WARNING:

FIRE OR EXPLOSION HAZARD

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

Be sure to read and understand the installation, operation, and service instructions in this manual.

Improper installation, adjustment, alteration, service, or maintenance can cause serious injury, death, or property damage.

— Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

— WHAT TO DO IF YOU SMELL GAS
  • Do not try to light any appliance.
  • Do not touch any electrical switch; do not use any phone in your building.
  • Leave the building immediately.
  • Immediately call your gas supplier from a phone remote from the building. Follow the gas supplier’s instructions.
  • If you cannot reach your gas supplier, call the fire department.

— Installation and service must be performed by a qualified installer, service agency, or the gas supplier.
Form I-SSCBL/RPBL, P/N 149159 R8, Page 2

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---

1.0 General

There are warning labels on the unit and throughout this manual. For your safety, read the definitions below and comply with all boxes labeled CAUTION, WARNING, and DANGER during installation, operation, maintenance, and service of this heater.

**Definitions of HAZARD INTENSITY LEVELS used in this Manual**

1. **DANGER**: Failure to comply will result in severe personal injury or death and/or property damage.

2. **WARNING**: Failure to comply could result in severe personal injury or death and/or property damage.

3. **CAUTION**: Failure to comply could result in minor personal injury and/or property damage.

---

**WARNING**

Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons, or in applications with airborne silicone substances. See Hazard Levels, above.

---

**WARNING**

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury or death. Read the installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment.

---

**WARNING**

To ensure safety, follow lighting instructions located on the outlet box cover. See Hazard Levels, above.
Installation should be done by a qualified agency in accordance with the instructions in this manual and in compliance with all codes and requirements of authorities having jurisdiction. The instructions in this manual apply to Model SSCBL and Model RPBL.

Refer to the limited warranty form in the "Literature Bag".

**WARRANTY: Warranty is void if...**

- a. Furnaces are used in atmospheres containing flammable vapors or atmospheres containing chlorinated or halogenated hydrocarbons or any contaminant (silicone, aluminium oxide, etc.) that adheres to the spark ignition flame sensing probe.
- b. Wiring is not in accordance with the diagram furnished with the heater.
- c. Unit is installed without proper clearances to combustible materials.
- d. Furnace air throughput is not adjusted within the range specified on the rating plate.

The packaged systems in this manual include duct furnace(s) that are design-certified to ANSI and CSA standards by the Canadian Standards Association. The duct furnaces are approved for installation in the United States and in Canada. All furnaces are approved for use with either natural gas or propane. The type of gas for which the furnace is equipped and the correct firing rate are shown on the rating plate attached to the unit. Electrical characteristics are shown on the unit rating plate.

These units must be installed in accordance with local building codes. In the absence of local codes, in the United States, the unit must be installed in accordance with the National Fuel Gas Code NFPA/ANSI Z223.1 (latest edition). A Canadian installation must be in accordance with the CSA B149.1 Natural Gas and Propane Installation Code. These codes are available from CSA Information Services, 1-800-463-6727. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements.

The separated-combustion furnaces in Model SSCBL are designed and manufactured in accordance with the ANSI definition of separated combustion. That definition reads, "Separated Combustion System Appliance: A system consisting of an appliance and a vent cap(s) supplied by the manufacturer, and (1) combustion air connections between the appliance and the outside atmosphere, and (2) flue gas connections between the appliance and vent cap, of a type(s) specified by the manufacturer but supplied by the installer, constructed so that, when installed in accordance with the manufacturer's instructions, air for combustion is obtained from the outside atmosphere and flue gases are discharged to the outside atmosphere." Separated combustion units are designed to separate air for combustion and flue products from the environment of the building in which the unit is installed. Separated combustion appliances are recommended for use in dust laden and some corrosive fume environments.

Installations in aircraft hangars should be in accordance with NFPA No. 409 (latest edition), Standard for Aircraft Hangars; in public garages in accordance with NFPA No. 88A (latest edition), Standard for Parking Structures; and for repair garages in accordance with NFPA No. 88B (latest edition), Standard for Repair Garages. In Canada, installations in aircraft hangars, repair garages, and parking garages should be in accordance with the requirements of the enforcing authorities and in accordance with CSA B149 codes.

These gas-fired products are certified by ANSI Z83 family of standards governing the safe usage of heating equipment in the industrial/commercial marketplace. This includes using the heaters in makeup air applications to supply corridor pressurization in commercial buildings such as office structures and apartment complexes.

The heaters are not certified as residential heating equipment and should not be used as such.

Clearances from the heater and vent to combustible construction or material in storage must conform with the National Fuel Gas Code ANSI Z223.1a (latest edition) pertaining to gas-burning devices, and such material must not attain a temperature over 160°F by continued operation of the heater.
2.0 Furnace Location (cont’d)

Location must comply with the clearances listed in Paragraph 4.2. There are a variety of factors, such as system application, building structure, dimensions, and weight, that contribute to selecting the location. Read the installation information in this manual and select a location that complies with the requirements.

CAUTION: Do not locate an indoor Model SSCBL where it may be exposed to water spray, rain, or dripping water.

<table>
<thead>
<tr>
<th>Key:</th>
<th>Blower Cabinet</th>
<th>Furnace Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSCBL or RPBL 400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSCBL or RPBL 500, 600, 700, 800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSCBL or RPBL 1050, 1200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hazards of Chlorine

The presence of chlorine vapors in the combustion air of gas-fired heating equipment presents a potential corrosion hazard. Chlorine will, when exposed to flame, precipitate from the compound, usually freon or degreaser vapors, and go into solution with any condensation that is present in the heat exchanger or associated parts. The result is hydrochloric acid which readily attacks all metals including 300 grade stainless steel. Care should be taken to separate these vapors from the combustion process. This may be done by wise location of the furnace with regard to exhausters or prevailing wind direction. Remember, chlorine is heavier than air. This fact should be kept in mind when determining installation locations of heating equipment and building exhaust systems.

3.0 Uncrating and Preparation

3.1 Uncrating and Inspecting

This furnace was test operated and inspected at the factory prior to crating and was in operating condition. If the equipment has incurred any damage in shipment, document the damage with the transporting agency and immediately contact an authorized Reznor® distributor. If you are an authorized Distributor, follow the FOB freight policy procedures as published by Reznor for Reznor® products.

Check the rating plate for the gas specifications of the furnace and electrical characteristics of the unit to be sure that they are compatible with the gas and electric supplies at the installation site.

3.2 Preparing for Installation

Shipped-Separate Components

Read this booklet and become familiar with the installation requirements of your particular furnace. If you do not have knowledge of local requirements, check with the local gas company or any other local agencies who might have requirements concerning this installation. Before beginning, make preparations for necessary supplies, tools, and manpower.

Options - Some gas control options have parts either shipped loose with the heater or shipped separately. If your unit is equipped with any of the following gas control options, be sure these parts are available at the job site.

<table>
<thead>
<tr>
<th>Controls</th>
<th>Option AG</th>
<th>Shipped-Separate Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Gas</td>
<td>7</td>
<td>Thermostat, P/N 48033</td>
</tr>
<tr>
<td>Control Options</td>
<td>10</td>
<td>Thermostat, P/N 91919</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Thermostat, P/N 93435</td>
</tr>
<tr>
<td>Makeup Air Gas</td>
<td>3, 8</td>
<td>Control Switch, P/N 29054</td>
</tr>
<tr>
<td>Control Options</td>
<td>9</td>
<td>Remote Temperature Selector, P/N 48042</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control Switch, P/N 29054</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Remote Temperature Selector, P/N 115848</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stage-Adder Module, P/N 115849 (one furnace - 1; two furnaces - 3; three furnaces - 5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control Switch, P/N 29054</td>
</tr>
<tr>
<td></td>
<td>17, 19</td>
<td>Remote Temperature Selector, P/N 115848</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stage-Adder Module, P/N 115849 (two furnaces - 1; three furnaces - 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control Switch, P/N 29054</td>
</tr>
<tr>
<td></td>
<td>18, 20</td>
<td>Remote Temperature Selector, P/N 115848</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stage-Adder Module, P/N 115849 (two furnaces - 1; three furnaces - 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remote Display Module, P/N 115852</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control Switch, P/N 29054</td>
</tr>
<tr>
<td></td>
<td>39, 41</td>
<td>Remote Temperature Selector, P/N 174849</td>
</tr>
</tbody>
</table>
Other shipped-separate options could include a roof curb, an outside air hood, a gas shut-off valve, a thermostat, an optional control switch, a remote console, a vent extension, a gas supply regulator, and/or a disconnect switch. If ordered with either an evaporative cooling module or a DX or chilled water cooling coil module, the module is shipped separately. A drain and fill or freeze kit and a water hammer arrestor are shipped-separate options for an evaporative cooling module.


All Model SSCBL installations require a vent/combustion air kit (Option CC2 or CC6) including a concentric adapter box for each duct furnace. See page 19 (Option CC6) or page 22 (Option CC2) for the component list of each kit. Be sure all of the factory-supplied and field-supplied parts needed for the vent/combustion air kit(s) are at the job site.

### 4.0 Dimensions and Clearances

#### 4.1 Dimensions

##### 4.1.1 Dimensions of Indoor Model SSCBL

**Approximate Gas Connection Location**

<table>
<thead>
<tr>
<th>Size</th>
<th>Drawing Location (above)</th>
<th>Approx Distance from inside Curb Cap on Blower End of System</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>1</td>
<td>7 ft + 5 to 6 inches (2.3 meters)</td>
</tr>
<tr>
<td>500, 600, 700, 800</td>
<td>2</td>
<td>8 ft + 7 to 8 inches (2.7 meters)</td>
</tr>
<tr>
<td>1050, 1200</td>
<td>3</td>
<td>9 ft + 2 to 3 inches (2.8 meters)</td>
</tr>
</tbody>
</table>

*The gas line is manifolded requiring only one supply connection. The gas connection is at curb cap "height" on the control side of the system.

#### Air Opening Descriptions & Dimensions

<table>
<thead>
<tr>
<th>Size</th>
<th>Horizontal Air Inlet</th>
<th>Optional Return Air Opening (bottom)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>19-1/2x6B</td>
<td>19-1/2x6B</td>
</tr>
<tr>
<td>500, 600, 700, 800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1050, 1200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Dimensions E and H listed here do not apply to a system with a field-attached cooling coil cabinet (Option AU2 or AU3); see NOTE in FIGURE 4.**
### 4.0 Dimensions and Clearances (cont'd)

#### 4.1 Dimensions (cont'd)

#### 4.1.2 Dimensions of Outdoor Model RPBL

**FIGURE 3 - Dimensions of Outdoor Model RPBL - inches (mm)**

**FIGURE 4** downturn plenum (Options AU2, AU3, AU11, AU12, AU13, and AU14). See NOTE in FIGURE 4.

**Dimensions E and F listed here do not apply to system with field-attached cooling coil cabinet or cooling coil cabinet with downturn plenum (Options AU2, AU3, AU11, AU12, AU13, and AU14). See NOTE in FIGURE 4.**

---

**FIGURE 4 - Dimensions of Outdoor Model RPBL - inches (mm)**

**Dimension Key:**
- **A** Width of Cabinet
- **B** Width of Optional Downturn Plenum Discharge Air Opening; Width of Standard Horizontal Air Inlet Opening; and Width of Optional Return Air (Bottom ) Opening
- **C** Width of the Curb Cap
- **D** Width of Standard Horizontal Discharge Air Opening
- **E** Overall Length of Inside of Curb Cap
- **F** Distance between Optional Return Air Bottom Opening and Optional Downturn Plenum Discharge Air Opening

**Approximate Gas Connection Location**

<table>
<thead>
<tr>
<th>Size</th>
<th>Drawing Location</th>
<th>Approximate Distance from inside Curb Cap on Blower End of System</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>1</td>
<td>7 ft + 5 to 6 inches (2.3 meters) The gas line is manifolded requiring only one supply connection.</td>
</tr>
<tr>
<td>500, 600, 700, 800</td>
<td>2</td>
<td>8 ft + 7 to 8 inches (2.7 meters) The gas connection is at curb cap &quot;height&quot; on the control side of the system.</td>
</tr>
<tr>
<td>1050, 1200</td>
<td>3</td>
<td>9 ft + 2 to 3 inches (2.8 meters) The gas connection is at curb cap &quot;height&quot; on the control side of the system.</td>
</tr>
</tbody>
</table>

---

**Model | Size | A | B | C | D**

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
<th>inches</th>
<th>mm</th>
<th>inches</th>
<th>mm</th>
<th>inches</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPBL</td>
<td>500, 600</td>
<td>47-1/8</td>
<td>1216</td>
<td>36-5/8</td>
<td>930</td>
<td>45-1/8</td>
<td>1146</td>
</tr>
<tr>
<td>RPBL</td>
<td>700, 1050</td>
<td>53-3/8</td>
<td>1356</td>
<td>42-1/8</td>
<td>1070</td>
<td>50-5/8</td>
<td>1286</td>
</tr>
<tr>
<td>RPBL</td>
<td>400, 800, 1200</td>
<td>58-7/8</td>
<td>1495</td>
<td>47-5/8</td>
<td>1210</td>
<td>56-1/8</td>
<td>1426</td>
</tr>
</tbody>
</table>

**Air Openings:**

- **Standard Horizontal Air Inlet:** 19-1/2 x B, 495 x B
- **Optional Return Air Opening (bottom):** 19-1/2 x B, 495 x B
- **Standard Horizontal Discharge Air Opening:** 18 x E, 457 x D
- **Opt Discharge Air Opening (w/Downturn Plenum):** 19-1/2 x B, 495 x D

**Model | Size | with Downturn Opt AQ5 or AQ8* | E** | F** |

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
<th>inches</th>
<th>mm</th>
<th>inches</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPBL</td>
<td>400</td>
<td>83-3/4</td>
<td>2127</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>RPBL</td>
<td>500, 600, 700, 800</td>
<td>109-3/4</td>
<td>2788</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>RPBL</td>
<td>1050, 1200</td>
<td>135-3/4</td>
<td>3397</td>
<td>86-5/16</td>
<td>2192</td>
</tr>
</tbody>
</table>

**Notes:**
- *Dimensions E and F listed here do not apply to system with field-attached cooling coil cabinet or cooling coil cabinet with downturn plenum (Options AU2, AU3, AU11, AU12, AU13, and AU14). See NOTE in FIGURE 4.
4.1.3 Dimensions - Optional Cooling Coil Cabinet

FIGURE 4 - Optional Cooling Coil Cabinets with DX or Chilled Water Coil, with and without Downturn Plenum Cabinet

DX Coil Cabinet - Option AU3 for RPBL and SSCBL and Options AU13 and AU14 for RPBL only

Chilled Water Coil Cabinet - Option AU2 for RPBL and SSCBL and Options AU11 and AU12 for RPBL only

Dimensions (all AU coil cabinets)

<table>
<thead>
<tr>
<th>SSCL or RPBL Size</th>
<th>500, 000</th>
<th>700, 1050</th>
<th>400, 800, 1200</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>inches</td>
<td>47-3/4</td>
<td>53-1/4</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>1213</td>
<td>1353</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>inches</td>
<td>34-1/2</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>876</td>
<td>1016</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>inches</td>
<td>45-1/8</td>
<td>50-5/8</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>1146</td>
<td>1286</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>inches</td>
<td>56-3/8</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>1432</td>
<td>1575</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>inches</td>
<td>59-3/8</td>
<td>64-7/8</td>
</tr>
<tr>
<td>Without Downturn</td>
<td>mm</td>
<td>1508</td>
<td>1648</td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>inches</td>
<td>83-3/8</td>
<td>88-7/8</td>
</tr>
<tr>
<td>With Downturn</td>
<td>mm</td>
<td>2118</td>
<td>2257</td>
</tr>
<tr>
<td><strong>G</strong></td>
<td>inches</td>
<td>57-3/8</td>
<td>63</td>
</tr>
<tr>
<td>Without Downturn</td>
<td>mm</td>
<td>1457</td>
<td>1600</td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>inches</td>
<td>81-3/8</td>
<td>87</td>
</tr>
<tr>
<td>With Downturn</td>
<td>mm</td>
<td>2067</td>
<td>2210</td>
</tr>
</tbody>
</table>

NOTE: For the length of a Model RPBL with a cooling coil cabinet, see the table on the right. Cooling coil cabinet is shipped separately and attached in the field. See page 11 for roof curb dimensions.

Total length of an indoor system with a cooling coil cabinet depends on how the system is installed. If the blower/furnace is suspended, a special curb cap and a field-installed transition duct are required. Contact your Sales Representative to receive specific information. If an indoor system is mounted, add the cabinet length to the blower/furnace length on page 5.

Discharge Damper Note: Optional two-position discharge dampers in Option AU12 or AU14 fit in the discharge air opening. The damper motor fits inside the downturn cabinet. See field wiring instructions in Paragraph 6.3.6.

RPBL Size | Width of Cabinet (not curb) | Length of Cabinet (not curb)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>w/Chilled Water Coil Cabinet</td>
<td>w/DX Coil Cabinet</td>
</tr>
<tr>
<td>inches</td>
<td>mm</td>
<td>inches</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>400</td>
<td>58-7/8</td>
<td>1495</td>
</tr>
<tr>
<td>500, 600</td>
<td>47-1/8</td>
<td>1197</td>
</tr>
<tr>
<td>700</td>
<td>53-3/8</td>
<td>1356</td>
</tr>
<tr>
<td>800</td>
<td>58-7/8</td>
<td>1495</td>
</tr>
<tr>
<td>1050</td>
<td>53-3/8</td>
<td>1356</td>
</tr>
<tr>
<td>1200</td>
<td>58-7/8</td>
<td>1495</td>
</tr>
</tbody>
</table>
4.2 Clearances
For safety and convenience, provide clearances as shown in the table. Clearance to combustibles is defined as the minimum distance from the heater to a surface or object that is necessary to ensure that a surface temperature of 90°F above the surrounding ambient temperature is not exceeded. Minimum clearances are also listed on the heater rating plate.

<table>
<thead>
<tr>
<th>Required Clearances - inches (mm)</th>
<th>Model SSCBL</th>
<th>Model RPBL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side Opposite Controls - 6&quot; (152mm) is required for clearance to combustibles. 30&quot; (762mm) service clearance is recommended for access to the motor.</td>
<td>Control Side (for service) - 56&quot; (1422mm)</td>
<td>Control Side (for service) - 56&quot; (1422mm)</td>
</tr>
<tr>
<td>Top - 6&quot; (152mm)</td>
<td>Furnace Bottom - 6&quot; (152mm)</td>
<td>Side Opposite Controls - 30&quot; (762mm) service clearance is recommended for access to the motor.</td>
</tr>
<tr>
<td>Furnace Bottom - 6&quot; (152mm)</td>
<td>*Furnace Bottom - 0&quot; (0mm)</td>
<td></td>
</tr>
</tbody>
</table>

*When installed on a roof curb on a combustible roof, the roof area enclosed within the curb must be either ventilated, left open, or covered with non-combustible material which has an "R" value of at least 5.0. See FIGURE 9A, page 11.

5.0 Suspension and Mounting
5.1 Weights
Before installing, check the supporting structure to be sure that it has sufficient load-carrying capacity to support the weight of the unit. Properly suspending or mounting the unit is the responsibility of the installer. Model SSCBL systems are designed for either suspension or mounting. Model RPBL systems are designed for mounting only. All installed systems must be level.

