

# VERTICAL STACKED WATER SOURCE HEAT PUMPS

PREMIUM EFFICIENCY VPCS SERIES • 16 EER



## Revision Notes

The following revisions were completed in this version of the document.

AFFECTED PAGES	DESCRIPTION	DATE IMPLEMENTED
4	10.0 USGPM autoflow regulator option removed.	February 2020
12	Added optional 2-inch MERV 13 filter data per model in the Physical Data table	March 2020
28	Graphic added: Fresh air opening without motorized damper, left and right hand shown.	February 2020
31	Updated figure and table dimensions for OA option with or without a damper	May 2020

# Nomenclature

## VERTICAL STACKED WATER SOURCE HEAT PUMP - CABINET

1, 2, 3 4, 5 6 7 8 9 10 11 12, 13 14 15 16

VPB 12 M 1 D E A 2 2T 4 0 C

### PRODUCT CATEGORY

VPB = Vertical Stacked Heat Pump - Standard Cabinet Assembly

VPM = Vertical Stacked Heat Pump - Master Cabinet Assembly

VPS = Vertical Stacked Heat Pump - Satellite Cabinet Assembly

### UNIT CAPACITY

09 = 0.75 TON	24 = 2 TON
12 = 1 TON	30 = 2.5 TON
15 = 1.25 TON	36 = 3 TON
18 = 1.5 TON	

### CONTROL OPTIONS

	Thermostat Location			
	Remote	Whip	Surface	ADA Door
2-Speed Unit-Mounted Switch	M	W	P	A
3-Speed Thermostat Control	3	4	5	7

### VOLTAGE

1 = 208/230-60-1

### ELECTRICAL CONNECTION

0 = None (Terminal Block)

D = Non-Fused Disconnect

F = Disconnect with Fuses

### BLOWER OPTIONS

A = PSC Blower

B = Hi-Static PSC

E = ECM Blower

F = Hi-Static ECM Blower

G = ECM with Continuous Low Speed

H = Hi-Static ECM with Continuous Low Speed

### DESIGN SERIES

A = Current Generation

### MISCELLANEOUS OPTIONS

Filters: MERV (Depth)

Option	4 (1")	8 (1")	13 (2")
Galvanized Drain Pan (DP)	0	F	G
Stainless Steel (SST) Drain Pan	S	T	U
Sealed Openings	L	M	N
SST DP with Sealed	C	D	E

### HORIZONTAL DISCHARGE OPENING ORIENTATION

00, 0T	1H, 1T	2H, 2T	3H, 3T
X = None	B = Back	1 = Left + Front	7 = Front + Left + Right
	F = Front	2 = Left + Back	8 = Front + Right + Back
	L = Left	3 = Left + Right	9 = Front + Left + Back
	R = Right	4 = Right + Back	
		5 = Right + Front	
		6 = Back + Front	

### SUPPLY AIR CONFIGURATION

1H = Single Horizontal Supply	2T = Double Horizontal Supply + Top
2H = Double Horizontal Supply	
3H = Triple Horizontal Supply	3T = Triple Horizontal Supply + Top
0T = Top Only	
1T = Single Horizontal Supply + Top	00 = Field Cut (No Openings)

### RISER ARRANGEMENT

1 = Right Hand Risers

2 = Left Hand Risers

3 = Back Risers

4 = Right Hand Risers with Cover

5 = Left Hand Risers with Cover

6 = Back Risers with Cover

### CABINET OPTIONS

Cabinet Height	No OA Options	Left Top OA Entry (4-inch Round)	Left Top OA Entry (4-inch Round with Motorized Damper)	Right Top OA Entry (4-inch Round)	Right Top OA Entry (4-inch Round with Motorized Damper)
88 inches	A	G	L	R	W
80 inches	B	H	M	T	X
88 inches with 2-inch Stand	C	J	N	U	Y
80 inches with 2-inch Stand	E	1	3	5	7
80 inches with 4-inch Stand	D	K	P	V	Z
80 inches with 8-inch Stand	F	2	4	6	8

# Nomenclature (Cont'd)

## VERTICAL STACKED WATER SOURCE HEAT PUMP - CHASSIS

1, 2, 3, 4	5, 6	7	8	9	10	11	12	13
VPCS	12	C	1	0	0	A	C	0

### PRODUCT CATEGORY

VPCS = Vertical Stacked Heat Pump Chassis  
R-410A

### UNIT CAPACITY

09 = 0.75 TON

12 = 1 TON

15 = 1.25 TON

18 = 1.5 TON

24 = 2 TON

30 = 2.5 TON

36 = 3 TON

### DESIGN SERIES

A = Current Generation

### VOLTAGE

1 = 208/230-60-1

### WATER VALVE & PUMP OPTIONS

VALVE OPTIONS	VALVE ONLY	Y-STRAINER
No Water Control Valve	O	S
Motorized 2-Way Shut-Off Valve	M	Y
Motorized 3-Way Shut-Off Valve	N	V

### MISCELLANEOUS OPTIONS

O = None

S = Quiet Chassis

C = Washerless Hose Connection

B = Quiet Chassis with Washerless Hose Connection

### WATERSIDE OPTIONS

C = Standard Water Coil

N = Cupro-Nickel Water Coil

### AIRSIDE OPTIONS

A = Standard Airside Coil

C = Dipped Electrofin Coating

### AUTO-FLOW REGULATOR

0 = No Flow Control Valve

B = 1.5 USGPM

C = 2.0 USGPM

D = 2.5 USGPM

E = 3.0 USGPM

F = 3.50 USGPM

H = 4.0 USGPM

J = 4.5 USGPM

K = 5.0 USGPM

L = 6.0 USGPM

M = 7.0 USGPM

N = 8.0 USGPM

P = 9.0 USGPM

## Approvals



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# Introduction

## **Performance, Value and Stainability in a Labor-Saving Package.**

The Vertical Stacked Water Source Heat Pumps (VPCS) from Johnson Controls offer the ultimate in multi-story HVAC design flexibility. The VPCS Series is a compact, concealed system, capable of providing total heating and cooling functions for a single zone or multiple rooms. These units offer the flexibility of a four-pipe fan coil system at the cost of a two-pipe system, with the added flexibility of individual tenant metering. VPCS Series units are ideally suited for the total heating and cooling needs of any two-plus story building with a consistent floor plan.

- Hotels
- High-Rise Apartments / Condominiums
- Hospitals / Nursing homes
- Dormitories
- Renovated office space

The space saving VPCS unit is a two-part system featuring a self-supporting, pre-piped cabinet, and a removable heat pump chassis. The cabinet, complete with supply/return/drain risers, is installed during the intermediate phase of building construction. The cabinet is framed-in, and covered with drywall, as part of the interior wall structure. The finished equipment installation is hidden from view, blending with the decor of the room. Access to the mechanical components of the unit can be made entirely through the front/return air panel.

The provision for as many as three cabinet supply air outlets allows for maximum design flexibility and cost savings. One strategically located unit can serve up to three separate rooms without the need for ductwork. The ease of removal and replacement of the heat pump chassis offers enhanced serviceability. A chassis that requires service may be quickly removed, replaced with a back-up chassis, and serviced at a more convenient time or place.

All units are tested and certified by AHRI / ISO 13256-1 and ETL for United States and Canada. Johnson Controls stacked heat pump design exceeds ASHRAE 90.1 requirements at all rating conditions, making the VPCS series an excellent choice for water-loop and geothermal applications.

## Product Overview

### Refrigerant

R-410A

### Sizes

0.75–3 Tons (2.6–10.6 kW)

### Models Available

Cabinets:

VPB	Standard Assembly
VPM	Master Assembly
VPS	Satellite Assembly

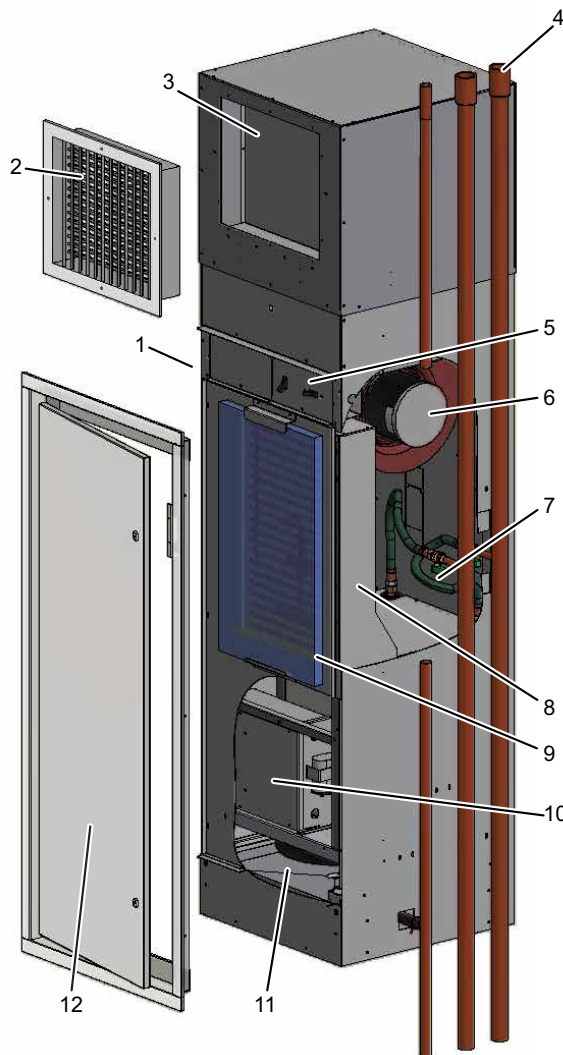
Chassis:

VPCS	Heat Pump Assembly
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### Features

1. Terminal box
2. Double-deflection discharge grille (optional: opposed blade damper)
3. Sight/sound discharge baffles on all horizontal openings
4. Type M copper risers (optional: Type L)
5. Non-fused electrical disconnect
6. EC motor
7. Stainless steel braided hoses
8. Copper tube aluminum fin refrigerant-to-air coil (optional: dipped electrofin coated coil)
9. MERV 4 throw-away filter (optional: MERV 8)
10. Microprocessor control box
11. ASHRAE 62.1 compliant removable double-sloped drain pan (optional: stainless steel)
12. Acoustic perimeter return air intake door (locking options available)



LD19510



# ***Standard and Optional Features***

## **STANDARD FEATURES**

### **Construction**

- AHRI/ISO 13256-1 certified and labeled
- Galvanized steel construction
- 1/2 inch thick fiberglass insulation
- Integral filter rack with 1 inch throwaway filter

### **Decorator Front Panel**

- Perimeter intake return air door
- Durable powder coat paint
- Magnetic latches

### **Supply Air**

- Front, back, side, and/or top outlets
- Sight and sound baffles

### **Air-to-Refrigerant Coils**

- R-410A direct expansion air coil
- 3/8 inch O.D. seamless copper tubes
- High efficiency aluminum fin surface for optimizing heat transfer, pressure drop, and carryover
- Easily removable for service

### **Water-to-Refrigerant Coils**

- Coaxial heat exchanger with convoluted inner tube design
- Capable of operation with an entering fluid temperature range of 20.0–110.0°F
- Riser connection with stainless steel braided hoses

### **Drain Pans**

- Single wall, galvanized steel
- Fully insulated
- P-trap factory installed
- Condensate switch

## ***Standard and Optional Features (Cont'd)***

### **Fan Assemblies**

- Forward curved, double width double inlet (DWDI) centrifugal type blowers
- 208/230V, single phase, EC motors

### **Electrical**

- cETL listed for safety compliance
- Electrical enclosure with access door for field wiring terminations
- Microprocessor controller handles reversing valve operation (no heat pump thermostat needed)
- Terminal block for field connections
- Single point power connection

### **OPTIONAL FEATURES**

#### **Construction**

- Master/Satellite arrangements
- 1 inch MERV 8 filter

#### **Decorator Front Panel**

- Quarter turn or key lock

#### **Supply Air**

- Double deflection discharge grille
- Opposed blade damper

#### **Outside Air**

- 4 inch round connection on top left/right of cabinet
- Motorized damper

#### **Drain Pans**

- Stainless steel construction

### **Fan Assemblies**

- High-static EC motors

### **Electrical**

- Non-fused disconnect or disconnect with fusing

### **Piping Options**

- 2-way and 3-way motorized valves
- Fixed flow control valves
- P/T ports and Y-strainers

**Thermostats**

- Digital display
- Non-programmable or programmable
- Fan speed control
- ADA height thermostat mounting
- Communicating thermostat options

**Risers**

- Type M or L copper with swaged connections
- 3/4 inch to 3 inch diameters
- 1/2 inch and 3/4 inch closed cell insulation
- Type M copper condensate riser
- Riser extensions
- Riser cover
- Ship in advance risers

# Physical Data

TABLE 1 - VPCS SERIES

PREMIUM SERIES MODEL	09	12	15	18	24	30	36
Nominal Cooling (Ton) <sup>1</sup>	0.75	1.0	1.25	1.5	2.0	2.5	3.0
COMPRESSOR TYPE	ROTARY			SCROLL			
Refrigerant Charge (Oz)	33	39	45	47	51	52	58
AIR COIL-TYPE	ENHANCED COPPER TUBES, ENHANCED ALUMINUM FINS						
Face Area (Sq Ft)	1.83	1.83	2.72	2.72	3.14	3.38	3.38
Rows/Fpi	2/14	3/14	3/14	3/14	3/14	3/14	3/14
WATER COIL-TYPE	HIGH EFFICIENCY GREEN SURFACE CO-AXIAL						
ECM BLOWER/MOTOR	DWDI FORWARD-CURVED CENTRIFUGAL / ECM DIRECT-DRIVE						
Diameter X Width (In)	9x4T	9x4T	9x7T	9x7T	10x7T	9x8	9x8
Motor Hp	0.33	0.33	0.33	0.33	0.33	0.50	0.50
FILTER QUANTITY-SIZE (IN)	1-14x25x1 1-14x25x2 <sup>2</sup>	1-14x25x1 1-14x25x2 <sup>2</sup>	1/16x30x1 1/16x30x2 <sup>2</sup>	1/16x30x1 1/16x30x2 <sup>2</sup>	1/20x30x1 1/20x30x2 <sup>2</sup>	1/20x30x1 1/20x30x2 <sup>2</sup>	1/20x30x1 1/20x30x2 <sup>2</sup>
FLEXIBLE HOSE SIZE	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"
CONDENSATE CONNECTION SIZE	7/8" ID	7/8" ID	7/8" ID	7/8" ID	7/8" ID	7/8" ID	7/8" ID
CABINET WEIGHT (LB) <sup>3</sup>	145	145	145	145	175	175	175
CHASSIS WEIGHT (LB)	104	110	117	137	156	165	172

## NOTES:

1. Nominal Capacity calculated in accordance with ARI / ISO Standard 13256-1 for Water Loop Application
2. Optional 2-inch MERV 13 filters.
3. Cabinet weight is approximate and does not include weight of risers

TABLE 2 - OPERATING LIMITS\*

	COOLING	HEATING
MINIMUM EWT	50.0°F / 30.0°F*	50.0°F / 20.0°F*
MAXIMUM EWT	110.0°F	90.0°F

\*NOTE: Geothermal operation (glycol-water mixture)

# AHRI/ISO 13256-1 Performance Data

**TABLE 3 - EC MOTORS (ECM)**

MODEL	FLOW RATE (USGPM)	COOLING	HEATING	WATER LOOP CONDITIONS <sup>1</sup>				GROUND WATER CONDITIONS <sup>2</sup>				GROUND LOOP CONDITIONS <sup>3</sup>			
		AIR FLOW (SCFM)		COOLING		HEATING		COOLING		HEATING		COOLING		HEATING	
				CAPACITY (BTUH) <sup>4</sup>	EER	CAPACITY (BTUH) <sup>5</sup>	COP	CAPACITY (BTUH) <sup>4</sup>	EER	CAPACITY (BTUH) <sup>5</sup>	COP	CAPACITY (BTUH) <sup>4</sup>	EER	CAPACITY (BTUH) <sup>5</sup>	COP
09	2.4	375	400	9,700	15.6	12,800	5.2	11,400	25.0	10,300	4.4	10,000	17.5	7,900	3.5
12	2.8	450	500	11,900	15.5	15,000	5.0	13,900	22.5	12,200	4.3	12,400	17.5	9,600	3.5
15	3.75	520	580	14,800	16.4	16,900	5.1	17,100	23.5	14,000	4.6	15,500	18.5	10,600	3.6
18	5	700	750	18,400	16.0	21,400	5.6	21,600	24.4	17,800	4.7	19,000	18.0	13,700	3.7
24	6.2	850	950	24,300	16.0	28,900	5.7	27,000	24.8	23,800	4.9	25,300	18.5	18,600	4.0
30	7.5	1075	1075	30,100	16.6	34,000	5.6	34,200	24.4	27,900	4.8	31,300	18.5	21,800	3.8
36	9	1100	1250	36,300	15.3	44,000	5.1	40,800	23.2	35,900	4.4	37,400	17.0	27,800	3.6

**NOTES:**

1. Water Loop capacities are rated at 86.0°F EWT Cooling, 68.0°F EWT Heating.
2. Ground Water capacities are rated at 59.0°F EWT Cooling, 50.0°F EWT Heating.
3. Ground Loop capacities are rated at 77.0°F EFT Cooling, 32.0°F EFT Heating.
4. All Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature.
5. All Heating capacities based upon 68.0°F DB, 59.0°F WB entering air temperature.

