 24 volts.
2. The combustion blower motor energizes. After the motor begins to rotate, the centrifugal switch (located in the motor end cap) closes.
3. A 30 second pre-purge period begins and the ignition control initiates an internal safety start check.
4. If ignition control passes the safety check, a 15 second ignitor warm-up period begins. During this period, the ignitor warms up to an ignition temperature.
5. The control applies 24 volts to the gas valve.
6. The ignitor ignites the gas, and the presence of flame must be detected within a timed trial ignition period.  
**NOTE:** If flame is detected, the ignitor is de-energized and the gas valve will remain open until the call for heat from the thermostat is completed. If the flame is not detected, the control will close the gas valve at the end of the timed trial ignition period. The control will attempt ignition 2 more times before locking out.
7. The circulating air blower will energize when the temperature fan switch closes.
8. When the thermostat demand for heat is satisfied, the **W** terminal de-energizes the gas valve circuit and the gas valve will close.
9. The circulating air blower will de-energize when the temperature fan switch opens.

### NOTES:

- The control will close the gas valve if the flame sensor does not detect the presence of a flame. The control will attempt to re-ignite the gas 2 times before locking out. If lock-out occurs, the control can be reset by setting the thermostat below room temperature for at least 45 seconds, and then returning it to the desired setting. If adjusting the thermostat does not reset the ignition control, turn off all power to the appliance for 45 seconds, and then turn it back on.
- If the gas control has been replaced or serviced, lighting may not be satisfactory until air has been purged from the gas line or the gas input and combustion air have been adjusted.

### PO Oil Furnaces

The processes listed below are applicable only to furnaces equipped with a Honeywell R7184 or Beckett 7505 Control.

1. When a call for heat is initiated, there is a 2-6 second delay while the control performs a safe start check.
2. The ignition and motor turn on for the 15 second valve on delay. Following the delay, the valve energizes and a flame should establish within a 15-second lockout time.

### NOTES:

- If flame is not sensed within the 15-second lockout time, the control shuts down on safety lockout. The reset button on the control must be manually reset.

- If control locks out 3 times, the control enters restricted lockout. To reset: Honeywell R7184: hold down the reset button for 45 seconds until the LED flashes once. Beckett 7505: hold down reset button for 15 seconds until the red light turns off and the yellow light turns on.
- 3. After flame is established, the ignition remains ON for 10 seconds to ensure flame stability. It then turns off (interrupted ignition).
- 4. The circulating air blower will energize and the temperature fan switch will close.
- 5. The furnace runs until the demand for heat is satisfied and the burner shuts down.
- 6. The circulating air blower will de-energize when the temperature fan switch opens.

## TROUBLESHOOTING

### **WARNING:**

#### **ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**

**Failure to follow safety warnings exactly could result in serious injury or property damage. Only persons trained and experienced in direct ignition systems should service this equipment.**

**Improper servicing could result in dangerous operation, serious injury, death or property damage.**

- **Before servicing, disconnect all electrical power to furnace.**
- **When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.**
- **Verify proper operation after servicing.**

### PG Direct Ignition-Gas Gun (Power Burner)

#### **IMPORTANT NOTES:**

- If a condition exists that causes the ignition control to go into safety lockout, meter readings must be taken quickly after restart - within trial for ignition period.
- Always de-energize the system for at least 45 seconds before recycling for further tests.
- The ignition control cannot be repaired. If the troubleshooting procedure indicates a malfunction in the control, it must be replaced.

#### High Gas Bills

- Check the combustion air adjustment.
- Verify the proper size orifice is being used.
- Check the return air filter is clean.
- Be sure the home is insulated, windows and doors fit tightly, and there are no air leaks in the heating ducts.

- Check room thermostat. Make sure the setting is not higher than necessary. Low humidity levels require higher temperatures for comfort. Perhaps humidity should be increased.

