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.

ROBERTS GORDON®

CoRayVac®

CLASSIC SF

Heavy Duty, High Efficiency Infrared Heating for Specialty Fuel Repair Facilities*

Installation, Operation & Service Manual

CRVSF-2
CRVSF-4
CRVSF-6
CRVSF-8

⚠ 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.

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
1250 William Street
Buffalo, New York 14206
Telephone: +1.716.852.4400

www.robertsgordon.com

DESIGN CERTIFIED®

CERTIFIED®

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

P/N 127302NA Rev. B 05/23

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Printed in U.S.A.

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.

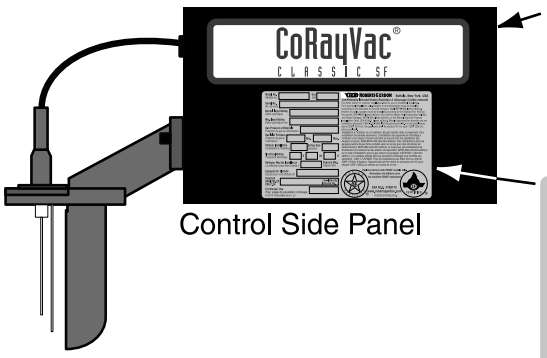
1.2 Safety Labels and Their Placement

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

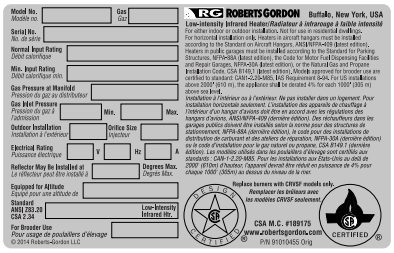
In accordance with California Proposition 65 requirements, a warning label must be placed in a highly visible location on the outside of the equipment (i.e., near equipment's serial plate). See label placement drawing *on Page 3, Figure 2* for label location. Avoid placing label on areas with extreme 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

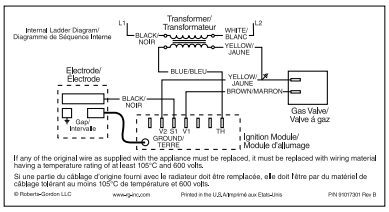


Control Side Panel

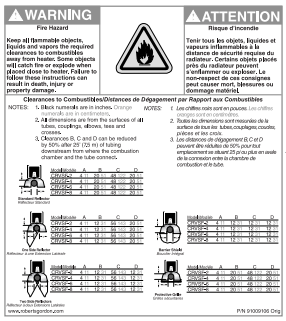
Logo Label



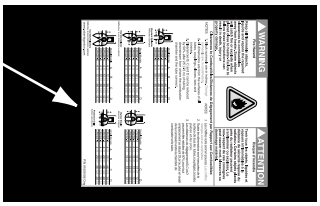
Rating Plate Label



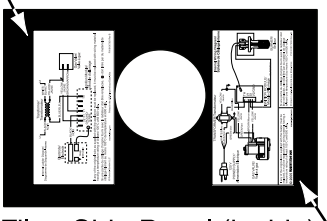
Internal Ladder Diagram Label



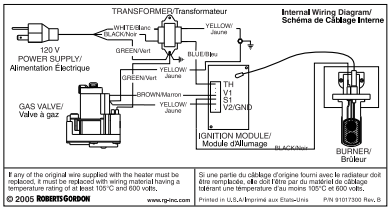
Clearances to Combustibles Label



Control Side Panel (inside)



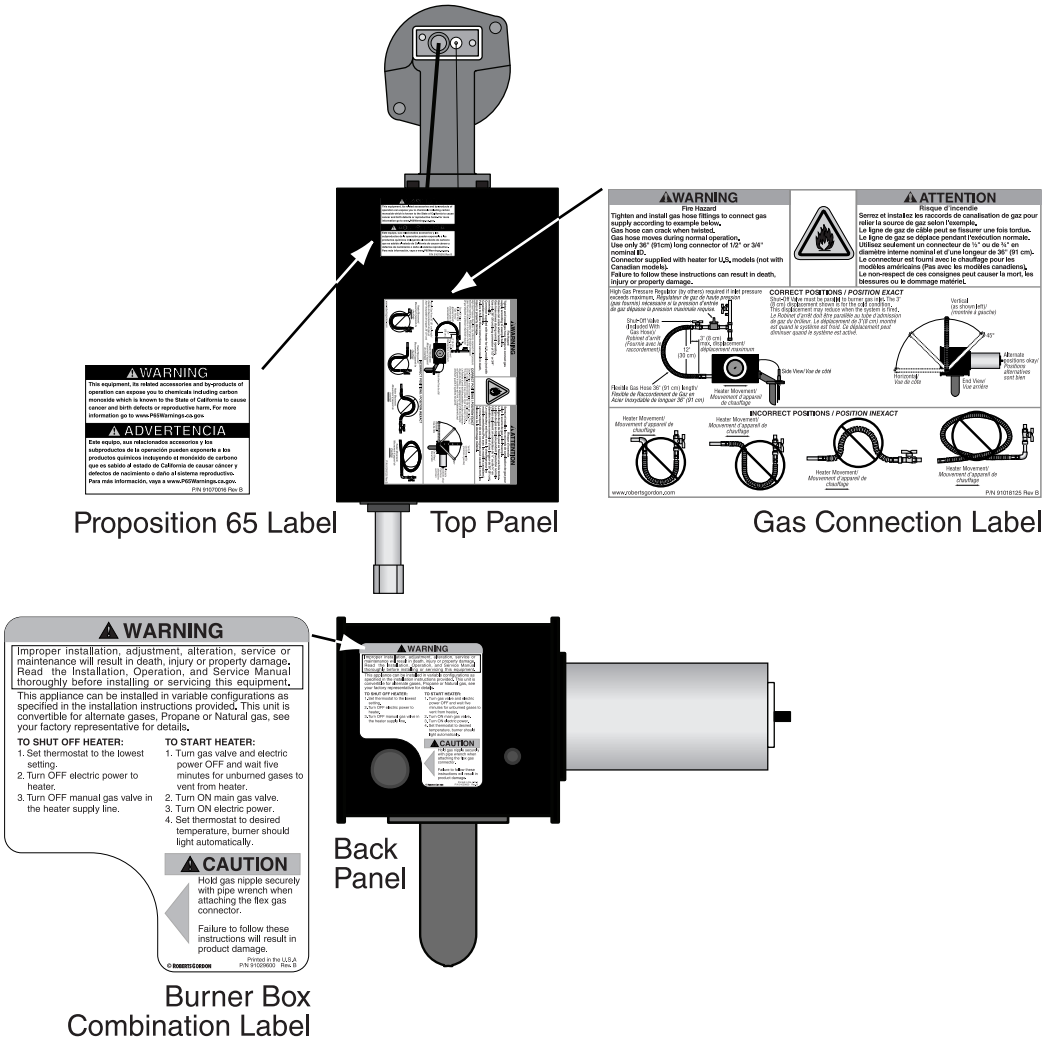
Filter Side Panel (inside)



Wiring Label

Description	Part Number
Logo Label	91031110
Rating Plate Label	91010455
Clearances to Combustibles Label	91009106
Internal Ladder Diagram Label	91017301
Wiring Label	91017300

FIGURE 2: Top and Back Panel Label Placement



Description	Part Number
Gas Connection Label	91018125
Burner Box Combination Label	91029600
Proposition 65 Label	91070016

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 provide schedule 40 heat exchanger radiant pipe and fittings. Pipe: ASTM A53 (Latest edition) grade B ERW black steel pipe TNC 4", both ends threaded to 4" NPT conforming to ANSI/ASME B1.20.1 (latest edition). Fittings: 150 lb malleable black iron 4", both ends threaded to 4" NPT conforming to ANSI/ASME B1.20.1 (latest edition).
- To install the heater, as well as the gas and electrical supplies, in accordance with applicable specifications and codes. Roberts-Gordon LLC recommends the installer contact a local building Inspector or fire marshal for guidance.
- 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

chemicals or halogenated hydrocarbons* anywhere in the premises.

*** 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 make sure 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.

⚠WARNING

Fire Hazard

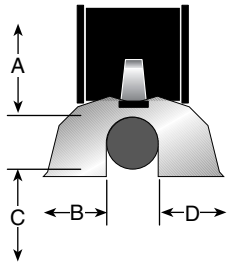
Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater.

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.

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



Model	(inches) A	B	C	D	(centimeters) A	B	C	D
CRVSF-2/-4/-6/-8	4	20	48	20	11	51	122	51

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.

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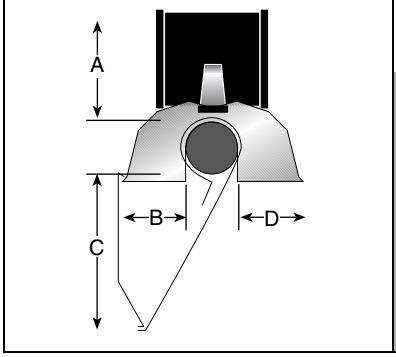
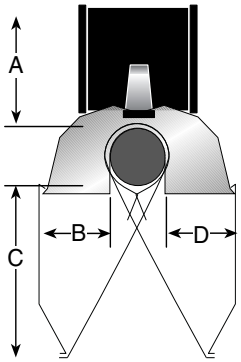
FIGURE 4: ONE SIDE REFLECTOR



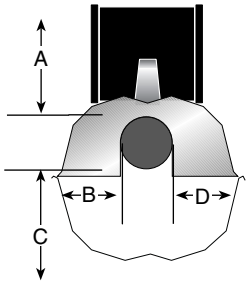
Model	(inches) A	B	C	D	(centimeters) A	B	C	D
CRVSF-2/-4/-6/-8	4	12	56	20	11	31	143	51

FIGURE 5: TWO SIDE REFLECTORS



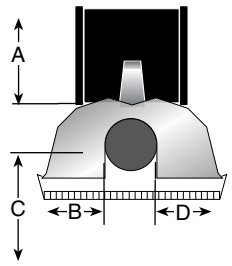
Model	(inches) A	B	C	D	(centimeters) A	B	C	D
CRVSF-2/-4/-6/-8	4	12	56	12	11	31	143	31

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



Model	(inches) A	B	C	D	(centimeters) A	B	C	D
CRVSF-2/-4/-6/-8	4	12	12	12	11	31	31	31

FIGURE 7: PROTECTIVE GRILLE



Model	(inches) A	B	C	D	(centimeters) A	B	C	D
CRVSF-2/-4/-6/-8	4	20	48	20	11	51	122	51

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.

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.

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:

United States: Refer to Standard for Parking Structures NFPA 88A - latest revision or Code for Motor Fuel Dispensing Facilities and Repair Garages, NFPA 30A - latest revision.

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:

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.

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

Installation must comply with Code for Motor Fuel Dispensing Facilities and Repair Garages NFPA 30A – latest revision. Heaters are certified by CSA to meet maximum tube temperature of 750 °F (399 °C) in accordance with NFPA 30A (2012 Edition) section 7.6.6.

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

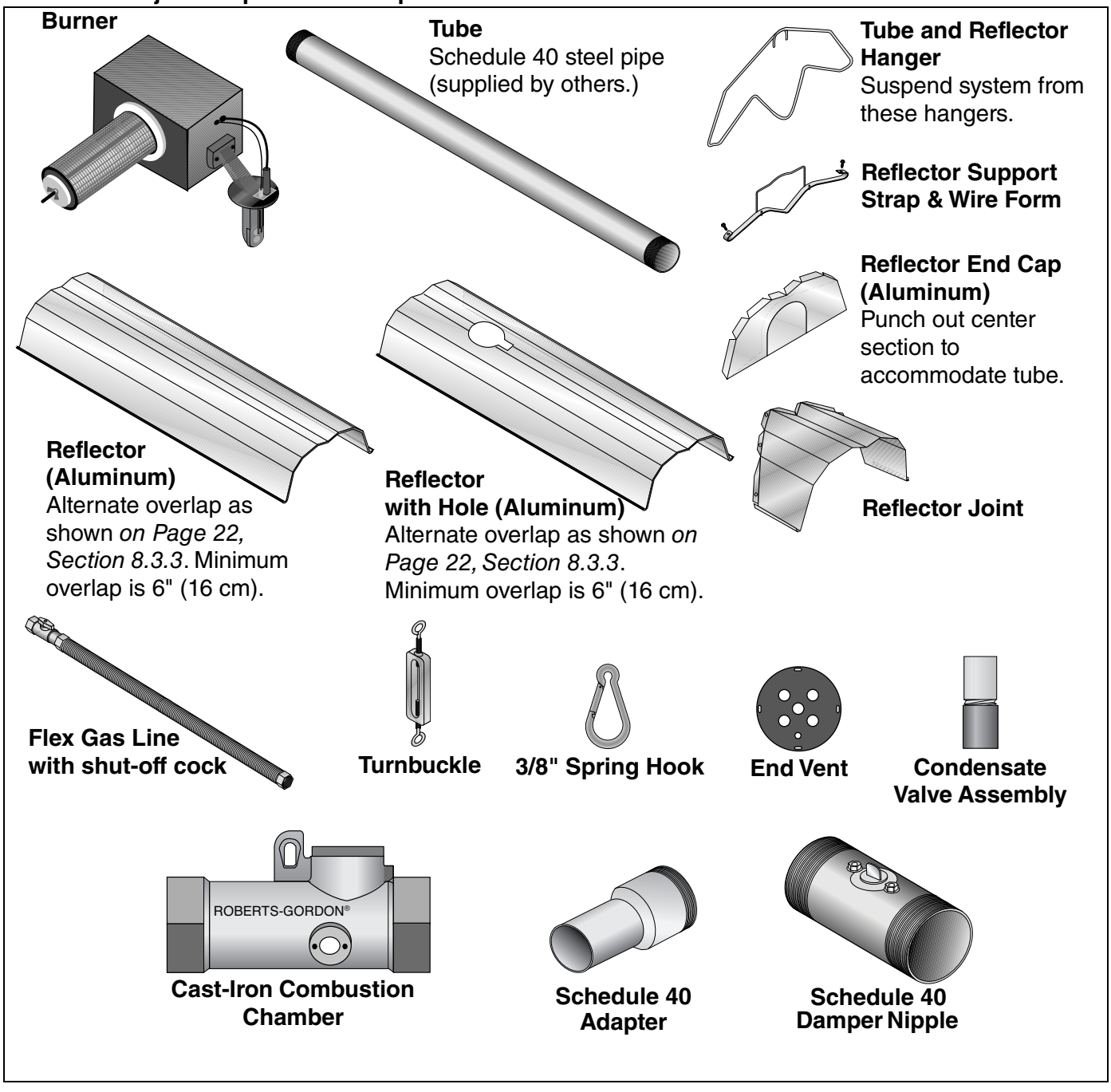
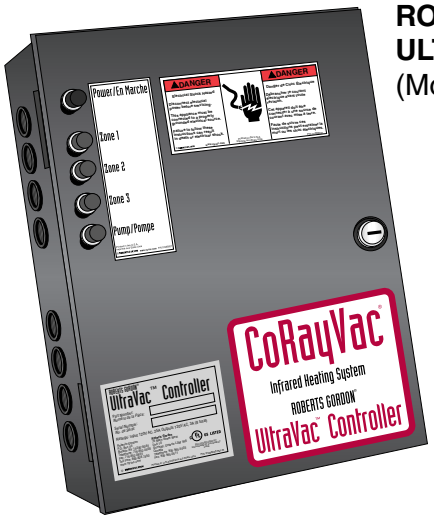
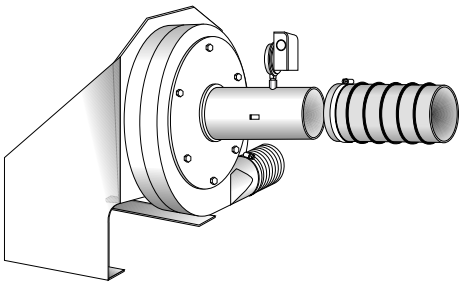


FIGURE 9: Major Component Descriptions (Continued)

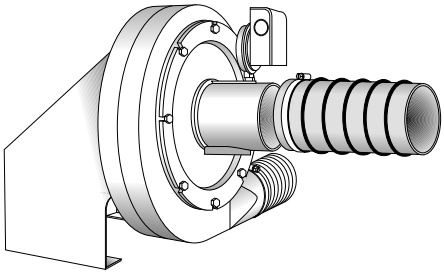


ROBERTS GORDON®
ULTRAVAC™ Controller
(Models CRVSF-6/-8 only)



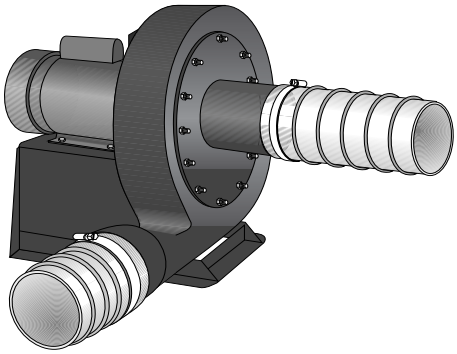
EP-100 Pump Package - 4" dia
For more information, refer to the EP-100 Installation, Operation and Service Manual (P/N 127201NA).

ROBERTS GORDON®
ULTRAVAC™
Variable Frequency Drive



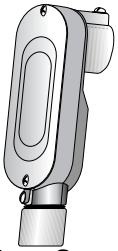
EP-201 Pump Package - 4" dia
EP-203 Pump Package - 4" dia
For more information, refer to the EP-200 Series Installation, Operation and Service Manual (P/N 127200NA).

System Control



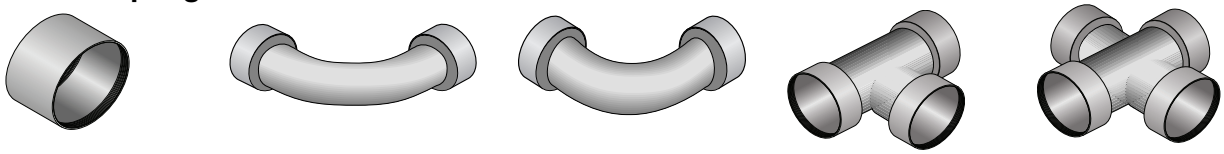
EP-301 Pump Package - 4" dia
EP-301 Pump Package - 6" dia
EP-303 Pump Package - 4" dia
EP-303 Pump Package - 6" dia
For more information, refer to the EP-300 Series Installation, Operation and Service Manual (P/N 127202NA).

ROBERTS GORDON®
ULTRAVAC™
Adjustable Indoor Sensor



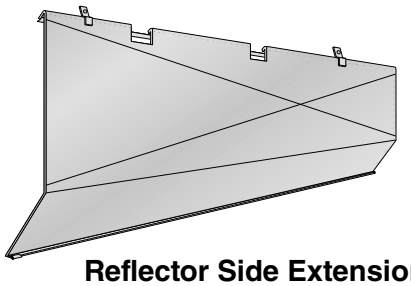
Outdoor Sensor
(P/N 10081501)

FIGURE 10: Schedule 40 Black Steel Fittings



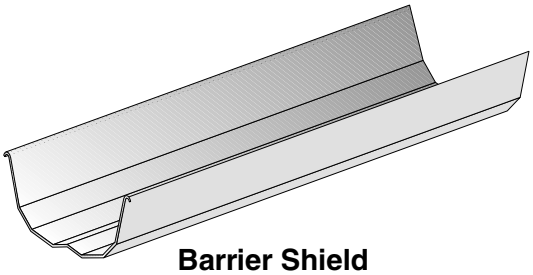
(All Schedule 40 Black Steel Fittings are supplied by others.)

FIGURE 11: Optional Heater Accessories

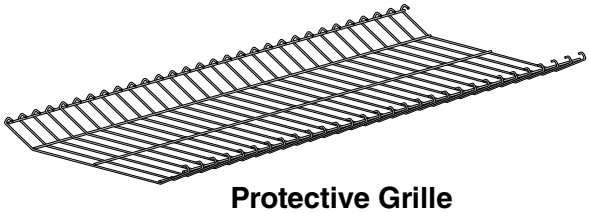


Reflector Side Extension

Reflector Side Extension Bracket



Barrier Shield



Protective Grille

5.1 Standard Parts List for In-Series Systems

Table 1: Contents of CRVSF-Series Burner Carton

Part No.	Description
0270XXXX-SF	Burner (Rate and Fuel Varies)
*91412200	Flexible Stainless Steel Gas Hose, 1/2" NPT (US models only)
01397300	Accessory Package
01361200	Filter Support Disk
01367800	Combustion Chamber Gasket
02724901	Door Assembly w/ Hole
91115100	Screw #10 - 24 x 5/8
91119500	U-Clip
91905500	Filter Support
92123900	Nut 5/16 - 18
92511601	Wing Nut #10 - 24
96411600	Lock Washer 5/16"
01312401	Filter and Gasket

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

Table 2: Common CRVSF-Series Components

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

Part No.	Description
Control Packages and Accessories	
10001501	Water Resistant Sensor
02770002	System Control
ULTRAVAC™ Control Packages	
URVCCM	ROBERTS GORDON® ULTRAVAC™ Central Controller (with Modem Chip & Software) Includes:
URVSC	ROBERTS GORDON® ULTRAVAC™ Controller
10080142	Modem Chip
10080450	Comms Equalization Cable
10081501	Outdoor Sensor
10080410	PC Connection Cable Package
URVCCR	ROBERTS GORDON® ULTRAVAC™ Central Controller (with RS-485 Converter & Software) Includes:
Part No.	**Description**
URVSC	ROBERTS GORDON® ULTRAVAC™ Controller
10080142	Modem Chip
10080450	Comms Equalization Cable
10080430	RS-485 Converter with 9 V Power Supply
10081501	Outdoor Sensor
10080410	PC Connection Cable Package
URVCCL	ROBERTS GORDON® ULTRAVAC™ Central Controller (with TCP/IP Communication Module & Software) Includes:
URVSC	ROBERTS GORDON® ULTRAVAC™ Controller
10080142	Modem Chip
10080450	Comms Equalization Cable
10080440	TCP/IP Communication Module
10081501	Outdoor Sensor
10080410	PC Connection Cable Package
URVBNC	Controller, ROBERTS GORDON® ULTRAVAC™ BACnet®
URVSC	Controller, ROBERTS GORDON® ULTRAVAC™, 1 Pump 3 Zones (Satellite Control)
URVU	Controller, ROBERTS GORDON® ULTRAVAC™, Unitary
Variable Frequency Drive Assemblies	
VFD75115	VFD Assembly, .75 HP, 115 V, 1 Ø Input
VFD75230	VFD Assembly, .75 HP, 230 V, 1 Ø Input
VFD20230	VFD Assembly, 2 HP, 230 V, 1 Ø Input
VFD75115N4	VFD Assembly, .75 HP, 115 V, 1 Ø Input, NEMA 4
VFD75230N4	VFD Assembly, .75 HP, 230 V, 1 Ø Input, NEMA 4
VFD75460	VFD Assembly, .75 HP, 460 V, 3 Ø Input
VFD75460N4	VFD Assembly, .75 HP, 460 V, 3 Ø Input, NEMA 4
VFD20230N4	VFD Assembly, 2 HP, 230 V, 1 Ø Input, NEMA 4
VFD20460	VFD Assembly, 2 HP, 460 V, 3 Ø Input
VFD20460N4	VFD Assembly, 2 HP, 460 V, 3 Ø Input, NEMA 4
ULTRAVAC™ Accessories	
10080142	Modem, Plug-In Chip
10080410	Cable Package, PC Connection
10080430	RS-485 Converter with 9V Power Supply
10080440	TCP/IP Communication Module
10081500	Sensor, Adjustable Indoor, Deg F, ROBERTS GORDON® ULTRAVAC™ Controller
10081501	Sensor, Outdoor, ULTRAVAC™
10081502	Sensor, Adjustable Indoor, Deg C, ULTRAVAC™
90602450	Voltage Surge Suppressor 277/480 V

Part No.	Description
90602451	Voltage Surge Suppressor 120 V
90602452	Voltage Surge Suppressor 120/240 V 1 Ø 60 Hz
90602460	Line Reactor 480 V 3 Ø 60 Hz w/Enclosure (Output)
90602461	Line Reactor 230 V 3 Ø 60 Hz .75 HP (Output)
90602462	Line Reactor 230 V 3 Ø 60 Hz 2 HP (Output)
90602470	Line Reactor 480 V 3 Ø 60 Hz 4 A w/Enclosure (Input)

Thermostats	
05023000	Load Relay Package
90417600K	Transformer Relay - SPST (12 A)
90436300	Transformer Relay - SPDT (12 A)
90423000	24 V Low Voltage Thermostat (Marked 1-5)
90424300	Thermostat Guard
90425104	Thermostat, Modulating LonWorks®
90425105	Thermostat, Modulating
90425109	Thermostat, Modulating BACnet®
90425400	Thermostat, 24 V Programable
90429107	Thermostat, On/Off BACnet®
10081520	Sensor, Remote Modulating
10081521	Sensor, Outdoor Modulating

Pump Packages and Accessories	
02719105	EP-100 Pump Package
02719100	EP-100 Pump
02724700	Accessory Package
02716305	EP-201 Pump Package
01312001	EP-201 Pump
01317805	Accessory Package
02712034	EP-203 Pump Package
01312002	EP-203 Pump
01317805	Accessory Package
02723014	EP-301 Pump Package 4"
02730101	EP-301 Pump Assembly
02730104	Accessory Package
02723016	EP-301 Pump Package 6"
02730101	EP-301 Pump Assembly
02730106	Accessory Package
02723034	EP-303 Pump Package 4"
02730103	EP-303 Pump Assembly
02730104	Accessory Package
02723036	EP-303 Pump Package 6"
02730103	EP-303 Pump Assembly
02730106	Accessory Package

Part No.	Description
Pump Accessories	
90430600K	Pressure Switch
01327001	Condensate Check Valve Assembly
02718851	Drain Cap, 4" (10 cm)
02718852	Drain Cap, 6" (15 cm)
01327002	Condensate Neutralization Tube 200
01327003	Condensate Neutralization Tube 600
01327004	Condensate Neutralization Tube 1000
01327005	Condensate Neutralization Tube 2000
01327007	Refill, Condensate Neutralization Tube 600
01327008	Refill, Condensate Neutralization Tube 1000
01327009	Refill, Condensate Neutralization Tube 2000

Contactors	
10050011	Contactor, 120 Vac for EP-203, EP-303, 3 Ø EP-100, EP-201 208/230 V, 1 Ø EP-301 208/230 V, 1 Ø
10050012	Contactor, 120 Vac for EP-301, 120 V, 1 Ø

Protective Grille	
08050001	Protective Grille, 40" (102 cm)
08050002	Protective Grille Cap

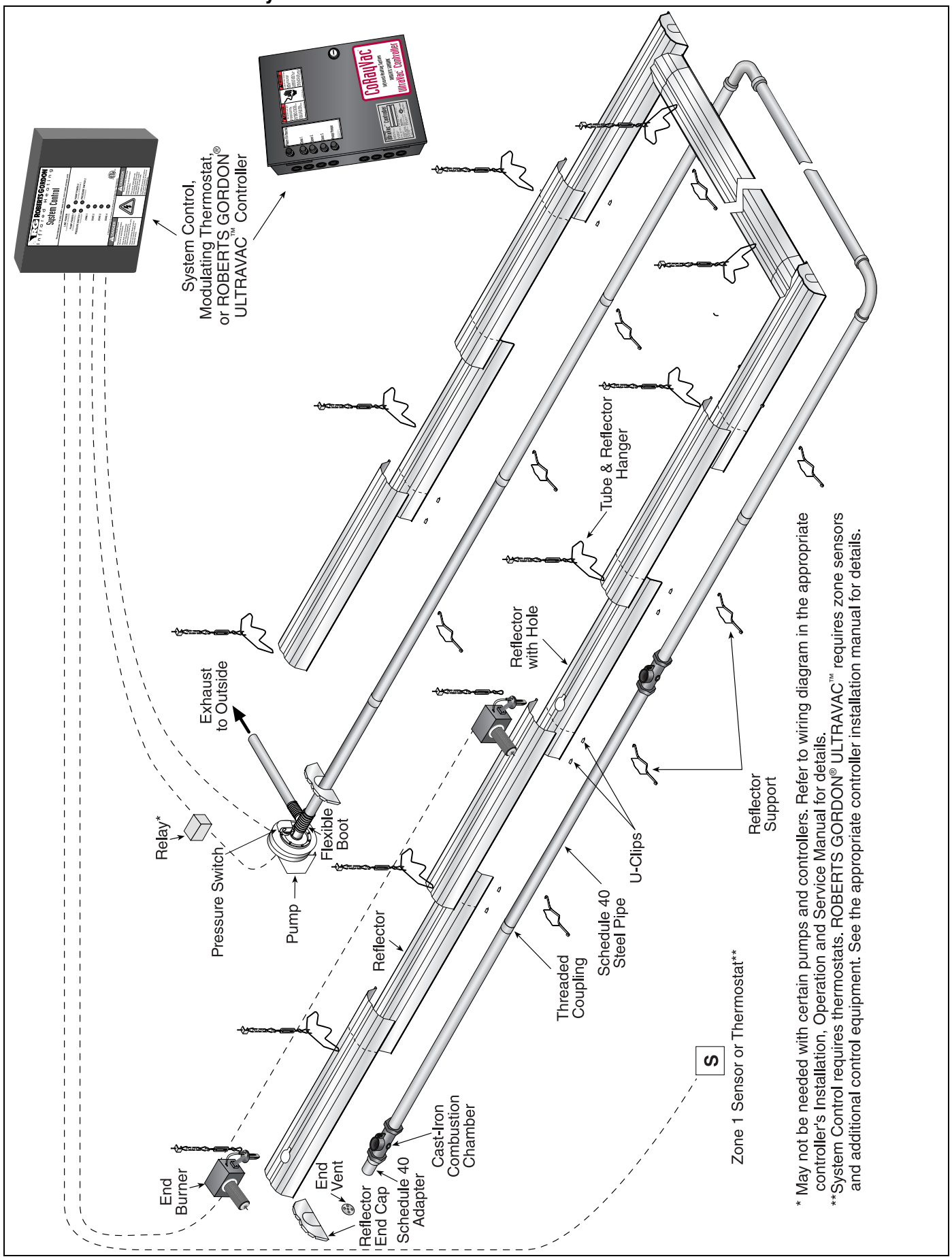
Shields	
02750303	Barrier Shield

Fresh Air Filter Box	
90740100K	Fresh Air Filter Box
20628	Aluminum Mesh Filter 20" x 20" x 1" (51 cm x 51 cm x 3 cm)

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



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

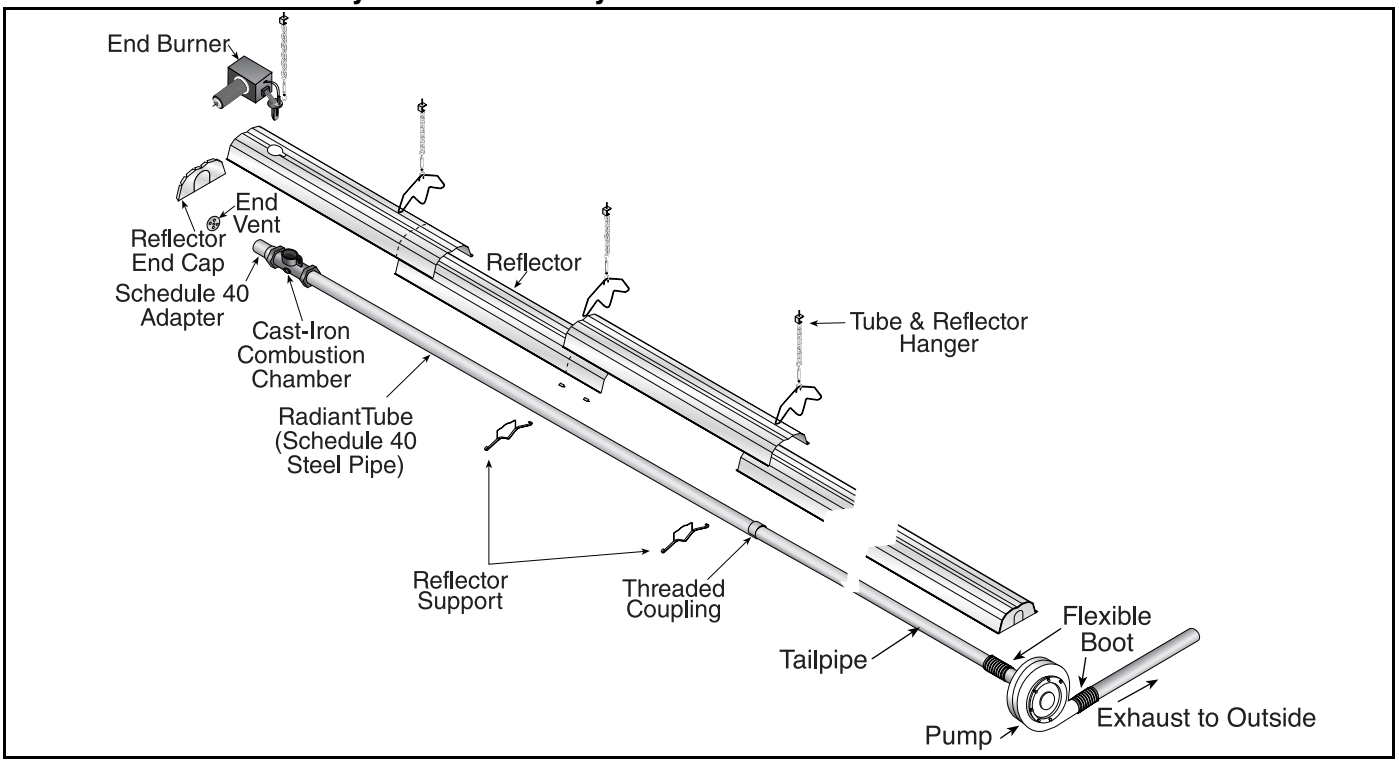
Part Number	Length
CRVSF60N	31.5' (9.6 m)
CRVSF60P	31.5' (9.6 m)
CRVSF80N	42" (12.8 m)
CRVSF80P	42" (12.8 m)

Table 4: Contents of CRVSF Unitary Packages

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

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

FIGURE 13: CRVSF Unitary Heater Assembly Overview



SECTION 8: HEATER INSTALLATION

⚠WARNING

Severe Injury Hazard

Hang heater with materials with a minimum working load of 750 lbs. (340 kg).