## Performance Data - EC Motor

**TABLE 4 - VPCS09 - EC MOTOR (ECM)- COOLING AIRFLOW: 375 CFM AND HEATING AIRFLOW: 400 CFM**

EWT	GPM	WPD		COOLING						HEATING				
		PSI	FT	TC	SC	SHR	KW	HR	EER	HTG	KW	HE	LAT	COP
20	3.2	5.7	13.1							5.8	0.55	4.2	81.4	3.1
30	1.6	1.9	4.5	12.7	9.3	0.73	0.34	13.6	37.7	7.0	0.59	5.3	84.1	3.5
	2.4	3.4	7.9	12.9	9.4	0.73	0.34	13.8	38.6	7.3	0.59	5.6	84.9	3.6
	3.2	5.5	12.7	13.0	9.5	0.73	0.33	13.9	39.4	7.5	0.60	5.8	85.4	3.7
40	1.6	1.9	4.3	12.2	9.1	0.75	0.38	13.2	32.2	9.0	0.63	7.2	88.8	4.2
	2.4	3.3	7.6	12.3	9.1	0.74	0.37	13.3	33.8	9.0	0.63	7.2	88.9	4.2
	3.2	5.3	12.2	12.4	9.2	0.74	0.36	13.4	34.5	9.2	0.63	7.3	89.2	4.2
50	1.6	1.8	4.1	11.6	8.8	0.76	0.43	12.8	27.1	9.7	0.65	7.8	90.4	4.4
	2.4	3.1	7.2	11.8	8.9	0.76	0.41	12.9	28.7	10.0	0.66	8.1	91.2	4.5
	3.2	5.1	11.7	11.8	8.9	0.75	0.40	12.9	29.4	10.3	0.66	8.3	91.8	4.5
60	1.6	1.7	3.9	11.1	8.6	0.78	0.49	12.5	22.7	10.9	0.67	8.9	93.3	4.8
	2.4	3.0	6.9	11.2	8.6	0.77	0.47	12.6	23.9	11.4	0.67	9.4	94.4	5.0
	3.2	4.8	11.1	11.3	8.7	0.77	0.46	12.6	24.4	11.8	0.67	9.8	95.2	5.2
70	1.6	1.6	3.7	10.6	8.4	0.79	0.56	12.2	19.0	12.3	0.67	10.3	96.5	5.4
	2.4	2.9	6.6	10.7	8.5	0.79	0.54	12.3	19.9	12.9	0.67	10.9	97.9	5.6
	3.2	4.6	10.6	10.8	8.4	0.78	0.53	12.3	20.4	13.4	0.68	11.4	99.0	5.8
80	1.6	1.5	3.6	10.1	8.2	0.81	0.63	11.9	16.1	13.8	0.69	11.7	99.9	5.9
	2.4	2.7	6.3	10.2	8.3	0.81	0.61	12.0	16.8	14.5	0.70	12.4	101.6	6.1
	3.2	4.4	10.1	10.3	8.2	0.80	0.60	12.0	17.2	15.0	0.72	12.9	102.8	6.2
90	1.6	1.5	3.4	9.6	8.0	0.84	0.70	11.7	13.7	15.3	0.72	13.1	103.4	6.2
	2.4	2.6	6.0	9.7	8.0	0.83	0.68	11.7	14.3	16.1	0.73	13.9	105.2	6.5
	3.2	4.2	9.6	9.8	8.0	0.82	0.67	11.8	14.6	16.7	0.75	14.5	106.6	6.6
100	1.6	1.4	3.2	9.0	7.8	0.86	0.78	11.4	11.6					
	2.4	2.5	5.7	9.2	7.8	0.85	0.76	11.5	12.1					
	3.2	4.0	9.1	9.2	7.8	0.85	0.75	11.5	12.4					
110	1.6	1.3	3.0	8.5	7.4	0.88	0.86	11.1	9.8					
	2.4	2.3	5.3	8.6	7.5	0.87	0.84	11.2	10.2					
	3.2	3.7	8.6	8.7	7.5	0.86	0.83	11.2	10.4					

**NOTES:**

- Cooling Performance is tabulated at 80.6°F DB and 66.2°F WB entering air. Heating performance tabulated at 68.0°F EAT
- Tabulated data does not include AHRI/ISO corrections for fan and pump power.
- All capacities are expressed in MBH.
- Insulated water circuit is recommended for operation below 60.0°F EWT.
- Operation below 60.0°F EWT is based on 15% methanol.
- See performance correction tables for conditions beyond what is listed.
- Extrapolation is not permissible.
- Shaded areas indicate conditions where operation is not recommended.
- All performance is based on 208V on 208-230V units.

**TABLE 5 - VPCS12 - EC MOTOR (ECM) - COOLING AIRFLOW: 450 CFM AND HEATING AIRFLOW: 500 CFM**

EWT	GPM	WPD		COOLING						HEATING				
		PSI	FT	TC	SC	SHR	KW	HR	EER	HTG	KW	HE	LAT	COP
20	3.8	7.0	16.2							8.1	0.70	6.1	83.0	3.4
30	1.9	2.5	5.7	14.6	10.7	0.73	0.40	15.7	36.4	9.0	0.71	6.9	84.6	3.7
	2.8	4.4	10.2	14.7	10.7	0.73	0.39	15.7	37.9	9.1	0.71	7.1	84.9	3.8
	3.8	6.8	15.8	15.1	10.9	0.72	0.38	16.1	39.5	9.3	0.72	7.2	85.2	3.8
40	1.9	2.3	5.2	14.2	10.5	0.74	0.45	15.5	31.5	10.1	0.73	7.9	86.7	4.1
	2.8	4.2	9.7	14.4	10.5	0.73	0.44	15.5	32.9	10.4	0.73	8.2	87.2	4.2
	3.8	6.6	15.2	14.4	10.5	0.73	0.43	15.6	33.7	10.6	0.73	8.4	87.6	4.2
50	1.9	2.0	4.7	13.8	10.4	0.75	0.51	15.3	26.9	11.3	0.74	9.2	89.0	4.5
	2.8	4.0	9.2	14.0	10.3	0.74	0.49	15.3	28.2	11.7	0.74	9.5	89.7	4.6
	3.8	6.4	14.8	14.0	10.4	0.74	0.48	15.4	29.0	12.1	0.74	9.9	90.3	4.8
60	1.9	1.8	4.2	13.4	10.2	0.76	0.58	15.0	23.0	12.8	0.75	10.6	91.7	5.0
	2.8	3.8	8.7	13.5	10.1	0.75	0.56	15.1	24.0	13.3	0.75	11.1	92.6	5.2
	3.8	6.2	14.3	13.6	10.2	0.75	0.55	15.1	24.6	13.7	0.76	11.5	93.5	5.3
70	1.9	1.6	3.7	12.9	9.9	0.77	0.66	14.8	19.5	14.4	0.76	12.1	94.6	5.5
	2.8	3.6	8.2	13.0	10.0	0.77	0.64	14.9	20.4	15.1	0.77	12.8	95.9	5.7
	3.8	6.0	13.8	13.1	10.1	0.77	0.63	14.9	20.9	15.6	0.77	13.3	97.0	5.9
80	1.9	1.4	3.2	12.3	9.6	0.78	0.74	14.6	16.6	16.2	0.78	13.8	97.9	6.1
	2.8	3.4	7.7	12.5	9.7	0.78	0.72	14.6	17.4	17.0	0.79	14.7	99.5	6.3
	3.8	5.8	13.3	12.6	9.8	0.78	0.71	14.7	17.8	17.8	0.80	15.4	100.9	6.5
90	1.9	1.2	2.7	11.8	9.4	0.80	0.83	14.3	14.1	18.1	0.81	15.7	101.6	6.6
	2.8	3.1	7.2	11.9	9.4	0.79	0.81	14.4	14.8	19.2	0.82	16.7	103.5	6.8
	3.8	5.6	12.8	12.0	9.5	0.79	0.80	14.4	15.1	20.1	0.84	17.6	105.2	7.0
100	1.9	1.0	2.2	11.2	9.2	0.82	0.93	14.0	12.1					
	2.8	2.9	6.7	11.3	9.2	0.81	0.90	14.1	12.6					
	3.8	5.3	12.3	11.4	9.3	0.81	0.89	14.2	12.9					
110	1.9	0.7	1.7	10.6	8.9	0.84	1.03	13.7	10.3					
	2.8	2.7	6.3	10.7	8.9	0.83	1.00	13.8	10.7					
	3.8	5.1	11.8	10.8	9.0	0.83	0.99	13.9	11.0					

**NOTES:**

- Cooling Performance is tabulated at 80.6°F DB and 66.2°F WB entering air. Heating performance tabulated at 68.0°F EAT
- Tabulated data does not include AHRI/ISO corrections for fan and pump power.
- All capacities are expressed in MBH.
- Insulated water circuit is recommended for operation below 60.0°F EWT.
- Operation below 60.0°F EWT is based on 15% methanol.
- See performance correction tables for conditions beyond what is listed.
- Extrapolation is not permissible.
- Shaded areas indicate conditions where operation is not recommended.
- All performance is based on 208V on 208-230V units.

## Performance Data - EC Motor (Cont'd)

**TABLE 6 - VPCS15 - EC MOTOR (ECM) - COOLING AND HEATING AIRFLOW: 520 CFM**

EWT	GPM	WPD		COOLING						HEATING				
		PSI	FT	TC	SC	SHR	KW	HR	EER	HTG	KW	HE	LAT	COP
20	5.0	11.5	26.5							8.1	0.72	6.0	86.3	3.3
30	2.5	3.4	7.8	17.3	13.5	0.78	0.48	18.6	36.1	10.3	0.80	7.9	86.6	3.8
	3.8	6.9	15.9	17.4	13.6	0.78	0.42	18.5	41.7	10.5	0.80	8.1	86.9	3.8
	5.0	11.1	25.7	17.5	13.6	0.78	0.39	18.5	44.8	10.6	0.80	8.2	88.5	3.9
40	2.5	3.2	7.5	16.9	13.4	0.79	0.55	18.5	30.8	11.5	0.82	9.0	89.0	4.1
	3.8	6.6	15.2	17.1	13.5	0.79	0.48	18.4	35.7	11.8	0.82	9.3	89.4	4.2
	5.0	10.6	24.4	17.1	13.5	0.79	0.44	18.3	38.6	12.0	0.83	9.5	91.0	4.3
50	2.5	3.1	7.1	16.5	13.2	0.80	0.60	18.2	27.6	12.9	0.84	10.4	91.7	4.5
	3.8	6.3	14.4	16.6	13.3	0.80	0.54	18.1	30.7	13.3	0.85	10.8	92.3	4.6
	5.0	10.1	23.3	16.7	13.3	0.80	0.52	18.1	32.4	13.6	0.85	11.1	93.8	4.7
60	2.5	2.9	6.7	15.8	12.8	0.81	0.68	17.8	23.1	14.5	0.86	11.9	94.7	4.9
	3.8	5.9	13.7	16.1	13.1	0.81	0.64	18.0	25.2	15.0	0.87	12.4	95.5	5.0
	5.0	9.5	22.0	16.2	13.1	0.81	0.62	18.0	26.1	15.4	0.88	12.8	96.8	5.1
70	2.5	2.8	6.4	15.4	12.8	0.83	0.79	17.8	19.6	16.2	0.89	13.5	98.0	5.3
	3.8	5.6	12.9	15.6	12.8	0.82	0.75	17.8	20.7	16.8	0.90	14.1	98.9	5.5
	5.0	9.0	20.8	15.7	12.8	0.82	0.74	17.8	21.2	17.4	0.90	14.6	100.0	5.6
80	2.5	2.6	6.0	14.8	12.5	0.84	0.89	17.5	16.7	18.0	0.91	15.2	101.4	5.8
	3.8	5.3	12.2	15.0	12.6	0.84	0.86	17.6	17.4	18.8	0.92	16.0	102.6	6.0
	5.0	8.5	19.6	15.1	12.6	0.84	0.85	17.6	17.8	19.4	0.93	16.6	103.4	6.1
90	2.5	2.4	5.6	14.2	12.2	0.86	1.00	17.2	14.2	19.9	0.93	17.0	105.1	6.3
	3.8	5.0	11.4	14.3	12.3	0.86	0.97	17.3	14.7	20.8	0.94	18.0	106.4	6.5
	5.0	8.0	18.4	14.4	12.4	0.86	0.96	17.3	15.0	21.6	0.95	18.7	108.0	6.7
100	2.5	2.3	5.3	13.5	12.0	0.89	1.11	16.9	12.2					
	3.8	4.6	10.7	13.6	12.0	0.88	1.08	17.0	12.6					
	5.0	7.5	17.2	13.7	12.1	0.88	1.07	17.0	12.8					
110	2.5	2.1	4.9	12.7	11.7	0.92	1.22	16.6	10.4					
	3.8	4.3	9.9	12.9	11.7	0.91	1.19	16.6	10.8					
	5.0	6.9	16.0	13.0	11.8	0.91	1.18	16.7	11.0					

**NOTES:**

- Cooling Performance is tabulated at 80.6°F DB and 66.2°F WB entering air. Heating performance tabulated at 68.0°F EAT
- Tabulated data does not include AHRI/ISO corrections for fan and pump power.°
- All capacities are expressed in MBH.
- Insulated water circuit is recommended for operation below 60.0°F EWT.
- Operation below 60.0°F EWT is based on 15% methanol.
- See performance correction tables for conditions beyond what is listed.
- Extrapolation is not permissible.
- Shaded areas indicate conditions where operation is not recommended.
- All performance is based on 208V on 208-230V units.



**TABLE 7 - VPCS18 - EC MOTOR (ECM) - COOLING AND HEATING AIRFLOW: 700 CFM**

EWT	GPM	WPD		COOLING						HEATING				
		PSI	FT	TC	SC	SHR	KW	HR	EER	HTG	KW	HE	LAT	COP
20	6.8	22.9	52.9							11.2	1.00	8.3	82.8	3.3
30	3.4	4.6	10.7	23.8	17.9	0.75	0.51	25.1	46.4	12.6	1.01	9.6	84.6	3.6
	5.0	13.2	30.5	23.9	17.7	0.74	0.50	25.1	47.5	12.8	1.01	9.9	85.0	3.7
	6.8	22.0	50.8	24.0	17.8	0.74	0.49	25.2	49.5	13.1	1.02	10.1	85.3	3.8
40	3.4	4.4	10.2	22.8	17.3	0.76	0.60	24.3	38.2	14.4	1.03	11.4	87.0	4.1
	5.0	12.7	29.3	22.9	17.4	0.76	0.59	24.4	39.0	14.8	1.03	11.8	87.5	4.2
	6.8	21.1	48.7	23.0	17.5	0.76	0.57	24.5	40.3	15.1	1.03	12.1	88.0	4.3
50	3.4	4.2	9.8	21.9	17.1	0.78	0.68	23.7	32.2	16.4	1.04	13.3	89.7	4.6
	5.0	12.1	28.0	21.9	17.1	0.78	0.67	23.7	32.7	17.0	1.05	13.9	90.5	4.7
	6.8	20.2	46.5	22.1	17.2	0.78	0.66	23.8	33.6	17.5	1.05	14.4	91.1	4.9
60	3.4	4.0	9.3	21.0	16.8	0.80	0.79	23.2	26.5	18.7	1.06	15.5	92.7	5.1
	5.0	11.6	26.7	21.1	16.6	0.79	0.79	23.3	26.8	19.4	1.07	16.2	93.7	5.3
	6.8	19.3	44.4	21.2	16.7	0.79	0.77	23.3	27.5	20.0	1.07	16.9	94.5	5.5
70	3.4	3.9	8.9	20.2	16.3	0.81	0.91	22.8	22.1	21.1	1.08	17.9	95.9	5.7
	5.0	11.0	25.4	20.2	16.4	0.81	0.90	22.8	22.4	22.0	1.09	18.8	97.1	5.9
	6.8	18.3	42.3	20.3	16.5	0.81	0.89	22.9	22.9	22.8	1.10	19.5	98.1	6.1
80	3.4	3.7	8.4	19.3	16.1	0.83	1.04	22.4	18.6	23.7	1.10	20.4	99.3	6.3
	5.0	10.5	24.2	19.4	16.1	0.83	1.03	22.4	18.8	24.8	1.11	21.5	100.8	6.5
	6.8	17.4	40.2	19.5	16.2	0.83	1.02	22.5	19.2	25.7	1.12	22.4	102.0	6.7
90	3.4	3.5	8.0	18.5	15.7	0.85	1.18	22.0	15.7	26.4	1.12	23.0	102.9	6.9
	5.0	9.9	22.9	18.6	15.6	0.84	1.17	22.1	15.8	27.7	1.13	24.3	104.6	7.2
	6.8	16.5	38.1	18.7	15.7	0.84	1.15	22.1	16.2	28.8	1.14	25.4	106.1	7.4
100	3.4	3.3	7.5	17.6	15.5	0.88	1.34	21.7	13.2					
	5.0	9.4	21.6	17.7	15.4	0.87	1.33	21.7	13.3					
	6.8	15.6	36.0	17.8	15.5	0.87	1.31	21.8	13.6					
110	3.4	3.1	7.1	16.7	15.0	0.90	1.52	21.4	11.0					
	5.0	8.8	20.4	16.7	15.0	0.90	1.51	21.4	11.1					
	6.8	14.7	33.9	16.8	15.1	0.90	1.49	21.4	11.3					

**NOTES:**

- Cooling Performance is tabulated at 80.6°F DB and 66.2°F WB entering air. Heating performance tabulated at 68.0°F EAT
- Tabulated data does not include AHRI/ISO corrections for fan and pump power.°
- All capacities are expressed in MBH.
- Insulated water circuit is recommended for operation below 60.0°F EWT.
- Operation below 60.0°F EWT is based on 15% methanol.
- See performance correction tables for conditions beyond what is listed.
- Extrapolation is not permissible.
- Shaded areas indicate conditions where operation is not recommended.
- All performance is based on 208V on 208-230V units.

## Performance Data - EC Motor (Cont'd)

**TABLE 8 - VPCS24 - EC MOTOR (ECM) - COOLING AIRFLOW: 850 CFM AND HEATING AIRFLOW: 950 CFM**

EWT	GPM	WPD		COOLING						HEATING				
		PSI	FT	TC	SC	SHR	KW	HR	EER	HTG	KW	HE	LAT	COP
20	8.2	12.1	27.8							14.9	1.35	11.0	82.5	3.2
30	4.1	4.5	10.3	29.5	20.9	0.71	0.75	31.5	39.5	16.6	1.36	12.7	84.2	3.6
	6.2	7.2	16.6	29.7	21.1	0.71	0.71	31.6	41.8	17.0	1.36	13.0	84.6	3.7
	8.2	11.5	26.6	29.8	20.9	0.70	0.70	31.6	42.8	17.3	1.36	13.3	84.9	3.7
40	4.1	4.1	9.5	28.8	20.7	0.72	0.87	31.1	33.3	18.9	1.38	14.9	86.5	4.0
	6.2	6.9	15.8	29.0	20.6	0.71	0.83	31.2	34.9	19.6	1.38	15.5	87.1	4.2
	8.2	11.0	25.3	29.1	20.7	0.71	0.82	31.3	35.7	20.0	1.38	15.9	87.5	4.2
50	4.1	3.8	8.7	28.0	20.1	0.72	0.99	30.8	28.4	21.6	1.39	17.5	91.6	4.5
	6.2	6.5	15.0	28.2	20.3	0.72	0.95	30.9	29.7	22.5	1.40	18.3	92.5	4.7
	8.2	10.4	24.0	28.3	20.4	0.72	0.94	30.9	30.3	23.2	1.40	18.9	93.2	4.8
60	4.1	3.4	7.8	27.1	19.8	0.73	1.12	30.3	24.3	24.7	1.41	20.5	92.0	5.1
	6.2	6.1	14.2	27.4	20.0	0.73	1.08	30.5	25.4	25.8	1.42	21.6	93.2	5.3
	8.2	9.8	22.6	27.5	20.1	0.73	1.06	30.5	25.9	26.6	1.43	22.4	94.0	5.5
70	4.1	3.0	7.0	26.2	19.4	0.74	1.26	29.9	20.8	27.9	1.44	23.7	95.2	5.7
	6.2	5.8	13.4	26.3	19.4	0.74	1.22	29.8	21.6	29.4	1.45	25.1	96.6	5.9
	8.2	9.3	21.3	26.6	19.7	0.74	1.20	30.1	22.2	30.4	1.45	26.1	97.6	6.1
80	4.1	2.7	6.2	25.2	19.1	0.76	1.42	29.4	17.7	31.4	1.46	27.0	98.6	6.3
	6.2	5.4	12.6	25.4	19.1	0.75	1.37	29.5	18.6	33.1	1.47	28.8	100.3	6.6
	8.2	8.7	20.0	25.6	19.2	0.75	1.35	29.6	18.9	34.4	1.48	30.0	101.5	6.8
90	4.1	2.3	5.4	24.1	18.5	0.77	1.61	29.0	15.0	35.1	1.49	30.6	102.2	6.9
	6.2	5.1	11.7	24.4	18.8	0.77	1.55	29.1	15.7	37.1	1.51	32.6	104.2	7.2
	8.2	8.1	18.7	24.5	18.6	0.76	1.53	29.2	16.0	38.6	1.52	34.1	105.6	7.5
100	4.1	2.0	4.6	22.9	18.1	0.79	1.82	28.6	12.6					
	6.2	4.7	10.9	23.3	18.4	0.79	1.76	28.7	13.2					
	8.2	7.6	17.4	23.4	18.2	0.78	1.74	28.7	13.5					
110	4.1	1.6	3.8	21.7	17.6	0.81	2.08	28.2	10.4					
	6.2	4.4	10.1	22.0	17.9	0.81	2.01	28.3	11.0					
	8.2	7.0	16.1	22.2	17.7	0.80	1.98	28.3	11.2					

**NOTES:**

- Cooling Performance is tabulated at 80.6°F DB and 66.2°F WB entering air. Heating performance tabulated at 68.0°F EAT
- Tabulated data does not include AHRI/ISO corrections for fan and pump power.°
- All capacities are expressed in MBH.
- Insulated water circuit is recommended for operation below 60.0°F EWT.
- Operation below 60.0°F EWT is based on 15% methanol.
- See performance correction tables for conditions beyond what is listed.
- Extrapolation is not permissible.
- Shaded areas indicate conditions where operation is not recommended.
- All performance is based on 208V on 208-230V units.

