RUSKIN INSTALLATION, START-UP AND MAINTENANCE INSTRUCTIONS

REVT-05ERV
APRIL 30 , 2020
SUPERSEDES: 01-23-20

ENERVENT+© SERIES: EVT-09 EVT-19, EVT-28, EVT-36, EVT-46, EVT-62, EVT-74, EVT-88, EVT-10, EVT-12

ENERGY RECOVERY VENTILATOR WITH OPTIONAL TEMPERING

Energy recovery COMPONENT certified to the AHRI Air-to-Air Energy Recovery Ventilation Equipment Certification Program in accordance with AHRI Standard 1060-2000. Actual performance in packaged equipment may vary.

ETL Certified per UL 1995 and CSA 22.2

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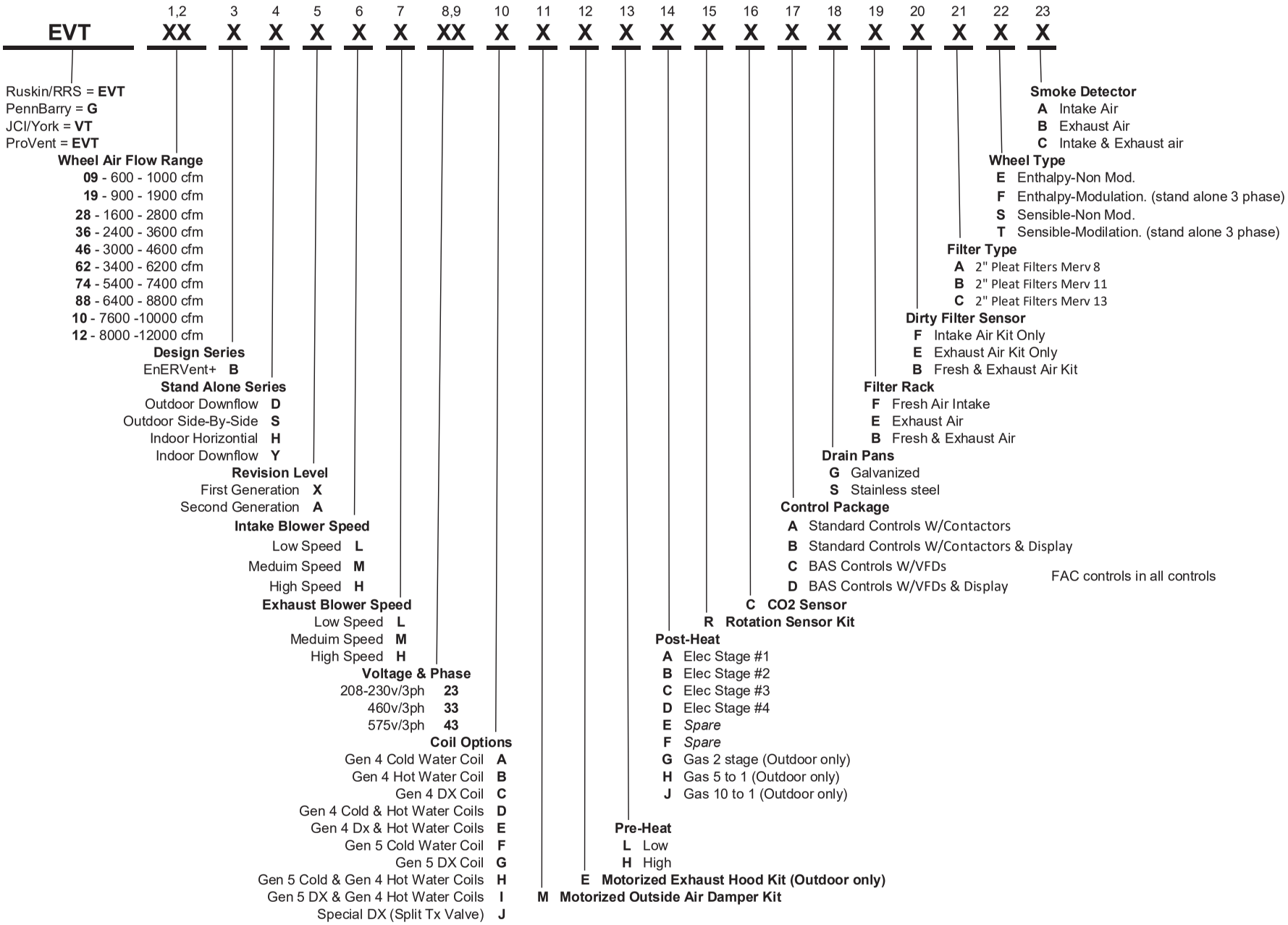

EVT
1,2 XX
3 X
4 X
5 X
6 X
7 X
8,9 XX
10 X
11 X
12 X
13 X
14 X
15 X
16 X
17 X
18 X
19 X
20 X
21 X
22 X
23 X
Ruskin/RRS = EVT
PennBarry = G
JCI/York = VT
ProVent = EVT
Wheel Air Flow Range
09 - 600 - 1000 cfm
19 - 900 - 1900 cfm
28 - 1600 - 2800 cfm
36 - 2400 - 3600 cfm
46 - 3000 - 4600 cfm
62 - 3400 - 6200 cfm
74 - 5400 - 7400 cfm
88 - 6400 - 8800 cfm
10 - 7600 -10000 cfm
12 - 8000 -12000 cfm
Design Series
EnERVent+ B
Stand Alone Series
Outdoor Downflow D
Outdoor Side-By-Side S
Indoor Horizontial H
Indoor Downflow Y
Revision Level
First Generation X
Second Generation A
Intake Blower Speed
Low Speed L
Meduim Speed M
High Speed H
Exhaust Blower Speed
Low Speed L
Meduim Speed M
High Speed H
Voltage & Phase
208-230v/3ph 23
460v/3ph 33
575v/3ph 43
Coil Options
Gen 4 Cold Water Coil A
Gen 4 Hot Water Coil B
Gen 4 DX Coil C
Gen 4 Cold & Hot Water Coils D
Gen 4 Dx & Hot Water Coils E
Gen 5 Cold Water Coil F
Gen 5 DX Coil G
Gen 5 Cold & Gen 4 Hot Water Coils H
Gen 5 DX & Gen 4 Hot Water Coils I
Special DX (Split Tx Valve) J
M Motorized Outside Air Damper Kit
E Motorized Exhaust Hood Kit (Outdoor only)
Pre-Heat
L Low
H High
Post-Heat
A Elec Stage #1
B Elec Stage #2
C Elec Stage #3
D Elec Stage #4
E Spare
F Spare
G Gas 2 stage (Outdoor only)
H Gas 5 to 1 (Outdoor only)
J Gas 10 to 1 (Outdoor only)
R Rotation Sensor Kit
C CO2 Sensor
Control Package
A Standard Controls W/Contactors
B Standard Controls W/Contactors & Display
C BAS Controls W/VFDs
D BAS Controls W/VFDs & Display
FAC controls in all controls
Drain Pans
G Galvanized
S Stainless steel
Filter Rack
F Fresh Air Intake
E Exhaust Air
B Fresh & Exhaust Air
Dirty Filter Sensor
F Intake Air Kit Only
E Exhaust Air Kit Only
B Fresh & Exhaust Air Kit
Filter Type
A 2" Pleat Filters Merv 8
B 2" Pleat Filters Merv 11
C 2" Pleat Filters Merv 13
Wheel Type
E Enthalpy-Non Mod.
F Enthalpy-Modulation. (stand alone 3 phase)
S Sensible-Non Mod.
T Sensible-Modilation. (stand alone 3 phase)
Smoke Detector
A Intake Air
B Exhaust Air
C Intake & Exhaust air

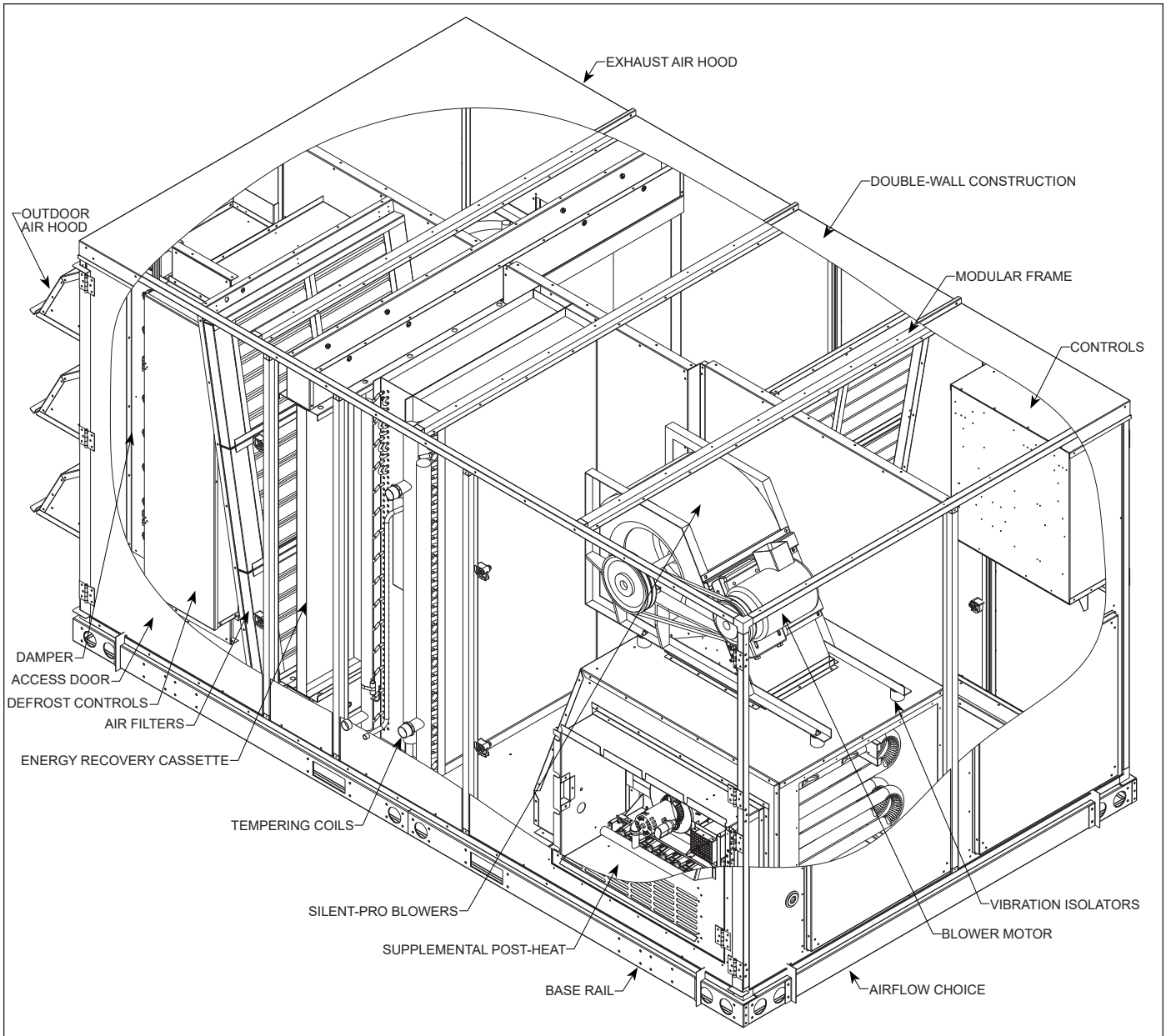


FIGURE 1 - TYPICAL CABINET FEATURES AND OPTIONS

II - GENERAL

⚠ WARNING

Cancer - www.P65Warnings.ca.gov

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer, service agency or the gas supplier.

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

This Manual covers Full Featured Energy Recovery Ventilators, this series offers 10 distinct unit capacities in 5 different cabinet sizes. These units offer a full line of pre-heat and tempering options designed to deliver neutral air (outside air equal to or below the temperature of the exhaust air) to the ventilated space, as well as additional options designed to deliver an additional heating or cooling load, **See Page 15** for a full list and description of options.

Communication and control of this unit can be achieved through a bacnet compatible building automation system like Metasys, or if ordered the unit can be controlled via thermostat.

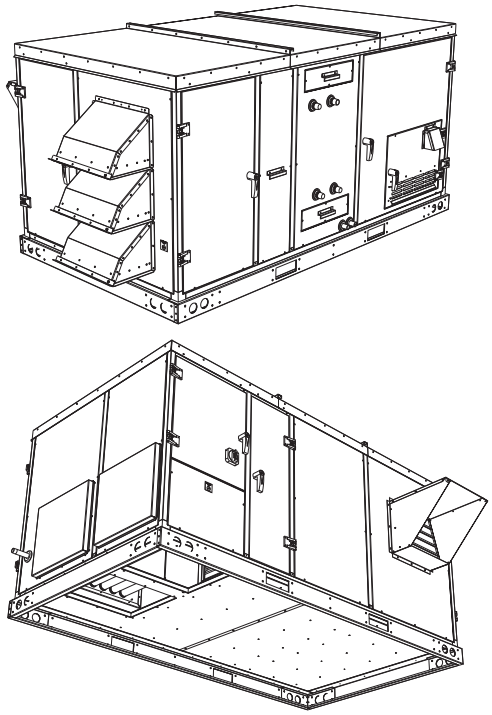
III - PARTS ARRANGEMENT

Figure 1 shows the parts arrangement for the typical cabinet, including major standard features and factory-installed options that are offered and, therefore, may be included in the unit being installed. The units shown are typical of the entire series with regard to component location, features, and options available

IV - FEATURES and OPTIONS (Figure 1)

A. BASIC UNIT - STANDARD FEATURES

1. **BASE RAIL** - Full perimeter, reinforced, heavy-gauge base rail with forklift slots and rigging holes maintains structural integrity during transportation, handling, and installation.
2. **MODULAR FRAME** - Extruded aluminum Modular Frame System adds structural strength and rigidity to entire cabinet. Assures a square, sturdy overall structure and frame for access doors and other openings such as supply and return openings.
3. **DOUBLE-WALL CONSTRUCTION** - All exterior panels, plus divider panel between supply and exhaust chambers, are double-wall construction; which, along with multiple modular framing cross members, adds strength and rigidity to the top and bottom panels. Each panel has an interior core of 1 inch, R-3.6 fiberglass insulation for effective thermal and acoustical performance.
4. **ACCESS DOORS** - Hinged with tool-less, quarter-turn latching handles that possess a "cam latch" assuring tight air and water seal. Provide quick access to components and protect panels and roof from damage. Hinges and handles are made of high strength nylon reinforced fiberglass.
5. **AIRXCHANGE ERC** - Standard Energy Recovery Cassette is an all-welded stainless steel assembly containing a desiccant coated (enthalpy) wheel. Desiccant used is silica gel, which has superior moisture handling capacity in the working range above 30% R.H., the range of greatest concern. Patented and proprietary process permanently bonds desiccant to surface without adhesives permitting long life with repeated washings without loss of effectiveness. Removable, light weight segments make easy cleaning and replacement possible and convenient. An AHRI Certified Component assuring credible and reliable performance per AHRI Standard 1060.
6. **SILENT-PRO® BLOWERS** - Manufactured specifically for Ruskin Rooftop Systems by Lau Industries to a proprietary specification. Shafts are ground and polished steel mounted in permanently lubricated, sealed, ball bearing pillow-block bearings selected for a minimum life of L-10. All supply and exhaust blowers are belt driven to allow independent balancing of supply and exhaust airflow.
7. **VIBRATION ISOLATORS** - Both the supply and the exhaust blowers are mounted on neoprene vibration isolators providing additional acoustical performance.
8. **BLOWER MOTORS and DRIVES** - NEMA Premium Efficient motors that exceed requirements of Energy Policy Act of 1992. Base mount with easy adjustment of belt tension. Mounting permits "slide-out" of motor and adjustable mount for easy service or replacement. All drive combinations are sized for 150% of driven horsepower. Low, medium, and high speed drive kits are available to achieve required CFM range. Fixed diameter cast iron pulley on blower with adjustable pitch cast iron sheave on motor - laser aligned for V-belt connection.



EXTERIOR VIEWS

9. **AIRFLOW CHOICE** - Available in downflow (vertical) or horizontal supply and return airflow configuration.
10. **OUTDOOR AIR HOOD** - Angled to prevent water induction and includes 1 inch aluminum mesh mist elimination filters. Shipped as a separate kit with instructions for field assembly and installation.
11. **EXHAUST AIR HOOD** - Shipped separately as an assembly for field installation. Includes back draft dampers and cover screen.
12. **AIR FILTERS** - Supply and return MERV 8 (optional MERV 11 and MERV 13 available), 2 inch pleated filters with average dust spot efficiency of 30-35%.
13. **CONTROLS** - All internal electrical components are factory wired for single-point power connection. Units with electric pre-heat and/or post-heat are wired with field supplied independent power supply. All components are UL Listed, Approved, or Recognized where applicable and wired in compliance with National Electric Code (NEC). Hinged external access door to control box has an interlocking, fused NEMA 3R disconnect switch. Control box containing all major electrical control components has removable cover panel.

    Direct Digital Controller - Unit controls are performed by a Johnson Controls FEC programmable direct digital controller with features that allow state of the art commercial HVAC control. The controller communicates with Building Automations Systems that support the BACnet application specific controller profile. Every Unit has a Device Address, MAC Address, and baud rate set at the factory to customer specifications to assure communication compatibility in the field.

B. OPTIONS and ACCESSORIES

14. DAMPERS - Parallel-blade, motorized or gravity, damper assembly for outdoor or exhaust airflow. Aluminum blades with galvanized steel frames.

15. DEFROST CONTROL - Three types of frost control available:

a. Electric pre-heater

b. Exhaust only (low ambient kit)

c. Modulating wheel frost control

Pre-Heater - An ETL Certified Component, two-stage heater with controls wired at the factory. Single point power for the heating elements to be field provided.

16. SUPPLEMENTAL POST-HEAT - Two post-heaters are available: Gas Fired (shown) and Electric.

Gas Fired Post-Heat - An ETL Certified Component. Standard with aluminized inshot burners, direct spark ignition, electronic flame sensor, combustion air inducer, and redundant automatic 2-stage (EVT-28 and larger) gas valve with manual shut-off. Additional options available are 5:1 modulation and; when a high turn-down gas input ratio is needed; a split-manifold, 10:1 modulation is recommended to optimize efficiency at the highest rate. Heat exchanger is tubular construction, aluminized steel (EVT-10 and EVT-12 are stainless steel), and life cycle tested. Stainless steel heat exchanger is an option, but is required if mixed air temperature is below 45°F. Electric spark ignition of burners on each operating cycle. System permits main gas valve to stay open only when the burners are proven to be lit. Should a loss of flame occur, gas valve closes, shutting of gas to burners. Ignition module has LED to indicate status as troubleshooting aid. Ignition control is factory installed in heating compartment. Redundant limit controls are factory installed with fixed temperature setting. Heat limit controls protect heat exchanger and other components from overheating. Flame roll-out switch, flame sensor and combustion air inducer proving switch protect system operation.

Electric Post-Heat - An ETL Certified Component, with controls wired at the factory. Single point power for the heating elements to be field provided. Staging ranges from 1 to 4 depending on the unit size and heater option selected.

17. TEMPERING COILS - Copper tube and aluminum fin construction, rated in accordance to ARI Standard 410. Tubing and return bends are seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. Designed to withstand 250 psi maximum operating pressures and a maximum temperature of 300°F. Aluminum fins are Sine Wave and are die-formed to provide self-spacing collars which completely cover the entire tube surface. Copper tubes are mechanically expanded to form an interference fit with the fin collars.

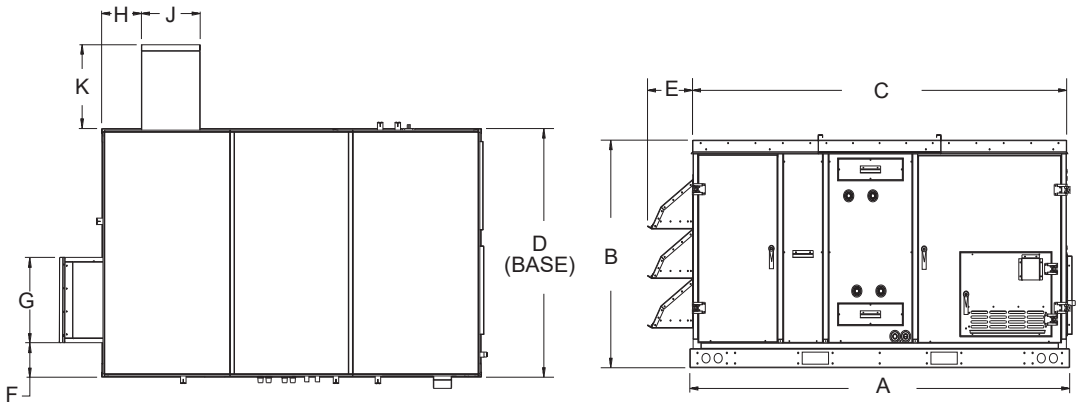
Chilled and Hot Water - Design permits in-tube water velocities up to 6 ft/sec. Headers have factory-installed air vents and drain plugs placed at the highest and lowest points respectively. MPT connections are provided.

Direct Expansion - All copper tubing is internally enhanced with Rifled surfacing for improved heat transfer performance. Factory-installed, externally adjustable, Thermal Expansion Valve is standard. Two-stage, interlaced circuiting is provided for the EVT-46 and larger units with the Neutral Air Option (**See SECTION VI - TEMPERING MODE**) and for the EVT-28 and larger with the Neutral Air Plus Option.

PRODUCT SPECIFICATIONS - A summary of specifications for the **ENERVENT+** series is listed in **Table 14. See Page 39.**

V - DIMENSIONS

Overall unit dimensions are illustrated and tabulated in **Figure 2**.



UNIT OVERALL DIMENSIONS (INCHES)										
UNIT	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**
EVT-09 / -19	93 ½	47 ⅜	92 ¼	51 ¾	11 ⅛	6 ⅝	17 ¾	9	14 ⅜	18 ¼
EVT-28 / -36	110 ⅞	54 ⅜	109 ⅝	61 ⅝	13 ⅞	6 ¾	20	8 ⅝	15 ⅜	18 ¼
EVT-46 / -62	135 ½	70	134 ¼	79 ½	17 ½	7 ¼	24 ½	11 ⅞	20 ⅜	18 ¼
EVT-74 / -88	149 ½	76 ⅞	148	90 ¼	19 ¼	11 ⅜	29	12 ¼	27 ¾	21 ¼
EVT-10 / -12	161 ½	88 ¼	160 ¼	101 ⅞	21	10 ¾	34	15 ⅜	27 ¾	21 ¼

FIGURE 2 - OVERALL DIMENSIONS

VI - BASIC OPERATING MODES

A. ENERGY RECOVERY MODE

The Energy Recovery Mode utilizes two blowers operating continuously with one supplying the required VOLUME of fresh outdoor air, and the other exhausting an equal VOLUME of stale indoor air returned from the conditioned space. Energy Recovery is achieved by slowly rotating the Energy Recovery Wheel within its cassette framework, known as the Energy Recovery Cassette, or ERC.

During *winter* operation the ERC absorbs heat and moisture from the return air stream during one half of a complete revolution and recovers that energy by transferring it to the cold, dryer outdoor air during the other half of the same revolution. The process automatically reverses for *summer* operation when heat and moisture are absorbed from the fresh, outdoor supply air and transferred to the return air stream being exhausted. This transfer of energy takes place at an efficiency of 70 to 80%.

This mode of operation allows outdoor air ventilation rates to be increased by a factor of three or more without additional energy penalty or increase in size of heating or cooling systems.

B. TEMPERING MODE

Neutral Air Option - Also available are cooling and heating options installed after the ERC to further temper the supply air to achieve a space neutral condition. This is an ideal solution for applications requiring 100% outdoor air.

Neutral Air Plus Option - If a cooling capacity beyond that required to achieve a space neutral condition is desired there is an option available that will meet that requirement. This will provide a solution for applications requiring 100% outdoor air, plus meet an additional cooling load. See supplemental brochure for cooling performance with matching condensing unit.

C. HOW IT WORKS

The ERC contains an Enthalpy Wheel that is a new concept in rotary air-to-air heat exchangers. Designed as a packaged unit for ease of installation and maintenance, the standard unit (without optional features) requires only the connection of electrical power to make the system operational. The Enthalpy Wheel is coated with a Silica Gel Desiccant using a patented and proprietary process developed by the wheel manufacturer that permanently bonds it to the polymer substrate without adhesives. Even after years of operation and repeated washings, the desiccant remains in place.

Silica Gel is a highly porous solid adsorbent material that structurally resembles a rigid sponge. Water vapor is transferred between two air streams of different vapor pressures; which drives water molecules into/from the desiccant cavities to transfer moisture from the more humid air stream to the dryer air stream.

Enthalpy is a term representing total heat energy, meaning sensible heat energy plus latent heat energy. Sensible and latent heat are the two components of total heat. Sensible heat is the energy contained in dry air and can be recovered by simply effecting a temperature change in a given VOLUME of air. While latent heat is the energy contained in the water vapor within moist air.

During the summer cooling season the latent heat can only be removed by condensing that vapor below its dew point with the optional cooling coil (water or refrigerant) and draining off the condensate or by absorbing it from the moist supply air stream and then transferring it to the dryer return air stream, which exhausts it to the outside. For buildings that require a large amount of outside air to meet ventilation codes, this greatly reduces the cooling load on the air conditioning system. An additional load reduction can be achieved if the unit contains the optional Tempering Coil.

In the winter heating season this vapor transfer capability works to increase moisture in the supply air stream by absorbing it from the return air. This reduces the amount of humidification required to maintain comfort level in the occupied space during the heating season. Since the Enthalpy Wheel transfers moisture entirely in the vapor phase, the wheel remains dry eliminating wet surfaces that retain dust and promote fungal growth. Because it is always dry and constantly rotating between the supply and exhaust air streams, which reverses the direction of air flow each half cycle, dust or other particles impinging on the surface are blown off when it rotates into the opposite air stream. This creates a self-cleaning effect.

When the outdoor air temperatures are below 15°F, it is recommended to use the optional Low Ambient Kit

VII - RECEIVING and INSPECTION

⚠CAUTION

Danger of sharp metallic edges. Can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.

Do not attempt to operate the unit if there is indication that any part or control has been under water. Any control or component that has been under water must be replaced prior to start-up.

A. SHIPPING and PACKING LIST

1. Assembled ERV
2. Assembled Exhaust Hood
   Inside ERV behind door marked:
   "Filter Access-Exhaust."
3. Disassembled Intake Hood
   Inside ERV behind door marked:
   "Filter Access-Supply."
4. Flue Vent Hood (Gas Post-Heat Option)
   Inside ERV behind door marked:
   "Filter Access-Supply."

NOTE: The EVT 09/-19 will have Hoods attached before shipping, remove during rigging for lifting if they obstruct the lifting straps and reinstall after the unit is set on its curb.

B. SHIPPING DAMAGE

The ERV is thoroughly inspected and test run at the factory. Nevertheless, damage may occur during shipping and handling; therefore, upon delivery, inspect the unit for both obvious and hidden damage, and ensure all options/ accessories items are present.

Additional inspection steps:

1. Turn each blower wheel by hand to ensure it turns freely and does not bind.
2. Inspect dampers (if supplied) for free operation of all moving parts.
3. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier.

C. REQUIREMENTS

If the unit is stored for any length of time prior to installation it must be stored in the original crate and protected from dust, debris, and weathering. If storage is in a humid, dusty or corrosive atmosphere, rotate the blowers and purge the bearings once a month. Improper storage resulting in damage to the unit or components will void the warranty.

Use of this unit as a construction heater is not recommended during any phase of construction. If it has been used for heating of buildings under construction, the following conditions must be met or the warranty will be void:

- The Intake Hood must be installed per these installation instructions.
- The Flue Vent Hood (gas heat option) must be installed.
- A room thermostat must control the unit; i.e., the use of fixed jumpers that will provide continuous heating is not allowed.
- Air filters must be replaced upon construction completion.
- The input rate and temperature rise must be set per the unit rating plate.
- The unit operating conditions (including airflow, ignition, input rate, temperature rise, and venting) must be verified according to these installation instructions.

VIII - UNIT PLACEMENT and SUPPORT

⚠WARNING

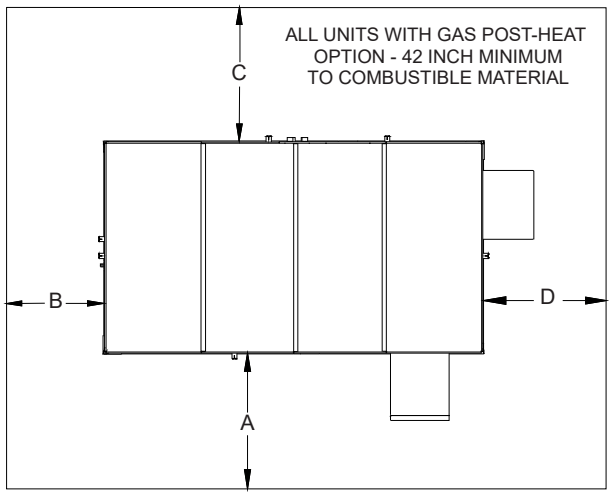
Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off gas and electrical power to unit before performing any maintenance or servicing operations on the unit. Follow lighting instructions attached to unit when putting unit back into operation and after service or maintenance.

A. POSITIONING (MIN CLEARANCES)

General Unit Requirements

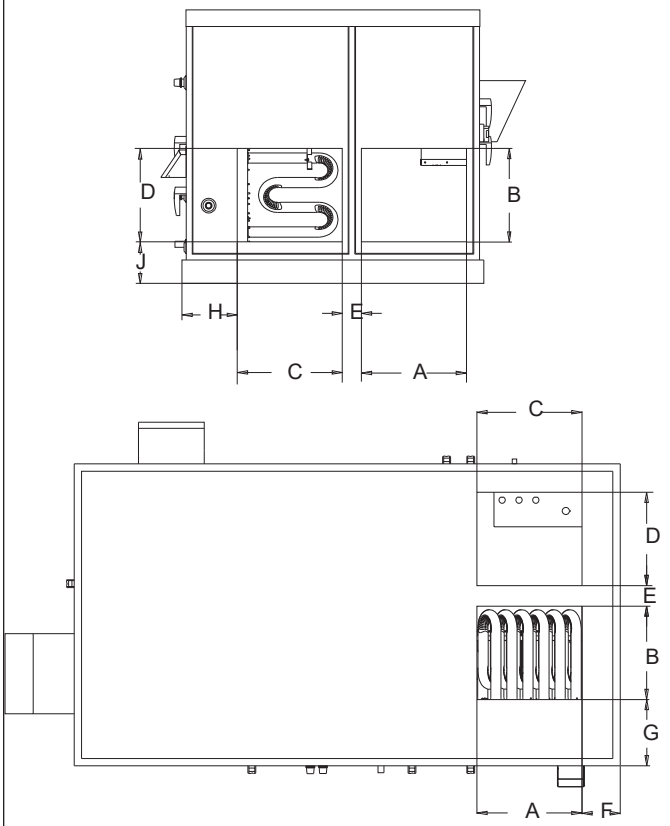
Do not position the unit with the outdoor air intake into the prevailing wind and keep the intake away from any other exhaust fans. Likewise, position the exhaust discharge opening away from the outdoor intakes of other units.

The following items must be completed prior to rigging and lifting the ERV onto the roof.



MINIMUM CLEARANCES (INCHES)				
UNIT	A	B	C	D
EVT-09/-19	48	36	42	42
EVT-28/-36	48	36	48	42
EVT-46/-62	48	36	60	48
EVT-74/-88	48	42	72	48
EVT-10/-12	48	48	84	48

FIGURE 3 - MINIMUM CLEARANCES



SUPPLY AND RETURN DUCT OPENINGS DIMENSIONS (INCHES)									
UNIT	A	B	C	D	E	F	G	H	J
EVT-09/-19	18	16	18	16	3 ¾	6 ½	11	9	7
EVT-28/-36	22	22 ⅛	22 ⅛	22 ⅛	3 15⁄16	7 13⁄16	9 ¾	10	6 5⁄16
EVT-46/-62	28	28	28	28	4 15⁄16	8 ⅛	13 ¼	13 5⁄16	7
EVT-74/-88	33 ⅞	34 ⅛	34	34	4 7⁄16	12 9⁄16	11 ⅛	12 ⅝	6 ⅝
EVT-10/-12	34	42	42	34	6	8 ⅝	15 ⅜	15	7 ¼

FIGURE 4 - DUCT OPENINGS

1. Roof Mounting Frame (RMF) must be positioned to provide minimum clearances shown in **Figure 3**.
2. RMF must be installed, flashed and sealed in accordance with the manufacturer's instructions provided with the frame.
3. RMF should be square and leveled to 1/16 inch per linear foot (5mm per linear meter) in any direction.
4. Roof openings for ducts must be complete and ducts installed by attaching to the RMF and not to the unit. **See Figure 4** for location and size of Supply and Return openings in the unit.
5. Roof curb gasket must be applied to all top surfaces of the curb

Gas Heat Unit Requirements

1. Do not position where flue products can be drawn into adjacent building openings, such as windows, fresh air intakes, etc.
2. Distance from flue discharge to adjacent buildings, public walkways, operable windows and other building openings shall conform to local codes. In the absence of applicable local codes, installation shall conform to the National Fuel Gas Code ANSI Z223.1, or CAN/CGA B-149 Installation Codes.
3. Building materials that will be affected by flue gases should be protected. A minimum of 42 inches must be provided from any combustible materials.
4. Avoid locating in an area where deep snow is likely to accumulate. During winter months keep snow clear on access side of unit to prevent blockage of combustion air inlet or flue exhaust opening.
5. Maintain a minimum horizontal clearance of 48 inches from electric meters, regulators and relief equipment. In Canada this minimum clearance is 72 inches.
6. To prevent premature heat exchanger failure, do not locate unit where chlorinated, halogenated or acid vapors are present.
7. Unit must not be installed in a potentially explosive, flammable or corrosive atmosphere.
8. Do not modify or obstruct the combustion air inlet, flue exhaust duct or vent cover in any manner.
9. Local codes may supersede any of the proceeding provisions.

B. DOWNFLOW APPLICATION

⚠CAUTION

In downflow applications, do not drill or punch holes in base of unit. Leaking in roof may occur if unit base is punctured.

NOTE: In downflow applications, units equipped with the post-heat option (gas or electric) must be installed on a non-combustible surface only unless installed on a Ruskin 022E1 Roof Mounting Frame.

**** DISCLAIMER for Indoor and Outdoor applications: RRS shall not be liable for any consequential, Incidental, contingent, indirect, special, punitive or liquidated damages whatsoever as a result of purchasing another vendors roof curbs or other accessories that have not been first approved by RRS.***

Therefore any failures of said equipment due to the non-use of RRS roof curb accessories, will render any warranties provided with said equipment to be null and void.

Roof Mounting with Ruskin 022E1 RMF

1. Securely fasten RMF to roof per local codes.
2. The RMF must be installed, flashed and sealed in accordance with the manufacturer's instructions provided with the frame.
3. The RMF should be square and level to 1/16 inch per linear foot (5 mm per linear meter) in any direction.
4. Supply and return ducts must be attached to the RMF and not to the unit and plenums must be installed before setting the unit.

Roof Mounting with Installer's RMF

It is recognized that many types of roof frames can be used to support the unit depending upon different roof structures. However, items to keep in mind when not using a manufacturer's roof mounting frame.

1. The Enervent base is fully insulated, so an enclosed frame is not required.
2. The frame or support must be constructed with non-combustible materials and should be square and level to 1/16 inch per linear foot (5 mm per linear meter) in any direction.
3. Frame or support must be high enough to prevent any form of moisture from entering the unit. Recommended minimum frame height is 14 inches (356 mm)
4. Ducts must be attached to the roof mounting frame and not to the unit. Supply and return plenums must be installed before setting the unit.
5. Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.
6. When installing a unit equipped with optional gas or electric post-heat on a combustible surface, a RMF must be provided to Ruskin Rooftop System's specifications.

C. HORIZONTAL FLOW APPLICATION

NOTE: In horizontal flow applications, units equipped with the post-heat option (gas or electric) may be installed on combustible surfaces.

All exterior ducts joints and openings in roof or building walls must be insulated and weather-proofed with flashing and sealing compounds in accordance with applicable codes. Any duct passing through an unconditioned space must be insulated.

1. The supply and return air ducts connect to the unit's corresponding horizontal air openings.
2. Specified installation clearances must be maintained when positioning units. **Refer to Figure 3.**
3. Unit requires support along all four sides of unit base.

Supports must be constructed of steel or suitably treated wood materials.

4. If slab-mounted: top of support slab should be approximately 4 inches (102 mm) above finished grade and located so no run-off water from higher ground can collect around the unit.
5. The bottom supply and return duct openings should be closed with factory supplied panels, best practice is to double check that these were ordered and installed correctly before the unit is set on a slab or curb.

XI - RIGGING and LIFTING

1. Remove all shipping materials from the unit.
2. All panels must be in place before rigging.
3. Remove the forklift channels from the base frame before setting the ERV on a roof curb.
4. Proper rigging and handling of the equipment is mandatory during unloading and setting it into position to retain warranty status.
5. A properly qualified rigging professional should be responsible for the handling and setting of the unit on the roof curb.
6. Rigger should use suitable mating hardware to attach to the unit's lifting holes located on the base frame. Refer to **Table 1** to for unit weights.

UNIT	MAXIMUM WEIGHT	
	LBS	KG
EVT-09	1,510	680
EVT-19	1,670	760
EVT-28	2,610	1,180
EVT-36	2,780	1,260
EVT-46	3,080	1,400
EVT-62	3,330	1,510
EVT-74	5,210	2,360
EVT-88	5,560	2,520
EVT-10	6,230	2,830
EVT-12	6,670	3,030

TABLE 1 - MAXIMUM UNIT WEIGHTS WITH ALL OPTIONS

NOTE: The EVT 09/-19 will have Hoods attached before shipping, remove during rigging for lifting if they obstruct the lifting straps and reinstall after the unit is set on its curb.

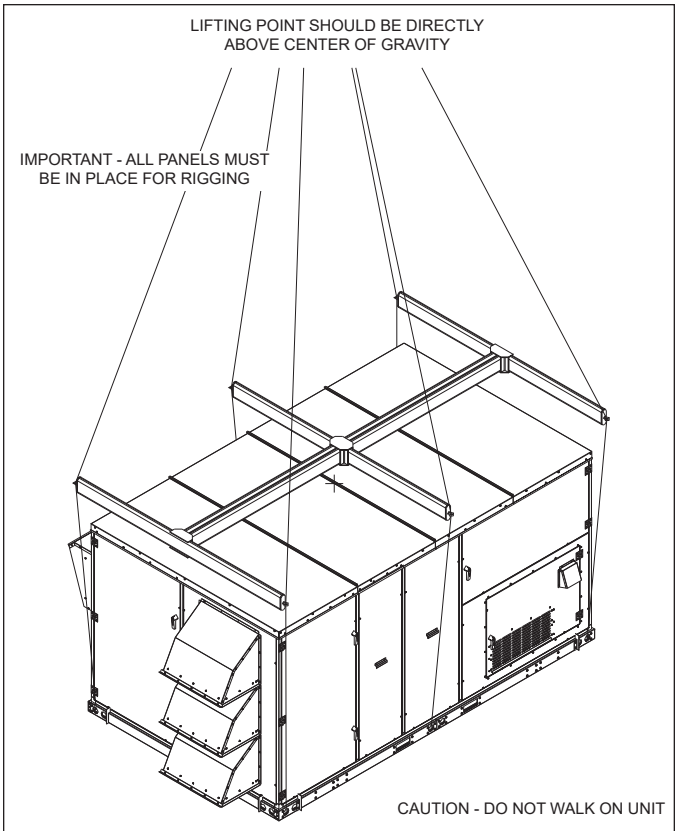
Important: A properly qualified rigging professional should be responsible for the handling and setting of the unit on the roof curb.

