

# Centennial *Variable Speed* Oil Furnaces

## CHB High Boy

## CLB Low Boy

## (SERIES 2)

**KEEP THESE INSTRUCTIONS  
WITH FURNACE FOR FUTURE  
REFERENCE.**



## Furnace Manual

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### Hazard definitions

#### **⚠ DANGER**

Hazards that **will cause severe** personal injury, death, or substantial property damage.

#### **⚠ CAUTION**

Hazards that **will or can cause minor** personal injury or property damage.

#### **⚠ WARNING**

Hazards that **can cause severe** personal injury, death, or substantial property damage.

#### **NOTICE**

Special instructions on installation, operation or maintenance that are important but not related to personal injury or property damage.

#### **⚠ WARNING**

**INSTALLER** – Read all instructions before installing. **Read page 2 first.** Follow all instructions in proper order to prevent personal injury or death.

- Consider ducting, fuel supply, venting and installation when determining furnace location.
- Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

#### **⚠ WARNING**

Do not store or use gasoline or other flammable liquids or vapors near this furnace or any other appliance.

#### **⚠ CAUTION**

Ventilate house while operating furnace for the first time. Odors may be emitted for a brief period.

#### **⚠ WARNING**

Do not alter this furnace in any way. The manufacturer will not be liable for any damage resulting from changes made in the field to the furnace or its components or from improper installation. Failure to comply could result in severe personal injury, death, or substantial property damage.

**USER** – Please read the following. Failure to comply could result in severe personal injury, death, or substantial property damage.

- **This manual is for the sole use by your qualified heating installer / service technician.**
- Please see the **Owner's information** only, at the end of this manual.
- Have the furnace serviced by a qualified service technician, at least once a year.

#### **⚠ WARNING**

This manual must only be used by a **qualified heating installer / service technician**. Furnace and burner must be installed and serviced only by a qualified heating installer / service technician. Failure to comply could result in severe personal injury, death, or substantial property damage.

#### **NOTICE**

When calling or writing about the furnace – Please indicate furnace model number and serial number from rating label. You may list the serial number and model number in the space provided on the "Installation and service certificate" found on page 21.

## READ THIS FIRST!

### **⚠ WARNING**

Failure to adhere to the guidelines below can result in severe personal injury, death, or substantial property damage.

### **Service and maintenance –**

1. To avoid electric shock, disconnect electrical supply before performing maintenance.
2. To avoid severe burns, allow furnace to cool before performing maintenance.
3. Perform service and maintenance as described in this manual and the burner manual.
4. Do not attempt to make adjustments to the blower or motor while the furnace is in operation. Disconnect power to the furnace and be sure all parts have stopped moving before attempting adjustments or maintenance.
5. The burner must be set up and adjusted using combustion test instruments. Visual examination of the flame alone cannot determine combustion performance.

### **Operation -**

6. Do not use the furnace as a construction heater.
7. Do not operate any furnace if the heat exchanger is damaged, corroded or pitted. Toxic flue products could enter the air stream.
8. Do not jumper, attempt to by-pass or override any limit control.
9. Do not block flow of combustion or ventilation air to furnace. Do not block or obstruct the air openings in the furnace casing.
10. Do not store or use combustible materials, gasoline, or other flammable liquids or vapors in the furnace area.
11. Do not operate the furnace if the furnace area will be exposed to air contaminants as described on page 5.
12. Should overheating occur, do not turn off or disconnect electrical supply to furnace. Instead, shut off the oil supply at a location external to the appliance, if possible.
13. Do not use this furnace if any part of it has been under water. Call a qualified service technician immediately, to inspect the furnace and to replace any part of the furnace, control system or burner that was submerged in water.
14. Do not operate furnace if temperature rise through heat exchanger exceeds 85°F.

15. Inspect, clean, and replace (if necessary) return air filter regularly.
16. Do not obstruct return air grills or supply air outlets.
17. Supply only #2 fuel oil to the burner. Never attempt to use gasoline, a mixture of gasoline and oil, waste fuel, reused or any other substance in the burner of furnace.

### **Installation -**

18. Do not block flow of combustion or ventilation air to furnace. Do not block or obstruct the air openings in the furnace casing.
19. Connect furnace only to a functional vent system in good condition. Place the furnace to allow proper venting, with the shortest possible venting and minimum number of elbows.
20. Always connect and seal a return air duct to the furnace unless the furnace is in a large space, such as an unpartitioned basement. Route the return air duct to an adjacent room if no return air manifold is used.
21. Install furnace maintaining minimum clearances for service and separation from combustible surfaces described in this manual.
22. Install, start-up, service and maintain burner per instructions in this manual and the burner manual.
23. Verify burner is properly inserted through the combustion chamber opening.
24. Furnace must be installed so that burner and control system components are protected from dripping, spraying water or rain during operation or service.
25. If installing an air conditioning evaporator coil, install the coil downstream of, or in parallel with, the furnace to prevent condensation on the furnace heat exchanger. If the coil is in parallel, provide means to prevent flow of chilled air into the furnace, including an interlock to prevent simultaneous operation of heating and air conditioning.

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### **NOTICE**

Apply the following suggestions to prevent unsatisfactory operation of the furnace.

### **Installation –**

1. Be sure to level the furnace, using a spirit level on the front and one side. If the furnace is not level, oil can drip into the combustion chamber after burner cycling and contaminate the heat exchanger and the burner head.
2. Make sure all legs are in contact with the floor to distribute the load and prevent the possibility of undue noise or vibration.
3. Avoid locating return grills in rooms that may contain undesirable odors.
4. Never locate a return air grill closer than approximately 20 feet from the furnace.
5. Locate the furnace near the center of the supply and return duct systems.
6. Always check the size of the ducts on a replacement installation, particularly if adding air conditioning.

## 1 Prepare furnace location

### Pre-installation checklist

#### Verify code compliance

- ☐ Local, state, provincial, and national codes, laws, regulations and ordinances
- ☐ NFPA-31, Installation of Oil-Burning Equipment
- ☐ National Electrical Code
- ☐ All local codes and/or regulations take precedence over the instructions in this manual and should be followed accordingly.

**NOTICE** CHB & CLB furnaces, their burners and controls meet safe lighting and other performance criteria when furnace underwent tests specified in Underwriters Laboratories Standard UL727.

#### Check location and furnace specifications

- ☐ Furnace heating capacity
- ☐ Space is large enough to provide required clearances  
Verify the installation will meet the requirements of this manual:
- ☐ Clearances (Table 1)
- ☐ Combustion/ventilation air openings (Section 1)
- ☐ Supply air duct (Section 3)
- ☐ Return air duct (Section 3)
- ☐ Vent system (Section 4)
- ☐ Fuel oil piping (Section 6 and burner manual)
- ☐ Electrical connection (Section 6)

### Clearances

#### Minimum clearance to combustible materials

1. Install the furnace, ductwork, and vent such that no combustible surface is closer than listed in Table 1.

#### NOTICE

Flue pipe clearances must take precedence over jacket clearances (listed below).

#### Service accessibility clearances

1. Provide no less than the minimum clearances given in Table 1 to ensure the furnace can be properly operated, serviced and maintained.
2. Always apply whichever clearance is **LARGER** – combustible construction or service accessibility.

### Flooring and foundation

#### Flooring

CHB & CLB furnaces are approved for installation on combustible flooring but must never be installed on carpeting.

#### WARNING

Do not install furnace on carpeting even if foundation is used. Fire can result, causing severe personal injury, death, or substantial property damage.

#### Foundation

1. Provide a solid brick or minimum 2-inch-thick concrete foundation pad if any of the following is true:
  - The floor can become flooded.
  - The furnace mounting area is not level.

### Residential garage installations

Take the following special precautions when installing the furnace in a residential garage. If the furnace is in a residential garage:

- Mount the furnace a minimum of 18 inches above the floor of the garage.
- Locate or protect the furnace so a moving vehicle cannot damage it.

**Table 1** Minimum clearances

| Minimum clearances from furnace, duct work and vent                                                                                                                                                                                                                                                                                                                                       |                             |                           |                             |                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------|-----------------------------|---------------------------|
| Service accessibility clearances are recommended minimum dimensions to allow access to furnace components (motor, blower, filters, etc.).                                                                                                                                                                                                                                                 | CHB-105/140 Furnaces        |                           | CLB-105/140 Furnaces        |                           |
|                                                                                                                                                                                                                                                                                                                                                                                           | To combustible construction | For service accessibility | To combustible construction | For service accessibility |
| Top of plenum to ceiling                                                                                                                                                                                                                                                                                                                                                                  | 1"                          | NA                        | 1"                          | NA                        |
| Above warm air duct within 6' of furnace                                                                                                                                                                                                                                                                                                                                                  | 1"                          | NA                        | 1"                          | NA                        |
| Front of furnace                                                                                                                                                                                                                                                                                                                                                                          | 18" (alcove)                | 18"                       | 18" (alcove)                | 18"                       |
| Flue pipe or barometric d.c. to any surface                                                                                                                                                                                                                                                                                                                                               | 9" (note 1)                 | 18"                       | 9" (note 1)                 | 18"                       |
| Rear of furnace                                                                                                                                                                                                                                                                                                                                                                           | 0"                          | NA                        | 0"                          | 18"                       |
| Side of furnace                                                                                                                                                                                                                                                                                                                                                                           | 0"                          | NA                        | 0"                          | NA                        |
| Warm air plenum to wall                                                                                                                                                                                                                                                                                                                                                                   | 1"                          | NA                        | 1"                          | NA                        |
| Combustible floor                                                                                                                                                                                                                                                                                                                                                                         | 0"                          | NA                        | 0"                          | NA                        |
| Note 1: Single wall metal vent (or barometric draft control) can be no closer than 9" to any combustible surface. Apply requirements of NFPA 31 and local codes to reduce clearance using double-wall vent pipe and/or protective insulation between the flue pipe or barometric draft control and combustible surfaces. Minimum clearance when using Type L double-wall vent pipe is 6". |                             |                           |                             |                           |

## 1 Prepare furnace location (continued)

### Air for combustion and ventilation



Adequate combustion and ventilation air ensures proper combustion and reduces risk of severe personal injury or death from possible flue gas leakage and carbon monoxide emissions.



Do not install exhaust fan in furnace room.

### Consider building construction

Older buildings with single-pane windows, minimal weather-stripping and no vapor barrier often provide enough natural infiltration and ventilation without dedicated openings.

New construction or remodeled buildings are most often built tighter. Windows and doors are weather-stripped, vapor barriers are used and openings in walls are caulked. As a result, such tight construction is unlikely to allow proper natural air infiltration and ventilation.

For buildings with tight construction, provide openings directly to outside or to a ventilated crawl space or attic. Size the openings to the same specifications as for the furnace location per the following paragraphs.

Follow state, provincial, or local codes when sizing adequate combustion and ventilation air openings. In absence of codes, use the following guidelines when furnace is in a confined room (defined by NFPA 31 as less than 7200 cubic feet per 1 GPH input of all appliances in area. A room 8 ft. high x 30.0 ft. x 30.0 ft. is 7200 cu. ft.).

### Provide two permanent openings

#### Opening locations

One within 12 inches of ceiling, one within 12 inches of floor. Minimum height or width dimension of each rectangular opening should be at least 3 inches.

#### When inside air is used

Each opening must freely connect with areas having adequate infiltration from outside. Each opening should be at least 140 sq. in. per 1 GPH input (1 sq. in. per 1000 BTU input) of all fuel-burning appliances plus requirements for any equipment that can pull air from room (including clothes dryer and fireplace).

#### When outside air is used

Connect each opening directly, by way of ducts to the outdoors, or to crawl or attic space that freely connects with outdoors. Size per below:

- Through outside wall or vertical ducts – at least 35 sq. in. per 1 GPH input (1 sq. in. per 4000 BTU input) of all fuel burning appliances plus requirements for any equipment that can pull air from room (including clothes dryer and fireplace).
- Through horizontal ducts – at least 70 sq. in. per 1 GPH furnace input (1 sq. in. per 2000 BTU input) of all fuel-burning appliances plus requirements for any equipment that can pull air from room (including clothes dryer and fireplace).
- Where ducts are used, they should have the same cross-sectional area as free area of openings to which they connect. Compensate for louver, grille or screen blockage when calculating free air openings. Refer to the manufacturers' instructions for details. If unknown, use:
  - Wood louvers which provide 20-25% free air
  - Metal louvers or grilles, which provide 60-75% free air

Lock louvers in open position or interlock with equipment to prove open before furnace operation.

### Basement installations

When the furnace is in an unconfined space, such as an unpartitioned basement, adequate air should normally be available without additional openings. An unconfined space is defined as one having no less than 50 cubic feet room volume per 1,000 BTU/h input of all appliances in the space.

If the house is of tight construction, provide air openings to the basement directly from outside or from a ventilated attic. Size the openings as described above under "When outside air is used".

### Closet installations – special NOTICE

#### Openings in closet doors

Provide TWO openings – one within 6 inches of top of closet door, the other within 6 inches of the bottom of closet door.

EACH opening must be at least 24 inches wide by 12 inches high.



Advise homeowner that the openings to the closet must never be obstructed or blocked in any way. Failure to provide adequate air for combustion and ventilation could result in severe personal injury, death, or substantial property damage.

## 1 Prepare furnace location (continued)

### Air contamination

Please review the following information on potential combustion air contamination problems.

See Table 2 for products and areas that may cause contaminated combustion air.



To prevent the potential of severe personal injury or death, check for products or areas listed below before installing furnace. If any of these contaminants are found:

- Remove contaminants permanently.

**-OR-**

- Isolate furnace and provide outside combustion air. See national, provincial, or local codes for further information.

**Table 2** Corrosive contaminants and likely locations

| Products to avoid                                                                          |
|--------------------------------------------------------------------------------------------|
| Spray cans containing chloro/fluorocarbons                                                 |
| Permanent wave solutions                                                                   |
| Chlorinated waxes/cleaners                                                                 |
| Chlorine-based swimming pool chemicals                                                     |
| Calcium chloride used for thawing                                                          |
| Sodium chloride used for water softening                                                   |
| Refrigerant leaks                                                                          |
| Paint varnish removers                                                                     |
| Hydrochloric acid/muriatic acid                                                            |
| Cements and glues                                                                          |
| Antistatic fabric softeners used in clothes dryers                                         |
| Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms |
| Adhesives used to fasten building products and other similar products                      |
| Areas likely to have contaminants                                                          |
| Dry cleaning/laundry areas and establishments                                              |
| Swimming pools                                                                             |
| Metal fabrication plants                                                                   |
| Beauty shops                                                                               |
| Refrigeration repair shops                                                                 |
| Photo processing plants                                                                    |
| Auto body shops                                                                            |
| Plastic manufacturing plants                                                               |
| Furniture refinishing areas and establishments                                             |
| New building construction                                                                  |
| Remodeling areas                                                                           |
| Garages with workshops                                                                     |

## 2 Prepare furnace and place in position

### Inspect & prepare furnace

#### Remove furnace from carton

Remove the furnace from its shipping carton and inspect thoroughly. Remove access panels to inspect the furnace interior.

**NOTICE**

Immediately file a claim with the transportation company if you discover concealed damage.

**WARNING**

Do not install or attempt to operate the furnace if the heat exchanger, burner, or controls have been damaged. Immediately contact your furnace supplier. Operating a damaged furnace could result in severe personal injury, death, or substantial property damage.

#### Prepare furnace (CHB models)

CHB furnaces require cutting the return air opening into one side of the furnace. Carefully cut the opening on the correct side of the furnace, using the four knockouts on the side as guides.

#### Prepare burner

Remove the burner from its shipping carton and inspect thoroughly. Read the burner manual and follow instructions for preparing and installing the burner.

Install the correct nozzle for the required firing rate, using the burner manual and the information in Section 14 of this manual. Follow the burner manual instructions for nozzle installation. Verify the correct setting of electrodes after the nozzle and burner oil tube assembly are in place.

### Openings in walls, floor & ceiling

#### General

Ensure that the finished door opening to the furnace room is large enough to install and remove the furnace, water heater or any other appliances in the room.

Before placing furnace in a closet or small room, cut all openings required in floor, ceiling or walls for ducts and vent. This will simplify the work and prevent construction dust from entering the furnace heat exchanger.

**WARNING**

Verify that all clearances to combustible construction and for service accessibility will be met. The vent must be no closer than 18 inches to any combustible surface, unless a type "L" double-wall vent pipe is used, or the vent is constructed per NFPA 31 requirements. Provide a ventilated thimble per all applicable codes where the vent pipe passes through a wall or ceiling. Failure to comply could result in severe personal injury, death, or substantial property damage.

#### Duct locations and sizing

Verify that the size of the supply and return duct system is sufficient for the application. The pressure drop through the duct system must not exceed 0.25" water column.

The total drop through the duct system and air conditioning evaporator coil (if used) must not exceed 0.5" water column.

See suggested duct sizing in this manual. For more detailed sizing information refer to ACCA Manual D.

### Return air duct

You must install a return air duct, sealed to the furnace, even if no return manifold is used. The only exception is when the furnace is installed in a large unpartitioned room, such as a basement. (A room whose volume is at least 50 cubic feet per 1,000 BTU/h input of all appliances in the room is considered large). For large rooms, return air may be taken directly at the furnace, without a return air duct. No return air register should be within 20 feet of the furnace.

Cut the required opening for the return air duct in the wall (or floor or ceiling) of the room before placing the furnace.

### Install filter

Install return air filter of the size listed in Section 14.

You will need to install a filter rack provided with the furnace for Models CHB only.

**NOTICE**

Verify that the filter will be easily accessible for removal after the furnace is in place.

### Install furnace and burner

#### Place furnace

Place the furnace in the desired location. Measure clearances and verify per table 1 of this manual.

Using a spirit level on the front and one side of the furnace, level it, using the 4 or 6 leveling legs. Make sure each of the legs is firmly in contact with the floor.

#### Inspect combustion chamber

Inspect the combustion chamber. Verify that it is in good condition and correctly positioned inside the heat exchanger. The burner opening in the chamber must align with the burner heat exchanger opening.

**WARNING**

The combustion chamber is constructed of ceramic fiber materials. See the WARNING information of this manual. Comply with these instructions when handling any ceramic fiber or fiberglass materials. Failure to adhere to these guidelines could result in severe personal injury or death.

#### Insert burner

Following the burner manual instructions, install the burner and its gasket in the burner opening. Make sure the burner passes through the opening in the combustion chamber and does not be recessed for more than 1/4 inch from the inside wall of the chamber.

Secure the burner in place with the three nuts and washers provided. Wire and pipe fuel to the burner, as per the burner manual and this manual.

## Blocked Vent Shut-Off (BVSO) for chimney venting (OPTIONAL)

**CAUTION** It is imperative that this device be installed by a qualified agency.

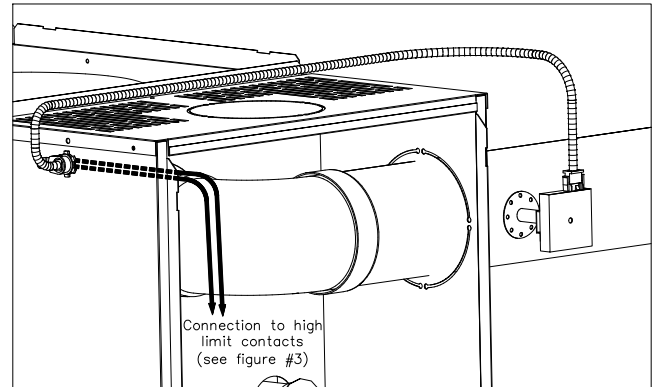
This device is designed to detect the insufficient evacuation of combustion gases in the event of a vent blockage. In such a case the thermal switch will shut down the oil burner. The device will then need to be re-armed MANUALLY.

In the event that the BVSO repetitively shuts down the oil burner, a qualified technician needs to evaluate the cause of this shut down.

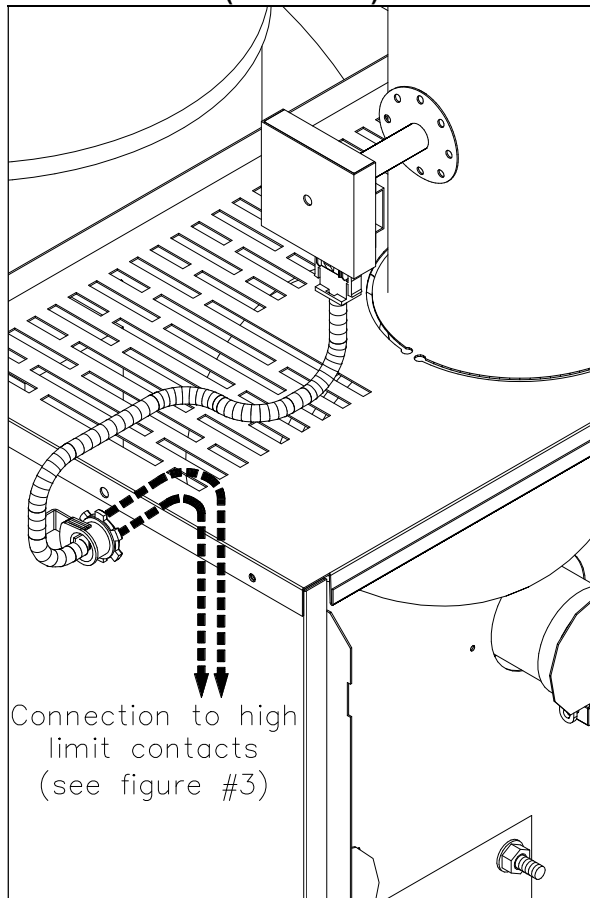
Refer to the figures 3 to 5, Wiring Diagrams and detailed instructions supplied with the BVSO for the installation and wiring procedures.

It is also essential the the BVSO be maintained annually. For more details refer to the instructions supplied with the device itself, as well as the Maintenance Section.

**Figure 2**  
Blocked Vent Shut-Off device mounting  
Installation: Up flow with Horizontal exhaust  
(Optional)



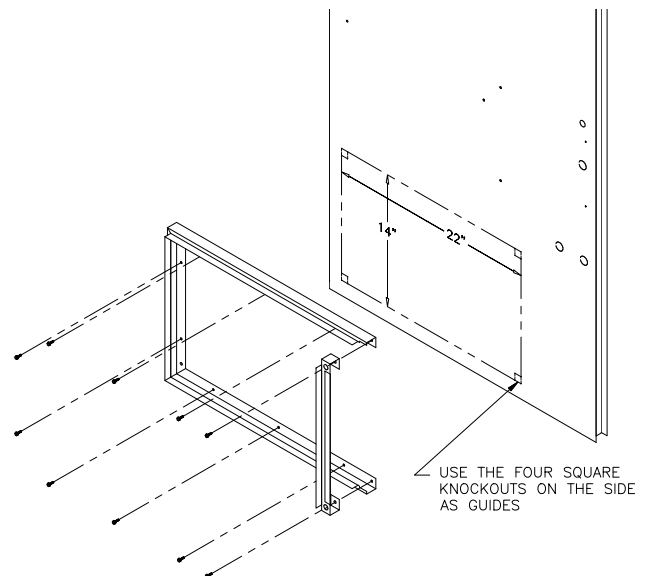
**Figure 1**  
Blocked Vent Shut-Off device mounting  
Installation: Up flow with Vertical exhaust  
(OPTIONAL)



## 3 Connect supply and return ducts

### CHB Filter rack support installation

- Use the ten screws included with the filter rack inside the furnace. Make sure that the rack support installation is in accordance with the following figure



## 3 Connect supply and return ducts (continued)

### Duct sizing

#### Determine airflow CFM

The temperature rise through the furnace must not exceed 85°F but should be at least 55°F for comfort. When calculating airflow, assume a temperature rise of 70°F.

The noticeable temperature change for cooling would be approximately 27-30°F. Actual temperature change will be approximately 18-21°F due to humidity of the air.

To calculate noticeable heat temperature change ( $\Delta T$ ), you can use the formula:

$$\Delta T = \text{BTU/h} / (1.1 \times \text{CFM}) \quad \text{Eq. 3-1}$$

To calculate air flow when you know temperature change ( $\Delta T$ ), you can use:

$$\text{CFM} = \text{BTU/h} / (1.1 \times \Delta T) \quad \text{Eq. 3-2}$$

You can estimate air flow using the following rules of thumb:

- Heating: **14 CFM per 1,000 BTU/h output** Eq. 3-3  
Cooling: **400 CFM per ton air conditioning** Eq. 3-4

Determine the required airflow based on whichever is larger: heating mode or air conditioning mode.

Examples:

- What would the temperature rise be for a 100,000 BTU/h output furnace with an airflow rate of 1200 CFM?

Use Equation 3-1 since you know CFM and BTU/h:

$$\Delta T = 100,000 / (1.1 \times 1200) = 76^\circ\text{F}$$

- The temperature rise would be 76°F.
- If the air enters the furnace at 70°F, it will leave the furnace at 70°F + 76°F = 146°F.

- What would the airflow be to obtain a 70°F rise through a 120,000 BTU/h output furnace?

Use equation 3-2 since you know  $\Delta T$  and BTU/h:

$$\text{CFM} = 120,000 / (1.1 \times 70) = 1,558 \text{ CFM}$$

- The air flow would have to be 1,558 CFM to obtain a temperature rise of 70°F.

- Estimate the required airflow for a 75,000 BTU/h output furnace installed with a 2-ton air conditioning evaporator coil.

Heating mode air flow (use Equation 3-3):

$$\text{CFM} = 75 \times 14 = 1,050 \text{ CFM}$$

Cooling mode air flow (use Equation 3-4):

$$\text{CFM} = 2 \times 400 = 800 \text{ CFM}$$

- The larger number is 1,050 CFM (heating), so the duct system should be sized for 1,050 CFM.
- The supply duct would need to be 16" round or a rectangular equivalent such as 8" x 25" or 12" x 18", using Table 4.

- Estimate the required airflow for the same furnace installed with a 4-ton air conditioning evaporator coil.

Heating mode airflow is still 1,050 CFM.

Cooling mode air flow (use Equation 3-4):

$$\text{CFM} = 4 \times 400 = 1,600 \text{ CFM}$$

- The larger number is 1,600 CFM (cooling), so the duct system should be sized for 1,600 CFM.
- The supply duct would need to be 18" round or a rectangular equivalent such as 8" x 36" or 12" x 23", using Table 4.

#### CAUTION

Always check the size of existing ducts, particularly if you are adding air conditioning. The air pressure loss through the cooling evaporator coil reduces available airflow. If the ducts are too small as well, the system may not work satisfactorily on either heating or cooling.

### Determine duct dimensions

Table 4 and Table 5 provide typical round and rectangular duct sizes for rectangular and flat oval galvanized ducts. Do not apply these tables to size ductwork if the total equivalent length of the duct exceeds approximately 100 feet. For longer systems or for duct board, fiberglass-lined or flexible duct sizing, use the ACCA Manual D or the ACCA duct sizing slide rule. These tables are based on pressure loss of approximately 0.10" water column per 100 feet equivalent length of duct.

Use Table 3 below to size or check sizing of take-offs to supply registers or return grills.

Verify the size and type of registers, diffusers, and grills from the manufacturer's ratings. Do not exceed the recommended flow rate. The pressure drop allowance for each should not exceed approximately 0.05" water column.

Install a return air filter, sized per specifications in Section 14.

Use only a return air filter mounted to the furnace. Do not add additional filters unless the duct system is carefully sized to allow for the additional pressure drop.

