Product Data

Aquazone™ Large Capacity Water Source Heat Pumps

6 to 30 Nominal Tons

50VQP Vertical and 50HQP Horizontal Large Capacity Water Source Heat Pumps with Puron Advance™ Refrigerant (R-454B)

Sizes 072-360

Overview

Carrier's Aquazone™ indoor packaged large capacity water source heat pump (WSHP) is an efficient, budget-friendly solution great for both new construction and retrofit applications.

The Carrier Aquazone 50HQP/50VQP large capacity water source heat pumps (WSHPs) are offered with Puron Advance™ low GWP refrigerant (R-454B), with a GWP of 465, ensuring compliance with U.S. EPA (Environmental Protection Agency) and other regulatory agency limits of 700. Units are designed in both vertical and horizontal single packaged configurations. A wide variety of factory-installed options and flexible configurations are available, making them suitable for boiler tower, geothermal, and hybrid water loop systems. Efficient and budget-friendly units come equipped with belt driven fans and dual independent refrigerant circuits, offering two-stage cooling and heating capabilities. Easy service access facilitated by large access panels.

Optional integrated Carrier TruVu™ DDC controller for Constant Volume (CV) or Staged Air Volume (SAV) units are available. For Variable Air Volume (VAV) applications, an optional SCU Open controller is available.

These controllers ensure advanced equipment control and monitoring, seamlessly integrating with the i-Vu® building automation system.

Cabinet construction and insulation

Cabinets are heavy gauge galvanized sheet metal cabinet construction designed with large access panels for easy maintenance and service. Cabinet interior surfaces are lined with 1/2 in. thick, 1-1/2 lb fiberglass insulation or closed-cell foam insulation. Sheet metal surfaces are treated for maximum corrosion protection to provide resilience for long term vitality. Vertical cabinets have an insulated divider panel between the blower compartment and the compressor section to minimize the transmission of compressor noise, and to permit operational service testing without air bypass.

Compressor

Large capacity Aquazone units include dual, high capacity scroll compressors. Compressors are mounted on sturdy channels attached to the cabinet of the unit, ensuring robust support and stability. In addition, compressors are mounted on rubber grommets effectively minimizing vibration and noise transmission to the unit structure.

Refrigerant circuit

All units come with dual independent refrigerant circuits with two-stage cooling and heating and contain sealed Puron Advance™ refrigerant (R-454B). Refrigerant circuits include features such as:

Thermal expansion valve (TXV)

Units are equipped with a thermostatic expansion valve (TXV) metering device to ensure reliable operation across a wide range of entering air and water temperatures.

Reversing valve (4-way valve)

Units are equipped with a refrigerant reversing valve. This valve's operation is specifically controlled to switch modes, ensuring heightened reliability in functionality.

Pressure ports

All units are provided with high and low pressure ports integral to the refrigeration circuit for ease service.

Filter dryer

Standard in all units, the refrigerant circuit filter dryer enhances system performance by efficiently filtering and removing contaminants for improved longevity and efficiency.

A2L leak detection

Industry safety standard UL 60335-2-40 requires systems charged with over 64 ounces of R-454B to include an integrated A2L Leak Detection system to ensure safety in the event of a refrigerant leak. If a refrigerant leak occurs the A2L leak detection system activates, shutting down compressor operation and running the blower motor to disperse any leaked refrigerant. All 50HQP/50VQP units include a factory-installed A2L leak detection system.

Refrigerant to air heat exchanger

All units come standard with a copper tube, aluminum-fin air coil. These air coils employ lanced fin and rifled tubing for maximum heat transfer. Large face areas result in lower face velocity reducing sound while ensuring high latent heat removal for maximum dehumidification in cooling mode. Additional air coil coating protection option is available for units.

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Overview (cont)

Refrigerant to water heat exchanger

50HQP/50VQP units are offered with a copper coaxial (tube-in-tube) refrigerant to-water heat exchanger. An optional cupronickel coaxial heat exchanger is available for higher corrosion protection for applications such as open tower, geothermal, etc. Consult the water quality guidelines for proper application and selection of this option.

Additionally, heat exchanger is insulated to prevent condensation, and therefore potential dripping problems, in applications where the entering water temperature is less than 50°F.

Refrigerant to Water Heat Exchanger

Blower motor and housing

All units come equipped with adjustable belt-drive centrifugal blowers. These blowers can be easily adjusted with a pulley to balance air flow rate in the field. Fans offer cost-effective serviceability with easily replaceable components like bearings, reducing overall maintenance costs. The belt-driven design ensures quieter operation and less wear, providing a reliable and efficient solution. The optional (reverse) blower orientation allows for optimized airflow alignment with ductwork, reducing air pressure drop and enhancing energy efficiency. Units also offer Staged Air Volume (SAV) operation with Variable Frequency Drive (VFD) compatibility, providing precise fan control for heating and cooling, ensuring code compliance and energy savings.

Optional Reverse Blower

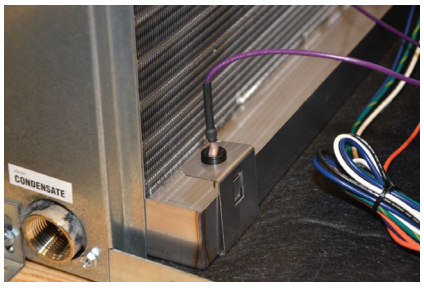
Stainless steel drain pan with condensate switch

Protection against corrosion is a feature in the 50HQP/50VQP series. A stainless steel drain pan is designed to last the lifetime of the unit and resist corrosion and cracking that may occur with steel or plastic materials.

Condensate overflow sensor

Factory-installed sensor is an electronic sensor mounted to the drain pan. When condensate pan liquid reaches an unacceptable level, the unit is automatically deactivated and placed in a lockout condition. The sensor recognizes 30 continuous seconds of overflow as a fault condition.

Condensate Overflow Sensor



Unit controls

All Carrier WSHPs are equipped with a 24-v low voltage control circuit. Units are selectable to be provided with no controls for control via a field installed thermostat or third party DDC. Advanced equipment control and monitoring units are offered with factory installed Carrier i-Vu TruVu DDC controller for constant volume (CV) or staged air volume (SAV) units, or SCU Open controller for variable air volume (VAV) units. Regardless of the selection all units will be equipped with a unit protection module, which regulates unit operation, features integrated safeties, and simplifies unit troubleshooting.

Electrical protection

Units are offered with standard 5 kA SCCR (Short-Circuit Current Rating).

Operating efficiencies

All efficiencies stated are in accordance with the latest edition of ISO/AHRI/ASHRAE/ISO 13256-1 and meet ASHRAE 90.1 cooling EERs (energy efficiency ratios) and heating COPs (coefficients of performance). Unit sizes 072-120 have AHRI (Air-Conditioning, Heating, and Refrigeration Institute)/ISO, NRTL (Nationally Recognized Testing Lab), or CSA (Canadian Standards Association) labels and are factory tested under normal operating conditions at nominal water flow rates. Quality assurance is provided via testing report cards shipped with each unit to indicate specific unit performance under cooling and heating modes.

Safe, reliable operation

Equipment standard safety features include high and low refrigerant pressure protection, voltage protection, air and water coil freeze protection, condensate overflow shutdown, and optional refrigerant leak detector. All safety features are tested and run at the factory to assure proper operation of all components and safety switches. All components are carefully designed and selected for endurance, durability, and carefree day-to-day operation. The Aquazone unit is shipped to provide internal and external equipment protection. Shipping supports are placed under the blower housing. In addition, horizontal and vertical units are both mounted on oversized pallets with lag bolts for sturdiness and maximum protection during transit.

Ease of installation

The Aquazone™ unit is packaged for simple low cost handling and requires minimal installation. All units are prewired and factory charged with refrigerant. Water connections (FPT) and condensate drains (FPT) are anchored securely to the unit cabinet. High and low voltage knockouts are provided on all units. The take apart construction option is available for challenging installations like retrofits, facilitating effortless setup in tight spaces by splitting the unit into two major sections.

Overview (cont)

Simple maintenance and serviceability

The Aquazone WSHP units are constructed to provide ease of maintenance. Units have large removable panels for easy access. Additional panels are provided to access the blower and control box sections. The blower housing assembly can be serviced without disconnecting ductwork from the dedicated blower access panel. Blower units are provided with permanently lubricated bearings for worry-free performance. Electrical disconnection of the blower motor and control box is easily accomplished from quick disconnects on each component. Easy removal of the control box from the unit provides access to all refrigeration components. The refrigeration circuit is easily tested and serviced through the use of high and low pressure ports integral to the refrigeration circuit.

Airflow configuration

Airflow configurations for horizontal units are available in patterns including left or right return with straight through or back discharge. Vertical units are available in rear or front return with top, front or rear discharge. Check dimensional drawings for available configurations.

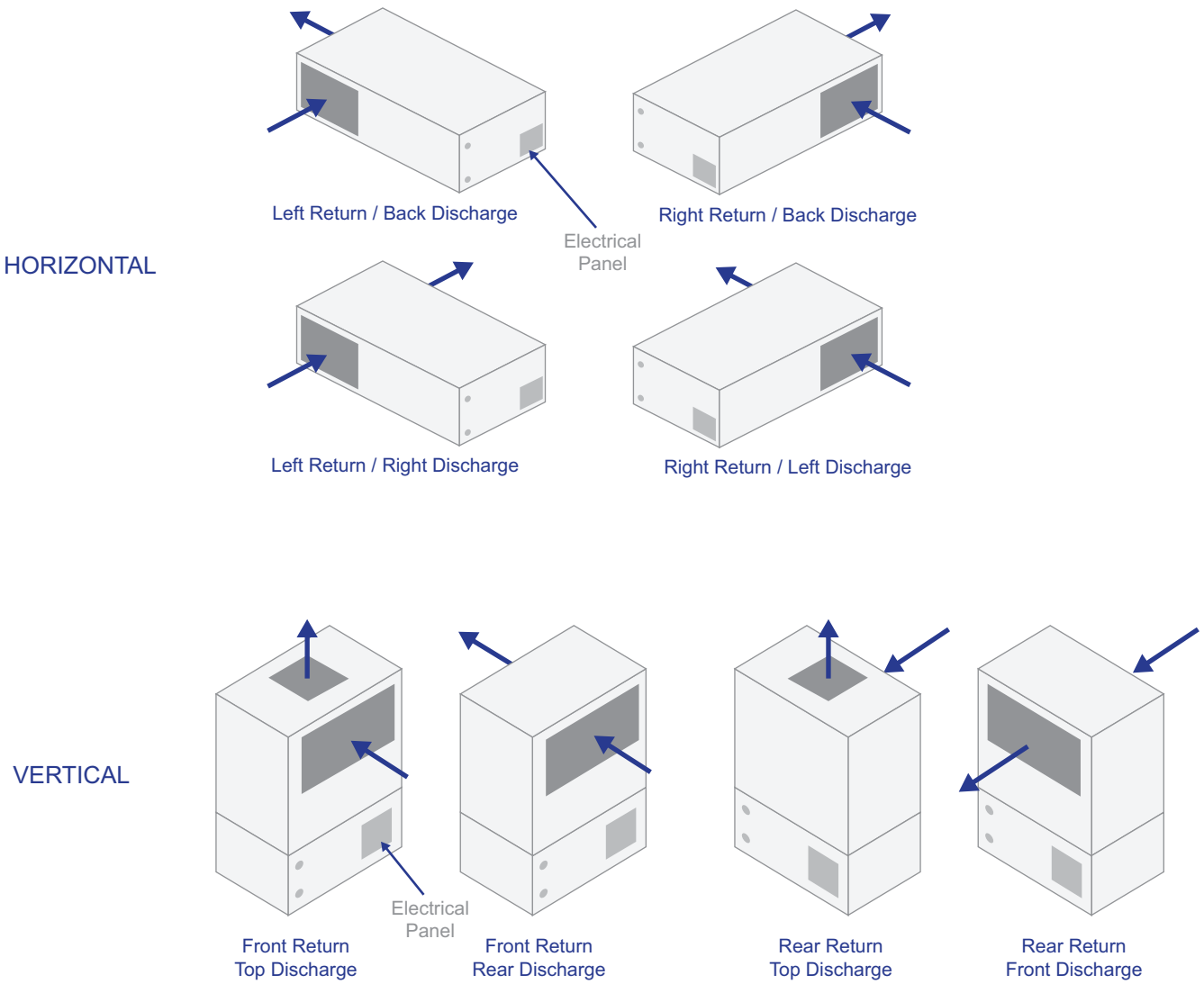
Water connections

All water connections are heavy duty bronze FPT fittings securely fastened to the unit corner post. This allows connecting to a flexible hose kit without the use of a backup wrench making for easier, faster installation.

TruVu™ DDC control box

For added controller protection, the TruVu™ DDC control box is mounted on the main electrical box cover and safeguarded by the dedicated access panel. This feature increases the unit's depth by 3 inches.

Airflow Configuration Options



Model number nomenclature

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
5	0	V	Q	P	0	7	2	B	A	C	3	C	1	A	X

Model Series (1-2)
50 = Packaged WSHP Unit

Configuration (3)
V = Vertical
H = Horizontal

Unit Type (4-5)
QP = Single piece

Nominal Capacity MBH (6-8)
072 = 72 (6 tons)
096 = 96 (8 tons)
120 = 120 (10 tons)
150 = 150 (12.5 tons)
151 = 150 (12.5 tons)
180 = 180 (15 tons)
181 = 180 (15 tons)
210 = 210 (17.5 tons)
240 = 240 (20 tons)
242 = 240 (20 tons)
300 = 300 (25 tons)
360 = 360 (30 tons)

Airflow Configuration (9)

DESCRIPTION	HQP	VQP
Front Return, Rear Discharge	—	Z
Front Return, Top Discharge	—	F
Front Return, Top Discharge, BLR Rotated	—	G
Front Return, Top Discharge, BLR and MTR Rotated	—	H
Rear Return, Front Discharge	—	S
Rear Return, Top Discharge	—	B
Rear Return, Top Discharge, 180° BLR Rotated	—	C
Rear Return, Top Discharge, 180° BLR and MTR Rotated	—	D
Right Return, Left Discharge	J	—
Left Return, Right Discharge	N	—
Left Return, Back Discharge	P	—

Controls — Option / VFD wiring (10)
A = UPM / SAV (2 speed)
B = UPM + Boilerless E-heat (BE) / SAV (2 speed)
V = UPM + TV DDC /SAV (3 speed)
E = UPM + SCU Open, VAV (duct static pressure control)[a,b]
F = UPM + Compressor Status Relays (SR) / SAV (2 speed)
G = UPM + Pump Relay (PR) / SAV (2 speed)
H = UPM + EMS / SAV (2 speed)
J = UPM + BE + PR / SAV (2 speed)
K = UPM + BE + SR / SAV (2 speed)
L = UPM + BE + SR + PR / SAV (2 speed)
M = UPM + SR + PR / SAV (2 speed)
N = UPM + EMS + SR / SAV (2 speed)
P = UPM + EMS + PR / SAV (2 speed)
Q = UPM + EMS + SR + PR / SAV (2 speed)
R = UPM + EMS + BE / SAV (2 speed)
S = UPM + EMS + BE + SR / SAV (2 speed)
T = UPM + EMS + BE + PR / SAV (2 speed)
U = UPM + EMS + BE + PR + SR / SAV (2 speed)

SEE NEXT PAGE FOR REMAINDER OF MODEL NOMENCLATURE

Model number nomenclature (cont)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
5	0	V	Q	P	0	7	2	B	A	C	3	C	1	A	X

Model Series (1-2)
50 = Packaged WSHP Unit

SEE PREVIOUS PAGE FOR REMAINDER OF MODEL NOMENCLATURE

Blower Motor Options (16)
C = 3 Hp Belt Drive
R = 5 Hp Belt Drive
X = 1 Hp Belt Drive
Z = 1.5 Hp Belt Drive
B = 2 Hp Belt Drive
P = 2 Hp Belt Drive w/ VFD
V = 3 Hp Belt Drive w/ VFD
M = 5 Hp Belt Drive w/ VFD

Sound, IAQ, TAC (15)
A = None
B = Take Apart Construction (TAC)
D = Closed Cell Foam Insulation (CCF)
J = MP (Mute Package)
F = MP + CCF
H = CCF + TAC
L = MP + CCF + TAC
M = MP + TAC
T = 4 sided 2" FR with 1" MERV 5
U = FR + MP
X = FR + CCF
Y = FR + MP + CCF
3 = FR + TAC
4 = FR + MP + TAC
7 = FR + CCF + TAC
8 = FR + MP + CCF + TAC

Additional Options (14)
1 = None
A = Cooling Only (CO)
B = Condenserless (CL)
C = Hot Water Coil (HWC)
D = CO + HWC
E = CO + CL
F = CL + HWC
G = CO + CL + HWC

Revision (13)
C = R-454B (All Sizes)

Electrical Options (12)
1 = 575-3-60
3 = 208/230-1-60
5 = 208/230-3-60
6 = 460-3-60

Refrigerant Circuit Options (11)

OPTION	NON-COATED AIR		COATED AIR	
	Cu Water Coil	CuNi Water Coil	Cu Water Coil	CuNi Water Coil
None	C	N	A	J
Hot Gas Reheat (HGRH)	E	P	D	F
Hot Gas Bypass (HGBP)	T	S	U	W
Water Side Economizer (WSE)	B	G	H	K
HGRH + HGBP	L	M	R	V
HGRH + WSE	7	8	9	Q
HGBP + WSE	Y	Z	5	6
HGRH + HGBP + WSE	1	2	3	4

NOTE(S):
a. SCU Open controller is available only for Cooling only units (Position 14). VAV units must be selected with HGRH and HGBP option (nomenclature Position 11).
b. VAV units utilize face split air coils and should not be operated below 50% of the rated air flow to prevent coil freezing.

LEGEND

BE — Boilerless Electric Heat
BLR — Blower
CCF — Closed-Cell Foam Insulation
CO — Cooling Only
CuNi — Cupronickel Water Coil
EMS — Energy Management Switch
FR — Filter Rack
HGBP — Hot Gas Bypass
HGRH — Hot Gas Reheat
HWC — Hot Water Coil
MP — Mute Package
MTR — Motor
PR — Pump Relay
SAV — Staged Air Volume
SR — Compressor Status Relay
TAC — Take Apart Construction
TV DDC — TruVu™ Direct Digital Controller
UPM — Unit Protection Module
VFD — Variable Frequency Drive
WSE — Waterside Economizer
WSHP — Water Source Heat Pump

AHRI ratings and capacities

50HQP/50VQP Series Water Source Heat Pumps Ratings[a,b,c,d,e,f]

UNIT SIZES	AIRFLOW RATE (cfm)	WATER FLOW RATE (gpm)	WATER COIL OPTION	WATER LOOP HEAT PUMP				GROUND WATER HEAT PUMP				GROUND LOOP HEAT PUMP			
				Cooling 86°F		Heating 68°F		Cooling 59°F		Heating 50°F		Cooling 77°F		Heating 32°F	
				Capacity BTU/h	EER	Capacity BTU/h	COP	Capacity BTU/h	EER	Capacity BTU/h	COP	Capacity BTU/h	EER	Capacity BTU/h	COP
072	2,400	18	Cu/CuNi	77,500	16.25	86,500	4.55	85,100	24.40	69,900	4.55	80,600	18.85	55,900	3.85
096	2,820	21	Cu/CuNi	101,300	16.50	126,200	4.65	109,100	24.45	102,600	4.65	104,000	18.90	82,000	4.00
120	4,000	28	Cu/CuNi	125,700	13.40	157,600	3.90	134,900	18.95	128,900	3.90	129,100	15.15	102,300	3.30
150	5,000	35	Cu/CuNi	148,800	17.70	167,600	5.20	162,300	26.45	134,400	5.20	153,600	20.25	106,100	4.35
151	5,000	35	Cu/CuNi	148,900	17.75	163,000	4.55	162,000	26.45	131,100	4.55	153,400	20.20	103,800	3.75
180	6,000	42	Cu/CuNi	173,100	16.35	182,300	4.65	190,200	24.85	144,400	4.65	179,200	18.80	112,200	3.80
181	6,000	42	Cu/CuNi	170,700	14.00	180,500	4.15	187,100	21.25	143,600	4.15	176,500	16.10	112,300	3.45
210	7,000	50	Cu/CuNi	214,800	15.05	257,200	4.10	239,600	23.15	210,200	4.10	221,800	16.55	167,900	3.70
240	8,000	60	Cu/CuNi	248,800	15.60	323,600	4.25	268,300	23.10	263,300	4.25	255,800	17.65	209,500	3.35
242	8,000	60	Cu/CuNi	237,100	13.90	304,600	3.95	262,100	21.15	248,400	3.95	244,100	15.85	210,300	3.35
300	10,000	75	Cu/CuNi	310,900	14.60	403,300	3.95	336,800	20.15	329,200	3.95	319,700	16.30	264,400	3.40
360	12,000	90	Cu/CuNi	386,000	13.30	458,900	4.20	419,400	18.50	413,800	4.00	399,500	14.85	303,500	3.15

NOTE(S):

a. Ratings based upon AHRI/ANSI 13256-1 with 1in. disposable MERV 5 filter.
b. For specific configuration ratings, refer to WSHP Builder in the Carrier NG ECAT.
c. These ratings are for Vertical and Horizontal configurations.
d. Certified in accordance with ANSI/AHRI/ASHRAE/ISO 13256-1.
e. Cooling rated capacities based on EAT = 80.6°F/66.2°F (db/wb).
f. Heating rated capacities based on EAT = 68°F (db).

LEGEND

AHRI — Air-Conditioning, Heating and Refrigeration Institute
BTU/hr — British Thermal Unit per Hour
COP — Coefficient Performance
EER — Energy Efficiency Ratio

Sizes 072-120 only

AHRI CERTIFIED™
www.ahridirectory.org
Water Source HP
ANSI/AHRI/ASHRAE/ISO13256-1

Physical data

50HQP and 50VQP Unit Physical Data

50HQP,VQP UNIT SIZE	072	096		120	150	151	180
	Cu/CuNi	Cu	CuNi	Cu/CuNi	Cu/CuNi	Cu/CuNi	Cu/CuNi
Compressor Type (Qty 2)	Scroll	Scroll		Scroll	Scroll	Scroll	Scroll
Max Water Working Pressure (psig / kPa)	450 / 3100	450 / 3100		450 / 3100	450 / 3100	450 / 3100	450 / 3100
Number of Refrigeration Circuits	2	2		2	2	2	2
Water Coil Connection (Size / Type)	1" / FPT	1" / FPT		1-1/4" / FPT (Horizontal) 1-1/2" / FPT (Vertical)	1-1/2" / FPT	1-1/2" / FPT	1-1/2" / FPT
Water Coil Type	Coaxial	Coaxial		Coaxial	Coaxial	Coaxial	Coaxial
Coil Volume (gal)	0.64	0.64		0.87	1.06	1.06	1.06
Economizer Option Supply Water Connection (Size / Type)[a]	2" / FPT	2" / FPT		2" / FPT	2" / FPT	2" / FPT	2" / FPT
Vertical Cabinet							
Coil Type	Tube-Fin	Tube-Fin		Tube-Fin	—	Tube-Fin	—
Air Coil Dimensions Vertical (H x L) (in.)	20 x 32.5 (2)	20 x 32.5 (2)		20 x 32.5 (2)	—	24 x 43 (2)	—
Row(s)	3	3		3	—	3	—
Nominal Size of Standard Filter - 1" (H x L) (in.)	20 x 34.5 (2)	20 x 34.5 (2)		20 x 34.5 (2)	—	24 x 24 (4)	—
Standard Fan Motor (hp)	1.0	1.5		2.0	—	3.0	—
Blower Wheel Size (Dia. x W x Qty) (in.)	12 x 12 x 1	12 x 12 x 1		15 x 15 x 1	—	15 x 15 x 1	—
Refrigeration Charge/Circuit (oz)	68	77	74	77	—	99	—
Total Refrigerant Charge (oz)	136	154	148	154	—	198	—
Weight - Operating (lb)	670	702		935	—	1050	—
Weight - Shipping (lb)	715	752		980	—	1140	—
Horizontal Cabinet							
Coil Type	Tube-Fin	Tube-Fin		Tube-Fin	Tube-Fin	—	Tube-Fin
Air Coil Dimensions Horizontal (H x L) (in.)	20 x 32.5 (2)	20 x 32.5 (2)		20 x 32.5 (2)	24 x 65	—	24 x 65
Nominal Size of Standard Filter - 1" (H x L) (in.)	20 x 34.5 (2)	20 x 34.5 (2)		20 x 34.5 (2)	24 x 34 (2)	—	24 x 34 (2)
Row(s)	3	3		3	3	—	3
Standard Fan Motor (hp)	1	2		3	3	—	2
Blower Wheel Size (Dia. x W x Qty) (in.)	12 x 12 x 1	12 x 12 x 1		12 x 9 x 2	15 x 15 x 1	—	12 x 12 x 2
Refrigeration Charge/Circuit (oz)	70	83	74	77	104	—	117
Total Refrigerant Charge (oz)	140	166	148	154	208	—	234
Weight - Operating (lb)	670	702		935	1060	—	1530
Weight - Shipping (lb)	715	752		980	1150	—	1620

NOTE(S):

a. For return water connection size refer to drawings with waterside economizer option.