X - UNIT INSTALLATION

A. DUCT SIZING and CONNECTION

NOTE: Recommended duct sizes shown in Figure 4 result in duct velocities over the published cfm range for each model of approximately 300 feet per second minimum for the EVT-09 (600 cfm) to approximately 1200 feet per second maximum for the EVT-12 (12,000 cfm).

1. No holes should be drilled into the base of the Unit for the installation of ductwork, all ductwork should be attached to a roof curb that is either factory supplied or built to manufacturer's specifications.



SPREADER BARS WIDER THAN THE UNIT'S WIDTH SHOULD BE USED TO PREVENT DAMAGE TO THE ERV'S CABINET

FIGURE 5 - RIGGING UNIT FOR LIFTING

2. Installation of ducts should be done in accordance with SMACNA and SMCA guidelines.
3. Units with horizontal supply and return ductwork should have the bottom supply and return openings closed off and sealed.

IMPORTANT: All downflow units with any Gas or Electric post heat options must have a sheet metal L or T shaped supply duct that makes a transition from vertical to horizontal directly below the supply opening. No outlets or registers should be placed directly below the supply opening.

B. GAS PIPING (OPTION)

NOTE: Before connecting gas piping, check with gas provider or local authorities having jurisdiction for local code requirements. When installing gas supply piping, length of run from gas meter must be considered in determining pipe size for 0.5 i.w.c. (0.12 kPa) maximum pressure drop. Do not use supply pipe smaller than unit gas connection. For natural gas units, operating pressure at the unit gas connection must be a minimum of 4.7 i.w.c. (1.17 kPa) and a maximum of 10.5 i.w.c. (2.60 kPa).

Connect Gas Piping

1. All gas piping shall conform with local codes and ordinances or, in the absence of local codes, to the National Fuel Gas Code or ANSI Z223.1. In Canada, installation must be in accordance with CAN/CGA-B149.1 for Natural Gas.

2. A manual gas shut-off valve (furnished by installer) must be installed immediately adjacent to the point where the gas supply enters the cabinet. Codes may require that both a manual main shut-off valve and a union be installed and that the union must be of the ground joint type. **See Figure 6.**
3. Always use clean, scale-free pipe and malleable iron fittings, and remove all cutting and threading debris prior to connecting pipes.
4. Firmly support the gas piping so that it cannot be dislodged from its installed position.

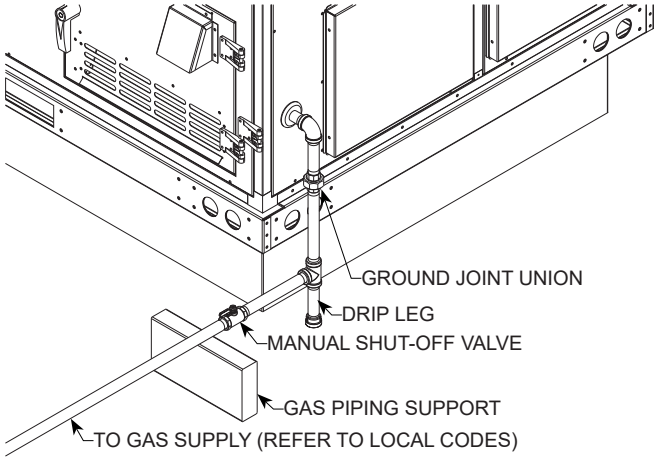


FIGURE 6 - GAS SUPPLY PIPING

A. DUCT SIZING and CONNECTION

NOTE: Recommended duct sizes shown in Figure 4 result in duct velocities over the published cfm range for each model of approximately 300 feet per second minimum for the EVT-09 (600 cfm) to approximately 1200 feet per second maximum for the EVT-12 (12,000 cfm).

1. No holes should be drilled into the base of the Unit for the installation of ductwork, all ductwork should be attached to a roof curb that is either factory supplied or built to manufacturer's specifications.
2. Installation of ducts should be done in accordance with SMACNA and SMCA guidelines.
3. Units with horizontal supply and return ductwork should have the bottom supply and return openings closed off and sealed.

IMPORTANT: All downflow units with any Gas or Electric post heat options must have a sheet metal L or T shaped supply duct that makes a transition from vertical to horizontal directly below the supply opening. No outlets or registers should be placed directly below the supply opening.

B. GAS PIPING (OPTION)

NOTE: Before connecting gas piping, check with gas provider or local authorities having jurisdiction for local code requirements. When installing gas supply piping, length of run from gas meter must be considered in determining pipe size for 0.5 i.w.c. (0.12 kPa) maximum pressure drop. Do not use supply pipe smaller than unit gas connection. For natural gas units, operating pressure at the unit gas connection must be a minimum of 4.7 i.w.c. (1.17 kPa) and a maximum of 10.5 i.w.c. (2.60 kPa).

Connect Gas Piping

⚠CAUTION

Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed. Do not use matches, candles, flame or other sources of ignition to check for gas leaks.

⚠WARNING

Danger of explosion. Can cause injury or product or property damage. Do not use matches, candles, flame or other sources of ignition to check for leaks.

1. All gas piping shall conform with local codes and ordinances or, in the absence of local codes, to the National Fuel Gas Code or ANSI Z223.1. In Canada, installation must be in accordance with CAN/CGA-B149.1 for Natural Gas.
2. A manual gas shut-off valve (furnished by installer) must be installed immediately adjacent to the point where the gas supply enters the cabinet. Codes may require that both a manual main shut-off valve and a union be installed and that the union must be of the ground joint type. **See Figure 6.**
3. Always use clean, scale-free pipe and malleable iron fittings, and remove all cutting and threading debris prior to connecting pipes.
4. Firmly support the gas piping so that it cannot be

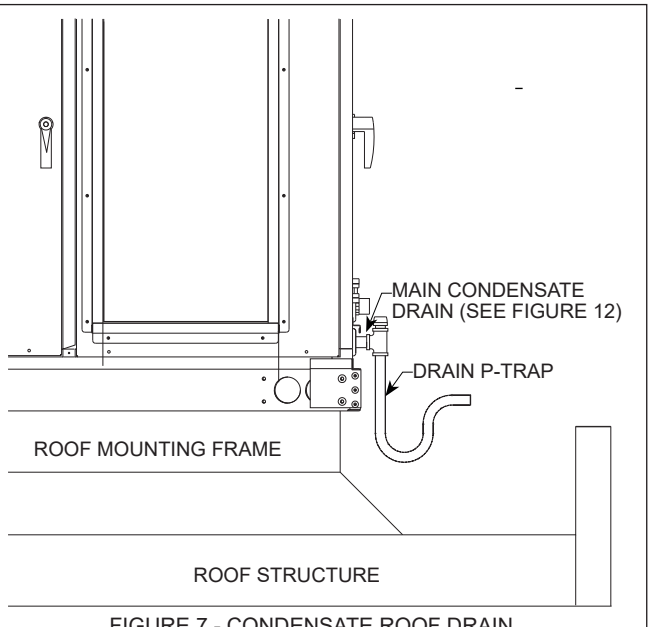


FIGURE 7 - CONDENSATE ROOF DRAIN

NOTE: Use a PVC T-fitting with a cap to provide washout access for the P-trap.

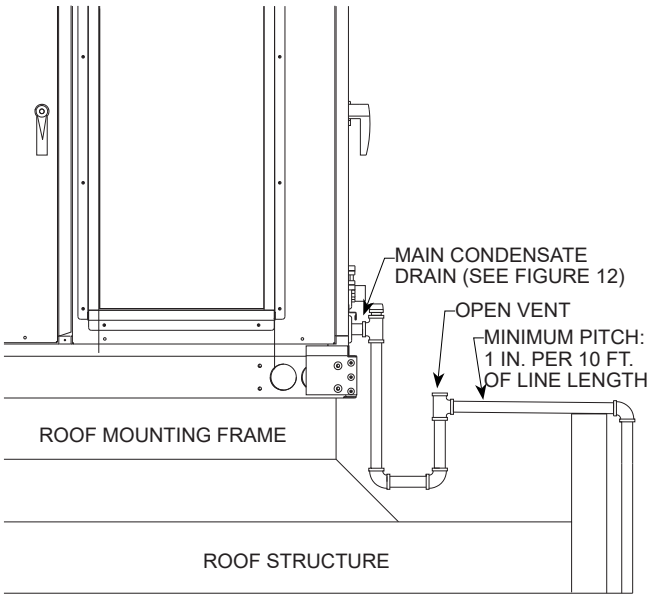
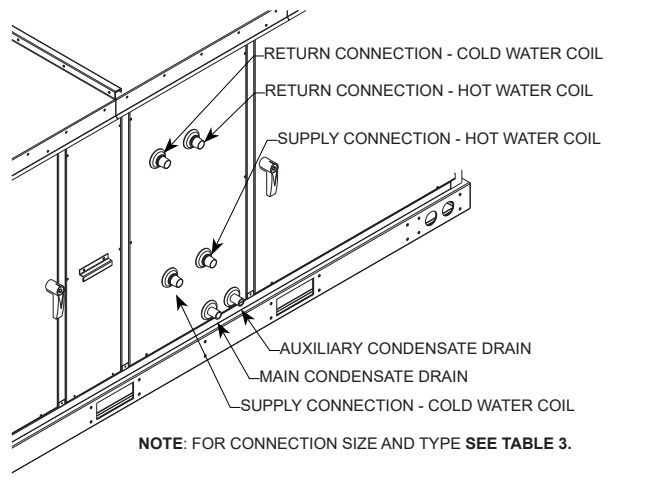


FIGURE 8- CONDENSATE DRAIN CONNECTION

dislodged from its installed position.

5. Gas piping must be sized for the total Btuh input of the appliance. Refer to the unit rating plate for total input.
6. Regulators used must be sized for the total Btuh input of the unit.
7. For the unit to operate properly, the inlet gas pressure must be maintained at 7.0 i.w.c. for Natural Gas. Maximum inlet pressure must not exceed 13.0 i.w.c. to prevent damage to the gas valve.
8. A ⅛ inch NPT tap is provided on the inlet of the gas valve. A fitting suitable for connection to a pressure gauge capable of measuring gas pressure should be connected to the valve at this tap.
9. A drip-leg shall be provided at any point in the gas line where condensate and sediment could collect.
10. Prior to operating this unit for the first time, it is important to leak test all gas piping and fix any leaks before turning on the unit.

Pressure Test Gas Piping



NOTE: FOR CONNECTION SIZE AND TYPE **SEE TABLE 3.**

FIGURE 9 - DRAIN CONNECTIONS

NOTE: The appliance gas valve can be damaged if subjected to more than 0.5 psig (3.48 kPa).

EXTERNAL CONNECTIONS						
TEMPERING COILS				CONDENSATE	GAS	
UNIT	WATER COILS	DIRECT EXPANSION		MAIN & AUX	2 STAGE & 5:1 MODULATION	SPLIT MANIFOLD 10:1 MODULATION
	SUPPLY & RETURN	LIQUID	SUCTION			
EVT-09	1 MPT	⅜ SWT	¾ SWT	¾ MPT	¾ MPT	NA
EVT-19		½ SWT	⅞ SWT			
EVT-28	1 ¼ MPT		1 ⅛ SWT			¾ MPT
EVT-36						
EVT-46	1 ½ MPT	⅝ SWT	1 ⅜ SWT	1 MPT		
EVT-62						
EVT-74	2 MPT	¾ SWT				
EVT-88						
EVT-10	2 ½ MPT				1 MPT	1 MPT
EVT-12						

TABLE 2 - EXTERNAL CONNECTIONS - SIZE AND TYPE

1. Prior to operating this unit for the first time, it is important to leak test all gas piping and fix any leaks before turning on the unit.
2. Isolate the gas valve from the gas supply system by closing its individual manual shut-off valve or by disconnecting it from the gas supply piping system during any pressure testing equal to or more than 0.5 psig (3.48 kPa).
3. After all connections have been made and the valve isolated, pressurize the piping system and check all connections for gas leaks, using only a leak detection solution or other preferred means. **DO NOT** use matches, candles or other sources of ignition to check for gas leaks.

C. CONDENSATE DRAIN CONNECTIONS (OPTION)

Units ordered with a Cooling Coil Option are provided with a heavy gage, galvanized steel (stainless steel optional) drain pan with a male, 1 inch N.P.T. main and auxiliary (overflow) connection external to the unit as shown in **Figure 7**. A trap must be installed between drain connection and an open vent for proper condensate removal. It is recommended that the auxiliary drain also be connected to a drain line. This line does not require a trap or vent. If not connected, it must be plugged with provided cap.

It is sometimes acceptable to drain condensate onto the roof or grade. In this case a simple drain trap as shown in **Figure 7** may be suitable. If draining onto a roof, place a drip pad below drain to protect roof.

If draining onto roof is not acceptable, a drain line must be attached to the trap. In this case the main drain must be configured similar to that shown in **Figure 8** where the condensate is routed downward to an open drain or sump. Local codes may require drainage into a waste water system. Do not connect drain to a closed waste system. Additionally, the condensate line must be vented and pitched away from the unit at least 1 inch for every 10 feet of line length. On longer runs, an air break should be used to ensure proper drainage. Be certain to check local codes concerning condensate disposal.

Drainage problems can also result from a lack of

maintenance. Algae can form in the drain pan and trap resulting in reduced water flow, which can cause a backup into the unit. Regular maintenance can prevent this condition.

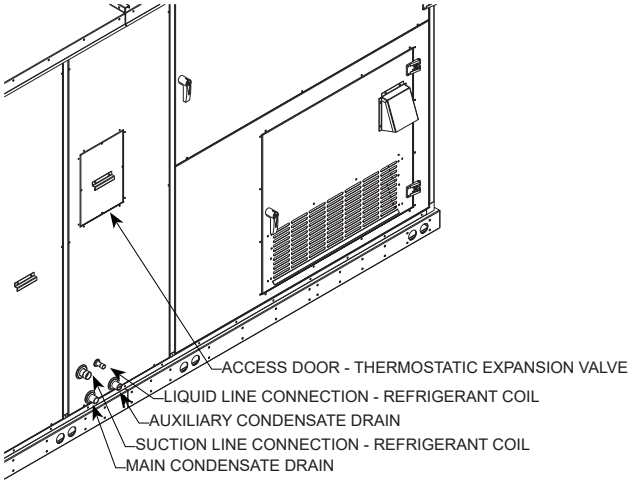


FIGURE 10 - DRAIN CONNECTIONS

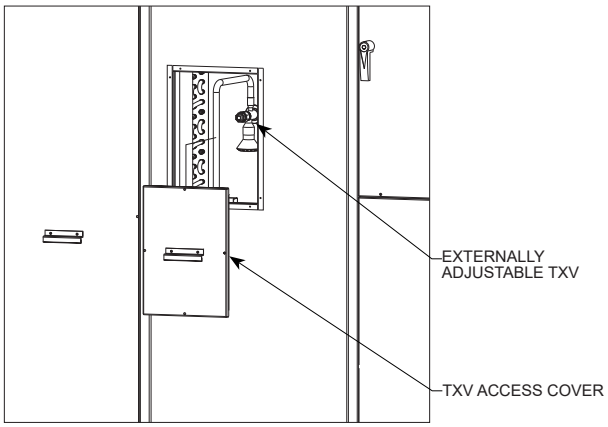


FIGURE 11 - THERMOSTATIC EXPANSION VALVE

D. WATER COIL CONNECTIONS (OPTION)

Factory installed water coils for cooling and heating are located after the ERC and before the blower on the supply side of the unit. Note the supply and return water connections extending outside the unit above the condensate drain as shown in **Figure 9**.

XI - ELECTRICAL CONNECTIONS

Electrical connections must conform to all local codes and to current National Electric Codes (NEC) and Canadian Electric Codes (CEC). Refer closely to unit wiring diagram for proper wiring connections.

Refer to nameplate on Base Unit and on Electric Heat Options (Pre- and Post-Heat) for minimum circuit ampacity (MCA) and maximum fuse size.

Ground Base Unit with a suitable ground connection, either through unit supply wiring or an earth ground. Power supply entries must be sealed weather tight after wiring is complete.

A. BASE UNIT POWER SUPPLY

⚠WARNING

Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

Do not apply power or close disconnect switch until installation is complete. Refer closely to start-up directions and to unit wiring diagram on inside of control box access door or see **Pages 47-57**, Electric and Gas Post-Heat unit wiring diagrams respectively. Wiring diagrams for each pre-heat and post-heat (electric and gas) option can be found in **SECTION XVIII - WIRING DIAGRAMS**

1. 230/460/575 volt units are factory wired. For 208V supply, remove the connector from the 208V terminal and the wire from the 230V terminal on each of the control power transformers (2). Place the connector on the 230V terminal and connect the wire to the 208V terminal.
2. Route power through exterior panel below the Control Box. Recommended entry location is indicated by Drill Location Sticker (**Figure 12**). Power is then routed upward through the bottom of the Control Box and wired into the factory supplied Disconnect Switch

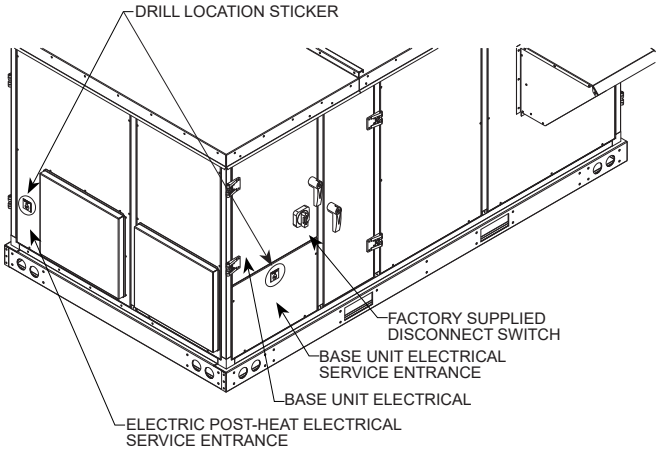


FIGURE 12 - FIELD ELECTRICAL SERVICE ENTRANCE

B. POST-HEAT POWER SUPPLY (OPTION)

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram on inside of Post-Heat Control Box cover.

1. Route power through exterior panel to the left of Base Unit power entry. Again the recommended entry location is marked by Drill Location Sticker (two if Post-Heat input is greater than 60kw) shown in **Figure 12.**
2. **EVT-09 and -19** - After entry through exterior panel, wires are routed down through the Blower Deck into the top of Post-Heat Control Box and connected to the Power Distribution Block.

3. **EVT-28, -36, -46, -62, -74, -88, -10 and -12** - After entry through exterior panel, wires are routed up into the back side of factory installed Post-Heat Fuse Box to the Power Distribution Block(s).

C. PRE-HEAT POWER SUPPLY (OPTION)

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram on inside of Pre-Heat Control Box cover. (**NOTE** - A typical Pre-Heat wiring diagram can be found on **Page 58** for general reference only.)

1. Route power through front panel below and to the right of the Intake Hood as noted in **Figure 13**. Recommended location of entry is marked with a Drill Location Sticker. Route through bottom of Pre-Heat Control Box and connect to Power Distribution Block.

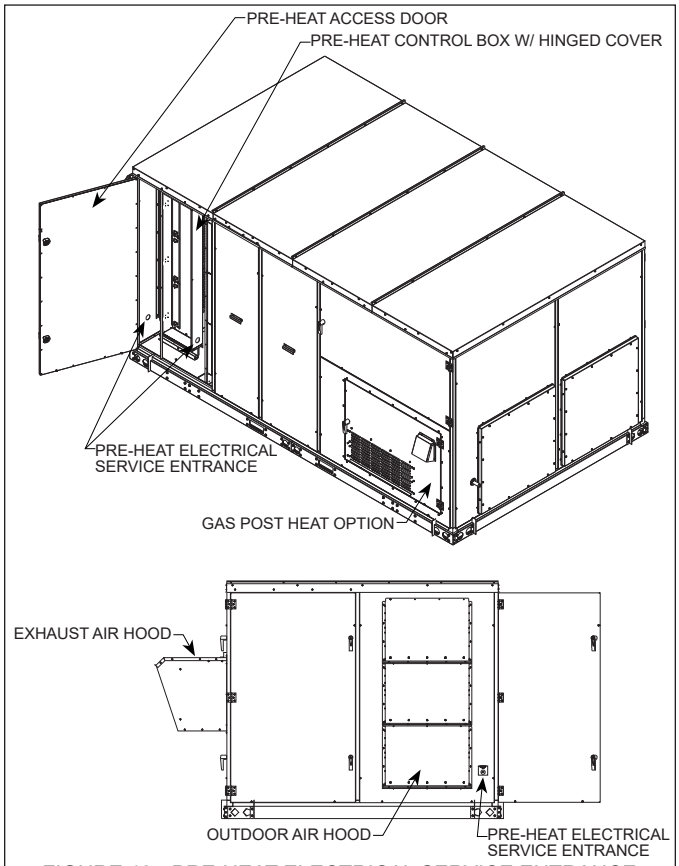


FIGURE 13 - PRE-HEAT ELECTRICAL SERVICE ENTRANCE

D. CONTROL WIRING

Route low voltage control wire from thermostat or energy management through small bushing in the upper right corner of the Base Unit Control Box as shown in **Figure 14.**

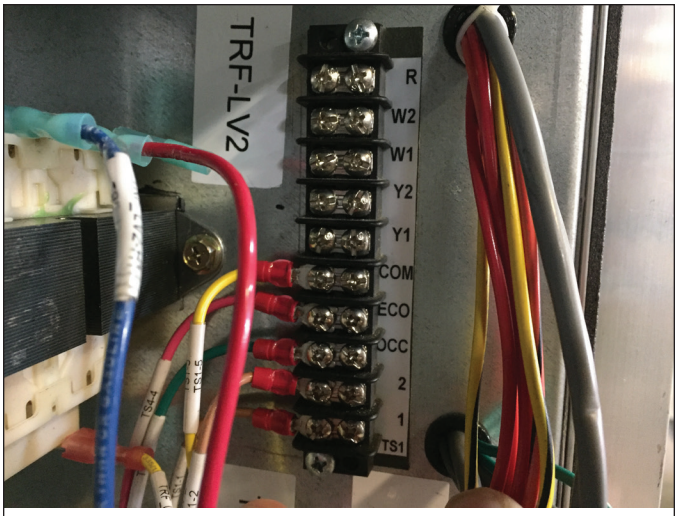


FIGURE 14 - THERMOSTAT CONTROL CONNECTIONS

IMPORTANT - Unless field thermostat wires are rated for maximum unit voltage, they must be routed away from line voltage wiring.

1. **Dependent Thermostat** controlled units should use a class II low voltage wire with at least 6 conductors.
2. **Dedicated Thermostat** - In the instance when an ERV is to be run off of it's own thermostat and not connected to an HVAC system or BMS the control terminals from the thermostat can be connected to the corresponding terminals on the unit and 24v can be taken from the 24v+ terminal (blue wire) on one of the transformers
3. **Energy Management System (EMS)** - Connect the shielded communication wire to the FC-Bus terminal, 24v+ to 1, Com to 2, Ground to 3.

   See Sequence of Operations for EMS Details

FIGURE 15 - TYPICAL CONTROLS LAYOUT

XII - BLOWER OPERATION

A. 3 PH VOLTAGE PHASING

Three phase blower motors must be phased sequentially to ensure correct rotation and operation. Motors are wired in phase at the factory. Check for proper blower wheel rotation by momentarily energizing blower demand at the thermostat. Correct rotation is determined by observing the wheel from the drive side and should match the rotation decal affixed to the fan housing. If rotation is not correct, direction can be reversed by interchanging any two of the three field-installed leads in the base unit control box. Make certain the connections are tight. Do not reverse wires at blower contactor.

B. SPEED SETTING

All drives are factory set at mid-range.

1. ***Determine Required RPM*** - Starting with desired supply side (outdoor air) CFM use **Chart 1** on **Page 40** to determine the internal static pressure (ISP) drop for each option. Total these values and add the external static pressure (ESP), then refer to **Chart 2** on **Pages 41-43**. Using this total SP (ISP + ESP) value, along with the desired CFM, determine the RPM and BHP required at that operating point. Adjust the blower RPM by opening or closing the motor pulley. Loosen the Allen screw and turn adjustable pulley clockwise to increase RPM and counterclockwise to decrease RPM.

Repeat this process for the return (exhaust) side to determine the RPM and BHP requirements for that blower.

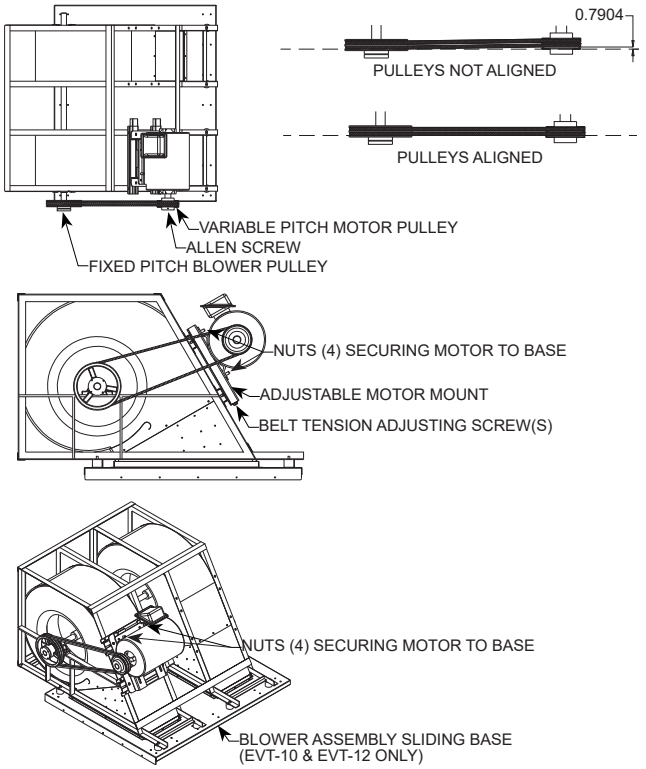
C. PULLEY ALIGNMENT

All Pulleys are laser aligned in the factory during production, movement of the pulleys is possible however if the set screws weren't properly torqued down during adjustment. Make sure blower and motor pulleys are aligned as shown in **Figure 16** before commissioning is complete.

D. BELT ADJUSTMENT

Maximum belt life can be obtained only if proper pulley alignment and belt tension are maintained. Tighten new belts after 24-48 hours of operation. This is necessary to allow for belt stretch and for belts to seat into grooves.

1. Loosen four nuts securing blower motor to adjustable base. To increase belt tension turn motor mount adjustment screw counterclockwise. Turn adjustment screw clockwise to decrease belt tension.
2. Check belt tension as follows:
   a. Measure center distance (CD) between blower and motor shafts as noted in **Figure 17**.
   b. Apply force perpendicular to CD line with enough pressure to deflect belt 1/64 inch per inch (1.5 mm per 100 mm) of CD. Example: Deflection for a CD of 24 inches would be 24/64 inch, or 3/8 inch.
   c. Measure belt deflection force. For a used belt, the deflection force should be 5 lbs (35 kPa). A new belt deflection force should be 7 lbs (48 kPa). A force below these values indicates an under tensioned belt and a force above, an over tensioned belt.



TO INCREASE RPM:
Loosen motor pulley allen screw and turn pulley clockwise.

TO DECREASE RPM:
Loosen motor pulley allen screw and turn pulley counter clockwise.

TO INCREASE BELT TENSION:

1. Loosen four nuts securing blower motor to adjustable motor mount.
2. Turn belt tension adjusting screw(s) clockwise to move the motor downwards increasing belt tension.
3. **See Figure 19** to determine proper belt tension.
4. Re-tighten four nuts loosened in **Step 1**.

FIGURE 16 - PULLEY ALIGNMENT & BELT TENSION

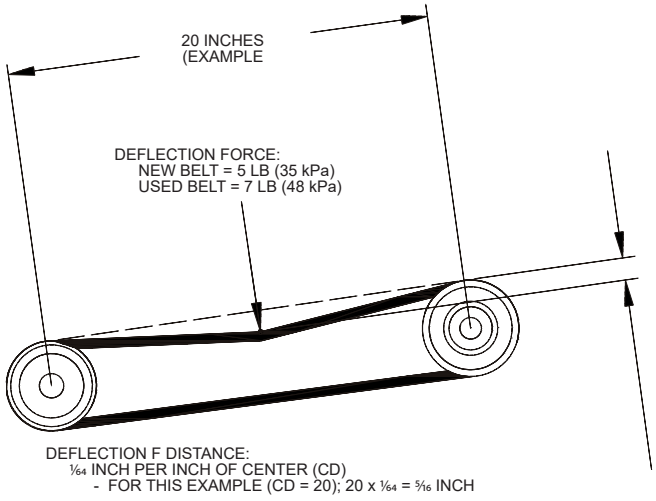


FIGURE 17 - BELT TENSION DETERMINATION

E. FIELD-FURNISHED BLOWER DRIVES

For field-furnished blower drives, use **Charts 1 and 2** on **Pages 40-43** as described in B.1. of this section to determine BHP and RPM required. Use **Chart 3** on **Pages 44-45** to determine components required for a) the desired rpm, b) the Ruskin part number and c) the corresponding manufacturer's part number.

XIII - OPTIONS (FACTORY INSTALLED)

A. ELECTRIC PRE-HEAT

Pre-Heaters are standard as 2-stage, step control. Step control heaters are designed with multiple stagers made up of equal increments of heating capacity. For example, a 10 kw heater with two stages will be composed of two 5 kw stages. Pre-Heaters are single point wired at the factory. A temperature sensor (with field adjustable set point) is mounted in the outdoor air stream after the pre-heater to turn the pre-heater on. See Frost Control Application/ Operation for typical set points. If the temperature falls below the set point and the wheel pressure drop sensor is triggered, the first stage of the pre-heater will turn on. If the first stage does not satisfy the set point, the second stage will also turn on.

B. TEMPERING COILS

Factory installed cooling and/or heating coils are mounted downstream of the Energy Recovery Cassette (ERC) on the supply air side of the unit. All connections are located external to the unit. Water coil connections are wrought copper MPT, and refrigerant coil connections (suction and liquid) are SWT. All coils are copper tubing and aluminum fin construction with expanded collar interface between tube and fin for efficient heat transfer.

Water System - Chilled and hot water coils may be ordered together or separate in a given unit for installation in either a four-pipe or a two-pipe system respectively. Water coils are not normally recommended for use with entering air temperatures below 40°F; but, while no system can be 100% safe against freeze-up with water coils, the ERC does maintain an air temperature higher than 40°F entering the coil. However; glycol solutions, or brines, are the only safe fluid for use in water coils with low entering air temperatures. Additionally, continuous fluid circulation through the coil is highly recommended.

Control of hot and cold water solenoids uses the same W1, W2 / Y1, Y2 outputs from the controller as Gas/Electric Post Heat and DX Cooling Coil. A separate controller is required for Modulating Solenoids.

Refrigerant System - Evaporator Coil performance is based on an R-410a Refrigerant with a suitably sized condenser matched to the Coil. An externally adjustable, externally equalized expansion valve (TXV) is provided on the Evaporator Coil in order to match any 3rd Party R-410a condenser on the market. Providing the TXV with liquid line connection external to the unit reduces installation time and provides peak cooling performance across the entire application range.

As a guide for selecting a matching R-410a condensing unit the TXV provided with each coil was nominally sized for each unit as shown in **Table 3** on **Page 16**.

UNIT	TXV NOM SIZE	
	NEUTRAL AIR	NEUTRAL AIR PLUS
EVT-09	1.5 TON	4 TON
EVT-19	4 TON	8 TON
EVT-28	6 TON	12 TON
EVT-36	8 TON	15 TON
EVT-46	10 TON	20 TON
EVT-62	13.5 TON	26 TON
EVT-74	16 TON	32 TON
EVT-88	19 TON	37 TON
EVT-10	21 TON	43 TON
EVT-12	26 TON	50 TON

ELECTRIC POST-HEAT - REQUIRED MINIMUM AIR FLOW					
UNIT	NON CFM	MAX KW	NO STAGES	KW AVAIL	MIN CFM
EVT-09	1,000	9.6	1	9.6	800
EVT-19	1,900	19.2	2 1	19.2 9.6	1,600 800
EVT-28	2,800	19.2	1	19.2	1,600
EVT-36	3,600	19.2	2 1	38.4 19.2	3,200 1,600
EVT-46	4,600	38.4	2 1	38.4 19.2	3,200 1,600
EVT-62	6,200	57.6	3 2 1	57.6 38.4 19.2	4,800 3,200 1,600
EVT-74	7,400	60	2 1	60 30	5,000 2,500
EVT-88	8,800	90	3 2 1	90 60 30	7,500 5,000 2,500
EVT-10	10,000	90	3 2 1	90 60 30	7,500 5,000 2,500
EVT-12	12,000	120	4 3 2 1	120 90 60 30	10,000 7,500 5,000 2,500

TABLE 3 - MINIMUM CFM WITH ELECTRIC POST-HEAT OPTION

C. ELECTRIC POST-HEAT

Post-Heat will stage on and cycle with thermostat demand. Number of stages will vary depending on Post-Heat assembly. See Post-heat wiring diagram on unit for sequence of operation. Limit controls are factory-set and are not adjustable. A minimum air volume must be maintained through Post-Heat section per **Table 3** to avoid tripping the limit during long periods of operation.

D. GAS POST-HEAT

Construction - Heat exchanger is tubular construction. Standard material is aluminized steel for all units except the EVT-10 and EVT-12 where stainless steel is required. Stainless steel is optional for all other units unless the air temperature supplied to the heat exchanger is below 45°F, where it is required. Burners are inshot, aluminized steel, with direct spark ignition and the gas valve is a redundant automatic dual stage with manual shut-off.

Controls - Ignition Control provides positive, direct ignition of burners on each operating cycle. The system permits main gas valve to stay open only when burners are proven to be lit. Should flame loss occur, the gas valve closes, shutting off the gas supply to the burners. Ignition module has coded LED to indicate status and aid in troubleshooting. Redundant limit controls are factory installed with fixed temperature setting. Heat limit controls protect heat exchanger and other components from overheating. Flame roll-out switch, flame sensor and combustion air proving switch protect system operation.

Available Selections - **See Chart 4 on Page 46** for available capacities and specifications by unit size. **Chart 5 on Page 46** lists performance data for all gas heat units.

E. MOTORIZED DAMPERS

Intake Air - Damper mounts behind the outdoor air intake hood. Opens when the ERV is energized and closes when de-energized. Powered by B30 damper motor.

Exhaust Air - Mounts between the exhaust blower and the return air exhaust hood. Operates in conjunction with Motorized Intake Air Damper. Powered by B31 damper motor.

F. DIRTY FILTER SENSOR

Measures pressure drop across Intake and Exhaust Filters and sends a signal to field wired alarm when filters require maintenance.

G. FROST CONTROL

Extremely cold outdoor air temperatures can cause moisture condensation and frosting on the energy recovery wheel (ERW). The temperature below which frost will begin to accumulate is referred to as the Frost Threshold Temperature, and is a function of both outside temperature and indoor relative humidity (**See Table 4**). Frost formation causes reduction of airflow through the ERW; therefore, without frost control, energy recovery and airflow may be significantly reduced.

Frost control is an optional feature that will control wheel frosting. Three frost Control options are available:

1. Exhaust Only
2. Variable ERW Speed
3. Electric Pre-Heat

FROST THRESHOLD TEMPERATURE (OD DB)				
INDOOR RH (%)	INDOOR DB TEMPERATURE			
	70°F	72°F	75°F	80°F
20	-14	-13	-11	-8
30	-3	-2	-1	3
40	5	7	9	11
50	13	13	15	18
60	18	19	21	26

TABLE 4 - FROST THRESHOLD GUIDELINES

Exhaust Only - An exhaust temperature sensor value will signal the controls to shutdown the supply blower when the temperature in the exhaust quadrant reaches a field adjustable temperature (Factory set 18°F). This temperature can only be reached when the wheel is frosted over. Normal operation resumes after a heat rise of 16°F. To avoid depressurization of the conditioned space, automatic or pressure operated fresh air dampers may be required as part of the ventilation system.

Modulating Wheel Frost Control - The modulating wheel feature uses a variable frequency drive to modulate the wheel's speed based on outside air temperature. The wheels RPM will slow as the temperature drops, hence lowering the effectiveness of the wheel and preventing icing up. The variable frequency drive is programmed to have minimum frequency of 15hz so the wheel speed does not interfere with the wheel rotation sensor's operation. Values in **Table 5** have been derived from the accepted empirical model to allow entering supply air to remove all water deposited on the wheel by the exhaust. This option is best used for applications where the hours required for frost control are limited.

Electric Pre-Heat - This is the recommended method of preventing frost formation while ensuring required ventilation rates for most cold climate applications. A constant air temperature, above the frost threshold, is

EXHAUST AIR TEMPERATURE AND ERW EFFECTIVENESS						
ERW EFF	70°F AND 20% RH INDOORS		70°F AND 30% RH INDOORS		70°F AND 40% RH INDOORS	
	DESIGN TEMP	EAT	DESIGN TEMP	EAT	DESIGN TEMP	EAT
%	F°	F°	F°	F°	F°	F°
0.80	-13	4.0	-3	12.0	4	17.3
0.70	-15	11.0	-4.5	18.0	3	23.1
0.60	-19	17.0	-8	24.0	1	28.6
0.50	-26	22.0	-13	28.5	-3	33.5
0.45	-31	25.0	-17	31.0	-5	36.2
0.40	-40	26.0	-24	32.5	-10	38.0

TABLE 5 - EXHAUST AIR LEAVING TEMPERATURE AND ENERGY RECOVERY WHEEL EFFECTIVENESS

maintained entering the ERC by cycling a 2-stage electric heat unit located just after the fresh air hood. The heater is controlled by a field adjustable temperature sensor located at the inlet of the wheel. If the temperature falls below the setpoint the first stage will turn on. If that does not satisfy the load, the second stage turns on. **See Pre-Heat wiring diagram for circuit logic.**

H. CO_2 SENSOR

Helps control indoor air quality based on CO_2 levels in the occupied space. High CO_2 levels can either trigger a response from the ERV unit by turning on the blowers to bring in fresh air or by modulating the blowers if a VFD option has been selected. **See Basic Unit wiring diagram for circuit information.**

I. ROTATION SENSOR

The circuit indicates the absence of pulses, within a specified time range, provided by a magnetic sensor detecting a magnet mounted on wheel surface. After the initial time delay of approximately 5 seconds from circuit power up, if the sensor fails to provide a signal pulse (no wheel rotation) within approximately 5 additional seconds, the alarm relay will activate the latch (until circuit powers down) providing a 5 amp contact closure output. This would indicate no wheel rotation and/or magnet in the system has stopped at the magnetic sensor pickup point. If the pulse (wheel rotation) is detected within the approximately 5 second time period, the alarm relay will remain open. No field timing adjustment of any type will be required.

J. SMOKE DETECTORS

Duct mounted smoke detectors can be installed in both return and/or supply air streams. Signals from the smoke detectors can be set to start-up or shut-down the ERV unit if smoke is detected. **See Basic Unit wiring diagram for circuit information.**

K. LOW AMBIENT KIT

Limits HVAC system operation when outdoor temperature is below 10°F.

L. SENSIBLE-ONLY ERC

An Energy Transfer Wheel without the latent energy transfer capability of the standard Enthalpy Wheel is available for dry-climate application (RH less than 30%). This wheel does not have the Silica Gel coating applied.

