



OMEGA VSHP SERIES

Product Guide

VERTICAL STACKED

WATER SOURCE HEAT PUMPS

MODEL: VSHP (SE)

STANDARD EFFICIENCY

DEV. G

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Omega has a policy of continuous product improvement and reserves the right to change design specifications without notice.



1. GENERAL DESIGN

1.1 Product Overview

All Omega vertical stack heat pumps (VSHP) are engineered for quiet and reliable year round operation.

Reliability

Omega water-source heat pump systems provide reliable year round heating and cooling operation. Each unit features an advanced microprocessor controller for ensuring reliable and energy efficient heating and cooling comfort.

Serviceability

Omega VSHP units feature a slide out chassis and a blower assembly which are easily accessible through the front return air panel. For servicing or repairs, a spare replacement chassis can be temporarily swapped in allowing for uninterrupted operation.

Energy Efficient

A VSHP system can transfer energy to different zones in a building. During moderate weather, solar heat gain on the south side of a building may require cooling while the north side requires heating.

Customizable

Omega units can be customized to meet the specific requirements of any project. Some options include: variable cabinet height dimensions, choice of supply discharge air locations and sizes, outside fresh air duct locations, acoustic or perimeter return air panels, and remote thermostat control.

Two Phase Installation

The equipment is shipped to site in two stages for integration with the phases of construction. This avoids potential issues with storage, and on-site damage and allows mechanical units to be installed in acceptable environmental conditions.

Phase 1

- During the initial stages of construction, the cabinets are installed. As construction progresses, they become part of the interior wall structure. Cabinets can ship with risers attached, or risers

are shipped loose for installation prior to cabinet installation.

Phase 2

- The refrigeration chassis is shipped as required and installed into the cabinet after riser loop commissioning and majority of construction is completed. Riser loop must be cleaned and flushed and chemically treated prior to installing chassis units. Return air Panels and filters are installed to complete the installation.

Testing & Quality

To maintain the highest level of quality control, each refrigeration chassis is factory charged and tested before being shipped to the job site. The chassis production and testing line features a computer controlled 6-step quality control (QC) system to ensure that every stage of chassis production is tested and re-tested. Units are performance tested in Omega's state-of-the-art in-house test facility to ensure unit performance and reliability meets or exceeds industry standards. Each unit is AHRI certified and ETL listed.



1.2 Key Features

Energy Efficient Design

- High efficiency compressors and blower motors
- Optimized air-coil circuiting of refrigerant coils
- Refrigerant metering thermal expansion valves
- Low pressure drop water coaxial coils
- Coefficient of Performance (COP)/Energy Efficiency Ratio (EER) meets or exceeds ASHRAE 90.1

Quiet Operation

- High density sound insulated cabinet
- Noise attenuating return air panels
- Double isolated chassis base
- Compressor mounted on vibration isolators

Space Considerations

- Quiet operation
- Fire and mould resistant insulation
- Heavy duty cabinet construction
- Architectural supply grilles and return air panels
- Durable, long life gasketing on chassis
- Convenient room side, front access to the air filter
- Choice of discharge air opening configurations
- Riser mounting location flexibility

Acoustical Design Features—Standard Silver Series

- 1 inch high density sound insulation throughout
- Double isolated chassis base to isolate the refrigeration chassis from the cabinet
- Compressor elastomeric isolation mounts
- Unit base with closed cell foam isolation pads
- Optimized design of refrigerant piping for reduced compressor noise

Gold Series: Enhanced Acoustic Package

- Adds a flexible canvas duct connection between the base cabinet and discharge plenum prevents noise transmission to the supply discharge ducts and grilles.

Reliability

- Factory tested and charged with R-410A
- Industry leading rotary and scroll compressors
- Modern components and microprocessor controlled safety protection devices

Environment

- Eco-friendly refrigerant (R-410A)
- Recyclable materials used in unit construction
- Energy efficient fan motors
- High-efficient DX and water coils

Service

- Slide-out chassis for easy removal and servicing
- All control components are in one location
- Plug-n-play harnesses
- Capacitor in front of unit
- Easy disconnecting water connections
- Refrigerant service access ports
- Simple LED diagnostics on control board
- Plug-n-play Web browser diagnostics
- Test-mode and data logging for troubleshooting

Certification

All Omega products are listed by ETL (Intertek) Omega products conform to UL STD 1995 And certified to CSA C22.2 NO. 236.

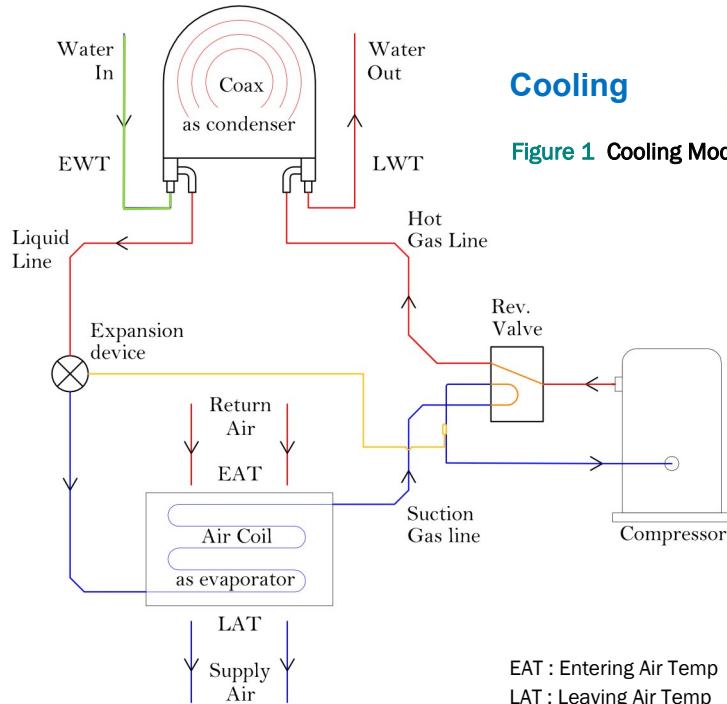


VSHP (HRP) units are AHRI certified as per ANSI/ASHRAE/ISO 13256 and conform to CAN/CSA-C13256-1.





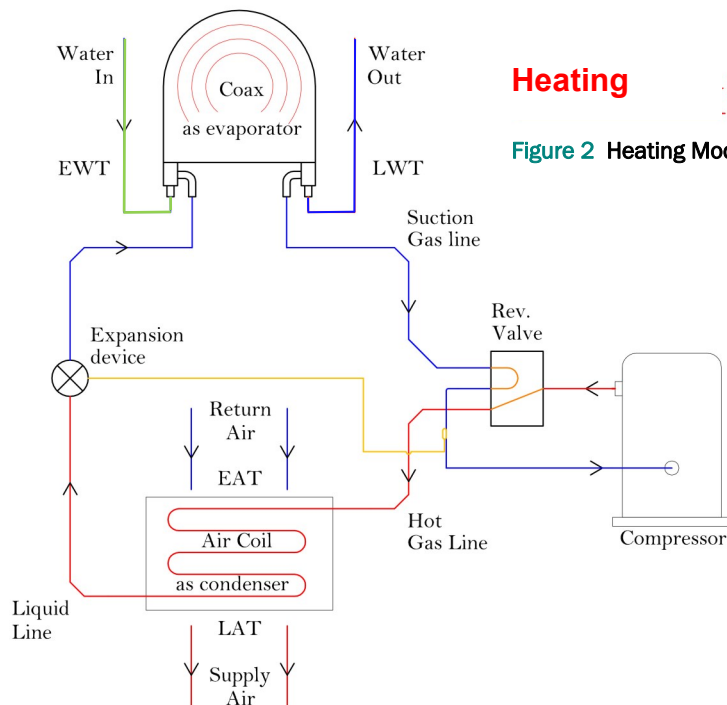
1.3 Heat Pump Operation Schematic



Cooling

Figure 1 Cooling Mode Flow Diagram

EAT : Entering Air Temp
 LAT : Leaving Air Temp
 EWT : Entering Water Temp
 LWT : Leaving Water Temp



Heating

Figure 2 Heating Mode Flow Diagram



2. PRODUCT DETAILS

2.1 Standard & Optional Features

STANDARD FEATURES

Cabinet

The galvanized sheet metal cabinet is designed for structural rigidity, installation flexibility, and serviceability. Cabinet interior is lined with 1" thick acoustic, thermal, mould and fire resistant insulation rated to meet NFPA 90.

Control Panel with Advanced Microprocessor

All controls and contactors are mounted in the electrical box connected with quick connect plugs. Each unit features an advanced microprocessor controller. Unit comes with four standard temperature sensors: entering and leaving water temperature sensors (WLST & WLDT), suction freeze-stat sensor (RST), and leaving air temperature (LAT) sensor. All controls are accessible from the front of the unit for easy service and troubleshooting. Controller features an ethernet port for quick web based access to system diagnostics, data logging and parameters setpoints.

Blower Fan & Motor

A centrifugal forward curved double width double inlet (DWDI) blower with a direct drive motor assembly with easy removal and servicing provides air delivery. Three-speed permanent split capacitor (PSC) type motors are standard complete with quick connect plugs for easy serviceability

Field Selectable Supply Air Discharge

Cabinets feature our standard "Knockout" style supply discharge openings for field selectable supply air openings in Left, Right, Front, Back, and/or Top configurations.

DX Coil

Air to refrigerant coils are multi-row with copper tubes and enhanced aluminum fins. Coil fins are mechanically bonded to the tubes. The coils are fully cased with a handy grip point for chassis removal.

Compressors

High efficient R-410A compressors are standard, rotary type 1/2 to 1.5 Ton (VSHP 020-060) and scroll type 2 to 3 Ton (VSHP 080-120). Compressors are mounted to the chassis frame with elastomer vibration isolators to minimize vibration transmission. Ad-

ditionally the compressor chassis is mounted on a double isolated base for enhanced noise attenuation to prevent vibration transmission into the occupied space.

Coax-Coil

The water to refrigerant coaxial coil is tube in tube with a convoluted inner copper tube design. The coaxial coil is selected for minimum water pressure drop and low fouling characteristics. The coils are optimized for heat pump operation.

Stainless Steel Drain Pan

Standard stainless steel drain pan provides corrosion resistance. Drain pan is positively sloped, externally insulated with a 7/8 inch O.D. connection and factory mounted p-trap condensate hose.

Reversing Valve

A 4-way reversing valve, pilot operated, sliding piston type with solenoid coil is installed in each heat pump chassis to change refrigerant flow. Reversing valve is installed in "Energized to Cool" mode and "Fails to Heating" mode.

Thermostatic Expansion Valve (TXV)

All units come with a bi-flow thermostatic expansion valve (TXV). TXV is precision machined brass assembly providing precise refrigerant flow metering.

Air Filter

Unit comes with standard 1-inch MERV 10 disposable media filters.

OPTIONAL FEATURES

Gold Series Cabinet

Cabinet comes in two sections to minimize noise transmission into duct system. The lower section includes all components, chassis, and risers. The upper section is an acoustic supply discharge plenum lined with 1-inch thick acoustic insulation. The plenum is connected to lower cabinet using a flexible duct connector for noise attenuation.

EC Fan Motors

High-efficient EC motors (ECM) for improved fan operating efficiency and fan performance across a



wider operating range over traditional PSC motors.

Auto Shut-Off Control Valve

Optional factory installed 2-way automatic shut-off control valves shut off water flow to the unit when compressor is not operating. This reduces pumping loads and power consumption in variable speed or staged pumping applications.

Automatic Balancing Valve

Optional automatic balancing valves are factory installed for automatically limiting water flow through the unit to the nominal rated flow rate by providing constant flow ($\pm 10\%$ of rated GPM) over a large differential pressure range of 2-80 psig (3-80 psig for VSHP 080 to 120 units).

Condensate Overflow Switch (COFS)

Condensate overflow switch (float switch or electronic) is mounted to the unit drain pan for detecting overflow conditions such as a clogged condensate drain. If condensate switch is tripped compressor operation is stopped.

Fresh Outside Air Duct

Fresh Outside Air Duct take-off is installed at the top of the cabinet for providing fresh air into the occupied space. Fresh air is dumped on the negative pressure side of the fan. Ideal for designs with a remote mounted ERV specified. Comes with Omega's "Whisper Mode" ultra-low fan speed continuous fan-on operation.

Return Air Panel

Omega offers 2 styles of return air panels. **Acoustic** panel, stamped blade style, is designed as a narrow, removable panel making it ideal for space constrained installations. **Perimeter**, enhanced aesthetic, is a noise attenuating insulated swing door style panel. Both are easily removed to access the air filter, chassis, blower and all controls.

Supply, Return & Condensate Risers

Risers are available in Type M and Type L copper. Factory supplied risers come standard with manual shut-off isolation ball valves soldered to the riser tee. Risers can be ordered swaged or as straight pipe.

Geothermal

A geothermal option package includes an insulated water circuit and condenser coil to prevent conden-

sation. Geothermal option is only intended for fluid loops containing a glycol mixture for freeze protection. If a water only loop is being utilized, it is recommended to select the Low Temperature Water option as it provides enhanced freeze protection.

Low Temperature Water

A low temperature water option is recommended for units running on water loops between 45F and 55F in heating. Units are fitted with high water pressure safety switches sensors, one on each water inlet and water outlet to stop compressor operation in the event of water freezing conditions.

SmartOne Communication Board

A RS-485 add-on communication board is supplied to communicate with SmartOne building automation systems. Includes remote temperature sensor (RTS). RTS acts as back-up thermostat air temperature sensor in the event of communication disruption with SmartOne wallpad.

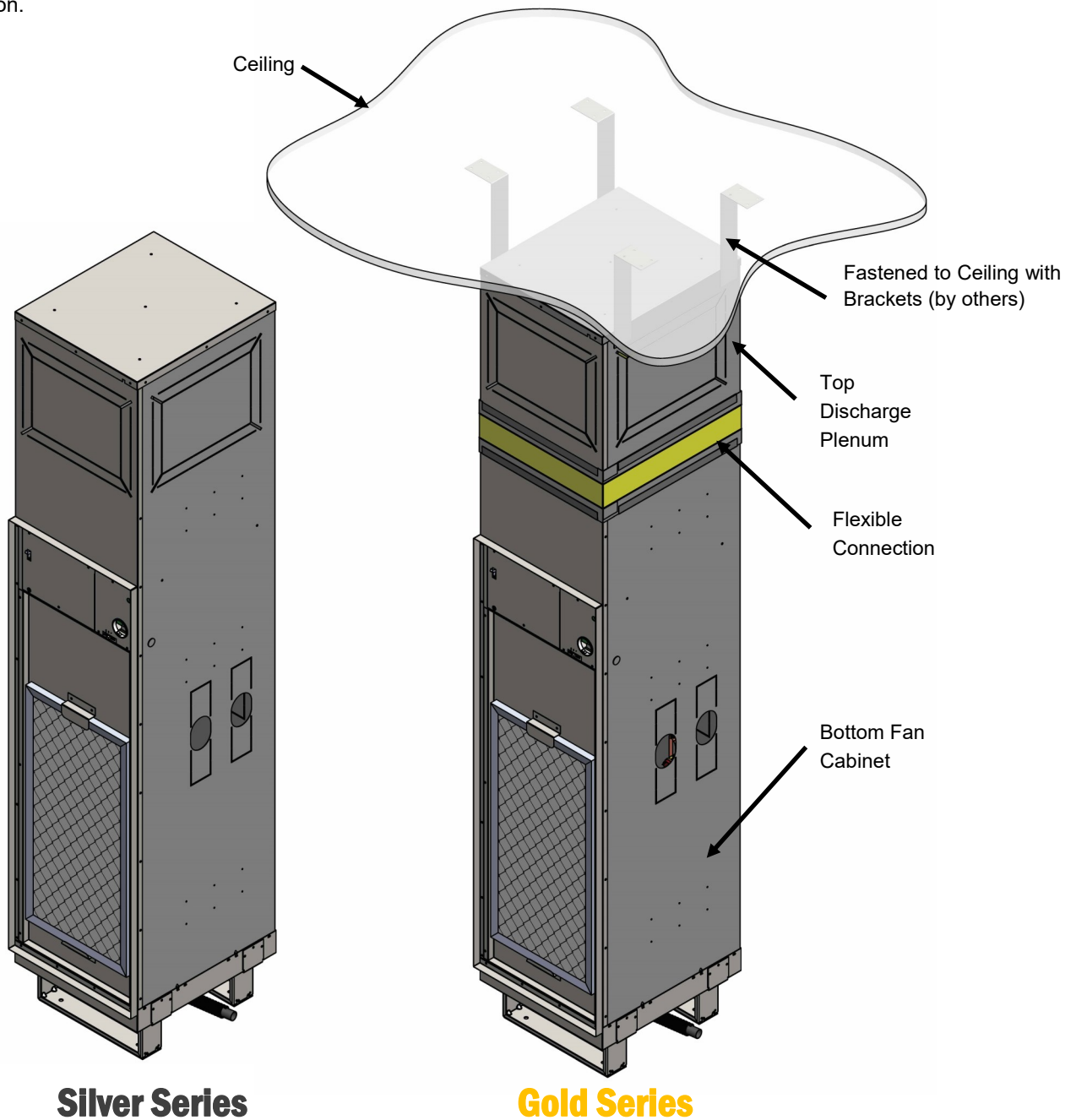
MERV 13 Filter

Unit comes with 2-inch filter rack with MERV 13 rated pleated filter for enhanced air filtration and performance. ECM fan option is recommended.



2.2 Cabinet Types—Silver & Gold Series

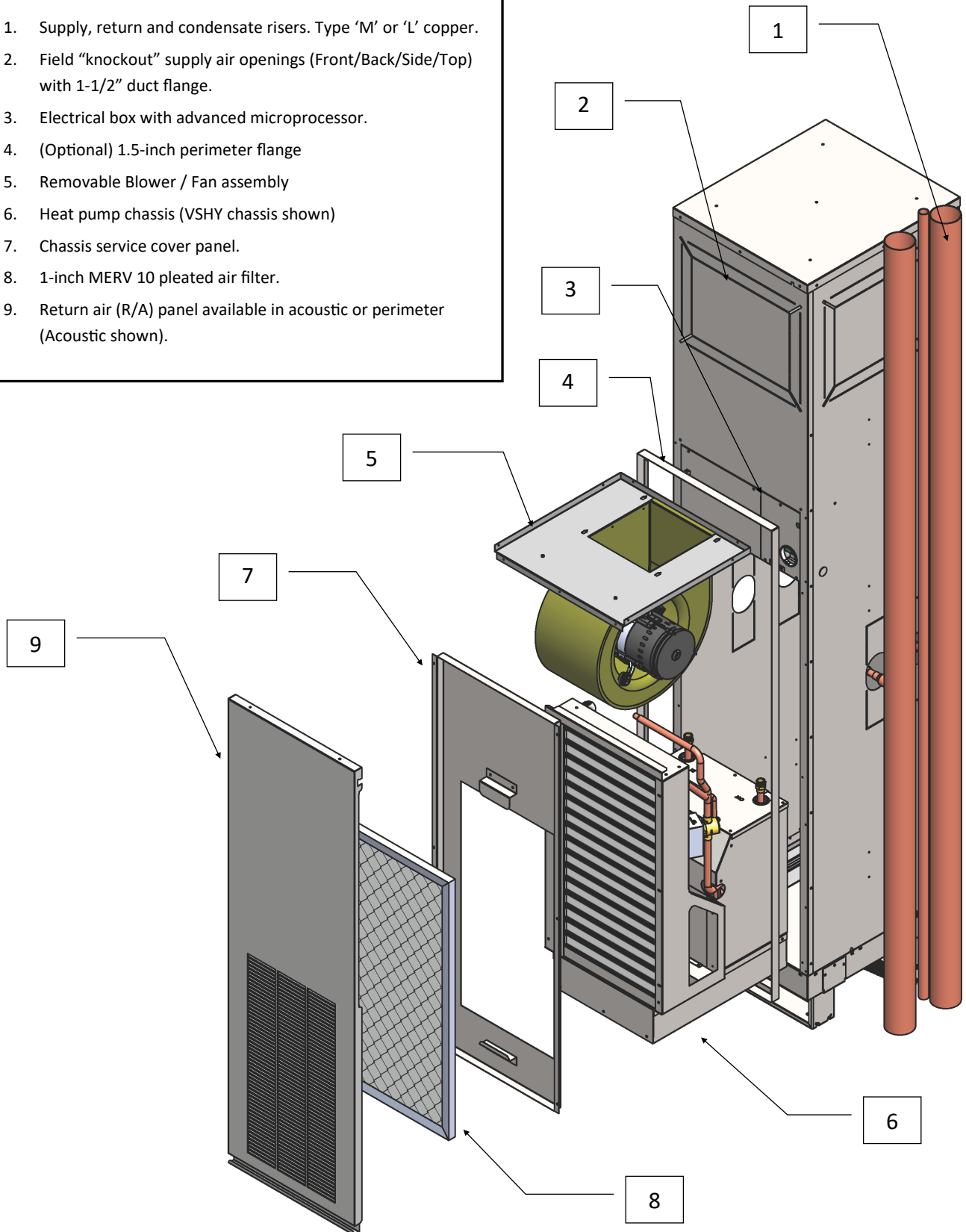
Omega offers two distinct cabinet options for VSHP units: the Silver and optional Gold series (see below). Silver series is the Omega standard product built as a free standing design. The optional Gold series cabinet includes a factory built-in canvas flex duct collar between the base chassis/blower section and upper discharge plenum. The upper discharge plenum is field mounted to the ceiling structure creating a non-rigid, acoustically isolated connection between the discharge plenum and the cabinet compressor and blower base section.





2.3 Assembly View

1. Supply, return and condensate risers. Type 'M' or 'L' copper.
2. Field "knockout" supply air openings (Front/Back/Side/Top) with 1-1/2" duct flange.
3. Electrical box with advanced microprocessor.
4. (Optional) 1.5-inch perimeter flange
5. Removable Blower / Fan assembly
6. Heat pump chassis (VSHY chassis shown)
7. Chassis service cover panel.
8. 1-inch MERV 10 pleated air filter.
9. Return air (R/A) panel available in acoustic or perimeter (Acoustic shown).