<table>
<thead>
<tr>
<th>Model and Size</th>
<th>Name</th>
<th>Net Weight (lbs and kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>SSCBL</td>
<td>lbs</td>
<td>849</td>
</tr>
<tr>
<td></td>
<td>kg</td>
<td>385</td>
</tr>
<tr>
<td>RPBL</td>
<td>lbs</td>
<td>849</td>
</tr>
<tr>
<td></td>
<td>kg</td>
<td>385</td>
</tr>
</tbody>
</table>

A Model SSCBL unit is equipped with a load-bearing curb cap which forms an integral part of the unit. The curb cap is welded at all joints and has suspension holes at each corner and hanger brackets on the sides. See FIGURE 2 for suspension dimensions. Each suspension location requires a 1/2" threaded rod as illustrated in FIGURE 5.

5.2 Suspension - Model SSCBL

5.3 Indoor Mounting on Field-Supplied Supports - Model SSCBL

Prior to installation, be sure that the method of support is in agreement with all local building codes. Whether the supports are being mounted directly on a surface or being placed "up" on additional structure, the horizontal length of the system should be supported by two 4x4 treated wooden rails. Cut the rails to the appropriate length (Dimension "A" in FIGURE 6A).

Space the 4x4 wooden rails (See "B" Dimension, FIGURE 6A) so that the curb cap "skirt" will fit over the edge of the boards with the rails setting inside the horizontal length of the curb cap.

If the rails are being laid directly on a surface, position them as shown in FIGURE 6B. Set the system on the rails, leaving the "ends" underneath open for ventilation.

FIGURE 5 - Support Rod Detail - Required at all Suspension Points

![Support Rod Detail](image_url)

WARNING
Units must be supported level for proper operation. Do not place or add additional weight to the suspended unit. See Hazard Levels, page 2.
If the rails are not placed directly on a surface, cross-supports should be placed underneath the rails at the ends of the unit and at all cabinet "joints" (between the blower cabinet and the furnace section, between each furnace section, and between the furnace and an optional downturn plenum cabinet). See FIGURE 6B. The field-supplied, cross-support structure must be adequate for the weight of the unit. Cross-supports should run the entire width of the unit, supporting the 4x4 wooden rails at all recommended locations.

| A |
---|
| Leave both ends open for ventilation. |

| B |
---|
| 4x4 Treated Lumber |

FIGURE 6A - Mounting Support Dimensions - inches (mm)

<table>
<thead>
<tr>
<th>SSCBL</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;A&quot;</td>
<td>&quot;B&quot;</td>
</tr>
<tr>
<td></td>
<td>Width - All Configurations</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>82-1/4 (2089)</td>
<td>150-1/4 (3816)</td>
</tr>
<tr>
<td>500/600</td>
<td>108-1/4 (2750)</td>
<td>176-1/4 (4477)</td>
</tr>
<tr>
<td>700</td>
<td>108-1/4 (2750)</td>
<td>176-1/4 (4477)</td>
</tr>
<tr>
<td>800</td>
<td>108-1/4 (2750)</td>
<td>176-1/4 (4477)</td>
</tr>
<tr>
<td>1050</td>
<td>134-1/4 (3410)</td>
<td>202-1/4 (5137)</td>
</tr>
<tr>
<td>1200</td>
<td>134-1/4 (3410)</td>
<td>158-1/4 (4020)</td>
</tr>
</tbody>
</table>

5.4 Mounting Outdoor Model RPBL

5.4.1 Rigging
Lifting holes are provided for rigging. Use spreader bars when lifting to prevent chains or cables from damaging the unit. If the unit is being mounted on a roof curb, apply caulking to the roof curb prior to lifting the unit to the roof and setting it on the curb. See FIGURE 9A, page 11. If the system includes an outside air hood, a cooling coil cabinet, or an evaporative cooling module, attach them after the system is in place.

5.4.2 Base Construction
Curb Cap Base - A Model RPBL unit is equipped with a load-bearing curb cap which forms an integral part of the unit. This curb cap is welded at all joints and has a "skirt" which fits over a roof curb to provide a weatherproof installation. Holes are provided at the curb cap corners for lifting the unit. These holes do not interfere with unit weatherproofing. The curb cap is not designed to be placed directly on the roof surface. The system may be mounted on an optional roof curb purchased with the unit, a field-supplied roof curb, or field-supplied supports. If the system has a downturn plenum and/or a bottom return air opening, a roof curb is recommended to provide a weatherproof installation as well as more workable clearances for ductwork. That the method of support is in agreement with all local building codes and is suited to the climate. If considering this type of installation in snow areas, it is recommended that the 4x4 wooden rails underneath the system be on cross-support structure at least 12" higher than the roof surface (see cross support locations in FIGURE 8, page 10).

Whether the supports are being mounted directly on the roof or being placed "up" on additional structure, the horizontal length of the system should be supported by two 4x4 treated wooden rails. Cut the rails to the appropriate length (Dimension "A") in FIGURE 7. (NOTE: Although dimensions are included for units with a downturn plenum cabinet, it is strongly recommended that a full roof curb be used on an installation with a downturn plenum cabinet and/or a bottom return air duct.)

Space the 4x4 wooden rails (See "B" Dimension, FIGURE 7) so that the curb cap "skirt" will fit over the edge of the boards with the rails setting inside the horizontal length of the curb cap.
5.0 Suspension and Mounting (cont’d)

5.4 Mounting Outdoor Model RPBL (cont’d)

5.4.4 Mounting on a Roof Curb - Applies to Outdoor Model RPBL

If the rails are being laid directly on the roof, position them as shown in FIGURE 7. Set the system on the rails, leaving the "ends" underneath open for ventilation.

If the treated wooden rails are not being placed directly on the roof surface, cross-supports should be placed underneath the rails at the ends of the unit and at all cabinet "joints" (between the blower cabinet and the heater section and between the furnace and the optional downturn plenum cabinet). See FIGURE 8.

The field-supplied, weather-resistant cross-support structure must be adequate for the weight of the system, and all cross-supports should run the entire width of the system supporting the 4x4 wooden rails at the recommended locations. Do not enclose the area under the furnace; leave space for ventilation.

**WARNING**

Do not close or block the openings under each end of a system mounted on 4x4 treated wooden rails; the space under the furnace **MUST** be left open for ventilation.

If cross supports are used under the 4x4 rails, do not enclose the area under the furnace; leave open space for ventilation.

**FIGURE 8 - Cross-Support Locations for Outdoor Systems when the wooden 4x4 rails supporting the length of the system are supported by additional structure**

Whether using an optional roof curb supplied with the system or a field-supplied curb, the curb must be secure, square and level. The top surface of the roof curb must be caulked with 1/4" x 1-1/4" sealant tape or two 1/4" beads of suitable sealant. The unit must be sealed to the curb to prevent water leakage into the curb area due to wind blown rain and capillary action. Except for the curb assembly details, the information and requirements in this section apply to all curbs. See FIGURES 9A, 9B, and 9C and the curb installation instructions.
Roof Curb Dimensions for Model RPBL

<table>
<thead>
<tr>
<th>Size</th>
<th>400</th>
<th>500/600</th>
<th>700</th>
<th>800</th>
<th>1050</th>
<th>1200</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Option CJ1 - Roof Curb for RPBL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>54-1/2</td>
<td>43-9/16</td>
<td>49-1/16</td>
<td>49-1/16</td>
<td>49-1/16</td>
<td>54-1/2</td>
</tr>
<tr>
<td>C*</td>
<td>1994</td>
<td>2654</td>
<td>2654</td>
<td>2654</td>
<td>3315</td>
<td>3315</td>
</tr>
<tr>
<td>D*</td>
<td>50-13/16</td>
<td>39-13/16</td>
<td>45-5/16</td>
<td>50-13/16</td>
<td>50-13/16</td>
<td>50-13/16</td>
</tr>
<tr>
<td><strong>Option CJ2 - Roof Curb for RPBL with Factory-Installed Downturn Plenum, Option AC5 or AC8</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>54-1/2</td>
<td>43-9/16</td>
<td>49-1/16</td>
<td>49-1/16</td>
<td>49-1/16</td>
<td>54-1/2</td>
</tr>
<tr>
<td>C*</td>
<td>2604</td>
<td>3264</td>
<td>3264</td>
<td>3264</td>
<td>3924</td>
<td>3924</td>
</tr>
<tr>
<td>D*</td>
<td>50-13/16</td>
<td>39-13/16</td>
<td>45-5/16</td>
<td>50-13/16</td>
<td>50-13/16</td>
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</tr>
<tr>
<td>Wt lbs</td>
<td>150</td>
<td>167</td>
<td>173</td>
<td>179</td>
<td>202</td>
<td>208</td>
</tr>
<tr>
<td><strong>Option CJ4 - Roof Curb for RPBL with Field-Installed</strong> Cooling Coil Cabinet, Option AU2 or AU3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A inches</td>
<td>150-1/4</td>
<td>165-1/4</td>
<td>170-3/4</td>
<td>176-1/4</td>
<td>1 -3/4</td>
<td>202-1/4</td>
</tr>
<tr>
<td>B</td>
<td>54-1/2</td>
<td>43-9/16</td>
<td>49-1/16</td>
<td>49-1/16</td>
<td>49-1/16</td>
<td>54-1/2</td>
</tr>
<tr>
<td>C*</td>
<td>1384</td>
<td>1106</td>
<td>1246</td>
<td>1384</td>
<td>1246</td>
<td>1384</td>
</tr>
<tr>
<td>D*</td>
<td>146-1/2</td>
<td>161-1/2</td>
<td>167</td>
<td>172-1/2</td>
<td>193</td>
<td>198-1/2</td>
</tr>
<tr>
<td>Wt lbs</td>
<td>227</td>
<td>231</td>
<td>243</td>
<td>255</td>
<td>271</td>
<td>282</td>
</tr>
<tr>
<td><strong>Option CJ5 - Roof Curb for RPBL with Field-Installed</strong> Cooling Coil Cabinet w/Dowturn, Option AU11, AU12, AU13 or AU14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A inches</td>
<td>174-1/4</td>
<td>189-1/4</td>
<td>194-3/4</td>
<td>200-1/4</td>
<td>206-1/4</td>
<td>222-1/4</td>
</tr>
<tr>
<td>B</td>
<td>54-1/2</td>
<td>43-9/16</td>
<td>49-1/16</td>
<td>49-1/16</td>
<td>49-1/16</td>
<td>54-1/2</td>
</tr>
<tr>
<td>C*</td>
<td>1384</td>
<td>1106</td>
<td>1246</td>
<td>1384</td>
<td>1246</td>
<td>1384</td>
</tr>
<tr>
<td>D*</td>
<td>170-1/2</td>
<td>185-1/2</td>
<td>191</td>
<td>196-1/2</td>
<td>217</td>
<td>222-1/2</td>
</tr>
<tr>
<td>Wt lbs</td>
<td>1291</td>
<td>1101</td>
<td>1151</td>
<td>1291</td>
<td>1151</td>
<td>1291</td>
</tr>
</tbody>
</table>

*C and D are roof opening dimensions.

** Field installed means that the cooling coil cabinet with or without the downturn is factory assembled and shipped separately. The roof curb is sized to accommodate the complete length of the system. The shipped-separate cooling coil cabinet with or without a downturn must be lifted to the roof separately from the packaged system, set on the roof curb, and attached to the furnace section (see instructions in Paragraph 6.3.6).

FIGURE 9A - Optional Roof Curb and Dimensions for Model RPBL

** Illustration is shown with an Option AQ5 or AQ8 downturn plenum. The system can have a variety of configurations which affect installation.

- If the system does not have a downturn plenum, the discharge is horizontal.
- Downturn plenum Options AQ5 and AQ8 are factory installed to be lifted to the roof and set on the roof curb as part of the packaged system.
- If the system has an Option AU2 or AU3 cooling coil cabinet, the discharge is horizontal. If the system has an AU11, AU12, AU13, AU14 cooling coil cabinet, there is a downturn plenum with vertical discharge. Options AU2, AU3, AU11, AU12, AU13, and AU14 are not factory installed. Options AU2, AU3, AU11, AU12, AU13, and AU14 must be lifted to the roof separately from the packaged system, set on the roof curb, and attached to the furnace.

IMPORTANT: Area enclosed by the roof curb must comply with clearance to combustible materials. If roof is constructed of combustible materials, area within curb must be either ventilated, left open, or covered with non-combustible material which has an "R" value of at least 5.0. If area within curb is left open, higher radiated sound levels may result.
5.0 Suspension and Mounting (cont'd)

5.4 Mounting Outdoor Model (cont'd)

FIGURE 9B - Roof Curb Assembly

3. Level the roof curb. To ensure a good weathertight seal between the curb cap and the roof curb, the roof curb must be leveled in both directions with no twist end to end. Shim level as required and secure curb to roof deck before proceeding with framing.

4. Install field-supplied flashing.

5. Before placing the unit into position, apply furnished 1/4" x 1-1/4" foam sealant tape to top surface of curb, making good butt joint at corners. The unit must be sealed to the curb to prevent water leakage into the curb area due to blown rain and capillary action.

FIGURE 9D - Duct Opening Dimensions (inches and mm) in relation to Roof Curb CJ Option

- 1-5/8" (41mm) is the measurement from the duct openings to the inside edge of the roof curb.
- Openings for ductwork should be 1" (25mm) larger than the duct size for installation clearance.

5.4.4 Mounting on a Roof Curb - Model RPBL (cont'd)
Roof Curb Assembly and Installation Instructions

Curbs are shipped unassembled. Field assembly and mounting on the roof are the responsibility of the installer. All required hardware necessary to complete the assembly is supplied. Before installing roof curb, verify that the size is correct for the system being installed.

1. Position curb cross rails and curb side rails as illustrated in FIGURE 9A. If there are two side pieces to a side, fasten them with splice plates and hardware as illustrated in the splicing detail drawing (FIGURE 9B). Join the corners as illustrated in the corner detail (FIGURE 9B).

2. Check the assembly for squareness. Adjust the roof curb so that the diagonal measurements are equal within a tolerance of + or - 1/8".

- 1-5/8" (41mm) is the measurement from the duct openings to the inside edge of the roof curb.

Form I-SSCBL/RPBL, P/N 149159 R8, Page 12
6.0 Mechanical

6.1 Gas Piping and Pressures

<table>
<thead>
<tr>
<th>Gas Connection Size (Not Gas Supply Line Size)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSCBL / RPBL / 400</td>
</tr>
<tr>
<td>Natural Gas</td>
</tr>
<tr>
<td>Propane</td>
</tr>
</tbody>
</table>

WARNING
This appliance is equipped for a maximum gas supply pressure of 1/2 psi, 3.5 kPa, or 14 inches water column. NOTE: Supply pressures higher than 1/2 psi require installation of an additional service regulator external to the unit.

Pressure Testing Supply Piping

Test Pressure Above 1/2 PSI: Disconnect the heater and manual valve from the gas supply which is to be pressure tested. Cap or plug the supply line.

Test Pressure Below 1/2 PSI: Before testing, close the manual valve on the heater.

WARNING
Manifold gas pressure must never exceed 3.5” w.c. for natural gas or 10” w.c. for propane gas.

All piping must be in accordance with requirements outlined in the National Fuel Gas Code ANSI/Z223.1 (latest edition) or CSA B149.1 and B149.2. (See Paragraph 1.4.) Gas supply piping installation should conform with good practice and with local codes. These separated-combustion units for natural gas are orificed for gas having a heating value of 1000 (±50) BTU per cubic ft. If the gas at the installation does not meet this specification, consult the factory for proper orificing.

Pipe joint compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or any other chemical constituents of the gas being supplied.

Install a ground joint union and manual shutoff valve upstream of the unit control system. The 1/8” plugged tapping in the shutoff valve provides connection for supply line pressure test gauge. The National Fuel Gas Code requires the installation of a trap with a minimum 3” drip leg. Local codes may require a longer drip leg, typically 6”.

After all connections are made, disconnect the pilot supply at the control valve and bleed the system of all air. Reconnect the pilot line and leak test all connections by brushing on a soap or leak-detecting solution.

FIGURE 10 - Gas Connection and Gas Train Manifold Arrangements

WARNING
All components of a gas supply system must be leak tested prior to placing the equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. See Hazard Levels, page 2.
6.0 Mechanical (cont’d)

6.1 Gas Piping and Pressures (cont’d)

Sizing Gas Supply Lines

<table>
<thead>
<tr>
<th>Length of Pipe</th>
<th>Diameter of Pipe</th>
<th>Capacity of Piping - Cubic Feet per Hour based on 0.3” w.c. Pressure Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1” Natural</td>
<td>1-1/4” Natural</td>
</tr>
<tr>
<td>20’</td>
<td>350</td>
<td>214</td>
</tr>
<tr>
<td>30’</td>
<td>285</td>
<td>174</td>
</tr>
<tr>
<td>40’</td>
<td>245</td>
<td>149</td>
</tr>
<tr>
<td>50’</td>
<td>215</td>
<td>131</td>
</tr>
<tr>
<td>60’</td>
<td>195</td>
<td>119</td>
</tr>
<tr>
<td>70’</td>
<td>180</td>
<td>110</td>
</tr>
<tr>
<td>80’</td>
<td>170</td>
<td>104</td>
</tr>
<tr>
<td>90’</td>
<td>160</td>
<td>98</td>
</tr>
<tr>
<td>100’</td>
<td>150</td>
<td>92</td>
</tr>
<tr>
<td>125’</td>
<td>130</td>
<td>79</td>
</tr>
<tr>
<td>150’</td>
<td>120</td>
<td>73</td>
</tr>
<tr>
<td>175’</td>
<td>110</td>
<td>67</td>
</tr>
<tr>
<td>200’</td>
<td>100</td>
<td>61</td>
</tr>
</tbody>
</table>

Note: When sizing supply lines, consider possibilities of future expansion and increased requirements. Refer to National Fuel Gas Code for additional information on line sizing.

Measuring manifold gas pressure cannot be done until the heater is in operation. It is included in the steps of the "Check-Test-Start" procedure in Paragraph 9.0. The following warnings and instructions apply.

**For Natural Gas:** When the heater leaves the factory, the combination valve is set so that the outlet gas pressure of a single-stage valve or high fire of a two-stage valve is regulated to 3.5” w.c. Low fire on a two-stage valve is set to 1.8” w.c. Inlet supply pressure to the valve must be a minimum of 5” w.c. or as noted on the rating plate and a maximum of 14” w.c. **NOTE:** Always check the rating plate for minimum gas supply pressure. Minimum supply pressure requirements vary based on size of burner and the gas control option. Most units require a minimum of 5” w.c. of natural gas as stated above, but larger sizes with electronic modulation require a minimum of 6” w.c. natural gas supply pressure.

**For Propane:** When the heater leaves the factory, the combination valve is set so that the outlet gas pressure of a single-stage valve or high fire of a two-stage valve is 10” w.c. Low fire on a two-stage valve is set to 5” w.c. Inlet pressure to the valve must be a minimum of 11” w.c. and a maximum of 14” w.c.

Before attempting to measure or adjust manifold gas pressure, the inlet (supply) pressure must be within the specified range for the gas being used both when the heater is in operation and on standby. Incorrect inlet pressure could cause excessive manifold gas pressure immediately or at some future time.