**TABLE 9 - VPCS30 - EC MOTOR (ECM) - COOLING AND HEATING AIRFLOW: 1075 CFM**

EWT	GPM	WPD		COOLING						HEATING				
		PSI	FT	TC	SC	SHR	KW	HR	EER	HTG	KW	HE	LAT	COP
20	7.5	8.7	20.1							18.4	1.64	13.4	83.8	3.3
30	3.8	4.4	10.2	35.7	25.0	0.70	1.00	38.4	35.8	20.7	1.66	15.7	85.8	3.6
	5.7	6.5	15.0	36.1	24.9	0.69	0.91	38.6	39.6	21.0	1.66	16.0	86.1	3.7
	7.5	8.4	19.3	36.4	25.1	0.69	0.87	38.7	41.9	21.3	1.67	16.3	86.3	3.7
40	3.8	4.2	9.8	34.6	24.2	0.70	1.17	37.9	29.7	23.1	1.69	18.0	87.9	4.0
	5.7	6.2	14.3	35.1	24.6	0.70	1.09	38.2	32.4	23.7	1.70	18.5	88.4	4.1
	7.5	8.0	18.5	35.4	24.7	0.70	1.05	38.3	33.8	24.1	1.70	18.9	88.8	4.1
50	3.8	4.1	9.3	33.6	23.8	0.71	1.33	37.4	25.2	25.9	1.73	20.7	90.3	4.4
	5.7	5.9	13.7	34.1	24.2	0.71	1.25	37.7	27.2	26.8	1.74	21.5	91.1	4.5
	7.5	7.7	17.7	34.3	24.4	0.71	1.21	37.8	28.3	27.4	1.75	22.1	91.6	4.6
60	3.8	3.9	8.9	32.5	23.4	0.72	1.50	36.9	21.6	29.2	1.77	23.8	93.1	4.8
	5.7	5.7	13.1	33.0	23.8	0.72	1.42	37.2	23.3	30.3	1.79	24.9	94.1	5.0
	7.5	7.3	16.9	33.3	23.9	0.72	1.38	37.3	24.1	31.2	1.80	25.7	94.8	5.1
70	3.8	3.7	8.5	31.4	23.2	0.74	1.69	36.4	18.6	32.8	1.82	27.2	96.2	5.3
	5.7	5.4	12.4	31.9	23.3	0.73	1.59	36.7	20.0	34.2	1.84	28.6	97.5	5.5
	7.5	7.0	16.1	32.2	23.5	0.73	1.55	36.8	20.7	35.3	1.85	29.6	98.4	5.6
80	3.8	3.5	8.1	30.1	22.6	0.75	1.89	35.9	16.0	36.6	1.87	30.9	99.5	5.7
	5.7	5.1	11.8	30.7	23.1	0.75	1.79	36.2	17.2	38.4	1.90	32.6	101.1	5.9
	7.5	6.6	15.2	31.0	22.9	0.74	1.74	36.3	17.8	39.7	1.92	33.8	102.2	6.1
90	3.8	3.3	7.6	28.9	22.2	0.77	2.12	35.4	13.6	40.7	1.93	34.8	103.0	6.2
	5.7	4.9	11.2	29.5	22.7	0.77	2.00	35.7	14.7	42.8	1.96	36.8	104.9	6.4
	7.5	6.3	14.4	29.8	22.6	0.76	1.95	35.8	15.3	44.3	1.99	38.2	106.2	6.5
100	3.8	3.1	7.2	27.5	21.7	0.79	2.39	35.0	11.5					
	5.7	4.6	10.6	28.2	22.0	0.78	2.25	35.2	12.5					
	7.5	5.9	13.6	28.5	22.2	0.78	2.19	35.3	13.0					
110	3.8	2.9	6.8	26.0	21.3	0.82	2.70	34.5	9.6					
	5.7	4.3	9.9	26.7	21.7	0.81	2.53	34.7	10.6					
	7.5	5.6	12.8	27.1	21.7	0.80	2.47	34.8	11.0					

**NOTES:**

- Cooling Performance is tabulated at 80.6°F DB and 66.2°F WB entering air. Heating performance tabulated at 68.0°F EAT
- Tabulated data does not include AHRI/ISO corrections for fan and pump power.°
- All capacities are expressed in MBH.
- Insulated water circuit is recommended for operation below 60.0°F EWT.
- Operation below 60.0°F EWT is based on 15% methanol.
- See performance correction tables for conditions beyond what is listed.
- Extrapolation is not permissible.
- Shaded areas indicate conditions where operation is not recommended.
- All performance is based on 208V on 208-230V units.

## Performance Data - EC Motor (Cont'd)

**TABLE 10 - VPCS36 - EC MOTOR (ECM) - COOLING AIRFLOW: 1100 CFM AND HEATING AIRFLOW: 1250 CFM**

EWT	GPM	WPD		COOLING						HEATING				
		PSI	FT	TC	SC	SHR	KW	HR	EER	HTG	KW	HE	LAT	COP
20	9.0	11.7	27.1							22.3	2.18	15.8	84.5	3.0
30	4.5	3.1	7.2	43.9	29.9	0.68	1.27	47.3	34.7	25.8	2.21	19.3	87.1	3.4
	6.8	7.1	16.4	44.3	30.1	0.68	1.19	47.5	37.1	26.4	2.22	19.8	87.5	3.5
	9.0	10.9	25.2	44.6	30.3	0.68	1.15	47.6	38.9	26.8	2.22	20.2	87.8	3.5
40	4.5	2.9	6.8	42.7	29.5	0.69	1.47	46.8	29.1	29.0	2.25	22.3	89.5	3.8
	6.8	6.6	15.3	43.1	29.8	0.69	1.40	47.0	30.8	29.9	2.26	23.2	90.1	3.9
	9.0	10.2	23.6	43.4	29.9	0.69	1.36	47.1	31.9	30.5	2.26	23.8	90.6	3.9
50	4.5	2.7	6.3	41.5	29.0	0.70	1.66	46.2	25.0	32.7	2.29	25.8	92.2	4.2
	6.8	6.2	14.3	41.9	28.9	0.69	1.60	46.4	26.2	33.8	2.30	27.0	93.1	4.3
	9.0	9.5	21.9	42.1	29.1	0.69	1.56	46.6	27.1	34.7	2.31	27.8	93.7	4.4
60	4.5	2.5	5.8	40.2	28.5	0.71	1.86	45.6	21.6	36.7	2.33	29.7	95.1	4.6
	6.8	5.7	13.2	40.6	28.4	0.70	1.79	45.8	22.6	38.2	2.35	31.2	96.3	4.8
	9.0	8.8	20.3	40.9	28.6	0.70	1.75	45.9	23.3	39.3	2.36	32.2	97.1	4.9
70	4.5	2.3	5.4	38.8	27.6	0.71	2.07	45.0	18.8	40.9	2.38	33.8	98.3	5.0
	6.8	5.3	12.1	39.3	27.9	0.71	2.00	45.2	19.6	42.8	2.40	35.6	99.7	5.2
	9.0	8.1	18.7	39.5	28.1	0.71	1.96	45.3	20.2	44.2	2.42	37.0	100.8	5.4
80	4.5	2.1	4.9	37.4	27.3	0.73	2.30	44.3	16.3	45.5	2.43	38.1	101.7	5.5
	6.8	4.8	11.1	37.8	27.2	0.72	2.22	44.5	17.0	47.7	2.46	40.3	103.4	5.7
	9.0	7.4	17.0	38.1	27.4	0.72	2.18	44.6	17.5	49.4	2.48	41.9	104.6	5.8
90	4.5	1.9	4.4	35.8	26.5	0.74	2.57	43.6	14.0	50.2	2.49	42.7	105.2	5.9
	6.8	4.4	10.0	36.3	26.5	0.73	2.48	43.8	14.6	52.8	2.52	45.2	107.1	6.1
	9.0	6.7	15.4	36.6	26.7	0.73	2.43	44.0	15.1	54.8	2.55	47.1	108.6	6.3
100	4.5	1.7	3.9	34.1	25.9	0.76	2.88	43.0	11.9					
	6.8	3.9	9.0	34.6	26.0	0.75	2.78	43.2	12.5					
	9.0	6.0	13.8	34.9	26.2	0.75	2.72	43.3	12.8					
110	4.5	1.5	3.5	32.3	25.2	0.78	3.24	42.4	10.0					
	6.8	3.4	7.9	32.8	25.3	0.77	3.13	42.6	10.5					
	9.0	5.3	12.2	33.2	25.5	0.77	3.06	42.7	10.8					

**NOTES:**

- Cooling Performance is tabulated at 80.6°F DB and 66.2°F WB entering air. Heating performance tabulated at 68.0°F EAT
- Tabulated data does not include AHRI/ISO corrections for fan and pump power.°
- All capacities are expressed in MBH.
- Insulated water circuit is recommended for operation below 60.0°F EWT.
- Operation below 60.0°F EWT is based on 15% methanol.
- See performance correction tables for conditions beyond what is listed.
- Extrapolation is not permissible.
- Shaded areas indicate conditions where operation is not recommended.
- All performance is based on 208V on 208-230V units.

# Performance Data

TABLE 11 - ANTIFREEZE CORRECTION

		ANTIFREEZE CONCENTRATION						
		5%	10%	15%	20%	25%	30%	40%
ETHYLENE GLYCOL	TC, SC	0.998	0.995	0.993	0.991	0.989	0.987	0.984
	HTG	0.995	0.990	0.985	0.980	0.974	0.969	0.964
	WPD	1.040	1.055	1.080	1.105	1.135	1.165	1.210
PROPYLENE GLYCOL	TC, SC	0.995	0.992	0.987	0.983	0.979	0.975	0.970
	HTG	0.989	0.982	0.975	0.967	0.958	0.951	0.943
	WPD	1.035	1.055	1.100	1.145	1.200	1.260	1.320
METHANOL	TC, SC	0.999	0.995	0.990	0.986	0.982	0.980	0.978
	HTG	0.989	0.985	0.979	0.971	0.963	0.954	0.946
	WPD	1.050	1.072	1.094	1.116	1.140	1.165	1.196

TABLE 12 - AIRFLOW CORRECTION

AIRFLOW %	COOLING				HEATING		
	TC	SC	KW	HR	HTG	KW	HE
70	0.931	0.847	0.964	0.946	0.942	1.075	0.940
75	0.941	0.872	0.969	0.956	0.953	1.059	0.949
80	0.950	0.896	0.979	0.961	0.960	1.039	0.958
85	0.966	0.923	0.983	0.971	0.970	1.023	0.969
90	0.977	0.948	0.989	0.981	0.979	1.015	0.979
95	0.989	0.974	0.995	0.990	0.989	1.007	0.989
100	1.000	1.000	1.000	1.000	1.000	1.000	1.000
105	1.008	1.025	1.006	1.010	1.009	0.994	1.010
110	1.018	1.048	1.013	1.017	1.019	0.992	1.018
115	1.026	1.070	1.019	1.026	1.029	0.991	1.028

TABLE 13 - COOLING PERFORMANCE CORRECTION

EAT WB (F)	TC	EAT DB (F) - SC						HR
		70	75	80.6	85	90	95	
60	0.845	0.86	1.1	1.305	S	S	S	0.904
65	0.948	0.628	0.865	1.082	1.312	S	S	0.979
66.2	1	0.539	0.777	1	1.22	1.475	S	1
70	1.061		0.631	0.855	1.081	1.331	1.543	1.039
75	1.162			0.618	0.848	1.09	1.296	1.107

NOTE: SC = Sensible cooling is equal to total cooling

TABLE 14 - HEATING PERFORMANCE CORRECTION

EAT DB (F)	HTG	KW	HE
45	1.101	0.785	1.162
50	1.080	0.832	1.125
55	1.059	0.878	1.079
60	1.039	0.926	1.064
65	1.019	0.960	1.023
68	1.000	1.000	1.000
70	0.990	1.028	0.983
75	0.974	1.064	0.957
80	0.951	1.111	0.918

# Riser Selection and Data

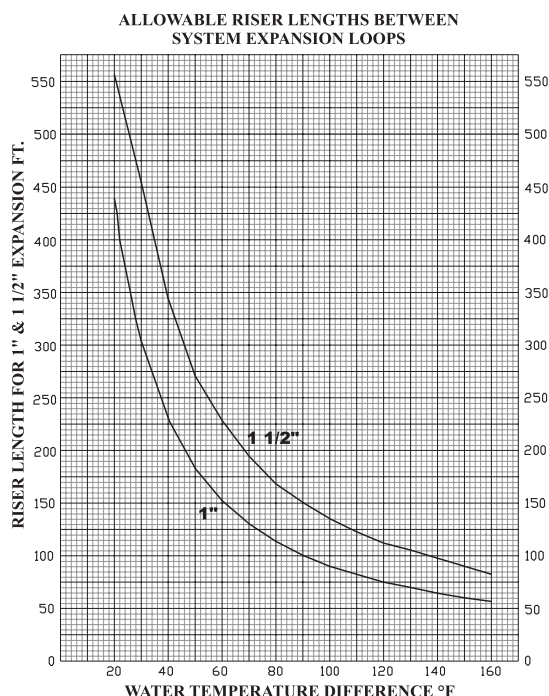
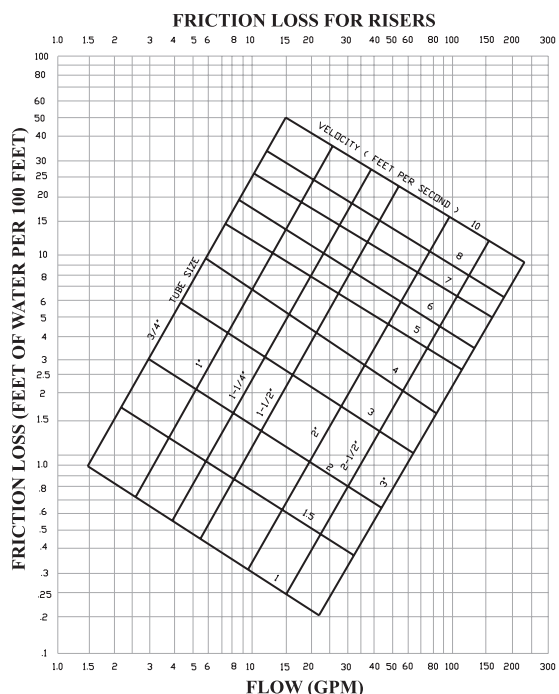
## RISER APPLICATION AND SIZING

Technical information on heat transfer, fluid flow and pipe sizing can be found in the ASHRAE Fundamentals Handbook and various other technical documents and publications. Some of the factors affecting riser application and sizing are noise, tube erosion and economics. The Friction Loss For Risers chart (next page) displays riser tube diameter sizes as a function of flow (GPM), friction loss and water velocity. For maximum riser velocity on pressure drop per 100 ft., refer to ASHRAE 2001 Fundamentals 35.3 Table 6 for Riser Sizing. Riser sizes can be of a single diameter on low rise buildings, or varying sizes on medium to high rise buildings. Generally, riser copper type, size, length and insulation thickness are determined by the location of the unit in the building.

Risers are available in Type-M or Type-L copper, varying diameters from 3/4 inch to 3 inch, and with either 1/2" or 3/4" thick closed cell foam insulation. Condensate risers are available in Type-M copper, varying diameters from 3/4 inch to 1-1/4 inch, and with 3/8 inch thick closed cell foam insulation.

## RISER EXPANSION

Generally, in medium to high rise buildings, allowance must be made for pipe expansion. Model VPCS vertical stacked water source heat pumps are furnished with hoses which act as expansion loops integral to the unit. The hose will allow for +/- 1-1/2 inches of riser expansion and contraction. Additional expansion compensation must be made in the riser system in the field where movement is expected to exceed the factory allowances. The Allowable Riser Lengths Between System Expansion Loops chart displays the expansion characteristics of risers compared to water temperature difference. Technical information on pipe expansion, contraction and anchoring can be found in the ASHRAE HVAC Systems and Equipment Handbook and various other technical documents and publications.