2.4 Noise Attenuation Features

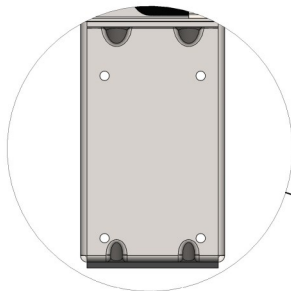
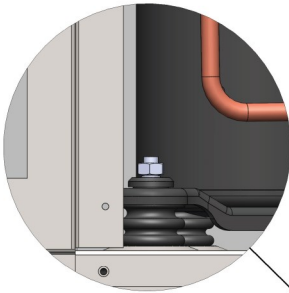
Omega Heat Pump units offer up to 5 separate methods of vibrational isolation (Shown below).

Flex Duct Isolator

Units with the optional **Gold Series** option feature a factory installed flexible canvas duct collar for added noise and vibration isolation.

Compressor Mounts

All compressors are mounted to the chassis using vibration dampening inserts.

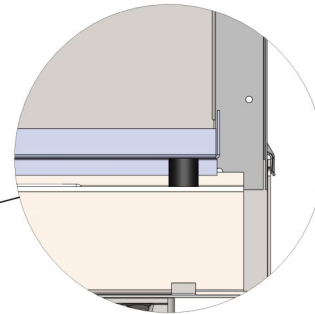
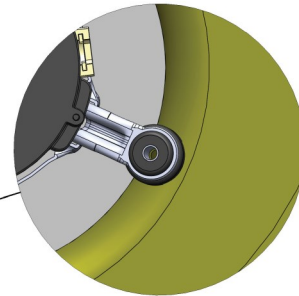


Unit Foot Insulation

1/4" closed cell foam pads are factory installed under the cabinet base to isolate the unit from the floor surface.

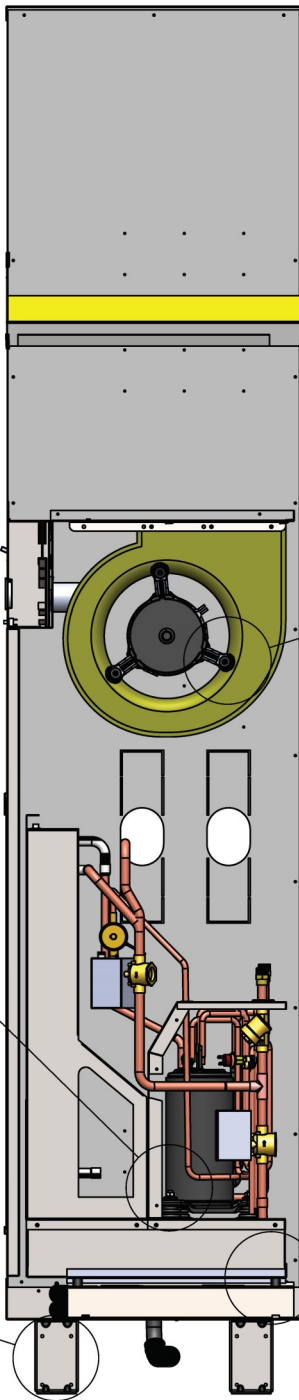
Motor Mount Isolators

Motors are attached to the blower housings with rubber isolation fasteners which reduces the vibration produced by the rotating fan assembly.



Vibrational Rail

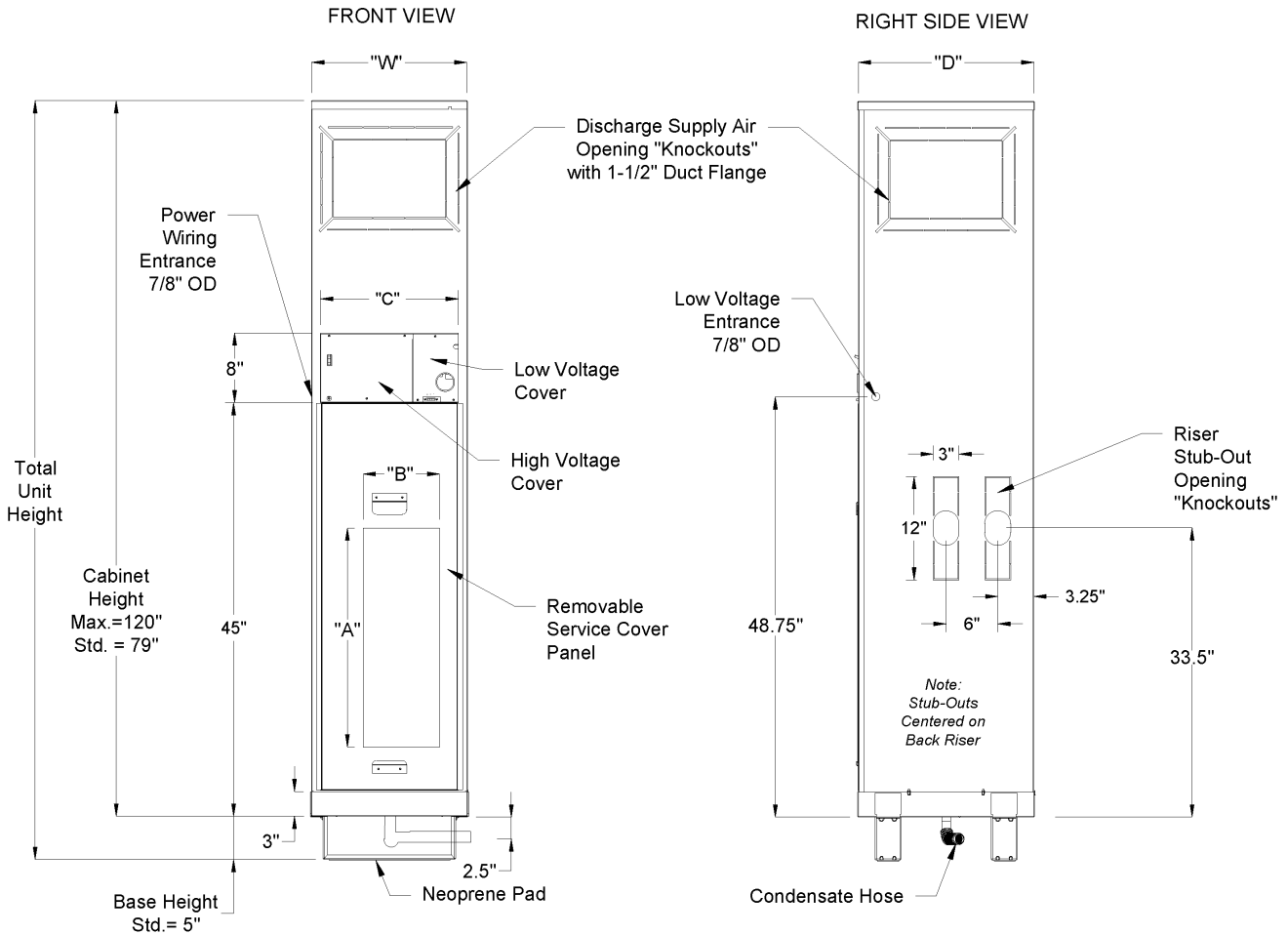
The refrigeration chassis is mounted on a double isolated base with rubberized dampeners to isolate the chassis from the cabinet to minimize noise vibrations.





3. CABINET DIMENSIONS & SUPPLY DISCHARGES

3.1 Standard Silver Series Cabinet



(Drawing not to scale, dimensions are subject to change)

Table 1 VSHP Cabinet Dimensions (Silver & Gold Series)

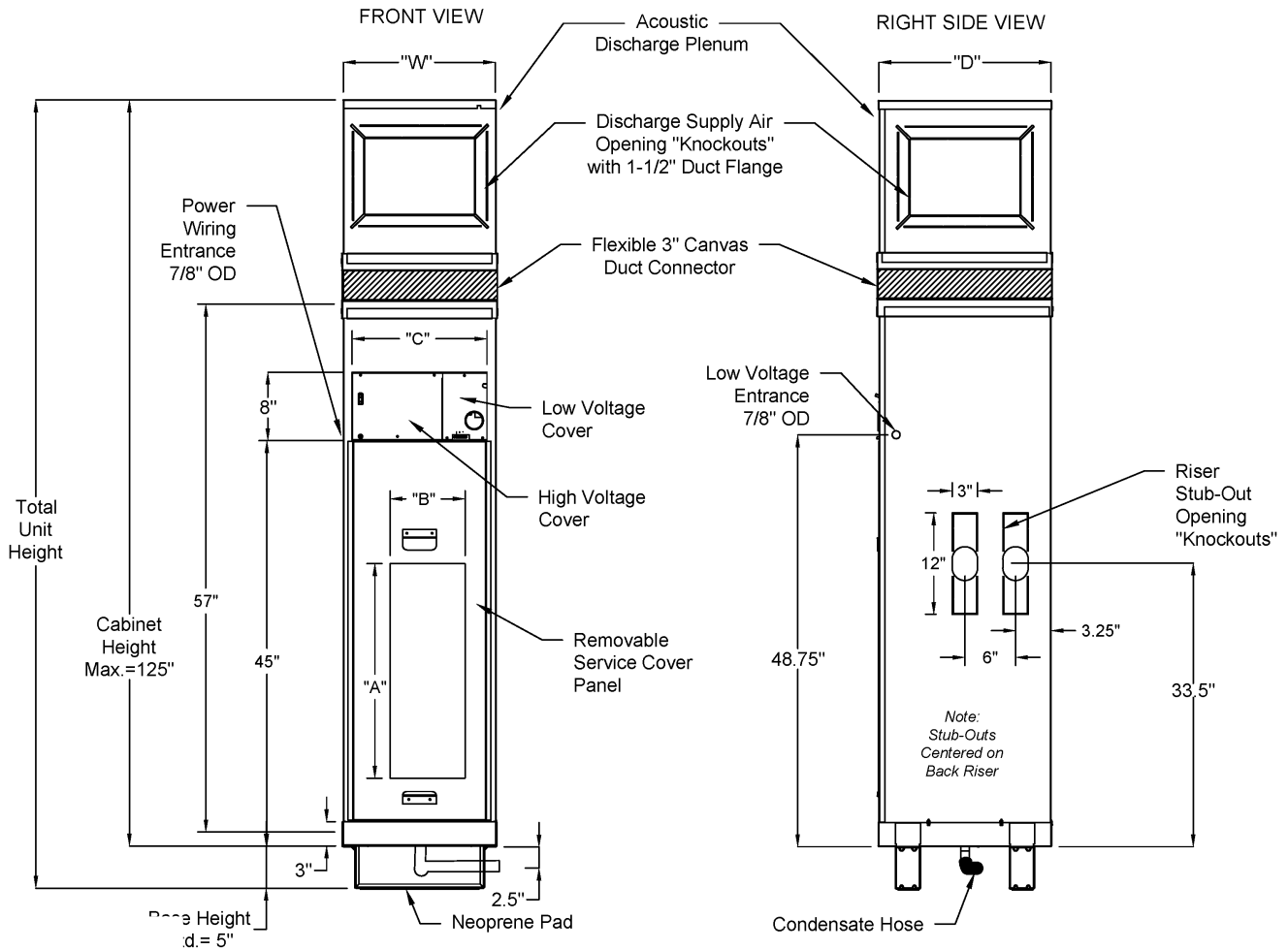
Model	Cabinet Size	Dimensions (in)			VSHP Supply Discharge Opening (W X H) inches	
		"W"	"D"	"C"	Horizontal	Top
VSHP 020G	X	16	17.5	14	14 x 8	12 x 12
VSHP 030G					14 x 8	12 x 12
VSHP 040G					14 x 10	12 x 12
VSHP 050G	Y	18	20.5	16	16 x 12	14 x 12
VSHP 060G					16 x 12	14 x 12
VSHP 080G	Z	22	24.5	20	18 x 14	14 x 14
VSHP 100G					18 x 16	16 x 14
VSHP 120G					18 x 16	16 x 16

Note: Discharge opening sizes are customer configurable. Published sizes shown are maximum factory default sizes. Customer to verify discharge opening sizes match design requirements for proper airflow and select appropriate discharge openings at time of order.

Lower riser knockout can be used to match previous generation fan cabinet riser stub-out locations.



3.2 Optional Gold Series Cabinet with Acoustic Plenum



(Drawing not to scale, dimensions are subject to change)

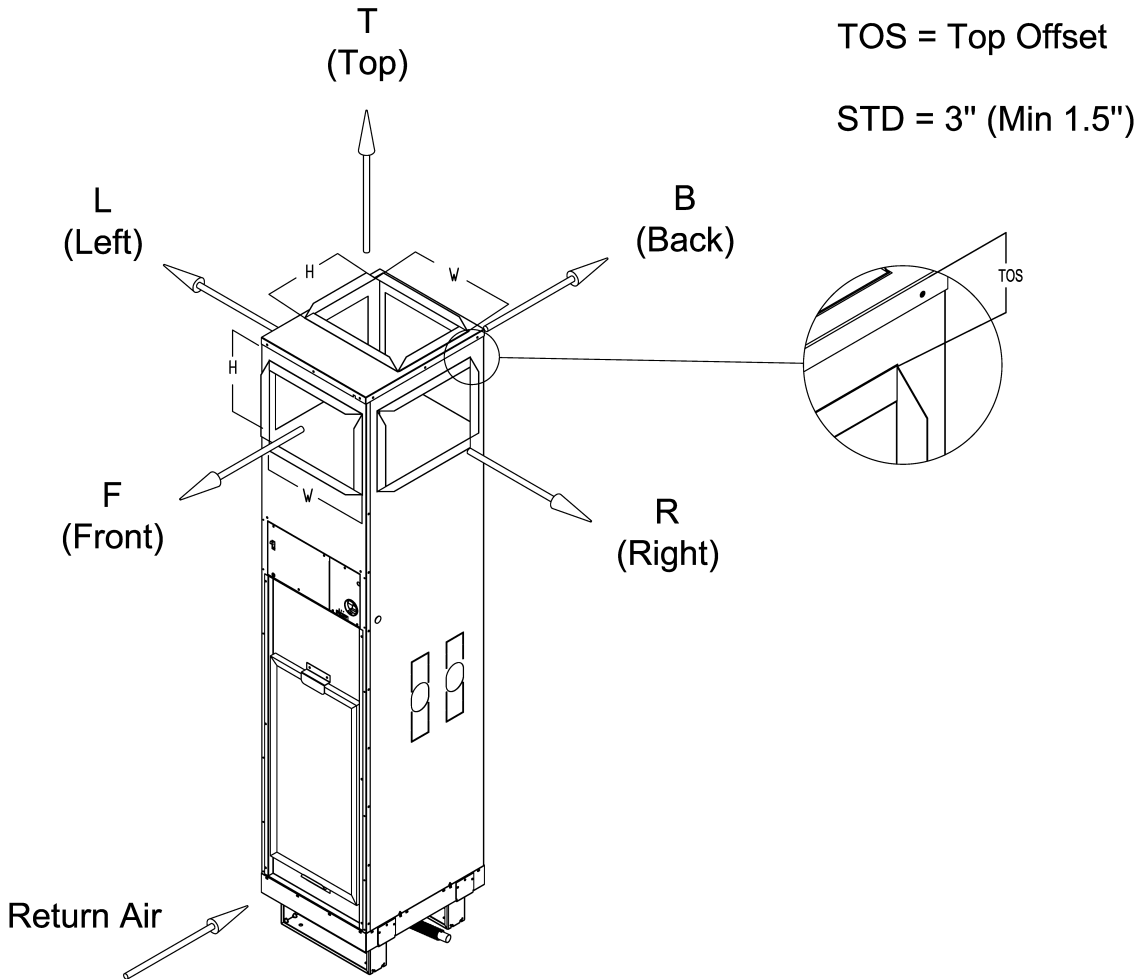
Model	Cabinet Size	Dimensions (in)			Minimum Cabinet Height (in)	
		"W"	"D"	"C"	Silver Series*	Gold Series
VSHP 020G	X	16	17.5	14	60 / 72	80
VSHP 030G						
VSHP 040G						
VSHP 050G	Y	18	20.5	16	60 / 74	82
VSHP 060G						
VSHP 080G	Z	22	24.5	20	60 / 74	86
VSHP 100G						
VSHP 120G						

* 60in without horizontal (side) discharges



3.3 Supply Discharge Openings

Units comes with standard “*Knockout*” style discharge openings on top and all sides for field configuration. This allows for custom discharge configurations based on site requirements. Discharge opening sizes are configurable to meet site design conditions.



Supply Air Opening Sizes

Model	VSHP Supply Discharge Opening (W X H) inches							
	020	030	040	050	060	080	100	120
Horizontal	14 x 8	14 x 8	14 x 10	16 x 12	16 x 12	18 x 14	18 x 16	18 x 16
Top	12 x 12	12 x 12	12 x 12	14 x 12	14 x 12	14 x 14	16 x 14	16 x 16

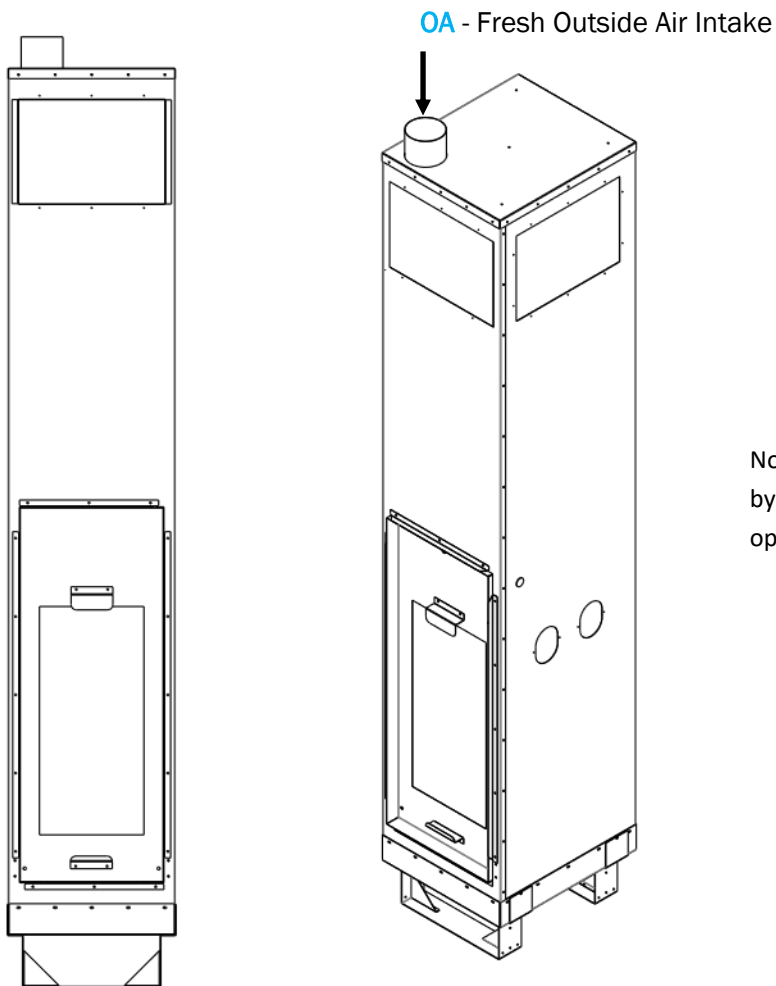
Notes:

- Discharge opening sizes are customer configurable. Published sizes shown are maximum factory default sizes. Customer to verify discharge opening sizes match design requirements for proper airflow and select appropriate discharge openings at time of order.
- Unit comes standard with field “knockout” style discharge openings on all sides. Discharge flanges are 1-1/2 inches.
- Line of Site Baffles (LOSBS) are available where two or more horizontal discharge (Front, Left, Right and/or Back) openings are specified.
- All handing's determined by facing return air opening
- Top Discharge is centered left and right, and offset 2 inches from the back.



3.4 Optional Fresh Outside Air Duct

Optional built-in Fresh Air Duct is suited for applications where the Energy Recovery Ventilator (ERV) unit is remote mounted. The factory installed fresh air intake accepts fresh air connection from a remote mounted ERV. Refer to Section 3.5 to see different configurations available for location of fresh outside air duct.



Note: Handling is referenced by facing the unit return air opening (front).