**Instructions to Check Valve Outlet (Manifold) Pressure:**

1) With the manual valve (on the combination valve) positioned to prevent flow to the main burners, connect a manometer to the 1/8” pipe outlet pressure tap in the valve. **NOTE:** A manometer (fluid-filled gauge) is recommended rather than a spring type gauge due to the difficulty of maintaining calibration of a spring type gauge.

2) Open the valve and operate the heater. Measure the gas pressure to the manifold. To measure the low stage pressure on units equipped with a two-stage valve, disconnect the wire from the "HI" terminal on the valve. (Be sure to reconnect the wire.) Normally adjustments should not be necessary to the factory preset regulator. If adjustment is necessary, set pressure to correct settings by turning the regulator screw IN (clockwise) to increase pressure. Turn regulator screw OUT (counterclockwise) to decrease pressure. Consult the valve manufacturer’s literature provided with the furnace for more detailed information.

**CAUTION:** DO NOT bottom out the gas valve regulator adjusting screw. This can result in unregulated manifold pressure causing overfire and heat exchanger failure.
6.2 Venting and Combustion Air

6.2.1 Separated-Combustion Model SSCBL

Each furnace section in the packaged system MUST BE equipped with both combustion air and exhaust piping to the outdoors. Refer to FIGURES 2 and 3 in Paragraph 4.1 for locations of vent and inlet air collars. The vent pipe collar is 6" O.D.; the inlet air collar is 6" I.D. Either a horizontal (Option CC6) or vertical (Option CC2) combustion air inlet/vent terminal concentric adapter assembly must be ordered for field installation to each furnace section. Each concentric adapter assembly is shipped in a separate carton. Be sure that the concentric adapter carton(s) are at the installation site.

These instructions apply to installation and use of the concentric adapter and vent/combustion air kits (Option CC2 or CC6) designed for use with all Model SSCBL systems. The vent/combustion systems illustrated in this manual are the only vent/combustion air systems approved for use with a Model SSCBL packaged heating system.

**WARNING**

Do not use an existing venting system. Installation of a combustion air/vent system ordered as Option CC2 or Option CC6 is required for each furnace section.

Installation should be done by a qualified agency in accordance with these instructions. The qualified service agency installing this separated-combustion system is responsible for the installation.

**WARNING**

Model SSCBL separated combustion units are not designed or approved for use in atmospheres containing flammable vapors or atmospheres highly laden with chlorinated vapors. See Hazard Levels, page 2.

6.2.1.1 Specific Venting Requirements - Model SSCBL

*(read all venting information before installing)*

1) Vent/Combustion Air Kit (ordered with the heater as either Option CC2 or Option CC6)

All Model SSCBL installations require a vent/combustion air kit for each furnace section. Follow the instructions on pages 19-21 to install a horizontal vent/combustion air system (Option CC6). Follow the instructions on pages 22-25 to install a vertical vent/combustion air system (Option CC2).

2) Type of Pipe (field-supplied)

*Vent Pipe Between the Furnace Section and the Concentric Adapter Box* - Use either vent pipe approved for a Category III appliance OR single-wall, 26-gauge or heavier galvanized (or a material of equivalent corrosion resistance) vent pipe.

*Vent Pipe Between the Concentric Adapter Box and the Vent Cap* - Double-wall (Type B) vent pipe is required. The length of vent pipe that extends through the box and runs concentric through the combustion air pipe must be one-piece with no joints.

*Combustion Air Inlet Pipe* - Sealed, single-wall galvanized pipe is recommended.

3) Venter Outlet and Combustion Air Inlet Collars

Each furnace section has both an inlet air and a venter outlet connection (See FIGURE 2). Both are 6” diameter for all sizes.

- **NOTE:** If using 7” pipe (see table below), use a taper-type 6” to 7” enlarger to attach the vent pipe and a 7” to 6” reducer to attach the combustion air pipe.

4) Pipe Diameter and Length

Pipe diameters and maximum indoor vent lengths apply to both horizontal and vertical vents. Add all straight sections and equivalent lengths for elbows. The total length of the straight sections and elbows must not exceed the Maximum Length.
4) Pipe Diameter and Length (cont’d)

<table>
<thead>
<tr>
<th>Model</th>
<th>Pipe Diameter</th>
<th>Maximum Length</th>
<th>Equivalent Length for an Elbow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vent</td>
<td>Inlet Air</td>
<td>90°</td>
</tr>
<tr>
<td>500, 600</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>50 ft (15 M)</td>
</tr>
<tr>
<td>400, 700, 800, 1050, 1200</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>30 ft (9 M)</td>
</tr>
<tr>
<td>All Sizes</td>
<td>7&quot;</td>
<td>7&quot;</td>
<td>70 ft (21M)</td>
</tr>
</tbody>
</table>

The outside (terminal) portion of the inlet air pipe is 8" in diameter. The 5" I.D. diameter double-wall vent pipe runs through the 8" inlet air pipe. See FIGURE 13, page 17. The outdoor lengths depend on the installation. Outdoor vent length requirements are listed in the installation instructions for the horizontal and vertical vent/combustion air kits.

5) Joints/Seals

Provide pipe as specified in Requirement No. 2 and make joints as follows:

- If using Category III vent pipe runs, follow the pipe manufacturer’s instructions for joining and sealing Category III vent pipe sections.
- If using single-wall vent pipe runs, secure slip-fit pipe connections using sheetmetal screws or rivets. Seal all joints with aluminum tape or silicone sealant.
- To seal joints in the single-wall combustion air pipe, secure slip fit pipe connections using sheetmetal screws or rivets. Seal all joints with aluminum tape or silicone sealant.
- To seal joint in the terminal section of double-wall vent pipe (allowed ONLY ABOVE the concentric pipes on a VERTICAL vent), follow the pipe manufacturer’s instructions for joining and sealing double-wall vent pipe sections.
- When joining the terminal section of double-wall vent pipe to the vent cap, follow the illustrated step-by-step instructions in FIGURE 11.
- When joining the terminal section of double-wall vent pipe to a single-wall or Category III vent pipe run, follow the illustrated step-by-step instructions in FIGURE 12.

FIGURE 11 - Follow STEPS to join Double-Wall (Type B) Pipe and the Vent Terminal Cap (horizontal or vertical)

(NOTE: Pipes and vent caps may not look exactly as shown in the illustrations. Instructions apply to both horizontal and vertical vent kits.)

**Figure 11 - STEP 1**

Place a continual 3/8” bead of silicone sealant around the circumference of the vent cap collar. This will prevent any water inside the vent cap from running down the double-wall pipe. Do STEP 2 immediately following STEP 1.

**Figure 11 - STEP 2**

Insert the collar on the vent cap inside the inner wall of the double-wall pipe. Insert as far as possible. Add additional silicone sealant to fully close any gaps between the vent cap and the double wall pipe. This is necessary to prevent water from entering the double wall pipe.

**Figure 11 - STEP 3**

Secure the vent cap to the double-wall pipe by drilling and inserting a 3/4” long sheetmetal screw into the vent cap collar. Do not overtighten screw.
FIGURE 12 - Follow STEPS to join the Double-Wall (Type B) Pipe to the Taper-type Reducer that Joins it to the Single-Wall or Category III Vent Run

Make this connection a maximum of 6" (152mm) from the concentric adapter box.

6) Support
Support horizontal runs every six feet (1.8M). Support vertical runs of type "B" double-wall or Category III vent pipe in accordance with the requirements of the pipe manufacturer. Support single-wall vertical pipe in accordance with accepted industry practices. Do not rely on the heater or the adapter box for support of either horizontal or vertical pipes. Use non-combustible supports on vent pipe.

7) Clearance
Do not enclose the vent pipe or place pipe closer than 6" (152mm) to combustible material.

8) Concentric Adapter Box
All separated combustion installations require a concentric adapter box as illustrated in FIGURE 13. The concentric adapter box is included in the vent/combustion air kit. Installation instructions depend on whether the vent system is horizontal (Option CC6) or vertical (Option CC2).

FIGURE 13 - A Concentric Adapter Box is Required for EACH Furnace Section of a Model SSCBL Installation

View of Heater Connection Side
Collar for connecting indoor portion of the combustion air pipe
Opening for double-wall vent pipe to pass through the box.

View of Vent Terminal Connection Side
Collar for attaching outside concentric portion of the 8" combustion air pipe

Dimensions
P/N 205885, Concentric Adapter Box

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>P/N 205885, Concentric Adapter Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top View</td>
<td>8&quot; dia Collar for Combustion Air Pipe</td>
</tr>
<tr>
<td>6-1/32&quot; (153mm)</td>
<td>Bottom View</td>
</tr>
<tr>
<td>2&quot; (51mm)</td>
<td></td>
</tr>
</tbody>
</table>

Heater Side View
6" Collar for Combustion Air Pipe
14-1/4" (362mm)
5" (127mm)
5-7/32" (133mm)
5-1/2" (139mm)
Opening for vent pipe to pass through the box
13-3/8" (340mm)
6.0 Mechanical (cont’d)
6.2 Venting and Combustion Air (cont’d)
6.2.1 Separated-Combustion Model SSCBL (cont’d)

FIGURE 14 - Concentric Adapter Box Connections (6” or 7” pipe)

• If using 6” diameter pipes, a 6” to 5” (152 to 127 mm) reducer is required in the vent pipe.

• If using 7” diameter pipes, a 7” to 5” (178 to 127 mm) reducer is required in the vent pipe and a 6” to 7” (152 to 178 mm) enlarger is required for attaching the combustion air pipe.

---

6.2.1.1 Specific Venting Requirements (cont’d) (read all before installing)

Pipe Connections at the Concentric Adapter Box

When pipe diameters differ, depending on direction of airflow, join the pipes with either a taper-type reducer or enlarger. Refer to illustrations in FIGURE 14 for pipe connection requirements at the concentric adapter box.

Do NOT make actual connections until after reading the instructions and length requirements for installing the vent/combustion air kit. The connection requirements are the same for both vertical and horizontal systems, but the length of the double-wall pipe will vary.

---

Model SSCBL - Pipe diameters and connections required at each concentric adapter box when using 6” pipes between the furnaces and the boxes

- Requires a 6 to 5 inch (152 to 127mm) taper-type reducer a maximum of 6” (152mm) from the concentric adapter box.
- 6” (152mm) diameter single-wall or Category III vent pipe attaches to the heater.
- 6” (152mm) diameter single-wall inlet air pipe attaches to the heater.

Model SSCBL - Pipe diameters and connections required at each concentric adapter box when using 7” pipes between the furnaces and the boxes

- Requires a 7 to 5 inch (178 to 127mm) taper-type reducer a maximum of 6” (152mm) from the concentric adapter box.
- 7” (178mm) diameter single-wall or Category III vent pipe attaches to the heater.
- 7” (178mm) diameter single-wall inlet air pipe attaches to the heater.
- Requires a 6 to 7 inch (152 to 178mm) taper-type enlarger at the concentric adapter box.

---

Is the Vent Terminal HORIZONTAL OR VERTICAL?

Follow the instructions for the Vent Terminal being installed:

Horizontal, Option CC6, instructions begin on page 19.

Vertical, Option CC2, instructions begin on page 22.
6.2.1.2 Horizontal Vent Instructions - Model SSCBL

FIGURE 15 - Parts in each Horizontal Vent Terminal/Combustion Air Package (Option CC6) - One required for each furnace section.

Components Required - Factory and Field

<table>
<thead>
<tr>
<th>Qty</th>
<th>P/N</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>205883</td>
<td>Complete Horizontal Vent Kit (Same as Option CC6)</td>
</tr>
<tr>
<td>1</td>
<td>205885</td>
<td>Concentric Adapter Box Assembly (See FIGURE 13, page 17.)</td>
</tr>
<tr>
<td>1</td>
<td>53316</td>
<td>Screened Exhaust Assembly (illustrated below)</td>
</tr>
<tr>
<td>1</td>
<td>205894</td>
<td>Inlet Guard (illustrated below)</td>
</tr>
<tr>
<td>4</td>
<td>37661</td>
<td>#10-16 x 1/2&quot; long Screws to attach the inlet guard</td>
</tr>
<tr>
<td>2</td>
<td>207232</td>
<td>Brackets for attaching Concentric Adapter Box (FIGURE 16B, page 20)</td>
</tr>
<tr>
<td>1</td>
<td>53335</td>
<td>Tube of High Temperature (450°F) Silicone Sealant</td>
</tr>
</tbody>
</table>

Field-supplied installation requirements:

- Vent pipes - see requirements, page 15.
- Combustion air pipes - see requirements, page 15.
- Taper-type vent pipe diameter reducers and/or increasers as required.
- Thimble (a thimble is not required if wall is of non-combustible construction).
- Flashing.
- Sheetmetal screws, tape, and sealant as required.

Installation Instructions for Horizontal Vent Kit Option CC6 - Model SSCBL

1. Determine the location on the outside wall for the vent terminal. Location must comply with vent length requirements, Requirement No. 4 on pages 15-16. In most applications, the terminal would be on a level with the heater mounting height. Allow 1/4" per foot (6mm per 305mm) downward pitch for condensate drain.

The distance of the termination of the horizontal vent from adjacent public walkways, adjacent buildings, openable windows, and building openings must be in accordance with local codes or, in the absence of local codes, must conform with National Fuel Gas Code Z223.2. Local codes supersede all provisions in these instructions and in the National Fuel Gas Code. Minimum clearances for the horizontal vent terminal are shown below. Also, select a location that complies with adjoining building clearances as shown in FIGURE 17, page 21.

Products of combustion can cause discoloring of some building finishes and deterioration of masonry materials. Applying a clear silicone sealant that is normally used to protect concrete driveways can protect masonry materials. If discoloration is an esthetic problem re-locate the vent or install a vertical vent.

Clearances to a Horizontal Vent Terminal

<table>
<thead>
<tr>
<th>Structure</th>
<th>Minimum Clearances for Vent Terminal Location (all directions unless specified)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forced air inlet within 10 ft (3.1M)*</td>
<td>3 ft (0.9M) above</td>
</tr>
<tr>
<td>Combustion air inlet of another appliance</td>
<td>6 ft (1.8M)</td>
</tr>
<tr>
<td>Door, window, or gravity air inlet (any building opening)</td>
<td>4 ft (1.2M) horizontally</td>
</tr>
<tr>
<td>Electric meter, gas meter ** and relief equipment</td>
<td>U.S. - 4 ft (1.2M) horizontally; Canada - 6 ft (1.8M)</td>
</tr>
<tr>
<td>Gas regulator **</td>
<td>U.S. - 3 ft (0.9M); Canada - 6 ft (1.8M) horizontally</td>
</tr>
<tr>
<td>Adjoining building or parapet</td>
<td>6 ft (1.8M)</td>
</tr>
<tr>
<td>Adjacent public walkways</td>
<td>7 ft (2.1M) above</td>
</tr>
<tr>
<td>Grade (ground level)</td>
<td>3 ft (.9M) above**</td>
</tr>
</tbody>
</table>

*Does not apply to the inlet of a direct vent appliance. **Do not terminate the vent directly above a gas meter or service regulator. *** Consider local snow depth conditions. The vent must be at least 6" (152mm) higher than anticipated snow depth.

2. Install the Vent Pipe and Combustion Air Pipe Runs - Use the type of pipe specified in Requirement No. 2, page 15. Comply with requirements in Requirement No. 3, page 15, when attaching pipes to the heater.

Seal all joints. Due to the high temperature, do not enclose the exhaust pipe or place pipe closer than 6" (152 mm) to combustible material. Extend the runs close to the wall location selected in Step 1. Support pipes as required in Requirement No. 6, page 17.
6.0 Mechanical (cont’d)

6.2 Venting and Combustion Air (cont’d)

FIGURE 16A - Prepare holes so that there is a minimum of 26-1/8” (664mm) between centerlines of each terminal pipe.

6.2.1.2 Horizontal Vent Instructions - Model SSCBL (cont’d)

3. Prepare a hole through the outside wall for the 8” (203mm) diameter combustion air pipe. Outside wall construction thickness should be between 1” (25mm) minimum and 48” (1143mm) maximum. The larger diameter combustion air pipe serves as clearance for the vent pipe on non-combustible construction. A thimble may be required depending on wall construction and/or local codes.

When installing a system with more than one furnace section, a minimum of 26-1/8” (664mm) is required between the centerlines of each terminal pipe (FIGURE 16A).

With more than one furnace section, prepare one hole per furnace with spacing as shown.

4. Prepare the Concentric Adapter Box

a) Attach the brackets to the box. Follow the instructions in FIGURE 16B.

b) Attach the outside portion of the combustion air pipe to the box. Determine the length by measuring the bracket length from box to wall, plus the wall thickness, plus 2” (51 mm). (The inlet air pipe should extend beyond the outside wall approximately 2” (51mm).)

Attach the inlet air pipe to the collar of the concentric adapter with sheetmetal screws and seal.

5. Attach the concentric adapter box to the wall. Insert the combustion air pipe through the wall. Attach the brackets (FIGURE 16B) to the wall. On the outside, caulk or flash the inlet air pipe. Flashing is field-supplied.

6. Position the inlet guard over the end of the combustion air pipe. See FIGURE 17. Attach the guard to the inlet air pipe with the four 1/2” long screws.

7. Determine length and install the double-wall terminal vent pipe.

a) Determine length of pipe. The length of the vent pipe is determined by the installation within the maximum and minimum requirements. See FIGURE 17, to determine lengths of each segment and calculate the total length required. The vent pipe extending through the box and the inlet air pipe must be one piece of double-wall vent pipe without joints. The transition to the single-wall or Category III vent pipe run, must be a maximum of 6” (152mm) from the heater side of the box.

b) Install double-wall terminal vent pipe. Being sure the vent pipe is in the proper flow direction, slide the end through the box. Position the vent pipe so that it will extend between 16” (406mm) and 24” (610mm) past the end of the combustion air pipe and no more than 6” (152mm) out of the box toward the heater.
8. Attach the exhaust (vent) cap to the end of the vent pipe. Align the cap so that its baffle strips are positioned on the horizontal and vertical centerlines (See FIGURE 17). Follow the instructions in FIGURE 11, page 16, to attach the exhaust cap. (NOTE: If vent pipe is inserted from outside, cap may be attached before the double-wall vent pipe is installed. If cap is attached first, be sure the baffle strips are positioned correctly when attaching the vent terminal pipe to the vent run.)

9. Seal the vent pipe. Verify that the double-wall section of vent pipe has a slight downward drop (1/4" per foot / 6mm per 305mm) toward the vent terminal end. Use silicone sealant and seal the circumference of the pipe and the opening of the box. Seal the area around the pipe completely.

10. Attach the indoor combustion air pipe. If using 6" pipes, attach the single-wall combustion air pipe run to the collar on the concentric adapter box with sheetmetal screws. If using 7" pipe, install a taper type enlarger as illustrated in FIGURE 14, page 18. Seal joints with tape or sealant.

Installation of the horizontal vent and combustion air system on your separated-combustion unit is complete. Verify compliance with all venting installation requirements, pages 15-18, and illustrated in FIGURE 17.
6.2 Venting and Combustion Air (cont’d)

Components Required - Factory and Field

FIGURE 18 - Parts in the Vertical Vent Terminal/Combustion Air Package (Option CC2) - One required for each furnace section.