# Blower Performance

**TABLE 15 - ECM BLOWER PERFORMANCE (CFM)**

UNIT SIZE	MOTOR SPEED	EXTERNAL STATIC OPTION	ECM TAP#	RATED COOLING CFM	RATED HEATING CFM	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	
09	OPTIONAL FAN ONLY	N/A	1	375	400	300	280	260	235	210	190	170	-	-	-	-	-	-	
	LOW	LOW	2			320	305	290	270	250	225	200	-	-	-	-	-	-	
	HIGH		3			400	370	350	335	315	290	265	230	-	-	-	-	-	
	LOW	HIGH	4			410	395	385	370	350	335	315	290	260	-	-	-	-	-
	HIGH		5			535	520	510	500	485	470	460	440	420	400	375	350	330	
12	OPTIONAL FAN ONLY	N/A	1	450	500	300	280	260	235	210	190	170	-	-	-	-	-	-	
	LOW	LOW	2			410	395	385	370	350	335	315	290	260	-	-	-	-	-
	HIGH		3			475	460	445	430	415	395	380	355	335	315	-	-	-	-
	LOW	HIGH	4			500	485	475	460	450	435	425	410	395	380	360	-	-	-
	HIGH		5			590	570	550	535	525	510	490	470	450	430	405	380	350	
15	OPTIONAL FAN ONLY	N/A	1	520	580	415	405	395	350	320	275	245	-	-	-	-	-	-	
	LOW	LOW	2			480	460	440	415	390	370	350	-	-	-	-	-	-	
	HIGH		3			570	545	520	505	490	470	450	430	410	-	-	-	-	
	LOW	HIGH	4			600	585	570	550	530	510	490	475	460	435	410	-	-	
	HIGH		5			630	615	600	580	560	545	530	510	490	470	450	425	400	
18	OPTIONAL FAN ONLY	N/A	1	700	750	415	405	395	350	320	275	245	-	-	-	-	-	-	
	LOW	LOW	2			610	595	580	565	550	530	510	495	480	-	-	-	-	
	HIGH		3			730	720	710	695	680	670	660	640	625	600	580	555	530	
	LOW	HIGH	4			680	665	650	635	620	610	595	570	565	545	530	510	490	
	HIGH		5			790	775	760	745	730	715	700	675	650	625	600	570	540	
24	OPTIONAL FAN ONLY	N/A	1	850	950	660	620	590	565	540	510	480	460	440	420	-	-	-	
	LOW	LOW	2			800	785	770	750	730	710	690	670	650	625	600	-	-	
	HIGH		3			880	865	850	835	820	810	795	780	770	750	730	-	-	
	LOW	HIGH	4			920	900	880	870	860	845	830	810	790	775	760	740	720	
	HIGH		5			1070	1055	1040	1020	1000	980	960	940	920	905	890	870	850	
30	OPTIONAL FAN ONLY	N/A	1	1075	1075	870	850	830	810	790	770	750	725	700	680	660	-	-	
	LOW	LOW	2			940	920	900	885	870	855	840	820	800	775	750	-	-	
	HIGH		3			1160	1125	1090	1075	1060	1050	1040	1035	1010	995	980	960	930	
	LOW	HIGH	4			1070	1055	1040	1020	1000	980	960	940	920	900	880	860	840	
	HIGH		5			1330	1315	1300	1285	1270	1250	1230	1205	1160	1130	1080	1070	1060	
36	OPTIONAL FAN ONLY	N/A	1	1100	1250	870	850	830	810	790	770	750	725	700	680	660	-	-	
	LOW	LOW	2			1070	1055	1040	1020	1000	980	960	940	920	900	880	-	-	
	HIGH		3			1200	1185	1170	1155	1140	1120	1100	1085	1070	1055	1040	995	950	
	LOW	HIGH	4			1160	1125	1090	1075	1060	1050	1040	1035	1010	995	980	960	930	
	HIGH		5			1460	1430	1400	1370	1340	1295	1250	1210	1175	1145	1090	1080	1070	

**NOTES:**

- All airflow ratings are at lowest voltage rating of dual rating (e.g. 208 volt).
- Airflow ratings include resistance of wet coil and clean air filters.

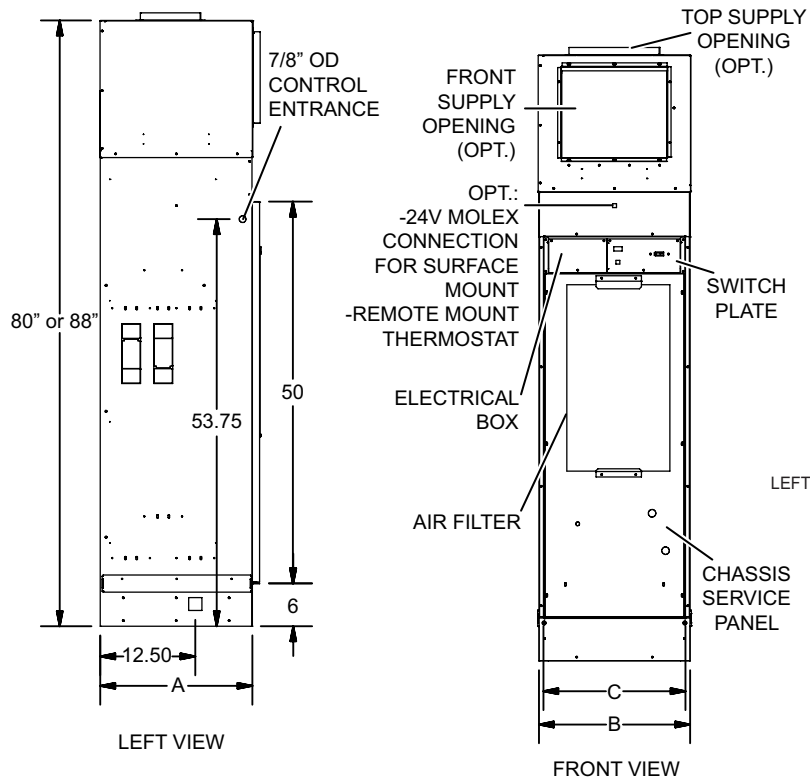
## Electrical Data

**TABLE 16 - EC MOTOR (ECM)**

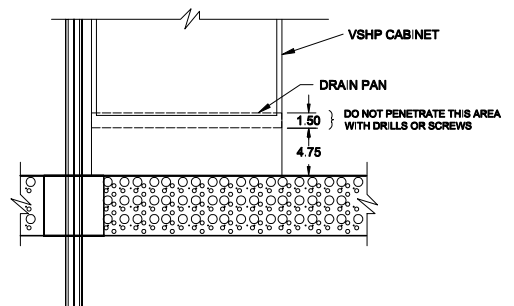
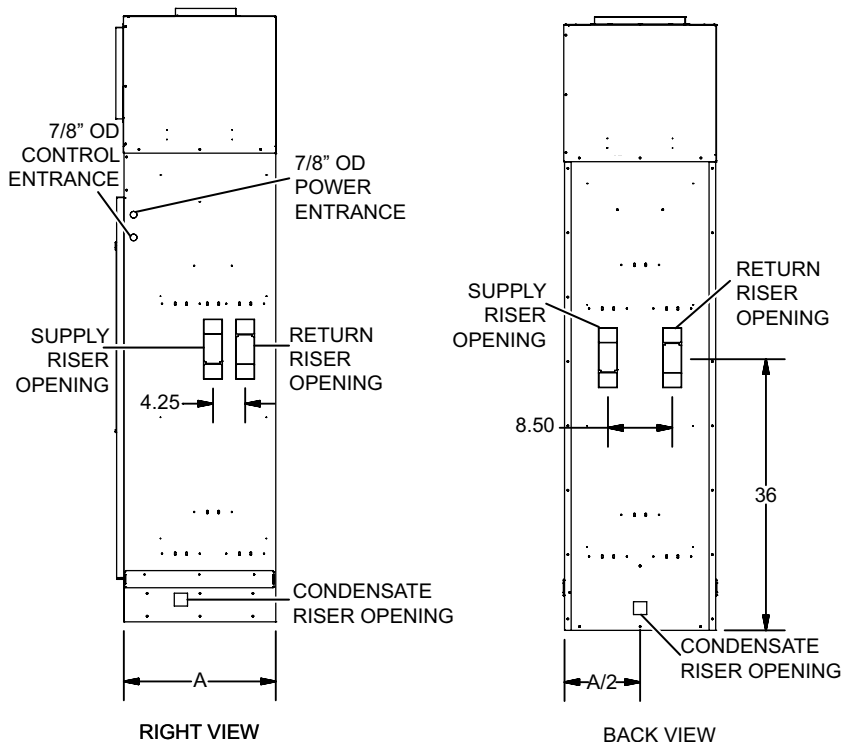
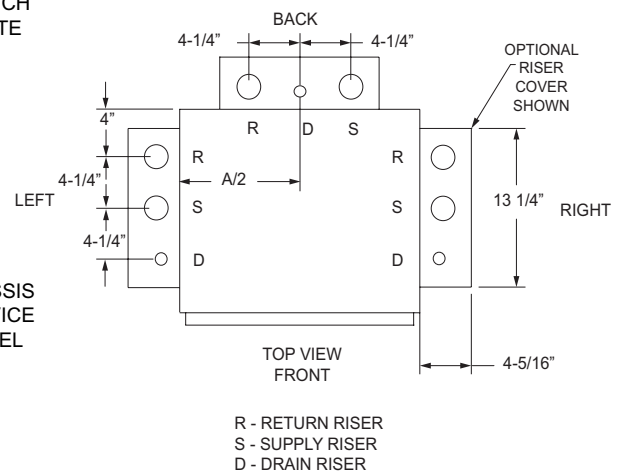
UNIT SIZE	SUPPLY VOLTAGE	COMPRESSOR				BLOWER		MIN. CCT. AMPACITY	MAX FUSE / CCT. BKR. AMP
		QTY		RLA	LRA	HP	FLA		
<b>09</b>	208-230/1/60	1	@	3.7	22.0	0.33	1.0	5.63	15
<b>12</b>	208-230/1/60	1	@	4.7	26.0	0.33	1.0	6.88	15
<b>15</b>	208-230/1/60	1	@	5.5	26.0	0.33	2.0	8.88	15
<b>18</b>	208-230/1/60	1	@	9.0	47.5	0.33	2.0	13.25	20
<b>24</b>	208-230/1/60	1	@	10.9	62.9	0.33	2.0	15.63	25
<b>30</b>	208-230/1/60	1	@	13.5	72.5	0.50	2.4	19.28	30
<b>36</b>	208-230/1/60	1	@	15.4	83.9	0.50	2.4	21.65	35



# Dimensional Data



CABINET DIMENSIONS			
MODEL	A	B	R/A FLANGE (C)
SIZE 1: 09-12-15-18	20	20	18.75
SIZE 2: 24-30-36	24	24	22.75

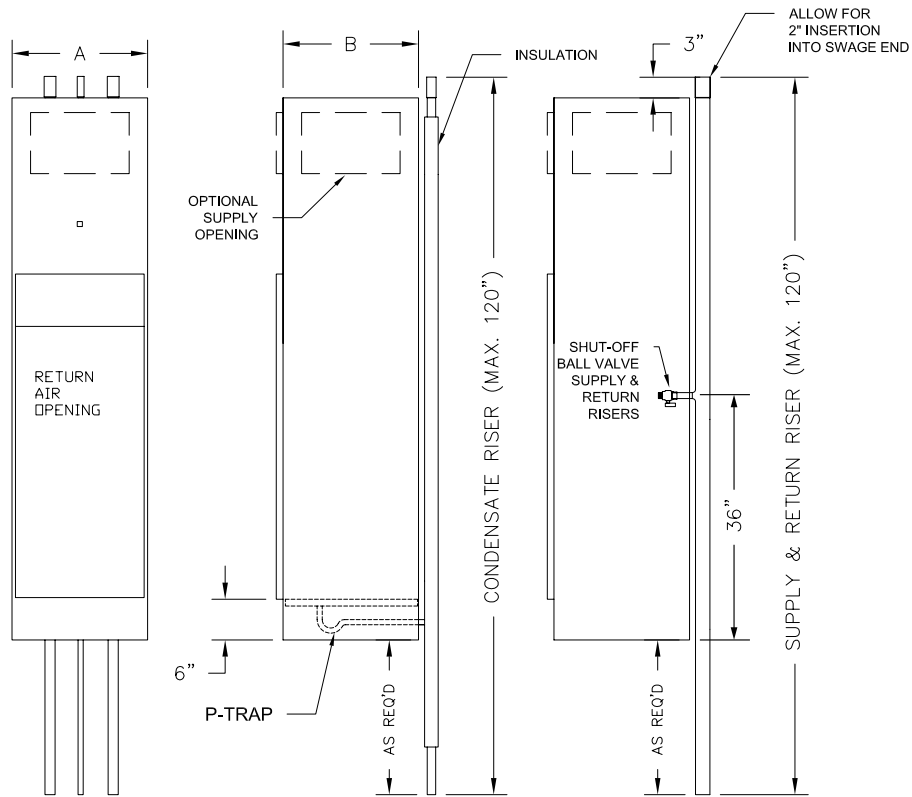
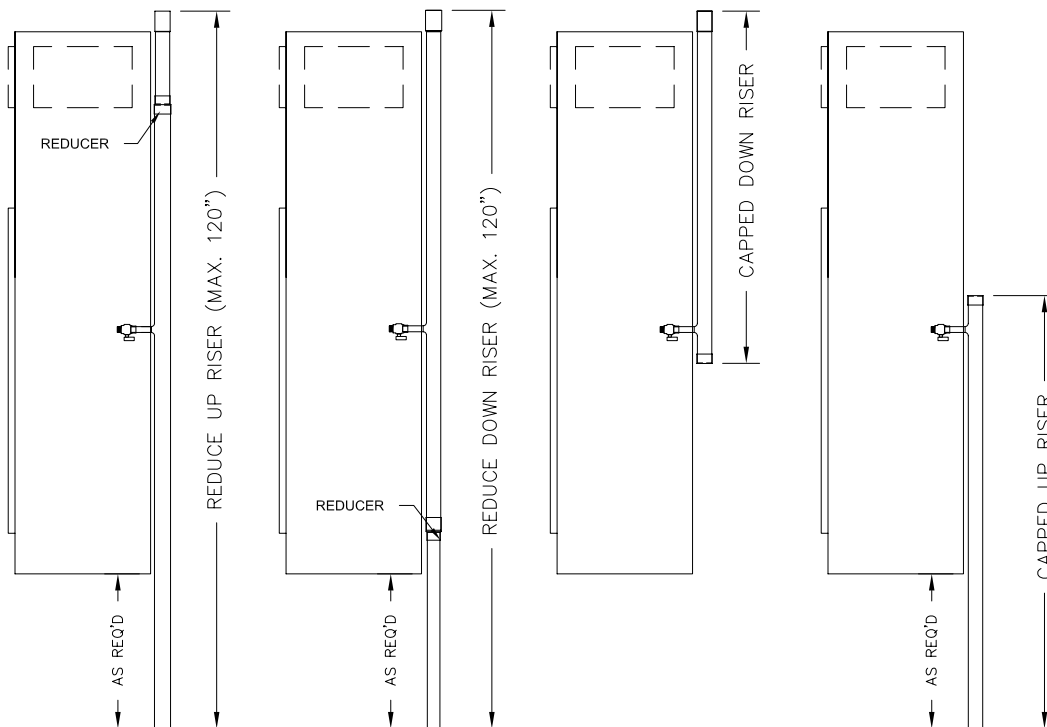


## Note:

- 1) Supply, Return, and Condensate riser openings are pre-punched on all sides and field convertible. Cut tabs to remove knock-out.
- 2) Supply and Return openings are 4" x 2.5". During riser installation, ensure stub-out is centered in supply and return openings.
- 3) Condensate P-trap is accessible from front by removing bottom cover plate.
- 4) Riser and shut-off location is measured from base of cabinet and does not include stand height.

LD19318a

## Dimensional Data (Cont'd)

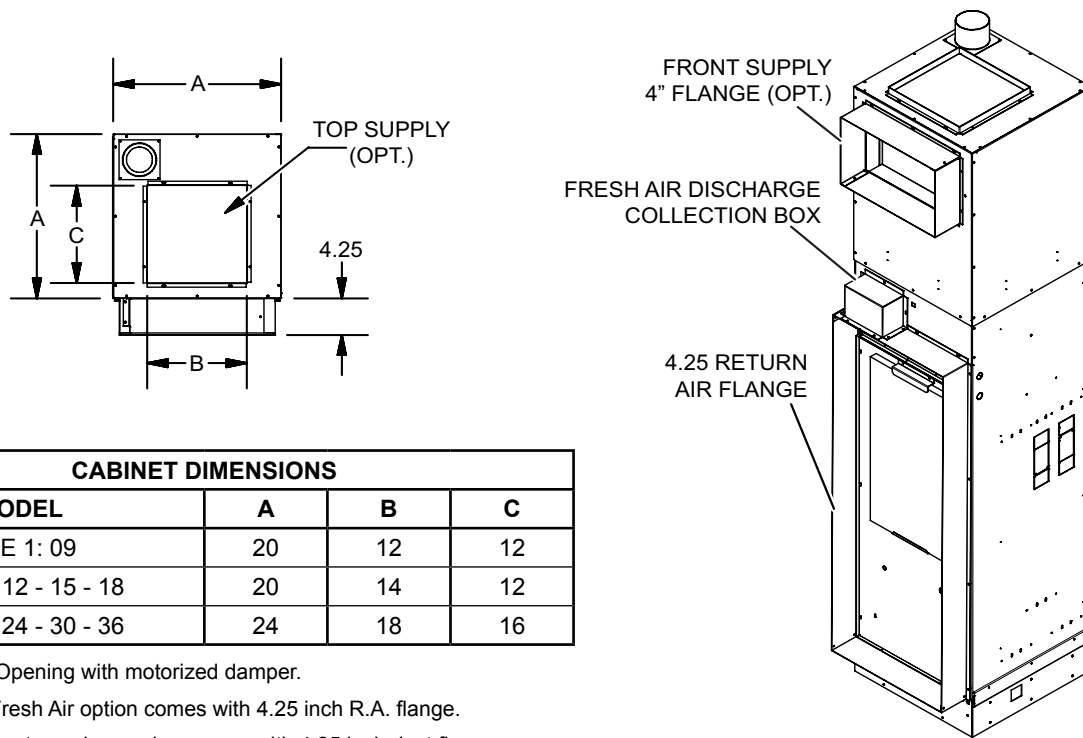
FRONT VIEW  
(BACK RISERS)RIGHT SIDE VIEW  
CONDENSATE RISERSTANDARD  
RISERREDUCE UP  
RISERREDUCE DOWN  
RISERCAPPED DOWN  
RISERCAPPED UP  
RISER

### NOTES:

1. Riser shut-off valve is measured from base of cabinet and does not include stand height.

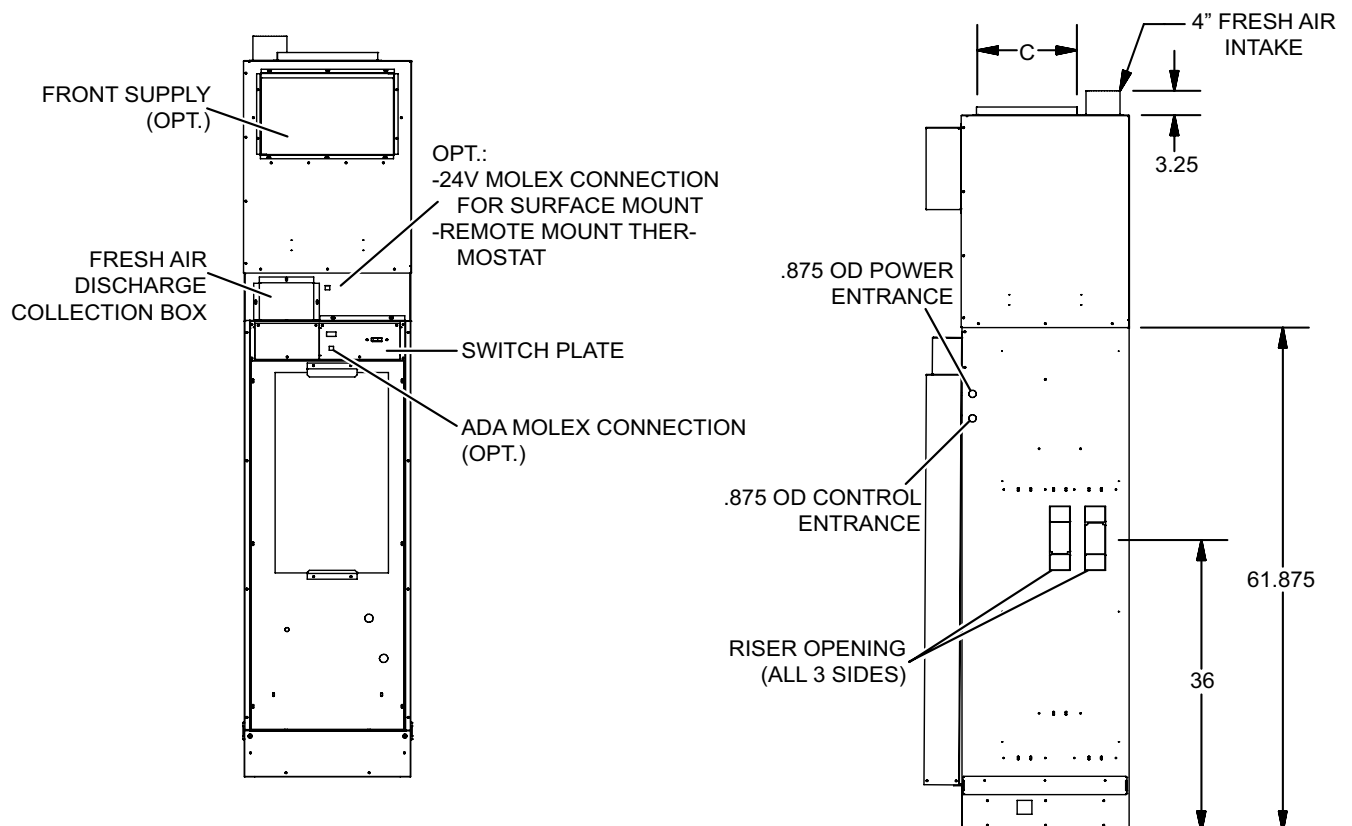
LD19330

## FRESH AIR OPENING WITH MOTORIZED DAMPER



CABINET DIMENSIONS			
MODEL	A	B	C
SIZE 1: 09	20	12	12
SIZE 2: 12 - 15 - 18	20	14	12
SIZE 3: 24 - 30 - 36	24	18	16

1. Fresh Air Opening with motorized damper.
2. Optional Fresh Air option comes with 4.25 inch R.A. flange.
3. Optional front supply opening comes with 4.25 inch duct flange.
4. All other openings come with standard 1" duct flange.
5. Left and right hand versions shown.