**Table 3** Suggested maximum flow to runouts

| TAKE-OFF SIZE<br>(Inches)                    | CFM    |        |
|----------------------------------------------|--------|--------|
|                                              | SUPPLY | RETURN |
| <b>Sheet metal or ductboard</b>              |        |        |
| 5 Round                                      | 60     | 45     |
| 6 Round                                      | 100    | 75     |
| 7 Round                                      | 140    | 110    |
| 8 Round                                      | 210    | 160    |
| 3 ¼ x 8 Stack                                | 70     | 55     |
| 3 ¼ x 10 Stack                               | 100    | 75     |
| 3 ¼ x 14 Stack                               | 140    | 110    |
| 2 ¼ x 12 Stack                               | 70     | 55     |
| 2 ¼ x 14 Stack                               | 90     | 70     |
| <b>Flexible duct (keep bends to minimum)</b> |        |        |
| 6 Round                                      | 55     | 40     |
| 8 Round                                      | 120    | 90     |
| 10 Round                                     | 200    | 160    |
| 12 Round                                     | 320    | 250    |
| 14 Round                                     | 480    | 375    |
| 16 Round                                     | 660    | 530    |
| 18 Round                                     | 880    | 680    |
| 20 Round                                     | 1200   | 900    |

### 3 Connect supply and return ducts (continued)

#### Duct sizing (continued)

**Table 4** Typical duct sizing for systems not over 100 feet equivalent length – round or rectangular galvanized

| Typical duct sizing                                                                               |                              |                                                       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---------------------------------------------------------------------------------------------------|------------------------------|-------------------------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| (For approximately 0.10 inch w.c. in a typical residential installation of galvanized metal duct) |                              |                                                       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| CFM                                                                                               | Round duct diameter (inches) | Rectangular duct equivalent sizes                     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|                                                                                                   |                              | Minimum width (inches) for duct heights (inches) of : |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|                                                                                                   |                              | 4                                                     | 5  | 6  | 7  | 8  | 9  | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
|                                                                                                   |                              | x                                                     | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  |
| 45                                                                                                | 4                            | 4                                                     | 4  | 4  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 65                                                                                                | 5                            | 6                                                     | 5  | 4  | 4  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 100                                                                                               | 6                            | 8                                                     | 6  | 5  | 5  | 4  | 4  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |
| 150                                                                                               | 7                            | 12                                                    | 9  | 7  | 6  | 5  | 5  | 5  | 4  | 4  | -  | -  | -  | -  | -  | -  | -  | -  |
| 200                                                                                               | 8                            | 14                                                    | 11 | 9  | 8  | 7  | 6  | 6  | 5  | 4  | 4  | -  | -  | -  | -  | -  | -  | -  |
| 250                                                                                               | 9                            | 18                                                    | 13 | 10 | 9  | 8  | 7  | 6  | 6  | 5  | 5  | 4  | 4  | -  | -  | -  | -  | -  |
| 300                                                                                               | 9                            | 20                                                    | 15 | 12 | 10 | 9  | 8  | 7  | 6  | 6  | 5  | 5  | 4  | 4  | -  | -  | -  | -  |
| 400                                                                                               | 10                           | 26                                                    | 19 | 15 | 13 | 11 | 10 | 9  | 8  | 7  | 6  | 6  | 5  | 5  | 5  | 4  | 4  | -  |
| 500                                                                                               | 12                           | 32                                                    | 23 | 18 | 15 | 13 | 12 | 11 | 9  | 8  | 7  | 6  | 6  | 6  | 5  | 5  | 5  | 5  |
| 600                                                                                               | 12                           | 38                                                    | 28 | 22 | 18 | 15 | 13 | 12 | 10 | 9  | 8  | 7  | 7  | 6  | 6  | 6  | 5  | 5  |
| 700                                                                                               | 12                           | 46                                                    | 32 | 25 | 20 | 17 | 15 | 14 | 11 | 10 | 9  | 8  | 7  | 7  | 7  | 6  | 6  | 6  |
| 800                                                                                               | 14                           | 52                                                    | 36 | 28 | 23 | 19 | 17 | 15 | 13 | 11 | 10 | 9  | 8  | 8  | 7  | 7  | 6  | 6  |
| 900                                                                                               | 14                           | 58                                                    | 41 | 31 | 25 | 21 | 19 | 17 | 14 | 12 | 11 | 10 | 9  | 8  | 8  | 7  | 7  | 7  |
| 1000                                                                                              | 16                           | 64                                                    | 45 | 34 | 28 | 23 | 20 | 18 | 15 | 13 | 11 | 10 | 9  | 9  | 8  | 8  | 7  | 7  |
| 1100                                                                                              | 16                           | 72                                                    | 49 | 38 | 30 | 25 | 22 | 19 | 16 | 14 | 12 | 11 | 10 | 9  | 9  | 8  | 8  | 7  |
| 1200                                                                                              | 16                           | -                                                     | 54 | 41 | 33 | 27 | 24 | 21 | 17 | 15 | 13 | 12 | 11 | 10 | 9  | 9  | 8  | 8  |
| 1300                                                                                              | 16                           | -                                                     | 58 | 44 | 35 | 29 | 25 | 22 | 18 | 16 | 14 | 12 | 11 | 10 | 10 | 9  | 9  | 8  |
| 1400                                                                                              | 18                           | -                                                     | 63 | 47 | 38 | 31 | 27 | 24 | 19 | 16 | 14 | 13 | 12 | 11 | 10 | 10 | 9  | 9  |
| 1500                                                                                              | 18                           | -                                                     | 68 | 51 | 40 | 34 | 29 | 25 | 20 | 17 | 15 | 14 | 12 | 12 | 11 | 10 | 10 | 9  |
| 1600                                                                                              | 18                           | -                                                     | 72 | 54 | 43 | 36 | 30 | 27 | 21 | 18 | 16 | 14 | 13 | 12 | 11 | 11 | 10 | 9  |
| 1700                                                                                              | 18                           | -                                                     | -  | 58 | 45 | 38 | 32 | 28 | 23 | 19 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 10 |
| 1800                                                                                              | 18                           | -                                                     | -  | 61 | 48 | 40 | 34 | 29 | 24 | 20 | 17 | 16 | 14 | 13 | 12 | 11 | 11 | 10 |
| 1900                                                                                              | 20                           | -                                                     | -  | 64 | 51 | 42 | 35 | 31 | 25 | 21 | 18 | 16 | 15 | 14 | 13 | 12 | 11 | 11 |
| 2000                                                                                              | 20                           | -                                                     | -  | 68 | 53 | 44 | 37 | 32 | 26 | 22 | 19 | 17 | 15 | 14 | 13 | 12 | 12 | 11 |
| 2200                                                                                              | 20                           | -                                                     | -  | -  | 59 | 48 | 41 | 35 | 28 | 23 | 20 | 18 | 16 | 15 | 14 | 13 | 12 | 12 |
| 2400                                                                                              | 22                           | -                                                     | -  | -  | 64 | 52 | 44 | 38 | 30 | 25 | 22 | 19 | 17 | 16 | 15 | 14 | 13 | 12 |
| 2600                                                                                              | 22                           | -                                                     | -  | -  | 69 | 56 | 47 | 41 | 32 | 27 | 23 | 21 | 19 | 17 | 16 | 15 | 14 | 13 |
| 2800                                                                                              | 22                           | -                                                     | -  | -  | -  | 61 | 51 | 44 | 34 | 29 | 25 | 22 | 20 | 18 | 17 | 15 | 15 | 14 |
| 3000                                                                                              | 22                           | -                                                     | -  | -  | -  | 65 | 54 | 47 | 37 | 30 | 26 | 23 | 21 | 19 | 17 | 16 | 15 | 14 |
| 3500                                                                                              | 24                           | -                                                     | -  | -  | -  | -  | 63 | 54 | 42 | 34 | 29 | 26 | 23 | 21 | 19 | 18 | 17 | 16 |
| 4000                                                                                              | 26                           | -                                                     | -  | -  | -  | -  | 72 | 61 | 47 | 39 | 33 | 29 | 26 | 23 | 21 | 20 | 19 | 18 |



Do not apply this table for duct systems over approximately 100 equivalent feet length. For longer systems or systems using other duct materials, refer to ACCA Manual D. Incorrectly sizing duct systems can result in unsafe or uncomfortable operation.

### 3 Connect supply and return ducts (continued)

#### Duct sizing (continued)

**Table 5** Typical duct sizing for systems not over 100 feet equivalent length – round or flat oval galvanized

| Typical duct sizing                                                                               |                              |                                                       |        |        |        |        |        |        |         |         |         |         |         |         |
|---------------------------------------------------------------------------------------------------|------------------------------|-------------------------------------------------------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| (For approximately 0.10 inch w.c. in a typical residential installation of galvanized metal duct) |                              |                                                       |        |        |        |        |        |        |         |         |         |         |         |         |
| CFM                                                                                               | Round duct diameter (inches) | Flat oval duct equivalent sizes                       |        |        |        |        |        |        |         |         |         |         |         |         |
|                                                                                                   |                              | Minimum width (inches) for duct heights (inches) of : |        |        |        |        |        |        |         |         |         |         |         |         |
|                                                                                                   |                              | 3<br>x                                                | 4<br>x | 5<br>x | 6<br>x | 7<br>x | 8<br>x | 9<br>x | 10<br>x | 12<br>x | 14<br>x | 16<br>x | 18<br>x | 20<br>x |
| 45                                                                                                | 4                            | 6                                                     | 5      | -      | -      | -      | -      | -      | -       | -       | -       | -       | -       | -       |
| 65                                                                                                | 5                            | 8                                                     | 6      | -      | -      | -      | -      | -      | -       | -       | -       | -       | -       | -       |
| 100                                                                                               | 6                            | 11                                                    | 8      | 7      | -      | -      | -      | -      | -       | -       | -       | -       | -       | -       |
| 150                                                                                               | 7                            | 16                                                    | 11     | 9      | 8      | -      | -      | -      | -       | -       | -       | -       | -       | -       |
| 200                                                                                               | 8                            | 21                                                    | 15     | 11     | 10     | 8      | -      | -      | -       | -       | -       | -       | -       | -       |
| 250                                                                                               | 9                            | 26                                                    | 18     | 14     | 11     | 10     | 9      | -      | -       | -       | -       | -       | -       | -       |
| 300                                                                                               | 9                            | 30                                                    | 20     | 16     | 13     | 11     | 10     | -      | -       | -       | -       | -       | -       | -       |
| 400                                                                                               | 10                           | 40                                                    | 26     | 20     | 16     | 14     | 12     | 11     | -       | -       | -       | -       | -       | -       |
| 500                                                                                               | 12                           | 49                                                    | 32     | 24     | 19     | 16     | 14     | 13     | 12      | -       | -       | -       | -       | -       |
| 600                                                                                               | 12                           | 59                                                    | 38     | 28     | 22     | 19     | 16     | 15     | 13      | -       | -       | -       | -       | -       |
| 700                                                                                               | 12                           | 69                                                    | 44     | 32     | 25     | 21     | 18     | 16     | 15      | 13      | -       | -       | -       | -       |
| 800                                                                                               | 14                           | -                                                     | 50     | 36     | 29     | 24     | 20     | 18     | 16      | 14      | -       | -       | -       | -       |
| 900                                                                                               | 14                           | -                                                     | 56     | 41     | 32     | 26     | 22     | 20     | 18      | 15      | -       | -       | -       | -       |
| 1000                                                                                              | 16                           | -                                                     | 63     | 45     | 35     | 29     | 24     | 22     | 19      | 17      | 15      | -       | -       | -       |
| 1100                                                                                              | 16                           | -                                                     | 69     | 49     | 38     | 31     | 26     | 23     | 21      | 18      | 16      | -       | -       | -       |
| 1200                                                                                              | 16                           | -                                                     | 75     | 53     | 41     | 33     | 28     | 25     | 22      | 19      | 17      | -       | -       | -       |
| 1300                                                                                              | 16                           | -                                                     | -      | 58     | 44     | 36     | 30     | 26     | 24      | 20      | 18      | -       | -       | -       |
| 1400                                                                                              | 18                           | -                                                     | -      | 62     | 47     | 38     | 32     | 28     | 25      | 21      | 18      | 17      | -       | -       |
| 1500                                                                                              | 18                           | -                                                     | -      | 66     | 50     | 41     | 34     | 30     | 26      | 22      | 19      | 18      | -       | -       |
| 1600                                                                                              | 18                           | -                                                     | -      | 71     | 54     | 43     | 36     | 31     | 28      | 23      | 20      | 18      | -       | -       |
| 1700                                                                                              | 18                           | -                                                     | -      | -      | 57     | 46     | 38     | 33     | 29      | 24      | 21      | 19      | -       | -       |
| 1800                                                                                              | 18                           | -                                                     | -      | -      | 60     | 48     | 40     | 35     | 31      | 25      | 22      | 20      | -       | -       |
| 1900                                                                                              | 20                           | -                                                     | -      | -      | 63     | 50     | 42     | 36     | 32      | 26      | 23      | 21      | 19      | -       |
| 2000                                                                                              | 20                           | -                                                     | -      | -      | 67     | 53     | 44     | 38     | 33      | 27      | 24      | 21      | 20      | -       |
| 2200                                                                                              | 20                           | -                                                     | -      | -      | 73     | 58     | 48     | 41     | 36      | 29      | 25      | 23      | 21      | -       |
| 2400                                                                                              | 22                           | -                                                     | -      | -      | -      | 63     | 52     | 44     | 39      | 32      | 27      | 24      | 22      | 21      |
| 2600                                                                                              | 22                           | -                                                     | -      | -      | -      | 68     | 56     | 48     | 42      | 34      | 29      | 25      | 23      | 22      |
| 2800                                                                                              | 22                           | -                                                     | -      | -      | -      | -      | 60     | 51     | 44      | 36      | 30      | 27      | 24      | 23      |
| 3000                                                                                              | 22                           | -                                                     | -      | -      | -      | -      | 64     | 54     | 47      | 38      | 32      | 28      | 26      | 24      |
| 3500                                                                                              | 24                           | -                                                     | -      | -      | -      | -      | -      | 63     | 54      | 43      | 36      | 32      | 28      | 26      |
| 4000                                                                                              | 26                           | -                                                     | -      | -      | -      | -      | -      | 71     | 61      | 48      | 40      | 35      | 31      | 29      |

#### **⚠ WARNING**

Do not apply this table for duct systems over approximately 100 equivalent feet length. For longer systems or systems using other duct materials, refer to ACCA Manual D. Incorrectly sizing duct systems can result in unsafe or uncomfortable operation.

## 4 Venting

### General venting requirements

#### **⚠ WARNING**

Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

#### **⚠ DANGER**

Inspect existing chimney before installing furnace. Clean chimney thoroughly. Replace or repair chimney if visual inspection indicates chimney may be unsuitable for use. Insufficient draft can cause flue gas leakage and carbon monoxide emissions. Failure to clean or replace perforated pipe or tile lining and/or patch mortar and joints can cause severe personal injury or death.

- CHB & CLB furnaces are designed to operate with an over-fire draft of -0.01" to -0.02" w.c. Proper draft for these oil furnaces may be achieved using either a conventional chimney (natural draft) or a power vent (sidewall) system that has been properly designed for use with oil-fired equipment. Power vent manufacturer's instructions must be followed.
- Use vent material approved by local codes for oil-fired burners. In their absence, refer to:
  - NFPA 31, Installation of Oil-Burning Equipment.
  - NFPA211, Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.
  - In Canada, refer to CSA B139, Installation Code for Oil-Burning Equipment.
  - NFPA-211 requires chimney to be lined before being connected to furnace.
- To prevent downdrafts, extend chimney at least 3 feet above highest point where it passes through roof and 2 feet higher than any portion of building within 10 feet. Increase chimney cross-sectional area and height at least 4% per 1,000 feet above sea level.
- Provide minimum clearances from vent (flue) pipe to combustible material:
  - Single-wall vent – 18 inches minimum
  - Type "L" double-wall vent – 6 inches minimum
- Provide a chimney no smaller than that listed in Table 6.

#### **NOTICE**

Oversized chimneys, outside masonry chimneys and/or derated inputs can result in condensation in chimney. Relining an outside masonry chimney may be needed to avoid condensation, downdrafts, and damage to masonry surfaces.

### Connect venting

#### **⚠ WARNING**

Long horizontal vent runs, excessive number of tees and elbows, or other obstructions restricting combustion gas flow can result in the possibility of condensation, flue gas leakage and carbon monoxide emissions, which can lead to severe personal injury or death.

1. The horizontal vent must slope upwards, away from the furnace, a minimum of ¼ inch per foot.
2. Connect full-sized venting when possible. See Table 6.
3. Connection must be made above bottom of chimney to avoid blockage. Vent pipe must not enter chimney far enough to cause obstruction. Use thimble or slip joint where vent pipe enters chimney to allow removal for cleaning.

### Connect venting (continued)

4. When burner and furnace are properly installed, draft overfire will be approximately -0.01" to -0.02" w.c. Install barometric control in vent, per control manufacturer's instructions, when excess draft needs to be relieved or to comply with applicable codes and regulations. Use draft gauge to adjust proper opening.
5. An induced draft fan for the chimney may be necessary if:
  - Excessive resistance to flow of combustion gases can be expected.
  - Cross-sectional area of chimney is smaller than minimum recommended.
  - Chimney height is less than recommended.
  - When using induced draft fan, seal all vent joints and interlock burner with fan operation.

**Table 6** Minimum chimney / vent size

| Furnace model number | Minimum vent diameter | Minimum chimney size                       |       | Minimum chimney height |
|----------------------|-----------------------|--------------------------------------------|-------|------------------------|
|                      |                       | Rectangular<br>(minimum inside dimensions) | Round |                        |
| CHB/CLB-105          | 6"                    | 6" x 6"                                    | 6"    | 15'                    |
| CHB/CLB-140          | 7"                    | 6" x 6"                                    | 6"    | 15'                    |

### Vent dampers

#### **⚠ WARNING**

Do not install a thermal-type vent damper on this furnace. Failure to comply could result in severe personal injury, death, or substantial property damage.

#### **NOTICE**

If a vent damper is required, use only a motorized one, installed and wired in the furnace according to the vent damper manufacturer's instructions.

### Barometric draft control

Install a barometric control in the vent, as per the manufacturer's instructions, when excess draft needs to be relieved or to comply with applicable codes and regulations. Use draft gauge to adjust proper opening.

1. Install a barometric draft control in the vent pipe at least one foot from the furnace vent connection, preferably in the highest part of the vent pipe before the vent enters the chimney. If headroom does not provide enough clearance to locate the control at least one foot from the vent connection, install an elbow at the furnace and mount the control in a horizontal pipe at least one foot from the elbow. Install an elbow after the control to turn vertically.
2. To operate correctly, the barometric draft control must be in the same room as the furnace.
3. Ensure that the barometric draft control is accessible. Adjust the damper to obtain the correct overfire draft, as described in this manual and the burner manual.

### 5 Connect fuel oil piping

#### General oil piping requirements

- Location and installation of oil tanks, oil piping and burners must follow:
  - NFPA 31, Standard for the Installation of Oil-Burning Equipment.
  - In Canada, CSA B139, Installation of Oil-Burning Equipment.
  - Local codes and regulations.
  - Information provided with burner and fuel pump.
- If any part of the fuel oil tank is above burner level, an anti-siphon device must be used to prevent the flow of oil in case of an oil line break.
- Support oil lines as required by codes.
- Make tank connections with swing joints or copper tubing to prevent breakage in case the tank settles. Make swing joints so they will tighten as tank settles. Non-hardening pipe joint compounds should be used on all threads.

#### **⚠WARNING**

Do not use Teflon tape as an oil pipe sealant. It can cause valves to fail, creating hazards. Use only flare fittings. Do not use compression fittings. Failure to comply could result in severe personal injury, death, or substantial property damage from oil leakage and/or fire hazard.

- Underground pipe must be run in a casing to prevent oil leaking into the ground or under the floor. Check local codes for information.

#### Oil piping connection at burner

- Connect oil line to burner using a flare fitting.

#### **⚠WARNING**

Use of any connection other than a flare fitting at the oil connection to the burner could result in a fuel oil leak, with the potential for severe personal injury, death, or substantial property damage.

- See local codes for appropriate arrangement and piping of filter, control valves, etc. connecting to oil tank.
- Refer to burner manual for oil system requirements. Verify that suction lift does not exceed stated limit. Where lift exceeds limit for a one-pipe system, use a two-pipe system as directed in burner manual.

### 6 Wire furnace & burner

#### **⚠WARNING**

Electric shock hazard. It can cause severe personal injury or death if power sources, including the service switch on the furnace, are not disconnected before installation or servicing.

#### Wire burner

The burner harness is factory-wired to the furnace. Plug the burner harness into the matching burner connector. Refer to the wiring diagrams on pages 16 and 17 for further information.

#### Install and wire thermostat

A thermostat must be installed to control the temperature of the area to be heated.

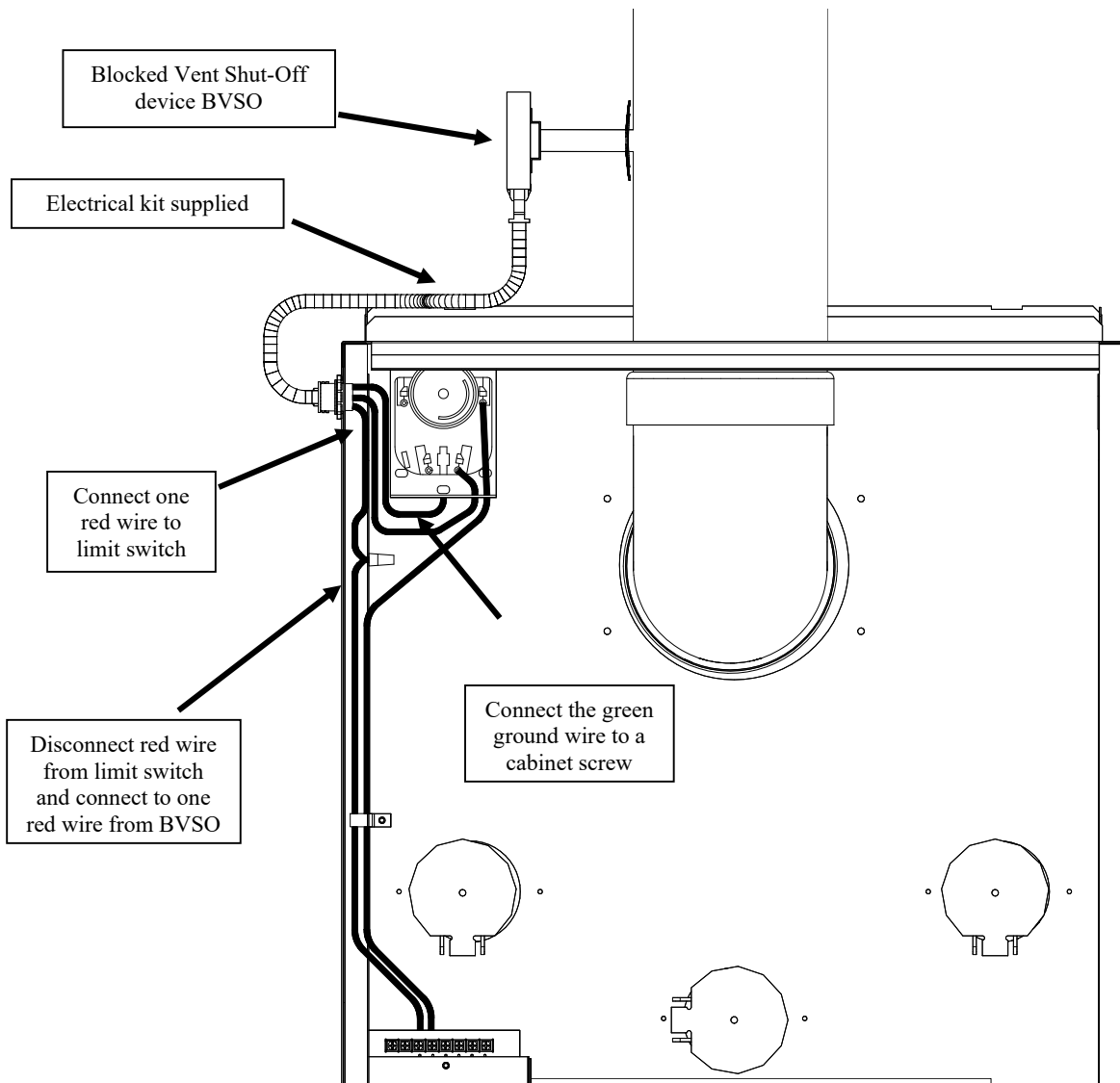
Locate the room thermostat on an interior wall in the natural circulating path of room air. Do not locate thermostat so it is exposed to cold air infiltration, drafts from windows or doors, air currents from supply or return air registers, behind obstructions, on a shelf, in a closet, or in a corner.

Ensure the thermostat won't be exposed to heat from nearby fireplace, radio, television, lamp, or rays from the sun. Do not mount thermostat on a wall over a supply or return duct, chimney, or vent.

Wire thermostat to the control board of the furnace and set thermostat anticipator as shown on wiring diagrams, pages 14, 16 and 17.

## 6 Wire furnace and burner (continued)

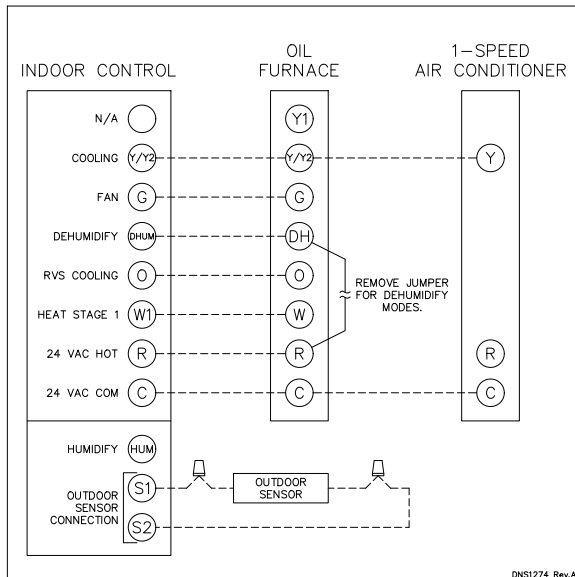
**Figure 3**  
Blocked Vent Shut-Off device wiring (Optional)



## 6 Wire furnace & burner (continued)

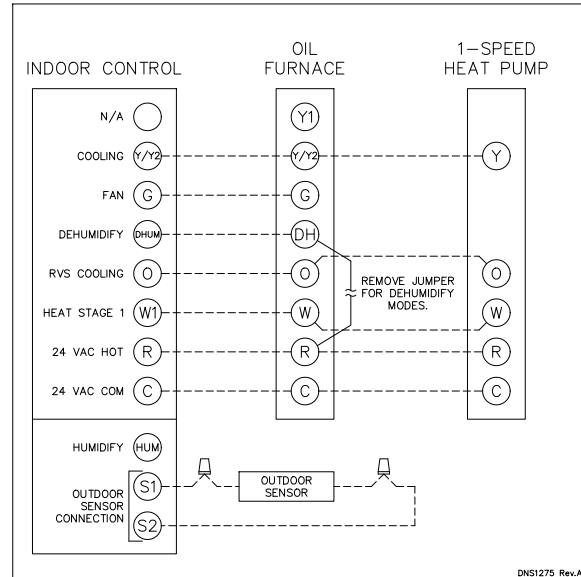
### Thermostat Wiring Heating and Air Conditioning with ECM variable speed motor

24 VAC OIL FURNACE WIRING WITH  
1-SPEED AIR CONDITIONER

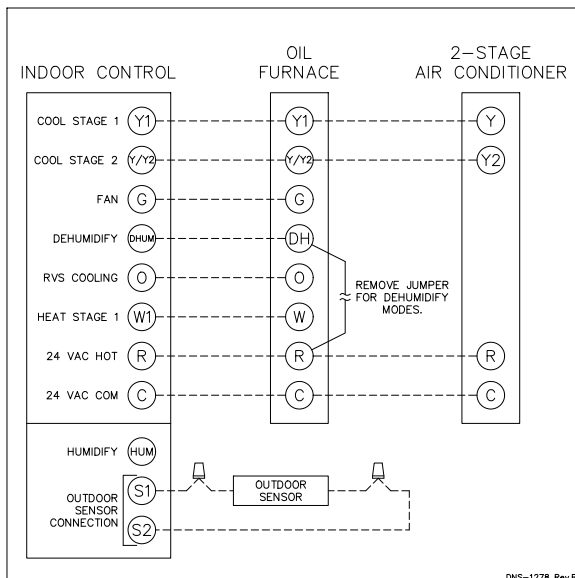


### Thermostat Wiring Heating and Air Conditioning/Heat pump with ECM variable speed motor

24 VAC OIL FURNACE WIRING WITH  
1-SPEED HEAT PUMP



24 VAC OIL FURNACE WIRING WITH  
2-STAGE AIR CONDITIONER



## Connect power wiring

All wiring must conform to:

- National Electrical Code, ANSI/NFPA 70, latest edition and any additional national, state, or local codes.
- In Canada, CSA C22.1 Canadian Electrical Code Part One and any local codes.
- Wiring must be N.E.C. Class 1. If original wire, as supplied with the furnace, must be replaced, type 105°C wire or equivalent must be used. Supply wiring to furnace must be sized for the load required (see Section 14).
- Provide electrical ground at furnace as required by codes.

