FOR YOUR SAFETY
If you smell gas:
1. Open windows.
2. DO NOT try to light any appliance.
3. DO NOT use electrical switches.
4. DO NOT use any telephone in your building.
5. Extinguish any open flame.
6. Leave the building.
7. Immediately call your local gas supplier after leaving the building. Follow the gas supplier’s instructions.
8. If you cannot reach your gas supplier, call the Fire Department.

**WARNING**

**Fire Hazard**

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater.

Some objects will catch fire or explode when placed close to heater.

Failure to follow these instructions can result in death, injury or property damage.

**WARNING**

Improper installation, adjustment, alteration, service or maintenance can result in death, injury or property damage. Read the Installation, Operation and Service Manual thoroughly before installing or servicing this equipment.

Installation must be done by a contractor qualified in the installation and service of gas-fired heating equipment or your gas supplier.

*Approved and certified by CSA to meet maximum tube temperature of 750 °F (399 °C) in accordance with NFPA30A7.6.6.

installer

Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

Owner

Keep this manual in a safe place in order to provide your service technician with necessary information.

Roberts-Gordon LLC
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Telephone: +1.716.852.4400
Fax: +1.716.852.0854
Toll Free: 800.828.7450
www.robertsgordon.com
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SECTION 1: HEATER SAFETY

Your Safety is Important to Us!
This symbol is used throughout the manual to notify you of possible fire, electrical or burn hazards. Please pay special attention when reading and following the warnings in these sections.
Installation, service and annual inspection of heater must be done by a contractor qualified in the installation and service of gas-fired heating equipment.
Read this manual carefully before installation, operation or service of this equipment. This heater is designed for heating nonresidential, indoor spaces, where exposed surfaces of heating equipment cannot exceed temperatures of 750 °F (399 °C) in facilities where compressed natural gas (CNG) or liquid natural gas (LNG) are present. Do not install in residential spaces.
These instructions, the layout drawing, local codes and ordinances, and applicable standards that apply to gas piping, electrical wiring, venting, etc. must be thoroughly understood before proceeding with the installation.
Protective gear is to be worn during installation, operation and service in accordance to the Occupational Safety and Hazard Administration (OSHA). Gear must be in accordance to NFPA 70E, latest revision when working with electrical components. Thin sheet metal parts have sharp edges. To prevent injury, the use of work gloves is recommended. The use of gloves will also prevent the transfer of body oils from the hands to the surface of the reflector.
Before installation, check that the local distribution conditions, nature of gas and pressure, and adjustment of the equipment are compatible.
This heater must be applied and operated under the general concepts of reasonable use and installed using best building practices.
This equipment is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the equipment by a person responsible for their safety. Children should be supervised to ensure that they do not play with the equipment.
For additional copies of the Installation, Operation and Service Manual, please contact Roberts-Gordon LLC.

1.1 Manpower Requirements
To prevent personal injury and damage to the heater, two persons or more will be required for installation.

1.2 Safety Labels and Their Placement
Product safety signs or labels should be replaced by the product user when they are no longer legible. Please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor to obtain replacement signs or labels. See Page 2, Figure 1 through Page 3, Figure 2.

1.3 California Proposition 65
In accordance with California Proposition 65 requirements, a warning label must be placed in a highly visible location on the outside of the equipment (i.e., near equipment’s serial plate). See label placement drawing on Page 3, Figure 2 for label location. Avoid placing label on areas with extreme heat, cold, corrosive chemicals or other elements. To order additional labels, please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor.
FIGURE 1: Side Panel Label Placement

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logo Label</td>
<td>91031110</td>
</tr>
<tr>
<td>Rating Plate Label</td>
<td>91010455</td>
</tr>
<tr>
<td>Clearances to Combustibles Label</td>
<td>91009106</td>
</tr>
<tr>
<td>Internal Ladder Diagram Label</td>
<td>91017301</td>
</tr>
<tr>
<td>Wiring Label</td>
<td>91017300</td>
</tr>
</tbody>
</table>
FIGURE 2: Top and Back Panel Label Placement

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Connection Label</td>
<td>91018125</td>
</tr>
<tr>
<td>Burner Box Combination Label</td>
<td>91029600</td>
</tr>
<tr>
<td>Proposition 65 Label</td>
<td>91070016</td>
</tr>
</tbody>
</table>
SECTION 2: INSTALLER RESPONSIBILITY

The installer is responsible for the following:

- To ensure the system is designed in accordance with the parameters of the CRVSF-Series Design Manual (P/N 127502NA).
- To install all threaded components with a minimum thread engagement of three threads. Apply sufficient amount of high temperature, anti-seize pipe compound (P/N 91308001 or equivalent) to threads prior to engagement. Hot compound may drip from threads. Protect surfaces underneath heater during first start-up.
- To use the information given in a layout drawing and in the manual together with the cited codes and regulations to perform the installation.
- To install the heater in accordance with the clearances to combustibles.
- To furnish all needed materials not furnished as standard equipment.
- To plan location of supports.
- To provide access to burners on all sides for servicing or burner removal.
- To provide the owner with a copy of this Installation, Operation and Service Manual.
- To never use heater as a support for ladder or other access equipment and to never hang or suspend anything from heater.
- To ensure there is adequate air circulation around the heater and to supply air for combustion, ventilation and distribution in accordance with local codes.
- To safely and adequately install heater using materials with a minimal working load of 750 lb (340 kg).
- To ensure the heater is placed in an approved application.
- Expansion and contraction of the tube dictates that the minimum suspension lengths must be maintained. See table on Page 18, Figure 14.
- To install all components of the system with a minimum of 18" (45 cm) ceiling clearance in accordance to National Fire Protection Association NFPA 30A 7.6.6 (2012 edition) latest revision.
- To install the outside air supply system to each burner and end vent.
- To coordinate with ROBERTS GORDON® independent distributor the return of the completed CORAYVAC® CLASSIC SF start up and installation report within 24 hours of start-up. See Page 79, Section 24.

2.1 Wall Tag

A laminated wall tag is available for the heater as a permanent reminder of the safety instructions and the importance of the required clearances to combustibles. Please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor to obtain the wall tag. Affix the tag by peeling off the backing of the adhesive strips on the rear surface and position the tag on a wall near the CRVSF-Series heater (e.g. thermostat or controller). A copy of the wall tag (P/N 91037912) is illustrated on the back cover. For an immediate solution, you may affix this copy on the wall near the heater.

Know your model number and installed configuration. Model number and installed configuration are found on the burner and in the Installation, Operation and Service Manual. See Page 6, Figure 3. Write the proper clearance dimensions in permanent ink according to your model number and configuration in the open spaces on the tag.

2.2 Corrosive Chemicals

![CAUTION]

Product Damage Hazard

Do not use heater in area containing corrosive chemicals.

Refer to appropriate Material Safety Data Sheets (MSDS).

Failure to follow these instructions can result in product damage.

Roberts-Gordon LLC cannot be responsible for ensuring that all appropriate safety measures are undertaken prior to installation; this is entirely the responsibility of the installer. It is essential that the contractor, the sub-contractor, or the owner identifies the presence of combustible materials, corrosive
Section 2: Installer Responsibility

*Halogenated Hydrocarbons* are a family of chemical compounds characterized by the presence of halogen elements (fluorine, chlorine, bromine, etc.). These compounds are frequently used in refrigerants, cleaning agents, solvents, etc. If these compounds enter the air supply of the burner, the life span of the heater components will be greatly reduced. An outside air supply must be provided to the burners whenever the presence of these compounds is suspected. Warranty will be invalid if the heater is exposed to halogenated hydrocarbons.

2.3 National Standards and Applicable Codes

All equipment must be installed in accordance with the latest revision of the applicable standards and national codes. This refers also to the electric, gas and venting installation. Note: Additional standards for installations in public garages, aircraft hangars, etc. may be applicable.
SECTION 3: CLEARANCES TO COMBUSTIBLES

3.1 Required Clearances to Combustibles

Clearances are the required distances that combustible objects must be away from the heater to prevent serious fire hazards. Combustibles are materials that may catch fire and include common items such as wood, paper, rubber, fabric, etc.

Maintain clearances to combustibles at all times for safety.

Clearances for all heater models are located on the burner of the heater and on Page 6, Figure 3 in this manual. Check the clearances on each burner for the model heater being installed to ensure the product is suitable for your application and the clearances are maintained. Read and follow the safety guidelines below:

- Keep gasoline or other combustible materials including flammable objects, liquids, dust or vapors away from this heater or any other equipment.
- The stated clearances to combustibles represents a surface temperature of 90°F (50°C) above room temperature. Building materials with a low heat tolerance (such as plastics, vinyl siding, canvas, tri-ply, etc) may be subject to degradation at lower temperatures. It is the installer’s responsibility to assure that adjacent materials are protected from degradation.
- Maintain clearances from heat sensitive equipment and workstations.
- Maintain clearances from vehicles parked below the heater.
- Maintain clearances from swinging and overhead doors, overhead cranes, vehicle lifts, partitions, storage racks, hoists, building construction, etc.
- In locations used for the storage of combustible materials, signs must be posted to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles. Signs must be posted adjacent to the heater thermostat. In the absence of a thermostat, signs must be posted in a conspicuous location.
- Consult local Fire Marshal, Fire Insurance Carrier or other authorities for approval of proposed installation when there is a possibility of exposure to combustible airborne materials or vapors.
- Hang heater in accordance to the minimum suspension requirements on Page 18, Figure 14.
- If the radiant tubes must pass through the building structure, be sure that adequate sleeving and fire stop is installed to prevent scorching and/or fire hazard.

NOTE: 1. All dimensions are from the surfaces of all tubes, couplings, elbows, tees and crosses.
2. Clearances B, C and D can be reduced by 50% after 25’ (7.5 m) of tubing downstream from where the combustion chamber and the tube connect.

FIGURE 3: STANDARD REFLECTOR

<table>
<thead>
<tr>
<th>Model</th>
<th>(inches)</th>
<th>(centimeters)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A B C D</td>
<td>A B C D</td>
</tr>
<tr>
<td>CRVSF-2/-4/-6/-8</td>
<td>4 20 48 20</td>
<td>11 51 122 51</td>
</tr>
</tbody>
</table>
NOTE:  1. All dimensions are from the surfaces of all tubes, couplings, elbows, tees and crosses.  
2. Clearances B, C and D can be reduced by 50% after 25’ (7.5 m) of tubing downstream from where the combustion chamber and the tube connect.

FIGURE 4: ONE SIDE REFLECTOR

<table>
<thead>
<tr>
<th>Model</th>
<th>(inches) A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRVSF-2/-4/-6/-8</td>
<td>4</td>
<td>12</td>
<td>56</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>31</td>
<td>143</td>
<td>51</td>
</tr>
</tbody>
</table>

FIGURE 5: TWO SIDE REFLECTORS

<table>
<thead>
<tr>
<th>Model</th>
<th>(inches) A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRVSF-2/-4/-6/-8</td>
<td>4</td>
<td>12</td>
<td>56</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>31</td>
<td>143</td>
<td>31</td>
</tr>
</tbody>
</table>

FIGURE 6: BARRIER SHIELD (SEE SECTION 9.4 FOR APPLICATION RESTRICTIONS)

<table>
<thead>
<tr>
<th>Model</th>
<th>(inches) A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRVSF-2/-4/-6/-8</td>
<td>4</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
</tbody>
</table>

FIGURE 7: PROTECTIVE GRILLE

<table>
<thead>
<tr>
<th>Model</th>
<th>(inches) A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRVSF-2/-4/-6/-8</td>
<td>4</td>
<td>20</td>
<td>48</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>51</td>
<td>122</td>
<td>51</td>
</tr>
</tbody>
</table>
## SECTION 4: NATIONAL STANDARDS AND APPLICABLE CODES

### 4.1 Gas Codes

- The type of gas appearing on the nameplate must be the type of gas used. Installation must comply with national and local codes and requirements of the local gas company.

  - Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

### 4.2 Aircraft Hangars

Installation in aircraft hangars must be in accordance with the following codes:

  - United States: Refer to Standard on Aircraft Hangars, NFPA 409 - latest revision.
  - Canada: Refer to Natural Gas and Propane Installation Code, Standard CSA B149.1 - latest revision.

### 4.3 Public Garages

Installation in garages must be in accordance with the following codes:

  - Canada: Refer to Natural Gas and Propane Installation Code, Standard CSA B149.1 - latest revision.

### 4.4 Electrical

The heater must be electrically grounded in accordance with the following codes:

  - United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances and any special diagrams furnished.
  - Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

### 4.5 Venting

The venting must be installed in accordance with the requirements within this manual and the following codes:

  - Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

### 4.6 High Altitude

These heaters are approved for installations up to 2000' (610 m)(US), 4500' (1370 m)(Canada) without modification. Consult factory if US installation is above 2000' (610 m) or Canadian installation is above 4500' (1370 m).

### 4.7 Compressed and Liquid Natural Gas Installations

SECTION 5: MAJOR COMPONENTS

The figures in this section provide a general overview of component placement in a CRVSF-Series system. The location of some components such as supports and couplings is crucial for proper installation. Assemble the heater components as shown on Page 15, Figure 12.

Install appropriate suspension hardware, beam clamps, chain or rod at predetermined locations. Adjustments of chain or turnbuckle length will provide uniform pitch. Thread pipe and fittings per ASTM. See Page 4, Section 2.

FIGURE 8: Major Component Descriptions

- **Burner**
- **Tube** Schedule 40 steel pipe (supplied by others.)
- **Tube and Reflector Hanger** Suspend system from these hangers.
- **Reflector Support Strap & Wire Form**
- **Reflector End Cap (Aluminum)** Punch out center section to accommodate tube.
- **Reflector Joint**
- **Reflector (Aluminum)** Alternate overlap as shown on Page 22, Section 8.3.3. Minimum overlap is 6" (16 cm).
- **Reflector with Hole (Aluminum)** Alternate overlap as shown on Page 22, Section 8.3.3. Minimum overlap is 6" (16 cm).
- **Flex Gas Line with shut-off cock**
- **Turnbuckle**
- **3/8" Spring Hook**
- **End Vent**
- **Condensate Valve Assembly**
- **Cast-Iron Combustion Chamber**
- **Schedule 40 Adapter**
- **Schedule 40 Damper Nipple**
FIGURE 9: Major Component Descriptions (Continued)

ROBERTS GORDON®
ULTRAVAC™ Controller
(Model CRVSF-6/-8 only)

EP-100 Pump Package - 4" dia
For more information, refer to the EP-100 Installation, Operation and Service Manual (P/N 127201NA).

ROBERTS GORDON®
ULTRAVAC™
Variable Frequency Drive

EP-201 Pump Package - 4" dia
EP-203 Pump Package - 4" dia
For more information, refer to the EP-200 Series Installation, Operation and Service Manual (P/N 127200NA).

System Control

EP-301 Pump Package - 4" dia
EP-301 Pump Package - 6" dia
EP-303 Pump Package - 4" dia
EP-303 Pump Package - 6" dia
For more information, refer to the EP-300 Series Installation, Operation and Service Manual (P/N 127202NA).

ROBERTS GORDON®
ULTRAVAC™
Adjustable Indoor Sensor

Outdoor Sensor (P/N 10081501)
### FIGURE 10: Schedule 40 Black Steel Fittings

<table>
<thead>
<tr>
<th>Threaded Coupling</th>
<th>45° Elbow</th>
<th>90° Elbow</th>
<th>Tee</th>
<th>Cross</th>
</tr>
</thead>
</table>

(All Schedule 40 Black Steel Fittings are supplied by others.)