M. MERV 11 and 13 AIR FILTERS

All units are shipped with MERV 8 supply and exhaust air filters. MERV 11 or 13 filters are available as factory installed options. MERV 8 filters are 30-35% efficient. MERV 11 provides 60-65% efficiency at roughly the same resistance level. The MERV 13 filter achieves the minimum efficiency requirements (80-85%) of LEED Green Building design. All are 2 inch thick, V-pleat design, supported with expanded metal with Minimum Efficiency Reporting Value determined per ASHRAE 52.2.

N. ELECTRONIC TEMPERATURE CONTROL SYSTEM

Works in conjunction with optional heating and cooling coils to temper the supply air back to ambient conditions. Tempering the air entering the occupied pace allows Enervent to bring in 100% outside air without putting an additional load on the rooftop unit. The ETCS can be entreated with a building automation system.

O. FREE AIR APPLICATION

Operation of the Energy Recovery Wheel can be altered, sometimes referred to as Start, Stop, Jog, to take advantage of economizer operation, which amounts to free cooling. This is accomplished by:

De-energizing The ERC - Accomplished with a signal from a Primary Temperature Sensor mounted in the air intake compartment. This sensor will de-energize the energy wheel when the outdoor air temperature falls below the set point; which is factory set at 65°F, but is field adjustable. An Override temperature sensor is also furnished in the outdoor air intake compartment to deactivate the economizer mode. This Override sensor, also field adjustable, is factory set at 50°F; i.e., something less that the Primary sensor. The two sensors together create a deadband where the ERC will not operate and free cooling can enter the building unconditioned.

P. GFCI SERVICE OUTLET

A 120 VAC GFCI service outlet is shipped loose for field installation. Requires separate power source so power is available when unit main disconnect is turned off for servicing.

Q. EME INTAKE LOUVERS

A fresh air hood consisting of a built-in, louvered, moisture eliminator requiring no maintenance during the life of the unit. This contrasts with the standard hood, which contains an aluminum mesh filter(s) requiring routine maintenance. The EME intake surface is parallel to front of the unit and extends outward approximately four inches.

R. VFD BLOWER CONTROL

Variable Frequency Drives (VFD) control the blower speed. One VFD is provided for each blower (supply and return), as well as the ERC if Modulating frost Control is selected.. The VFDs provided are Johnson Controls DC* line of drives manufactured by Eaton. Refer to the Drive's manual included with the ERV for further technical specifications and information.

Refer to the VFD operation manual Chapter 5 for information on parameters. Most manufactures setpoints are retained except for :

P1 - Max Frequency - set to 60Hz
P2 - Min Frequency - set to 21.5 Hz
P7 - Operating Voltage - off motor nameplate
P8 - Motor AMPS - off motor nameplate

XIV - EVT SEQUENCE OF OPERATION (JCI)

EVT Communications

The unit communication baud rate is set at 38400. The MAC Address and device instance is set to customer specifications per job. Communication is established by connecting to the terminal block labeled Bacnet. It is connected using an MS/TP network.

EVT Parameters

The unit ships with different set of parameters. These set are separated into 3 categories:

- **Hardware Inputs/Outputs:**

  Hardware Inputs/Outputs are the devices such as Sensors, Actuators, Relays etc. connected to the Inputs/Outputs of the controller to monitor and control the unit's behavior.

- **Control Points:**

  Control points are intended to control the unit's behavior. Control points are meant to be overwritten by the user according to the buildings requirement.

- **Monitoring points:**

  Monitoring points are intended to monitor the unit's behavior. Monitoring points are read only points to inspect the unit's functionality.

The tables below show the different parameter set and the description for each parameter. These parameters can be accessed through the HMI display or a Bacnet network.

Controller	Input/ Output		Object Name	Description (Hardware IO)	Instance Number
FAC 2611	Inputs	IN1	SA-DP	Supply Air Differential pressure	AI 10011
		IN2	EA-DP	Exhaust Air Differential Pressure	AI 10047
		IN3	OA-TEMP-REST	Outside Air Temperature Resistance	AI 25407
		IN4	SA-TEMP-REST	Supply Air Temperature Resistance	AI 25413
		IN5	RA-TEMP-REST	Return Air Temperature Resistance	AI 25410
		IN6	EA-TEMP-REST	Exhaust Air Temperature Resistance	AI 25404
		IN7	WHL-FAIL-SIG	Wheel Failure Signal	BI 10005
		IN8	OCC-STS	Occupancy Status	BI 17564
	Outputs	OUT1	SA-FAN-CMD	Supply Air Fan Command	BO 10017
		OUT2	EA-FAN-CMD	Exhaust Air Fan Command	BO 17525
		OUT3	WHL-CMD	Wheel Command	BO 10023
		OUT4	MOH-CMD	Outside Air Hood Command	BO 15224
		OUT5	MEH-CMD	Exhaust Air Hood Command	BO 17742
		OUT6		**Spare**	
		OUT7	HTG-CMD	Heating Command	BO 21240
		OUT8	SA-FAN-OUT	Supply Fan Output	AO 28730
		OUT9	EA-FAN-OUT	Exhaust Fan Output	AO 28746
IOM4711-1	Inputs	IN1	BYP-STS	Bypass Damper Status	BI 24231
		IN2	MOH-STS	Motorized Outside Air Damper Status	BI 17503
		IN3	MEH-STS	Motorized Exhaust Air Damper Status	BI 17506
		IN4	ECON-SIG	Economizer Signal	BI 22410
		IN5	SMOKE-ALM	Smoke Alarm	BI 17573
		IN6	AF-STS	Air Flow Status	BI 21644
		IN7	OAFILT-STS	Outside Air Filter Status	BI 23783
		IN8	RAFILT-STS	Return Air Filter Status	BI 23786
	Outputs	OUT1	CLG1-CMD	Cooling 1 Command	BO 23797
		OUT2	CLG2-CMD	Cooling 2 Command	BO 21249
		OUT3	PREHEAT-CMD	Pre Heat Command	BO 21252
		OUT4	BYP-CMD	Bypass Damper Command	BO 21258
		OUT5	HTG1-CMD	Heating Stage 1 Command	BO 30120
		OUT6	HTG2-CMD	Heating Stage 2 Command	BO 30123
		OUT7		**Spare**	
		OUT8	HTG-OUT	Heating Output	AO 21255
		OUT9	WHL-OUT	Wheel Modulating Signal Output	AO 10014
IOM4711-2	Inputs	IN1	RA-CO2	Return Air CO2	AI 10008
		IN2	CLG1-SIG	Cooling 1 Signal (Y1)	BI 24108
		IN3	CLG2-SIG	Cooling 2 Signal (Y2)	BI 24111
		IN4	HTG1-SIG	Heating 1 Signal (W1)	BI 24114
		IN5	HTG2-SIG	Heating 2 Signal (W2)	BI 24117
		IN6		**Spare**	
		IN7	SA-FAN-STS	Supply Air Fan Status	BI 17496
		IN8	EA-FAN-STS	Exhaust Air Fan Status	BI 17500

Object Name	Description (Control Points)	Instance Number
SAFLOW-SP-IN	Supply Air Flow Set Point Input (For the units with VFD)	AV 10188
EAFLOW-SP-IN	Exhaust Air Flow Set point Input (For the units with VFD)	AV 10091
CO2-SP-IN	CO2 Set point Input (For the units with VFD)	AV 10185
HTG-SP	Heating Set Point (For the units with Gas Heat)	AV 21236
PREHEAT-SP	Pre Heat Set Point (For the units with Electric Preheat)	AV 21238
LA-TEMP-MIN	Low Ambient Minimum Temp (For Frost Control)	AV 10092
UNIT-EN	Unit Enable	MV 25746
OCC-MODE	Occupancy Mode (For TEC series Thermostat)	MV 31996
NOCC-STS	Network Occupancy Status (For BAS)	BV 32004
HTG-EN	Heating Enable Input (From the Thermostat/BAS to turn the GAS heat ON)	BV 21829
HTG2-EN	Heating 2 Enable (For Bacnet Thermostat/BAS)	BV 32024
CLG1-SW-EN	Cooling 1 Software Enable (For Bacnet Thermostat/BAS)	BV 22415
CLG2-SW-EN	Cooling 2 Software Enable (For Bacnet Thermostat/BAS)	BV 22416
TUNING-RESET	PID Tuning Reset	BV 32041
USE-TSTAT-INPUTS	Use Thermostat Inputs (For the units with Thermostat Control)	BV 31930
USE-CO2-MODE	Use CO2 Control Mode Flag	BV 10218
USE-SSJ-MODE	Use Start Stop Jog Mode Flag	BV 10219
USE-LA-MODE	Use Low Ambient Mode Flag	BV 10216
USE-SMOKE-MODE	Use Smoke Control Mode Flag	BV 15295
USE-CLG-MODE	Use Cooling Mode Flag	BV 22433
USE-MOD-HTG	Use Modulating Post Heat Mode Flag	BV 21261
USE-PREHEAT-MODE	Use Pre Heat Mode Flag	BV 21263
USE-MOD-WHEEL	Use Modulating Wheel Mode Flag	BV 22667
USE-FILT-ALM	Use Dirty Filter Indication Mode Flag	BV 23748
USE-STAGED-HTG	Use Staged Post Heat Flag	BV 23879
USE-BYPASS-MODE	Use Bypass Mode Flag	BV 22435
EMG-STANDALONE-HTG	Emergency Standalone Heating Mode Flag	BV 32050
SSJ-MIN-TEMP	Start Stop Jog Min Temperature	AV 10186
SSJ-MAX-TEMP	Start Stop Jog Max Temperature	AV 10187
SSJ-ONTIME	Start Stop Jog Wheel On Time	AV 10184
SSJ-OFFTIME	Start Stop Jog Wheel Off Time	AV 10183
HTG-MINOFF	Gas Heat Minimum Off Time (For 2 stage Gas Heating)	AV 32052
HTG-MINON	Gas Heat Minimum On Time (For 2 stage Gas Heating)	AV 32051
WHL-INTERCEPT	Wheel Intercept	AV 10077
WHL-SLOPE	Wheel Slope	AV 10090
Object Name	**Description (Monitoring Points)**	**Instance Number**
EA-FLOW	Exhaust Air Flow (Calculated using differential pressure across the wheel)	AV 10276
SA-FLOW	Supply Air Flow (Calculated using differential pressure across the wheel.)	AV 10277
RA-CO2	Return Air CO2	AI 10008
RA-TEMP	Return Air Temperature (Calculated value using resistance input)	AV 25418
OA-TEMP	Outside Air Temperature (Calculated value using resistance input)	AV 25417
EA-TEMP	Exhaust Air Temperature (Calculated value using resistance input)	AV 25416
SA-TEMP	Supply Air Temperature (Calculated value using resistance input)	AV 25419
SAFLOW-SP	Supply Air Flow Set Point (Validated Set point)	AV 17734
EAFLOW-SP	Exhaust Air Flow Set Point (Validated Set point)	AV 17735
CO2-SP	CO2 Set Point (Validated Set point)	AV 17736
MAX-FLOW	Maximum Flow (Design flow of the unit)	AV 14835
MIN-FLOW	Minimum Flow (Design flow of the unit)	AV 14836
OCC-STS	Occupancy Status (24VAC signal from Thermostat)	BI 17564
ECON-SIG	Economizer Signal (24VAC signal from Thermostat)	BI 22410
AF-STS	Air proving Status	BI 21644
EA-FAN-STS	Exhaust Air Fan Status	BI 17500
SA-FAN-STS	Supply Air Fan Status	BI 17496
MEH-STS	Motorized Exhaust Air Damper Status	BI 17506
MOH-STS	Motorized Outside Air Damper Status	BI 17503
BYP-STS	Bypass Damper Status	BI 24231

CLG1-SIG	Cooling 1 Signal (Y1 From Thermostat)	BI 24108
CLG2-SIG	Cooling 2 Signal (Y2 From Thermostat)	BI 24111
HTG1-SIG	Heating 1 Signal (W1 From Thermostat)	BI 24114
HTG2-SIG	Heating 2 Signal (W2 From Thermostat)	BI 24117
START-UP	Start Up Mode Flag	BV 17740
SMOKE-MODE	Smoke Control Mode Flag	BV 10255
LA-MODE	Low Ambient Control Mode Flag	BV 10252
CO2-MODE	CO2 Control Mode Flag	BV 10254
PREHEAT-MODE	Pre Heat Mode Flag	BV 21265
CLG-MODE	Cooling Mode Flag	BV 22443
HTG-MODE	Heating Mode Flag	BV 21266
SSJ-MODE	Start Stop Jog Mode Flag	BV 10257
BYP-MODE	Bypass Mode Control Flag	BV 22445
SAFAN-FAIL-ALM	Supply Air Fan Failure Alarm	MV 25178
WHL-FAIL-ALM	Wheel Failure Alarm	MV 25177
MOH-FAIL-ALM	Motorized Outside Air Damper Fail Alarm	MV 25179
EAFAN-FAIL-ALM	Exhaust Air Fan Failure Alarm	MV 25180
MEH-FAIL-ALM	Motorized Exhaust Air Damper Fail Alarm	MV 25176
BYP-FAIL-ALM	Bypass Failure Alarm	MV 25181
RAFILT-ALM	RA Dirty Filter Alarm	MV 25479
OAFILT-ALM	OA Dirty Filter Alarm	MV 25478
SAFLOW-SP-ALM	SA Flow Set Point Out Of Range Alarm	MV 25595
EAFLOW-SP-ALM	EA Flow Set Point Out Of Range Alarm	MV 25594
CO2SP-ALM	CO2 Set Point Out Of Range Alarm	MV 25596

Unit Enable (Standard)

EVT will be operational when "**UNIT-EN**" (Unit Enable) option is set to enable. The unit is operated utilizing any of following two methods:

Occupancy signal from Bacnet: This is an option that is used to gain control over the unit through a Bacnet network. In order for the unit to operate, the "**NOCC-S**" (Network occupancy Status) parameter must be true.

Occupancy signal from Thermostat (24VAC output): The unit can be operated by supplying a 24VAC signal to the occupied input in the terminal block labeled as "**occ**" and "**com**". If the Thermostat used is of series **TEC3630**, then it will automatically detect the occupancy signal, provided thermostat is configured for the **Device ID: 1625**.

If any of the two methods, "**NOCC-S**" parameter or an occupancy input signal from thermostat are true the sequence of operation is as follows:

1. The unit will set the "**START-UP**" parameter to True, indicating unit is ready to operate.
2. The unit will turn on the wheel.
3. The unit will open motorized outside air and exhaust air damper.
4. The unit will check for the motorized dampers to be opened.
5. If the damper statuses are satisfied, then unit will turn the blowers on.

Set Point Validation (Standard)

This mode is responsible for the validations of the user's inputted set points. It is important to note that the user's inputted set points "**SAFLOW-SP-IN**", "**EAFLOW-SP-IN**" and "**CO2-SP-IN**" are not the machine's validated set points. The user's inputted set points go through a validation block that compares the set points to the unit's maximum and minimum capabilities. If the inputted set point is greater than the maximum limit, the validation block will modify the machine's set point to the maximum value of that particular unit. If the inputted set point is below the machine's minimum limit, the validation block will modify the machine's set point to the minimum value of that particular unit. "**SAFLOW-SP**", "**EAFLOW-SP**" and "C**O2-SP**" are validated set points for the EVT.

When the unit detects that the set points are outside the unit's range it will set the alarm parameters "S**AFLOW-SP-ALM**", "**EAFLOW-SP-ALM**" and "**CO2SP-ALM**" to true.

As a rule of thumb, if the machine's set points differ from the user's inputted set points, the user should check that the set points are not outside the machine's operating range or that the unit is not engaged in a control mode.

Smoke Control Mode (Optional)

Smoke control is a mode that checks for the existence of smoke on the return air stream. When this mode is engaged, the unit will:

1. Set the "**SMOKE-MODE**" parameter to True, indicating the unit is running on this mode.
2. Turns off outside air damper and the supply blower to prevent more oxygen to be fed in case of a fire.
3. The unit will set the exhaust air blower speed to 90% in order to exhaust the smoke out of the system.
4. Once this mode is disengaged the unit will:
   a. Open the motorized outside air damper.
   b. Check for the motorized outside air damper to be open. If satisfied, the unit will turn the supply blower on. Release exhaust air blower speed to maintain exhaust air flow to set point.

Low Ambient Control Mode (Standard)

Low Ambient Control is a mode of operation that monitors the Exhaust Air Temperature and compares to the set point "**LA-TEMP-MIN**" (Low Ambient Minimum Temp) as a method of frost control. When this mode is engaged the unit will:

1. Set the "**LA-MODE**" parameter to True, indicating the unit is running on this mode.
2. Shut down the motorized outside air damper and the supply blower to avoid supplying more cold air that could cause frost on the energy wheel.
3. The exhaust air flow set point is set to the design max flow value that the unit can handle, in order to utilize the return air as the defrosting agent for the energy wheel.
4. Once the mode is disengaged, the motorized outside air damper and the supply blower will return to their normal operation and the exhaust flow will be returned to the user's inputted set point.

Once the unit engages in Low Ambient Control Mode, the exhaust air temperature will have to rise above Low Ambient Minimum Temp set point by 16°F in order to disengage the mode.

This mode will only engage if "Smoke Control Mode" is not active.

Pre-Heat Control Mode (Optional)

Pre-Heat Control is a mode responsible for the control of the outside air temperature that is supplied to the unit. The unit compares "**PREHEAT-SP**" (Pre-Heat set point) with the outside air temperature of the unit. When the temperature falls below the set point, the unit will:

1. Check if the air is flowing through the unit by determining the status of an air proving switch located at the supply air quadrant.
2. If the air flow is confirmed, then unit will set the parameter "PREHEAT-MODE" to True, indicating the unit is running on this mode.
3. The unit will enable the electrical heating coil located at the outside air quadrant.

This mode will only engage if "Smoke Control Mode" or "Low Ambient Control Mode" is not active.

CO_2 Control Mode (Standard)

The CO_2 Control Mode inspects the CO_2 level in the return air stream and compares it to the validated CO_2 set point "**CO2-SP**". If the space CO_2 is higher than the set point, the unit will:

1. Set the parameter "**CO2-MODE**" to True, indicating the unit is running on this mode.
2. Overwrite the supply and exhaust flow set points to the unit's maximum design flow, in order to get more outside air in the building and exhaust the contaminated air out.

Once the mode is disengaged, the supply and exhaust flow set points will return to the user's inputted set points.

This mode will only engage if "Low Ambient Control Mode" or "Smoke Control Mode" is not active.

Cooling Control Mode (Optional)

Cooling control mode is responsible for the control of optional cooling coils shipped with the unit. The cooling coils are controlled in 2 different ways, Cooling control is operated by commands issued through a Bacnet network or physical **24VAC** signals from thermostat connected to a terminal block for customer connection.

When using a Bacnet controlled commands, the cooling coils are operated by overwriting the network parameters "**CLG1-SW-EN**" and "**CLG2-SW-EN**" from Building Automation system.

When using an input signal (Thermostat controlled) unit, the cooling coils are operated by sending **24VAC** signals to the connections labeled **Y1** and **Y2** on the supplied customer connections terminal block. If the Thermostat used is of series **TEC3630**, then it will automatically detect cooling signals, provided thermostat is configured for the **Device ID: 1625**.

If any of the above values are TRUE, the unit will:

1. Check if the air is flowing through the unit by determining the status of an air proving switch located at the supply air quadrant.
2. If the air flow check is satisfied and any of the above said parameter is active, the unit sets the parameter "**CLG-MODE**" to True, indicating the unit is running on this mode.
3. If either "**CLG1-SW-EN**" or **Y1** signal is TRUE, The unit will turn on stage 1 of the cooling coil.
4. If either "**CLG2-SW-EN**" or **Y2** signal is TRUE, The unit will turn on stage 2 of the cooling coil

This mode will only engage if "Pre-Heat Mode", "Low Ambient Control Mode" or "Smoke Control Mode" is not active.

Heating Control Mode (Optional)

Heating control mode is responsible for the control of the heating furnace shipped with the unit. We have currently two versions of the furnace:

1. Modulating Furnace.
2. Two Staged Furnace.

The type of furnace shipped with the unit will be decide the type of control used to operate the unit.

Modulating Furnace

This type of furnace use 0-10 VDC signal to modulate the gas heat to maintain the supply air temperature with required "**HTG-SP**" (heating set point). The unit checks the Bacnet parameter "**HTG-EN**" (Heating Enable) from Building Automation System or Heating 1 (**W1**) signal if the unit is thermostat controlled to determine if the zone is calling for heat. If the heating enable is True, the unit will:

1. Check if the air is flowing through the unit by determining the status of an air proving switch located at the supply air quadrant.
2. Unit compares the Supply Air Temperature to its heating set point "**HTG-SP**".
3. If the supply Air Temperature is less than its set point then Unit sets the parameter "**HTG-MODE**" to True, indicating the unit is running on this mode.

4. The unit will activate the furnace and modulates the flame to maintain Supply Air Temperature to its heating set point.
5. Once the Supply Air Temperature reaches to the Heating set point with a dead band of 2°F, it will deactivate the furnace.

Two Stage Furnace

This type of furnace use two stage gas heat control to maintain the required heating set point. Two stage gas heat can be controlled in 2 different ways,

Input Signals to control two stage furnace (Thermostat controlled 2-Stage Furnace):

Gas heat control can be operated by commands issued through a Bacnet network or physical **24VAC** signals from thermostat connected to a terminal block for customer connection. To use this option for control "**USE-TSTAT-INPUTS**" parameter must be set to True.

When using a Bacnet thermostat, the gas heat is operated by overwriting the network parameters "**HTG-EN**"and "**HTG2-EN**" from Building Automation system.

When using an input signal (Thermostat controlled) unit, the gas heat is operated by sending 24VAC signals to the connections labeled **W1** & **W2** on the supplied customer connections terminal block. If the Thermostat used is of series **TEC3630**, then it will automatically detect heating signals, provided thermostat is configured for the **Device ID: 1625**.

If any of the above values are TRUE, the unit will:

1. Check if the air is flowing through the unit by determining the status of an air proving switch located at the supply air quadrant.
2. If the air flow check is satisfied and any of the above said parameter is active, the unit sets the parameter "**HTG-MODE**" to True, indicating the unit is running on this mode.
3. If either "**HTG-EN**" or **W1** signal is TRUE, The unit will turn on stage 1 of the gas heat.
4. If either "**HTG2-EN**" or **W2** signal is TRUE, The unit will turn on stage 2 of the gas heat.

Supply Air Temperature to control two stage furnace (BAS controlled 2-stage Furnace):

Gas heat control can be staged up and down by comparing supply air temperature with the heating set point. If this option is selected, the unit checks the Bacnet parameter "**HTG-EN**" (Heating Enable) from Building Automation System to determine if the zone is calling for heat. If the heating enable is True, the unit will:

1. Check if the air is flowing through the unit by determining the status of air proving switch located at the supply air quadrant.
2. Unit compares the Supply Air Temperature to its heating set point "**HTG-SP**".
3. If the supply Air Temperature is less than its set point then Unit sets the parameter "**HTG-MODE**" to True, indicating the unit is running on this mode.
4. The unit will activate the furnace and it will stage the flame up and down to maintain Supply Air Temperature to its heating set point.
5. Once the Supply Air Temperature reaches to the Heating set point with a dead band of 2°F, it will deactivate the furnace.

This mode will only engage if "Cooling Control Mode", "Low Ambient Control Mode" or "Smoke Control Mode" is not active.

Economizer Modes (Optional)

The unit could ship with one of two different economizer modes listed below:

1. Start Stop Jog Mode
2. Bypass Mode

The modes are explained below:

Start Stop Jog Mode (Optional):

Start Stop Jog mode is a type of an economizer mode where the wheel is stopped and then turned on intervals in order to stop energy transfer between the air streams entering and leaving the unit. This happens when the conditions of the outside air are favorable for free cooling. The unit compares the outside air temperature to be within 65°F (Adj) and 40°F (Adj). If the outside air temperature is within this range, the unit will:

1. Set the parameter "**SSJ-MODE**" to True, indicating the unit is running on this mode.
2. The unit will turn off the wheel for 10 minutes, after 10 minutes passed it will turn on the wheel for 1 minute.
3. It will repeat this cycle until the unit is out of this mode.
4. The mode will disengage when the unit outside air temperature is out of the specified range by 2°F in either direction.

This mode will only engage if "Cooling Control Mode", "Low Ambient Control Mode", "Smoke Control Mode", "Post Heat Control Mode", "Pre-Heat Control Mode" or "CO_2 Control Mode"is not active.

Bypass Control Mode (Optional):

Bypass mode is a type of an economizer mode where the unit shuts down and 2 bypass dampers open in order to stop energy transfer between the air streams entering and leaving the unit. This mode is used when the unit size is not suitable for Start Stop Jog Mode. This mode will active when the unit receives a signal attached to the customer supplied terminal block labeled "**Econ**". The signal comes from an economizer board that is calling for an economizer. If the economizer signal is true, the unit will

1. Set the parameter "**BYPASS-MODE**" to True, indicating the unit is running on this mode.
2. The unit will turn off supply and exhaust fans.
3. The unit will turn off the Energy wheel.
4. The unit will close motorized outside air and exhaust air damper.
5. The unit will open supply and return air bypass damper.
6. Once the mode is disengaged the unit will return to its normal operation.

This mode will only engage if "Cooling Control Mode", "Low Ambient Control Mode", "Smoke Control Mode", "Post Heat Control Mode", "Pre-Heat Control Mode", "Start Stop Jog Control Mode" or "CO_2 Control Mode" is not active.

Failure Alarms (Standard)

Failure alarms are an indication for the user if something goes wrong with the unit. All the alarms are Bacnet exposed and can be monitored with BAS or Display panel.

1. Supply Air Fan Failure Alarm.
2. Exhaust Air Fan Failure Alarm.
3. Wheel Failure Alarm.
4. Motorized Outside Air Damper Failure Alarm.
5. Motorized Exhaust Air Damper Failure Alarm.
6. Return Air Dirty Filter Alarm.
7. Outside Air Dirty Filter Alarm.
8. Bypass Failure Alarm.
9. Supply Air Flow Set Point Out Of Range Alarm.
10. Exhaust Air Flow Set Point Out Of Range Alarm.
11. CO_2 Set Point Out Of Range Alarm.

XV - UNIT STARTUP

⚠WARNING

Electric shock hazard. Can cause injury or death. Do not use this unit if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system and any gas control which has been under water.

A. WIRING

Before starting the Unit take the time to check all field wiring to make sure it is securely connected.

Make sure that plugs for the OA and EA damper proving switches are securely connected to the switches or the jumpers if this option wasn't chosen.

On units with gas post heat make sure the Supply Air Temp sensor is inserted into the supply duct 6'-10' from the furnace outlet.

B. FAN WHEELS

Before applying electrical power rotate the blower wheels by hand to assure that they turn freely and do not rub the inlet orifice. If any binding occurs, check for damage or foreign objects in the housing.

Upon applying power make certain that both fan wheels are rotating in the required direction. Direction of rotation must conform to the Rotation Sticker affixed to the outside of the blower housing. A further visual indicator is whether it rotates in the same direction as the blade curvature. All

ERV blowers have forward curved wheels. If rotation is in the wrong direction, it can be reversed by interchanging any two of the three field-installed electrical leads.

C. FAN RPM

The adjustable sheave on both the supply and the exhaust blowers are factory set to the mid-range rpm for the selected drive kit. **Refer to Section XII, Blower Operation**, for instructions on changing blower RPM and proper sheave alignment and belt tension. Before powering the blower all access doors, other than the unit Control Box, must be closed and the ductwork in place to avoid overloading the motor. Check the motor amperage reading against the motor nameplate to assure that it is operating below the FLA rating. A further limitation is the maximum operating RPM of the blower wheel listed in **Table 6**. All Enervent blowers have a Class II rating except for EVT-09, for which Class II are neither available nor required for that blower model.

UNIT	LOCATION	BLOWER MODEL	MAXIMUM RPM	
		DIA. x WIDTH	CLASS I	CLASS II
EVT-09	Supply	A[9] x [4]AT	5200	NA
	Exhaust			
EVT-19	Supply	A10 x 6A	-	2488
	Exhaust			
EVT-28	Supply	A12 x 6A	-	2089
	Exhaust	A12 x 9A	-	2058
EVT-36	Supply	A12 x 9A	-	2058
	Exhaust	A12 x 12A	-	2091*
EVT-46	Supply	A15 x 11A	-	1714
	Exhaust			
EVT-62	Supply	A15 x 11A	-	1714
	Exhaust	A18 x 13A	-	1478
EVT-74	Supply	A18 x 13A	-	1478
	Exhaust	A18 x 18A	-	1501*
EVT-88	Supply	A18 x 13A	-	1475
	Exhaust	A18 x 18A	-	1501*
EVT-10	Supply	A20 x 9H (2)	NA	1278
	Exhaust	A20 x 20H	NA	1278
EVT-12	Supply	A20 x 9H (2)	NA	1278
	Exhaust	A20 x 20H	NA	1278

*** Blower wheel is braced to obtain maximum Class II limit.**

TABLE 6 - MAXIMUM BLOWER RPM

D. VIBRATION

Rubber vibration isolators are standard on all Enervent blowers, which will eliminate most vibration and resulting noise. However, if excessive vibration is present during initial start-up it must be addressed immediately; for it could result in major problems, such as structural or component failure, immediately or in the near future. There are numerous causes, but some of the most common are:

1. Blower wheel imbalance
2. Drive pulley imbalance or misalignment
3. Incorrect belt tension
4. Faulty belts
5. Bearing misalignment
6. Faulty belts
7. Loose fasteners

Many of these conditions can be discovered by careful observation, if not, a qualified technician using vibration analysis equipment should be consulted. If the problem is blower wheel imbalance, it can be rebalanced in-place by a technician with the proper equipment.

E. TEMPERING COILS

Water Coils - Leak check all system joints to insure connections are sufficiently tight. Check condensate drain to be certain that a properly configured trap is present.

Refrigerant Coil - Since the manufacturer does not supply a matching condensing unit with the full featured ERV and seeing any manufacturers condensing unit can be matched to the provided coil, for information on installation, start-up, and operation of the complete refrigerant system contact the condenser manufacturer.

TXV Superheat Adjustment - This should be set as part of the start-up procedure for the refrigerant system. As a rule, the TXV should rarely need adjustment after it has been properly set.

F. ENERGY RECOVERY CASSETTE

Wheel - Turn the wheel by hand to be certain no damage or misalignment occurred during shipment of the unit. If should rotate smoothly with no wobble present.

Drive Belt - Check the drive belt to make certain it rides smoothly through the motor pulley and around the wheel rim.

RPM - Observe the rotation rate of the wheel by opening the Filter Access Door slightly. Rotation rate should be approximately 50-60 revolutions per minute.

G. ELECTRIC POST-HEAT

Electric heat will stage on and cycle with the thermostat demand. Number of stages will vary depending on electric heat option installed. See electric heat wiring diagram on unit for sequence of operation.

H. GAS POST-HEAT

For your safety read before lighting - BEFORE LIGHTING smell around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

- What to do if you smell gas.
- Do not try to light any appliance.
- Do not touch any electrical switch.
- Do not use any telephone in your building.
- Leave the building immediately.
- Call your gas supplier from a phone remote from your building and follow their instructions.

If you cannot reach your gas supplier, call the fire department.

NEVER USE TOOLS to push in or to turn the gas control knob - use only your hand. If knob will not push in or turn by hand, do not try to repair it - call a qualified service technician. The use of force or attempting a repair may result in fire or explosion.

This unit is equipped with an automatic spark ignition system. Therefore; there is no pilot. In case of a safety shutdown, to reset the ignition control: move the thermostat switch to ***OFF*** and then return the thermostat switch to ***HEAT***.

⚠WARNING

Danger of explosion. Can cause injury or product or property damage. If overheating occurs or if gas supply fails to shut off, shut off the manual gas valve to the appliance before shutting off electrical supply.

⚠WARNING

SMOKE POTENTIAL

The heat exchanger in this unit could be a source of smoke on initial firing. Take precautions with respect to building occupants and property. Vent initial supply air outside when possible.

⚠WARNING

Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.

⚠WARNING

Danger of explosion and fire. Can cause injury or product or property damage. You must follow these instructions exactly.

Check Gas Supply Pressure - Connect test gage to inlet pressure tap on the Gas Regulator Valve. **See Figure 20**. Test gas supply pressure with unit firing at maximum rate (High-Fire energized). Natural gas supply pressure must be between 4.7 i.w.c. and 10.5 i.w.c. (1168 Pa and 2610 Pa). Low pressure may result in erratic operation or "underfire." High pressure may result in permanent damage to the gas valve or "overfire." For multiple unit installations, each unit should be checked separately while operating at maximum rate, beginning with the one closest to the supply gas main and progressing to the one farthest from the main. This should be done with and without all units operating. In each case the supply pressure must fall within the range listed above. If it does not, notify the local gas provider for required adjustment.

Check Manifold Pressure - After supply pressure has been checked and adjusted, check the manifold pressure at both the maximum rate (High-Fire) and the minimum rate (Low-Fire). Move test gauge to the outlet pressure tap shown in **Figure 18**. The manifold pressure is factory set and should not require adjustment. If pressure adjustment is required, **See Figure 18** to locate the high and low fire adjustment screws for the 2-Stage and 5:1 Modulation options or for the Split-Manifold, 10:1 Modulation option. Remove cap that conceals adjustment screw. Turn adjusting screw counterclockwise (out) to decrease manifold pressure or clockwise (in) to increase manifold pressure. Set manifold pressure to the values listed in **Table 7** that correspond to the altitude of unit installation, following the procedure below.

Manifold Adjustment Procedure

1. Connect test gauge to the outlet pressure tap on the gas valve (**Figure 18**) or on the manifold. Start the

⚠CAUTION

For safety, connect a shut-off valve between the manometer and the gas tap to permit shut off of gas pressure to the manometer.

⚠CAUTION

Disconnect heating demand as soon as an accurate reading has been obtained.

unit calling for maximum rate (High-Fire) and allow five minutes for the unit to reach steady state.

2. While waiting for the unit to stabilize, notice the flame. It should be stable without flash-back and should not lift from the burner heads. Natural gas should burn mostly blue with some clear yellow streaks.
3. After allowing the unit to stabilize for five minutes, record the manifold pressure and compare to the value given in **Table 7**.

Proper Gas Flow - To check for proper gas flow to burners, determine Btuh input from the gas heating capacity table (**Chart 4 on Page 46**). Divide the input rating by the Btuh per cubic foot of available gas. Result is the number of cubic feet per hour required. Determine the flow of gas through gas meter for two minutes and multiply by 30 to get hourly flow of gas to burners.

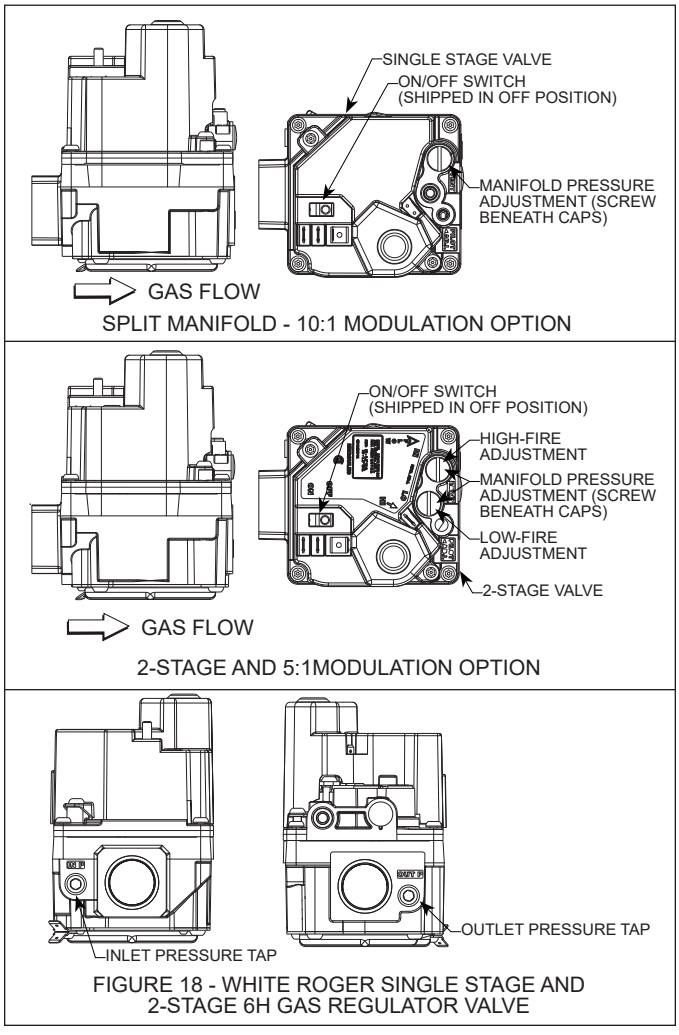


FIGURE 18 - WHITE ROGER SINGLE STAGE AND 2-STAGE 6H GAS REGULATOR VALVE

ALTITUDE - ft. (m)	GAS MANIFOLD PRESSURE - i.w.g. (kPa)			
	HIGH FIRE		LOW FIRE	
	EVT-12	EVT-09 thru EVT-10	EVT-12	EVT-09 thru EVT-10
0 - 2000 (0 - 610)	3.7 (0.92)	3.5 (0.87)	1.6 (0.40)	1.1 (0.29)
2001 - 3000 (610 - 915)	3.6 (0.90)	3.4 (0.85)	1.5 (0.37)	1.1 (0.28)
3001 - 4000 (915 - 1220)	3.5 (0.87)	3.3 (0.82)	1.4 (0.35)	1.1 (0.27)
4001 - 5000 (1220 - 1525)	3.4 (0.85)	3.2 (0.80)	1.3 (0.32)	1.1 (0.26)
5001 - 6000 (1525 - 1830)	3.3 (0.82)	3.1 (0.77)	1.2 (0.30)	1.0 (0.25)
6001 - 7000 (1830 - 2135)	3.2 (0.80)	3.0 (0.75)	1.1 (0.27)	1.0 (0.24)
7001 - 8000 (2135 - 2440)	3.1 (0.77)	2.9 (0.72)	1.0 (0.25)	0.9 (0.23)

TABLE 7 - HIGH ALTITUDE DERATE

High Altitude Derate - Natural gas units may be installed at altitudes up to 2000 feet (610m) above sea level without any modification. At altitudes above 2000 feet (610m), units must be derated to match gas manifold pressures shown in **Table 7**.

NOTE - This is the only permissible derate for these units.

The adjusted high altitude input rate for the United States can be calculated using the Derate Multiplier Factor listed in **Table 8**. There is a difference between the United States and Canada regarding derating for altitude:

UNITED STATES

At altitudes above 2000 ft. (610M), the input rate must be reduced by 2 percent for each 1000 ft. (305M) above sea level. **See Table 8** for Derate Multiplier Factor and apply as follows:

Example:

1. 100,000 Btuh input heater installed at 4300 ft.
2. Input rate at sea level x Derate Multiplier Factor = input rate at installed altitude
3. 100,000 x 0.91 = 91,000 Btuh

ALTITUDE - FT (M)	PERCENT DERATE	DERATE MULTIPLIER FACTOR*
0 - 2000 (0 - 610)	0	1.00
2001 - 4000 (610 - 914)	4 - 6	0.95
3001 - 4000 (914 - 1219)	6 - 8	0.93
4001 - 5000 (1219 - 1524)	8 - 10	0.91
5001 - 6000 (1524 - 1829)	10 - 12	0.89
6001 - 7000 (1829 - 2134)	12 - 14	0.87
7001 - 8000 (2134 - 2438)	14 - 16	0.85
8001 - 9000 (2438 - 2743)	16 -18	0.83
9001 - 10,000 (2743 - 3048)	18 - 20	0.81

* Derate Multiplier Factor based on midpoint of altitude range

TABLE 8 - ALTITUDE DERATE MULTIPLIER FACTOR

CANADA

At altitudes from 2000 to 4500 ft. (610 to 1372M) above sea level the input must be derated 5 percent by an authorized Gas Conversion Station or Dealer. To determine correct input rate for altitude see example above and use 0.95 as the Derate Multiplier Factor.