Use special tube and reflector hangers when suspending the schedule 40 steel pipe system.

Schedule 40 steel pipe is heavy and will fall if not supported properly.

Distance between supports must be 7' (2.13 m) or less.

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

⚠WARNING

Cut/Pinch Hazard

Wear protective gear during installation, operation and service.

Edges are sharp.

Failure to follow these instructions can result in injury.

⚠WARNING

Burn Hazard

Pipe compound may drip during first start-up.

Protect personnel and surfaces below heater prior to start-up.

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

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.

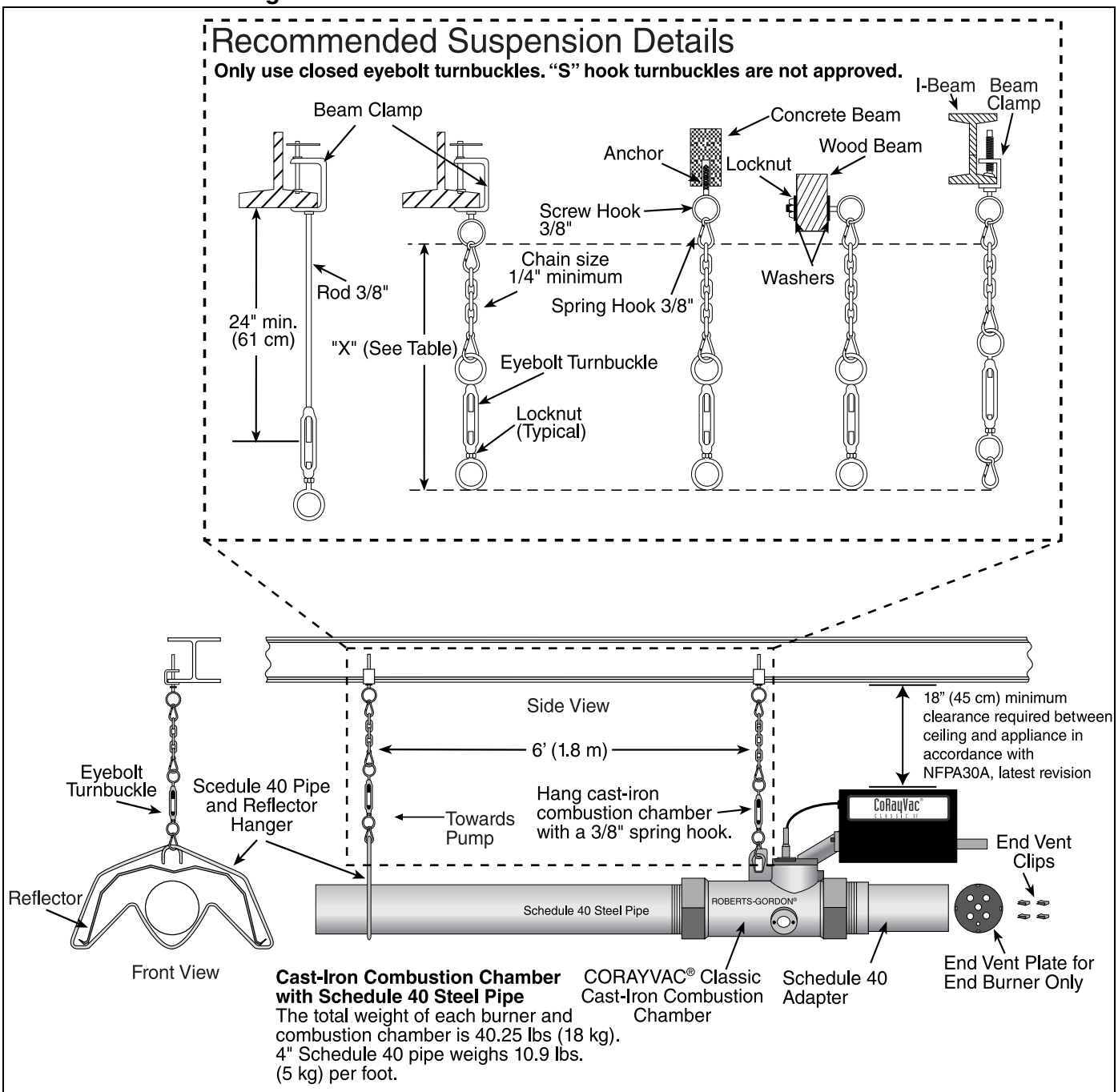
The minimum and maximum gas inlet pressures must be maintained as indicated on the rating plate.

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.

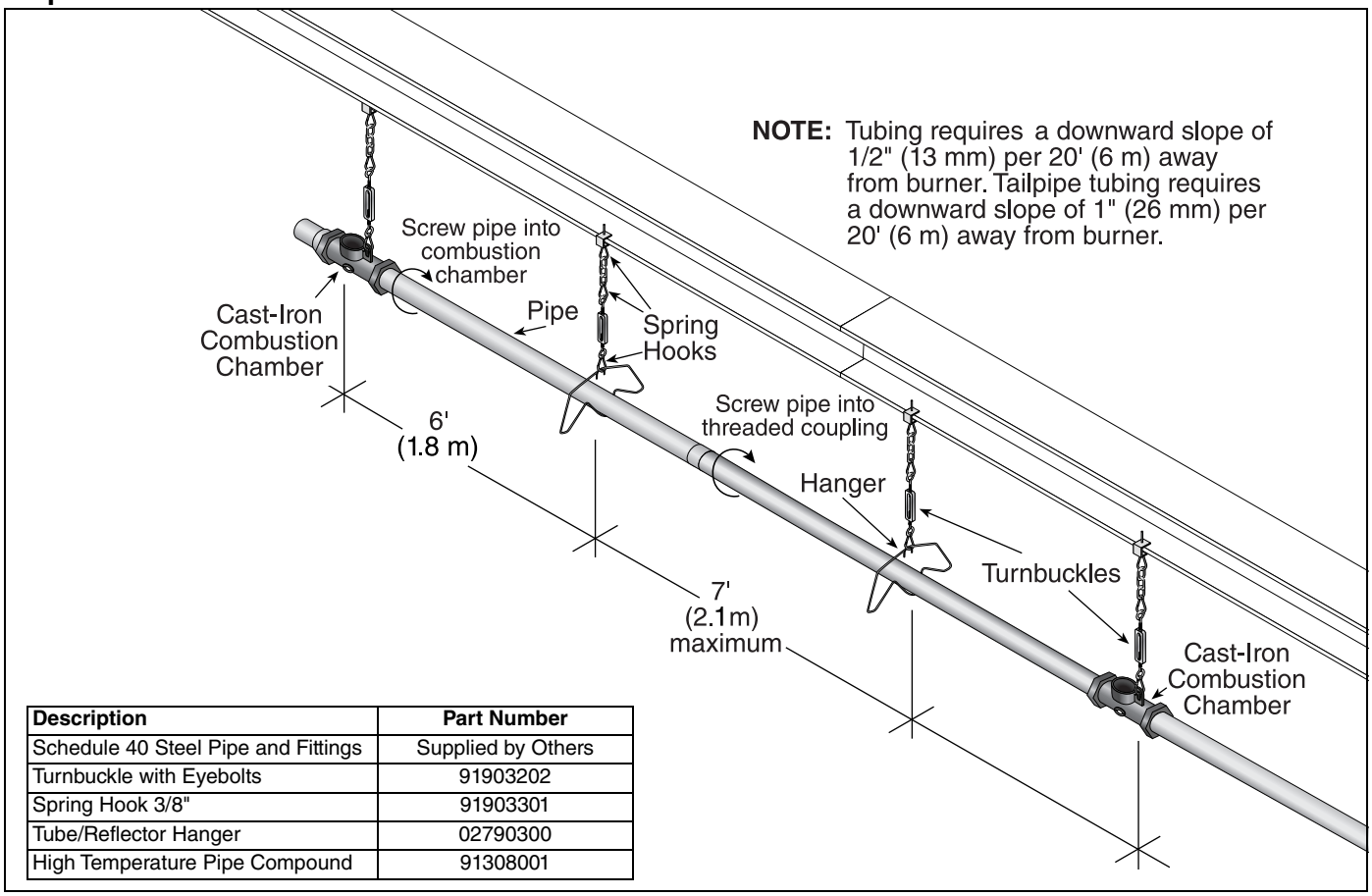
FIGURE 14: Critical Hanger Placement



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)

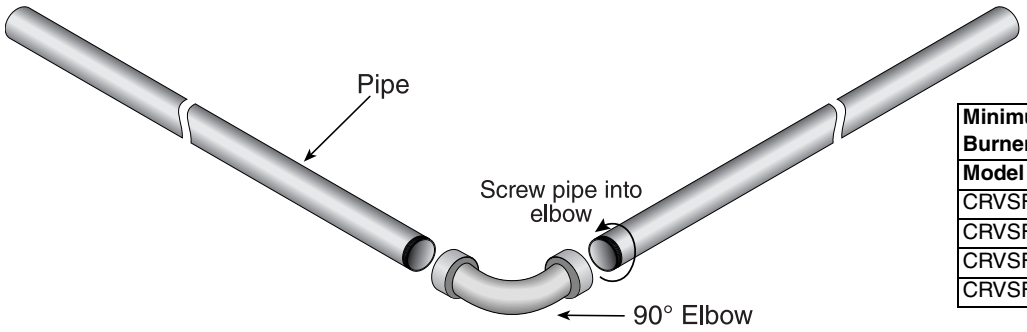
Step 8.1 Tube Installation



Description	Part Number
Schedule 40 Steel Pipe and Fittings	Supplied by Others
Turnbuckle with Eyebolts	91903202
Spring Hook 3/8"	91903301
Tube/Reflector Hanger	02790300
High Temperature Pipe Compound	91308001

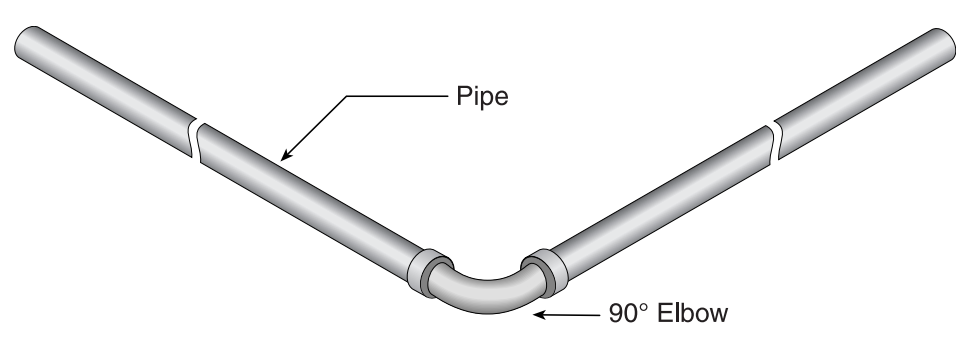
8.2 Elbow Package Configuration

Step 8.2.1 Elbow Installation



Minimum Distance Required Between Burner and Elbow	
Model	**Minimum Distance**
CRVSF-2	5' (1.5 m)
CRVSF-4	5' (1.5 m)
CRVSF-6	10' (3 m)
CRVSF-8	10' (3 m)

Step 8.2.2 Elbow Installation



Step 8.3 Reflector Installation

⚠ WARNING

Fire Hazard

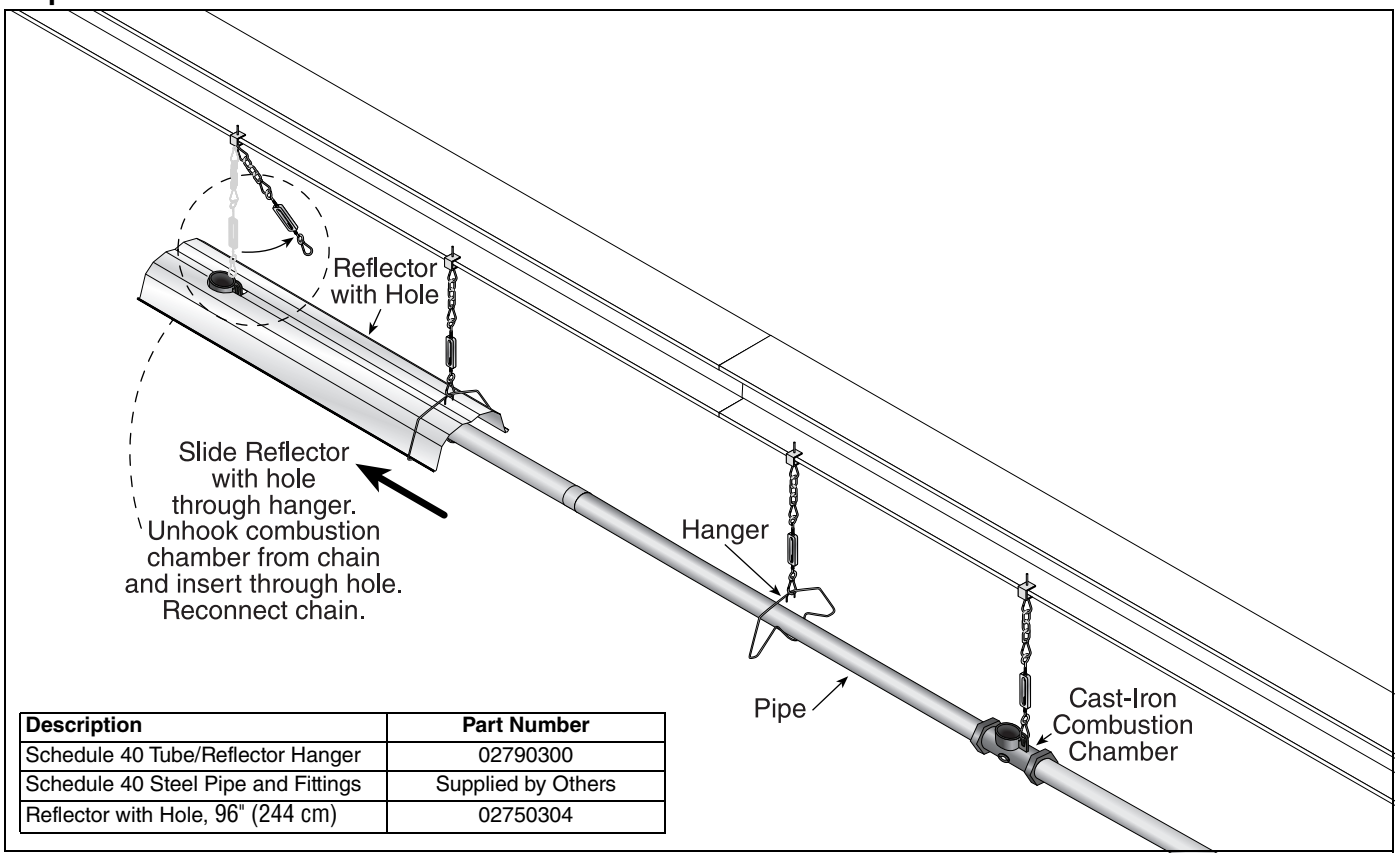
Support reflector with reflector hanger and support strap.

Reflector must not touch tube.

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

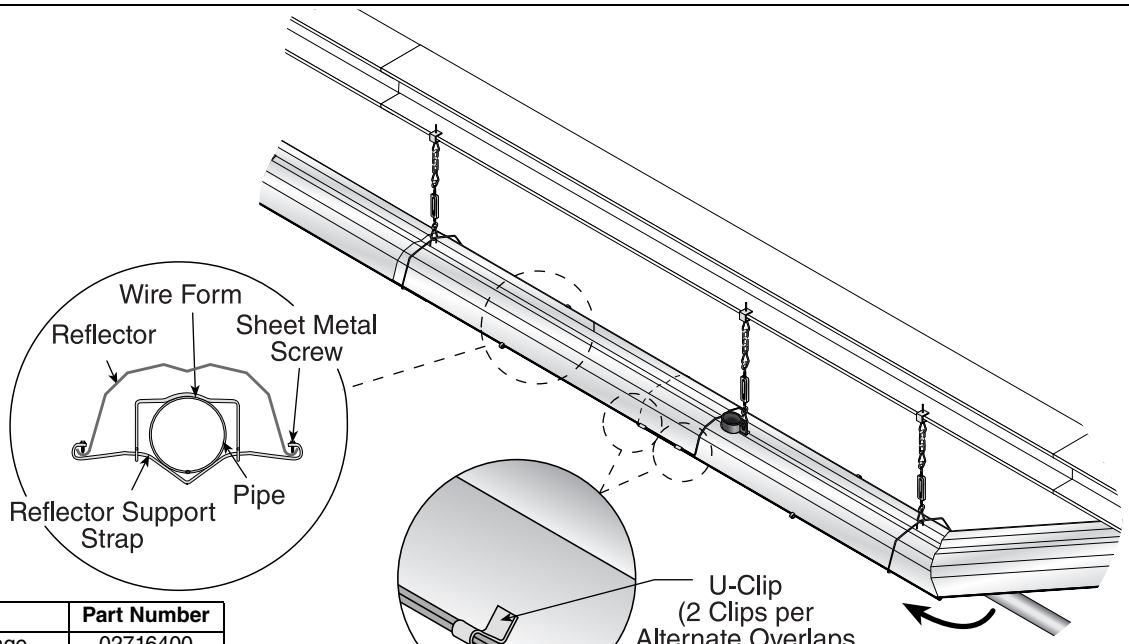
Install all threaded components with a minimum thread engagement of three threads. Apply sufficient amount of high temperature, anti-seize pipe compound (P/N 91308001 or equivalent) to threads prior to engagement.

Step 8.3.1 Reflector Installation with Hole



Description	Part Number
Schedule 40 Tube/Reflector Hanger	02790300
Schedule 40 Steel Pipe and Fittings	Supplied by Others
Reflector with Hole, 96" (244 cm)	02750304

Step 8.3.2 Reflector Installation



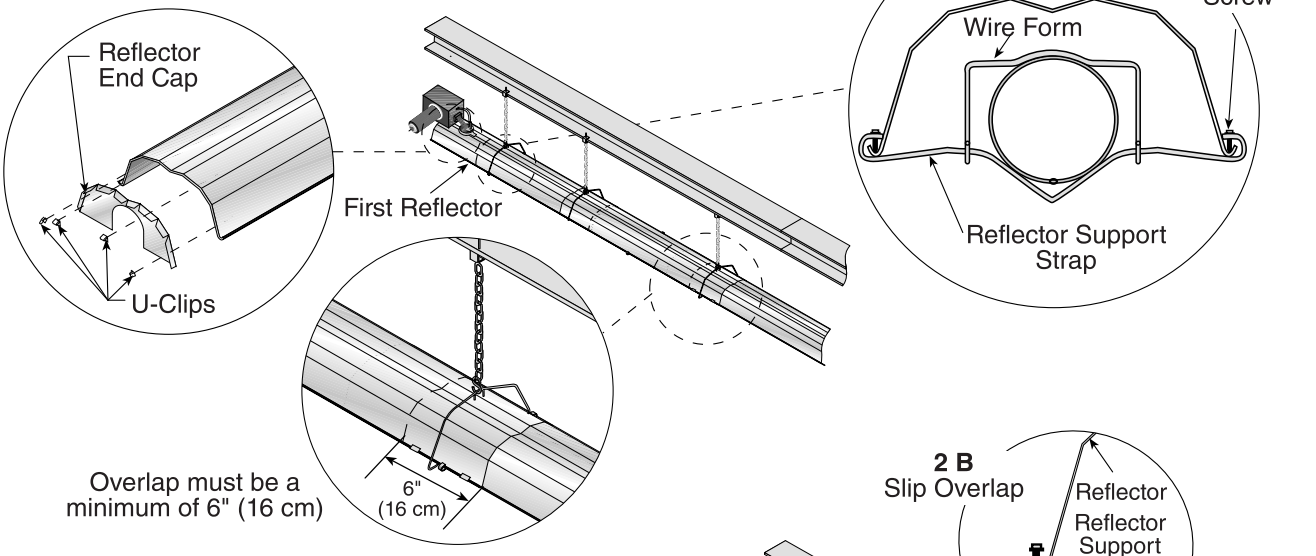
Description	Part Number
Reflector Support Package	02716400
U-Clip Package	91107720
Reflector End Cap	02750800

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.

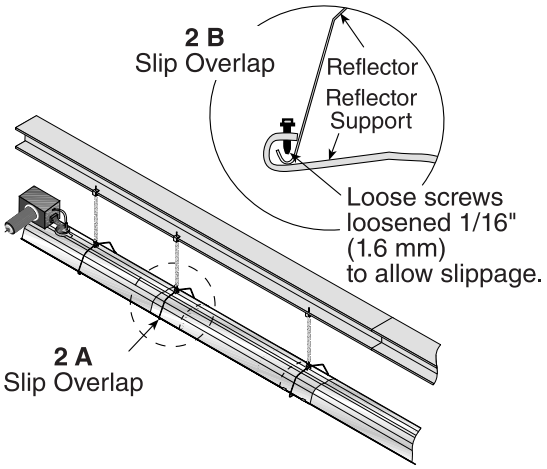
To ensure proper expansion and contraction movement of the reflectors, a combination of U-clips and reflector supports are used. The positioning of reflector supports and U-clips depend on the individual installation. Use either pop rivets or sheet metal screws instead of u-clips when installing end 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.



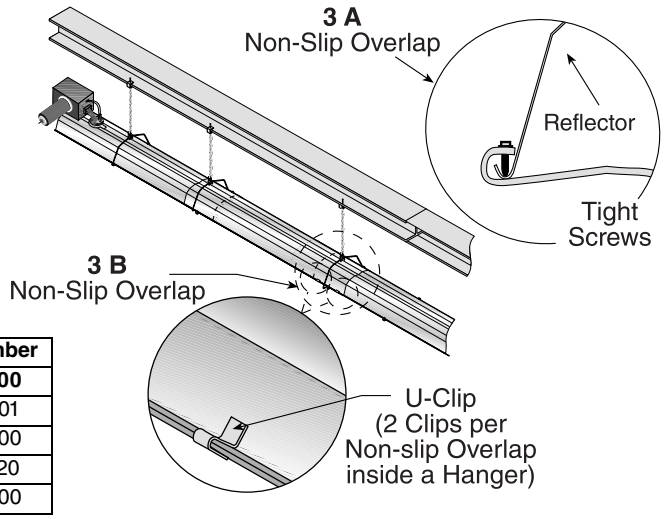
Note: For proper reflector support, the reflector with hole is placed underneath the second reflector.

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.



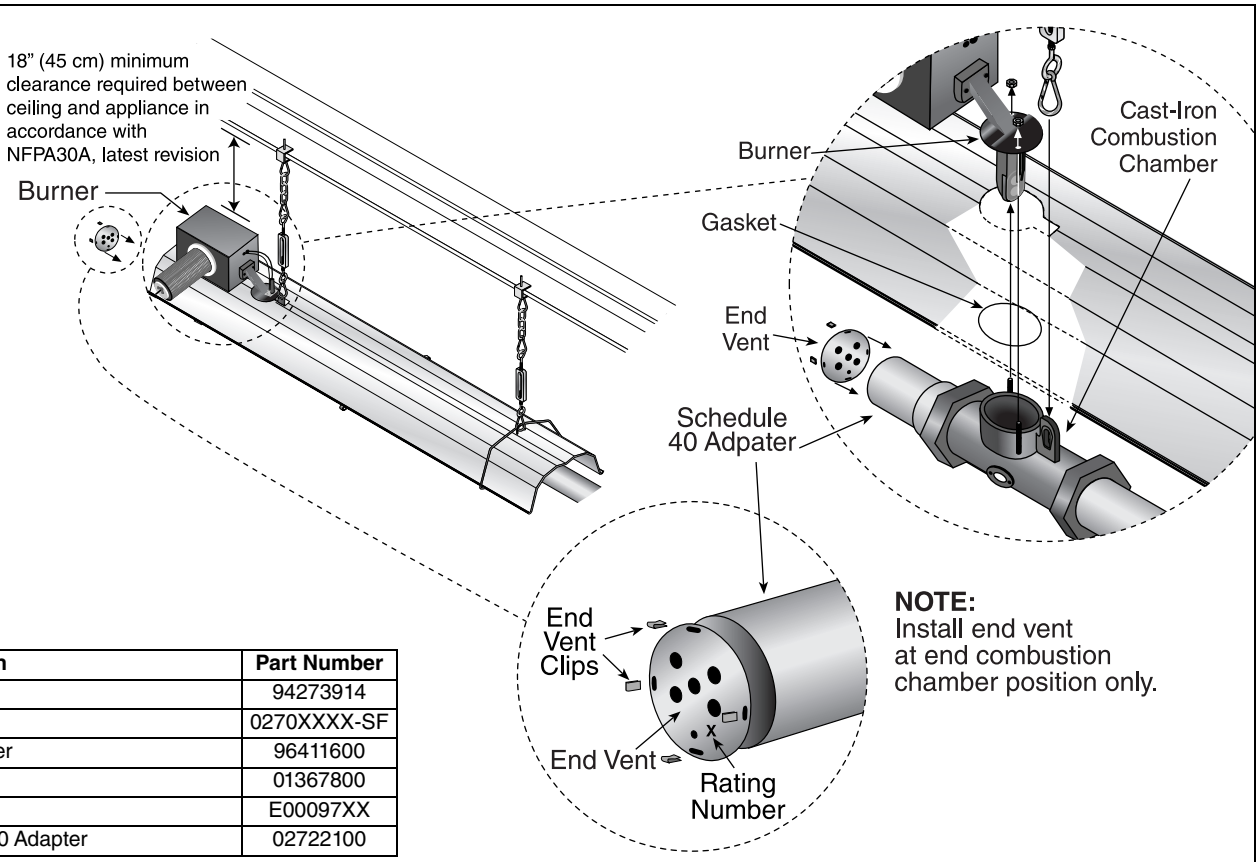
3. The remaining reflector overlaps require a **non-slip overlap connection.** To affix the reflectors together in a non-slip overlap either:
   a.) use reflector support and tight screws.
   b.) if both reflectors lay inside a hanger, u-clips or sheet metal screws may be used.

   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



Description	Part Number
Bolt	94273914
Burner	0270XXXX-SF
Lock Washer	96411600
Gasket	01367800
End Vent	E00097XX
Schedule 40 Adapter	02722100

SECTION 9: OPTIONAL HEATER ACCESSORIES

⚠ WARNING

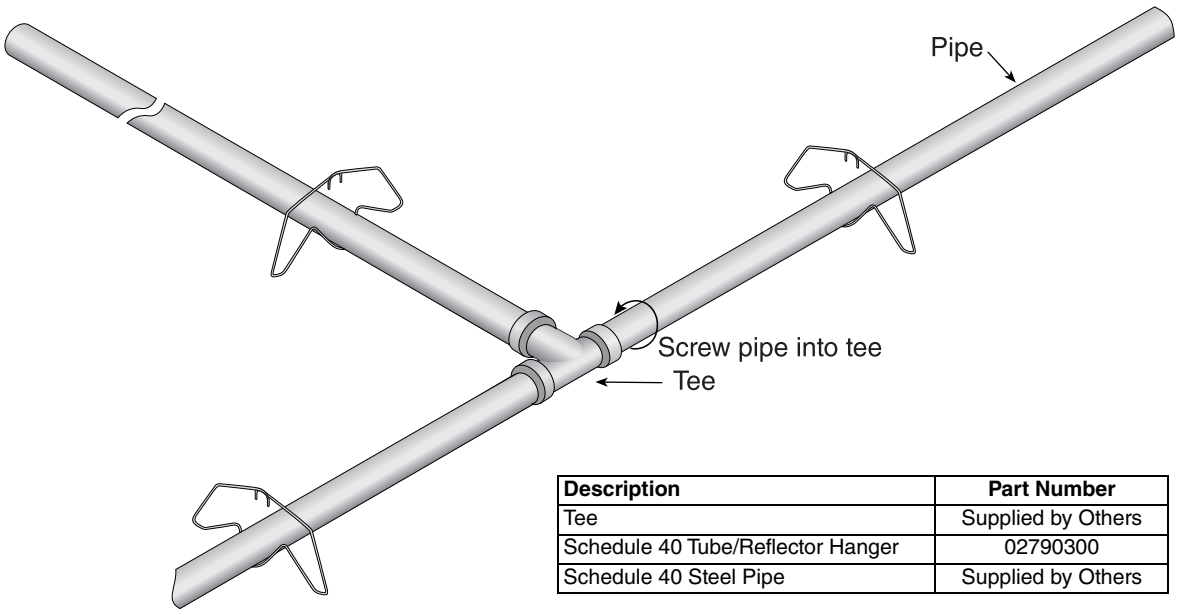
Cut/Pinch Hazard

Wear protective gear during installation, operation and service.