Field-supplied installation requirements:

- Vent pipes - see requirements, page 15.
- Combustion air pipes - see requirements, page 15.
- Taper-type pipe diameter reducers and/or increasers as required
- Thimble (a thimble is not required if wall is of non-combustible construction)
- Flashing
- Sheetmetal screws, tape, and sealant as required

Installation Instructions for Vertical Vent/Combustion Air Kit Option CC2

1. Determine the Location of the Vent Terminal(s). - Select a location away from fresh air intakes, allowing space for each concentric adapter box inside. Vent terminals must be located from adjacent buildings as shown in FIGURE 24, page 25. A vent terminal is required for each furnace section. When more than one vertical concentric vent/combustion air terminal (Option CC2) is being installed, the minimum spacing between vent centerlines is determined by the minimum outdoor design temperature (most extreme outdoor condition at the installation site).

<table>
<thead>
<tr>
<th>Minimum Outdoor Design Temperature</th>
<th>Minimum Spacing between Centerlines of Vent Pipes in Vertical Combustion Air/Vent Terminals (Option CC2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>°F</td>
<td>°C</td>
</tr>
<tr>
<td>31 or warmer 0 or warmer</td>
<td>36</td>
</tr>
<tr>
<td>-10 to 30 -23 to -1</td>
<td>60</td>
</tr>
<tr>
<td>less than -10 less than -23</td>
<td>84</td>
</tr>
</tbody>
</table>

2. Install the Vent Pipe and Combustion Air Pipe Run(s). - Use the type of pipe specified (Requirement No. 2, page 15), and comply with the attachment requirements in Requirement No. 3, page 15. Length must comply with Requirement No. 4, pages 15-16. Seal all joints. Due to the high temperature, do not enclose the exhaust pipes or place pipes closer than 6” (152 mm) to combustible material. Provide supports for the pipes. Extend the runs to close to the roof at the location(s) selected in Step 1 above.

3. Prepare hole(s) through the roof for the 8” (203mm) diameter combustion air pipe. - A thimble may or may not be required depending on building construction and/or local codes. The larger diameter combustion air pipe serves as clearance for the vent pipe on non-combustible construction.

4. Prepare the Concentric Adapter Box
   a) Attach the brackets to the box. Follow the instructions in FIGURE 20.
   b) Attach the outside portion of the combustion air pipe to the box. Determine the length of the combustion air pipe so that dimension “X” in FIGURE 21 is equal to the bracket length, plus the roof thickness, plus anticipated snow depth, but does not exceed 48” (1219mm) or have less than 18” (457mm) of pipe above the roof. Attach the inlet air pipe to the collar of the concentric adapter box with sheetmetal screws.
5. Attach the concentric adapter box to the roof. On the inside, insert the combustion air pipe up through the opening and attach brackets to the roof. (See FIGURES 21 and 22.) On the outside, flash the combustion air pipe to the roof. Flashing is field supplied.

6. Determine the length and install the double-wall vent pipe.

a) Determine the length. See FIGURE 21 to determine the required length of the vent pipe. The vent pipe extending through the box and the inlet air pipe must be one piece of double-wall vent pipe without joints.

---

FIGURE 20 - Brackets for Attaching the Concentric Adapter Box to the Roof

2) Attach the Box to the Roof (Step 5)
   When the box is attached to the roof in Step 5, use the 2-1/2" (64mm) portion of the brackets. To adjust to construction each bracket has three 7/32" diameter holes.

1) Attach the Brackets to the Box - The 6" (152mm) portion of each bracket is designed with five 7/32" diameter holes so that attachment to the box can be adjusted.

If the roof is combustible, position brackets to allow for a 2" (51mm) clearance between the box and the roof.

After careful positioning, use sheetmetal screws to attach the brackets. NOTE: If any holes are made in the box in error, they must be sealed.

---

FIGURE 21 - Assemble Concentric Adapter Box, Outdoor Combustion Air Pipe, and Double-Wall Vent Pipe

A second section of double-wall pipe is permitted, joining the long continuous piece of vent pipe a minimum of 3" (76mm) above the top of the combustion air pipe.

22" (559mm) minimum

Cold Climate NOTE: In geographic areas where the design ambient is -10°F or lower, this minimum height is 34" (864mm).

X = length of combustion air pipe required through and above the roof.

Height from box to top of inlet air pipe must not exceed 48" (1219mm). Minimum height above the roof is 18" (457mm) and must be higher than anticipated snow depth.

---

FIGURE 22 - Slide attached Combustion Air Pipe up through the Roof

After box is installed, install Concentric Vent Pipe - One piece of continuous double-wall pipe must extend from a minimum of 3" (76mm) above the combustion air pipe to a maximum of 6" (152mm) below the box. (NOTE: Vent pipe does not attach to the box; it must be supported.)

1) Calculate height (see requirements on the left).
2) Be sure vent flow marking on pipe is in the right direction.
3) Slide pipe through the box and the outer inlet air pipe.
4) Attach to vent run no more than 6" (152mm) from the adapter box. See instructions on page 18.

First, attach Combustion Air Pipe and install the Concentric Box

1) Determine length (X) of pipe (see requirements on the left).
2) Attach the pipe to the collar on the box.
3) Attach the brackets to the roof.

---

Outside View with concentric adapter box attached to underside of roof. Install field-supplied flashing at roof opening.
Determine the minimum length by adding the requirements. Starting at the bottom, the maximum the vent pipe can extend below the box is 6" (152mm); plus 6" (152mm) through the box; plus length of bracket extending above the box; plus the width of the roof; plus the height of the outside combustion air pipe above the roof; plus a minimum of 3" (76mm) beyond the top of the inlet air pipe. Total is the minimum length of the vent pipe section. If the actual piece of vent pipe is longer, extend it further above the combustion air pipe. Do not extend it more than 6" (152mm) below the box.

b) Install the pipe. Being sure the pipe is in the proper flow direction, slide the end into the box and out through the combustion air pipe. Position the vent pipe so that the end is no more than 6" (152mm) below the box. The upper end should extend at least 3" (76mm) above the combustion air pipe. **NOTE:** The double-wall vent pipe does not attach to the box. The installer must provide support.

Follow the instructions in **FIGURE 12**, page 17 for connecting the double-wall pipe to the single-wall pipe or Category III vent pipe run. A taper-type reducer is required. Seal the circumference of the pipe and the opening of the box with silicone sealant. Seal the area around the pipe completely.

7. On the outside, slide the combustion air inlet over the vent pipe and fasten the collar to the combustion air pipe with sheetmetal screws. See **FIGURE 23.** Seal the opening at the top between the vent pipe and the combustion air inlet with silicone sealant to prevent water leakage.

8. Attach the exhaust (vent) cap. See **FIGURE 23** and follow the illustrated instructions in **FIGURE 11,** page 16.

9. Attach the indoor combustion air pipe. Use sheetmetal screws to attach the single-wall combustion air pipe run to the collar on the concentric adapter box. Seal with tape or sealant. If using 7" pipe, install a taper type enlarger as illustrated in **FIGURE 14,** page 18.

Installation of the vertical vent and combustion air system on your separated-combustion unit is complete. **Verify compliance with all venting installation requirements, pages 15-18,** and **FIGURE 24.**
6.2.2 Venting Outdoor Power Vented Model RPBL

The screened flue gas and combustion air openings are located on the side of each furnace section just above the control access panel (FIGURE 25).

Optional Vertical Flue Discharge (Option CC3) for Model RPBL

These power vented furnaces are certified with four feet (1.2M) of vertical pipe attached as shown in FIGURES 26A and 26B. The distance is measured from the top of the unit to the bottom of the vent cap. The option package includes the 5" vent cap, the adapter assembly and the seal plate. (One package is required for each furnace section.) The vent pipe and supports are field supplied. The straight pipe connecting the furnace to the 90° elbow must be at least 18" (457mm) in length.
6.0 Mechanical (cont'd)  6.2 Venting and Combustion Air (cont'd)
6.2.2 Venting Outdoor Power Vented Model RPBL (cont'd)
Optional vertical vent piping provides compliance with local codes that require either 10-ft (3M) horizontal or 4-ft (1.2M) vertical clearance between the flue outlet and fresh air intake of the heating system and/or the building.

FIGURE 26A - Installation of Adapter for Optional Vertical Flue Discharge (Option CC3, P/N 45021)

1) Remove and discard the louvered discharge grill.
2) Using venter seal plate as a template, drill holes. Use 3/8"-10 sheetmetal screws to attach both the venter seal plate and the oval adapter assembly.

FIGURE 26B - Installation of the Vent Cap (included in the option package) and the fieldsupplied Piping and Supports

6.3 Unit Inlet Air

6.3.1 100% Outside Air Hood - Model RPBL
Outside air hood (Option AS2) is a weatherized, screened hood designed to be field assembled and installed around the horizontal inlet air opening of the blower cabinet. The air hood includes a louver assembly designed to help eliminate moisture from the inlet air. Complete installation instructions are packaged with the air hood option.

FIGURE 27 - Dimensions of Outside Air Hood, Option AS2

NOTE: Either a manufacturer designed optional air inlet hood as shown in FIGURE 27 or an evaporative cooling module as shown in Paragraph 6.3.3 is required to ensure complete weather resistance.

CAUTION: It is recommended that the inlet to the outside air hood NOT be facing into the prevailing wind. Allow 14" minimum clearance from the bottom of the air hood to the mounting surface.

Installation Instructions - 100% Outside Air Hood
Refer to FIGURE 28. All screw ends except those across the bottom should be inside the air hood. To avoid possible damage, it is recommended that the outside air hood be installed after the system has been placed on the roof. The air hood should be installed before the heater is operated. Do not install the hood while the system (furnace or blower) is in operation.

1. Top Panel -- On the air inlet side of the blower cabinet, remove the factory-installed screws attaching the blower cabinet top. Slide the air hood top panel underneath the edge of the blower cabinet top. The edge of the air...
6.3.2 Screened Air Hood for 30% Outside Air Opening, Part of Inlet Air Options AR6 and AR7 - Model RPBL

The outside air hood included in the air inlet options that have a 30% outside air opening (Option AR6 or AR7) is shipped separately for field installation. Instructions are packaged with the air hood.

FIGURE 29 - Installation of Air Hood on Cabinets with 30% Outside Air Opening Options

Installation Instructions - 30% Outside Air Hood (FIGURE 29)
1. On the inlet air side of the blower cabinet, remove the factory installed screws attaching the blower cabinet top.
2. Slide the air hood top flange underneath the lip of the blower cabinet top and the sides into the vertical slots. The air hood flange must be between the blower cabinet top and the cabinet end panel.
3. Reinsert all of the sheetmetal screws.
6.0 Mechanical (cont’d)

6.3 Unit Inlet Air (cont’d)

6.3.3 Optional Dampers and Controls - RPBL and SSCBL

Damper controls are identified on the wiring diagram as AR Options. The illustration in FIGURE 30A is intended to show location only of various air control accessories and does not represent suggested combinations of accessories. The illustration does not accurately depict the blower cabinet; control locations are approximately correct.

FIGURE 30A - Control Locations for 100% Outside Air and 100% Return Air Damper Options

1) Damper Motor
2) Return Air Damper
3) Potentiometer
4) Potentiometer
5) Mixed Air Controller
6) Warmup Control
7) Outside Air Damper
8) Damper Motor Transformer

FIGURE 30B - Location of Controls for 30% Outside Air Hood and Damper Options (AR6 or AR7)

NOTE: See Paragraph 6.3.2.

FIGURE 30C - Example of Outside Air and Return Air Damper Linkage

Inlet Air Damper Linkage -- When units are equipped with dampers, the dampers are closed during shipment. When there are both return air and outside air dampers, the return damper linkage must be adjusted prior to use.

1. Loosen the set screw on the return air damper rod at the damper arm.
2. Manually open the return air dampers. While the dampers are opening, the damper rod and arm will automatically move to their correct positions.
3. Tighten the set screw.

Pressure Null Switch (Used to control Outside Air Dampers in Option AR23)

The pressure null switch used in Option AR23 is a Dwyer #1640-0 with a range of .01-.20" w.c. It is shipped separately for field installation. Refer to the following paragraphs and the manufacturer’s installation instructions included with the switch.

Description and Application - The pressure null switch is a diaphragm operated differential pressure switch used in makeup air applications to control building pressure.
It maintains a selected positive or negative pressure setpoint by changing the amount of outside air being introduced to the building through the modulating outside air dampers. As more pressure is required in the building, the pressure null switch activates the damper motor driving the outside air damper towards the full open position and the recirculated air damper towards the closed position. Conversely, as less pressure is required, the switch drives the dampers in the opposite direction.

Installation Instructions for Pressure Null Switch

1. Select an indoor location free from excessive vibration where oil or water will not drip onto the switch and where ambient temperature will be within a range of -30°F (dry air) to 110°F.

2. Mount the switch with the diaphragm in a vertical plane. The switch is position sensitive and is calibrated to operate properly when the diaphragm is vertical. Mount switch securely.

3. Connect the pressure taps on the top of the switch to sources of air pressure differential. Metal tubing with 1/4” O.D. is recommended, but any tubing system which will not unduly restrict the air flow may be used. To maintain a positive building pressure, vent the low pressure tap to the outdoors and allow the high pressure tap to monitor building pressure. To maintain a negative building pressure, reverse the functions of the high and low pressure taps. In either case, be sure that the outdoor vent is protected from the wind and screened from insects.

4. Adjustment of the Switch - The “HIGH” actuation point of the null switch is indicated on a calibrated scale secured to the transparent range screw enclosure. Building pressure is set by turning the adjustment screw. The “Low” actuation point is set by adjusting the span of the null by turning the span adjustment screw. The span range is .01” to .03” w.c.

5. See the wiring diagram included with the furnace to make electrical connections.

FIGURE 31 - Pressure Null Switch (used with Inlet Air Option AR23)

The system is equipped with a combination blower/filter cabinet. Filter rack and filters are optional equipment.

6.3.4 Optional Filter Rack and Filters - SSCBL and RPBL

Quantities and Sizes of Optional Filters

<table>
<thead>
<tr>
<th>Type/All 2”</th>
<th>SSCBL/RPBL 400; 800; 1200</th>
<th>SSCBL/RPBL 500; 800</th>
<th>SSCBL/RPBL 700; 1050</th>
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<tr>
<td>Disposable</td>
<td>(2) 16 x 16; (1) 16 x 25; (4) 12 x 25; (4) 12 x 30</td>
<td>(1) 16 x 25; (1) 16 x 20; (4) 12 x 20; (4) 12 x 25</td>
<td>(2) 16 x 25; (4) 12 x 30; (4) 12 x 20</td>
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<tr>
<td>Permanent</td>
<td>(2) 16 x 16; (8) 12 x 16; (1) 16 x 25; (4) 12 x 26</td>
<td>(1) 16 x 20; (4) 12 x 20; (1) 16 x 25; (4) 12 x 26</td>
<td>(2) 16 x 25; (8) 12 x 26</td>
</tr>
<tr>
<td>Pleated</td>
<td>Disposable (2) 16 x 16; (4) 12 x 25; (1) 16 x 25; (4) 12 x 32</td>
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<td>(2) 16 x 25; (4) 12 x 32; (4) 12 x 20</td>
</tr>
</tbody>
</table>
6.0 Mechanical (cont'd)

6.3 Unit Inlet Air (cont'd)

6.3.4 Optional Filter Rack & Filters (cont'd)

Filter Arrangements for 2" Disposable Filters (Option AW7)

Filter Arrangements for 2" Disposable Pleated Filters (Option AW11)

Filter Arrangements for 2" Permanent Filters (Option AW9)

Filter Pressure Drops

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<th>CFM</th>
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<td>4000</td>
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<td></td>
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<td></td>
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<table>
<thead>
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<th>SSCBL or RPBL</th>
<th>CFM</th>
<th>Filter Pressure Drops (&quot; w.c.)</th>
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<tr>
<td></td>
<td>13000</td>
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</tr>
</tbody>
</table>

Filter Airflow Range

Dispos .. 0 to 400 FPM
Permanent .. 0 to 600 FPM

**FIGURE 32 - Filter Arrangements by Model and Size**

*Tested in accordance with ASHRAE 52-76 Test Standard*
Optional Dirty Filter Switch

The optional dirty filter pressure switch is used to provide warning to the user by energizing an indicator light on an optional remote console. The light indicates that the filters are in need of cleaning or changing. The adjustable, single-pole/normally open differential switch closes when an increase in pressure differential above the setpoint, is sensed across the filter bank.

This switch is located in the furnace section. See page 43, FIGURE 46, Item 17. After the unit is started, before continuous operation, the dirty filter switch must be set.

Instructions for Setting Dirty Filter Switch (FIGURE 33)

With clean filters in place, blower doors closed, and blower in operation, decrease the pressure setting by adjusting the set screw on the switch clockwise until the filter light is energized or the screw is bottomed out. At that point, adjust the set screw three full turns counterclockwise or until the screw is top-ended. At that setpoint the filter light will be activated at approximately 50% filter blockage.

FIGURE 33 - Dirty Filter Switch
Set screw (on front of switch) must be manually adjusted after the system is in operation.
Positive pressure connection is toward the "back" or "bottom" of the switch (senses air inlet side of filters)
Negative pressure connection is toward the "front" or "top" of the switch (senses blower side of filters)

6.3.5 Optional Evaporative Cooling Module - Applies to Model RPBL

Evaporative cooling provides excellent comfort cooling at low initial equipment and installation costs and low operating and maintenance costs. Direct evaporative cooling works solely on the principle that water in direct contact with a moving airstream will eventually evaporate if the droplets have long enough exposure. This evaporative cooling module uses wetted rigid cellulose or glass fiber media to retain water in order to allow time for evaporation.

The evaporative cooling module for these systems is factory assembled but is not attached to the blow cabinet at the factory. It is shipped separately for field attachment to the system blow cabinet. The base support for the cooling module and the transitional ductwork between the cooling module and the blow cabinet inlet are shipped separately and must be field assembled and installed. Complete installation instructions including water and electrical connections are included with the evaporative cooling module package.

Included in the cooling module installation booklet is a preparation checklist. All items in that checklist should be consulted prior to beginning installation of the optional evaporative cooling module. Four of those items are listed below.

- Make certain the supporting platform is capable of handling the additional load of a full cooling module reservoir.

Weights of Evaporative Cooling Module - w/Wet Media & Full Reservoir (lbs.)
Module with 12" rigid cellulose media (Opt AS4) 431 lbs
Module with 12" rigid glass fiber media (Opt AS8) 514 lbs
6.0 Mechanical (cont'd)
6.3 Unit Inlet Air (cont'd)
6.3.5 Optional Evaporative Cooling Module - Applies to Model RPBL (cont'd)

- Make certain the surface is level and free of debris where cooling module will be mounted.
- Provide a weather-resistant, solid wood or metal base under legs of cooling module base.

**FIGURE 35 - Field-Assembled Base for Optional Evaporative Cooling Module**

- Make certain that there will be adequate clearance between the bottom of the reservoir and the mounting surface to allow for drain and overflow pipe connections.

The optional evaporative cooling module is equipped with high efficiency pad media of either 12" rigid cellulose (Option AS4) or 12" rigid glass fiber (Option AS6). 12" media provides 90% efficiency. Efficiency values are stated at maximum allowable CFM without the addition of a moisture elimination pad with an inlet dry bulb temperature of 95°F and inlet wet bulb temperature of 65°F. The evaporative cooling efficiency is a function of inlet temperature and of face velocity through the media. The stated cooling efficiency will rise with the decrease of CFM and the increase of inlet temperature. Moisture elimination pads (Option ASA1) may be used on all units but are required on units with over 11,200 CFM (950 FPM). Instructions for field installation of the optional moisture elimination pad are included with the cooling module.