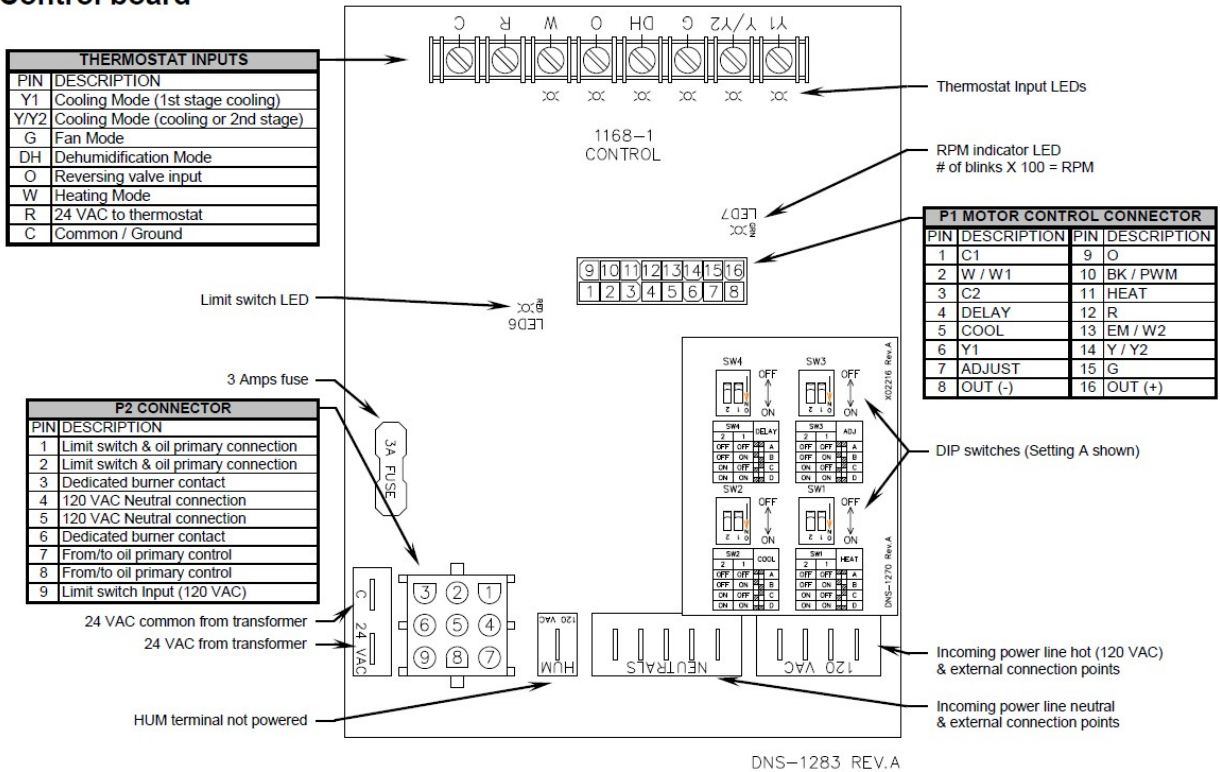
Connect 120 VAC/60 Hertz, single phase separate electrical line from the main house panel to the power leads in the furnace electrical box as shown on wiring diagrams on pages 16 and 17. Provide a fused disconnect in the power wiring, following all local codes.

Ensure the wire size and type are adequate for the electrical load (see Section 14 and furnace nameplate for value).

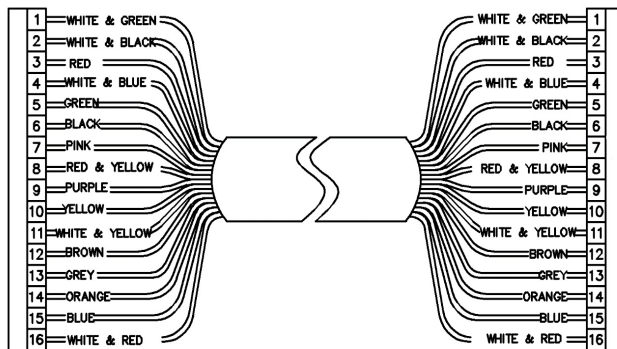
**Note:** On units with 2 stage cooling or heat pump, terminal Y1 must be used. When Y1 on the electronic control receives a 24 VAC signal, the air flow is reduced by 20%. Do not use terminal Y1 with a single stage cooling or heat pump.

## 6 Wire furnace & burner (continued)

### Control board



### Motor control wires



### Limit control

The furnace is equipped with a fan switch/limit control. This control limits the air leaving the heat exchanger to 200°F or less. The cool down period is set by SW4-Delay dip switch on the control board (see Section 7).

### Installation of accessories

#### ⚠ WARNING

Electrical shock hazard

Turn OFF electrical power at the fuse box or service panel before making any electrical connections and ensure a proper ground connection is made before connecting line voltage. Failure to do so can result in death or bodily injury.

#### Electronic Air Cleaner (EAC)

If the EAC is equipped with an airflow switch, one of the 120 VAC terminals on the electronic board can be used to provide a constant supply of 120 VAC.

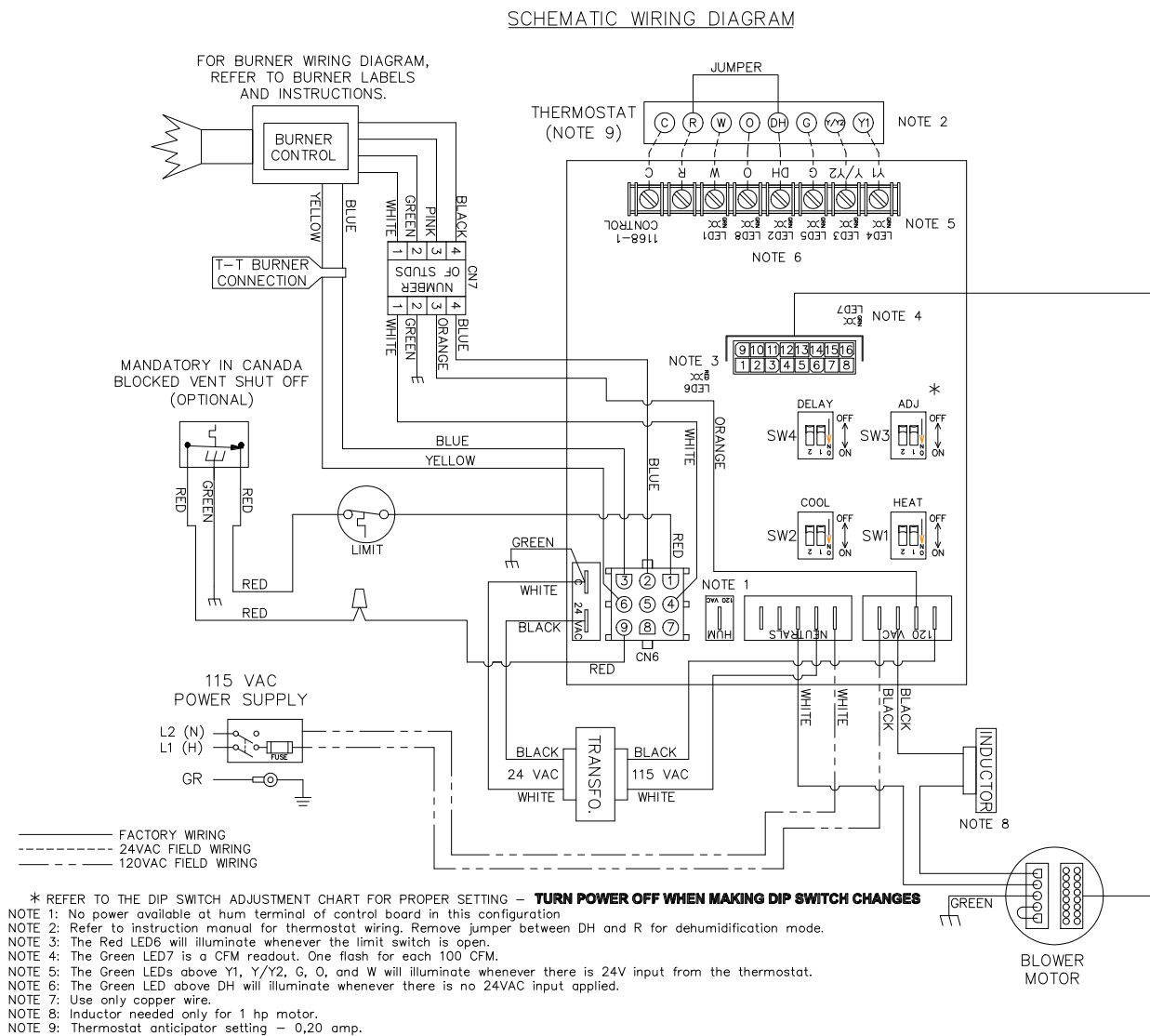
Also refer to the instructions supplied with the accessory.

#### Air Conditioner (or Heat Pump)

An air conditioning coil may be installed on the supply air side ONLY.

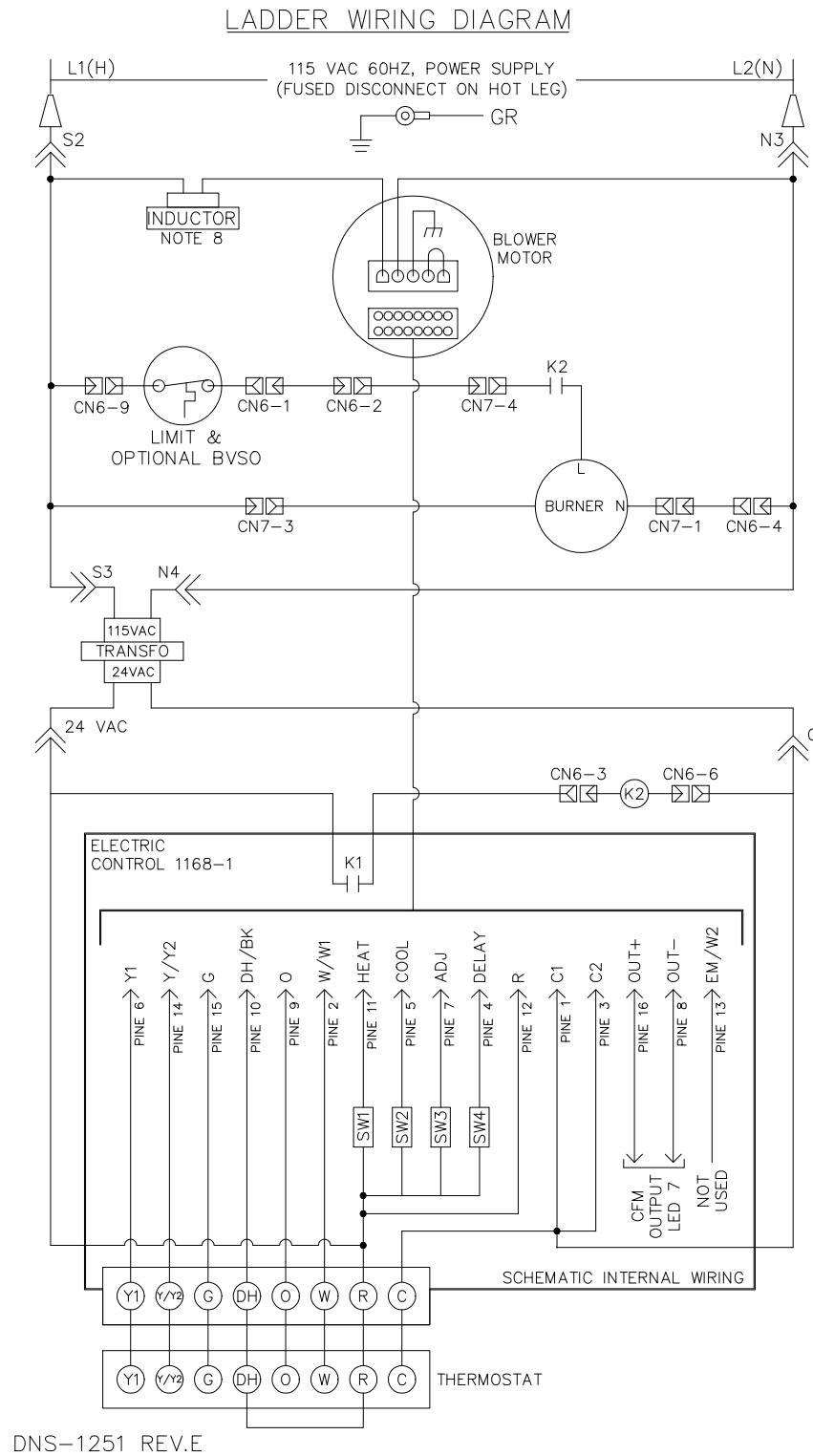
6 Wire furnace & burner (continued)

Figure 4 Wiring – CHB & CLB Variable Speed furnaces



6 Wire furnace & burner (continued)

Figure 5 Ladder wiring – CHB & CLB Variable Speed furnaces



## 7 Supply air adjustments

On units equipped with ECM variable speed blower motors, the air supply must be adjusted based on heating/air conditioning output. The start/stop delays of the blower must also be adjusted by positioning the DIP switches on the electronic board. Refer to the following tables and the wiring diagram in this manual for the proper settings.

# DIP SWITCH ADJUSTMENT CHART FOR INPUTS 0.65 TO 0.85 USGPH AND COOLING CAPACITIES FROM 2.0 TONS TO 3.5 TONS

## OIL HEATING MODE

| SW1 – HEAT          |     |      | INPUT USGPH |
|---------------------|-----|------|-------------|
| DIP switch position |     |      |             |
| 1                   | 2   | POS. |             |
| OFF                 | OFF | A    | 0.85        |
| ON                  | OFF | B    | 0.75        |
| OFF                 | ON  | C    | 0.65        |
| ON                  | ON  | D    | 0.85        |

| SW4 – DELAY         |     |      | INPUT USGPH |
|---------------------|-----|------|-------------|
| DIP switch position |     |      |             |
| 1                   | 2   | POS. |             |
| OFF                 | OFF | A    | 0.85        |
| ON                  | OFF | B    | 0.75        |
| OFF                 | ON  | C    | 0.65        |
| ON                  | ON  | D    | 0.85        |

## CFM ADJUSTMENT IN ALL MODES

| SW3 – ADJUST        |     |      | HEATING CFM*              | COOLING CFM*              |
|---------------------|-----|------|---------------------------|---------------------------|
| DIP switch position |     |      | % increase<br>or decrease | % increase<br>or decrease |
| 1                   | 2   | POS. |                           |                           |
| OFF                 | OFF | A    | 0%                        | 0%                        |
| ON                  | OFF | B    | +10%                      | +10%                      |
| OFF                 | ON  | C    | -10%                      | -10%                      |
| ON                  | ON  | D    | 0%                        | 0%                        |

## HEAT PUMP AND COOLING MODE

| SW2 – COOL          |     |      | A/C SIZE<br>(TON) |
|---------------------|-----|------|-------------------|
| DIP switch position |     |      |                   |
| 1                   | 2   | POS. |                   |
| OFF                 | OFF | A    | 3.5               |
| ON                  | OFF | B    | 3.0               |
| OFF                 | ON  | C    | 2.5               |
| ON                  | ON  | D    | 2.0               |

\*REFER TO THE LITERATURE ASSEMBLY FOR CFM DATA

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# DIP SWITCH ADJUSTMENT CHART FOR INPUTS 1.00 TO 1.25 USGPH AND COOLING CAPACITIES FROM 3.0 TO 5.0 TONS

## OIL HEATING MODE

| SW1 – HEAT          |     |      | INPUT USGPH |
|---------------------|-----|------|-------------|
| DIP switch position |     |      |             |
| 1                   | 2   | POS. |             |
| OFF                 | OFF | A    | 1.25        |
| ON                  | OFF | B    | 1.00        |
| OFF                 | ON  | C    | 1.25        |
| ON                  | ON  | D    | 1.00        |

| SW4 – DELAY         |     |      | INPUT USGPH |
|---------------------|-----|------|-------------|
| DIP switch position |     |      |             |
| 1                   | 2   | POS. |             |
| OFF                 | OFF | A    | 1.25        |
| ON                  | OFF | B    | 1.00        |
| OFF                 | ON  | C    | 1.25        |
| ON                  | ON  | D    | 1.00        |

## CFM ADJUSTMENT IN ALL MODES

| SW3 – ADJUST        |     |      | HEATING CFM*              | COOLING CFM*              |
|---------------------|-----|------|---------------------------|---------------------------|
| DIP switch position |     |      | % increase<br>or decrease | % increase<br>or decrease |
| 1                   | 2   | POS. |                           |                           |
| OFF                 | OFF | A    | 0%                        | 0%                        |
| ON                  | OFF | B    | +10%                      | +10%                      |
| OFF                 | ON  | C    | -10%                      | -10%                      |
| ON                  | ON  | D    | 0%                        | 0%                        |

## HEAT PUMP AND COOLING MODE

| SW2 – COOL          |     |      | A/C SIZE<br>(TON) |
|---------------------|-----|------|-------------------|
| DIP switch position |     |      |                   |
| 1                   | 2   | POS. |                   |
| OFF                 | OFF | A    | 5.0               |
| ON                  | OFF | B    | 4.0               |
| OFF                 | ON  | C    | 3.5               |
| ON                  | ON  | D    | 3.0               |

\*REFER TO THE LITERATURE ASSEMBLY FOR CFM DATA

**TURN POWER OFF WHEN MAKING DIP SWITCH CHANGES**

X04093 REV.E

## To start furnace

1. Factory burner adjustment and settings may not be suitable for specific job conditions. Refer to burner manual for burner start up, adjustment and checkout procedures.
2. Set room thermostat to call for heat.
3. Start burner as described in burner manual.
4. The furnace blower will ramp-up slowly after burner starts. The ramp-up is defined within motor program.
5. Set room thermostat to its lowest setting. Burner should turn off.
6. Furnace blower will continue to run until the limit/fan switch senses air temperature below the fan OFF setting.
7. Set the room thermostat to call for heat again. Allow furnace to heat to design temperature. Then adjust burner for correct combustion, using combustion test equipment. Adjust burner for:
  - Draft: -0.01" to -0.02" water column draft in furnace combustion chamber.
  - CO<sub>2</sub>: between 10% and 11.5%, with 0 smoke.
8. Verify that optional blocked vent shut-off is installed properly.



Make final burner adjustments using combustion test equipment to assure proper operation.

9. Check furnace and duct system for proper operation and conditions.
10. Inspect vent system for proper operation.
11. To set limit/fan switch:
12. To check operation of the limit switch, slide a piece of cardboard into the furnace filter slot. After a few minutes of operation (not more than 5 minutes), the burner should shut off (limit switch open). The blower will operate until the furnace cools down. Remove cardboard when finished.
13. Perform a complete burner cad cell test as per the burner instruction manual.

## To shut down furnace

1. Set the room thermostat to its lowest setting.
2. Turn off the disconnect switch on the 120-VAC power line to the furnace.
3. If the burner will be shut down for an extended time, tightly close all oil valves.
4. Refer to burner manual for any additional instructions.

## 8 Start up



Follow information below to prevent severe personal injury, death, or substantial property damage:

- Do not use gasoline, crankcase draining or any oil containing gasoline. See burner manual for proper fuel oil.
- Do not attempt to start burner when excess oil has accumulated, when unit is full of vapor or when combustion chamber is very hot.
- Do not start burner unless collector box, breeching and burner mounting plate are secured in place.
- Never burn garbage or paper in the furnace.
- Never leave combustible material around it.

## 9 Sequence of operation

---

Using the wiring diagram, pages 16 and 17, follow the sequences of operation through the different modes.

**NOTE:** ECM variable speed motors deliver infinitely variable CFMs. At start-up the motor increases its speed gradually, to lower noise perception. ECM motors ramp down in the same gradual fashion as they do on start-up. ECMs are energized by 120V, whenever power is available to the furnace control. However, they operate only when 24V motor control signals are received.

---

### Oil fired heating mode

1. The thermostat closes R to W.
2. Burner motor fan pre-purges the combustion chamber for 10 to 15 seconds, establishing the combustion air pattern. During this time a spark is also established. The fan starts at 13% of nominal heating for a period equivalent to the "Pre-Run Delay". Refer to tables on pages 43 to 46.
3. The solenoid valve opens, and a flame is established. A short time after that, the ignition transformer ceases sparking.
4. After the "Pre-Run Delay" the blower slightly increases its speed for a period of time equivalent to the "Short-Run Delay". Refer to tables on pages 43 to 46.
5. After the "Short-Run Delay" the blower increases its speed to reach the CFMs indicated in tables on pages 43 to 46.
6. The call for heat is satisfied.
7. The solenoid valve closes, the burner motor stops, and the flame extinguishes.
8. The blower slows down gradually to a certain percentage of nominal CFMs for a period of time equivalent to the "Off-Delay" and then stops.

---

### Cooling Mode

**NOTE:** On units using a 2-stage compressor, the terminal Y1 must be used. Once the Y1 terminal on the electronic control receives a 24 V signal, the airflow is reduced by 20% percent. If a single stage compressor is used, do not use the Y1 terminal.

1. The R - G and R - Y/Y2 thermostat contacts close. The R-Y/Y2 circuit starts the outdoor unit, and the R - G circuit starts the blower at cooling speed. Refer to tables on pages 43 to 46.
2. When the call for cooling is satisfied, the R - G and R - Y/Y2 thermostat contacts open. The cooling unit stops, and furnace blower stops after a period of 1 ½ minutes.

---

### Continuous Fan Mode

1. When the R - G thermostat contacts close, the blower functions at 68%, 75% or 83% of cooling airflow, depending on the adjustment of the DIP switches. Refer to tables on pages 43 to 46.
2. When the R - G thermostat contacts open, the blower stops immediately.

---

### Heat pump – Heating / Cooling Mode

**NOTE 1:** A dual-fuel thermostat is required when a variable speed furnace is used with a heat pump. See dual-fuel thermostat Installation Instructions for interface connections. The interface prevents simultaneous operation of both the furnace and heat pump and prevents direct transition from heat pump to furnace operation.

**NOTE 2:** On units using 2-stage compressors, terminal Y1 must be used. When Y1 on the electronic control board receives a 24 V signal, the airflow is cut by 20%. If a single stage compressor is used, do NOT use terminal Y1.

#### a. Heat Pump Cooling Mode

1. The thermostat contacts R - G, R - Y/Y2 and R - O close. The R - Y/Y2 circuit starts-up the outdoor cooling unit, the R - O maintains the reversing valve in the cooling mode and the R - G circuit starts-up the blower at cooling speed. Refer to tables on pages 43 to 46.
2. When the call for cooling is satisfied, the R - G, R - Y/Y2 and R - O contacts open. The cooling unit stops, and the furnace blower stops after a period of 1 ½ minutes.

#### b. Heat Pump Heating Mode

1. The thermostat contacts R - G and R - Y/Y2 close. The R - G circuit starts-up the blower at heating speed by way of the Thermo Pump. Refer to tables on pages 43 to 46.
2. When the call for heat is satisfied, the thermostat contacts open and the furnace blower stops after a period of 1 ½ minutes.

---

### Defrost Mode

When the R - W and R - Y/Y2 circuits are closed by the thermostat and the heat pump, the electronic control starts-up the burner and the blower in the oil heating mode during defrost.

## 10 Checkout procedure

### Furnace selection

- ☐ ..1. Heat loss ..... BTU/h at ..... °F  
outdoor design temperature.
- ☐ ..2. Furnace model .....  
Output ..... BTU/h.
- ☐ ..3. Burner model .....  
Nozzle: ..... GPH ..... ° type .....
- ☐ ..4. Burner pump pressure ..... psig.

### Furnace installation

- ☐ ..5. Is the furnace level and are all legs in contact with the  
floor?
- ☐ ..6. Are return and supply ducts securely attached to  
furnace?
- ☐ ..7. Are the fuel filter and fuel lines installed and inspected as  
per the burner manual?
- ☐ ..8. Are furnace and burner wired as per the wiring diagram?
- ☐ ..9. 120 VAC wiring: type ..... size ..... AWG.

### Vent and combustion air

- ☐ ..10. Was the existing chimney / vent system inspected and  
found in proper condition?
- ☐ ..11. Was new vent piping installed and sealed as required?
- ☐ ..12. Was the vent sizing checked against furnace manual and  
codes?

### Ductwork

- ☐ ..13. Was the duct sizing checked against furnace manual  
and / or ACCA Manual D?
- ☐ ..14. Were the supply and return registers checked for size  
based on airflow?
- ☐ ..15. Were balancing dampers installed as needed?
- ☐ ..16. Was the ductwork sealed and insulated as needed?

### Furnace operation

- ☐ ..17. Is a / are clean air filter(s) in place?
- ☐ ..18. Was the temperature rise through furnace checked (not  
to exceed 85°F) and the blower speed adjusted if  
necessary?
- ☐ ..19. Was the thermostat heat anticipator set per wiring  
diagram?
- ☐ ..20. Was the burner started and tested per burner manual?
- ☐ ..21. Is there proper draft and burner flame? Were final  
adjustments made with combustion test equipment?
- ☐ ..22. Was air purged from oil piping and piping checked for  
leaks?
- ☐ ..23. Was burner sealed to furnace and nuts tightened? Was  
burner harness securely plugged in?