Burner Ignition Control

The Direct Spark Ignition Control is shown in **Figures 19 thru 22**, depending on the Gas Heat Option and the Unit Model involved. It is manufactured by UTEC and provides the following features:

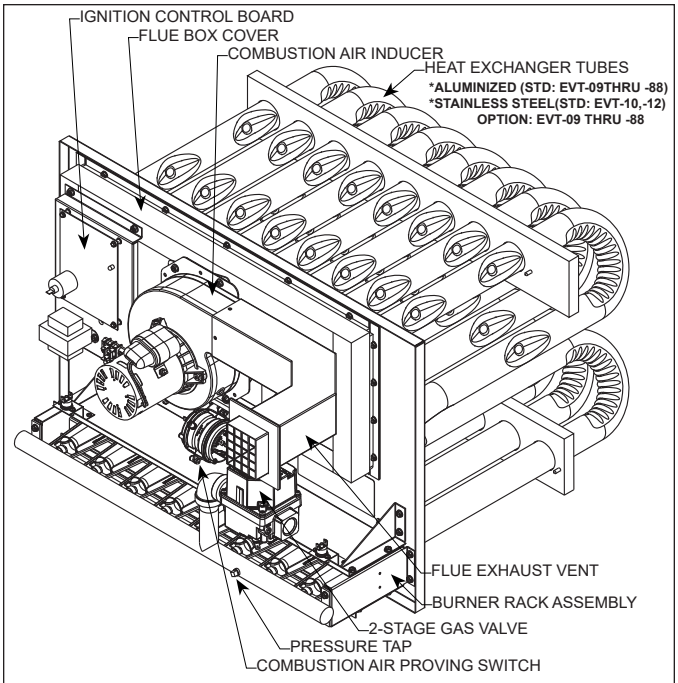


FIGURE 19 - 2-STAGE GAS POST HEAT OPTION
(FOR ALL MODELS)

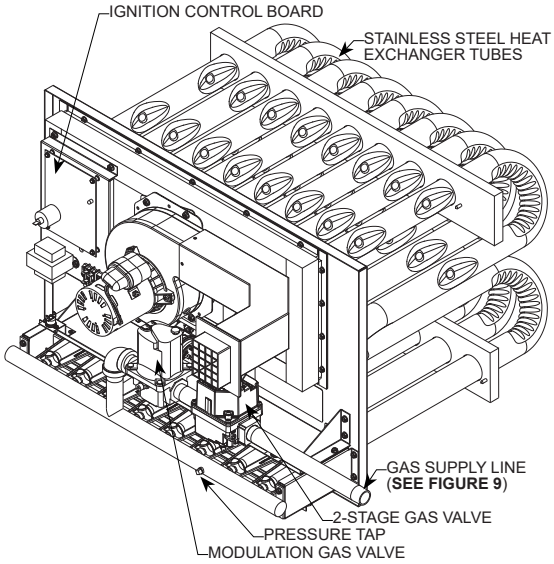


FIGURE 20 - 5:1 MODULATION GAS HEAT OPTION
(FOR ALL MODELS)

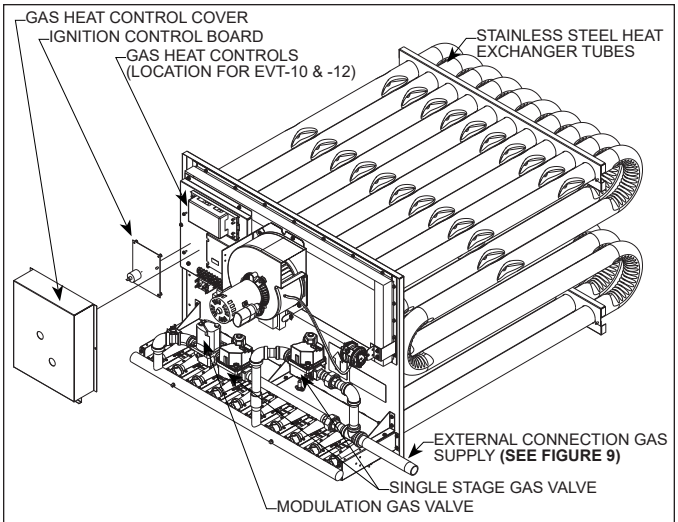


FIGURE 21 - 10:1 MODULATION GAS HEAT OPTION
(FOR EVT-36 THRU -12)

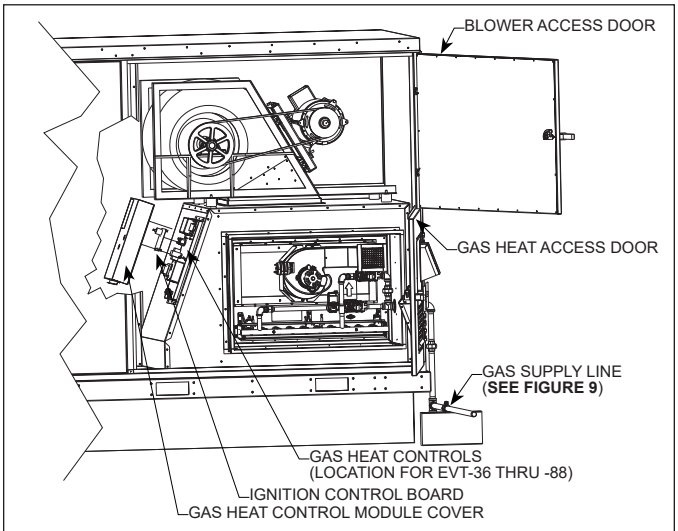


FIGURE 22 - 10:1 MODULATION GAS HEAT OPTION
(FOR EVT-36 THRU -88)

1. Spark ignition of main flame and control of main gas valve.
2. Sensing of main flame.
3. Control of 2nd stage gas valve.
4. Sensing of system induced draft centrifugal or pressure switch.
5. Sensing of high temperature limit and rollout switch.
6. Control of system induced draft motor.
7. Diagnostic LED.

The unit will usually ignite on the first attempt; however, the ignition attempt sequence provides three trials for ignition before locking out. The lockout time for the control is five minutes. After lockout, the ignition control automatically resets and provides three more attempts at ignition. Manual reset after lockout requires breaking and remaking power to the ignition control. **See Figure 23** for a normal ignition sequence and **Figure 24** for the ignition attempt sequence with retrials (normal timings given for simplicity). Specific timings for the ignition controls are shown in **Figure 25**.

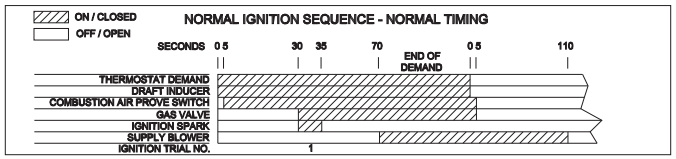


FIGURE 23 - NORMAL IGNITION SEQUENCE

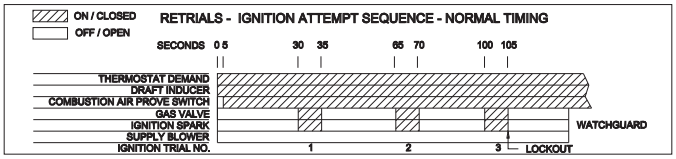


FIGURE 24 - IGNITION ATTEMPT SEQUENCE

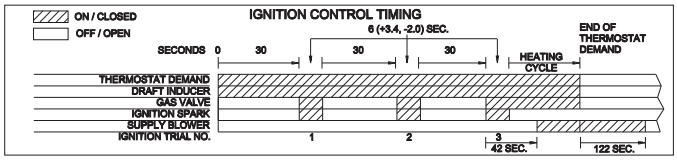


FIGURE 25 - IGNITION CONTROL TIMING

LED Faults and Operation Failures

See Table 9 for LED codes.

UTEC IGNITION CONTROL LED ERROR CODES	
LED CODE	**DIAGNOSTIC INDICATION**
HEARTBEAT	All conditions are normal
2 FLASHES	Pressure Switch open with inducer on
3 FLASHES	Pressure Switch closed with inducer off
4 FLASHES	Lockout from too many failed ignition tries (3)
5 FLASHES	Lockout from too many flame losses
6 FLASHES	High Temperature Switch open
7 FLASHES	Rollout Switch open
8 FLASHES	Flame present with gas off
9 FLASHES	Exceeded max limit trips in one call for heat (5)

TABLE 9 - IGNITION CONTROL DIAGNOSTICS - LED CODES

1. If the flame is lost during a call for heat, the control de-energizes the gas valve and counts the flame loss. If the burner fails to light or prove flame a total of three times, the control will go into a one hour lockout period.
2. Any time the High Temperature Limit Switch opens; the control will run the inducer on high speed, de-energize the gas valve, and flash "6" on the LED. When the High Limit Switch closes, the control will restart the ignition sequence again.
3. If the flame is sensed for longer than two seconds when the gas valve should be closed, the control will enter lockout. The control will turn on the inducer blower while the flame signal is present.
4. If the Rollout Switch opens during operation, the control will run the inducer on high speed for the post-purge period, will immediately de-energize the gas valve and flash "7" on the LED.

Lighting Sequence

NOTE - This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

1. Turn thermostat or temperature controller to the **lowest** setting.
2. Turn off gas supply at the manual shut-off valve.
3. Turn off electrical supply at the disconnect switch.
4. Open the heat section access door.
5. Turn gas valve control knob clockwise to ***"OFF"*** position.
6. Wait five (5) minutes to clear out any gas. If you then smell gas, ***STOP!*** Immediately call your gas supplier from a **neighbor's phone**. Follow the gas supplier's instructions. If you do not smell gas, go to the next step.
7. Turn the gas valve control knob counterclockwise to the ***"ON"*** position.
8. Close the heat section access door.
9. Turn gas supply to ***"ON"*** position.
10. Turn electrical power on.
11. Set thermostat switch to ***"HEAT"*** and turn to the highest setting.
12. LED light at the ignition will light up.
13. Induced draft blower will run for a 30 second pre-purge period.
14. At the end of the pre-purge period, the spark ignitor and the gas valve will be energized.
15. If the unit does not light the first time (gas line not fully purged), it will attempt up to two more ignitions before locking out.
16. If lockout occurs, repeat steps 1 through 11.
17. If the unit still fails to ignite, follow the instructions ***"Turning Off Gas to Unit"*** and call your service technician or gas supplier.

Turning Off Gas to Unit

1. If using an electro-mechanical thermostat, set to the **lowest** setting.
2. Before performing any service, turn off all electrical power to the unit.
3. Open the heat section access door.
4. Turn gas valve control knob clockwise to ***"OFF"*** position. ***Do not force.***

⚠WARNING

Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.

Heating sequence of operation (2-Stage Option)

1. On a call-for-first-stage-heat, "W1," "W2" and "R" closes allowing 24vac to flow to "W1," and "W2" circuits. The control board then checks to see if the pressure switches are open. If either pressure switch is closed, the control flashes "3" on the LED and waits indefinitely for it to open.
2. When the pressure switch is sensed as open, the control begins the pressure switch proving period. The Ignition Control will verify that the pressure switch is open and that limits are in closed position before energizing the Combustion Air Inducer.
3. The Combustion Air Inducer is energized on high speed and the control waits for the pressure switch to close.
4. When the pressure switch closes, a 30 second pre-purge period begins.
5. At the end of the pre-purge period, the spark igniter is energized and then the second stage gas valve high-fire is energized.
6. Burners ignite and carry over. Once the flame is established and detected by the flame sensor all the burners should be lit. The Spark Igniter is de-

energized. The Gas Valve and Combustion Air Inducer remain energized for a 2-minute warm-up period regardless of what the thermostat calls for.

7. If a flame is not detected after first ignition trial, the Ignition Control will repeat **Steps 5 and 6** two more times before locking out the gas valve.
8. For troubleshooting purposes, an ignition attempt after lockout may be re-established manually by moving the thermostat switch to ***"OFF"*** and then return to ***"HEAT"*** position
9. After burner ignition the unit will remain on second-stage fire for a 2-minute warm-up period regardless of what the thermostat calls for.
10. After this warm-up period, the unit will react to what the thermostat calls for. If the thermostat calls for low-fire, the inducer will drop to low speed and the valve will go to low fire.
11. When the building thermostat is satisfied and the demand for heat ends, the Gas Valve is de-energized immediately and the Combustion Air Inducer switches to high speed for a 30-second post-purge period.

Heating sequence of operation
(MD-5:1 Modulating Option)

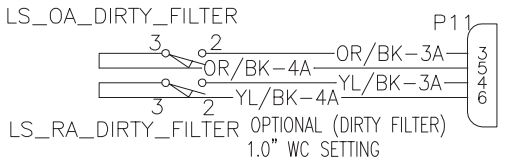
1. On a call-for-first-stage-heat, "W1," "W2" and "R" closes allowing 24vac to flow to "W1," and "W2" circuits. The control board then checks to see if the pressure switches are open. If either pressure switch is closed, the control flashes "3" on the LED and waits indefinitely for it to open.
2. When the pressure switch is sensed as open, the control begins the pressure switch proving period. The Ignition Control will verify that the pressure switch is open and that limits are in closed position before energizing the Combustion Air Inducer.
3. The Combustion Air Inducer is energized on high speed and the control waits for the pressure switch to close.
4. When the pressure switch closes, a 30 second pre-purge period begins.
5. At the end of the pre-purge period, the spark igniter and the second stage gas valve high-fire are energized. At the same time 24vac is sent to the SC30 to start modulating.
6. Burners ignite and carry over. Once the flame is established and detected by the flame sensor all the burners should be lit and the Spark Igniter de-energized. The Gas Valve and Combustion Air Inducer remain energized for a 2-minute warm-up period regardless of what the thermostat calls for. During the warm-up period the SC30 Control will send a 20vdc signal to the Maxtrol Valve regardless of the dc input.
7. If a flame is not detected after first ignition trial, the Ignition Control will repeat steps 5 and 6 two more times before locking out the gas valve.
8. For troubleshooting purposes, an ignition attempt after lockout may be re-established manually by moving the thermostat switch to ***"OFF"*** and then return to ***"HEAT"*** position
9. When the warm-up period expires, modulation of the system is handed over to the Building Management System.
10. If the building controller is providing an analog signal between 2.0 and 5.3 vdc to the SC30 Control, the system will continue to operate at low fire and low speed Combustion Air Inducer. The modulation valve will be powered proportionally to the input voltage from the controller and will open or close, changing the gas manifold pressure; which vary from 0.2 to 1.2 iwc.
11. If the signal increases above 5.3 vdc, the Combustion Air Inducer switches to high speed and the high-fire second stage Gas Valve is energized. The manifold pressure will vary from 1.4 to 3.5 iwc.
12. Operation will continue in high-fire mode until the signal from the Building Management Controller drops below 4.7 vdc. At this point the SC30 de-energizes the second stage Gas Valve and the Combustion Air Inducer switches to low speed.
13. When the building thermostat is satisfied and the demand for heat ends, the Gas Valve is de-energized immediately and the Combustion Air Inducer switches to high speed for a 30-second post-purge period.

Heating sequence of operation
(SP-10:1 Modulating Option)

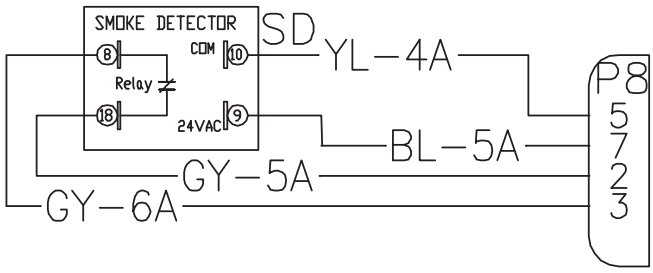
1. On a call-for-first-stage-heat, "W1", "W2" and "R" closes allowing 24vac to flow to "W1," and "W2" circuits. The control board then checks to see if the pressure switches are open. If either pressure switch is closed, the control flashes "3" on the LED and waits indefinitely for it to open.
2. When the pressure switch is sensed as open, the control begins the pressure switch proving period. The Ignition Control will verify that the pressure switch is open and that limits are in closed position before energizing the Combustion Air Inducer.
3. The Combustion Air Inducer is energized on high speed and the control waits for the pressure switch to close.
4. When the pressure switch closes, a 30 second pre-purge period begins.
5. At the end of the pre-purge period, the spark igniter and the second stage gas valve high-fire are energized. At the same time 24vac is sent to the SC30 to start modulating.
6. Burners ignite and carry over. Once the flame is established and detected by the flame sensor all the burners should be lit. The Spark Igniter is de-energized. The Gas Valve and Combustion Air Inducer remain energized for a 2-minute warm-up period regardless of what the thermostat calls for. During the warm-up period the SC30 Control will send a 20vdc signal to the Maxtrol Valve regardless of the dc input.
7. If a flame is not detected after first ignition trial, the Ignition Control will repeat **Steps 5 and 6** two more times before locking out the gas valve.

FACTORY INSTALLED OPTIONS WIRING DIAGRAMS

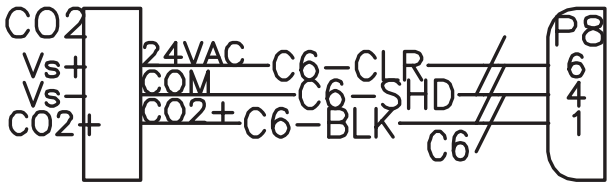
Optional Dirty Filter



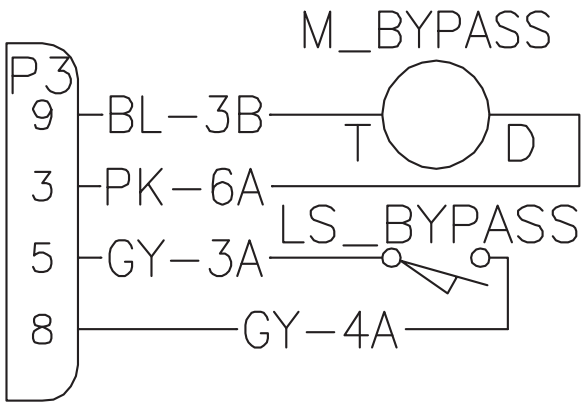
Optional Smoke Detector



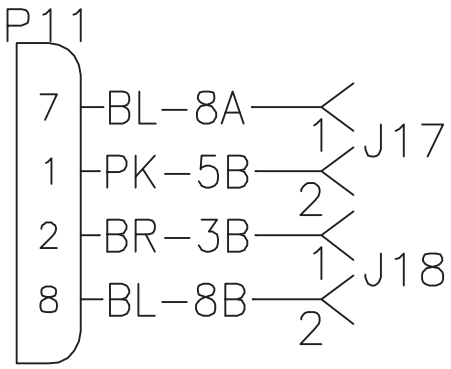
Optional CO_2 Sensor



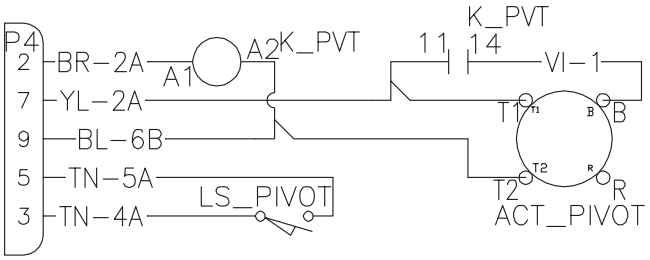
Optional Bypass



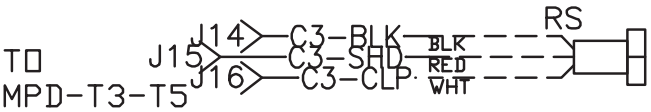
Optional DX Coil



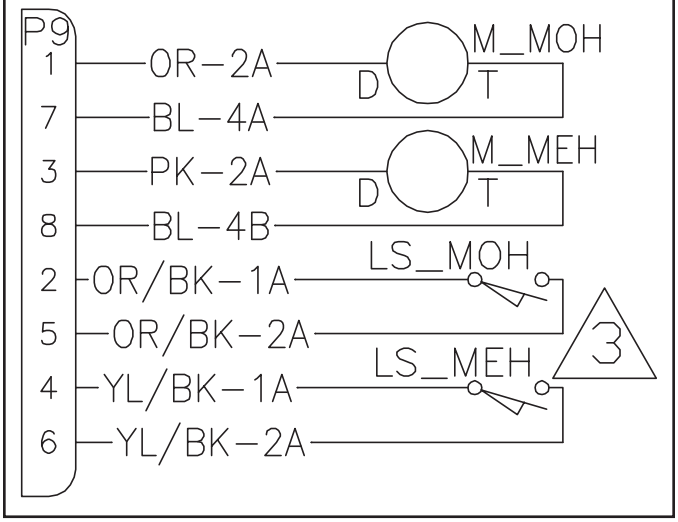
Optional Pivot



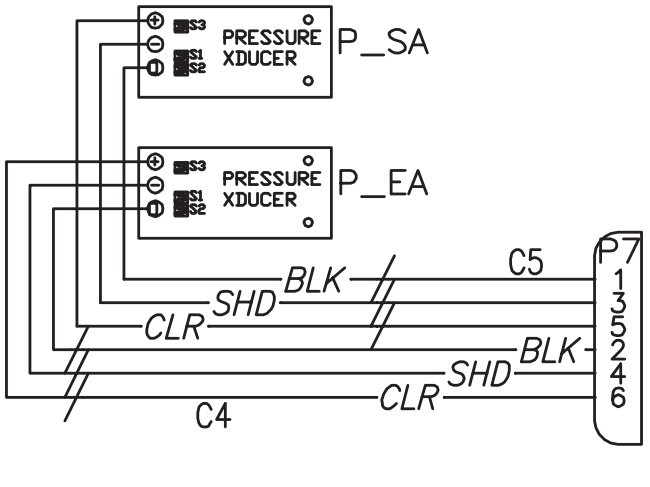
Optional Rotation Sensor



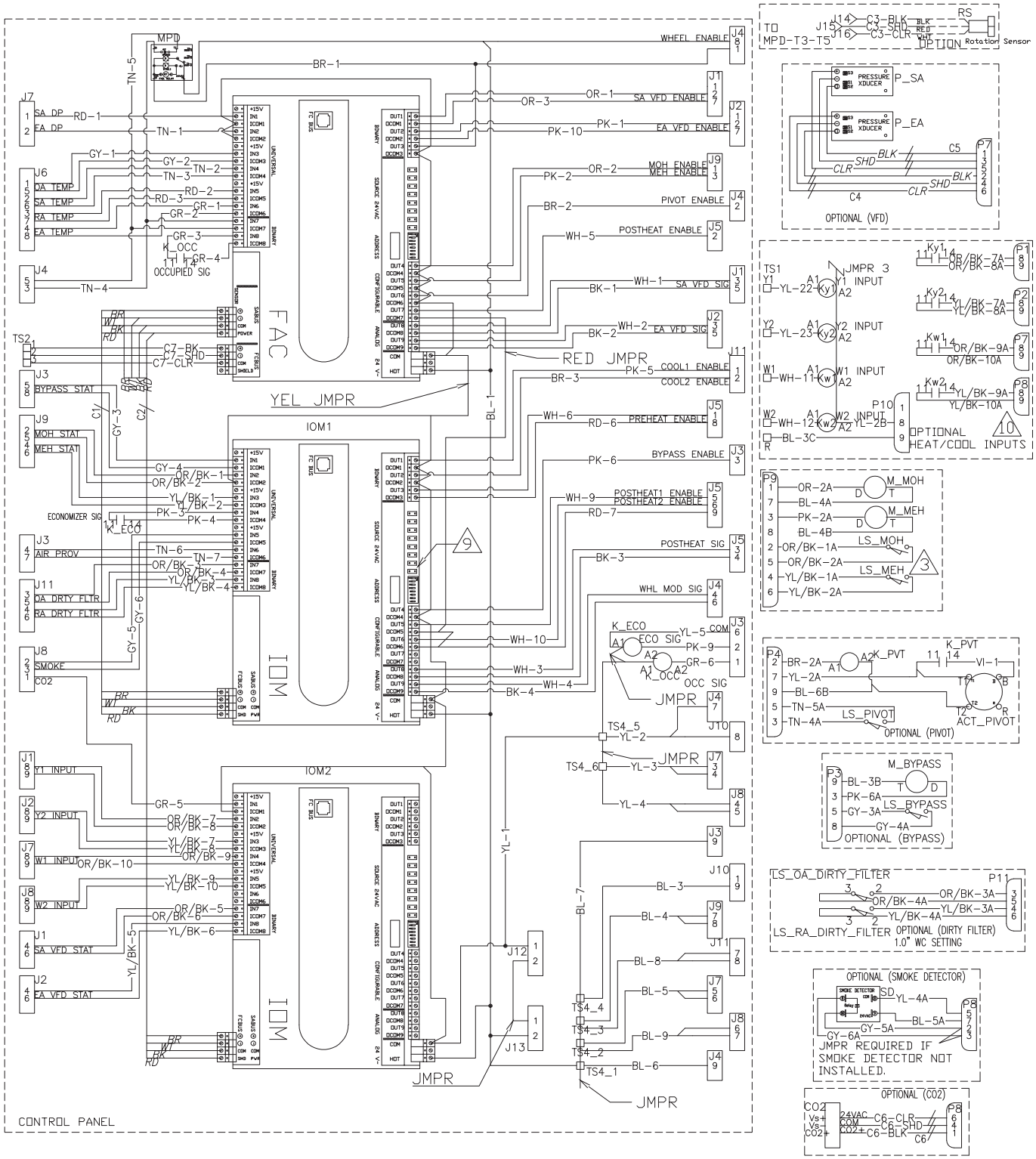
Optional MOH / MEH



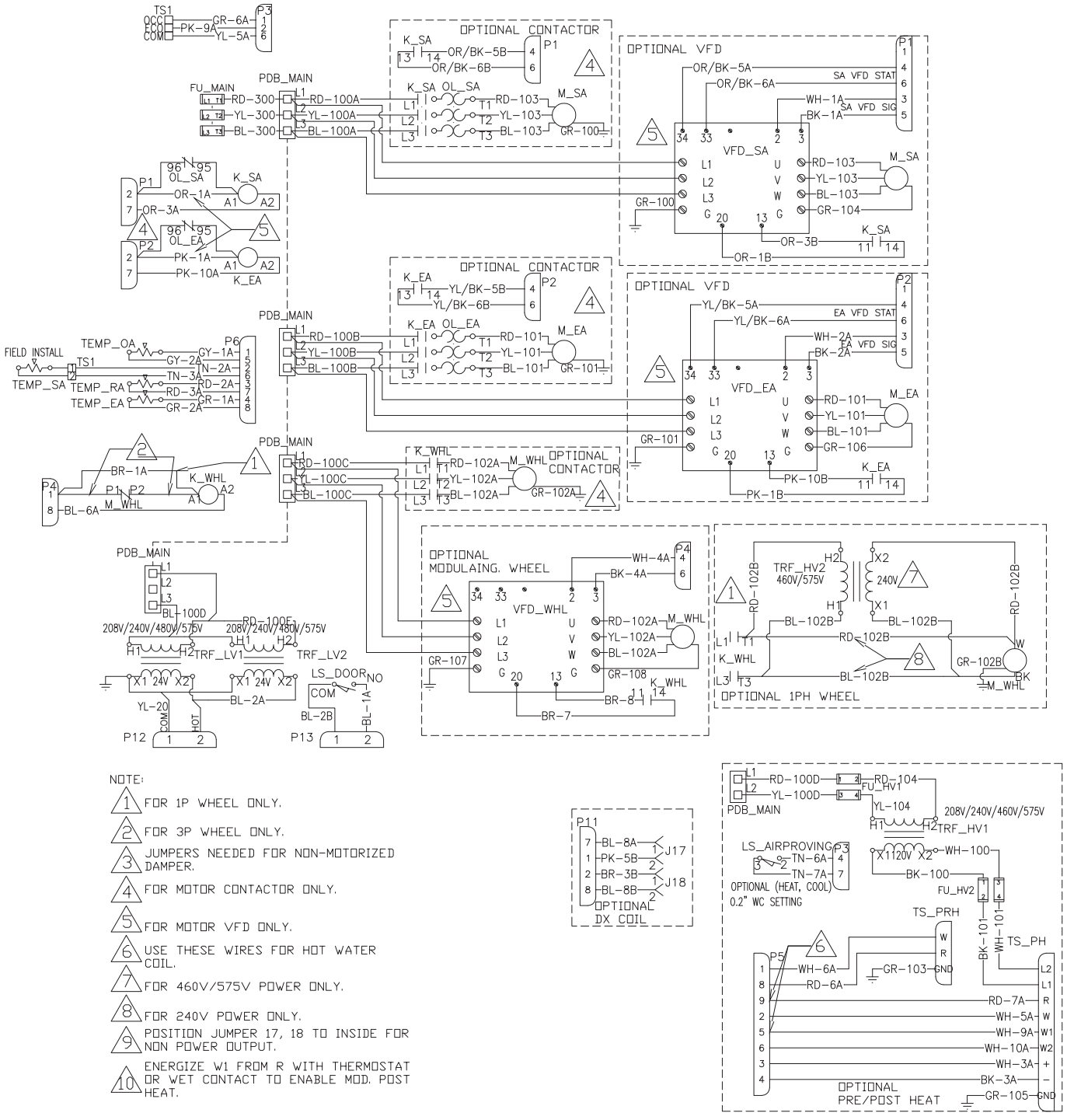
Optional VFD



UNIT WIRING DIAGRAM



UNIT WIRING DIAGRAM - CONTINUED

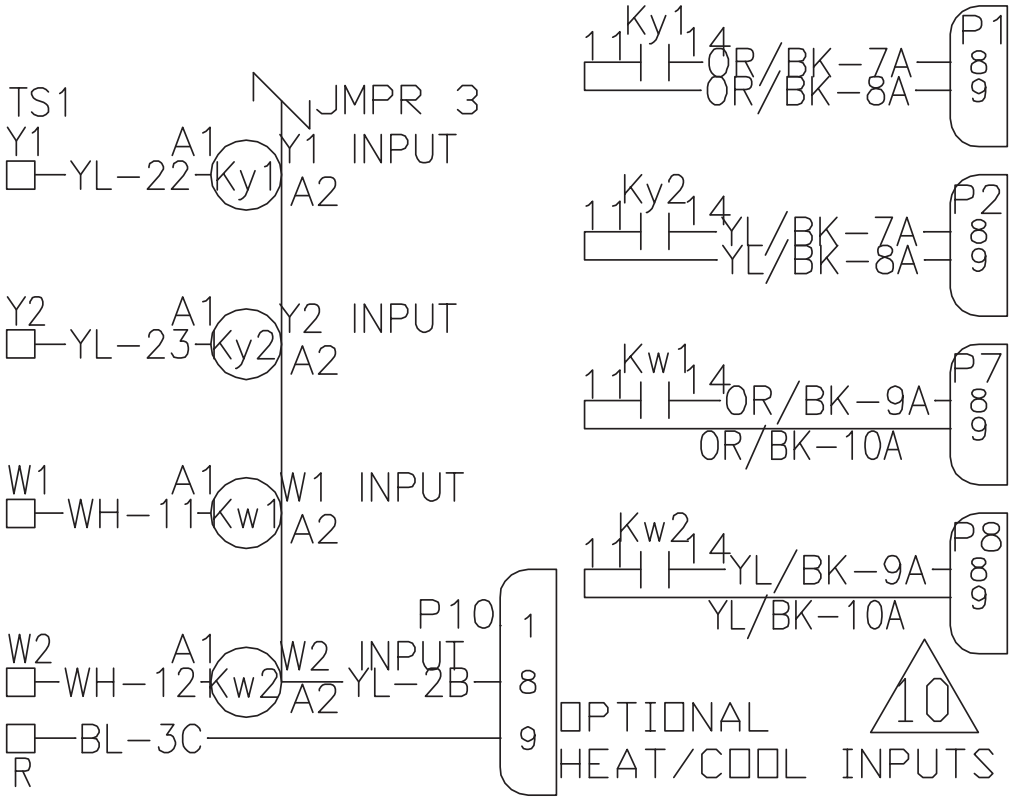


NOTE:

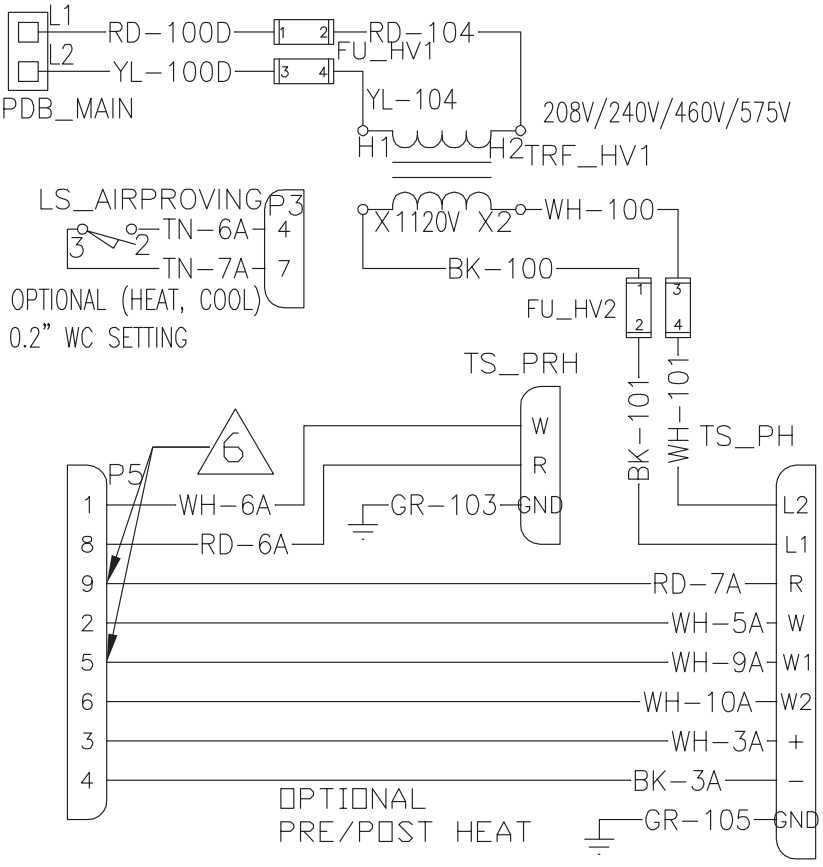
1. FOR 1P WHEEL ONLY.
2. FOR 3P WHEEL ONLY.
3. JUMPERS NEEDED FOR NON-MOTORIZED DAMPER.
4. FOR MOTOR CONTACTOR ONLY.
5. FOR MOTOR VFD ONLY.
6. USE THESE WIRES FOR HOT WATER COIL.
7. FOR 460V/575V POWER ONLY.
8. FOR 240V POWER ONLY.
9. POSITION JUMPER 17, 18 TO INSIDE FOR NON POWER OUTPUT.
10. ENERGIZE W1 FROM R WITH THERMOSTAT OR WET CONTACT TO ENABLE MOD. POST HEAT.

FACTORY INSTALLED OPTIONS WIRING DIAGRAMS- CONTINUED

Optional Heat / Cool Inputs



Optional Pre/Post Heat



8. For troubleshooting purposes, an ignition attempt after lockout may be re-established manually by moving the thermostat switch to ***"OFF"*** and then return to ***"HEAT"*** position
9. When the warm-up period expires, modulation of the system is handed over to the Building Management System.
10. If the building controller is providing an analog signal between 2.0 and 10.0 vdc to the SC30 Control, the system will modulate from 20 to 100% of the modulating side input (ST1 LED light on).
11. As the call for heat continues, stage 2 comes on (ST2 LED light on) and, simultaneously, stage 1 decreases to minimum output.
12. If the Building Management System continues to call for heat, stage 1 continues to increase rate until system is running at 100% capacity.
13. When the building thermostat is satisfied and the demand for heat ends, the Gas Valve is de-energized immediately and the Combustion Air Inducer switches to high speed for a 30-second post-purge period.

Limit Controls - Limit controls are factory-set and are not adjustable.

Heating Adjustment - Main burners are factory-set and do not require adjustment.

XVI - ROUTINE MAINTENANCE

⚠CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

A. INTAKE HOOD MESH FILTER(S)

The aluminum mesh filter(s) located in the standard Fresh Air Hood (**See Figure 26**) must be cleaned on a regular basis for best efficiency (not applicable for units with EME). The frequency depends on cleanliness of the incoming air.

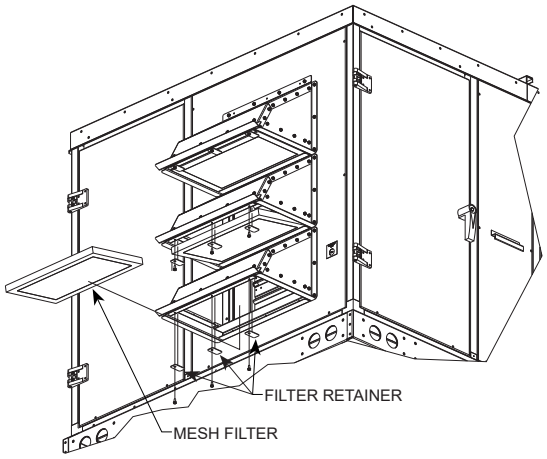


FIGURE 26- MESH FILTER INSTALLATION

B. SUPPLY AND RETURN AIR FILTERS

Supply Air Filters - Located upstream of the Enthalpy Wheel as shown in **Figure 27**. Should be checked regularly and cleaned or replaced. Again the frequency depends on cleanliness of the incoming air. It is important that the wheel, and tempering coil (if present) remain clean to maintain desired airflow and efficiency.

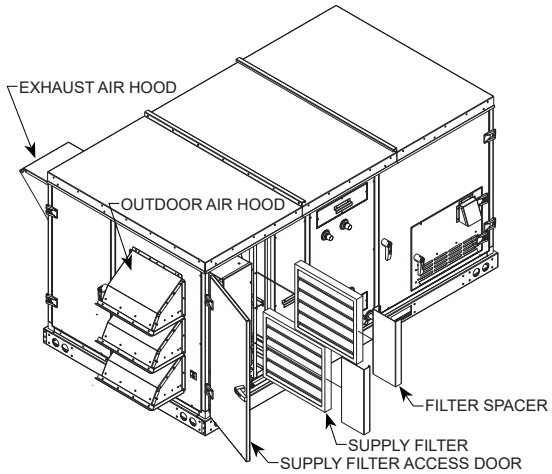


FIGURE 27 - SUPPLY AIR FILTER LOCATION

Return Air Filters - Similar to the Supply Air Filters the Return (or exhaust) Air Filters are located upstream of the Enthalpy Wheel and are also shown in **Figure 28**. Should also be checked regularly and cleaned or replaced. The frequency depends on cleanliness of the return air, which could vary considerably either way from that of the Supply Air Filters. This is a function of the environment and processes performed in the conditioned space. Like the supply filters, maintaining the desired airflow and wheel efficiency is directly dependent upon maintaining clean filters.