### FIGURE 11: Optional Heater Accessories

- Reflector Side Extension
- Reflective Side Extension Bracket
- Protective Grille
- Barrier Shield
### 5.1 Standard Parts List for In-Series Systems

#### Table 1: Contents of CRVSF-Series Burner Carton

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0270XXX-SF</td>
<td>Burner (Rate and Fuel Varies)</td>
</tr>
<tr>
<td><em>91412200</em></td>
<td>Flexible Stainless Steel Gas Hose, 1/2&quot; NPT (US models only)</td>
</tr>
<tr>
<td>01397300</td>
<td>Accessory Package</td>
</tr>
<tr>
<td>01396100</td>
<td>Filter Support Disk</td>
</tr>
<tr>
<td>01367800</td>
<td>Combustion Chamber Gasket</td>
</tr>
<tr>
<td>02724901</td>
<td>Door Assembly w/ Hole</td>
</tr>
<tr>
<td>91115100</td>
<td>Screw #10 - 24 x 5/8</td>
</tr>
<tr>
<td>91119500</td>
<td>U-Clip</td>
</tr>
<tr>
<td>91905500</td>
<td>Filter Support</td>
</tr>
<tr>
<td>92123900</td>
<td>Nut 5/16 - 18</td>
</tr>
<tr>
<td>92511601</td>
<td>Wing Nut #10 - 24</td>
</tr>
<tr>
<td>96411600</td>
<td>Lock Washer 5/16&quot;</td>
</tr>
<tr>
<td>01312401</td>
<td>Filter and Gasket</td>
</tr>
</tbody>
</table>

* Canadian Models: Rubber (Type 1) Gas Hoses available as an accessory. See Page 42, Figure 27.

#### Table 2: Common CRVSF-Series Components

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Combustion Chambers</strong></td>
</tr>
<tr>
<td>02721200-1P</td>
<td>Cast Iron Combustion Chamber</td>
</tr>
<tr>
<td></td>
<td><strong>End Vent Components</strong></td>
</tr>
<tr>
<td>E00094XX</td>
<td>End Vent Plate Package</td>
</tr>
<tr>
<td>02722100</td>
<td>Schedule 40 Adapter</td>
</tr>
<tr>
<td></td>
<td><strong>Tubing and Related Accessories</strong></td>
</tr>
<tr>
<td>91308001</td>
<td>High Temperature Pipe Compound</td>
</tr>
<tr>
<td>01332000</td>
<td>Schedule 40 Damper Nipple</td>
</tr>
<tr>
<td></td>
<td><strong>Venting Accessories</strong></td>
</tr>
<tr>
<td>01324401</td>
<td>Outside Air Supply Takeoff, 4&quot; (10 cm)</td>
</tr>
<tr>
<td>01326801</td>
<td>Outside Air Filter Housing</td>
</tr>
<tr>
<td>90707501</td>
<td>Air Supply Blower/Power Venter</td>
</tr>
<tr>
<td>91409601</td>
<td>Outside Air Flex Duct, 4&quot; (10 cm) (Box of 8 - 8' [2.4 m] sections)</td>
</tr>
<tr>
<td></td>
<td><strong>Gas Components</strong></td>
</tr>
<tr>
<td>90207600</td>
<td>High Pressure Regulator - 2 psi</td>
</tr>
<tr>
<td>90207601</td>
<td>High Pressure Regulator - 5 psi</td>
</tr>
<tr>
<td></td>
<td><strong>Reflectors and Related Accessories</strong></td>
</tr>
<tr>
<td>02716400</td>
<td>Reflector Support Package (Schedule 40 Pipe)</td>
</tr>
<tr>
<td>02750303</td>
<td>Reflector, Aluminum, 96&quot; (244 cm)</td>
</tr>
<tr>
<td>02750304</td>
<td>Reflector, Aluminum with Hole, 96&quot; (244 cm)</td>
</tr>
<tr>
<td>02750800</td>
<td>Reflector End Cap, Aluminum</td>
</tr>
<tr>
<td>02750900</td>
<td>Reflector Joint</td>
</tr>
<tr>
<td>02790300</td>
<td>Tube and Reflector Hanger (Schedule 40 Pipe)</td>
</tr>
<tr>
<td>91903301</td>
<td>Spring Hook 3/8&quot;</td>
</tr>
<tr>
<td>91903202</td>
<td>Eyebolt Turnbuckle</td>
</tr>
<tr>
<td>01329910</td>
<td>Reflector Side Extension Support</td>
</tr>
<tr>
<td>02712700</td>
<td>Reflector Side Extension, 96&quot; (244 cm)</td>
</tr>
</tbody>
</table>

#### Control Packages and Accessories

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10001501</td>
<td>Water Resistant Sensor</td>
</tr>
<tr>
<td>02770002</td>
<td>System Control</td>
</tr>
</tbody>
</table>

**ULTRAVAC™ Control Packages**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>URVCCM</td>
<td>ROBERTS GORDON® ULTRAVAC™ Central Controller (with Modem Chip &amp; Software)</td>
</tr>
<tr>
<td>URVSC</td>
<td>ROBERTS GORDON® ULTRAVAC™ Controller</td>
</tr>
<tr>
<td>10080142</td>
<td>Modem Chip</td>
</tr>
<tr>
<td>10080450</td>
<td>Comms Equalization Cable</td>
</tr>
<tr>
<td>10080430</td>
<td>RS-485 Converter with 9 V Power Supply</td>
</tr>
<tr>
<td>10081501</td>
<td>Outdoor Sensor</td>
</tr>
<tr>
<td>10080410</td>
<td>PC Connection Cable Package</td>
</tr>
</tbody>
</table>

**ULVCCR**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>URVCCCL</td>
<td>ROBERTS GORDON® ULTRAVAC™ Central Controller (with TCP/IP Communication Module &amp; Software)</td>
</tr>
<tr>
<td>URVSC</td>
<td>ROBERTS GORDON® ULTRAVAC™ Controller</td>
</tr>
<tr>
<td>10080142</td>
<td>Modem Chip</td>
</tr>
<tr>
<td>10080450</td>
<td>Comms Equalization Cable</td>
</tr>
<tr>
<td>10080440</td>
<td>TCP/IP Communication Module</td>
</tr>
<tr>
<td>10081501</td>
<td>Outdoor Sensor</td>
</tr>
<tr>
<td>10080410</td>
<td>PC Connection Cable Package</td>
</tr>
</tbody>
</table>

**URVNC**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>URVU</td>
<td>Controller, ROBERTS GORDON® ULTRAVAC™, 1 Pump 3 Zones (Satellite Control)</td>
</tr>
<tr>
<td>URVU Controller</td>
<td>Controller, ROBERTS GORDON® ULTRAVAC™, Unitary</td>
</tr>
</tbody>
</table>

**Variable Frequency Drive Assemblies**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFD75115</td>
<td>VFD Assembly, .75 HP, 115 V, 1 Ø Input</td>
</tr>
<tr>
<td>VFD75230</td>
<td>VFD Assembly, .75 HP, 230 V, 1 Ø Input</td>
</tr>
<tr>
<td>VFD20230</td>
<td>VFD Assembly, 2 HP, 230 V, 1 Ø Input</td>
</tr>
<tr>
<td>VFD75115N4</td>
<td>VFD Assembly, .75 HP, 115 V, 1 Ø Input, NEMA 4</td>
</tr>
<tr>
<td>VFD75230N4</td>
<td>VFD Assembly, .75 HP, 230 V, 1 Ø Input, NEMA 4</td>
</tr>
<tr>
<td>VFD75460N4</td>
<td>VFD Assembly, .75 HP, 460 V, 3 Ø Input, NEMA 4</td>
</tr>
<tr>
<td>VFD20230N4</td>
<td>VFD Assembly, 2 HP, 230 V, 1 Ø Input, NEMA 4</td>
</tr>
<tr>
<td>VFD20460N4</td>
<td>VFD Assembly, 2 HP, 460 V, 3 Ø Input, NEMA 4</td>
</tr>
</tbody>
</table>

**ULTRAVAC™ Accessories**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10080410</td>
<td>Modem, Plug-In Chip</td>
</tr>
<tr>
<td>10080410</td>
<td>Cable Package, PC Connection</td>
</tr>
<tr>
<td>10080430</td>
<td>RS-485 Converter with 9V Power Supply</td>
</tr>
<tr>
<td>10080440</td>
<td>TCP/IP Communication Module</td>
</tr>
<tr>
<td>10081500</td>
<td>Sensor, Adjustable Indoor, Deg F, ROBERTS GORDON® ULTRAVAC™ Controller</td>
</tr>
<tr>
<td>10081501</td>
<td>Sensor, Outdoor, ULTRAVAC™</td>
</tr>
<tr>
<td>10081502</td>
<td>Sensor, Adjustable Indoor, Deg C, ULTRAVAC™</td>
</tr>
<tr>
<td>90602450</td>
<td>Voltage Surge Suppressor 277/480 V</td>
</tr>
</tbody>
</table>
### SECTION 5: MAJOR COMPONENTS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>90602451</td>
<td>Voltage Surge Suppressor 120 V</td>
</tr>
<tr>
<td>90602452</td>
<td>Voltage Surge Suppressor 120/240 V 1 Ø 60 Hz</td>
</tr>
<tr>
<td>90602460</td>
<td>Line Reactor 480 V 3 Ø 60 Hz w/Enclosure (Output)</td>
</tr>
<tr>
<td>90602461</td>
<td>Line Reactor 230 V 3 Ø 60 Hz .75 HP (Output)</td>
</tr>
<tr>
<td>90602462</td>
<td>Line Reactor 230 V 3 Ø 60 Hz 2 HP (Output)</td>
</tr>
<tr>
<td>90602470</td>
<td>Line Reactor 480 V 3 Ø 60 Hz 4 A w/Enclosure (Input)</td>
</tr>
<tr>
<td></td>
<td><strong>Thermostats</strong></td>
</tr>
<tr>
<td></td>
<td>05023000 Load Relay Package</td>
</tr>
<tr>
<td>90417600K</td>
<td>Transformer Relay - SPST (12 A)</td>
</tr>
<tr>
<td>90423000</td>
<td>Transformer Relay - SPDT (12 A)</td>
</tr>
<tr>
<td>90424300</td>
<td>Thermostat Guard</td>
</tr>
<tr>
<td>90425104</td>
<td>Thermostat, Modulating LonWorks®</td>
</tr>
<tr>
<td>90425105</td>
<td>Thermostat, Modulating</td>
</tr>
<tr>
<td>90425109</td>
<td>Thermostat, Modulating BACnet®</td>
</tr>
<tr>
<td>90425400</td>
<td>Thermostat, 24 V Programable</td>
</tr>
<tr>
<td>90429107</td>
<td>Thermostat, On/Off BACnet®</td>
</tr>
<tr>
<td>10081520</td>
<td>Sensor, Remote Modulating</td>
</tr>
<tr>
<td>10081521</td>
<td>Sensor, Outdoor Modulating</td>
</tr>
<tr>
<td></td>
<td><strong>Pump Packages and Accessories</strong></td>
</tr>
<tr>
<td>02719105</td>
<td>EP-100 Pump Package</td>
</tr>
<tr>
<td>02719100</td>
<td>EP-100 Pump</td>
</tr>
<tr>
<td>02724700</td>
<td>Accessory Package</td>
</tr>
<tr>
<td>02716305</td>
<td>EP-201 Pump Package</td>
</tr>
<tr>
<td>01312001</td>
<td>EP-201 Pump</td>
</tr>
<tr>
<td>01312002</td>
<td>Accessory Package</td>
</tr>
<tr>
<td>02712034</td>
<td>EP-203 Pump Package</td>
</tr>
<tr>
<td>01312003</td>
<td>EP-203 Pump</td>
</tr>
<tr>
<td>01317805</td>
<td>Accessory Package</td>
</tr>
<tr>
<td>02723014</td>
<td>EP-301 Pump Package</td>
</tr>
<tr>
<td>02730101</td>
<td>EP-301 Pump Assembly</td>
</tr>
<tr>
<td>02730104</td>
<td>Accessory Package</td>
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<tr>
<td>02723016</td>
<td>EP-301 Pump Package</td>
</tr>
<tr>
<td>02730101</td>
<td>EP-301 Pump Assembly</td>
</tr>
<tr>
<td>02730106</td>
<td>Accessory Package</td>
</tr>
<tr>
<td>02723034</td>
<td>EP-303 Pump Package</td>
</tr>
<tr>
<td>02730103</td>
<td>EP-303 Pump Assembly</td>
</tr>
<tr>
<td>02730104</td>
<td>Accessory Package</td>
</tr>
<tr>
<td>02723036</td>
<td>EP-303 Pump Package</td>
</tr>
<tr>
<td>02730106</td>
<td>EP-303 Pump Assembly</td>
</tr>
<tr>
<td></td>
<td><strong>Pump Accessories</strong></td>
</tr>
<tr>
<td></td>
<td>90430600K Pressure Switch</td>
</tr>
<tr>
<td>01327001</td>
<td>Condensate Check Valve Assembly</td>
</tr>
<tr>
<td>02718851</td>
<td>Drain Cap, 4&quot; (10 cm)</td>
</tr>
<tr>
<td>02718852</td>
<td>Drain Cap, 6&quot; (15 cm)</td>
</tr>
<tr>
<td>01327002</td>
<td>Condensate Neutralization Tube 200</td>
</tr>
<tr>
<td>01327003</td>
<td>Condensate Neutralization Tube 600</td>
</tr>
<tr>
<td>01327004</td>
<td>Condensate Neutralization Tube 1000</td>
</tr>
<tr>
<td>01327005</td>
<td>Condensate Neutralization Tube 2000</td>
</tr>
<tr>
<td>01327007</td>
<td>Refill, Condensate Neutralization Tube 200</td>
</tr>
<tr>
<td>01327008</td>
<td>Refill, Condensate Neutralization Tube 1000</td>
</tr>
<tr>
<td>01327009</td>
<td>Refill, Condensate Neutralization Tube 2000</td>
</tr>
<tr>
<td></td>
<td><strong>Contactors</strong></td>
</tr>
<tr>
<td>10050011</td>
<td>Contactor, 120 Vac for EP-203, EP-303, 3 Ø</td>
</tr>
<tr>
<td></td>
<td>EP-100, EP-201 208/230 V, 1 Ø</td>
</tr>
<tr>
<td></td>
<td>EP-301 208/230 V, 1 Ø</td>
</tr>
<tr>
<td>10050012</td>
<td>Contactor, 120 Vac for EP-301, 120 V, 1 Ø</td>
</tr>
<tr>
<td></td>
<td><strong>Protective Grille</strong></td>
</tr>
<tr>
<td>08050001</td>
<td>Protective Grille, 40&quot; (102 cm)</td>
</tr>
<tr>
<td>08050002</td>
<td>Protective Grille Cap</td>
</tr>
<tr>
<td></td>
<td><strong>Shields</strong></td>
</tr>
<tr>
<td>02750303</td>
<td>Barrier Shield</td>
</tr>
<tr>
<td></td>
<td><strong>Fresh Air Filter Box</strong></td>
</tr>
<tr>
<td>90740100K</td>
<td>Fresh Air Filter Box</td>
</tr>
<tr>
<td>20628</td>
<td>Aluminum Mesh Filter 20&quot; x 20&quot; x 1&quot; (51 cm x 51 cm x 3 cm)</td>
</tr>
</tbody>
</table>
SECTION 6: DESIGN REQUIREMENTS
The CRVSF-Series system’s design is related to the system operation and performance required by the building being heated. Every effort should be made to follow the dimensions on the layout drawing. If deviations are necessary, either contact the company responsible for the layout design, your ROBERTS GORDON® independent distributor or consult the CRVSF-Series Design Manual (P/N 127502NA).
FIGURE 12: Heater Assembly Overview

- System Control, Modulating Thermostat, or ROBERTSON ULTRAVAC™ Controller
- Tube & Reflector Hanger
- Reflector Support
- Exhaust to Outside
- Flexible Boot
- Pump
- Reflector with Hole
- Schedule 40 Steel Pipe
- Reflector Support

Notes:
- May not be needed with certain pumps and controllers. Refer to wiring diagram in the appropriate controller's installation, operation, and service manual for details. ROBERTSON ULTRAVAC™ requires zone sensors and additional control equipment. See the appropriate controller installation manual for details.
SECTION 7: UNITARY HEATERS

7.1 In-Series Systems vs. Unitary Heaters

CRVSF-Series burners may be used as in-series systems or unitary heaters.