Physical data (cont)

50HQP and 50VQP Unit Physical Data (cont)

50HQP,VQP UNIT SIZE	181	210	240	242	300	360
	Cu/CuNi	Cu/CuNi	Cu/CuNi	Cu/CuNi	Cu/CuNi	Cu/CuNi
Compressor Type (Qty 2)	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Max Water Working Pressure (psig / kPa)	450 / 3100	450 / 3100	450 / 3100	450 / 3100	450 / 3100	450 / 3100
Number of Refrigeration Circuits	2	2	2	2	2	2
Water Coil Connection (Size / Type)	1-1/2" / FPT	2" / FPT	2" / FPT	2" / FPT	2" / FPT	2" / FPT
Water Coil Type	Coaxial	Coaxial	Coaxial	Coaxial	Coaxial	Coaxial
Coil Volume (gal)	1.06	3.04	3.40	3.40	3.40	3.31
Economizer Option Supply Water Connection (Size / Type)[a]	2" / FPT	2" / FPT	2" / FPT	2" / FPT	2" / FPT	2" / FPT
Vertical Cabinet						
Coil Type	Tube-Fin	Tube-Fin	Tube-Fin	—	Tube-Fin	Tube-Fin
Air Coil Dimensions Vertical (H x L) (in.)	24 x 43 (2)	20 x 32.5 (4)	20 x 32.5 (4)	—	20 x 32.5 (4)	30 x 32.5 (2)
Row(s)	3	3	3	—	3	3
Nominal size of Standard Filter - 1" (H x L) (in.)	24 x 24 (4)	20 x 34.5 (4)	20 x 34.5 (4)	—	20 x 34.5 (4)	30 x 34.5 (4)
Standard Fan Motor (hp)	5.0	1.5	2.0	—	3.0	5.0
Blower Wheel Size (Dia. x W x Qty) (in.)	15 x 15 x 1	15 x 15 x 2	15 x 15 x 2	—	15 x 15 x 2	15 x 15 x 2
Refrigeration Charge/Circuit (oz)	113	141	146	—	146	247
Total Refrigerant Charge (oz)	226	282	292	—	292	494
Weight - Operating (lb)	1090	1090	1310	—	1530	1650
Weight - Shipping (lb)	1180	1180	1400	—	1630	1750
Horizontal Cabinet						
Coil Type	—	—	—	Tube-Fin	—	—
Air Coil Dimensions Horizontal (H x L) (in.)	—	—	—	34 x 65	—	—
Nominal Size of Standard Filter - 1" (H x L) (in.)	—	—	—	20 x 34.5 (4)	—	—
Row(s)	—	—	—	3	—	—
Standard Fan Motor (hp)	—	—	—	2	—	—
Blower Wheel Size (Dia. x W x Qty) (in.)	—	—	—	15 x 15 x 2	—	—
Refrigeration Charge / Circuit (oz)	—	—	—	146	—	—
Total Refrigerant Charge (oz)	—	—	—	292	—	—
Weight - Operating (lb)	—	—	—	1655	—	—
Weight - Shipping (lb)	—	—	—	1755	—	—

NOTE(S):

a. For return water connection size refer to drawings with waterside economizer option.

Options and accessories

ITEM	FACTORY-INSTALLED OPTION	FIELD-INSTALLED ACCESSORY
Coated Air Coil	X	
Cupronickel Water Heat Exchanger	X	
Blower and Motor Orientation	X	
Staged Air Volume (SAV), Supply Fan VFD	X	
Hot Gas Reheat (HGRH)	X	
Modulating Hot Gas Reheat (MHGRH)	X	
Hot Gas Bypass (HGBP)	X	
Water Side Economizer (WSE)	X	
Hot Water Coil (HWC)	X	
Take Apart Construction (TAC)	X	
Cooling Only (CO)	X	
Condenserless	X	
Electric Heater		X
4-Sided 2" Filter Rack (FR)	X	
Closed Cell Foam (CCF)	X	
Mute Package (MP)	X	
Two-Position Motorized Isolation Valve (2-way solenoid valve)		X
Autoflow Regulator		X
Supply and Return Water Hose Kits		X
Ball Valves		X
Y-Strainers		X
Thermostat		X
Non-Communicating Sensors		X
TruVu™ DDC Controller	X	
SCU Open DDC Controller	X	
User Interfaces		X
ZS Sensors		X

Factory-installed options

Coated air coil

Additional air coil protection option is available for units. This option offers tin electro-plated copper tubing with high-tech polymer coated aluminum which fins will protect the air coil from all forms of corrosive elements in the air-stream. Air coil protection is required for primary residence applications to protect against formicary corrosion. Protected coils exceed 1000 hours of ASTM B117 salt spray testing.

Cupronickel water heat exchanger

This option is available for higher corrosion protection for applications such as open tower, geothermal, etc. Consult the water quality guidelines for proper application and selection of this option.

Blower and motor orientation

An optional (reverse) blower orientation is available for applications where the ductwork orientation is opposite of the standard unit fan discharge. Incorporating a blower rotation aligned with ductwork orientation can minimize air pressure drop and mitigate energy wastage with more streamlined and optimized airflow. The blower location remains the same (top or front). An optional motor orientation provides the ability to choose the motor's pulley service side (front or side) in the cabinet for better serviceability. See dimensional drawings on pages 24-58 for details.

Staged Air Volume (SAV™) supply fan VFD

Units come wired for Staged Air Volume (SAV) operation (except 208/230-1-60 units). This option is available for applications that require a VFD for code compliance, providing two stages of fan control. The SAV option is a supply fan control arrangement that adjusts the fan speed based on the call for heating, cooling, or fan only. Units with VFD option also include an inverter duty motor.

NOTE: On 50VQP units, the VFD is factory wired and installed. On 50HQP units, the VFD does not fit in the cabinet and will ship loose for field installation. See supplemental VFD installation instructions.

Hot Gas Reheat (HGRH)

HGRH is an efficient and effective method of providing space humidity control. HGRH allows the unit to dehumidify the space when there is no demand for space cooling without the need for additional energy consuming devices.

The HGRH package is factory installed and includes a HGRH coil (installed behind the indoor air coil) an on/off HGRH control valve, and additional refrigerant piping. The HGRH coil is factory sized to maximize performance.

When the space temperature is satisfied but the space humidity is above the desired set point, a call for dehumidification is initiated and the unit fan, reversing valve, HGRH valve, and compressor are enabled. The fan draws in warm humid air through the indoor air coil where is it cooled and dehumidified. The cool, dehumidified air then passes through the reheat coil where it is heated to a neutral temperature (typically 68 to 78°F). The neutral, dry air is then delivered to the space and reduces space humidity levels without cooling the space. See NG ECAT unit report for HGRH performance.

This option requires a thermostat with dehumidification output, humidistat, or DDC controller with space relative humidity sensor and binary/digital output.

Options and accessories (cont)

Modulating Hot Gas Reheat (MHGRH)

MHGRH is an effective method of providing supply air temperature control for Variable Air Volume (VAV) applications. It provides steady supply air temperature by modulating HGRH during compressor cycles, preventing temperature fluctuations. This ensures precise and efficient temperature regulation.

The MHGRH package is factory installed and includes an HGRH coil (installed behind the indoor air coil) a modulating HGRH control valve, and additional refrigerant piping.

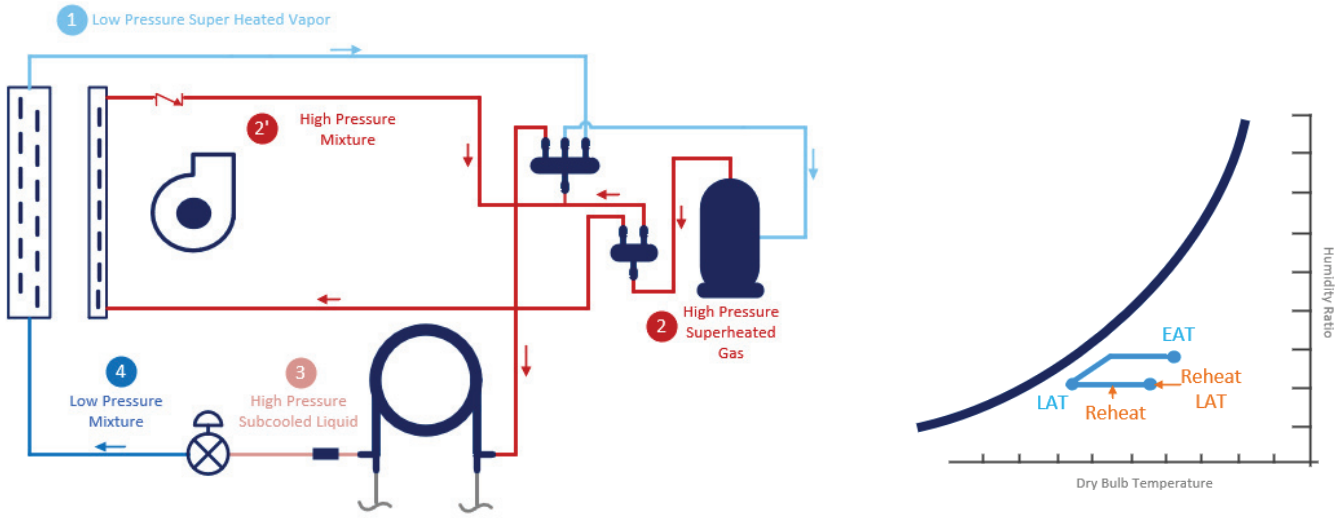
Cooling only Aquazone VAV units (sizes 210-360) are standard with modulating HGRH for supply air temperature control. If the air leaving the indoor air coil is colder than the unit supply air temperature set point, the modulating HGRH coil is enabled to reheat the air back up to the supply air temperature set point. The modulating HGRH system is controlled by the unit DDC control for supply air temperature control only and will not operate for dehumidification purposes.

NOTE: MHGRH is available only with unit sizes 210-360 and requires selection of Cooling only option and HGBP plus HGRH options. The HGRH option is provided with modulating valve.

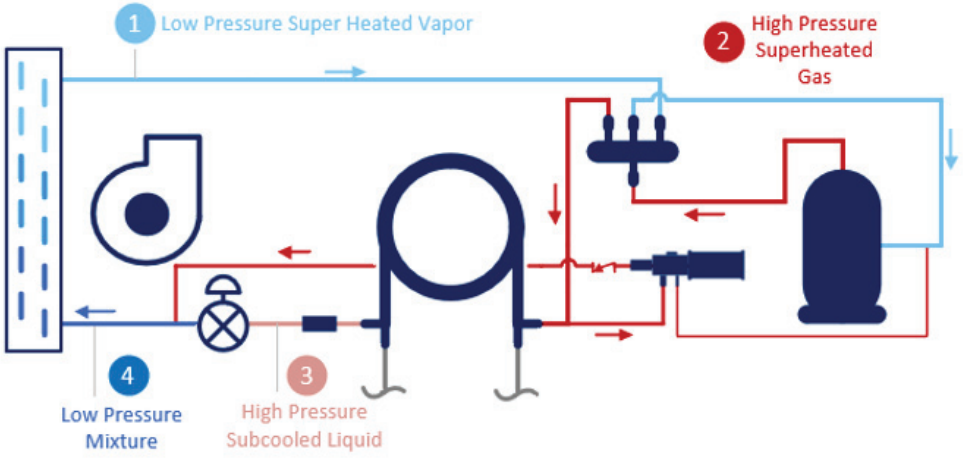
Hot Gas Bypass (HGBP)

HGBP helps to reduce unit cycling and prevents icing of the air coil when the unit is operating at low cooling load conditions. The hot gas bypass valve located in the compressor discharge line diverts hot gas to the inlet of the air coil. The valve is factory set to open when the evaporating pressure falls to 105 psig (sizes 072-120) and 120 psig (sizes 150-360) and will modulate to prevent the pressure falling any lower. This setting is field adjustable for sizes 072-120 (95-115 psig), and sizes 150-360 (75-150 psig), and this set point may be adjusted as required.

Hot Gas Reheat (HGRH)



Hot Gas Bypass (HGBP)



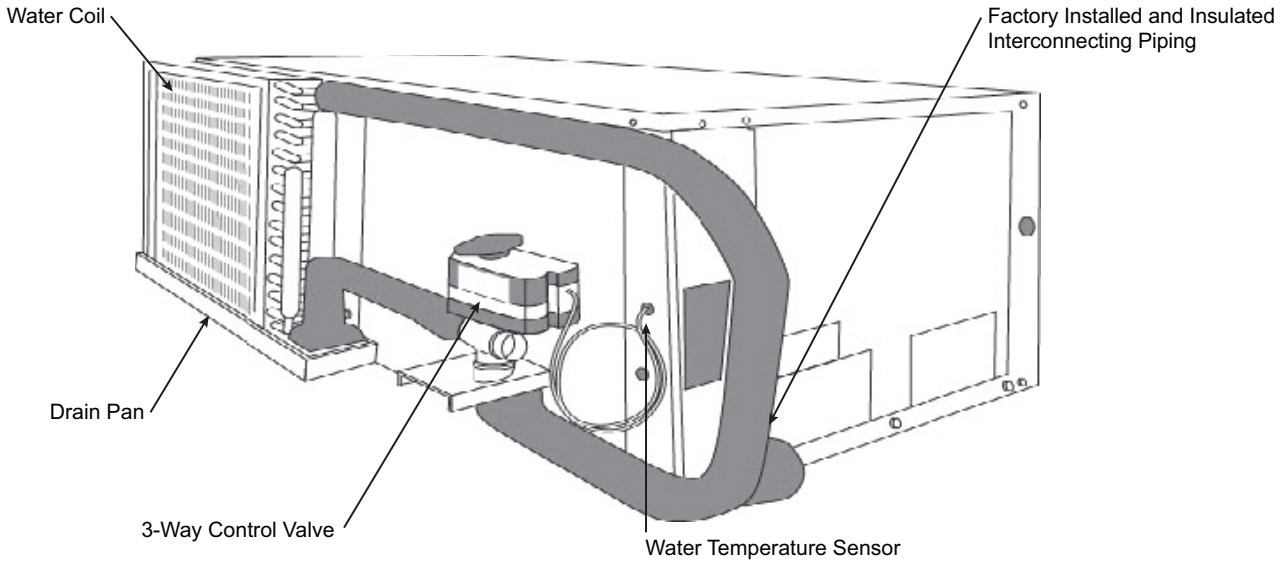
Options and accessories (cont)

Waterside economizer

A waterside economizer is available as a factory installed option and allows for free cooling for applications where the water loop temperature is able to reach temperatures between 40 and 65°F. When the loop is cold enough, the waterside economizer acts as a chilled water coil, providing free cooling limiting fully or partially the usage of the compressor (mechanical cooling). The water leaving the economizer coil is then directed to the unit coaxial coil, which can allow compressor operation in integrated economizer cooling applications. The factory-installed waterside economizer coil is mounted external to the air coil and piped as shown below, and diverting motorized 3-way valve, drain pan with condensate overflow switch, aquastat (without TruVU™ DDC), entering water temperature sensor, and factory controls are included with the option.

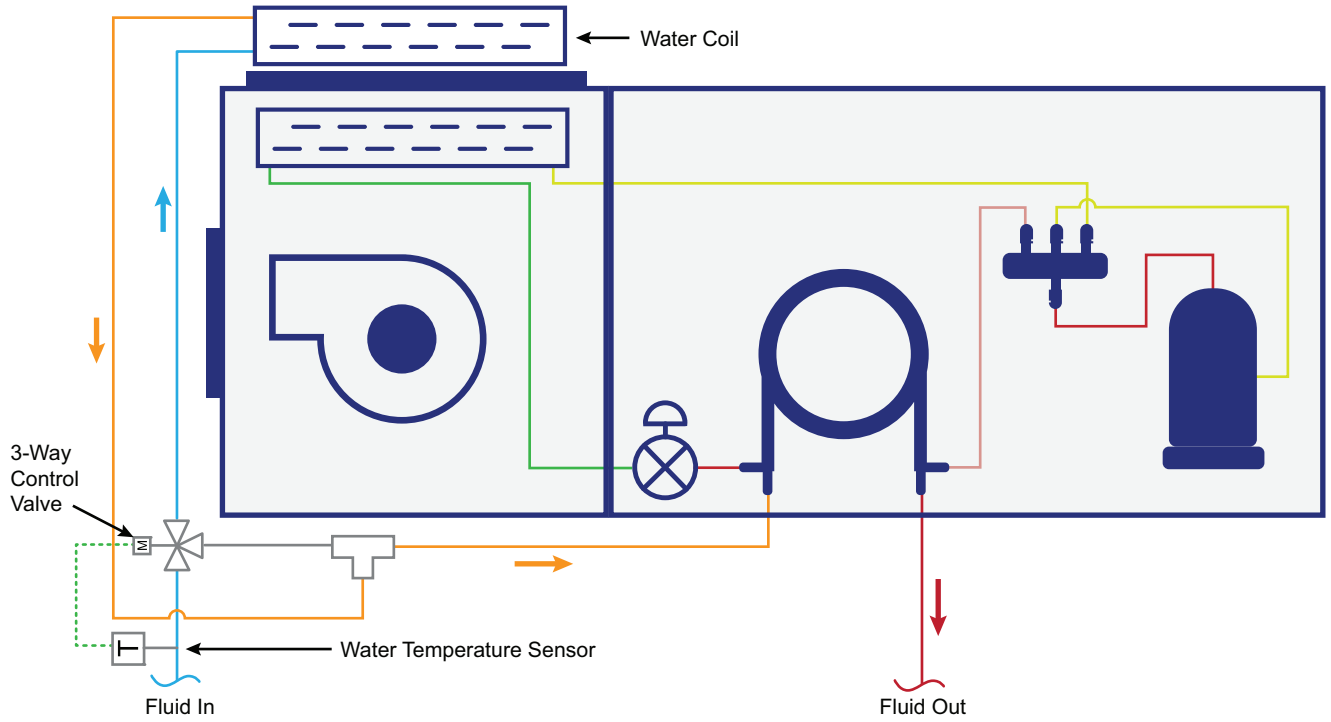
See dimensional drawings on pages 24-58 for details.

Waterside Economizer



Options and accessories (cont)

Waterside Economizer Piping



Hot water coil

A factory-installed hot water coil is available for CV/SAV units. The hot water coil is intended to have a separate water supply and provides pre-heat operation (upstream of the evaporator coil and supply fan). The hot water coil package includes a factory-installed 1 or 2-row hot water coil and pipe connections on the side of the unit. See dimensional drawings on pages 24-58 for details.

A factory-installed hot water coil is available for VAV units. The hot water coil is intended to have a separate water supply and provides supplemental heat to the heat provided by compressor or emergency heat during compressor fail or low source water temperature. The hot water coil is located upstream of the evaporator coil and supply fan. The provided SCU Open controller with VAV units includes modulating hot water heat functionality. The hot water coil package includes a factory-installed 1 or 2-row hot water coil installed and pipe connections on the side of the unit. See dimensional drawings for details.

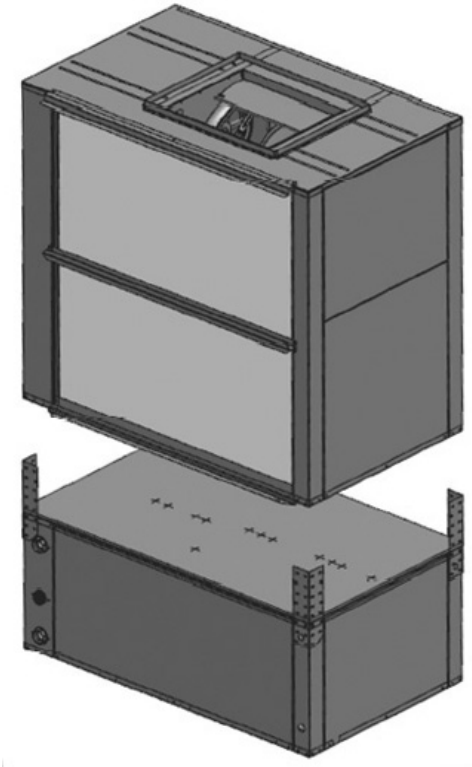
NOTE: The hot water coil requires a separate pipe connection, field provided and installed control valves and strainer, and field provided and installed control system with freeze protection.

Take apart construction

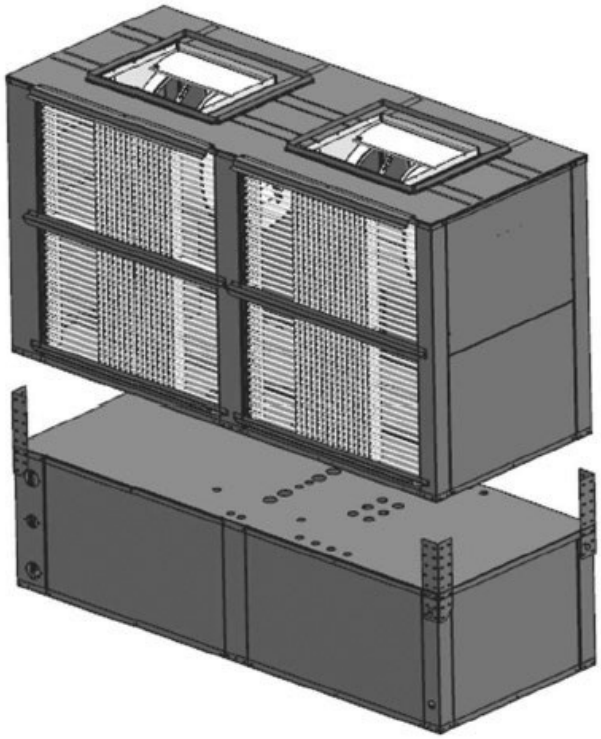
Take apart construction (TAC) is available for applications when the unit needs to be split into two major pieces for ease of installation and rigging. Retrofit projects often utilize this feature since the units may have to be brought through existing doorways, down existing hallways, or even up elevators. Take apart construction consists of splitting the unit horizontally into two sections: a condensing section (condenser/compressor) and an air handler section (evaporator/fan) as shown in "Take Apart Construction" figures for single and double units on page 14. Units ordered as take apart construction will ship as an assembled single piece with pre-cut interconnecting piping to be installed in the field. If units include a waterside economizer this will include pre-cut piping for the WSE as well. Each section will be factory charged with nitrogen. Refrigerant to be provided and charged in the field per the unit's data plate. See dimensional drawings on pages 24-58 for details (for more detailed information, refer to "Application Data" on page 59).

Options and accessories (cont)

Take Apart Construction (single unit)



Take Apart Construction (double unit)



Options and accessories (cont)

Cooling only

Optional cooling only modification is available for these units. The Cooling Only option excludes the reversing valve from refrigerant circuit. This modification provides efficient cooling in environments where heating is not a primary need.

Condenserless

The condenserless option offers the unit without the built-in refrigerant to water heat exchanger, allowing for the providing of a third-party remote condenser in the field. This option is exclusively available for Constant Volume or Staged Air Volume units starting from 12.5 tons and up. As all WSHPs are dual circuit units, a dual circuit remote condenser must be provided in the field, and selected based on the required total heat of rejection. (See unit report performance for total heat rejection based on application.) With the condenserless option, users can tailor their system to meet unique needs while maintaining efficient operation and performance.

IEQ Options

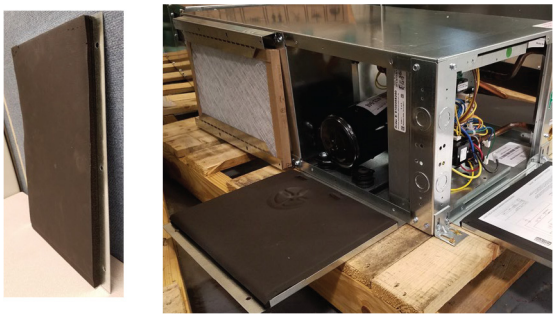
4-sided 2" filter rack

Every unit is equipped with a default one-inch, 2-sided filter rack and 1" MERV 5 filter suitable for free return applications. Alternatively, there is an optional 4-sided, 2" filter rack with 1" MERV 5 filter for ducted returns.

Closed-cell foam insulation

Units are offered with the option of 1/2-in. thick closed-cell foam insulation to help aid indoor air quality (IAQ) and to further attenuate low frequency noise from the compressor compartment. The closed-cell foam insulation option is available in all unit sizes.

Closed-Cell Foam Insulation (shown on unit)



Mute package

The mute package includes a compressor sound blanket to attenuate compressor sound.

Mute Package Compressor Blanket

Field-installed accessories

Supply and return water hose kits

Hose kits are recommended for connection between the unit and the water loop piping. Hose kits are available in 24 or 36 inches in length. All hose kits come with flexible stainless steel hoses and have options for manual isolation valves with and without autoflow regulators and Y-strainer.

Supply and Return Water Hose Kits

Autoflow regulator

Field-installed pressure independent Autoflow Regulator (automatic balancing valve) is a part of the hose kit and is available with wide range of set flow rate internal cartridges. Factory-installed auto-flow regulator ensures a constant water flow rate to the unit. The system installation is much easier with autoflow regulators compared to manually balanced systems, and the “fluctuation” seen in manually balanced systems is no longer an issue.

Ball valves

Carrier’s ball valves can be field installed between supply and return lines and the WSHP. These valves provide manual stoppage of water flow during maintenance or when service is needed.

Options and accessories (cont)

Ball Valve

Two-position water valve (2-way solenoid valve)

Carrier's motorized water valves are normally closed, 2-position water valves field installed on the WSHP return line. The valve opens to allow 100% of the fluid flow through the WSHP when compressor is energized and closes to shut off flow to the WSHP when compressor is de-energized. Closing off fluid flow to the unit when there is no call for cooling or heating reduces system operating costs, when using variable speed pump.