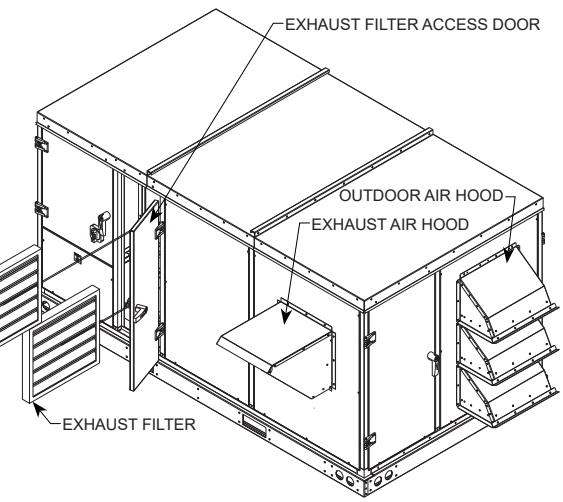


FIGURE 28 - EXHAUST AIR FILTER LOCATION

Filter Size and Quantity - **Table 10** on **Page 34** gives the number and size filter for each unit model. Note that the supply and return filters are identical within a given unit.

AIR FILTER SPECIFICATIONS								
UNIT	SUPPLY AIR FILTERS				EXHAUST AIR FILTERS			
	QTY	W	H	D	QTY	W	H	D
EVT-09 EVT-19	2	18	20	2	2	18	20	2
EVT-28 EVT-36	2	20	25	2	2	20	25	2
EVT-46 EVT-62	6	16	20	2	6	16	20	2
EVT-74 EVT-88	6	20	20	2	6	20	20	2
EVT-10 EVT-12	8	18	25	2	8	20	20	2

TABLE 10 - SUPPLY AND EXHAUST FILTER SPECIFICATIONS

C. TEMPERING COILS

Cleaning Coils - Coils must remain clean to maintain desired performance. Inspect and clean coil at the beginning of each season (cooling or heating). Heating coils may be brushed or vacuum cleaned. Clean cooling coils using a mild detergent or commercial coil cleaner. Many coil cleaners contain harsh chemicals, so they must bee used with caution by qualified personnel only. Flush the coil and condensate drain with water taking care not to get insulation, filters and air duct wet. Care should be taken not to damage the coils, particularly the fins, while cleaning. High pressure water should not be used due to possible fin damage. If there is any doubt regarding water pressure it is recommended that it be tested on a small corner of the coil to determine if the fins will withstand the questionable pressure level.

Drain Pans - Drain pans in any air conditioning unit will have some moisture in them therefore, algae and other organisms will grow due to airborne spores and bacteria. Periodic cleaning is necessary to prevent this build-up from plugging the drain and causing the drain pan to overflow. Also, drain pans should be kept clean by qualified personnel to prevent the spread of disease.

Winterizing - Coil freeze-up can be caused by such things a air stratification and failure of outdoor air dampers. Routine draining of water cooling coils for winter shutdown cannot be depended upon as insurance against freeze-up. Severe coil damage may result. It is recommended that all coils be drained as thoroughly as possible (**See Figure 29**) and then treated in the following manner:

1. Fill each coil independently with an antifreeze solution using a small circulating pump and again thoroughly drain.
2. Check freezing point of antifreeze before proceeding to next coil. Due to small amount of water always remaining in each coil, there will be diluting effect. The small amount of antifreeze solution remaining in the coil must always be concentrated enough to prevent freeze-up. Carefully read instructions for mixing antifreeze solution used. Some products will have a higher freezing point in their natural state than when mixed with water.

D. ENERGY RECOVERY CASSETTE (ERC)

Cleaning Wheel - Over time, build up of material on energy transfer surfaces reduces latent energy (water vapor) transfer and reduces air flow. Therefore, periodic cleaning is required to maintain building moisture control

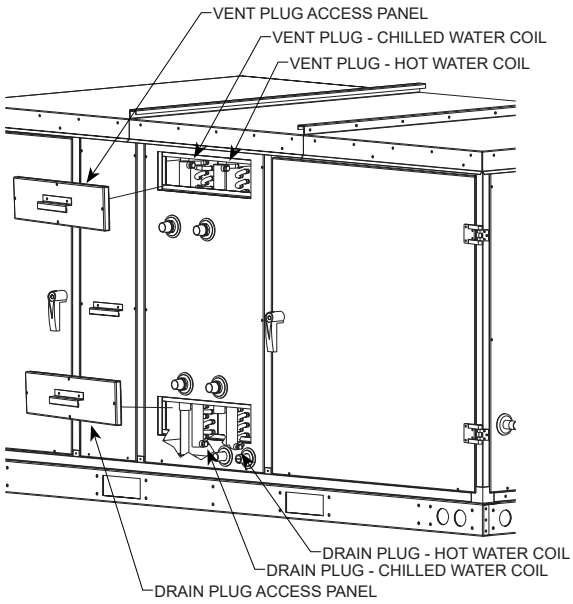


FIGURE 29 - WATER COIL VENT AND DRAIN PLUGS

and ventilation requirements. Frequency and method of cleaning varies greatly with the application and amount of run time. Use the following guidelines combined with initial annual inspections to establish an appropriate cleaning schedule.

Normal Indoor Environments - In schools, office buildings, or most homes, reductions in airflow or effectiveness may not occur for five to ten years.

Moderate Occupant Smoking - Measurable changes in latent energy transfer and some loss of airflow can occur in less than five years.

High Levels of Occupant Smoking - In lounges, nightclubs, bars and restaurants, latent effectiveness may be severely reduced in less than one year, but without a correspondingly severe loss of airflow

Industrial Applications - Welding and machine operations normally ventilate high levels of smoke or oil-based aerosols that may result in a three to six month washing cycle.

Tar and oil based aerosols condensing on the desiccant surfaces eventually close off the micron-sized pores, reducing the efficiency with which the desiccant can transfer moisture. This reduces latent capacity, but does not adversely affect sensible heat transfer. However, this "Sticky" material builds up on the face of the wheel bridging the narrow opening between parallel plates reducing airflow, which does reduce sensible capacity and ventilation rate. This "bridging" material can be removed with a brush, vacuum or flat-bladed scraper. Any loose particles that remain are subject to the self-cleaning characteristics for dry particles; i.e., particles small enough to enter the energy transfer matrix will pass through, while larger particles attempting to enter are blown clear as the wheel rotates into the counter-flowing airstream

Restoration of latent effectiveness to near original performance requires washing with water and alkaline based coil cleaners. To facilitate washing, all Enervent ERW segments are removable in minutes without the

use of tools. Depending on wheel size, segments weigh between 4 and 23 pounds. Soaking in a water and detergent solution to loosen deposited tars and oils, and follow with a clear-water rinse. **See Figures 30 and 31** for removal of ERC and individual segments.

To install wheel segments follow **Steps A through E**. **See Figure 31.** Reverse procedure for segment removal.

A. Unlock two segment retainers (one on each side of the selected segment opening).

B. With the embedded stiffener facing the motor side, insert the "nose" of the segment between the hub plates.

C. Holding segment by the two outer corners, press the segment toward the center of the wheel and inward against the spoke flanges. If hand pressure does not fully seat the segment, insert the flat tip of a screw driver between the wheel rim and outer corners of the segment and apply downward force while guiding the segment into place.

D. Close and latch each segment retainer under segment retaining catch.

E. Slowly rotate the wheel 180°. Install the second segment opposite the first for counterbalance. Rotate the two installed segments 90° to balance the wheel while the third segment is installed. Rotate the wheel 180° again to install the fourth segment. Repeat this sequence with the remaining four segments.

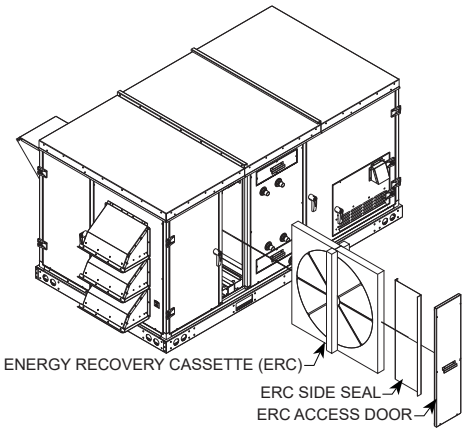


FIGURE 30 - ENERGY RECOVERY CASSETTE REMOVAL

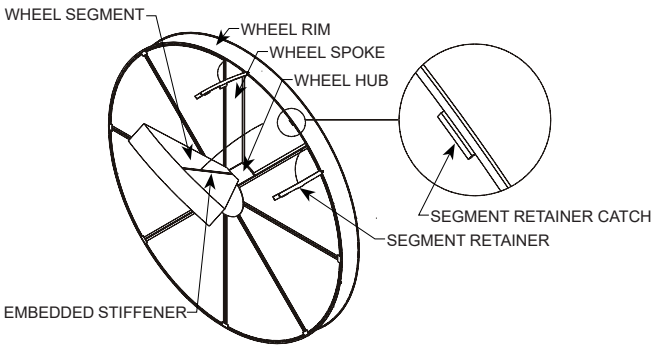


FIGURE 31 - ENTHALPY WHEEL SEGMENT REPLACEMENT

Wheel Belt - It is recommended that the link belt driving the wheel be inspected each time the filters are cleaned or replaced. Check to see if it has a “chewed-up” look or is leaving belt dust near the motor pulley. Determine if the wheel rotates in a smooth, unrestricted manner. If the belt has broken it is possible to repair by replacing broken or damaged links. If the belt must be replaced, contact the local Ruskin representative for ordering.

New link belts generally need to be stretched to fit and in this application may seem 6" to 8" too small. Follow the replacement instructions that will arrive with the new belt.

Wheel Motor - The motor has pre-lubricated, sealed bearings requiring no lubrication. It should be checked during scheduled maintenance for possible dust build-up and to be certain it remains securely mounted.

Wheel Bearings - Bearings supporting the Enthalpy Wheel are unlikely to fail during the serviceable life of the unit and, therefore, require no scheduled maintenance. Nevertheless; in the unlikely event of a failure, they are accessible through a removable plate located on the Bearing Support Beam.

E. GAS POST-HEAT

An annual inspection of the gas heater (**Figure 19 thru 22**) by qualified service personnel is recommended to check for proper operation and to look for damage or degradation of any component. Any damaged or deteriorated parts should be replaced before the unit is put back into service.

1. Turn off all electrical power before inspection and servicing.
2. Check Heat Exchanger for cracks and blockage.
3. Check and clean burners and carryover from dirt, rust and blockage by insects.
4. Check venting system for blockage by animals and wasps.
5. Check the piping for leaks.

Burners - Periodically examine burner flames for proper appearance during the heating season. Before each heating season examine the burners for any deposits or blockage which may have occurred.

If Necessary, Clean burners as follows:

1. Turn off both electrical power and gas supply to unit.
2. Open burner compartment access door.
3. Remove two screws securing burners to burner support and lift the burners from the orifices. **See Figure 32**. Clean as necessary.
4. Replace burners and screws securing burner.
5. Close access door.
6. Restore electrical power and gas supply. Follow lighting instructions listed previously in section **XV - UNIT STARTUP**.

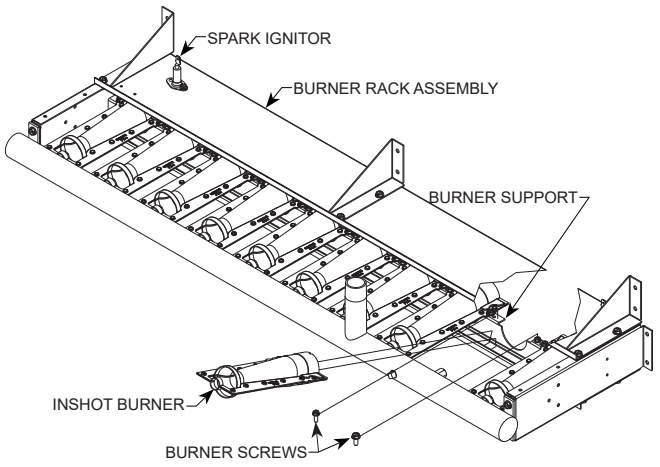


FIGURE 32 - BURNER REMOVAL

Spark Igniter - A spark igniter is used to provide an ignition spark for lighting the burners. The igniter is mounted on the burner wrapper and is located above the left-most burner as shown in **Figure 33** and can be easily removed for service without removing any part of the burners. During the ignition process, voltage is applied to the Electrode, which arcs to Ground (**See Figure 34**) creating a spark that ignites the left burner; which then lights the adjacent burner and the flame travels from burner to burner until all are lit.

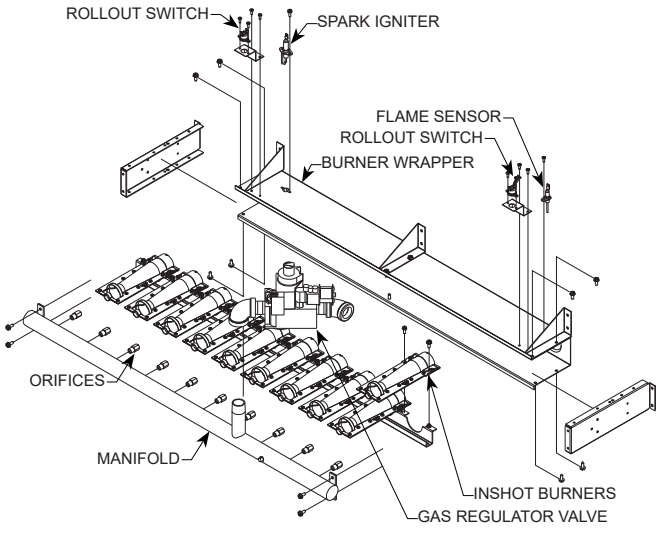


FIGURE 33 - BURNER RACK ASSEMBLY

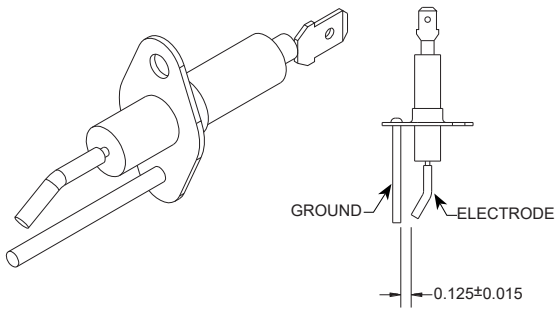


FIGURE 34 - SPARK IGNITER

The Spark Electrode is connected to the ignition control by an 8 mm silicone-insulated, stranded, high voltage wire. The wire uses a ¼" female quick-connect on the electrode end and a female spark plug- type terminal on the ignition control end.

NOTE: In order to maximize spark energy to the Electrode, the high voltage wire should not touch the cabinet unnecessarily.

Also, for proper operation, the Electrode to Ground gap (spark gap) must be set correctly at 0.125 ± 0.015 inch (3.2 ± 0.4 mm).

Flame Sensor - A Flame Sensor (**Figure 35**) is located on the right side of the Burner Rack Assembly directly opposite the Spark Igniter (**Figure 33**) with the tip protruding into the flame envelope of the right-most burner. Like the Spark Igniter, the Flame Sensor can be removed for service without removing any other part of the Burner Rack Assembly.

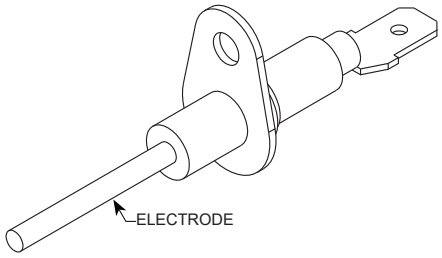


FIGURE 35 - FLAME SENSOR

When flame is sensed by the Flame Sensor (indicated by micro-amp signal through the flame) the Spark Igniter is de-energized immediately. During operation, flame is sensed by current passed along the ground electrode (located on the Spark Igniter), through the flame and into the Sensor electrode. The Ignition Control allows the Gas Valve to remain open as long as a flame signal (current passed through the flame) is sensed.

Gas Valve (2-Stage and 5:1 Modulation) - A two-stage redundant valve (**Figures 18**) manufactured by White-Rodgers. First-stage (low-fire) is quick opening (on and off in less than 3 seconds), second-stage is slow opening (on to high-fire pressure in 40 seconds and off to low-fire pressure in 30 seconds). On a call for first-stage heat (low-fire), the valve is energized by the ignition control simultaneously with the spark electrode. On a call for second-stage heat (high-fire), the second-stage operator is energized directly. A manual switch is provided on the valve, which closes both stages without delay.

Gas Valve (Split Manifold, 10:1 Modulation) – Two single-stage redundant valves (***Figures 18 and 21***) manufactured by White-Rodgers. Both are quick opening (on and off in less than 3 seconds). The valve is energized by the ignition control simultaneously with the spark electrode. A manual switch is provided on the valve, which closes both stages without delay.

Combustion Air Inducer - A combustion air proving switch checks combustion air inducer operation before allowing power to the gas control valve. Gas controller will not operate if inducer is obstructed.

Under normal operating conditions, the combustion air inducer wheel should be checked and cleaned prior to the heating season. However, it should be examined periodically during the heating season to establish an ideal cleaning schedule. With power supply disconnected, the condition of the inducer wheel can be determined by removing the Flue Vent (**Figure 19**) and looking through the discharge opening.

Clean the combustion air inducer as follows:

1. Shut off power supply and gas to unit.
2. Disconnect pressure switch air tubing from combustion air inducer port.
3. Remove and retain screws securing flue vent to the inducer. Remove and retain screws securing combustion air inducer to the flue box. ***See Figure 19.***
4. Clean inducer wheel blades with a small brush and wipe off any dust from housing. Clean accumulated dust from front of flue box cover.

At this point the flue passageway and flue box may be cleaned as described below.

5. Reassemble the unit. It is recommended that the combustion air inducer gasket be replaced during reassembly.
6. Clean combustion air inlet louvers on heat access door using a small brush.

⚠WARNING

The State of California has determined that this product may contain or produce a chemical or chemicals, in very low doses, which may cause serious illness or death. It may also cause cancer, birth defects, or reproductive harm.

Flue Passageway and Flue box

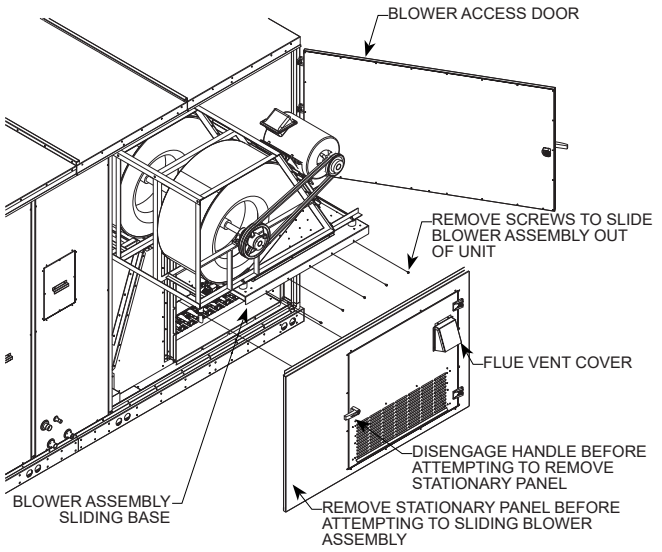
1. Remove combustion air inducer as described in **Steps 1-3** above.
2. Remove flue box cover and clean with a wire brush as required.
3. Clean tubes with wire brush.
4. Follow **Steps 5-6** above.

F. BLOWER COMPONENTS

Blower Access - The dual supply blower assembly in the EVT-10 and EVT-12 is designed to slide-out for servicing as shown in ***Figure 36***.

Lubrication - All motors are lubricated at the factory - no further lubrication is required. Blower shaft bearings are pre-lubricated; however, for extended bearing life, re-lubricate at least once every two years with a lithium base grease, such as Alvania 3 (Shell Oil), Chevron BRB@ (Standard Oil), or Regal AFB2 (Texas Oil).

Use a hand grease gun for re-lubrication and add only enough grease to purge through the bearings so that a bead of grease appears at the seal lip contacts.



For EVT-10 & EVT-12 Units Only: Blower assembly slides out to provide rear-blower service access.

FIGURE 36 - SLIDE-OUT BLOWER ASSEMBLY

Supply / Exhaust Blower Wheels

Fan Belts - Check on a regular basis for wear, tension, alignment, and dirt accumulation. Premature or frequent belt failures can be caused by improper belt tension or misaligned sheaves. Abnormally high belt tension or drive misalignment will cause excessive bearing loads and may result in failure of the fan and/or motor bearings. Loose belts will cause squealing on start-up, excessive belt flutter, slippage, and overheated sheaves. Both loose and tight belts can cause fan vibration.

When replacing belts on multiple groove drives, all belts must be changed in matched sets to provide uniform drive loading. Do not pry belts on or off the sheave. Loosen belt tension until belts can be removed by simply lifting off of the sheave. Belt dressing should never be used. Never install new belts on worn sheaves. If the sheaves have grooves worn in them, they must be replaced before new belts are installed. Determine proper belt tension as shown in **Figure 17**.

Fan Motors - All motors use pre-lubricated, sealed bearings that require no further lubrication. Motor maintenance is generally limited to inspection and cleaning. Cleaning should be limited to exterior surfaces only. Removing dust and grease buildup on motor housing aids motor cooling. Never wash-down motor with high pressure spray.

Fan Wheels - Require little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. When this occurs the wheel and housing should be cleaned to assure smooth and safe operation. Inspect fan wheel and housing for fatigue cracks, corrosion and wear.

Fan Bearings - Enervent units have pillow block bearings that require proper lubrication at regular intervals to extent bearing life and to prevent premature failure. **Table 11** shows the recommended lubrication schedule under normal operating conditions. If unusual conditions exist; i.e., below 32°F or above 200°F, with moisture or contaminants present, more frequent lubrication is required.

BLOWER BEARING LUBRICATION SCHEDULE		
BLOWER	**SHAFT DIA (in.)**	
RPM	**1.00 to 1.50**	**1.75 to 2.00**
< 500	6 mo	6 mo
500-1000	6 mo	5 mo
1000-1500	5 mo	4 mo
1500-2000	4 mo	3 mo
2000-2500	4mo	2 mo
2500-3000	3 mo	1 mo
3000-3500	2 mo	1 mo

TABLE 11 - BLOWER BEARING LUBRICATION SCHEDULE

Be careful not to unseat the seal by over lubricating or using excessive pressure. With the unit running, add grease very slowly with a manual grease gun until a slight bead forms at the seal. As a guide fill 30 to 60% of available space within the bearing and its housing. Use a high quality lithium based grease that conforms to NLGI Grade 2.

In addition to lubricating the bearings at specified intervals, set screws in the bearing collars should be checked for tightness. A bearing collar which has loosened will cause premature failure of the fan shaft. Fasteners attaching the bearings to the drive frame should also be checked.

XVII - VFD FACTORY SET POINTS

Modulating Control for Fan Speed – Variable Frequency Drives (VFD) for the blower are factory set to receive a 0-10 VDC signal wired in the field. Most of the setpoints in the VFD's are factory defaults. There are a few, however, that are changed in the factory and are shown in **Table 12.** If job specifications requires changing these set points refer to the VFD Manufacture's manual included with the unit.

VFD STARTUP WITH BASIC PROGRAM		
PARAMETER	**DESCRIPTION**	**CODE**
P031	Motor Nameplate Amps	Based on Drive Rating
P032	Motor Nameplate Hertz	60 Hz (Default)
P033	Motor Overload Current	Based on Motor FLA Rating
P034	Minimum Frequency	0.0 Hz (Default)
P035	Maximum Frequency	60.0 Hz (Default)
P036	Start Source	2-Wire
P037	Stop Mode	0-Coast (Default)
P038	Speed Reference	2 = 0-10 Volt Input
		3 = 4-20 ma Input
P039	Acceleration Time	10 sec (Default)
P040	Deceleration Time	10 sec (Default)
P041	Reset to Defaults	0 = Ready/Idle (Default)
P042	Voltage Class	3 (Default)
P043	Motor Overload Retention	0 = Disabled (Default)

TABLE 12 - VFD SETPOINTS

XVIII - WIRING DIAGRAMS, PRE- AND POST-HEAT

Table 13 provides a quick reference for locating a given Electric Post-Heat diagram on **Pages 49-54**. Gas Post-Heat can be found on **Page 55**, **Diagram 14** and Electric Pre-Heat diagrams can be ready found on **Pages 55-56, Diagrams 15-17.**

Model	WIRING DIAGRAM NUMBER -- ELECTRIC POST-HEAT											
	240V				480V				575V			
	1-STG	2-STG	3-STG	4-STG	1-STG	2-STG	3-STG	4-STG	1-STG	2-STG	3-STG	4-STG
EVT-09	1	—	—	—	1	—	—	—	1	—	—	—
EVT-19	1	4	—	—	1	4	—	—	1	4	—	—
EVT-28	2	—	—	—	2	—	—	—	2	—	—	—
EVT-36	2	6	—	—	2	5	—	—	2	5	—	—
EVT-46	2	6	—	—	2	5	—	—	2	5	—	—
EVT-62	2	6	8	—	2	5	9	—	2	5	10	—
EVT-74	3	7	—	—	2	6	—	—	2	6	—	—
EVT-88	3	7	11	—	2	6	8	—	2	6	8	—
EVT-10	3	7	11	—	2	6	8	—	2	6	8	—
EVT-12	3	7	11	12	2	6	8	13	2	6	8	13

TABLE 13 - WIRING DIAGRAM INDEX - ELECTRIC POST-HEAT

EVT Unit#		EVT-09	EVT-19	EVT-28	EVT-36	EVT-46
CFM Range (Min-Max)		600- 1,000	900- 1,900	1,600-2,800	2,400-3,600	3,000- 4,600
ERC Model		2510C	3019C	3628	4136	4646
Supply Blower	Model	A9 x 4AT	A10 x 6A	A12 x 6A	A12 x 9A	A15 x 11A
	Shaft Dia. (in.)	0.750	0.750	1.000	1.000	1.188
	Max RPM	2894	2488	2069	2058	1714
Exhaust Blower	Model	A9 x 4AT	A10 x 6A	A12 x 9A	A12 x 12A	A15 x 11A
	Shaft Dia. (in.)	0.750	0.750	1.000	1.188	1.188
	Max RPM	5200	2488	2058	2091	1714
Supply Drive Kits (Mtr HP-RPM Range)	Min HP	1-2250/1625 1641/1094	1-1703/1230 1250/833	1.5-1591/1193 1250/833	2-1489/1117 1167/843	2-1212/875 913/659
	Med HP	---------	1.5-2068/1670 1703/1230	2-1591/1193 1346/1010	3-1750/1333 1395/1111	3-1434/1142 1160/924 957/778
	Max HP	1.5-2593/1944	2-2068/1670	3-1750/1333 1395/1111	5-1750/1422	5-1434/1142 1160/924
Exhaust Drive Kits (Mtr HP-RPM Range)	Min HP	1-2250/1625 1641/1094	1-1703/1230 1250/833	1-1193/795	1.5-1193/795	2-1212/875 913/659
	Med HP	---------	1.5-2068/1670 1703/1230	1.5-1500/1083 1193/795	2-1432/1034	3-1434/1142 1160/924 957/778
	Max HP	1.5-2593/1944	2-2068/1670	2-1500/1083	3-1564/1191	5-1434/1142 1160/924
Supply ESP (in.wg)	Min	0	0	0	0	0
	Max	1.5	1.5	1.5	1.5	1.5
Exhaust ESP (in.wg)	Min	0	0	0	0	0
	Max	1	1	1	1	1
Weight (lbs)		1510	1670	2610	2780	3080

EVT Unit#		EVT-62	EVT-74	EVT-88	EVT-10	EVT-12
CFM Range (Min-Max)		3,400-6,200	5,400-7,400	6,400-8,800	7,600-10,000	8,000-12,000
ERC Model		5262	5874	6488	68100	74122
Supply Blower	Model	A15 x 11A	A18 x 13A	A18 x 13A	A20 x 9H (2)	A20 x 9H (2)
	Shaft Dia. (in.)	1.188	1.188	1.188	1.438	1.438
	Max RPM	1714	1478	1478	1278	1278
Exhaust Blower	Model	A18 x 13A	A18 x 18A	A18 x 18A	A20 x 20H	A20 x 20H
	Shaft Dia. (in.)	1.188	1.438	1.438	1.688	1.688
	Max RPM	1478	1501	1501	1278	1278
Supply Drive Kits (Mtr HP-RPM Range)	Min HP	3-1395/1111 1122/894 913/723	3-813/648	5-991/805 813/648	5-813/648 687/558	7.5-991/805 846/703 705/575
	Med HP	5-1395/1111 1122/894	5-1155/938 957/778 813/648	7.5-1263/1046 1160/924 932/789	7.5-1027/837 846/703	10-1087/866 882/717
	Max HP	7.5-1454/1158	7.5-1263/1046 1160/924	10-1263/1046	10-1087/866	15-1104/914
Exhaust Drive Kits (Mtr HP-RPM Range)	Min HP	2-818/591	3-813/648	5-991/805 813/648	3-599/484	5-753/565
	Med HP	3-957/778 813/648	5-1047/850 882/703	7.5-932/789 1263/1046 1160/924	5-813/648 687/558	7.5-882/717 775/631
	Max HP	5-1187/945 957/778	7.5-1263/1046 1160/924	10-1263/1046	7.5-882/717	10-1087/866 882/717
Supply ESP (in.wg)	Min	0	0	0	0	0
	Max	1.5	1.5	1.5	1.5	1.5
Exhaust ESP (in.wg)	Min	0	0	0	0	0
	Max		1	1	1	1
Weight (lbs)		3330	5210	5560	6230	6670

TABLE 14 - UNIT SPECIFICATIONS

STATIC PRESSURE DROP - FACTORY INSTALLED OPTIONS																		
MODEL	AIR VOLUME	INTAKE HOOD	FILTERS				COILS					ELECTRIC HEAT				GAS HEAT	DAMPERS	
			MIST ELIM	2 in. PLEATED			NEUTRAL AIR		NEUTRAL AIR PLUS		HWC	PRE-HEAT		POST-HEAT			INTAKE	EXHAUST
		EME		MERV 8	MERV 11	MERV [13]	DXC	CWC	DXC	CWC		MIN BTUH	MAX BTUH	MIN BTUH	MAX BTUH		MOD	GRAV
model	CFM	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.
EVT-09	600	0.04	0.02	0.04	0.05	.05	0.02	0.02	0.02	0.04	0.02	0.01	0.02	0.01	0.01	0.06	0.02	0.02
	700	0.05	0.03	0.05	0.06	.06	0.03	0.03	0.03	0.06	0.02	0.01	0.02	0.01	0.02	0.07	0.02	0.03
	800	0.07	0.03	0.06	0.07	.07	0.05	0.04	0.04	0.07	0.03	0.01	0.02	0.01	0.03	0.09	0.03	0.03
	900	0.08	0.04	0.07	0.08	.09	0.07	0.05	0.06	0.09	0.03	0.01	0.03	0.02	0.03	0.10	0.03	0.04
	1000	0.10	0.05	0.08	0.09	.10	0.08	0.05	0.08	0.10	0.04	0.02	0.04	0.02	0.04	0.12	0.03	0.05
EVT-19	900	0.08	0.04	0.07	0.08	.09	0.03	0.05	0.14	0.15	0.02	0.01	0.03	0.02	0.03	0.13	0.03	0.03
	1150	0.14	0.06	0.10	0.11	.12	0.04	0.08	0.21	0.22	0.02	0.02	0.04	0.03	0.06	0.15	0.04	0.04
	1400	0.20	0.10	0.13	0.14	.16	0.06	0.10	0.30	0.29	0.03	0.03	0.06	0.04	0.08	0.18	0.06	0.05
	1650	0.25	0.13	0.17	0.19	.20	0.08	0.13	0.39	0.38	0.05	0.04	0.09	0.06	0.12	0.21	0.08	0.07
	1900	0.38	0.18	0.22	0.24	.26	0.10	0.17	0.50	0.47	0.06	0.06	0.11	0.08	0.16	0.24	0.10	0.08
EVT-28	1600	0.10	0.05	0.08	0.09	.10	0.04	0.05	0.11	0.18	0.02	0.02	0.03	0.03	0.05	0.07	0.03	0.03
	1900	0.14	0.06	0.11	0.12	.13	0.05	0.07	0.15	0.23	0.03	0.02	0.04	0.04	0.07	0.10	0.04	0.03
	2200	0.18	0.08	0.13	0.15	.16	0.06	0.09	0.19	0.29	0.03	0.03	0.06	0.05	0.10	0.14	0.05	0.04
	2500	0.24	0.11	0.16	0.18	.19	0.08	0.11	0.23	0.36	0.04	0.04	0.07	0.06	0.13	0.18	0.06	0.05
	2800	0.30	0.14	0.20	0.21	.23	0.09	0.13	0.28	0.42	0.05	0.04	0.09	0.08	0.16	0.22	0.08	0.06
EVT-36	2400	0.22	0.10	0.15	0.17	.18	0.09	0.13	0.23	0.40	0.04	0.03	0.07	0.06	0.12	0.10	0.06	0.03
	2700	0.28	0.13	0.19	0.20	.22	0.11	0.16	0.28	0.48	0.05	0.04	0.08	0.07	0.15	0.14	0.07	0.04
	3000	0.34	0.16	0.22	0.24	.26	0.13	0.19	0.33	0.56	0.06	0.05	0.10	0.09	0.19	0.19	0.09	0.05
	3300	0.41	0.19	0.26	0.28	.30	0.15	0.22	0.39	0.64	0.08	0.06	0.12	0.11	0.23	0.23	0.10	0.06
	3600	0.45	0.23	0.30	0.33	.35	0.18	0.26	0.45	0.73	0.09	0.07	0.14	0.14	0.27	0.29	0.12	0.06
EVT-46	3000	0.10	0.05	0.11	0.11	.13	0.05	0.10	0.18	0.22	0.05	0.02	0.04	0.01	0.03	0.09	0.04	0.04
	3400	0.13	0.07	0.13	0.14	.15	0.07	0.12	0.22	0.26	0.06	0.02	0.05	0.02	0.04	0.12	0.04	0.05
	3800	0.17	0.08	0.15	0.16	.18	0.08	0.15	0.27	0.32	0.07	0.03	0.06	0.02	0.05	0.15	0.05	0.06
	4200	0.21	0.10	0.18	0.19	.21	0.09	0.18	0.32	0.37	0.09	0.03	0.07	0.03	0.06	0.20	0.06	0.07
	4600	0.25	0.12	0.21	0.22	.24	0.11	0.21	0.37	0.43	0.10	0.04	0.08	0.04	0.07	0.24	0.07	0.08
EVT-62	3400	0.13	0.07	0.13	0.14	.15	0.10	0.15	0.30	0.28	0.06	0.02	0.05	0.02	0.04	0.11	0.04	0.03
	4100	0.19	0.10	0.17	0.19	.20	0.14	0.21	0.41	0.38	0.08	0.03	0.06	0.03	0.06	0.15	0.06	0.04
	4800	0.27	0.13	0.22	0.24	.26	0.18	0.27	0.54	0.49	0.11	0.04	0.09	0.04	0.08	0.19	0.08	0.05
	5500	0.35	0.18	0.28	0.30	.33	0.23	0.33	0.68	0.61	0.14	0.06	0.11	0.05	0.11	0.24	0.10	0.06
	6200	0.44	0.23	0.34	0.37	.40	0.28	0.41	0.83	0.74	0.17	0.07	0.14	0.07	0.14	0.30	0.12	0.07
EVT-74	5400	0.09	0.10	0.12	0.13	.15	0.11	0.18	0.40	0.43	0.08	0.03	0.07	0.02	0.04	0.18	0.06	0.04
	5900	0.11	0.12	0.14	0.15	.17	0.13	0.20	0.47	0.49	0.10	0.04	0.08	0.03	0.05	0.20	0.07	0.05
	6400	0.13	0.14	0.16	0.17	.19	0.15	0.23	0.54	0.56	0.12	0.04	0.09	0.03	0.06	0.22	0.08	0.05
	6900	0.15	0.16	0.18	0.20	.21	0.17	0.27	0.61	0.63	0.13	0.05	0.10	0.04	0.07	0.25	0.09	0.06
	7400	0.17	0.19	0.20	0.22	.24	0.19	0.30	0.69	0.71	0.15	0.06	0.12	0.04	0.09	0.27	0.10	0.07
EVT-88	6400	0.13	0.14	0.16	0.17	.19	0.18	0.25	0.61	0.61	0.12	0.04	0.09	0.03	0.06	0.22	0.08	0.05
	7000	0.15	0.17	0.19	0.20	.22	0.21	0.30	0.71	0.70	0.14	0.05	0.11	0.04	0.08	0.24	0.09	0.06
	7600	0.18	0.20	0.21	0.23	.25	0.24	0.34	0.82	0.80	0.16	0.06	0.12	0.05	0.09	0.26	0.11	0.07
	8200	0.21	0.23	0.24	0.26	.28	0.28	0.38	0.93	0.90	0.18	0.07	0.14	0.05	0.11	0.29	0.12	0.08
	8800	0.24	0.27	0.27	0.30	.32	0.31	0.43	1.05	1.01	0.21	0.08	0.17	0.06	0.12	0.32	0.14	0.09
EVT-10	7600	0.18	0.09	0.15	0.16	.18	0.10	0.15	0.27	0.41	0.08	0.03	0.06	0.03	0.07	0.18	0.05	0.04
	8200	0.21	0.11	0.17	0.19	.20	0.12	0.17	0.31	0.46	0.09	0.04	0.07	0.04	0.08	0.20	0.06	0.04
	8800	0.24	0.12	0.19	0.21	.23	0.13	0.19	0.35	0.52	0.11	0.04	0.08	0.05	0.09	0.22	0.07	0.05
	9400	0.27	0.14	0.21	0.23	.25	0.14	0.22	0.39	0.58	0.12	0.05	0.09	0.05	0.11	0.25	0.08	0.05
	10000	0.31	0.16	0.24	0.26	.28	0.16	0.24	0.43	0.64	0.13	0.05	0.10	0.06	0.12	0.28	0.09	0.06
EVT-12	8000	0.20	0.10	0.16	0.18	.19	0.12	0.18	0.34	0.48	0.09	0.03	0.07	0.04	0.08	0.22	0.06	0.04
	9000	0.25	0.13	0.20	0.22	.23	0.15	0.22	0.41	0.58	0.11	0.04	0.08	0.05	0.10	0.25	0.07	0.05
	10000	0.31	0.16	0.24	0.26	.28	0.18	0.27	0.48	0.69	0.13	0.05	0.10	0.06	0.12	0.28	0.09	0.06
	11000	0.37	0.19	0.28	0.30	.33	0.21	0.31	0.56	0.80	0.16	0.06	0.12	0.07	0.15	0.31	0.10	0.07
	12000	0.44	0.23	0.33	0.35	.38	0.24	0.36	0.64	0.92	0.19	0.07	0.14	0.09	0.17	0.35	0.12	0.08

CHART 1 - STATIC PRESS DROP FOR FACTORY INSTALLED OPTIONS

EVT-09 SUPPLY & EXHAUST AIR PERFORMANCE RATINGS																
AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)														
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
600	1250	1120	0.20	1338	0.28	1536	0.37	1721	0.47	1893	0.58	na	na	na	na	na	na
700	1458	1249	0.29	1446	0.38	1624	0.48	1792	0.59	1952	0.70	2105	0.83	2251	0.95	na	na
800	1667	1375	0.40	1557	0.51	1720	0.62	1874	0.74	2020	0.86	2162	0.99	2299	1.12	2432	1.26
900	1875	1495	0.53	1667	0.66	1819	0.78	1961	0.91	2097	1.04	2228	1.17	2356	1.31	2480	1.46
1000	2083	1618	0.69	1781	0.83	1924	0.97	2057	1.11	2185	1.25	2307	1.39	2426	1.54	2542	1.70