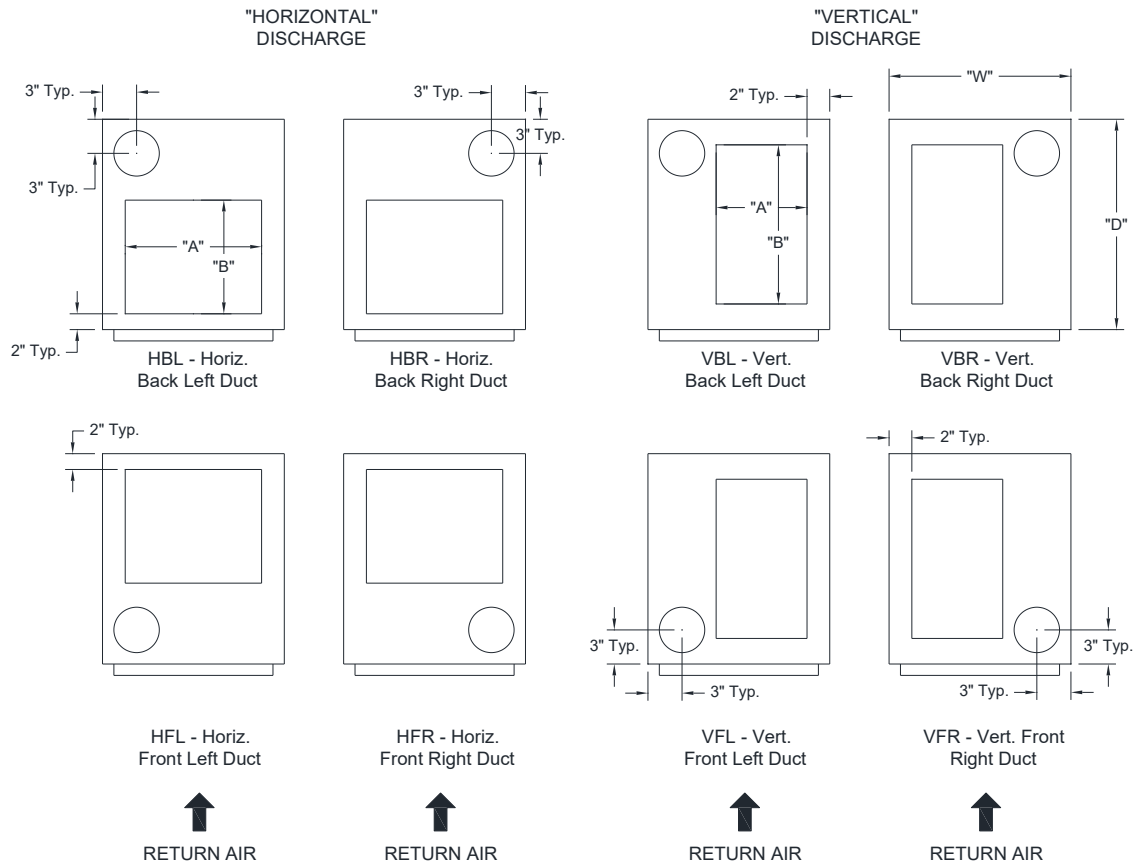
CAUTION

The introduction of cold conditioned outside air from a remote energy recovery ventilation device into the heat pump cabinet can result in potential freezing and bursting of mechanical components carrying water in the heat pump. Designer should take care to treat these considerations accordingly (e.g. utilize water glycol treatment or ensure ERV tempers Outside Air sufficiently above freezing point before entering the unit).



3.5 Top Supply Discharge Openings with Optional Fresh Outside Air Duct

Top discharge for VSHP cabinet with Fresh Outside Air duct is available in two orientations: “Horizontal” and “Vertical”. Each orientation contains four possible configuration options for fresh air duct location. Discharge openings are field “knockout” style with 1.5” duct flange.



Supply Air Opening Sizes with OA in Horizontal & Vertical Configurations

Supply Air Opening Sizes w/ Fresh Air Duct

Model	Cabinet Size	Dimensions (in)		Top Supply Opening w/ Fresh Air Duct (A x B) inches	
		"W"	"D"	"Horizontal"	"Vertical"
VSHP 020G	X	16	17.5	12 x 8	8 x 12
VSHP 030G				12 x 8	8 x 12
VSHP 040G				12 x 8	8 x 12
VSHP 050G	Y	18	20.5	14 x 12	10 x 16
VSHP 060G				14 x 12	10 x 16
VSHP 080G	Z	22	24.5	14 x 14	14 x 14
VSHP 100G				16 x 14	14 x 18
VSHP 120G				16 x 16	14 x 18

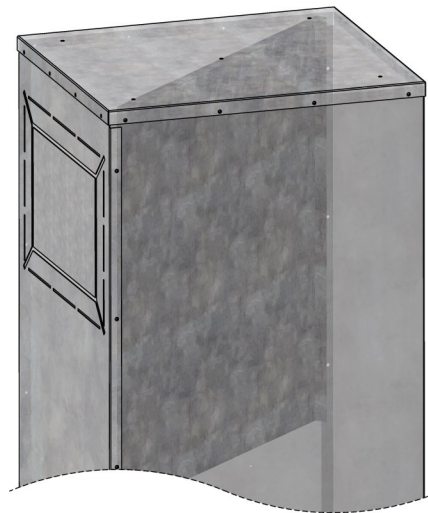
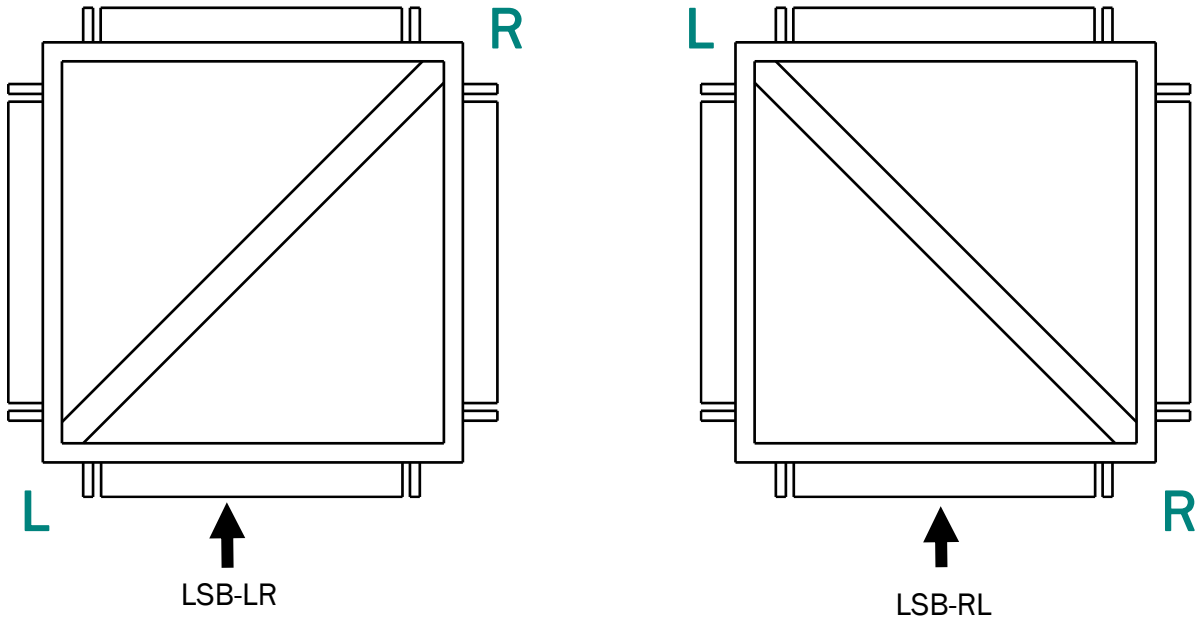
Note: Discharge opening sizes are customer configurable. Published sizes shown are maximum factory default sizes.



3.6 Line of Sight Baffle

Optional Line of Sight Baffles (LOSBS) can be supplied inside discharge plenums on units with (2) two or more horizontal discharge openings. The LOSBS provide occupant privacy between adjacent rooms. Two configurations (LSB-LR or LSB-RL) of LOSBS are available based on the unit discharge arrangement. LOSBS is not available with optional Fresh Outside Air Duct intake.

TOP VIEW

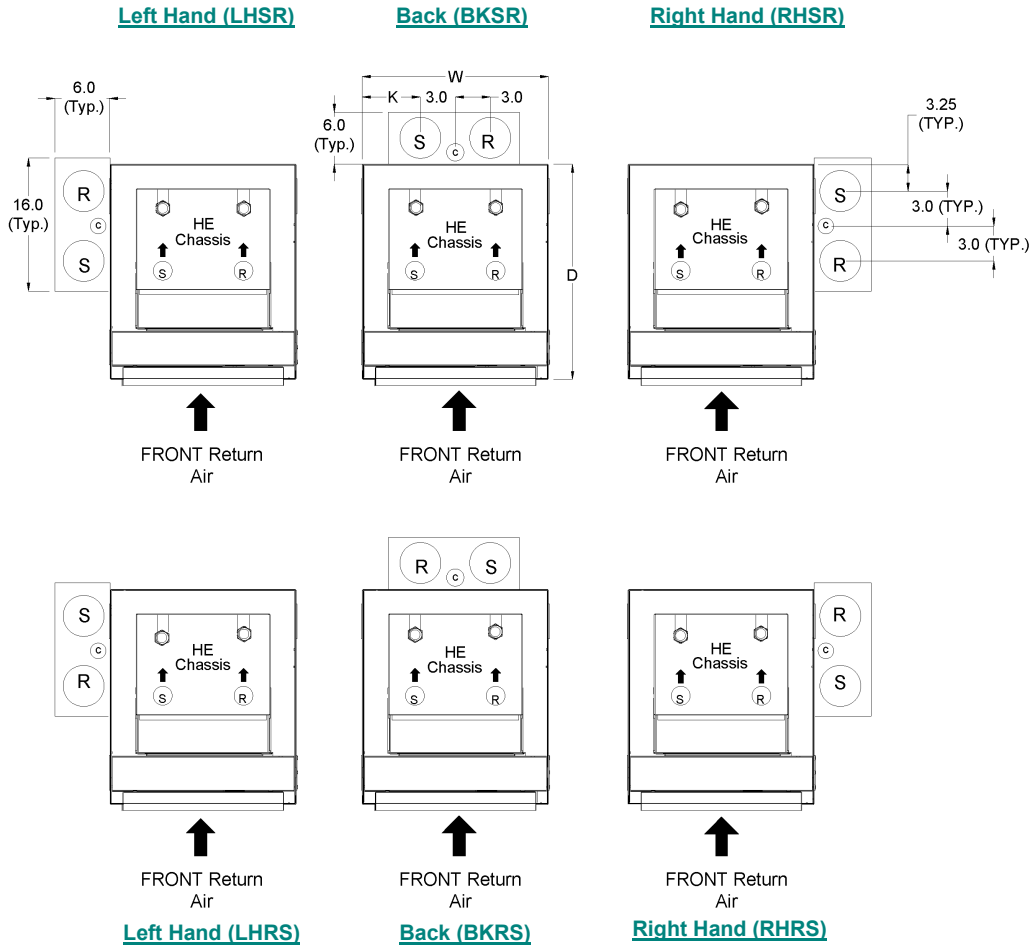


Line of Sight Baffle Configurations



4. RISERS & HOSE KITS

4.1 Riser Handling Conventions (Top View)



S = Supply Riser
 C = Condensate Riser
 R = Return Riser

Riser Handling Configurations

VSHP Cabinet Riser Dimensions

Unit Size	Cabinet Size	W	D	"K" (in)
020, 030, 040	X	16	17.5	5
050, 060	Y	18	20.5	6
080, 100, 120	Z	22	24.5	8

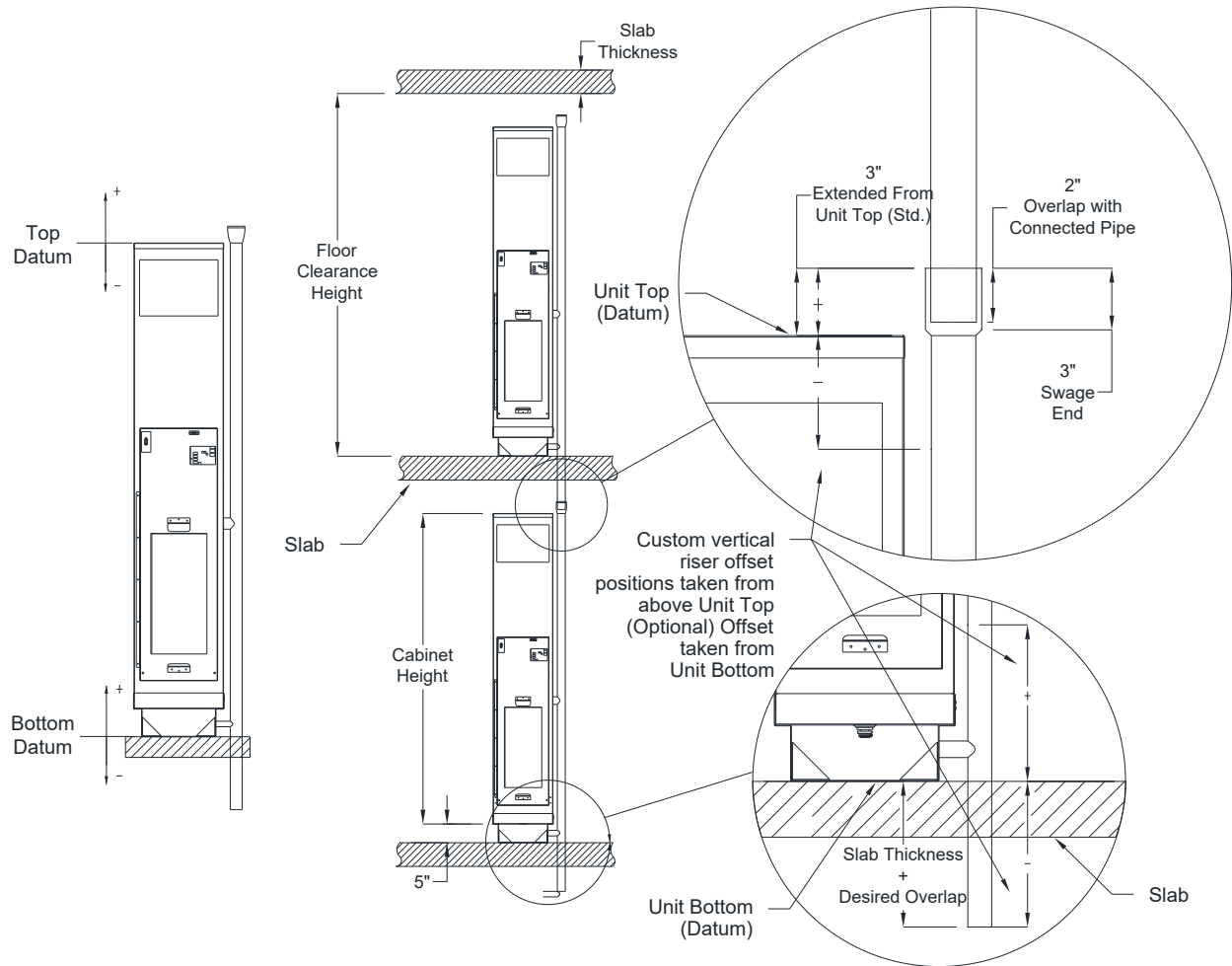
Note: Units do not come with a riser chase or riser sleeve. Depiction shown indicates typical coring openings.

Notes:

- As viewed from top, risers can be order in either SR configuration (supply, condensate, return) or RS (return, condensate, supply)
- Optional risers come in Type M or L copper . Risers can be ordered from factory with 3 inch deep swage.
- Contractor to provide riser transition pieces when joining dissimilar riser sizes.
- Risers available in sizes, 3/4" to 3". Consult factory for larger sizes.
- All handling's determined by facing front of the unit (return air opening)



4.2 Riser Sizing Reference



Riser Length Reference Measurements

Notes:

- Risers are positioned relative to cabinet using a standard “Top” Datum reference (optional “Base” Datum). Top Datum Offset indicates where the top of riser will be located relative to top of cabinet. A Base Datum indicates where bottom of riser will be located relative to base of cabinet.
- Upon request Omega will provide 3 inch deep swage on risers of same pipe size (optional for all risers) for connection to units on the floor below.
- Risers should insert 2 inches into the 3 inch deep swage connection (minimum 1 inch insertion is required)
- Riser Length = Floor Clearance Height + Slab Thickness + 2 inch (overlap) (Rounded up to 120” or 144”).
- Omega supplies two standard riser lengths, 120” (10’) and 144” (12’), to be field cut on-site.
- Omega does not supply extension tailpieces or transition riser pieces for joining dissimilar piping sizes. Items are field provided.
- Risers available in Type L and Type M/DWV copper.
- Condensate riser comes standard with 3/8 inch thick closed cell insulation to prevent condensation.
- Optional insulation on supply and return risers is available.

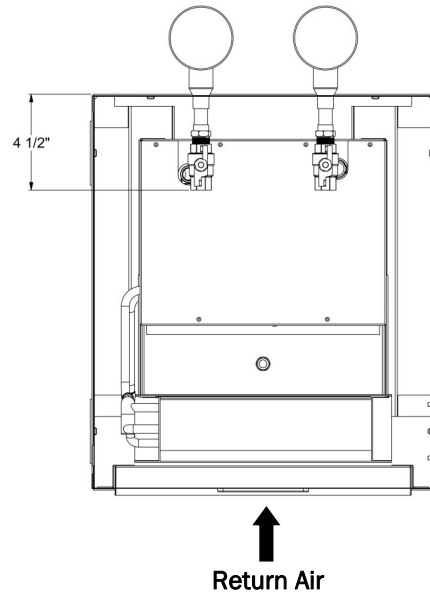


4.3 Hose Kit & Riser Stub Out Details

Hose Kit Sizes

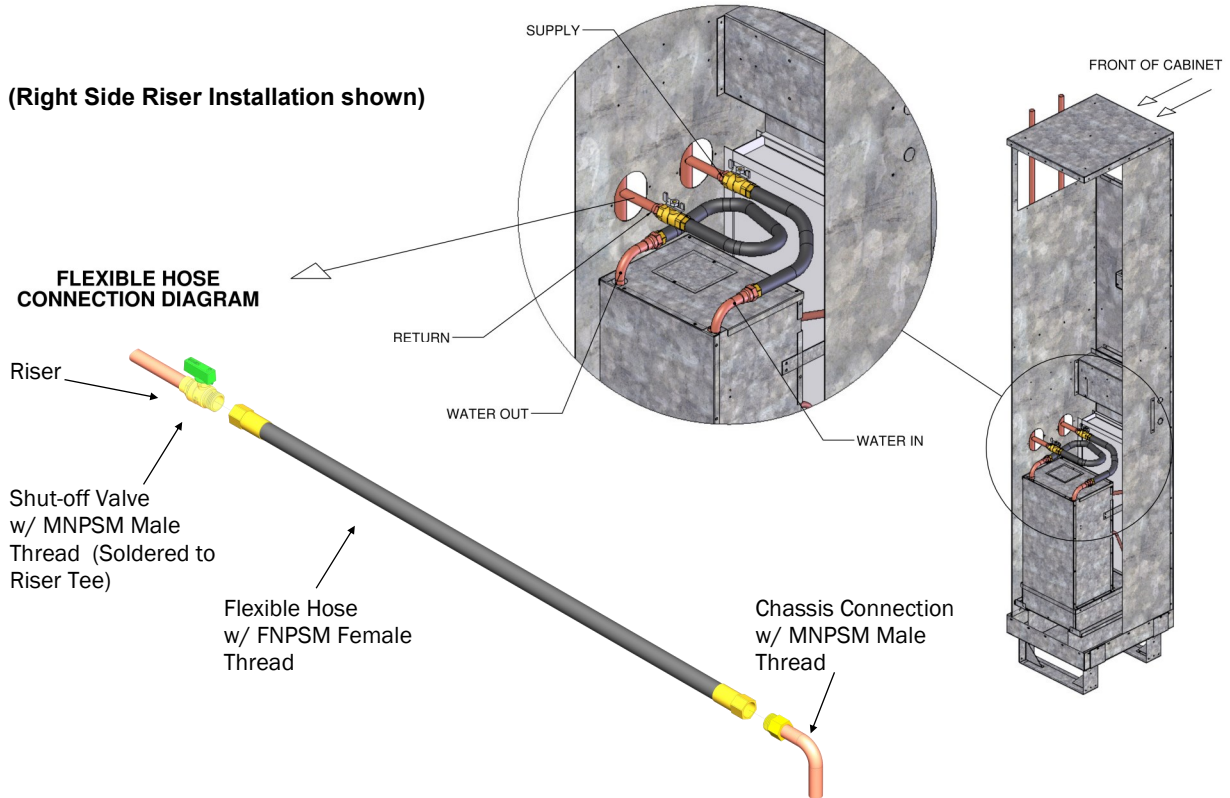
Model	Hose Kit	
	Size (in)	Length (in)
VSHP 020	1/2	24
VSHP 030	1/2	24
VSHP 040	1/2	24
VSHP 050	1/2	24
VSHP 060	1/2	24
VSHP 080	3/4	30
VSHP 100	3/4	30
VSHP 120	3/4	30

Hose kits are supplied with each unit. Hose kit configurations vary by unit size as shown.