2-Position Water Valve

Y strainers

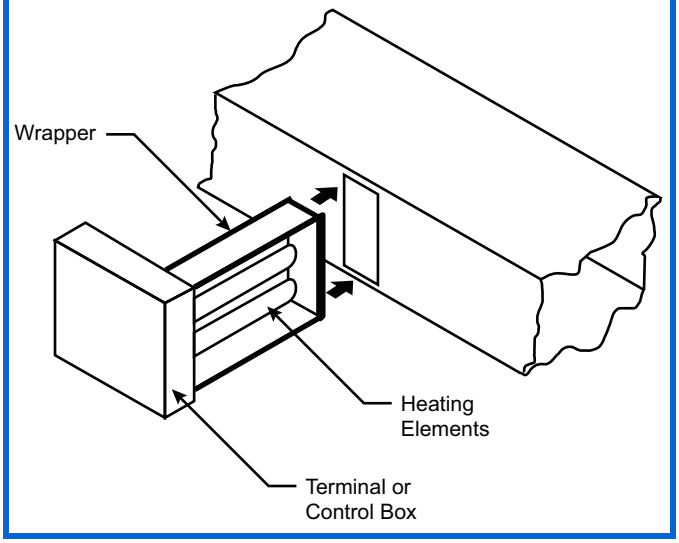
Carrier's strainers are field installed on the supply line of the WSHP. These strainers are a combination strainer and ball valve and equipped with a union end, blow down port, and two accessory ports. The strainers provide a 20-mesh removable filter screen.

Y Strainer

Slip-in electric duct heater

Field installed duct slip-in electric heaters provide an economical heating source that can be easily integrated into an existing HVAC (Heating, Ventilation and Air-Conditioning) system and new installations. These heaters provide space heating, primary heating, auxiliary heating, and reheating in a wide variety of configurations. The design of the heaters allows for free flow air.

Slip-in Electric Heating Unit



Controls Options

Unit Protection Module (UPM)

All Carrier WSHP units feature an advanced UPM which implements all the critical equipment safeties and allows for continuous safe and reliable operation. It is located in the control box.

Features of the unit protection module include:

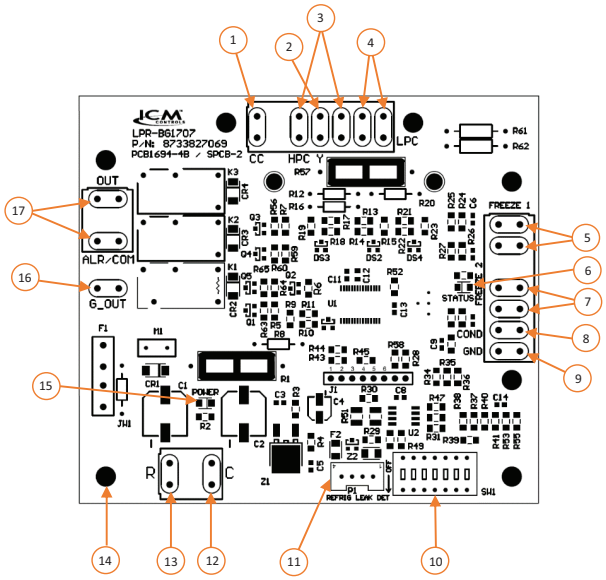
- High and Low Refrigerant Pressure Protection: The unit is equipped with high and low-pressure switches set to disable operation at pressures above 600 psig or below 40 psig.
- Low Pressure Bypass Timer: This bypass helps to eliminate nuisance trips by keeping the compressor on for 120 seconds upon the LPS opening. If the LPS is still open after 2 minutes the unit is shut down and put into soft lockout.
- Air and Water Coil Freeze Protection: Both the cooling and heating refrigerant liquid line temperatures are monitored to prevent freeze up of both the water and air coil. The freeze limit by default is set to 25°F and is configurable via a dip switch on the UPM to 15°F for applications utilizing antifreeze.
- High Condensate Level Shutdown: All units are equipped with a condensate overflow sensor in the drain pan set to disable operation in the event of an overflow condition.
- Anti-Short Cycle Time Delay: A 5-minute delay on break timer to prevent compressor short cycling.
- Random Start Time Delay: Each controller has a unique random start delay ranging from 270 to 300 seconds on initial power up to reduce the chance of multiple units simultaneously starting at the same time after

Options and accessories (cont)

powering up or after a power interruption, thus avoiding creating large inrush current.

- Brownout/Surge Protection: The UPM board will disable the compressor if the incoming low voltage power falls below 18 vac.
- Intelligent Alarm Reset: Upon fault, a 5-minute break is initiated, and the unit will automatically restart after this time period has expired.
- Hard Lockout Reset: A hard lockout can be reset by turning the unit thermostat off and then back on when the RESET DIP switch is set to "Y" or by shutting off unit power at the circuit breaker when the RESET DIP switch is set to "R".
- Alarm Output: The alarm output is normally open (NO) dry contact. The output is configurable via a dip switch on the UPM to be constant, as a general alarm, or pulsed, to be interpreted for the specific alarm by a remote device.
- Refrigerant Leak Detection: On units equipped with an A2L refrigerant leak detection sensor the controller will take mitigation action in the event of a leak. The leak detection sensor is standard option and included with the unit when required by the product safety standard UL60335-2-40. The leak detection sensor is an optional feature in cases where it is required by requirements more stringent than the UL60335-2-40 standard.
- Test Mode: the UPM features a test mode for ease of service which shortens the anti-short cycle and random start delays and requires manual reset for both soft and hard lockouts.

UPM Control Board



LEGEND

1 — Compressor Contact Output
2 — Compressor Y1 Call
3 — High Pressure Switch
4 — Low Pressure Switch
5 — Water Coil Freeze 1
6 — LED Status Diagnostic
7 — Air Coil Freeze 2
8 — Condensate Overflow
9 — Ground
10 — UPM Settings Dip Switch
11 — A2L Sensor
12 — 24 vac Power Common
13 — 24 vac Power Input
14 — UPM Standoff
15 — Power LED
16 — Fan
17 — Dry Contact

Options and accessories (cont)

Thermostat Control

The Carrier 50HQP/50VQP series water source heat pumps utilize 24-v non-communicating controls and are suitable for control via most 24-vnon-communicating single stage heat pump thermostats. Carrier has several 24-v non-communicating thermostats that are well suited for pairing with water source heat pumps. See the "Thermostats" table for a summary of the available carrier thermostats and the general functionality/capability of each.

Thermostats

								
TYPE	**NON-COMMUNICATING THERMOSTATS**		**BACNET®a THERMOSTAT WITH WI-FI**				**BACNET THERMOSTAT**	
Feature	**Comfort Pro Programmable Thermostat**	**Edge Pro Programmable Thermostat**	**Connect 43FX Thermostat**	**Connect BACnet Wi-Fi Thermostat**	**Non-Branded 43FX Thermostat**	**Non-Branded BACnet Wi-Fi Thermostat**	**ComfortVu BACnet Standard Thermostat**	**ComfortVu BACnet Plus Thermostat**
	33CSCPACHP-01	**33CS2PP2S-03 / 33CS2PPRH-03**	**33CONNECTSTAT43FX**	**33ConnectStat43**	**33WIFISTAT43FX**	**33WIFISTAT43**	**TB-24-C / TB24-HM-C**	**TBPL-24-H-C**
Power	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac
Power Requirements	3 Va	3 Va	6 Va	6 Va	6 Va	6 Va	4 Va Unit, 76 Va Full Load	4 Va Unit, 76 Va Full Load
Interface	Backlit Display	Backlit Display	4.3" LCD Touchscreen	4.3" LCD Color Touchscreen	4.3" LCD Touchscreen	4.3" LCD Color Touchscreen	LCD Pushbutton	LCD Touchscreen
Onboard Sensors	Temperature	Temperature & Humidity (optional)	Temperature & Humidity	Temperature & Humidity	Temperature & Humidity	Temperature & Humidity	Temperature & Humidity	Temperature & Humidity
Scheduling	✔	✔	✔	✔	✔	✔	✔	✔
Occupancy (motion)	—	—	—	—	—	—	4	4
Compressor Stages	1-2	1-2	1-3	1-3	1-3	1-3	1-2	1-2
Auxiliary Heat Stages	1	1	1-2	1-2	1-2	1-2	1-3	1-3
Fan Control	1-Speed	1-Speed	1-Speed	1-Speed	1-Speed	1-Speed	1 to 3-Speed	1 to 3-Speed
Dehumidification Output for HGRH	—	✔	✔	✔	✔	✔	—	✔
Humidification Output	—	✔	✔	✔	✔	✔	✔	✔
Remote Sensors	OAT / RRS / SAT / RAT	OAT / RRS	RH + OAT / RRS / SAT	OAT / RRS / SAT	RH + OAT / RRS / SAT	OAT / RRS / SAT	ECON / RRS / DEICE	ECON / RRS / DEICE
Dry Contact	—	Dehum or Economizer	OCC / ECFL / FLTR	OCC / ECFL	OCC / ECFL / FLTR	OCC / ECFL	Window / Door / KeyTag	Window / Door / KeyTag
BACnet MS/TP	—	—	✔	✔	✔	✔	✔	✔
Wi-Fi	—	—	✔	✔	✔	✔	—	—
Accessories	OAT Sensor: 33ZCSENOAT Remote Temperature with Averaging: 33ZCT55SPT Remote Supply/Return Temp Sensing: 33ZCSENSAT							

NOTE(S):

a. Third-party trademarks and logos are the property of their respective owners.

Options and accessories (cont)

Control options to supplement thermostat

The 50HQP/50VQP units have a number of control options available to supplement the control of a thermostat allowing for control of various auxiliary components that thermostats are not typically capable of controlling. These options include:

"Boilerless" Electric Heat Control

Boilerless heat control is a means to control an auxiliary electric heater on units that are connected to a water loop without a reliable heat injection source. This option includes an aquastat and 24-v output to enable an external heat source. When the water loop drops below the setpoint and there is a call for heating the compressor will be disabled and 24-v signal sent to enable the electric heater.

Energy Management Switch (EMS) Relay

An optional relay providing a normally open set of contacts for remotely enabling and disabling the unit via an external 24 vac signal.

Pump Relay

An optional relay providing a signal to energize a pump when the compressor is commanded to run.

Compressor Status Relays

An optional relay providing compressor status via a normally open set of dry contacts.

Carrier i-Vu WSHP TruVu™ DDC

Carrier's WSHP TruVu™ controller is an integrated component of a Carrier water source heat pump. The WSHP TruVu™ controller continuously monitors and regulates water source heat pump operation with reliability and precision. This advanced controller features a sophisticated, factory-engineered control program that provides optimum performance and energy efficiency. It also features plug and play connectivity to the Carrier i-Vu Building Automation System. For added flexibility, the controller is capable of stand-alone operation, or it can be integrated with any other building automation system utilizing BACnet IP.

Application Features

- Provides space temperature control with up to 2 stages of mechanical cooling and heating
- Integrated 2-position or modulating waterside economizer control for optimized mechanical cooling (ASHRAE 90.1)
- Controls modulating or 2-position outside air damper to meet ASHRAE 62 ventilation requirements
- Automatic 3-speed fan control for efficient WSHP operation. Using the space temperature input, the TruVu™ controller automatically operates the fan at the optimal speed to maintain space temperature while providing increased latent heat removal, reduced sound and the lowest fan energy consumption (exception: for units without VFD only 1-speed is available).
- Auxiliary Heat — Provides control over auxiliary heating, allowing for the management of a 2-position or modulating water/steam valve, or a two-stage electric heater. The auxiliary heat functionality can be configured in two modes: Boilerless (alternative) or Auxiliary Heat (supplemental), providing flexibility and adaptability to different system designs.
- Dehumidification — Provides occupied and unoccupied dehumidification, allowing configure setpoints for both occupancy types. The controller offers the choice of cycling on/off HGRH control or modulating control with Modulating HGRH for precise dehumidification.
- Equipment performance monitoring/statuses for compressor status, fan status, water flow switch, secondary condensate overflow, EWT, LWT, SAT, RAT.
- Scheduling — Provides adaptable scheduling for occupied and unoccupied periods with ability for internal/local occupancy configuration or remote occupancy configuration via external dry contact, local user interfaces, i-Vu network, or BAS network. Additionally, flexible intermittent fan operation is available during both occupied and unoccupied periods for energy savings.
- Learning adaptive optimal start transitions the WSHP from unoccupied set points to occupied set points in the most efficient means possible. Over time, the WSHP will learn and determine the best adjustment rates of the set points to provide the most efficient means of shifting the WSHP to an occupied mode.
- Space temperature input via communicating ZS sensor, or non-communication zone sensor (10K thermistor), or over the network.
- Shutdown Inputs — Fire/Smoke Detector Shutdown and Network Shutdown to safely shut down the unit in a controlled fashion with ability to monitor the unit.
- Alarm Status — Alarms status is accessible through equipment user interfaces or network. (see TruVu™ Alarm Table on page 21).

Options and accessories (cont)

Hardware Features

- USB port for service/commissioning/troubleshooting, hard-wired via laptop/smartphone/TruVu™ ET display, or wireless service connections via USB-WiFi kit
- dual 10/100 Mbps, BACnet IP and IP addressing
- supports home run, daisy chain and ring IP network topologies
- capacitor-backed real-time clock keeps time in the event of power failure or network interruption for at least three days
- LED indicators for power, status of network and controller, and 1 programmable LED indicator
- supports Rnet devices like ZS sensors, Equipment touch, and TruVu™ ET Display
- supports Act Net devices (Smart actuators)

System Features

- integrated Carrier waterside linkage algorithm for plug-and-play integration with the Carrier WSHP System
- fully plug-and-play with the Carrier i-Vu Building Automation System
- supports demand limiting for maximum energy savings
- compatible with i-Vu Tenant Billing for tracking tenant's after-hours energy usage
- built-in network diagnostic capture functionality for troubleshooting
- network statistics that can be viewed numerically or as trend graphs

Options and accessories (cont)

Field-Installed TruVu™ DDC Accessories

ZS sensors

ZS sensors are the preferred method of monitoring space temperature, humidity and CO_2 levels when using the TruVu™ controller.

TruVu™ Alarms

ALARM	DESCRIPTION
Fire/Smoke Detector Alarm	Immediate shutdown of equipment (fan, compressor, aux heat, and damper) after alarm is generated.
Space Temperature Alarms	Generates an alarm whenever the space temperature exceeds configurable alarm set points for occupied and unoccupied periods.
Source Water Temperature Alarm	Four configurable alarm limits for leaving condenser water temperature.
Supply Air Temperature Alarm	Two configurable alarm limits for supply air temperature.
High Condensate/Overflow Alarm	Disables the compressor and fan outputs when alarm is generated.
Fan Status Alarm	Monitors the fan output and alarm is generated after 30 seconds of no fan status (all speeds).
Compressor Status Alarm	Monitors the compressor output and alarm is generated after 6 minutes of energizing compressor and no status.
Filter Status Alarm	Generates an alarm after the number of fan run hours exceeds a configurable filter alarm timer limit.
Indoor Air Quality Alarm	Generates an alarm during occupied periods whenever the CO_2 sensor value exceeds the user adjustable limit.
Relative Humidity Alarm	Generates an alarm whenever the space relative humidity exceeds configurable alarm set point.
Source Water Linkage Failure Alarm	Generates an alarm after linkage fail with water loop controller for > 6 min.
Airside Linkage Failure Alarm	Generates an alarm once linkage fails for > 6 min.
OAT Sensor Alarm	Generates an alarm if the value of OAT fails to be updated through the network.
SPT (space temperature) Sensor Alarm	Generates an alarm if the SPT sensor fails to communicate with the control for > 5 minutes.
ZS Sensor Alarm	Generates an alarm if the ZS sensor fails to communicate with the control for > 5 minutes.
Return Air Temperature Alarm	Configurable alarm limits for return air temperature.
Entering Water Temperature Alarm	Configurable alarm limits for entering condenser water temperature.
Water Side Delta T Alarm	Configurable alarm limits for waterside Delta T.
Air Side Delta T Alarm	Configurable alarm limits for airside Delta T.
Low Water Flow Alarm	Monitors the differential pressure switch and generates alarm if unit has no flow.
UPM Alarm - Hard Lockout Status	Generates alarm if hard lockout conditions occurred on UPM board. Soft lockout alarm history can be viewed.
Source Water Valve Alarm	Monitors communicating source water valve (ACT net) and alarm is generated if valve fails to communicate.

TruVu™ DDC Accessories

	ZS STANDARD	ZS PLUS	ZS PRO	ZS PRO-M	ZS PRO-F
MODEL NUMBER	**ZS-CAR**	**ZSPL-CAR**	**ZSP-CAR**	**ZS P-M-CAR**	**ZSPF-CAR**
Temp CO_2 Humidity Options	X	X	X	X	X
VOC Options	X	X	X		X
Neutral Color	X	X	X	X	X
Motion-Sensing Option				X	
Addressable / Supports Daisy-Chain	X	X	X	X	X
Hidden Communication Port	X	X	X	X	X
Mounts on a Standard 2 x 4 in. Electrical Box	X	X	X	X	X
Occupancy Status Indicator		X	X	X	X
Push Button Occupancy Override		X	X	X	X
Setpoint Adjust		X	X	X	X
Large Easy-to-Read LCD			X	X	X
Alarm Indicator			X	X	X
Fan Speed Control					X
Cooling/Heating/Fan Only - Mode Control					X
°F to °C Conversion Button					X

Options and accessories (cont)

User interfaces

Interfaces are used for start up, commissioning, access information, read sensor values, set or adjust setpoints and schedules, view trends, and monitor alarms.

TruVu™ ET Display

Carrier's TruVu™ equipment touch (ET) displays are an integrated component of the i-Vu building automation system. They feature illuminated color pixel touchscreens in two different sizes and connect to a single i-Vu controller. Designed for panel or wall mounting, they provide building occupants, facility managers, and technicians a powerful user interface for managing HVAC equipment in a building. They can view or change its property values, schedule equipment, view trends and alarms, and more, without having to access the system's server. For more details about the TruVu™ equipment touch devices, see the TruVu™ ET Display Installation and Setup Guide.

Field Assistant

Field Assistant is a standalone tool you can install on computer or laptop to access a single TruVu™ controller, several controllers, or a network of i-Vu TruVu™ controllers (up to 750 controllers). It can communicate with the devices using a USB port on the TruVu™ controller or over an IP network. For more details about the Field Assistant tool, see the Field Assistant tool Help manual.

Field provided non-communicating sensors

In addition to supplementing the thermostat or DDC controller, a variety of non-communicating sensors are available to fulfill specific requirements of your application.

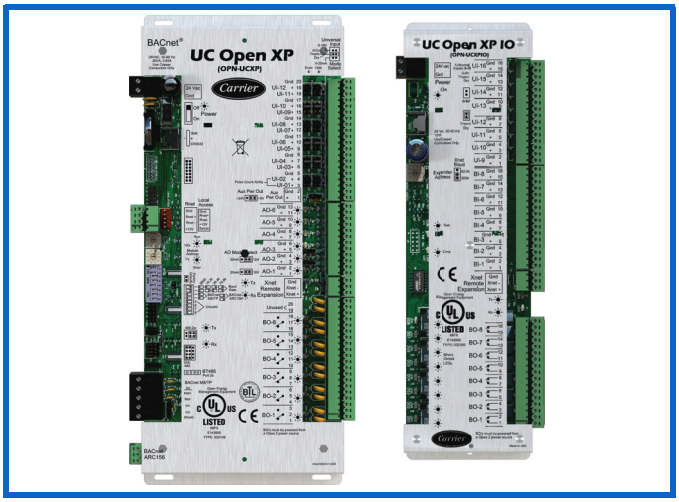
Non-Communicating Sensors

PART NUMBER	DESCRIPTION
33ZCSENSRH-02	Space Wall Mounted Relative Humidity Sensor
33ZCSPTCO2-01	CO_2/Space Temp. Sensor without LCD Display and No Override
33ZCT55CO2-02	Space Temp and CO_2 Room Sensor with Override
33ZCSPTCO2LCD-01	CO_2/Space Temp. Sensor with LCD Display and No Override
33ZCT55CO2-02	Space Temp. and CO_2 Room Sensor with Override
33ZCT56CO2-02	Space Temp. and CO_2 Room Sensor with Override and Set Point Adjustment
33ZCT55SPT	Space Temperature Sensor with Override
33ZCT56SPT	Space Temperature Sensor with Override and Set Point Adjustment
33ZCT59SPT	Space Temperature Sensor with Override and Set Point Adjustment and Digital Display

NOTE: Check capability/inputs of the controlling device (thermostat or DDC controller) to accept non-communicating sensor.

Carrier i-Vu SCU Open DDC for VAV units

All VAV units include a factory-installed, programmed, and run-tested SCU Open DDC controller configured for multi-zone VAV operation that can also be configured as a single-zone unit for space temperature control. VAV units can operate standalone or integrated in a Building Automation System using open protocols BACnet (ARCnet and MS/TP). Local interface to the DDC control for start-up, commissioning, or troubleshooting is accomplished through Carrier's i-Vu user interface Equipment Touch™ or System Touch™ interface, or the Field Assistant technician tool.



Multi-zone VAV Application Features

- Provides multi-zone supply air temperature control with up to 2 stages of mechanical cooling and modulating hot water valve control. Additionally, controller provides modulating fan control to maintain duct static pressure.
- Controls modulating or 2-position outside air damper to meet ASHRAE 62 ventilation requirements.
- Integrated 2-position waterside economizer control for optimized mechanical cooling (ASHRAE 90.1).
- Scheduling — Adaptable scheduling for occupied and unoccupied periods with ability for internal/local occupancy configuration or remote occupancy configuration via external dry contact, local user interfaces, i-Vu network, or BAS network. Additionally, flexible intermittent fan operation is available during both occupied and unoccupied periods for energy savings.
- Equipment Performance Monitoring: EWT, LWT, SAT, RAT.
- Optional discrete inputs for: compressor status, fan status, condenser water valve status, filter status, water flow switch (DPS), supply duct high static pressure.
- Learning adaptive optimal start transitions the WSHP from unoccupied set points to occupied set points in the most efficient means possible. Over time, the WSHP will learn and determine the best adjustment rates of the set points to provide the most efficient means of shifting the WSHP to an occupied mode.
- Shutdown Inputs — Fire/Smoke detector shutdown and network shutdown will safely shut down the unit in a controlled fashion with ability to monitor the unit.
- Alarm Status — Alarms status is accessible through equipment user interfaces or network. Refer to Controls, Start-Up, Operation and Troubleshooting Guide for full list of alarms.

Options and accessories (cont)

Hardware Features

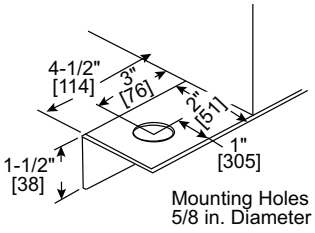
- native BACnet MS/TP or ARCnet communications
- battery-backed real time clock keeps time in the event of power failure
- LED indicators for power, status of communications, running, and errors
- supports Rnet devices like ZS sensors, Equipment Touch, and TruVu™ ET Display.
- local access port for system start-up and troubleshooting using Field Assistant tool

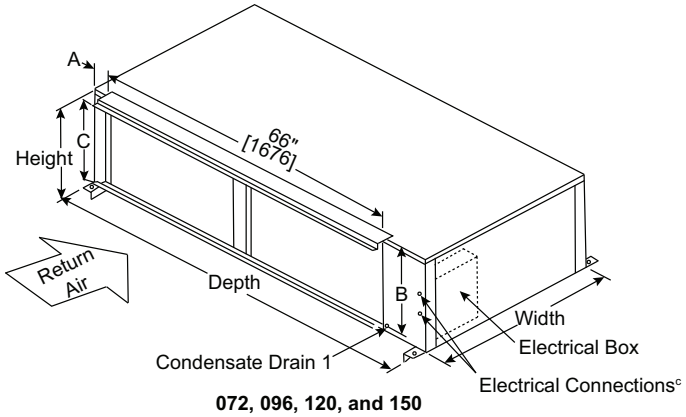
System Features

- integrated Carrier airside and waterside linkage algorithm for plug-and-play integration with the Carrier WSHP System
- fully plug-and-play with the Carrier i-Vu® Building Automation System
- supports demand limiting for maximum energy savings

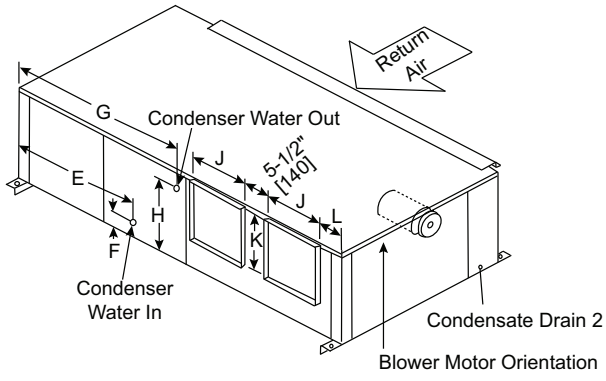
Dimensions

50HQP072-150 Units
Horizontal Dimensions

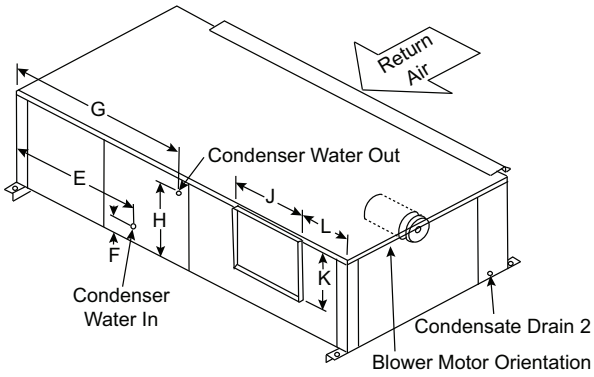




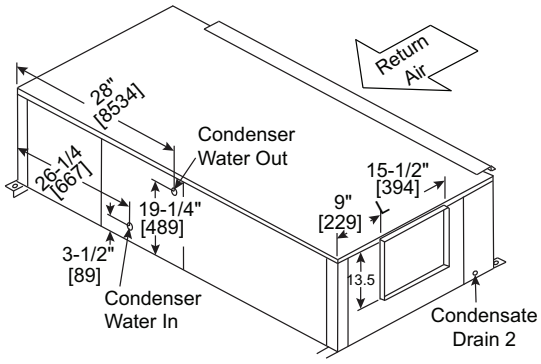
072, 096, 120, and 150
Left Return, Right Discharge



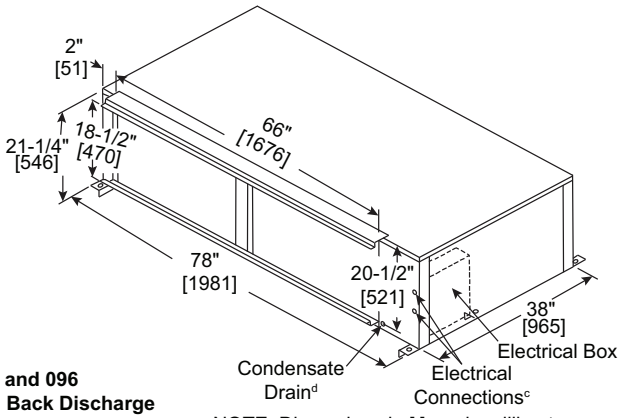
120
Left Return, Right Discharge



072, 096, and 150
Left Return, Right Discharge



072 and 096
Left Return, Back Discharge



NOTE: Dimensions in [ ] are in millimeters.