EVT-19 SUPPLY & EXHAUST AIR PERFORMANCE RATINGS																	
AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
900	1385	**746**	**0.16**	1002	0.27	1216	0.38	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
1150	1769	**869**	**0.29**	1088	0.42	1281	0.55	1453	0.70	1610	0.85	**na**	**na**	**na**	**na**	**na**	**na**
1400	2154	984	0.46	1175	0.61	1349	0.77	1508	0.94	1656	1.12	1794	1.29	1923	1.47	**na**	**na**
1650	2538	1096	0.69	1263	0.86	1421	1.05	1568	1.24	1706	1.43	1837	1.63	1960	1.84	2078	2.05
1900	2923	1205	0.97	1353	1.17	1497	1.38	1632	1.59	1761	1.81	1884	2.04	2002	2.26	**2114**	**2.49**

EVT-28 SUPPLY AIR PERFORMANCE RATINGS																	
AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1600	1951	**697**	**0.39**	876	0.57	1033	0.75	1177	0.95	1309	1.15	**na**	**na**	**na**	**na**	**na**	**na**
1900	2317	**784**	**0.60**	941	0.81	1083	1.02	1215	1.24	1338	1.47	1454	1.70	1564	1.95	1668	2.20
2200	2683	865	0.87	1006	1.10	1136	1.34	1257	1.59	1372	1.84	1481	2.10	1585	2.37	1684	2.64
2500	3049	950	1.21	1076	1.47	1196	1.74	1308	2.01	1414	2.29	1516	2.57	1614	2.87	1709	3.17
2800	3415	1032	1.62	1145	1.91	1255	2.20	1361	2.50	1461	2.81	1555	3.12	1648	3.44	**1738**	**3.76**

EVT-28 EXHAUST AIR PERFORMANCE RATINGS																	
AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1600	1416	645	0.29	852	0.46	1024	0.64	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
1900	1681	712	0.44	899	0.63	1060	0.84	1204	1.05	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
2200	1947	772	0.61	943	0.84	1094	1.07	1231	1.31	1357	1.56	1473	1.82	**na**	**na**	**na**	**na**
2500	2212	834	0.83	991	1.09	1133	1.35	1263	1.61	1383	1.88	1495	2.16	**1601**	**2.45**	**1701**	**2.75**
2800	2478	890	1.09	1037	1.37	1171	1.66	1294	1.95	1409	2.25	**1517**	**2.55**	**1620**	**2.86**	**1717**	**3.18**

EVT-36 SUPPLY AIR PERFORMANCE RATINGS																	
AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2400	2124	**772**	**0.70**	939	0.94	1088	1.19	1222	1.44	1346	1.71	1462	1.98	1570	2.26	na	na
2700	2389	**832**	**0.90**	987	1.21	1126	1.48	1224	1.76	1373	2.05	1484	2.34	1589	2.65	1689	2.95
3000	2655	888	1.20	1032	1.51	1164	1.82	1285	2.12	1399	2.44	1506	2.75	1608	3.08	1705	3.41
3300	2920	944	1.52	1078	1.86	1202	2.19	1318	2.53	1428	2.87	1531	3.21	1629	3.56	1723	3.92
3600	3186	999	1.89	1125	2.26	1243	2.62	1353	2.99	1458	3.36	1557	3.73	1652	4.10	1744	4.48

EVT-36 EXHAUST AIR PERFORMANCE RATINGS																	
AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2400	1667	**753**	**0.60**	932	0.86	1090	1.14	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
2700	1875	809	0.80	974	1.08	1123	1.38	1259	1.70	1385	2.03	**na**	**na**	**na**	**na**	**na**	**na**
3000	2083	859	1.02	1013	1.33	1154	1.65	1284	1.99	1405	2.35	1519	2.72	**na**	**na**	**na**	**na**
3300	2292	908	1.27	1053	1.61	1186	1.96	1310	2.32	1427	2.70	1537	3.09	**1641**	**3.49**	**na**	**na**
3600	2500	956	1.56	1094	1.93	1220	2.31	1338	2.69	1450	3.09	**1556**	**3.50**	**1658**	**3.93**	**1755**	**4.37**

CHART 2 - BLOWER PERFORMANCE

EVT-46 SUPPLY & EXHAUST AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3000	1887	**610**	**0.71**	756	1.01	885	1.32	1001	1.65	1107	1.99	1205	2.34	**na**	**na**	**na**	**na**
3400	2138	**657**	**0.96**	793	1.29	914	1.64	1024	2.00	1126	2.37	1221	2.75	1310	3.14	**na**	**na**
3800	2390	704	1.26	830	1.62	944	2.00	1049	2.40	1146	2.80	1238	3.21	1325	3.63	1407	4.06
4200	2642	750	1.60	867	2.01	975	2.42	1075	2.84	1169	3.28	1257	3.72	1341	4.18	1421	4.64
4600	2893	795	2.01	905	2.44	1007	2.89	1102	3.35	1192	3.82	1277	4.29	1359	4.78	1434	5.28

EVT-62 SUPPLY AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3400	2138	**594**	**0.83**	**738**	**1.15**	864	1.49	979	1.85	1084	2.21	1182	2.59	1273	2.97	1359	3.37
4100	2579	**672**	**1.32**	799	1.71	913	2.10	1018	2.52	1116	2.94	1208	3.37	1295	3.81	1377	4.26
4800	3019	748	1.96	862	2.42	966	2.88	1062	3.34	1153	3.82	1239	4.31	1321	4.81	1400	5.31
5500	3459	823	2.78	926	3.30	1021	3.82	1111	4.35	1195	4.89	1276	5.43	1354	5.98	1428	6.55
6200	3899	895	3.79	989	4.37	1078	4.96	1161	5.55	1240	6.14	1316	6.74	13.89	7.35	1460	7.97

EVT-62 EXHAUST AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3400	1491	**482**	**0.64**	625	0.99	747	1.37	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
4100	1798	**537**	**0.99**	664	1.40	776	1.83	877	2.28	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
4800	2105	**589**	**1.44**	704	1.91	807	2.39	902	2.90	990	3.43	1072	3.97	**na**	**na**	**na**	**na**
5500	2412	640	2.00	745	2.53	840	3.07	929	3.63	1013	4.21	1091	4.80	1166	5.42	**1236**	**6.05**
6200	2719	687	2.67	784	3.25	873	3.85	957	4.47	1036	5.10	1111	5.74	**1182**	**6.41**	**1250**	**7.09**

EVT-74 SUPPLY AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5400	2368	**575**	**1.66**	687	2.17	789	2.70	881	3.24	968	3.80	1050	4.38	1126	4.98	1199	5.59
5900	2588	**608**	**2.07**	714	2.62	810	3.19	899	3.77	982	4.37	1061	4.98	1136	5.62	1207	6.27
6400	2807	**640**	**2.52**	741	3.13	833	3.74	918	4.36	998	5.00	1074	5.65	1147	6.32	1216	7.01
6900	3026	673	3.06	769	3.71	856	4.36	938	5.02	1015	5.69	1088	3.62	1159	7.09	1226	7.81
7400	2719	707	3.66	798	4.36	882	5.06	960	5.75	1035	6.47	1105	7.20	1174	7.94	1239	8.70

EVT-74 EXHAUST AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5400	1882	559	1.53	683	2.13	792	2.77	890	3.43	981	4.12	**na**	**na**	**na**	**na**	**na**	**na**
5900	2056	588	1.87	706	2.53	810	3.21	905	3.92	993	4.54	1075	5.41	**na**	**na**	**na**	**na**
6400	2230	617	2.27	729	2.97	829	3.70	921	4.45	1006	5.23	1086	6.03	1163	6.88	1233	7.69
6900	2404	646	2.71	752	3.46	848	4.24	937	5.04	1020	5.86	1098	6.70	1171	7.57	1242	8.45
7400	2578	676	3.22	777	4.02	870	4.84	955	5.69	1036	6.56	1112	7.45	1184	8.36	1252	9.28

EVT-88 SUPPLY AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6400	2807	**617**	**2.40**	720	3.00	813	3.61	900	4.22	981	4.86	1058	5.51	1131	6.17	1201	6.85
7000	3070	656	3.01	753	3.68	841	4.34	924	5.00	1001	5.68	1075	6.38	1145	7.08	1214	7.81
7600	3333	695	3.72	786	4.44	870	5.16	949	5.88	1023	6.61	1094	7.34	1162	8.10	1227	8.87
8200	3596	734	4.53	823	5.35	900	6.08	975	6.86	1046	7.64	1115	8.43	1180	9.22	1243	10.03
8800	2719	773	5.45	853	6.28	930	7.12	1002	7.95	1071	8.78	1136	9.61	1200	10.46	**1260**	**11.30**

CHART 2 (CONT'D) - BLOWER PERFORMANCE

EVT-88 EXHAUST AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6400	2230	**591**	**2.12**	705	2.81	807	3.54	901	4.29	988	5.06	1069	5.85	1145	6.67	1217	7.50
7000	2439	**625**	**2.63**	733	3.39	831	4.17	920	4.97	1004	5.80	1082	6.65	1159	7.54	1228	8.40
7600	2648	**659**	**3.22**	761	4.04	854	4.87	940	5.73	1021	6.61	1097	7.51	1170	8.43	1239	9.37
8200	2857	692	3.88	789	4.76	879	5.65	961	6.57	1039	7.50	1113	8.45	1184	9.43	1251	10.42
8800	3066	725	4.63	818	5.56	903	6.52	983	7.48	1058	8.47	1130	9.48	1199	10.51	**1264**	**11.55**

EVT-10 SUPPLY AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
7600	2242	**520**	**2.35**	610	3.05	694	3.80	775	4.60	851	5.44	923	6.32	991	7.23	1060	8.17
8200	2419	**548**	**2.85**	632	3.58	713	4.37	788	5.21	861	6.09	931	7.01	998	7.97	1061	8.94
8800	2596	575	3.40	655	4.18	731	5.01	803	5.89	873	6.81	941	7.78	1005	8.76	1067	9.78
9400	2773	603	4.03	679	4.85	750	5.72	820	6.63	886	7.59	951	8.59	1013	9.62	1074	10.68
10000	2950	630	4.72	702	5.59	771	6.49	837	7.45	901	8.44	963	9.47	1023	10.55	**1082**	**11.65**

EVT-10 EXHAUST AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
7600	1788	484	2.06	584	2.86	678	3.75	764	4.69	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
8200	1929	507	2.46	602	3.31	691	4.24	774	5.23	851	6.26	**na**	**na**	**na**	**na**	**na**	**na**
8800	2071	530	2.91	620	3.80	704	4.77	784	5.81	859	6.89	**na**	**na**	**na**	**na**	**na**	**na**
9400	2212	554	3.42	638	4.34	719	5.36	795	6.43	868	7.56	**937**	**8.74**	**na**	**na**	**na**	**na**
10000	2353	577	3.97	657	4.94	734	5.99	807	7.11	878	8.29	**945**	**9.51**	**1009**	**10.76**	**na**	**na**

EVT-12 SUPPLY AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
8000	2360	**523**	**2.56**	**610**	**3.27**	692	4.03	770	4.85	845	5.72	916	6.62	984	7.55	1049	8.51
9000	2655	**569**	**3.46**	649	4.25	707	4.89	795	5.96	865	6.89	932	7.85	996	8.85	1058	9.88
10000	2950	615	4.56	688	5.41	757	6.31	824	7.25	888	8.24	951	9.26	1011	10.33	1070	11.43
11000	3245	660	5.85	728	6.78	793	7.75	854	8.75	914	9.80	973	10.89	1030	12.01	1086	13.17
12000	3540	703	7.32	768	8.36	828	9.39	886	10.46	942	11.57	997	12.71	1051	13.89	1103	15.11

EVT-12 EXHAUST AIR PERFORMANCE RATINGS

AIR VOLUME (CFM)	OUTLET VELOCITY (FPM)	TOTAL STATIC PRESSURE (In. w.g.)															
		0.00		0.50		1.00		1.50		2.00		2.50		3.00		3.50	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
8000	1882	**482**	**2.19**	580	3.00	671	3.90	756	4.87	835	5.88	**na**	**na**	**na**	**na**	**na**	**na**
9000	2118	**521**	**2.92**	610	3.80	676	4.55	773	5.81	849	6.90	920	8.03	**na**	**na**	**na**	**na**
10000	2353	**560**	**3.79**	641	4.74	719	5.78	793	6.88	864	8.05	932	9.26	997	10.51	**na**	**na**
11000	2588	599	4.81	673	5.84	746	6.94	814	8.11	881	9.34	946	10.62	**1008**	**11.95**	**1065**	**13.31**
12000	2824	624	5.75	705	7.08	771	8.22	837	9.47	900	10.77	**961**	**12.11**	**1020**	**13.51**	**1078**	**14.95**

	LOW SPEED	**XXXX**	An operating point in BOLD TYPE indicates a field furnished drive.
	MED SPEED	**na**	This operating point is outside the efficient operating range of the blower.
	HIGH SPEED	**XXXX**	This operating point exceeds the maximum BHP of the blower motor.

Notes:

1. This blower data accounts for the pressure drop across the Energy Recovery Wheel and the internal cabinet losses, but does not include the pressure drop for selected Accessories and Options; which can be found in the corresponding tables and must be added to the system External Static Pressure to determine Total Static Pressure correct RPM and BHP.
2. Gross Supply Air Performance Ratings (airflow, pressure, and power) are at Port 2 with Port 1, Port 3 and Port 4 at manufacturers specified static pressures, with Port 1 and Port 3 equal.
3. Gross Exhaust Air Performance Ratings (airflow, pressure, and power) are to Port 3 with Port 1, Port 2 and Port 4 at manufacturers specified static pressures, with Port 2 and Port 4 equal.
4. Power rating (bhp) does not include drive losses.
5. Performance ratings do not include the effects of appurtenances in the air stream.
6. Drives are sized for a minimum of 150% of driven horsepower.
7. WATTS = 746 x BHP

CHART 2 - BLOWER PERFORMANCE

UNIT MODEL NO.	BLOWER			MOTOR					DRIVE COMPONENTS											
	LOC.	MODEL	SHAFT DIA.	NOMINAL		MAX USABLE2		SHAFT DIA.	SPEED	RPM RANGE		ADJUSTABLE PULLEY		FIXED PULLEY		BUSHING		BELT	
				HP	KW	HP	KW			MIN	MAX	SUPPLIER PART NO.	RRS PART NO.	SUPPLIER PART NO.	RRS PART NO.	SUPPLIER PART NO.	RRS PART NO.	SUPPLIER PART NO.	RRS PART NO.
EVT-09	SUPPLY	A9-4AT	0.75	1	0.75	1.15	0.86	0.875	HIGH	1625	2250	1VP40x7/8	700 000 053	AK28x3/4	700 000 098	NA	NA	AX35	410 430 106
									MED	1094	1641	1VP34x7/8	700 000 028	AK32x3/4	700 000 099				
				1.5	1.12	1.73	1.29		HIGH	1944	2593	1VL44x7/8	700 000 025	AK27x3/4	700 000 091			AX36	410 430 100
	EXHAUST	A9-4AT	0.75	1	0.75	1.15	0.86	0.875	HIGH	1625	2250	1VP40x7/8	700 000 053	AK28x3/4	700 000 098	NA	NA	AX21	410 430 109
									MED	1094	1641	1VP34x7/8	700 000 028	AK32x3/4	700 000 099				
				1.5	1.12	1.73	1.29		HIGH	1944	2593	1VL44x7/8	700 000 025	AK27x3/4	700 000 091			AX22	410 430 110
EVT-19	SUPPLY	A10-6A	0.75	1	0.75	1.15	0.86	0.875	HIGH	1230	1703	1VP40x7/8	700 000 053	AK39x3/4	300 000 775	NA	NA	AX42	410 430 079
									MED	833	1250	1VP34x7/8	700 000 028	AK44x3/4	700 000 030				
				1.5	1.12	1.73	1.29		HIGH	1670	2068	1VP56x7/8	700 000 060	AK46x3/4	700 000 029			AX46	410 430 114
									MED	1230	1703	1VP40x7/8	700 000 053	AK39x3/4	300 000 775			AX42	410 430 079
				2	1.49	2.30	1.72		HIGH	1670	2068	1VP56x7/8	700 000 060	AK46x3/4	700 000 029			AX46	410 430 114
	EXHAUST	A10-6A	0.75	1	0.75	1.15	0.86	0.875	HIGH	1230	1703	1VP40x7/8	700 000 053	AK39x3/4	300 000 775	NA	NA	AX22	410 430 110
									MED	833	1250	1VP34x7/8	700 000 028	AK44x3/4	700 000 030				
				1.5	1.12	1.73	1.29		HIGH	1670	2068	1VP56x7/8	700 000 060	AK46x3/4	700 000 029			AX26	410 430 111
									MED	1230	1703	1VP40x7/8	700 000 053	AK39x3/4	300 000 775			AX22	410 430 110
				2	1.49	2.30	1.72		HIGH	1670	2068	1VP56x7/8	700 000 060	AK46x3/4	700 000 029			AX26	410 430 111
EVT-28	SUPPLY	A12-6A	1.00	1.5	1.12	1.73	1.29	0.875	HIGH	1193	1591	1VL44x7/8	700 000 025	AK46x1	700 000 086	NA	NA	AX49	410 430 151
									MED	833	1250	1VP34x7/8	700 000 028	AK44x1	700 000 031			AX47	410 430 115
				2	1.49	2.30	1.72		HIGH	1193	1591	1VL44x7/8	700 000 025	AK46x1	700 000 086			AX49	410 430 151
									MED	1010	1346			AK54x1	700 000 111			AX50	410 430 152
				3	2.24	3.45	2.57	1.125	HIGH	1333	1750	1VP44x1-1/8	700 000 059	BK45x1	700 000 114			BX51	410 430 132
									MED	1111	1395			BK77x1	700 000 092			BX59	410 430 162
	EXHAUST	A12-9A	1.00	1	0.75	1.15	0.86	0.875	HIGH	795	1193	1VP34x7/8	700 000 028	AK46x1	700 000 086	NA	NA	AX25	410 430 092
				1.5	1.12	1.73	1.29		HIGH	1083	1500	1VP40x7/8	700 000 053	AK44x1	700 000 031			AX26	410 430 111
									MED	795	1193	1VP34x7/8	700 000 028	AK46x1	700 000 086			AX25	410 430 092
				2	1.49	2.30	1.72		HIGH	1083	1500	1VP40x7/8	700 000 053	AK44x1	700 000 031			AX26	410 430 111
EVT-36	SUPPLY	A12-9A	1.00	2	1.49	2.30	1.72	0.875	HIGH	1117	1489	1VL44x7/8	700 000 025	AK49x1	700 000 110	NA	NA	AX49	410 430 151
									MED	843	1167	1VP40x7/8	700 000 053	AK56x1	700 000 052			AX50	410 430 152
				3	2.24	3.45	2.57	1.125	HIGH	1333	1750	1VP44x1-1/8	700 000 100	BK45x1	700 000 114			BX50	410 430 159
									MED	1111	1395	1VP60x1-1/8	700 000 059	BK77x1	700 000 092			BX58	410 430 161
				5	3.73	5.75	4.29		HIGH	1422	1750	1VP65x1-1/8	700 000 102	BK67x1	700 000 115			BX57	410 430 160
	EXHAUST	A12-12A	1.188	1.5	1.12	1.73	1.29	0.875	HIGH	795	1193	1VP34x7/8	700 000 028	AK46x1-3/16	700 000 112	NA	NA	AX25	410 430 092
				2	1.49	2.30	1.72		HIGH	1034	1432	1VP40x7/8	700 000 053					AX26	410 430 111
				3	2.24	3.45	2.57	1.125	HIGH	1191	1564	1VP44x1-1/8	700 000 100	BK50x1-3/16	700 000 117			BX29	410 430 125
EVT-46	SUPPLY	A15-11A	1.188	2	1.49	2.30	1.72	0.875	HIGH	875	1212	1VP40x7/8	700 000 053	AK54x1-3/16	700 000 113	NA	NA	AX55	410 430 153
									MED	659	913			AK71H	700 000 128	H—1-3/16	700 000 097	AX58	410 430 154
				3	2.24	3.45	2.57	1.125	HIGH	1142	1434	1VP60x1-1/8	700 000 059	BK75H	700 000 130			BX63	410 430 081
									MED	924	1160			1B5V86	700 000 132	B—1-3/16	700 000 096	BX66	410 430 107
									LOW	778	957	1VP65x1-1/8	700 000 102	BK120x1-3/16	700 000 082	NA	NA	BX71	410 430 108
				5	3.73	5.75	4.29		HIGH	1142	1434	1VP60x1-1/8	700 000 059	BK75H	700 000 130	H—1-3/16	700 000 097	BX63	410 430 081
									MED	924	1160			1B5V86	700 000 132	B—1-3/16	700 000 096	BX66	410 430 107
	EXHAUST	A15-11A	1.188	2	1.49	2.30	1.72	0.875	HIGH	875	1212	1VP40x7/8	700 000 053	AK54x1-3/16	700 000 113	NA	NA	AX32	410 430 112
									MED	659	913			AK71H	700 000 128	H—1-3/16	700 000 097	AX35	410 430 106
				3	2.24	3.45	2.57	1.125	HIGH	1142	1434	1VP60x1-1/8	700 000 059	BK75H	700 000 130			BX38	410 430 126
									MED	924	1160			1B5V86	700 000 132	B—1-3/16	700 000 096	BX40	410 430 127
									LOW	778	957	1VP65x1-1/8	700 000 102	BK120x1-3/16	700 000 082	NA	NA	BX46	410 430 129
				5	3.73	5.75	4.29		HIGH	1142	1434	1VP60x1-1/8	700 000 059	BK75H	700 000 130	H—1-3/16	700 000 097	BX38	410 430 126
									MED	924	1160			1B5V86	700 000 132	B—1-3/16	700 000 096	BX40	410 430 127
EVT-62	SUPPLY	A15-11A	1.188	3	2.24	3.45	2.57	1.125	HIGH	1111	1395	1VP60x1-1/8	700 000 059	BK77H	700 000 131	H—1-3/16	700 000 097	BX63	410 430 081
									MED	894	1122			BK95H	700 000 093			BX66	410 430 107
									LOW	723	913	1VP50x1-1/8	700 000 056					BX65	410 430 138
				5	3.73	5.75	4.29		HIGH	1111	1395	1VP60x1-1/8	700 000 059	BK77H	700 000 131			BX63	410 430 081
									MED	894	1122			BK95H	700 000 093			BX66	410 430 107
				7.5	5.59	8.63	6.43	1.375	HIGH	1158	1454	2VP60x1-3/8	700 000 095	2B5V68	700 000 107	B—1-3/16	700 000 096	BX64	410 430 082
	EXHAUST	A18-13A	1.188	2	1.49	2.30	1.72	0.875	HIGH	591	818	1VP40x7/8	700 000 053	AK79H	700 000 129	H—1-3/16	700 000 097	AX45	410 430 070
				3	2.24	3.45	2.57	1.125	HIGH	778	957	1VP65x1-1/8	700 000 102	BK120x1-3/16	700 000 082	NA	NA	BX53	410 430 134
									MED	648	813	1VP60x1-1/8	700 000 059	BK130x1-3/16	700 000 121			BX54	410 430 135
				5	3.73	5.75	4.29		HIGH	945	1187			BK90x1-3/16	700 000 083			BX47	410 430 130
									MED	778	957	1VP65x1-1/8	700 000 102	BK120x1-3/16	700 000 082			BX53	410 430 134

CHART 3 - DRIVE COMPONENT PART NUMBERS

UNIT MODEL NO.	BLOWER			MOTOR				DRIVE COMPONENTS									
									RPM RANGE		ADJUSTABLE PULLEY		FIXED PULLEY		BUSHING		BELT	
	LOC.	MODEL	SHAFT DIA.	NOMINAL HP	MAX USABLE2 HP	MAX USABLE2 KW	SHAFT DIA.	SPEED	MIN	MAX	SUPPLIER PART NO.	RRS PART NO.	SUPPLIER PART NO.	RRS PART NO.	SUPPLIER PART NO.	RRS PART NO.	SUPPLIER PART NO.	RRS PART NO.
EVT-74	SUPPLY	A18-13A	1.188	3	3.45	2.57	1.125	HIGH	648	813	1VP60x1-1/8	700 000 059	BK130x1-3/16	700 000 121	NA	NA	BX77	410 430 164
				5	5.75	4.29		HIGH	938	1155	1VP65x1-1/8	700 000 102	BK100x1-3/16	700 000 119			BX73	410 430 163
								MED	778	957			BK120x1-3/16	700 000 082			BX76	410 430 176
								LOW	648	813	1VP60x1-1/8	700 000 059	BK130x1-3/16	700 000 121			BX77	410 430 164
				7.5	8.63	6.43	1.375	HIGH	1046	1263	2VP71x1-3/8	700 000 105	2BK100x1-3/16	700 000 126			BX74	410 430 140
								MED	924	1160	2VP60x1-3/8	700 000 095	2B5V86	700 000 094	B—1-3/16	700 000 096	BX71	410 430 108
	EXHAUST	A18-18A	1.438	3	3.45	2.57	1.125	HIGH	648	813	1VP60x1-1/8	700 000 059	BK130x1-7/16	700 000 124	NA	NA	BX54	410 430 135
				5	5.75	4.29		HIGH	850	1047	1VP65x1-1/8	700 000 102	BK110x1-7/16	700 000 122			BX51	410 430 132
								MED	703	882	1VP60x1-1/8	700 000 059	BK120x1-7/16	700 000 123			BX52	410 430 133
				7.5	8.63	6.43	1.375	HIGH	1046	1263	2VP71x1-3/8	700 000 105	2BK100x1-7/16	700 000 127			BX47	410 430 130
								MED	924	1160	2VP60x1-3/8	700 000 095	2B5V86	700 000 094	B—1-7/16	700 000 101	BX45	410 430 128
EVT-88	SUPPLY	A18-13A	1.188	5	5.75	4.29	1.125	HIGH	805	991	1VP65x1-1/8	700 000 102	1B5V110	700 000 133	B—1-3/16	700 000 096	BX75	410 430 141
								MED	648	813	1VP60x1-1/8	700 000 059	BK130x1-3/16	700 000 121	NA	NA	BX76	410 430 142
				7.5	8.63	6.43	1.375	HIGH	1046	1263	2VP71x1-3/8	700 000 105	2BK100x1-3/16	700 000 126			BX75	410 430 141
								MED	924	1160	2VP60x1-3/8	700 000 095	2B5V86	700 000 094	B—1-3/16	700 000 096	BX72	410 430 139
								LOW	789	932	2VP71x1-3/8	700 000 105	2AK124x1-3/16	700 000 125	NA	NA	AX79	410 430 155
				10	11.50	8.58		HIGH	1046	1263	2VP71x1-3/8	700 000 105	2BK100x1-3/16	700 000 126			BX74	410 430 140
	EXHAUST	A18-18A	1.438	5	5.75	4.29	1.125	HIGH	805	991	1VP65x1-1/8	700 000 102	1B5V110	700 000 133	B—1-7/16	700 000 101	BX52	410 430 133
								MED	648	813	1VP60x1-1/8	700 000 059	BK130x1-7/16	700 000 124	NA	NA	BX54	410 430 135
				7.5	8.63	6.43	1.375	HIGH	1046	1263	2VP71x1-3/8	700 000 105	2BK100x1-7/16	700 000 127			BX47	410 430 130
								MED	924	1160	2VP60x1-3/8	700 000 095	2B5V86	700 000 094	B—1-7/16	700 000 101	BX45	410 430 128
								LOW	789	932	2VP71x1-3/8	700 000 105	2AK124x1-7/16	700 000 125	NA	NA	AX52	410 430 116
				10	11.50	8.58		HIGH	1046	1263	2VP71x1-3/8	700 000 105	2BK100x1-7/16	700 000 127			BX47	410 430 130
EVT-10	SUPPLY	TWIN A20-9H	1.438	5	3.45	2.57	1.125	HIGH	648	813	1VP60x1-1/8	700 000 059	1B5V124	700 000 134	B—1-7/16	700 000 101	BX88	410 430 165
								MED	558	687	1VP65x1-1/8	700 000 102	1B5V160	700 000 136			BX95	410 430 169
				7.5	3.45	2.57	1.375	HIGH	837	1027	2VP60x1-3/8	700 000 095	2B5V94	700 000 109			AX85	410 430 156
								MED	703	846	2VP65x1-3/8	700 000 104	2B5V124	700 000 118			AX90	410 430 157
				10	11.50	8.58		HIGH	866	1087	2VP62x1-3/8	700 000 103	2B5V94	700 000 109			5VX880	410 430 170
	EXHAUST	A20-20H	1.688	3	3.45	2.57	1.125	HIGH	484	599	1VP56x1-1/8	700 000 044	1B5V154	700 000 135	B—1-11/16	700 000 137	AX69	410 430 120
				5	5.75	4.29		HIGH	648	813	1VP60x1-1/8	700 000 059	1B5V124	700 000 134			BX64	410 430 082
								MED	558	687	1VP65x1-1/8	700 000 102	1B5V160	700 000 136			BX71	410 430 108
				7.5	8.63	6.43	1.375	HIGH	717	882	2VP65x1-3/8	700 000 104	2B5V124	700 000 118			BX64	410 430 082
EVT-12	SUPPLY	TWIN A20-9H	1.438	7.5	8.63	6.43	1.375	HIGH	805	991	2VP65x1-3/8	700 000 104	2B5V110	700 000 116		700 000 101	BX89	410 430 166
								MED	703	846			2B5V124	700 000 118			BX90	410 430 088
								LOW	575	705	2VP60x1-3/8	700 000 095	2B5V136	700 000 120			AX92	410 430 158
				10	11.50	8.58		HIGH	866	1087	2VP62x1-3/8	700 000 103	2B5V94	700 000 109			5VX880	410 430 170
								MED	717	882	2VP65x1-3/8	700 000 104	2B5V124	700 000 118			BX91	410 430 168
				15	17.25	12.86	1.625	HIGH	914	1104	2VP71x1-5/8	700 000 085	2B5V110	700 000 116			5VX950	410 430 171
	EXHAUST	A20-20H	1.688	5	5.75	4.29	1.125	HIGH	565	753	2VP42x1-1/8	700 000 106	2B5V90	700 000 108	B—1-11/16	700 000 137	BX55	410 430 136
				7.5	8.63	6.43	1.375	HIGH	717	882	2VP65x1-3/8	700 000 104	2B5V124	700 000 118			BX64	410 430 082
								MED	631	775	2VP60x1-3/8	700 000 095					AX62	410 430 119
				10	11.50	8.58		HIGH	866	1087	2VP62x1-3/8	700 000 103	2B5V94	700 000 109			5VX610	410 430 172
								MED	717	882	2VP65x1-3/8	700 000 104	2B5V124	700 000 118			BX64	410 430 082

Notes:

1. Using total air VOLUME and system static pressure requirement determine rpm and motor output required from blower performance tables.
2. Maximum usable output of motors furnished by Ruskin is for the U.S. only. In Canada, nominal motor output is also maximum usable motor output. If motors of comparable output are used, be sure to keep within the service factor limitations on motor nameplate.
3. Factory will set selected drive at mid-range rpm.

CHART 3 (CONT'D) - DRIVE COMPONENT PART NUMBERS

UNIT	AIR VOLUME (cfm)		INPUT	OUTPUT @ 81% EFF			MANIFOLD PRESSURE		NATURAL GAS
				ALL	2-STAGE	MODULATING			
	Min.	Max.	HIGH FIRE (Btuh)	HIGH FIRE[1] (Btuh)	LOW FIRE[2] (Btuh)	LOW FIRE[3] (Btuh)	HIGH FIRE	LOW FIRE	ORIFICE SIZE
EVT-09	300	1,000	40,000	32,400	17,800	NA	3.5	1.1	51
EVT-19	600	1,900	80,000	64,800	35,600				
EVT-28	900	2,800	112,500	91,100	50,100				46
EVT-36	1,200	3,600	150,000	121,500	66,800	12,200			
EVT-46	1,500	4,600	200,000	162,000	89,100	16,200			42
EVT-62	1,900	6,200	250,000	202,500	111,400	20,300			
EVT-74	2,200	7,400	300,000	243,000	133,700	24,300			34
EVT-88	2,600	8,800	350,000	283,500	155,900	28,400			
EVT-10	3,000	10,000	400,000	324,000	178,200	32,400			3.3mm
EVT-12	3,700	12,000	500,000	405,000	263,300	40,500	3.7	1.6	

1. High Fire (Stage 2) output is at the guaranteed minimum of 81% efficiency.
2. Low Fire (Stage 1) output is 55% of High Fire output except for EVT-12, which is 65%.
3. Low Fire (Modulating) output is 20% of one half the High Fire output.

CHART 4 - GAS POST-HEAT DATA

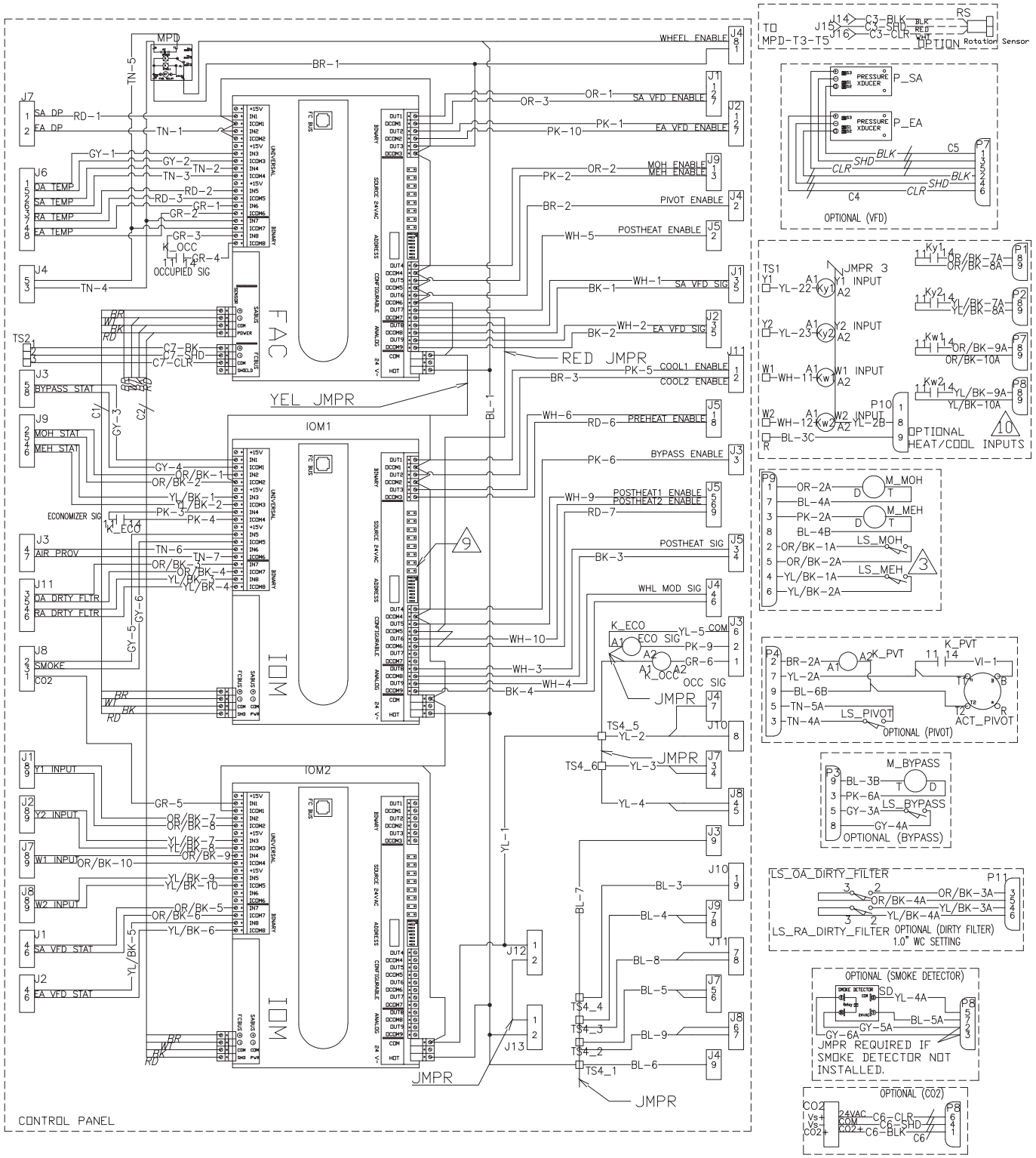
GAS HEAT PERFORMANCE DATA														
MODEL	INPUT	OUTPUT[1]	Temperature Rise (TR, deg F)											
			20	25	30	35	40	45	50	55	60	65	70	75	80
	(Btuh)		CFM												
EVT-09	40,000	32,400	1,500	1,200	1,000	860	750	670	600	550	500	470	430	400	380
EVT-19	80,000	64,800	3,000	2,400	2,000	1,720	1,500	1,340	1,200	1,100	1,000	930	860	800	750
EVT-28	112,500	91,100	4,220	3,380	2,820	2,420	2,110	1,880	1,690	1,540	1,410	1,300	1,210	1,130	1,060
EVT-36[2]	150,000	121,500	5,630	4,500	3,750	3,220	2,820	2,500	2,250	2,050	1,880	1,740	1,610	1,500	1,410
EVT-46[2]	200,000	162,000	7,500	6,000	5,000	4,290	3,750	3,340	3,000	2,730	2,500	2,310	2,150	2,000	1,880
EVT-62[2]	250,000	202,500	9,380	7,500	6,250	5,360	4,690	4,170	3,750	3,410	3,130	2,890	2,680	2,500	2,350
EVT-74[2]	300,000	243,000	11,250	9,000	7,500	6,430	5,625	5,000	4,500	4,100	3,750	3,460	3,210	3,000	2,800
EVT-88[2]	350,000	283,500	13,130	10,500	8,750	7,500	6,570	5,840	5,250	4,780	4,380	4,040	3,750	3,500	3,290
EVT-10[2]	400,000	324,000	15,000	12,000	10,000	8,580	7,500	6,670	6,000	5,460	5,000	4,620	4,290	4,000	3,750
EVT-12[3]	500,000	405,000	18,750	15,000	12,500	10,720	9,380	8,340	7,500	6,820	6,250	5,770	5,360	5,000	4,690

1. Listed Output is at the guaranteed minimum efficiency of 81%
2. Stainless Steel Heat Exchanger is Standard for Modulating Gas Heat Options Only.
3. Stainless Steel Heat Exchanger is Standard for all Gas Heat Options.