#### Burner motor does not run - thermostat calls for heat.

- Defective thermostat circuit - bridge TT connections on burner junction box. See Figure 18 (page 29). If burner motor runs, check thermostat and connections between furnace and thermostat.
- No voltage to burner - plug test lamp into burner plug receptacle. If it does not light, check:
  - Blown fuse, electric supply off
  - Door switch not making contact
  - Limit switch in open mode
  - Air filter for proper airflow
  - Loose wire connections
  - Tripped manual reset auxiliary limit.
- 120 volts is available to burner - Test lamp does not light. Remove junction box cover on burner, check for:
  - Loose wires
  - Defective transformer
  - Defective motor

#### Burner motor does not run, no main flame.

- Defective centrifugal switch. Check switch operation by removing end bell of the burner motor.
- Check for gas supply - gas line valve and control lever are on.
- Check for burner safety lockout. (Restart burner)
- Check for 24 volts to ignition control (See Figure 18).
  - No voltage at purge timer - check the centrifugal switch in the combustion motor.
  - No voltage to ignition control - check purge timer and allow 1 minute for timer to activate.
- Check for 120 volts to ignition control. Use voltmeter at L1 & L2 (See Figure 18).

#### Ignition control is powered (120v and 24v). Ignitor does not heat up.

- Remove AMP plug from burner tube receptacle and check for 120 volts at the plug during ignition sequence.
- Replace ignition control if 120 volts is not supplied to AMP plug within 3 minutes of ignition cycle start.

#### 120 volts is available at AMP plug. Ignitor does not heat up.

1. Disconnect burner plug from furnace receptacle.
2. Disconnect AMP plug from burner tube receptacle.
3. Check ignitor circuit through receptacle with an ohmmeter. Normal ohm reading should be between 40 to 75 ohms. An infinite or zero ohm reading indicates a defective ignitor and must be replaced.
5. Check for continuity from ignitor receptacle to burner ground.
6. Check for hairline cracks in ignitor's insulating ceramic.

24 volts supplied to gas valve during ignition but no main gas flow.

- Gas valve may be defective. Replace if necessary.
- Gas piping may be plugged. Check for adequate gas supply to gas valve at union.

Main flame ignites but burner locks out.

- Ignition control is not properly grounded.

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## **WARNING:**

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**When replacing the ignition control, replacement control must have the safety lockout time. FAILURE TO FOLLOW THIS WARNING MAY RESULT IN AN EXPLOSION.**

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- Defective ignition control.
- Improper gas pressure or burner air adjustment is not allowing flame to contact ignitor tip for flame proving rectification.

Burner operates, insufficient heat

- Check the thermostat for proper setting and location.
- Check for clean air filters and proper air flow.
- Check burner for proper gas firing rate.
- Verify unit is not undersized for its thermal load.
- Check thermostat anticipator. (0.9 amps)

Burner does not shut off.

**NOTE:** Burner will stop when the door switch is open. With the door open, secure the door switch in the closed position by depressing the switch. The means for securing the door switch must be removed once this testing has been completed.

- Disconnect the thermostat wires from TT connections on the burner junction box. If the burner shuts off, check for:
  - Short circuit in the thermostat wires.
  - Defective thermostat.

Burner has flame but motor isn't running

- Gas valve stuck in open position.
  - Replace the control.
  - Burner and heat exchanger may need cleaning.

Noisy fire

- Re-adjust combustion air to reduce volume of air being drawn into the burner. See Adjusting the Burner (page 21) for flame adjustment.

Circulation blower will not operate even though the burner operates.

- Turn on the manual blower switch, if the blower operates, check the fan switch.
- Check the wiring to the motor.
- Check for a burned out motor.

## **PO Oil Furnace**

Honeywell R7184 or Beckett 7505 controls only.

Burner does not start with a call for heat.

1. Check the electrical supply to furnace.
2. Verify the furnace door switch is in the on position.
3. Check line voltage (115 VAC) at the oil primary control.
4. Check indicator light with burner off, no call for heat (flame). See Table 8 (page 26).
  - If green LED indicator is on, the cad cell sees stray light or the cad cell of controller is defective.
  - If green LED indicator is off, go to step 5.
  - If LED indicator is flashing (red or green light on Beckett 7505 control), refer to step 1 below (Reset primary control).
5. Jumper **T** to **T** terminals on primary control.
  - If burner starts, check thermostat or limit wiring connections.
  - If burner does not start, turn off power. Check all wiring connections.
  - If burner does not start, replace primary control.

Burner starts & then locks out on safety with Honeywell R7184 LED indicator flashing ½ second on, ½ second off. For Beckett 7505 control, the red LED will flash.