Riser Stub Distance from Cabinet Wall

(Right Side Riser Installation shown)

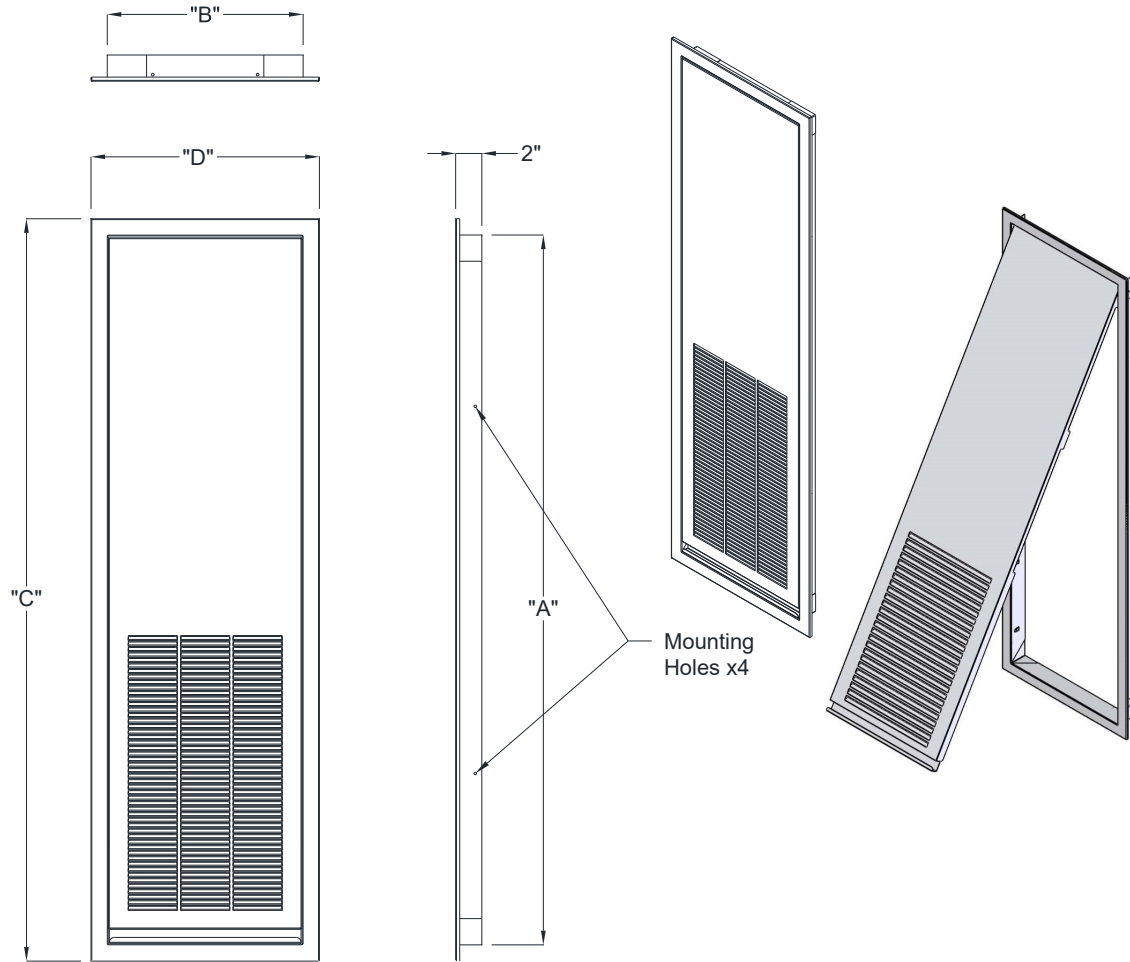


Hose Kit Details



5. RETURN AIR PANELS

5.1 Acoustic Front Return Air Panel



Acoustic Panel Sizes

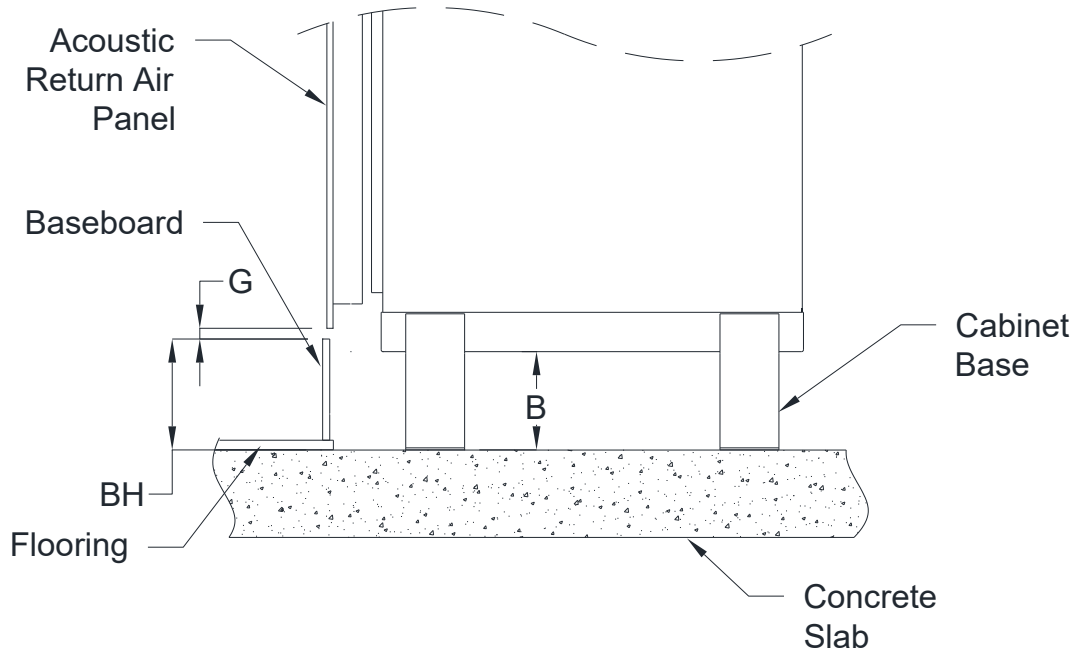
Model	Cabinet Size	Acoustic RA Panel Dimensions (inches)			
		A	B	C	D
VSHP 020	X	54	15 1/4	56 1/2	17 5/8
VSHP 030					
VSHP 040					
VSHP 050	Y	54	17 1/4	56 1/2	19 5/8
VSHP 060					
VSHP 080	Z	54	21 1/4	56 1/2	23 5/8
VSHP 100					
VSHP 120					

Notes:

- Panel is lined with acoustic insulation for enhanced sound attenuation.
- Return air panel supplied in standard powder coat appliance white finish.



5.2 Acoustic Panel Cabinet Base Height Calculation



Acoustic Panel Cabinet Base Height Calculation:

BH = Baseboard Height + Finish Floor Height*

G = Gap (min 0.5") between baseboard and panel.

B = Cabinet Base Height
(Min. 5", increases in 1" increments)

$$B = BH + G - 1.5''$$

Note: *Include flooring thickness, underlayment, and any concrete leveling as part of calculation.

Example:

If using a 5" baseboard, with 1" Finished Flooring height, and 0.5" gap:

$$B = (5'' + 1'') + (0.5'') - 1.5''$$

$$B = 5''$$

Therefore a 5" Cabinet Base is required.

Example: Baseboard to Base Height Table

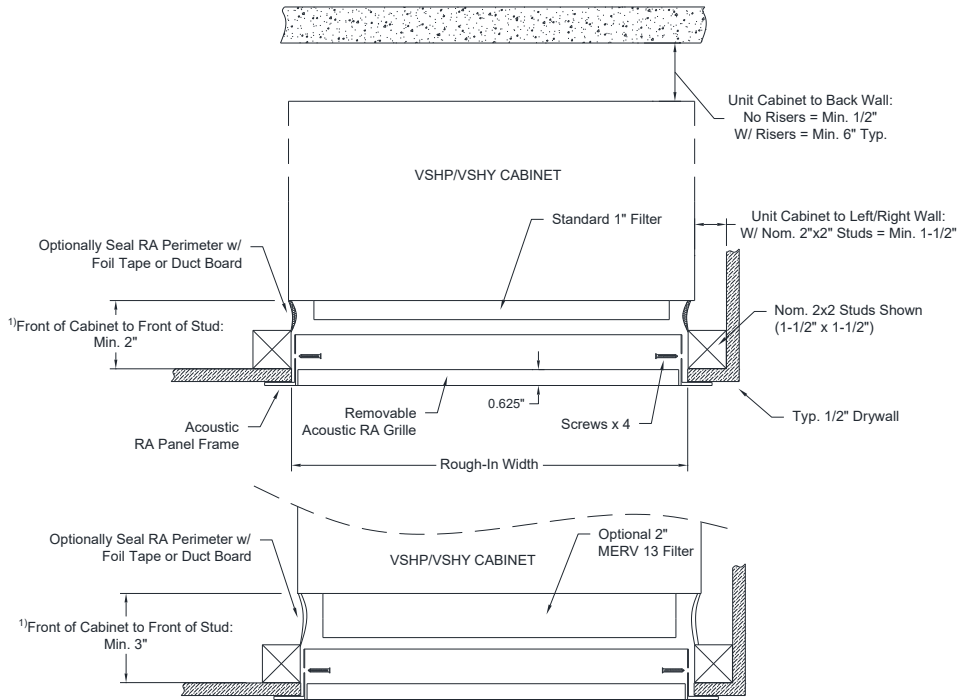
Baseboard Height*	Cabinet Base Height
Up to 5"	5"
>5" to 6"	6"
>6" to 7"	7"
>7" to 8"	8"

*Includes 1" Total Flooring

*Using gap G= 0.5" (from top of baseboard to return panel flange)



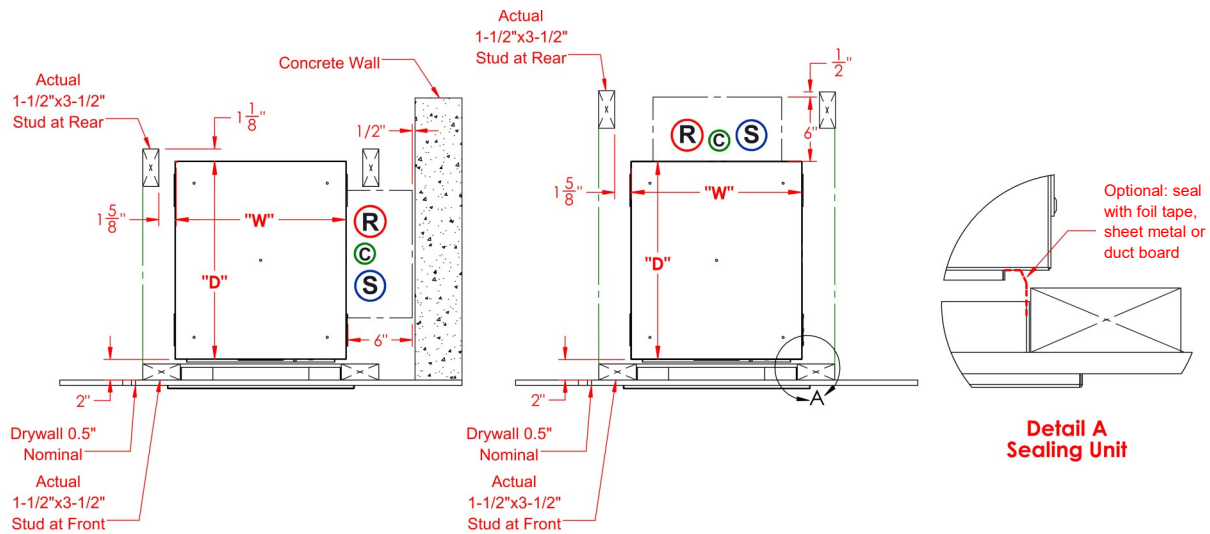
5.3 Acoustic Front R/A Panel Furring Details



Acoustic Panel Furring Detail—Typ. 2x2 Framing Plan View

Notes:

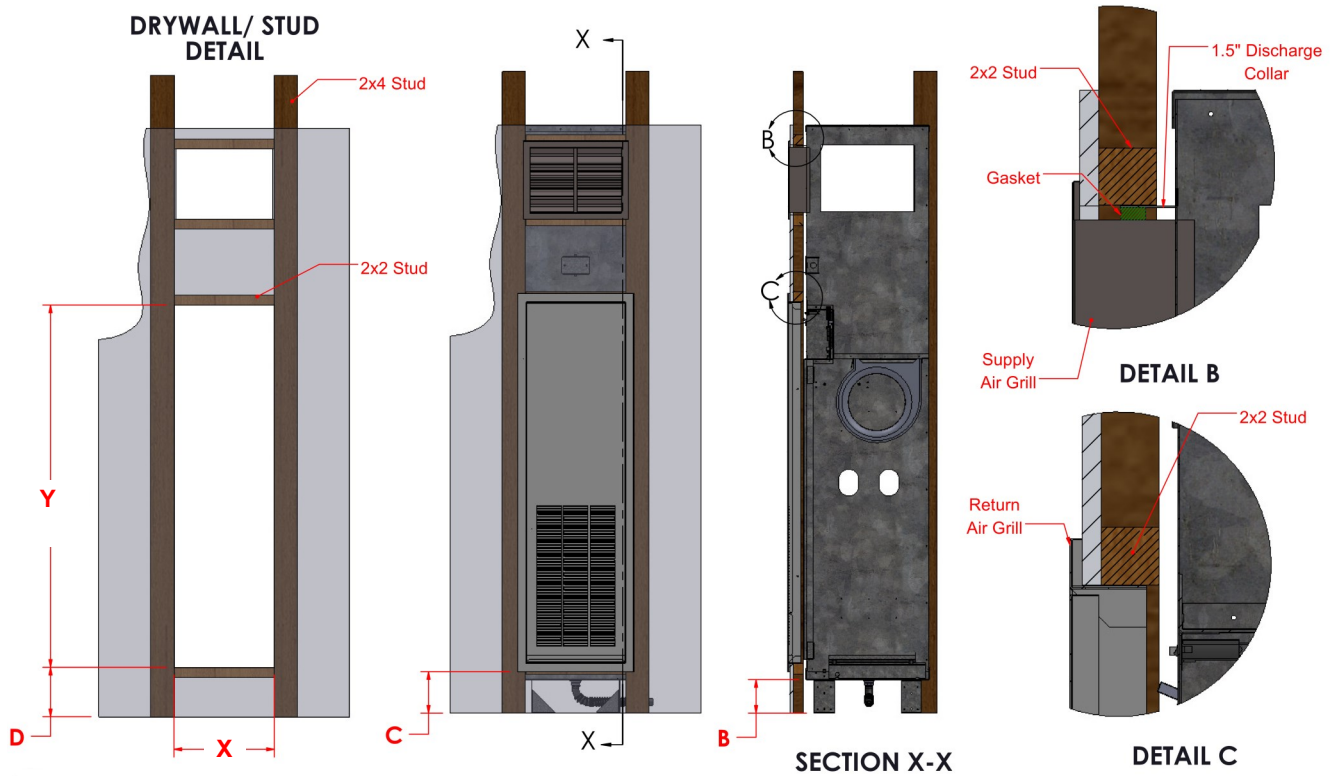
- 1) Provide 2" from framing stud to cabinet. With optional 2-inch MERV 13 filter provide 3" from front of stud or min 1-1/2" from back of stud to cabinet. With optional flange, provide gap min. 1/2" from stud to flange.
- 2) Return air panel should be centered in front of the unit return air opening.
- 3) With rear/side risers, allow for min. 6" typical clearance at the rear/side of the units.
- 4) For additional sound attenuation insulate the closet cavity with plenum rated acoustical insulation.



Acoustic Panel Furring Detail—Typ. 2x4 Framing Plan View



5.3 Acoustic Front R/A Panel Furring Details (Cont'd)



Acoustic Panel Furring Detail—Front & Side View

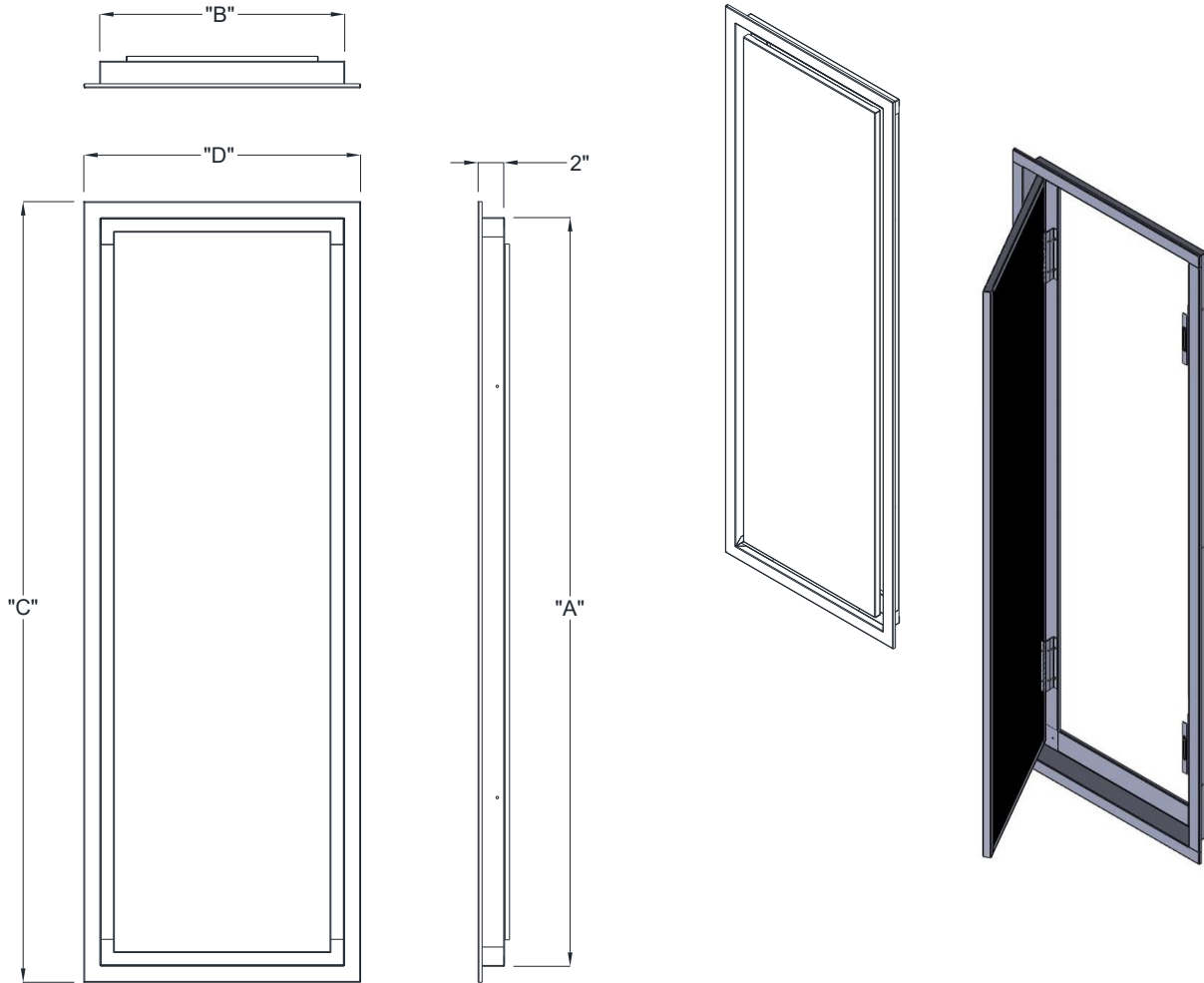
- B** = Cabinet Base Height (Min 5", increases in 1" increments)
- C** = Flange Height Above Floor (B + 1.25")
- D** = Rough-In Height Above Floor (B + 2.5")

Acoustic Panel Rough-In Dimensions

Model	Cabinet Size	Cabinet Dimensions (in)		Rough-In (in)	
		W	D	"X"	"Y"
VSHP 020G	X	16	17 1/2	15 3/4	54 1/2
VSHP 030G					
VSHP 040G					
VSHP 050G	Y	18	20 1/2	17 3/4	54 1/2
VSHP 060G					
VSHP 080G	Z	22	24 1/2	21 3/4	54 1/2
VSHP 100G					
VSHP 120G					



5.4 Perimeter Front Return Air Panel



Perimeter Panel Sizes

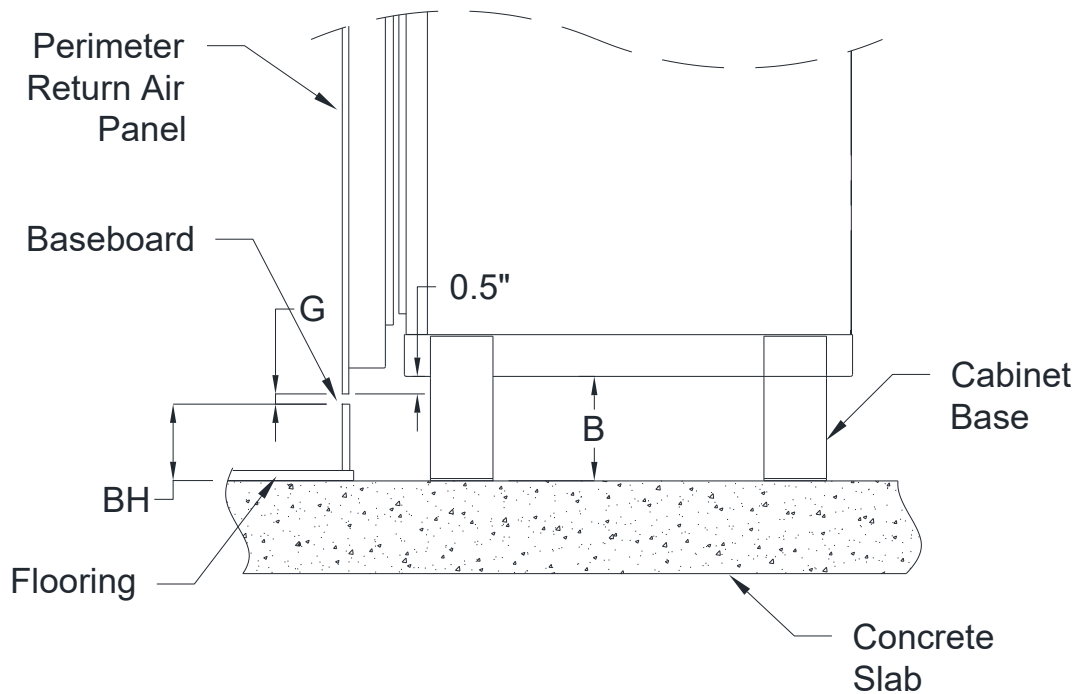
Model	Cabinet Size	Perimeter RA Panel Dimensions (inches)			
		A	B	C	D
VSHP 020	X	58 1/4	19 1/8	60 3/4	21 5/8
VSHP 030					
VSHP 040					
VSHP 050	Y	58 1/4	21 1/8	60 3/4	23 5/8
VSHP 060					
VSHP 080	Z	58 1/4	25 1/8	60 3/4	27 5/8
VSHP 100					
VSHP 120					

Notes:

- Return Panel interior is lined with 1/2 inch acoustic insulation for enhanced sound attenuation.
- Return air panel supplied in standard powder coat white finish.



5.5 Perimeter Panel Cabinet Base Height Calculation



Perimeter Panel Cabinet Base Height Calculation:

BH = Baseboard Height + Finish Floor Height*

G = Gap (min 0.5")

B = Cabinet Base Height
(Min. 5", increases in 1" increments)

$$B = BH + G + 0.5"$$

Note: *Include flooring thickness, underlayment, and any concrete leveling as part of calculation.

Example:

If using a 5" baseboard, with 1" Finished Flooring height, and 0.5" gap:

$$B = (5" + 1") + (0.5") + 0.5"$$

$$B = 7"$$

Therefore a 7" Cabinet Base is required.