Unitary heaters consist of a single burner, a single run of radiant tubing and a vacuum pump. See Page 16, Figure 13 for details.

In-series systems consist of more than one burner and more than one run of radiant tubing. The runs of radiant tubing are connected together by manifold tubing. The manifold tubing connects to a single pump that exhausts the flue gases outdoors.

Since this manual addresses installation of both unitary heaters and in-series systems, pay close attention to section and figure titles to verify relevance to in-series systems and unitary heaters.

NOTE: Quantities and items listed in Table 3 represent components needed to complete a CRVSF unitary heater at specified minimum heat exchanger length.

Table 3: Minimum Heat Exchanger Length

<table>
<thead>
<tr>
<th>Part Number</th>
<th>CRVSF60N</th>
<th>CRVSF60P</th>
<th>CRVSF80N</th>
<th>CRVSF80P</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRVSF60N</td>
<td>31.5' (9.6 m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRVSF60P</td>
<td>31.5' (9.6 m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRVSF80N</td>
<td>42' (12.8 m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRVSF80P</td>
<td>42' (12.8 m)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Contents of CRVSF Unitary Packages

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>CRVSF60N</th>
<th>CRVSF60P</th>
<th>CRVSF80N</th>
<th>CRVSF80P</th>
</tr>
</thead>
<tbody>
<tr>
<td>02700XXX-SF</td>
<td>Burner CRVSF</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>02790300</td>
<td>Tube and Reflector Hanger (Schedule 40 Pipe)</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>02716400</td>
<td>Reflector Support Package (Schedule 40 Pipe)</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>91903202</td>
<td>Eyebolt Turnbuckle</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>91903301</td>
<td>Spring Hook 3/8&quot; (Schedule 40)</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>02721200-1P</td>
<td>Cast Iron Combustion Chamber Pkg-1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>02750800</td>
<td>Reflector End Cap, Aluminum</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>02750304</td>
<td>Reflector with Hole for CRV Burner, Aluminum - 96” (244 cm)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>02750303</td>
<td>Reflector, Aluminum - 96” (244 cm)</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>E00094XX</td>
<td>End Vent Package CRVSF</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>01326801</td>
<td>Housing Filter Assy - Outside Air</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>91308001</td>
<td>Pipe Joint Compound - High Temp 1lb (Never Seize)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>91107720</td>
<td>U-Clips (20 Pkg)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>02719105</td>
<td>Pump Package, EP-100</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

NOTE: Scheduled 40 pipe and fittings are provided by others.

FIGURE 13: CRVSF Unitary Heater Assembly Overview
To ensure your safety and comply with the terms of the warranty, all units must be installed in accordance with these instructions. The gas or the electrical supply lines must not be used to support the heater.

Do not locate the gas or electric supply lines directly over the path of the flue products from the heater. The heater must be installed in a location that is readily accessible for servicing. The heaters must be installed in accordance with clearances to combustibles as indicated on the burner control side panel (inside) and in this instruction manual. The minimum and maximum gas inlet pressures must be maintained as indicated on the rating plate. Typical installation configurations are shown on Page 18, Figure 14. Expansion and contraction of the tube dictates that the minimum suspension lengths must be maintained. See table on Page 18, Figure 14. Install all threaded components with a minimum thread engagement of three threads. Apply sufficient amount of high temperature anti-seize pipe compound (P/N 91308001 or equivalent) to threads prior to engagement. Hot compound may drip from threads.
FIGURE 14: Critical Hanger Placement

Recommended Suspension Details

Only use closed eyebolt turnbuckles. "S" hook turnbuckles are not approved.

---

Description Part Number
Eyebolt Turnbuckle 91903202
Spring Hook 3/8" 91903301
Tube/Reflector Hanger 02790300
Cast-Iron Combustion Chamber 02721200-1P

---

**Run Length** | **Typical Expansion** | **Minimum "X" Length**
--- | --- | ---
50' (15 m) | ±1" (3 cm) | 12" (30 cm)
100' (31 m) | ±2" (5 cm) | 24" (61 cm)
150' (46 m) | ±3" (8 cm) | 36" (91 cm)
200' (61 m) | ±4" (10 cm) | 46" (122 cm)
250' (76 m) | ±5" (13 cm) | 57" (145 cm)

---

Cast-Iron Combustion Chamber with Schedule 40 Steel Pipe

The total weight of each burner and combustion chamber is 40.25 lbs (18 kg).
4" Schedule 40 pipe weighs 10.9 lbs. (5 kg) per foot.
Step 8.1 Tube Installation

**NOTE:** Tubing requires a downward slope of 1/2" (13 mm) per 20' (6 m) away from burner. Tailpipe tubing requires a downward slope of 1" (26 mm) per 20' (6 m) away from burner.

### Description Part Number

<table>
<thead>
<tr>
<th>Schedule 40 Steel Pipe and Fittings</th>
<th>Supplied by Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnbuckle with Eyebolts</td>
<td>91903202</td>
</tr>
<tr>
<td>Spring Hook 3/8&quot;</td>
<td>91903301</td>
</tr>
<tr>
<td>Tube/Reflector Hanger</td>
<td>02790300</td>
</tr>
<tr>
<td>High Temperature Pipe Compound</td>
<td>91308001</td>
</tr>
</tbody>
</table>

8.2 Elbow Package Configuration

#### Step 8.2.1 Elbow Installation

### Minimum Distance Required Between Burner and Elbow

<table>
<thead>
<tr>
<th>Model</th>
<th>Minimum Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRVSF-2</td>
<td>5' (1.5 m)</td>
</tr>
<tr>
<td>CRVSF-4</td>
<td>5' (1.5 m)</td>
</tr>
<tr>
<td>CRVSF-6</td>
<td>10' (3 m)</td>
</tr>
<tr>
<td>CRVSF-8</td>
<td>10' (3 m)</td>
</tr>
</tbody>
</table>

#### Step 8.2.2 Elbow Installation
Step 8.3 Reflector Installation

⚠️ WARNING

Fire Hazard

Support reflector with reflector hanger and support strap.

Reflector must not touch tube.

Failure to follow these instructions can result in death, injury or property damage.

Install all threaded components with a minimum thread engagement of three threads. Apply sufficient amount of high temperature, anti-seize pipe compound (P/N 91308001 or equivalent) to threads prior to engagement.

### Step 8.3.1 Reflector Installation with Hole

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule 40 Tube/Reflector Hanger</td>
<td>02790300</td>
</tr>
<tr>
<td>Schedule 40 Steel Pipe and Fittings</td>
<td>Supplied by Others</td>
</tr>
<tr>
<td>Reflector with Hole, 96&quot; (244 cm)</td>
<td>02750304</td>
</tr>
</tbody>
</table>
Step 8.3.2 Reflector Installation

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflector Support Package</td>
<td>02716400</td>
</tr>
<tr>
<td>U-Clip Package</td>
<td>91107720</td>
</tr>
<tr>
<td>Reflector End Cap</td>
<td>02750800</td>
</tr>
</tbody>
</table>

Wire Form

Reflector Support Strap

Sheet Metal Screw

Pipe

U-Clip (2 Clips per Alternate Overlaps per Side)
Step 8.3.3 Reflector, U-Clip and Reflector Support Installation

The pictorial drawings of the heater construction in Section 8 are schematic only and provide a general guideline of where hangers, reflector supports and U-clips are to be installed.

To ensure proper expansion and contraction movement of the reflectors, a combination of U-clips and reflector supports are used. The positioning of reflector supports and U-clips depend on the individual installation. Use either pop rivets or sheet metal screws instead of U-clips when installing end caps and joint pieces in areas where impact and high wind may be a factor. The following rules must be observed.

1. The first reflector after the burner must be affixed in the middle of the reflector with a reflector support and tight screws.

    - Reflector End Cap
    - U-Clips
    - Overlap must be a minimum of 6" (16 cm)

**Note:** For proper reflector support, the reflector with hole is placed underneath the second reflector.

2. The overlap at the first and second reflector is a **slip overlap**. Thereafter, every third reflector joint is a slip overlap. A slip overlap is achieved by either:
   a.) both reflectors lay inside a hanger. (No reflector support needed).
   b.) using a reflector support with loose screws at the reflector overlap.

3. The remaining reflector overlaps require a **non-slip overlap connection**. To affix the reflectors together in a non-slip overlap either:
   a.) use reflector support and tight screws.
   b.) if both reflectors lay inside a hanger, U-clips or sheet metal screws may be used.

This section of three reflectors joined together must be affixed to the tube with at least one reflector support with tight screws.

---

**Description** | **Part Number**
--- | ---
Reflector Support Package (Schedule 40 Pipe) | 02716400
Wire Form (Schedule 40 Pipe) | 91908001
Reflector Support Strap | 03050000
U-Clip Package | 91107720
Reflector End Cap | 02750800
Step 8.4 Burner Installation

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolt</td>
<td>94273914</td>
</tr>
<tr>
<td>Burner</td>
<td>0270XXXX-SF</td>
</tr>
<tr>
<td>Lock Washer</td>
<td>96411600</td>
</tr>
<tr>
<td>Gasket</td>
<td>01367800</td>
</tr>
<tr>
<td>End Vent</td>
<td>E00097XX</td>
</tr>
<tr>
<td>Schedule 40 Adapter</td>
<td>02722100</td>
</tr>
</tbody>
</table>

NOTE: Install end vent at end combustion chamber position only.
SECTION 9: OPTIONAL HEATER ACCESSORIES

**WARNING**

Cut/Pinch Hazard

Wear protective gear during installation, operation and service.

Edges are sharp.

Failure to follow these instructions can result in injury.

**Step 9.1 Tee Installation**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tee</td>
<td>Supplied by Others</td>
</tr>
<tr>
<td>Schedule 40 Tube/Reflector Hanger</td>
<td>02790300</td>
</tr>
<tr>
<td>Schedule 40 Steel Pipe</td>
<td>Supplied by Others</td>
</tr>
</tbody>
</table>
Step 9.2 Reflector Joint
Step 9.2.1 Reflector Joint Installation

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflector End Cap</td>
<td>02750800</td>
</tr>
<tr>
<td>Reflector Joint</td>
<td>02750900</td>
</tr>
<tr>
<td>U-clip Package</td>
<td>91107720</td>
</tr>
</tbody>
</table>

Step 9.2.2 Reflector Joint Installation

- Cut away contour with tin snips.
- Punch/drill six 3/32" (2 mm) holes.
Step 9.2.3 Reflector Joint Detail

Install reflector end cap.

Attach reflector joint with six #8 sheet metal screws. (supplied by others)

FIGURE 15: Reflector Joint Detail
9.3 Reflector Side Extension

Step 9.3.1 Bracket Installation

- **Tube**
- **Reflector**
- **Tube and Reflector Hanger**
- **Reflector Support**
- **Reflector Side Extension Bracket** (2 per reflector)

*Use additional supports in high air movement applications.*

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflector Side Extension Package</td>
<td>02712700</td>
</tr>
<tr>
<td>Reflector Side Extension, 96&quot; (244 cm)</td>
<td>01368000</td>
</tr>
<tr>
<td>Retainer Clips</td>
<td>02712700</td>
</tr>
<tr>
<td>Sheet Metal Screws</td>
<td>94118106</td>
</tr>
</tbody>
</table>

Order Separately

- **Reflector Side Extension Bracket** 01329910

---

Step 9.3.2 Side Reflector Installation

- **#8 x 3/8 (3.9 x 9.5 mm) Sheet Metal Screw**
- **Cut relief notches for supports and hangers.**
- **Retainer Clip (2 per Side)**
- **Reflector Side Extension**
9.4 Barrier Shield

Barrier shields must be cut down to 4' (1.2 m) sections. Do not install barrier shield less than 5' (1.5 m) downstream of any burner or within 1' (.3 m) of next in-series burner. Do not install more than 1 barrier shield in between in-series burners.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrier Shield</td>
<td>02750303</td>
</tr>
<tr>
<td>U-Clip Package</td>
<td>91107720</td>
</tr>
</tbody>
</table>
9.5 Protective Grille Installation

Step 9.5.1 Silicone Cap Installation

- **Step 9.5.1 Silicone Cap Installation**

  - **Silicone Cap**
  - **Grille Finger**
  - **Grille**
  - **Grille End Cap**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grille Section</td>
<td>08050001</td>
</tr>
<tr>
<td>Grille End Cap</td>
<td>08050002</td>
</tr>
<tr>
<td>Silicone Cap</td>
<td>91915951-6P</td>
</tr>
</tbody>
</table>

Step 9.5.2 Grille End Cap Installation

- **Step 9.5.2 Grille End Cap Installation**

  - **A**
  - **B**
  - **C**
  - **D**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grille Section</td>
<td>08050001</td>
</tr>
<tr>
<td>Grille End Cap</td>
<td>08050002</td>
</tr>
<tr>
<td>Silicone Cap</td>
<td>91915951-6P</td>
</tr>
</tbody>
</table>

Step 9.5.3 Grille Installation

- **Step 9.5.3 Grille Installation**

  - **Reflector**
  - **Grille**
  - **Grille Section**
  - **Grille End Cap**

  - **40" (101 cm)**
SECTION 10: PUMP INSTALLATION AND VENTING

10.1 Pump Installation


FIGURE 16: EP-200 Condensate Valve Assembly

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condensate Valve Assembly</td>
<td>01327001</td>
</tr>
</tbody>
</table>

WARNING

Carbon Monoxide Hazard

Heaters installed unvented must be interlocked with sufficient building exhaust.

Heaters must be installed according to the installation manual.

Failure to follow these instructions can result in death or injury.

WARNING

Cut/Pinch Hazard

Wear protective gear during installation, operation and service.

Edges are sharp.

Failure to follow these instructions can result in injury.

NOTE: Ice build up may occur if condensate line is installed outdoors.
10.1.1 Condensate Neutralization Tube (optional)

If a condensate neutralization tube is specified to be used with the heating system, follow the steps below to choose the proper condensate neutralization tube. See Page 32, Figure 17.

**Step 1: Condensate flow (gal/h) per 100,000 Btu/h installed**

You will need to know the tailpipe length per flow unit and the total input (Btu/h) on the heating system. Please refer to the following chart to determine the condensate flow (gal/h) per 100,000 Btu/h installed:

<table>
<thead>
<tr>
<th>Radiant Tube Length (average distance between burners)</th>
<th>Tailpipe Length per Flow Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>N/A</td>
</tr>
<tr>
<td>Recommended</td>
<td>0.1</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Step 2: Total condensate**

Determine the total condensate (gal/h) using the following calculation:

Total condensate (gal/h) = Total Input (Btu/h) / 100,000 (Btu/h) x condensate flow (gal/h)

**Step 3: Choose the condensate neutralization tube**

Choose the condensate neutralization tube which is closest to and higher than the calculated gal/h value.

**Example:**

CORAYVAC® CLASSIC SF system has a total input of 600,000 Btu/h. The radiant tube length and tailpipe are set-up according to the RECOMMENDED specifications.

**Step 1: Condensate flow (gal/h) per 100,000 Btu/h installed**

Select 0.3 from the Condensate flow chart.

<table>
<thead>
<tr>
<th>Calculated gal/h</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2</td>
<td>Condensate Neutralization Tube 200</td>
<td>01327002</td>
</tr>
<tr>
<td>Less than 6</td>
<td>Condensate Neutralization Tube 600</td>
<td>01327003</td>
</tr>
<tr>
<td>Less than 10</td>
<td>Condensate Neutralization Tube 1000</td>
<td>01327004</td>
</tr>
<tr>
<td>Less than 20</td>
<td>Condensate Neutralization Tube 2000</td>
<td>01327005</td>
</tr>
</tbody>
</table>

**Step 2: Total condensate**

Multiply the total input Btu/h / 100,000 by the condensate flow (gal/h) per 100,000 (Btu/h)

(600,000 / 100,000) x 0.3 = 1.8 (gal/h)

**Step 3: Choose the condensate neutralization tube**

Choose the condensate neutralization tube which is closest to and higher than the calculated gal/h value. For this example, the total condensate is 1.8 (gal/h), the condensate neutralization tube which is closest to and higher than the calculated gal/h value is P/N 01327002.