1. Reset primary control: To reset the control from (soft) lockout, the button needs only to be pressed and released.
  - **R7184 control:** If control is in restricted mode, press and hold the button for 45 seconds - until the LED flashes once.
  - **7505 control:** If control is in restricted mode, press and hold the button in for 15 seconds until the red turns off and the yellow LED turns on.

**NOTE:** Restricted Lockout: If the control locks out three times in a row without a complete heat cycle between attempts, the lockout becomes a restricted (hard) lockout.

2. If the LED indicator stops flashing and the ignition remains off, the primary control could be defective. If line voltage is present at the igniter terminals, and there is no ignition, the igniter is likely defective and needs to be replaced.
3. If the LED stops flashing, burner turns on, but the control locks out again, check the cad cell. See step 5 below. If the cad cell is operational, replace the primary control.
4. If the LED continues to flash at the interval listed above, verify that the control is not in restricted mode. If in restricted mode, reset it. If not in restricted mode, replace the control.
5. If the (LED indicator for R7184 control; green LED for 7505 control) stays off while the flame is on, check the cad cell sighting for view of the flame.
6. If the burner locks out, check the cad cell resistance. See Table 9 (page 26).

7. If the burner stays running, the system is operational.
8. If the (LED indicator for R7184 control; green LED for 7505 control) is off, check the cad cell assembly after disconnecting the line voltage. See Table 9.

Honeywell R7184 Control		
Indicator LED	Status	
On	Cad cell is sensing flame (could be flame or stray light)	
Off	Cad cell is not sensing flame	
Flashing (1/2 sec. on, 1/2 sec. off)	Lockout/Restricted Lockout	
Flashing (2 sec. on, 2 sec. off)	Recycle	
Beckett 7505 Control		
Light color	On Continuously	Flashing
Red	Restricted (Hard) Lockout	Soft Lockout
Green	Cad cell is sensing flame (could be flame or stray light)	Recycle
Yellow	Pump prime mode or reset button currently held for 15+ sec.	N/A

**Table 8. Cad Cell Fault Conditions**

Honeywell R7184	
LED Flashes (Ohms)	Cad Cell Resistance
1	0-400
2	400-800
3	800-1600
4	>1600

**Table 9. Cad Cell Resistance when sensing flame**

Burner will not start and the LED indicator is flashing at 2 seconds on, 2 seconds off for R7184 (or the green LED is flashing for 7505).

- Hold the reset button down for 1 - 2 seconds. If LED indicator continues to flash, wait for 60 - 70 seconds. If it still continues to flash, replace the primary control.
- **Honeywell R7184 control:** To check cad cell resistance, press and release the button during the run mode, with the igniter off. The LED will flash to indicate the cad cell resistance. For proper burner operation, it is important that the cad cell resistance is under 1600 Ohms. See Table 9.
- **Beckett 7505 control:** To check cad cell resistance, unplug the cad cell leads (yellow wires) from the control. Measure the resistance with a meter in the conventional way (when a flame is present). For proper burner operation, it is important that the cad cell resistance is under 1,600 Ohms.

#### Control Module Status Indicator

##### Gas Furnace

- One flash - the inducer centrifugal switch is stuck closed.
- Two flashes - the signal was not received by the control that the inducer centrifugal switch had closed within the time.

- Three flashes - a failed ignition attempt, a gas valve error, or a false flame sensed during the warm up period. A false flame condition occurs when the flame sensor senses a flame without a flame present. If a false flame occurs, the control will only return to normal operation after the false flame condition is no longer present.
- Four flashes - the control senses a failure within the control board.

##### Oil Furnace

The indicator lights on the oil primary control provides lockout, recycle, and cad cell indications. See Table 8.

## COMPONENT FUNCTIONS

### Combustion Blower Centrifugal Switch

The electric motor for the blower which supplies combustion air to the burner is equipped with a centrifugal switch wired in series with the burner controls. This switch is normally open until the speed of the blower motor closes it thereby powering the burner controls. The burner controls will not function until the blower motor is operating at full speed.

### Fan Switch

The FAN ON and OFF switch is located on top of the control box. This switch provides either automatic operation of the blower through the thermostat or continuous blower operation.

### Fan Limit Switch

The fan limit switch closes and turns on the main blower after a period of burner ON time when thermostat calls for heat. The fan limit switch opens after the thermostat is satisfied. The blower operates a period of burner OFF time and turns the blower off.