Edges are sharp.

Failure to follow these instructions can result in injury.

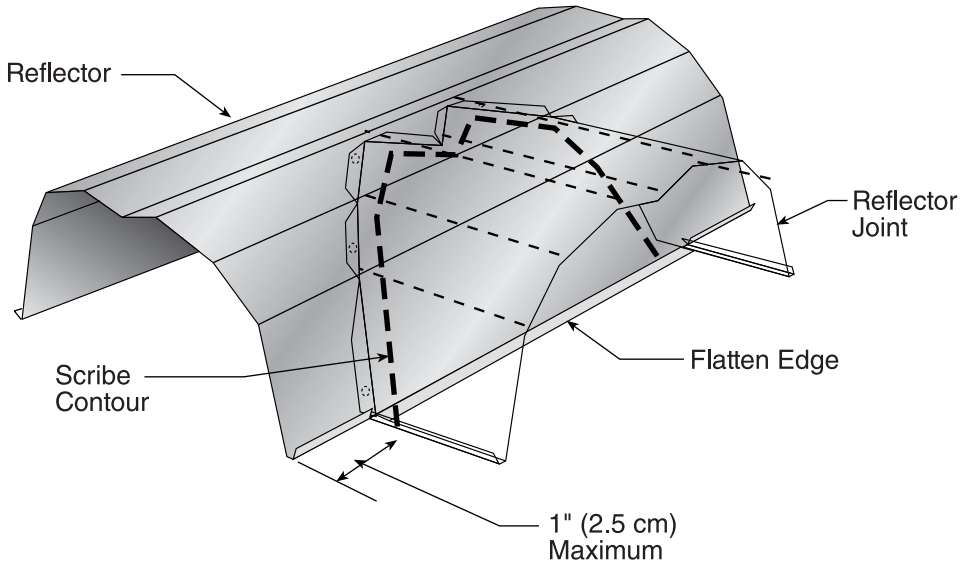
Step 9.1 Tee Installation



Description	Part Number
Tee	Supplied by Others
Schedule 40 Tube/Reflector Hanger	02790300
Schedule 40 Steel Pipe	Supplied by Others

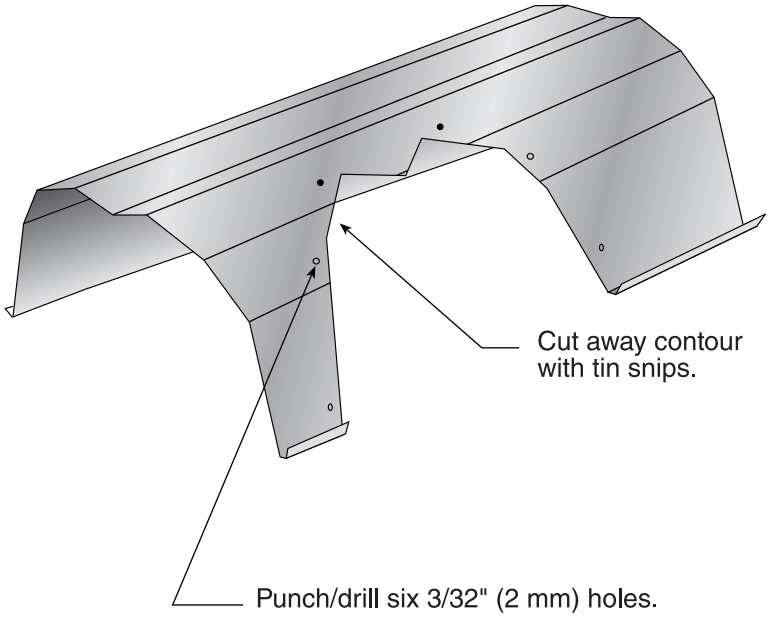
Step 9.2 Reflector Joint

Step 9.2.1 Reflector Joint Installation



Description	Part Number
Reflector End Cap	02750800
Reflector Joint	02750900
U-clip Package	91107720

Step 9.2.2 Reflector Joint Installation



Step 9.2.3 Reflector Joint Detail

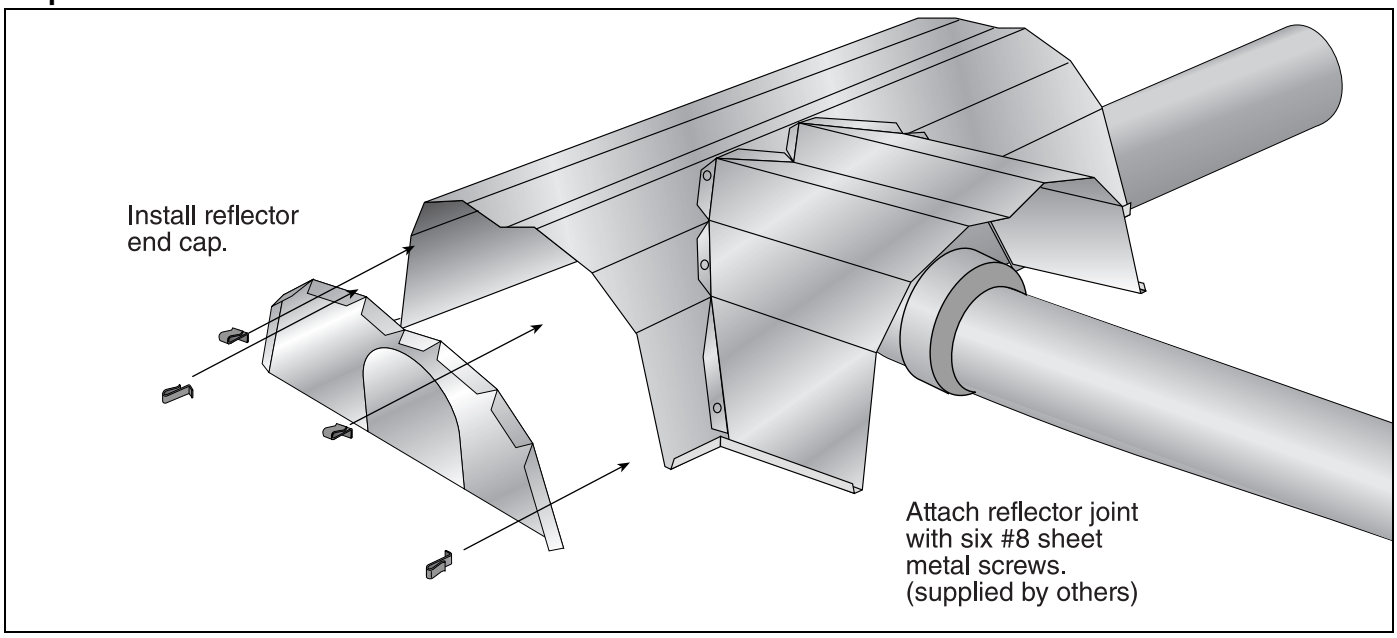
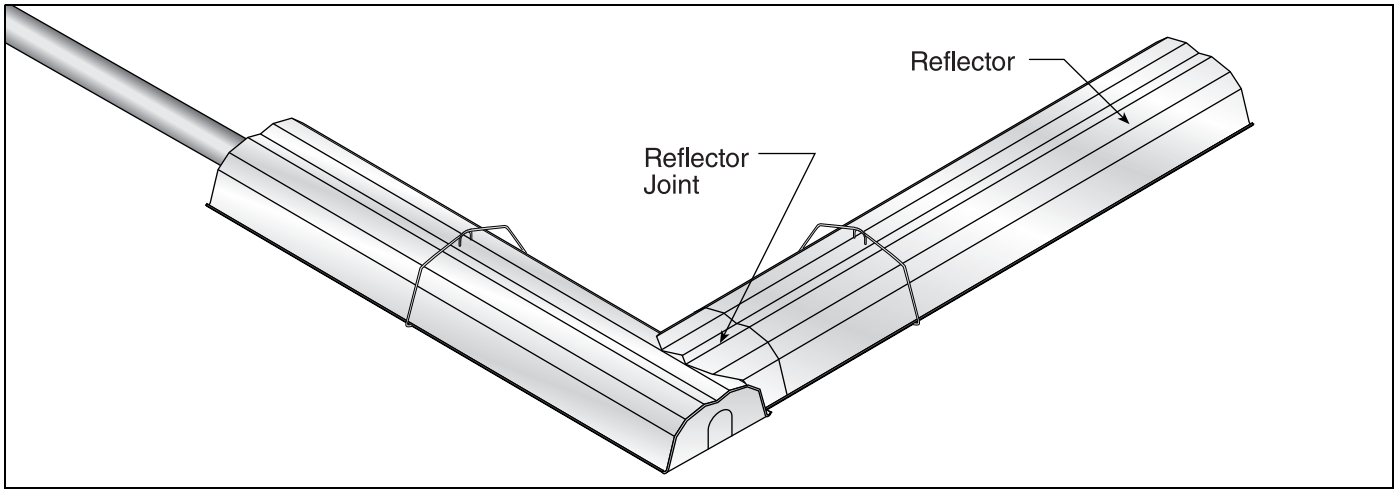
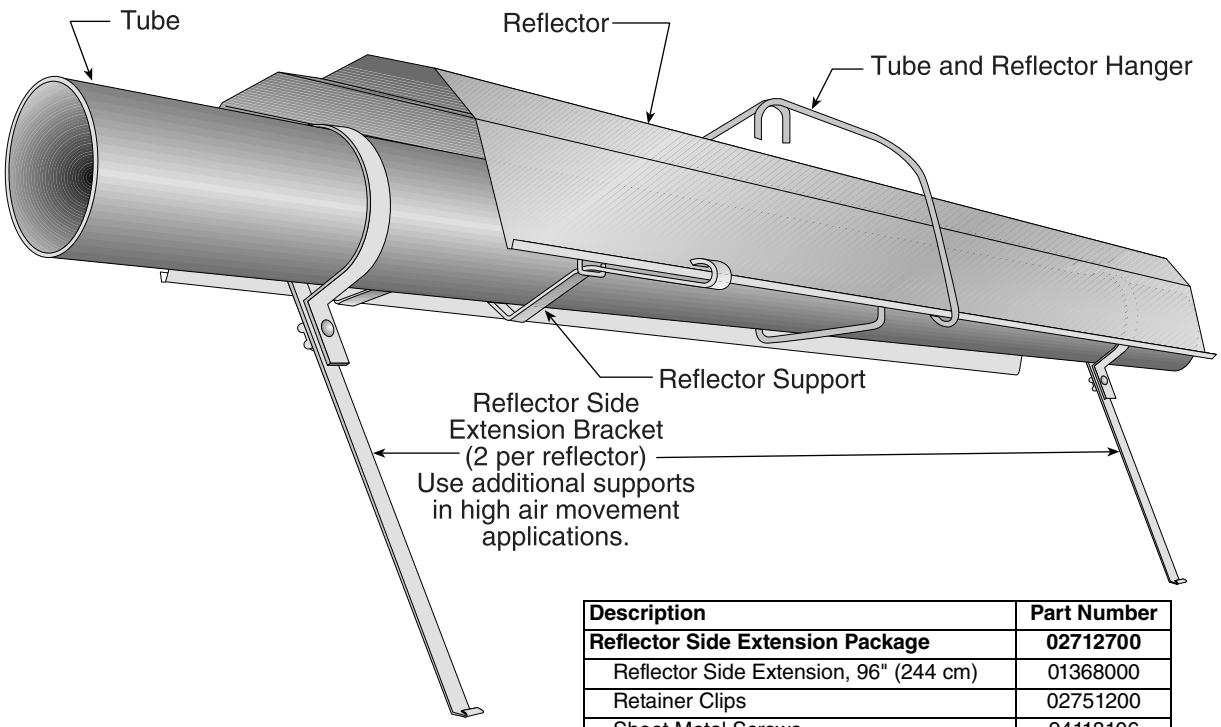


FIGURE 15: Reflector Joint Detail



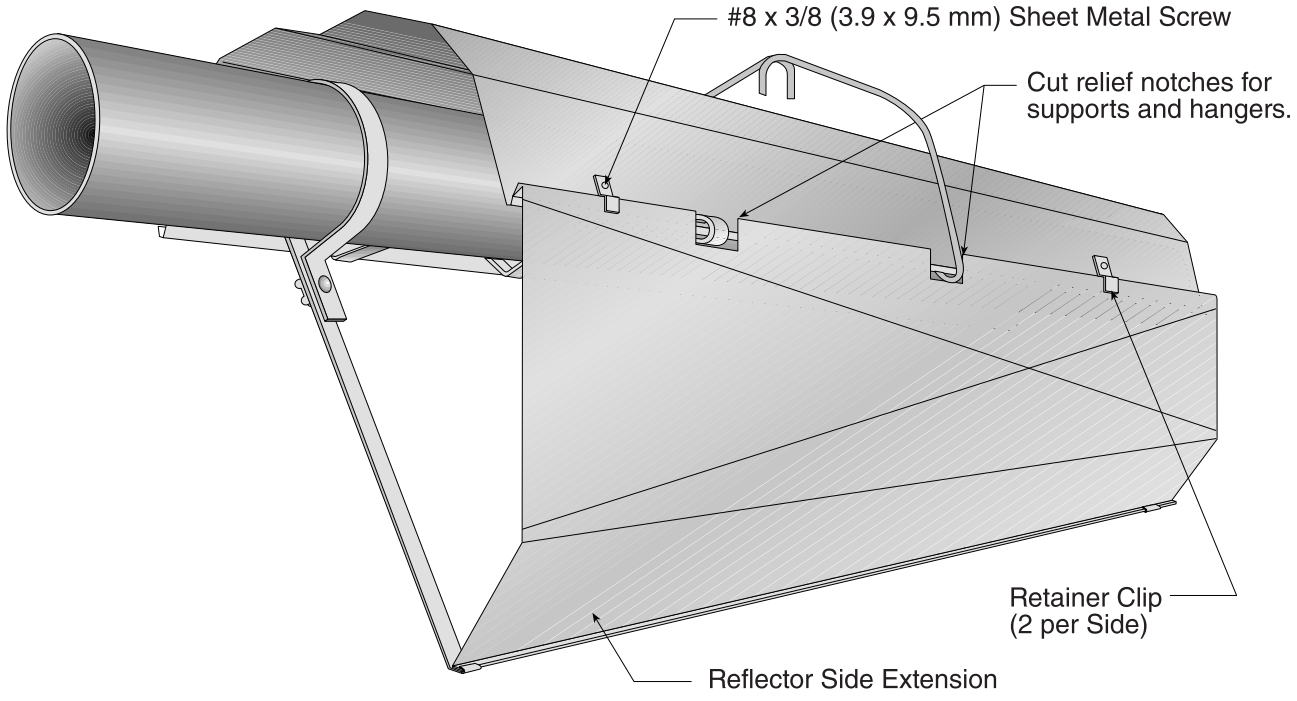
9.3 Reflector Side Extension

Step 9.3.1 Bracket Installation



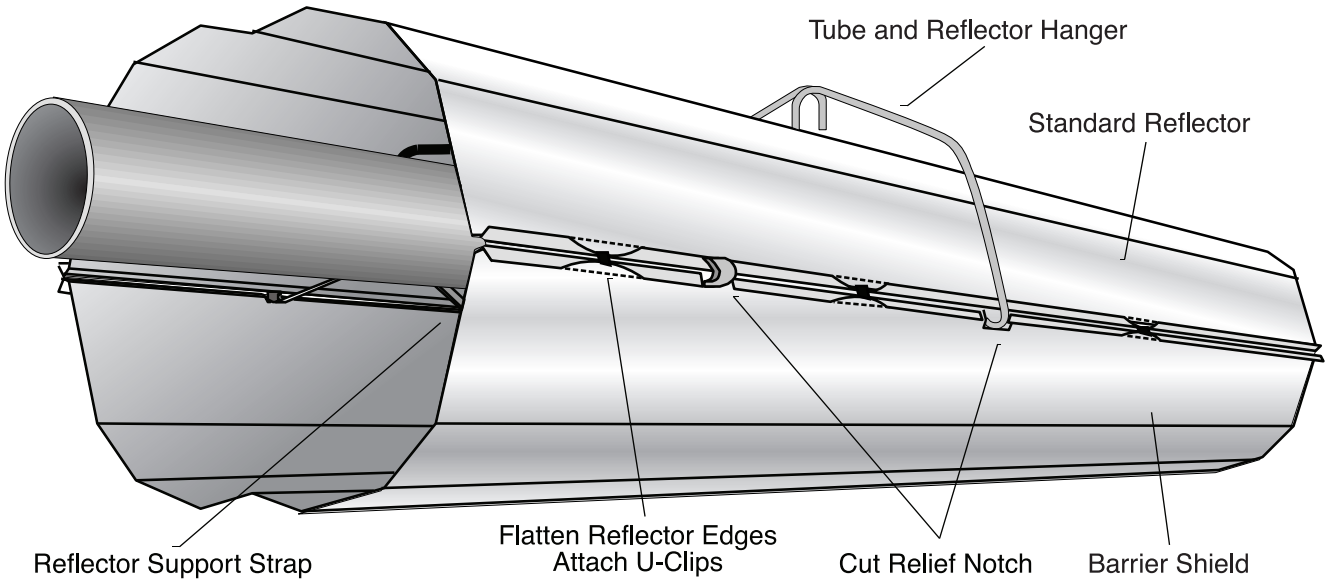
Description	Part Number
Reflector Side Extension Package	**02712700**
Reflector Side Extension, 96" (244 cm)	01368000
Retainer Clips	02751200
Sheet Metal Screws	94118106
Order Separately	
Reflector Side Extension Bracket	01329910

Step 9.3.2 Side Reflector Installation



9.4 Barrier Shield

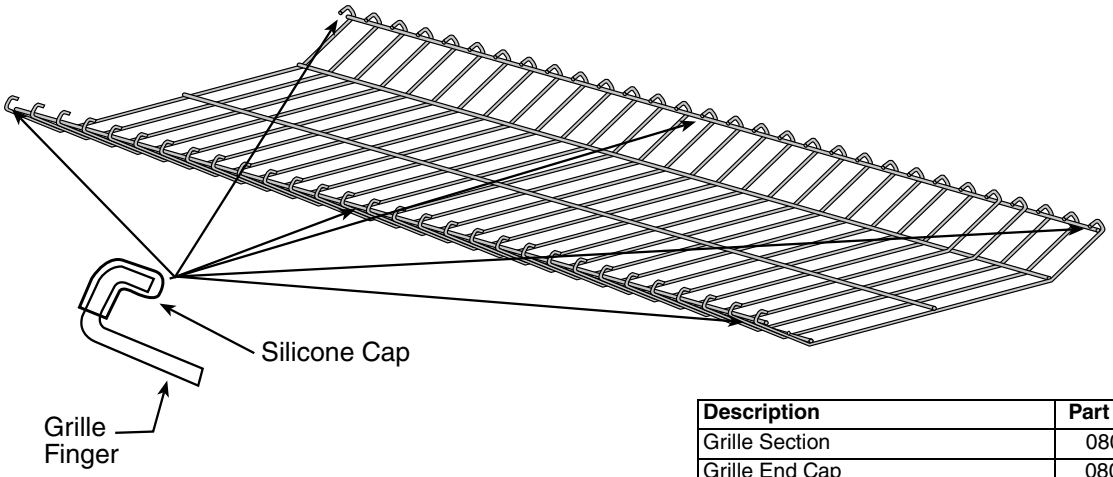
Barrier shields must be cut down to 4' (1.2 m) sections. Do not install barrier shield less than 5' (1.5 m) downstream of any burner or within 1' (.3 m) of next in-series burner. Do not install more than 1 barrier shield in between in-series burners.



Description	Part Number
Barrier Shield	02750303
U-Clip Package	91107720

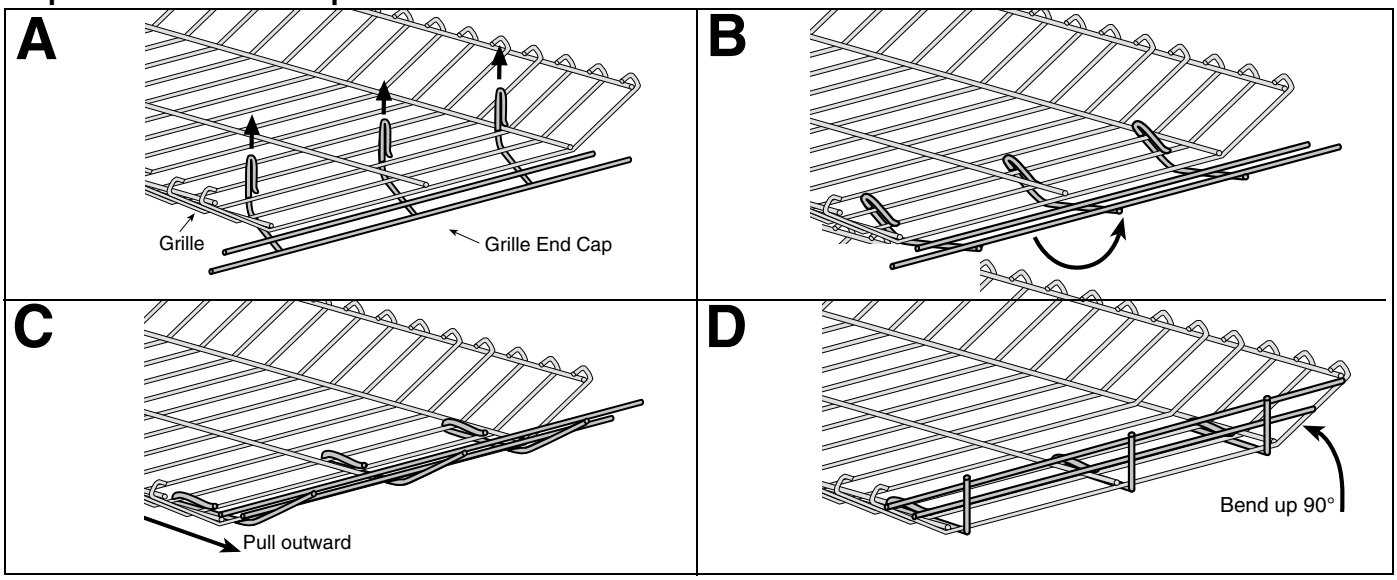
9.5 Protective Grille Installation

Step 9.5.1 Silicone Cap Installation

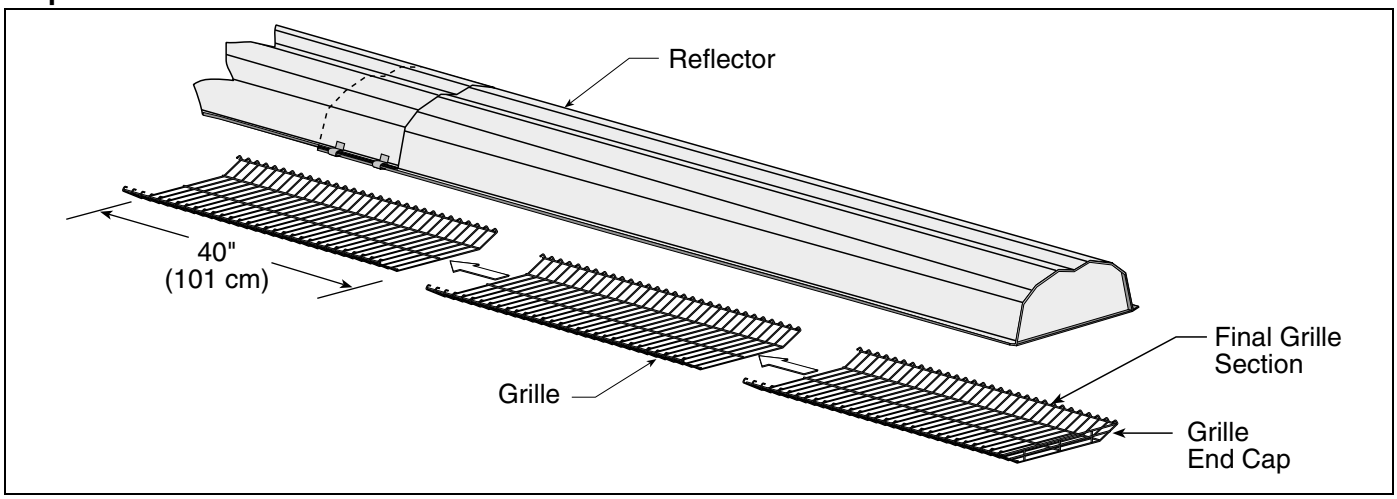


Description	Part Number
Grille Section	08050001
Grille End Cap	08050002
Silicone Cap	91915951-6P

Step 9.5.2 Grille End Cap Installation



Step 9.5.3 Grille Installation



SECTION 10: PUMP INSTALLATION AND VENTING

⚠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.

10.1 Pump Installation

For complete pump installation, including wiring and venting, please refer to the EP-100, EP-200 or EP-300 Series Installation, Operation and Service Manuals, latest edition.

FIGURE 16: Horizontal Venting Configuration (EP-100 and EP-300) (Category IV, Vent Gas Temperature Can Cause Excessive Condensation)

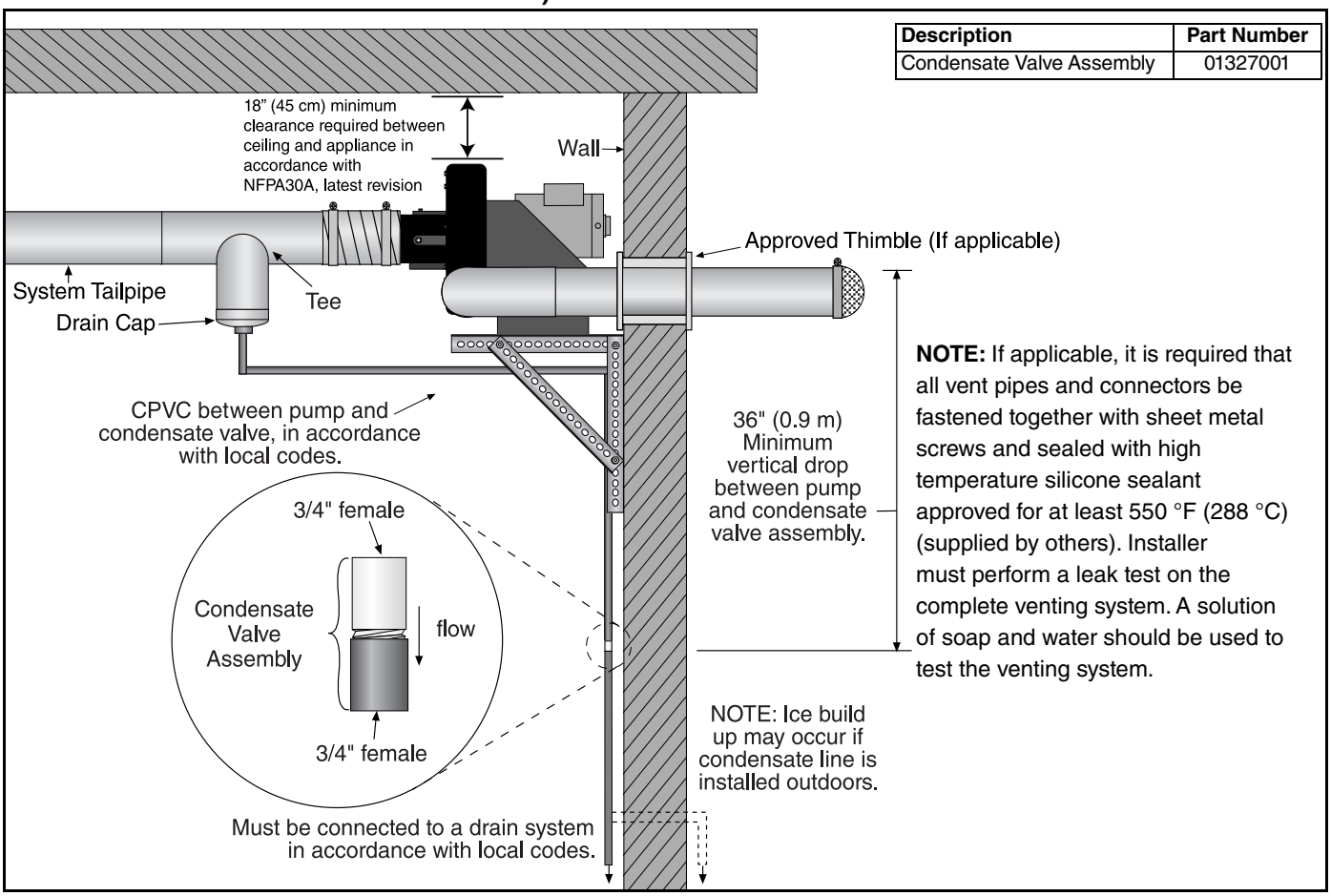
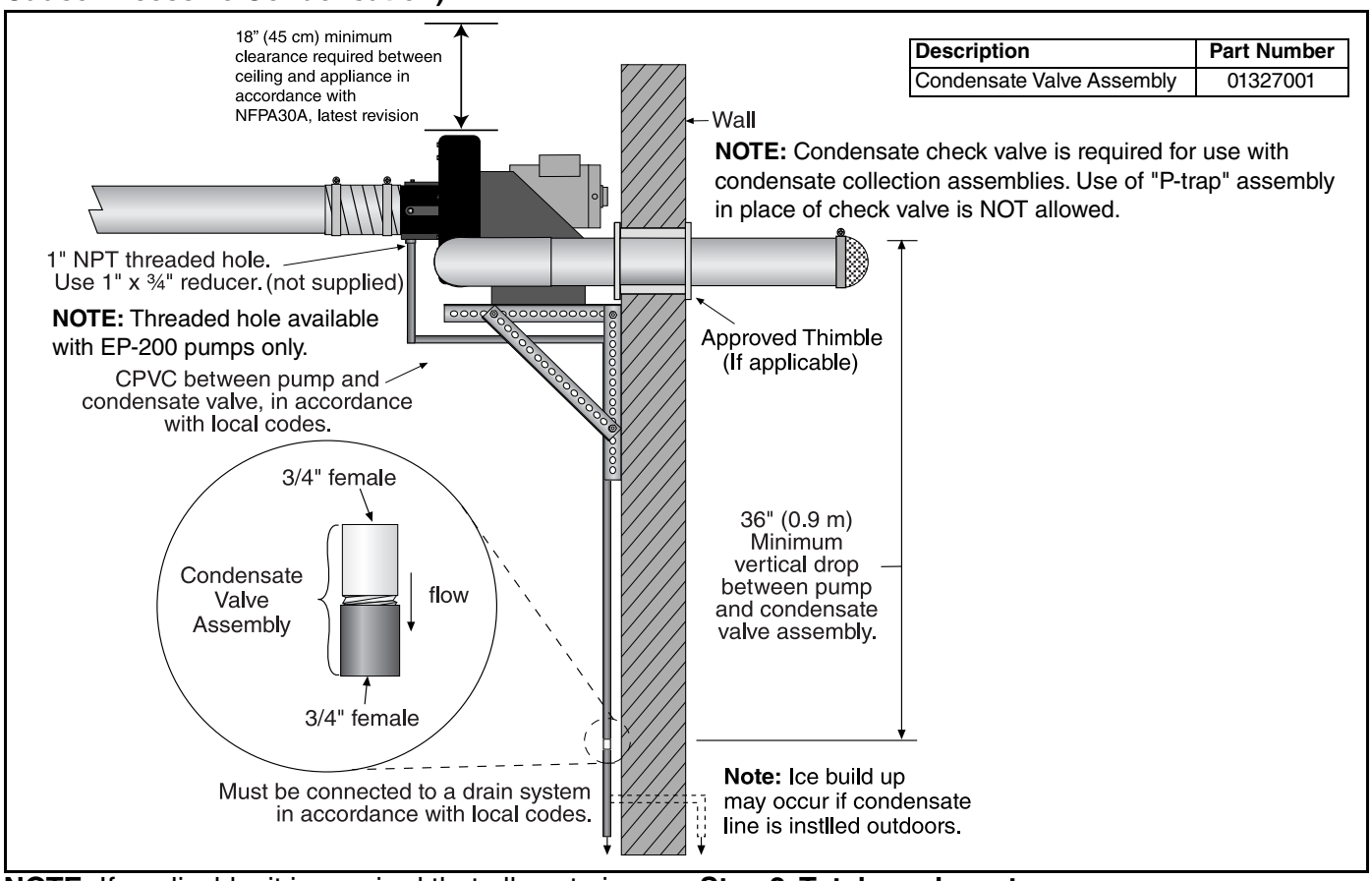


FIGURE 17: Horizontal Venting Configuration (EP-200)(Category IV, Vent Gas Temperature Can Cause Excessive Condensation)



Description	Part Number
Condensate Valve Assembly	01327001

NOTE: If applicable, it is required that all vent pipes and connectors be fastened together with sheet metal screws and sealed with high temperature silicone sealant approved for at least 550 °F (288 °C) (supplied by others). Installer must perform a leak test on the complete venting system. A solution of soap and water should be used to test the venting system.