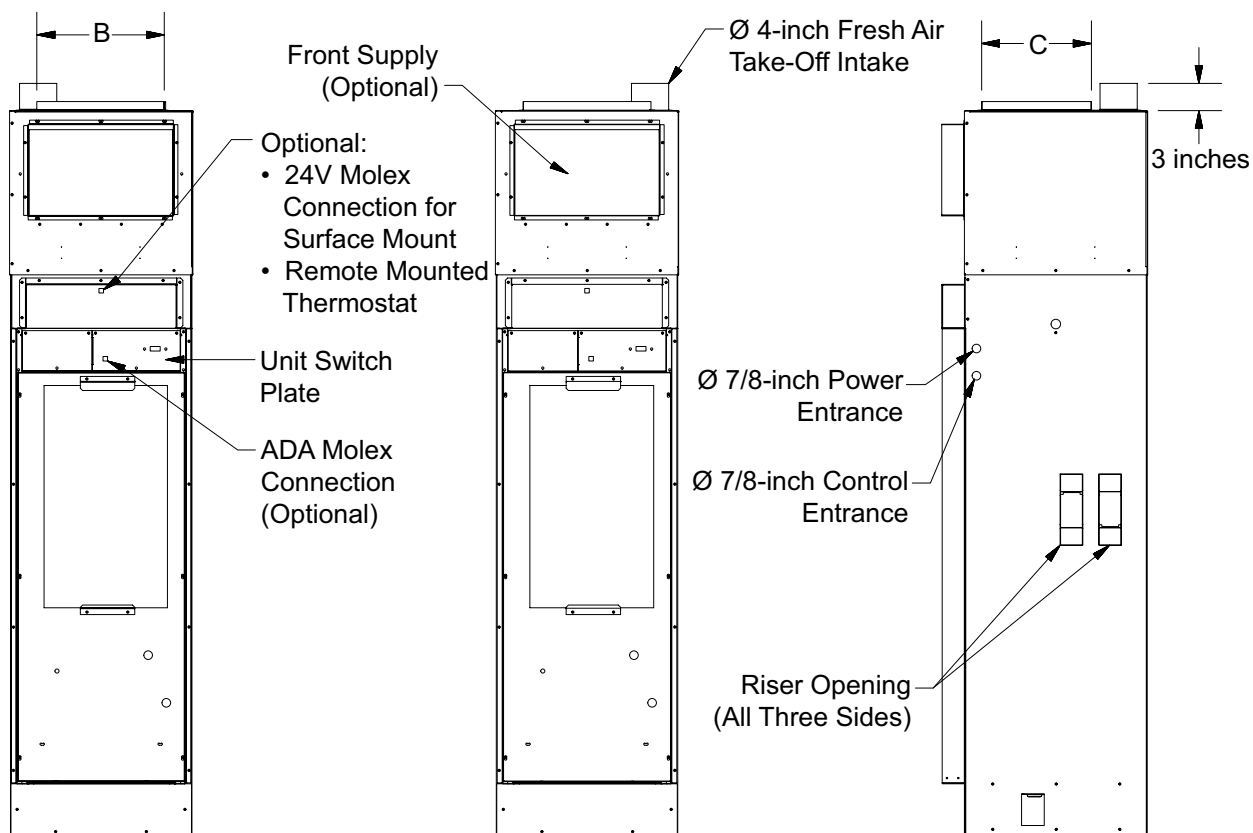
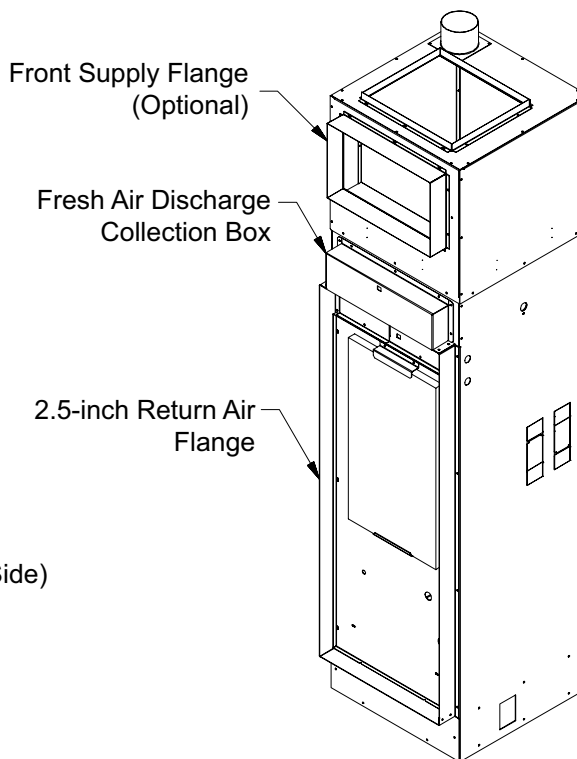
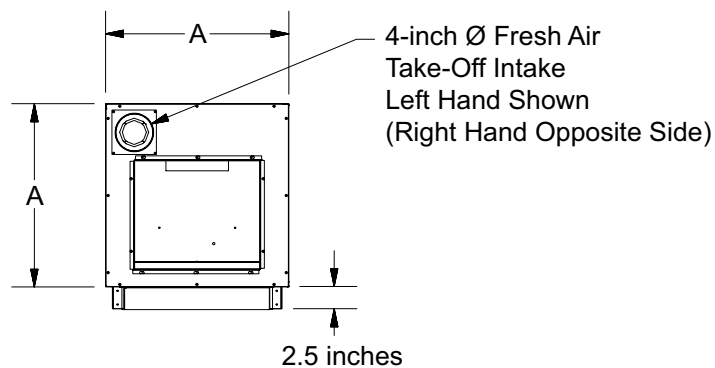


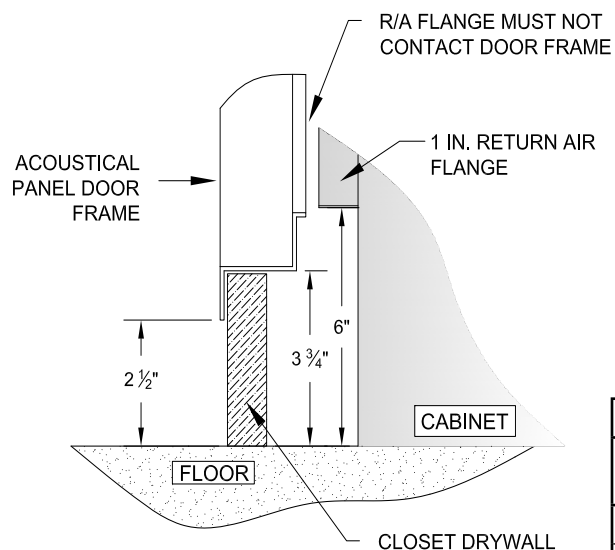
## Dimensional Data (Cont'd)

### FRESH AIR OPENING WITHOUT MOTORIZED DAMPER

CABINET DIMENSIONS (INCHES)			
MODEL	A	B	C
09	20	12	12
12-18	20	14	12
24-36	24	18	16

1. Fresh air opening without motorized damper.
2. Optional fresh air option comes with 2.25-inch RA flange.
3. Optional front supply opening comes with 2.5-inch duct flange.
4. All other openings come with standard 1-inch duct flange.
5. Left and right hand versions shown.



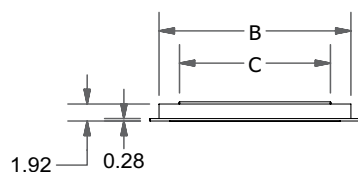


\* Cut away view for standard cabinet with no stand. Add stand height to cabinet to obtain correct dimension of R/A panel from floor.

ALL DIMENSIONS ARE IN INCHES							
RA PANEL	CABINET SIZE	A	B	C	D	ROUGH-IN WIDTH	ROUGH-IN HEIGHT
VSPE-S1	VPB09-18	25.75	23.50	19.25	21.50	23.75	54.75
VSPE-S2	VPB24-36	29.75	27.50	23.25	25.50	27.75	54.75

Note:

1) Dimensions shown do not include optional stand height.

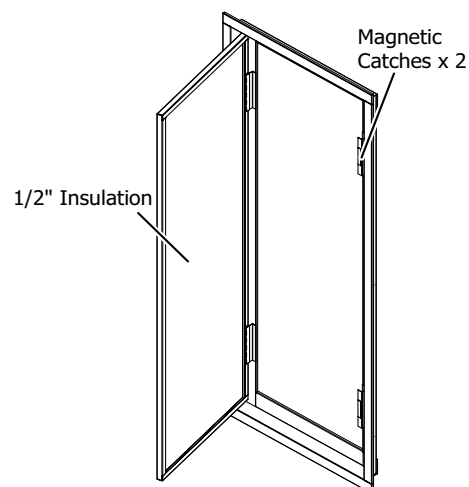
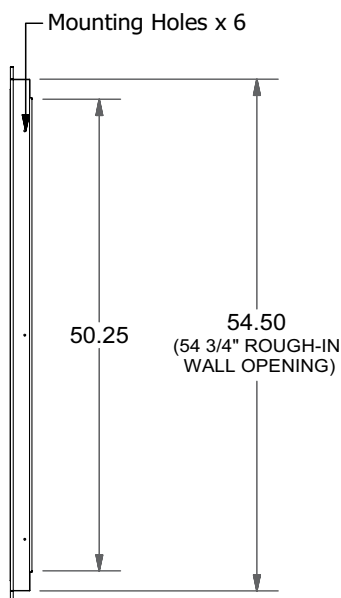
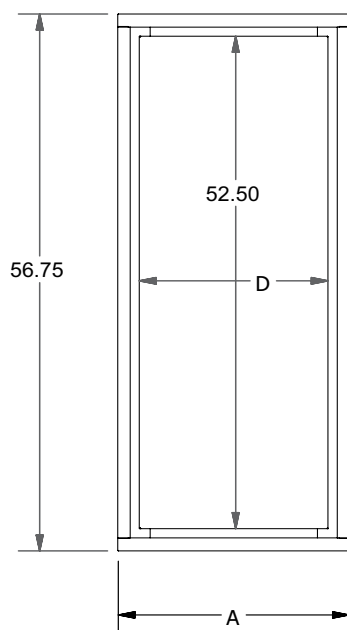


#### NOTES:

-Acoustic Panel powder coated in 'Appliance White'

-Acoustic Panel may be installed on the right-hand side or left-hand side

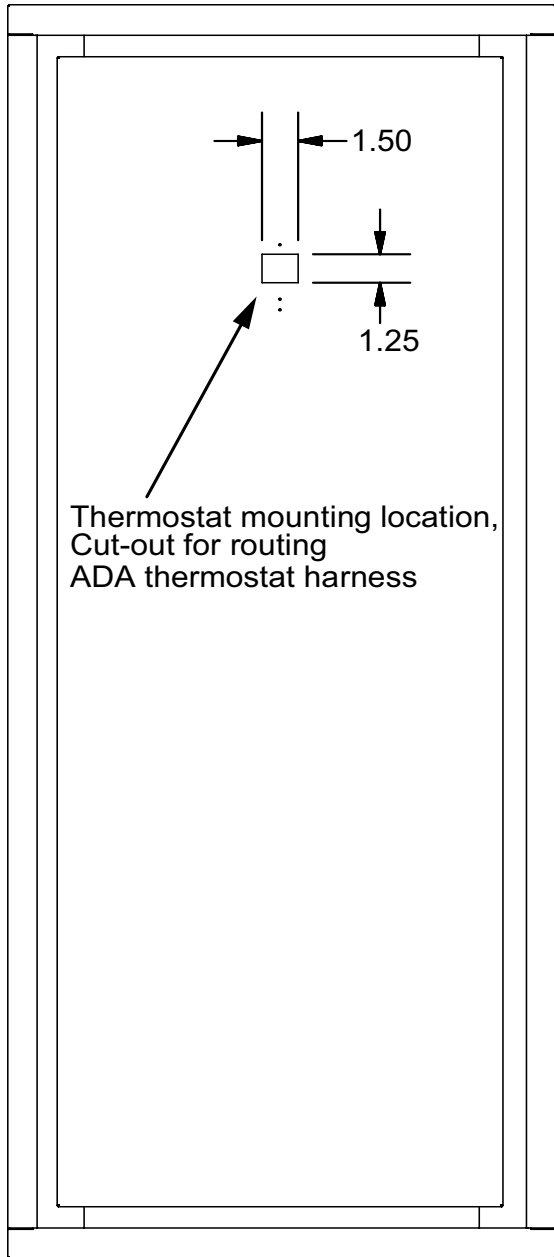
**IMPORTANT:** For maximum R.A. flow, flush-mounted acoustic panel must be centered vertically and horizontally over the Return Air opening of the cabinet. Supply air duct collar extensions may be required to prevent short cycling.



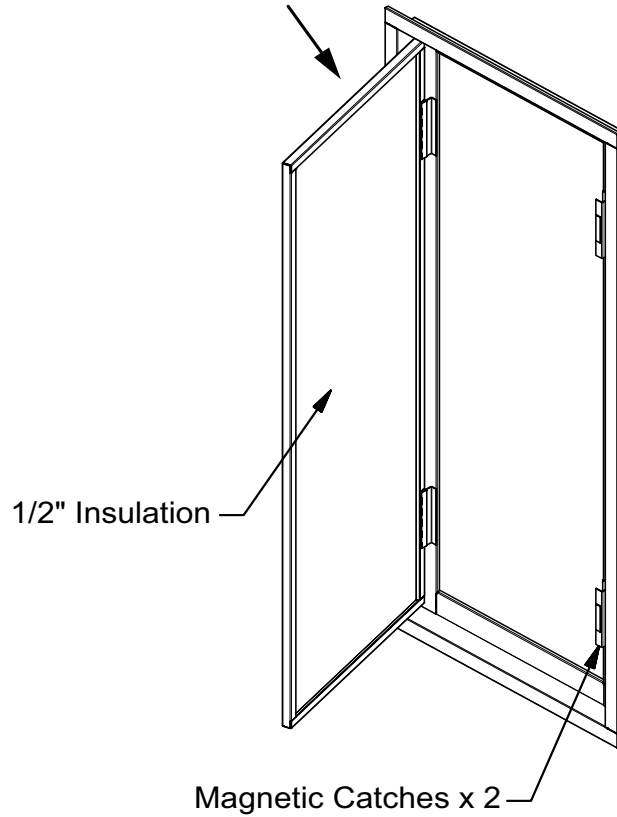
LD19319a

**NOTES:** See figure on 31 for additional RA panel and cabinet installation information.

## Dimensional Data (Cont'd)



LEFT HAND OPENING SHOWN

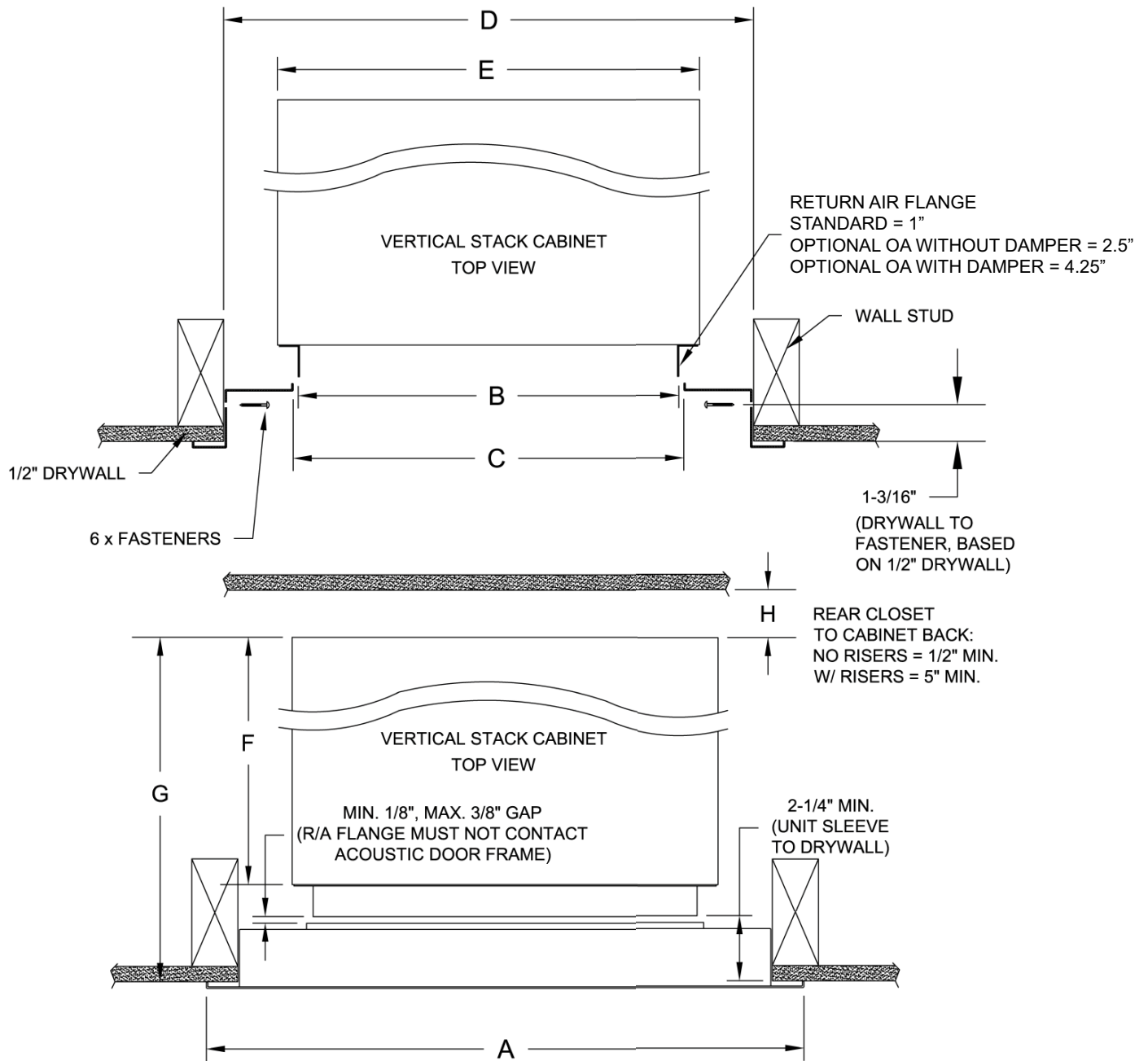


### Notes:

- Powder coated in 'Appliance White'
- Inside panel lined with 1/2" acoustical insulation
- Hinged panel complete with magnetic latches
- Panel comes either Left or Right hand opening