### Gas Burner Controls

The gas valve lever can be set to ON or OFF, as shown in Figure 14 (page 21). When in the ON position, gas flow through the gas valve is allowed when the valve is energized electrically. When in the OFF position, gas flow is completely shut off.

### Supply Air Limit Switch

The supply air limit switch is the safety device that prevents the furnace from exceeding the maximum allowable outlet temperature.

### Auxiliary Limit

This furnace is equipped with an auxiliary manual reset limit. This limit will trip in the event of a blower motor failure. If the limit trips, reset the limit by firmly pressing the red button in the center of the limit. The limit is located on the left hand side of the blower assembly. If the limit will not reset, continues to trip, or the blower does not function, notify your servicing contractor.

## UNIT MAINTENANCE

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### **WARNING:**

---

**Shut off all electrical power to the unit before performing any maintenance or service on the system. Failure to comply may result in personal injury or death.**

---

**NOTE:** All servicing of this heating appliance other than the normal maintenance described in this section must be done by authorized trained service personnel. Do not attempt any servicing which requires opening of the control panels.

- Proper maintenance is most important to achieve the best performance from the appliance and should be performed frequently at the beginning of each heating season.
- Keep the area surrounding the unit clean. Keep the unit clear of obstructions.

### **Furnace Filter**

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### **WARNING:**

---

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

---

- CMF2 Furnaces are supplied with a single air filter when shipped from the factory. It is recommended that the filter be cleaned or replaced monthly. Newly built or recently renovated homes may require more frequent changing until the construction dust has minimized. replacement filters are available at most local retailers. Inspect filters frequently and replace when necessary with filter of same dimensional size
- Filters designed to remove smaller particles such as pollen, may require additional maintenance.

### **Blower Compartment**

Dirt and lint can create excessive loads on the motor resulting in higher than normal operating temperatures and shortened service life. Vacuum or wipe clean the interior of furnace cabinet. Clean all lint and dust from around the furnace. It is recommended that the blower compartment be cleaned of dirt or lint that may have accumulated in the compartment or on the blower and motor as part of regular maintenance.

### **Combustion Air and Venting System**

Inspect the combustion air and venting system at the beginning and end of the heating system for deterioration, blockage, or damage. Clean the system, if necessary.