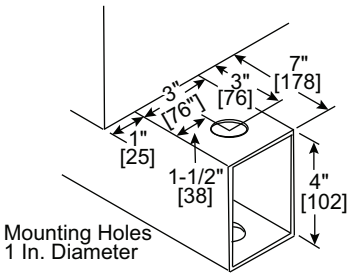
50HQP UNIT SIZE	HEIGHT[a]	WIDTH	DEPTH[b]	RETURN AIR			CONDENSER WATER CONNECTIONS					SUPPLY AIR (BLOWER OUTLETS)			REPLACEMENT FILTER SIZE (NOMINAL)
				A	B	C	E	F	G	H	Diameter (FPT)	J	K	L	
072	21.50	38.00	78.00	2.00	20.50	18.50	28.00	3.50	28.00	15.25	1.00	15.50	13.50	10.50	20 x 34-1/2 x 1 (2 per unit)
096	21.50	38.00	78.00	2.00	20.50	18.50	28.00	3.50	28.00	15.25	1.00	15.50	13.50	10.50	
120	21.50	38.00	78.00	2.00	20.50	18.50	27.00	3.00	27.00	15.25	1.25	12.50	13.50	5.25	
150	25.50	42.00	82.00	2.00	20.50	18.50	24.00	3.25	24.00	17.50	1.50	18.50	16.00	14.00	24 x 34 x 1 (2 per unit)

NOTE(S):

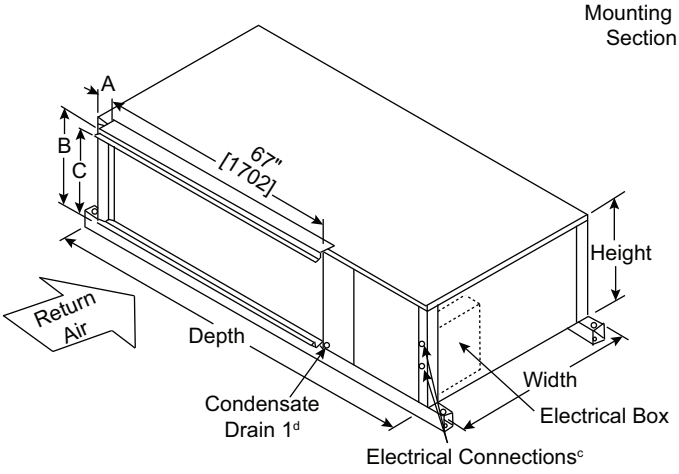
a. All dimensions in inches unless otherwise noted. All dimensions within ± 0.125-in. Specifications subject to change without notice. Condensate connections are 0.75-in. FPT on sizes 072-150.
b. When TruVu™ controller is installed increase depth by 3.00 inches.
c. Front of the unit is considered as the side with electrical box location.
d. Distance from condensate drain center line to the bottom of the unit is 1-1/4 inches.

Dimensions (cont)

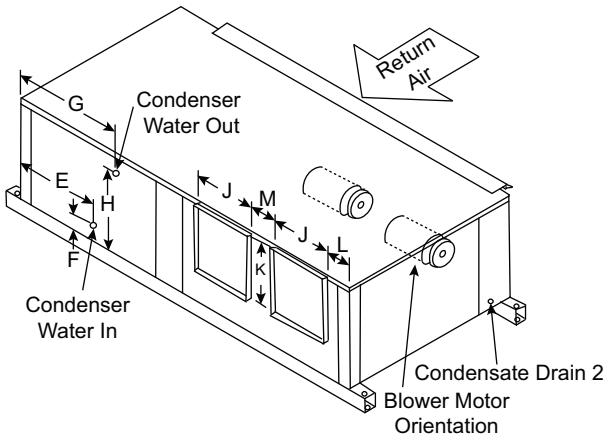
50HQP180-242 Units
Horizontal Dimensions



Mounting Bracket
Section View



Left Return, Right Discharge



Left Return, Right Discharge

NOTE: Dimensions in [ ] are in millimeters.

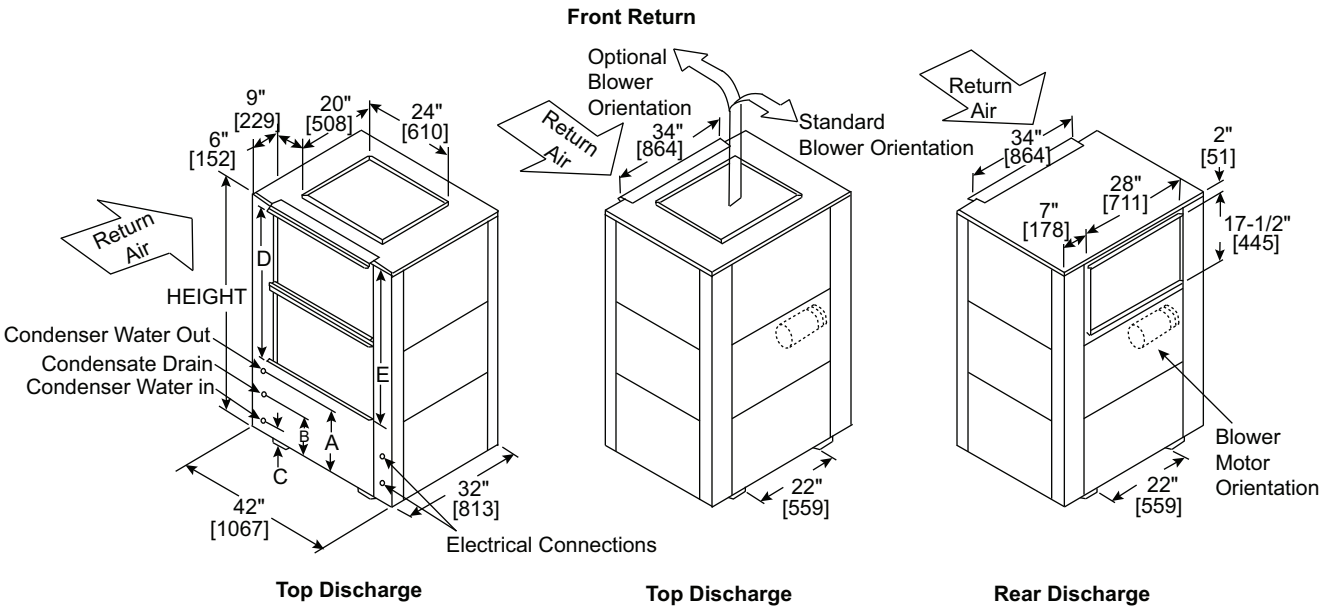
50HQP UNIT SIZE	HEIGHT[a]	WIDTH	DEPTH[b]	RETURN AIR			CONDENSER WATER CONNECTIONS					SUPPLY AIR (BLOWER OUTLETS)				REPLACEMENT FILTER SIZE (NOMINAL)
				A	B	C	E	F	G	H	Diameter (FPT)	J	K	L	M	
180	25.25	60.25	106.50	2.00	24.00	22.00	22.00	7.25	22.00	16.00	1.5	27.75	17.25	5.00	4.00	24 x 34 x 1 (2 per unit)
242	36.00	60.25	106.50	2.00	34.75	32.75	24.50	7.25	24.50	19.62	2.0	23.75	19.75	7.75	9.75	17-1/4 x 34-1/2 x 1 (4 per unit)

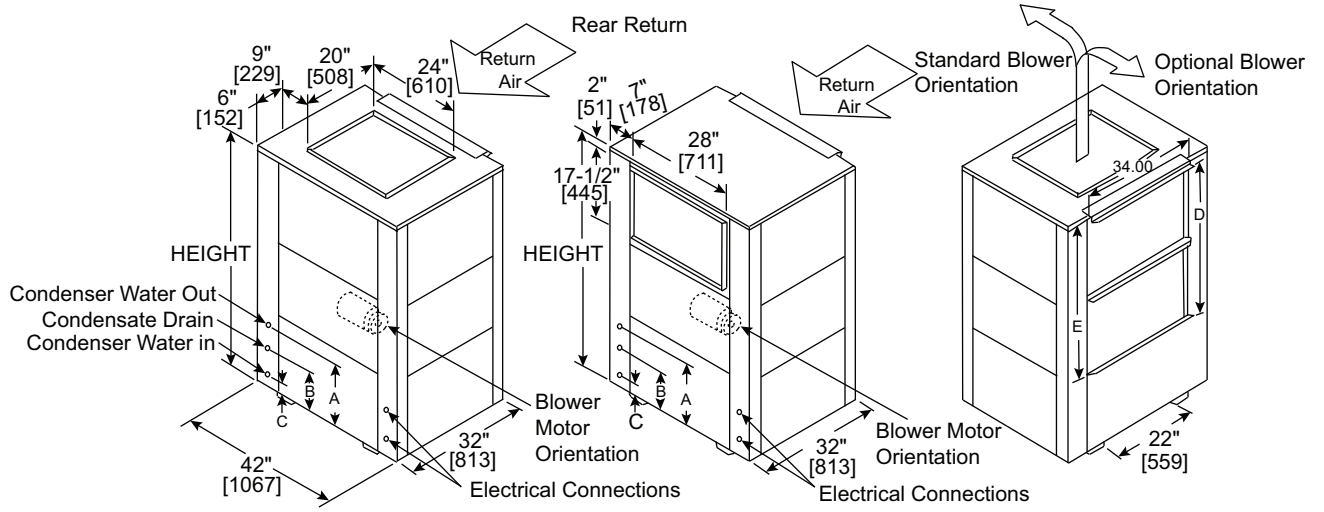
NOTE(S):

a. All dimensions in inches unless otherwise noted. All dimensions within ± 0.125-in. Specifications subject to change without notice. Condensate connections are 1.25-in. FPT on sizes 180 and 242.
b. When TruVu™ controller is installed increase depth by 3.00 inches.
c. Front of the unit is considered as the side with electrical box location.
d. Distance from condensate drain center line to the bottom of the unit is 1-1/4 inches.

Dimensions (cont)

50VQP072-120 Units
(Single Blower Large Commercial-Vertical Dimensions)





NOTE: Dimensions in [ ] are in millimeters.

50VQP UNIT SIZE	HEIGHT[a]	WIDTH	DEPTH[b]	CONDENSER WATER CONNECTIONS[c]				DUCT FLANGE	FILTER RACK	REPLACEMENT FILTER SIZE (NOMINAL)
				A	B	C	Diameter (FPT)	D	E	
072	62.00	42.00	32.00	14.75	8.50	2.75	1	38.00	40.00	20 x 34-1/2 x 1 (2)
096	62.00	42.00	32.00	14.75	8.50	2.75	1			
120	62.00	42.00	32.00	15.00	9.00	3.00	1-1/2			

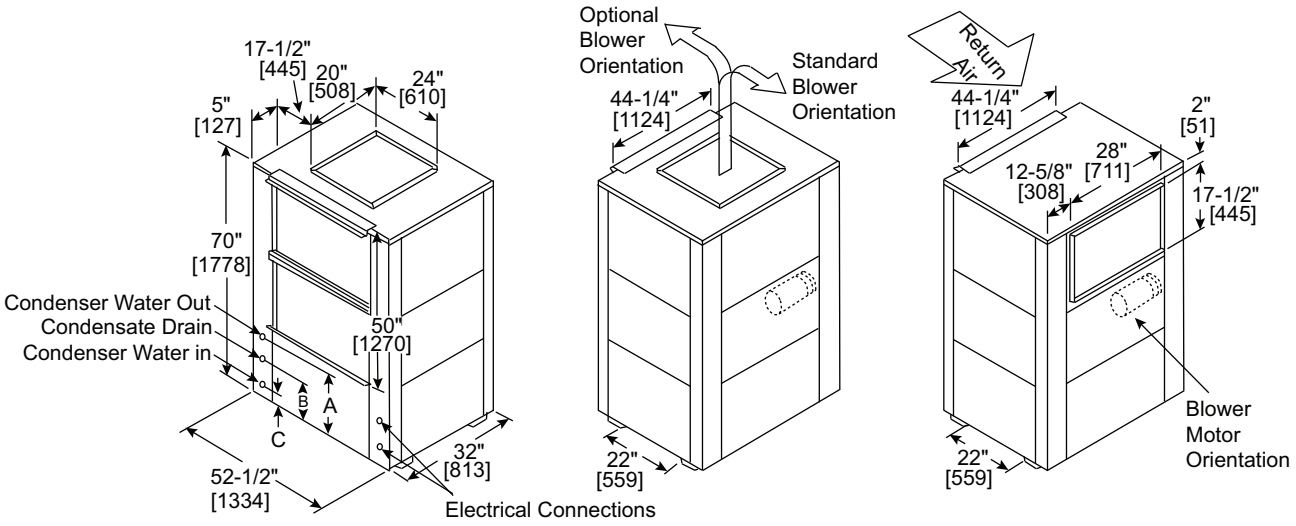
NOTE(S):

a. All dimensions in inches unless otherwise noted. All dimensions within ± 0.125-in. Specifications subject to change without notice. Condensate connections are 0.75 in. FPT on sizes 072-120.
b. When TruVu™ controller is installed increase depth by 3.00 inches.
c. Front of unit is side with water and electrical connections.

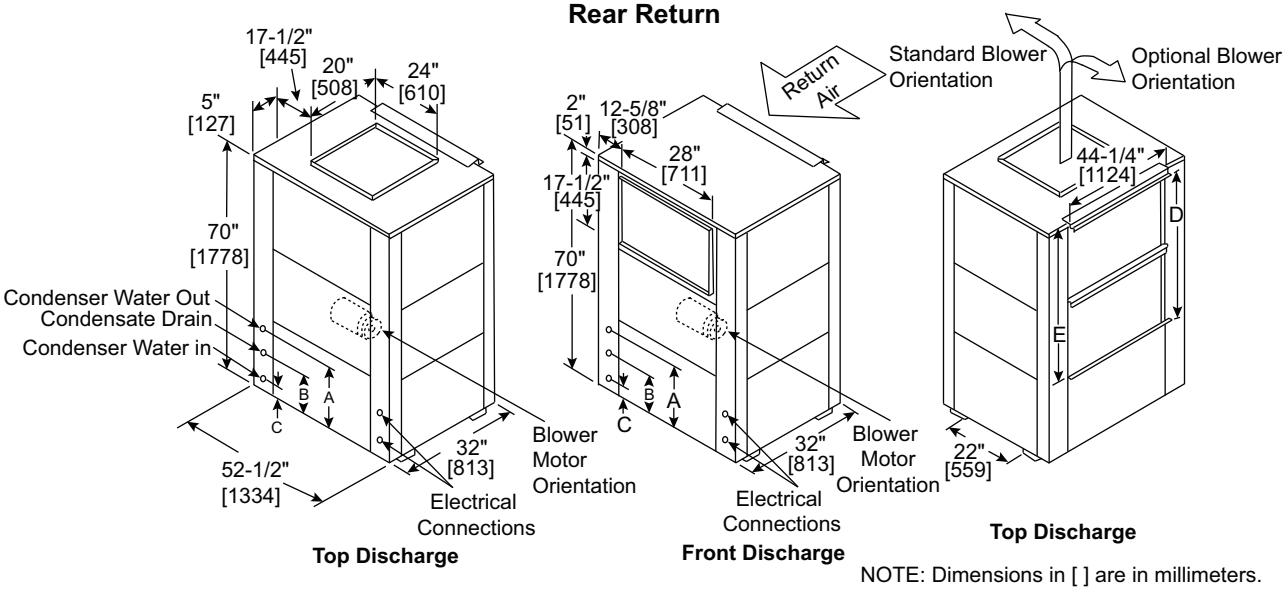
Dimensions (cont)

50VQP151-181 Units
(Single Blower Large Commercial-Vertical Dimensions)

Front Return



Rear Return



NOTE: Dimensions in [ ] are in millimeters.

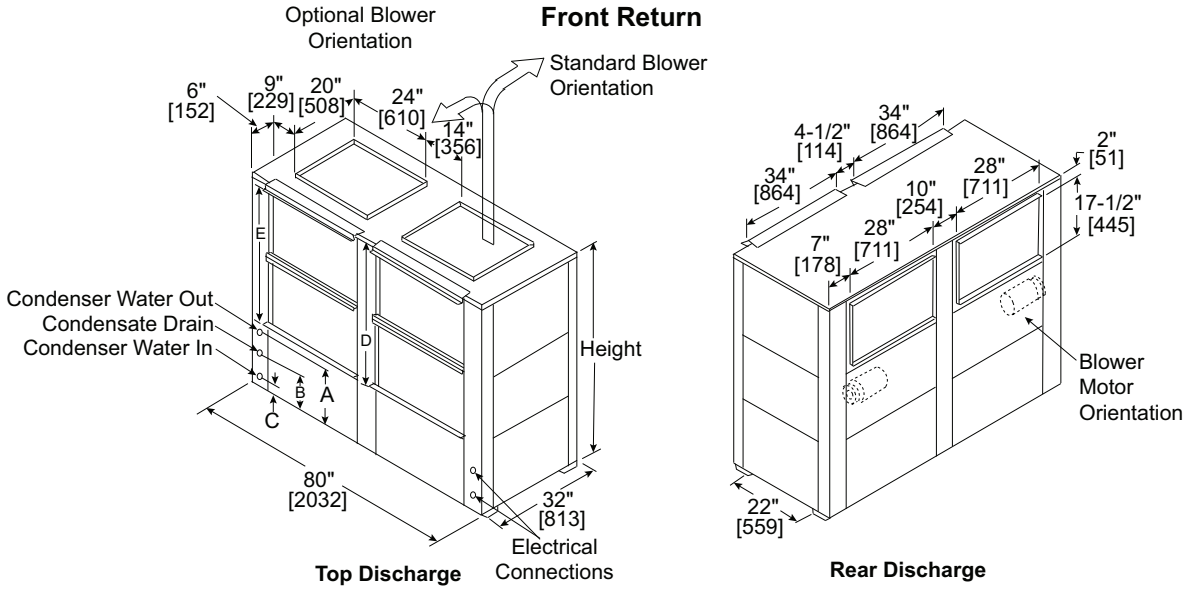
50VQP UNIT SIZE	HEIGHT[a]	WIDTH	DEPTH[b]	CONDENSER WATER CONNECTIONS[c]				DUCT FLANGE	FILTER RACK	REPLACEMENT FILTER SIZE (NOMINAL)
				A	B	C	Diameter (FPT)	D	E	
151	70.00	52.50	32.00	17.00	10.50	3.00	1-1/2	48.00	50.00	24 x 24 x 1 (4 per unit)
181	70.00	52.50	32.00	17.00	10.50	3.00	1-1/2			

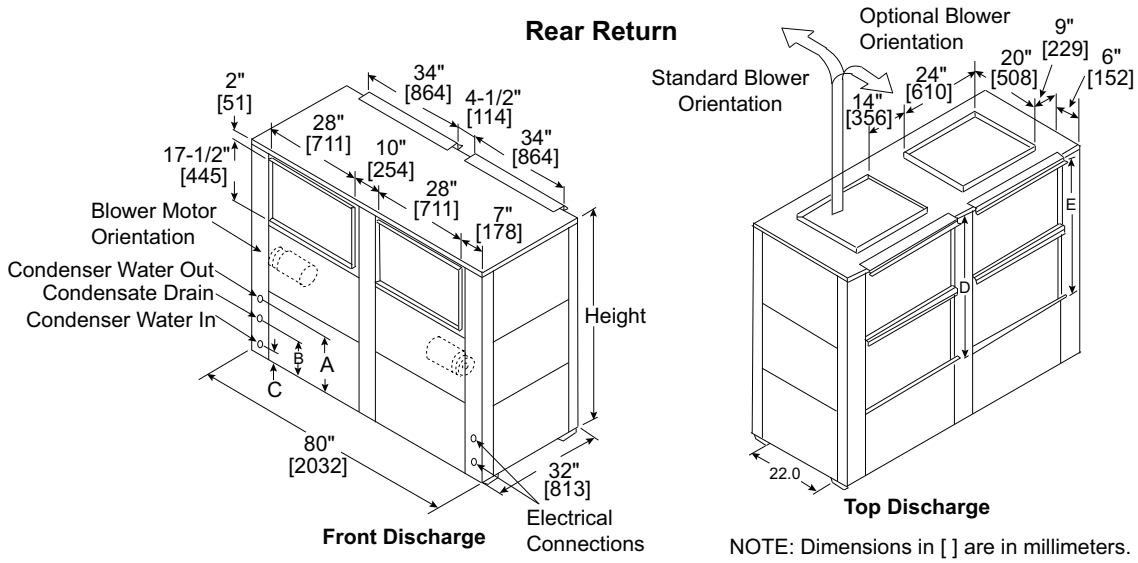
NOTE(S):

a. All dimensions in inches unless otherwise noted. All dimensions within ± 0.125-in. Specifications subject to change without notice. Condensate connections are 0.75 in. FPT on sizes 151 and 181.
b. When TruVu™ controller is installed increase depth by 3.00 inches.
c. Front of unit is side with water and electrical connections.

Dimensions (cont)

50VQP210-360 Units
(Dual Blower Large Commercial-Vertical Dimensions)





NOTE: Dimensions in [ ] are in millimeters.

50VQP UNIT SIZE	HEIGHT[a]	WIDTH	DEPTH[b]	CONDENSER WATER CONNECTIONS[c]				DUCT FLANGE	FILTER RACK	REPLACEMENT FILTER SIZE (NOMINAL)
				A	B	C	Diameter (FPT)	D	E	
210	62.00	80.00	32.00	17.50	8.75	2.75	2	38.00	40.00	20 x 34-1/2 x 1 (4 per unit)
240	66.50	80.00	32.00	18.88	8.75	2.75	2	38.00	40.00	
300	66.50	80.00	32.00	18.80	8.75	2.75	2	38.00	40.00	
360	86.50	80.00	32.00	17.00	8.75	2.75	2	58.00	60.00	30 x 34-1/2 x 1 (4 per unit, size 360 only)

NOTE(S):

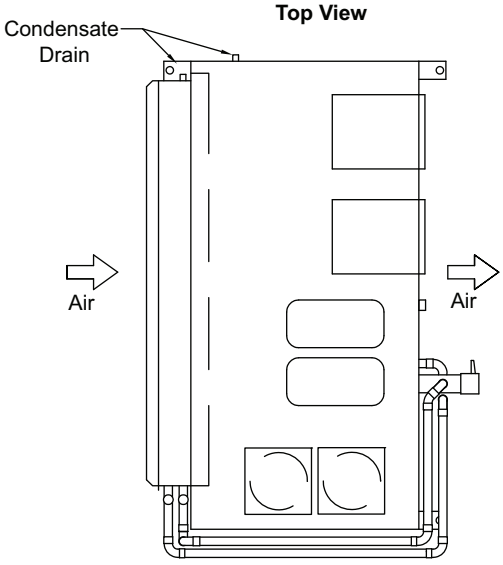
a. All dimensions in inches unless otherwise noted. All dimensions within ± 0.125 in. Specifications subject to change without notice. Condensate connections are 1.25-in. FPT on sizes 210-360.
b. When TruVu™ controller is installed increase depth by 3.00 inches.
c. Front of unit is side with water and electrical connections.