Example: Baseboard to Base Height Table

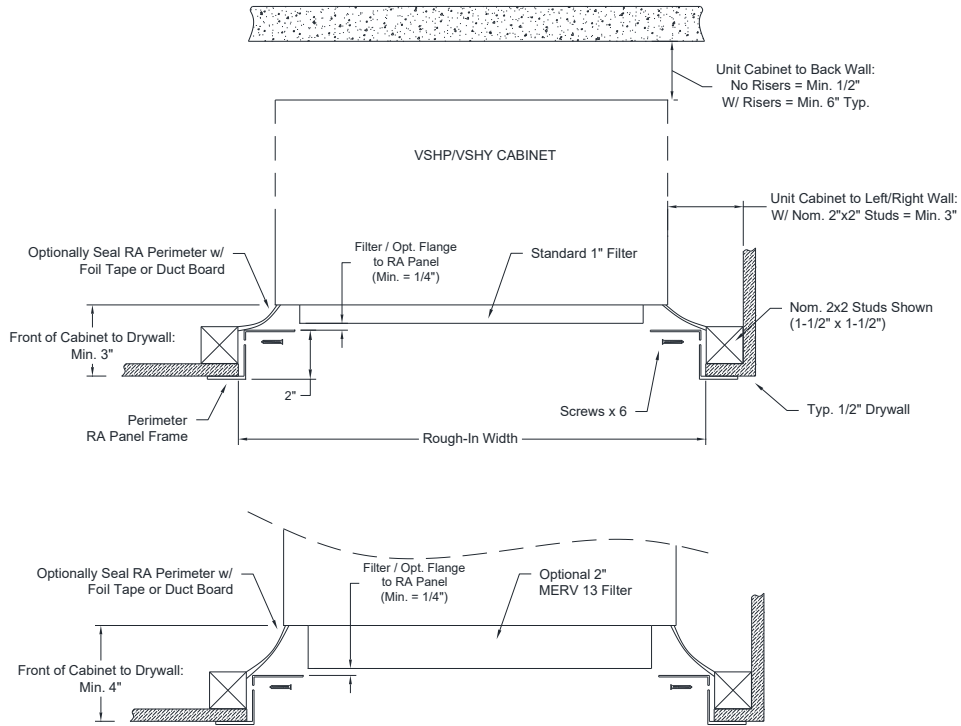
Baseboard Height*	Cabinet Base Height
Up to 3"	5"
>3" to 4"	6"
>4" to 5"	7"
>5" to 6"	8"

*Includes 1" Total Flooring

*Using gap G= 0.5" (from top of baseboard to return panel flange)



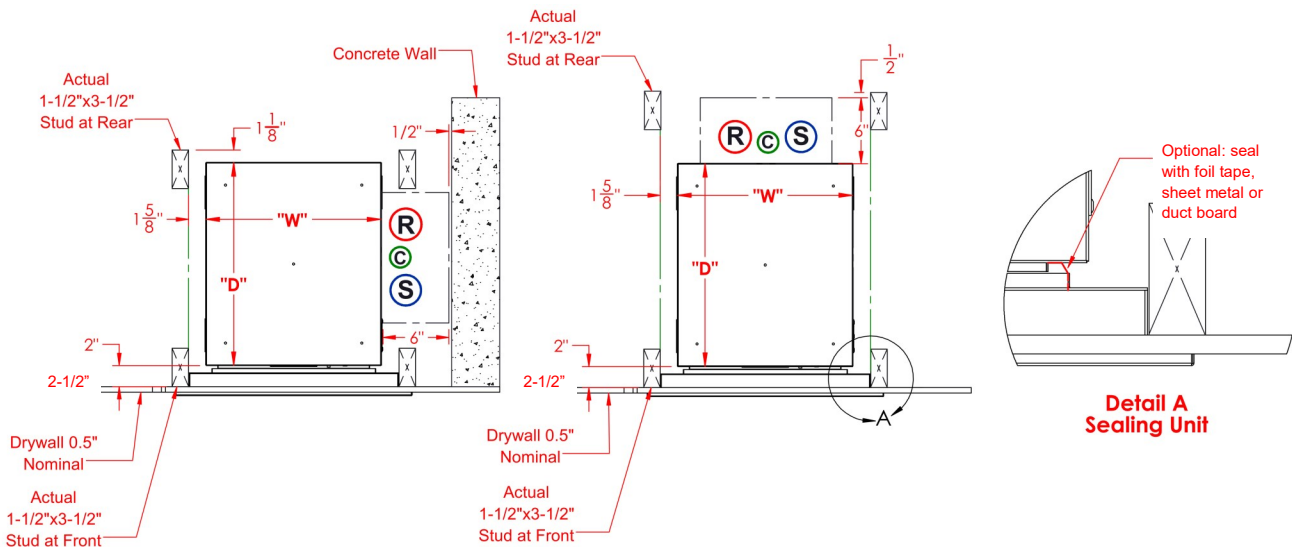
5.6 Perimeter Front R/A Panel Furring Details



Perimeter Panel Furring Drawing—Typ. 2x2 Framing Plan View

Notes:

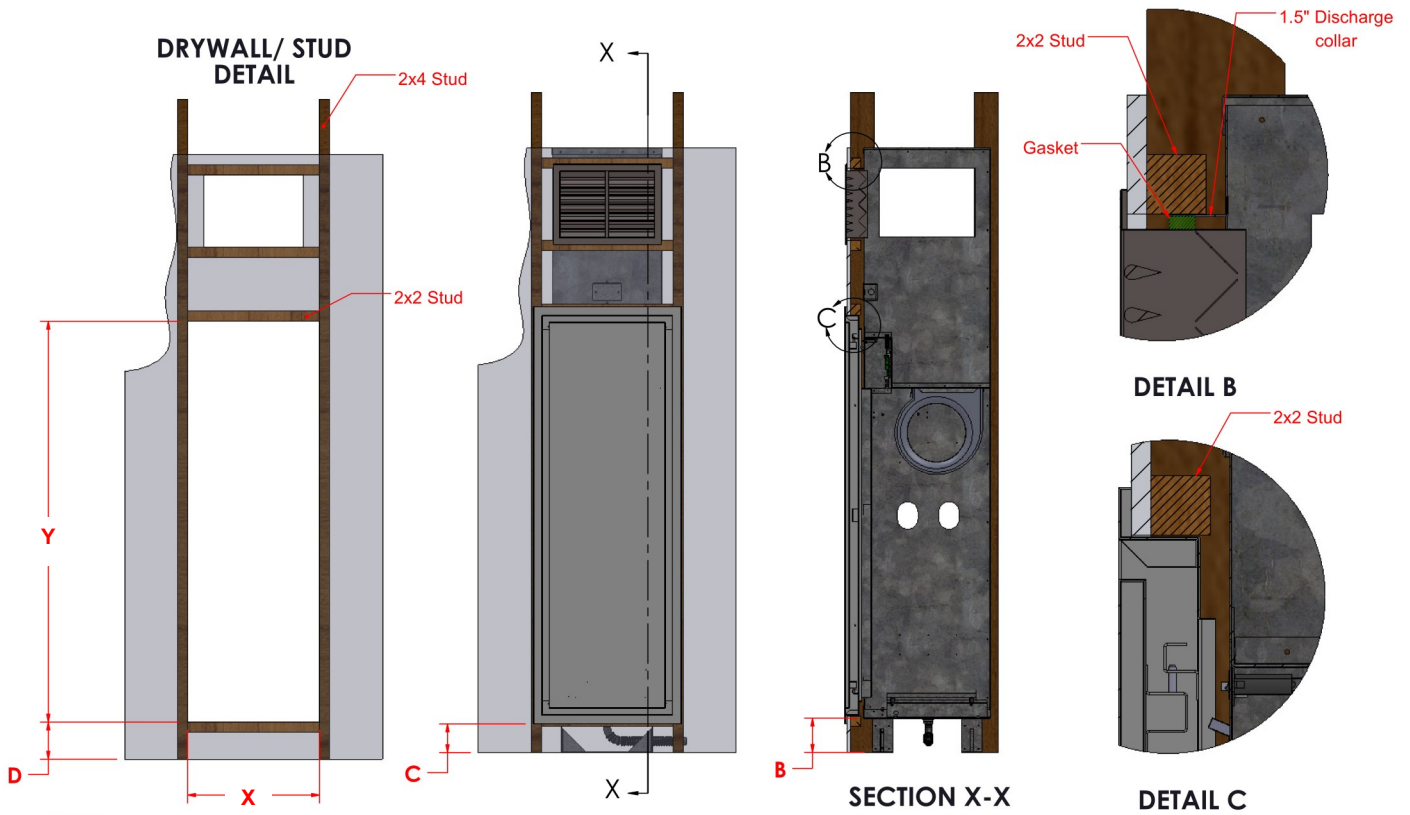
- 1) Provide gap of 3" from framing finished drywall to cabinet. With optional 2-inch MERV 13 filter provide 4" from finished drywall to cabinet. With optional flange, provide gap min. 1/4" from RA Panel to flange.
- 2) Return air panel should be centered in front of the unit return air opening.
- 3) With rear/side risers, allow for min. 6" typical clearance at the rear/side of the units.
- 4) For additional sound attenuation insulate the closet cavity with plenum rated acoustical insulation.



Perimeter Panel Furring Drawing—Typ. 2x4 Framing Plan View



5.6 Perimeter Front R/A Panel Furring Details (Cont'd)



- B** = Cabinet Base Height (Min 5", increases in 1" increments)
- C** = Flange Height Above Floor (B - 0.5")
- D** = Rough-In Height Above Floor (B + 0.625")

Perimeter Panel Rough-In Dimensions

Model	Cabinet Size	Cabinet Dimensions (in)		Rough-In (in)	
		W	D	"X"	"Y"
VSHP 020G	X	16	17 1/2	19 1/2	58 3/4
VSHP 030G					
VSHP 040G					
VSHP 050G	Y	18	20 1/2	21 1/2	58 3/4
VSHP 060G					
VSHP 080G	Z	22	24 1/2	25 1/2	58 3/4
VSHP 100G					
VSHP 120G					



6. PERFORMANCE & ELECTRICAL DATA

6.1 ISO Performance Data

Unit Model	Refrig.	Air Flow (SCFM)	Water Flow (GPM)	WPD (FT)	WLHP Cooling ¹		WLHP Heating ¹		GLHP Cooling ²		GLHP Heating ²	
					Capacity (BTUH)	EER	Capacity (BTUH)	COP	Capacity (BTUH)	EER	Capacity (BTUH)	COP
VSHP 020	R-410A	200	1.5	3.3	6,500	12.9	8,500	4.4	6,700	14.1	5,300	3.2
VSHP 030	R-410A	350	2.6	11.0	8,900	12.5	11,900	4.5	9,200	14.1	7,500	3.2
VSHP 040	R-410A	460	3.5	11.1	11,600	13.5	14,700	4.5	12,000	15.3	9,200	3.2
VSHP 050	R-410A	530	4.0	14.3	15,000	15.0	17,200	4.8	15,600	16.5	10,800	3.3
VSHP 060	R-410A	630	5.1	20.2	17,900	14.5	22,500	4.5	18,600	15.7	14,000	3.2
VSHP 080	R-410A	820	6.7	10.2	23,000	14.5	28,000	4.5	23,900	15.7	17,500	3.2
VSHP 100	R-410A	1010	7.9	14.2	28,700	14.5	35,500	4.6	29,900	15.6	22,200	3.2
VSHP 120	R-410A	1200	9.0	18.4	36,000	13.0	46,000	4.3	36,200	15.0	28,700	3.2

¹Performance based on ARI/ISO 13256-1 Water Loop conditions at 86F EWT Cooling, 68F EWT Heating.

²Performance based on ARI/ISO 13256-1 Ground Loop conditions at 77F EWT Cooling, 32F EWT Heating.

Cooling performance shown is for 80.6F DB and 66.2F WB entering air.

Heating performance shown based on 68F entering air.

6.2 Electrical Data

VSHP SE - PSC Motor

Model	Supply Voltage	Compressor			Blower		Total Unit FLA	MCA	MaxFuse/Circuit Breaker
		Qty	RLA	LRA	HP	FLA			
VSHP 020	208-230/1/60	1	@ 3.0	15.0	1/10	0.7	3.7	4.5	15
VSHP 030	208-230/1/60	1	@ 3.7	22.0	1/10	0.7	4.4	5.3	15
VSHP 040	208-230/1/60	1	@ 4.7	25.0	1/10	0.7	5.4	6.6	15
VSHP 050	208-230/1/60	1	@ 5.6	26.0	1/5	1.5	7.1	8.5	15
VSHP 060	208-230/1/60	1	@ 7.4	33.0	1/5	1.5	8.9	10.7	15
VSHP 080	208-230/1/60	1	@ 10.9	62.9	1/3	2.8	13.7	16.4	25
VSHP 100	208-230/1/60	1	@ 13.5	72.5	1/2	3.6	17.1	20.5	30
VSHP 120	208-230/1/60	1	@ 15.4	83.9	3/4	5.0	20.4	24.3	35

VSHP SE - ECM Fan

Model	Supply Voltage	Compressor			Blower		Total Unit FLA	MCA	MaxFuse/Circuit Breaker
		Qty	RLA	LRA	HP	FLA			
VSHP 020G	208-230/1/60	1	@ 3.0	15.0	1/4	1.0	4.0	4.8	15
VSHP 030G	208-230/1/60	1	@ 3.7	22.0	1/4	1.0	4.7	5.6	15
VSHP 040G	208-230/1/60	1	@ 4.7	25.0	1/4	1.1	5.8	7.0	15
VSHP 050G	208-230/1/60	1	@ 5.6	29.0	1/3	2.0	7.6	9.0	15
VSHP 060G	208-230/1/60	1	@ 7.4	33.0	1/3	2.4	9.8	11.7	15
VSHP 080G	208-230/1/60	1	@ 10.9	62.9	1/2	2.6	13.5	16.2	25
VSHP 100G	208-230/1/60	1	@ 13.5	72.5	1/2	4.2	17.7	21.1	30
VSHP 120G	208-230/1/60	1	@ 15.4	83.9	1/2	4.2	19.6	23.5	35

Minimum voltage 200 V. Operating voltage 208-230 V, single phase

Adhere to all applicable electrical codes

RLA - Rated load amps

LRA - Locked rotor amps

FLA - Full load amps



6.3 PSC Motor Fan Data

Model	Min. SCFM	Rated SCFM	Speed	External Static Pressure (in w.g.)						
				0	0.1	0.2	0.3	0.4	0.5	0.6
				SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM
020	150	200	LOW	285	230	210	195	160	-	-
			MED	320	270	250	225	200	160	-
			HIGH	430	355	340	315	280	240	185
030	210	350	LOW	275	235	220	-	-	-	-
			MED	310	275	250	230	-	-	-
			HIGH	405	370	350	315	280	235	-
040	270	460	LOW	340	300	275	-	-	-	-
			MED	410	370	350	338	315	-	-
			HIGH	600	550	520	500	380	310	-
050	370	530	LOW	560	510	475	450	-	-	-
			MED	645	585	550	505	460	415	-
			HIGH	765	715	670	630	585	530	455
060	410	630	LOW	560	510	475	450	-	-	-
			MED	645	585	550	505	460	415	-
			HIGH	765	715	670	630	585	530	455
080	270	820	LOW	785	735	700	655	615	570	-
			MED	855	790	750	710	670	615	-
			HIGH	895	840	790	745	710	645	600
100	640	1010	LOW	895	855	790	745	670	-	-
			MED	1045	970	925	855	785	710	-
			HIGH	1155	1075	1010	935	845	775	670
120	740	1200	LOW	1155	1080	1015	950	875	790	-
			MED	1170	1095	1025	970	890	800	-
			HIGH	1225	1150	1080	1000	935	850	760

Note: All airflow ratings are taken at lowest voltage rating of dual rating (ie. 208 volt).
 Airflow ratings include resistance of dry coil, Return Air panel and clean MERV10 air filters.
 Please call customer service for external static pressure requirements exceeding 0.5" w.g.



6.4 EC Motor (ECM) Fan Data

Model	EC Motor Speed	External Static Pressure Option	Min. SCFM	Rated SCFM	External Static Pressure (in w.g.)												
					0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6
					SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM
020	WHISPER* MODE	N/A	N/A	N/A	210	195	180	160	145	130	115	100	75	55	-	-	-
	LOW	LOW ESP	150	200	250	240	225	210	200	185	150	-	-	-	-	-	-
	MED				-	-	255	240	225	215	200	190	175	165	150	-	-
	MED	HIGH ESP			-	-	255	240	225	215	200	190	175	165	150	-	-
	HIGH				-	-	-	-	260	240	230	220	210	195	185	175	165
WHISPER* MODE	N/A				N/A	N/A	225	210	195	175	160	145	130	115	100	85	70
030	LOW	LOW ESP	220	350	315	305	295	285	275	265	250	240	225	-	-	-	-
	MED				350	340	335	325	315	305	295	285	275	265	255	245	235
	MED	HIGH ESP			350	340	335	325	315	305	295	285	275	265	255	245	235
	HIGH				-	-	365	355	350	340	330	320	310	305	295	285	275
	WHISPER* MODE				N/A	N/A	N/A	250	230	225	205	180	160	145	125	110	90
040	LOW	LOW ESP	300	460	410	400	390	380	370	365	350	340	330	325	310	300	-
	MED				460	450	445	440	430	425	415	405	395	385	375	365	355
	MED	HIGH ESP			460	450	445	440	430	425	415	405	395	385	375	365	355
	HIGH				-	-	-	-	470	465	455	445	435	430	420	410	400
	WHISPER* MODE				N/A	N/A	N/A	450	430	410	390	370	350	320	300	270	250
050	LOW	LOW ESP	375	530	520	510	490	470	450	430	410	390	375	-	-	-	-
	MED				-	-	550	540	520	505	485	470	450	430	410	390	375
	MED	HIGH ESP			-	-	550	540	520	505	485	470	450	430	410	390	375
	HIGH				-	-	-	-	-	-	555	540	525	510	490	475	460
	WHISPER* MODE				N/A	N/A	N/A	450	430	410	390	370	350	320	300	270	250
060	LOW	LOW ESP	450	630	580	565	550	540	520	505	485	470	450	-	-	-	-
	MED				640	620	610	595	580	565	555	540	525	510	490	475	460
	MED	HIGH ESP			640	620	610	595	580	565	555	540	525	510	490	475	460
	HIGH				-	-	675	670	655	650	640	620	610	595	580	565	550
	WHISPER* MODE				N/A	N/A	N/A	620	580	560	520	480	440	410	380	340	300
080	LOW	LOW ESP	600	820	800	760	740	720	695	660	640	620	-	-	-	-	-
	MED				880	860	840	820	800	780	750	720	700	670	650	625	600
	MED	HIGH ESP			880	860	840	820	800	780	750	720	700	670	650	625	600
	HIGH				-	-	-	-	895	880	860	820	805	795	780	770	760
	WHISPER* MODE				N/A	N/A	N/A	620	580	560	520	480	440	410	380	340	300
100	LOW	LOW ESP	750	1010	960	940	920	890	860	840	820	800	775	750	-	-	-
	MED				1080	1060	1040	1010	990	970	950	930	900	880	860	840	820
	MED	HIGH ESP			1080	1060	1040	1010	990	970	950	930	900	880	860	840	820
	HIGH				-	-	-	-	1110	1090	1070	1060	1040	1020	990	980	960
	WHISPER* MODE				N/A	N/A	N/A	620	580	560	520	480	440	410	380	340	300
120	LOW	LOW ESP	900	1200	1120	1100	1090	1070	1050	1025	1010	990	970	940	920	-	-
	MED				1230	1200	1185	1170	1150	1130	1110	1095	1080	1055	1040	1020	1000
	MED	HIGH ESP			1230	1200	1185	1170	1150	1130	1110	1095	1080	1055	1040	1020	1000
	HIGH				1320	1290	1275	1260	1240	1225	1205	1190	1175	1160	1140	1120	1100
	WHISPER* MODE				N/A	N/A	N/A	620	580	560	520	480	440	410	380	340	300

Note: All airflow ratings are taken at lowest voltage rating of dual rating (ie. 208 volt).
 Airflow ratings include resistance of dry coil, Return Air panel and clean MERV10 air filters.
 *Optional "Whisper" mode is Fan On, Compressor Off mode for constant fresh air circulation. Low Fan Speed is not available in Whisper mode.



6.5 Physical Data

Model Series	VSHP020G	VSHP030G	VSHP040G	VSHP050G	VSHP060G	VSHP080G	VSHP100G	VSHP120G
Nominal Cooling (Ton) ¹	0.50	0.75	1.0	1.25	1.50	2.0	2.5	3.0
Compressor-Type	High Efficiency Rotary					High Efficiency Scroll		
Refrigerant Charge (ozs)	17	23	29	36	38	44	47	49
Air Coil-Type	Enhanced Copper tubes, Enhanced Aluminum Fins							
Face Area(sq ft)	1.46	1.46	1.46	2.30	2.30	2.81	3.10	3.10
Rows/FPI	2/14	2/14	3/14	3/14	3/14	3/14	3/14	3/14
Water Coil-Type	High Efficiency Co-Axial							
Hose Size (in)	1/2"					3/4"		
Water Connections	1/2" NPSM					3/4" NPSM		
Drain Connection Size	7/8" ID (Standard)							
Standard Blower / Motor	DWDI Forward-Curved Centrifugal / Direct-Drive							
Diameter x Width (in)	9x4T	9x4T	9x4T	9x6	9x6	10X7T	10X7	10X7
Motor Type	ECM	ECM	ECM	ECM	ECM	ECM	ECM	ECM
Motor HP/Speeds	0.25/3	0.25/3	0.25/3	0.25/3	0.33/3	0.5/3	0.50/3	0.50/3
Standard 1" Filter MERV8	1-14x25x1			1-16x30x1		1-20x30x1		
Optional 2" Filter MERV13	1-14x25x2			1-16x30x2		1-20x30x2		
VSHP Chassis Weight (lb)	65	72	77	105	110	150	165	175

6.6 Unit Weights & Fluid Volume

Model	Cabinet Size	Cabinet (lbs)	Chassis (lbs)	Total Chassis Fluid Volume*	
				Fluid Volume (In ³)	Fluid Volume (US gallons)
VSHP 020G	X	153	65	30.4	0.13
VSHP 030G			72	30.4	0.13
VSHP 040G			77	33.8	0.15
VSHP 050G	Y	158	105	49.8	0.22
VSHP 060G			110		
VSHP 080G	Z	223	150	134.0	0.58
VSHP 100G			165		
VSHP 120G			233		

*Note: Volume includes chassis and hoses.