FIGURES & TABLES

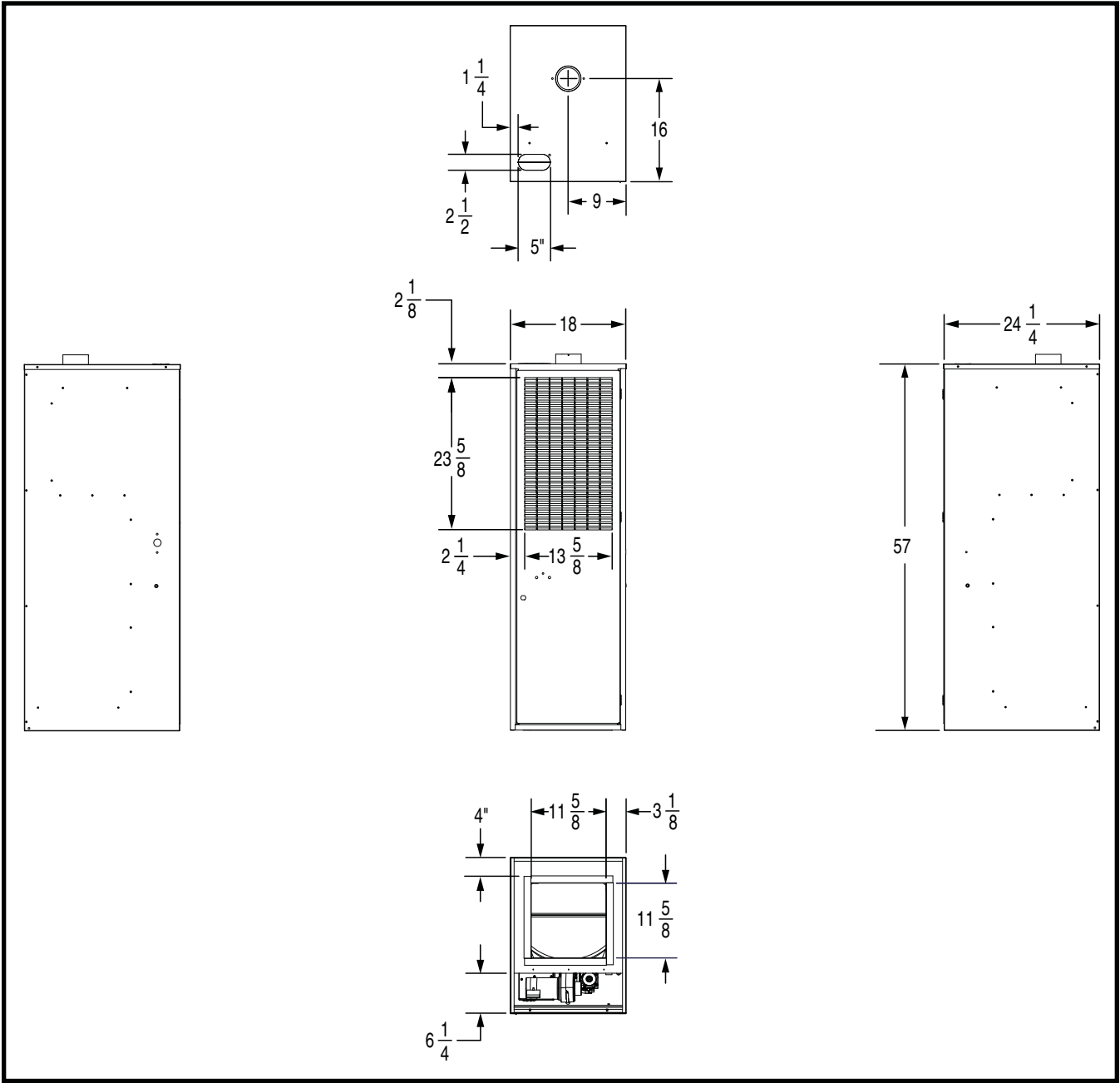


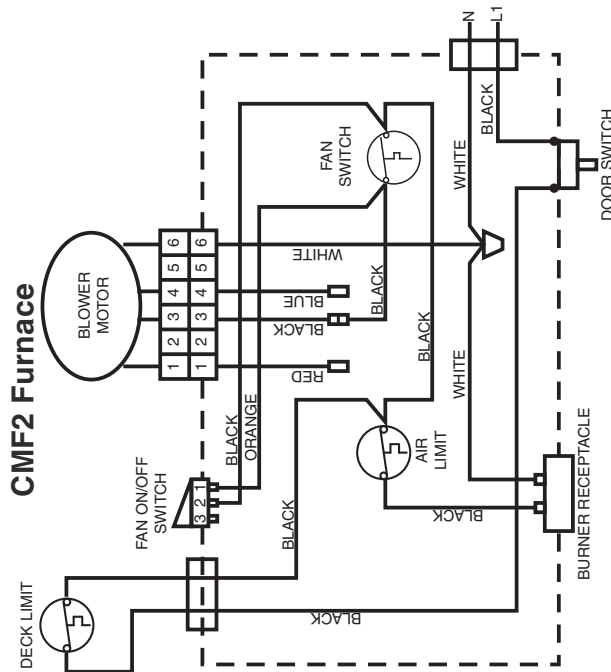
Figure 17. CMF2 Physical Dimensions

# WIRING DIAGRAM

## CMF2 Furnace Series

### NOTES:

1. Incoming power must be polarized. Observe color coding. (See furnace data label for electrical information.)
2. If any of the original wires (as supplied with the appliance) must be replaced, use 105°C Thermoplastic type wire or its equivalent.
3. Use copper conductors only.