Obtain gas-tight seals at burner flange, cleanout plates and/or flue collector box to prevent possible flue gas leakage and carbon monoxide emissions, leading to severe personal injury or death.

- ☐ ..24. Was limit control tested as per the "To start furnace"  
section in this manual?
- ☐ ..25. Was furnace cycled with thermostat? Raise to highest  
setting and verify furnace goes through normal start up  
cycle. Lower to lowest setting and verify furnace shuts  
off.
- ☐ ..26. Were several operating cycles observed for proper  
operation?
- ☐ ..27. Were room thermostat(s) set to desired room  
temperatures?

### After installation

- ☐ ..28. Was "Installation and service certificate" (below) filled  
out?
- ☐ ..29. Was Owner's information in this manual reviewed with  
owner or maintenance person and the person instructed  
to keep the manual for future reference?
- ☐ ..30. Were all instruction manuals placed near the furnace for  
future reference?

**Installation and service certificate**

Furnace model \_\_\_\_\_ Series \_\_\_\_\_

Serial number \_\_\_\_\_ Date installed \_\_\_\_\_

- ☐ Installation instructions have been followed.
- ☐ Checkout sequence has been performed.
- ☐ Above information is certified to be correct.
- ☐ Information received and left with owner/maintenance person.

Installer \_\_\_\_\_  
(Company) (Address) (Phone)

\_\_\_\_\_  
(Installer's signature)

## 11 Troubleshooting

| Before beginning these troubleshooting procedures, ALWAYS :                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Check 120 volt supply to furnace. If there is no supply voltage, check fuses and service switch. CAUTION : When testing electrical equipment, always follow standard electrical safety procedures.</li> <li>Make sure thermostat is calling for burner operation.</li> <li>Check oil supply and make sure all valves are open.</li> </ul> | <ul style="list-style-type: none"> <li>To successfully service the oil furnace, you must have these instruments :                             <ul style="list-style-type: none"> <li>smoke tester</li> <li>carbon-dioxide (CO<sub>2</sub>) or oxygen (O<sub>2</sub>) analyzer</li> <li>draft gauge (scale should read from -.01" w.c. to -.25" w.c.)</li> <li>volt/OHM/milliamper multimeter</li> <li>pressure gauge capable of reading 0-150 lb/sq. inch (for oil only)</li> </ul> </li> <li>Be familiar with these instruments as well as the burner manufacturer's recommended settings.</li> </ul> |                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                |
| Symptom – Burner                                                                                                                                                                                                                                                                                                                                                                 | Possible corrections :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                |
| Burner motor does not start.                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Check fuses and make sure service switch is on.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Check for voltage from primary relay to burner motor. Make sure the primary relay has not locked out on safety.</li> </ul>                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Check for line voltage into furnace junction box.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>Make sure the thermostat is calling for heat and that the wiring to the thermostat is correct and tight.</li> </ul>                                                                                                                                                     |
| Burner short cycles or locks out on primary relay safety.                                                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>If the primary relay control is not popping out the reset button, measure the milliamperage at the thermostat and set the heat-anticipator accordingly. Also check wiring from the thermostat to the burner.</li> </ul>                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>Check the alignment of the cad cell to assure it is aimed at the fire.</li> </ul>                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Check nozzle and electrode position. (Reference burner manufacturers instructions).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Check ignition transformer output</li> </ul>                                                                                                                                                                                                                            |
| Unable to achieve clean combustion by setting air adjustments.                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Check tube insertion and alignment.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Check nozzle and electrode position (Reference burner manufacturer's instructions).</li> </ul>                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Replace nozzle.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Check pump pressure (varies with manufacturer and application; see burner manual).</li> </ul>                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Check overfire draft.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                |
| To check CAD cell operation, use the following procedure :                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Remove CAD cell leadwires from the f-f terminals on the primary safety control, then start burner. Shortly after burner starts, place a temporary jumper between terminals f-f. Connect ohmmeter across CAD cell leadwires-resistance should be under 1,600 ohms.</li> </ul>                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>With burner off, check dark cell resistance across CAD cell leadwires. Resistance should be greater than 20,000 ohms. If cell resistances are different from above, recheck wiring and location of cell, etc. If necessary, replace plug-in portion of cell.</li> </ul> |
|                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Stop burner and remove temporary jumper.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                |
| Symptom – Furnace blower                                                                                                                                                                                                                                                                                                                                                         | Possible corrections :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                |
| Furnace blower will not start.                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Check if connector in control board is fully pushed in.</li> <li>Check if motor connector is fully pushed-in.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>See if blower motor will run when it is switched on manually at the thermostat sub-base (if sub-base is installed).</li> </ul>                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Check wiring from Fan and limit control</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Verify voltage across R (pin12) and Com (pin 1) is 24VAC (+/- 6VAC).</li> <li>Turn fan switch ON at thermostat and verify voltage across G (pin15) and Com (pin 1) is 24VAC (+/- 6VAC).</li> </ul>                                                                      |
| Blower short cycles on limit control.                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>Return ducts may be undersized.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                |

## 12 Service and maintenance

### Annual service and start-up



Follow the “Service and maintenance” procedures given throughout this manual and in component literature shipped with the furnace. Failure to perform the service and maintenance could result in damage to the furnace or system. Failure to follow the directions in this manual and component literature could result in severe personal injury, death, or substantial property damage.



The furnace should be inspected and started annually, at the beginning of the heating season, only by a qualified service technician. In addition, the maintenance and care of the furnace outlined in the table below and explained on the following pages must be performed to assure maximum furnace efficiency and reliability. Failure to service and maintain the furnace and system could result in equipment failure.



This furnace contains fiberglass and ceramic fiber materials. These materials require special attention. Please refer to the WARNING and guidelines given on page 24. Failure to comply could result in severe personal injury, death, or substantial property damage.

| Service technician annual maintenance/start up<br>(see following pages and burner manual for instructions)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service and maintenance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Annual start up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p><b>Furnace and air system</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Consult with homeowner to see if there were any problems with furnace or system during the prior heating season (or cooling season)</li> <li><input type="checkbox"/> Clean and inspect blower motor and wheel</li> <li><input type="checkbox"/> Check condition of electrical wiring and tightness of terminals and connectors</li> <li><input type="checkbox"/> Clean and inspect heat exchanger and combustion chamber</li> <li><input type="checkbox"/> Clean and inspect system accessories</li> </ul> <p><b>Vent system</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Clean and inspect flue pipe, chimney/vent, and draft regulator</li> </ul> <p><b>Fuel oil system</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Check oil tank and piping for leaks</li> <li><input type="checkbox"/> Replace oil filter</li> </ul> <p><b>Oil burner</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Clean and inspect oil burner assembly</li> <li><input type="checkbox"/> Bleed system of air (single-pipe system)</li> <li><input type="checkbox"/> Check oil pump pressures</li> <li><input type="checkbox"/> Check combustion air ducts, grilles, etc. (if applicable)</li> </ul> | <p><b>Check operation</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Check sequence of operation</li> <li><input type="checkbox"/> Check flame characteristics</li> <li><input type="checkbox"/> Perform combustion checks/tests per burner manual and furnace manual</li> <li><input type="checkbox"/> Check temperature rise</li> <li><input type="checkbox"/> Check thermostat heat anticipator setting</li> <li><input type="checkbox"/> Check safety controls (high-temperature limit switch, flame cutoff time, etc.)</li> </ul> |

### 12 Service and maintenance (continued)

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#### Handling ceramic fiber and fiberglass materials

##### HANDLING OR REMOVAL OF COMBUSTION CHAMBER



The combustion chamber in this product contains ceramic fiber materials. Ceramic fiber can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)".

- Avoid breathing dust and contact with skin and eyes.
  - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Apply enough water to the combustion chamber lining to prevent airborne dust.
- Remove combustion chamber lining from the furnace and place it in a plastic bag for disposal.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

##### NIOSH stated First Aid.

- Eye: Irrigate immediately
- Breathing: Fresh air.

##### HANDLING OR REMOVAL OF FIBERGLASS WOOL – OR – INSTALLATION OF FIBERGLASS WOOL OR COMBUSTION CHAMBER:



This product contains fiberglass jacket insulation and ceramic fiber materials in combustion chamber. Airborne fibers from these materials have been listed by the State of California as a possible cause of cancer through inhalation.

- Avoid breathing dust and contact with skin and eyes.
  - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for fiberglass wool at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Operations such as sawing, blowing, tear out, and spraying may generate airborne fiber concentration requiring additional protection.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

##### NIOSH stated First Aid.

- Eye: Irrigate immediately
- Breathing: Fresh air.

## 12 Service and maintenance (continued)

### Service/maintenance procedures

#### To inspect blower motor

Blower motor is permanently lubricated and do not require oiling.

Clean blower wheel – Vacuum dust from blower wheel blades and surrounding area.

#### To clean heat exchanger



The heat exchanger must be cleaned and inspected at least once each year. Operating the furnace with a fouled or leaking heat exchanger could result in severe personal injury, death, or substantial property damage.



The combustion chamber contains ceramic fiber materials. Wear a NIOSH-approved respirator while cleaning the furnace and follow WARNING on page 24 for proper handling.

1. Remove the burner and mounting plate.
2. Inspect the heat exchanger using a mirror inserted through the burner opening.
3. Using a brush on a flexible handle, loosen the soot on the inside of the heat exchanger.
4. Remove the soot with a vacuum. Be careful not to damage the combustion chamber while cleaning the heat exchanger.
5. Open the heat exchanger cleanout cover. Using a brush on a flexible handle, loosen the soot from the heat exchanger surfaces. Remove as much soot as possible using a vacuum.
6. Close cleanout cover.
7. Inspect combustion chamber and replace with a new one if chamber is damaged in any way.
8. Re-install burner and mounting plate.



Obtain gas-tight seal at burner flange and cleanout plates to prevent possible flue gas leakage and carbon monoxide emissions, leading to severe personal injury or death.

#### Inspect vent system

Thoroughly inspect the entire vent system at least annually, including horizontal vent pipe and chimney or vertical vent. Ensure vent system is repaired or replaced if necessary, before placing furnace in operation.

#### Oiled-bearing burner motors

The burner may need to be lubricated if motor is equipped with oiling cups. Refer to burner manual for specific instructions. If instructed, apply a few drops only of S.A.E. 20 detergent oil (never use household oils). Do not attempt to "fill up" the oil cup. Over-oiling can damage the motor.

#### Optional Blocked vent shut off (BVSO) cleaning

For continued safe operation, the Blocked Vent Shut Off System (BVSO) is required to be inspected and maintained annually by a qualified agency.

1. Disconnect the power to the appliance.
2. Remove the two screws holding on the BVSO assembly cover.
3. Remove the cover.
4. Remove the two screws holding the thermal switch to the assembly base.
5. Without removing the electrical wires, remove the thermal switch and remove any build-up from the thermal switch surface.



Do not dent or scratch the surface of the thermal switch. If the thermal switch is damaged, replacement is required.

6. Clear and remove any build-up or obstruction inside the heat transfer tube.
7. Re-mount the thermal switch to the assembly base.
8. Re-attach the assembly cover with the screws removed in step 2.
9. Re-establish power to the appliance.

### Annual start up



Follow information below to prevent severe personal injury, death, or substantial property damage:

- Do not use gasoline, crankcase draining or any oil containing gasoline. See burner manual for proper fuel oil.
- Do not attempt to start burner when excess oil has accumulated, when unit is full or vapor or when combustion chamber is very hot.
- Do not start burner unless vent and burner mounting plate are secured in place.
- Never burn garbage or paper in the furnace.
- Never leave combustible material around it.

### To start furnace

10. Factory burner adjustment and settings may not be suitable for specific job conditions. Refer to burner manual for burner start up, adjustment and checkout procedures.
11. Set room thermostat to call for heat.
12. Refer to burner manual for start up.
13. The furnace blower will delay for a short period after burner starts, until the limit/fan switch senses air temperature above the fan ON setting.
14. Set room thermostat to its lowest setting. Burner should turn off.
15. Furnace blower will continue to run until the limit/fan switch senses air temperature below the fan OFF setting.
16. Set the room thermostat to call for heat again. Allow furnace to heat to design temperature. Then adjust burner for correct combustion, using combustion test equipment. Adjust burner for:  
Draft: -0.01" to -0.02" water column draft in furnace combustion chamber.  
CO<sub>2</sub>: between 10% and 11.5%, with 0 smoke.



Make final burner adjustments using combustion test equipment to ensure proper operation.

17. Check furnace and duct system for proper operation and conditions.
18. Inspect vent system for proper operation.
19. To set limit switch:

The blower operates until the air temperature drops below the fan OFF setting. If the air at the supply registers is too warm at blower start up or shutdown, lower the fan OFF and ON settings on the limit switch. To check operation of the limit switch, slide a piece of cardboard into the furnace filter slot. After a few minutes of operation (not more than 5 minutes), the burner should shut off (limit switch open). The blower will operate until the furnace cools down. Remove cardboard when finished.

20. Complete testing of the burner cad cell control using the instructions in the burner manual.

**Figure 6** Model CHB-105 furnaces – Component locations



# 13 Components and replacement parts (continued)

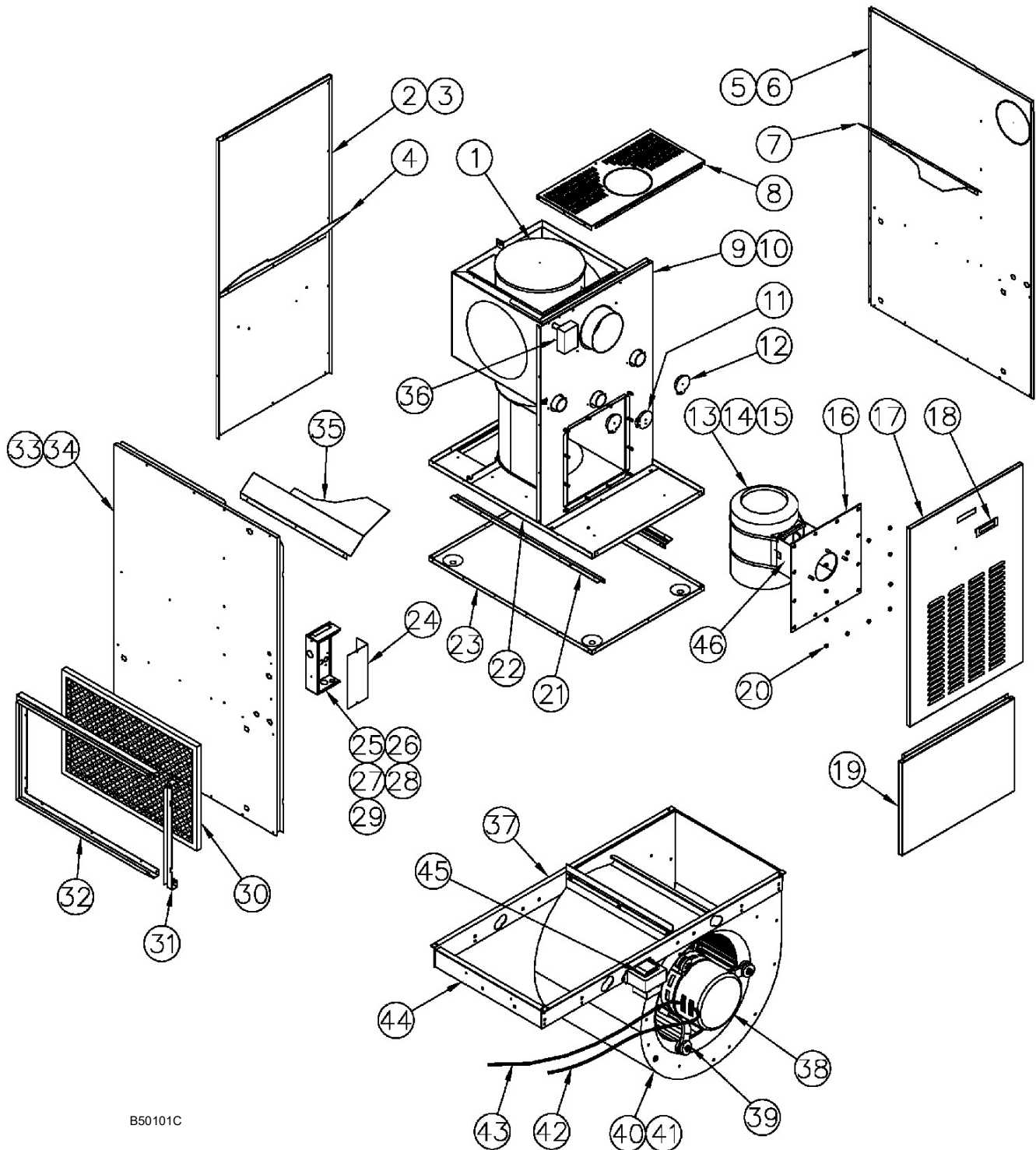
Model CHB-105 furnaces – Replacement parts list

| Item | Part description                                      | Part number | Item | Part description                                             | Part number    |
|------|-------------------------------------------------------|-------------|------|--------------------------------------------------------------|----------------|
| 1    | Heat exchanger                                        | B02935-01   | 23   | Floor                                                        | B02960         |
| 2    | Rear panel assembly<br>(item 3 included)              | B02971      | 24   | Electrical box cover assembly                                | B03800         |
| 3    | Rear panel insulation                                 | B02969      | 25   | Electrical box assembly<br>(items 26, 27, 28 & 29 included)  | B03803         |
| 4    | Rear baffle                                           | B02963      | 26   | Transformer                                                  | L01F009        |
| 5    | Right side panel assembly<br>(items 6 & 7 included)   | B02970-01   | 27   | Electronic card                                              | R99G003        |
| 6    | Right side panel insulation                           | B02968-01   | 28   | Electronic card wire harness                                 | B03807         |
| 7    | Baffle                                                | B02964      | 29   | Burner wire harness                                          | B03808         |
| 8    | Top panel                                             | B02959      | 30   | Filter rack access                                           | B01696-01      |
| 9    | Front panel divider assembly<br>(items 10 included)   | B02972      | 31   | Paper filter 16" x 24"                                       | Obtain locally |
| 10   | Front divider insulation                              | B02967      | 32   | Filter rack "U" frame                                        | B01695-01      |
| 11   | Observation door                                      | B02111      | 33   | Left side panel assembly<br>(items 7 & 32 included)          | B02970-02      |
| 12   | Clean out door                                        | B01842      | 34   | Left side panel insulation                                   | B02968-02      |
| 13   | Burner plate assembly<br>(items 14, 15 & 16 included) | B02938      | 35   | Fan limit                                                    | B04272-02      |
| 14   | Combustion chamber                                    | B02898      | 36   | Blower slides (qty 2)                                        | B01681         |
| 15   | Burner plate                                          | B02952      | 37   | Motor 3/4 HP                                                 | B03812-05      |
| 16   | Gasket, burner plate                                  | B02907      | 38   | Motor support assembly<br>(band, legs, nut & bolts included) | B01888         |
| 17   | Front door (door only)                                | B02958      | 39   | Blower assembly<br>(items 37, 38 & 40 included)              | B03680-03      |
| 18   | Handle                                                | Z99F050     | 40   | Blower 100-10T                                               | B03720-04      |
| 19   | Blower door                                           | B02957      | 41   | Electronic motor harness                                     | B03242-03      |
| 20   | Hex nut 3/8-NC brass (qty 12)                         | F07O001     | 42   | Electric motor harness                                       | B03798-01      |
| 21   | Blower slides (qty 2)                                 | B01680      | 43   | Electric box support                                         | B01682         |
| 22   | Blower deck assembly<br>(item 21 included)            | B02973      | 44   | Combustion chamber support                                   | B02953         |

B50100D

### 13 Components and replacement parts (continued)

Figure 7 Model CHB-140 furnaces – Component locations



B50101C

## 13 Components and replacement parts (continued)

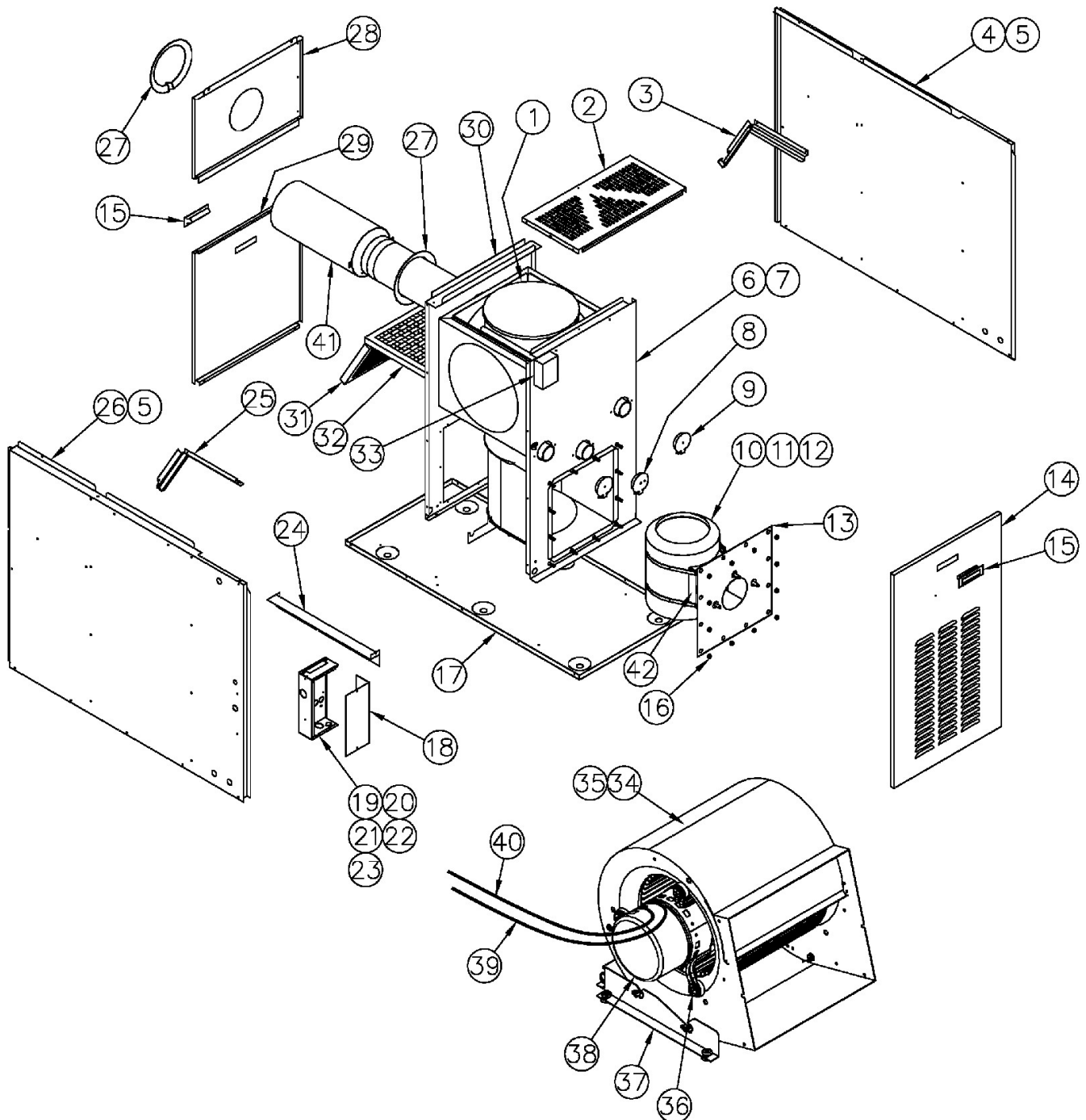
Model CHB-140 furnaces – Replacement parts list

| Item | Part description                                      | Part number | Item | Part description                                             | Part number    |
|------|-------------------------------------------------------|-------------|------|--------------------------------------------------------------|----------------|
| 1    | Heat exchanger                                        | B03115-01   | 23   | Floor                                                        | B03156         |
| 2    | Rear panel assembly<br>(items 3 & 4 included)         | B03174      | 24   | Electrical box cover assembly                                | B03800         |
| 3    | Rear panel insulation                                 | B03182      | 25   | Electrical box assembly<br>(items 26, 27, 28, & 29 included) | B03803         |
| 4    | Rear baffle                                           | B03158      | 26   | Transformer                                                  | L01F009        |
| 5    | Right side panel assembly<br>(items 6 & 7 included)   | B03173-01   | 27   | Electronis card                                              | R99G003        |
| 6    | Right side panel insulation                           | B03181-01   | 28   | Electronic card wire harness                                 | B03807         |
| 7    | Baffle, right side                                    | B03157-01   | 29   | Burner wire harness                                          | B03808         |
| 8    | Top panel                                             | B03135      | 30   | Paper filter 20" x 30"                                       | Obtain locally |
| 9    | Front panel divider assembly<br>(items 10 included)   | B03175      | 31   | Filter rack access                                           | B01808-01      |
| 10   | Front divider insulation                              | B03180      | 32   | Filter rack "U" frame                                        | B01809-01      |
| 11   | Observation door                                      | B02111      | 33   | Left side panel assembly<br>(items 34 & 35 included)         | B03173-02      |
| 12   | Clean out door                                        | B01842      | 34   | Left side panel insulation                                   | B02968-02      |
| 13   | Burner plate assembly<br>(items 14, 15 & 16 included) | B03160      | 35   | Baffle, left side                                            | B03157-02      |
| 14   | Combustion chamber                                    | B02899      | 36   | Fan limit                                                    | B04272-02      |
| 15   | Burner plate                                          | B03149      | 37   | Blow er slides (qty 2)                                       | B01681         |
| 16   | Gasket, burner plate                                  | B02905      | 38   | Motor 1 HP                                                   | B03813-08      |
| 17   | Front door (door only)                                | B03153      | 39   | Motor support assembly<br>(band, legs, nut & bolts included) | B01889         |
| 18   | Handle                                                | Z99F050     | 40   | Blow er assembly<br>(items 38, 39 & 41 included)             | B03322-04      |
| 19   | Blow er door                                          | B03177      | 41   | Blow er 120-10T                                              | B03720-05      |
| 20   | Hex nut 3/8-NC brass (qty 12)                         | F07O001     | 42   | Electronic motor harness                                     | B03242-03      |
| 21   | Blow er slides (qty 2)                                | B01794      | 43   | Electric motor harness                                       | B03798-01      |
| 22   | Blow er deck assembly<br>(item 21 included)           | B03176      | 44   | Electric box support                                         | B01682         |
|      |                                                       |             | 45   | Inductor                                                     | B03141         |
|      |                                                       |             | 46   | Combustion chamber support                                   | B03148         |