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 41, Figure 26*.

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:

Radiant Tube Length (average distance between burners)	Tailpipe Length per Flow Unit			
	Minimum	Recommended	1.7 ft/flow unit	Maximum
Minimum	N/A	0.1	0.3	0.6
Recommended	0.1	0.3	0.6	0.8
Maximum	0.3	0.6	0.8	0.8

Step 2: Total condensate

Determine the total condensate (gal/h) using the follow 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.

Calculated gal/h	Description	Part Number
Less than 2	Condensate Neutralization Tube 200	01327002
Less than 10	Condensate Neutralization Tube 1500	01327006
Less than 20	Condensate Neutralization Tube 2000	01327005

Example:

CORAYVAC® 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.

Radiant Tube Length (average distance between burners)	**Tailpipe Length per Flow Unit**			
	Minimum	**Recommended**	1.7 ft/flow unit	Maximum
Minimum	N/A	0.1	0.3	0.6
Recommended	0.1	**0.3**	0.6	0.8
Maximum	0.3	0.6	0.8	0.8

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)

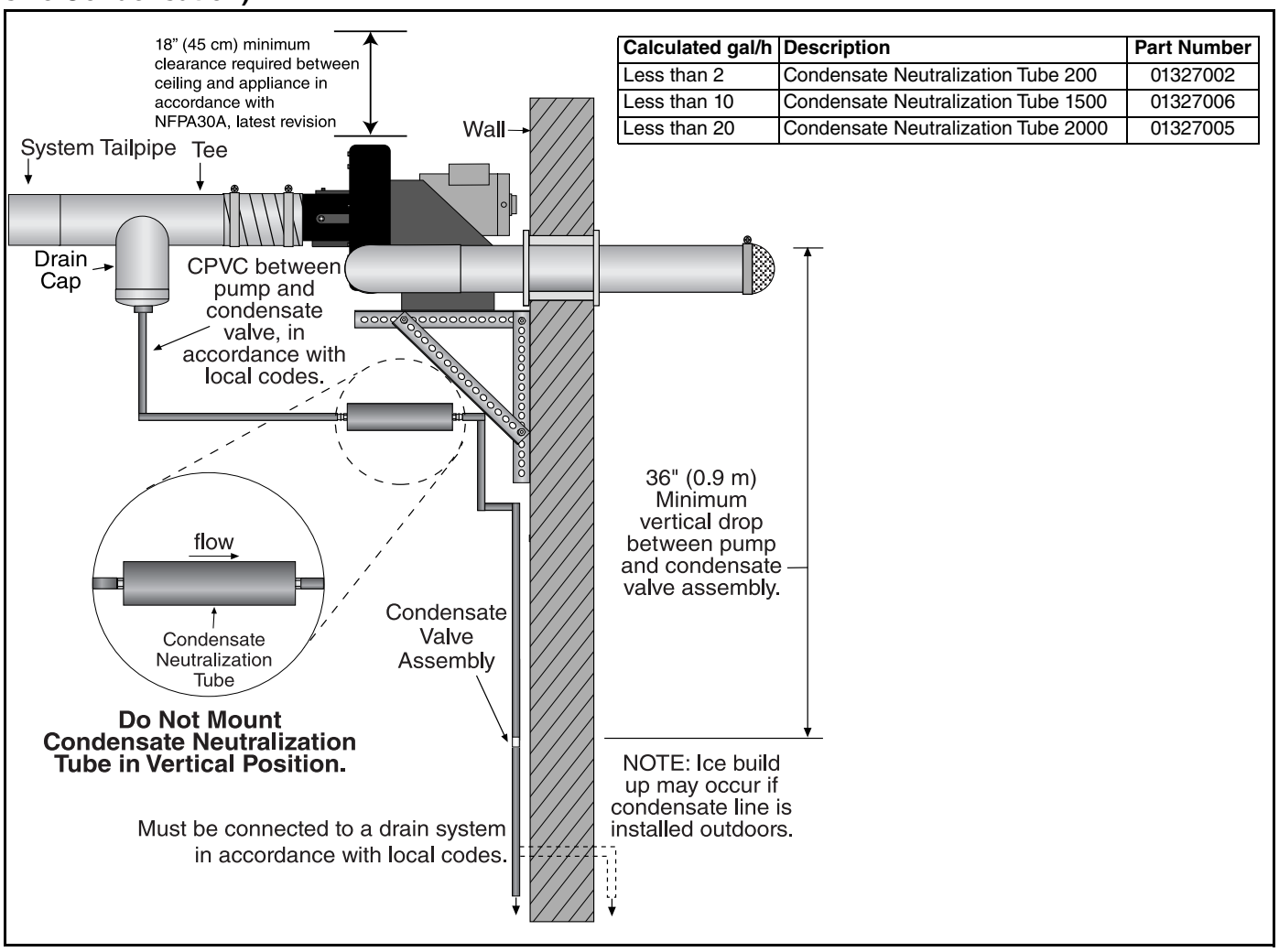
Step 3: Choose the condensate neutralization tube

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.

Calculated gal/h	**Description**	**Part Number**
Less than 2	Condensate Neutralization Tube 200	01327002
Less than 10	Condensate Neutralization Tube 1500	01327006
Less than 20	Condensate Neutralization Tube 2000	01327005

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.

FIGURE 18: Condensate Neutralization Tube (Category IV, Vent Gas Temperature Can Cause Excessive Condensation)



Calculated gal/h	Description	Part Number
Less than 2	Condensate Neutralization Tube 200	01327002
Less than 10	Condensate Neutralization Tube 1500	01327006
Less than 20	Condensate Neutralization Tube 2000	01327005

NOTE: If applicable, it is required that all vent pipes and connectors be fastened together with sheet metal screws and sealed with high temperature silicone sealant approved for at least 550 °F (288 °C) (supplied by others). Installer must perform a leak test on the complete venting system. A solution of soap and water should be used to test the venting system.

10.2 General Venting Requirements Model EP-100, EP-200 and EP-300 Series Pumps

This heating system is considered a Category III or Category IV vented system.

This heating system 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 appliance.

Step 10.2.3 Vent Category Definitions

Radiant tube heaters are divided into four categories based on the static pressure produced in the vent and the percentage flue loss.

Category I – a radiant tube heater that operates with a non-positive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent

Category II – a radiant tube heater that operates with a non-positive vent static pressure and with a vent gas temperature that can cause excessive condensate production in the vent

Category III - a radiant tube heater/heating system that operates with a positive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent

Category IV - a radiant tube heater/heating system that operates with a positive vent static pressure and with a vent gas temperature that can cause excessive condensate production in the vent

This heating system is considered a Category III or Category IV vented appliance.

CORAYVAC® heating system has a wide range of design flexibility which affects how system venting may be configured. Horizontal or vertical venting configurations do not determine venting category. CORAYVAC® Design Manual (P/N 127500NA) and *Section 9.3* must be referenced to determine if system is condensing (Category IV) or non-condensing (Category III). All condensing systems will require proper collection and disposal of condensate formed by the heating system. This manual will illustrate venting configurations and installation instructions.

10.2.4 Vertical Venting

See Page 45, Figure 27 for recommended vertical venting options.

Approved venting material for vertical venting (Category III or Category IV) must be single-wall corrosion resistant with a thickness of no less than 26 gauge. If applicable, it is required that all vent pipes and connectors be fastened together with sheet metal screws and sealed with high temperature silicone sealant approved for at least 550 °F (288 °C) (supplied by others). The installer must perform a leak test on the complete venting system. A solution of soap and water should be used to test the venting system. Vertical venting (Category III or Category IV) does not allow the use of type B-vent inside of the space.

Category IV venting requires condensate collection method to properly collected and dispose of condensate formed by the heating system. This manual will illustrate examples of proper condensation collection methods.

10.2.5 Horizontal Venting

See Page 46, Figure 28 through Page 48, Figure 10 for recommended horizontal venting options.

Approved venting material for horizontal venting (Category III or Category IV) must be single-wall corrosion resistant with a thickness of no less than 26 gauge. If applicable, it is required that all vent pipes and connectors be fastened together with sheet metal screws and sealed with high temperature silicone sealant approved for at least 550 °F (288 °C) (supplied by others). The installer must perform a leak test on the complete venting system. A solution of soap and water should be used to test the venting system. Horizontal venting (Category III or Category IV) does not allow the use of type B-vent inside of the space.

Category IV venting requires condensate collection method to properly collected and dispose of condensate formed by the heating system. This manual will illustrate examples of proper condensation collection methods.

NOTE: Category I or Category II is not a possible configuration with this heating system.

10.2.6 Length Requirements

See EP-100, EP-200 or EP-300 Pump Series Installation, Operation and Service Manuals for complete venting options.

Vent lengths are allowed as follows:

Vent Length	EP-300 Vent Size	EP-200 Vent Size	EP-100 Vent Size
Up to 10' (3 m)	6" (15 cm) - 1 elbow	4" (10 cm) - 1 elbow	4" (10 cm) - 3 elbows
Up to 25' (8 m)	7" (18 cm) - 3 elbow	5" (12.7 cm) - 3 elbows	4" (10 cm) - 3 elbows
Up to 50' (15 m)	8" (20 cm) - 3 elbow	6" (15 cm) - 3 elbows	5" (12.7 cm) - 3 elbows

NOTE: If applicable, it is required that all vent pipes and connectors be fastened together with sheet metal screws and sealed with high temperature silicone sealant approved for at least 550 °F (288 °C) (supplied by others). Installer must perform a leak test on the complete venting system. A solution of soap and water should be used to test the venting system. Insulation and additional sealing measures may 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.

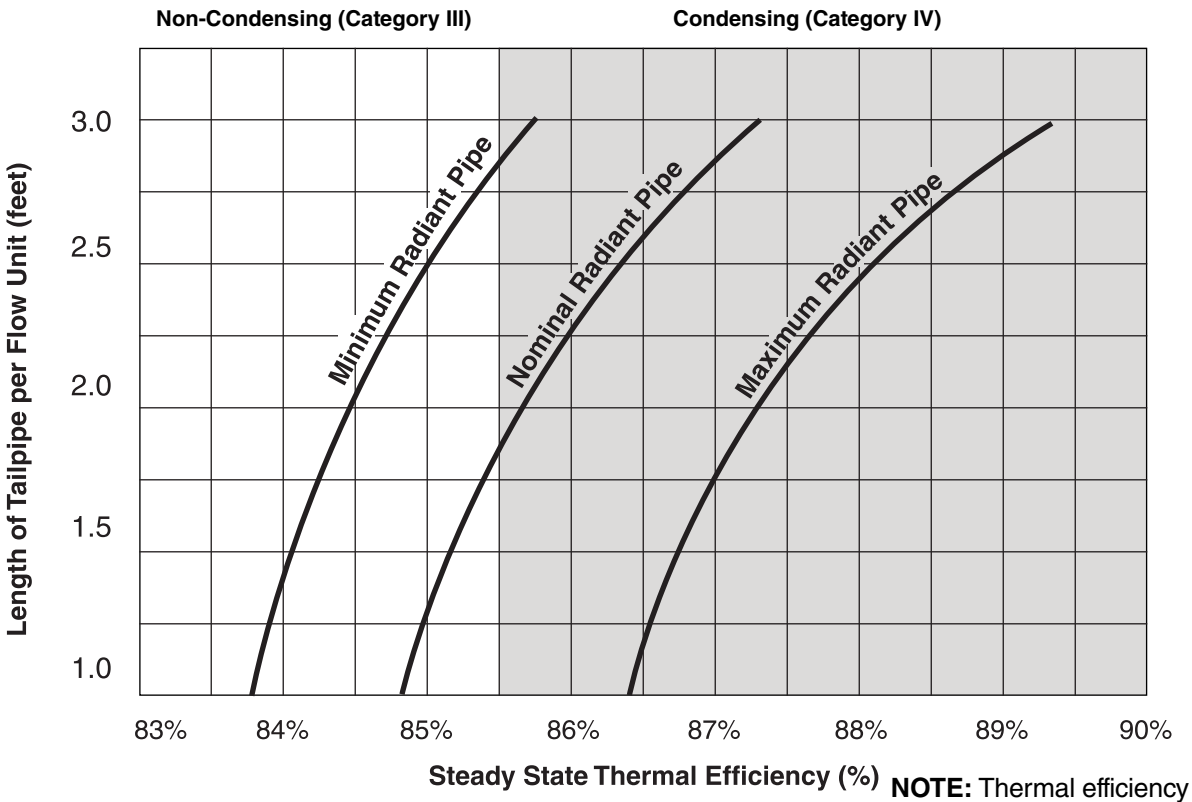
10.2.7 Vent Material Recommendations

Vent recommendations:

1. Schedule 40 ASTM A53 (Latest Edition) hot-dipped galvanized steel pipe.

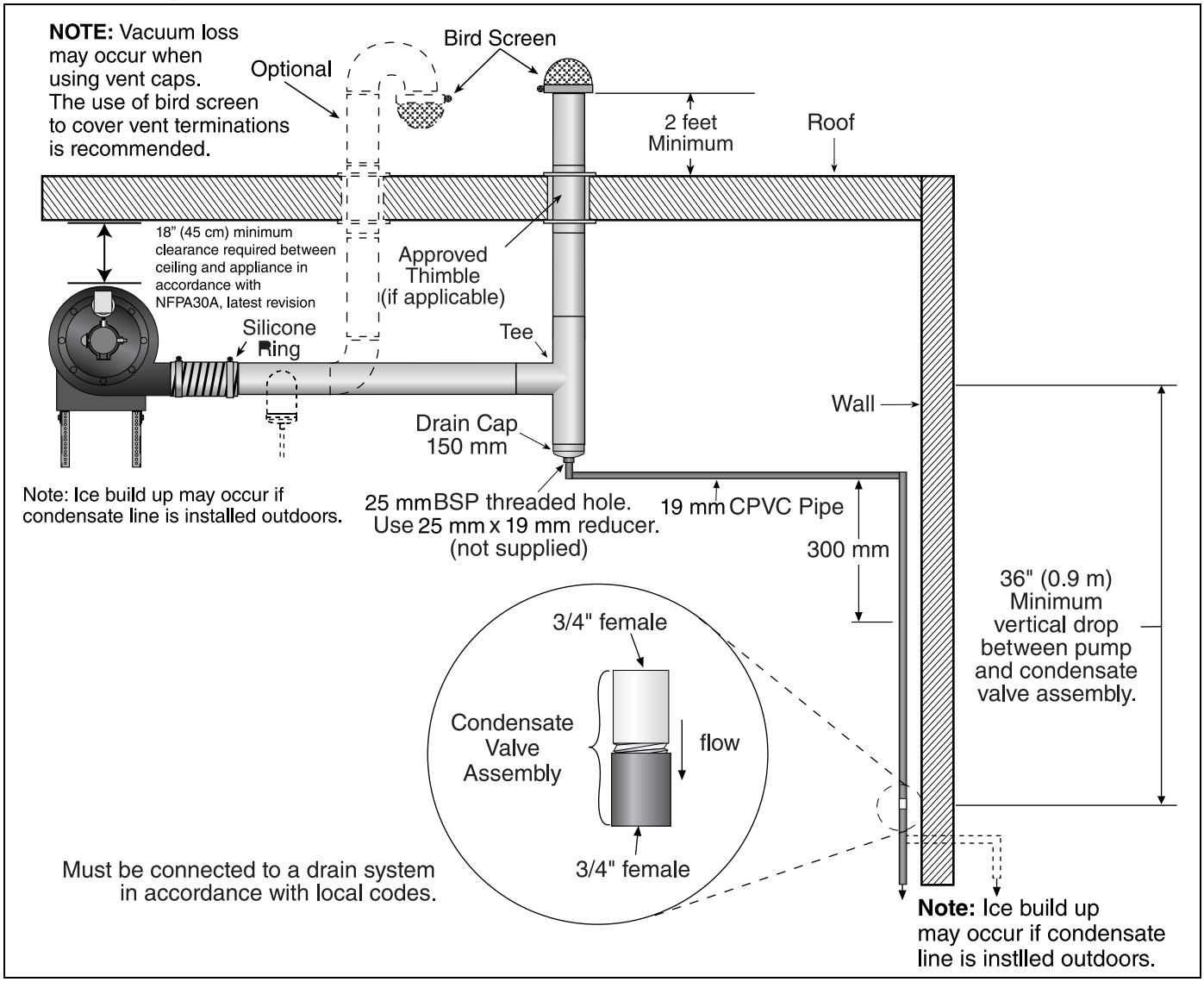
10.3 Tube Length vs Efficiency

Vent gas temperatures determine if heating system falls under Category III or Category IV. Graph below is used to calculate thermal efficiency which will influence vent gas temperatures and determine vent category defined below as "Non-Condensing (Category III)" and "Condensing (Category IV)".



NOTE: Thermal efficiency values shown do not include the contribution due to condensing conditions when operating in cyclic fashion. To estimate cyclic efficiencies, add 2-3% to the values obtained from the graph.

FIGURE 19: Vertical Venting Configuration (Category IV, Vent Gas Temperature Can Cause Excessive Condensation)



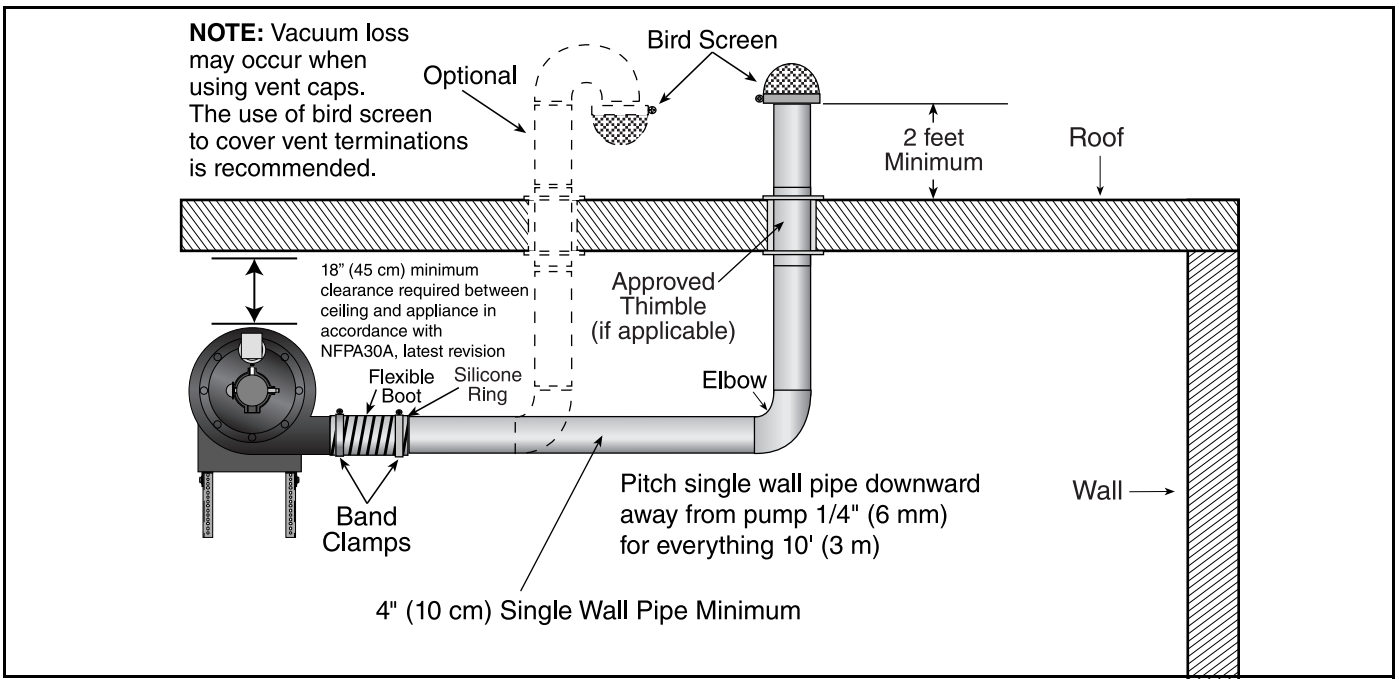
Part Number	Description
01330203	Tee, 4" (10 cm) Aluminized
01330204	Tee, 6" (15 cm) Aluminized
01335801	Elbow, 4" (10 cm) Aluminized 90°
02718851	Drain Cap, 4" (10 cm)
02718852	Drain Cap Assembly, 6" (15 cm)
01327002	Condensate Neutralization Tube 200
01327006	Condensate Neutralization Tube 1500
01327005	Condensate Neutralization Tube 2000
90502300	Vent Cap, 4" (10 cm) Metalbestos
90502302	Vent Cap, 6" (15 cm) Metalbestos

Part Number	Description
91412801	Flexible Boot, 4.5" (11 cm)
91412802	Flexible Boot, 6" (15 cm)
91901300	Boot Clamp, 4" (10 cm)
91913703	Boot Clamp, 6" (15 cm)
T0100320	Elbow, 6" (15 cm) Aluminized 90°
01365400	Bird Screen 4" (10 cm)
01397400	Bird Screen 6" (15 cm)
01335901	Alumized U-Tube 4" (10 cm)
91906900	Silicone Ring
01327001	Condensate Valve Assembly

NOTE: If applicable, it is required that all vent pipes and connectors be fastened together with sheet metal screws and sealed with high temperature silicone sealant approved for at least 550 °F (288 °C) (supplied by

others). Installer must perform a leak test on the complete venting system. A solution of soap and water should be used to test the venting system.

FIGURE 20: EP-100 and EP-200 Vertical Venting Configurations (Category III, Vent Gas Temperature Avoids Excessive Condensation)



NOTE: If applicable, it is required that all vent pipes and connectors be fastened together with sheet metal screws and sealed with high temperature silicone sealant approved for at least 550 °F (288 °C) (supplied by others). Installer must perform a leak test on the complete venting system. A solution of soap and water should be used to test the venting system.

FIGURE 21: EP-100 and EP-200 Horizontal Venting Configurations (Category III, Vent Gas Temperature Avoids Excessive Condensation)

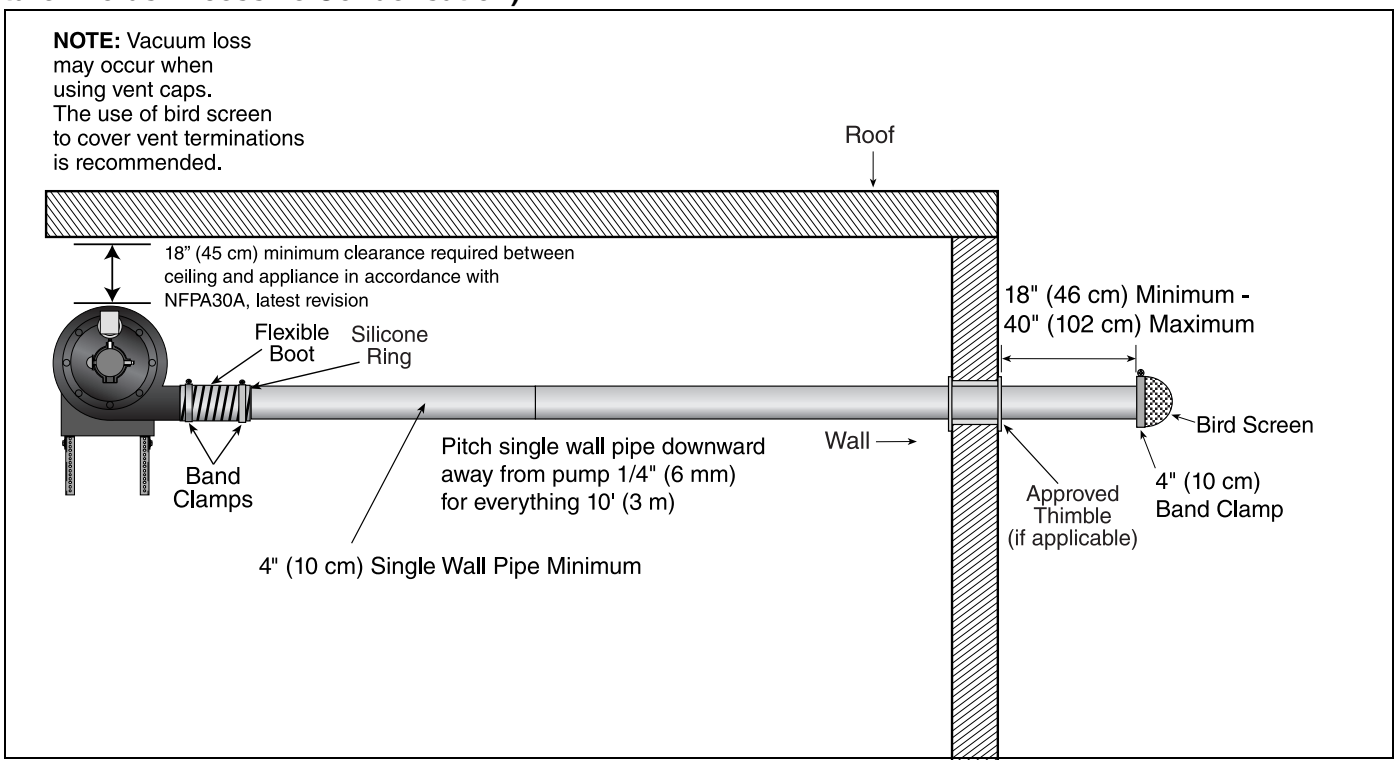
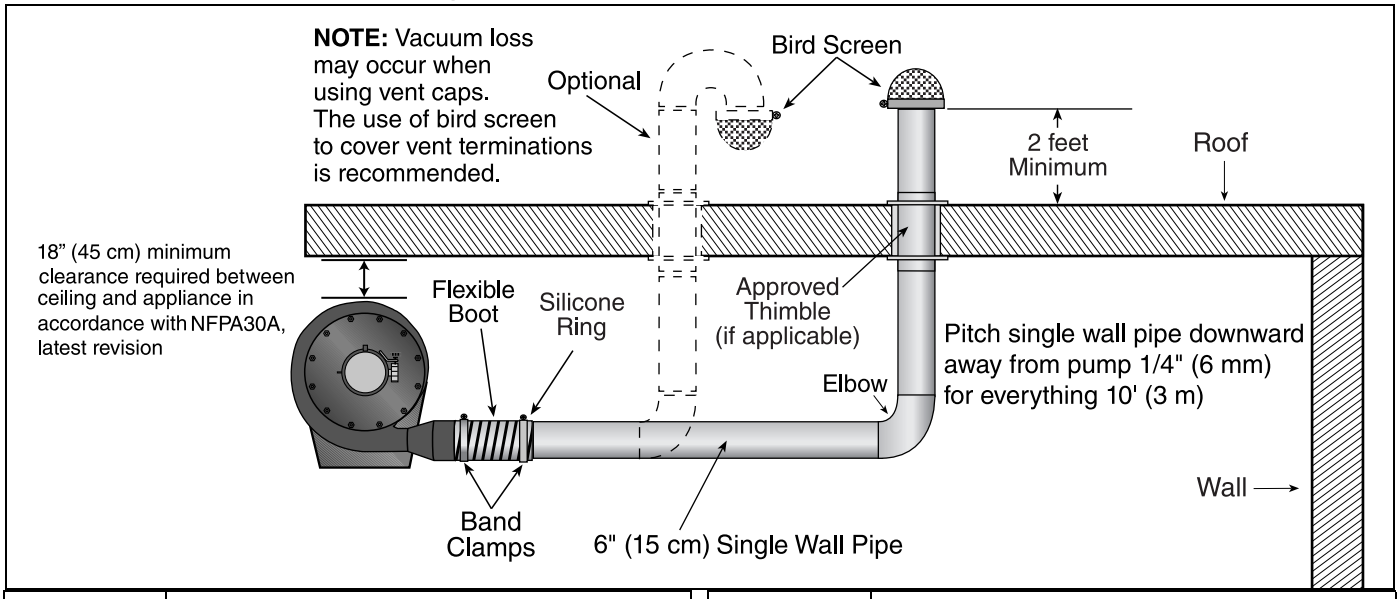


FIGURE 22: EP-300 Series Vertical Venting Configurations (Category III, Vent Gas Temperature Avoids Excessive Condensation)

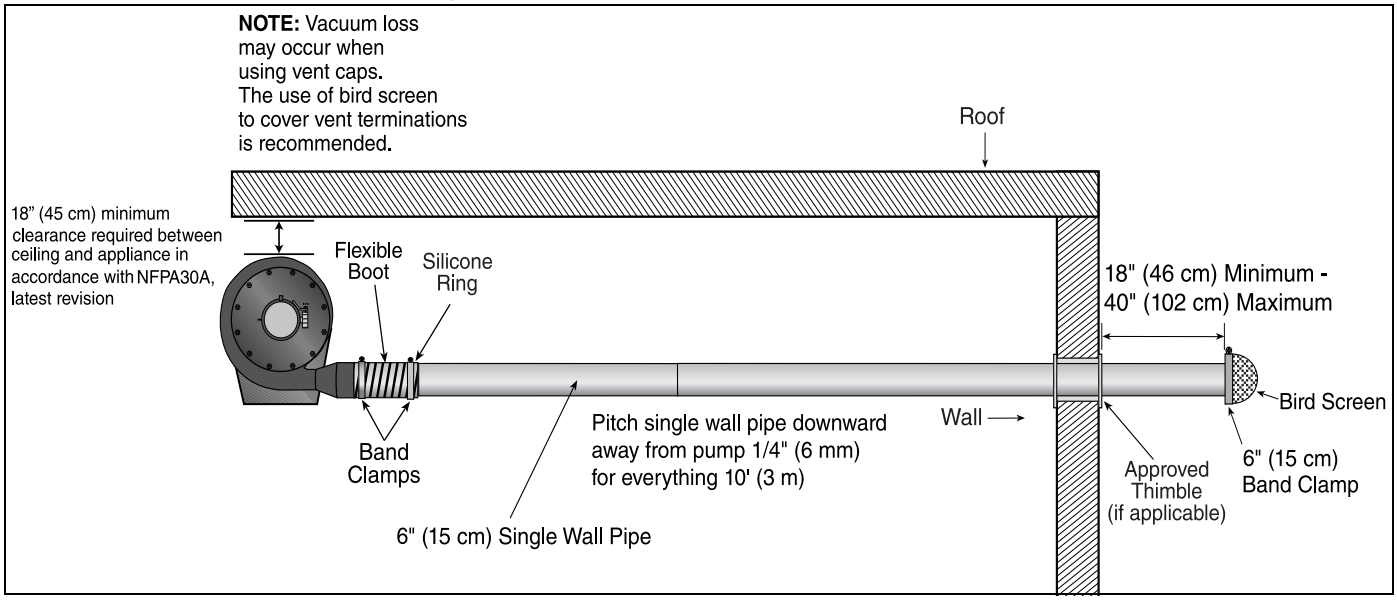


Part Number	Description
01330203	Tee, 4" (10 cm) Aluminized
01331900	Damper Coupling, 4" (10 cm)
01335801	Elbow, 4" (10 cm) Aluminized 90°
01365400	Bird Screen, 4" (10 cm)
01397400	Bird Screen, 6" (15 cm)
02718851	4" Drain Cap
01327002	Condensate Neutralization Tube 200
01327006	Condensate Neutralization Tube 1500

Part Number	Description
01327005	Condensate Neutralization Tube 2000
91409403	Tube, Aluminized 4" (10 cm) dia. 10' (3 m)
91409420	Tube, Aluminized 6" (15 cm) dia. 10' (3 m)
91412801	Flexible Boot, 4.5" (11 cm)
91418200	Tube Adapter, 6" (15.2 cm) dia. x 4" (10 cm) dia.
91901300	Boot Clamp, 4" (10 cm)
91906900	Silicone Ring
91412802	Flexible Boot, 6" (13cm)

NOTE: If applicable, it is required that all vent pipes and connectors be fastened together with sheet metal screws and sealed with high temperature silicone sealant approved for at least 550 °F (288 °C) (supplied by others). Installer must perform a leak test on the complete venting system. A solution of soap and water should be used to test the venting system.