Blower speed Setting Shown is the High Speed (see table)

Blower Wire Color	Blower Speed
Red	Low
Blue	Med.
Black	High

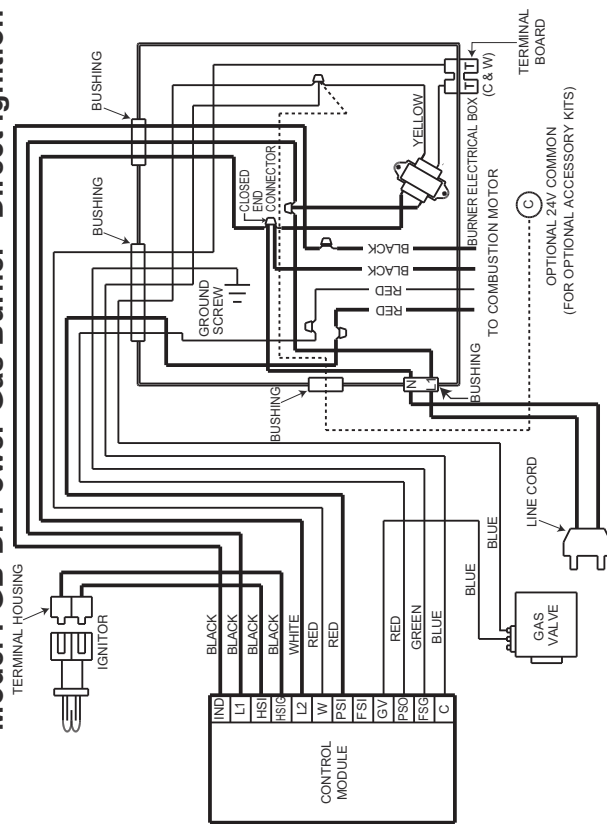
### LEGEND:

---	FIELD WIRING
---	LOW VOLTAGE
---	HIGH VOLTAGE

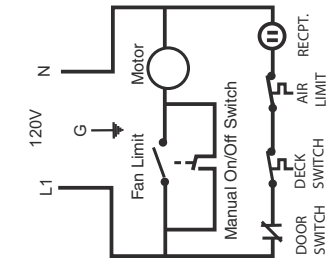
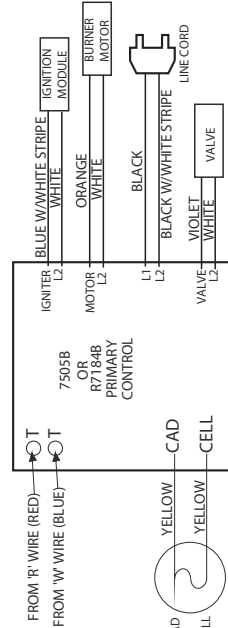
## 120 Volt