**WARNING**

Pump must never be operated without water in the reservoir. See Hazard Levels, page 2.

**WARNING**

Disconnect all power to the unit before doing any maintenance. Failure to do so can cause electrical shock, personal injury or death.

---

**Evaporative Cooling Module Maintenance**

**NOTE:** For troubleshooting information about the optional evaporative cooling module, refer to Form I-OPT-EC, installation manual shipped with the evaporative cooling module.

**Instructions for Replacing Evaporative Cooling Media**

Media – Over time, excessive amounts of mineral deposits will begin to build up on the media. Annually, scale and dirt should be washed off the entering surface of the media. Remove the pad retainers and screen (See Steps 1-3 and 6-8 of Media Replacement Instructions). Clean the media using a garden hose, mild soap, and a soft bristled brush. When the media becomes too clogged with mineral deposits and dirt that it cannot be cleaned, the pads should be replaced. The average pad life expectancy is approximately three cooling seasons.

Select the correct replacement part numbers and order replacement media pads from your distributor. Follow the instructions below and remove and replace pads as shown in **FIGURES 36 and 37**.

1. Remove the three sheetmetal screws that hold the top pad retainer in place. Release the top pad retainer from the cooling module.
2. Remove the three sheetmetal screws that hold the bottom pad retainer in place. Release bottom pad retainer from the cooling module.
3. Disengage the screen retainers from the sides of the media.
4. Disengage inlet screen from media pads and remove.
5. Slide all media pads horizontally away from the cooling module until clear of bottom reservoir pan. Dispose of properly.
6. Replace media by sliding media pads over both support rails until back stop is encountered. Media must be placed as shown in **FIGURE 37**.
7. Center screen on the incoming air side of the media.
FIGURE 36 - Removal and Replacement of Evaporative Cooling Module Media

8. Replace the two side screen retainers by fitting them between the side of the media pad and the side of the cooling module. The retainers should fit snugly, pinching the screen against the media pads.
9. Replace the bottom pad retainer by securing the retainer between the pad and the reservoir pan. Fasten with the three sheetmetal screws removed in Step 2.
10. Replace the top pad retainer by securing the retainer between the pad and top of the cooling module. Fasten with the three sheetmetal screws removed in Step 1.

Water Feed Line and Distribution Piping – Annually, the water supply line and the water distribution line (either PVC pipe or water sock) should be flushed of debris and contaminants.
1. Remove the media pads following the instructions above.
2. Remove the water feed line from the downstream side of the ball valve and unscrew the water bleed line barbed hose fitting.
3. Force a fresh water supply up through the water inlet hose and thoroughly flush the distribution line.
4. Re-assemble, being careful to install media with air flow direction as shown in FIGURE 37.

Water Pump and Inlet Basket Screen (Does not apply to module with optional timed metering system.) – Annually, the pump and inlet basket should be removed, disassembled and cleaned.

WARNING
Do not expose pump motor or any part of the electrical box to water. Evaporative cooling pump is NOT submersible.

1. Disconnect the power supply to the unit.
2. Remove the junction box door and disconnect the two power supply wires from the terminal block inside the junction box.
3. Disconnect the water feed line hose from the upstream side of the ball valve.
4. Unscrew the four sheetmetal screws holding the junction box to the cooling module. Remove the junction box-pump-float switch assembly.
5. Dislodge the inlet basket screen from the pump and clean any buildup of debris and dirt. Carefully remove the base cover plate from the bottom of the pump.
6.0 Mechanical (cont'd)

6.3 Unit Inlet Air (cont'd)

FIGURE 38 - Remove Junction Box, Pump and Float Switch as an Assembly

(NOTE: Applies to evaporative cooling module with float and pump control system only. Depending on date of manufacture, actual assembly may not appear exactly as in the photo.)

6.3.6 Cooling Coil Cabinet, Option AU - SSCBL and RPBL

FIGURE 39 - Optional Cooling Coil Cabinet is shipped separately for field attachment.

6.3.5 Optional Evaporative Cooling Module - RPBL (cont'd)

Using a mild soap solution, wash all deposits from the inside of the pump and remove all debris from the impeller.

6. Reassemble the pump. Replace the parts in exact reverse order, being careful that everything is returned to its proper position.

The optional cooling coil cabinet is shipped separately for attachment in the field. The cabinet includes either a chilled water or a refrigerant (DX) air conditioning coil. Cabinets alone have horizontal discharge but may have an attached downturn plenum for vertical discharge. If the downturn plenum is equipped with discharge dampers, field wiring including drilling holes and running wires is required. Cooling coil cabinet dimensions are on page 7. (NOTE: If the system is being installed on an indoor Model SSCBL, consult the factory regarding installation.)

WARNINGS

Do NOT attach the cooling coil cabinet before lifting the packaged blower/furnace system into position. Lift the cooling coil cabinet separately. Do NOT attach the cooling coil cabinet while the furnace is in operation.

Using the parts shipped inside the cooling coil cabinet (see list below), follow the instructions to connect the coil cabinet to the furnace. In addition to normally required tools, a driver extension, a hammer, and bar or short length of 2x4 will be required. Silicone caulking must be field-supplied.

Factory-Supplied Parts for Attaching Optional Cooling Coil Cabinet

<table>
<thead>
<tr>
<th>Description</th>
<th>Qty</th>
<th>400</th>
<th>500, 600</th>
<th>700</th>
<th>800</th>
<th>1050</th>
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<tbody>
<tr>
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<td>106338, 36&quot;</td>
<td>106339, 41-1/2&quot;</td>
<td>106340, 47&quot;</td>
<td>106339, 41-1/2&quot;</td>
<td>106340, 47&quot;</td>
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<tr>
<td>Side Duct Connectors. 19-1/2&quot;</td>
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<td>172357</td>
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<td></td>
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<td>64-7/8&quot;</td>
</tr>
</tbody>
</table>
Instructions for Lifting and Attaching Cabinet
(NOTE: If suspending cabinet, consult factory.)

1. After the blower/furnace packaged system is in place on the roof curb or mounting rails, use a 9/16” wrench or socket to remove the lifting lugs that are on the discharge end of the system.

2. Lift the cooling coil cabinet and position it with the inlet side next to the discharge opening of the furnace. Remove the lifting lugs that are on the cooling coil cabinet.

3. Slide the cooling coil cabinet so that the duct flanges of the furnace and the cooling coil cabinet butt together (See FIGURE 40A).

4. Join the Duct Flanges

a) Use the four "U" shaped duct connector pieces and the 3/4” screws to join the duct flanges. Attach one of the 19-1/2” (495mm) long side connectors to both the top and bottom duct connectors, being sure that the "U" in the metal is open to the inside. (See FIGURE 40B.)

b) Position the assembled connectors so that the screw holes will be in the top piece at the open side (See FIGURE 40C). In this position, insert the assembled top and bottom connectors into the space between the furnace and the cooling coil cabinet.

Tap with a hammer, first on the side, then on the top, and last on the bottom of the assembled duct connector until it is seated over both duct flanges.

c) Position the remaining side connector. Use a driver extension to insert the screws that attach the side connector to the top and bottom connectors. See FIGURE 40D.

5. Wiring Instructions - Apply to Downturn Plenum Cabinet with Optional Discharge Dampers Only

- If installing an Option AU12 or AU14 cooling coil cabinet with a downturn plenum cabinet equipped with optional discharge dampers, the damper motor wires must be connected to the terminal blocks in the furnace electrical compartment. If the coil cabinet being installed does not include a downturn plenum with a discharge damper, skip Step 5 and proceed to Step 6.

a) Drill three 7/8” holes as instructed below. Be sure all holes are free of burrs.

First Hole:
1) Remove the control side door on the discharge plenum.
2) Locate the discharge damper motor. Connected to the motor are three wires in lengths adequate to reach the furnace section.
Instructions for Lifting and Attaching Coil Cabinet (cont'd)

3) Refer to FIGURE 40E. On the leg of the downturn plenum next to the cooling coil cabinet locate the mounting screw illustrated. Measure up 6" (152mm). At same centerline as the screw, drill the first 7/8" hole.

Second Hole:
1) Remove the cooling coil access panel(s).
2) Locate the coil blockoff plate. Measure up 4" (102mm) from the bottom of the blockoff plate. At that location, find the center point of the blockoff plate and drill a 7/8" hole. The hole should be approximately even with the hole drilled in the downturn plenum leg.

Third Hole:
On the cabinet leg on the entering air side of the cooling coil cabinet, measure up 10" (254mm) from the bottom pan. At that height, measure in 4" (102mm) from the edge and drill a 7/8" hole.

b) On the outside of the furnace section (where the flanges were joined in Step 4), locate the three hole plugs. Remove the center plug exposing a 7/8" hole in the cabinet leg. See FIGURE 40F.

FIGURE 40D - Position the remaining side connector over the duct flanges. Attach to the top and bottom connectors with 3/4" screws creating a "U" shaped rectangular frame that joins the duct flanges on all four sides.

Top screws should be vertical.

Bottom screws should be horizontal.

FIGURE 40E
3) Drill 7/8" Hole
2) Measure up 6" (152mm)
1) Locate Mounting Screw

FIGURE 34F
On the furnace section, remove the center hole plug

FIGURE 40G - Sample of a Partial Wiring Diagram showing Typical Field-Wiring Connections for Optional Discharge Damper
6.3.6 Optional Cooling Coil Cabinet, Option AU (cont’d)

c) Run the wires attached to the damper motor 1) out through the hole in the discharge plenum leg into the cooling coil cabinet, 2) through the blockoff plate, across the coil cabinet, 3) out through the hole in the cooling coil cabinet leg, and 4) into the furnace section.

d) On the bottom of the electrical box in the furnace section, remove the hole plug that is below the terminal blocks. Route the damper motor wires up through the hole and into the electrical box. Attach according to the connections on the wiring diagram. Refer to sample in FIGURE 40G.

6. Prepare Cabinets to Install Filler Panels (See FIGURE 40H.)

a) At the side corners of both the cooling coil cabinet and the furnace, remove the factory-installed screws that attach the cabinet tops.

b) Across the edge of the cooling coil cabinet, remove the row of screws that attach the top.

7. Install the Cabinet Side Filler Panels (See FIGURE 40J.)

Place a piece of the supplied insulation against the inner panel of the cooling coil cabinet. Slide the filler panel into place and attach with 1/2" sheetmetal screws. Repeat on the other side. NOTE: It may be easier to slide the filler panels in place with the door panels removed.

8. Install the Cabinet Top Filler Panel (See FIGURE 40K)

a) Remove the backing from the gasket strip, and adhere it along the edge of the bottom of the top filler panel.

b) Slide the filler panel underneath the edge of the cooling coil cabinet top (NOTE: The edge of the top panel may have to be pulled out slightly to slide the panel underneath.) The filler panel must be between the cooling coil cabinet top and end panel to prevent water from leaking into the cabinet. Attach with 1/2" screws.

9. Reinsert Screws and Apply Caulking

a) Reinsert any remaining screws removed in Step 6. Check for gaps between the top and side filler panels; apply caulking as needed.

b) Apply silicone caulking where the cooling cabinet curb cap meets the furnace curb cap.
6.0 Mechanical (cont'd)
6.3 Unit Inlet Air (cont'd)
6.3.6 Optional Cooling Coil Cabinet, Option AU (cont'd)

Cooling Coil Maintenance

6.4 Duct Connections - SSCBL and RPBL

Requirements and Suggestions for Connecting and Installing Ducts

- **Type of Ductwork** - The type of duct installation to be used depends in part on the type of construction of the roof (whether wood joist, steelbar joist, steel truss, precast concrete) and the ceiling (whether hung, flush, etc.).
- **Ductwork Material** - Rectangular duct should be constructed of not lighter than No. 26 U.S. gauge galvanized iron or No. 24 B & S gauge aluminum.
- **Ductwork Structure** - All duct sections 24 (610mm) inches or wider, and over 48 (1219mm) inches in length, should be cross broken on top and bottom and should have standing seams or angle-iron braces. Joints should be S and drive strip, or locked.
- **Through Masonry Walls** - No warm air duct should come in contact with masonry walls. Insulate around all air duct through masonry walls with not less than 1/2" (1" is recommended) of insulation.
- **Through Unheated Space** - Insulate all exposed warm air ducts passing through an unheated space with at least 1/2" (1" is recommended) of insulation.
- **Duct Supports** - Suspend all ducts securely from adjacent buildings members. Do not support ducts from unit duct connections.
- **Duct Sizing** - Proper sizing of the supply air ductwork is necessary to ensure a satisfactory heating installation. The recognized authority for such information is the Air Conditioning Contractors Association, 2800 Shirlington Road, Suite 300, Arlington, VA 22206 (www.acca.org). A manual covering duct sizing in detail may be purchased directly from them.

**CAUTION:** An external duct system static pressure not within the limits shown on the rating plate, or improper motor pulley or belt adjustment, may overload the motor. See Hazard Levels, page 2.
• **Removable Panels** (See FIGURE 42.) - The ducts should have removable access panels. These openings must be accessible when the furnace is in service and should be a minimum of 6” x 10” (152mm x 254mm) in size so smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. Attach the covers for the openings in a manner that will prevent leakage.

**FIGURE 42 - Connecting Supply Air Duct to the Furnace**
(1) Flanges on the furnace (heat exchanger) turn out as shown.
(2) Shape duct connection as shown -- "U" on top and bottom; "L" on sides.
(3) Slide "U" channels over furnace top and bottom flanges making connection.
(4) Form "U" channels to seal sides. Drill and lock with sheetmetal screws.

**FIGURE 43 - Install "U" Channel on Sides of Duct Connection**

Check belt tension. Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. Adjust the belt tension by turning the adjusting screw on the motor base until the belt can be depressed 3/4" (19mm). (See FIGURE 44.) After correct tension is achieved, re-tighten the locknut on the adjustment screw. Be sure that the belt is aligned in the pulleys.

**Adjusting Blower Speed**
The system is set at the factory for the RPM required to meet the CFM and external static pressure specified on the order. If estimated external static pressure is incorrect, or changes were made to the duct system, the blower RPM may have to be adjusted. Motors are equipped with adjustable pitch pulleys which permit adjustment of blower speed.

To make adjustments to units with less than a 5HP motor, follow these instructions.
1. Turn off the gas and the electric power.
2. Loosen belt tension and remove the belt.
3. Loosen the set screw on the side of the pulley away from the motor.
4. **To increase the blower speed, decreasing outlet temperature**, turn the adjustable half of the pulley inward. **To decrease the blower speed, increasing the outlet temperature**, turn the adjustable half of the pulley outward. One turn of the pulley will change the speed 8-10%.
5. Tighten the set screw on the flat portion of the pulley shaft.
6. Replace the belt and adjust the belt tension. Adjust tension by turning the adjusting screw on the motor base until the belt can be depressed 3/4". (See FIGURE 44.) Re-tighten the locknut on the adjusting screw. Be sure that the belts are aligned in the pulley grooves properly and are not angled from pulley to pulley.

**FIGURE 44 - Check Belt Tension**
6.0 Mechanical (cont’d)
6.5 Blowers, Belts, and Drives (cont’d)
Adjusting Blower Speed (cont’d)

7. Turn on the electric and the gas. Light the heater following the instructions on the lighting instruction plate.
8. Check the motor amps with an amp meter. The maximum motor amp rating on the motor nameplate must not be exceeded.
9. When installation is complete, check for proper operation.

For units with a 5 HP and larger motor, follow these instructions for adjusting RPM:

1. Turn off the gas and the electric power.
2. Slack off all belt tension by moving motor towards driven shaft until belts are free of grooves. For easiest adjustment, remove the belts from the grooves.
3. On the outer locking ring, locate the two locking screws that are directly across from each other. Loosen these two screws, but do not remove them. Do not loosen any other screws.
4. Adjust sheave to desired pitch diameter by turning the outer locking ring. One complete turn of the outer locking ring will result in .233” change in pitch diameter. To decrease blower speed, increase diameter; to increase blower speed, decrease diameter.

CAUTION: Sheaves should not be adjusted in either direction to the point where movable and stationary flanges are in contact.

5. After completing adjustment, tighten both locking screws in the outer locking ring (loosened in Step 2.).
6. Replace belts and move motor away from the driven shaft to apply sufficient belt tension to prevent slippage. (See FIGURE 44.) Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. Be sure that the belts are aligned in the pulley grooves and are not angled from pulley to pulley.
7. Check motor amps with an amp meter. The maximum motor amp rating on the nameplate must not be exceeded.
8. When installation is complete, check for proper operation.

Blower Pulley - Some blower pulleys require the use of a split taper bushing in the blower pulley. These split taper bushings must be loosened in order to remove the pulley. Follow these instructions to loosen the bushing:

a) Notice that there are three cap screws in the bushing and two holes without screws, called push-off holes. (See FIGURE 45.)
b) Remove the three cap screws.
c) Put two of the cap screws into the two push-off holes. Tighten these two screws evenly until the pulley is loosened.
d) Pulley may now be removed from the shaft.

Blower Bearings - The blower bearings on systems with less than a 10 HP motor (standard blower) are permanently lubricated cartridge ball bearings and do not require greasing.

The blower bearings on systems equipped with a 10-20 HP motor are pillow block ball bearings and are equipped with a grease fitting. These bearings should be lubricated twice a year with a high temperature, moisture-resistant grease (Type NLGI-1 or -2 standard grease is recommended). Be sure to clean the grease fitting before adding grease. Add grease with a handgun until a slight bead of grease forms at the seal. Be careful not to unseat the seal by over lubricating. NOTE: If unusual environmental conditions exist (temperatures below 32°F or above 200°F; moisture; or contaminants) or if unit is in continuous operation, more frequent service is required.

CAUTION: If the blower is unused for more than three months, bearings with a grease fitting should be purged with new grease prior to startup.

Blower Rotation - Each blower housing is marked for proper rotation. Rotation may be changed on single-phase motors by re-wiring in the motor terminal box. Three-phase motors may be reversed by interchangeing two wires on the 3-phase supply connections.
Optional Variable Frequency Drive

If the system is equipped with an optional variable frequency drive, the motor will operate on speeds as determined by the electrical frequency. 60 hertz is maximum speed. Speeds must be within the temperature rise range approved for a Model SCE Series 6 heater which is 30-90°F.

Follow the variable frequency controller manufacturer’s instructions that are packaged with the heater (in the owner’s envelope) to program the variable frequency drive settings. The formula for motor speed is \( N = \frac{120 \times f}{p} \) where \( N \) is speed; \( f \) is frequency; and \( p \) is number of poles (3600 RPM motor has 2 poles; an 1800 RPM motor has 4 poles).

Example: 1800 RPM motor on 60Hz; \( N = \frac{120 \times 60}{4} = 1800 \)
1800 is synchronous speed; assume 2% slip. Motor will run between 1750 and 1790 RPM at full load depending on design. Run the same motor at 45Hz (120 \( \times \frac{45}{4} = 1350 \)). 1350 RPM less 2% slip equals about 1300 RPM.