**NOTE:** Condensate neutralization tubes must be replaced yearly (every 2000 operating hours) or check condensate water pH level. If it is below pH 6, replace tube.

To order replacement, see the chart below:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condensate Neutralization Tube 200</td>
<td>01327002</td>
</tr>
<tr>
<td>Condensate Neutralization Tube 600</td>
<td>01327003</td>
</tr>
<tr>
<td>Condensate Neutralization Tube 1000</td>
<td>01327004</td>
</tr>
<tr>
<td>Condensate Neutralization Tube 2000</td>
<td>01327005</td>
</tr>
<tr>
<td>Refill, Condensate Neutralization Tube 600</td>
<td>01327007</td>
</tr>
<tr>
<td>Refill, Condensate Neutralization Tube 1000</td>
<td>01327008</td>
</tr>
<tr>
<td>Refill, Condensate Neutralization Tube 2000</td>
<td>01327009</td>
</tr>
</tbody>
</table>

This heater must be vented in accordance with the rules contained in this manual and with the following national codes and any state, provincial or local codes which may apply:

**United States:** Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision.

**Canada:** Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

Any portion of vent pipe passing through a combustible wall must have an approved thimble to conform with the above listed codes.

Vent pipe must be sloped downward away from the pump ¼" every 10' (3 m).

The bottom of the vent or air intake terminal shall not be located less than 1' (0.3 m) above grade level.

The vent shall not terminate less than 7' (2.1 m) above grade where located adjacent to public walkways.

Vent terminal must be installed at a height sufficient to prevent blockage by snow, and building materials protected from degradation by flue gases.

Secure all joints with #8 x 3/8 sheet metal screws.

Seal all joints with high temperature silicone sealant.

Vent terminal must be beyond any combustible overhang.

**10.2.1 United States Requirements**

Vent must terminate at least 3' (0.9 m) above any forced air inlet located within 10' (3.1 m).

Vent must terminate at least 4' (1.2 m) below, 4' (1.2 m) horizontally from, or 1' (0.3 m) above any door, operable window, or gravity air inlet into any building.

**10.2.2 Canadian Requirements**

The vent shall not terminate within 6' (1.8 m) of a mechanical air supply inlet to any building.

The vent shall not terminate within 3' (0.9 m) of a
window or door that can be opened in any building, any non-mechanical air supply inlet to any building, or of the combustion air inlet of any other equipment.

NOTE: Vertical venting (venting through roof) is not recommended.

10.2.3 Horizontal Venting
See Page 34, Figure 18 through Page 34, Figure 18 for recommended horizontal venting options.

10.2.4 Length Requirements

Vent lengths are allowed as follows:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 10’ (3 m)</td>
<td>6” (15 cm) - 1 elbow</td>
<td>4” (10 cm) - 1 elbow</td>
<td>4” (10 cm) - 3 elbows</td>
</tr>
<tr>
<td>Up to 25’ (8 m)</td>
<td>7” (18 cm) - 3 elbow</td>
<td>5” (12.7 cm) - 3 elbows</td>
<td>4” (10 cm) - 3 elbows</td>
</tr>
<tr>
<td>Up to 50’ (15 m)</td>
<td>8” (20 cm) - 3 elbow</td>
<td>6” (15 cm) - 3 elbows</td>
<td>5” (12.7 cm) - 3 elbows</td>
</tr>
</tbody>
</table>

Seal all pipe joints with high temperature silicone sealant in the vent pipe. Insulation and additional sealing measures will be required.

Optional heat exchanger lengths are considered as vent length for length determination.

Subtract 15’ (4.6 m) of maximum allowed vent or outside air duct length per vent elbow if more than three are used.

10.2.5 Vent Material Recommendations
Vent recommendations:

1. Porcelain coated tubing 4” (10 cm) O.D. (P/N 9141030D)
2. Heat treated aluminized tubing 4” (10 cm) O.D. (P/N 91409408)
   Heat treated aluminized tubing 6” (15 cm) O.D. (P/N E0009105)
   (Supplied by others - Not suitable for modulating and condensing system designs.)

Pitch single wall pipe downward away from pump 1/4" (6 mm) for every 10' (3 m).

<table>
<thead>
<tr>
<th>Pump</th>
<th>Maximum Length A</th>
<th>Maximum Number of Elbows</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP-100</td>
<td>25' (8 m)</td>
<td>3</td>
</tr>
<tr>
<td>EP-200</td>
<td>10' (3 m)</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01330203</td>
<td>Tee, 4&quot; (10 cm) Porcelain</td>
</tr>
<tr>
<td>01365400</td>
<td>Bird Screen, 4&quot; (10 cm)</td>
</tr>
<tr>
<td>02537801-1P</td>
<td>Vent Terminal (Non-Combustible Wall)</td>
</tr>
<tr>
<td>02718851</td>
<td>Drain Cap, 4&quot; (10 cm)</td>
</tr>
<tr>
<td>90502100</td>
<td>Vent Terminal, 4&quot; (10 cm) (Combustible Wall)</td>
</tr>
<tr>
<td>02771000</td>
<td>4.5&quot; (11 cm) Flexible Boot Package</td>
</tr>
<tr>
<td>90502101</td>
<td>Vent Terminal, 6&quot; (15 cm) (Combustible Wall)</td>
</tr>
<tr>
<td>91409403</td>
<td>Tube, Aluminized 4&quot; (10 cm) dia. 10' (3 m)</td>
</tr>
<tr>
<td>91412800</td>
<td>Flexible Boot, 4&quot; (10 cm)</td>
</tr>
<tr>
<td>91901300</td>
<td>Boot Clamp, 4&quot; (10 cm)</td>
</tr>
<tr>
<td>Not Supplied</td>
<td>Tube Adapter, 6&quot; (15.2 cm) dia. x 5&quot; (12.7 cm) dia.</td>
</tr>
</tbody>
</table>
FIGURE 19: EP-300 Series Horizontal Venting Configurations

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01330203</td>
<td>Tee, 4&quot; (10 cm) Aluminized</td>
<td>91409403</td>
<td>Tube, Aluminized 4&quot; (10 cm) dia. 10' (3 m)</td>
</tr>
<tr>
<td>01330204</td>
<td>Tee, 6&quot; (15 cm) Aluminized</td>
<td>91409420</td>
<td>Tube, Aluminized 6&quot; (15 cm) dia. 10' (3 m)</td>
</tr>
<tr>
<td>01397400</td>
<td>Bird Screen, 6&quot; (15 cm)</td>
<td>91412800</td>
<td>Flexible Boot, 4&quot; (10 cm)</td>
</tr>
<tr>
<td>02537801-1P</td>
<td>Vent Terminal (Non-Combustible Wall)</td>
<td>91412802</td>
<td>Flexible Boot, 6&quot; (15 cm)</td>
</tr>
<tr>
<td>02718851</td>
<td>Drain Cap, 4&quot; (10 cm)</td>
<td>91418200</td>
<td>Tube Adapter, 6&quot; (15.2 cm) dia. x 4&quot; (10 cm) dia.</td>
</tr>
<tr>
<td>02718852</td>
<td>Drain Cap, 6&quot; (15 cm)</td>
<td>91901300</td>
<td>Boot Clamp, 4&quot; (10 cm)</td>
</tr>
<tr>
<td>90502100</td>
<td>Vent Terminal, 4&quot; (10 cm) (Combustible Wall)</td>
<td>91913703</td>
<td>Boot Clamp, 6&quot; (15 cm)</td>
</tr>
<tr>
<td>90502101</td>
<td>Vent Terminal, 6&quot; (15 cm) (Combustible Wall)</td>
<td>T0100320</td>
<td>Elbow, 6&quot; (15 cm) Aluminized 90°</td>
</tr>
<tr>
<td>90502302</td>
<td>Vent Cap, 6&quot; (15 cm) Metalbestos</td>
<td>02771000</td>
<td>4.5&quot; (11 cm) Flexible Boot Package</td>
</tr>
</tbody>
</table>

Pitch single wall pipe downward away from pump 1/4" (6 mm) for every 10' (3 m).
SECTION 11: OUTSIDE AIR SUPPLY

CAUTION

Product Damage Hazard
Do not use heater in area containing corrosive chemicals.

Refer to appropriate Material Safety Data Sheets (MSDS).

Failure to follow these instructions can result in product damage.

The CRVSF-Series system must use an outside air system.
Halogenated hydrocarbons or other corrosive chemicals in the air can be drawn into the equipment and seriously damage the system components. Avoid the use of such chemical compounds near the air inlet to the heaters. All joints and seams in the air supply system must be airtight. Attach the filter housing to the burner assembly using the wing nut provided. To prevent condensation, insulate the outside air duct.

11.1 Pressurized
See Page 39, Figure 24 for a typical layout of a pressurized air supply system.
For pressurized outside air supplies, the outside air blower motor has a pressure switch that must be used. Wire this switch in series with the pump pressure switch. When using an outside air blower with a ROBERTS GORDON® System Control or ROBERTS GORDON® ULTRAVAC™ control or relay transformer, a separate load relay package is required. Wire the control for the relay in parallel with the pump. The outside air blower must have a separate 20 A, 120 V power supply. See Page 37, Figure 21 for outside air blower internal wiring requirements. The outside air blower has an adjustable internal damper that should be wide open. On smaller systems (about 3 burners) this damper might need to be closed up to half way if the pressure switch does not make.

11.2 Non-Pressurized
For a non-pressurized outside air supply, a 4" (O.D.) single wall pipe duct may be attached to the burner
FIGURE 20: Duct Sizing

Outside Air System Design Requirements:

Blower Performance (90707501K):
112 Flow Units
One outside air blower is required per each EP-100 or EP-200 series pump and two outside air blowers may be required for each EP-300 series pump. Outside air blowers cannot be shared between two separate CRVSF-Series systems.

Duct Design Rules:
- System should be designed so that the blower is positioned closest to the highest flow requirements (end vents).
- When a duct is carrying more than 40 flow units, it must be at least 6" (15 cm) diameter.

Pressurized Systems
- 6" (15 cm) diameter duct must not exceed 120' (36 m) total per system.
- 4" (10 cm) diameter duct must not exceed 120' (36 m) per radiant branch.

Non Pressurized
- 6" (15 cm) diameter duct must not exceed 90' (27 m) maximum 100 flow units
- 4" (10 cm) diameter duct must not exceed 90' (27 m)
- Elbows are equivalent to 10' (3 m) of duct length.

11.3 Outside Air Blower Internal Wiring

FIGURE 21: Outside Air Blower Internal Wiring Diagram

The outside air blower is shipped with the blower manufacturer’s standard internal wiring. For use with ROBERTS GORDON® heaters, the outside air blower must be rewired with existing wires by the electrical contractor. See diagram.

NOTE: The internal 24 V relay provided will not be used and can be discarded.
FIGURE 22: Filter Housing Assembly

![Filter Housing Assembly Diagram]

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter Housing</td>
<td>01326801</td>
</tr>
<tr>
<td>Filter and Gaskets</td>
<td>01312401</td>
</tr>
<tr>
<td>Filter Support</td>
<td>91905500</td>
</tr>
<tr>
<td>Wing Nut</td>
<td>92511601</td>
</tr>
<tr>
<td>4&quot; (10 cm) Air Flex Duct (box of eight 8&quot; (2.4 m) sections)</td>
<td>91409601</td>
</tr>
</tbody>
</table>

NOTE: Apply adhesive side of bottom gasket to filter.

FIGURE 23: Air Supply Blower Support

![Air Supply Blower Support Diagram]

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower</td>
<td>90707501K</td>
</tr>
<tr>
<td>5&quot; (12.7 cm) Vent Cap</td>
<td>90502302</td>
</tr>
<tr>
<td>6&quot; (15 cm) Bird Screen</td>
<td>01397400</td>
</tr>
<tr>
<td>6&quot; (15 cm) Band Clamp</td>
<td>91913703</td>
</tr>
</tbody>
</table>
**FIGURE 24: Pressurized Outside Air Supply**

- **Filter Housing**: 01326801
- **4" (10 cm) Take Off**: 01324401
- **Blower**: 90707501K
- **5" (12.7 cm) Vent Cap**: 90502301
- **6" (15 cm) Bird Screen**: 01365400
- **6" (15 cm) Band Clamp**: 91913703

**FIGURE 25: Non-Pressurized Outside Air Supply**

- **Pressure Switch Kit**: 90434501
- **4" (10 cm) Bird Screen**: 01365400
- **4" (10 cm) Vent Cap**: 90502300
- **6" (15 cm) Vent Cap**: 90502302

*Wire pressure switch normally closed for non-pressurized outside air supply installations.*
Double filtered outside air is recommended. Mount Fresh Air Filter box on exterior wall. Connect duct work to 8” (20 cm) diameter fresh air inlet.

### Description

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh Air Filter Box</td>
<td>90740100K</td>
</tr>
<tr>
<td>Filter Box</td>
<td>9074100</td>
</tr>
<tr>
<td>Aluminum Mesh Filter, (washable)</td>
<td>20628</td>
</tr>
<tr>
<td>20” x 20” x 1” (51 cm x 51 cm x 3 cm)</td>
<td></td>
</tr>
<tr>
<td>Magnetic Strip (20 inches)</td>
<td>90740101</td>
</tr>
</tbody>
</table>
SECTION 12: GAS PIPING

**WARNING**

Tighten gas hose fittings to connect gas supply according to Figure 28.

Gas hose can crack when twisted.

Gas hose moves during normal operation.

Use only 36" (91 cm) long connector of 1/2" or 3/4" nominal ID.

Connector supplied with heater for U.S. models (not with Canadian models).

Failure to follow these instructions can result in death, injury or property damage.

**WARNING**

Leak test all components of gas piping before operation.

Gas can leak if piping is not installed properly.

Do not high pressure test gas piping with heater connected.

Failure to follow these instructions can result in death, injury or property damage.

Install the gas hose as shown on Page 42, Figure 27. The gas hose accommodates expansion of the heating system and allows for easy installation and service of the burner. Before connecting the burners to the supply system, verify that all high pressure testing of the gas piping has been completed.

There is an expansion of the tube with each firing cycle. This will cause the burner to move with respect to the gas hose. This can cause a gas leak resulting in an unsafe condition if the gas connection is not made in strict accordance with Figure 27.

Meter and service must be large enough to handle all the burners being installed plus any other connected load. The gas hose which feeds the system must be large enough to supply the required gas with a maximum pressure drop of 1/2" wc. When gas piping is not included in the layout drawing, the local gas supplier will usually help in planning the gas piping.

Gas lines must meet applicable codes:

**United States:** The Flexible Stainless Steel Gas Hose (US models) supplied with the heater is certified per the Standard for Connectors for Gas equipment, ANSI Z21.24/CSA 6.10 - latest revision.

**Canada:** The Rubber Type 1 Gas Hose (Canadian models) optional with the heater is certified as being in compliance with the Standard for Elastomeric Composite Hose and Hose Couplings for Conducting Propane and Natural Gas, CAN/CGA 8.1 - Latest revision.

- Check the pipe and tubing ends for leaks before placing heating equipment into service. When checking for gas leaks, use a soap and water solution; never use an open flame.

**WARNING**

Explosion Hazard

Leak test all components of gas piping before operation.

Gas can leak if piping is not installed properly.

Do not high pressure test gas piping with heater connected.

Failure to follow these instructions can result in death, injury or property damage.
FIGURE 27: Gas Connection with Flexible Gas Hose

CORRECT POSITIONS

Shut-Off Valve (included with gas hose) must be parallel to burner gas inlet. The 3" (8 cm) displacement shown is for the cold condition. This displacement may reduce when the system is fired.

High Gas Pressure Regulator to be installed upstream of flexible gas hose if inlet pressure exceeds maximum allowance. See Page 75, Section 20.