Dimensions (cont)

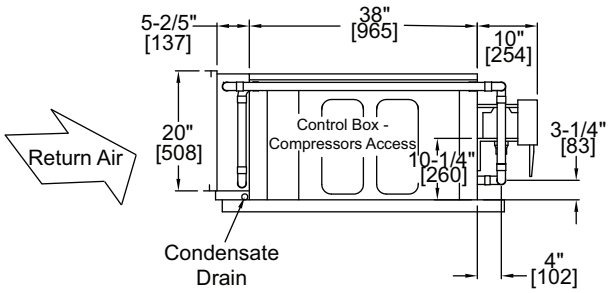
50HQP072-120 Units with Waterside Economizer (Left Return, Right Discharge)

Left Hand Return Right Discharge

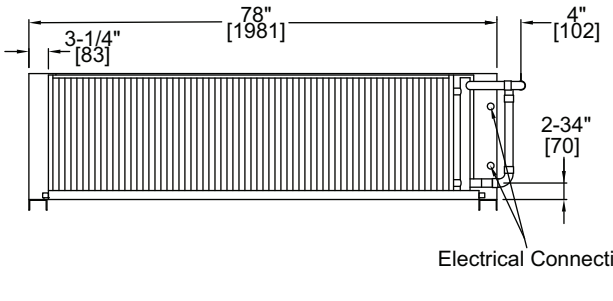
Top View



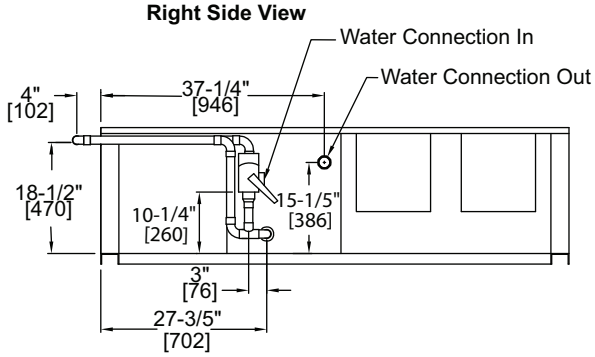
Front View



Left Side View (return air)



Right Side View



50HQP UNIT SIZE	072	096	120
FILTER QTY & SIZE	(2) 20" x 34-1/2" x 1"	(2) 20" x 34-1/2" x 1"	(2) 20" x 34-1/2" x 1"
CONDENSATE DRAIN	3/4" FPT	3/4" FPT	3/4" FPT
WATER CONN. OUT	1" FPT	1" FPT	1-1/4" FPT
WATER CONN. IN	2" FPT	2" FPT	2" FPT

NOTE(S):

a. Dimensions in inches [mm].

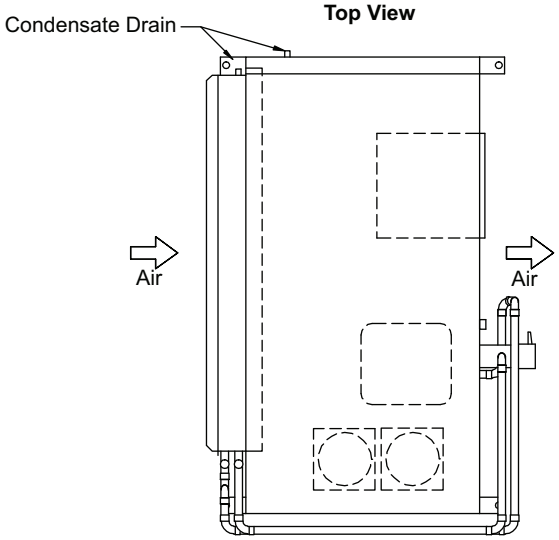
b. Units with two supply fan blowers require a pair of pants discharge duct.

Dimensions (cont)

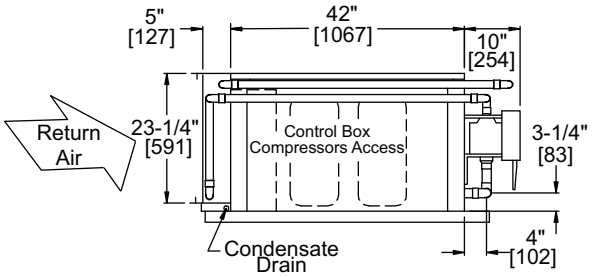
50HQP150 Units with Waterside Economizer

Left Return
Right Discharge

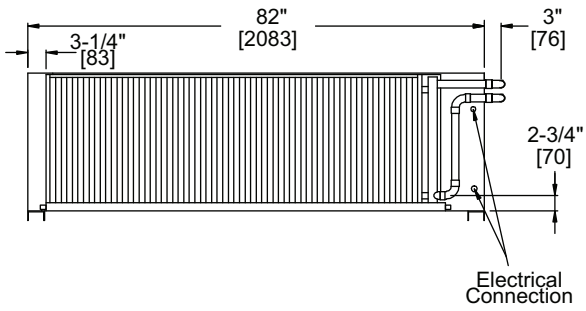
Top View



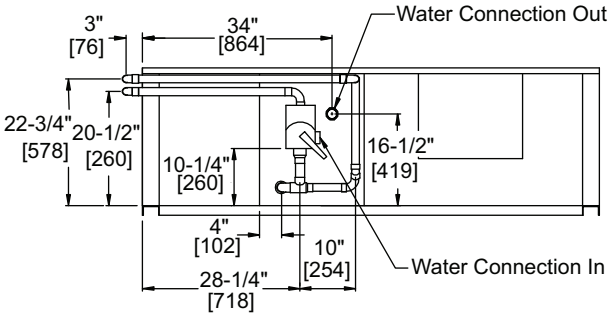
Front View



Left Side View
(Return Air)



Right Side View



FILTER QTY & SIZE	(2) 24" x 34" x 1"
CONDENSATE DRAIN	3/4" FPT
WATER CONN. OUT	1-1/2" FPT
WATER CONN. IN	2" FPT

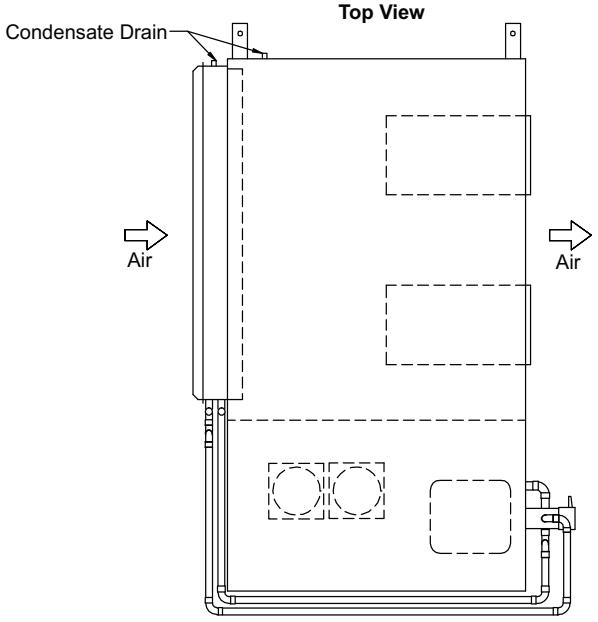
NOTE: Dimensions in inches [mm].

Dimensions (cont)

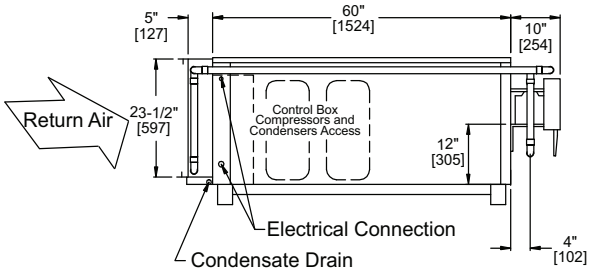
50HQP180 Units with Waterside Economizer (Left Return, Right Discharge)

Left Return Right Discharge

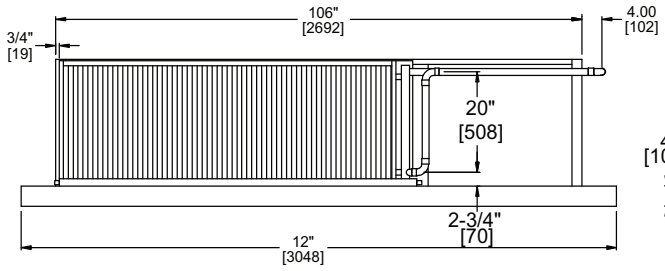
Top View



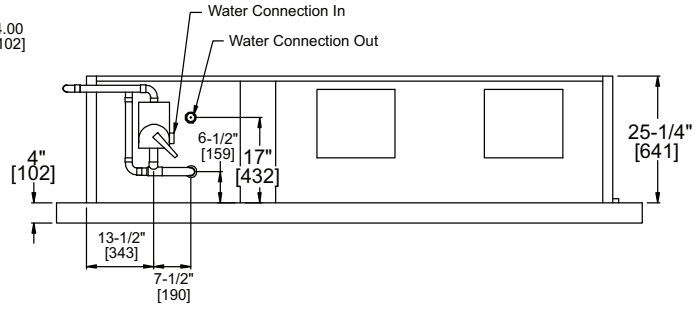
Front View



Left Side View (return air)



Right Side View



FILTER QTY & SIZE	(2) 24" x 34" x 1"
CONDENSATE DRAIN	1-1/4" FPT
WATER CONN. OUT	1-1/2" FPT
WATER CONN. IN	2" FPT

NOTE(S):

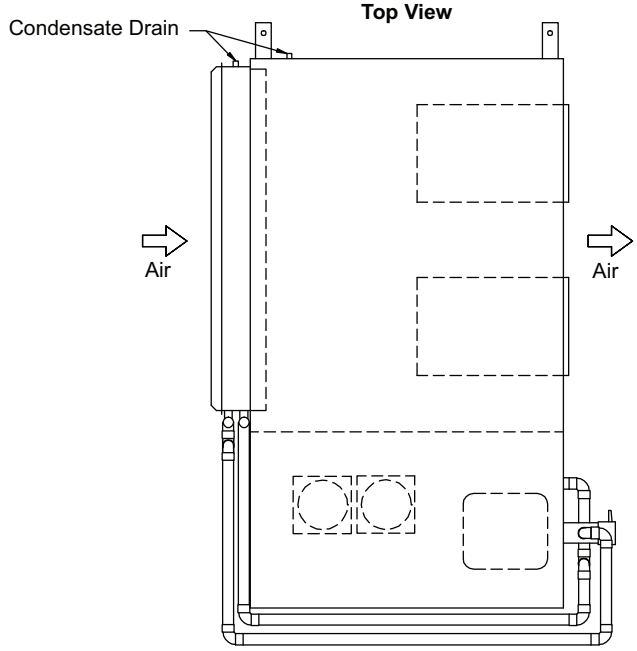
a. Dimensions in inches [mm].

b. Units with two supply outlets require a pair of pants duct connection.

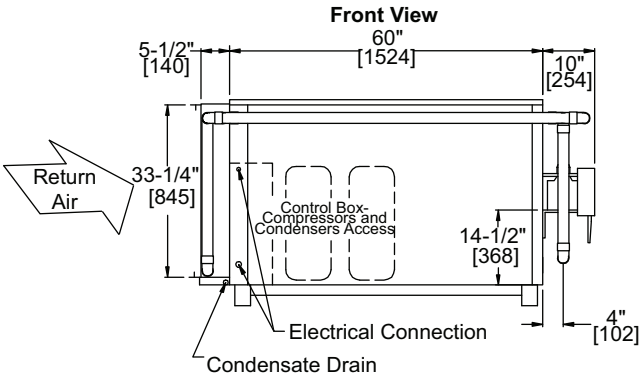
Dimensions (cont)

50HQP242 Units with Waterside Economizer (Left Return, Right Discharge)

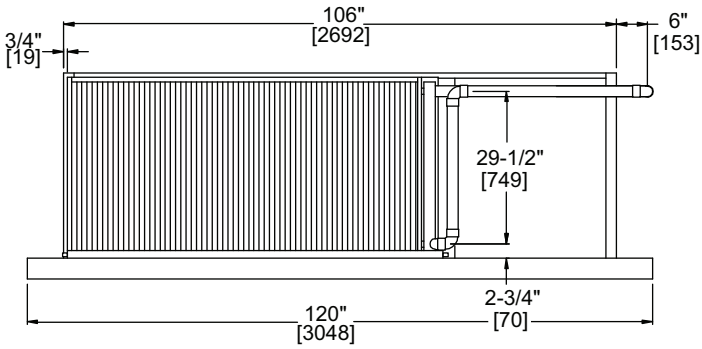
Left Return Right Discharge
Top View



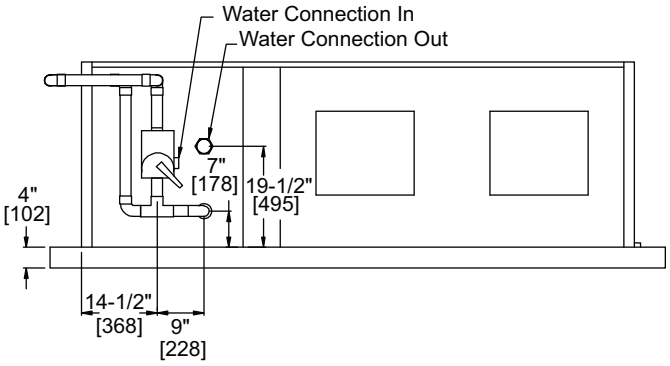
Front View



Left Side View
(return air)



Right Side View



FILTER QTY & SIZE	(4) 17-1/4" X 34-1/2" X 1"
CONDENSATE DRAIN	1-1/4" FPT
WATER CONN. OUT	2" FPT
WATER CONN. IN	2" FPT

NOTE(S):

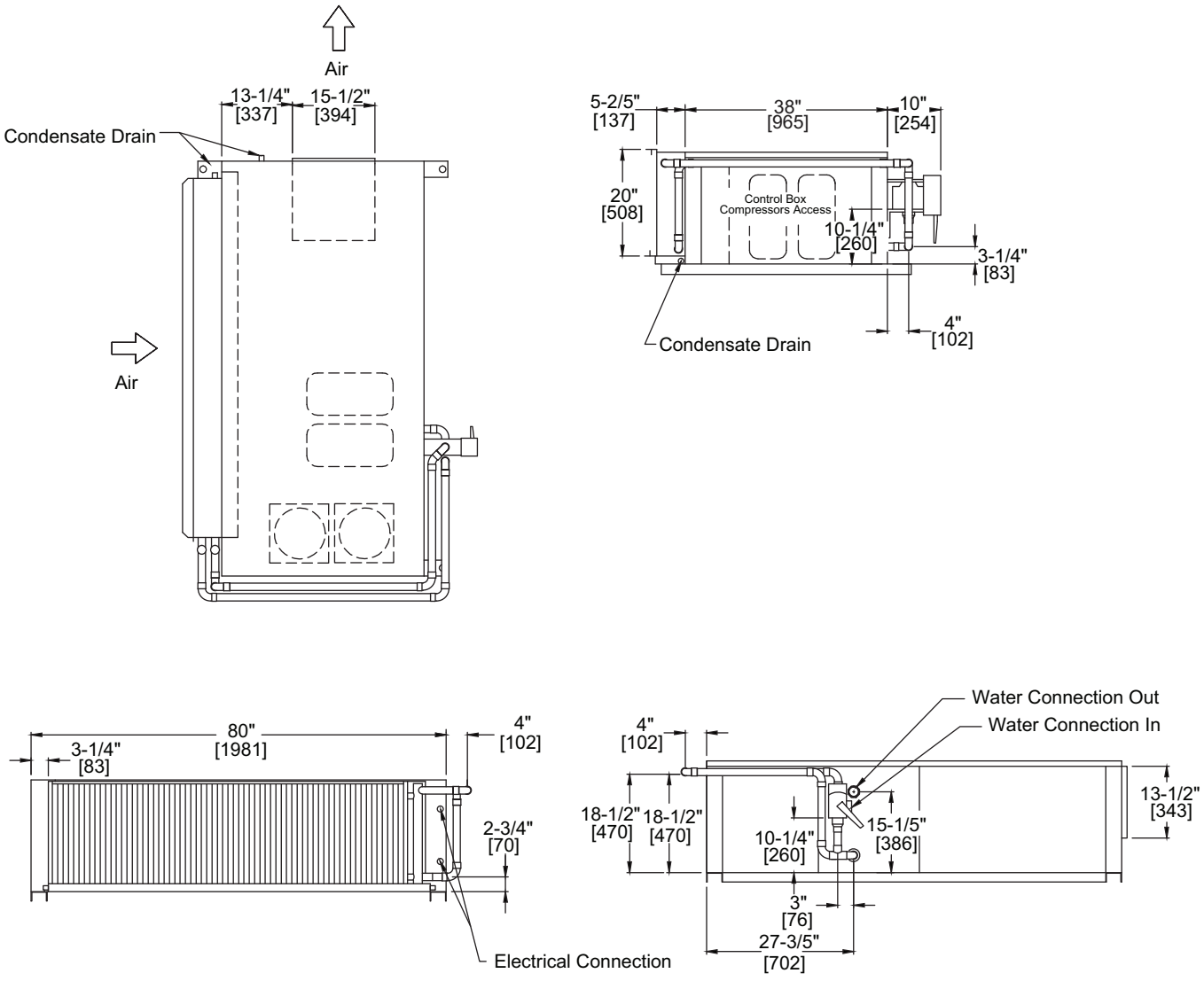
a. Dimensions in inches [mm].

b. Units with two supply outlets require a pair of pants duct connection.

Dimensions (cont)

50HQP072-096 Units with Waterside Economizer (Left Return, Back Discharge)

Left Return Back Discharge

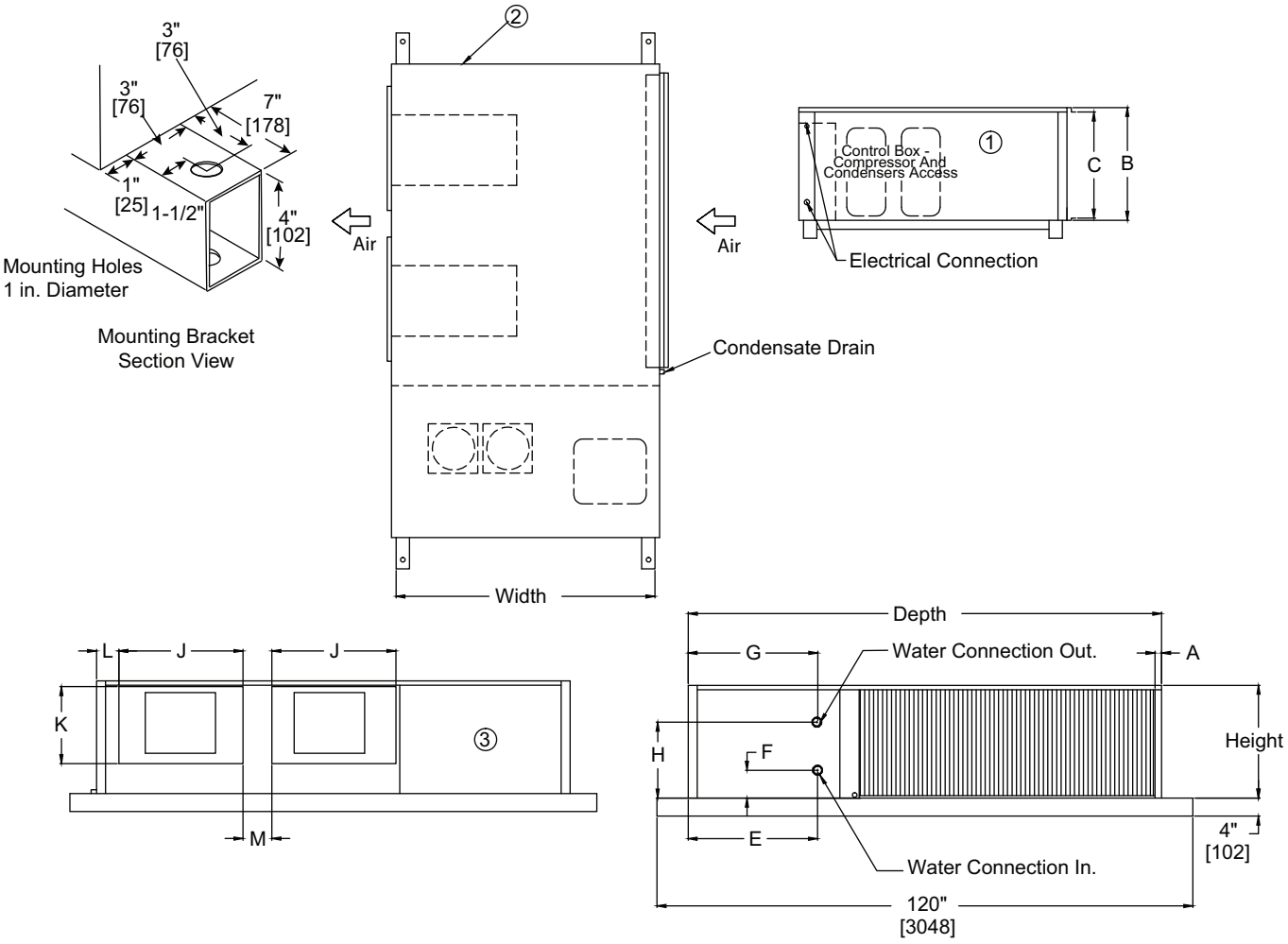


FILTER QTY & SIZE	(2) 20" X 34-1/2" X 1"
CONDENSATE DRAIN	3/4" FPT
WATER CONN. OUT	1" FPT
WATER CONN. IN	1" FPT

NOTE: Dimensions in inches [mm].

Dimensions (cont)

50HQP180-242 Units without Waterside Economizer



UNIT SIZE	HEIGHT	WIDTH	DEPTH	RETURN AIR			CONDENSER WATER CONNECTIONS					SUPPLY AIR				REPLACEMENT FILTER SIZE (NOMINAL)
				A	B	C	E	F	G	H	DIA. (FPT)	J	K	L	M	
180	25.25	60.25	106.50	2.00	24.00	22.00	22.50	7.25	22.00	16.00	1.25	27.75	17.25	5.00	4.00	2 (24 x 34 x 1)
242	36.00	60.25	106.50	2.00	36.00	34.00	24.50	8.00	24.00	19.62	1.25	23.75	19.75	7.75	9.75	2 (17.25 x 34.50 x 1)

SERVICE ACCESS TO:		
1	2	3
CONTROLS COMPRESSORS	BLOWER AND MOTOR	COMP. REFIG. COMPONENTS

NOTE(S):

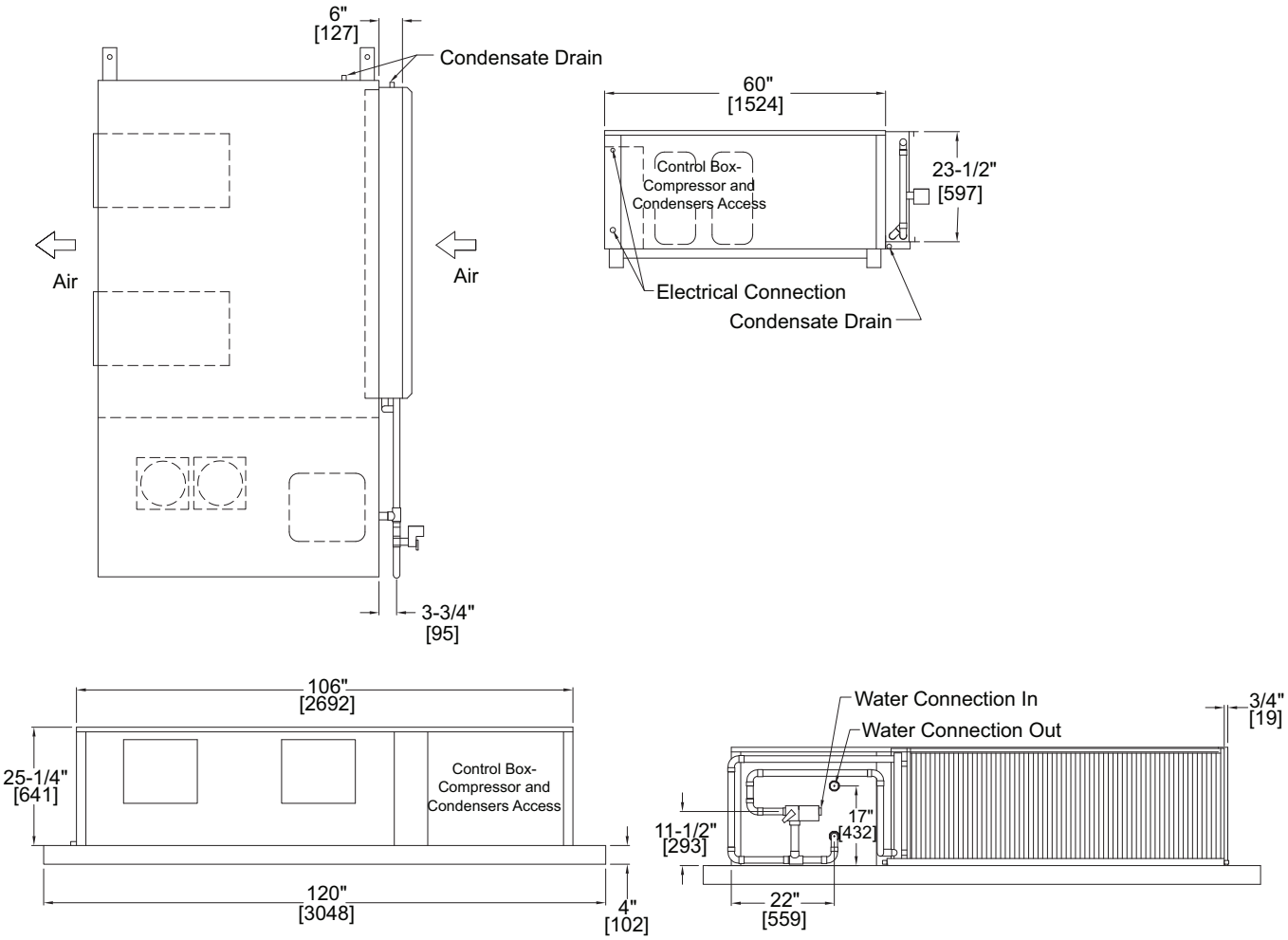
a. Dimensions in inches [mm].

b. Units with two supply outlets require a pair of pants duct connection.