Motor Loads and Amps

Use an amp meter to check blower motor amps. The following chart lists full load amps for various HP and voltages of open-type blower motors. Amps may be adjusted downward by reducing blower RPM or by increasing duct system static pressure. This chart can be used for sizing line wiring but should not be interpreted as the exact motor amps. See the motor rating plate for exact motor specifications. Do not exceed amp rating on the motor nameplate.

Venter motor amps for a 115 volt or 575 volt unit are 1.5 amps; venter motor amps for a 208, 230 or 460 volt unit are .8 amps.

<table>
<thead>
<tr>
<th>HP</th>
<th>1</th>
<th>1-1/2</th>
<th>2</th>
<th>3</th>
<th>5</th>
<th>7-1/2</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>208V/1</td>
<td>7.2</td>
<td>10.1</td>
<td>11.3</td>
<td>13.7</td>
<td>28.0</td>
<td>26.0</td>
<td>32.0</td>
<td>38.0</td>
<td></td>
</tr>
<tr>
<td>230V/1</td>
<td>6.5</td>
<td>9.1</td>
<td>10.2</td>
<td>12.4</td>
<td>26.0</td>
<td>32.0</td>
<td>38.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>208V/3</td>
<td>3.6</td>
<td>5.8</td>
<td>7.3</td>
<td>9.3</td>
<td>14.6</td>
<td>23.2</td>
<td>28.8</td>
<td>42.0</td>
<td>55.3</td>
</tr>
<tr>
<td>230V/3</td>
<td>3.2</td>
<td>5.2</td>
<td>6.6</td>
<td>8.4</td>
<td>13.2</td>
<td>21.0</td>
<td>26.0</td>
<td>38.0</td>
<td>50.0</td>
</tr>
<tr>
<td>460V/3</td>
<td>1.6</td>
<td>2.6</td>
<td>3.3</td>
<td>4.2</td>
<td>6.6</td>
<td>10.5</td>
<td>13.0</td>
<td>19.0</td>
<td>25.0</td>
</tr>
<tr>
<td>575V/3</td>
<td>1.3</td>
<td>2.1</td>
<td>2.6</td>
<td>3.4</td>
<td>5.3</td>
<td>8.4</td>
<td>10.4</td>
<td>15.2</td>
<td>20.0</td>
</tr>
</tbody>
</table>

7.0 Electrical Supply and Controls

7.1 General

All electrical wiring and connections including electrical grounding must be made in accordance with local, state and national codes and regulations and with the National Electric Code ANSI/NFPA No. 70 (latest edition) or, in Canada, the Canadian Electrical Code, Part I-C.S.A. Standard C22.1. Check any local ordinances or gas company requirements that apply.

Check the rating plate on the heater for the supply voltage and the current requirements. A separate line voltage supply with fused disconnect switch should be run directly from the main electrical panel to the unit, making connection to the motor contactor or starter in the electrical box. All external wiring must be within approved conduit and have a minimum temperature rise rating of 60°C. Conduit from the disconnect switch must be run so as not to interfere with the service panels of the furnace.

7.2 Supply Voltage and Wiring

Size of Field-Supplied Wire from Disconnect to Electrical Box for

<table>
<thead>
<tr>
<th>Voltage/Phase</th>
<th>Motor</th>
<th>Wire Gauge</th>
<th>BX Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>208/1 &amp; 230/1</td>
<td>1 - 2</td>
<td>14</td>
<td>3/8”</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>1/2”</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>1/2”</td>
<td></td>
</tr>
<tr>
<td>7.5</td>
<td>6</td>
<td>1”</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>1”</td>
<td></td>
</tr>
<tr>
<td>1 - 3</td>
<td>14</td>
<td>3/8”</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>3/8”</td>
<td></td>
</tr>
<tr>
<td>7.5</td>
<td>10</td>
<td>1/2”</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>1/2”</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>6</td>
<td>1”</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td>1”</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltage/Phase</th>
<th>Motor</th>
<th>Wire Gauge</th>
<th>BX Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>460/3</td>
<td>1 - 7.5</td>
<td>14</td>
<td>3/8”</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>3/8”</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>1/2”</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>8</td>
<td>1/2”</td>
<td></td>
</tr>
<tr>
<td>575/3</td>
<td>1 - 7.5</td>
<td>14</td>
<td>3/8”</td>
</tr>
<tr>
<td>10 - 20</td>
<td>10</td>
<td>1/2”</td>
<td></td>
</tr>
</tbody>
</table>

Connection to Motor Contactor or Starter

Refer to the wiring diagram to identify any optional controls. If the system has an optional convenience outlet (Option BC), a separate power supply is required.
7.0 Electrical Supply and Controls (cont’d)

7.2 Supply Voltage and Wiring (cont’d)

Disconnect Switch
A disconnect switch is a required part of this installation. The disconnect switch may be fusible or non-fusible. When providing or replacing fuses in a fusible disconnect switch, use dual element time delay fuses and size according to 1.25 times the maximum total input amps. A disconnect switch is available as optional equipment or may be supplied locally. When installing the disconnect switch, be careful that the conduit and switch housing are clear of all service panels. Allow at least four feet (1.2M) of service room between the disconnect switch and any removable service panels.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you turn off the power supply, turn off the gas. See Hazard Levels, page 2.</td>
</tr>
</tbody>
</table>

| CAUTION: If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C, except for sensor lead wires which must be 150°C. See Hazard Levels, page 2. |

7.3 Thermostat and Control Wiring

CAUTION: Make sure the thermostat has an adequate VA rating for the total requirements. Add coil rating of all relays and match thermostat rating. See Hazard Levels, page 2.

Approximate Ampere Rating of 24-Volt Controls
- Fan Control Time Delay ............. .12 amps
- Spark Ignition System............. .1 amps
- Maxitrol Gas Control System .51 amps
- Heater..................................... .14 amps
- RBM Relay Coil ..................... 2 amps
- Single-Stage Gas Valve........... .6 amps
- Contactor Coil......................... .45 amps
- Two-Stage Gas Valve ............. .6 amps

Separately activated relays must be substituted at the unit thermostat connections to cycle more than one furnace from one thermostat.

The heater is equipped with a low voltage (24V) control circuit. See the wiring diagram in the heater electrical box.

A thermostat is not supplied with the furnace. Use either an optional or a field-provided low-voltage (24V) thermostat. Install the thermostat according to the manufacturer’s instructions.

If the low-voltage thermostat is equipped with a heat anticipator, set the anticipator at full load control amps. See chart below for amp ratings of optional controls.

<table>
<thead>
<tr>
<th>Field Control Wiring - Length and Gauge</th>
<th>Total Wire Length</th>
<th>Distance from Unit to Control</th>
<th>Minimum Recommended Wire Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>150’</td>
<td>75’</td>
<td>#18 gauge</td>
<td></td>
</tr>
<tr>
<td>250’</td>
<td>125’</td>
<td>#16 gauge</td>
<td></td>
</tr>
<tr>
<td>350’</td>
<td>175’</td>
<td>#14 gauge</td>
<td></td>
</tr>
</tbody>
</table>

Remote Console

A selection of consoles is available with specific combinations of controls factory mounted. Consoles include indicator lights for the blower and burner, an off/on system switch, terminal block wiring, and may include optional controls. Consoles are shipped separately for remote installation and can be either mounted on a wall or recessed.

CAUTION: Make sure the thermostat has an adequate VA rating for the total requirements. Add coil rating of all relays and match thermostat rating. See Hazard Levels, page 2.
8.0 Controls

8.1 Control Locations

FIGURE 46 - Locations of Standard and Optional Controls

NOTE: Illustration of cabinet is not entirely accurate for these models. Models SSCBL and RPBL have one, two, or three furnace sections.

1) Optional Auto Reset Freezestat
2) Combustion Air Pressure Switch
3) Optional Discharge Air Firestat
4) Ignition Controller
5) Optional Maxitrol Discharge Air Sensor (Opt AG8 or AG9)
6) Optional Two-Stage Controller (Opt AG3) or Maxitrol Amplifier (Opt AG7, AG8 or AG9)
7) Optional Main Low Gas Pressure Switch
8) Optional Pilot High Gas Pressure Switch
9) Optional Main High Gas Pressure Switch
10) Time Delay Relay (power-vented)
11A) Limit Control (disc type limit control)
11B) Limit Control (capillary type limit control)
12) Fan Control
13) Optional Freezestat Time Delay Relay
14) Line Voltage Terminal Block
15) Low Voltage Terminal Block
16) Freezestat Relay
17) Optional Dirty Filter Pressure Switch
18) Line Voltage Connection (field)
19) Opt Convenience Outlet and Outlet Transformer
20) Blower Motor Contactor or Starter
21) Optional High Ambient Limit Control and/or Optional AG41 or 42 Heat Stage Controls (2 or 4)
22) Optional Outside Air or Return Air Controller
23) Optional Mixed Air Controller
24) Optional Potentiometer
25) Optional Return Air Dampers
26) Optional Two Position or Modulating Damper Motor
27) Optional Outside Air Damper
28) Optional Potentiometer
29) Optional Filters
30) Blower Motor
31) Optional Control Relays (as required, 8 maximum)
32) Auto Reset Reverse Flow Limit
33) Optional Return Air Firestat
34) Low Voltage Terminal Strip
35) Line Voltage Terminal Strip
36) Control Transformer
37) Control Transformer (as required)
38) Optional Damper Motor Transformer
39) Low Voltage Connection (field)
40) Optional Air Proving Switch
41) Venter Assembly

8.2 Fan Control

1. A fan control provides for the following control of the blower.
   (a) After the gas valve opens, there is a time delay of blower operation to prevent the discharge of cold air.
   (b) Blower operation continues after the thermostat is satisfied as determined by the fan time delay.

2. To be sure that the blower can continue to operate, the power supply to the furnace MUST NOT be interrupted except when servicing the unit.

3. If the customer wants the furnace off at night, the gas valve circuit SHOULD BE OPENED by a single pole switch wired in series with the thermostat. Some thermostats are provided with this feature. Multiple units controlled from a single thermostat are shut off in the same manner. For proper operation, be sure the fan control wiring is observed.

Refer to the wiring diagram furnished with the furnace. For location, See FIGURE 46 Item 12.

Service NOTE: To replace a fan control on units manufactured prior to 11/04, a replacement kit is required. Order P/N 209184.
8.0 Controls (cont’d)

8.3 High Temperature Limits
Each furnace is equipped with a non-adjustable high temperature limit switch which shuts off the gas in the event of motor failure, lack of air due to dirty filters, or restrictions at the inlet or outlet of the unit. See Paragraph 9.3, "Check Installation after Start-up", for checking operation of high temperature limit controls.

The furnace farthest downstream in each system is also equipped with a linear-type limit control. The switch is mounted on a bracket on the bottom of the junction box with the capillary sensor extending across the discharge opening of the furnace. See FIGURE 46, Items 11A and 11B.

8.4 Optional Airflow Proving Switch (Makeup Air Only)

The optional airflow switch ensures that the circulating air blower is functionally providing an adequate amount of airflow prior to the unit being fired. The switch is a single pole - normally open - device which closes when an increase in pressure above the setpoint, is sensed in the circulating air blower. The switch is located in the blower junction box (See FIGURE 46, Item 40).

Air Proving Switch (Option BW1)
Contacts will close at .26" w.c. maximum

8.5 Reverse Flow, Limit Control

The furnace is factory equipped with an automatic reset reverse flow limit control. This control is located in the blower compartment, mounted in the blower junction box adjacent to the blower inlet opening, and is wired in series with the main limit control mounted on the heat exchanger duct side. For location, See FIGURE 46, Item 32.

In case of belt breakage or motor failure, the limit control will be opened by the high temperatures caused by reverse flow from the heat exchanger to the blower compartment, thus breaking the circuit to the electric gas valve and preventing burner operation.

8.6 Optional High Ambient Limit Control

The optional high ambient limit control functions to shut off the burner when the entering outside air reaches a set temperature. The temperature setting is field adjustable from 0-100°F. (For location, see FIGURE 46, Item 21.)

8.7 Combustion Air Proving Switch

The combustion air proving switch ensures that proper combustion air flow is available. The switch is a single-pole, double-throw switch, which senses pressure caused by the flow of combustion air from the venter. The switch is designed to close when a decreasing pressure is sensed in the outlet duct of the flue collection box.

On start-up when the furnace is cold, the sensing pressure is at the most negative level, and as the furnace and the flue system warm-up, the sensing pressure becomes less negative. After the system has reached equilibrium (approximately 20 minutes), the sensing pressure levels off. If a restriction or excessive flue length or turns cause the sensing pressure to become less than the switch setpoint, the pressure switch will function to shut off the main burners. The main burners will remain off until the system has cooled and/or the flue system resistance is reduced. The table below gives approximate water column negative pressure readings and switch setpoints for sea level operating conditions.

<table>
<thead>
<tr>
<th>Startup Cold</th>
<th>Equilibrium</th>
<th>Factory Setpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.0&quot; w.c.</td>
<td>-.70&quot; w.c.</td>
<td>-.63 +or-.05&quot; w.c.</td>
</tr>
</tbody>
</table>

**DANGER**
Safe operation requires proper venting flow. Never bypass the combustion air proving switch or attempt to operate the unit without the venter running and proper flow in the vent system. Hazardous condition could result. See Hazard Levels, page 2

8.8 Gas Controls

8.8.1. Operating Valve

**WARNING**
The operating valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting the unit. See Hazard Levels, page 2.
### TABLE A - Recommended Settings for Staging Application - Options AG3, AG15

<table>
<thead>
<tr>
<th>Option</th>
<th>No. of Furnaces</th>
<th>Ductstat Settings - Set each ductstat control (See FIGURE 47) in furnace “order”</th>
<th>Sequence of Staging with these settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG3</td>
<td>1 70°F</td>
<td>66°F High Stage ► 70°F Low Stage ► 74°F Shutdown</td>
<td>70°F Low Stage ► 74°F Shutdown</td>
</tr>
<tr>
<td></td>
<td>2 70°F 64°F</td>
<td>60°F High Stage Both Furnaces ► 64°F Low Stage 2nd Furnance ► 68°F Shutdown</td>
<td>70°F Low Stage 1st furnace ► 74°F Shutdown</td>
</tr>
<tr>
<td></td>
<td>3 70°F 66°F 62°F</td>
<td>58°F High Stage All Furnaces ► 62°F Low Stage 3rd Furnace ► 66°F Shutdown</td>
<td>70°F Low Stage 2nd Furnace ► 74°F Shutdown</td>
</tr>
</tbody>
</table>

**Option AG15 - Adjust the setpoint and the differential of the temperature selector (Johnson #A350).** Adjust the offset potentiometer on each of the stage adder modules (Johnson #S350). The settings listed below will provide the same sequence of staging as shown above for Option AG3. Follow the manufacturer’s instructions provided. **IMPORTANT:** Set the temperature selector and each stage adder module to “HEAT”. Follow the wiring diagram to obtain proper sequencing.

<table>
<thead>
<tr>
<th>Option</th>
<th>No. of Furnaces</th>
<th>Temperature Selector (A350)</th>
<th>Stage Adder (S350) Offset Settings (Refer to FIGURE 48)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Setpoint</td>
<td>Differential</td>
</tr>
<tr>
<td>AG15</td>
<td>1 74°F</td>
<td>8°F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 74°F</td>
<td>14°F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 74°F</td>
<td>16°F</td>
<td></td>
</tr>
</tbody>
</table>

**Operation:** The differential setting and offset degrees allow the controls to adapt to any adjustment in temperature selection (50-130°F).
### TABLE B - Recommended Settings for Staging Application - Options AG4, AG5, AG17, and AG19

<table>
<thead>
<tr>
<th>Option</th>
<th>No. of Furnaces</th>
<th>Ductstat Settings - Set each Ductstat (See FIGURE 47) in furnace &quot;order&quot;</th>
<th>Sequence of Staging with this setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG4</td>
<td>2</td>
<td>70°F -- -- 66°F</td>
<td>66°F Full Rate Both Furnaces ► 70°F Shutdown 1st Furnace ► 74°F Shutdown 2nd furnace</td>
</tr>
<tr>
<td>AG5</td>
<td>3</td>
<td>70°F 64°F --</td>
<td>60°F Full Rate Both Furnaces ► 68°F Shutdown 2nd &amp; 3rd Furnace ► 74°F Shutdown 1st furnace</td>
</tr>
</tbody>
</table>

Options AG17, AG18, AG19, AG20 - Adjust the setpoint and the differential of the temperature selector (Johnson #A350). Adjust the offset potentiometer on each of the stage adder modules (Johnson #S350). The settings listed below will provide the same sequence of staging as shown above for Option AG4. Follow the manufacturer's instructions provided. IMPORTANT: Set the temperature selector and each stage adder module to "HEAT". Follow the wiring diagram to obtain proper sequencing.

<table>
<thead>
<tr>
<th>Option</th>
<th>No. of Furnaces</th>
<th>Temperature Selector (A350) Setpoint</th>
<th>Differential</th>
<th>Stage Adder (S350) Offset Settings (Refer to illustrations in FIGURE 48)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG17</td>
<td>2</td>
<td>74°F</td>
<td>8°F</td>
<td>4°F -- --</td>
</tr>
<tr>
<td>AG19</td>
<td>3</td>
<td>74°F</td>
<td>10°F</td>
<td>6°F 6°F --</td>
</tr>
</tbody>
</table>

**Operation:** The differential setting and offset degrees allow the controls to adapt to any adjustment in temperature selection (50-130°F).

The makeup air control options with the complete two-stage ductstat (Options AG3, AG4, AG5) installed in the heater discharge use a ductstat (See FIGURE 47) with an adjustable range from 0° to 100°F with a fixed differential of 2-1/2°. Due to different CFM settings and outside air temperatures, the average downstream outlet temperature may not match the ductstat setting exactly. After the installation is complete, re-adjust the setpoint of the ductstat(s) to achieve the desired average discharge air temperature. In general, makeup air applications are usually adjusted to discharge an outlet air temperature between 65°F and 75°F.

Two-stage makeup air options that are controlled from a sensing probe with a remote electronic temperature selector have a temperature operating range to 130°F. The sensing probe and remote modules (FIGURE 48) are shipped separately for field installation. Follow the wiring diagram with the unit and the manufacturer's instructions for wiring and installing the remote modules. **CAUTION: Make sure heat/cool selector switch is set on "HEAT".** Depending on the staging provided, there will be one module for selecting temperature and one to five stage-adder modules. The digital display module is optional.

See TABLE A, page 45, or TABLE B, above, for recommended settings and staging sequence of all two-stage options.

---

**FIGURE 47 - Ductstat Control in Option AG3, AG4, and AG5**

Factory set as listed in TABLES A and B.

Adjustable range 0-100°F; markings are on the dial.

**FIGURE 48 - Remote Temperature Selector( A); and Stage-Adder Module (B)**

for Ductstat in Makeup Air Control Options (Options AG 15, 17, and 19)
1. Remove access panel in the ductwork adjacent to the control compartment access panel.
2. Element is retained by either spring clips or cable straps.
3. Round gasket and metal retaining plate provide airtight seal for capillary and must be removed to remove the element.

The type and capability of the electronic modulation system depends on the option selected. Electronic modulation options are identified by a suffix to the Serial No. printed on the heater rating plate. AG7 is identified as MV-1; AG8 is identified as MV-3; AG9 is identified as MV-4; AG21 is identified as MV-A; AG39 is identified as MP-1; and AG40 is identified as MP-2. AG39 and AG40 are available only on Size 400. AG41 is identified as MP3 and AG42 is identified as MP4. Both AG41 and AG42 apply only to Sizes 500, 600, 800, and 1200.