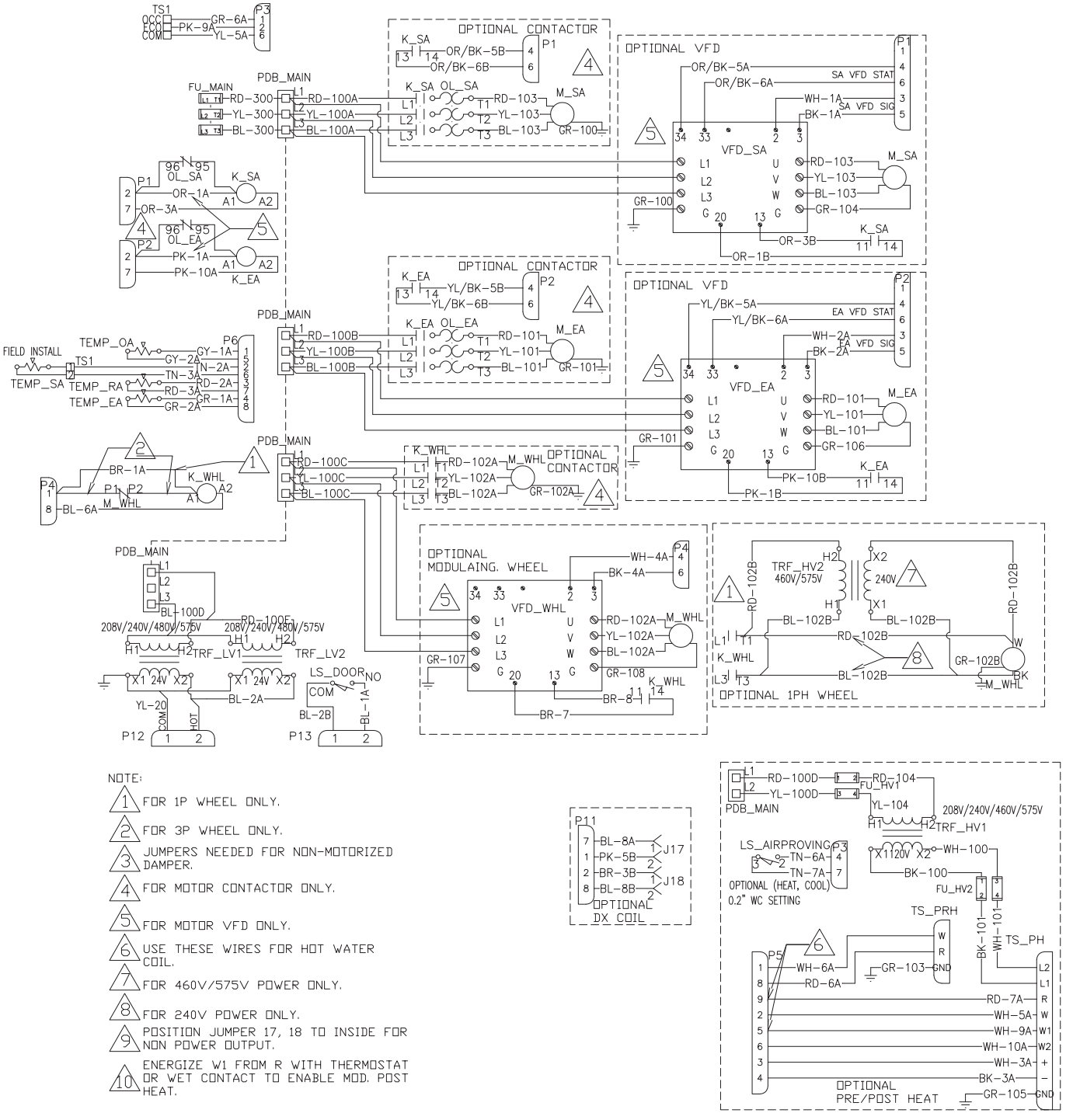
Note:
Ratings shown are for elevations up to 2000 ft. For higher elevations see Table 9 or reduce input by 4% per 1000 ft of additional altitude. In Canada, the input must be derated 10% for applications 2000 to 4500 ft in elevation.

CHART 5 - GAS HEAT PERFORMANCE (CFM VS TR)

UNIT WIRING DIAGRAM



UNIT WIRING DIAGRAM - CONTINUED

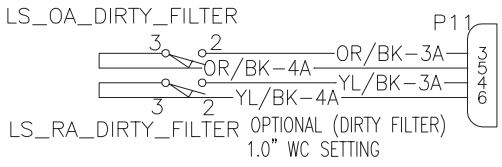


NOTE:

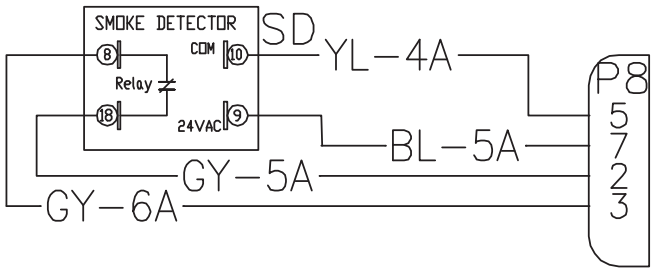
1. FOR 1P WHEEL ONLY.
2. FOR 3P WHEEL ONLY.
3. JUMPERS NEEDED FOR NON-MOTORIZED DAMPER.
4. FOR MOTOR CONTACTOR ONLY.
5. FOR MOTOR VFD ONLY.
6. USE THESE WIRES FOR HOT WATER COIL.
7. FOR 460V/575V POWER ONLY.
8. FOR 240V POWER ONLY.
9. POSITION JUMPER 17, 18 TO INSIDE FOR NON POWER OUTPUT.
10. ENERGIZE W1 FROM R WITH THERMOSTAT OR WET CONTACT TO ENABLE MOD. POST HEAT.

XIX- FACTORY INSTALLED OPTIONS WIRING DIAGRAMS

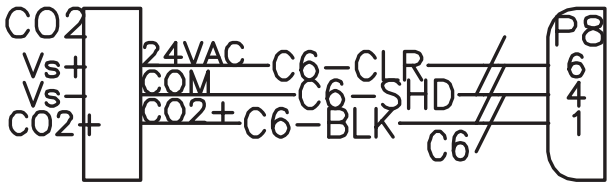
Optional Dirty Filter



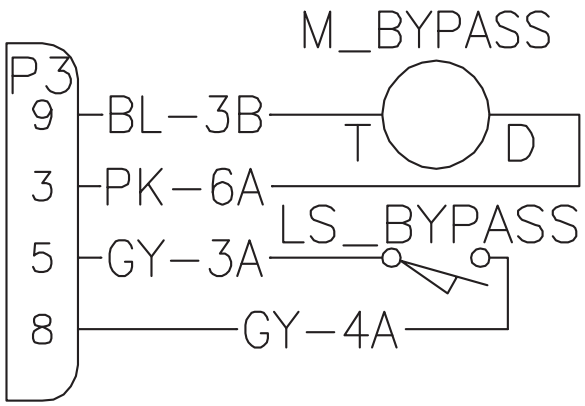
Optional Smoke Detector



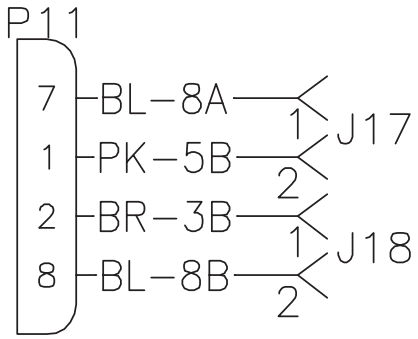
Optional CO_2 Sensor



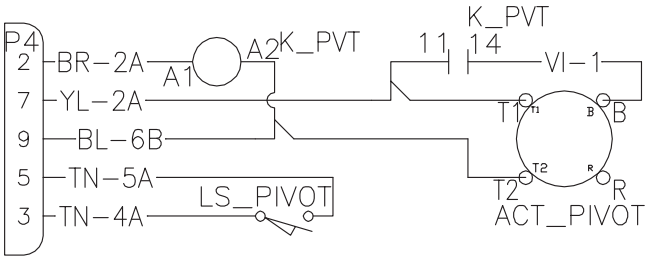
Optional Bypass



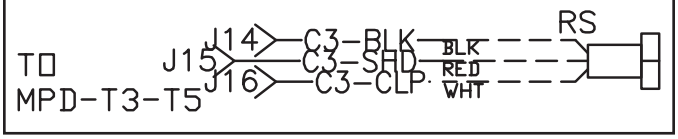
Optional DX Coil



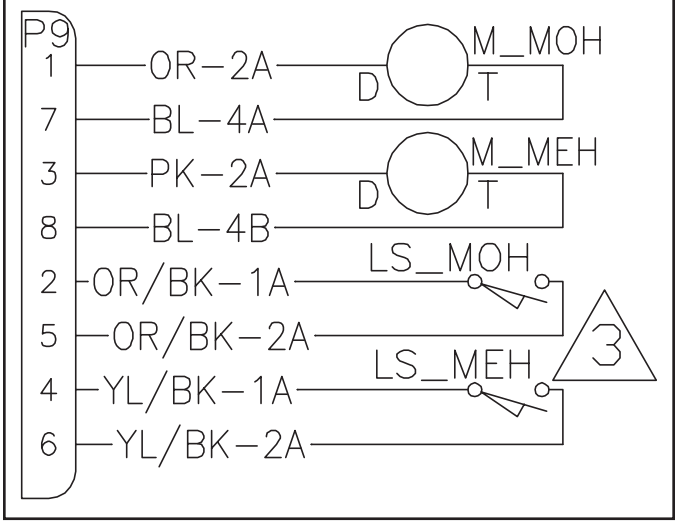
Optional Pivot



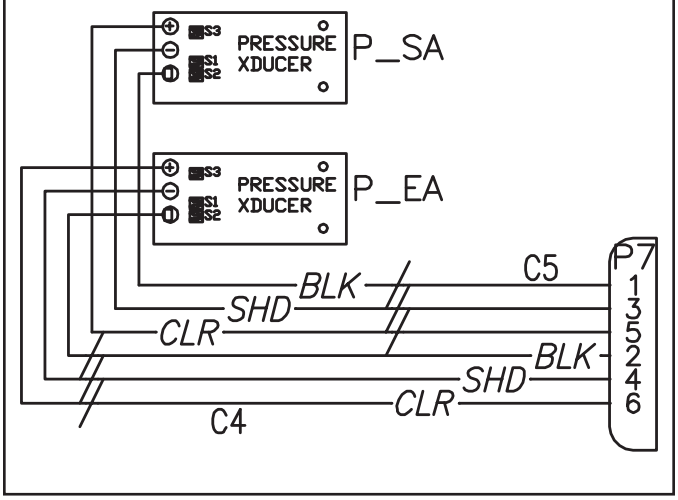
Optional Rotation Sensor



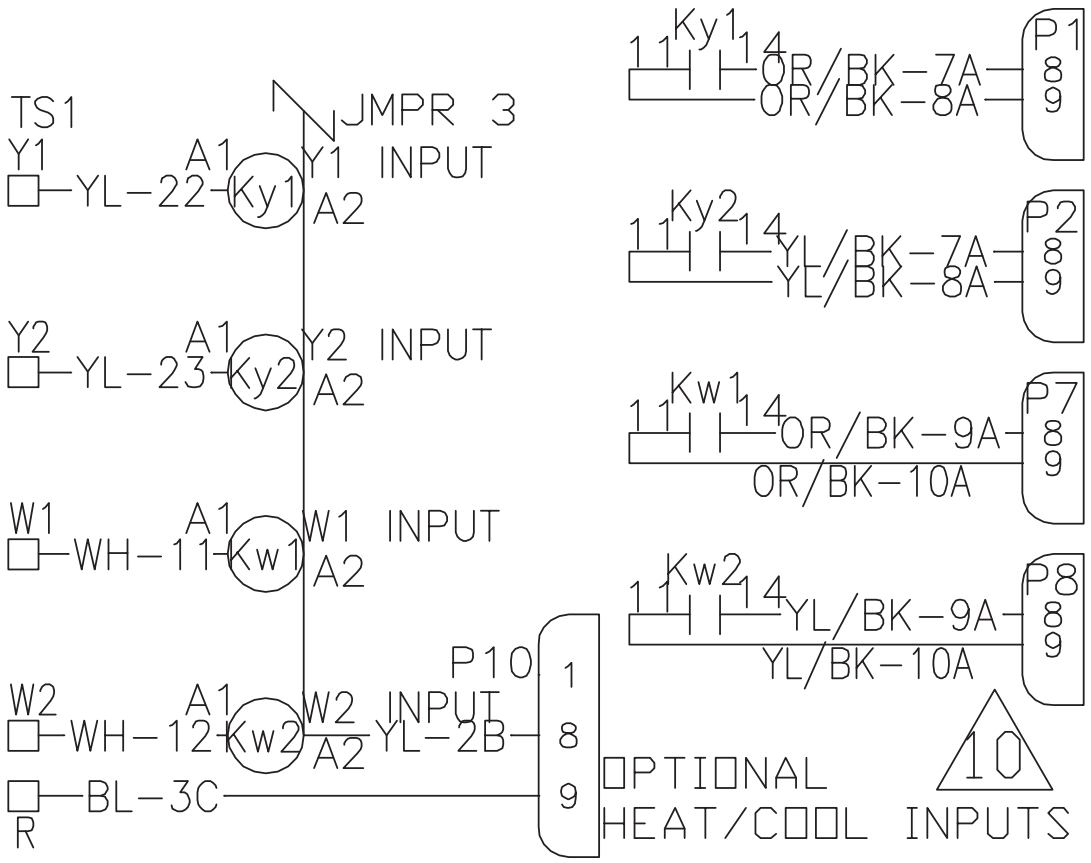
Optional MOH / MEH



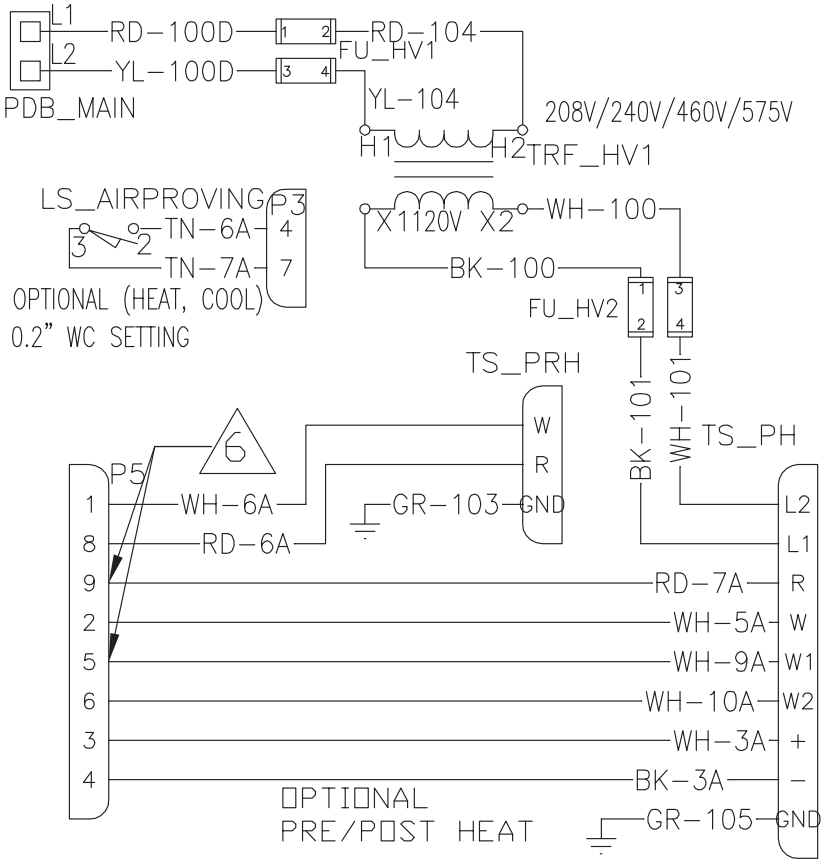
Optional VFD



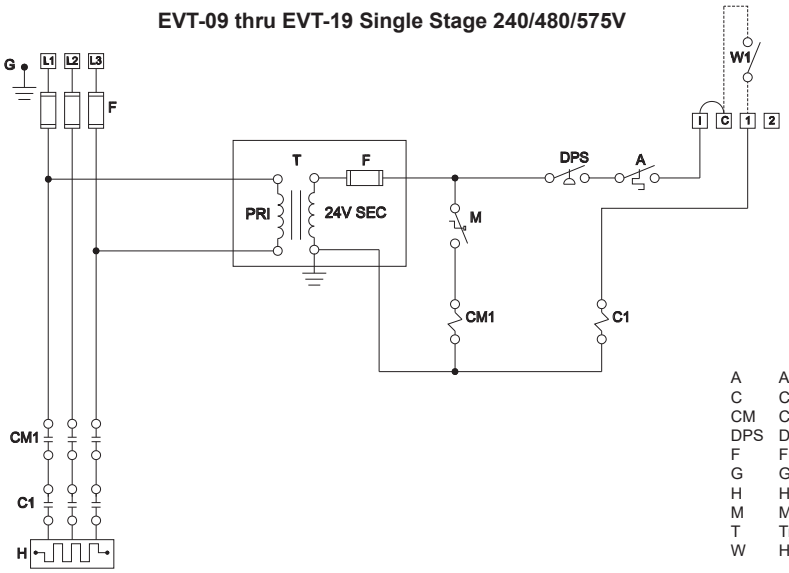
Optional Heat / Cool Inputs



Optional Pre/Post Heat



EVT-09 thru EVT-19 Single Stage 240/480/575V

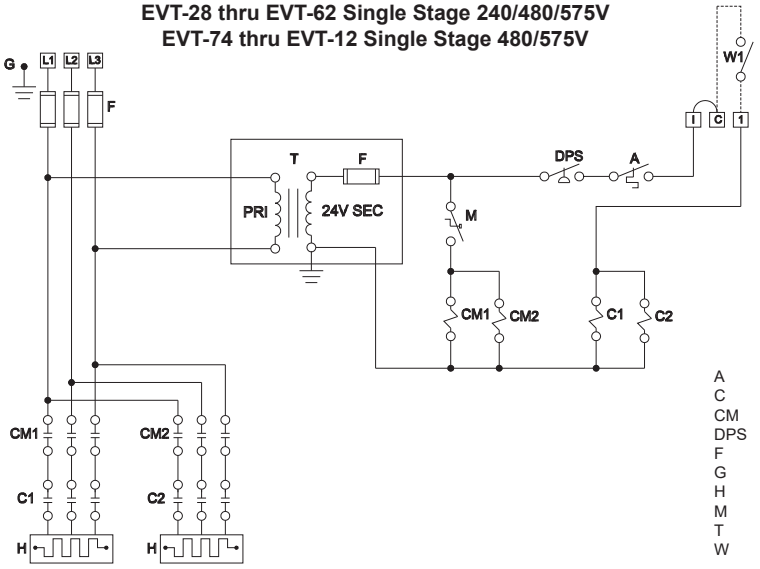


Legend

A	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
W	Heating Demand, Thermostat

DIAGRAM 1 - ELECTRIC POST-HEAT

EVT-28 thru EVT-62 Single Stage 240/480/575V
EVT-74 thru EVT-12 Single Stage 480/575V

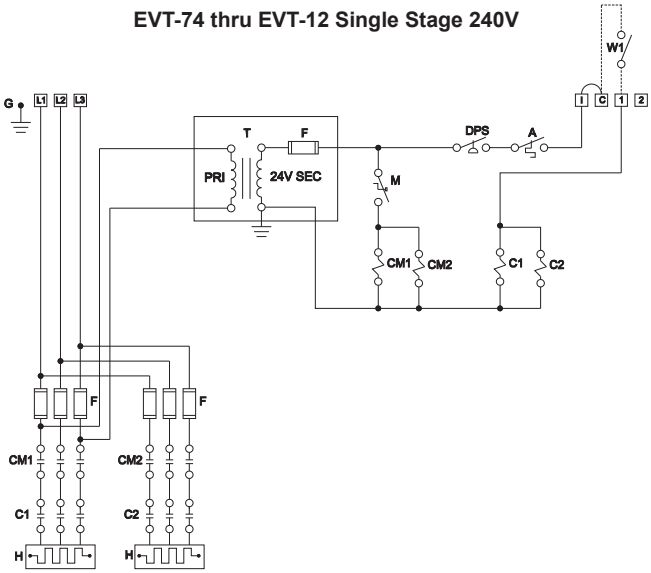


Legend

A	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
W	Heating Demand, Thermostat

DIAGRAM 2 - ELECTRIC POST-HEAT

EVT-74 thru EVT-12 Single Stage 240V

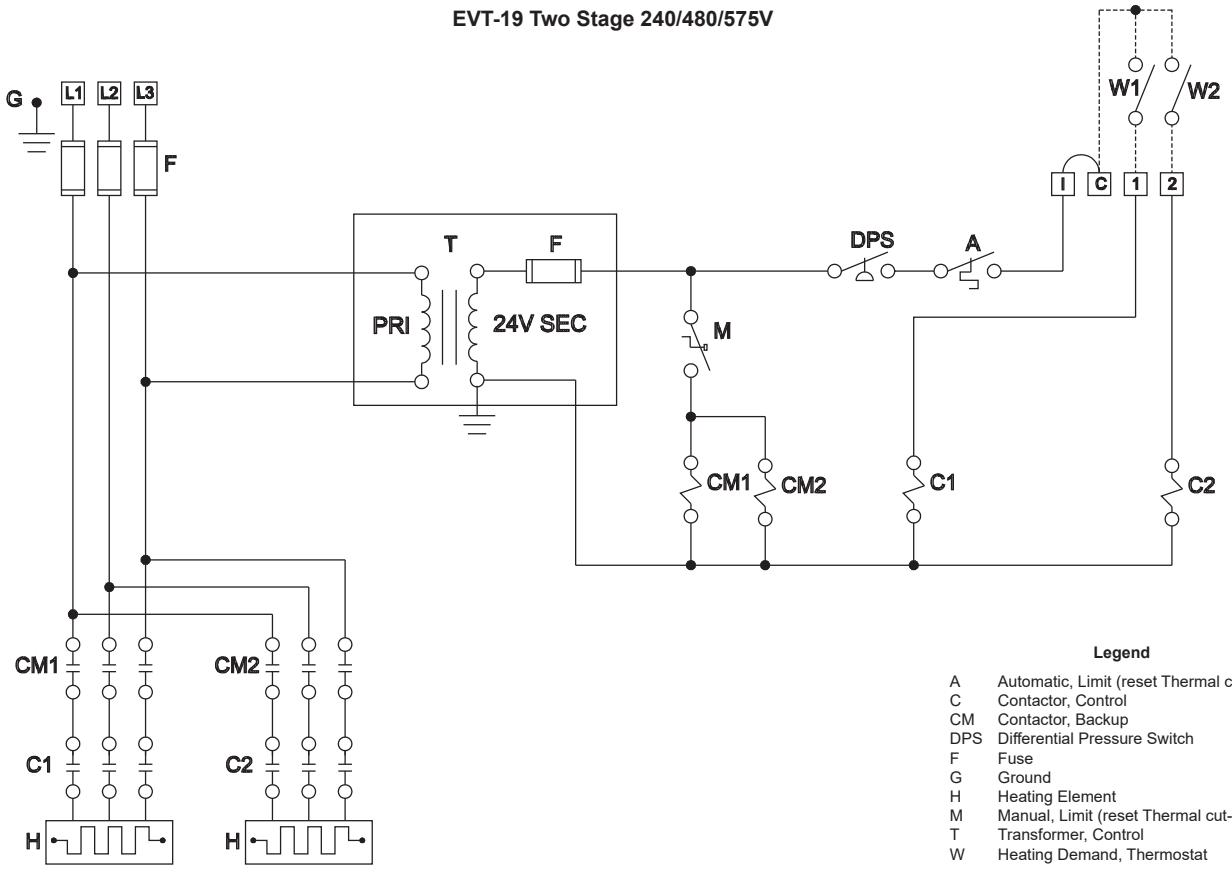


Legend

A	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
W	Heating Demand, Thermostat

DIAGRAM 3 - ELECTRIC POST-HEAT

EVT-19 Two Stage 240/480/575V

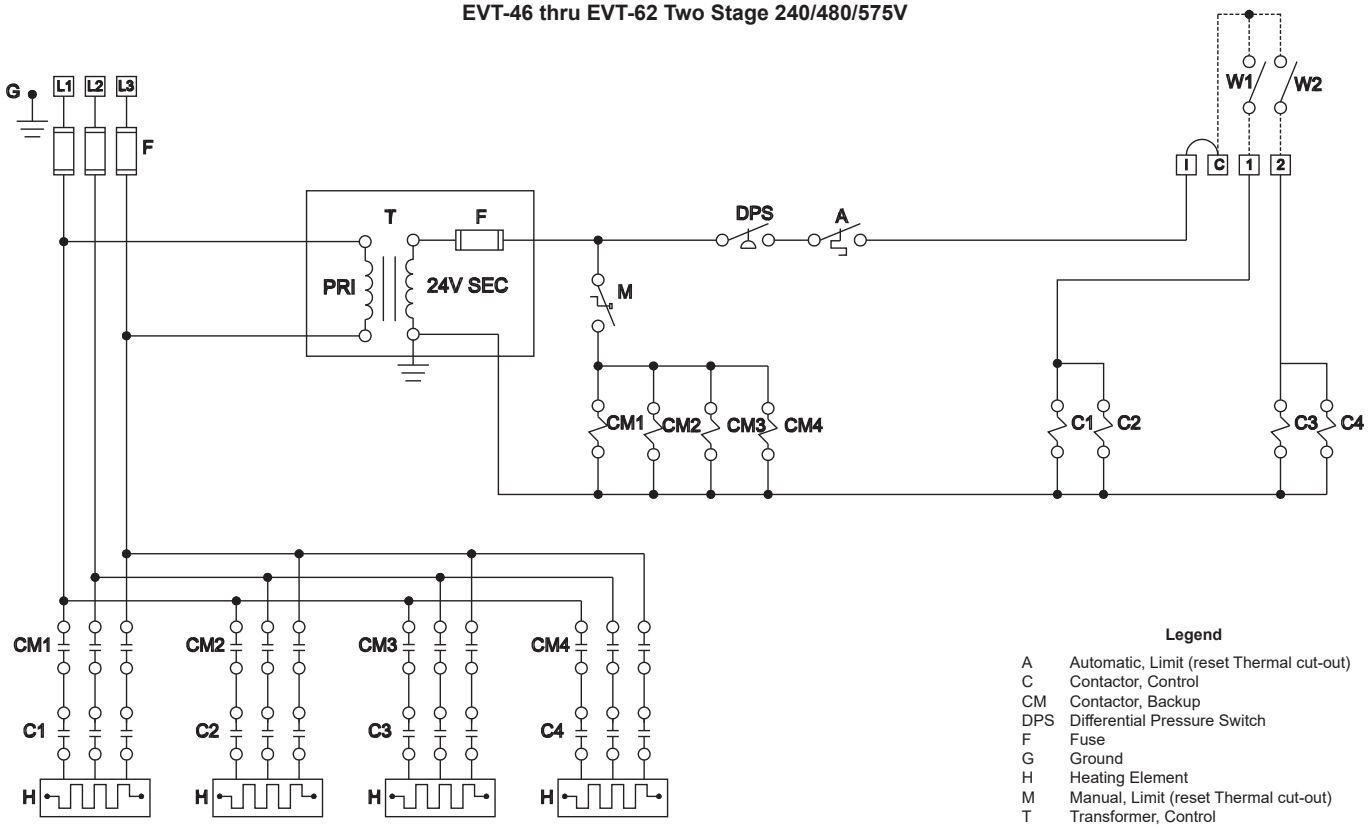


Legend

A	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
W	Heating Demand, Thermostat

DIAGRAM 4 - ELECTRIC POST-HEAT

EVT-36 Two Stage 480/575V
EVT-46 thru EVT-62 Two Stage 240/480/575V

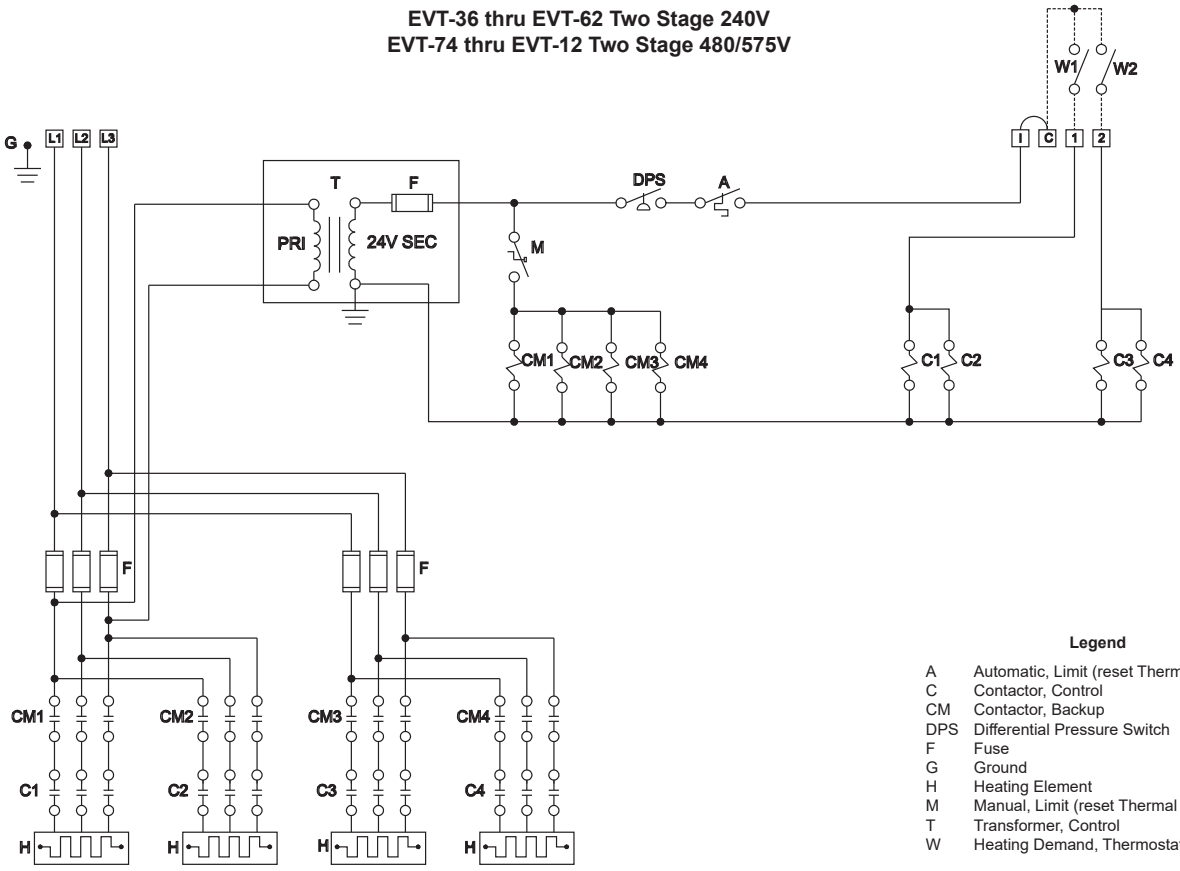


Legend

A	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
W	Heating Demand, Thermostat

DIAGRAM 5 - ELECTRIC POST-HEAT

EVT-36 thru EVT-62 Two Stage 240V
EVT-74 thru EVT-12 Two Stage 480/575V

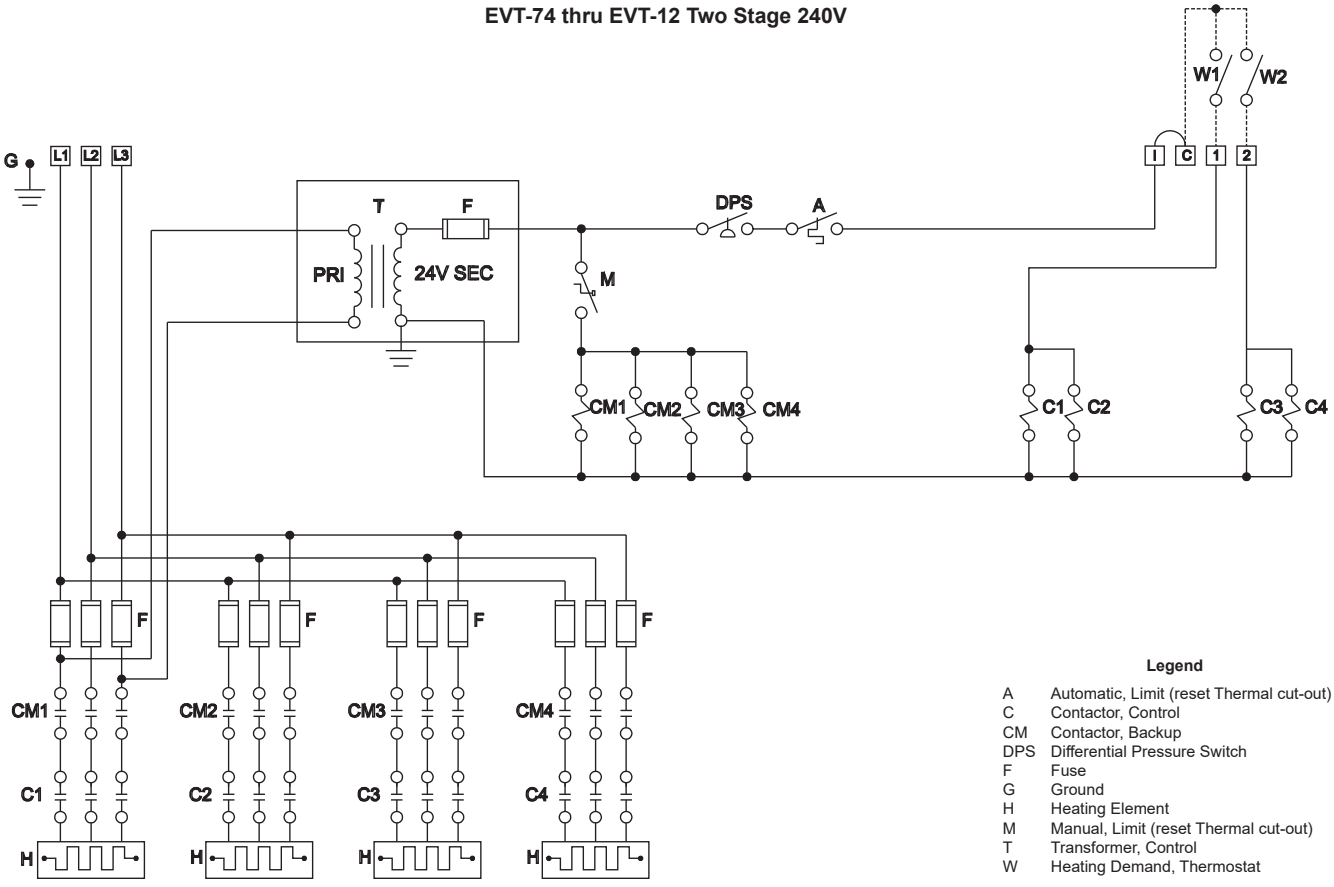


Legend

A	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
W	Heating Demand, Thermostat

DIAGRAM 6 - ELECTRIC POST-HEAT

EVT-74 thru EVT-12 Two Stage 240V



Legend

A	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
W	Heating Demand, Thermostat