Note: Allow 6" (15 cm) minimum clearance between burner box and overhead obstructions for service.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Pressure Regulator - 2 psi</td>
<td>90207600</td>
</tr>
<tr>
<td>High Pressure Regulator - 5 psi</td>
<td>90207601</td>
</tr>
</tbody>
</table>

CAUTION

Product Damage Hazard

Hold gas nipple securely with pipe wrench when attaching gas hose.

Failure to follow these instructions can result in product damage.

INCORRECT POSITIONS (WRONG INSTALLATION)

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; Flexible Stainless Steel Gas Hose (US Models)</td>
<td>91412200</td>
</tr>
<tr>
<td>1/2&quot; Rubber (Type 1) Gas Hose (Canadian Models)</td>
<td>91412206</td>
</tr>
</tbody>
</table>
SECTION 13: CONTROL METHODS

**DANGER**

Electrical Shock Hazard

Disconnect electric before service or maintenance.

More than one disconnect switch may be required to disconnect electric to the unit.

Control must be properly grounded to an electrical source.

Failure to follow these instructions can result in death or electrical shock.

**WARNING**

Explosion Hazard

Turn off gas supply to heater before service.

Failure to follow these instructions can result in death, injury or property damage.

There are several methods of controlling CRVSF-Series systems. The options are as follows:

13.1 ROBERTS GORDON® System Control

The System Control is an electronic control panel designed to control CRVSF-Series heating systems. The System Control wiring is shown on Page 50, Figure 32 through Page 52, Figure 35 and in the System Control Installation Manual (P/N 10091601NA).

The System Control can be used to control an EP-100 or EP-201 pump from the control panel. Other pumps such as the EP-301 and 3 Ø models may be controlled in conjunction with a relay or motor starter. The System Control can control up to four zones of burners and up to two vacuum pumps.

The electrical circuit is a 120 Vac (20 A) supply. The output for the thermostat is 24 Vac.

A System Control operated system has two minutes post purge pump operation to completely exhaust products of combustion from the system. A system control provides indication of power to the pump and zones and indicates the status of the pressure switch with lights.

The System Control is ETL listed in accordance with UL873 – Standard for Temperature Indicating and Regulating Equipment.

13.2 ROBERTS GORDON® ULTRAVAC™ (CRVSF-6/-8 only)

The ROBERTS GORDON® ULTRAVAC™ is a microprocessor based control package designed for modulating control of CRVSF-Series heaters based on outdoor temperatures. The controls offer full modulation between 60% and 100% of system maximum rated input.

This controller is capable of giving control outputs to one pump and three heating zones. The controller also features inputs which are used for indoor and outdoor signal condition monitoring.

System status and settings are viewed and altered from a PC (not supplied) running ROBERTS GORDON® ULTRAVAC™ Software.

ROBERTS GORDON® ULTRAVAC™ Software requires a PC (not supplied) running Windows® 95 or higher, with a Pentium® class processor and at least 64k of RAM. For complete installation details, please refer to the ROBERTS GORDON® ULTRAVAC™ Installation, Operation and Service Manual (P/N 10081601NA), latest revision.

**Special design requirements apply for CRVSF-Series systems using the ROBERTS GORDON® ULTRAVAC™ Controller.**

Buildings today demand all sorts of control options based on the user's preference. ULTRAVAC™ controls offer a host of communication options for integration with controls' networks to best serve individual needs:

**ULTRAVAC™ BMS Link:** Interface ULTRAVAC™ with other building management control platforms using BACnet® or MODBUS® protocol which communicates via our ULTRAVAC™ BMS Link option.

**TCP/IP (LAN):** Connect to ULTRAVAC™ via your local area network of computers. Load ULTRAVAC™ software onto any computer on the network and control and view your heating system from your computer via static IP address.

**MODEM:** Dial into ULTRAVAC™ from anywhere in the world via modem. Supplied as standard on all central controllers!

**RS-485:** Hard wire ULTRAVAC™ directly to your computer.

13.3 CORAYVAC® Modulating Controls

For a ROBERTS GORDON® CORAYVAC® Modulating system, combine a modulating thermostat, a thermostat relay (P/N 90417600K) and
any one of the existing ROBERTS GORDON® VFD assemblies. The result will be a one pump, one zone CORAYVAC® Modulating system. The system will modulate based on the temperature sensed at the modulating thermostat, not outdoor temperature. The modulating controls offer many features like 7 day programmability, four time periods per day (2 occupied, 2 unoccupied), temporary temperature setpoint override, keypad lockout security and more. Remote sensors or outdoor sensors are optional, not required. Remote sensors will allow for zone temperature averaging, if required.

13.3.1 Analog Signal Modulating Thermostat
A programmable, 7-day programming, modulating thermostat can be installed to supply an analog (4-20mA) or (2-10Vdc with 500 Ohm resistor) control signal to dictate the speed of the pump. For thermostat wiring, See Page 53, Figure 36. Optional room sensors (P/N 10081520) and outdoor air sensors (P/N 10081521) are available.

Room temperature averaging networks can be created with up to nine room sensors (P/N 10081520). Refer to thermostat installation instructions for wiring.

13.3.2 Analog Signal Modulating Thermostat with LonWorks® Communication
If LonWorks® communication is required, a modulating thermostat can be installed to supply an analog (4-20 mA or 2-10 Vdc) signal to control the pump speed. For thermostat wiring, See Page 53, Figure 36 and Page 54, Figure 37. An optional room sensor (P/N 10081520) and outdoor air sensors (P/N 10081521) are available for this thermostat as well.

The modulating thermostat with LonWorks® provides networking capability in a LonWorks® system. With communications port running at 78 kilobits per second (kbs), this thermostat can be configured to perform a variety of activities in which data is sent or received via LonWorks®. Information that can be shared, viewed and modified with the network includes:
- Current year, month, day, hour, minute, second.
- System Mode.
- Space Temperature
- Outdoor air temperature
- Current setpoint
- Occupied/Unoccupied schedule commands.
- Space Temperature

13.3.3 Analog signal Modulating with BACnet® Programmable Thermostat
If BACnet® communication is required, a BACnet® enabled modulating thermostat can be installed to supply an analog output (0-10VDC) signal control to dictate the speed of the pump. For thermostat wiring, See Page 55, Figure 38.

This thermostat is a flexible, wall-mounted stand-alone control with combined controller/sensor. BACnet® connections allow integral peer to peer BACnet® MS/TP LAN network communications with configurable baud rates and can easily integrate with a building automation system.

**MS/TP Wiring**
Connect the -A terminal in parallel with all other -A terminals on the network and the +B terminal in parallel with other +B terminals. Connect the shield of cable (Belden cable #82760 or equivalent). Connect the cable shield to a good earth ground at one end only.
13.3.4 Cable Requirement

*Table 5, on Page 45,* lists wiring types, sizes and distances for modulating thermostat communication.

**Power Requirement**

Programmable thermostats requires 24 volt, AC power.

*Table 5: Modulating Thermostat Cable Requirements*

<table>
<thead>
<tr>
<th>Wire Function</th>
<th>Recommended Wire Size (Minimum)</th>
<th>Specification or Requirement</th>
<th>Distance (Maximum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Outputs</td>
<td>18 AWG (0.75 sq mm)</td>
<td>Standard thermostat wire</td>
<td>1000 ft (304 m)</td>
</tr>
<tr>
<td>Modulating Outputs</td>
<td>18 AWG (0.75 sq mm)</td>
<td>1 pair</td>
<td>500 ft (152 m)</td>
</tr>
<tr>
<td>Outdoor Air Temperature Sensor</td>
<td>18 AWG (0.75 sq mm)</td>
<td>1 pair</td>
<td>500 ft (152 m)</td>
</tr>
<tr>
<td>Remote Sensor</td>
<td>18 to 22 AWG (0.75 to 0.34 sq mm)</td>
<td>Twisted pair wire</td>
<td>1000 ft (304 m)</td>
</tr>
<tr>
<td>Power Wiring</td>
<td>18 to 14 AWG (0.75 to 2.0 sq mm)</td>
<td>NEC Class II 140ºF (60°C )</td>
<td>Limited by line-loss effects on power consumption.</td>
</tr>
<tr>
<td>LonWorks® (P/N 90424104 only)</td>
<td>18 AWG (0.75 sq mm) nonshielded</td>
<td>1 pair</td>
<td>Refer to E-bus Wiring Guide 74-2865 for maximum length and generic cable specifications.</td>
</tr>
<tr>
<td>MS/TP (P/N 90425109)</td>
<td>18 AWG (0.75 sq mm) Shield</td>
<td>Belden cable #82760 or equivalent</td>
<td>Refer to Thermostat Installation Guide</td>
</tr>
</tbody>
</table>

13.3.5 Sequence of Operation

Depending on the space temperature, the thermostat will control the heat output based on demand signal communicated from the thermostat program. The thermostat will close contact on the transformer relay (P/N 90417600K). The VFD run command is energized by the transformer relay. When the VFD energizes the pump and the vacuum has been established, the pressure switch will close and energize the burners. At high heat, a demand signal will turn the pump speed to a maximum frequency and burner(s) ON at maximum firing rate. As the space temperature gets closer to the set point, the thermostat program will slow the pump speed and burner(s) firing rate down until the room temperature reaches the thermostat set point.

**NOTE:**

To obtain Analog 0-10VDC signal, connect as shown on Page 55, Figure 38 and set standard speed source (parameter 05 inside VFD menu) to 03.

13.3.6 Analog Signal

An Analog Signal 2-10 Vdc (with 500 ohm resistor) or 4-20 mA output from a modulating thermostat controls the ROBERTS GORDON® VFD. The VFD supplies a variable frequency output signal to the pump that will vary based on the signal from the modulating thermostat.

The ROBERTS GORDON® CORAYVAC® with modulating thermostat wiring diagram is shown on Page 53, Figure 36. When the temperature falls below the setpoint, the modulating thermostat will generate a demand signal to the VFD. The VFD will output a signal to the pump to run at the desired heater(s) firing rate. There are two means to set up the analog signal from the modulating thermostat to the VFD (See Page 45, Figure 28):

1. To obtain 4-20 mA signal, connect as shown on Page 54, Figure 37 and set standard speed source (parameter 05 inside VFD menu) to 04.
2. To obtain 2-10 Vdc (with 500 ohm resistor) signal, connect as shown on Page 53, Figure 36 and set standard speed source (parameter 05 inside VFD menu) to 03.

**FIGURE 28: VFD Terminal Strip**

![VFD Terminal Strip Diagram](image-url)

As the pump receives the analog signal from the VFD, the heater(s) modulate to the corresponding firing rate. As sensed air temperature rises closer to...
the temperature setpoint, the modulating thermostat and the VFD will reduce the signal output, in turn reducing the heater firing rate. Upon satisfying temperature setpoint, the modulating thermostat and the VFD will either:

1. Turn off heater.
2. Reduce the signal so that the minimum heating firing rate is maintained until the sensed temperature rises above the setpoint to a cut-off limit temperature when the modulating thermostat turns off the heater.

13.4 SPST Transformer Relay Kit (P/N 90417600K)
The transformer relay wiring diagram is shown on Page 47, Figure 29. The transformer relay can be used to control an EP-100 or EP-201 pump CORAYVAC® CLASSIC SF system. The single pole relay can only be used to control one zone of burners. The electrical circuit is a 120 V AC (20 A) supply. The transformer 24 V AC output for the thermostat is rated at 40 VA. Thermostats used with the transformer must not exceed this power requirement.
A transformer relay operated system will not give any post purge pump operation to completely exhaust products of combustion from the system or provide indication of operating conditions.

13.5 SPDT Transformer Relay (P/N 90436300)
The transformer relay wiring diagram is shown on Page 49, Figure 31. The transformer relay can be used to control an EP-100 or EP-201 pump CORAYVAC® system. The double pole relay can only be used to control two zones of burners. The electrical circuit is a 120 V AC (20 A) supply. The transformer 24 V AC output for the thermostat is rated at 40 VA. Thermostats used with the transformer must not exceed this power requirement.
A transformer relay operated system will not give any post purge pump operation to completely exhaust products of combustion from the system or provide indication of operating conditions.
FIGURE 29: One Zone Operation without Control Panel (optional)

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPST Transformer Relay</td>
<td>90417600K</td>
</tr>
</tbody>
</table>
FIGURE 30: One Zone Operation (with Outside Air Blower) without Control Panel (optional)
FIGURE 31: Two Zone Operation without Control Panel (optional)

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPDT Transformer Relay</td>
<td>90436300</td>
</tr>
</tbody>
</table>

120 V 1 Ω 60 Hz

Pump Motor Pressure Switch (Wired N.O.)

Nine Burners Total Maximum Between Zones
FIGURE 32: General System Wiring

- Burner Receptacles (4 Zone Max)
- Pressure switch located at outside air blower (optional)
- Pressure Switch
- Pump Motor: 115 Vac Operation (230 Vac Operation separate power circuit required for EP-203 or EP-300 series pumps)
- Motor Starter
- Outside Air Blower
- 120 V 1 Ø 60 Hz
- 120 Vac Maximum 20 Amps Total

FIGURE 33: External Wiring Diagram EP-100 and EP-201 120 V 1 Ø Pump

- EP-100 or EP-201 Pump
- All burners must be connected to Ground (Not shown)
- Zone 1 Zone 2 Zone 3 Zone 4
- 120 V 1 Ø 60 Hz
- Ground
- Pressure switch located at Pump 1
- 24 VAC
- Low voltage thermostats located in heated zone
- Pressure switch located at Pump 2
- 24 VAC
- Z1R Z2R Z3R Z4R
- AIR SW1 AIR SW2
FIGURE 34: External Wiring Diagram EP-100, EP-201 or EP-301 230 V 1 Ø Pump (optional)

**CAUTION**

Product Damage Hazard

Do not directly connect control relay terminals to pump motor.

Failure to follow these instructions can result in product damage.

---

Motor Contactors
P/N 10050011
P/N 10050012

The power supply for the pump must be separate from the controller supply.

208 - 230 V
1 Ø
60 Hz

Individual supply for pump rated for total full load current. See Pump Specifications Section for details.

All burners must be connected to Ground (Not shown)

Zone 1 Zone 2 Zone 3 Zone 4

EP-100, EP-201
or EP-301Pump

TWO PUMP SYSTEM (optional)
Pump 1 may be used for all zones.
Pump 2 may be used to control zone 3 and/or zone 4. Refer to Pump 1 for configuration.

24 VAC

Pressure switch located at Pump 1

Low voltage thermostats located in heated zone

Pressure switch located at Pump 2

CORAYVAC® Heating Control

120 V
1 Ø
60 Hz

AC POWER IN

GROUND

PUMP 1
ZONE 1
ZONE 2
ZONE 3
ZONE 4

PUMP 2

24 V
DC

AIR
SW1

AIR
SW2
FIGURE 35: External Wiring Diagram EP-203 or EP-303 208 - 230 V (or 460 V) 3 Ø Pump (optional)

**CAUTION**

Product Damage Hazard

Do not directly connect control relay terminals to pump motor.

Failure to follow these instructions can result in product damage.

1. **120 V 1 Ø 60 Hz**
2. **208 - 230 V (or 460 V) 3 Ø 60 Hz**
3. **24 VAC**

All burners must be connected to Ground (Not shown)

Zone 1  Zone 2  Zone 3  Zone 4

Pressure switch located at Pump 1

Low voltage thermostats located in heated zone

Pressure switch located at Pump 2

**CORAYVAC® Heating Control**

The power supply for the pump must be separate from the controller supply.