6.7 Expanded Heating & Cooling Performance Tables

VSHP 020 Performance Data															
		COOLING							HEATING						
GPM	WPD	EWT	LWT	TOT	SEN	WATT	EER	THR	EWT	LWT	TOT	WATT	COP	THA	
US GPM	FT	°F	°F	BTUH	BTUH			BTUH	°F	°F	BTUH			BTUH	
1.2	3.0								20	18.8	2128	418	1.79	695	
1.7	5.8								20	19.2	2194	414	1.87	720	
2.1	8.8								20	19.3	2246	388	2.02	736	
2.5	12.4								20	19.4	2298	342	2.26	750	
1.2	2.8		43.2	7066	4615	247	24.66	7922	30	27.0	3276	436	2.40	1789	
1.7	5.5		39.4	7204	4686	237	26.23	8031	30	27.8	3376	431	2.50	1852	
2.1	8.3		37.8	7261	4743	229	27.40	8143	30	28.2	3457	404	2.71	1894	
2.5	11.7		36.6	7270	4799	221	28.48	8277	30	28.5	3537	356	3.03	1930	
1.2	2.7		53.2	7014	4643	272	22.18	7944	40	35.3	4361	452	2.95	2823	
1.7	5.2		49.5	7151	4714	261	23.60	8053	40	36.6	4495	447	3.07	2922	
2.1	7.9		47.8	7207	4771	252	24.65	8165	40	37.2	4602	418	3.33	2990	
2.5	11.1		46.6	7216	4828	243	25.62	8299	40	37.6	4709	369	3.73	3046	
1.2	2.5		63.2	6880	4634	304	19.78	7913	50	43.7	5385	466	3.45	3799	
1.7	4.9		59.4	7015	4705	292	21.04	8021	50	45.4	5550	461	3.60	3933	
2.1	7.5		57.7	7070	4762	282	21.98	8133	50	46.2	5682	432	3.90	4023	
2.5	10.5		56.6	7079	4819	272	22.85	8266	50	46.7	5814	381	4.36	4099	
1.2	2.4		73.0	6665	4591	345	17.45	7829	60	52.1	6346	480	3.91	4716	
1.7	4.7		69.3	6795	4661	331	18.57	7936	60	54.3	6540	474	4.07	4882	
2.1	7.1		67.7	6849	4717	319	19.39	8047	60	55.2	6696	445	4.41	4994	
2.5	10.0		66.5	6858	4774	308	20.16	8179	60	55.9	6852	392	4.93	5089	
1.2	2.3		82.8	6369	4511	393	15.20	7693	70	60.7	7245	492	4.31	5574	
1.7	4.5		79.2	6493	4580	377	16.17	7798	70	63.2	7467	486	4.49	5771	
2.1	6.8		77.5	6545	4636	364	16.89	7907	70	64.4	7645	456	4.86	5904	
2.5	9.5		76.4	6553	4691	351	17.56	8037	70	65.2	7823	402	5.44	6015	
1.2	2.2		92.5	5991	4396	450	13.02	7504	80	69.4	8081	503	4.66	6374	
1.7	4.3		88.9	6108	4464	431	13.85	7607	80	72.2	8329	497	4.85	6599	
2.1	6.5		87.3	6157	4518	416	14.46	7713	80	73.6	8528	466	5.26	6751	
2.5	9.1		86.3	6164	4572	401	15.04	7839	80	74.5	8726	411	5.89	6878	
1.2	2.2		97.3	5772	4326	481	11.95	7390	85	73.7	8476	508	4.82	6752	
1.7	4.2		93.8	5885	4392	461	12.72	7491	85	76.8	8736	502	5.02	6990	
2.1	6.4		92.2	5931	4445	445	13.28	7595	85	78.2	8945	470	5.44	7151	
2.5	9.0		91.2	5938	4498	429	13.81	7720	85	79.2	9153	415	6.08	7286	
1.2	2.1		102.1	5532	4246	514	10.91	7263	90	78.1	8856	512	4.96	7115	
1.7	4.1		98.7	5640	4311	493	11.60	7362	90	81.3	9128	507	5.17	7366	
2.1	6.3		97.1	5685	4363	476	12.12	7465	90	82.8	9345	475	5.60	7535	
2.5	8.8		96.1	5692	4415	459	12.60	7587	90	83.9	9562	418	6.26	7677	
1.2	2.0		111.6	4992	4060	587	8.87	6969							
1.7	4.0		108.3	5090	4122	562	9.44	7064							
2.1	6.1		106.8	5130	4172	543	9.86	7163							
2.5	8.5		105.8	5136	4222	523	10.25	7280							
1.2	2.0		121.0	4370	3838	667	6.91	6623							
1.7	3.9		117.9	4456	3897	640	7.35	6713							
2.1	5.9		116.5	4491	3944	617	7.68	6807							
2.5	8.3		115.5	4497	3991	595	7.98	6919							

Cooling capacity is based on 80.6°F DB and 66.2°F WB entering air.

Heating capacity is based on 68°F DB entering air.

*See correction factor in section 8 for capacity multipliers at other conditions.



VSHP 030 Performance Data															
		COOLING							HEATING						
GPM	WPD	EWT	LWT	TOT	SEN	WATT	EER	THR	EWT	LWT	TOT	WATT	COP	THA	
US GPM	FT	°F	°F	BTUH	BTUH			BTUH	°F	°F	BTUH			BTUH	
1.3	3.7								20	15.2	5301	660	2.14	3133	
1.8	6.9									16.4	5487	665	2.20	3262	
2.4	12.1									17.2	5669	671	2.26	3391	
2.6	14.2									17.4	5719	672	2.27	3428	
1.3	3.5	30	49.1	10775	7077	486	26.04	12442	30	23.5	6455	679	2.61	4202	
1.8	6.6		43.9	10977	7146	471	27.43	12545		25.1	6681	684	2.68	4376	
2.4	11.6		40.5	11179	7245	449	29.21	12631		26.2	6903	690	2.75	4549	
2.6	13.5		39.7	11237	7282	440	29.83	12651		26.5	6965	692	2.77	4598	
1.3	3.4	40	58.8	10456	7027	521	22.80	12224	40	31.8	7629	698	3.08	5299	
1.8	6.3		53.7	10652	7096	505	24.02	12325		33.9	7897	703	3.16	5517	
2.4	11.0		50.3	10848	7195	481	25.57	12410		35.2	8160	709	3.24	5735	
2.6	12.9		49.6	10905	7231	471	26.11	12429		35.5	8233	711	3.26	5797	
1.3	3.2	50	68.5	10102	6945	564	19.79	11999	50	40.1	8825	715	3.54	6422	
1.8	6.0		63.4	10291	7013	547	20.85	12099		42.6	9135	721	3.63	6687	
2.4	10.6		60.2	10481	7110	520	22.20	12182		44.2	9438	727	3.72	6951	
2.6	12.4		59.4	10535	7146	510	22.67	12201		44.6	9522	728	3.74	7026	
1.3	3.1	60	78.1	9712	6829	616	17.02	11769	60	48.4	10041	732	3.99	7572	
1.8	5.8		73.2	9894	6895	596	17.93	11867		51.2	10393	737	4.09	7885	
2.4	10.2		70.0	10077	6991	568	19.09	11948		53.2	10738	743	4.20	8196	
2.6	11.9		69.2	10129	7027	557	19.50	11967		53.6	10834	745	4.22	8285	
1.3	3.0	70	87.7	9287	6679	675	14.48	11533	70	56.5	11277	747	4.43	8750	
1.8	5.6		82.9	9461	6744	654	15.26	11629		59.9	11673	753	4.55	9111	
2.4	9.8		79.8	9636	6838	623	16.25	11709		62.1	12061	759	4.66	9471	
2.6	11.5		79.0	9686	6873	610	16.59	11727		62.6	12169	761	4.69	9573	
1.3	2.9	80	97.4	8827	6496	743	12.18	11291	80	64.7	12534	762	4.87	9954	
1.8	5.4		92.6	8992	6560	720	12.83	11384		68.5	12974	768	5.00	10365	
2.4	9.5		89.6	9158	6651	685	13.66	11462		71.0	13405	774	5.12	10774	
2.6	11.2		88.8	9206	6685	672	13.95	11480		71.6	13525	776	5.16	10891	
1.3	2.9	85	102.2	8584	6392	780	11.12	11167	85	68.7	13171	769	5.09	10566	
1.8	5.4		97.5	8744	6455	755	11.71	11260		72.8	13633	775	5.22	11002	
2.4	9.4		94.4	8906	6544	719	12.47	11337		75.5	14086	782	5.35	11437	
2.6	11.0		93.7	8952	6577	705	12.74	11355		76.1	14212	784	5.39	11560	
1.3	2.8	90	107.0	8331	6279	819	10.11	11042	90	72.8	13812	776	5.30	11185	
1.8	5.3		102.4	8487	6341	793	10.65	11134		77.1	14297	782	5.44	11646	
2.4	9.3		99.3	8644	6429	755	11.35	11210		79.9	14772	789	5.58	12107	
2.6	10.9		98.6	8689	6462	740	11.59	11228		80.6	14904	791	5.62	12238	
1.3	2.8	100	116.6	7800	6030	903	8.28	10788							
1.8	5.2		112.1	7946	6089	875	8.72	10877							
2.4	9.1		109.1	8093	6173	833	9.29	10952							
2.6	10.7		108.4	8135	6205	816	9.49	10969							
1.3	2.7	110	126.2	7234	5746	995	6.68	10527							
1.8	5.2		121.8	7369	5803	964	7.04	10615							
2.4	9.0		118.9	7505	5883	918	7.50	10688							
2.6	10.6		118.2	7544	5913	900	7.66	10704							

Cooling capacity is based on 80.6°F DB and 66.2°F WB entering air.
 Heating capacity is based on 68°F DB entering air.
 *See correction factor in section 8 for capacity multipliers at other conditions.



VSHP 040 Performance Data															
		COOLING							HEATING						
GPM	WPD	EWT	LWT	TOT	SEN	WATT	EER	THR	EWT	LWT	TOT	WATT	COP	THA	
US GPM	FT	°F	°F	BTUH	BTUH			BTUH	°F	°F	BTUH			BTUH	
1.7	3.8								20	15.2	6789	791	2.55	4086	
2.4	7.4									16.4	7044	796	2.62	4270	
3.3	13.8									17.3	7267	802	2.69	4438	
3.5	15.4									17.4	7300	803	2.70	4465	
1.7	3.6	30	48.5	13971	9419	516	28.66	15743	30	23.6	8190	814	2.97	5416	
2.4	7.0		43.3	14308	9572	488	30.86	15910		25.3	8497	820	3.06	5659	
3.3	13.0		39.7	14487	9700	469	32.68	15991		26.4	8765	826	3.13	5882	
3.5	14.6		39.1	14488	9718	467	32.93	15989		26.6	8806	827	3.15	5918	
1.7	3.4	40	58.3	13659	9353	568	25.06	15592	40	32.0	9607	837	3.37	6759	
2.4	6.6		53.1	13989	9506	537	26.99	15758		34.1	9968	843	3.47	7063	
3.3	12.4		49.6	14164	9633	516	28.58	15838		35.6	10283	849	3.56	7341	
3.5	13.9		49.0	14164	9651	514	28.80	15836		35.8	10330	850	3.57	7386	
1.7	3.2	50	68.1	13267	9233	630	21.73	15392	50	40.5	11043	861	3.76	8115	
2.4	6.3		63.0	13587	9384	596	23.40	15556		42.9	11457	866	3.87	8481	
3.3	11.7		59.5	13757	9509	572	24.78	15635		44.7	11819	873	3.97	8814	
3.5	13.2		58.9	13758	9527	570	24.97	15633		44.9	11874	874	3.99	8868	
1.7	3.1	60	77.8	12794	9059	701	18.66	15144	60	48.8	12496	884	4.14	9485	
2.4	6.0		72.8	13103	9206	664	20.10	15304		51.7	12965	890	4.26	9912	
3.3	11.1		69.3	13266	9330	637	21.29	15382		53.8	13375	896	4.37	10302	
3.5	12.5		68.8	13267	9347	635	21.45	15380		54.1	13436	898	4.39	10365	
1.7	2.9	70	87.5	12240	8830	783	15.86	14845	70	57.2	13967	907	4.50	10868	
2.4	5.7		82.5	12536	8974	741	17.08	15003		60.5	14491	913	4.64	11357	
3.3	10.6		79.1	12692	9094	712	18.09	15080		62.8	14949	920	4.76	11804	
3.5	11.9		78.6	12693	9111	709	18.23	15077		63.2	15018	921	4.78	11876	
1.7	2.8	80	97.1	11606	8546	875	13.32	14498	80	65.6	15455	930	4.85	12264	
2.4	5.4		92.2	11886	8686	828	14.34	14652		69.3	16035	937	5.00	12816	
3.3	10.1		88.9	12034	8802	795	15.19	14727		71.9	16542	944	5.13	13321	
3.5	11.4		88.4	12035	8818	792	15.31	14725		72.3	16618	945	5.15	13401	
1.7	2.7	85	101.8	11258	8384	925	12.15	14306	85	69.7	16206	942	5.03	12967	
2.4	5.3		97.0	11530	8521	875	13.08	14458		73.7	16814	949	5.18	13551	
3.3	9.9		93.8	11674	8635	841	13.85	14532		76.5	17345	956	5.31	14084	
3.5	11.1		93.3	11675	8651	837	13.96	14530		76.9	17426	957	5.33	14170	
1.7	2.7	90	106.6	10891	8208	977	11.04	14102	90	73.9	16961	954	5.19	13673	
2.4	5.2		101.9	11154	8342	925	11.89	14251		78.1	17597	960	5.35	14289	
3.3	9.7		98.7	11293	8454	888	12.59	14324		81.0	18154	967	5.49	14851	
3.5	10.9		98.2	11293	8469	885	12.69	14322		81.5	18238	969	5.51	14941	
1.7	2.6	100	116.1	10095	7816	1089	9.03	13656							
2.4	5.0		111.5	10338	7943	1031	9.72	13801							
3.3	9.3		108.4	10467	8050	990	10.30	13871							
3.5	10.4		107.9	10468	8065	986	10.37	13869							
1.7	2.5	110	125.5	9218	7369	1212	7.28	13161							
2.4	4.8		121.1	9441	7489	1146	7.84	13301							
3.3	9.0		118.1	9559	7589	1101	8.30	13369							
3.5	10.1		117.6	9559	7603	1097	8.36	13367							

Cooling capacity is based on 80.6°F DB and 66.2°F WB entering air.
 Heating capacity is based on 68°F DB entering air.
 *See correction factor in section 8 for capacity multipliers at other conditions.



VSHP 050 Performance Data															
		COOLING							HEATING						
GPM	WPD	EWT	LWT	TOT	SEN	WATT	EER	THR	EWT	LWT	TOT	WATT	COP	THA	
US GPM	FT	°F	°F	BTUH	BTUH			BTUH	°F	°F	BTUH			BTUH	
2.8	8.1								20	16.5	8036	918	2.56	4960	
3.5	12.5									17.1	8227	923	2.61	5104	
3.8	14.6									17.3	8288	924	2.62	5146	
4	16.1									17.4	8322	925	2.63	5167	
2.8	8.0	30	44.5	18343	12071	551	39.34	20324	30	25.3	9704	945	2.99	6516	
3.5	12.2		41.7	18536	12160	536	41.15	20412		26.2	9934	950	3.05	6705	
3.8	14.3		40.7	18575	12183	531	41.64	20423		26.4	10008	952	3.07	6761	
4	15.8		40.2	18586	12194	529	41.87	20421		26.6	10049	953	3.08	6789	
2.8	7.8	40	54.3	17809	11836	611	33.59	19983	40	34.2	11434	971	3.43	8143	
3.5	12.0		51.5	17996	11924	595	35.13	20069		35.2	11704	977	3.49	8379	
3.8	14.1		50.6	18034	11947	590	35.55	20080		35.6	11791	978	3.51	8448	
4	15.5		50.0	18045	11957	587	35.75	20079		35.8	11840	979	3.52	8483	
2.8	7.7	50	64.0	17239	11589	682	28.41	19636	50	43.0	13226	997	3.87	9840	
3.5	11.8		61.3	17421	11675	663	29.72	19720		44.2	13539	1003	3.94	10125	
3.8	13.8		60.4	17457	11697	658	30.08	19731		44.6	13640	1004	3.96	10209	
4	15.3		59.9	17468	11707	655	30.24	19730		44.9	13696	1005	3.98	10251	
2.8	7.5	60	73.8	16635	11328	762	23.82	19283	60	51.7	15081	1022	4.31	11606	
3.5	11.6		71.1	16810	11412	741	24.91	19366		53.2	15438	1028	4.39	11944	
3.8	13.6		70.2	16846	11434	735	25.21	19376		53.7	15553	1030	4.42	12042	
4	15.0		69.7	16856	11444	732	25.35	19375		54.0	15617	1031	4.43	12092	
2.8	7.4	70	83.5	15997	11055	851	19.80	18923	70	60.4	16998	1046	4.76	13443	
3.5	11.4		80.9	16165	11137	828	20.71	19005		62.1	17401	1052	4.85	13834	
3.8	13.3		80.0	16199	11159	821	20.95	19015		62.7	17530	1054	4.88	13947	
4	14.7		79.5	16209	11168	818	21.07	19014		63.0	17602	1055	4.89	14005	
2.8	7.3	80	93.3	15323	10770	950	16.35	18558	80	69.0	18978	1070	5.21	15350	
3.5	11.2		90.7	15484	10849	924	17.10	18638		71.0	19428	1076	5.31	15796	
3.8	13.1		89.8	15517	10870	917	17.31	18648		71.6	19572	1078	5.34	15926	
4	14.5		89.3	15526	10879	913	17.40	18647		72.0	19653	1079	5.36	15992	
2.8	7.2	85	98.1	14973	10622	1003	14.85	18373	85	73.3	19991	1081	5.44	16330	
3.5	11.1		95.5	15131	10701	976	15.53	18453		75.4	20465	1087	5.54	16804	
3.8	13.0		94.7	15163	10721	968	15.71	18463		76.1	20617	1089	5.57	16942	
4	14.3		94.2	15172	10730	964	15.80	18461		76.5	20702	1090	5.59	17012	
2.8	7.2	90	103.0	14615	10471	1058	13.49	18187	90	77.6	21020	1093	5.67	17327	
3.5	11.0		100.4	14769	10549	1030	14.11	18266		79.8	21518	1099	5.78	17830	
3.8	12.9		99.6	14800	10569	1021	14.27	18276		80.5	21678	1101	5.81	17977	
4	14.2		99.1	14809	10578	1017	14.35	18274		81.0	21768	1102	5.83	18051	
2.8	7.0	100	112.7	13872	10160	1176	11.20	17810							
3.5	10.8		110.2	14018	10235	1144	11.71	17887							
3.8	12.7		109.4	14047	10255	1135	11.85	17897							
4	14.0		108.9	14056	10263	1130	11.92	17895							
2.8	6.9	110	122.4	13094	9836	1304	9.48	17427							
3.5	10.6		120.0	13232	9909	1268	9.92	17502							
3.8	12.4		119.2	13259	9928	1258	10.04	17512							
4	13.7		118.8	13268	9936	1253	10.09	17510							

Cooling capacity is based on 80.6°F DB and 66.2°F WB entering air.
 Heating capacity is based on 68°F DB entering air.
 *See correction factor in section 8 for capacity multipliers at other conditions.