FIGURE 23: EP-300 Series Horizontal Venting Configurations (Category III, Vent Gas Temperature Avoids Excessive Condensation)



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.

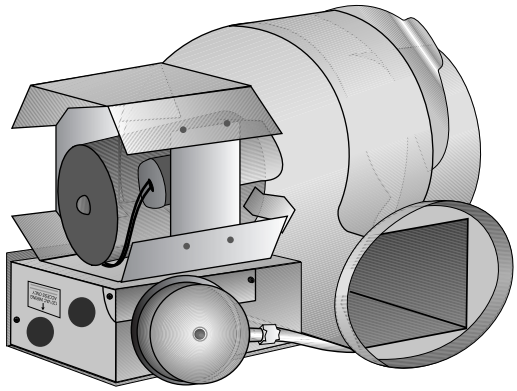
11.2 Non-Pressurized

For a non-pressurized outside air supply, a 4" (O.D.) single wall pipe duct may be attached to the burner and end vent via flexible duct as system will expand and contract. For length and duct sizing requirements, see duct design rules in *Figure 20*. To prevent condensation, insulate the outside air duct.

FIGURE 24: 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 25: 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.

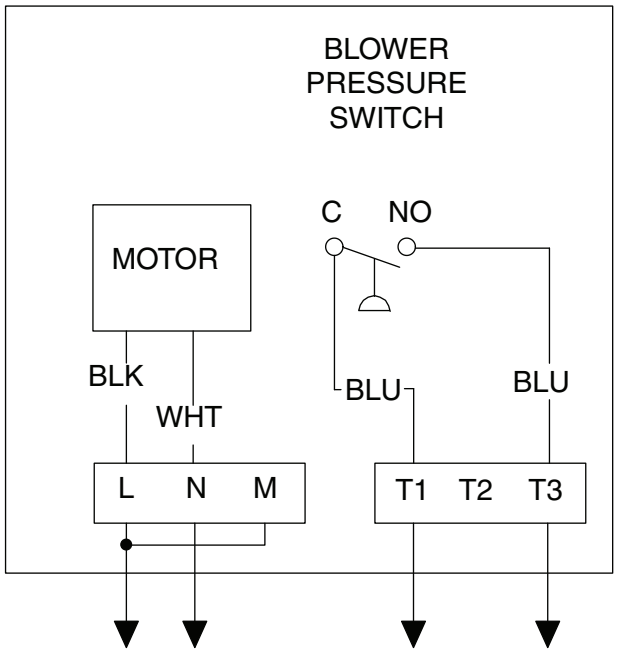
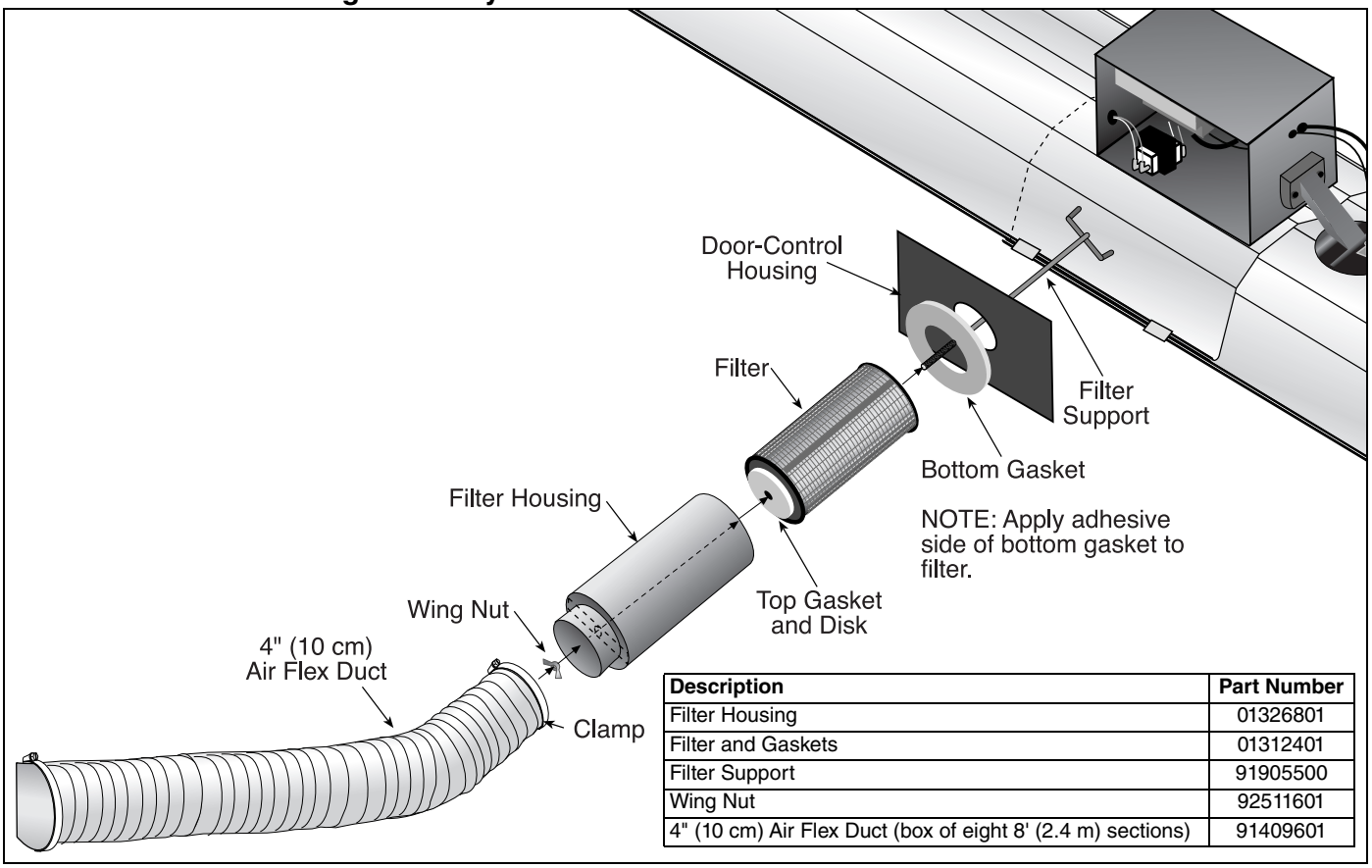
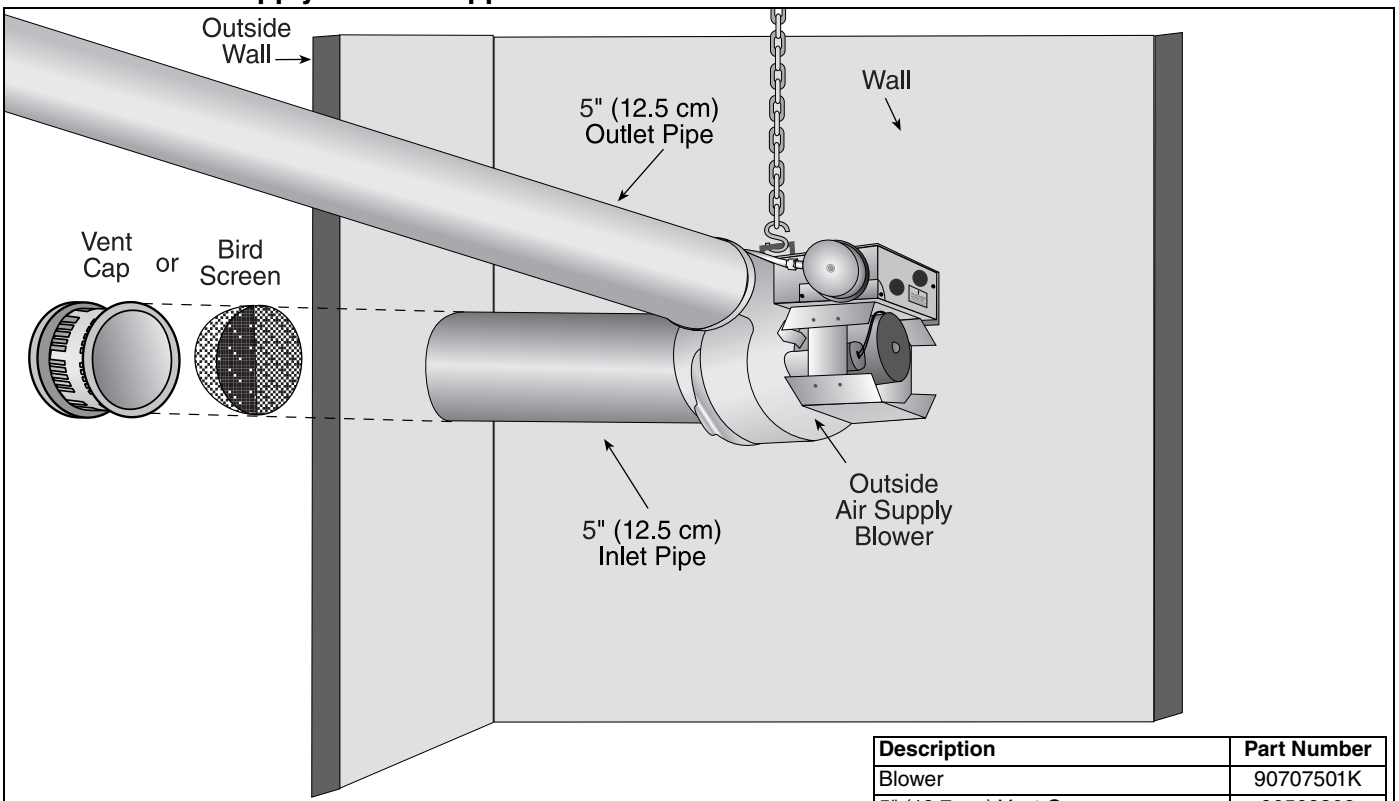


FIGURE 26: Filter Housing Assembly



Description	Part Number
Filter Housing	01326801
Filter and Gaskets	01312401
Filter Support	91905500
Wing Nut	92511601
4" (10 cm) Air Flex Duct (box of eight 8' (2.4 m) sections)	91409601

FIGURE 27: Air Supply Blower Support



Description	Part Number
Blower	90707501K
5" (12.7 cm) Vent Cap	90502302
6" (15 cm) Bird Screen	01397400
6" (15 cm) Band Clamp	91913703

FIGURE 28: Pressurized Outside Air Supply

Description	Part Number
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

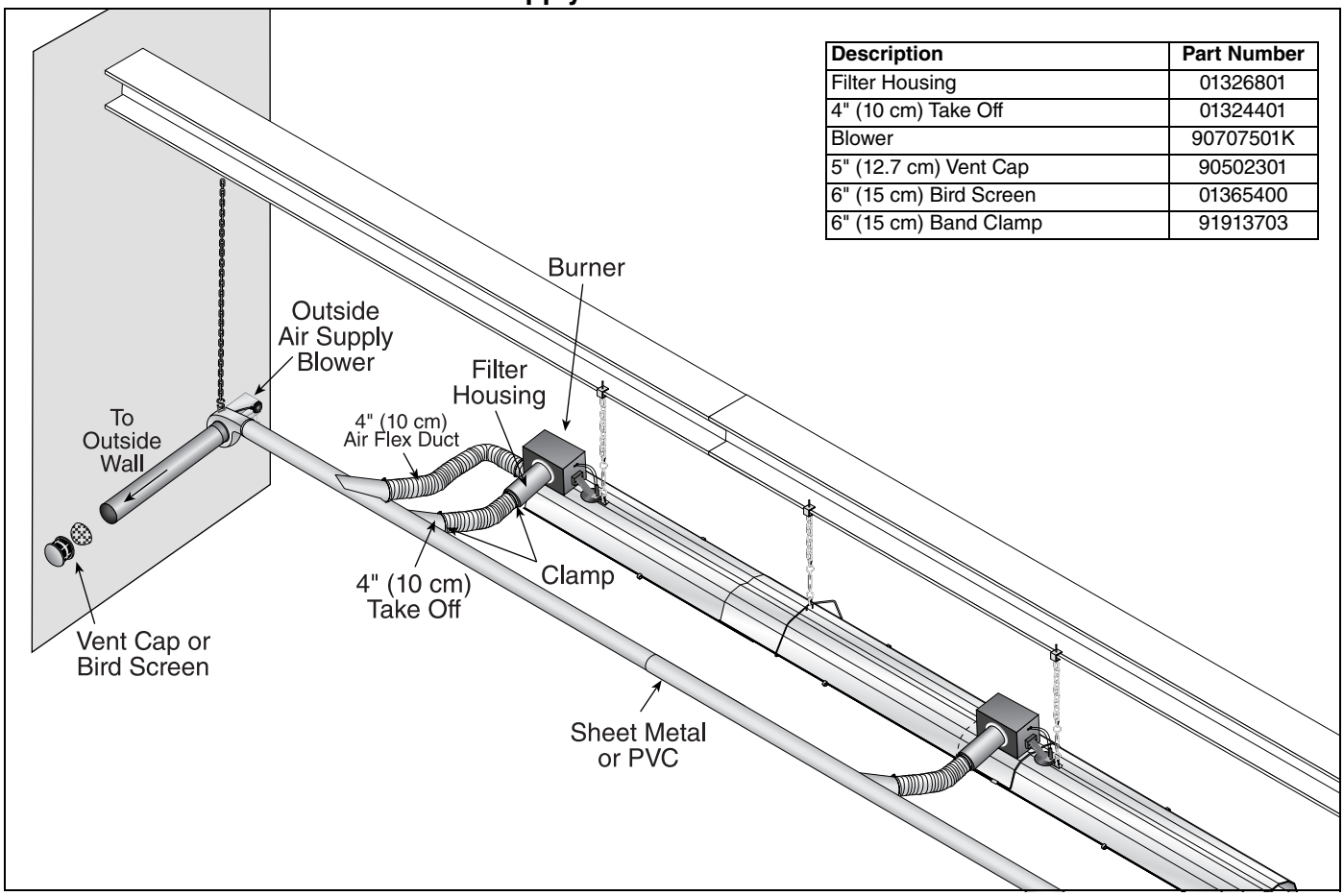


FIGURE 29: Non-Pressurized Outside Air Supply

Description	Part Number
Pressure Switch Kit	90434501
4" (10 cm) Bird Screen	01365400
4" (10 cm) Vent Cap	90502300
6" (15 cm) Vent Cap	90502302

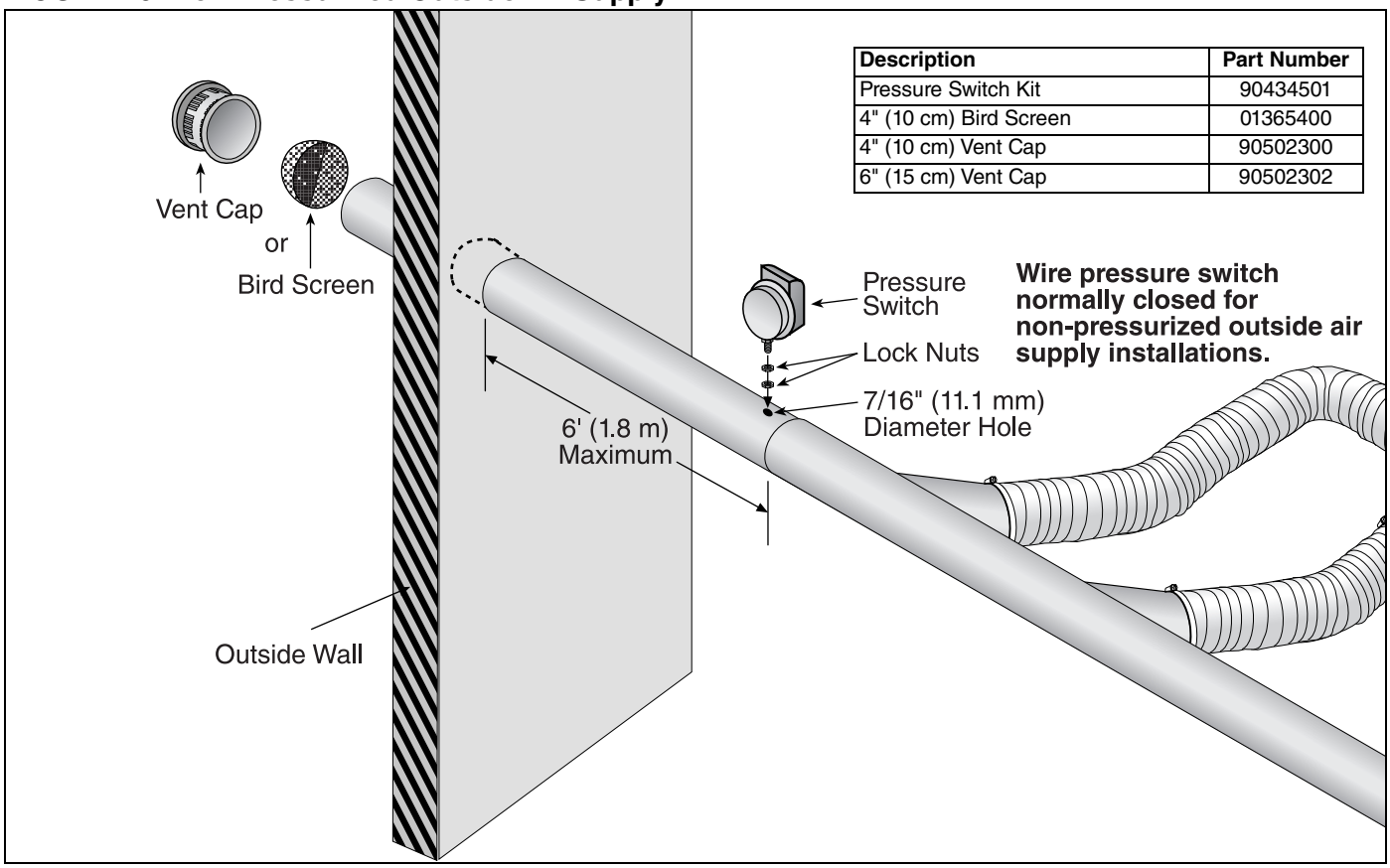
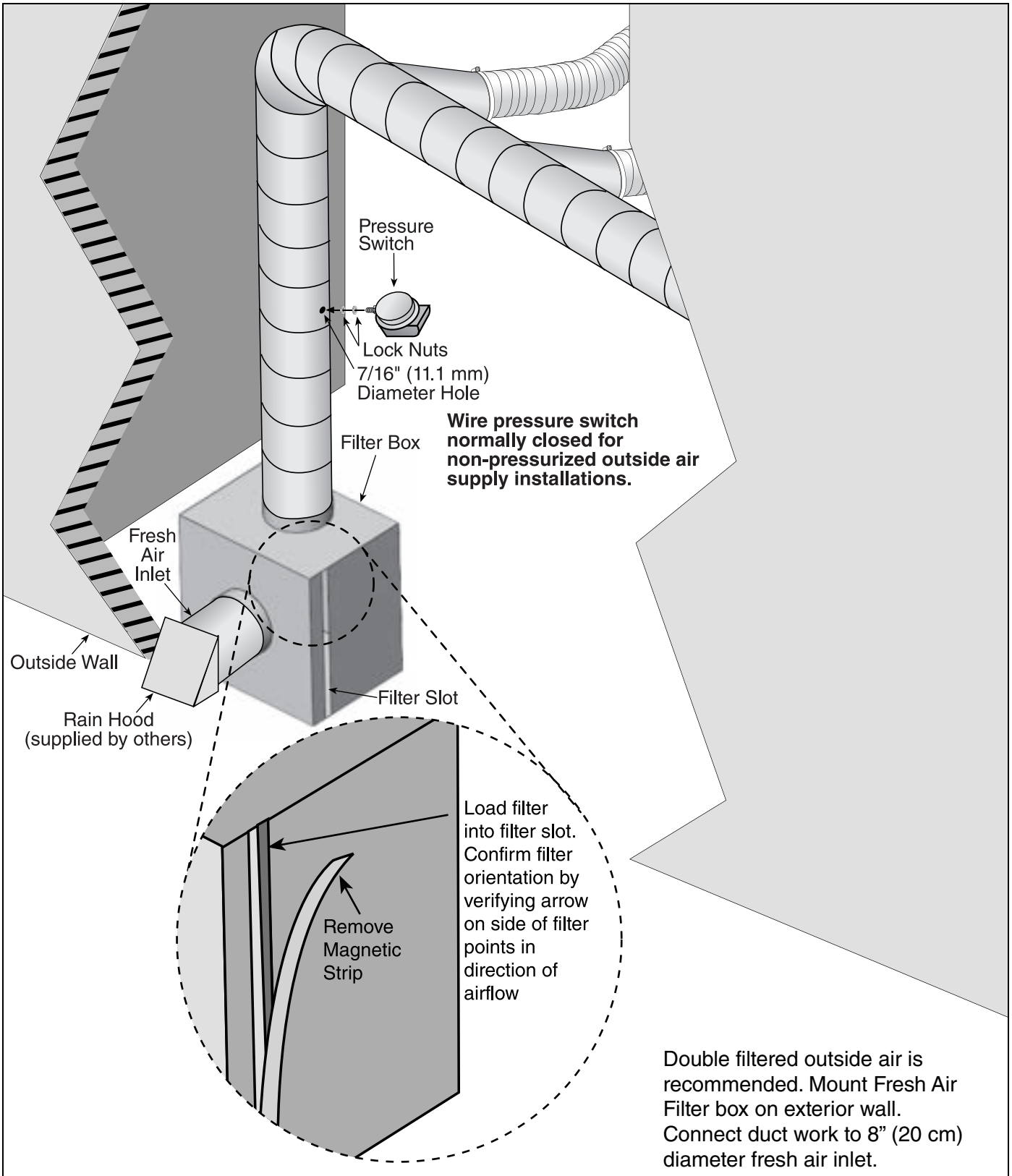


FIGURE 30: Filter Box



Description	Part Number
Fresh Air Filter Box	**90740100K**
Filter Box	9074100
Aluminum Mesh Filter, (washable) 20" x 20" x 1" (51 cm x 51 cm x 3 cm)	20628
Magnetic Strip (20 inches)	90740101

SECTION 12: GAS PIPING

⚠ WARNING

Fire Hazard

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

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.

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 equipments, 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.**

FIGURE 31: 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.

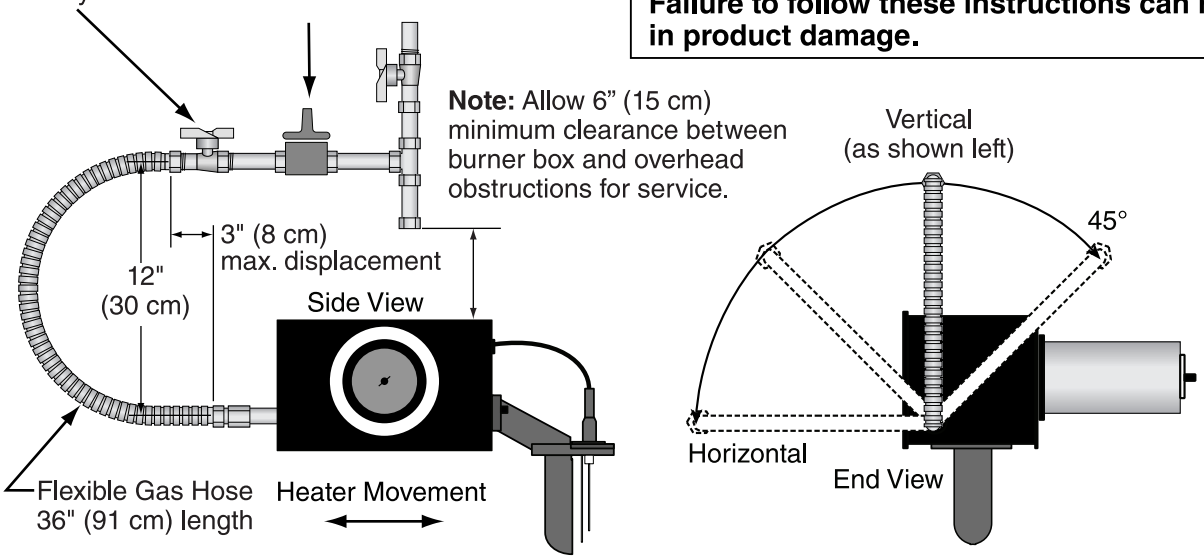
High Gas Pressure Regulator to be installed upstream of flexible gas hose if inlet pressure exceeds maximum allowance. *See Page 75, Section 20*.

⚠ CAUTION

Product Damage Hazard

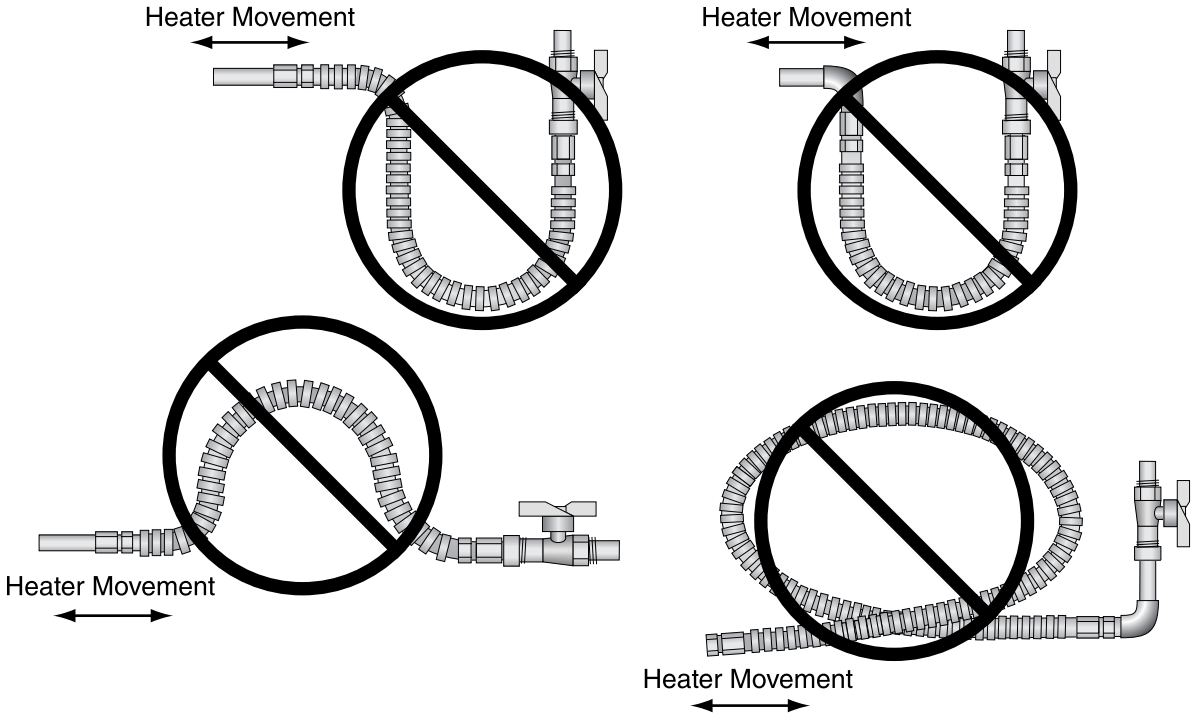
Hold gas nipple securely with pipe wrench when attaching gas hose.