Individual supply for pump rated for total full load current. See Pump Specification Section for details.
FIGURE 36: CORAYVAC® CLASSIC SF Modulating Wiring Diagram [LonWorks® (2-10 Vdc with 500 ohm resistor) optional]

NOTES:
1. For 2-10 mA Speed Control, Set standard speed source (parameter 05) to (03).
2. See VFD rating plate for required input.
   a) 120 V 1 Ø 60 Hz supply for 120 V VFD model.
   b) 230 V 1 Ø 60 Hz supply for 230 V VFD model.
3. Ground only one end of the shielded cable.
4. Control wire to be a minimum of 20 AWG type Belden 5401 FE CMR 75°C shielded or equivalent.
5. Wire over 24 VAC to be a minimum of 18 AWG flexing type MTW, 105°C, 600 V or equivalent.
   a) 120 VAC colors: Phase = Red, Neutral = White, Ground = Green.
   b) 24 VAC colors: Blue
6. All three power wires from terminals U, V and W to the pump motor must be kept tightly bundled and run in a separate conduit away from all other power and control wiring.
7. For Non-communicating thermostat without LonWorks® bus, thermostat terminals marked “EB” will be marked “_” and no LonWorks® bus communication wires are used.
8. If VFD is more than 100 (150 m) from the pump, a load reactor (PN 90402460) must be used.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPST Transformer Relay</td>
<td>90417600K</td>
</tr>
<tr>
<td>Thermostat, Modulating LonWorks®</td>
<td>90425104</td>
</tr>
<tr>
<td>Thermostat, Modulating</td>
<td>90425105</td>
</tr>
<tr>
<td>Sensor, Remote Modulating</td>
<td>10081520</td>
</tr>
<tr>
<td>Sensor, Outdoor Modulating</td>
<td>10081521</td>
</tr>
</tbody>
</table>
Figure 37: CORAYVAC® CLASSIC SF Modulating Wiring Diagram [LonWorks® (4-20 mA) optional]

**Notes:**
1. For 4-20 mA Speed Control, Set standard speed source (parameter 05) to (04).
2. See VFD rating plate for required input.
   A) 120 V 1 Ø 60 Hz supply for 120 V VFD model.
   B) 230 V 1 Ø 60 Hz supply for 230 V VFD model.
3. Ground only one end of the shielded cable.
4. Control wire to be a minimum of 20 AWG type Belden 5401 FE CMR 75° C shielded or equivalent.
5. Wire over 24 VAC to be a minimum of 16 AWG flexible type MTW, 105° C, 600 V or equivalent.
   A) 120 VAC colors: Phase = Red, Neutral = White, Ground = Green.
   B) 24 VAC colors: Blue.
6. All three power wires from terminals U, V and W to the pump motor must be kept tightly bundled and run in a separate conduit away from all other power and control wiring.
7. For Non-communicating thermostats without LonWorks® bus, thermostat terminals marked “EB” will be marked “EB” and no LonWorks® bus communication wires are used.
8. If VFD is more than 100 (150 m) from the pump, a lead reactor (P/N 90852460) must be used.

**Description** | **Part Number**
--- | ---
SPST Transformer Relay | 90417600K
Thermostat, Modulating LonWorks® | 90425104
Thermostat, Modulating | 90425105
Sensor, Remote Modulating | 10081520
Sensor, Outdoor Modulating | 10081521
FIGURE 38: CORAYVAC® CLASSIC SF Modulating with BACnet® Wiring Diagram (optional)

NOTES:
1. A jumper is pre-installed between Phase R (24 VAC) and SC1-3 (24 VAC Relay).
2. For 0-10VDC Speed Control, set standard speed source (parameter 05) to 03.
3. See VFD Rating Plate for Required Input:
   A) 120 V 1 PH 60 HZ Supply for 120V VFD Model.
   B) 230 V 1 PH 60 HZ Supply for 230V VFD Model.
4. Ground only one end of the shielded cable.
5. Control Wire To Be A Minimum of 20 AWG Type Belden 5401FE CMR 75° C Shielded or Equivalent.
6. Wire Over 24 VAC To Be A Minimum of 16 AWG Flexing Type MTW, 105° C, 600V or Equivalent
   B) 24 VAC Colors: Blue
7. All three power wires from terminals U, V, and W to the pump motor must be kept tightly bundled and run in a separate conduit away from all other power and control wiring.
8. If VFD is more than 100' (150 m) from the pump, a load reactor (P/N 90602460) must be used.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPST Transformer Relay</td>
<td>90417600K</td>
</tr>
<tr>
<td>Thermostat, Modulating BACnet®</td>
<td>90425109</td>
</tr>
</tbody>
</table>
If any of the original wire as supplied with the heater must be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C and 600 volts.
SECTION 14: STARTING THE SYSTEM

Start with the main gas valve closed and the electric power off.

14.1 Checking the Gas Line
1. Open the main valve and verify that no gas is flowing through the meter.
2. Purge the line if this was not done following pressure testing with air.
3. Verify that the gas pressure is not above 14" wc (1/2 PSIG).
4. Close the main gas valve.

14.2 Checking the Electrical System
1. See that all temperature setpoints are set below room temperature.
2. Turn on power supply to system controls.
3. Check to see that no part of the system (i.e. burners, pump or air supply blower) is powered.
4. Individually check each zone by raising the zone temperature set points separately. Raising each zone temperature set point above room temperature should start the pump immediately. After a 45 second delay, the burners will begin their ignition sequence by sparking at the electrode (visible through the burner window).

14.3 Starting the System
NOTE: During the initial firing, the protective oil on the pipe may smoke for 30 to 60 minutes and adequate ventilation should be provided.
1. Start with all temperature setpoints below room temperature.
2. Open main gas valve.
3. Turn up temperature setpoints one zone at a time, waiting to see that all burners in a zone start. When the burner ignites, a blue flame will be observed through the viewer window.
4. If any abnormal operation occurs, see the troubleshooting section of the service instructions.
14.4 Setting the Vacuum

1. Set temperature setpoints above room temperature. See that all burners are operating properly.

2. Allow at least one hour operation for temperature to normalize, then check system vacuum balance. Vacuum can be measured by inserting a manometer hose into the end vent as shown on Page 59, Figure 41. Normal end vent vacuum should be set at approximately 2.5" wc to 3.0" wc (hot).

Vacuum adjustments are made by means of the damper in the pump inlet and the adjustable damper nipple(s) in the system. Check the vacuum at all end vents and then adjust the damper coupling to obtain equal vacuum readings of 2.5" wc to 3.0" wc. If end vent vacuum exceeds 3.0" wc, adjust the pump inlet damper until vacuum readings are 2.5" wc to 3.0" wc.

With systems designed to operate at maximum vacuum, it may not be possible to obtain vacuum differential readings at or slightly above 2.5" wc. If so, adjust the damper couplings to maximum but equal vacuum reading. Be sure to lock all dampers securely after adjustment.

3. After adjustment, seal all openings found in the damper nipple(s) with high temperature silicone sealant.

4. Reset temperature setpoints to desired room temperature.

5. If heat is not required, turn off main switch and close the main gas valve.

14.5 Record Start-Up Results

1. During the initial installation and start-up of the system, fill out the CORAYVAC® CLASSIC SF Start-Up and Installation Report in its entirety. In locations where multiple CORAYVAC® CLASSIC SF systems are installed, one report should be completed for each pump system.

2. Submit each completed form to Roberts Gordon. The warranty will be voided if the form is not returned within 24 hours of start-up.
Figure 41: Vacuum Reading

- Cast-Iron Combustion Chamber at end position
- End Vent
- Insert tubing about 6" (15 cm).
- Manometer

Approximate reading after adjusting damper couplings and pump inlet: (2.5" - 3.0" wc)
SECTION 15: VARIABLE FREQUENCY DRIVE PROGRAMMING

15.1 VFD Parameter Settings For Use With Modulating Thermostats

The VFD parameters come with factory default settings. The following parameter settings must be changed for modulating thermostats. Settings can only be altered when the pump motor is stopped. Verify that there is power to the VFD (LCD display will be on) and modulating thermostat is set to off.

To override the rotary disconnect switch inside the VFD enclosure, turn the square rod with a wrench to the ON position. In order to be able to close the cover of the disconnect, the rods need to be turned back to the OFF position.

15.1.1 To enter the PROGRAM mode and access the parameters, press the Mode button. This will activate the PASSWORD prompt (if the password has not been disabled).

Display reads "00"
Upper right decimal point blinks

15.1.2 Use the arrow buttons to scroll to the password value (the factory set password is 225).

Press Mode to enter password.

Once the correct password value is entered, the display will read "P01", which indicates that the PROGRAM mode has been accessed at the beginning of the parameter menu (P01 is the first parameter).

NOTE: If the display flashes "Er", the password was incorrect, and the process to enter the password must be repeated.

15.1.3 Use the arrow buttons to scroll to the desired parameter number. For new parameter settings See Page 61, Section 15.2.

15.1.4 Once the desired parameter number is found: Press Mode to display present parameter setting (example setting is 20.0).

Upper right decimal point blinks.

Use arrow buttons to change setting.

Press Mode to store new setting and exit the program mode.

15.1.5 To change another parameter, press the Mode key again to re-enter the PROGRAM mode (the parameter menu will be accessed at the parameter that was last viewed or changed before exiting).

If the Mode key is pressed within two minutes of exiting the PROGRAM mode, the password is not required to access the parameters. After two minutes, the password must be entered in order to access the parameters again.
### 15.2 Altering VFD Parameters

Using the procedure described on Page 60, Section 15.1.1 through Section 15.1.5, alter the following parameters:

<table>
<thead>
<tr>
<th>Parameter Number</th>
<th>Parameter Name</th>
<th>Factory Default</th>
<th>New Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P01</td>
<td>Line Voltage</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>P03</td>
<td>Start Method</td>
<td>01</td>
<td>05</td>
</tr>
<tr>
<td>P05</td>
<td>Standard Speed Source</td>
<td>01</td>
<td>(03) (0-10) Vdc (04) (4-20) mA</td>
</tr>
<tr>
<td>P44</td>
<td>Password</td>
<td>225</td>
<td>Any # 000-999</td>
</tr>
<tr>
<td>P45</td>
<td>Speed at Minimum Signal</td>
<td>0.0Hz</td>
<td>Frequency Setting noted on Page 62, Section 16.2.2</td>
</tr>
<tr>
<td>P46</td>
<td>Speed at Maximum Signal</td>
<td>60.0Hz</td>
<td>Frequency Setting noted on Page 62, Section 16.2.1</td>
</tr>
</tbody>
</table>
SECTION 16: COMMISSIONING THE CORAYVAC® CLASSIC SF MODULATING SYSTEM

NOTE: Before starting the commissioning procedure, all the wiring of the ROBERTS GORDON® ULTRAVAC™ control boards, relay boards, modulating thermostats, pumps and VFD must be completed. The communication connection must be made to the controller, modulating thermostat and burners. The ROBERTS GORDON® ULTRAVAC™ software must be installed on the PC.

It is important to understand that the frequency that the VFD runs the motor at, determines the speed of the impeller in the pump. Variation of the impeller speed will increase or decrease vacuum in the system. The following procedure will help you set minimum and maximum VFD frequency settings to achieve proper vacuum in the system.

16.1 Setting The CORAYVAC® CLASSIC SF End Burner Vacuum

16.1.1 ROBERTS GORDON® ULTRAVAC™
For complete ROBERTS GORDON® ULTRAVAC™ installation please refer to the ROBERTS GORDON® ULTRAVAC™ Installation, Operation and Service Manual (P/N 10081601NA), latest edition.

16.1.2 Modulating Thermostat
Turn on power to the VFD and transformer relay; this should energize the modulating thermostat. Set the thermostat to "call for heat" as described in the accompanying instructions for the modulating thermostat. See Page 60, Section 15 for setting up the VFD.

16.2 Adjusting the Variable Frequency Drive

16.2.1 Maximum Signal Speed
The pump should be running and the burners should light within 60 seconds. At the VFD, verify the number displayed on the LCD screen is "60.0." If it is lower than 60.0, hit the "up" arrow button on the VFD until the number reads 60.0 Let the burners fire for approximately 20-30 minutes to warm up the system. Using a manometer, check the end vent vacuum in each zone (each branch of burners). See Page 64, Figure 42.
If the lowest end vent vacuum reading is above 3.0" wc, reduce the vacuum pump speed. Generally, the lowest end vent vacuum reading is on the longest branch of the system. Use the down arrow button on the VFD to reduce the frequency of the output signal to the pump, thus reducing the pump speed and lowering the end vent vacuum reading. Continue to reduce the frequency until the end vent vacuum reading is between 2.5" - 3.0" wc. Make note of this frequency setting below. The frequency is found on the VFD’s LCD screen.

2.5" wc - 3.0" wc VFD Frequency Setting

Record Frequency Setting Here:

NOTE: To avoid damage to the pump motor, do not adjust the frequency above 60.0 Hz. Verify that the end vent vacuum readings in the remaining branches are proper. If necessary, adjust the proper damper coupling to achieve an end vent vacuum of 2.5" - 3.0" wc, See Page 59, Figure 41. Damper couplings should be found near the end of the radiant portion of the pipe in each branch or where a branch connects to other branches at a cross or tee. See Page 64, Figure 42.

16.2.2 Minimum Signal Speed
After setting end vent vacuums between 2.5" wc and 3.0" wc, while all the burners are still operating, use the down arrow button on the VFD to reduce the frequency of the output signal to the pump. Reduce the frequency of the VFD until the manometer at each of the end vents reads 1.2" wc - 1.5" wc. Make note of this frequency setting below. The frequency is found on the VFD’s LCD screen.

1.0" wc - 1.2" wc VFD Frequency Setting

Record Frequency Setting Here:
16.3 Programming Of Variable Frequency Drive

<table>
<thead>
<tr>
<th>Parameter Number</th>
<th>Parameter Name</th>
<th>Factory Default</th>
<th>New Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P01</td>
<td>Line Voltage</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>P03</td>
<td>Start Method</td>
<td>01</td>
<td>05</td>
</tr>
<tr>
<td>P05</td>
<td>Standard Speed Source</td>
<td>01</td>
<td>(03) (0-10) Vdc (04) (4-20) mA</td>
</tr>
<tr>
<td>P44</td>
<td>Password</td>
<td>225</td>
<td>Any # 000-999</td>
</tr>
<tr>
<td>P45</td>
<td>Speed at Minimum Signal</td>
<td>0.0Hz</td>
<td>Frequency Setting noted on Page 62, Section 16.2.2</td>
</tr>
<tr>
<td>P46</td>
<td>Speed at Maximum Signal</td>
<td>60.0Hz</td>
<td>Frequency Setting noted on Page 62, Section 16.2.1</td>
</tr>
</tbody>
</table>

16.3.1 Modulating Thermostat

Turn "OFF" the power to the transformer relay. Using the procedure described on Page 60, Section 15, alter the parameters above on the VFD. Turn on the transformer relay and program the modulating thermostat to the customer’s requirements.
FIGURE 42: Possible Damper Nipples’ Locations

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule 40 Damper Nipple</td>
<td>01332000</td>
</tr>
</tbody>
</table>
SECTION 17: OPERATION AND MAINTENANCE

The heater is equipped with a direct-spark ignition system. (thermostat cycle is required) or automatically after 1 hour.

17.1 Sequence of Operation

1. Turn the thermostat up. When the thermostat calls for heat, the pump will start immediately. After a short period, the burners will begin their ignition sequence. Sparking will begin at the electrodes and the gas valve will be energized 45 seconds later.

2. The flame will be sensed by the flame sensing rod and the electrode is de-energized.

3. If a flame is detected, the gas valve remains open. When the call for heat is satisfied, the burner shuts off. On CRVSF-Series systems equipped with the optional ROBERTS GORDON® System Control, or ROBERTS GORDON® ULTRAVAC™, the pump will continue operation for a post-purge period of two minutes.

4. If no flame is detected, the module will close and a purge period begins. If a flame is not established, a second purge and warm-up will take place and then a third trial cycle will begin. After three trials, the module will lockout for one hour or until reset.

5. A reset is accomplished by removing power from the module for at least 5 seconds

17.2 To Shut Off Heater

Set thermostat to lowest setting.
Turn OFF electric power to heater.
Turn OFF manual gas valve in the heater supply line.

17.3 To Start Heater

Turn gas valve and electric power OFF and wait five minutes for unburned gases to vent from heater.
Turn ON main gas valve.
Turn ON electric power.
Set thermostat to desired temperature.
Burner should light automatically.