## Single Phase / 60 Hz

### Model PGB-DI Power Gas Burner "Direct Ignition"



### OIL GUN BURNER



710972A

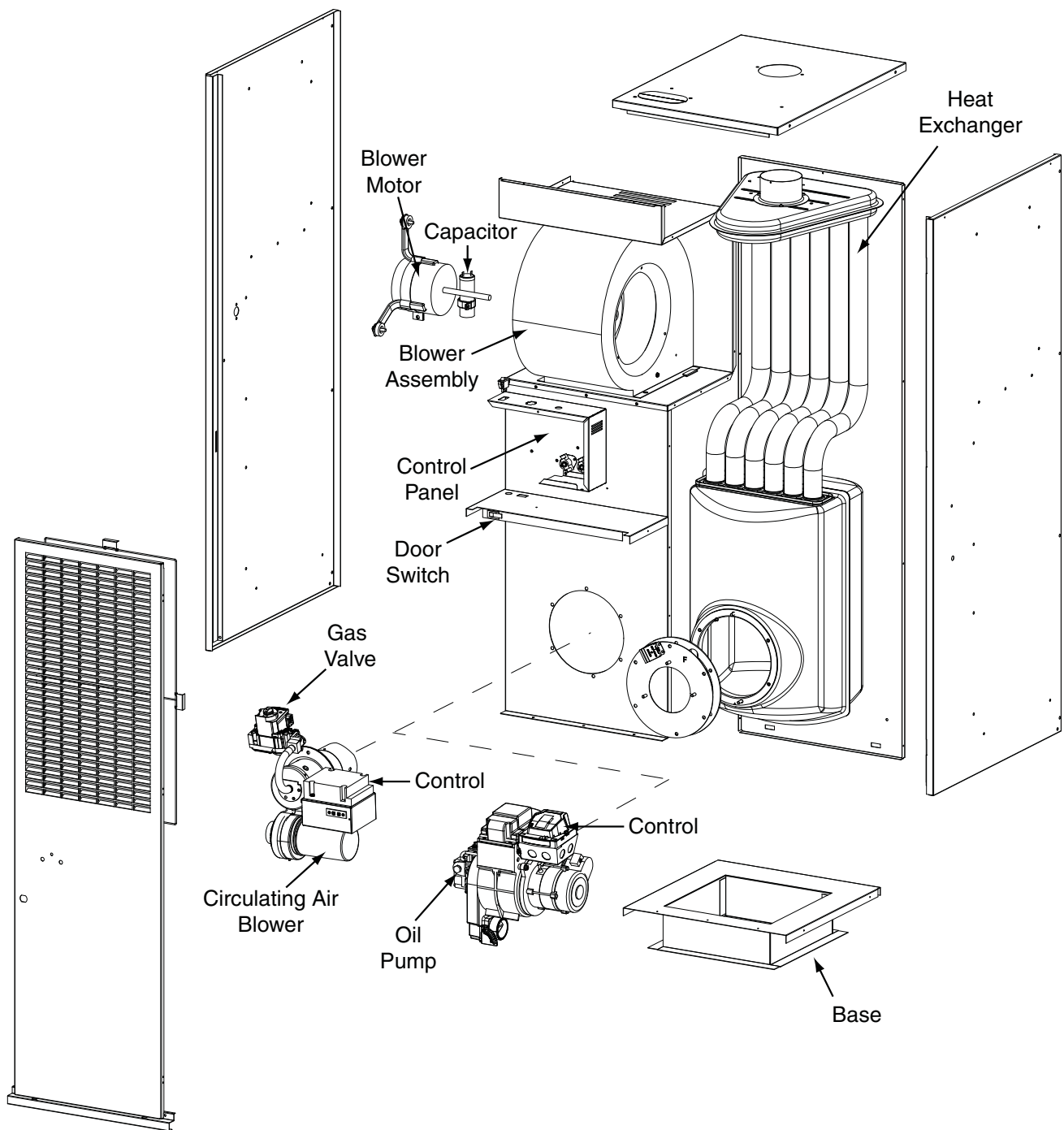
(Replaces 7109720

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Figure 18. Wiring Diagram for CMF2 Gas & Oil Furnaces

## LOCATION OF FURNACE COMPONENTS



**Figure 19. Furnace Components**



## INSTALLATION / PERFORMANCE CHECK LIST

### ATTENTION INSTALLERS:

It is your responsibility to know this product better than your customer. This includes being able to install the product according to strict safety guidelines and instructing the customer on how to operate and maintain the equipment for the life of the product. Safety should always be the deciding factor when installing this product and using common sense plays an important role as well. Pay attention to all safety warnings and any other special notes highlighted in the manual. Improper installation of the furnace or failure to follow safety warnings could result in serious injury, death, or property damage.

These instructions are primarily intended to assist qualified individuals experienced in the proper installation of this appliance. Some local codes require licensed installation/service personnel for this type of equipment. Please read all instructions carefully before starting the installation. Return these instructions to the customer's package for future reference.

### INSTALLER NAME:

CITY:

STATE:

### INSTALLATION ADDRESS:

CITY:

STATE:

UNIT MODEL #

UNIT SERIAL #

Minimum clearances per Table 1 (page 4)?	YES	NO
Is the unit properly installed and leveled?	YES	NO
Does condensate drain properly in both drain tubes?	YES	NO
Has the owner's information been reviewed with the home-owner?	YES	NO
Has the literature package been left near the appliance?	YES	NO

### ELECTRICAL SYSTEM:

Electrical connections tight?	YES	NO
Line voltage polarity correct?	YES	NO
Supply Voltage: _____(V)		
Has the thermostat been calibrated?	YES	NO
Is the thermostat level?	YES	NO
Is the heat anticipator setting correct?	YES	NO

### VENTING SYSTEM:

Is there adequate fresh air supply for ventilation?	YES	NO
Vent free from restrictions?	YES	NO
Filter properly installed?	YES	NO
Filter clean?	YES	NO
Flue connections tight?	YES	NO
Is there proper draft?	YES	NO
Return Air Temp: _____(° F)		
Supply Air Temp: _____(° F)		
Temperature Rise: _____(° F)		



### WARNING:

**PROPOSITION 65 WARNING:** This product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.



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COMPLETE COMFORT. GENUINE VALUE.

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