LD19320

## RETURN AIR PANEL

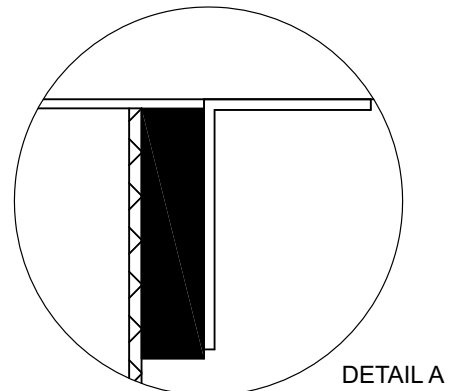
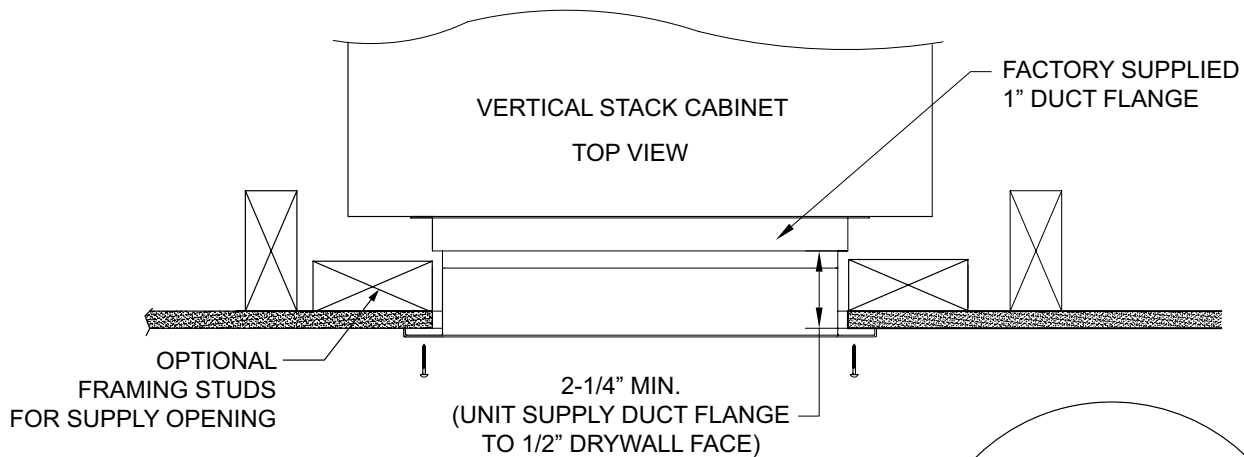
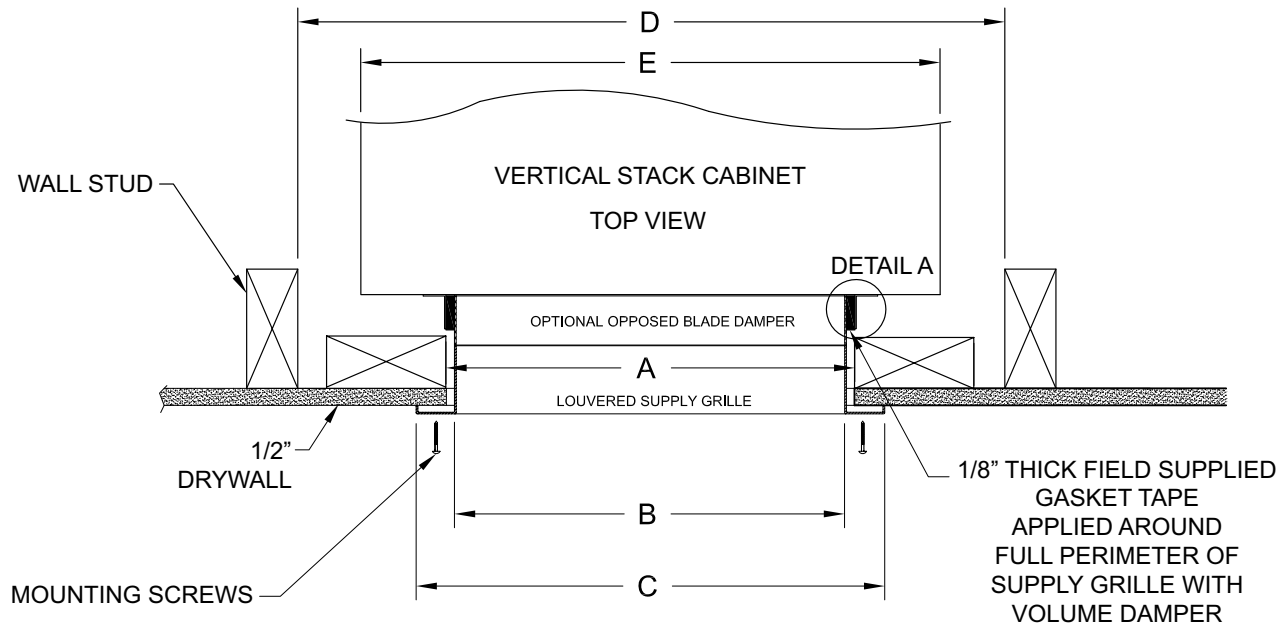


UNIT MODEL	(A) PANEL WIDTH	(B) SLEEVE WIDTH	(C) RA PANEL OPENING	(D) ROUGH IN WIDTH	(E) UNIT WIDTH	(F) UNIT DEPTH	(G) NO OA OPTION	(G) OA OPTION, NO DAMPER	(G) OA OPTION, WITH DAMPER
09/12/15/18	25.75	19	19.25	23.75 ± 0.125	20	20	23.25 MIN 23.50 MAX	24.75 MIN 25.00 MAX	26.50 MIN 26.75 MAX
24/30/36	29.75	23	23.25	27.75 ± 0.125	24	24	27.25 MIN 27.50 MAX	28.75 MIN 29.00 MAX	30.50 MIN 30.75 MAX

**NOTE:** All dimensions are in inches.

## Dimensional Data (Cont'd)

### SUPPLY GRILLES



UNIT SIZE	A (SUPPLY GRILLE NOMINAL WIDTH)	B (GRILLE WIDTH)	C (GRILLE FLANGE WIDTH)	D (ROUGH IN WIDTH)	E (UNIT WIDTH)
09/12/15/18	X	B=X-0.5"	C=X+1.75"	23 3/4 ± 1/8	20
24/30/36	X	B=X-0.5"	C=X+1.75"	27 3/4 ± 1/8	24

**NOTE:** All dimensions are in inches and typical for factory supplied grilles only. Check dimensions for field supplied grilles, as dimensions can be different.

LD19321



**TABLE 17 - UNIT SUPPLY OPENING SIZES**

MODEL	HORIZONTAL OPENINGS					TOP OPENING
	SINGLE HORIZONTAL		DOUBLE HORIZONTAL		TRIPLE HORIZONTAL	
	NO TOP OPENING	TOP OPENING	NO TOP OPENING	TOP OPENING	NO TOP OPENING	
<b>9</b>	16W x 12H	14W x 6H	14W x 8H	Consult Application Engineer	Consult Application Engineer	12 x 12
<b>12</b>	16W x 14H	14W x 6H	14W x 10H	Consult Application Engineer	Consult Application Engineer	14 x 12
<b>15</b>	16W x 14H	14W x 8H	16W x 12H	Consult Application Engineer	14W x 8H	14 x 12
<b>18</b>	Consult Application Engineer	14W x 8H	16W x 12H	14W x 6H	14W x 10H	14 x 12
<b>24</b>	Consult Application Engineer	14W x 10H	20W x 14H	14W x 6H	16W x 12H	18 x 16
<b>30</b>	Consult Application Engineer	16W x 12H	20W x 14H	14W x 6H	16W x 14H	18 x 16
<b>36</b>	Consult Application Engineer	16W x 12H	Consult Application Engineer	14W x 6H	16W x 14H	18 x 16

**NOTE:**

- Unit mounted supply grilles will be supplied as double-deflection type.
- Grilles for unequal airflow applications (e.g., unit-mounted plus ducted supply) shall be provided with integral opposed-blade dampers.
- All grilles will be supplied in standard "Appliance White" painted finish.
- Grilles are shipped loose for field installation upon completion of cabinet / ductwork / drywall installation.
- Top opening size does not change. When combined with any other discharge arrangement, shall be included in determining horizontal opening grille size.
- Openings marked "Not Available" result in face velocities outside the recommended 300-500 FPM range.
- Hi-Static Blower option is not recommended or single horizontal discharge openings with unit mounted supply grille.

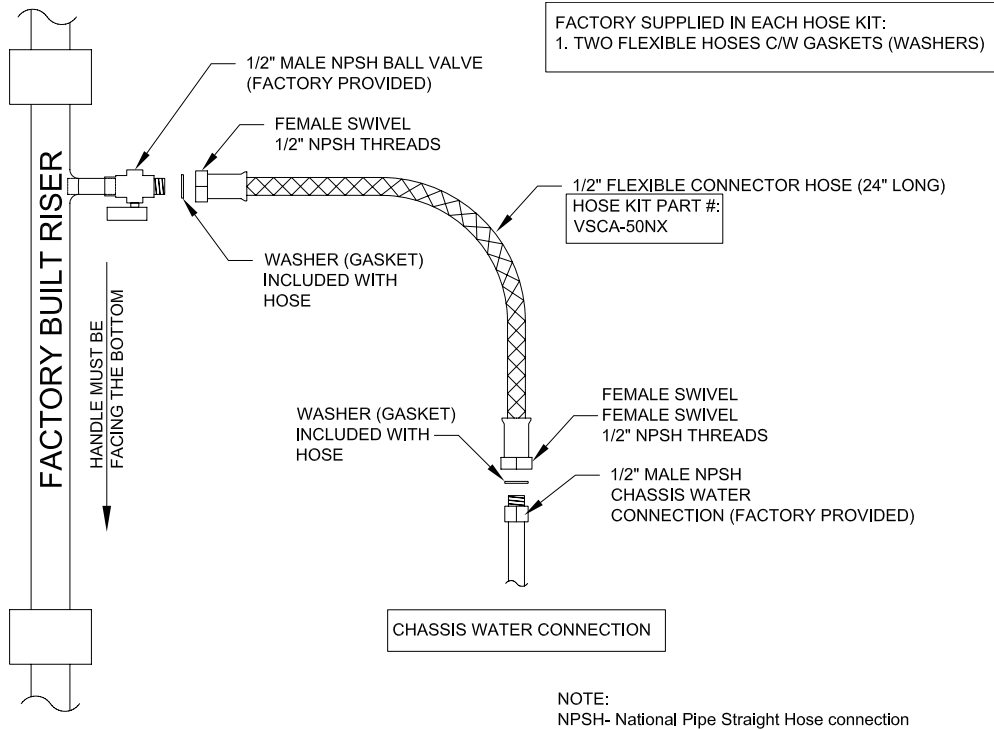
**TABLE 18 - UNIT SUPPLY FACE VELOCITY (FPM)**

MODEL	HORIZONTAL OPENINGS					TOP OPENING
	SINGLE HORIZONTAL		DOUBLE HORIZONTAL		TRIPLE HORIZONTAL	
	NO TOP OPENING	TOP OPENING	NO TOP OPENING	TOP OPENING	NO TOP OPENING	
<b>9</b>	446	280	426	Consult Application Engineer	Consult Application Engineer	375
<b>12</b>	459	299	369	Consult Application Engineer	Consult Application Engineer	386
<b>15</b>	531	324	310	Consult Application Engineer	394	446
<b>18</b>	Consult Application Engineer	436	417	379	383	600
<b>24</b>	Consult Application Engineer	326	337	317	337	425
<b>30</b>	Consult Application Engineer	379	427	401	366	538
<b>36</b>	Consult Application Engineer	423	Consult Application Engineer	448	408	600

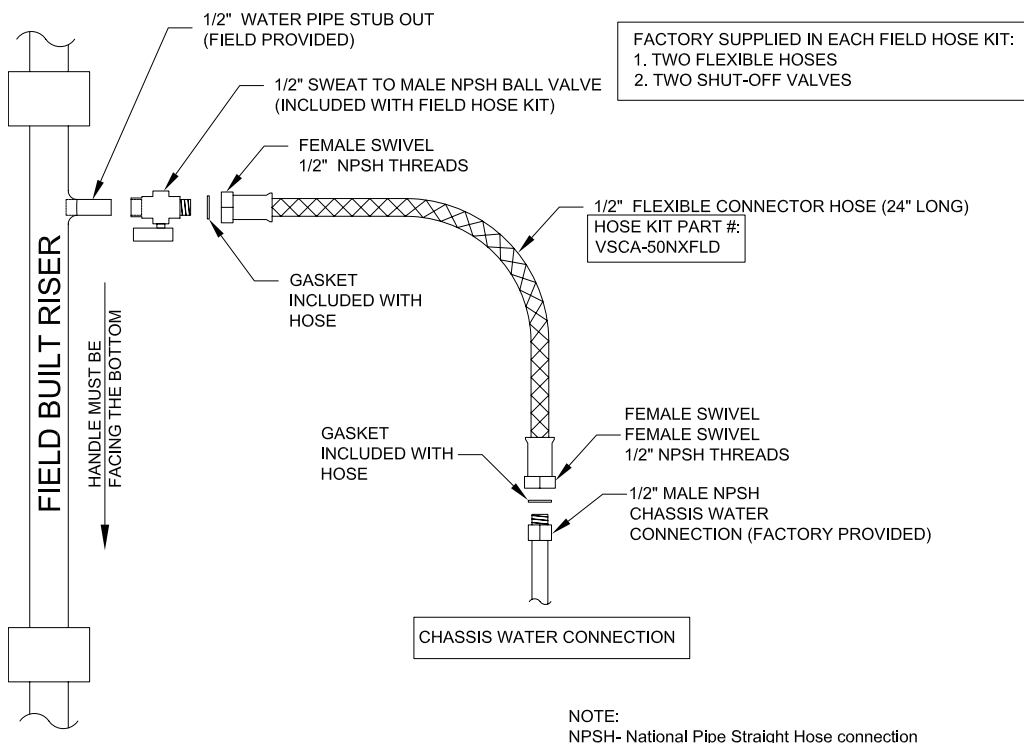
**NOTE:**

- Tabulated Face velocities do not account for supply grille free area factor. Face velocities at supply grille will be higher depending on grille type.
- Face velocities are based on the nominal rated CFM and in feet per minute (FPM).
- Face velocities are calculated by taking the average across all openings. Tabulated top opening face velocity is only for units with single Top Opening and no horizontal openings.

# Hose Kits - NPSH Water Connection

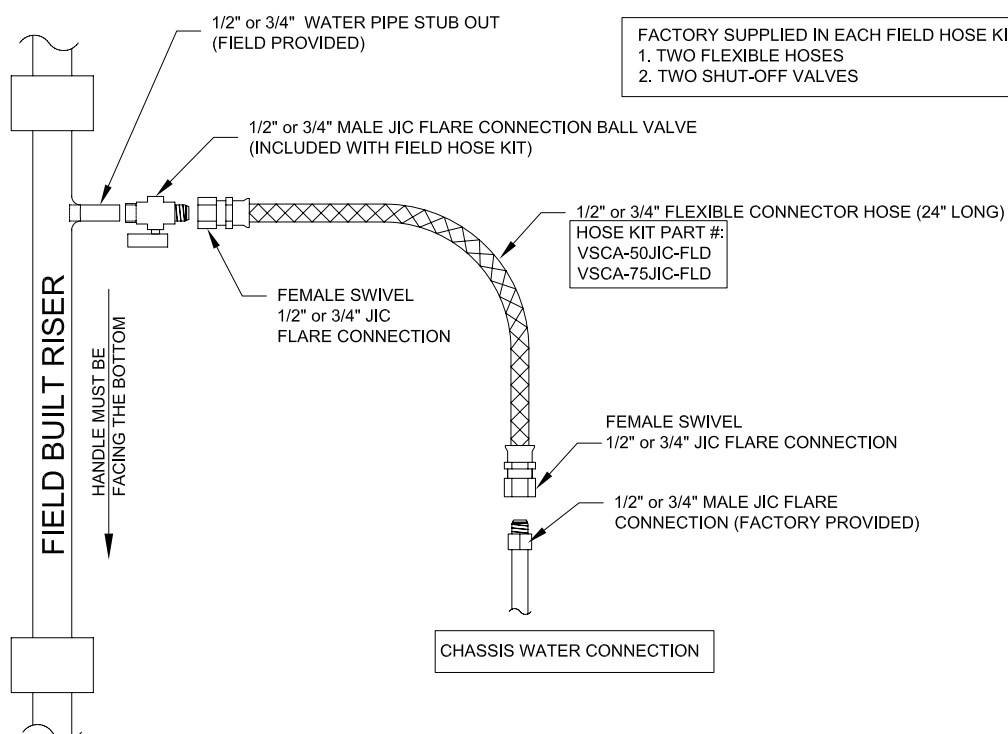
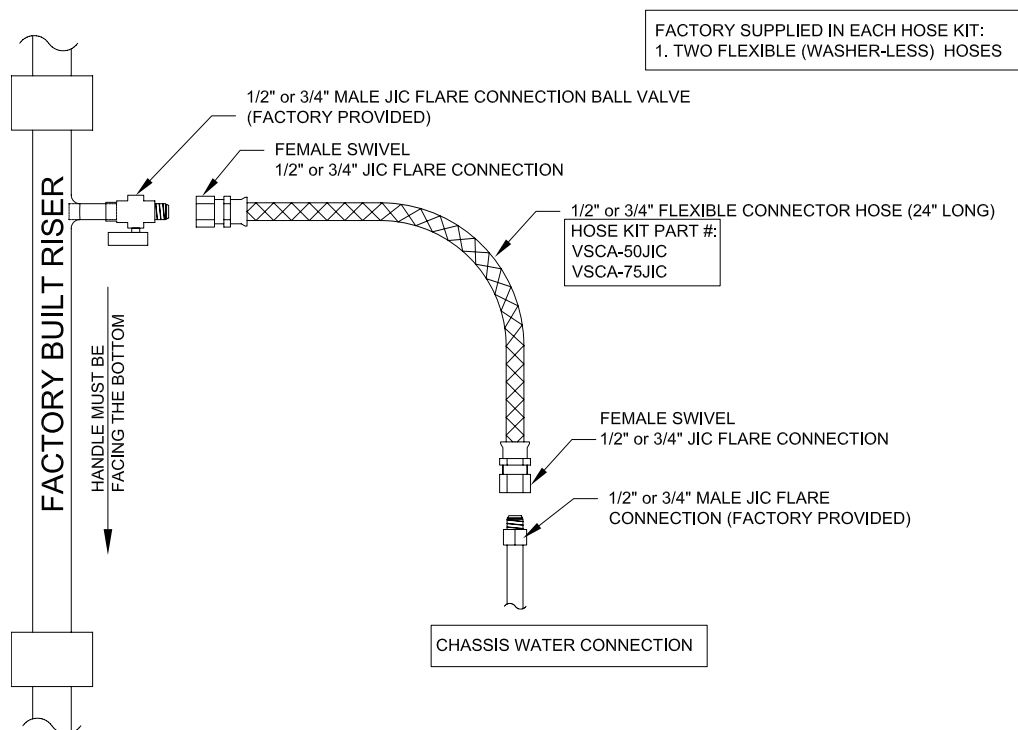