**Electronic Modulation between 50% & 100% Firing Rate (Options AG7, AG8, AG9)**

Depending on the heat requirements as established by the thermistor sensor, the burner modulates between 100% and 50% firing. The thermistor is a resistor that is temperature sensitive in that as the surrounding temperature changes, the Ohms resistance changes through the thermistor. This change is monitored by the solid state control center (amplifier) which furnishes varying DC current to the modulating valve to adjust the gas input.

Each modulating valve is basically a regulator with electrical means of raising and lowering the discharge pressure. When no DC current is fed to this device, it functions as a gas pressure regulator, supplying 3.5" w.c. pressure to the main operating valve. Refer to the wiring diagram supplied with the furnace for proper wiring connections.

Electronic modulation for heating controlled by a specially designed room thermostat (60°-85°F) is identified as Option AG7. Electronic modulation control systems for makeup air applications controlled by a duct sensor and temperature selector (55-90°F) are identified as either Option AG8 or Option AG9. The temperature selector setting for Option AG8 is on the amplifier; Option AG9 has a remote temperature selector. Both systems are available with an override thermostat.

**Computer Controlled Electronic Modulation between 50% and 100% Firing Rate (Option AG21)**

With this option the furnace is equipped with a Maxitrol signal conditioner which operates much the same way as the amplifier above to control the regulator valve. The conditioner accepts an input signal of either 4-20 milliamps or 0-10 volts from a customer-supplied control device such as a computer. With the dip switches on the conditioner in the "on" positions, the conditioner accepts a 4-20 milliamp signal. In the "off" positions, the conditioner accepts a 0-10V signal. The conditioner converts the signal to the 0 to 20 volt DC current required to control the modulating valve. Temperature selection is through the computer software.

A Size 400 unit equipped with electronic modulation Option AG39 has a 25%-100% firing range (4:1 turndown ratio). Option AG41 applies to Sizes 500, 600, and 800 with two furnaces and Size 1200 with three furnaces. The furnace closest to the blower is equipped with the electronic modulation option. The other furnace(s) have two-stage burner control from outside air temperature sensors identified as heat stage controllers. Option AG41 provides 6:1 turndown with two furnaces and 8:1 turndown with three furnaces.
8.0 Controls (cont’d)

8.8 Gas Controls (cont’d)

8.8.4 Optional Electronic Modulation (cont’d)

FIGURE 51 - Manifold Arrangement on Furnace with Optional Electronic Modulation between 25-100% Firing Rate

Elecronic Modulation between 25% and 100% Firing Rate), Options AG39, AG40, AG41, AG42 (cont’d)

The furnace with this type of electronic modulation will ignite at any input rate in the available range and will maintain average thermal efficiencies equal to or greater than the thermal efficiency at full fire. The following table applies to the furnace with the manifold illustrated in FIGURE 51.

<table>
<thead>
<tr>
<th>Size</th>
<th>Maximum Turndown</th>
<th>MBH Input Range</th>
<th>Inlet Pressure to Modulating Valve (factory set)</th>
<th>Gas Supply Pressure Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>25%</td>
<td>100-400</td>
<td>4.4” w.c.</td>
<td>6” w.c.</td>
</tr>
<tr>
<td>500</td>
<td>28%</td>
<td>69-250</td>
<td>4.0” w.c.</td>
<td>5” w.c.</td>
</tr>
<tr>
<td>600</td>
<td>23%</td>
<td>69-300</td>
<td>4.0” w.c.</td>
<td>5” w.c.</td>
</tr>
<tr>
<td>800</td>
<td>25%</td>
<td>100-400</td>
<td>4.4” w.c.</td>
<td>6” w.c.</td>
</tr>
<tr>
<td>1200</td>
<td>25%</td>
<td>100-400</td>
<td>4.4” w.c.</td>
<td>6” w.c.</td>
</tr>
</tbody>
</table>

Note: Arrangement may vary slightly depending on gas valve; components are the same.

The gas train (FIGURE 51) in a furnace with this type of electronic modulation control includes a single-stage gas valve, a modulating valve, and two gas pressure switches. The burner rack is equipped with one flash carryover and a regulated gas lighter tube system. The carryover lighter tube receives its gas supply through the regulator, simultaneously with the gas to the burner. Control of the system is through a Maxitrol amplifier with a corresponding remote temperature dial.

Description of Operation - furnace with Option AG39, AG40, AG41 or AG42

Combustion Air Pressure Switch Setting

This uniquely designed modulation system requires combustion air pressure settings different from the standard system. The approximate settings for the combustion air proving switch at sea-level operation are shown in the table.

<table>
<thead>
<tr>
<th>w/AG 39, 40, 41, 42</th>
<th>Startup Cold</th>
<th>Equilibrium at Full Rate</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>-1.2” w.c.±0.2</td>
<td>-0.95” w.c.±0.1</td>
<td>-.75” w.c.±0.5</td>
</tr>
<tr>
<td>500</td>
<td>-1.2” w.c.±0.2</td>
<td>-0.95” w.c.±0.1</td>
<td>-.75” w.c.±0.5</td>
</tr>
<tr>
<td>600</td>
<td>-1.2” w.c.±0.2</td>
<td>-0.95” w.c.±0.1</td>
<td>-.75” w.c.±0.5</td>
</tr>
<tr>
<td>800</td>
<td>-1.2” w.c.±0.2</td>
<td>-0.95” w.c.±0.1</td>
<td>-.75” w.c.±0.5</td>
</tr>
<tr>
<td>1200</td>
<td>-1.2” w.c.±0.2</td>
<td>-0.95” w.c.±0.1</td>
<td>-.75” w.c.±0.5</td>
</tr>
</tbody>
</table>
Sensor Location - Options AG39 and AG41

For the convenience of the installer, the duct temperature sensor is factory installed in the cabinet leg (See FIGURE 49, page 47). Although the sensor has a mixing tube, at this distance from the discharge it does not receive a true mix, so the temperature read by the sensor will be slightly higher than the actual air entering the ductwork. The system will provide comfort level heat if the selector is set slightly lower to compensate for this reading. The offset temperature will vary with the application. If a direct correlation of these two temperatures is required, move the duct sensor to a location in the ductwork about 10-12 feet (3 - 3.7M) from the furnace discharge.

Set Heat Stage Controllers - applies to Options AG41 and AG42 only

Systems with Option AG41 and AG42 have “heat stage controllers” that control operation of the “two-stage” furnace based on outside air temperature setpoints. Proper setpoints are important to ensure the modulating furnace (“Heat Stage 1”) is always in control and avoids cycling. The proper setpoint for each controller must be determined from basic design information. Sizes 500, 600, and 800 with two furnace sections have two heat stage controllers; Size 1200 with three furnace sections has four heat stage controllers.

Follow the steps and example to determine appropriate setpoints. Follow the instructions to locate and set the controllers.

<table>
<thead>
<tr>
<th>Calculate the Setpoints with Two Furnace Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the following formulas to calculate the controller settings for Heat Stage 2 and Heat Stage 3 in a system with two furnace sections.</td>
</tr>
<tr>
<td>$T_{sp} =$ Setpoints of Heat Stage Controllers ($T_{SP2}$ and $T_{SP3}$)</td>
</tr>
<tr>
<td>$T_{SA} =$ Desired Supply Air Temperature</td>
</tr>
<tr>
<td>$T_{D} =$ Design (minimum) Entering Air Temperature</td>
</tr>
<tr>
<td><strong>Formulas for two furnace sections:</strong></td>
</tr>
<tr>
<td><strong>Setpoint for Heat Stage 2:</strong> $T_{SP2} = T_{SA} - 0.46 (T_{SA} - T_{D})$</td>
</tr>
<tr>
<td><strong>Setpoint for Heat Stage 3:</strong> $T_{SP3} = T_{SA} - 0.73 (T_{SA} - T_{D})$</td>
</tr>
</tbody>
</table>

**EXAMPLE:** 3600 CFM, Power vented, 100% Outside Air, -10°F Outdoor Winter Design, 75°F Desired Supply Air

- $T_{SP2} = 75 - [0.46 x (75 - (-10))] = 75 - (0.46 x 85) = 35.9$
- $T_{SP3} = 75 - [0.73 x (75 - (-10))] = 75 - (0.73 x 85) = 12.9$

- Set Stage Heat #2 Controller to 36°F
- Set Stage Heat #3 Controller to 13°F

<table>
<thead>
<tr>
<th>Calculate the Setpoints with Three Furnace Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the following formulas to calculate the controller settings for Heat Stage 2, Heat Stage 3, Heat Stage 4, and Heat Stage 5 in a system with three furnace sections.</td>
</tr>
<tr>
<td>$T_{sp} =$ Setpoints of Heat Stage Controllers ($T_{SP2}$, $T_{SP3}$, $T_{SP4}$, $T_{SP5}$)</td>
</tr>
<tr>
<td>$T_{SA} =$ Desired Supply Air Temperature</td>
</tr>
<tr>
<td>$T_{D} =$ Design (minimum) Entering Air Temperature</td>
</tr>
<tr>
<td><strong>Formulas for three furnace sections:</strong></td>
</tr>
<tr>
<td><strong>Setpoint for Heat Stage 2:</strong> $T_{SP2} = T_{SA} - 0.30 (T_{SA} - T_{D})$</td>
</tr>
<tr>
<td><strong>Setpoint for Heat Stage 3:</strong> $T_{SP3} = T_{SA} - 0.49 (T_{SA} - T_{D})$</td>
</tr>
<tr>
<td><strong>Setpoint for Heat Stage 4:</strong> $T_{SP4} = T_{SA} - 0.65 (T_{SA} - T_{D})$</td>
</tr>
<tr>
<td><strong>Setpoint for Heat Stage 5:</strong> $T_{SP5} = T_{SA} - 0.82 (T_{SA} - T_{D})$</td>
</tr>
</tbody>
</table>

**EXAMPLE:** 8850 CFM, Power vented, 100% Outside Air, -10°F Outdoor Winter Design, 75°F Desired Supply Air

- $T_{SP2} = 75 - [0.30 x (75 - (-10))] = 75 - (0.30 x 85) = 49.5$
- $T_{SP3} = 75 - [0.49 x (75 - (-10))] = 75 - (0.49 x 85) = 33.3$
- $T_{SP4} = 75 - [0.65 x (75 - (-10))] = 75 - (0.65 x 85) = 19.8$
- $T_{SP5} = 75 - [0.82 x (75 - (-10))] = 75 - (0.82 x 85) = 5.3$

- Set Stage Heat #2 Controller to 49°F
- Set Stage Heat #3 Controller to 33°F
- Set Stage Heat #4 Controller to 20°F
- Set Stage Heat #5 Controller to 5°F

<table>
<thead>
<tr>
<th>Locate and Set the Heat Stage Controllers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In the inlet air section, locate the heat stage controllers. The same type of controller may also be used as the optional high ambient limit control (Option BN2) and as the mixed air controller that is part of certain air control options (Options AR12, AR13, AR15, and AR16). Identify the controllers marked Heat #2 and Heat #3 or Heat #2, Heat #3, Heat #4, and Heat #5.</td>
</tr>
</tbody>
</table>

| 2 Furnaces | Identify controllers marked Heat #2 and Heat #3; set as calculated above. |
| 3 Furnaces | Identify controllers marked Heat #2, Heat #3, Heat #4, and Heat #5; set as calculated above. |

2. Adjust each controller to the setpoint as determined in the calculation.
8.0 Controls  
8.8 Gas Controls  
8.8.4 Optional 
Electronic Modulation  

Electronic Modulation between 25% and 100% Firing Rate), Options AG39, AG40, AG41, AG42 (cont'd)

Wiring and Service
For wiring, consult the wiring diagram attached to the furnace. All wires in the electrical box connecting the modulation controls must be 150°C.

This is a unique system which includes custom-built components and custom settings. If service is required, follow the general troubleshooting guide and the special troubleshooting guide in FIGURE 52.

FIGURE 52 - Troubleshooting Guide for Checking Bypass Combustion Air Damper Safety Circuit on units with Option AG39, AG40, AG41, or AG42

Symptom - Part 1:
Main burners are inoperative.
Assumes that 24 volts is available between Terminal 2 and Terminal 7.

General Instructions:
For each step, check to ensure that the wiring is not defective and that the wiring connections are secure.

Symptom - Part 2:
Steady call for heat - burner cycles. Assumes that 24 volts is available between Terminals 11 and 7 and Terminals 2 and 7.

Computer Controlled 
Electronic Modulation between 25% and 100% Firing Rate, Option AG40 and AG42

The furnace functions and is equipped in the same way as for Options AG39 and AG41 except that the temperature settings are selected through field-supplied computer software and there is no temperature selector or duct sensor.
The furnace is equipped with a Maxitrol signal conditioner (see FIGURE 50) which accepts an input signal of either 4-20 milliamps or 0-10 volts from a customer-supplied control device such as a computer. With the dip switches on the conditioner in the "on" positions, the conditioner accepts a 4-20 milliamp signal. In the "off" positions, the conditioner accepts a 0-10V signal. The conditioner converts the signal to the 0 to 20 volt DC current required to control the modulating valve.
8.9 Pilot and Ignition Systems

Ignition System - Natural gas units are equipped with a spark ignited intermittent safety pilot system that shuts off the pilot gas flow between heat cycles. Propane units (or as an option on natural gas units) require a lockout device that stops the gas flow to the pilot if the pilot fails to light in 120 seconds. The lockout device has a 1-hour retry or requires manual reset by interruption of the thermostat circuit. Refer to the wiring diagram supplied with the unit for pilot system identification and proper wiring. Pilot with lockout is Option AH3; non-lockout spark pilot is Option AH2.

Ignition Controller - As part of the intermittent safety pilot systems, the ignition controller provides the high voltage spark to ignite the pilot gas and also acts as the flame safety device. After ignition of the pilot gas, the ignition controller electronically senses the pilot flame. A low voltage DC electrical signal is imposed on the separate metal probe in the pilot assembly. The metal probe is electrically insulated from ground. The pilot flame acts as a conduction path to ground completing the DC circuit and proving pilot flame. With pilot flame proven, the ignition controller energizes the main gas valve.

CAUTION: Due to high voltage on pilot spark wire and pilot electrode, do not touch when energized. See Hazard Levels, page 2.

FIGURE 53 - Ignition Controllers

Pilot - All pilots are vertical, target type with lint-free feature. Pilot flame should be approximately 1-1/4" in length. Pilot gas pressure should be the same as the supply line pressure. Pilot gas is supplied through the combination valve; the pilot gas flow is controlled by an adjustment screw located in the valve body. For maintenance, see Paragraph 10.2.2.

8.10 Burners, Orifices, and Carryover System

Burners - Individually formed steel burners capable of operating on either natural or propane gas are used in this heater. These burners have accurate, machine-formed ports to give controlled flame stability and operation without lifting or flashback. All burners are lightweight and factory mounted in an assembly which permits all of the burners to be removed as a unit for inspection or service.

Burner Carryover Systems (FIGURES 54 and 55) - All natural gas burners (except when equipped with electronic modulation Option AG39, AG40, AG41 or AG42; see Paragraph 8.8.4) are equipped with two flash carryover systems, one on each end of the burner rack. (NOTE: A natural gas burner rack on furnaces manufactured prior to Series 6 had a gas lighter tube carryover and one flash carryover.)
8.0 Controls (cont’d)

8.10 Burners, Orifices, and Carryover System (cont’d)

All propane gas burners are equipped with one flash carryover and a regulated gas lighter tube system. The carryover lighter tube receives its gas supply through a regulator, simultaneously with the gas to the burner orifices.

During regular service, check the main burner ports, the carryover assemblies, and the orifices for cleanliness.

Burner Orifices - Heaters are shipped with orifices of proper size and type for gas specified. **NOTE:** Natural gas units do not require a carryover orifice.

<table>
<thead>
<tr>
<th>Size</th>
<th>Qty per Furnace</th>
<th>Natural Gas Drill Size P/N</th>
<th>Propane Drill Size P/N</th>
<th>Propane Carryover Orifice</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>12</td>
<td>#44 11833</td>
<td>#55 11830</td>
<td>#59 10370</td>
</tr>
<tr>
<td>600</td>
<td>12</td>
<td>#42 84437 1.45 mm</td>
<td>#59 10370</td>
<td></td>
</tr>
<tr>
<td>700, 1050</td>
<td>14</td>
<td>#42 84437 1.45 mm</td>
<td>#56 9791</td>
<td></td>
</tr>
<tr>
<td>400, 800, 1200</td>
<td>16</td>
<td>#42 84437 1.45 mm</td>
<td>#56 9791</td>
<td></td>
</tr>
</tbody>
</table>

Air shutters are required on propane units, optional on natural units. A slotted screw on the end of the manifold bracket moves air shutters and adjusts all burners simultaneously (See FIGURE 56.) Turning the screw clockwise opens the air shutter; counterclockwise closes shutter.

After the furnace has been in operation for 15 minutes, close air shutter until the flame turns yellow. Open shutter until yellow disappears.

**DANGER**

Failure to adjust air shutters according to directions could cause property damage, personal injury, and or death.

9.0 Check Installation and Start-Up

9.1 Check the installation prior to start-up:
- Verify suspension/mounting methods and clearances. See Paragraphs 4.0 & 5.0.
- Check the duct connection. See Paragraph 6.4.
- Check venting. See Paragraph 6.2. Be sure that flue discharge and combustion air openings are free of obstructions. Be sure electrical entrance and gas supply pipe openings are sealed.

**Electrical Checks:**
- Be certain the electrical supply matches voltage rating of the furnace. (Refer to the rating plate.)
- Check all field wiring against the wiring diagram. Be sure that wire gauges are as required for the electrical load.
- Check that fuses or circuit breakers are in place and sized correctly.
- Option AG41 or AG42 - set the heat stage controllers. See Paragraph 8.7.4.

**Gas Supply Checks:**
- Check piping for leaks and proper gas line pressure. Bleed gas lines of trapped air. See Paragraph 6.1.
  a) Turn manual shutoff valve to off position.
  b) Turn gas supply on.
  c) Observe gas meter for movement, or
  d) Attach pressure gauge readable to .1” w.c. and after turning gas on for ten seconds, turn gas supply off. No change in pressure should occur over a three-minute period.
  e) If either c) or d) above indicate a leak, locate leak by brushing a soapy solution on all fittings. Bubbles will appear at a leak. Repair and repeat tests.

**Blower Checks:**
- Check blower pulley and motor pulley to be sure they are secure to the shafts.
  Check belt tension and alignment. Check blower rotation. See Paragraph 6.5.
- With optional dampers - Check damper linkage. See Paragraph 6.3.3.
9.2 Start-Up

- Close all panels tightly. Turn electric and gas supply on to the furnace. Adjust the thermostat or ductstat so that a call for heat exists. Observe for complete sequencing of safety pilot and ignition.