17.4 Pre-Season Maintenance and Annual Inspection

To ensure your safety and years of trouble-free operation of the heating system, service and annual inspections must be done by a contractor qualified in the installation and service of gas-fired heating equipment.
Turn off gas and electric supplies before performing service or maintenance. Allow heater to cool before servicing.
Before every heating season, a contractor qualified in the installation and service of gas-fired heating equipment must perform a thorough safety
inspection of the heater. For best performance, the gas, electrical, thermostat connections, tubing, venting, suspensions and overall heater condition should be thoroughly inspected.

**NOTE:** Gas flow and burner ignition are among the first things that should be inspected. Please see Page 66, Section 17.5 for suggested items to inspect.

---

### 17.5 Maintenance Checklist

**Installation Code and Annual Inspections:**

<table>
<thead>
<tr>
<th><strong>The Vicinity of the Heater</strong></th>
<th>Do not store or use flammable objects, liquids or vapors near the heating system. Immediately remove these items if they are present.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>See Page 6, Section 3.</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Vehicles and Other Objects</strong></th>
<th>Maintain the clearances to combustibles. Do not hang anything from, or place anything on, the heater. Make sure nothing is lodged underneath the reflector, in between the tubes or in the decorative or protective grilles (included with select models). Immediately remove objects in violation of the clearances to combustibles.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>See Page 6, Section 3.</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Reflector</strong></th>
<th>Support reflector with reflector hanger and support strap. Reflector must not touch tube. Make sure there is no dirt, sagging, cracking or distortion. Do not operate if there is sagging, cracking or distortion. Make sure reflectors are correctly overlapped. <em>See Page 22, Figure 8.3.3.</em> Clean outside surface with a damp cloth.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Vent Pipe</strong></th>
<th>Venting must be intact. Using a flashlight, look for obstructions, cracks on the pipe or gaps in the sealed areas or corrosion. The area must be free of dirt and dust. Remove any carbon deposits or scale using a wire brush. <em>See Page 30, Section 10.</em></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Outside Air Inlet</strong></th>
<th>Inlet must be intact. Look for obstructions, cracks on the pipe or gaps in the sealed areas or corrosion. The area must be free of dirt and dust. Clean and reinstall as required.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Tubes</strong></th>
<th>Make sure there are no cracks. Make sure tubes are connected and suspended securely. <em>See Page 18, Figure 14 through Page 19, Section 8.2.</em> Make sure there is no dirt, sagging, bending or distortion. Clean or replace as required.</th>
</tr>
</thead>
</table>

All installation and service of ROBERTS GORDON® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Roberts-Gordon LLC and conform to all requirements set forth in the ROBERTS GORDON® manuals and all applicable governmental authorities pertaining to the installation, service, operation and labeling of the equipment.

To help facilitate optimum performance and safety, Roberts-Gordon LLC recommends that a qualified contractor conduct, at a minimum, annual inspections of your ROBERTS GORDON® equipment and perform service where necessary, using only replacement parts sold and supplied by Roberts-Gordon LLC.
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Line</td>
<td>Check for gas leaks. See Page 42, Figure 27.</td>
</tr>
<tr>
<td>Combustion Chamber Window</td>
<td>Make sure it is clean and free of cracks or holes. Clean or replace as required.</td>
</tr>
<tr>
<td>Blower Scroll, Wheel and Motor</td>
<td>Compressed air or a vacuum cleaner may be used to clean dust and dirt.</td>
</tr>
<tr>
<td>Burner Head and Orifice</td>
<td>Clear of obstructions. (Even spider webs will cause problems). Carefully remove any dust and debris from the burner.</td>
</tr>
<tr>
<td>Electrode</td>
<td>Replace if there are cracked ceramics, excessive carbon residue, or erosion of the electrode. The electrode gap should be 1/8&quot; (3 mm).</td>
</tr>
<tr>
<td>Thermostat or Sensor</td>
<td>There should be no exposed wire or damage to the thermostat or sensor. See Page 43, Section 13.</td>
</tr>
<tr>
<td>Suspension Points</td>
<td>Make sure the heater is hanging securely. Look for signs of wear on the chain or ceiling. See Page 18, Figure 14.</td>
</tr>
<tr>
<td>Filter</td>
<td>Check for dirt or dust. Clean or replace as required.</td>
</tr>
<tr>
<td>Fresh Air Filter Box</td>
<td>Change or clean filter as necessary. Heavy contaminated filter may warrant a tighter maintenance schedule than the remaining of the heating system.</td>
</tr>
<tr>
<td>Pump</td>
<td>With pump operating, check for excessive vibration or noise. Vibration is usually a sign that the impeller is out of balance. Turn off the system, insure power is shut off and remove the inlet plate. Check the shaft seal and replace it if worn or missing. With the Power off: Check the inlet and outlet of the pump for blockage or excessive soot and clean as necessary. Check boots for cracking or deterioration and replace if necessary. If a condensate trap is installed, check the condition of the trap and the drain line attached. Note: the condensate trap should be filled with water at the beginning of each heating season. Check the condition of the motor mounts. Lift the motor from the rear; look for breaks in the rubber and replace if necessary. Check the condition and operation of the pressure switch.</td>
</tr>
<tr>
<td>Wall Tag</td>
<td>If wall tag is present, make sure it is legible and accurate. Please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor, if you need a wall tag. See Page 4, Section 2.1.</td>
</tr>
<tr>
<td>Safety Labels</td>
<td>Product safety signs or labels should be replaced by the product user when they are no longer legible. Please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor to obtain replacement signs or labels. See Page 2, Figure 1 through Page 3, Figure 2.</td>
</tr>
</tbody>
</table>
### SECTION 18: TROUBLESHOOTING

#### DANGER

**Electrical Shock Hazard**

Disconnect electric before service.

More than one disconnect switch may be required to disconnect electric from heater.

Heater must be properly grounded.

Failure to follow these instructions can result in death or electrical shock.

#### WARNING

<table>
<thead>
<tr>
<th>Hazard Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Hazard</td>
<td>Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater. Some objects will catch fire or explode when placed close to heater.</td>
</tr>
<tr>
<td>Explosion Hazard</td>
<td>Turn off gas supply to heater before service. Tubing may still be hot after operation.</td>
</tr>
<tr>
<td>Burn Hazard</td>
<td>Allow heater to cool before service. Edges are sharp.</td>
</tr>
<tr>
<td>Cut/Pinch Hazard</td>
<td>Wear protective gear during installation, operation and service.</td>
</tr>
</tbody>
</table>

Failure to follow these instructions can result in death, injury or property damage.
18.1 Troubleshooting

Flow Chart:

1. **START**
   - Turn up thermostat. Does the pump turn on? (Yes/No)
   - Is there power (120 V) to the control? (panel or relay) (Yes/No)
   - Check circuit breaker and/or fuse on panel supply circuit.
   - If No, refer to control panel manual.
   - After 45 seconds pre-purge period, do the burners light? (Yes/No)
   - Refer to control panel manuals list. Is there power to the zone? (Yes/No)
   - Refer to control panel list.
   - Do all the burners ignite smoothly? (Yes/No)
   - Is the vacuum setting too high? (Yes/No)
   - Adjust system for proper vacuum at the end vent.

2. **Check:**
   - Is the thermostat connected to the system? (Yes/No)
   - Refer to thermostat installation instruction manual and troubleshooting guide supplied with thermostat. Replace thermostat if necessary.
   - Is there power (120 V) to the control? (Yes/No)
   - Refer to control panels listed below. Does pump turn on? (Yes/No)
   - Check wiring to the burner. Make sure the burner is plugged in.
   - Correct gas problem.
   - Is there proper gas pressure and flow to the burners? (Yes/No)
   - Is there proper gas pressure and flow to the burners? (Yes/No)
   - Refer to control panel list.
   - Refer to control panel manual.
   - Is the motor hot? (Yes/No)
   - Motor may have tripped overload switch. Wait 10-15 minutes for automatic reset.
   - Is the motor connected properly? Refer to the wiring diagrams on the motor and in the installation manual.
   - Motor may have failed. Replace motor.
   - Motor bearings may have failed. Replace motor.
   - Is the pump impeller obstructed? (Yes/No)
   - Motor bearings may have failed. Replace motor.
   - Correct gas problem.

3. **Troubleshooting Ends**
   - Replace burner transformer. (Yes/No)
   - Is there 24 V at the burner transformer secondary (blue and yellow wires)? (Yes/No)
   - Replace ignition module.

**Module Diagnostic Codes:**

<table>
<thead>
<tr>
<th>LED</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 sec steady flash at start of cycle</td>
<td>Normal</td>
<td>Wait for valve to open</td>
</tr>
<tr>
<td>Steady on</td>
<td>Microprocessor failure within module</td>
<td>Replace module</td>
</tr>
<tr>
<td>Three flashes</td>
<td>Ignition lockout</td>
<td>Recycle unit: check for spark and valve opening and replace: if none, replace module</td>
</tr>
<tr>
<td></td>
<td>Lockout of module after 3 tries</td>
<td></td>
</tr>
</tbody>
</table>

Troubleshooting Flow Chart

Control Panel IOS Manuals:
- CORAYVAC® Heating Control P/N: 10091601NA
- CORAYVAC® Modulating Heating Control P/N: 1006101NA
- For systems with no control panel, refer to appropriate control manufacturers instructions.

Pump IOS Manuals:
- EP-100 P/N: 127201NA
- EP-200 P/N: 127200NA
- EP-300 P/N: 127202NA
## SECTION 19: REPLACEMENT PARTS

<table>
<thead>
<tr>
<th>DANGER</th>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Electrical Shock Hazard" /></td>
<td><img src="image" alt="Explosion Hazard" /></td>
</tr>
<tr>
<td><img src="image" alt="Fire Hazard" /></td>
<td><img src="image" alt="Carbon Monoxide Hazard" /></td>
</tr>
</tbody>
</table>

Use only genuine ROBERTS GORDON® replacement parts per this installation, operation and service manual.

Failure to follow these instructions can result in death, electric shock, injury or property damage.

See warnings and important information before removing or replacing parts. After any maintenance or repair work, always test fire the heater in accordance with the start-up instructions on Page 57, Section 14 to help ensure all safety systems are in working order before leaving the heater to operate. Minor faults may be traced by using the troubleshooting charts on Page 68, Section 18 through Page 70.
NOTE: In the event that a manifold replacement part is needed (e.g. gas valve, regulator), please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Valve (All Burners)</td>
<td>Contact Factory</td>
</tr>
<tr>
<td>Gasket (Burner to Mixing Chamber)</td>
<td>01351100</td>
</tr>
<tr>
<td>Burner Head Assembly Replacement Package (includes electrode and gasket installed)</td>
<td>Contact Factory</td>
</tr>
<tr>
<td>Mixing Chamber</td>
<td>Contact Factory</td>
</tr>
<tr>
<td>Transformer</td>
<td>90436900K</td>
</tr>
<tr>
<td>Regulator Replacement Kit</td>
<td>Contact Factory</td>
</tr>
<tr>
<td>Gasket (Combustion Chamber)</td>
<td>01367800</td>
</tr>
<tr>
<td>Electrode Replacement Kit</td>
<td>02713200</td>
</tr>
<tr>
<td>Ignition Module</td>
<td>90439500K</td>
</tr>
<tr>
<td>Ignition Cable</td>
<td>90427706</td>
</tr>
<tr>
<td>Filter Cartridge with Gasket (not shown)</td>
<td>01312401</td>
</tr>
</tbody>
</table>
19.1 Variable Frequency Drive Replacement Parts

**Caution:** Use only genuine ROBERTS GORDON® replacement parts. Use of parts not specified by Roberts-Gordon voids warranty.

**FIGURE 43: Variable Frequency Drive Components Diagram**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Frequency Drive, 1 HP, 120 V, 1 Ø Input (for use with EP-203)</td>
<td>10081201</td>
</tr>
<tr>
<td>Variable Frequency Drive, 3/4 HP, 230 V, 1 Ø Input (for use with EP-203)</td>
<td>10081202</td>
</tr>
<tr>
<td>Variable Frequency Drive, 2 HP, 230 V, 1 Ø Input (for use with EP-303)</td>
<td>10081203</td>
</tr>
<tr>
<td>Variable Frequency Drive, 1 HP, 460 V, 3 Ø Input (for use with EP-203)</td>
<td>10081204</td>
</tr>
<tr>
<td>Variable Frequency Drive, 2 HP, 460 V, 3 Ø Input (for use with EP-303)</td>
<td>10081205</td>
</tr>
<tr>
<td>Relay, 120 V</td>
<td>90429100</td>
</tr>
<tr>
<td>Fuse 10 A (for 7.5 HP 230 V VFD, 1 HP 460 V VFD and 2 HP 460 V VFD)</td>
<td>91321410</td>
</tr>
<tr>
<td>Fuse 25 A (for 1 HP 120 V VFD and 2 HP 230 V VFD)</td>
<td>91321425</td>
</tr>
<tr>
<td>Grounding Block</td>
<td>91321300</td>
</tr>
<tr>
<td>Fuse Holder</td>
<td>91321400</td>
</tr>
<tr>
<td>Rotary Disconnect Base Block</td>
<td>91321550</td>
</tr>
<tr>
<td>Rotary Disconnect Handle (not shown)</td>
<td>91321551</td>
</tr>
<tr>
<td>Rotary Disconnect Rod (not shown)</td>
<td>91321552</td>
</tr>
</tbody>
</table>
19.2 Replacement Parts Instructions

**DANGER**

Electrical Shock Hazard

Disconnect electric before service.

Controller must be properly grounded to an electrical source.

Failure to follow these instructions can result in death or electrical shock.

19.2.1 Variable Frequency Drive (VFD)

To replace the Variable Frequency Drive, turn off all power to the drive assembly at the breaker or disconnect switch. Turn off the 24 V power switch on the relay board. Turn off 120 V power to the relay board inside the ROBERTS GORDON® ULTRAVAC™ Controller or the modulating thermostat.

Mark all wires connected to the VFD, noting the terminals to which they are secured. Remove all wires from the VFD terminals.

Remove the VFD from its mounting plate by removing the four securing screws.

Verify that the input voltage noted on the rating plate of the VFD matches the input voltage of the old VFD. Secure the new VFD to the mounting plate with the four screws. Return all wires to the correct VFD terminals. If possible, it may be easier to partially rewire the new VFD before mounting it to the mounting plate.

Close the door and return power to the VFD. Return 120 V power to the relay board or modulating thermostat. Turn on the 24 V power switch on the relay board. Press the reset button on the control board and close the doors.

19.2.2 Variable Frequency Drive 25 A or 10 A Fuse

To replace a fuse, turn off input power to the variable frequency drive assembly at the breaker or disconnect switch.

Turn off 120 V power to the relay board inside the ROBERTS GORDON® ULTRAVAC™ Controller or modulating thermostat. Turn off the 24 V power switch on the relay board.

Inside the VFD assembly, open the fuse holder by pulling down the lever to expose the fuse. Remove the old fuse and insert a new fuse. Verify the correct fuse rating, 25 A for 1 HP 120 V VFD or 2 HP 230 V VFD, 10 A for the .75 HP 230 V VFD, 1 HP 460 V VFD and 2 HP 460 V VFD. Close the fuse holder. Return power to the VFD assembly and verify that the VFD LCD screen is on. (dashes displayed). Close the VFD assembly door.

Return 120V power to the relay board or modulating thermostat. Turn on 24 V power switch on the relay board. Press the reset button on the control board and close the doors.

**DANGER**

Electrical Shock Hazard

Disconnect electric before service.

Controller must be properly grounded to an electrical source.

Failure to follow these instructions can result in death or electrical shock.
SECTION 20: GENERAL SPECIFICATIONS

20.1 Material Specifications

20.1.1 Reflectors

.024 Aluminium.

20.2 Heater Specifications

20.2.1 Ignition

Fully Automatic, Three-Try, Direct Spark, Electronic Ignition Control, 100% Safety Shut-Off.

20.3 Suspension Specifications

Hang heater with materials with a minimum working load of 750 lbs (340 kg). See Page 18, Figure 14.

20.4 Controls Specifications

Time switches, thermostats, etc. can be wired into the electrical supply. External controls supplied as an option.