VSHP 060 Performance Data															
		COOLING							HEATING						
GPM	WPD	EWT	LWT	TOT	SEN	WATT	EER	THR	EWT	LWT	TOT	WATT	COP	THA	
US GPM	FT	°F	°F	BTUH	BTUH			BTUH	°F	°F	BTUH			BTUH	
2.7	7.0								20	15.0	11009	1285	2.35	6724	
3.9	14.1									16.4	11453	1300	2.42	7052	
4	14.8									16.5	11481	1301	2.42	7073	
5.2	24.5									17.2	11719	1311	2.45	7243	
2.7	6.8	30	47.1	20687	14075	668	30.16	23070	30	23.6	13071	1317	2.77	8652	
3.9	13.7		41.9	21118	14312	634	32.43	23277		25.3	13597	1333	2.86	9074	
4	14.3		41.6	21147	14328	632	32.58	23291		25.4	13631	1334	2.86	9101	
5.2	23.8		39.0	21405	14485	618	33.83	23399		26.4	13913	1344	2.90	9320	
2.7	6.6	40	57.2	20497	14229	754	26.47	23156	40	32.1	15161	1349	3.19	10612	
3.9	13.3		52.0	20925	14469	715	28.47	23364		34.3	15771	1365	3.29	11129	
4	14.0		51.7	20953	14486	713	28.60	23377		34.4	15810	1366	3.29	11162	
5.2	23.2		49.0	21209	14644	696	29.69	23486		35.6	16137	1377	3.33	11431	
2.7	6.4	50	67.1	20128	14248	854	23.05	23107	50	40.7	17278	1381	3.60	12603	
3.9	12.9		62.0	20548	14488	810	24.79	23314		43.2	17974	1397	3.71	13218	
4	13.6		61.7	20576	14504	807	24.90	23327		43.4	18019	1398	3.72	13257	
5.2	22.6		59.0	20827	14663	789	25.85	23436		44.8	18392	1409	3.76	13575	
2.7	6.3	60	77.0	19579	14130	968	19.89	22922	60	49.2	19424	1412	4.00	14625	
3.9	12.6		71.9	19987	14369	919	21.40	23127		52.1	20206	1429	4.12	15339	
4	13.3		71.6	20015	14385	916	21.49	23141		52.3	20257	1430	4.13	15384	
5.2	22.0		68.9	20259	14543	895	22.31	23249		53.9	20676	1441	4.18	15754	
2.7	6.1	70	86.7	18851	13877	1097	17.01	22601	70	57.6	21597	1443	4.38	16679	
3.9	12.4		81.7	19244	14111	1041	18.29	22804		61.0	22468	1460	4.52	17493	
4	13.0		81.4	19270	14127	1038	18.38	22817		61.2	22523	1461	4.53	17544	
5.2	21.6		78.8	19505	14282	1014	19.08	22923		63.1	22989	1472	4.58	17966	
2.7	6.0	80	96.4	17943	13488	1241	14.39	22145	80	66.1	23799	1474	4.77	18764	
3.9	12.1		91.5	18317	13716	1178	15.48	22344		69.9	24758	1491	4.91	19679	
4	12.7		91.2	18342	13731	1174	15.55	22357		70.1	24819	1492	4.92	19737	
5.2	21.2		88.6	18566	13882	1147	16.15	22461		72.2	25333	1503	4.98	20212	
2.7	6.0	85	101.2	17421	13243	1319	13.19	21867	85	70.3	24910	1489	4.95	19818	
3.9	12.0		96.3	17785	13466	1251	14.18	22063		74.3	25914	1506	5.11	20785	
4	12.6		96.0	17809	13482	1247	14.25	22075		74.6	25978	1508	5.12	20846	
5.2	21.0		93.5	18026	13629	1219	14.79	22178		76.8	26515	1519	5.18	21348	
2.7	5.9	90	106.0	16855	12964	1400	12.05	21554	90	74.5	26028	1504	5.14	20880	
3.9	11.9		101.2	17207	13182	1328	12.96	21747		78.8	27077	1522	5.30	21899	
4	12.5		100.9	17230	13197	1324	13.01	21759		79.0	27144	1523	5.31	21963	
5.2	20.8		98.4	17440	13342	1294	13.51	21861		81.3	27706	1534	5.37	22492	
2.7	5.8	100	115.4	15588	12303	1573	9.97	20827							
3.9	11.8		110.8	15913	12511	1492	10.72	21014							
4	12.3		110.5	15935	12525	1488	10.77	21026							
5.2	20.5		108.1	16129	12662	1454	11.18	21124							
2.7	5.8	110	124.8	14141	11507	1761	8.15	19964							
3.9	11.6		120.3	14436	11701	1670	8.77	20144							
4	12.2		120.1	14456	11714	1665	8.81	20155							
5.2	20.3		117.8	14632	11842	1627	9.15	20249							

Cooling capacity is based on 80.6°F DB and 66.2°F WB entering air.
 Heating capacity is based on 68°F DB entering air.
 *See correction factor in section 8 for capacity multipliers at other conditions.



VSHP 080 Performance Data															
		COOLING							HEATING						
GPM	WPD	EWT	LWT	TOT	SEN	WATT	EER	THR	EWT	LWT	TOT	WATT	COP	THA	
US GPM	FT H2O	°F	°F	BTUH	BTUH			BTUH	°F	°F	BTUH			BTUH	
3.4	3.9								20	15.5	13323	1690	2.11	7688	
4.9	7.6									16.7	13926	1713	2.17	8108	
6.5	12.9									17.4	14365	1732	2.22	8408	
6.7	13.6									17.5	14405	1734	2.23	8434	
3.4	3.6	30	47.1	25866	16695	926	31.18	29073	30	23.9	16141	1722	2.61	10383	
4.9	7.2		42.0	26500	16979	873	33.85	29391		25.5	16872	1745	2.69	10951	
6.5	12.2		39.1	26935	17259	835	35.85	29567		26.5	17404	1764	2.75	11354	
6.7	12.9		38.8	26972	17293	832	36.04	29577		26.6	17452	1766	2.76	11390	
3.4	3.5	40	57.1	25562	16719	1037	26.78	29120	40	32.3	19007	1761	3.07	13095	
4.9	6.8		52.0	26188	17004	978	29.07	29438		34.4	19868	1785	3.17	13811	
6.5	11.6		49.1	26618	17284	936	30.79	29615		35.6	20494	1805	3.24	14320	
6.7	12.3		48.8	26655	17318	932	30.96	29625		35.7	20551	1807	3.25	14365	
3.4	3.3	50	67.1	25020	16596	1170	22.76	28999	50	40.7	21921	1809	3.50	15824	
4.9	6.5		62.0	25632	16878	1104	24.72	29316		43.2	22914	1833	3.60	16689	
6.5	11.0		59.1	26053	17156	1056	26.18	29492		44.7	23635	1853	3.69	17304	
6.7	11.7		58.8	26089	17189	1052	26.32	29502		44.8	23701	1856	3.69	17359	
3.4	3.2	60	76.9	24240	16324	1327	19.14	28710	60	49.1	24882	1865	3.89	18570	
4.9	6.2		71.8	24833	16602	1252	20.78	29024		52.0	26009	1890	4.00	19585	
6.5	10.6		69.0	25241	16876	1197	22.01	29198		53.8	26827	1911	4.09	20308	
6.7	11.2		68.7	25276	16908	1193	22.12	29208		53.9	26902	1913	4.10	20372	
3.4	3.0	70	86.6	23222	15905	1506	15.89	28253	70	57.5	27890	1929	4.23	21334	
4.9	6.0		81.7	23790	16175	1421	17.26	28562		60.8	29153	1955	4.36	22500	
6.5	10.2		78.8	24181	16442	1359	18.28	28733		62.8	30071	1977	4.46	23330	
6.7	10.8		78.6	24214	16474	1354	18.37	28743		63.0	30155	1979	4.47	23403	
3.4	2.9	80	96.3	21966	15337	1708	13.04	27629	80	65.8	30946	2001	4.54	24114	
4.9	5.8		91.4	22503	15598	1611	14.15	27931		69.6	32348	2028	4.68	25432	
6.5	9.8		88.6	22873	15855	1542	14.99	28098		71.9	33366	2051	4.79	26370	
6.7	10.4		88.4	22905	15886	1535	15.07	28108		72.1	33459	2053	4.80	26454	
3.4	2.9	85	101.0	21249	14998	1818	11.75	27253	85	70.0	32492	2040	4.68	25511	
4.9	5.7		96.2	21769	15254	1715	12.76	27551		74.0	33964	2068	4.82	26905	
6.5	9.7		93.5	22127	15505	1641	13.51	27716		76.4	35033	2091	4.93	27898	
6.7	10.2		93.3	22157	15535	1634	13.58	27726		76.6	35130	2093	4.95	27986	
3.4	2.9	90	105.8	20472	14622	1933	10.56	26836	90	74.2	34050	2082	4.81	26912	
4.9	5.6		101.1	20973	14871	1824	11.47	27129		78.4	35592	2110	4.96	28383	
6.5	9.5		98.4	21318	15116	1745	12.15	27292		80.9	36712	2133	5.07	29430	
6.7	10.1		98.1	21347	15145	1737	12.21	27301		81.2	36814	2136	5.08	29523	
3.4	2.8	100	115.2	18740	13759	2181	8.47	25875							
4.9	5.5		110.7	19199	13993	2057	9.20	26158							
6.5	9.3		108.1	19515	14224	1968	9.74	26315							
6.7	9.9		107.9	19542	14252	1960	9.80	26324							
3.4	2.8	110	124.6	16771	12748	2451	6.77	24746							
4.9	5.4		120.2	17182	12965	2312	7.35	25017							
6.5	9.2		117.7	17464	13179	2212	7.79	25167							
6.7	9.7		117.5	17488	13205	2203	7.83	25175							

Cooling capacity is based on 80.6°F DB and 66.2°F WB entering air.
 Heating capacity is based on 68°F DB entering air.
 *See correction factor in section 8 for capacity multipliers at other conditions.



VSHP 100 Performance Data														
		COOLING							HEATING					
GPM	WPD	EWT	LWT	TOT	SEN	WATT	EER	THR	EWT	LWT	TOT	WATT	COP	THA
US GPM	FT	°F	°F	BTUH	BTUH			BTUH	°F	°F	BTUH			BTUH
4.3	4.9								20	15.4	17054	2183	2.17	9818
6.1	10.1									16.7	17599	2194	2.22	10206
6.5	11.5									16.8	17676	2196	2.23	10255
8.1	18.2									17.5	17823	2205	2.24	10317
4.3	4.7	30	45.8	29857	19986	1219	25.52	33970	30	23.5	21375	2241	2.69	13927
6.1	9.8		41.2	30433	20287	1171	26.98	34296		25.3	22059	2252	2.75	14477
6.5	11.1		40.6	30533	20344	1165	27.20	34368		25.5	22155	2254	2.76	14547
8.1	17.6		38.6	30830	20535	1162	27.65	34650		26.4	22339	2263	2.78	14634
4.3	4.5	40	55.9	29780	20450	1321	22.82	34224	40	31.8	25330	2295	3.15	17679
6.1	9.4		51.3	30354	20758	1268	24.12	34553		34.0	26140	2306	3.23	18377
6.5	10.8		50.7	30454	20816	1262	24.31	34625		34.3	26255	2309	3.24	18466
8.1	17.0		48.6	30750	21011	1258	24.72	34910		35.4	26473	2318	3.26	18576
4.3	4.4	50	65.9	29405	20658	1449	20.24	34270	50	40.2	28919	2346	3.56	21073
6.1	9.1		61.3	29972	20969	1391	21.39	34599		42.8	29843	2358	3.65	21905
6.5	10.4		60.7	30070	21028	1384	21.56	34672		43.2	29974	2360	3.66	22011
8.1	16.4		58.6	30363	21225	1381	21.92	34956		44.5	30223	2370	3.69	22143
4.3	4.3	60	75.9	28733	20610	1604	17.79	34107	60	48.8	32141	2394	3.91	24110
6.1	8.9		71.3	29287	20921	1540	18.80	34435		51.8	33168	2406	4.01	25062
6.5	10.1		70.6	29383	20980	1533	18.95	34507		52.3	33314	2409	4.02	25183
8.1	16.0		68.6	29668	21176	1529	19.27	34790		53.7	33591	2418	4.05	25334
4.3	4.2	70	85.7	27762	20307	1786	15.46	33736	70	57.5	34996	2439	4.21	26790
6.1	8.6		81.2	28298	20613	1715	16.35	34060		60.9	36115	2451	4.31	27848
6.5	9.9		80.5	28390	20671	1707	16.47	34131		61.4	36273	2454	4.33	27982
8.1	15.5		78.5	28667	20865	1702	16.75	34412		63.0	36575	2464	4.36	28150
4.3	4.1	80	95.4	26494	19748	1995	13.27	33156	80	66.5	37485	2481	4.45	29112
6.1	8.4		91.0	27005	20046	1916	14.02	33475		70.1	38684	2493	4.56	30262
6.5	9.6		90.3	27094	20102	1906	14.13	33545		70.6	38853	2496	4.57	30408
8.1	15.2		88.4	27357	20291	1901	14.37	33820		72.4	39176	2506	4.61	30590
4.3	4.0	85	100.3	25749	19373	2110	12.22	32788	85	71.0	38592	2500	4.55	30139
6.1	8.3		95.9	26245	19665	2026	12.91	33103		74.7	39826	2513	4.66	31330
6.5	9.5		95.2	26331	19720	2016	13.02	33172		75.3	40000	2515	4.68	31481
8.1	15.0		93.3	26587	19905	2010	13.23	33444		77.2	40333	2526	4.71	31670
4.3	4.0	90	105.1	24929	18934	2231	11.20	32367	90	75.5	39607	2519	4.63	31077
6.1	8.2		100.7	25409	19219	2142	11.84	32679		79.4	40874	2532	4.75	32305
6.5	9.4		100.1	25493	19273	2132	11.93	32747		80.0	41052	2534	4.76	32461
8.1	14.8		98.2	25741	19454	2126	12.13	33016		81.9	41394	2545	4.80	32655
4.3	3.9	100	114.6	23065	17864	2494	9.26	31370						
6.1	8.1		110.4	23510	18133	2394	9.79	31672						
6.5	9.2		109.8	23587	18184	2383	9.86	31738						
8.1	14.6		107.9	23816	18354	2376	10.03	31999						
4.3	3.8	110	124.0	20904	16538	2783	7.45	30164						
6.1	8.0		120.0	21307	16787	2673	7.87	30454						
6.5	9.1		119.4	21377	16834	2660	7.93	30518						
8.1	14.3		117.6	21585	16992	2652	8.07	30769						

Cooling capacity is based on 80.6°F DB and 66.2°F WB entering air.
 Heating capacity is based on 68°F DB entering air.
 *See correction factor in section 8 for capacity multipliers at other conditions.



120 Performance Data															
		COOLING							HEATING						
GPM	WPD	EWT	LWT	TOT	SEN	WATT	EER	THR	EWT	LWT	TOT	WATT	COP	THA	
US GPM	FT	°F	°F	BTUH	BTUH			BTUH	°F	°F	BTUH			BTUH	
5.5	9.6								20	14.2	25737	2865	2.20	16085	
7	14.7									15.3	26382	2885	2.24	16558	
8	18.7									15.8	26702	2896	2.27	16793	
9	23.2									16.2	26933	2904	2.28	16964	
5.5	9.2	30	47.6	42257	27336	1823	29.23	48479	30	22.8	29677	2926	2.65	19809	
7	14.1		44.0	43004	27642	1768	30.66	48929		24.2	30421	2947	2.70	20392	
8	17.9		42.3	43365	27782	1738	31.43	49141		24.8	30789	2957	2.73	20681	
9	22.2		41.0	43616	27869	1714	32.03	49282		25.4	31056	2966	2.75	20892	
5.5	8.9	40	57.5	41476	27301	1968	25.44	48156	40	31.5	33612	2993	3.07	23507	
7	13.5		53.9	42209	27607	1908	26.69	48603		33.1	34454	3014	3.13	24197	
8	17.2		52.2	42564	27747	1876	27.35	48813		33.9	34871	3025	3.16	24541	
9	21.3		50.9	42810	27834	1850	27.88	48954		34.5	35173	3034	3.18	24791	
5.5	8.5	50	67.3	40460	27081	2141	21.94	47689	50	40.1	37540	3066	3.45	27177	
7	13.0		63.8	41174	27385	2076	23.01	48131		42.0	38481	3088	3.52	27976	
8	16.6		62.1	41520	27523	2040	23.58	48340		42.9	38947	3099	3.55	28373	
9	20.5		60.8	41761	27610	2012	24.04	48479		43.6	39284	3108	3.57	28661	
5.5	8.2	60	77.1	39207	26675	2341	18.72	47077	60	48.8	41463	3145	3.80	30820	
7	12.6		73.6	39899	26974	2269	19.63	47514		50.9	42502	3167	3.87	31726	
8	16.0		71.9	40234	27110	2231	20.12	47719		52.0	43016	3179	3.91	32176	
9	19.8		70.6	40467	27196	2200	20.51	47857		52.8	43388	3188	3.94	32503	
5.5	8.0	70	86.8	37718	26083	2568	15.78	46321	70	57.5	45380	3230	4.11	34436	
7	12.2		83.4	38384	26375	2490	16.55	46750		59.9	46517	3253	4.20	35448	
8	15.5		81.7	38706	26509	2448	16.96	46953		61.0	47080	3265	4.24	35951	
9	19.2		80.5	38931	26592	2414	17.29	47088		61.9	47487	3274	4.26	36317	
5.5	7.8	80	96.5	35993	25305	2823	13.13	45420	80	66.2	49291	3321	4.39	38025	
7	11.9		93.1	36629	25589	2737	13.78	45841		68.8	50526	3345	4.48	39142	
8	15.1		91.5	36936	25718	2691	14.12	46040		70.1	51138	3357	4.53	39698	
9	18.7		90.3	37150	25800	2653	14.39	46172		71.1	51580	3366	4.55	40102	
5.5	7.7	85	101.3	35042	24847	2961	11.92	44915	85	70.5	51244	3369	4.52	39809	
7	11.7		98.0	35661	25126	2871	12.50	45332		73.3	52528	3393	4.61	40979	
8	14.9		96.4	35960	25253	2822	12.81	45528		74.6	53164	3405	4.66	41561	
9	18.4		95.1	36169	25332	2783	13.06	45659		75.7	53624	3415	4.69	41984	
5.5	7.6	90	106.1	34032	24342	3106	10.77	44375	90	74.9	53196	3418	4.64	41587	
7	11.6		102.8	34633	24615	3011	11.30	44786		77.8	54529	3442	4.74	42809	
8	14.7		101.2	34924	24739	2960	11.58	44980		79.1	55189	3455	4.78	43417	
9	18.2		100.0	35126	24817	2919	11.80	45110		80.3	55667	3465	4.81	43859	
5.5	7.5	100	115.7	31835	23193	3416	8.69	43185							
7	11.4		112.5	32397	23453	3312	9.12	43586							
8	14.5		110.9	32669	23572	3256	9.34	43774							
9	17.9		109.8	32858	23646	3211	9.53	43900							
5.5	7.4	110	125.2	29402	21858	3754	6.90	41851							
7	11.2		122.1	29921	22104	3639	7.24	42239							
8	14.3		120.6	30172	22215	3578	7.42	42422							
9	17.7		119.5	30347	22285	3528	7.56	42544							

Cooling capacity is based on 80.6°F DB and 66.2°F WB entering air.
 Heating capacity is based on 68°F DB entering air.
 *See correction factor in section 8 for capacity multipliers at other conditions.



7. CORRECTION FACTORS & DESIGN LIMITS

7.1 Correction Factor Tables

Entering Air Correction Factors for Cooling Performance											
EAT Wet Bulb (°F)	COOLING										
	Total Cooling Capacity (BTUh)	Watts (W)	THR (BTUh)	Sensible Cooling (BTUh) @ EAT Dry Bulb (°F)							
				65	70	75	80	80.6	85	90	95
55	0.770	0.989	0.878	0.838	1.038	S	S	S	S	S	S
60	0.873	0.995	0.924	0.609	0.842	1.053	1.247	1.283	S	S	S
65	0.976	0.998	0.984		0.636	0.844	1.054	1.085	1.260	S	S
66.2	1.000	1.000	1.000		0.590	0.798	1.008	1.000	1.215	1.477	S
67	1.016	1.000	1.013		0.553	0.762	0.971	1.010	1.177	1.365	S
70	1.077	1.003	1.058			0.639	0.845	0.883	1.051	1.257	1.440
75	1.180	1.006	1.145				0.639	0.680	0.839	1.039	1.252

S = Sensible Cooling capacity is equal to Total cooling at conditions shown
The cooling capacity based on 80.6°F DB and 66.2°F WB entering air.

Actual = Catalog Data x Correction Factor (CF)

- EAT- Entering Air Temperature
- EWT - Entering Water Temperature
- DB - Dry Bulb
- WB - Wet Bulb
- THR - Total Heat of Rejection
- THA - Total Heat of Absorption

Entering Air Correction Factors for Heating Performance			
EAT Dry Bulb (°F)	HEATING		
	Total Heating Capacity (BTUh)	Watts (W)	THA (BTUh)
45	1.077	0.768	1.155
50	1.061	0.818	1.123
55	1.044	0.868	1.088
60	1.027	0.918	1.055
65	1.010	0.968	1.021
68	1.000	1.000	1.000
70	0.993	1.023	0.987
75	0.978	1.071	0.955
80	0.958	1.124	0.915

The heating capacity based on 68°F DB entering air.

Entering air correction factors table is used to correct the catalog values if the desired EAT is outside of rated EAT. Calculate desired EAT based on the "EAT Wet Bulb" and "EAT Dry Bulb" columns. Multiply the catalog results by the value corresponding to the design EAT and the desired output.



7.1 Correction Factor Tables (Cont'd)

Airflow Correction Factors							
Airflow	COOLING				HEATING		
% Rated CFM	Total Cooling (BTUh)	Sensible Cooling (BTUh)	Watts (W)	THR (BTUh)	Total Heating (BTUh)	Watts (W)	THA (BTUh)
70	0.93	0.82	0.97	0.94	0.94	1.08	0.93
75	0.94	0.85	0.98	0.95	0.95	1.06	0.94
80	0.95	0.88	0.98	0.96	0.96	1.05	0.96
85	0.97	0.91	0.99	0.97	0.97	1.03	0.97
90	0.98	0.94	0.99	0.98	0.98	1.02	0.98
95	0.99	0.97	1.00	0.99	0.99	1.01	0.99
100	1.00	1.00	1.00	1.00	1.00	1.00	1.00
105	1.01	1.03	1.00	1.01	1.01	0.99	1.01
110	1.02	1.06	1.01	1.02	1.02	0.98	1.02
115	1.03	1.09	1.01	1.03	1.02	0.98	1.03

Airflow correction factor table is used to correct the catalog values if the desired CFM is outside of rated CFM. Calculate desired CFM based on the "% Rated CFM" column. Multiply the catalog results by the value corresponding to the desired % Rated CFM and the desired output.

Antifreeze Correction Factors						
Glycol Type	% Glycol	COOLING			HEATING	
		Total Cooling (BTUh)	Sensible Cooling (BTUh)	Watts (W)	Total Heating (BTUh)	Watts (W)
Ethylene Glycol (E.G.)	0	1.000	1.000	1.000	1.000	1.000
	10	0.996	0.997	1.001	0.990	0.996
	20	0.991	0.992	1.004	0.980	0.992
	30	0.987	0.985	1.009	0.971	0.988
	40	0.982	0.976	1.016	0.961	0.984
	50	0.976	0.965	1.025	0.952	0.980
Propylene Glycol (P.G.)	0	1.000	1.000	1.000	1.000	1.000
	10	0.991	0.991	1.007	0.984	0.993
	20	0.983	0.982	1.012	0.968	0.986
	30	0.975	0.975	1.017	0.953	0.979
	40	0.968	0.968	1.020	0.938	0.972
	50	0.961	0.963	1.023	0.923	0.965

Antifreeze correction factor table is used to correct the catalog values if glycol is being utilized. Calculate the required "% Glycol". Based on desired glycol type. Multiply the catalog results by the value corresponding to the desired glycol type and glycol ratio.