<table>
<thead>
<tr>
<th>Operating Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Set the thermostat switch at its lowest setting.</td>
</tr>
<tr>
<td>2. Turn on power.</td>
</tr>
<tr>
<td>3. Turn on the manual gas valves.</td>
</tr>
<tr>
<td>4. Set thermostat at desired setting.</td>
</tr>
<tr>
<td>5. Thermostat calls for heat</td>
</tr>
<tr>
<td>a) The venter motor is energized after 15-second (approximate) time delay.</td>
</tr>
<tr>
<td>b) Venter flow switches from N.C. to N. O. contacts, energizing the pilot gas valve and spark gap to produce a pilot flame on each operating cycle. The sensing probe proves the presence of the pilot flame and energizes the safety switch portion of the control. The switch action de-energizes the spark gap and energizes the main valve. The main gas ignites and the unit fires at full rate.</td>
</tr>
<tr>
<td>c) If the flame is extinguished during main burner operation, the safety switch closes the main valve and recycles the spark gap. On a unit equipped with a controller with lockout, if the pilot is not established within 120 seconds (approximately), the unit locks out for one hour, unless reset by interrupting the power to the control circuit (See Lighting Instructions).</td>
</tr>
<tr>
<td>7. Thermostat is satisfied.</td>
</tr>
<tr>
<td>a) Solenoid gas valve de-energized.</td>
</tr>
<tr>
<td>b) Pilot gas valve de-energized.</td>
</tr>
<tr>
<td>c) Ignition controller de-energized.</td>
</tr>
<tr>
<td>d) Time delay relay keeps venter motor on for approximately 90 seconds (post purge).</td>
</tr>
<tr>
<td>8. To shut down, set thermostat to lowest setting. Blower motor remains on as determined by fan time delay.</td>
</tr>
</tbody>
</table>

9.3 Check installation after Start-up:

- Observe burner flame at full fire. Natural gas flame should be about 1-1/2" in height with blue coloring. Propane gas flame should be approximately the same length with blue coloring. Yellow tipping may appear on propane gas. If yellow extends beyond 1/2 to 3/4", adjust air shutters. See Paragraph 8.11. If shutter adjustment will not reduce yellowing, check for gas leaks at the control manifold or orifice fitting.

- Turn the unit off and on, pausing two minutes between each cycle. Observe for smooth ignition. On two-stage or modulating burner systems, manipulate temperature adjustment slowly up and down to see if control is sequencing or modulating properly. Raising temperature setting drives burner on or to full fire.

- Using a manometer or slant gauge readable up to 14" w.c., check orifice manifold for operating pressure on full fire. Natural gas should be 3.5" w.c. at this point. Propane gas should be 10" w.c. at this point. Variations from these pressures are not recommended, as ignition and efficiency performance can be adversely affected by improper pressure adjustment. See Paragraph 6.1.

- With optional dirty filter switch - Set switch. See Paragraph 6.3.4.

- Place "Owner's Envelope" containing Limited Warranty Card, this booklet, and any optional information in an accessible location near the heater. Follow the instructions on the envelope.

**DANGER**

The gas burner in this gas-fired equipment is designed and equipped to provide safe, complete combustion. However, if the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is incomplete combustion which produces carbon monoxide, a poisonous gas that can cause death. Safe operation of separated-combustion, indirect-fired gas burning equipment requires a sealed, properly operating vent system which vents all flue products to the outside atmosphere. FAILURE TO PROVIDE PROPER VENTING WILL RESULT IN A HEALTH HAZARD WHICH COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH.

Install either the horizontal or vertical combustion air/vent system illustrated in Paragraph 6.2 using the concentric adapter supplied. Always comply with the combustion air requirements in the installation codes and instructions. Combustion air at the burner should be regulated only by manufacturer-provided equipment. NEVER RESTRICT OR OTHERWISE ALTER THE SUPPLY OF COMBUSTION AIR TO ANY HEATER. CHECK THE COMBUSTION AIR/VENT SYSTEM FOR SOUNDNESS AND FUNCTION; MAINTAIN IT IN PROPER OPERATING CONDITION.
10.0 Maintenance and Service

This unit will operate with a minimum of maintenance. To ensure long life and satisfactory performance, a furnace that is operating under normal conditions should be inspected every four months. If the furnace is operating in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent inspection is recommended. When servicing, follow standard safety procedures as well as those specific instructions and warnings mentioned in this manual.

10.1 Maintenance Schedule

The following procedures should be carried out at least annually (See paragraphs listed and Paragraphs 10.2.1-10.2.6 for instructions).

- Inspect the filters. Clean or replace as needed. See Paragraph 6.3.2.
- Check the blowers and belts. Check belts for tension, wear, and alignment. Adjust or replace as needed. Clean dirt from blower and motor. See Paragraph 6.5.
- Check the gas valve to ensure that gas flow is being shut off completely.
- Clean the heat exchanger both internally and externally.
- Check the pilot burner and main burners for scale, dust, or lint accumulation. Clean as needed.
- Check the vent/combustion air system; inspect all joints. Replace any parts that do not appear sound.
- Check the wiring for any damaged wire. Replace damaged wiring. (See Paragraph 7.0 for wiring requirements.)

CAUTION: When cleaning, wearing eye protection is recommended.

NOTE: Use only factory-authorized replacement parts.

10.2 Maintenance Procedures

10.2.1. Operating Gas Valve

The operating valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting to the unit to ensure positive closure. See Hazard Levels, page 2.

Remove external dirt accumulation and check wiring connections.

The combination gas valve must be checked annually to ensure that the valve is shutting off gas flow completely.

Instructions:

1) Locate the 1/8” FPT INLET pressure tap on the combination valve (FIGURE 57).

2) With the manual valve turned off to prevent flow to the gas valve, connect a manometer to the 1/8” inlet pressure tap in the valve. NOTE: A manometer (fluid-filled gauge) with an inches water column scale is recommended.

3) With the field-installed manual valve remaining closed, observe the manometer for two to three minutes for an indication of gas pressure. No pressure should be indicated on the manometer.

If the manometer indicates a gas pressure, the field-installed manual gas valve must be replaced or repaired before the combination gas valve can be checked.

4) If the manometer does not indicate gas pressure, slowly open the field-installed manual gas valve. After the manometer’s indicated gas pressure has reached...
10.2.2 Pilot and Main Burners

**CAUTION:** When cleaning, wearing eye protection is strongly recommended.

Burner Rack Removal Instructions

Instructions apply to all furnace sections.

1. Turn off the gas supply.
2. Turn off the electric supply.
3. Remove control access side panel.
4. Disconnect the pilot tubing and flame sensor lead (spark pilot).
5. Mark and disconnect electric valve leads.
6. Uncouple the union in the gas supply.
7. Remove sheetmetal screws in the top corners of the burner rack assembly.
8. Pull "drawer-type" burner rack out of the furnace.

To disassemble the burner rack:

1. Remove Carryover System --
   - **Natural Gas** - Remove the flash carryover system from the "manifold end" of the burner rack. **NOTE:** Natural gas burner racks manufactured prior to Series 6 have a lighter tube carryover system. Break the lighter tube connection at the orifice and remove the supply tubing, the drip shield and the lighter tube.
   - **Propane** - Break the lighter tube connection at the regulator and remove the lighter tube orifice supply tubing; remove the retaining screws in the drip shield and the shield; remove the retaining screws and slide out the lighter tube.

2. Pull main burners horizontally away from injection opening and lift out.
3. Remove manifold bracket screws and remove manifold.
4. Change main burner orifices, if necessary.
5. Remove screws and lift out pilot burner.

Follow the instructions to clean. To re-assemble and replace, reverse the above procedures being careful not to create any unsafe conditions.

Cleaning Pilot and Main Burners

In the event the pilot flame is short and/or yellow, check the pilot orifice for blockage caused by lint or dust accumulation. Remove the pilot orifice and clean with air pressure. DO NOT REAM THE ORIFICE. Check and clean the aeration slot in the pilot burner.

Clean the metal sensing probe and the pilot hood with an emery cloth and wipe off the ceramic insulator. Check the spark gap; spark gap should be maintained to .100". (Refer to **FIGURE 58.**) After the pilot is cleaned, blow any dirt away with compressed air.

Main burners may be cleaned using air pressure. Use an air nozzle to blow out scale and dust accumulation from the burner ports. Alternately blow through the burner ports and the venturi. Use a fine wire to dislodge any stubborn particles. Do not use anything that might change the port size.

Clean the burner rack carryover systems with air pressure.

Pilot and Spark Ignition System

The ignition controller provides the high voltage spark to ignite the pilot service and also acts as the flame safety device. After ignition of the pilot gas, the controller electronically senses the pilot flame. A separate solid metal probe in the pilot burner assembly is used to sense the flame. A low voltage DC electrical signal is imposed on the metal probe which is electrically insulated from ground. **Proper operation of the electronic spark ignition system requires a minimum flame signal of .2 microamps DC as measured by a microammeter.** When the pilot flame impinges on the sensing probe, the flame acts as a conduction path to ground. This completes the DC circuit; the ignition controller responds by energizing the main gas valve.

**CAUTION:** Due to high voltage on pilot spark wire and pilot electrode, do not touch when energized. See Hazard Levels, 2.
10.0 Maintenance and Service (cont'd)

10.2 Maintenance Procedures (cont'd)

FIGURE 58 - Pilot Assembly Spark Gap

10.2.2 Pilot and Main Burners (cont’d)

Pilot and Spark Ignition System (cont’d)

If no spark occurs, check the following:

a) Voltage between Terminals TH and 7 on the ignition controller should be at least 20 volts and no higher than 32 volts. Refer to Troubleshooting (Paragraph 10.3) if no voltage is observed.

b) Short to ground in the high tension lead and/or ceramic insulator.

c) Pilot spark gap should be approximately .100”.

NOTE: When checking for spark with the pilot burner assembly removed from the burner rack, the pilot assembly must be grounded to the heater for proper spark.

If the above conditions are normal and no spark occurs, replace the ignition controller.

If the main gas valve fails to open with a normal full size pilot flame established, check for the following:

a) If voltage between black and brown leads on the main gas valve is 20 to 32 VAC and there is no main gas flow with the built-in manual valve in FULL OPEN position, the main valve is defective.

b) If there is no voltage between black and brown leads on the main gas valve, check for disconnected or shorted flame sensor lead or flame sensor probe.

When the above conditions are normal and the main gas flow is still off, the ignition controller is probably defective. Do not attempt to service the ignition controller; it does not contain any replaceable components.

10.2.3 Cleaning the Heat Exchanger

To clean the inner surfaces of the heat exchanger, remove the burner rack assembly (See Paragraph 10.2.2.) permitting access to the inside of the heat exchanger tubes. Clean the tubes using a 1/2” diameter furnace brush. A mirror and flashlight are helpful in examining the narrow section of each tube. Remove any accumulated dust and soot.

10.2.4 Venter Motor

Power venter motors are permanently lubricated. No oiling is required.

10.2.5 Blower, Belt, and Drive

Check blower pulley and motor pulley to be sure they are secure to the shaft. Check belt condition and belt tension (See Paragraph 6.5).

Blower Bearings - The blower bearings on models with less than a 10 HP motor (standard blower) are permanently lubricated cartridge ball bearings and do not require greasing.

The blower bearings on models equipped with a 10-20 HP motor are pillow block ball bearings and are equipped with a grease fitting. These bearings should be lubricated twice a year with a high temperature, moisture-resistant grease. (Type NLGI-1 or -2 standard grease is recommended.) Be sure to clean the grease fitting before adding grease.

Add grease with a handgun until a slight bead of grease forms at the seal. Be careful not to unseat the seal by over lubricating. NOTE: If unusual environmental conditions exist (temperatures below 32°F or above 200°F; moisture; or contaminants), more frequent lubrication is required.

CAUTION: If the blower is unused for more than three months, bearings with a grease fitting should be purged with new grease prior to startup.

10.2.6 Limit Control Check

With the heater on, completely block off the distribution air. The limit control should open within a few minutes, shutting off gas supply to the main burners.
### Troubleshooting

<table>
<thead>
<tr>
<th>TROUBLE</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Venter motor will not start</strong></td>
<td>1. No power to the furnace.</td>
<td>1. Turn on power, check supply fuses or circuit breaker.</td>
</tr>
<tr>
<td></td>
<td>2. No 24-volt power to venter relay.</td>
<td>2. Turn up thermostat, check control transformer output. Check for loose or improper wire connections.</td>
</tr>
<tr>
<td></td>
<td>3. Venter relay defective.</td>
<td>3. Replace.</td>
</tr>
<tr>
<td></td>
<td>4. Defective motor or capacitor.</td>
<td>4. Replace defective part.</td>
</tr>
<tr>
<td></td>
<td>3. Dirt in pilot orifice.</td>
<td>3. Remove and clean with compressed air or solvent.</td>
</tr>
<tr>
<td></td>
<td>4. Gas pressure too high or too low.</td>
<td>4. Adjust supply pressure. (See Paragraph 6.1).</td>
</tr>
<tr>
<td></td>
<td>5. Kinked pilot tubing.</td>
<td>5. Replace tubing.</td>
</tr>
<tr>
<td></td>
<td>6. Pilot valve does not open.</td>
<td>6. If 24 volts available at the valve, replace valve.</td>
</tr>
<tr>
<td></td>
<td>7. No spark:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Loose wire connections</td>
<td>a) Be certain all wires connections are solid.</td>
</tr>
<tr>
<td></td>
<td>b) Transformer failure</td>
<td>b) Be certain 24 volts is available.</td>
</tr>
<tr>
<td></td>
<td>c) Incorrect spark gap</td>
<td>c) Maintain spark gap at .100&quot;.</td>
</tr>
<tr>
<td></td>
<td>d) Spark cable shorted to ground</td>
<td>d) Replace worn or grounded spark cable.</td>
</tr>
<tr>
<td></td>
<td>e) Spark electrode shorted to ground</td>
<td>e) Replace pilot if ceramic spark electrode is cracked or grounded.</td>
</tr>
<tr>
<td></td>
<td>f) Drafts affecting pilot.</td>
<td>f) Make sure all panels are in place and tightly secured to prevent drafts at pilot.</td>
</tr>
<tr>
<td></td>
<td>g) Ignition control not grounded.</td>
<td>g) Make certain ignition control is grounded to furnace chassis.</td>
</tr>
<tr>
<td></td>
<td>h) Faulty ignition controller.</td>
<td>h) If 24 volt is available to the ignition controller and all other causes have been eliminated, replace ignition control.</td>
</tr>
<tr>
<td></td>
<td>8. Optional lockout device interrupting control circuit by above causes.</td>
<td>8. Reset lockout by interrupting control at thermostat.</td>
</tr>
<tr>
<td></td>
<td>2. Main valve not operating.</td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td>a) Defective valve.</td>
<td>a) If 24 volt is measured at valve connections and valve remains closed, replace valve.</td>
</tr>
<tr>
<td></td>
<td>b) Loose wire connections.</td>
<td>b) Check and tighten all wiring connections.</td>
</tr>
<tr>
<td></td>
<td>3. Ignition control does not power main valve.</td>
<td>3.</td>
</tr>
<tr>
<td></td>
<td>a) Loose wire connections.</td>
<td>a) Check and tighten all wiring connections.</td>
</tr>
<tr>
<td></td>
<td>b) Flame sensor grounded. (Pilot lights - spark continues)</td>
<td>b) Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required.</td>
</tr>
<tr>
<td></td>
<td>c) Gas pressure incorrect.</td>
<td>c) Adjust gas pressure. (See Paragraph 6.1.)</td>
</tr>
<tr>
<td></td>
<td>d) Cracked ceramic at sensor.</td>
<td>d) Replace sensor.</td>
</tr>
<tr>
<td></td>
<td>e) Faulty ignition controller.</td>
<td>e) See Paragraph 10.2.2. If all checks indicate no other cause, replace ignition controller. Do not attempt to repair the ignition controller. This device has no field replaceable parts.</td>
</tr>
<tr>
<td><strong>No heat (Heater operating)</strong></td>
<td>1. Dirty filters in blower system.</td>
<td>1. Clean or replace filters.</td>
</tr>
<tr>
<td></td>
<td>2. Incorrect manifold pressure or orifices.</td>
<td>2. Check manifold pressure (See Paragraph 6.1).</td>
</tr>
<tr>
<td></td>
<td>3. Cycling on limit control.</td>
<td>3. Check air throughput.</td>
</tr>
<tr>
<td></td>
<td>4. Improper thermostat location or adjustment.</td>
<td>4. See thermostat manufacturer's instructions.</td>
</tr>
<tr>
<td></td>
<td>5. Belt slipping on blower.</td>
<td>5. Adjust belt tension</td>
</tr>
<tr>
<td><strong>Cold air - On startup/ during operation</strong></td>
<td>1. Fan control improperly wired.</td>
<td>1. Connect as per wiring diagram.</td>
</tr>
<tr>
<td></td>
<td>2. Defective fan control.</td>
<td>2. Replace fan control.</td>
</tr>
<tr>
<td></td>
<td>3. Incorrect manifold pressure.</td>
<td>3. Check manifold line pressure (See Paragraph 6.1).</td>
</tr>
<tr>
<td></td>
<td>4. Blower set for too low temperature rise.</td>
<td>4. Slow down blower or increase static pressure. (See Paragraph 6.5.)</td>
</tr>
<tr>
<td><strong>Motor will not run</strong></td>
<td>1. Circuit open.</td>
<td>1. Check wiring and connections.</td>
</tr>
<tr>
<td></td>
<td>2. Fan control inoperative</td>
<td>2. Replace fan control.</td>
</tr>
<tr>
<td><strong>Motor turns on and off while burner is operating (see below)</strong></td>
<td>1. Fan control heater element improperly wired.</td>
<td>1. Connect as per wiring diagram.</td>
</tr>
<tr>
<td></td>
<td>2. Defective fan control</td>
<td>2. Replace fan control.</td>
</tr>
<tr>
<td></td>
<td>3. Motor overload device cycling</td>
<td>3. Check motor load against motor rating plate. Replace motor or overload device.</td>
</tr>
<tr>
<td></td>
<td>4. 3-phase motor rotating in opposite direction</td>
<td>4. Interchange two legs of supply connections.</td>
</tr>
<tr>
<td><strong>Motor cuts out on overload</strong></td>
<td>1. Improper motor pulley adjustment</td>
<td>1. See instructions on air throughput (See Paragraph 6.5).</td>
</tr>
<tr>
<td></td>
<td>2. Improper static pressure on duct system</td>
<td>2. Adjust dampers in duct system.</td>
</tr>
<tr>
<td></td>
<td>3. Low voltage</td>
<td>3. Check power supply.</td>
</tr>
</tbody>
</table>
**INSTALLATION RECORD - to be completed by the installer:**

<table>
<thead>
<tr>
<th>Installer:</th>
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<tbody>
<tr>
<td>Name</td>
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<tr>
<td>Company</td>
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<td>Phone</td>
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<thead>
<tr>
<th>Distributor (company from which the unit was purchased):</th>
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<tbody>
<tr>
<td>Company</td>
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<td>Contact</td>
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<td>Phone</td>
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</tbody>
</table>

Model __________________ Serial No.______________________________ Date of Installation ____________

SPECIFIC INSTALLATION NOTES: (i.e. Location, Amps, Gas Pressure, Temperature, Voltage, Adjustments, Warranty, etc.)

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

**BUILDING OWNER OR MAINTENANCE PERSONNEL:**

For service or repair
- Contact the installer listed above.
- If you need additional assistance, contact the Reznor® Distributor listed above.
- For more information, contact your Reznor® Representative by calling 800-695-1901.

Reznor
150 McKinley Avenue
Mercer, PA 16137

www.ReznorHVAC.com; (800) 695-1901

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5/15 Form I-SSCBL/RPBL (Version E.3)