LD18126



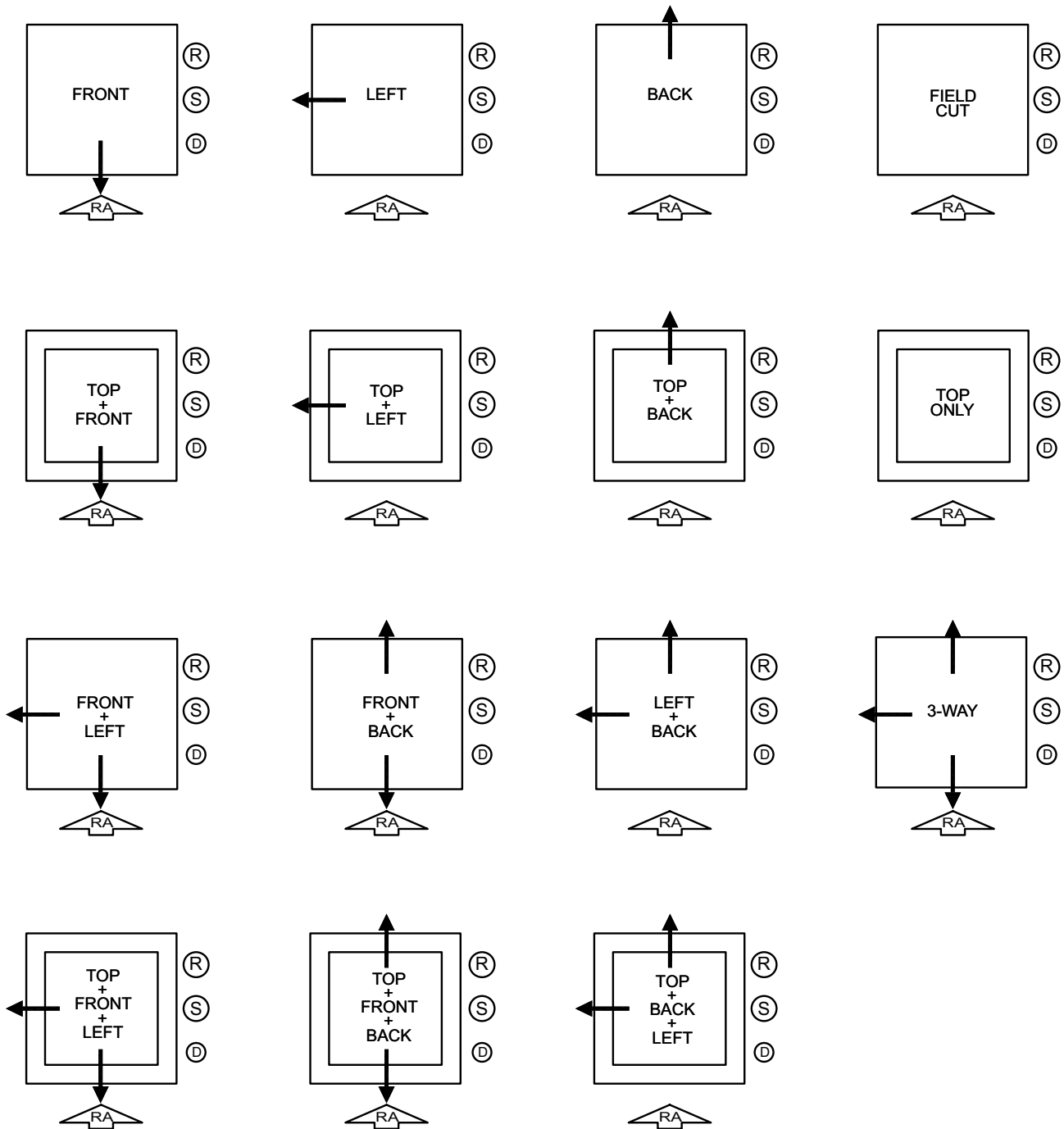
LD18127

# Hose Kits - JIC Water Connection



# Discharge Configurations

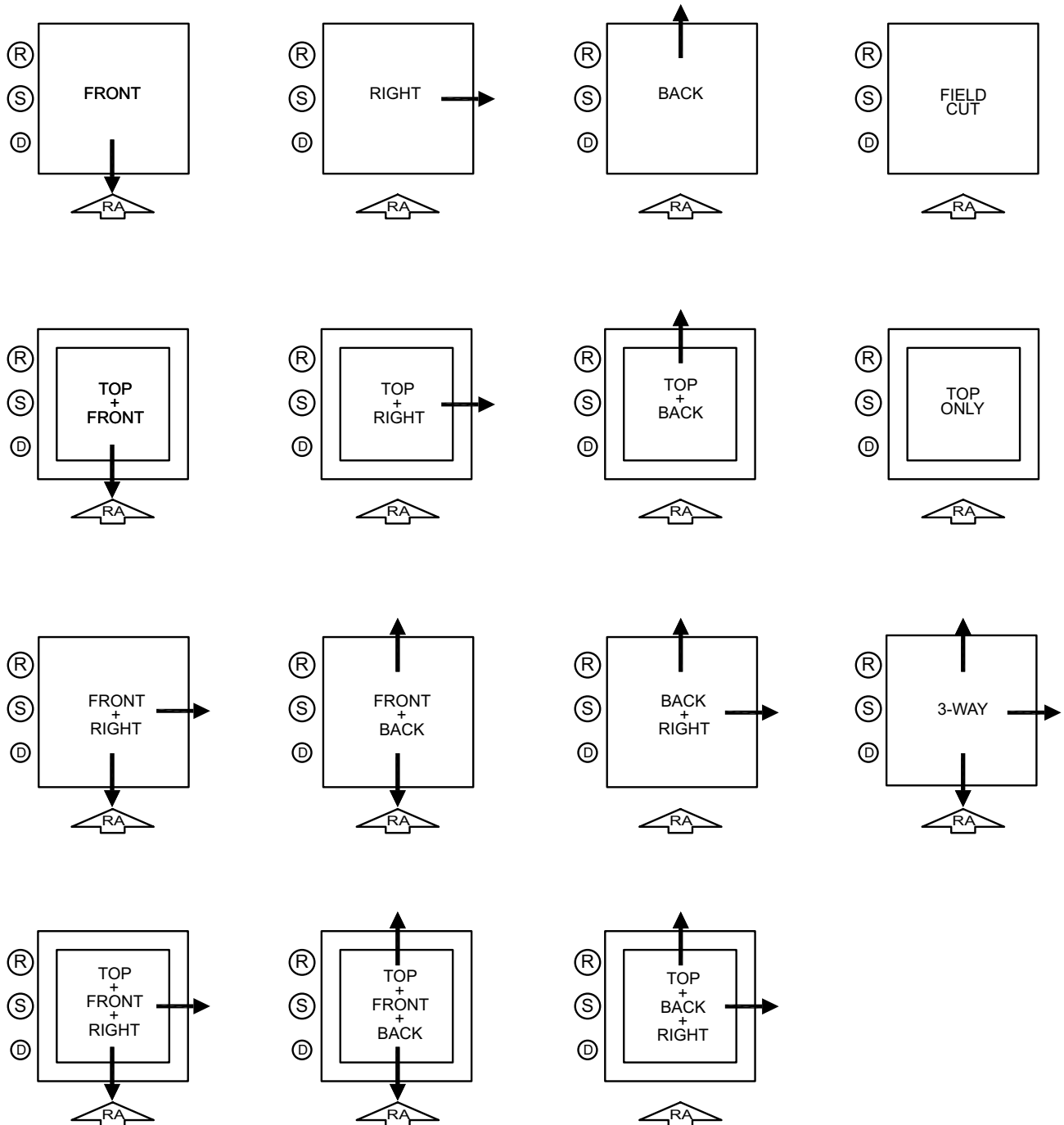
## RIGHT HAND RISER



### NOTES:

- 1) RETURN AIR OPENING SIDE IS DEFINED AS FRONT OF UNIT (CHASSIS AND CONTROL SERVICE ACCESS).
- 2) 3-WAY DISCHARGE ARRANGEMENT IS NOT RECOMMENDED FOR UNIT SIZES 009, 012
- 3) SINGLE DISCHARGE OPENING (EXCEPT TOP DISCHARGE) IS NOT RECOMMENDED FOR UNIT SIZES 030, 036

## LEFT HAND RISER



## NOTES:

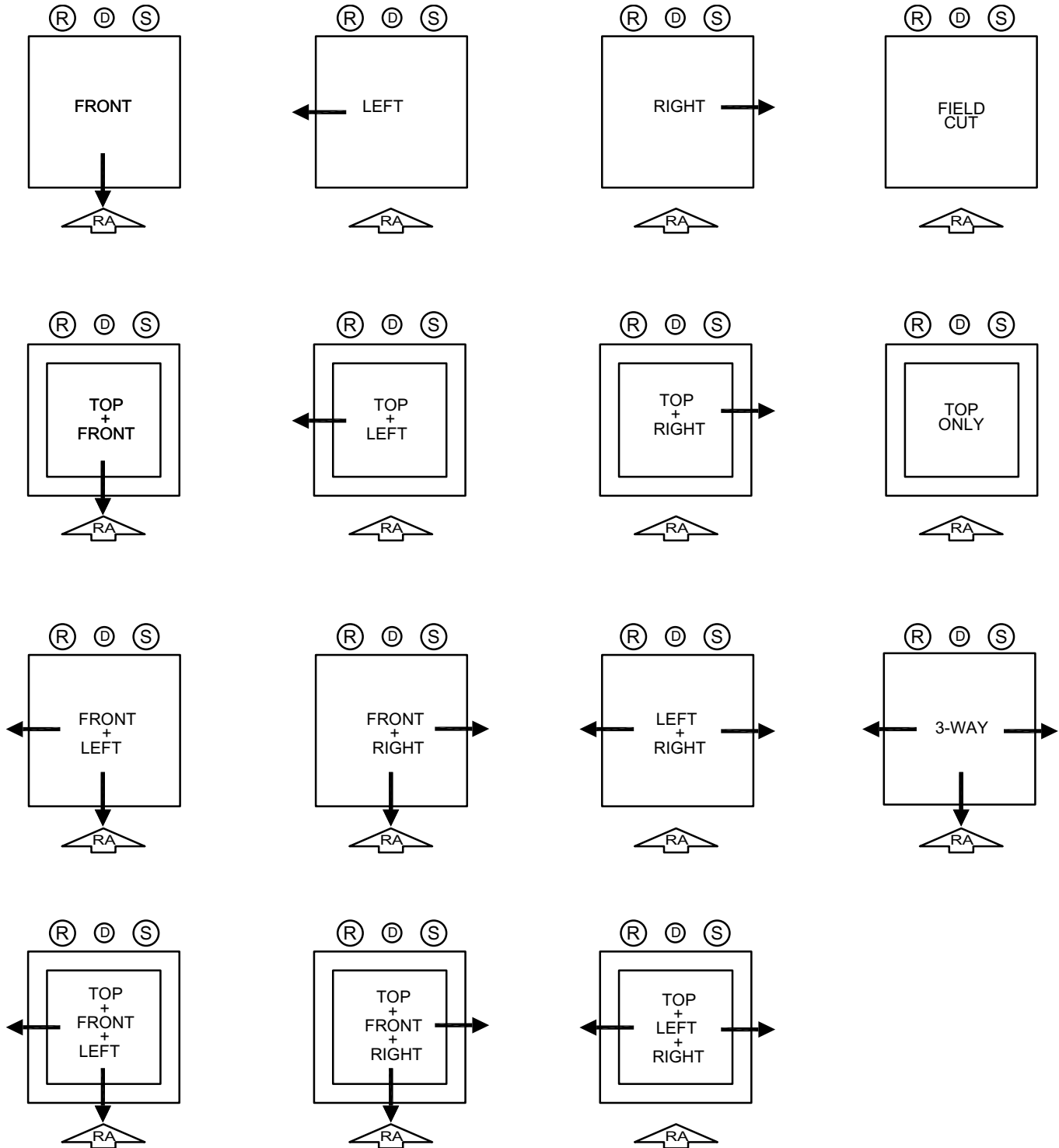
1) RETURN AIR OPENING SIDE IS DEFINED AS FRONT OF UNIT (CHASSIS AND CONTROL SERVICE ACCESS).

2) 3-WAY DISCHARGE ARRANGEMENT IS NOT RECOMMENDED FOR UNIT SIZES 009, 012

3) SINGLE DISCHARGE OPENING (EXCEPT TOP DISCHARGE) IS NOT RECOMMENDED FOR UNIT SIZES 030, 036

## Discharge Configurations (Cont'd)

### REAR RISER



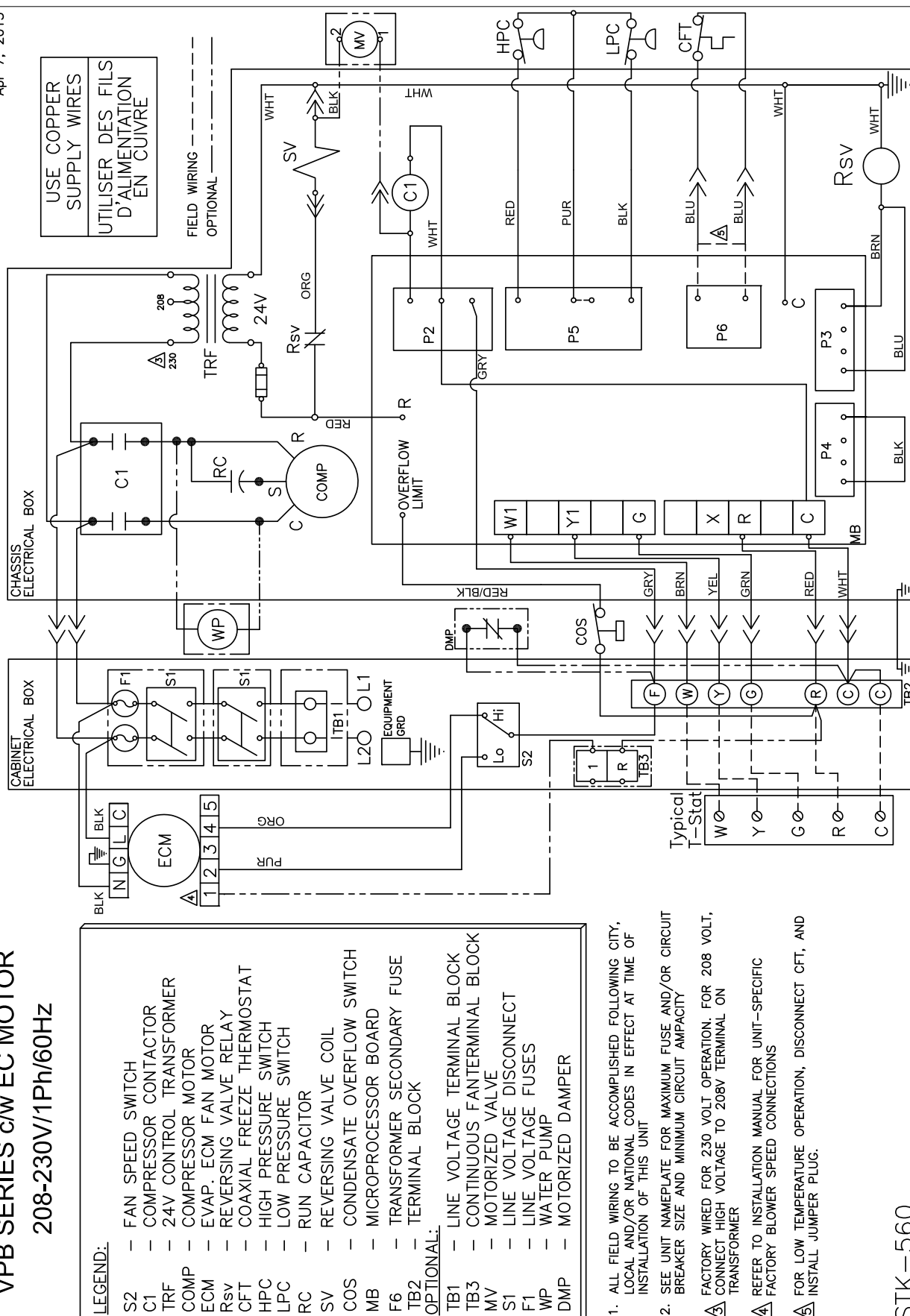
#### NOTES:

- 1) RETURN AIR OPENING SIDE IS DEFINED AS FRONT OF UNIT (CHASSIS AND CONTROL SERVICE ACCESS).
- 2) 3-WAY DISCHARGE ARRANGEMENT IS NOT RECOMMENDED FOR UNIT SIZES 009, 012
- 3) SINGLE DISCHARGE OPENING (EXCEPT TOP DISCHARGE) IS NOT RECOMMENDED FOR UNIT SIZES 030, 036