B50101D

### 13 Components and replacement parts (continued)

Figure 8 Model CLB-105 Rear furnaces – Component locations



B50103D

### 13 Components and replacement parts (continued)

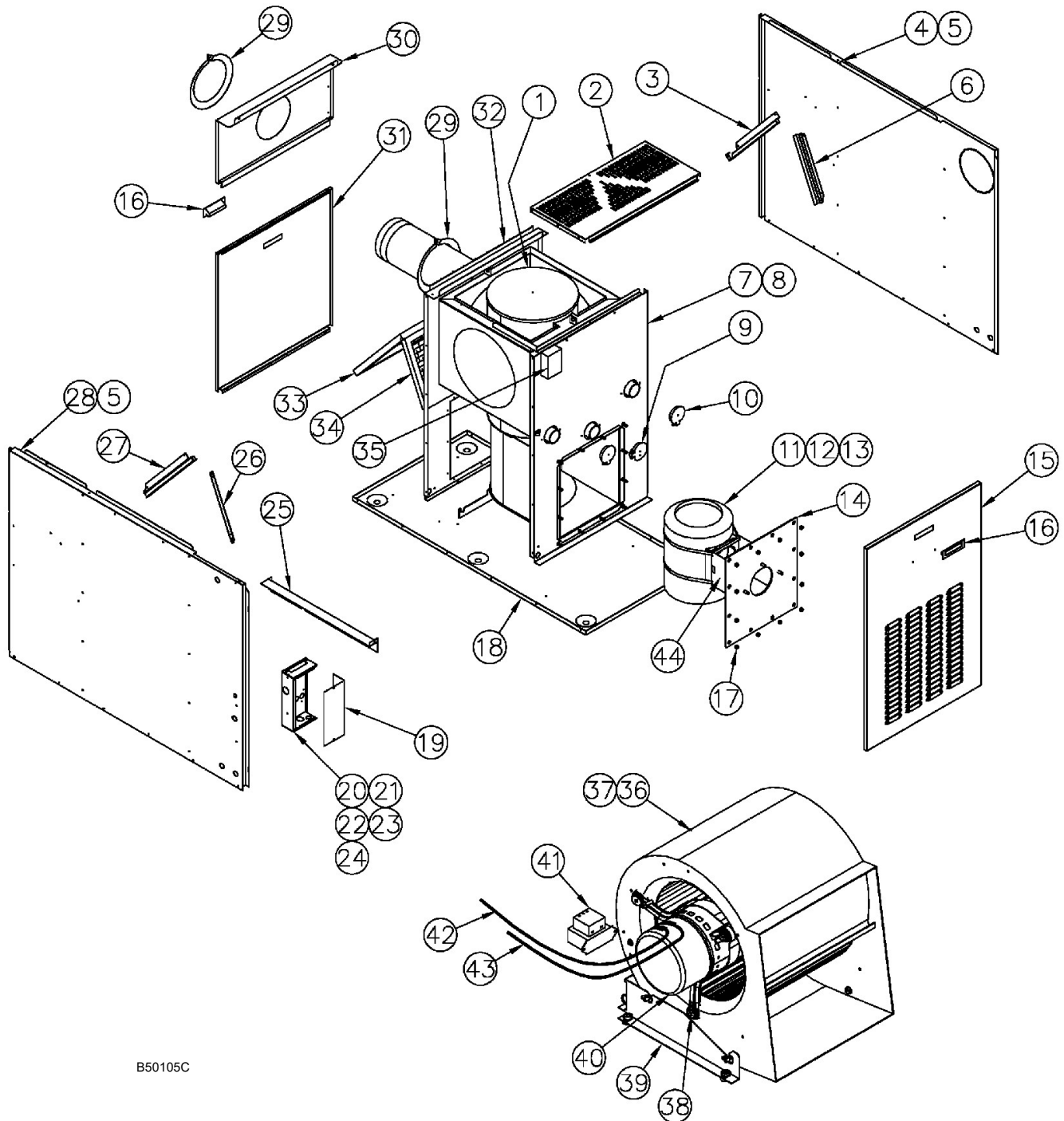
Model CLB-105 Rear furnaces – Replacement parts list

| Item | Part description                                            | Part number | Item | Part description                                             | Part number    |
|------|-------------------------------------------------------------|-------------|------|--------------------------------------------------------------|----------------|
| 1    | Heat exchanger                                              | B02935-02   | 21   | Electronic card                                              | R99G003        |
| 2    | Front top panel                                             | B03010      | 22   | Electronic card wire harness                                 | B03807         |
| 3    | Filter rack right side                                      | B03014-01   | 23   | Burner wire harness                                          | B03808         |
| 4    | Right side panel assembly<br>(Items 3 & 5 included)         | B03017-03   | 24   | Wire conduit                                                 | B03015         |
| 5    | Side panel insulation                                       | B03016      | 25   | Filter rack left side                                        | B03014-02      |
| 6    | Front divider panel assembly<br>(Item 7 included)           | B03022      | 26   | Left side panel assembly<br>(Items 5 & 25 included)          | B03017-02      |
| 7    | Front divider panel insulation                              | B03021      | 27   | Collar                                                       | B10016-03      |
| 8    | Observation door                                            | B02111      | 28   | Rear top panel                                               | B03008-02      |
| 9    | Clean out door                                              | B01842      | 29   | Blow er door                                                 | B03026         |
| 10   | Burner plate assembly<br>(Items 11,12 & 13 included)        | B02938      | 30   | Rear divider panel assembly                                  | B03027-02      |
| 11   | Combustion chamber                                          | B02898      | 31   | Paper filter 10" x 20"                                       | Obtain locally |
| 12   | Burner plate                                                | B02952      | 32   | Paper filter 12" x 20"                                       | Obtain locally |
| 13   | Gasket, burner plate                                        | B02907      | 33   | Fan limit                                                    | B04272-02      |
| 14   | Front door (only)                                           | B03011      | 34   | Blow er assembly<br>(items 35, 36 & 38 included)             | B02584-03      |
| 15   | Handle                                                      | Z99F050     | 35   | Blow er 100-10T                                              | B03720-04      |
| 16   | Hex nut 3/8-NC brass (qty 12)                               | F07O001     | 36   | Motor support assembly<br>(band, legs, nut & bolts included) | B01888         |
| 17   | Floor assembly                                              | B03025      | 37   | Blow er support                                              | B03013         |
| 18   | Electrical box cover assembly                               | B03800      | 38   | Motor 1/2 HP                                                 | B03811-12      |
| 19   | Electrical box assembly<br>(Items 20, 21, 22 & 23 included) | B03803      | 39   | Electric motor harness                                       | B03798-01      |
| 20   | Transformer                                                 | L01F009     | 40   | Electronic motor harness                                     | B03242-03      |
|      |                                                             |             | 41   | Oulet protector assembly                                     | B03900         |
|      |                                                             |             | 42   | Combustion chamber support                                   | B02953         |

B50103D

### 13 Components and replacement parts (continued)

Figure 9 Model CLB-140 Rear furnaces – Component locations



B50105C

## 13 Components and replacement parts (continued)

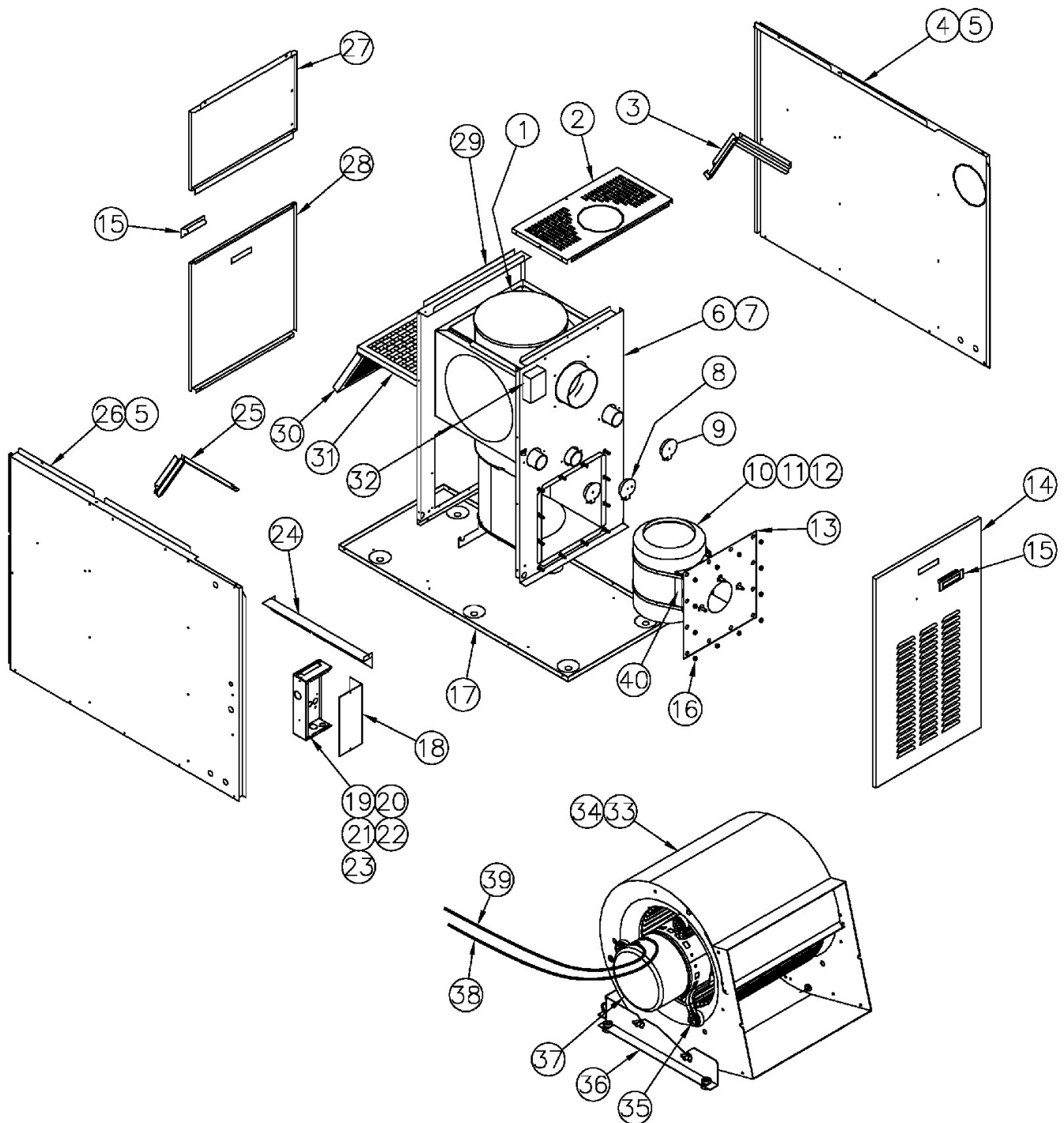
Model CLB-140 Rear furnaces – Replacement parts list

| Item | Part description                                             | Part number | Item | Part description                                             | Part number    |
|------|--------------------------------------------------------------|-------------|------|--------------------------------------------------------------|----------------|
| 1    | Heat exchanger                                               | B03115-02   | 22   | Electronic card                                              | R99G003        |
| 2    | Front top panel                                              | B03136      | 23   | Electronic card wire harness                                 | B03807         |
| 3    | Filter rack right side                                       | B03146-01   | 24   | Burner wire harness                                          | B03808         |
| 4    | Right side panel assemblyD<br>(Items 3, 5 & 6 included)      | B03162-03   | 25   | Wire conduit                                                 | B03144         |
| 5    | Side panel insulation                                        | B03169      | 26   | Filter rack left side                                        | B03147-02      |
| 6    | Filter rack right side                                       | B03147-01   | 27   | Filter rack left side                                        | B03146-02      |
| 7    | Front divider panel assembly<br>(Item 8 included)            | B03166      | 28   | Left side panel assembly<br>(Items 5, 26 & 27 included)      | B03162-02      |
| 8    | Front divider panel insulation                               | B03171      | 29   | Ring                                                         | B03138-01      |
| 9    | Observation door assembly                                    | B02111      | 30   | Rear top panel                                               | B03133-01      |
| 10   | Clean out door assembly                                      | B01842      | 31   | Blow er door                                                 | B03163         |
| 11   | Burner plate assembly<br>(Items 12,13 & 14)                  | B03160      | 32   | Rear divider panel assembly                                  | B03168-02      |
| 12   | Combustion chamber                                           | B02899      | 33   | Paper filter 16" x 24"                                       | Obtain locally |
| 13   | Burner plate                                                 | B03149      | 34   | Paper filter 12" x 24"                                       | Obtain locally |
| 14   | Gasket, burner plate                                         | B02905      | 35   | Fan limit                                                    | B04272-02      |
| 15   | Front door (only)                                            | B03137      | 36   | Blow er assembly<br>(items 37, 38 & 40 included)             | B02583-02      |
| 16   | Handle                                                       | Z99F050     | 37   | Blow er 120-10T                                              | B03720-05      |
| 17   | Hex nut 3/8-NC brass (qty 12)                                | F07O001     | 38   | Motor support assembly<br>(band, legs, nut & bolts included) | B01889         |
| 18   | Floor assembly                                               | B03167      | 39   | Blow er support                                              | B03143         |
| 19   | Electrical box cover assembly                                | B03800      | 40   | Motor 1 HP                                                   | B03813-09      |
| 20   | Electrical box assembly<br>(items 21, 22 , 23 & 24 included) | B03803      | 41   | Inductor                                                     | B03141         |
| 21   | Transformer                                                  | L01F009     | 42   | Electronic motor harness                                     | B03242-03      |
|      |                                                              |             | 43   | Electric motor harness                                       | B03798-01      |
|      |                                                              |             | 44   | Combustion chamber support                                   | B03148         |

B50105C

### 13 Components and replacement parts (continued)

Figure 10 Model CLB-105 Front furnaces – Component locations



B50102C

# **13 Components and replacement parts** (continued)

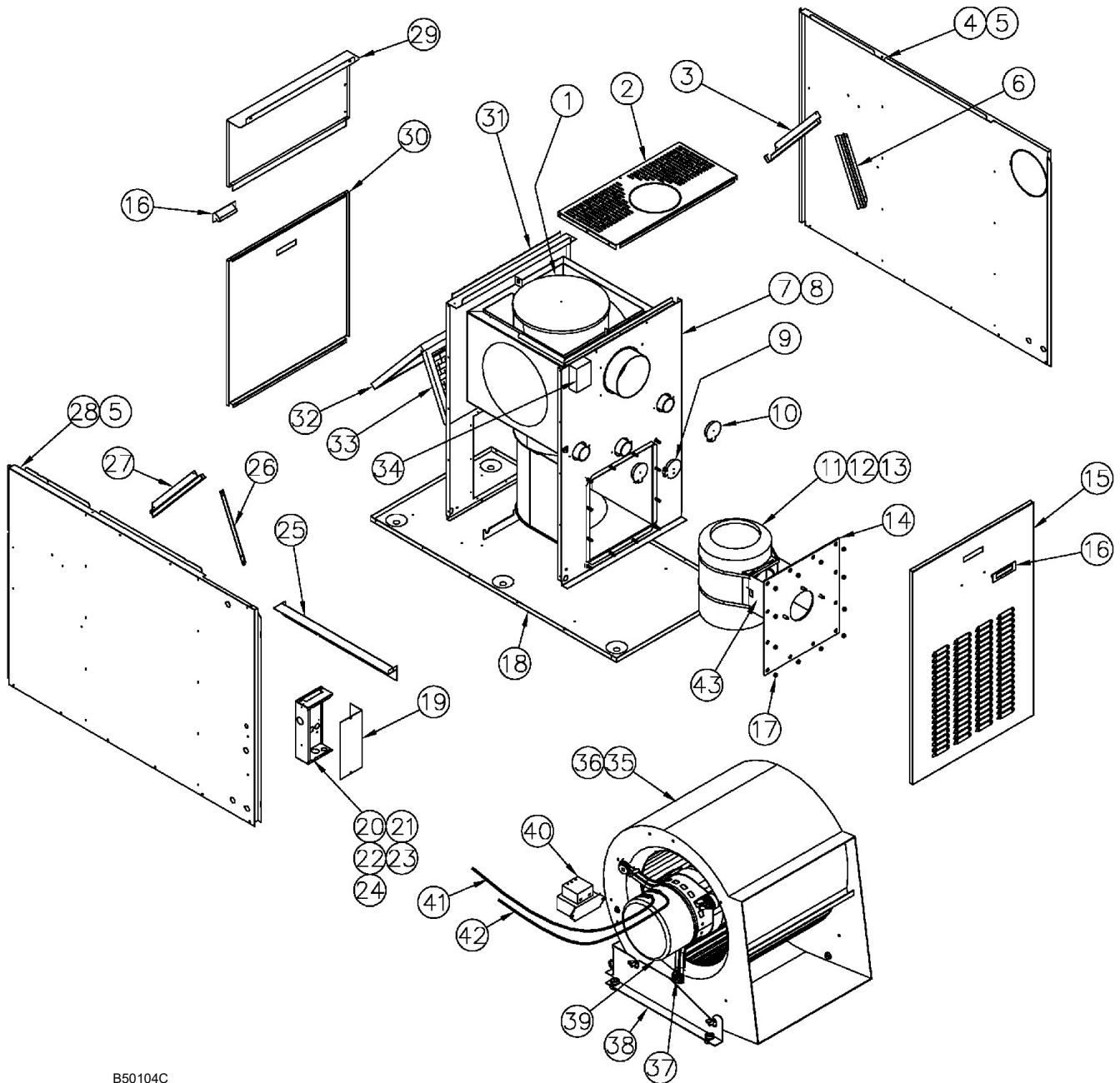
Model CLB-105 Front furnaces – Replacement parts list

| Item | Part description                                            | Part number | Item | Part description                                             | Part number    |
|------|-------------------------------------------------------------|-------------|------|--------------------------------------------------------------|----------------|
| 1    | Heat exchanger                                              | B02935-01   | 20   | Transformer                                                  | L01F009        |
| 2    | Front top panel                                             | B03009      | 21   | Electronic card                                              | R99G003        |
| 3    | Filter rack right side                                      | B03014-01   | 22   | Electronic card wire harness                                 | B03807         |
| 4    | Right side panel assembly<br>(Items 3 & 5 included)         | B03017-01   | 23   | Burner wire harness                                          | B03808         |
| 5    | Side panel insulation                                       | B03016      | 24   | Wire conduit                                                 | B03015         |
| 6    | Front divider panel assembly<br>(Item 7 included)           | B03019      | 25   | Filter rack left side                                        | B03014-02      |
| 7    | Front divider panel insulation                              | B03018      | 26   | Left side panel assembly<br>(Items 5 & 25 included)          | B03017-02      |
| 8    | Observation door assembly                                   | B02111      | 27   | Rear top panel                                               | B03008-01      |
| 9    | Clean out door assembly                                     | B01842      | 28   | Blow er door                                                 | B03026         |
| 10   | Burner plate assembly<br>(Items 11,12 & 13)                 | B02938      | 29   | Rear divider panel assembly                                  | B03027-02      |
| 11   | Combustion chamber                                          | B02898      | 30   | Paper filter 10" x 20"                                       | Obtain locally |
| 12   | Burner plate                                                | B02952      | 31   | Paper filter 12" x 20"                                       | Obtain locally |
| 13   | Gasket, burner plate                                        | B02907      | 32   | Fan limit                                                    | B04272-02      |
| 14   | Front door (only)                                           | B03011      | 33   | Blow er assembly<br>(Items 34, 35, 37 included)              | B02584-03      |
| 15   | Handle                                                      | Z99F050     | 34   | Blow er 100-10T                                              | B03720-04      |
| 16   | Hex nut 3/8-NC brass (qty 12)                               | F07O001     | 35   | Motor support assembly<br>(band, legs, nut & bolts included) | B01888         |
| 17   | Floor assembly                                              | B03025      | 36   | Blow er support                                              | B03013         |
| 18   | Electrical box cover assembly                               | B03800      | 37   | Motor 1/2 HP                                                 | B03811-12      |
| 19   | Electrical box assembly<br>(Items 20, 21, 22 & 23 included) | B03803      | 38   | Electric motor harness                                       | B03798-01      |
|      |                                                             |             | 39   | Electronic motor harness                                     | B03242-03      |
|      |                                                             |             | 40   | Combustion chamber support                                   | B02953         |

B50102C

### 13 Components and replacement parts (continued)

Figure 11 Model CLB-140 Front furnaces – Component locations



B50104C

# 13 Components and replacement parts (continued)

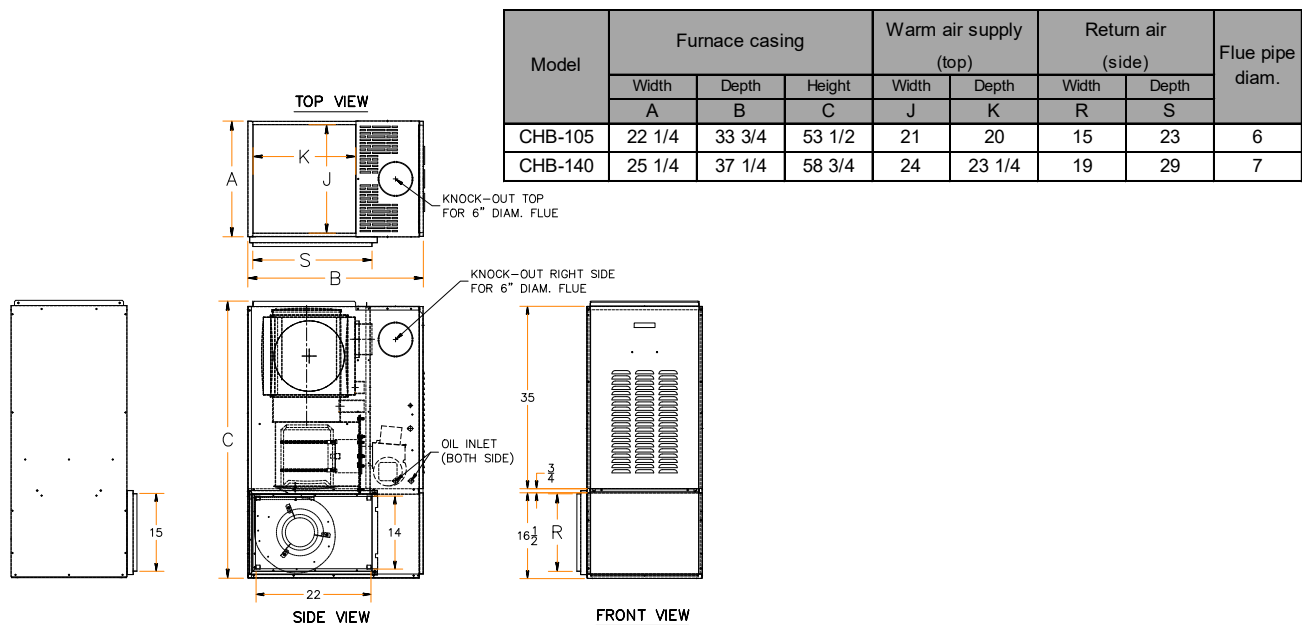
Model CLB-140 Front furnaces – Replacement parts list

| Item | Part description                                            | Part number | Item | Part description                                             | Part number    |
|------|-------------------------------------------------------------|-------------|------|--------------------------------------------------------------|----------------|
| 1    | Heat exchanger                                              | B03115-01   | 22   | Electronic card                                              | R99G003        |
| 2    | Front top panel                                             | B03135      | 23   | Electronic card wire harness                                 | B03807         |
| 3    | Filter rack right side                                      | B03146-01   | 24   | Burner wire harness                                          | B03808         |
| 4    | Right side panel assembly<br>(Items 3, 5 & 6 included)      | B03162-01   | 25   | Wire conduit                                                 | B03144         |
| 5    | Side panel insulation                                       | B03169      | 26   | Filter rack left side                                        | B03147-02      |
| 6    | Filter rack right side                                      | B03147-01   | 27   | Filter rack left side                                        | B03146-02      |
| 7    | Front divider panel assembly<br>(Item 8 included)           | B03165      | 28   | Left side panel assembly<br>(Items 5, 26 & 27 included)      | B03162-02      |
| 8    | Front divider panel insulation                              | B03170      | 29   | Rear top panel                                               | B03133-02      |
| 9    | Observation door assembly                                   | B02111      | 30   | Blow er door                                                 | B03163         |
| 10   | Clean out door assembly                                     | B01842      | 31   | Rear divider panel assembly                                  | B03168-01      |
| 11   | Burner plate assembly<br>(Items 12,13 & 14)                 | B03160      | 32   | Paper filter 16" x 24"                                       | Obtain locally |
| 12   | Combustion chamber                                          | B02899      | 33   | Paper filter 12" x 24"                                       | Obtain locally |
| 13   | Burner plate                                                | B03149      | 34   | Fan limit                                                    | B04272-02      |
| 14   | Gasket, burner plate                                        | B02905      | 35   | Blow er assembly<br>(Items 36, 37 & 39 included)             | B02583-02      |
| 15   | Front door (only)                                           | B03137      | 36   | Blow er 120-10T                                              | B03720-05      |
| 16   | Handle                                                      | Z99F050     | 37   | Motor support assembly<br>(band, legs, nut & bolts included) | B01889         |
| 17   | Hex nut 3/8-NC brass (qty 12)                               | F07O001     | 38   | Blow er support                                              | B03143         |
| 18   | Floor assembly                                              | B03167      | 39   | Motor 1 HP                                                   | B03813-09      |
| 19   | Electrical box cover assembly                               | B03800      | 40   | Inductor                                                     | B03141         |
| 20   | Electrical box assembly<br>(Items 21, 22, 23 & 24 included) | B03803      | 41   | Electronic motor harness                                     | B03242-03      |
| 21   | Transformer                                                 | L01F009     | 42   | Electric motor harness                                       | B03798-01      |
|      |                                                             |             | 43   | Combustion chamber support                                   | B03148         |

B50104C

## 14 Dimensions and ratings

**Figure 12** Model CHB-105/140 dimensional data – ALL DIMENSIONS IN INCHES



DNS-1269 Rev. A

| Model                | Input<br>(BTU/h) | Output<br>(BTU/h) | Firing rate<br>(GPH) | Installed nozzle | Blower size | Blower motor HP | Maximum cooling capacity<br>(tons) | Blower CFM                 |
|----------------------|------------------|-------------------|----------------------|------------------|-------------|-----------------|------------------------------------|----------------------------|
| Variable speed units |                  |                   |                      |                  |             |                 |                                    |                            |
| CHB-105              | 91,000           | 79,500            | 0.65                 |                  | 100-10T     | 3/4             | 3.5                                | See tables, pages 43 to 54 |
|                      | 105,000          | 90,000            | 0.75                 | □                | 100-10T     | 3/4             | 3.5                                |                            |
|                      | 119,000          | 101,000           | 0.85                 |                  | 100-10T     | 3/4             | 3.5                                |                            |
| CHB-140              | 140,000          | 119,000           | 1.00                 | □                | 120-10T     | 1               | 5                                  |                            |

| Model          | Maximum heating temperature rise<br>(°F) | Filter quantity and size | Volt - Hertz - Phase | Electrical load<br>(amps) | Minimum ampacity for wiring sizing | Maximum fuse size<br>(amps) | Ship weight<br>(pounds) |
|----------------|------------------------------------------|--------------------------|----------------------|---------------------------|------------------------------------|-----------------------------|-------------------------|
| CHB            |                                          |                          |                      |                           |                                    |                             |                         |
| Variable speed |                                          |                          |                      |                           |                                    |                             |                         |
| CHB-105        | 65 - 80                                  | (1) 16 X 24              | 115 - 60 - 1         | 12.2                      | 14.7                               | 20                          | 265                     |
| CHB-140        | 65 - 80                                  | (1) 20 X 30              | 115 - 60 - 1         | 15.7                      | 18.1                               | 20                          | 315                     |

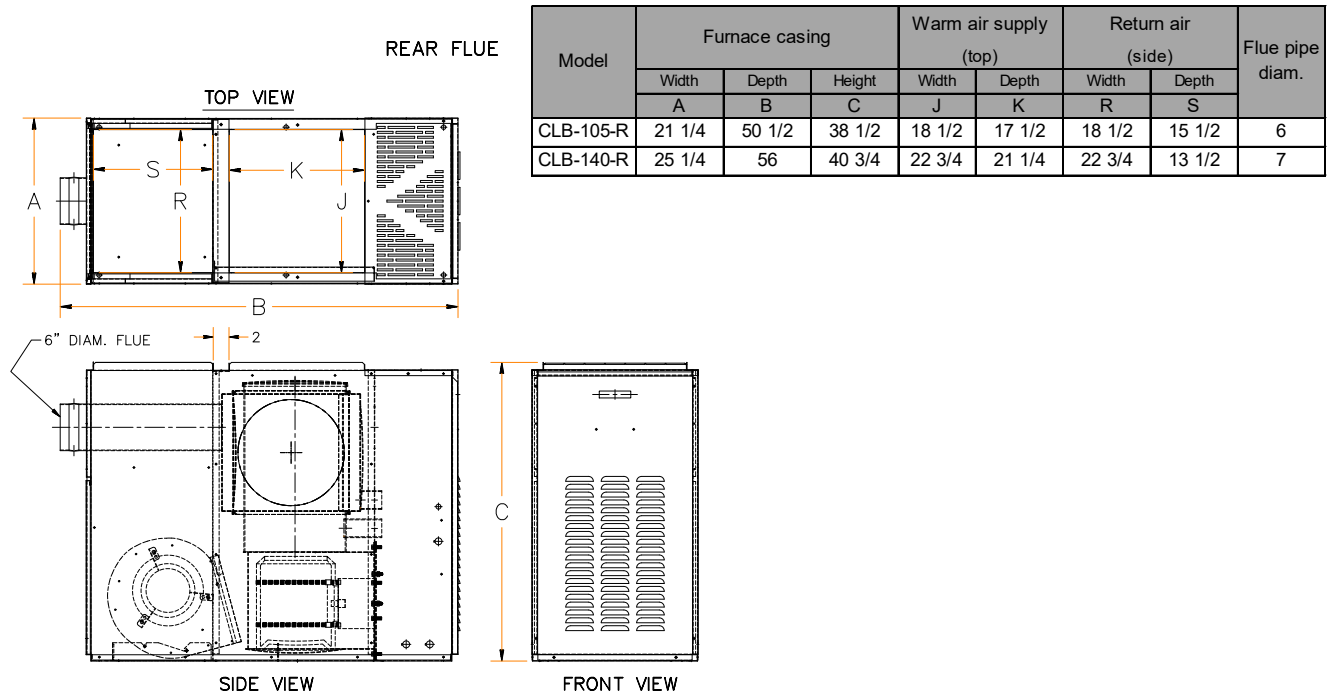


**NOTICE**

CHB furnaces are CSA design certified for installation on combustible flooring.