Failure to follow these instructions can result in product damage.



Description	Part Number
High Pressure Regulator - 2 psi	90207600
High Pressure Regulator - 5 psi	90207601

INCORRECT POSITIONS (WRONG INSTALLATION)



Description	Part Number
1/2" Flexible Stainless Steel Gas Hose (US Models)	91412200
1/2" Rubber (Type 1) Gas Hose (Canadian Models)	91412206

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 micro-processor 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

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

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.

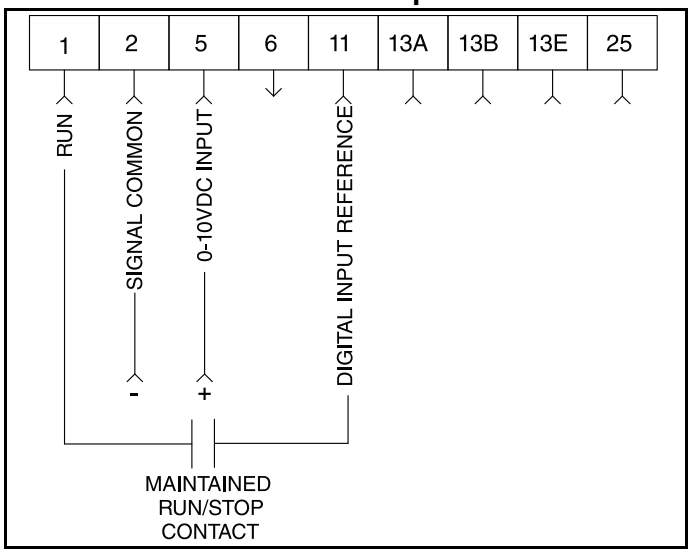
13.3.6 Analog Signal

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 32: VFD Terminal Strip



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.

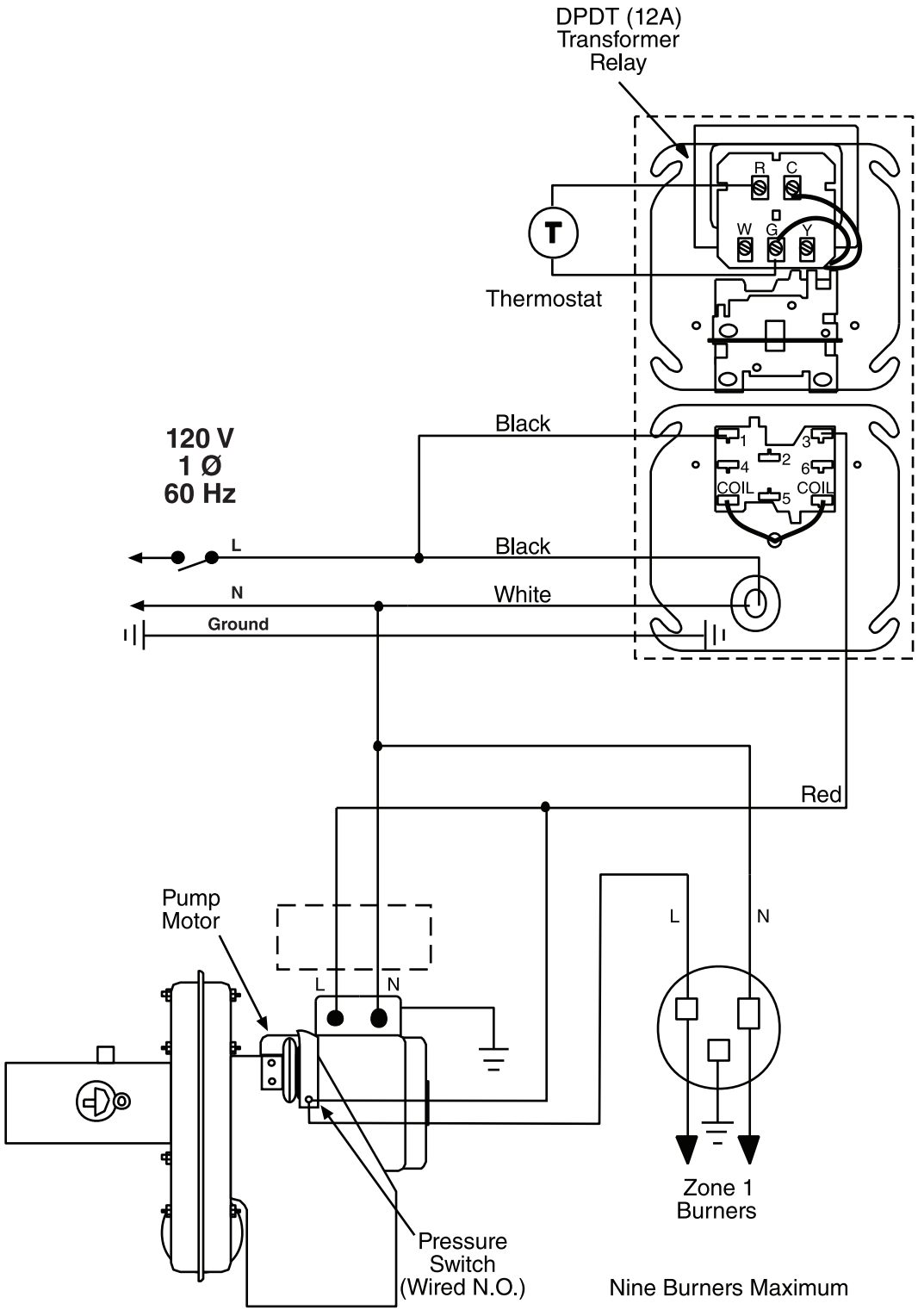
13.4 SPST Transformer Relay Kit (P/N 90417600K)

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 V A. 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 33: One Zone Operation without Control Panel (optional)



Description	Part Number
SPST Transformer Relay	90417600K

FIGURE 34: One Zone Operation (with Outside Air Blower) without Control Panel (optional)

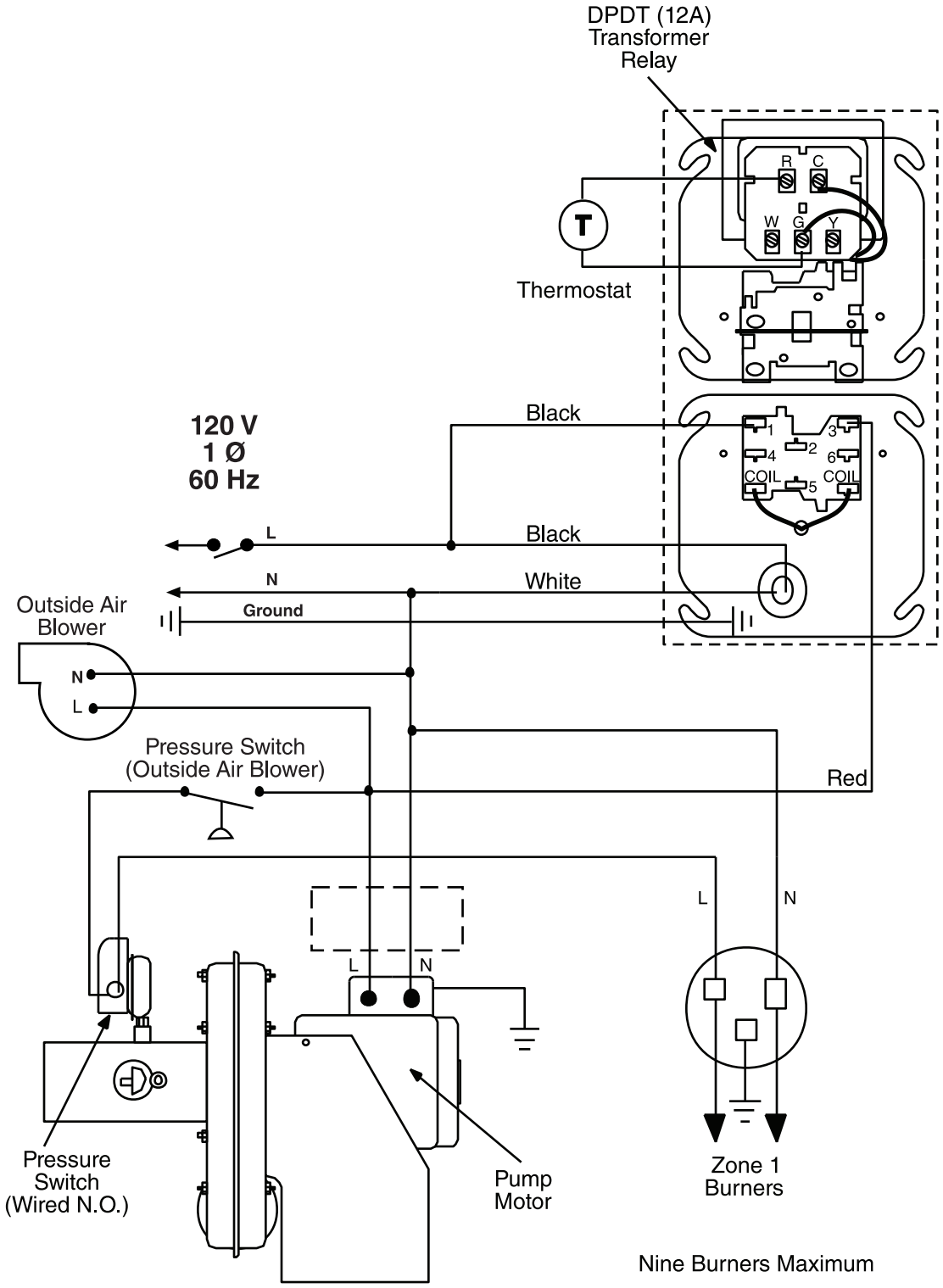
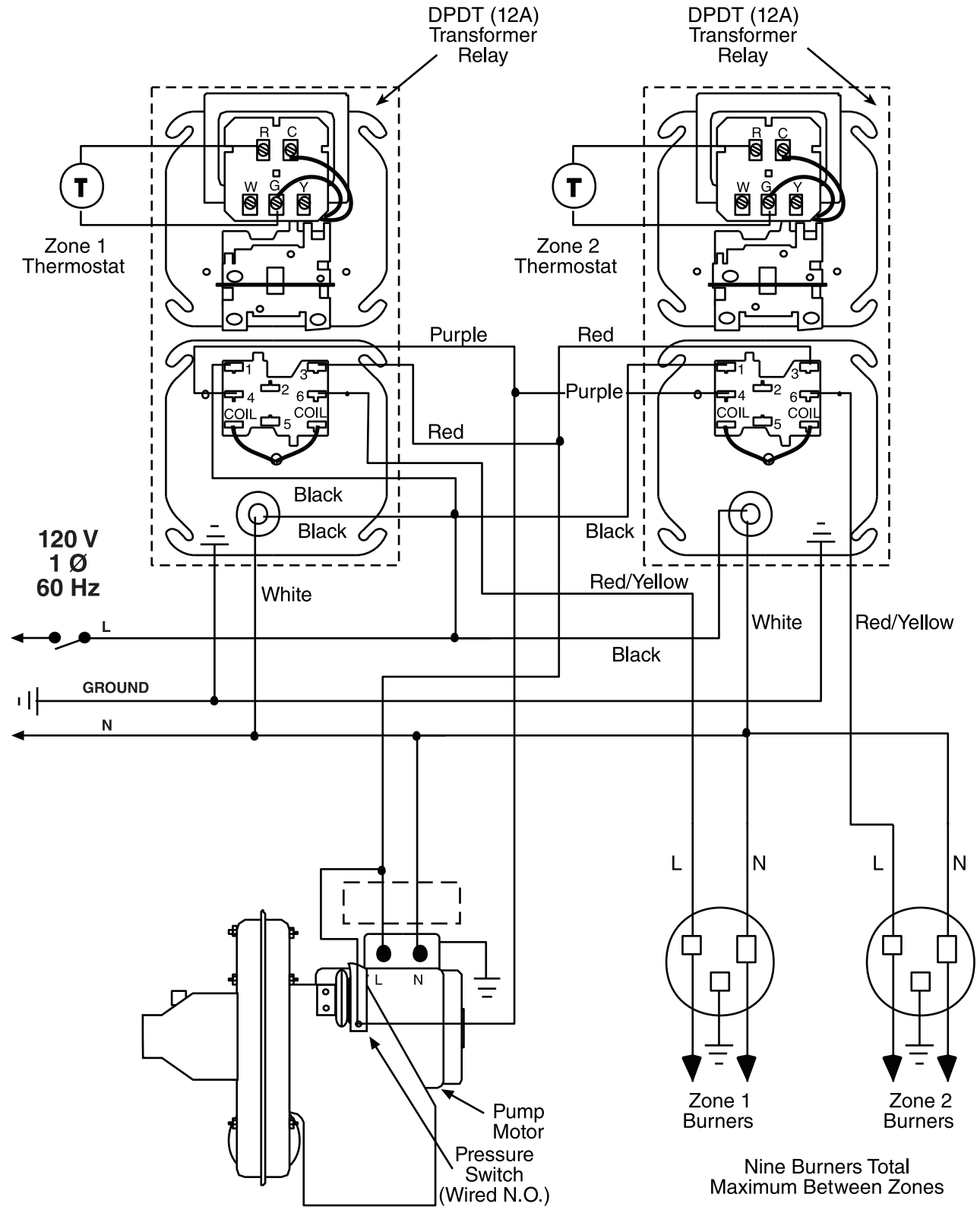


FIGURE 35: Two Zone Operation without Control Panel (optional)



Description	Part Number
SPDT Transformer Relay	90436300

FIGURE 36: General System Wiring

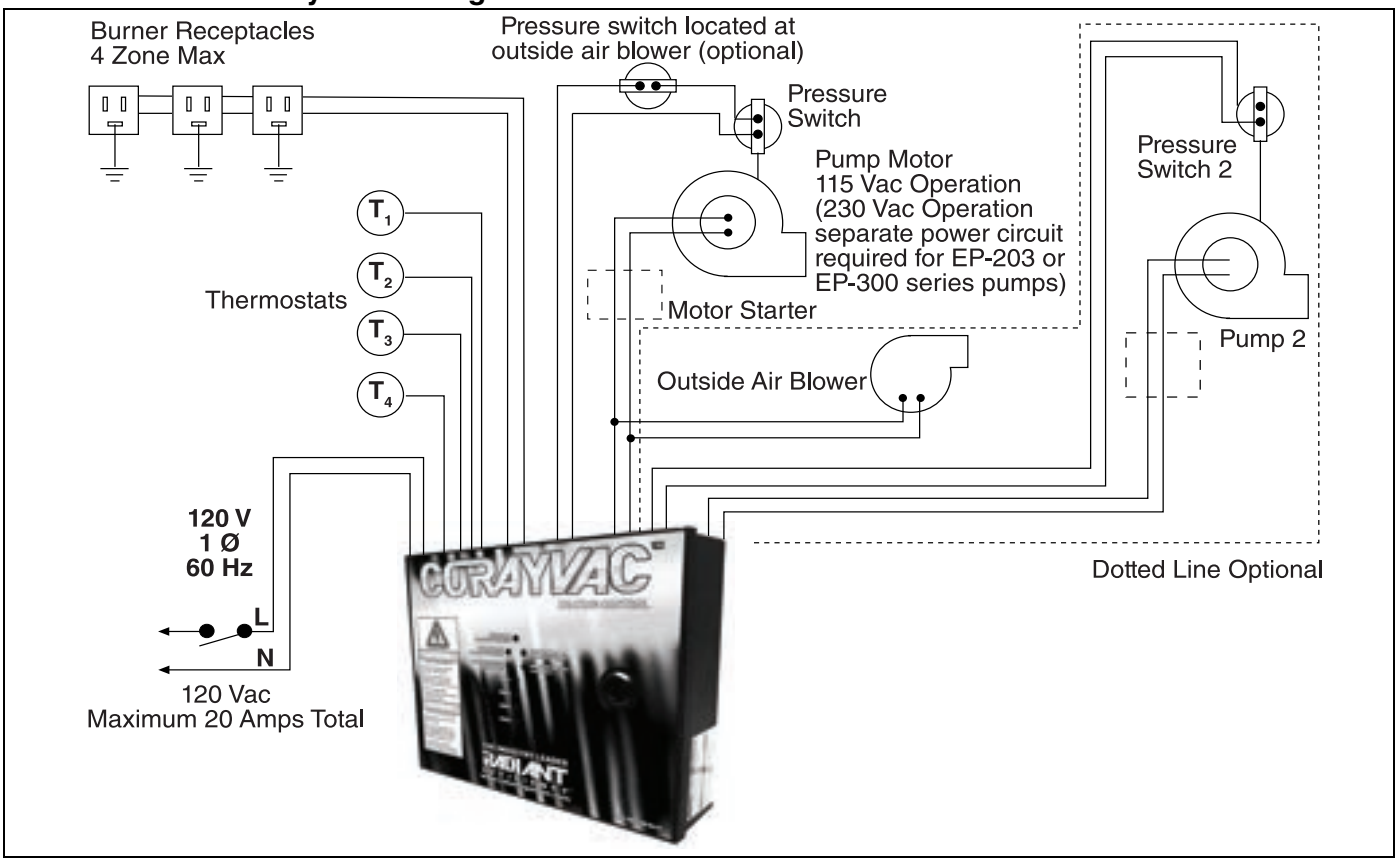


FIGURE 37: External Wiring Diagram EP-100 and EP-201 120 V 1 Ø Pump

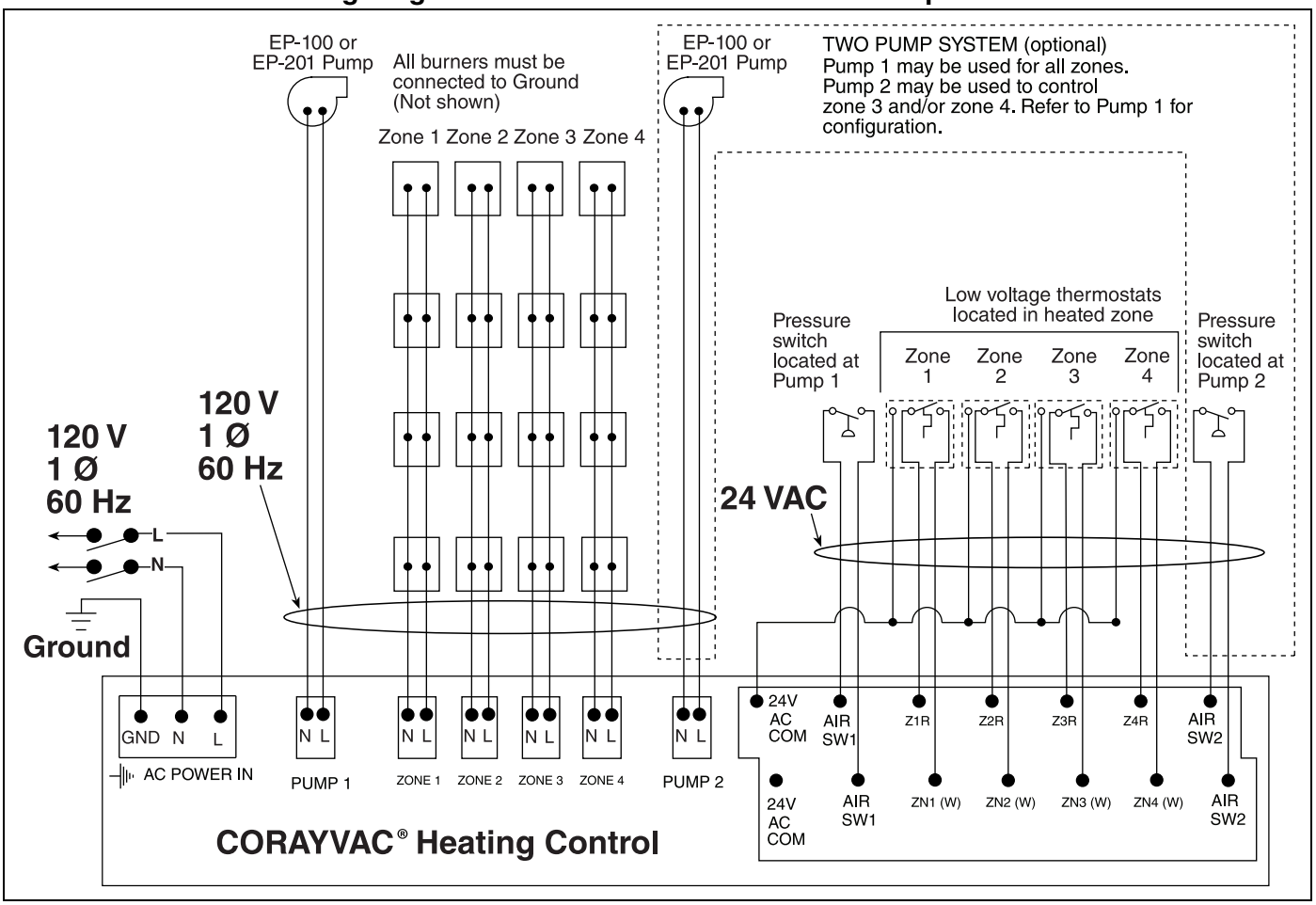


FIGURE 38: External Wiring Diagram EP-100, EP-201 or EP-301 230 V 1 Ø Pump (optional)

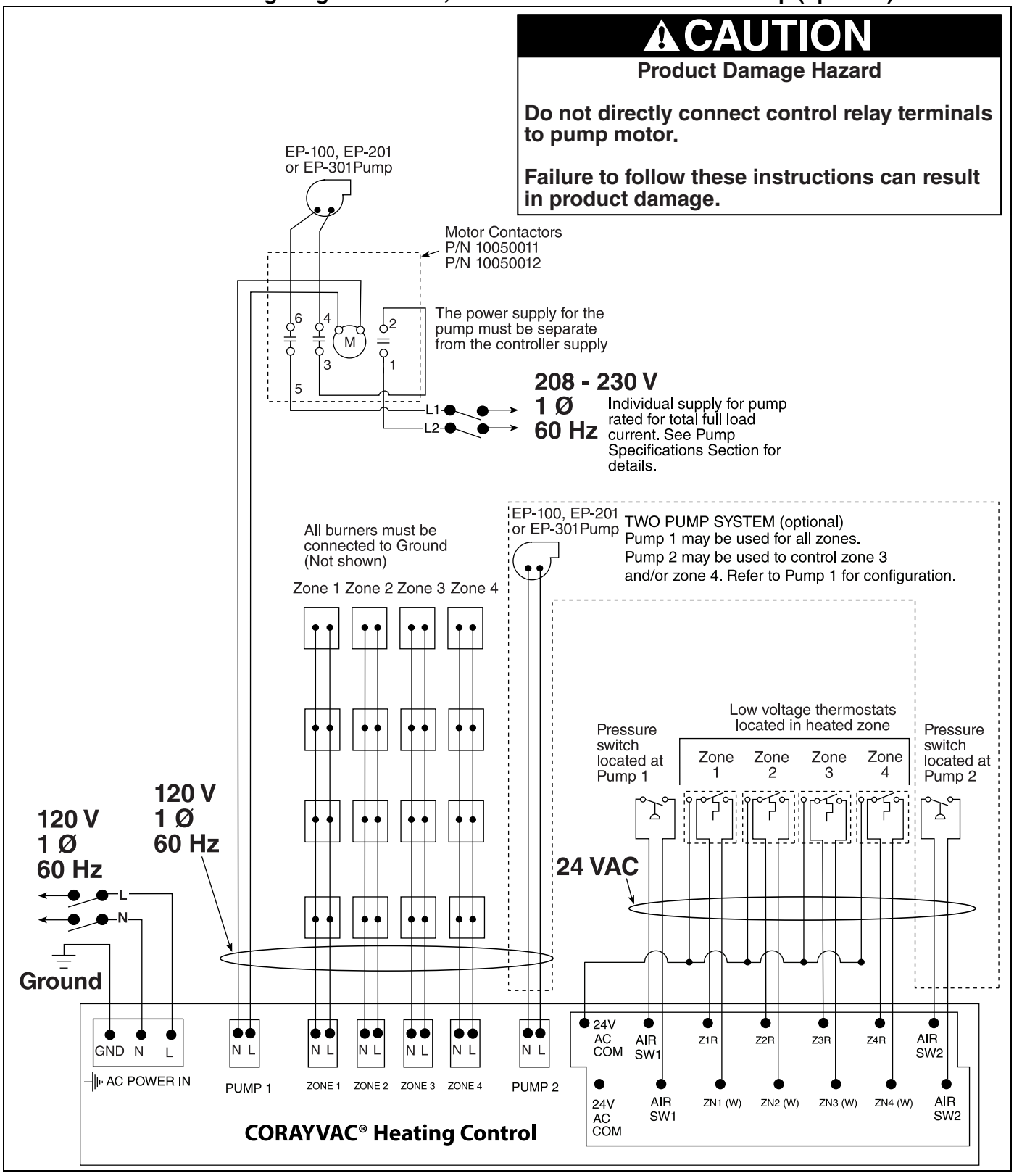


FIGURE 39: External Wiring Diagram EP-203 or EP-303 208 - 230 V (or 460 V) 3 Ø Pump (optional)

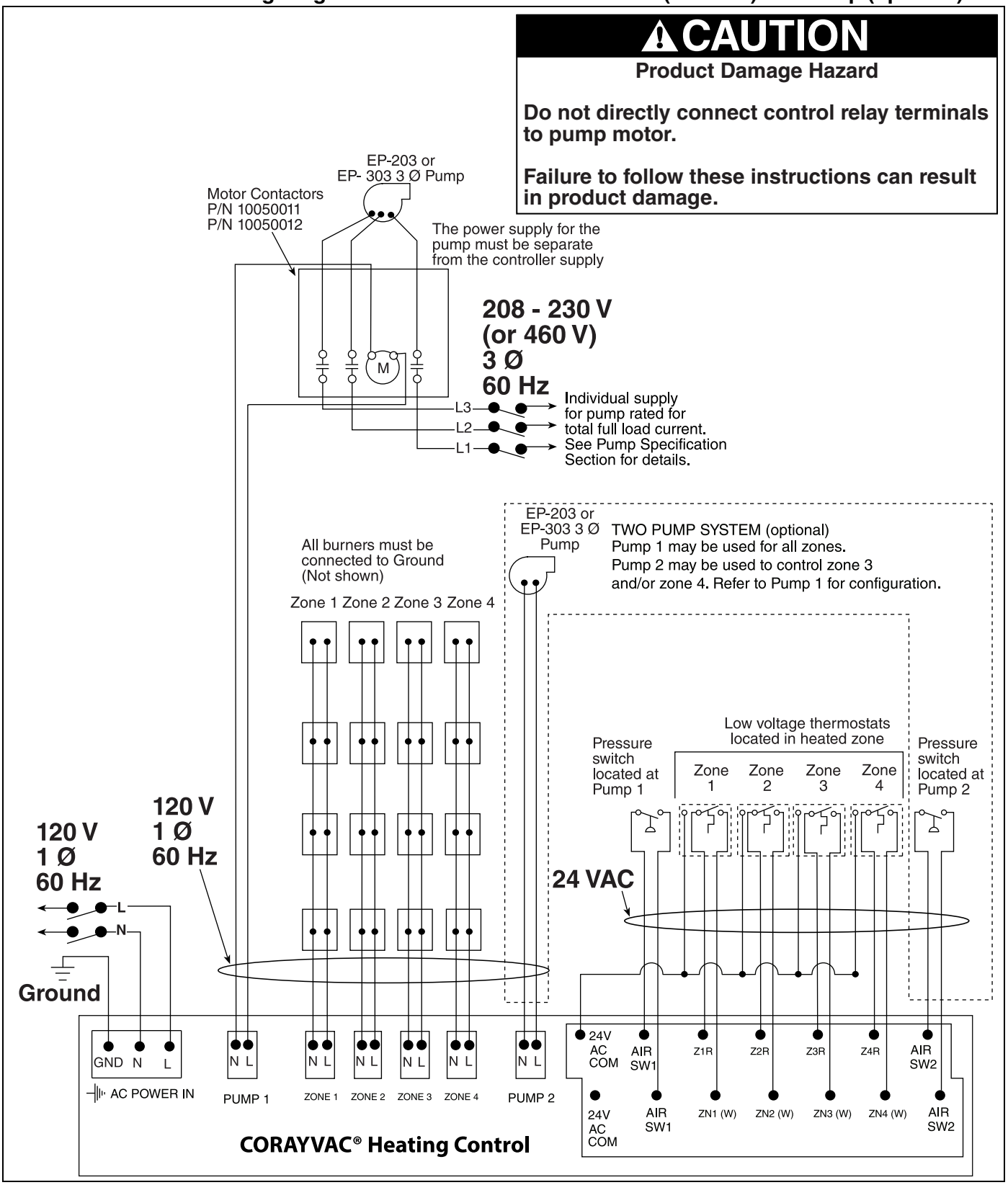
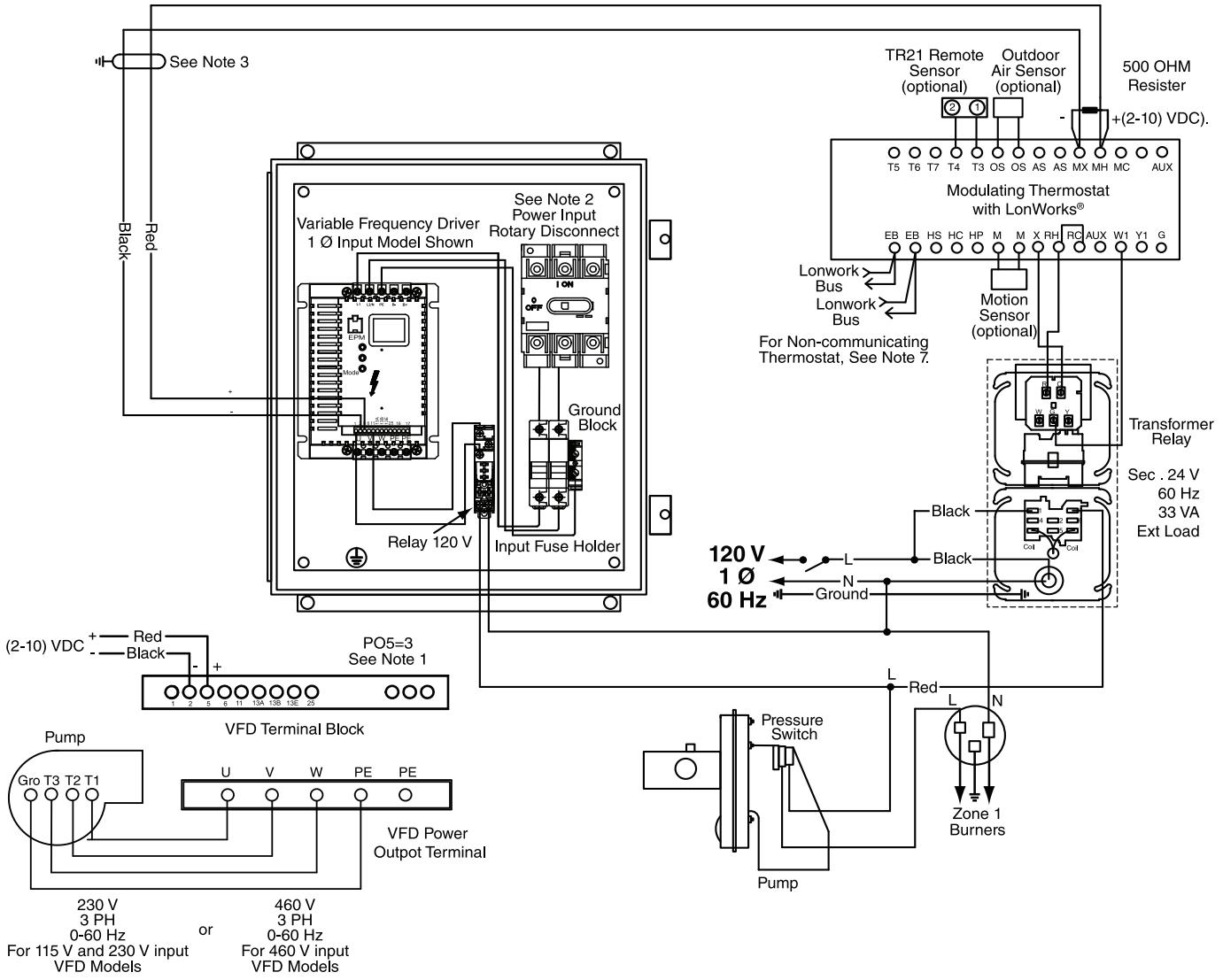