DIAGRAM 7 - ELECTRIC POST-HEAT

EVT-62 Three Stage 240V
EVT-88 thru EVT-12 Three Stage 480/575V

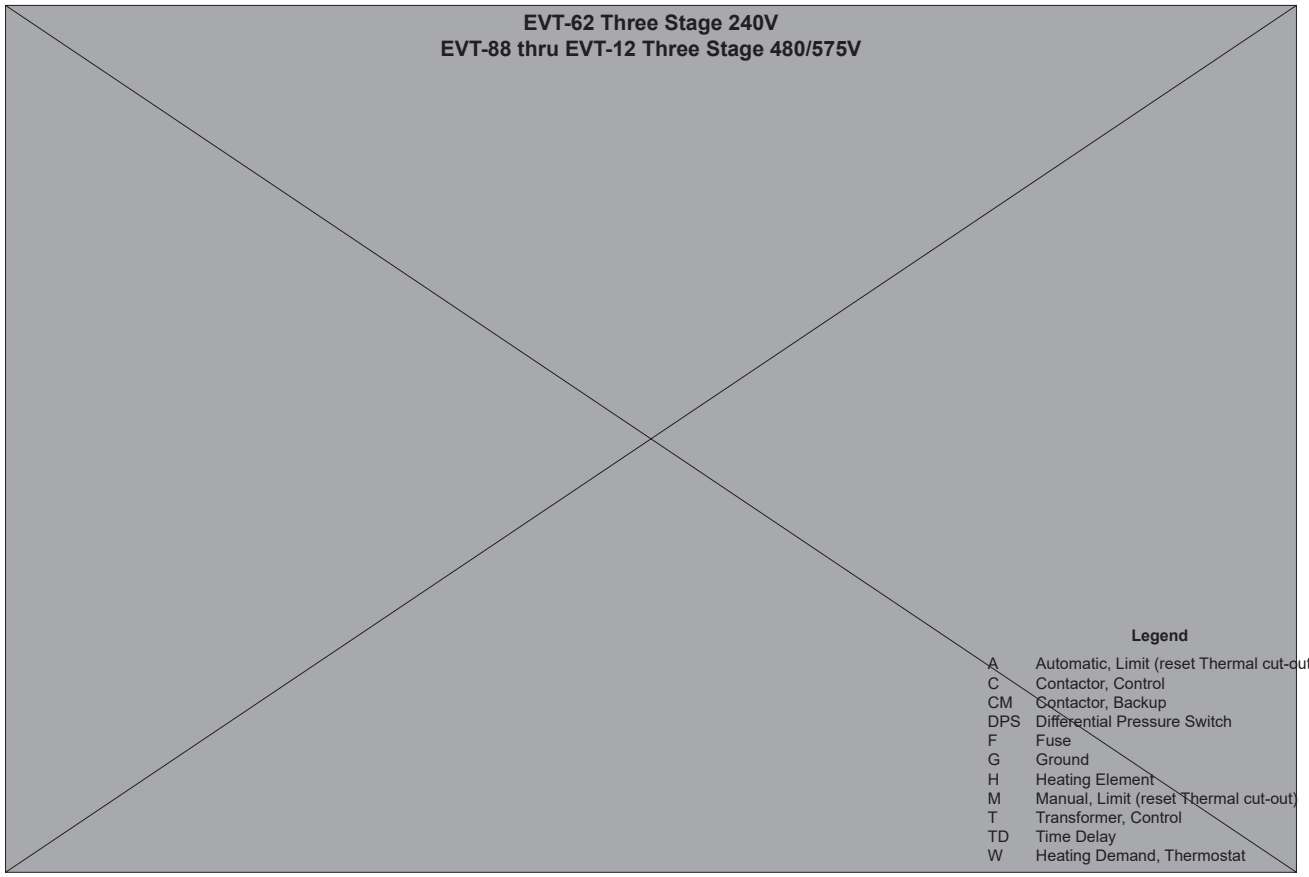


DIAGRAM 8 - ELECTRIC POST-HEAT

EVT-62 Three Stage 480V

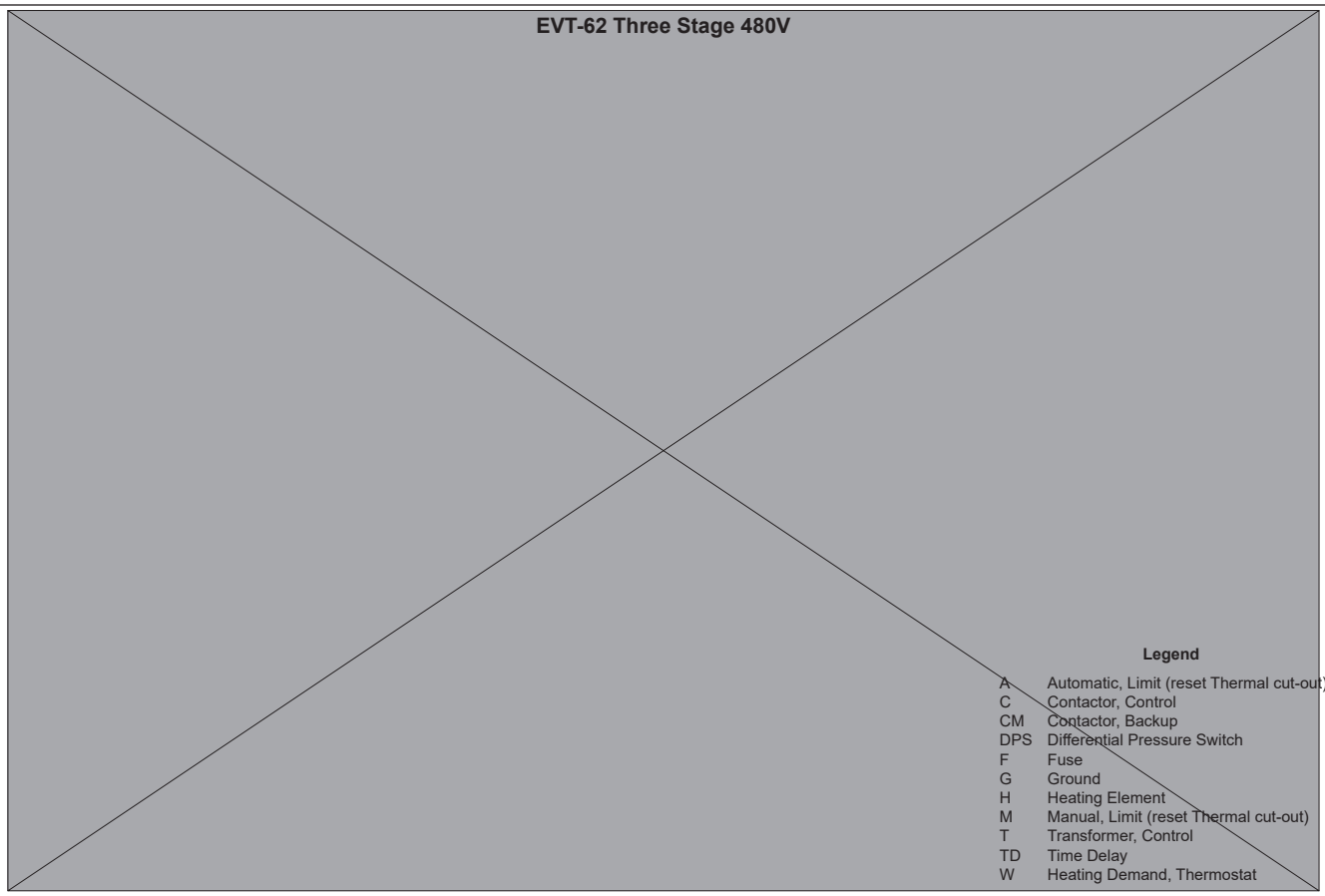
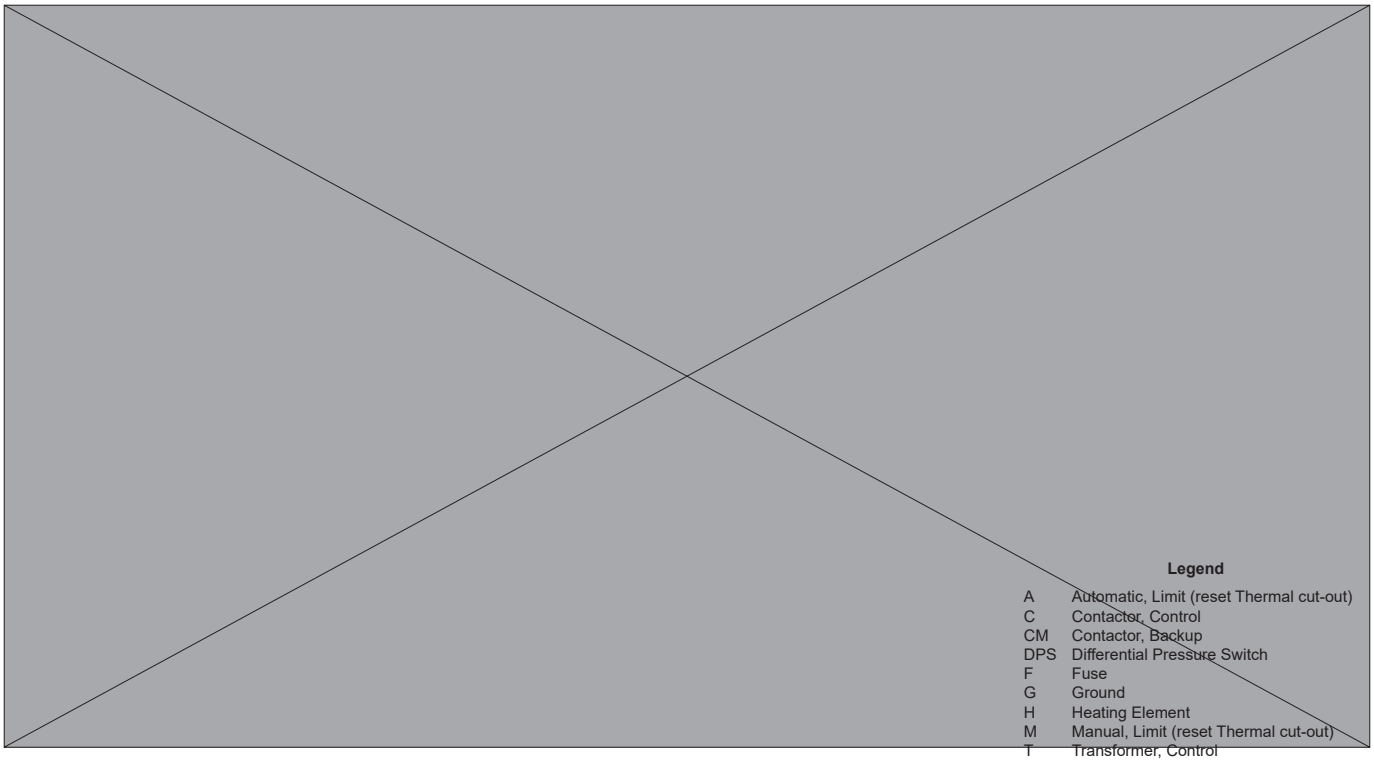


DIAGRAM 9 - ELECTRIC POST-HEAT

EVT-62 Three Stage 575V

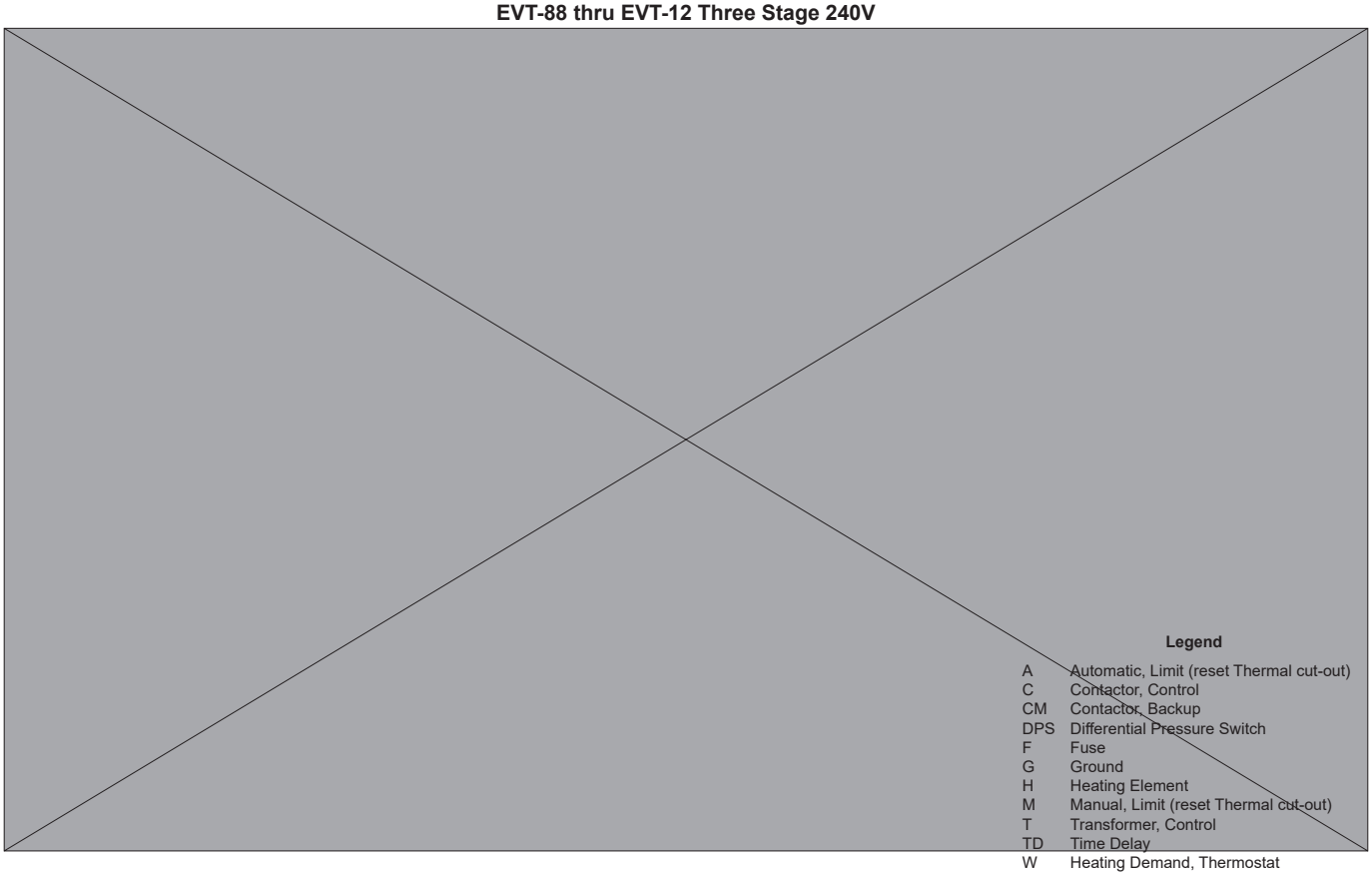


Legend

A	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
TD	Time Delay
W	Heating Demand, Thermostat

DIAGRAM 10 - ELECTRIC POST-HEAT

EVT-88 thru EVT-12 Three Stage 240V



Legend

A	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
TD	Time Delay
W	Heating Demand, Thermostat

DIAGRAM 11 - ELECTRIC POST-HEAT

Legend

A	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
TD	Time Delay
W	Heating Demand, Thermostat

EVT-12 Four Stage 480/575V

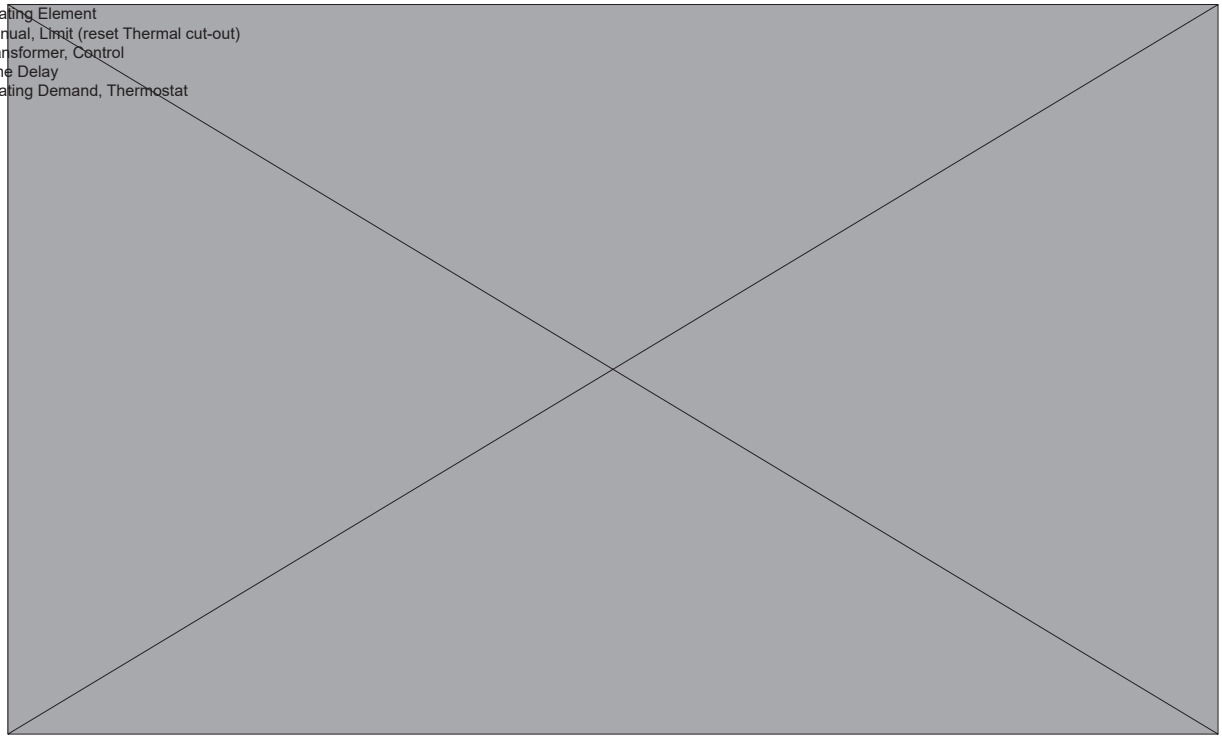


DIAGRAM 12 - ELECTRIC POST-HEAT

Legend

AA	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
T	Transformer, Control
TD	Time Delay
W	Heating Demand, Thermostat

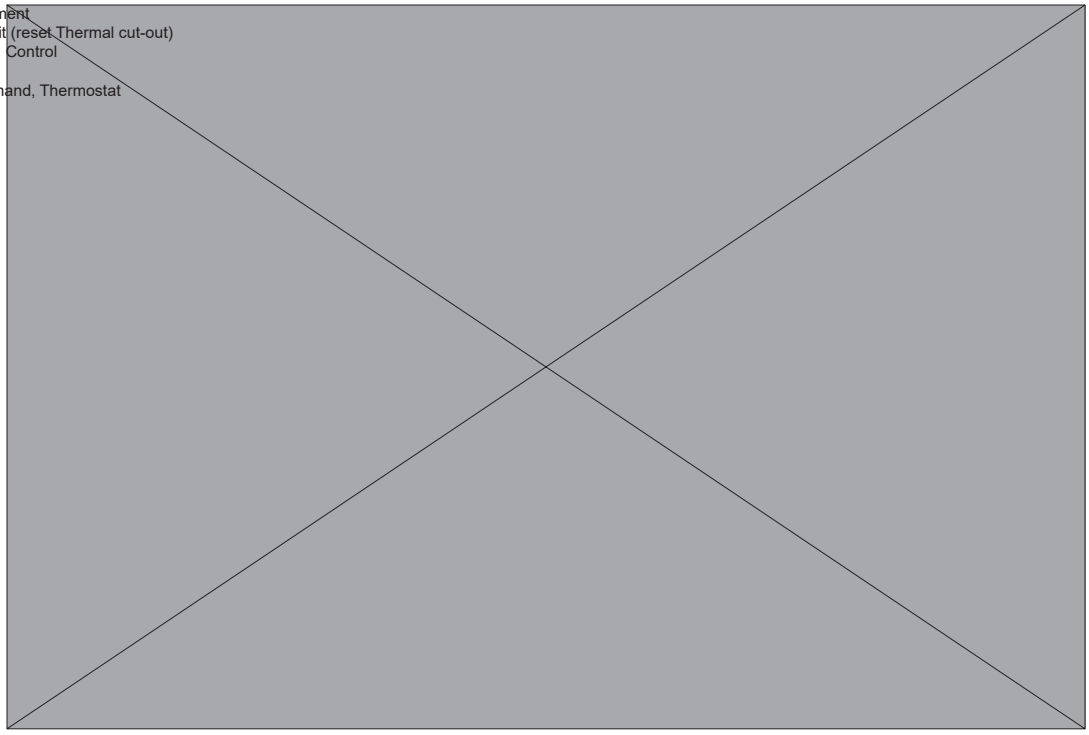


DIAGRAM 13 - ELECTRIC POST-HEAT

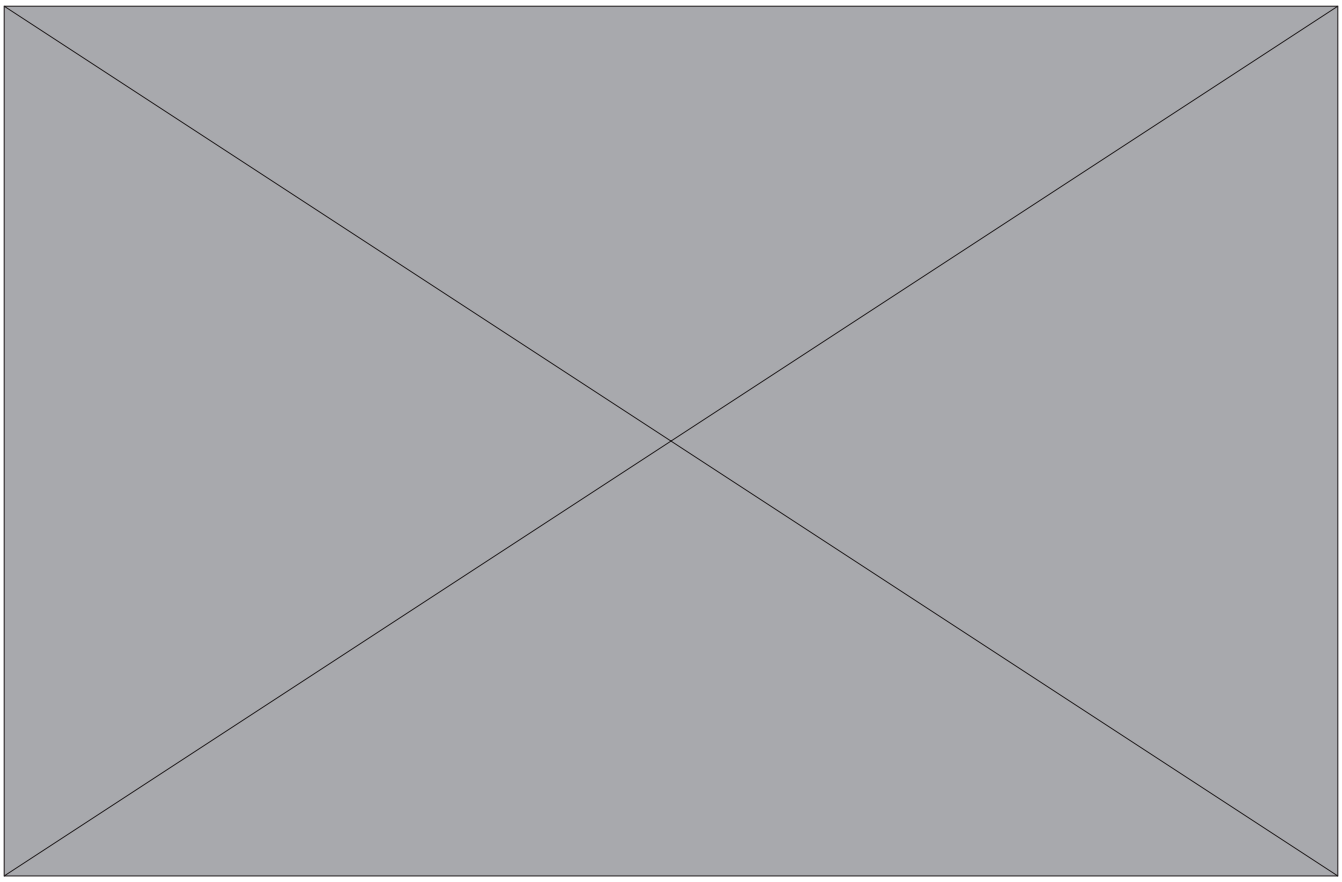


DIAGRAM 14 - 2-STAGE GAS POST-HEAT

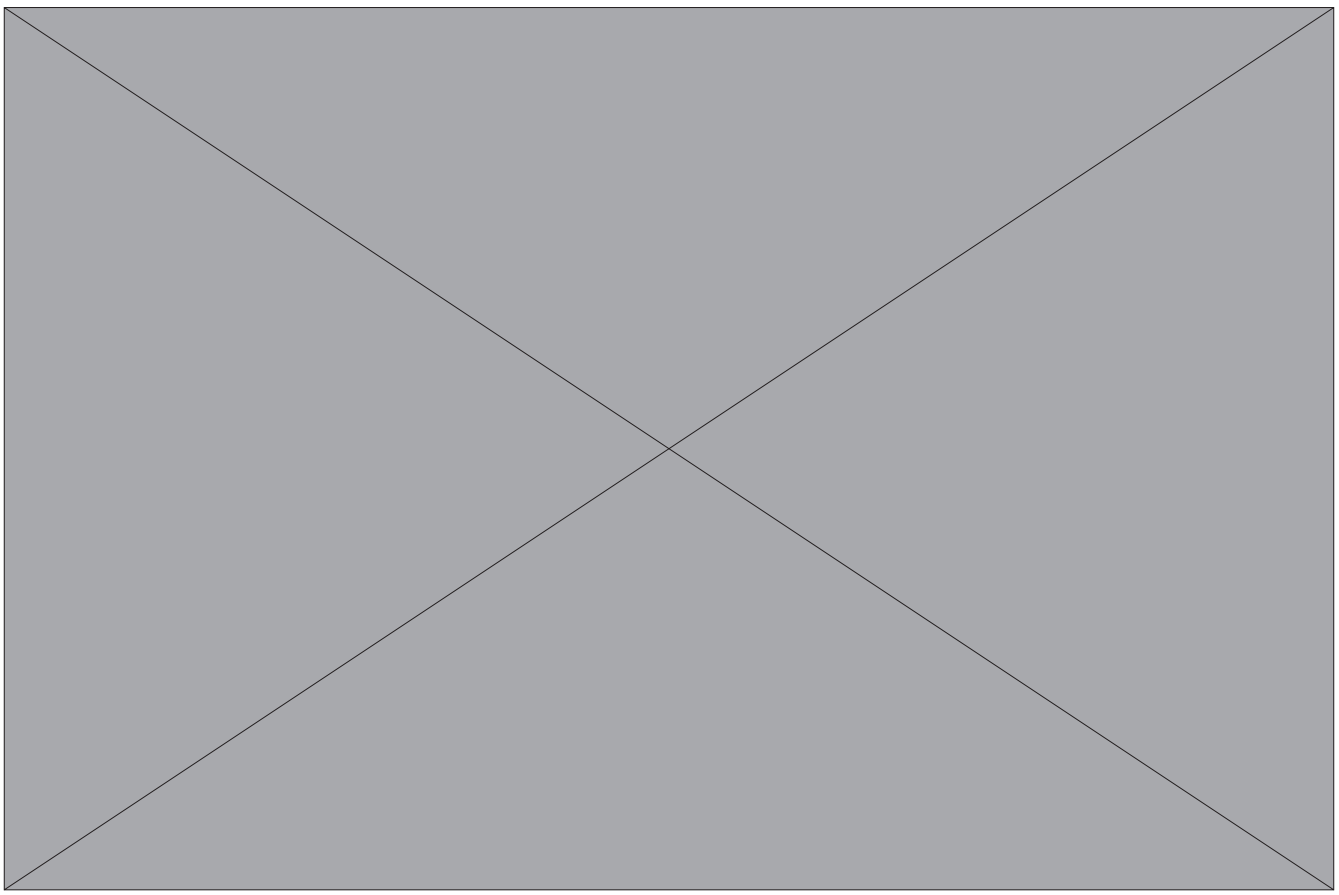


DIAGRAM 15 - 5:1 MODULATION GAS POST-HEAT

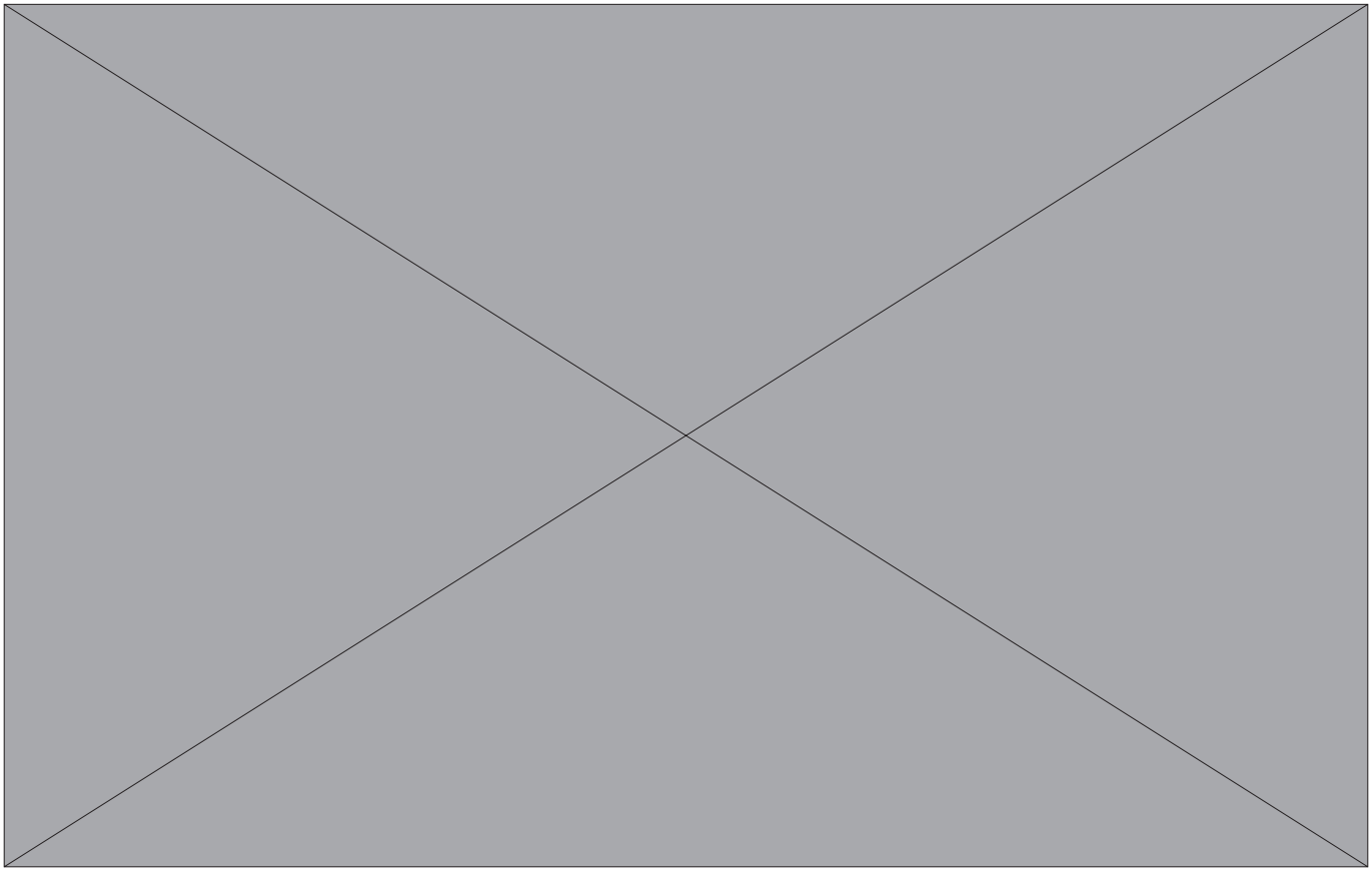


DIAGRAM 16 - 10:1 MODULATION GAS POST-HEAT

EVT-09 thru EVT-12 Single Stage 240/480/575V

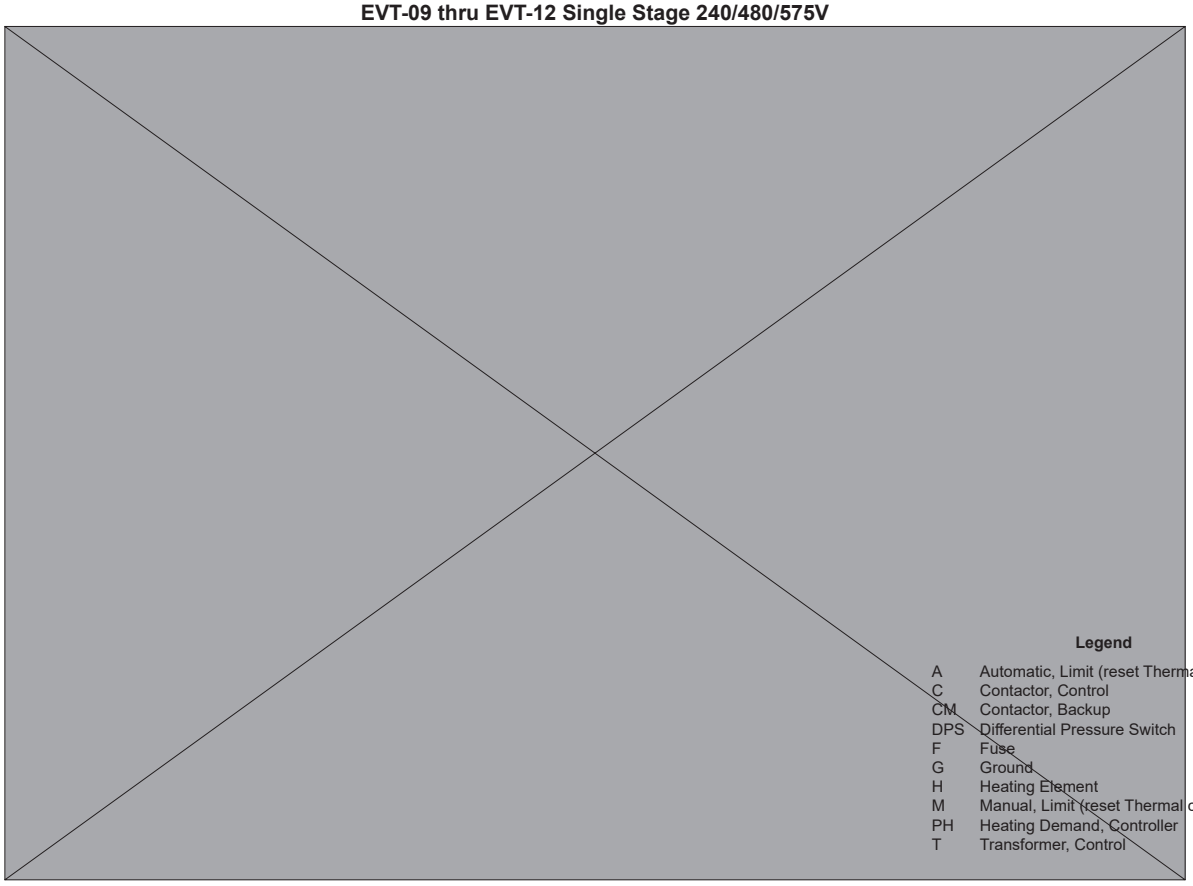
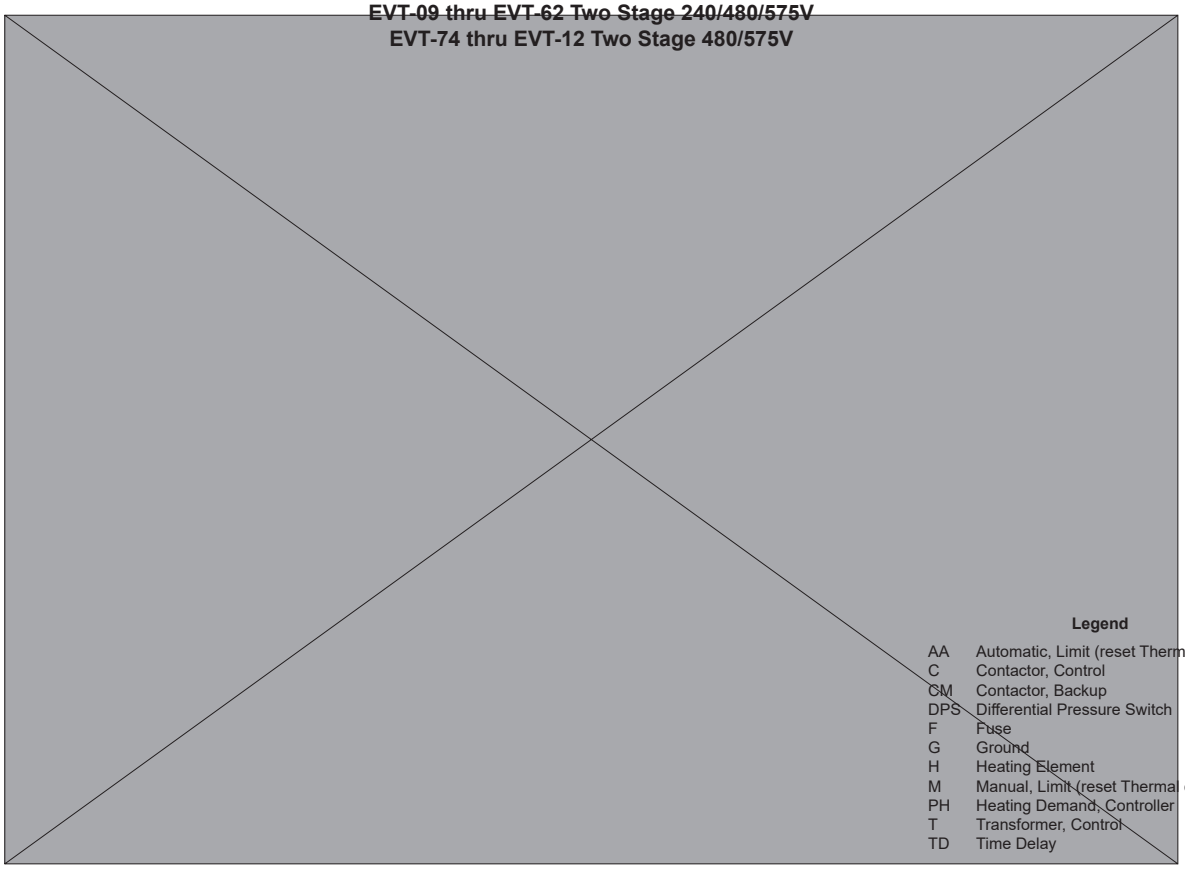


DIAGRAM 17 - ELECTRIC PRE-HEAT

EVT-09 thru EVT-62 Two Stage 240/480/575V
EVT-74 thru EVT-12 Two Stage 480/575V

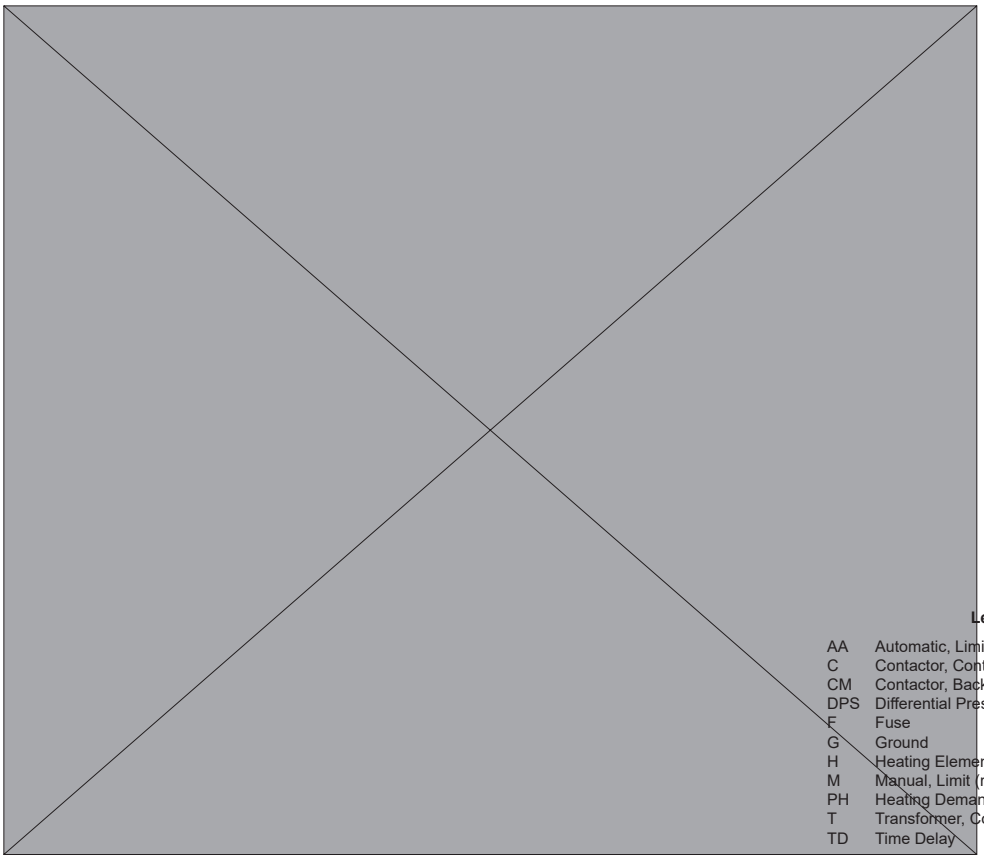


Legend

AA	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
PH	Heating Demand, Controller
T	Transformer, Control
TD	Time Delay

DIAGRAM 18 - ELECTRIC PRE-HEAT

EVT-74 thru EVT-12 Two Stage 240V



Legend

AA	Automatic, Limit (reset Thermal cut-out)
C	Contactor, Control
CM	Contactor, Backup
DPS	Differential Pressure Switch
F	Fuse
G	Ground
H	Heating Element
M	Manual, Limit (reset Thermal cut-out)
PH	Heating Demand, Controller
T	Transformer, Control
TD	Time Delay

DIAGRAM 19 - ELECTRIC PRE-HEAT

START UP INFORMATION SHEET

VOLTAGE - ERV UNIT

Incoming Voltage L1-L2_____ L1-L3_____ L2-L3_____

Running Voltage L1-L2_____ L 1-L3_____ L2-L3_____

Secondary Voltage_____ C (black) to G (green) Volts*_____

C (black) to W (white) Volts*_____

*** With thermostat calling.**

AMPERAGE - UERV MOTORS

Intake Motor: Nominal HP_____ Rated Amps_____ Running Amps_____

Exhaust Motor: Nominal HP_____ Rated Amps_____ Running Amps_____

Wheel Motor: Nominal HP_____ Rated Amps_____ Running Amps_____

AIRFLOW

Intake Design CFM_____ Pressure Drop_____ Calculated CFM_____

Exhaust Design CFM_____ Pressure Drop_____ Calculated CFM_____

Amb. db Temp_____ Return Air db Temp*_____ Tempered Air db Temp*_____

Amb. wb Temp_____ Return Air wb Temp*_____ Tempered Air wbTemp*_____

*** Measure after 15 minutes of run time**

INSTALLATION CHECK LIST

Model #_____ Serial # _____

Owner_____ Owner Phone #_____

Owner Address _____

Installing Contractor_____ Start Up Mechanic_____

- ☐ Inspect the unit for transit damage and report any damage on the carrier's freight bill.
- ☐ Check model number to insure it matches the job requirements.
- ☐ Install field accessories and unit adapter panels as required. Follow accessory and unit installation manuals.
- ☐ Verify field wiring, including the wiring to any accessories.
- ☐ Check all multi-tap transformers, to insure they are set to the proper incoming voltage.
- ☐ Verify correct belt tension, as well as the belt/pulley alignment. Tighten if needed.
- ☐ Prior to energizing the unit, inspect all the electrical connections.
- ☐ Power the unit. Bump the motor contactor to check rotation. Three phase motors are synchronized at the factory. If blower motor fans are running backwards, de-energize power to the unit, then swap two of the three incoming electrical lines to obtain proper phasing. Re-check.
- ☐ Perform all start up procedures outlined in the installation manual shipped with the unit.
- ☐ Fill in the Start Up Information as outlined on the opposite side of this sheet.
- ☐ Provide owner with information packet. Explain the thermostat and unit operation.