## 14 Dimensions and ratings (continued)

**Figure 13** Model CLB-105/140 Rear dimensional data – ALL DIMENSIONS IN INCHES



DNS-1268 Rev. A

| Model                | Input   | Output  | Firing rate | Installed nozzle | Blower size | Blower motor HP | Maximum cooling capacity | Blower CFM                |
|----------------------|---------|---------|-------------|------------------|-------------|-----------------|--------------------------|---------------------------|
|                      | (BTU/h) | (BTU/h) | (GPH)       |                  |             |                 | (tons)                   |                           |
| Variable speed units |         |         |             |                  |             |                 |                          |                           |
| CLB-105R             | 91,000  | 80,000  | 0.65        |                  | 100-10T     | 1 / 2           | 3.5                      | See tables, page 43 to 54 |
|                      | 105,000 | 90,000  | 0.75        | □                | 100-10T     | 1 / 2           | 3.5                      |                           |
|                      | 119,000 | 100,000 | 0.85        |                  | 100-10T     | 1 / 2           | 3.5                      |                           |
| CLB-140R             | 140,000 | 120,000 | 1.00        | □                | 120-10T     | 1               | 5                        |                           |
|                      | 168,000 | 142,000 | 1.20        |                  | 120-10T     | 1               | 5                        |                           |

| Model          | Maximum heating temperature rise<br>(°F) | Filter quantity and size  | Volt - Hertz - Phase | Electrical load<br>(amps) | Mnimum ampacity for wiring sizing | Maximum fuse size<br>(amps) | Ship weight<br>(pounds) |
|----------------|------------------------------------------|---------------------------|----------------------|---------------------------|-----------------------------------|-----------------------------|-------------------------|
| Variable speed |                                          |                           |                      |                           |                                   |                             |                         |
| CLB-105R       | 65 - 80                                  | (1) 12 X 20 / (1) 10 X 20 | 115 - 60 - 1         | 10.3                      | 12.2                              | 20                          | 250                     |
| CLB-140R       | 65 - 80                                  | (1) 16 X 24 / (1) 12 X 24 | 115 - 60 - 1         | 15.7                      | 18.1                              | 20                          | 345                     |

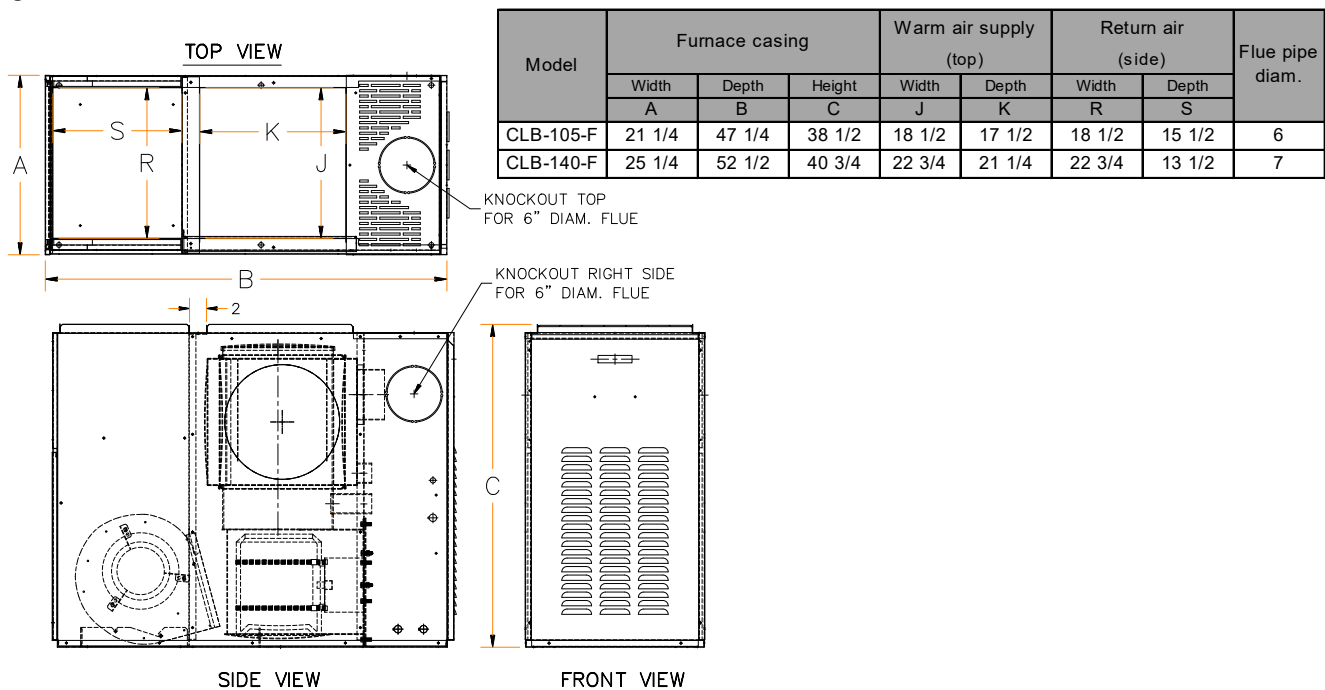


**NOTICE**

CLB furnaces are CSA design certified for installation on combustible flooring.

## 14 Dimensions and ratings (continued)

**Figure 14** Model CLB-105/140 Front dimensional data – ALL DIMENSIONS IN INCHES



DNS-1267 Rev. A

| Model                | Input<br>(BTU/h) | Output<br>(BTU/h) | Firing rate<br>(GPH) | Installed nozzle | Blower size | Blower motor HP | Maximum cooling capacity<br>(tons) | Blower CFM                 |
|----------------------|------------------|-------------------|----------------------|------------------|-------------|-----------------|------------------------------------|----------------------------|
| Variable speed units |                  |                   |                      |                  |             |                 |                                    |                            |
| CLB-105F             | 91,000           | 80,000            | 0.65                 |                  | 100-10T     | 1 / 2           | 3 1/2                              | See tables pages, 43 to 54 |
|                      | 105,000          | 90,000            | 0.75                 | □                | 100-10T     | 1 / 2           | 3 1/2                              |                            |
|                      | 119,000          | 100,000           | 0.85                 |                  | 100-10T     | 1 / 2           | 3 1/2                              |                            |
| CLB-140F             | 140,000          | 120,000           | 1.00                 | □                | 120-10T     | 1               | 5                                  |                            |
|                      | 168,000          | 141,000           | 1.20                 |                  | 120-10T     | 1               | 5                                  |                            |

| Model          | Maximum heating temperature rise<br>(°F) | Filter quantity and size  | Volt - Hertz - Phase | Electrical load<br>(amps) | Minimum ampacity for wiring sizing | Maximum fuse size<br>(amps) | Ship weight<br>(pounds) |
|----------------|------------------------------------------|---------------------------|----------------------|---------------------------|------------------------------------|-----------------------------|-------------------------|
| Variable speed |                                          |                           |                      |                           |                                    |                             |                         |
| CLB-105F       | 65 - 80                                  | (1) 10 X 20 / (1) 12 X 20 | 115 - 60 - 1         | 10.3                      | 12.2                               | 15                          | 241                     |
| CLB-140F       | 65 - 80                                  | (1) 16 X 24 / (1) 12 X 24 | 115 - 60 - 1         | 15.7                      | 18.1                               | 20                          | 330                     |



**NOTICE**

CLB furnaces are CSA design certified for installation on combustible flooring.

## 14 Dimensions and ratings (continued)

### Model CHB & CLB-105 burner data

#### BECKETT BURNER - Model AFG (3450 RPM) - Tube insertion 5 1/2"

| Model     | Input<br>BTU/h | Firing rate<br>USGPH | AFUE  | Nozzle<br>(Delavan) | Pump<br>pressure<br>(PSIG) | Head | Low firing<br>rate baffle | Static disc | Combustion<br>air adjustment<br>(Band/Shutter) |
|-----------|----------------|----------------------|-------|---------------------|----------------------------|------|---------------------------|-------------|------------------------------------------------|
| CHB-105   | 91,000         | 0.65                 | 86.0% | 0.65-80B            | 100                        | F3   | Yes                       | 3 3/8 U     | 0 / 6                                          |
|           | 105,000        | 0.75                 | 85.0% | 0.75-80B            | 100                        | F4   | Yes                       | 3 3/8 U     | 0 / 7                                          |
|           | 119,000        | 0.85                 | 85.3% | 0.85-80B            | 100                        | F4   | Yes                       | 3 3/8 U     | 0 / 9                                          |
| CLB-105 F | 91,000         | 0.65                 | 86.0% | 0.65-80B            | 100                        | F3   | Yes                       | 3 3/8 U     | 0 / 6                                          |
|           | 105,000        | 0.75                 | 86.0% | 0.75-80B            | 100                        | F4   | Yes                       | 3 3/8 U     | 0 / 7                                          |
|           | 119,000        | 0.85                 | 85.3% | 0.85-80B            | 100                        | F4   | Yes                       | 3 3/8 U     | 0 / 9                                          |
| CLB-105 R | 91,000         | 0.65                 | 86.1% | 0.65-80B            | 100                        | F3   | Yes                       | 3 3/8 U     | 0 / 6                                          |
|           | 105,000        | 0.75                 | 85.2% | 0.75-80B            | 100                        | F4   | Yes                       | 3 3/8 U     | 0 / 7                                          |
|           | 119,000        | 0.85                 | 85.2% | 0.85-80B            | 100                        | F4   | Yes                       | 3 3/8 U     | 0 / 9                                          |

#### BECKETT BURNER - Model NX - Tube insertion 5 1/4"

| Model     | Input<br>BTU/h | Firing rate<br>USGPH | AFUE  | Nozzle<br>(Delavan) | Pump<br>pressure<br>(PSIG) | Head   | Low firing<br>rate baffle | ATC      | Combustion<br>air adjustment |
|-----------|----------------|----------------------|-------|---------------------|----------------------------|--------|---------------------------|----------|------------------------------|
| CHB-105   | 91,000         | 0.65                 | 86.0% | 0,55 x 60W          | 140                        | 9 slot | No                        | NX70LBHS | 1.75                         |
|           | 105,000        | 0.75                 | 86.0% | 0,65 x 60W          | 140                        | 9 slot | No                        | NX70LBHS | 2.50                         |
|           | 119,000        | 0.85                 | 85.1% | 0,75 x 60W          | 140                        | 9 slot | No                        | NX70LBHS | 3.00                         |
| CLB-105 F | 91,000         | 0.65                 | 86.0% | 0,55 x 60W          | 140                        | 9 slot | No                        | NX70LBHS | 1.75                         |
|           | 105,000        | 0.75                 | 86.0% | 0,65 x 60W          | 140                        | 9 slot | No                        | NX70LBHS | 2.50                         |
|           | 119,000        | 0.85                 | 85.5% | 0,75 x 60W          | 140                        | 9 slot | No                        | NX70LBHS | 3.00                         |
| CLB-105 R | 91,000         | 0.65                 | 85.9% | 0,55 x 60W          | 140                        | 9 slot | No                        | NX70LBHS | 1.75                         |
|           | 105,000        | 0.75                 | 85.4% | 0,65 x 60W          | 140                        | 9 slot | No                        | NX70LBHS | 2.50                         |
|           | 119,000        | 0.85                 | 85.5% | 0,75 x 60W          | 140                        | 9 slot | No                        | NX70LBHS | 3.00                         |

#### RIELLO BURNER - Model 40-F3 - Tube insertion 5 1/2"

| Model     | Input<br>BTU/h | Firing rate<br>USGPH | AFUE  | Nozzle<br>(Delavan) | Pump<br>pressure<br>(PSIG) | Combustion<br>air adjustment<br>(Band/Shutter) |
|-----------|----------------|----------------------|-------|---------------------|----------------------------|------------------------------------------------|
| CHB-105   | 91,000         | 0.65                 | 86.0% | 0.55-60B            | 140                        | 1 / 1.75                                       |
|           | 105,000        | 0.75                 | 85.5% | 0.60-60B            | 155                        | 2 / 2.75                                       |
|           | 119,000        | 0.85                 | 85.4% | 0.75-60B            | 130                        | 2 / 3.75                                       |
| CLB-105 F | 91,000         | 0.65                 | 86.0% | 0.55-60B            | 140                        | 1 / 1.75                                       |
|           | 105,000        | 0.75                 | 86.0% | 0.60-60B            | 155                        | 2 / 2.75                                       |
|           | 119,000        | 0.85                 | 85.2% | 0.75-60B            | 130                        | 2 / 3.75                                       |
| CLB-105 R | 91,000         | 0.65                 | 86.4% | 0.55-60B            | 140                        | 1 / 1.75                                       |
|           | 105,000        | 0.75                 | 86.2% | 0.60-60B            | 155                        | 2 / 2.75                                       |
|           | 119,000        | 0.85                 | 85.6% | 0.75-60B            | 130                        | 2 / 3.75                                       |

#### CARLIN BURNER - EZ-1 - Tube insertion 5 1/2"

| Model     | Input<br>BTU/h | Firing rate<br>USGPH | AFUE  | Nozzle<br>(Hago) | Pump<br>pressure<br>(PSIG) | Combustion<br>air adjustment<br>(Bar / Band) |
|-----------|----------------|----------------------|-------|------------------|----------------------------|----------------------------------------------|
| CHB-105   | 91,000         | 0.65                 | 86.0% | 0.65-70A         | 100                        | 0.60-0.65 / 0.65                             |
|           | 105,000        | 0.75                 | 85.5% | 0.75-70A         | 100                        | 0.75 / 0.75                                  |
|           | 119,000        | 0.85                 | 85.4% | 0.85-70A         | 100                        | 0.85-1.00 / 0.85                             |
| CLB-105 F | 91,000         | 0.65                 | 86.0% | 0.65-70A         | 100                        | 0.60-0.65 / 0.65                             |
|           | 105,000        | 0.75                 | 86.0% | 0.75-70A         | 100                        | 0.75 / 0.75                                  |
|           | 119,000        | 0.85                 | 85.0% | 0.85-70A         | 100                        | 0.85-1.00 / 0.85                             |
| CLB-105 R | 91,000         | 0.65                 | 86.4% | 0.65-70A         | 100                        | 0.60-0.65 / 0.65                             |
|           | 105,000        | 0.75                 | 85.1% | 0.75-70A         | 100                        | 0.75 / 0.75                                  |
|           | 119,000        | 0.85                 | 85.4% | 0.85-70A         | 100                        | 0.85-1.00 / 0.85                             |

## 14 Dimensions and ratings (continued)

### Model CHB & CLB-140 burner data

#### BECKETT BURNER - Model AFG (3450 RPM) - Tube insertion 8 1/4"

| Model     | Input<br>BTU/h | Firing rate<br>USGPH | AFUE  | Nozzle<br>(Delavan) | Pump<br>pressure<br>(PSIG) | Head | Low firing<br>rate baffle | Static<br>disc | Combustion<br>air adjustment<br>(Band/Shutter) |
|-----------|----------------|----------------------|-------|---------------------|----------------------------|------|---------------------------|----------------|------------------------------------------------|
| CHB-140   | 140,000        | 1.00                 | 85.0% | 1.00 - 70A          | 100                        | F3   | No                        | 2 3/4 U        | 0 / 6                                          |
| CLB-140 F | 140,000        | 1.00                 | 85.7% | 1.00 - 70A          | 100                        | F3   | No                        | 2 3/4 U        | 0 / 6                                          |
|           | 168,000        | 1.20                 | 85.6% | 1.25 - 70A          | 100                        | F3   | No                        | 2 3/4 U        | 2 / 4                                          |
| CLB-140 R | 140,000        | 1.00                 | 85.7% | 1.00 - 70A          | 100                        | F3   | No                        | 2 3/4 U        | 0 / 6                                          |
|           | 168,000        | 1.20                 | 85.9% | 1.25 - 70A          | 100                        | F3   | No                        | 2 3/4 U        | 2 / 4                                          |

#### BECKETT BURNER - Model NX - Tube insertion 7 7/8"

| Model     | Input<br>BTU/h | Firing rate<br>USGPH | AFUE  | Nozzle<br>(Delavan) | Pump<br>pressure<br>(PSIG) | Head   | Low firing<br>rate baffle | ATC      | Combustion<br>air adjustment |
|-----------|----------------|----------------------|-------|---------------------|----------------------------|--------|---------------------------|----------|------------------------------|
| CHB-140   | 140,000        | 1.00                 | 86.0% | 0.85 x 60W          | 140                        | 9 slot | No                        | NX90LBHS | 3.5                          |
| CLB-140 F | 140,000        | 1.00                 | 86.0% | 0.85 x 60W          | 140                        | 9 slot | No                        | NX90LBHS | 3.5                          |
|           | 168,000        | 1.20                 | 85.4% | 1.00 x 60W          | 150                        | 9 slot | Yes (32229)               | NX90LDHS | 2.5                          |
| CLB-140 R | 140,000        | 1.00                 | 86.0% | 0.85 x 60W          | 140                        | 9 slot | No                        | NX90LBHS | 3.5                          |
|           | 168,000        | 1.20                 | 85.6% | 1.00 x 60W          | 150                        | 9 slot | Yes (32229)               | NX90LDHS | 2.5                          |

#### RIELLO BURNER - Model 40-F5 - Tube insertion 8"

| Model     | Input<br>BTU/h | Firing rate<br>USGPH | AFUE  | Nozzle<br>(Delavan) | Pump<br>pressure<br>(PSIG) | Combustion<br>air adjustment<br>(Band/Shutter) |
|-----------|----------------|----------------------|-------|---------------------|----------------------------|------------------------------------------------|
| CHB-140   | 140,000        | 1.00                 | 85.2% | 0.85 - 60B          | 140                        | 1 / 2.5                                        |
| CLB-140 F | 140,000        | 1.00                 | 86.0% | 0.85 - 60B          | 140                        | 1 / 2.5                                        |
|           | 168,000        | 1.20                 | 85.1% | 1.10 - 60B          | 120                        | 2 / 3.25                                       |
| CLB-140 R | 140,000        | 1.00                 | 86.0% | 0.85 - 60B          | 140                        | 1 / 2.5                                        |
|           | 168,000        | 1.20                 | 86.1% | 1.10 - 60B          | 120                        | 2 / 3.25                                       |

#### CARLIN BURNER - EZ-1 - Tube insertion 8 1/2"

| Model     | Input<br>BTU/h | Firing rate<br>USGPH | AFUE  | Nozzle<br>(Hago) | Pump<br>pressure<br>(PSIG) | Combustion<br>air adjustment<br>(Bar / Band) |
|-----------|----------------|----------------------|-------|------------------|----------------------------|----------------------------------------------|
| CHB-140   | 140,000        | 1.00                 | 86.0% | 1.00 - 60SS      | 100                        | 0.85 - 1.00 / 1,00                           |
| CLB-140 F | 140,000        | 1.00                 | 86.0% | 1.00 - 60SS      | 100                        | 0.85 - 1.00 / 1,00                           |
| CLB-140 R | 140,000        | 1.00                 | 86.0% | 1.00 - 60SS      | 100                        | 0.85 - 1.00 / 1,00                           |
|           | 168,000        | 1.20                 | 85.2% | 1.20 - 60SS      | 100                        | 1.10 - 1.25 / 1.20                           |

**14 Dimensions and ratings** (continued)

**MODEL: CHB105-VS**

| <b>OIL HEATING MODE</b><br>24 VAC input (R) on W only |                       |                                           |                                           |                                           |
|-------------------------------------------------------|-----------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| <b>SW1- HEAT</b><br>DIP switch position               | HEAT INPUT<br>(USGPH) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                      | 0.85                  | 1300                                      | 1425                                      | 1165                                      |
| B (1=ON, 2=OFF)                                       | 0.75                  | 1070                                      | 1175                                      | 965                                       |
| C (1=OFF, 2=ON)                                       | 0.65                  | 950                                       | 1050                                      | 855                                       |
| D (1=ON, 2=ON)                                        | 0.85                  | SAME VALUES AS 'A' DIP SWITCH POSITION    |                                           |                                           |

| <b>CONTINUOUS FAN</b><br>24 VAC input (R) on G only |                   |                                           |                                           |                                           |
|-----------------------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| <b>SW2- COOL</b><br>DIP switch position             | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                    | 3.5               | 1050                                      | + 15 %                                    | - 15 %                                    |
| B (1=ON, 2=OFF)                                     | 3.0               | 900                                       |                                           |                                           |
| C (1=OFF, 2=ON)                                     | 2.5               | 750                                       |                                           |                                           |
| D (1=ON, 2=ON)                                      | 2.0               | 600                                       |                                           |                                           |

| <b>COOLING OR HEAT PUMP HEATING MODE</b><br>24 VAC input (R) to G, Y/Y2 and O (for cooling or 2nd stage) |                   |                                           |                                           |                                           |
|----------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| <b>SW2- COOL</b><br>DIP switch position                                                                  | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                                                                         | 3.5               | 1400                                      | 1500                                      | 1260                                      |
| B (1=ON, 2=OFF)                                                                                          | 3.0               | 1200                                      | 1320                                      | 1080                                      |
| C (1=OFF, 2=ON)                                                                                          | 2.5               | 1000                                      | 1100                                      | 900                                       |
| D (1=ON, 2=ON)                                                                                           | 2.0               | 800                                       | 880                                       | 720                                       |

In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.

| <b>COOLING OR HEAT PUMP HEATING MODE</b><br>24 VAC input (R) to G, Y1 and O (first stage cooling) |                   |                                           |                                           |                                           |
|---------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| <b>SW2- COOL</b><br>DIP switch position                                                           | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                                                                  | 3.5               | 1115                                      | 1225                                      | 1005                                      |
| B (1=ON, 2=OFF)                                                                                   | 3.0               | 955                                       | 1050                                      | 860                                       |
| C (1=OFF, 2=ON)                                                                                   | 2.5               | 795                                       | 875                                       | 715                                       |
| D (1=ON, 2=ON)                                                                                    | 2.0               | 635                                       | 700                                       | 575                                       |

In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.

| <b>DELAY PROFILE FOR OIL HEATING MODE</b> |                       |                                     |                                       |                               |
|-------------------------------------------|-----------------------|-------------------------------------|---------------------------------------|-------------------------------|
| <b>SW4- DELAY</b><br>DIP switch position  | HEAT INPUT<br>(USGPH) | PreRun On-Delay<br>CFM Level - Time | ShortRun On-Delay<br>CFM Level - Time | Off-Delay<br>CFM Level - Time |
| A (1=OFF, 2=OFF)                          | 0.85                  | 13% - 120 sec.                      | 50 % - 60 sec.                        | 63 % - 450 sec.               |
| B (1=ON, 2=OFF)                           | 0.75                  | 13% - 210 sec.                      | 44 % - 60 sec.                        | 56 % - 600 sec.               |
| C (1=OFF, 2=ON)                           | 0.65                  | 13% - 180 sec.                      | 50 % - 60 sec.                        | 56 % - 600 sec.               |
| D (1=ON, 2=ON)                            | any                   | 13% - 30 sec.                       | 100 % - 30 sec.                       | 100 % - 120 sec.              |

PreRun and ShortRun are the periods of time when the the blower delivers very low air flow to minimize the distributon of cool air in the system and then runs up to normal speed.