# Wiring Diagrams

## VPB SERIES c/w EC MOTOR 208-230V/1Ph/60Hz

Apr 7, 2015



STK-560

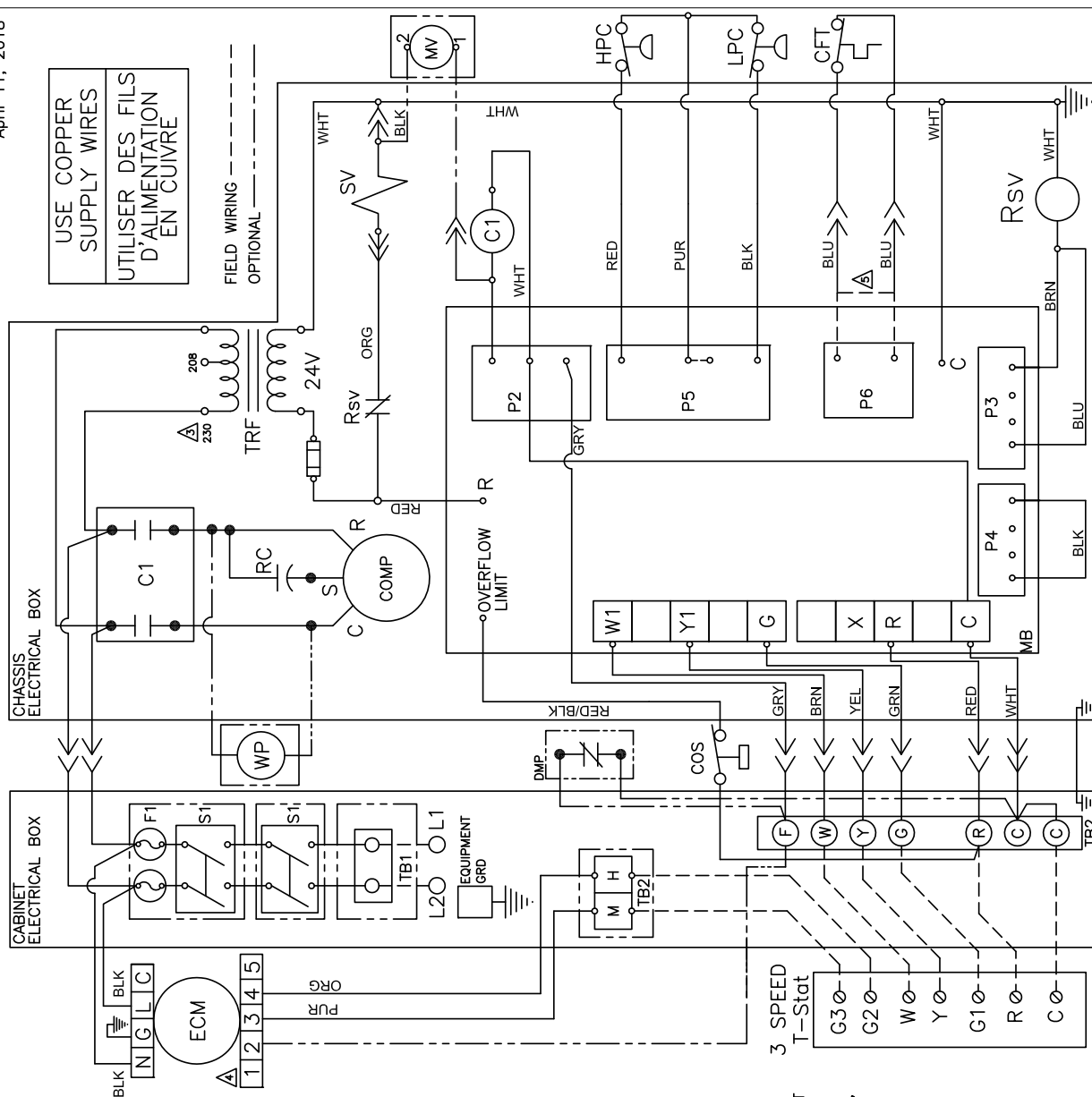
# Wiring Diagrams (Cont'd)

## VPB SERIES c/w EC MOTOR 3 SPEED FAN 208-230V/1Ph/60Hz

### LEGEND:

- S2 - FAN SPEED SWITCH
  - C1 - COMPRESSOR CONTACTOR
  - TRF - 24V CONTROL TRANSFORMER
  - COMP - COMPRESSOR MOTOR
  - ECM - EVAP. ECM FAN MOTOR
  - Rsv - REVERSING VALVE RELAY
  - CFT - COAXIAL FREEZE THERMOSTAT
  - HPC - HIGH PRESSURE SWITCH
  - LPC - LOW PRESSURE SWITCH
  - RC - RUN CAPACITOR
  - SV - REVERSING VALVE COIL
  - COS - CONDENSATE OVERFLOW SWITCH
  - MB - MICROPROCESSOR BOARD
  - F6 - TRANSFORMER SECONDARY FUSE
  - TB2 - FAN SPEED TERMINAL BLOCK
- OPTIONAL:
- TB1 - LINE VOLTAGE TERMINAL BLOCK
  - MV - MOTORIZED VALVE
  - S1 - LINE VOLTAGE DISCONNECT
  - F1 - LINE VOLTAGE FUSES
  - WP - WATER PUMP
  - DMP - MOTORIZED DAMPER

April 11, 2018



1. ALL FIELD WIRING TO BE ACCOMPLISHED FOLLOWING CITY, LOCAL AND/OR NATIONAL CODES IN EFFECT AT TIME OF INSTALLATION OF THIS UNIT

2. SEE UNIT NAMEPLATE FOR MAXIMUM FUSE AND/OR CIRCUIT BREAKER SIZE AND MINIMUM CIRCUIT AMPACITY

FACTORY WIRED FOR 230 VOLT OPERATION. FOR 208 VOLT, CONNECT HIGH VOLTAGE TO 208V TERMINAL ON TRANSFORMER

▲ HIGH STATIC UNIT CONNECTED TO 3 4 5 TERMINALS.  
▲ STANDARD STATIC CONNECTED TO 2 3 4 TERMINALS

▲ FOR LOW TEMPERATURE OPERATION, DISCONNECT CFT, AND INSTALL JUMPER PLUG.

- G1 - LOW FAN SPEED
- G2 - MEDIUM FAN SPEED
- G3 - HIGH FAN SPEED

STK-560\_U3S



# Specifications

## GENERAL

All VPCS-series models ship as a factory-charged package complete with R-410A refrigerant. All units from 3/4 to 3 tons shall be tested and certified by ASHRAE/ANSI/AHRI/ISO 13256-1 and ETL listed for United States and Canada. ASHRAE/ANSI/AHRI/ISO and ETL labels shall be applied prior to leaving the factory. All units are test operated at the factory. Both cabinets and refrigeration chassis are completely factory wired and pre-piped.

## CABINET

The self-supporting cabinet assembly is constructed of heavy gauge, corrosion-resistant, coated steel (minimum 20-gauge thickness for exterior panels). The entire cabinet interior is insulated with 1/2-inch thick, high-density thermal and acoustic insulation. Insulation shall meet NFPA 90, UL-181, and ASTM-C1071 standards, have a flame spread of less than 25, and a smoke developed classification of less than 50 per ASTM E-84 and UL 723. A removable inner service panel seals the fan and compressor compartment during operation. The cabinet base section contains a heavy gauge galvanized steel drain pan and 14-gauge guide rails for the slide-in heat-pump chassis. The drain pan outlet is readily accessible for cleaning (removal of inner service panel required). The drain pan comes standard with a normally closed condensate overflow switch. The drain pan outlet, incorporating a P-trap, is factory connected to the condensate riser.

The removable fan and motor assembly is suspended horizontally from an 18-gauge blower mounting deck, which creates an insulated discharge plenum in the upper section of the cabinet. Supply air openings are factory cut according to customer specifications. A noise attenuating insulated privacy air baffle is provided for horizontal supply air openings. All cabinet openings are provided with standard 1-inch drywall flange around the full opening perimeter.

- Optional surface-mount thermostat connection. Allows mounting of the space thermostat directly above the unit's return air panel or mounted remotely (requires optional extended harness). Electrical connection to the unit is by a plug-in Molex pigtail connector. Molex pigtail is field wired to thermostat terminals.
- Optional 4-inch round Outside Air Opening through top of unit (left- or right-hand configurations available). Unit comes with 4 1/4-inch return air flange.
- Optional 4-inch round Outside Air Opening with motorized damper through top of unit (left- or right-hand configurations available). Unit comes with 4 1/4-inch return air flange. Motorized damper is accessible and easily serviced through RA Panel (no additional service door is required).
- Optional Stainless Steel Drain Pan for added corrosion resistance. Entire drain pan is fabricated out of heavy gauge stainless steel.
- Optional 80-inch cabinet. Reduced height cabinet for applications where additional ceiling clearance is required.
- Optional 2-inch cabinet stand. Stand is factory installed to the base of the cabinet.

## Specifications (Cont'd)

- Optional 4-inch cabinet stand. Stand is factory installed to the base of the cabinet (80-inch cabinet only).
- Optional 8-inch cabinet stand. Stand is factory installed to the base of the cabinet (80-inch cabinet only).

### RISER ASSEMBLY

Full-length supply, return, and condensate risers can be either factory-assembled onto the cabinet or shipped loose on separate skids. Maximum factory installed riser length is 120 inches. When the slab-to-slab dimension for a given floor is in excess of 118 inches, separate riser extension pieces can be factory provided to reach the required total riser length (riser extensions are field installed). The top of all risers and riser extensions is internally expanded (3-inch depth) to allow connection of each subsequent riser section without the use of couplings. Type 'M' copper for risers is standard.

Riser placement may be on any of three sides of the cabinet (right, left, or back). Riser knock-outs are located on all three sides, allowing field conversion of riser placement if necessary. Risers and unit must be installed in such a way to prevent freezing of water.

Risers are internally piped into the cabinet assembly, including ball shut-off valves and threaded hose connection stubs. The condensate drain riser is insulated with 3/8-inch wall thickness closed-cell foam insulation.

- Optional Type 'L' copper risers
- Optional protective riser cover to prevent riser damage during shipping, handling, and installation

### REFRIGERATION CHASSIS

Each removable heat-pump chassis assembly includes an air-to-refrigerant coil, a water-to-refrigerant coil, a condensate collection drain pan, and features a high efficiency rotary or scroll compressor. The chassis base is fabricated from heavy gauge galvanized steel (14 gauge). A metal enclosure isolates the compressor from the moving air stream in the lower fan compartment. The compressor enclosure is insulated with 1/2-inch thick, 2-pound density insulation. Insulation shall meet NFPA 90, UL-181, and ASTM-C1071 standards, have a flame spread of less than 25, and a smoke developed classification of less than 50 per ASTM E-84 and UL 723.

Electrical connection between the cabinet and the chassis is by locking quick-connect plugs (separate high voltage and low voltage plugs). Water supply and return connection to the chassis is by factory-supplied reinforced high-pressure flexible hoses with quick-sealing swivel couplings. The hose assemblies are rated for a minimum 350 psig working pressure.

Rotary and scroll compressors are mounted on rubber vibration isolators. Compressor motors are provided with internal overload protection. Each refrigeration circuit is thoroughly evacuated and fully charged with R-410A refrigerant before shipment. An external high-pressure switch and a low-suction temperature switch are included in each compressor control circuit. The sealed refrigeration circuit includes a bi-flow thermal expansion valve, with external equalizer. Service gauge ports are provided for field diagnosis and service. The 4-way reversing valve is a pilot operated, sliding piston type with a replaceable magnetic solenoid coil. Each unit is equipped with a liquid line filter drier.

Refrigerant-to-air heat transfer coils are constructed of internally enhanced copper tubes, mechanically bonded to enhanced aluminum plate fins. The coaxial refrigerant-to water heat exchangers feature a convoluted inner tube design for high heat transfer efficiency. Standard models feature a copper inner tube surrounded by a steel outer tube and carry a 400 psig waterside working pressure rating. Units shall be capable of operation with an entering fluid temperature range of 20.0–110.0°F.

- Optional corrosion resistant air-to-refrigerant coil (E-Coat). Coil shall receive a 1-mil thickness of cathodic epoxy type electro-deposit coating to increase corrosion resistance and prevent microbial contamination.
- Optional cupronickel water coil. Waterside coaxial condenser coil shall be constructed of cupronickel metal alloy for increased resistance to corrosion and contamination buildup.
- Optional automatic water flow regulator, factory installed as an integral part of the refrigeration chassis. The automatic flow control valve shall be selected for the nominal rated flow rate and provides constant flow over a 2-80 psi differential pressure range.
- Optional Y-strainer with #20 mesh screen is factory installed.
- Optional 2-way water control valve. A factory installed 2-way motorized valve is wired in parallel with the compressor control circuit to shut off water flow to the unit when the compressor is off. This feature can significantly reduce power consumption in variable-speed or staged pumping applications. The valve has standard 25 psi close-off rating (optional 60 psi close-off rated valve is available). The actuator is of a slow-closing design to eliminate hydraulic shock.
- Optional 3-way water control valve. A factory installed 3-way motorized valve is wired in parallel with the compressor control circuit, to shut off water flow to the unit when the compressor is off. This feature allows loop water to circulate back to return column riser when unit is not in operation and can significantly reduce power consumption in variable-speed or staged pumping applications. The valve has standard 25 psi close-off rating (optional 60 psi close-off rated valve is available). The actuator is of a slow-closing design to eliminate hydraulic shock.
- Optional chassis mounted Circulating Pump for single riser systems. Unit chassis is fitted with a circulating pump in applications where supply and return water is circulated in the building through a single riser.
- Optional sound isolated chassis for improved sound performance. Integral to chassis, specially designed chassis rails improve vibrational and sound performance of complete unit (US patent pending).

## INDOOR FAN

Forward curved, double inlet and double width, direct-drive centrifugal blowers are used for air movement. Large diameter blower wheels are employed to provide required air-flow performance at minimum noise levels. Standard EC motors feature soft start and stop for added occupant comfort, consume less power, and maintain good fan performance when subjected to higher external static pressures. The fan motors are attached to the blower housings by means of an integral 'flex-mount' system, with additional vibration isolation provided by rubber mounting grommets. A manual selector switch is accessible through the hinged return air panel, allowing switching between the two available fan speeds (Hi – Low).

## Specifications (Cont'd)

- Optional Hi-Static ECM and blower assembly for applications with extended ductwork layout.
- Optional ECM with Continuous Low Speed fan option. Fan continuously circulates air at low fan speed.
- Optional Hi-Static ECM with Continuous Low Speed fan option. Fan continuously circulates air at low fan speed.

### ELECTRICAL/CONTROLS

All units are completely factory wired with all necessary operating controls.

- Optional Non-Fused Disconnect
- Optional Disconnect with Fusing added to the internal line voltage switch circuit
- 2-Speed Fan Control at Thermostat
- 3-Speed Fan Control at Thermostat (with ECMs only)

Standard unit control consists of a 24-volt electromechanical relay package. The cabinet-mounted electrical box contains a 50VA Class II transformer for field connection. The reversing valve solenoid coil shall be energized in cooling mode only.

The control system microprocessor board is specifically designed for water source heat pump operation. The control system interfaces with a conventional type thermostat.

- Unit shall incorporate a lockout circuit that provides reset capability at the space thermostat, base unit, or by interrupting service power, should any of the following standard safety devices trip and shut off the compressor.
  - Loss-of-charge/Low-pressure switch
  - High-pressure switch
  - Low water temperature protection
  - Condensate overflow protection
- Random start.
- Should the high-pressure or low-pressure safeties open three times within two hours of operation (1 hour for low-pressure safety), then lockout requiring manual reset will occur.
- Should the low water temperature or condensate overflow safeties trip three times sequentially, then lockout requiring manual reset will occur.
- The low-pressure switch shall not be monitored during the initial 30 seconds of a cooling system's operation to prevent nuisance trips.
- Unit shall have capability to defeat time delays for servicing.
- Unit control board shall have on-board diagnostics and an LED fault code display.
- Standard controls shall include anti-short cycle and low voltage protection.
- Control board shall monitor each refrigerant safety switch independently.
- Control board energizes reversing valve solenoid in cooling only.

- Control board shall have random start feature.
- Control board shall retain last five fault codes in non-volatile memory, which will not be lost in the event of a power loss.

In addition to the external pressure switches, the compressor also has inherent (internal) protection. If there is an abnormal temperature or power rise in a compressor, the internal protection will immediately shut down the compressor. The microprocessor control incorporates features to minimize compressor wear and damage. An anti-short cycle delay (ASCD) is utilized to prevent short cycling of the compressor. Additionally, a minimum run time is imposed any time a compressor is energized. The ASCD is initiated on unit start-up and on any compressor reset or lockout.

## **FILTERS**

All units are supplied with a 1-inch thick throwaway filter. Filters are accessible through the hinged return air panel without removing the inner service panel.

- Optional MERV 8 Filters

## **FIELD INSTALLED ACCESSORIES**

### **Acoustic Return Air Panel**

The flush-mounted return air panel is designed to minimize line-of-sight noise transmission. The panel assembly is fabricated from heavy gauge steel. An insulated, hinged center section allows convenient user access to the unit control panel and filter.

The perimeter frame of the panel is mounted to the drywall/framing opening at the front of the cabinet. The heat-pump chassis is fully accessible and removable through the hinged door section. The panel is supplied in standard Appliance White painted finish.

### **Supply Air Grilles**

Optional supply air grilles shall be supplied for each free discharge outlet directly from the cabinet (non-ducted outlets). All unit mounted supply grilles will be supplied as double deflection type. Grilles for unequal airflow applications shall be provided with integral opposed blade dampers (volume dampers). Grilles will be supplied in standard Appliance White painted finish.

## **Hoses**

High-pressure flexible hoses with quick-sealing swivel couplings provide supply and return water connections to the chassis. Hose material is fire-rated (UL-94 VO) thermoplastic inner tube, reinforced by a stainless steel wire outer braid. The hose assemblies are rated for a minimum 350 psig working pressure.

## **Thermostats**

- TEC3000 Series Thermostat

Included features for the TEC3000 series thermostats are:

- Field-selectable BACnet<sup>®</sup> MS/TP or N2 networked communication (TEC36xx-00-000 Models)
- USB port configuration
- Backlit liquid crystal display (LCD)

## Specifications (Cont'd)

- Configurable touch screen user interface
- Mobile access portal (MAP) gateway compatibility (MAP Release 4.0 or Later)
- Standalone and BACnet MS/TP or N2 networked models
- Onboard occupancy sensor (TEC3xx1-00-000 and TEC3xx3-00-000 Models)
- Single or two-stage control
- Full line of remote TE-6300 series temperature sensors
- T701 Series Thermostat

Included features for the T701 series thermostats are:

- Includes Model T701DFN-1 (non-programmable) and Model T701DFP-1 (7 day programmable)
- Auto-staging fan speed control
- Three speed fan control
- Remote sensor ready
- Dry contact equipped
- Backlit display
- Electric heat ready
- Non-volatile memory: all setpoints and programming are permanently stored during power loss
- Dual setpoint with adjustable deadband
- Keypad lockout
- Configurable display
- Display either °F or °C
- Wall plate available
- Self-prompting
- T8000 Series Thermostat

Included features for the T8000 series Color Touchscreen thermostats are:

- Remote control via Wi-Fi with optional Skyport™ Cloud Services Wi-Fi Key (ordered separately)
- Switchable programmable or non-programmable
- Programmable occupancy schedule: reduces operating expenses by controlling the room based on occupant schedules
- Up to four heat and two cool stages
- Independently adjustable timers and deadbands for all stages of heating and cooling
- Passcode security for screen lock and setpoint limits

- Programmable fan
- Outdoor sensor ready
- Multilingual display options: provide a user interface in English, French, and Spanish
- Weather forecast display capable
- Home/away feature
- Local equipment runtime trending: provides easy access to energy usage information; shows how much energy was used to heat and/or cool over a 7 day period
- SD memory card input: reduces configuration time by making inputting and exporting data between digital room thermostats quick and easy
- Configurable alerts: send messages to the digital room thermostat when certain conditions occur, such as when the room temperature exceeds a user-specified value