Dimensions (cont)

50HQP180-242 Units with Waterside Economizer (Right Return, Left Discharge)

Right Return
Left Discharge



Filter Qty and Size	(2) 23-1/4" x 34-1/2" x 1"
Condensate Drain	(3) 3/4"FPT
Water Conn. Out	1.5" FPT
Water Conn. In	2" FPT

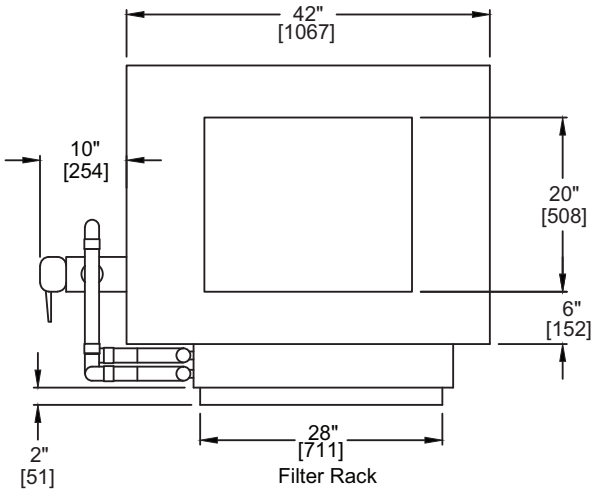
NOTE(S):

a. Dimensions in inches [mm].

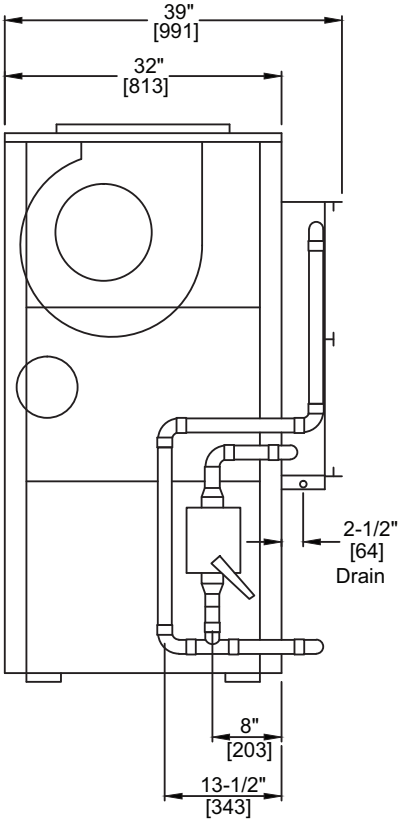
b. Units with two supply outlets require a pair of pants duct connection.

Dimensions (cont)

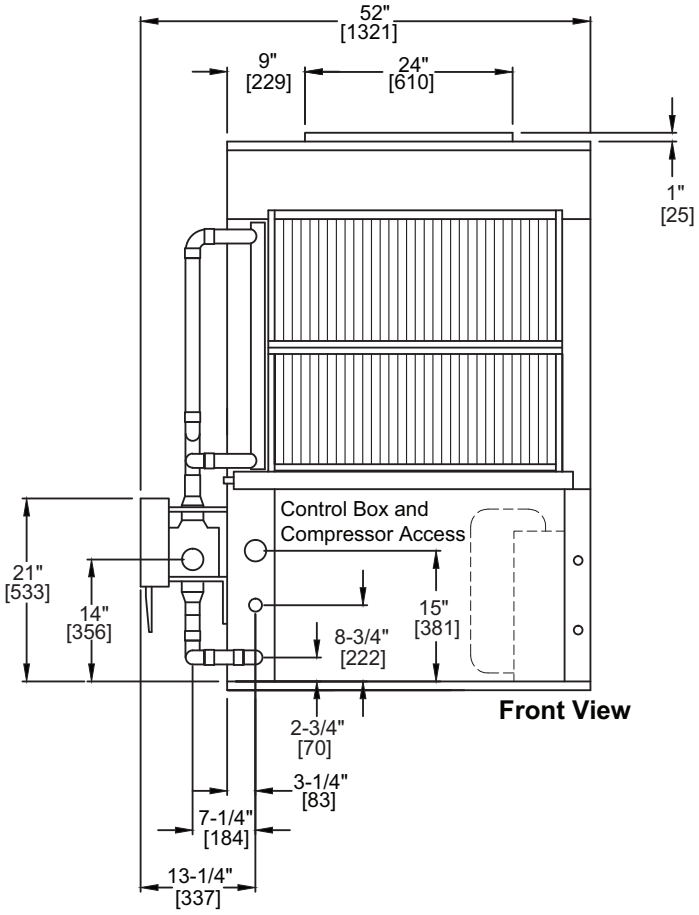
50VQP072-096 Units Front Return, Top Discharge, with Waterside Economizer



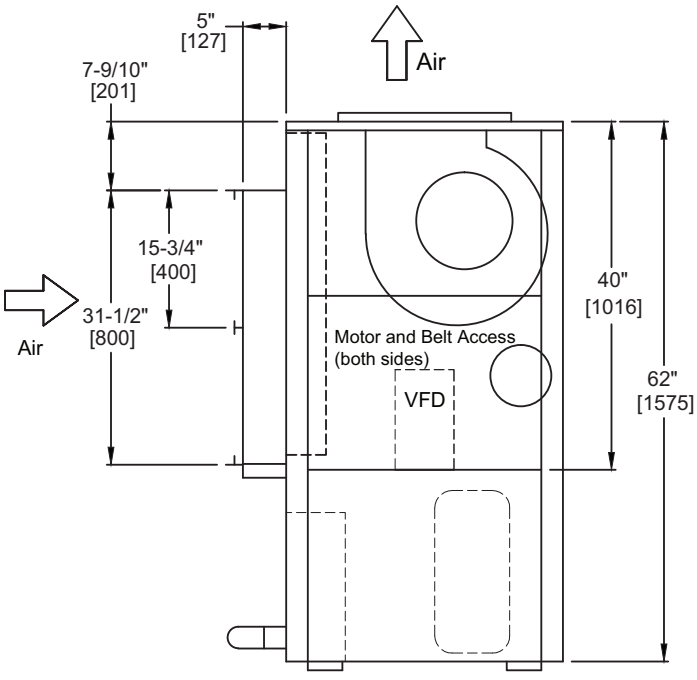
Top View



Left Side View



Front View



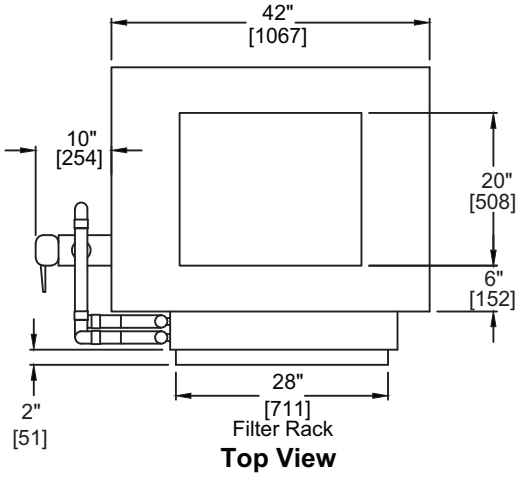
Right Side View

Filter Qty and Size	(2) 20" x 34-1/2" x 1"
Condensate Conn.	3/4" FPT
Water Conn. Out	1" FPT
Water Conn. In	2" FPT
Size	50VQP072-096

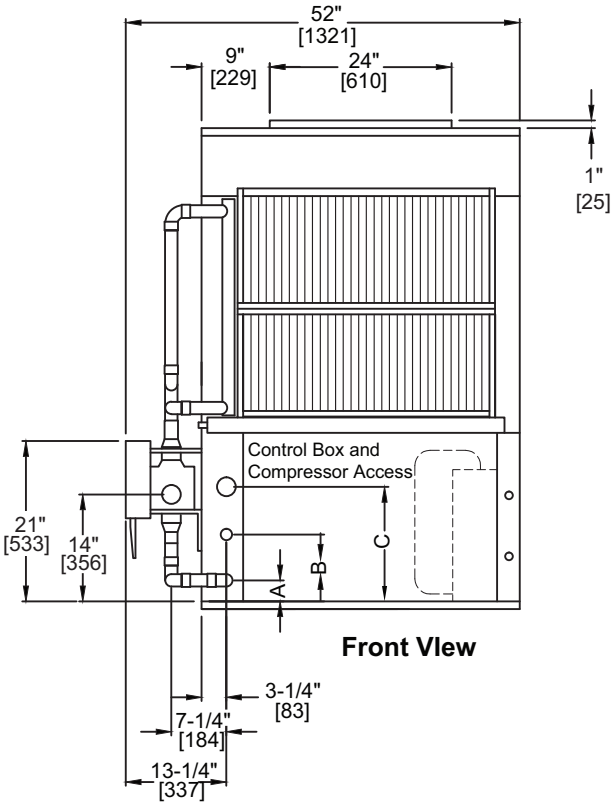
NOTE: Dimensions in inches [mm].

Dimensions (cont)

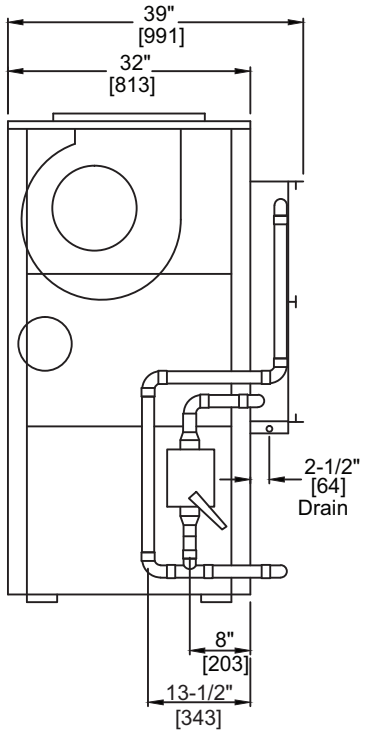
50VQP120 Units Front Return, Top Discharge, with Waterside Economizer



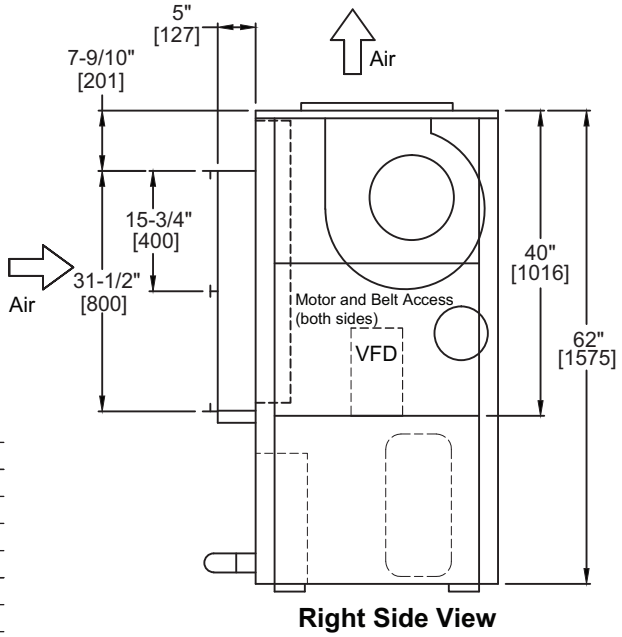
Top View



Front Vlew



Left Side View



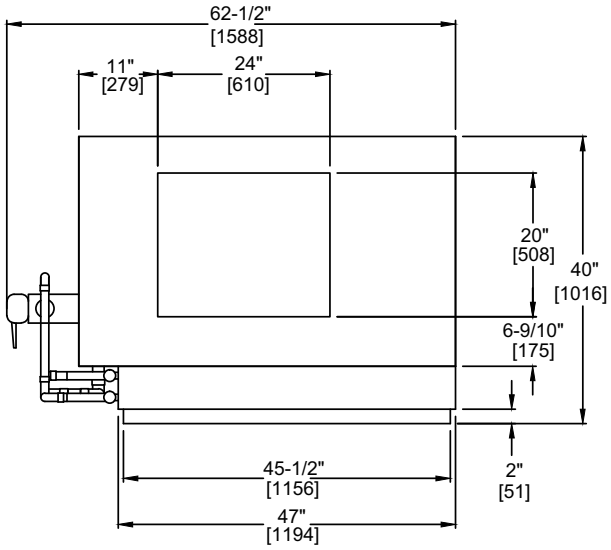
Right Side View

Filter Qty. and Size	(2) 20" x 34-1/2" x 1"
Condensate Conn.	3/4" FPT
Water Conn. Out	1-1/2" FPT
Water Conn. In	2" FPT
C	15"
B	9"
A	3"
Size	50VQP120

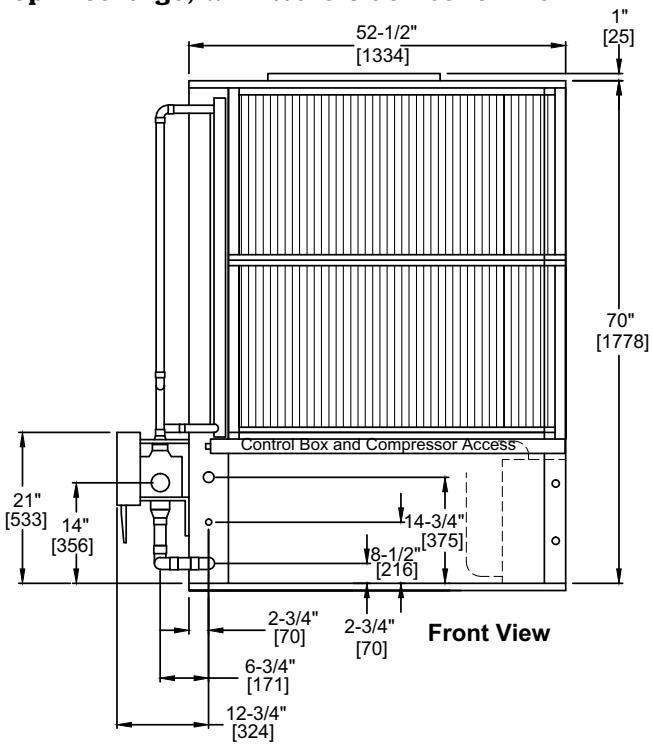
NOTE: Dimensions in inches [mm].

Dimensions (cont)

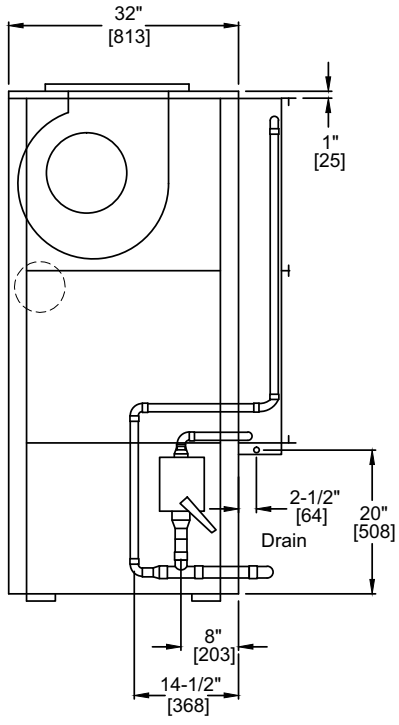
50VQP151 and 181 Units, Front Return, Top Discharge, with Waterside Economizer



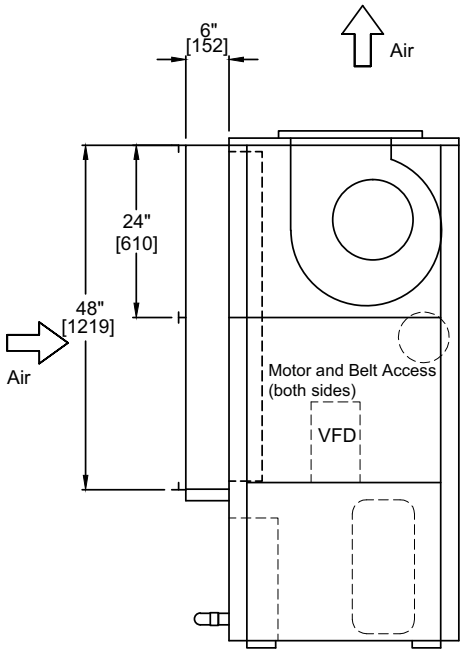
Top View



Front View



Left Side View

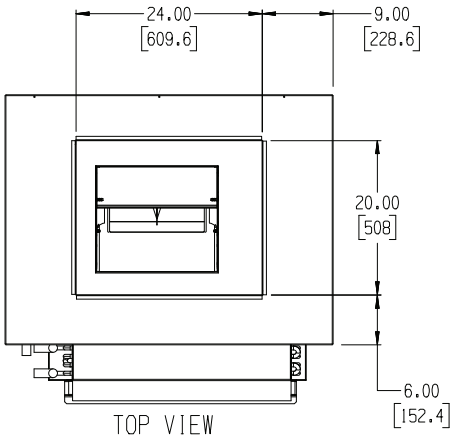


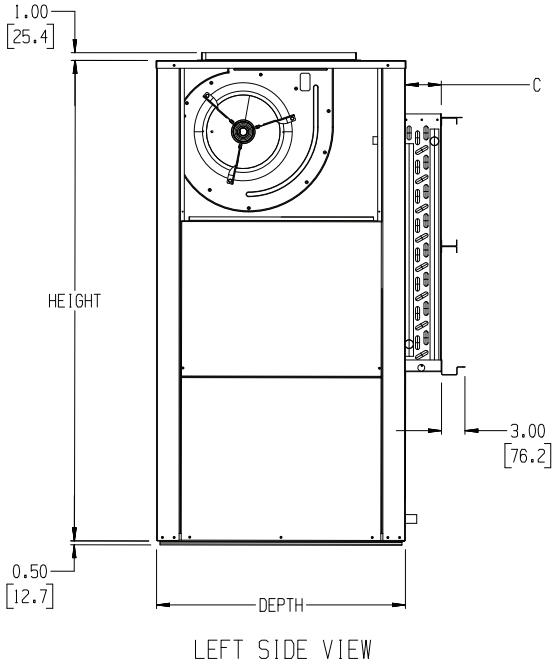
Right Side View

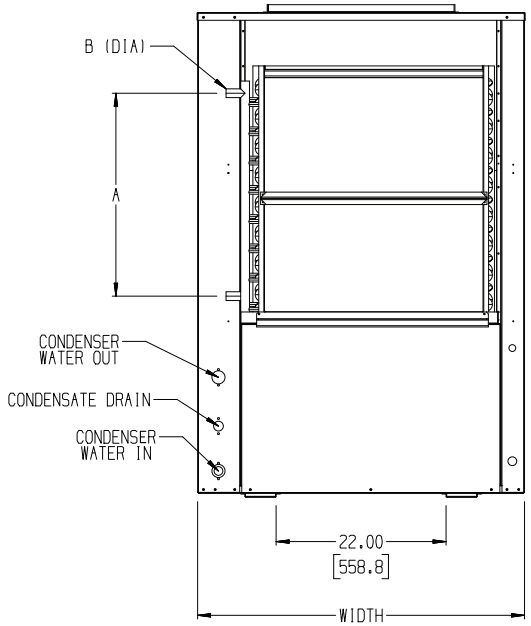
Filter Qty. and Size	(4) 24" x 24" x 1"
Condensate Conn.	3/4" FPT
Water Conn. Out	1.50" FPT
Water Conn. In	2" FPT
Size	50VQP151-181

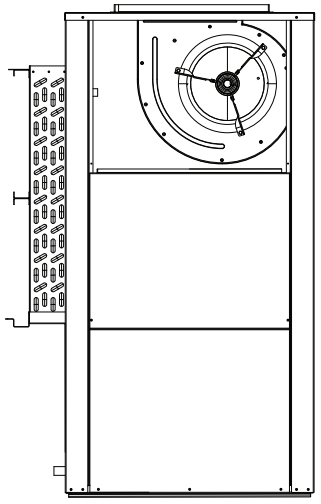
NOTE: Dimensions in inches [mm].

50VQP072-120, Front Return, Top Discharge with Hot Water Coil





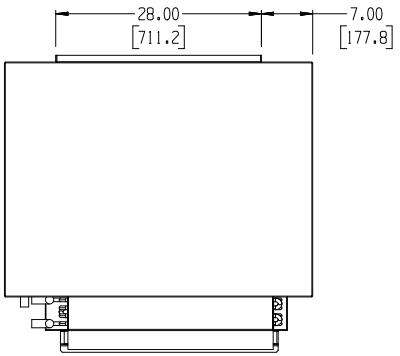




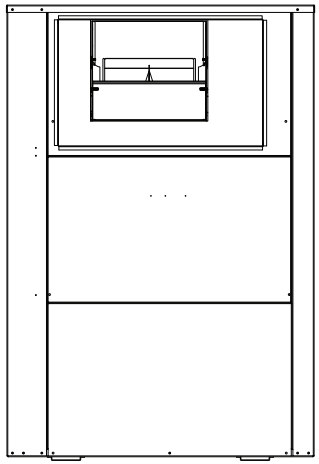
UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
072	62.00	42.00	32.00	26.00	1.12	5.00	17.25 X 34.5 (2)
096	62.00	42.00	32.00	26.00	1.12	5.00	17.25 X 34.5 (2)
120	62.00	42.00	32.00	30.75	1.63	5.00	17.25 X 34.5 (2)

8 733 849 558

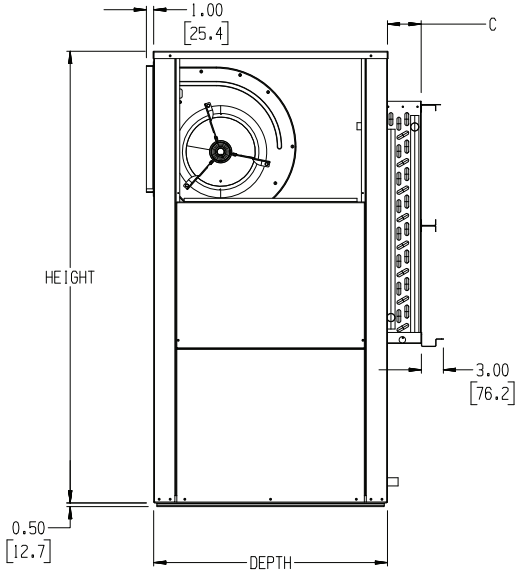
50VQP072-120, Front Return, Rear Discharge With Hot Water Coil



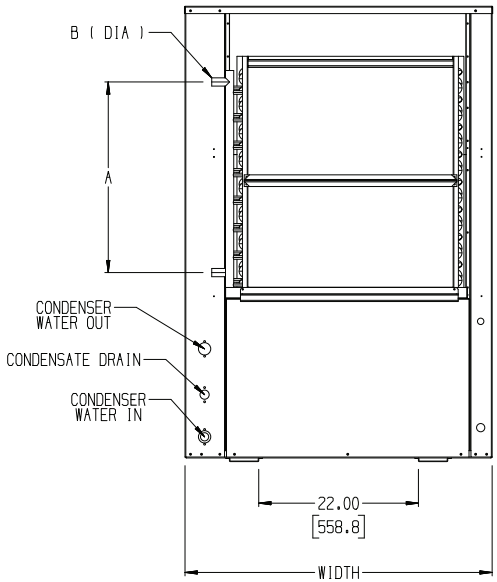
TOP VIEW



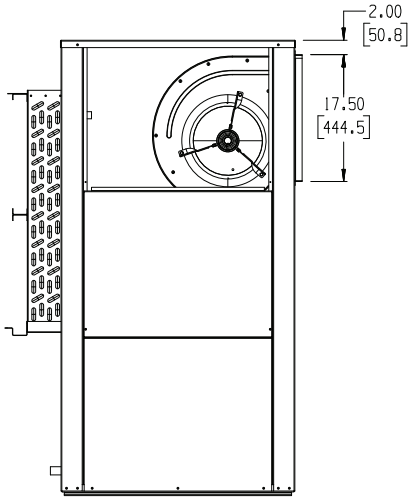
REAR VIEW



LEFT SIDE VIEW



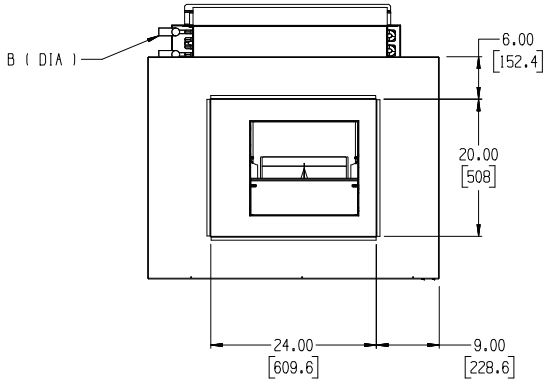
FRONT VIEW



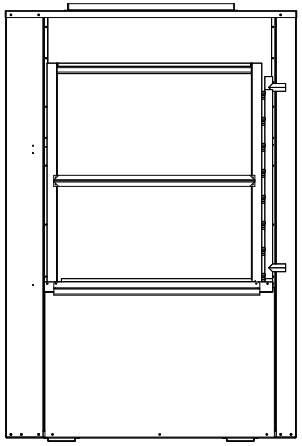
RIGHT SIDE VIEW

UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
072	62.00	42.00	32.00	26.00	1.12	5.00	17.25 X 34.5 (2)
096	62.00	42.00	32.00	26.00	1.12	5.00	17.25 X 34.5 (2)
120	62.00	42.00	32.00	30.75	1.63	5.00	17.25 X 34.5 (2)