Off Delay is the time required to cool down the heat exchanger with lower air flow, to minimize cool draft in the air distribution system.

| <b>DELAY PROFILE FOR COOLING OR HEAT PUMP HEATING MODE</b> |          |                                     |                                       |                               |
|------------------------------------------------------------|----------|-------------------------------------|---------------------------------------|-------------------------------|
| No adjustment<br>required                                  | A/C size | PreRun On-Delay<br>CFM Level - Time | ShortRun On-Delay<br>CFM Level - Time | Off-Delay<br>CFM Level - Time |
| -                                                          | All      | NO DELAY                            | NO DELAY                              | 100% - 90 sec.                |

**NOTE: Disconnect main power to unit prior to changing DIP switch settings.**

**14 Dimensions and ratings** (continued)

**MODEL: CHB140-VS**

| <b>OIL HEATING MODE</b><br>24 VAC input (R) on W only |                       |                                           |                                           |                                           |
|-------------------------------------------------------|-----------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| <b>SW1- HEAT</b><br>DIP switch position               | HEAT INPUT<br>(USGPH) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| B (1=ON, 2=OFF)                                       | 1.00                  | 1460                                      | 1605                                      | 1310                                      |
| D (1=ON, 2=ON)                                        | 1.00                  | SAME VALUES AS 'B' DIP SWITCH POSITION    |                                           |                                           |

| <b>CONTINUOUS FAN</b><br>24 VAC input (R) on G only |                   |                                           |                                           |                                           |
|-----------------------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| <b>SW2- COOL</b><br>DIP switch position             | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                    | 5.0               | 1500                                      | + 15 %                                    | - 15 %                                    |
| B (1=ON, 2=OFF)                                     | 4.0               | 1200                                      |                                           |                                           |
| C (1=OFF, 2=ON)                                     | 3.5               | 1050                                      |                                           |                                           |
| D (1=ON, 2=ON)                                      | 3.0               | 900                                       |                                           |                                           |

| <b>COOLING OR HEAT PUMP HEATING MODE</b><br>24 VAC input (R) to G, Y/Y2 and O (for cooling or 2nd stage) |                   |                                           |                                           |                                           |
|----------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| <b>SW2- COOL</b><br>DIP switch position                                                                  | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                                                                         | 5.0               | 2000                                      | 2000                                      | 1800                                      |
| B (1=ON, 2=OFF)                                                                                          | 4.0               | 1600                                      | 1760                                      | 1440                                      |
| C (1=OFF, 2=ON)                                                                                          | 3.5               | 1405                                      | 1545                                      | 1260                                      |
| D (1=ON, 2=ON)                                                                                           | 3.0               | 1200                                      | 1320                                      | 1080                                      |
| In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.             |                   |                                           |                                           |                                           |

| <b>COOLING OR HEAT PUMP HEATING MODE</b><br>24 VAC input (R) to G, Y1 and O (first stage cooling) |                   |                                           |                                           |                                           |
|---------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| <b>SW2- COOL</b><br>DIP switch position                                                           | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                                                                  | 5.0               | 1595                                      | 1755                                      | 1435                                      |
| B (1=ON, 2=OFF)                                                                                   | 4.0               | 1275                                      | 1400                                      | 1150                                      |
| C (1=OFF, 2=ON)                                                                                   | 3.5               | 1115                                      | 1230                                      | 1005                                      |
| D (1=ON, 2=ON)                                                                                    | 3.0               | 955                                       | 1050                                      | 860                                       |
| In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.      |                   |                                           |                                           |                                           |

| <b>DELAY PROFILE FOR OIL HEATING MODE</b>                                                                                                                                                                                                                                                                                     |                       |                                     |                                       |                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------------|---------------------------------------|-------------------------------|
| <b>SW4- DELAY</b><br>DIP switch position                                                                                                                                                                                                                                                                                      | HEAT INPUT<br>(USGPH) | PreRun On-Delay<br>CFM Level - Time | ShortRun On-Delay<br>CFM Level - Time | Off-Delay<br>CFM Level - Time |
| B (1=ON, 2=OFF)                                                                                                                                                                                                                                                                                                               | 1.00                  | 13% - 120 sec.                      | 50 % - 30 sec.                        | 56 % - 600 sec.               |
| D (1=ON, 2=ON)                                                                                                                                                                                                                                                                                                                | 1.00                  | 13% - 120 sec.                      | 50 % - 30 sec.                        | 44 % - 600 sec.               |
| PreRun and ShortRun are the periods of time when the blower delivers very low air flow to minimize the distribution of cool air in the system and then runs up to normal speed.<br>Off Delay is the time required to cool down the heat exchanger with lower air flow, to minimize cool draft in the air distribution system. |                       |                                     |                                       |                               |

| <b>DELAY PROFILE FOR COOLING OR HEAT PUMP HEATING MODE</b> |          |                                     |                                       |                               |
|------------------------------------------------------------|----------|-------------------------------------|---------------------------------------|-------------------------------|
| No adjustment<br>required                                  | A/C size | PreRun On-Delay<br>CFM Level - Time | ShortRun On-Delay<br>CFM Level - Time | Off-Delay<br>CFM Level - Time |
| -                                                          | All      | NO DELAY                            | NO DELAY                              | 100% - 90 sec.                |

**NOTE: Disconnect main power to unit prior to changing DIP switch settings.**

**Dimensions and ratings** (continued)

**MODEL: CLB105-VS**

| <b>OIL HEATING MODE</b>                 |                       |                                           |                                           |                                           |
|-----------------------------------------|-----------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| 24 VAC input (R) on W only              |                       |                                           |                                           |                                           |
| <b>SW1- HEAT</b><br>DIP switch position | HEAT INPUT<br>(USGPH) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                        | 0.85                  | 1200                                      | 1315                                      | 1075                                      |
| B (1=ON, 2=OFF)                         | 0.75                  | 1050                                      | 1155                                      | 945                                       |
| C (1=OFF, 2=ON)                         | 0.65                  | 880                                       | 970                                       | 790                                       |
| D (1=ON, 2=ON)                          | 0.85                  | SAME VALUES AS 'A' DIP SWITCH POSITION    |                                           |                                           |

| <b>CONTINUOUS FAN</b>                   |                   |                                           |                                           |                                           |
|-----------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| 24 VAC input (R) on G only              |                   |                                           |                                           |                                           |
| <b>SW2- COOL</b><br>DIP switch position | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                        | 3.5               | 1050                                      | + 15 %                                    | - 15 %                                    |
| B (1=ON, 2=OFF)                         | 3.0               | 900                                       |                                           |                                           |
| C (1=OFF, 2=ON)                         | 2.5               | 750                                       |                                           |                                           |
| D (1=ON, 2=ON)                          | 2.0               | 600                                       |                                           |                                           |

| <b>COOLING OR HEAT PUMP HEATING MODE</b>                     |                   |                                           |                                           |                                           |
|--------------------------------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| 24 VAC input (R) to G, Y/Y2 and O (for cooling or 2nd stage) |                   |                                           |                                           |                                           |
| <b>SW2- COOL</b><br>DIP switch position                      | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                             | 3.5               | 1400                                      | 1535                                      | 1260                                      |
| B (1=ON, 2=OFF)                                              | 3.0               | 1200                                      | 1315                                      | 1075                                      |
| C (1=OFF, 2=ON)                                              | 2.5               | 1000                                      | 1100                                      | 900                                       |
| D (1=ON, 2=ON)                                               | 2.0               | 800                                       | 880                                       | 720                                       |

In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.

| <b>COOLING OR HEAT PUMP HEATING MODE</b>              |                   |                                           |                                           |                                           |
|-------------------------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| 24 VAC input (R) to G, Y1 and O (first stage cooling) |                   |                                           |                                           |                                           |
| <b>SW2- COOL</b><br>DIP switch position               | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                      | 3.5               | 1115                                      | 1225                                      | 1000                                      |
| B (1=ON, 2=OFF)                                       | 3.0               | 955                                       | 1050                                      | 860                                       |
| C (1=OFF, 2=ON)                                       | 2.5               | 800                                       | 880                                       | 720                                       |
| D (1=ON, 2=ON)                                        | 2.0               | 640                                       | 705                                       | 575                                       |

In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.

| <b>DELAY PROFILE FOR OIL HEATING MODE</b> |                       |                                     |                                       |                               |
|-------------------------------------------|-----------------------|-------------------------------------|---------------------------------------|-------------------------------|
| <b>SW4- DELAY</b><br>DIP switch position  | HEAT INPUT<br>(USGPH) | PreRun On-Delay<br>CFM Level - Time | ShortRun On-Delay<br>CFM Level - Time | Off-Delay<br>CFM Level - Time |
| A (1=OFF, 2=OFF)                          | 0.85                  | 13% - 120 sec.                      | 50 % - 30 sec.                        | 50 % - 600 sec.               |
| B (1=ON, 2=OFF)                           | 0.75                  | 13% - 120 sec.                      | 50 % - 30 sec.                        | 63 % - 600 sec.               |
| C (1=OFF, 2=ON)                           | 0.65                  | 13% - 120 sec.                      | 50 % - 30 sec.                        | 75 % - 600 sec.               |
| D (1=ON, 2=ON)                            | any                   | 13% - 120 sec.                      | 50 % - 30 sec.                        | 82 % - 450 sec.               |

PreRun and ShortRun are the periods of time when the the blower delivers very low air flow to minimize the distribution of cool air in the system and then runs up to normal speed.

Off Delay is the time required to cool down the heat exchanger with lower air flow, to minimize cool draft in the air distribution system.

| <b>DELAY PROFILE FOR COOLING OR HEAT PUMP HEATING MODE</b> |          |                                     |                                       |                               |
|------------------------------------------------------------|----------|-------------------------------------|---------------------------------------|-------------------------------|
| No adjustment<br>required                                  | A/C size | PreRun On-Delay<br>CFM Level - Time | ShortRun On-Delay<br>CFM Level - Time | Off-Delay<br>CFM Level - Time |
| -                                                          | All      | NO DELAY                            | NO DELAY                              | 100% - 90 sec.                |

**NOTE: Disconnect main power to unit prior to changing DIP switch settings.**

## Dimensions and ratings (continued)

### MODEL: CLB140-VS

| OIL HEATING MODE                 |                       |                                           |                                           |                                           |
|----------------------------------|-----------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| 24 VAC input (R) on W only       |                       |                                           |                                           |                                           |
| SW1- HEAT<br>DIP switch position | HEAT INPUT<br>(USGPH) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                 | 1.20                  | 1755                                      | 1930                                      | 1580                                      |
| B (1=ON, 2=OFF)                  | 1.00                  | 1455                                      | 1600                                      | 1310                                      |
| C (1=OFF, 2=ON)                  | 1.20                  | SAME VALUES AS 'A' DIP SWITCH POSITION    |                                           |                                           |
| D (1=ON, 2=ON)                   | 1.00                  | SAME VALUES AS 'B' DIP SWITCH POSITION    |                                           |                                           |

| CONTINUOUS FAN                   |                   |                                           |                                           |                                           |
|----------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| 24 VAC input (R) on G only       |                   |                                           |                                           |                                           |
| SW2- COOL<br>DIP switch position | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                 | 5.0               | 1500                                      | + 15 %                                    | - 15 %                                    |
| B (1=ON, 2=OFF)                  | 4.0               | 1200                                      |                                           |                                           |
| C (1=OFF, 2=ON)                  | 3.5               | 1050                                      |                                           |                                           |
| D (1=ON, 2=ON)                   | 3.0               | 900                                       |                                           |                                           |

| COOLING OR HEAT PUMP HEATING MODE                            |                   |                                           |                                           |                                           |
|--------------------------------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| 24 VAC input (R) to G, Y/Y2 and O (for cooling or 2nd stage) |                   |                                           |                                           |                                           |
| SW2- COOL<br>DIP switch position                             | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                             | 5.0               | 2000                                      | 2100                                      | 1800                                      |
| B (1=ON, 2=OFF)                                              | 4.0               | 1600                                      | 1755                                      | 1435                                      |
| C (1=OFF, 2=ON)                                              | 3.5               | 1400                                      | 1540                                      | 1260                                      |
| D (1=ON, 2=ON)                                               | 3.0               | 1200                                      | 1320                                      | 1080                                      |

In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.

| COOLING OR HEAT PUMP HEATING MODE                     |                   |                                           |                                           |                                           |
|-------------------------------------------------------|-------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| 24 VAC input (R) to G, Y1 and O (first stage cooling) |                   |                                           |                                           |                                           |
| SW2- COOL<br>DIP switch position                      | A/C size<br>(TON) | CFM with SW3-ADJ<br>DIP switch position A | CFM with SW3-ADJ<br>DIP switch position B | CFM with SW3-ADJ<br>DIP switch position C |
| A (1=OFF, 2=OFF)                                      | 5.0               | 1595                                      | 1755                                      | 1435                                      |
| B (1=ON, 2=OFF)                                       | 4.0               | 1270                                      | 1400                                      | 1145                                      |
| C (1=OFF, 2=ON)                                       | 3.5               | 1115                                      | 1225                                      | 1005                                      |
| D (1=ON, 2=ON)                                        | 3.0               | 960                                       | 1055                                      | 860                                       |

In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.

| DELAY PROFILE FOR OIL HEATING MODE |                       |                                     |                                       |                               |
|------------------------------------|-----------------------|-------------------------------------|---------------------------------------|-------------------------------|
| SW4- DELAY<br>DIP switch position  | HEAT INPUT<br>(USGPH) | PreRun On-Delay<br>CFM Level - Time | ShortRun On-Delay<br>CFM Level - Time | Off-Delay<br>CFM Level - Time |
| A (1=OFF, 2=OFF)                   | 1.20                  | 13% - 120 sec.                      | 50 % - 30 sec.                        | 44 % - 600 sec.               |
| B (1=ON, 2=OFF)                    | 1.00                  | 13% - 120 sec.                      | 50 % - 30 sec.                        | 56 % - 600 sec.               |
| C (1=OFF, 2=ON)                    | 1.20                  | 13% - 120 sec.                      | 50 % - 30 sec.                        | 50 % - 600 sec.               |
| D (1=ON, 2=ON)                     | 1.00                  | 13% - 120 sec.                      | 50 % - 30 sec.                        | 75 % - 450 sec.               |

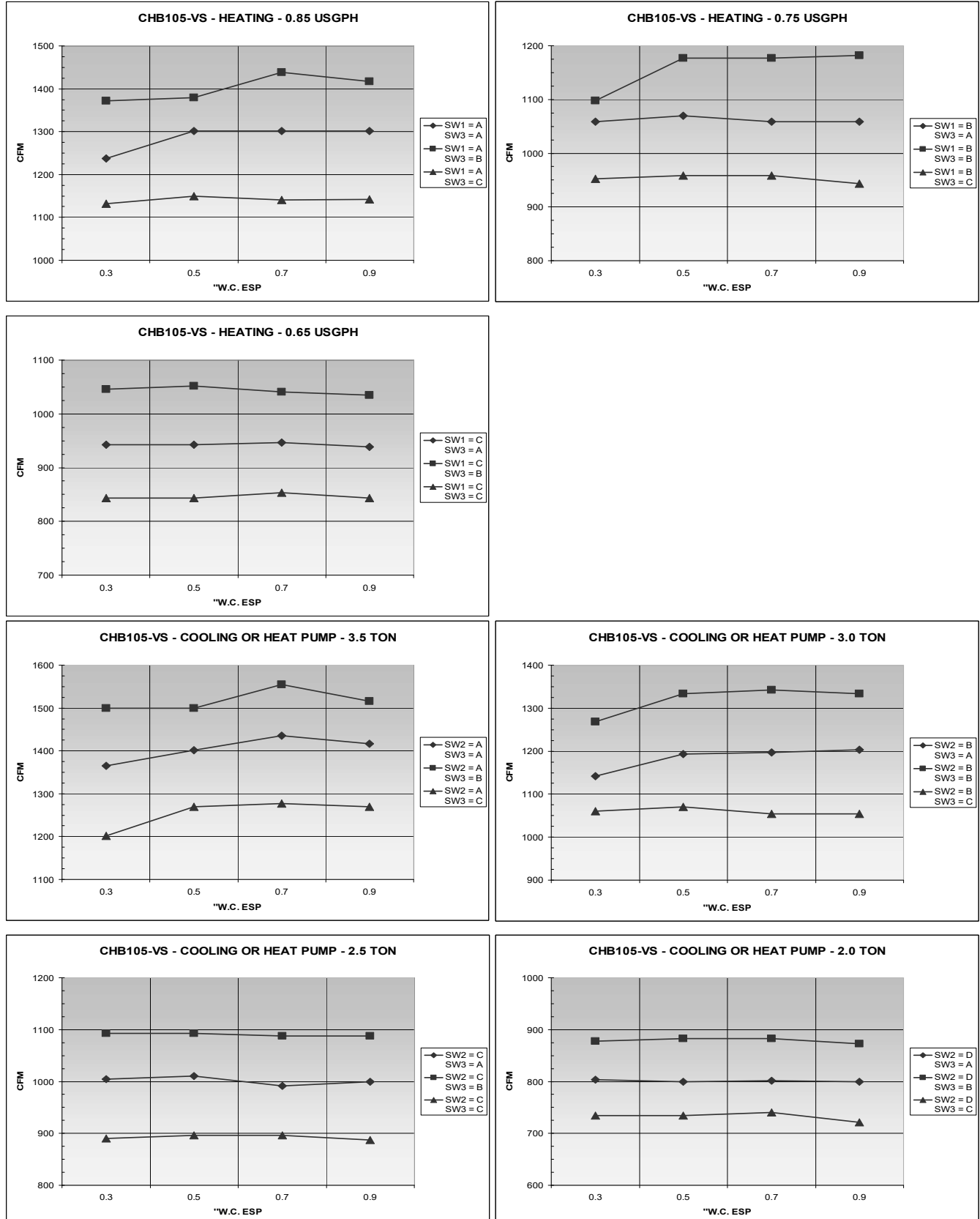
PreRun and ShortRun are the periods of time when the the blower delivers very low air flow to minimize the distribution of cool air in the system and then runs up to normal speed.

Off Delay is the time required to cool down the heat exchanger with lower air flow, to minimize cool draft in the air distribution system.

| DELAY PROFILE FOR COOLING OR HEAT PUMP HEATING MODE |          |                                     |                                       |                               |
|-----------------------------------------------------|----------|-------------------------------------|---------------------------------------|-------------------------------|
| No adjustment<br>required                           | A/C size | PreRun On-Delay<br>CFM Level - Time | ShortRun On-Delay<br>CFM Level - Time | Off-Delay<br>CFM Level - Time |
| -                                                   | All      | NO DELAY                            | NO DELAY                              | 100% - 90 sec.                |

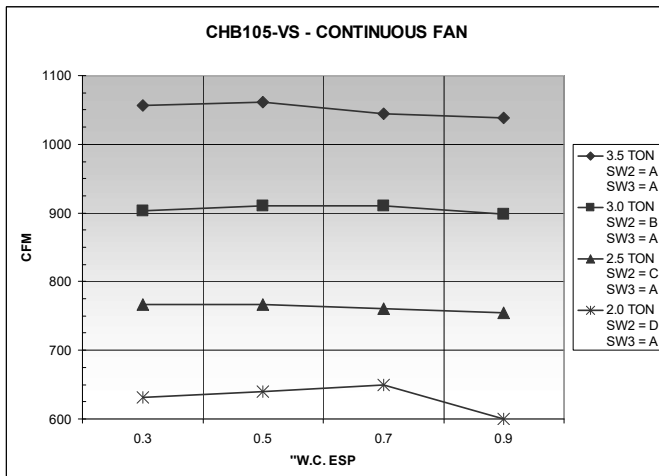
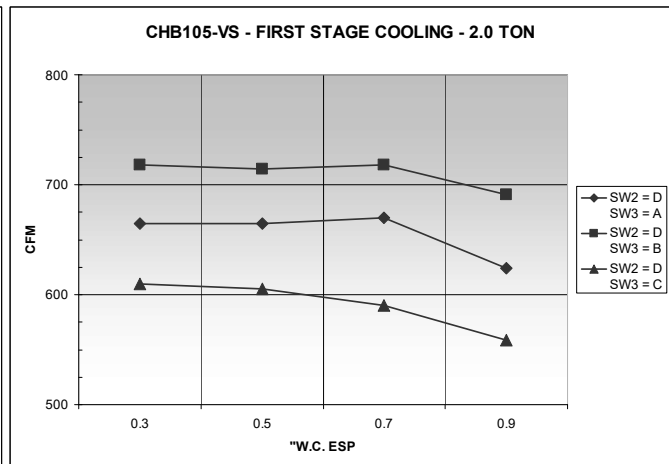
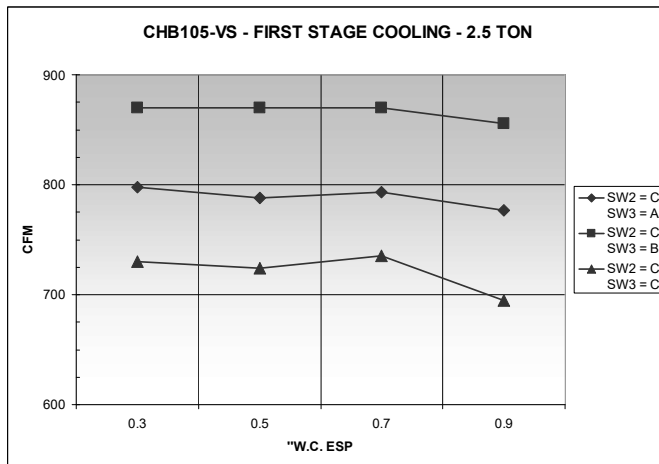
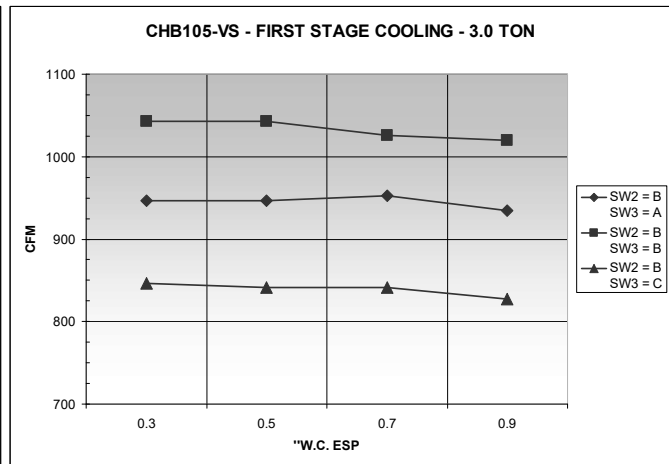
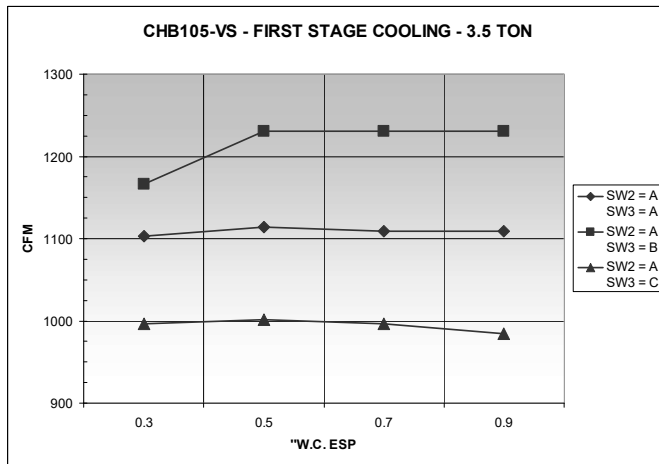
**NOTE: Disconnect main power to unit prior to changing DIP switch settings.**

**FLOW RATE GRAPHS - MODEL: CHB105-VS**



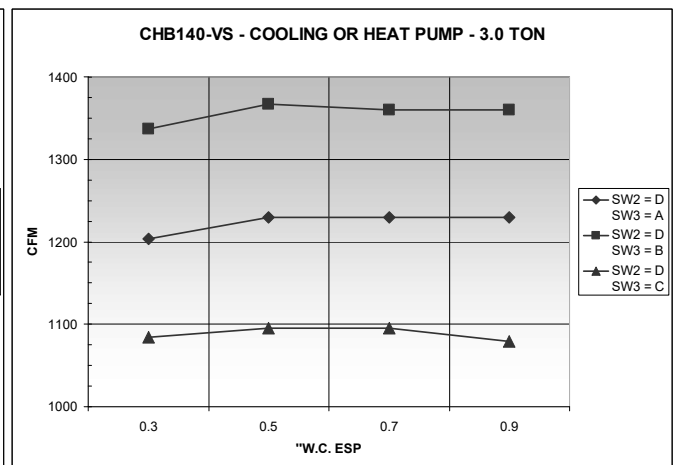
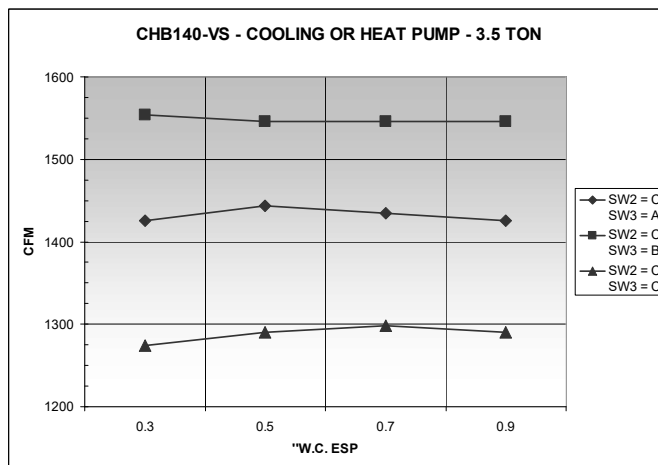
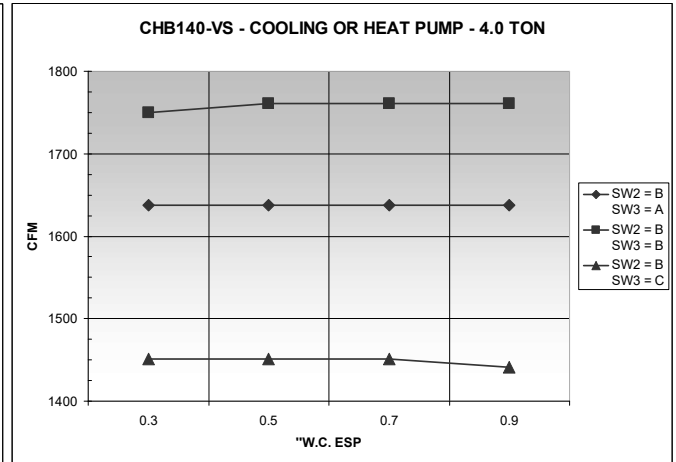
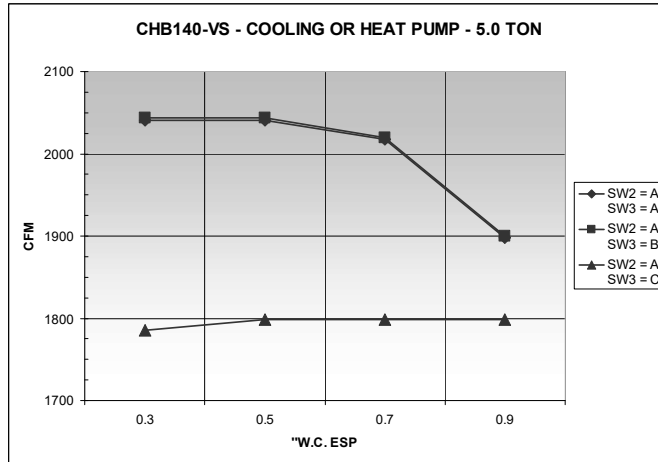
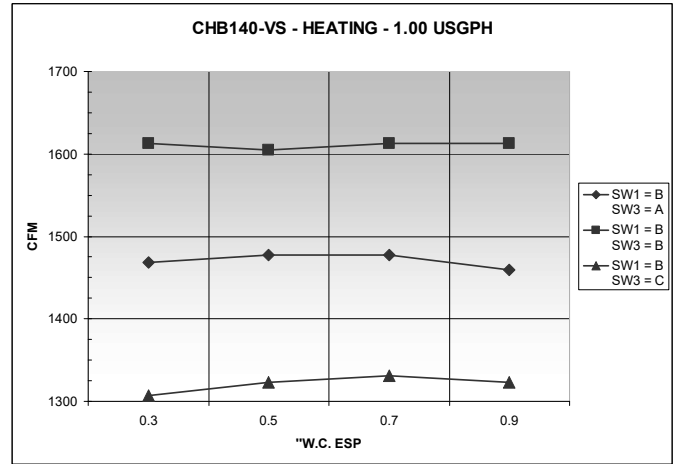
## 14 Dimensions and ratings (continued)