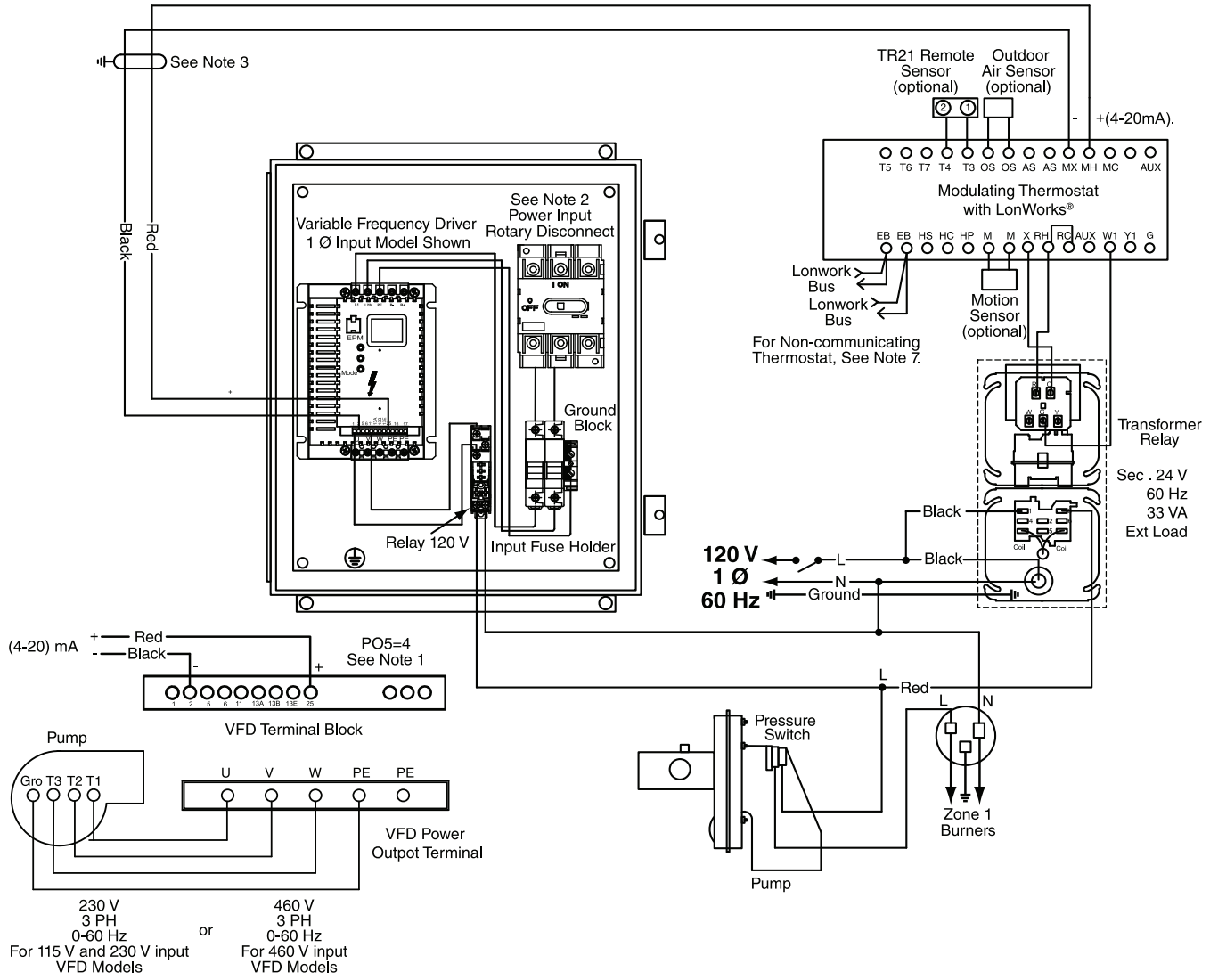
FIGURE 40: CORAYVAC® CLASSIC SF Modulating Wiring Diagram [LonWorks® (2-10 Vdc with 500 ohm resistor) optional]



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 16 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 thermostats 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 (P/N 100610XX) 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

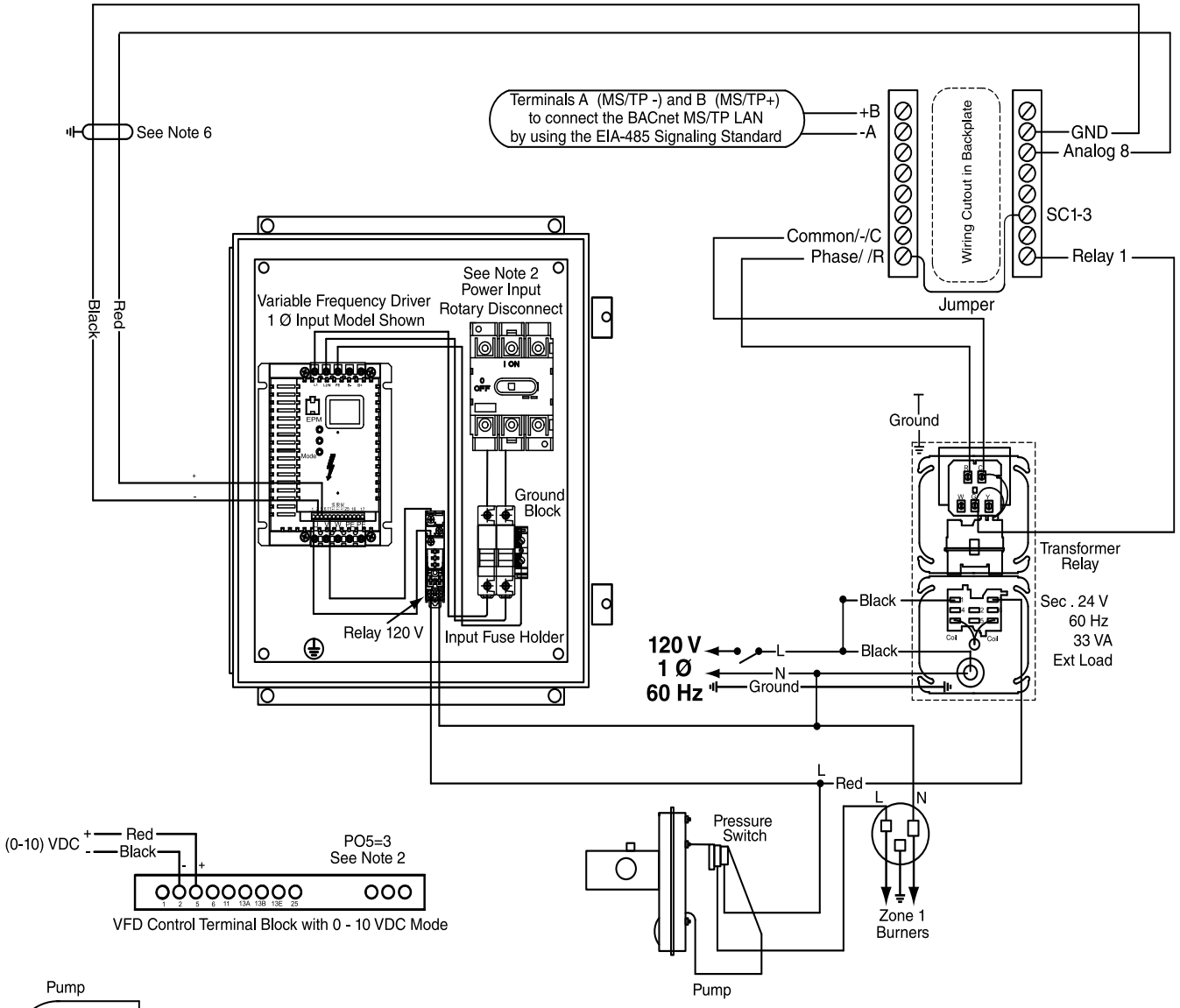
FIGURE 41: CORAYVAC® CLASSIC SF Modulating Wiring Diagram [LonWorks® (4-20 mA) optional]



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 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 thermostats 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 (P/N 100610XX) 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 42: CORAYVAC® CLASSIC SF Modulating with BACnet® Wiring Diagram (optional)

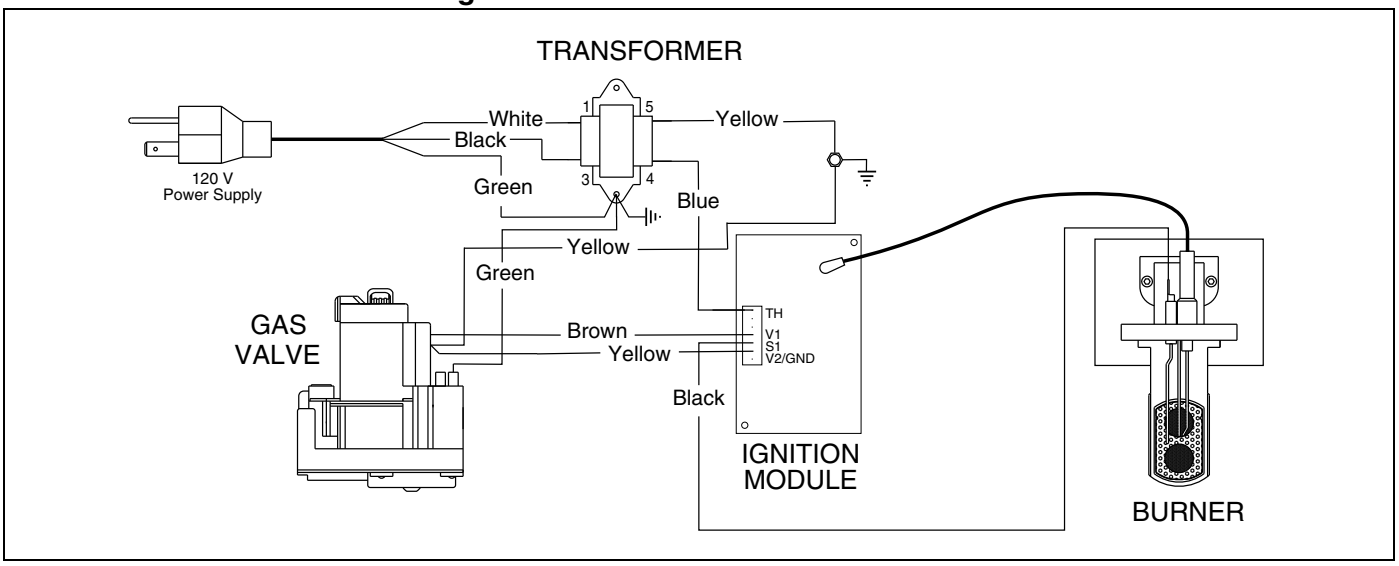


NOTES:

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
   A) 120 VAC Colors: Phase =Red, Neutral=White, Ground=Green.
   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.

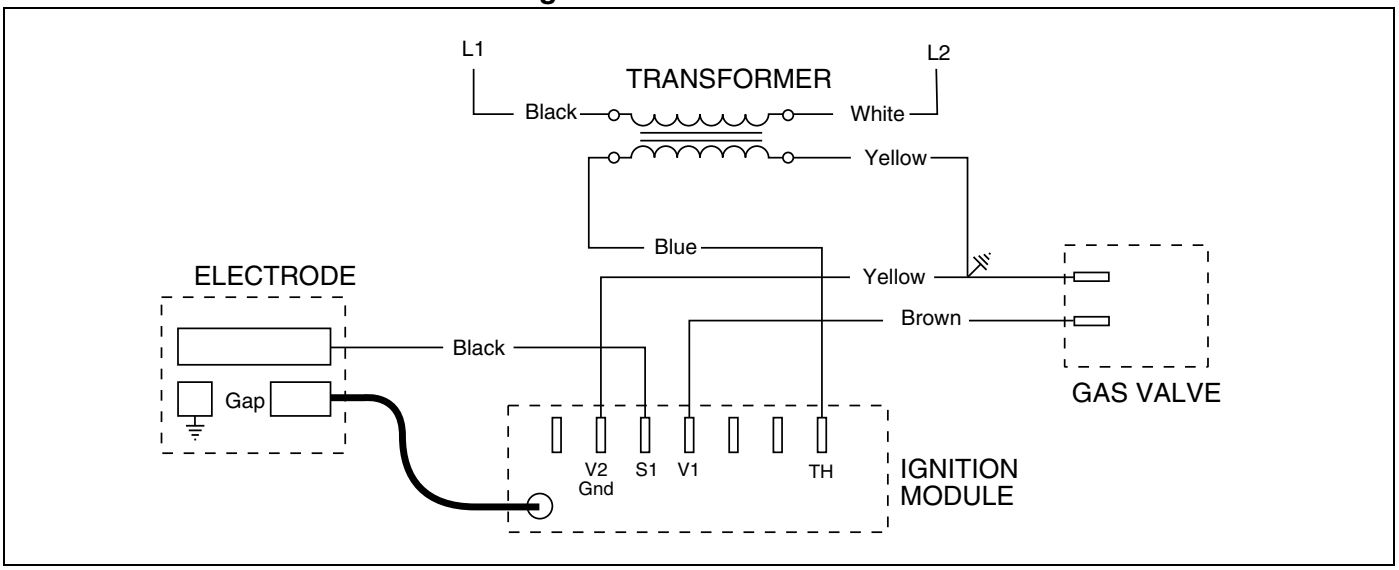
Description	Part Number
SPST Transformer Relay	90417600K
Thermostat, Modulating BACnet®	90425109

FIGURE 43: Burner Internal Wiring



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.

FIGURE 44: Burner Internal Ladder Diagram



SECTION 14: STARTING THE SYSTEM

⚠DANGER	⚠WARNING		
			
Electrical Shock Hazard **Disconnect electric before service.** **More than one disconnect switch may be required to disconnect electric from heater.** **Heater must be connected to a properly grounded electrical source.**	**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 equipment connected.**	**Carbon Monoxide Hazard** **Heaters installed unvented must be interlocked with sufficient building exhaust.** **Heaters must be installed according to the installation manual.**	**Burn Hazard** **Allow heater to cool before service.** **Tubing may still be hot after operation.**
Failure to follow these instructions can result in death, electric shock, injury or property damage.			

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).
5. Vacuum pump motors can be wired to rotate the impeller in either direction. A negative pressure can still be measured when the impeller is running backwards. Ensure proper rotation of the impeller prior to setting the vacuum pressure.
6. Make a preliminary vacuum check at burners in branches that have an adjustable damper coupling. *See Page 59, Figure 41* for manometer hookup to check vacuum. This check is to insure that all dampers are open before the system is fired. Vacuum, as measured at the end vents, should be approximately 3.5'' wc or slightly above (cold).

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.

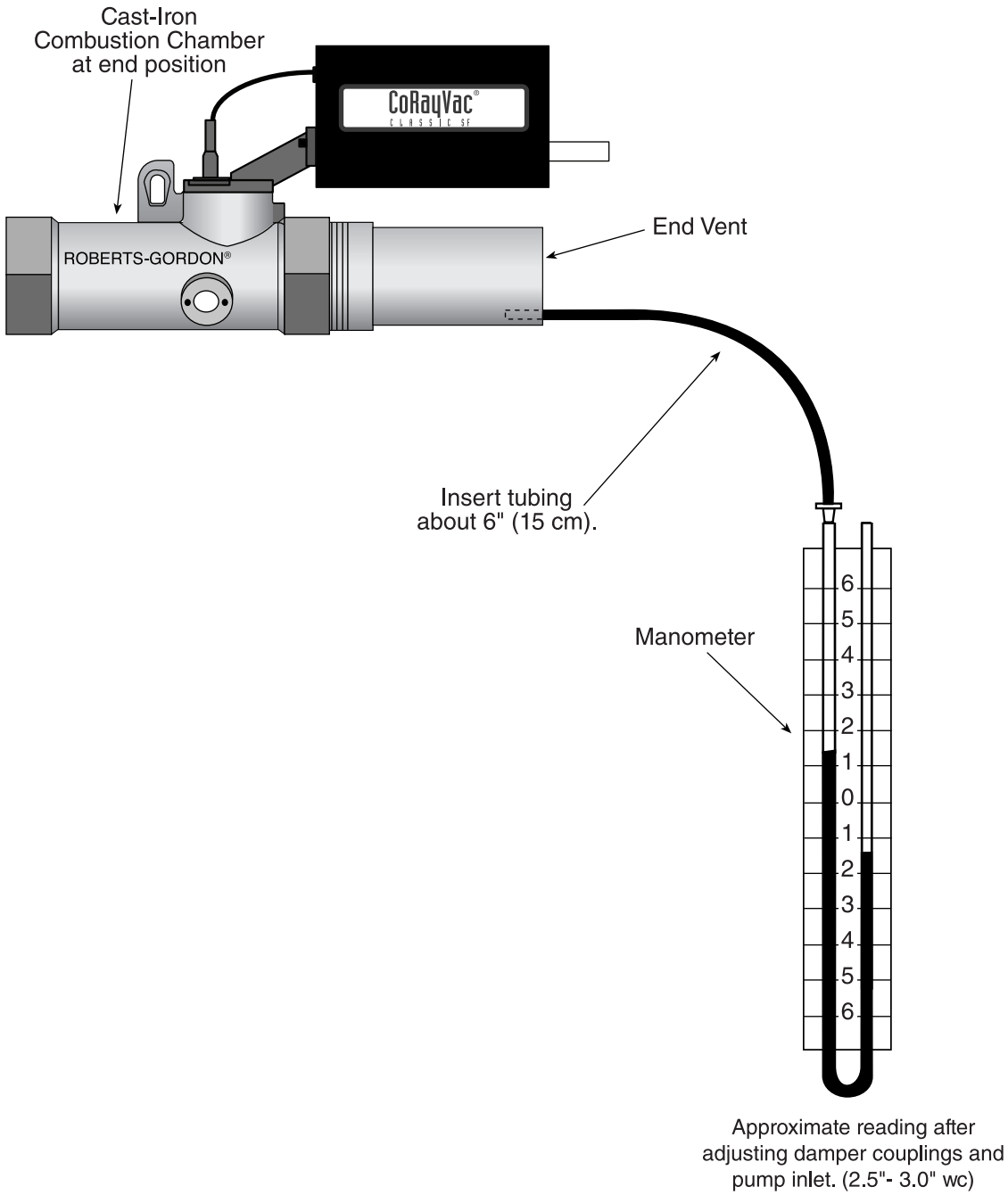
14.4 Setting the Vacuum

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 45: Vacuum Reading



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.

⚠DANGER

Electrical Shock Hazard

Enclosure contains live electrical components.

Programming must be done by a trained technician only.

Replace cover before operating.

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

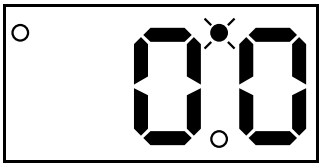
To override the rotary disconnect switch inside the VFD enclosure, turn the square rod with a wrench to the ON position. In order to be able to close the cover of the disconnect, the rods need to be turned back to the OFF position.

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

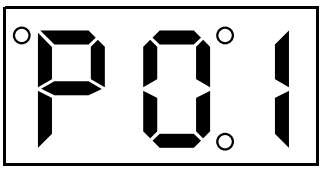


15.1.2

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).



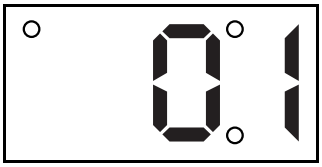
NOTE: If the display flashes "Er", the password was incorrect, and the process to enter the password must be repeated.

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:

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

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" w.c. - 1.2" wc VFD Frequency Setting

Record Frequency Setting Here:

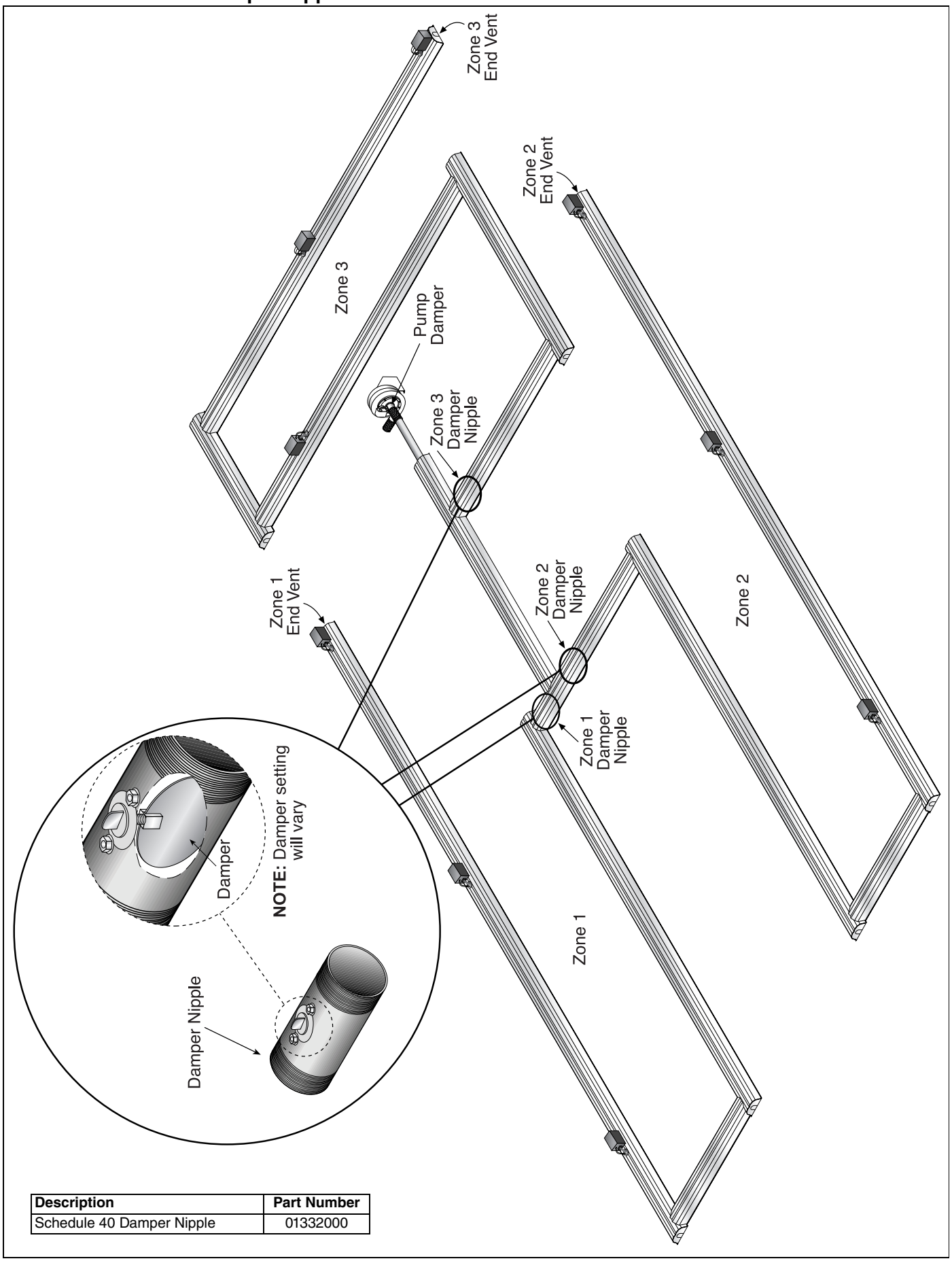
16.3 Programming Of Variable Frequency Drive

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

16.3.1 Modulating Thermostat

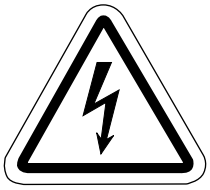
Turn "OFF" the power to the transformer relay. Using the procedure described *on Page 60, Section 15*, alter the parameters above on the VFD. Turn on the transformer relay and program the modulating thermostat to the customer's requirements.

FIGURE 46: Possible Damper Nipples' Locations



Description	Part Number
Schedule 40 Damper Nipple	01332000

SECTION 17: OPERATION AND MAINTENANCE

⚠ DANGER	⚠ WARNING		
			
Electrical Shock Hazard **Disconnect electric before service.** **More than one disconnect switch may be required to disconnect electric from heater.** **Heater must be connected to a properly earthed electrical source.**	**Explosion Hazard** **Turn off gas supply to heater before service.**	**Burn Hazard** **Allow heater to cool before service.** **Tubing may still be hot after operation.**	**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.			

The heater is equipped with a direct-spark ignition system.

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 (thermostat cycle is required) or automatically after 1 hour.

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.

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.

17.5 Maintenance Checklist

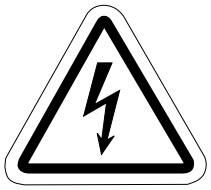
Installation Code and Annual Inspections:

The Vicinity of the Heater	Do not store or use flammable objects, liquids or vapors near the heating system. Immediately remove these items if they are present. *See Page 6, Section 3*.
Vehicles and Other Objects	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. *See Page 6, Section 3*.
Reflector	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. *See Page 22, Figure 8.3.3*. Clean outside surface with a damp cloth.
Vent Pipe	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. *See Page 30, Section 10*.
Outside Air Inlet	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.
Tubes	Make sure there are no cracks. Make sure tubes are connected and suspended securely. *See Page 18, Figure 14 through Page 19, Section 8.2*. Make sure there is no dirt, sagging, bending or distortion. Clean or replace as required.

Gas Line	Check for gas leaks. *See Page 42, Figure 27*.
Combustion Chamber Window	Make sure it is clean and free of cracks or holes. Clean or replace as required.
Blower Scroll, Wheel and Motor	Compressed air or a vacuum cleaner may be used to clean dust and dirt.
Burner Head and Orifice	Clear of obstructions. (Even spider webs will cause problems). Carefully remove any dust and debris from the burner.
Electrode	Replace if there are cracked ceramics, excessive carbon residue, or erosion of the electrode. The electrode gap should be 1/8" (3 mm).
Thermostat or Sensor	There should be no exposed wire or damage to the thermostat or sensor. *See Page 43, Section 13*.
Suspension Points	Make sure the heater is hanging securely. Look for signs of wear on the chain or ceiling. *See Page 18, Figure 14*.
Filter	Check for dirt or dust. Clean or replace as required.
Fresh Air Filter Box	Change or clean filter as necessary. Heavy contaminated filter may warrant a tighter maintenance schedule than the remaining of the heating system.
Pump	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.
Wall Tag	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*.
Safety Labels	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*.

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.

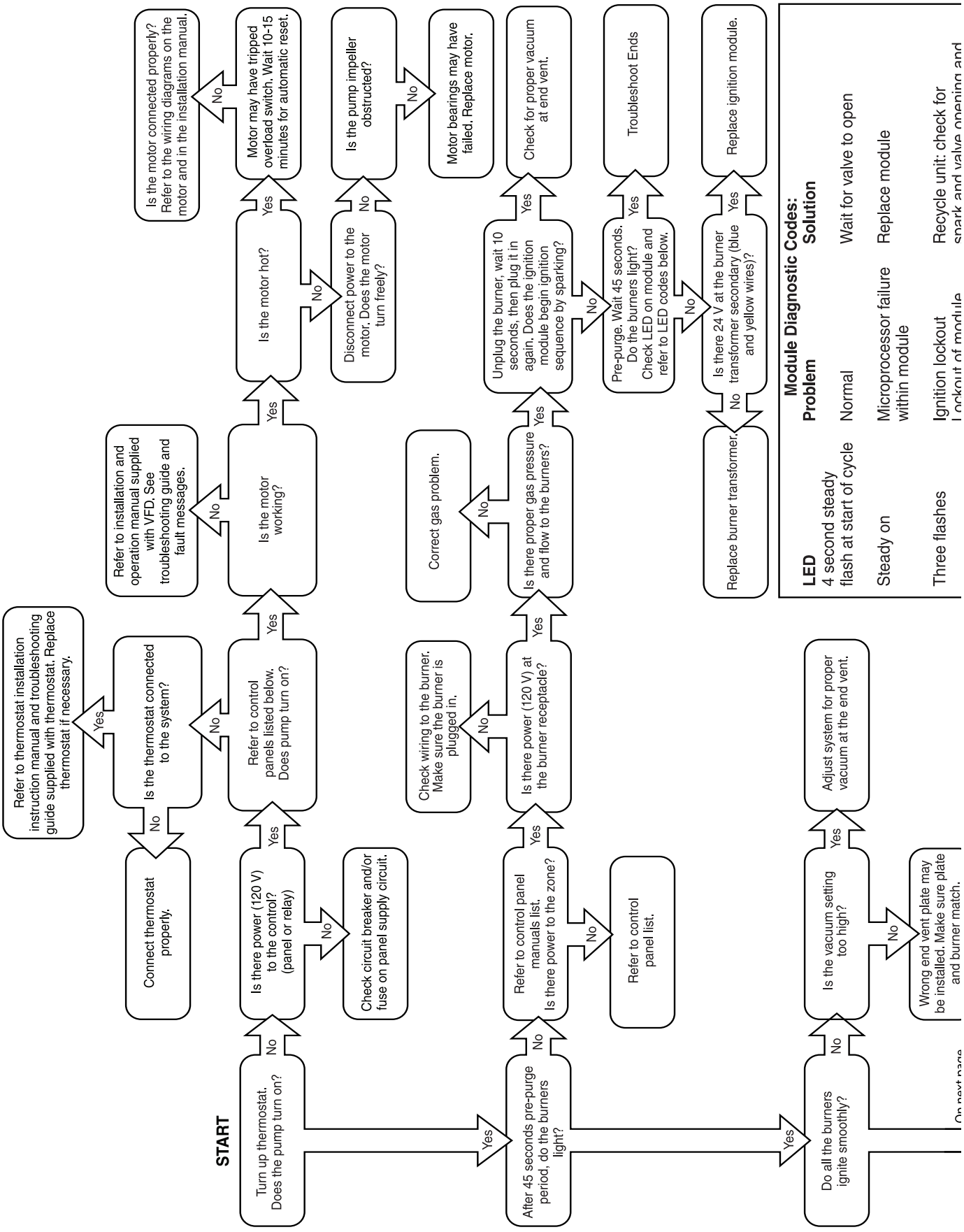
Failure to follow these instructions can result in death or electrical shock.