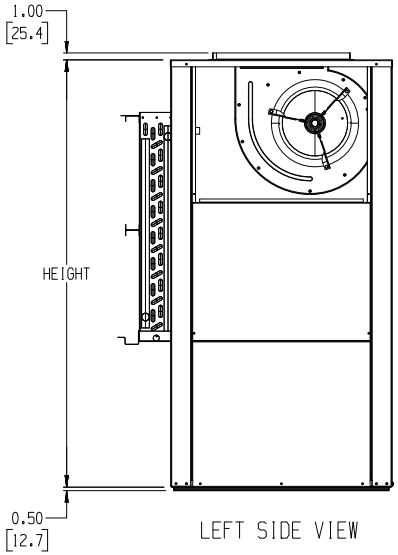
50VQP072-120, Rear Return, Top Discharge with Hot Water Coil



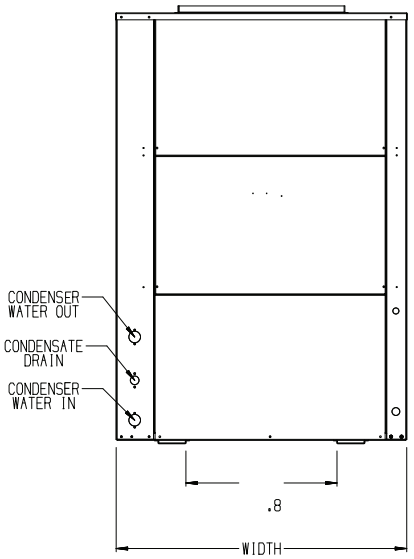
TOP VIEW



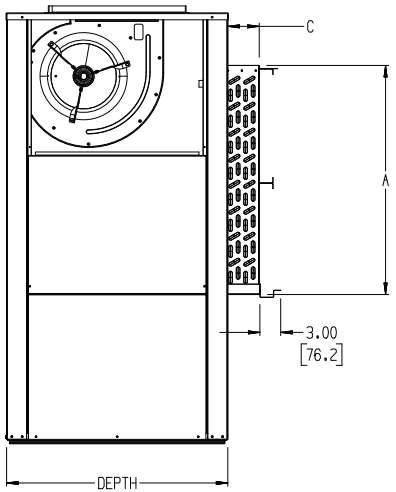
REAR VIEW



LEFT SIDE VIEW



FRONT VIEW

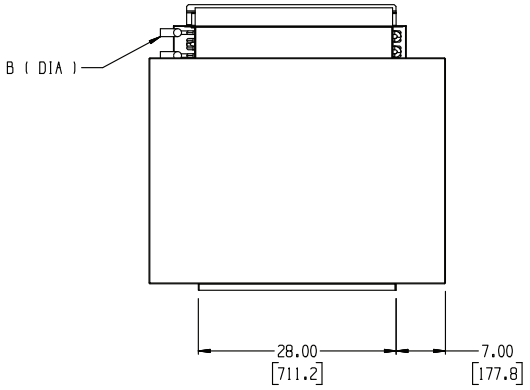


RIGHT SIDE VIEW

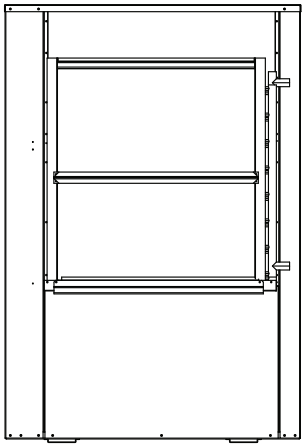
UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
072	62.00	42.00	32.00	26.00	1.12	5.00	17.25 X 34.5 (2)
096	62.00	42.00	32.00	26.00	1.12	5.00	17.25 X 34.5 (2)
120	62.00	42.00	32.00	30.75	1.63	5.00	17.25 X 34.5 (2)

8 733 849 591

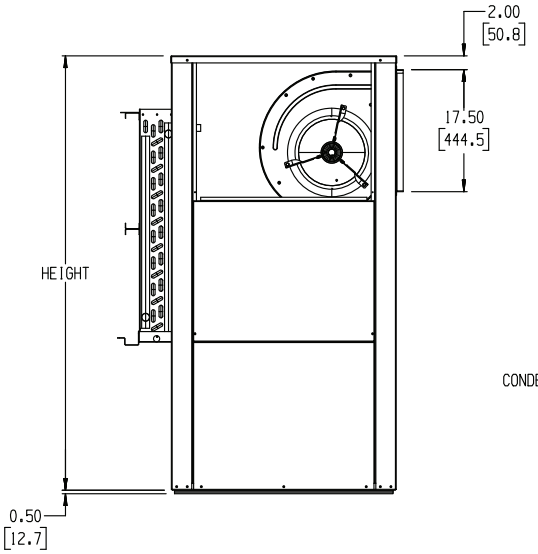
50VQP072-120, Rear Return, Front Discharge with Hot Water Coil



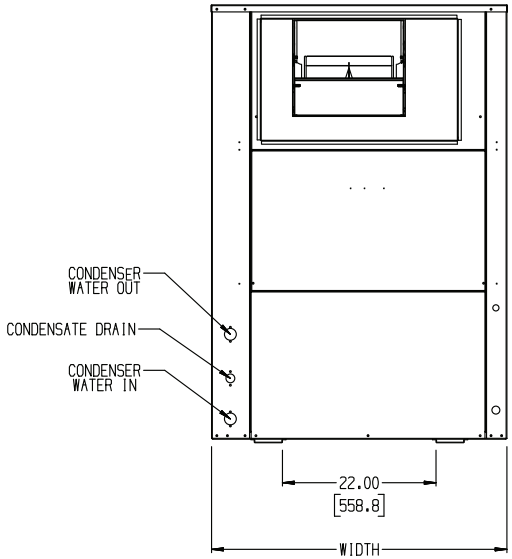
TOP VIEW



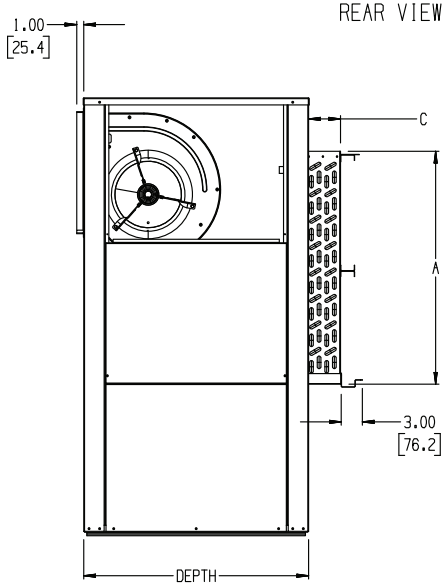
REAR VIEW



LEFT SIDE VIEW



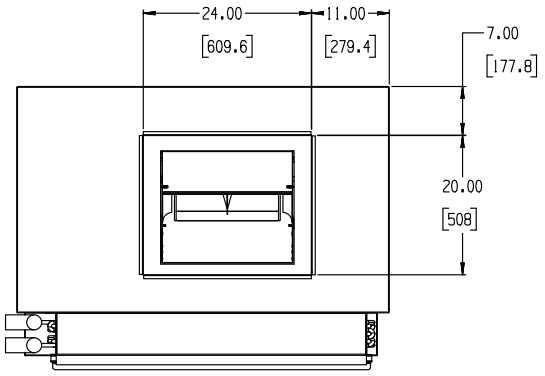
FRONT VIEW



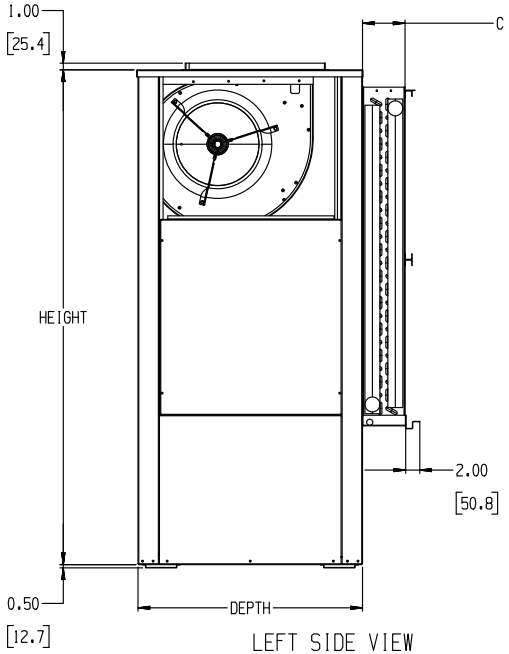
RIGHT SIDE VIEW

UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
072	62.00	42.00	32.00	26.00	1.12	5.00	17.25 X 34.5 (2)
096	62.00	42.00	32.00	26.00	1.12	5.00	17.25 X 34.5 (2)
120	62.00	42.00	32.00	30.75	1.63	5.00	17.25 X 34.5 (2)

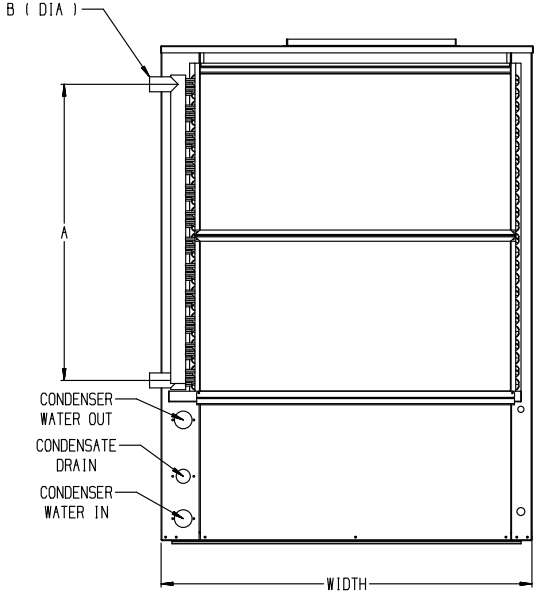
50VQP151-181, Front Return, Top Discharge with Hot Water Coil



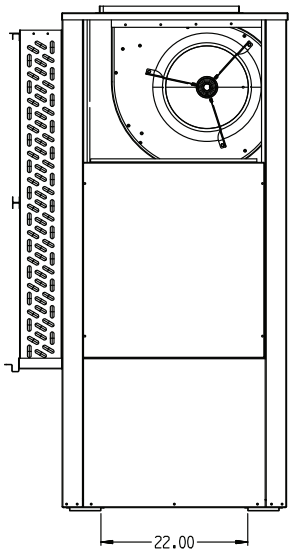
TOP VIEW



LEFT SIDE VIEW



FRONT VIEW

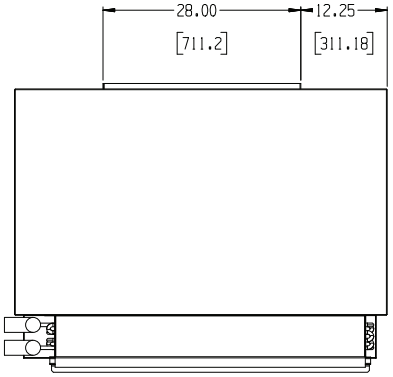


RIGHT SIDE VIEW

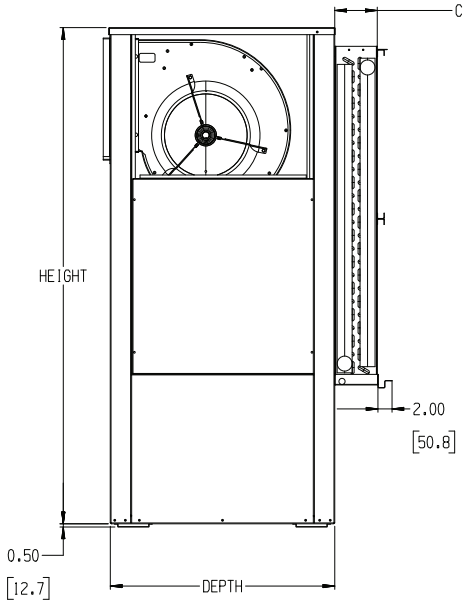
UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
151	70.00	52.50	32.00	42.00	2.12	6.00	24 x 24 (4)
181	70.00	52.50	32.00	42.00	2.12	6.00	24 x 24 (4)

8 733 849 593

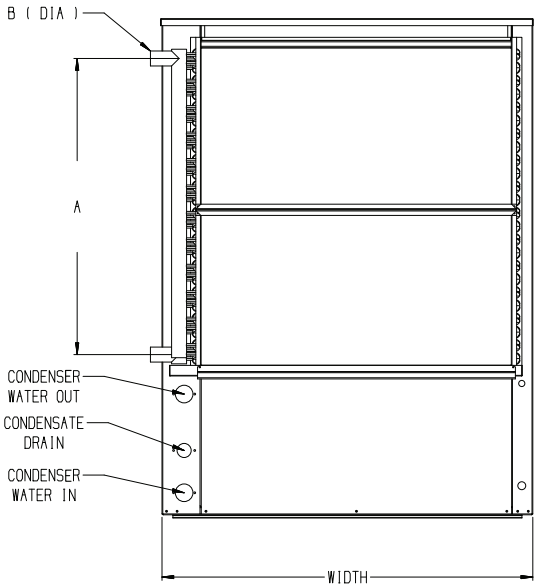
50VQP151-181, Front Return, Rear Discharge with Hot Water Coil



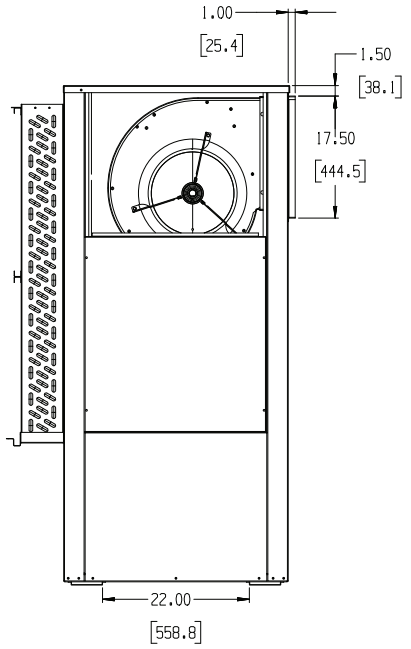
TOP VIEW



LEFT SIDE VIEW



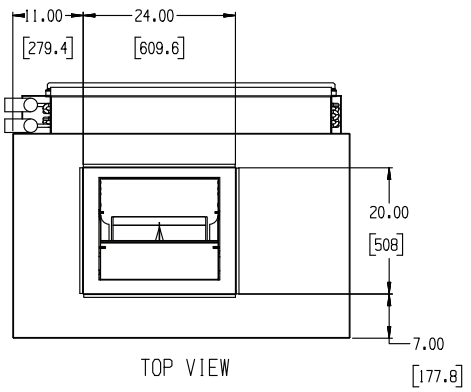
FRONT VIEW

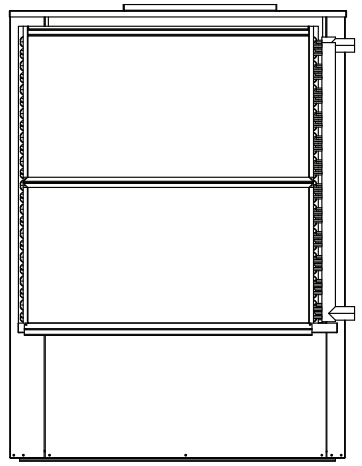


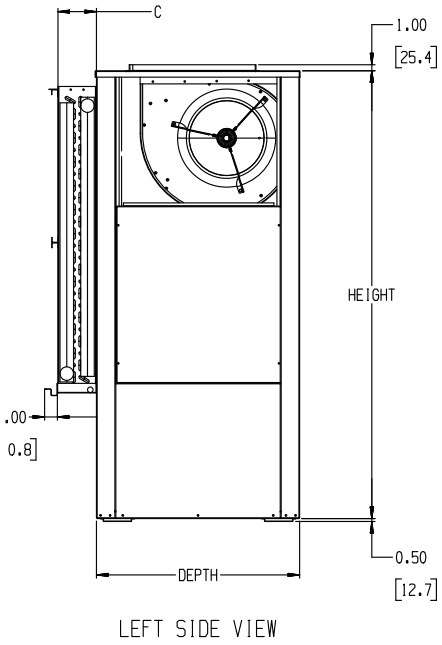
RIGHT SIDE VIEW

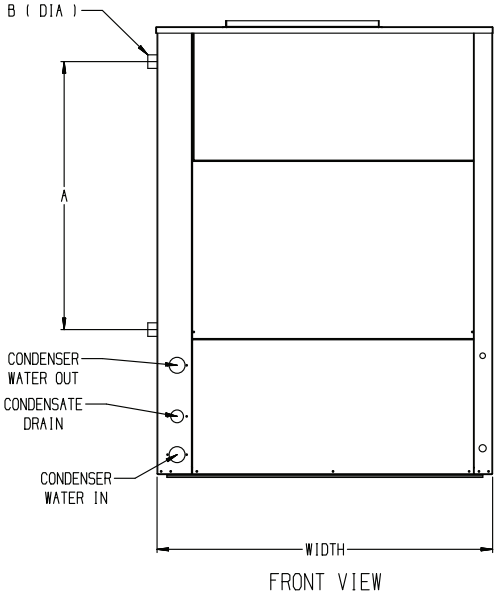
UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
151	70.00	52.50	32.00	42.00	2.12	6.00	24 x 24 (4)
181	70.00	52.50	32.00	42.00	2.12	6.00	24 x 24 (4)

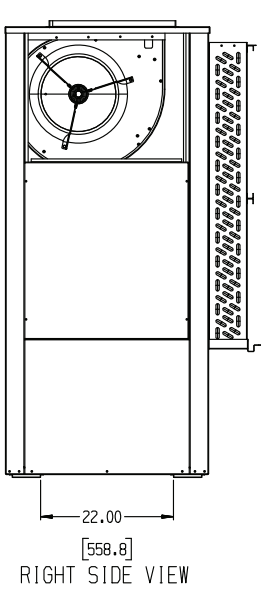
50VQP151-181, Rear Return, Top Discharge with Hot Water Coil







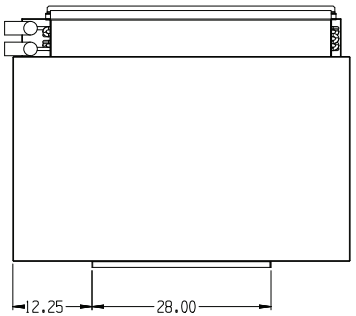




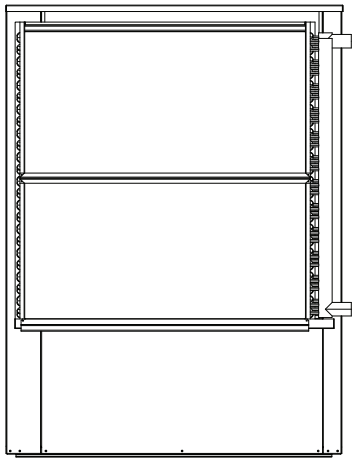
UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
151	70.00	52.50	32.00	42.00	2.12	6.00	24 x 24 (4)
181	70.00	52.50	32.00	42.00	2.12	6.00	24 x 24 (4)

8 733 849 595

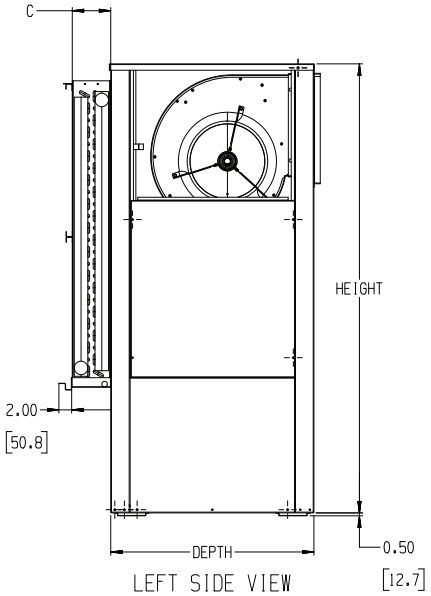
50VQP151-181, Rear Return, Front Discharge with Hot Water Coil



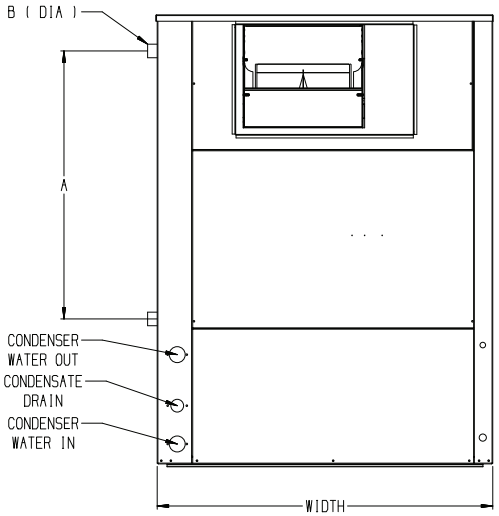
TOP VIEW



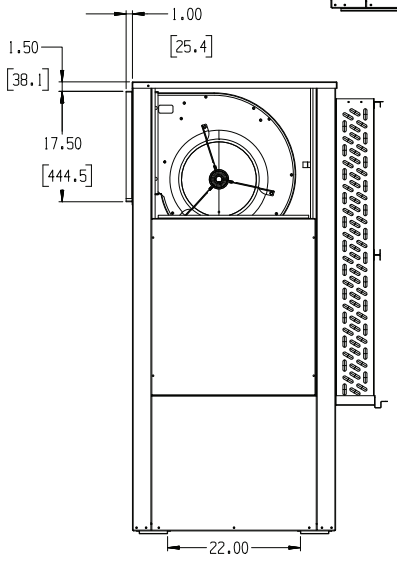
REAR VIEW



LEFT SIDE VIEW



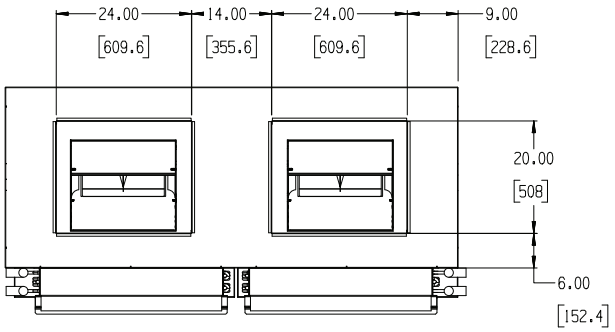
FRONT VIEW



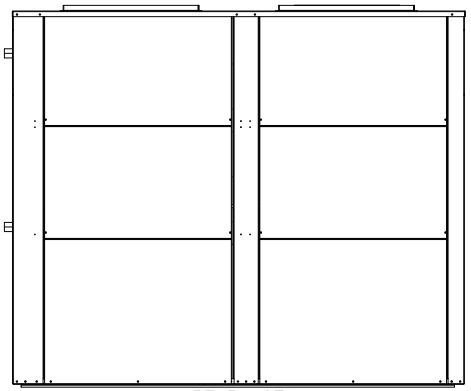
RIGHT SIDE VIEW

UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
151	70.00	52.50	32.00	42.00	2.12	6.00	24 x 24 (4)
181	70.00	52.50	32.00	42.00	2.12	6.00	24 x 24 (4)

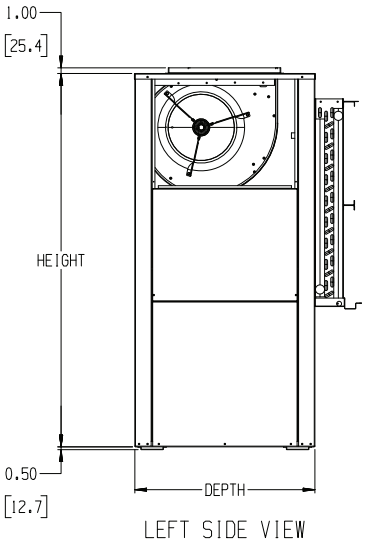
50VQP210-360, Front Return, Top Discharge with Hot Water Coil