### FLOW RATE GRAPHS - MODEL: CHB105-VS (continued)



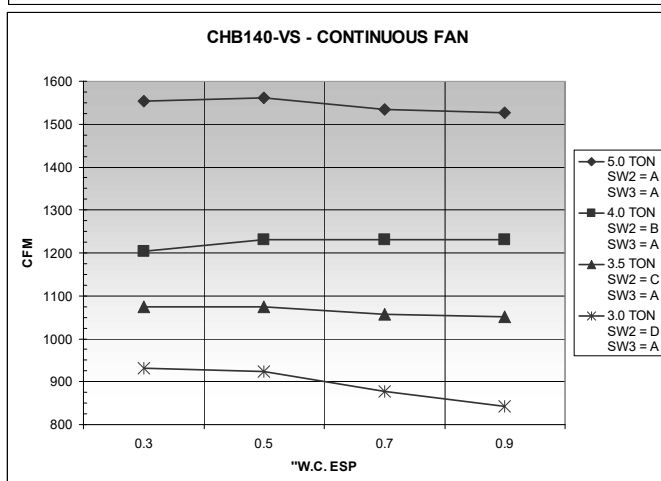
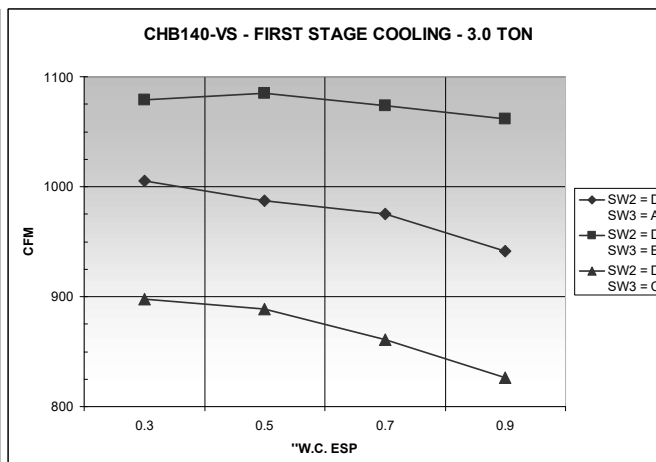
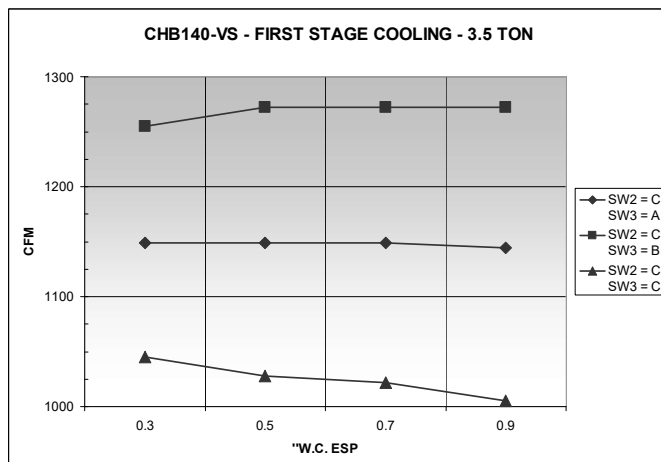
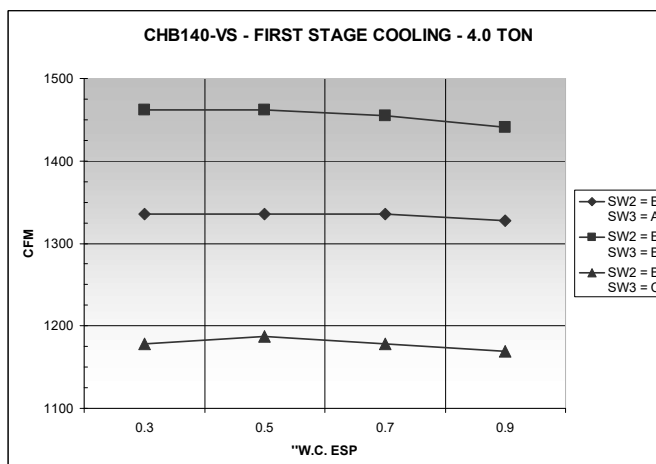
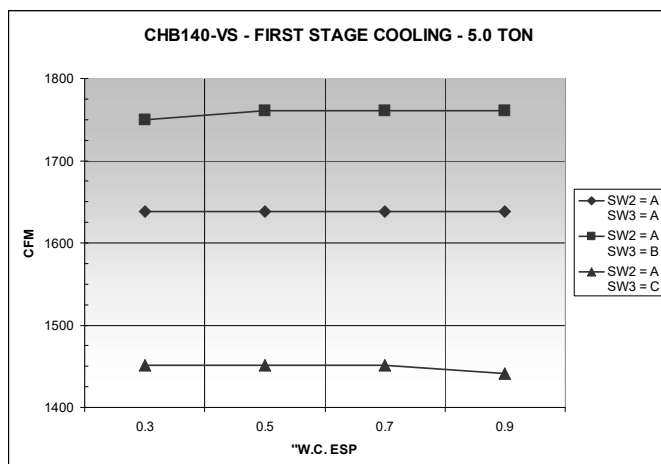
**14 Dimensions and ratings** (continued)

**FLOW RATE GRAPHS - MODEL: CHB140-VS**



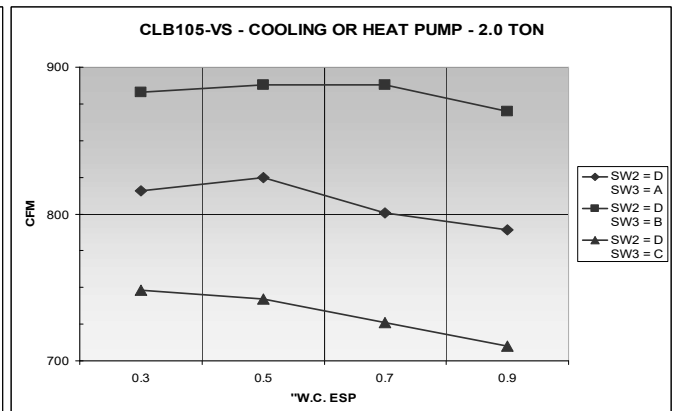
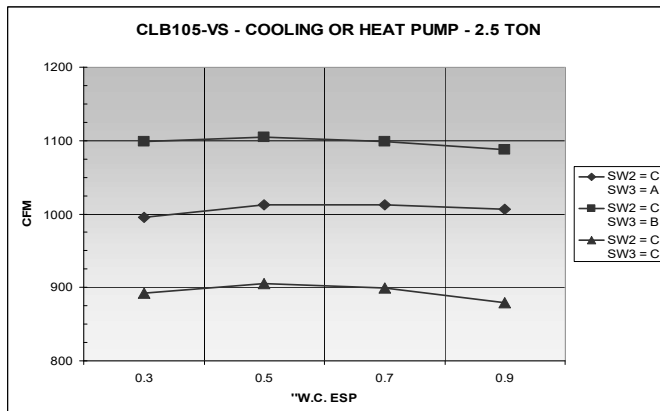
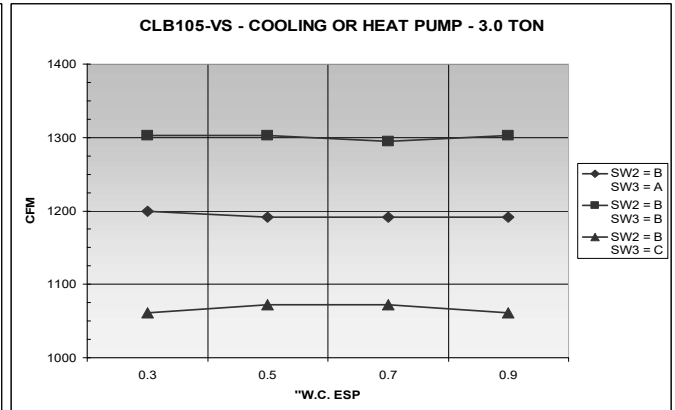
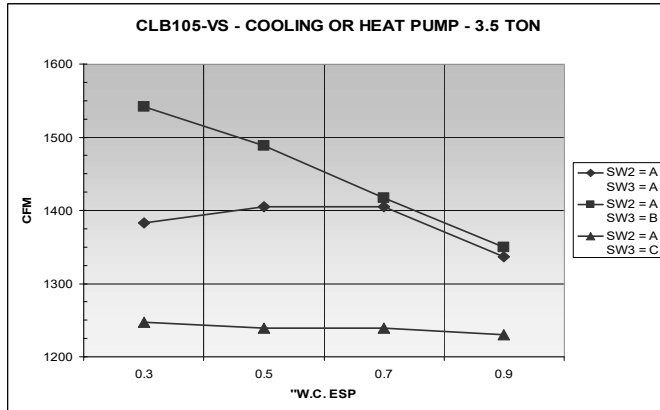
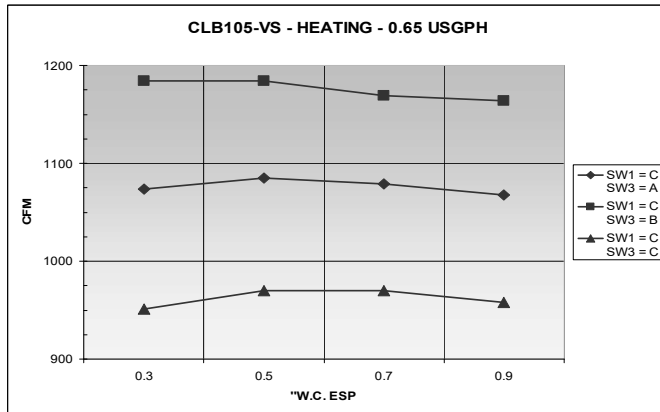
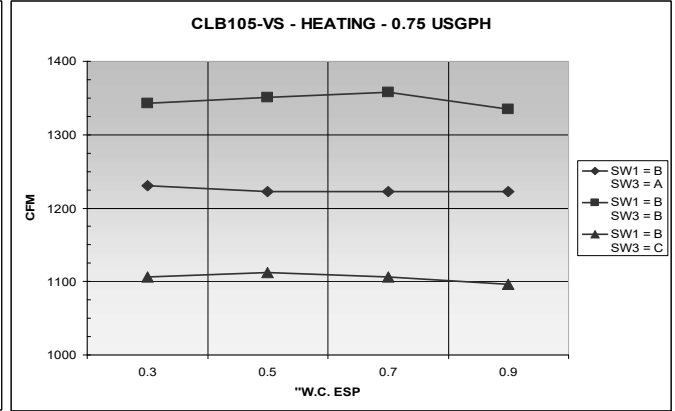
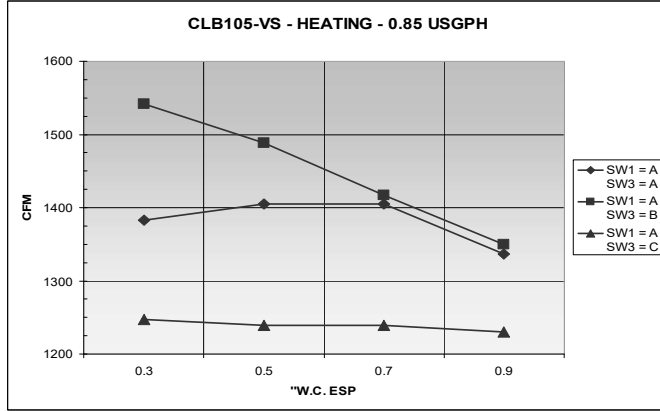
## 14 Dimensions and ratings (continued)

### FLOW RATE GRAPHS - MODEL: CHB140-VS (continued)



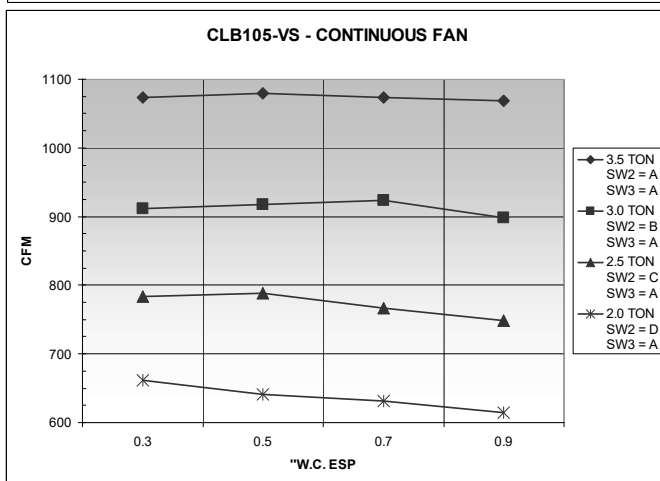
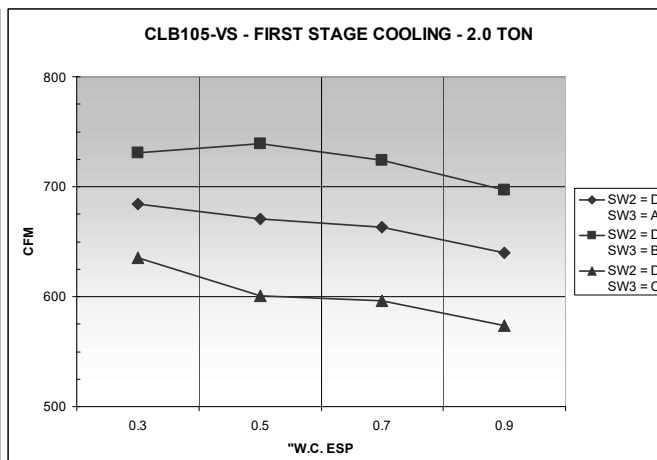
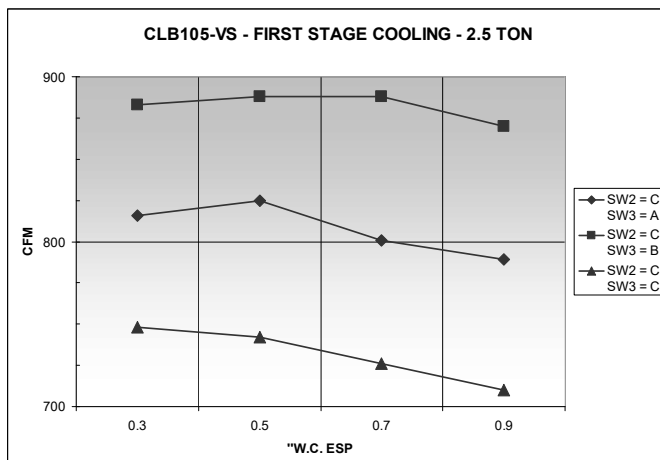
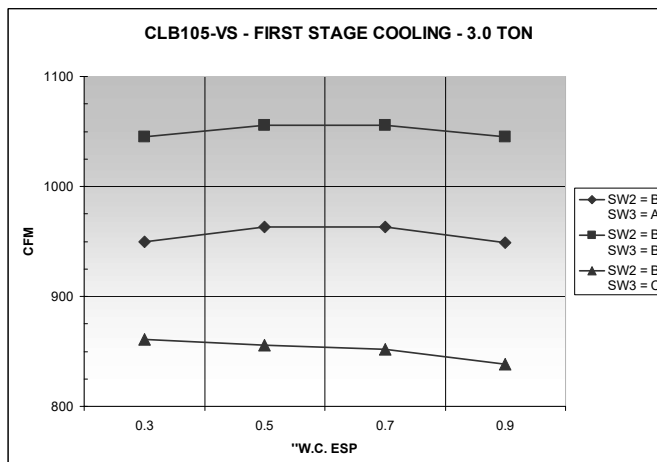
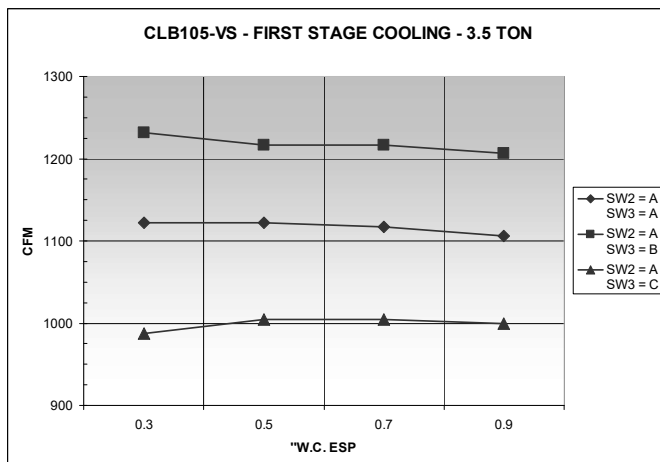
## 14 Dimensions and ratings (continued)

### FLOW RATE GRAPHS - MODEL: CLB105-VS



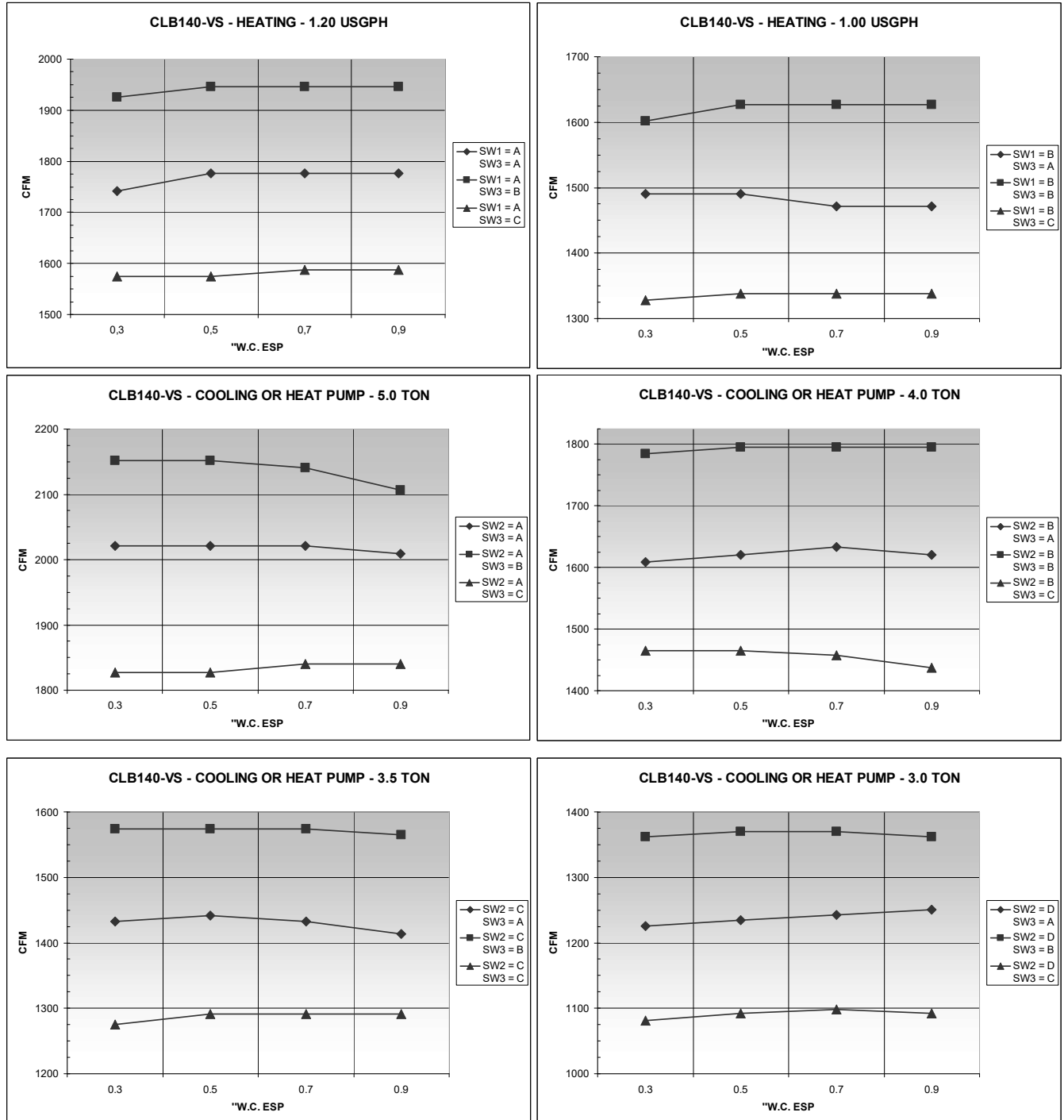
## 14 Dimensions and ratings (continued)

### FLOW RATE GRAPHS - MODEL: CLB105-VS (continued)



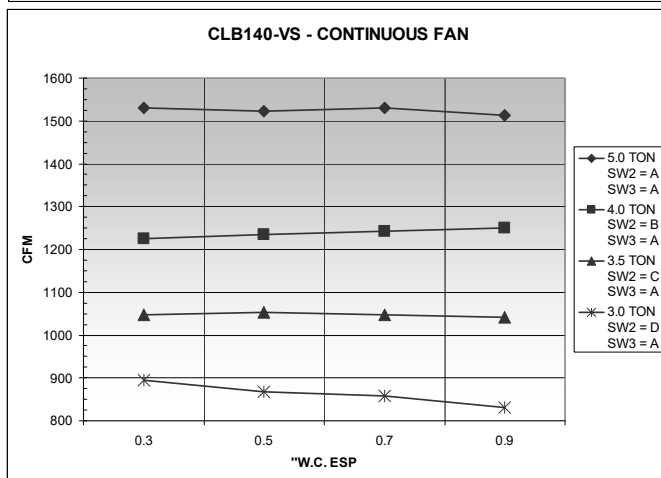
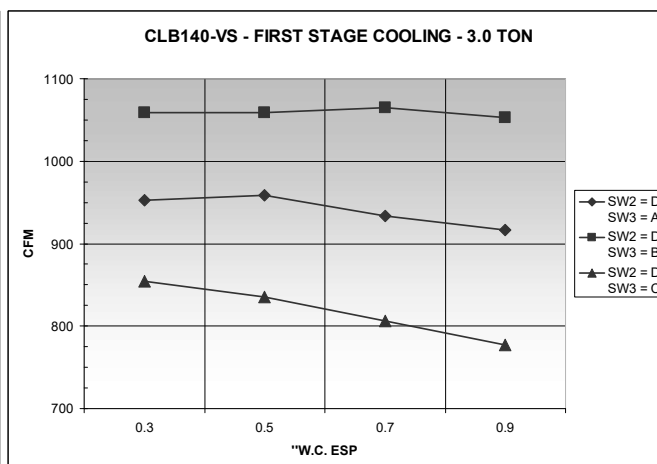
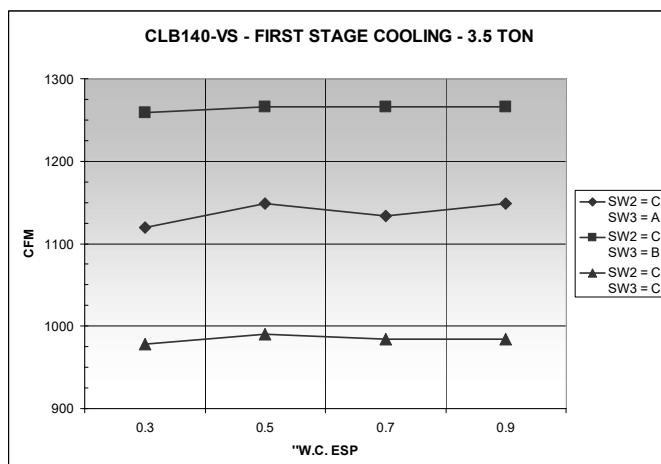
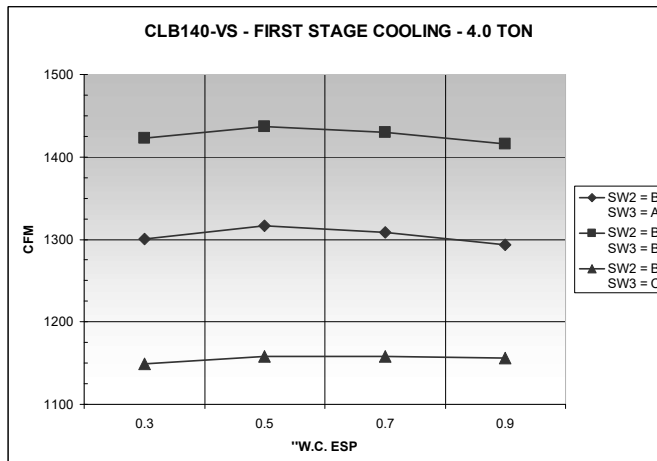
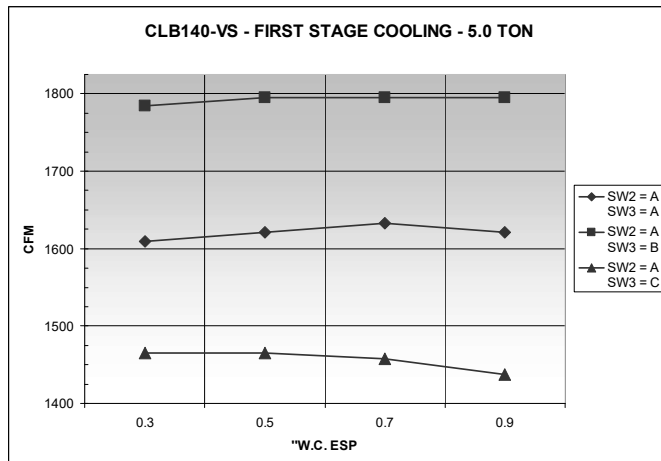
## 14 Dimensions and ratings (continued)

### FLOW RATE GRAPHS - MODEL: CLB140-VS



## 14 Dimensions and ratings (continued)

### FLOW RATE GRAPHS - MODEL: CLB140-VS (continued)



## **15 Owner's information**

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### **The furnace must be inspected and started ANNUALLY, at the beginning of the heating season, only by a qualified service technician.**

The service technician must perform annual service and maintenance on the furnace to ensure reliable operation. Failure to service and maintain the furnace and system could result in equipment failure, causing severe personal injury, death, or substantial property damage.

As the owner, you must be aware of the following requirements. You must inspect and clean or replace the furnace filter monthly, as described below, and perform the other inspection procedures as well. Failure to maintain a clean filter will result in cycling of the furnace and could lead to a no-heat condition. Failure to perform this maintenance could result in substantial property damage.

Follow all the procedures below. Failure to comply could result in severe personal injury, death, or substantial property damage.

---

### **Operating the furnace**

1. The furnace should operate automatically on call for heat from the room thermostat.
2. If the furnace oil burner should shut down on flame failure, the burner primary control will lock out. Ask your service technician to show you the correct procedure to reset the primary control button. NEVER push the button more than once in an attempt to start the burner after lockout. Continued lockout of the control means something is wrong with the burner, controls, or oil system. The condition must be corrected by a qualified service technician.

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### **Daily inspection**

1. Verify there are no combustible materials in the furnace room or near the furnace.
2. Verify the air openings to the furnace room are not obstructed in any way.
3. Verify the furnace seems to be operating normally. Notify your service technician immediately if you notice any abnormal behavior.

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### **Monthly – inspect and clean/replace filter**

1. Ask your service technician to show you the correct way to remove and clean your furnace filter. Replace the filter if you are unable to thoroughly clean it.

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### **To shut down furnace**

1. Set the room thermostat to its lowest setting.
2. Turn off the disconnect switch in the 120-VAC power line to the furnace.
3. If the burner will be shut down for an extended time, tightly close all oil valves.
4. Refer to burner manual for any additional instructions.

W-T Manufacturing  
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