⚠ WARNING

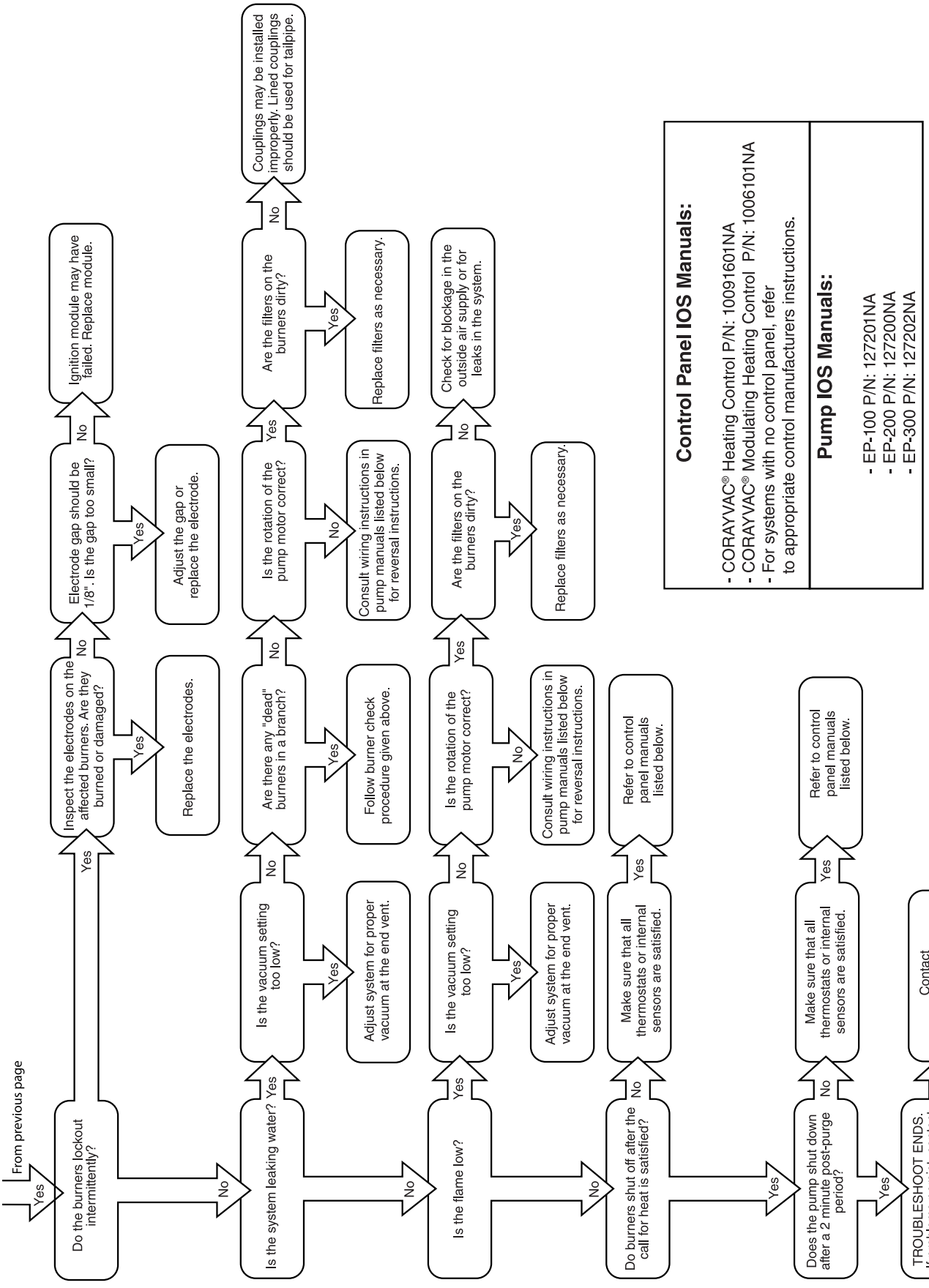
			
Fire Hazard	**Explosion Hazard**	**Burn Hazard**	**Cut/Pinch Hazard**
Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater. **Some objects will catch fire or explode when placed close to heater.**	**Turn off gas supply to heater before service.**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

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

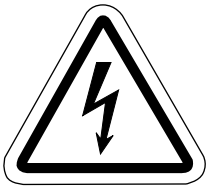
18.1 Troubleshooting Flow Chart



Troubleshooting Flow Chart



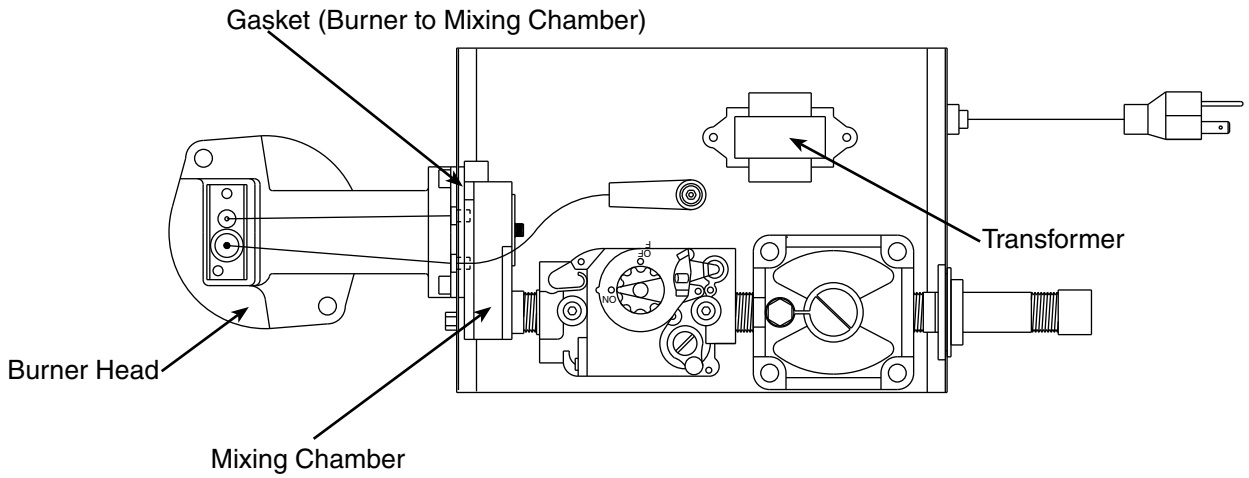
SECTION 19: REPLACEMENT PARTS

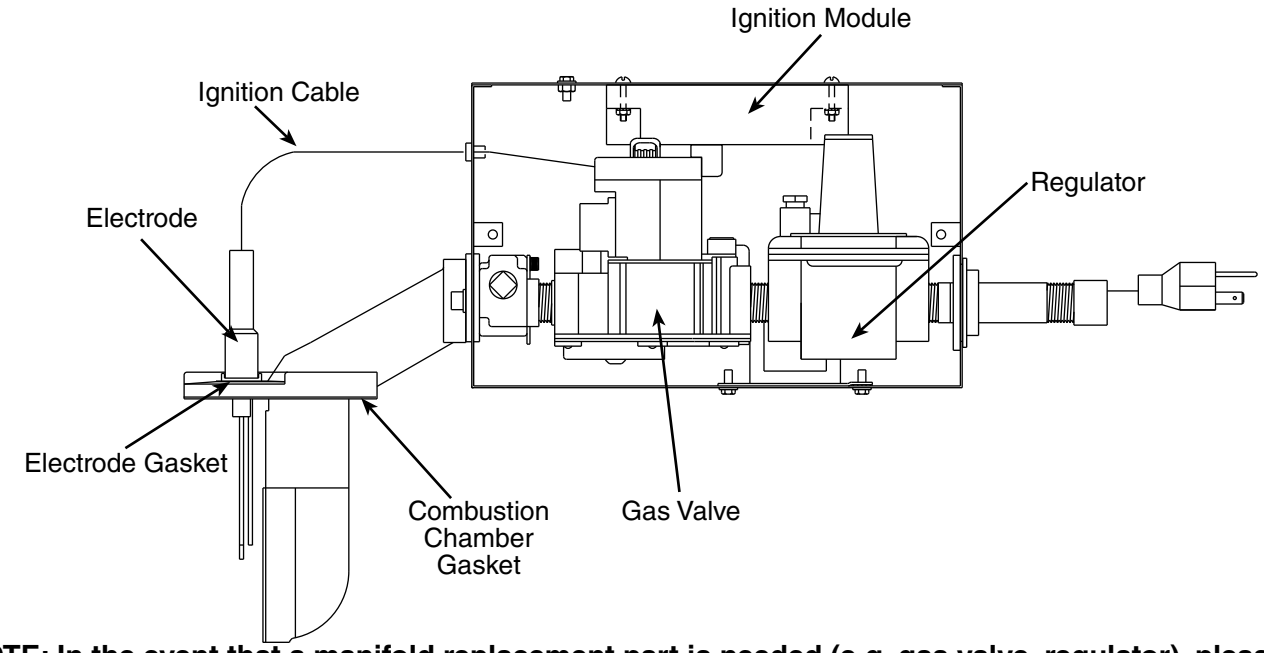
⚠ DANGER	⚠ WARNING		
			
Electrical Shock Hazard	**Explosion Hazard**	**Fire Hazard**	**Carbon Monoxide Hazard**

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.*





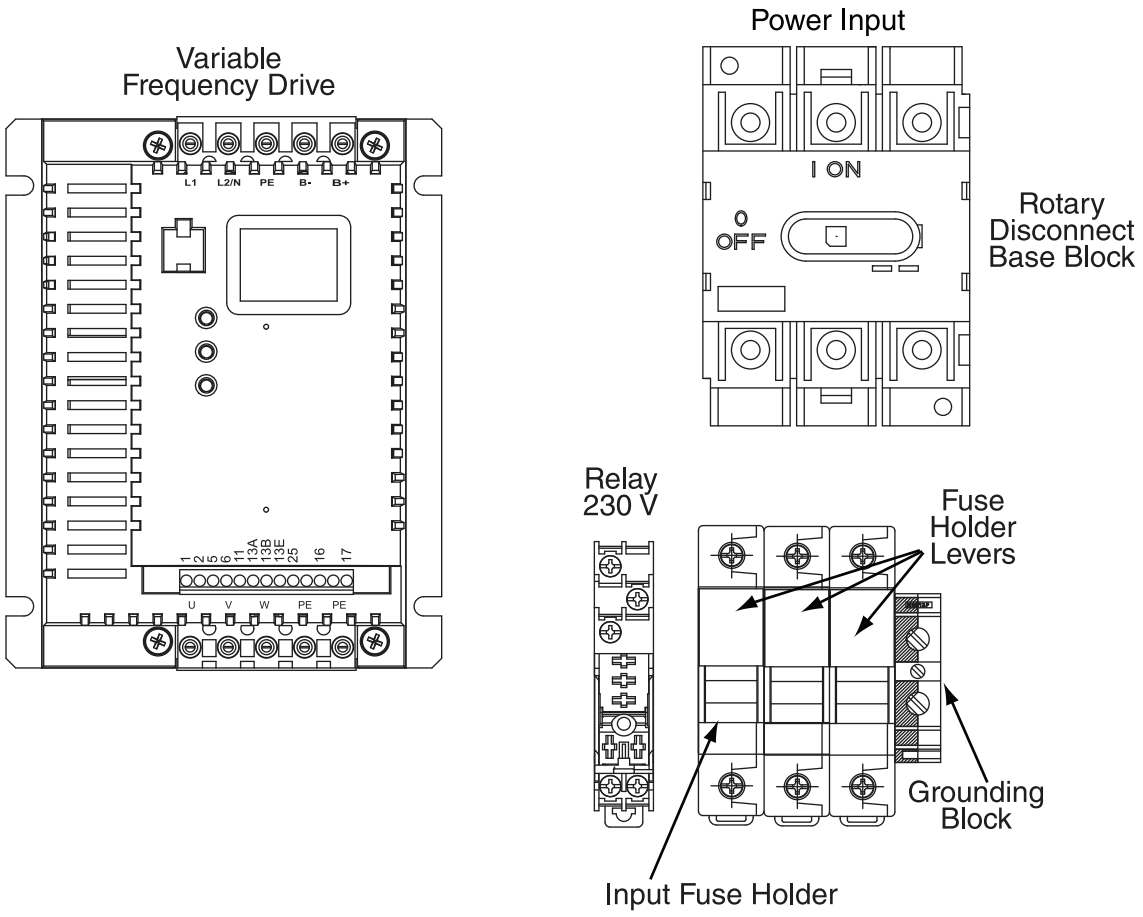
NOTE: In the event that a manifold replacement part is needed (e.g. gas valve, regulator), please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor.

Description	Part Number
Gas Valve (All Burners)	Contact Factory
Gasket (Burner to Mixing Chamber)	01351100
Burner Head Assembly Replacement Package (includes electrode and gasket installed)	Contact Factory
Mixing Chamber	Contact Factory
Transformer	90436900K
Regulator Replacement Kit	Contact Factory
Gasket (Combustion Chamber)	01367800
Electrode Replacement Kit (includes electrode, electrode gasket and mounting screws)	02713200
Ignition Module	90439500K
Ignition Cable	90427706
Filter Cartridge with Gasket (not shown)	01312401

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 47: Variable Frequency Drive Components Diagram



Description	Part Number
Variable Frequency Drive, 1 HP, 120 V, 1 Ø Input (for use with EP-203)	10081201
Variable Frequency Drive, 3/4 HP, 230 V, 1 Ø Input (for use with EP-203)	10081202
Variable Frequency Drive, 2 HP, 230 V, 1 Ø Input (for use with EP-303)	10081203
Variable Frequency Drive, 1 HP, 460 V, 3 Ø Input (for use with EP-203)	10081204
Variable Frequency Drive, 2 HP, 460 V, 3 Ø Input (for use with EP-303)	10081205
Relay, 120 V	90429100
Fuse 10 A (for.75 HP 230 V VFD, 1 HP 460 V VFD and 2 HP 460 V VFD)	91321410
Fuse 25 A (for 1 HP 120 V VFD and 2 HP 230 V VFD)	91321425
Grounding Block	91321300
Fuse Holder	91321400
Rotary Disconnect Base Block	91321550
Rotary Disconnect Handle (not shown)	91321551
Rotary Disconnect Rod (not shown)	91321552

19.2 Replacement Parts Instructions

⚠ DANGER

Electrical Shock Hazard

Disconnect electric before service.

Controller must be properly earthed.

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.

SECTION 20: GENERAL SPECIFICATIONS

20.1 Material Specifications

20.1.1 Reflectors

.024 Aluminium.

20.2 Heater Specifications

20.2.1 Ignition

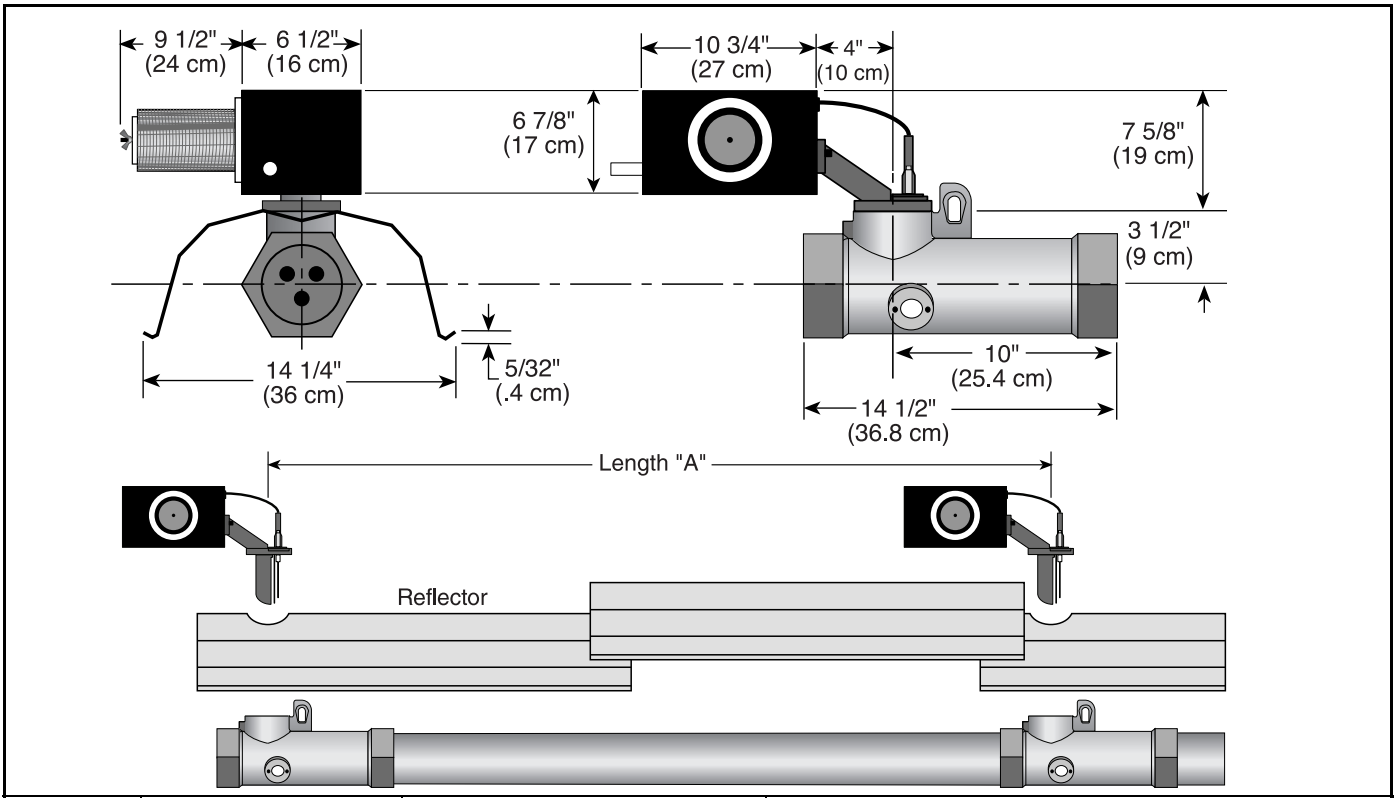
Fully Automatic, Three-Try, Direct Spark, Electronic Ignition Control, 100% Safety Shut-Off.

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.



Model	Heat Input Rate (Btu/h) x (1000)	Length "A" Minimum	Length "A" Maximum	Recommended Minimum Mounting Height* Spot Heating
CRVSF-2 (NG Only)	40	** See Below	21' (6.4 m)	8' (2.4 m)
CRVSF-4	40	** See Below	31.5' (9.6 m)	8' (2.4 m)
CRVSF-6	60	** See Below	42' (12.8 m)	8' (2.4 m)
CRVSF-8	80	** See Below	52.5' (16 m)	10' (3 m)

**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

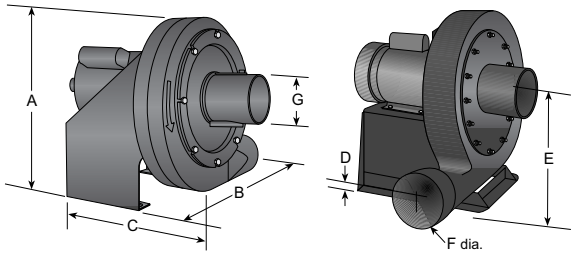
LP Gas: 10.5" wc Minimum 14.0" wc Maximum

ELECTRICAL RATING:

120 V - 60 Hz, 0.3 A

SECTION 21: GENERAL SPECIFICATIONS FOR PUMPS

Pump Dimensional Data (in.)							
Model	**A**	**B**	**C**	**D**	**E**	**F**	**G**
EP-100	17	14.5	21	3.75	10	4	4
EP-201/203	17.75	17	20.25	3.25	10	4.5	4.5
EP-301/303	25.6	24.8	22.7	4.8	15.2	6	6



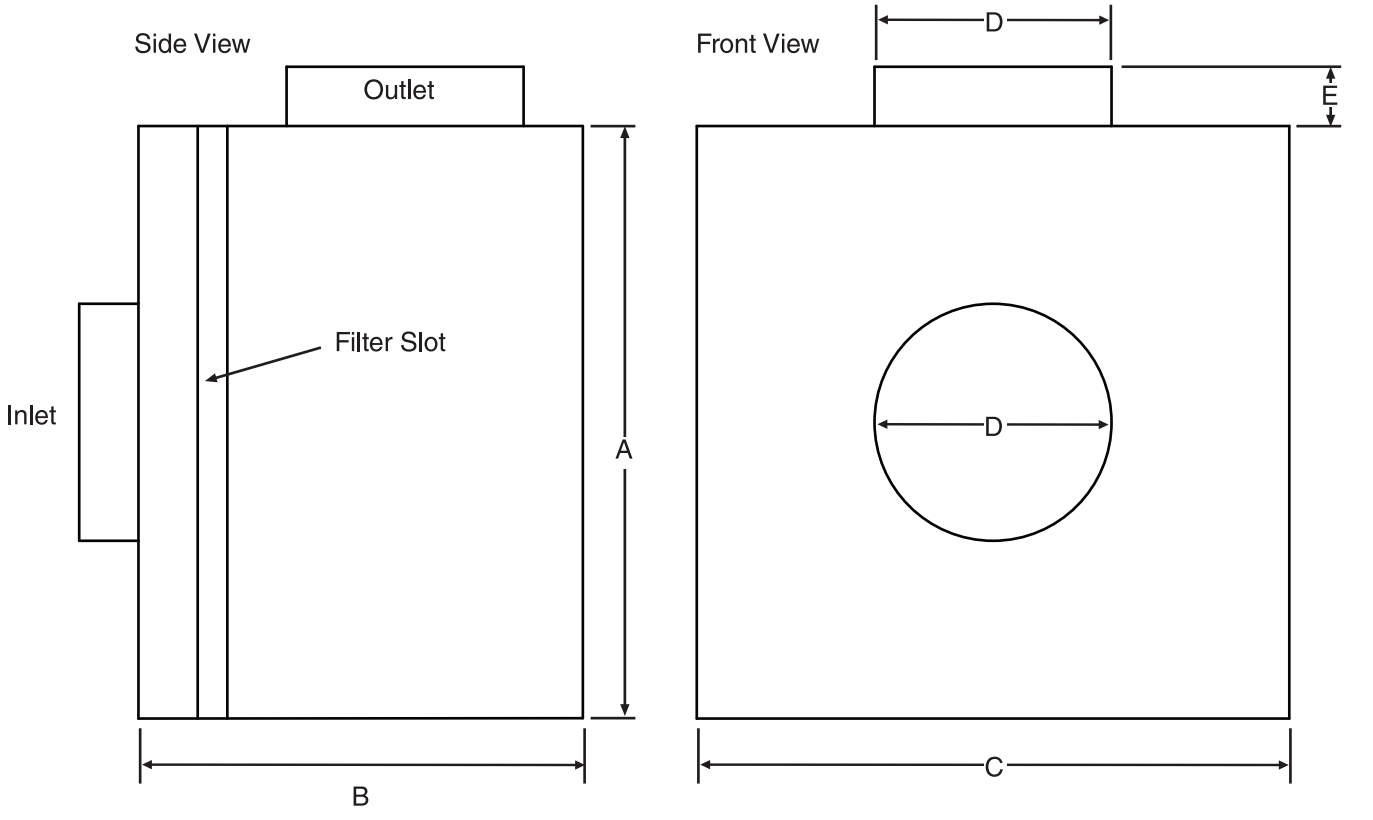
Model	EP-100	EP-201	EP-203	EP-301	EP-303
Horsepower (Hp)	1/3	3/4	3/4	2*	2*
Phase (Ø)	1	1	3	1	3
Hertz (Hz)	60	60	60	60	60
Voltage (V)	115/230	115/230	208-230/460	208-230	208-230/460
Full Load Amp (Amps)	4.8/2.4	6.6/3.3	2.4-2.2/1.1	12.8-11.5	5.5-5.2/2.6
R.P.M.	3450	3450	3500	3450	3450
Motor Frame	56	56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

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

SECTION 22: GENERAL SPECIFICATIONS FOR AIR SUPPLY BLOWER

Capacity	240 CFM @ 0.75 in wc
Power (W)	167
Phase	1
Hertz (Hz)	60
Voltage (V)	120
Full Load Amp (Amps)	1.5
R.P.M.	3000
Motor Enclosure	OPEN FC
Inlet/Outlet (In.)	5/5
Weight (lbs.)	10

SECTION 23: GENERAL SPECIFICATIONS FOR FRESH AIR FILTER BOX SPECIFICATIONS



Filter Box Dimensional Data					
A	B	C	D	E	F
20" (51 cm)	15" (38 cm)	20" (51 cm)	8" (20 cm)	2" (5 cm)	20" (51 cm)

SECTION 24: CORAYVAC® CLASSIC SF START-UP AND INSTALLATION REPORT

ROBERTS GORDON

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	⚠ WARNING		
			
Electrical Shock Hazard Disconnect electric before service. More than one disconnect switch may be required to disconnect electric from heater. Heater must be connected to a properly grounded electrical source.	**Explosion Hazard** Leak test all components of equipment gas piping before operation. Gas can leak if piping is not installed properly. Do not high pressure test gas piping with equipment connected.	**Burn Hazard** Allow heater to cool before service. Tubing may still be hot after operation.	**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	⚠ 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.	**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.

ROBERTS GORDON

CORAYVAC® Classic SF Start-Up and Installation Report

Fill out one report per system (1 pump). System defined as in-series burners connected to a single vacuum pump.

Job Name _____
Address: _____
Phone Number: _____
Customer Name: _____
Installation Date: _____
Start-Up Date: _____
Room Temperature: _____
Outside Temperature: _____
Technician Name: _____
Technician E-mail: _____

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
      Model Number_____

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

Branch #	End Vent Vacuum	End Vent Plate ID Number Installed

4. Electrical
   A. Pump Supply Voltage_____
   B. Pump Amperage Draw_____
   C. Thermostat(s)_____

Thermostat Location	Thermostat Type

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_____
   B. Double filtered air supply at occupant level
      ☐ YES ☐ NO

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

11. Other Comments_____

CORAYVAC® CLASSIC SF START-UP AND INSTALLATION REPORT (Continued)

12. Units Installed
Branch 1

Branch #	Model	Serial Number	Tube Temperature* (See Drawing)
1(@ End Burner)			
2			
3			
4			

Branch 2

Branch #	Model	Serial Number	Tube Temperature* (See Drawing)
1(@ End Burner)			
2			
3			
4			

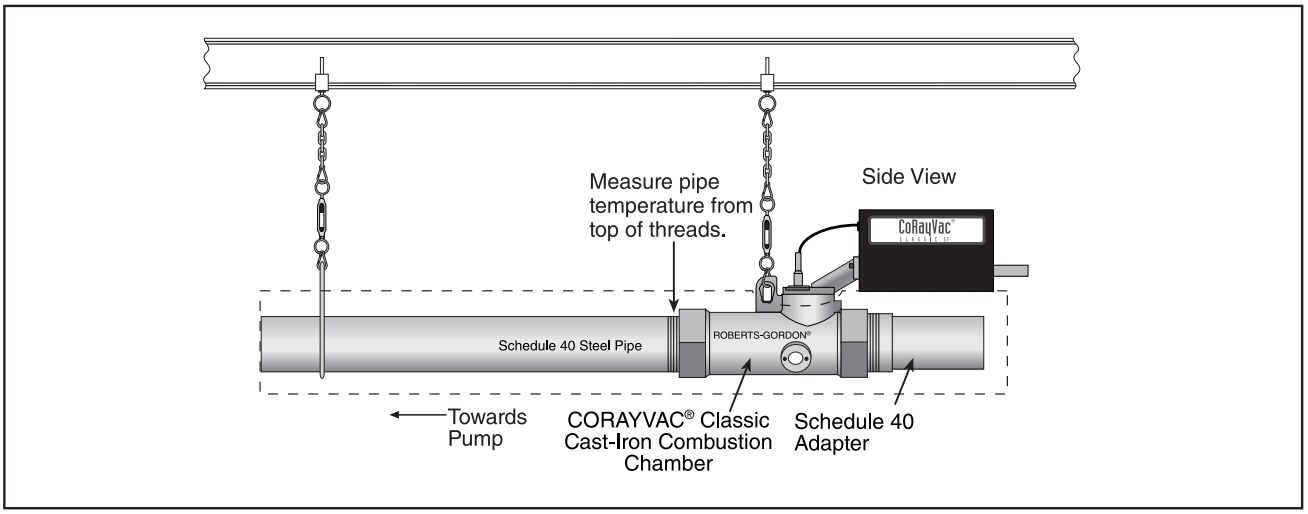
Branch 3

Branch #	Model	Serial Number	Tube Temperature* (See Drawing)
1(@ End Burner)			
2			
3			
4			

Branch 4

Branch #	Model	Serial Number	Tube Temperature* (See Drawing)
1(@ End Burner)			
2			
3			
4			

* 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.



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 warranty.

ROBERTS-GORDON LLC WILL NOT PAY FOR:

Service trips, service calls and labor charges.

Shipment 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.

ROBERTS GORDON
Infrared Heating

CORAYVAC® CLASSSIC SF
OWNER WARRANTY REGISTRATION CARD

Mail or Fax to:

Roberts Gordon LLC •1250 William Street, P.O. Box 44 • Buffalo, NY 14240-0044 • Phone: +1.716-852-4400 • Fax: +1.716-852-0854
Toll Free: 800-828-7450 • www.roberstgordon.com • www.corayvac.com

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, 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.

These products are not for residential use.

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

Attach this information to a wall near the ROBERTS GORDON® heater.

ROBERTS GORDON®
Infrared Heating

Read the Installation, Operation, and Service Manual thoroughly before installation, operation, or service.

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.

Write the largest clearance dimensions with permanent ink according to your model number and configuration in the open spaces below.

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.

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.

⚠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.

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

Roberts-Gordon LLC
1250 William Street
P.O. Box 44
Buffalo, NY 14240-0044 USA
Telephone: +1.716.852.4400
Fax: +1.716.852.0854

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Further Information: Applications, engineering and detailed guidance on systems design, installation and equipment performance is available through ROBERTS GORDON® representatives. Please contact us for any further information you may require, including the Installation, Operation and Service Manual.

This product is not for residential use.

www.robertsgordon.com P/N 91037912 Rev. K