<table>
<thead>
<tr>
<th>Model</th>
<th>Heat Input Rate (Btu/h) x (1000)</th>
<th>Length “A”</th>
<th>Recommended Minimum Mounting Height*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>CRVSF-2</td>
<td>40</td>
<td>** See Below</td>
<td>21’ (6.4 m)</td>
</tr>
<tr>
<td>(NG Only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRVSF-4</td>
<td>40</td>
<td>** See Below</td>
<td>31.5’ (9.6 m)</td>
</tr>
<tr>
<td>CRVSF-6</td>
<td>60</td>
<td>** See Below</td>
<td>42’ (12.8 m)</td>
</tr>
<tr>
<td>CRVSF-8</td>
<td>80</td>
<td>** See Below</td>
<td>52.5’ (16 m)</td>
</tr>
</tbody>
</table>

*See Page 6, Section 3 for clearances to combustibles.

**Refer to the CRVSF-Series Design Manual (P/N 127502NA)

PIPE CONNECTION:

1/2” NPT

DIMENSIONS:

Vent Connection Size: 4” (10 cm) or 6” (15 cm)
Outside Air Connection Size: 4” (10 cm)

Refer to figure above for dimensional information.

GAS INLET PRESSURE:

Natural Gas: 4.5” wc Minimum 14.0” wc Maximum
LP Gas: 10.5” wc Minimum 14.0” wc Maximum

ELECTRICAL RATING:

120 V - 60 Hz, 0.3 A
SECTION 21: GENERAL SPECIFICATIONS FOR PUMPS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP-100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP-201/203</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP-301/303</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horspower (Hp)</td>
<td>1/3</td>
<td>3/4</td>
<td>3/4</td>
<td>2*</td>
<td>2*</td>
</tr>
<tr>
<td>Phase (Ø)</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Hertz (Hz)</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Voltage (V)</td>
<td>115/230</td>
<td>115/230</td>
<td>208-230</td>
<td>208-230</td>
<td>208-230/460</td>
</tr>
<tr>
<td>Full Load Amp (Amps)</td>
<td>4.8/2.4</td>
<td>6.6/3.3</td>
<td>2.4-2.2/1.1</td>
<td>12.8-11.5</td>
<td>5.5-5.2/2.6</td>
</tr>
<tr>
<td>R.P.M.</td>
<td>3450</td>
<td>3450</td>
<td>3500</td>
<td>3450</td>
<td>3450</td>
</tr>
<tr>
<td>Motor Frame</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Motor Enclosure</td>
<td>TENV</td>
<td>TENV</td>
<td>TEFC</td>
<td>TEFC</td>
<td>TEFC</td>
</tr>
<tr>
<td>Noise Level @ 5' (DBA)</td>
<td>-</td>
<td>70</td>
<td>70</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Inlet/Outlet (In.)</td>
<td>4/4</td>
<td>4/4</td>
<td>4/4</td>
<td>6/6</td>
<td>6/6</td>
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<tr>
<td>Weight (lbs.)</td>
<td>62</td>
<td>112</td>
<td>112</td>
<td>170</td>
<td>170</td>
</tr>
</tbody>
</table>

* For starter, see National Electric Code (NEC) requirement for motors 1 hp or higher.

SECTION 22: GENERAL SPECIFICATIONS FOR AIR SUPPLY BLOWER

<table>
<thead>
<tr>
<th>Capacity</th>
<th>240 CFM @ 0.75 in wc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (W)</td>
<td>167</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
</tr>
<tr>
<td>Hertz (Hz)</td>
<td>60</td>
</tr>
<tr>
<td>Voltage (V)</td>
<td>120</td>
</tr>
<tr>
<td>Full Load Amp (Amps)</td>
<td>1.5</td>
</tr>
<tr>
<td>R.P.M.</td>
<td>3000</td>
</tr>
<tr>
<td>Motor Enclosure</td>
<td>OPEN FC</td>
</tr>
<tr>
<td>Inlet/Outlet (In.)</td>
<td>5/5</td>
</tr>
<tr>
<td>Weight (lbs.)</td>
<td>10</td>
</tr>
</tbody>
</table>
SECTION 23: GENERAL SPECIFICATIONS FOR FRESH AIR FILTER BOX SPECIFICATIONS

Filter Box Dimensional Data

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>20” (51 cm)</td>
<td>15” (38 cm)</td>
<td>20” (51 cm)</td>
<td>8” (20 cm)</td>
<td>2” (5 cm)</td>
<td>20” (51 cm)</td>
</tr>
</tbody>
</table>
CORAYVAC® Classic SF Start-Up and Installation Report

Date of Installation: __________________ Model #: __________________ Serial #: __________________

Installed at: __________________ Service Company: __________________

Name: __________________ Name: __________________

Address: __________________ Address: __________________

Phone: __________________ Phone: __________________

Fax: __________________ Fax: __________________

E-mail: __________________ E-mail: __________________

Form must be completed and returned within 24 hours of start-up or warranty is void.

⚠️ DANGER

Electrical Shock Hazard

Disconnect electric before service.

Explosion Hazard

Leak test all components of equipment gas piping before operation.

Burn Hazard

Allow heater to cool before service.

Cut/Pinch Hazard

Wear protective gear during installation, operation and service. Edges are sharp.

Failure to follow these instructions can result in death, electric shock, injury or property damage.

⚠️ WARNING

Fire Hazard

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater.

Some objects will catch fire or explode when placed close to heater.

Failure to follow these instructions can result in death, injury or property damage.

⚠️ WARNING

Falling Hazard

Use proper safety equipment and practices to avoid falling.

Do not use any part of equipment as support.

Failure to follow these instructions can result in death, injury or property damage.
1. Turn system on. Run for one hour.

2. Gas Type
   - Natural Gas
   - Liquid Propane
   A. Supply Pressure (measured at last burner of gas supply line with entire building heat operating at full capacity)
   B. Flex Lines Installed Properly
   C. High Pressure Regulators Used Installed Upstream of the Flex Line
      - YES
      - NO

3. Vacuum Pump
   A. Model/Serial Number Installed
   B. Motor Rotation Direction
      - CW
      - CCW
   C. Damper Nipples
      - YES
      - NO
   D. End Vent Vacuum

<table>
<thead>
<tr>
<th>Branch #</th>
<th>End Vent Vacuum</th>
<th>End Vent Plate ID Number Installed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Electrical
   A. Pump Supply Voltage
   B. Pump Amperage Draw
   C. Thermostat(s)

<table>
<thead>
<tr>
<th>Thermostat Location</th>
<th>Thermostat Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Flue Discharge
   A. Flue Direction
      - Roof
      - Wall
   B. Vent Material
   C. Vent Diameter

6. Condensate Discharge
   - YES
   - NO

7. Tube Pitch
   - YES
   - NO

8. Reflectors
   A. Proper Overlap at Joints
   B. Slip Joint every 3rd Reflector
   C. End Caps Installed

9. Mandatory Fresh Air Supply
   - YES
   - NO
   A. Blower Installed
      - YES
      - NO
   Blower Model Number
   - YES
   - NO
   B. Double filtered air supply at occupant level
      - YES
      - NO

10. Control Panel Installed
    A. URV
    B. System Controller
    C. Other

11. Other Comments

Job Name: __________________________________________
Address: __________________________________________
Customer Name: ____________________________________
Installation Date: ____________________
Start-Up Date: ______________________
Room Temperature: __________
Outside Temperature: __________
Technician Name: ____________________
Technician E-mail: __________________
### CORAYVAC® CLASSIC SF START-UP AND INSTALLATION REPORT (Continued)

12. Units Installed

<table>
<thead>
<tr>
<th>Branch 1</th>
<th>Model</th>
<th>Serial Number</th>
<th>Tube Temperature* (See Drawing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branch #</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (@ End Burner)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Branch 2</th>
<th>Model</th>
<th>Serial Number</th>
<th>Tube Temperature* (See Drawing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branch #</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (@ End Burner)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Branch 3</th>
<th>Model</th>
<th>Serial Number</th>
<th>Tube Temperature* (See Drawing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branch #</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (@ End Burner)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Branch 4</th>
<th>Model</th>
<th>Serial Number</th>
<th>Tube Temperature* (See Drawing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branch #</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (@ End Burner)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Highest measured temperature after each burner. Measurement must be taken using a calibrated thermometer type K thermocouple or its equivalent. Infrared temperature measuring devices are not acceptable.

---

![Diagram of CORAYVAC® CLASSIC SF system](image-url)
SECTION 25: THE ROBERTS GORDON® CORAYVAC® CLASSIC SF LIMITED WARRANTY

ROBERTS-GORDON LLC WILL PAY FOR:
Within 36 months from date of purchase by buyer or 42 months from date of shipment by Roberts-Gordon LLC (whichever occurs first), replacement parts will be provided free of charge for any part of the product which fails due to a manufacturing or material defect.

Roberts-Gordon LLC will require the part in question to be returned to the factory. Roberts-Gordon LLC will, at its sole discretion, repair or replace after determining the nature of the defect and disposition of part in question.

Roberts-Gordon LLC warrants the cast iron combustion chamber of the ROBERTS GORDON® CORAYVAC® CLASSIC SF Classic System will be free from defects in material and workmanship. This warranty is limited to twenty-five (25) years from the date of shipment by Roberts-Gordon LLC. All other components of the ROBERTS GORDON® CORAYVAC® CLASSIC SF System adhere to the standard warranty listed in the paragraph above.

ROBERTS GORDON® Replacement Parts are warranted for a period of 12 months from date of shipment from Roberts-Gordon LLC or the remaining ROBERTS GORDON® CORAYVAC® CLASSIC SF CLASSIC SF warranty.

ROBERTS-GORDON LLC WILL NOT PAY FOR:
Service trips, service calls and labor charges.

Shipments of replacement parts.

Claims where the total price of the goods have not been paid.

Damage due to:
- Improper installation, operation or maintenance.
- Misuse, abuse, neglect, or modification of the ROBERTS GORDON® CORAYVAC® CLASSIC SF in any way.
- Use of the ROBERTS GORDON® CORAYVAC® CLASSIC SF for other than its intended purpose.
- Incorrect gas or electrical supply, accident, fire, floods, acts of God, war, terrorism, or other casualty.
- Improper service, use of replacement parts or accessories not specified by Roberts-Gordon.
- Failure to install or maintain the ROBERTS GORDON® CORAYVAC® CLASSIC SF as directed in the Installation, Operation and Service Manual.
- Relocation of the ROBERTS GORDON® CORAYVAC® CLASSIC SF after initial installation.
- The use of the ROBERTS GORDON® CORAYVAC® CLASSIC SF in a corrosive atmosphere containing contaminants.
- The use of the ROBERTS GORDON® CORAYVAC® CLASSIC SF in the vicinity of a combustible or explosive material.
- Any defect in the ROBERTS GORDON® CORAYVAC® CLASSIC SF arising from a drawing, design, or specification supplied by or on behalf of the consumer.
- Damage incurred during shipment. Claim must be filed with carrier.

WARRANTY IS VOID IF:
The ROBERTS GORDON® CORAYVAC® CLASSIC SF is not installed by a contractor qualified in the installation and service of gas fired heating equipment.

You cannot prove original purchase date and required annual maintenance history.

The data plate and/or serial number are removed, defaced, modified or altered in any way.

The ownership of the ROBERTS GORDON® CORAYVAC® CLASSIC SF is moved or transferred. This warranty is nontransferable.

Roberts-Gordon LLC is not permitted to inspect the damaged equipment and/or component parts.

READ YOUR INSTALLATION, OPERATION AND SERVICE MANUAL
If you have questions about your equipment, contact your installing professional. Should you need Replacement Parts or have additional questions, call or write:

Roberts-Gordon LLC
1250 William Street
P.O. Box 44
Buffalo, New York 14240-0044
Telephone: +1.716.852.4400
Fax: +1.716.852.0854  Toll Free: 800.828.7450

www.robertsgordon.com  www.corayvac.com

Roberts-Gordon LLC’s liability, and your exclusive remedy, under this warranty or any implied warranty (including the implied warranties of merchantability and fitness for a particular purpose) is limited to providing replacement parts during the term of this warranty. Some jurisdictions do not allow limitations on how long an implied warranty lasts, so this limitation may not apply to you. There are no rights, warranties or conditions, expressed or implied, statutory or otherwise, other than those contained in this warranty.

Roberts-Gordon LLC shall in no event be responsible for incidental or consequential damages or incur liability for damages in excess of the amount paid by you for the ROBERTS GORDON® CORAYVAC® CLASSIC SF. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so this limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from jurisdiction to jurisdiction.

Roberts-Gordon LLC shall not be responsible for failure to perform under the terms of this warranty if caused by circumstances out of its control, including but not limited to war, fire, flood, strike, government or court orders, acts of God, terrorism, unavailability of supplies, parts or power. No person is authorized to assume for Roberts-Gordon LLC any other warranty, obligation or liability.

LIMITATIONS ON AUTHORITY OF REPRESENTATIVES:
No representative of Roberts-Gordon LLC, other than an Executive Officer, has authority to change or extend these provisions. Changes or extensions shall be binding only if confirmed in writing by Roberts-Gordon LLC’s duly authorized Executive Officer.
CORAYVAC® CLASSIC SF
OWNER WARRANTY REGISTRATION CARD

About the Owner:
Name: ________________________________
Address: ____________________________ City: ____________ State: ________ Zip Code: ________
Phone: ____________________________ Fax: __________________________ E-mail: ________________

About the Installer:
Name: ________________________________
Address: ____________________________ City: ____________ State: ________ Zip Code: ________
Phone: ____________________________ Fax: __________________________ E-mail: ________________

Purchased From (if different than installer):
Name: ________________________________
Address: ____________________________ City: ____________ State: ________ Zip Code: ________
Phone: ____________________________ Fax: __________________________ E-mail: ________________

About your Heater:
Model #: __________________ Serial #: __________________ Fuel: __________ Installation Date: ______

Type of Installation (check one):
- o Automotive
- o Manufacturing
- o Warehouse
- o Recreational
- o Aircraft
- o Public Building
- o Office
- o Retail
- o Agricultural
- o Other

Installation Code and Annual Inspections: All installation and service of ROBERTS GORDON®
equipment must be performed by a contractor qualified in the installation and service of equipment sold
and supplied by Roberts-Gordon LLC and conform to all requirements set forth in the ROBERTS
GORDON® manuals and all applicable governmental authorities pertaining to the installation,
operation, and labeling of the equipment.

To help facilitate optimum performance and safety, Roberts-Gordon LLC recommends that a
certified contractor conduct, at a minimum, annual inspections of your ROBERTS GORDON®
equipment and perform service where necessary, using only replacement parts sold and supplied by
Roberts-Gordon LLC.

These products are not for residential use.

This product is intended to assist licensed professionals in the exercise of their professional judgment.

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may be reproduced or copied in any form or by any means – graphic, electronic, or mechanical, including
photocopying, recording, taping, or information storage and retrieval systems – without written permission
of Roberts Gordon LLC. Printed in the U.S.A.
Attach this information to a wall near the ROBERTS GORDON® heater.

### OPERATING INSTRUCTIONS

1. STOP! Read all safety instructions on this information sheet.
2. Open the manual gas valve in the heater supply line.
3. Turn on electric power to the heater.
4. Set the thermostat to desired setting.

### WARNING

**Fire Hazard**

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater.

Some objects will catch fire or explode when placed close to heater.

Failure to follow these instructions can result in death, injury or property damage.

### TO TURN OFF THE HEATER

1. Set the thermostat to off or the lowest setting.

### IF THE HEATER WILL NOT OPERATE, TO ENSURE YOUR SAFETY, FOLLOW THESE INSTRUCTIONS TO SHUT DOWN YOUR HEATER

1. Set the thermostat to off or the lowest setting.
2. Turn off electric power to the heater.
3. Turn off the manual gas valve in the heater supply line.
4. Call your registered installer/contractor qualified in the installation and service of gas-fired heating equipment.

Maintain clearance to the side and clearance below the heater from vehicles and combustible materials.