7.2 Design Limits

Air Limits	Cooling		Heating
	DB	WB	DB
Std. Entering Air Temperature (EAT)	75°F	63°F	68°F
Min. Entering Air Temperature (EAT)	65°F	55°F	50°F
Max. Entering Air Temperature (EAT)	85°F	71°F	80°F

Fluid Limits	Standard Range		Low Temp Water Range		Geothermal Range	
	Cooling	Heating	Cooling	Heating	Cooling	Heating
Std. Entering Fluid Temperature (EFT)	85°F	70°F	85°F	55°F	85°F	60°F
Min. Entering Fluid Temperature (EFT)	50°F	55°F	50°F	45°F	30°F	20°F
Max. Entering Fluid Temperature (EFT)	110°F	90°F	110°F	90°F	110°F	90°F

CFM Limits	
Min. CFM/Ton	300
Design CFM/Ton	400
Max. CFM/Ton	450

Fluid GPM Limits	
Min. GPM/Ton	1.5
Design GPM/Ton	3
Max. GPM/Ton	4

CAUTION

Design limits can not be combined. Combining maximum or minimum limits is not allowed. This could exceed the operation and design limits of the unit.

For example: It is not allowed to combine maximum entering air temperature (EAT) limits with maximum entering fluid temperature (EFT) limits.

7.3 Antifreeze Percentages

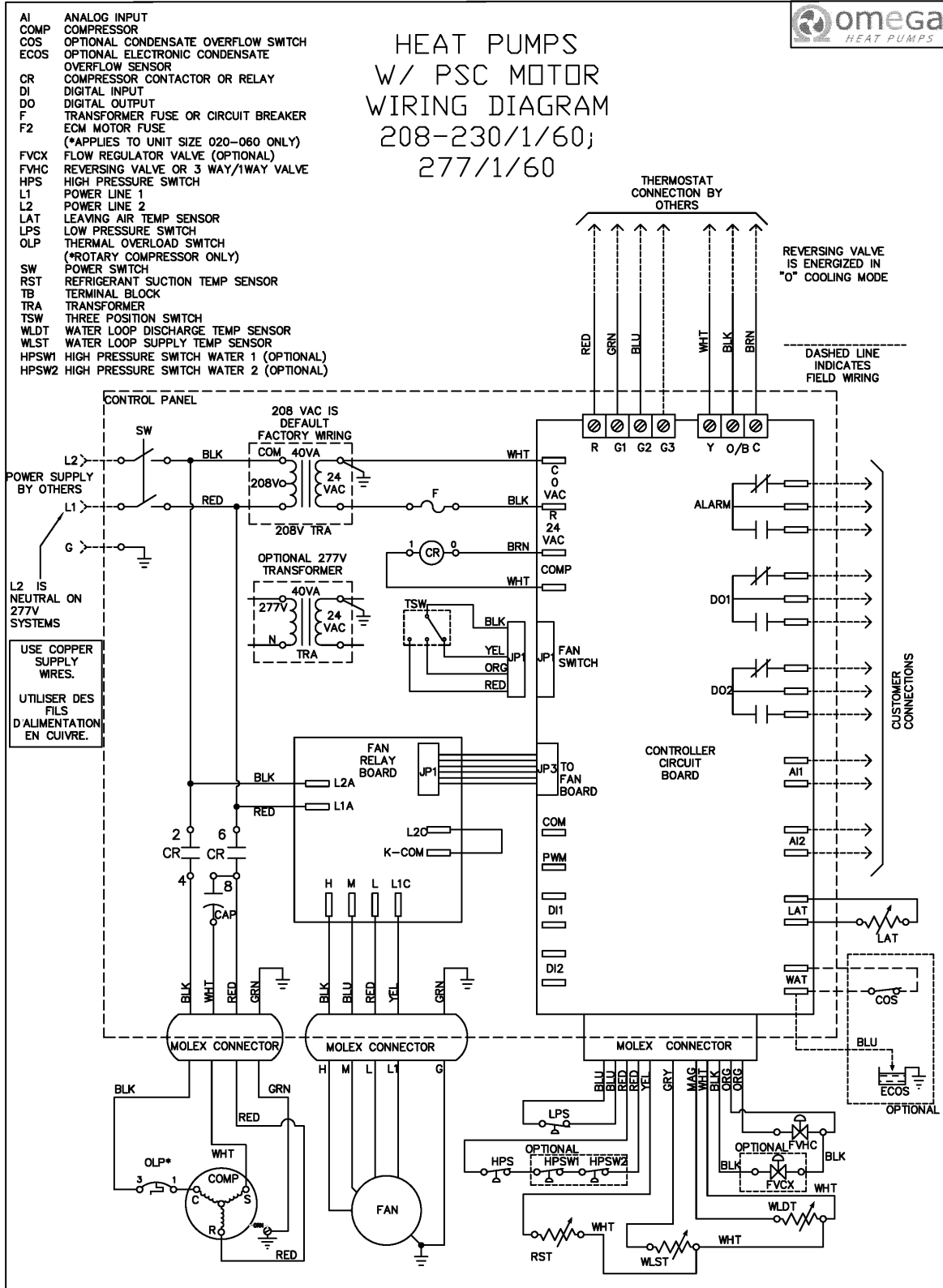
ANTIFREEZE PERCENTAGE (by Volume)	Minimum Leaving Water Temperature F (°C)		
	25 F (-4°C)	30 F (-1°C)	35 F (1.5°C)
	Protects Fluid To:		
	10 F (-12°C)	15 F (-9°C)	20 F (-6.5°C)
Methanol	25%	22%	17%
Propylene Glycol	39%	25%	22%

Recommended to operate geothermal water loop systems with minimum 20% glycol.



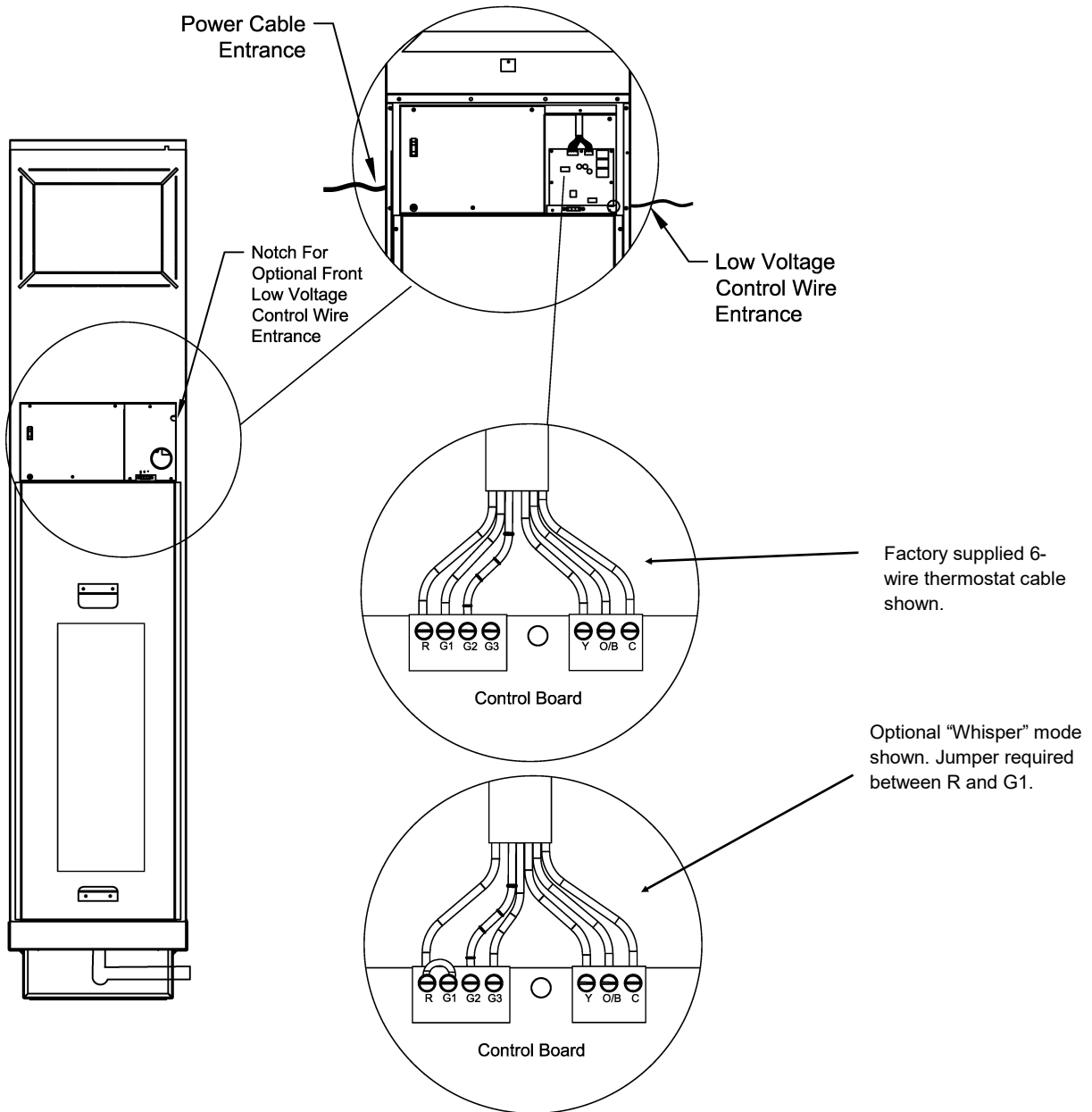
8. ELECTRICAL SCHEMATICS & CONTROL WIRING

8.1 Wiring Diagram - Standard PSC Motor (208-230/277V/1Ph/60Hz)





8.3 Thermostat Wiring Details



Note: Factory supplied 6-wire 24 inch thermostat cable coiled up in low-voltage compartment of electrical box for field wiring to thermostat. Single speed thermostat thermostats require minimum 4-wire low voltage control wire harness when common is not required.

Heat Pump Thermostat:
R = 24VAC
G1 = Fan Speed 1
G2 = Fan Speed 2
G3 = Fan Speed 3
Y = Compressor On
O/B = Reversing Valve
C = Common

Heat/Cool Thermostat:
R = 24VAC
G1 = Fan Speed 1
G2 = Fan Speed 2
G3 = Fan Speed 3
Y = Cooling
O/B = Heating
C = Common

Thermostat with Whisper Mode:
R = 24VAC
G1 = Whisper Mode (Cont. Fan On)
G2 = Fan Speed 2
G3 = Fan Speed 3
Y = Compressor On
O/B = Reversing Valve
C = Common



9. SPECIFICATIONS

1 GENERAL

Install Omega series Vertical Stack Heat Pumps as indicated on the plans and capacities listed in the schedule and specifications.

Each unit shall be factory tested and ship factory-charged with R-410A refrigerant. All units from 1/2 to 3 Tons shall be tested and certified by ASHRAE/ANSI/AHRI/ ISO 13256-1 and ETL listed for United States and Canada. Each unit shall have factory affixed label showing ASHRAE/ANSI/AHRI/ISO and ETL logos. Cabinets and refrigeration chassis shall be factory wired and pre-piped.

2 CABINET

2.1 The vertical stacked heat pump units shall be **Omega VSHP Series, Standard Efficiency (SE) Series**. Units shall provide scheduled capacities at the ampacity and voltage specified. Specified airflow shall be at the scheduled external static pressure and shall include the effects of a wet coil and clean filter.

2.2 The cabinet shall be 20-gauge galvanized steel with riveted internal components for rigidity. Cabinet shall have internal surfaces insulated with 1 inch thick, 3.5 lbs. high-density, mould resistant, thermal and acoustic insulation. Insulation shall meet NFPA 90, UL-181, and ASTM-C1071 standards and insulation shall have a flame spread of less than 25, and a smoke developed classification of less than 50 per ASTM E-84 and UL 723.

The unit shall be a single cabinet construction. Contractor shall be responsible for isolating the supply duct and supply grille from the cabinet.

(Optional GOLD Series) The cabinet shall be sectionalized using a factory installed canvas duct collar for acoustic and installation purposes. The lower section shall include the risers, blower and fan motor assembly, all controls, and removable refrigeration chassis. The upper section shall be an acoustic discharge plenum lined with 1 inch thick, 3.5 lbs. high-density, mould resistant, thermal and acoustic insulation. Final cabinet height shall be coordinated with the installing contractor and architect. The discharge plenum shall be designed to be fastened to the underside of the concrete slab with field cut "Knockout" discharge openings. Rigid connections will not be accepted. A factory supplied flexible canvas connection shall be provided between the upper and lower sections. Heat pump manufacturer shall factory attach flexible connection to the plenum section.

2.3 (Optional) Provide optional line of site baffles (LOS) on all units with multiple unit outlets.

2.4 Physical dimensions of each unit shall be accommodated within furring / ceiling-slab spaces provided as shown on the architectural drawings

2.5 Provide a minimum 5" (optional 6", 7" and 8") high stand factory installed to the bottom of the sheet metal cabinet to elevate the unit 5" above the floor.

2.4 A removable inner chassis service panel allowing

service access to the fan and compressor compartment shall be provided with each unit.

2.5 The drain pan shall be 16-gauge stainless steel. The drain pan shall come an optional condensate overflow switch. The drain pan outlet shall be readily accessible for cleaning with a 7/8 inch OD copper drain connection. Unit shall be provided with a flexible p-trap condensate hose for connection to the condensate riser.

2.6 Factory installed supply and return risers shall be (Type L) (Type M) copper, with (factory) (field) mounted shut-off ball valves on each supply and return riser. Valves shall be brass and rated for 400 psig. A (Type L) (Type M) condensate riser shall be (factory) (field) installed. Risers sizes shall be installed according to building plans.

2.7 Risers shall have a (field) (factory) provided 3-inch deep swage. Transition pieces & expansion joints shall be field supplied.

2.8 Unit cabinet shall come with supply discharge opening "knockouts". An optional noise attenuating insulated privacy air baffle (LOS) shall be provided, if available, for horizontal supply discharge openings. All cabinet discharge openings shall include 1-1/2 inch drywall flange around the full opening perimeter.

2.9 Supply ducts shall not be rigidly attached to the cabinet and shall be acoustically isolated from cabinet using flexible canvas connections. Contractor shall install flex connection on all discharge openings. There shall be no rigid connection to supply-air discharge grilles or supply ducts except on Gold Series units designed with split casing.

2.10 Each unit shall have an (Acoustic) (Perimeter) return air panel. The panels shall be insulated with 1/2 inch thick, lined fiberglass insulation. The panel shall be easily removable without tools to allow access to the filter, chassis compartment and (optional) service disconnect switch.

2.11 (Optional) Unit shall have an optional Fresh Outside Air Duct intake located at the top of the unit for introducing fresh outside air into the unit.

2.12 Each unit shall be (field) (factory) supplied with double deflection supply grilles as shown on the plans. (Field) (Factory) provide opposed blade balancing dampers on units with multiple outlets as indicated on the plans.

2.13 (Optional) Unit shall have an optional 2-inch filter rack with MERV 13 rated pleated filter. ECM fan option shall be selected.

3 FAN & BLOWER

3.1 Each unit shall include a factory mounted forward curved, double inlet double width centrifugal direct drive fan and motor assembly with internal overload protection. The blower fan assembly shall be positioned horizontally from a sheet metal blower deck.

3.2 Units shall be supplied with a 3 speed PSC fan motor



SPECIFICATIONS (CONT'D)

with permanent split capacitor. Fan motors speeds shall be field selectable using unit mounted 3-speed fan switch or by 3-speed thermostat.

3.3 (Optional) Units shall be supplied with an ECM, controlled using a PWM signal. Fan motors speeds shall be field selectable using unit mounted 3-speed fan switch or by compatible multi-speed thermostat. Units with fresh air option shall have an ultra-low 'Whisper' mode fan speed for air circulation when there is no call for compressor.

4 REFRIGERATION CHASSIS

4.1. Provide high temperature and pressure rated water hoses for connection of the risers to the chassis. The hoses supplied shall be constructed with an inner core of rubber, a stainless-steel metal braid, and rubber outer covering. Fittings shall be brass construction. Hoses shall carry a pressure rating of 600 psig.

4.2. The compressor chassis shall be mounted and vibrationally isolated on 12-gauge slide rails using a double isolated base. Compressor shall have an acoustical enclosure ensuring compressor noise is isolated from air stream. Provide plug type electrical connections for chassis control and power connections allowing for easy removal of the chassis from the front of the cabinet.

4.3 The refrigeration circuit shall have two service valves, for measuring high and low refrigerant pressure, in the chassis compartment enclosure. The refrigerant circuit shall contain a thermal expansion valve (TXV) refrigerant metering device and a reversing valve.

4.4 Compressor shall be hermetically sealed type with internal thermal overload protection. Compressor shall be mounted on rubber vibration isolators.

4.5 Air side coils shall have copper tubes mechanically bonded to aluminum fins. Coil shall be sized to meet scheduled performance for cooling and heating. Provide 1" T/A filter on coil face.

4.6 Water side condenser heat exchanger shall be coaxial type with steel outer tube and copper inner tube. Condenser shall be rated at 500 psig water side and 650 psig refrigerant side.

4.7 (Optional) The chassis shall employ an optional motorized auto shut-off valve to shut off water to the unit when compressor is not running. Valve shall be mounted in the chassis compartment.

4.8 (Optional) The chassis shall employ optional autoflow balancing valve mounted in the chassis compartment to maintain specified unit water flow rate over 2-80 psig differential water pressure. Auto flow balancing valve shall be field serviceable.

4.9 (Optional) Low Temp Water option: The chassis shall be factory supplied with a Low Temperature Water (LTW) kit. The LTW option shall be utilized for system water loops between 45F and 55F in heating mode that do not contain any glycol

freeze protection. The chassis shall come with a high-pressure switch factory installed in the entering and leaving water side circuit to stop compressor operation in the event of ice formation in the coaxial coil. Pressure switch cut out is 400 psig and cut in at 250 psig.

4.10 (Optional) Geothermal option: The chassis shall be factory supplied with a geothermal kit. The geothermal option includes geothermal rated low-pressure switch, insulated coaxial and insulated water piping.

5 CONTROLS

5.1 Each unit shall be factory wired with all necessary controls. Each unit shall come standard with a microprocessor controller mounted in the electrical box. Electrical box shall contain compressor and fan motor contactor, 24-volt control power transformer, terminal block for low voltage field wiring connection, and terminal block for main power electrical connection, unit mounted service disconnect switch.

5.2 The operating and safety controls shall be monitored by the microprocessor controller. Sensor parameters and timers shall be field adjustable to meet site conditions. Controller shall have the following safety switches and sensors and timers:

- Low Pressure Safety Switch
- High Pressure Safety Switch
- **(Optional)** High Water Pressure Safety Switches
- **(Optional)** Condensate Overflow Switch
- Entering Water Temperature sensor
- Leaving Water Temperature sensor
- Suction line freeze-stat temperature sensor
- Supply Air Temperature sensor
- Compressor Anti-Short Cycle timer
- Water Valve Open and Closed timer
- Low-pressure bypass timer
- Random wait time on unit power up
- Fan-On and Fan-Off timer

5.3 Microprocessor controller shall have Web based test and diagnostic mode capability for quick servicing and troubleshooting on site. Controller shall have data logging with stored alarm states, supply and leaving water temperature, suction line temperature, and supply air temperature readings. Access to controller status and data log shall be available through a smart phone device, tablet or laptop.

5.4 Microprocessor controller shall have 'future proof' feature to accept software updates. Microprocessor board shall be capable of being field updated with newer software patches or custom software as needed.

5.5 Thermostats shall be remote mounted. Unit will come with a standard 24-inch thermostat whip factory wired to the controller board terminals. Thermostats can be either Heat/Cool or Heat Pump type. Thermostat shall provide 24V signal to G



(fan) terminal during a call for cooling.

5.6 Microprocessor board shall have a field selectable setting for use with multi-speed or single speed thermostats.

5.7 Electrical box shall have a factory mounted 3-speed selector switch allowing for unit to be field configurable to either manual speed mode (3-speed selector switch) or auto fan speed mode (thermostat controlled fan speed).

5.8 (Optional) ECM shall have field configurable torque speed settings using the imbedded Web based interface in cases where speed settings need to be field adjusted to meet site requirements.

5.9 (Optional) Units shall come with a SmartOne compatible RS-485 communication add-on board and remote temperature sensor (RTS). Integrates with SmartOne wall pad through PCB board RS485 terminals. RTS acts as back-up thermostat air temperature sensor in the event of communication disruption with SmartOne wallpad.

6 TESTING & WARRANTY

6.1 Each chassis unit shall be factory tested using a multi-step computer controlled testing equipment to prevent operator error during factory testing.

6.2 Warranty shall be for parts, 1 year not to exceed 18 months from date of shipment. (Optional) Provide 5 year compressor replacement parts warranty only.

7 EXECUTION

7.1 Units shall be installed neat and level on neoprene vibration isolation pads, supplied by heat pump manufacturer, and secured to floor.

7.2 Flush the system per manufacturer instructions before connecting chassis. Contractor shall join supply and return riser flexible hoses together in each cabinet for flushing purposes.

7.3 Installing contractor shall install risers and install riser transition piece connections where riser sizes change.

7.4 The hoses shall be installed in the field by the contractor. The flare fittings on the hoses shall be connected according to industry standard (Finger tighten then tighten with wrench while always using back-up wrench).

7.5 (Optional): Contractor shall make provisions for connecting fresh air duct to the optional fresh outside air duct intake located at the top of the unit cabinet.

7.6 (Add for Gold Units) Discharge plenum shall be fastened to the underside of the concrete slab for noise attenuation using appropriate industry accepted mounting practices.

7.7 Flush the system per manufacturer instructions before connecting chassis. The riser system shall be flushed, cleaned and commissioned before connecting chassis units to the riser system.

7.8 Contractor shall provide duct and grille canvas connections on all single piece (Silver Series) units.

7.9 Start-up of units shall be supervised by trained representatives of the equipment manufacturer.

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