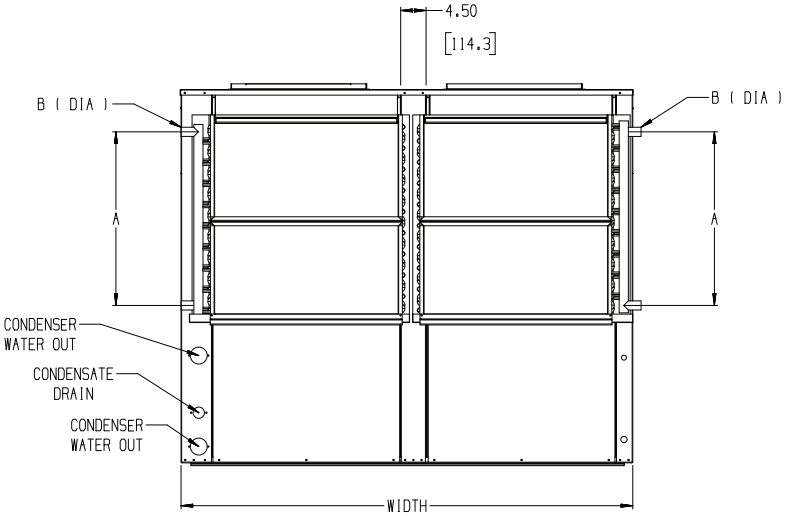
TOP VIEW



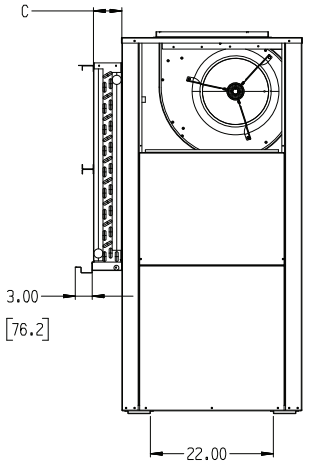
REAR VIEW



LEFT SIDE VIEW



FRONT VIEW

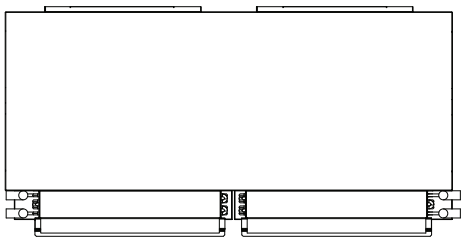


RIGHT SIDE VIEW

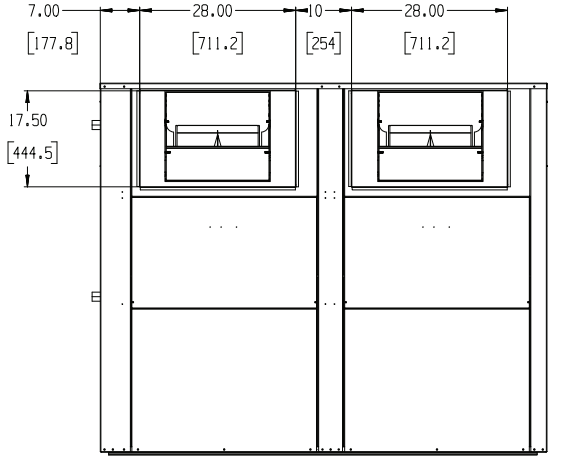
UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
210	62.00	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
240	66.50	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
300	66.50	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
360	86.50	80.00	32.00	47.75	2.12	6.00	17.25 X 34.5 (4) 20 X 34.5 (2)

8 733 849 600

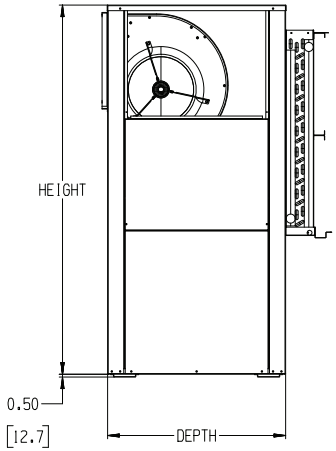
50VQP210-360, Front Return, Rear Discharge with Hot Water Coil



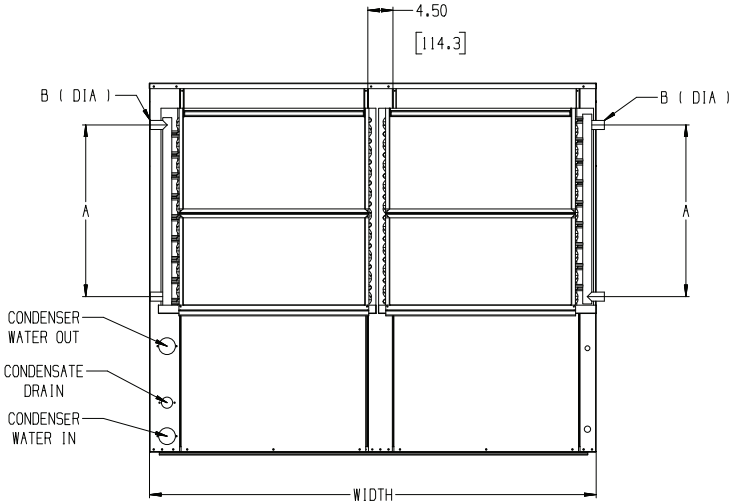
TOP VIEW



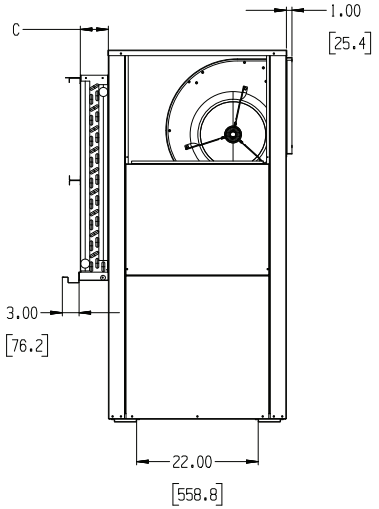
REAR VIEW



LEFT SIDE VIEW



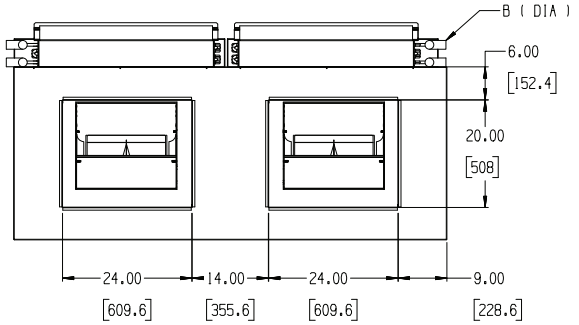
FRONT VIEW



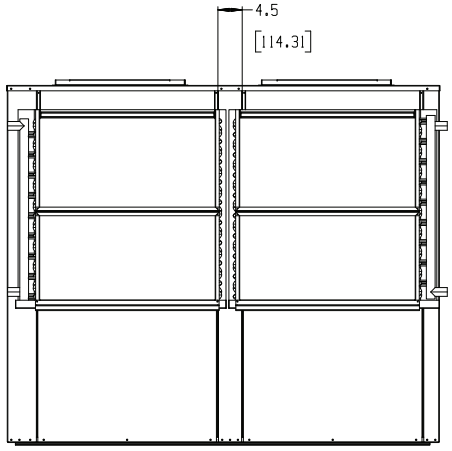
RIGHT SIDE VIEW

UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
210	62.00	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
240	66.50	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
300	66.50	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
360	86.50	80.00	32.00	47.75	2.12	6.00	17.25 X 34.5 (4) 20 X 34.5 (2)

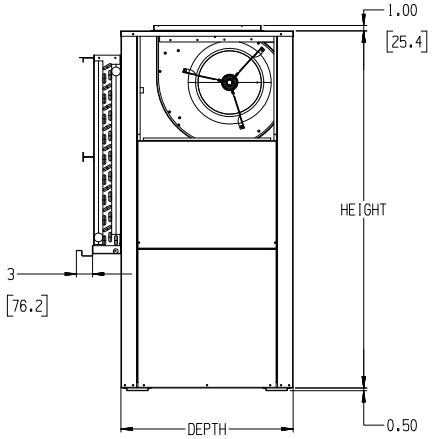
50VQP210-360, Rear Return, Top Discharge with Hot Water Coil



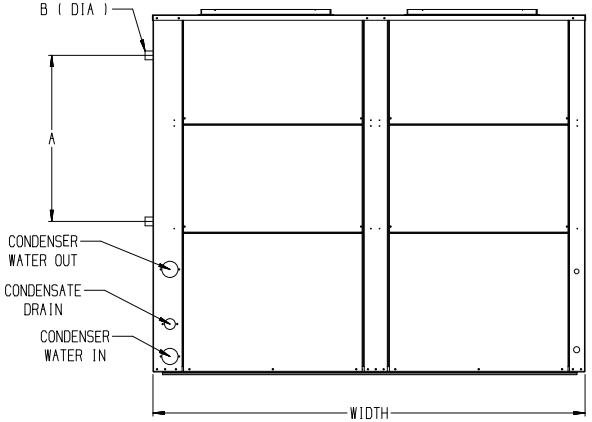
TOP VIEW



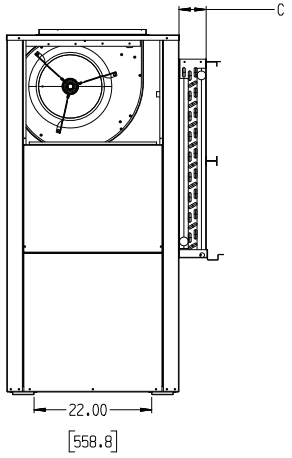
REAR VIEW



LEFT SIDE VIEW



FRONT VIEW

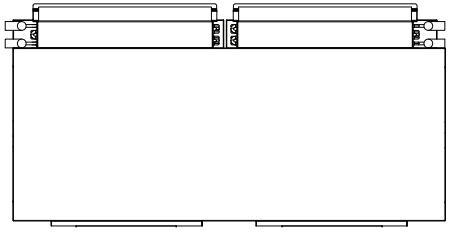


RIGHT SIDE VIEW

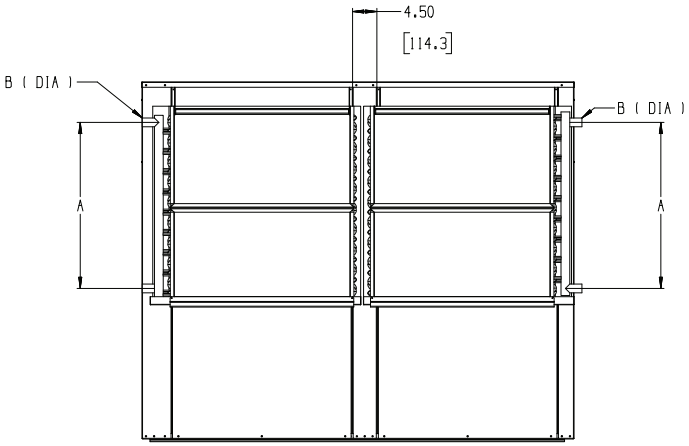
UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
210	62.00	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
240	66.50	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
300	66.50	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
360	86.50	80.00	32.00	47.75	2.12	6.00	17.25 X 34.5 (4) 20 X 34.5 (2)

8 733 849 602

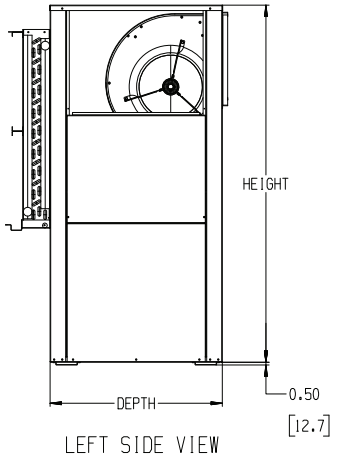
50VQP210-360, Rear Return, Front Discharge with Hot Water Coil



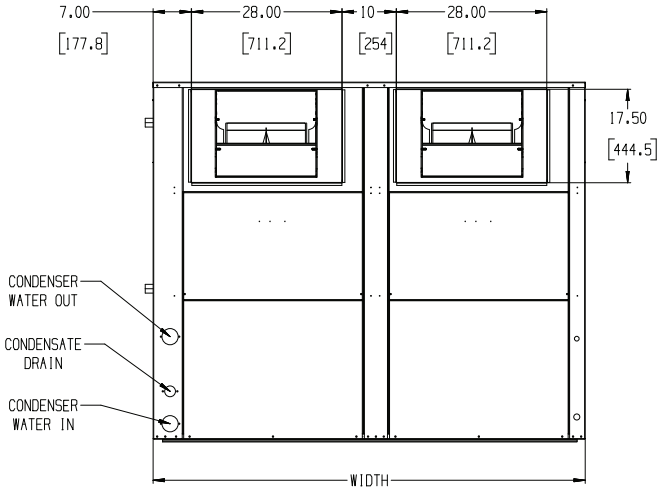
TOP VIEW



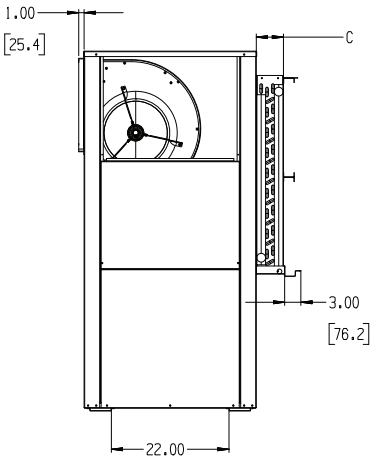
REAR VIEW



LEFT SIDE VIEW



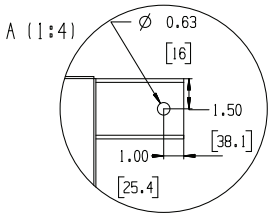
FRONT VIEW

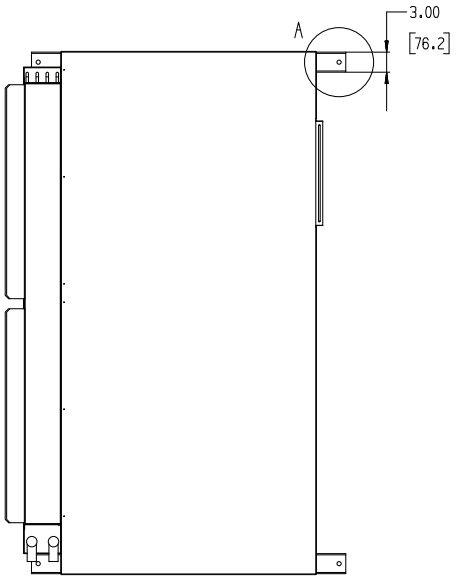


RIGHT SIDE VIEW

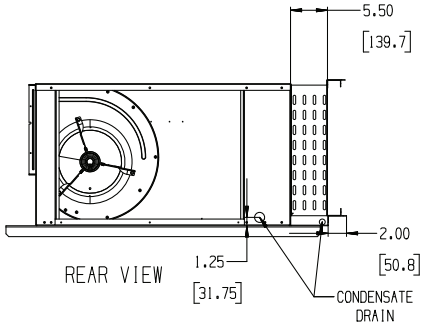
UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
210	62.00	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
240	66.50	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
300	66.50	80.00	32.00	30.75	1.12	5.00	17.25 X 34.5 (4)
360	86.50	80.00	32.00	47.75	2.12	6.00	17.25 X 34.5 (4) 20 X 34.5 (2)

50HQP072-150, Left Return, Right Discharge with Hot Water Coil

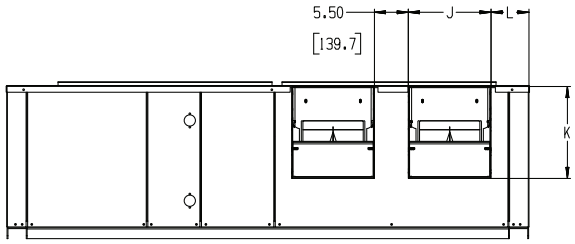




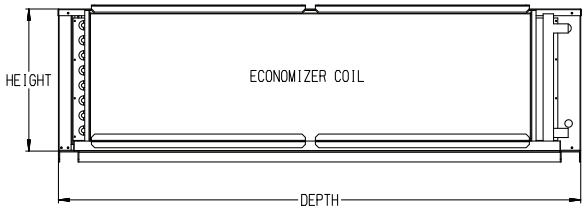
TOP VIEW



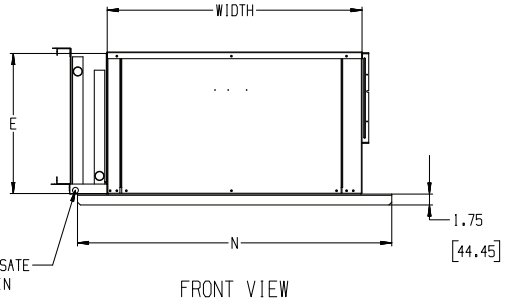
REAR VIEW



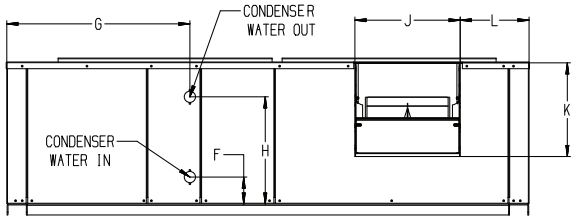
RIGHT SIDE VIEW 120



LEFT SIDE VIEW



FRONT VIEW

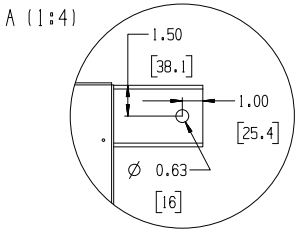


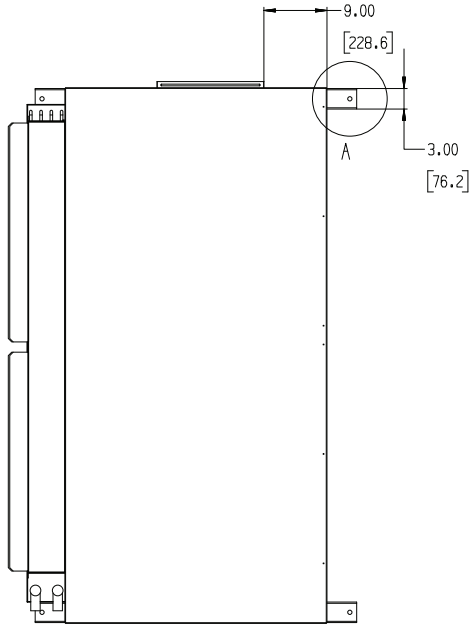
RIGHT SIDE VIEW 072/096/150

UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
072	21.50	38.00	78.00	15.62	1.38	5.50	20 X 34.5 (2)
096	21.50	38.00	78.00	15.62	1.38	5.50	20 X 34.5 (2)
120	21.50	38.00	78.00	15.62	1.38	5.50	20 X 34.5 (2)
150	25.50	42.00	82.00	19.5	1.38	5.00	24 X 34 (2)

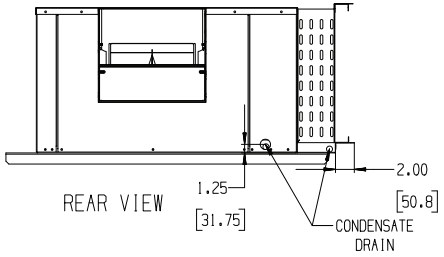
8 733 849 605

50HQP072-096 Left Return, Back Discharge with Hot Water Coil

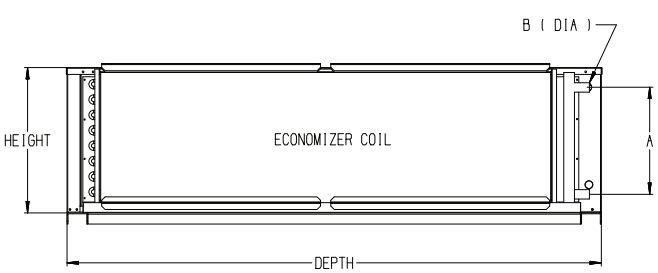




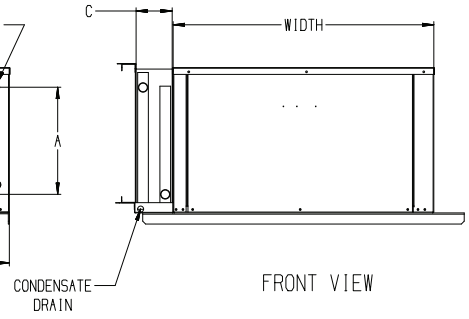
TOP VIEW



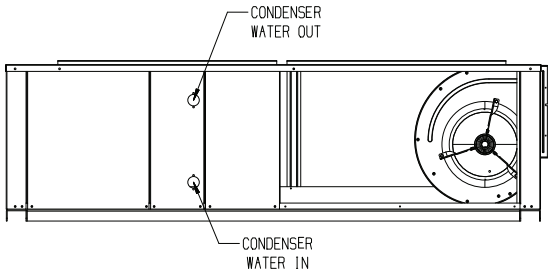
REAR VIEW



LEFT SIDE VIEW



FRONT VIEW

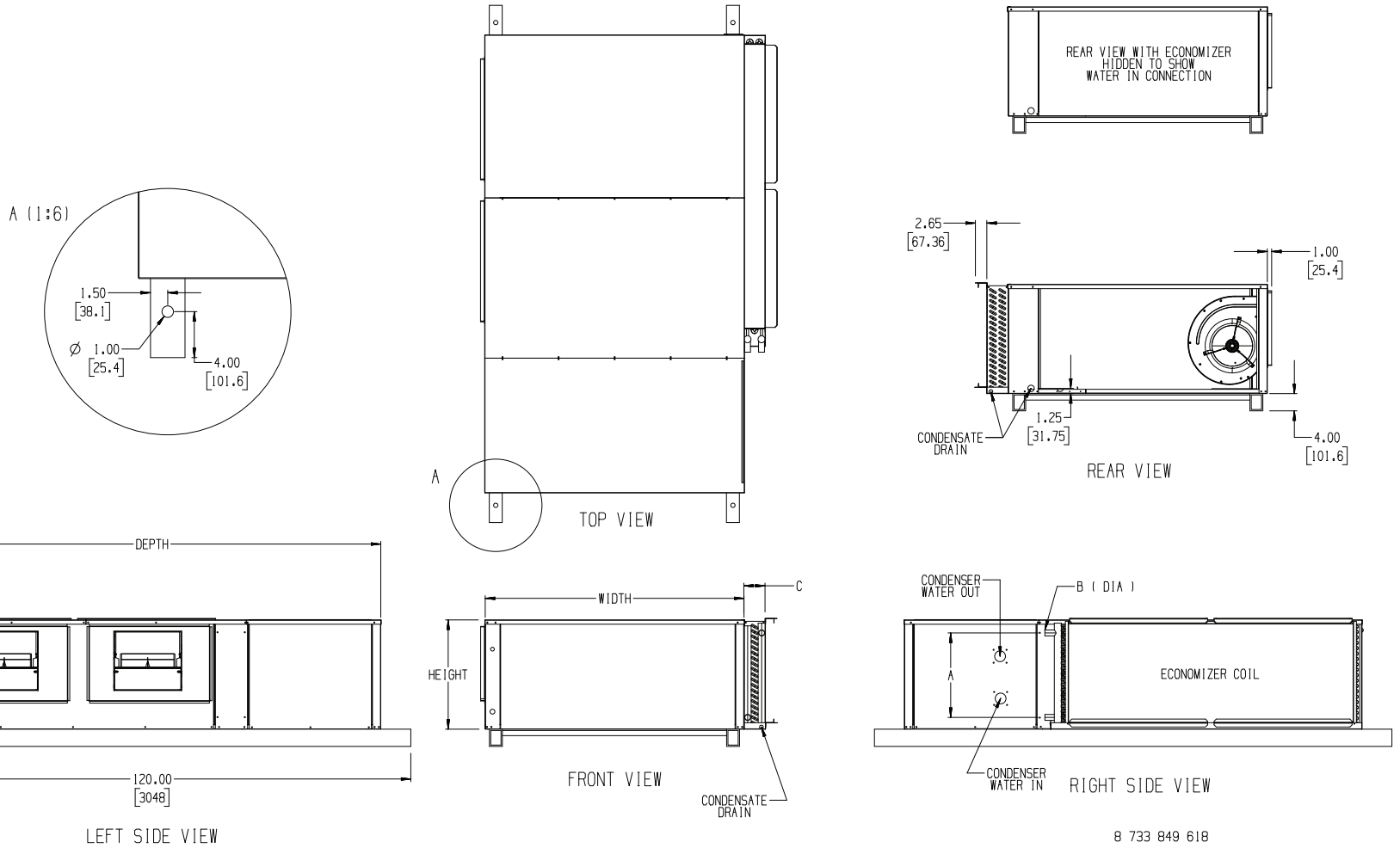


RIGHT SIDE VIEW

UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
072	21.50	38.00	78.00	15.62	1.38	5.50	20 X 34.5 (2)
096	21.50	38.00	78.00	15.62	1.38	5.50	20 X 34.5 (2)

8 733 849 611

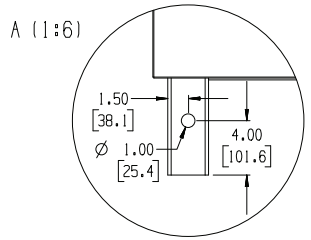
50HQP180-142 Right Return, Left Discharge with Hot Water Coil

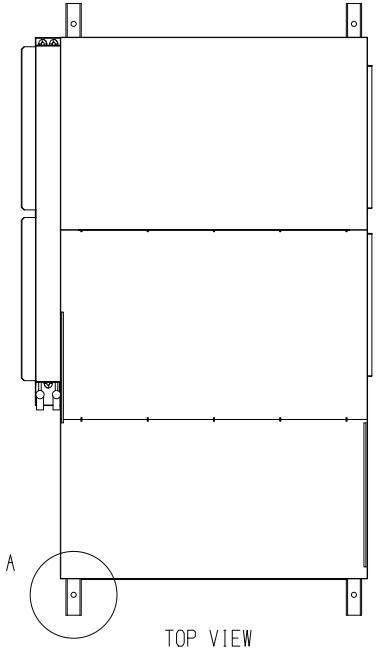


UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
180	25.25	60.25	106.50	15.62	1.38	5.00	24 X 34 (2)
242	36.00	60.25	106.50	29.5	2.12	5.50	17.25 X 34.5 (4)

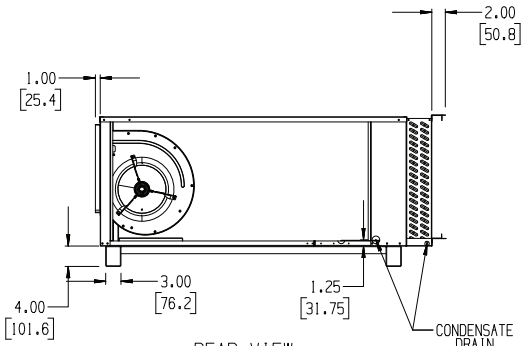
8 733 849 618

50HQP180-142 Left Return, Right Discharge with Hot Water Coil

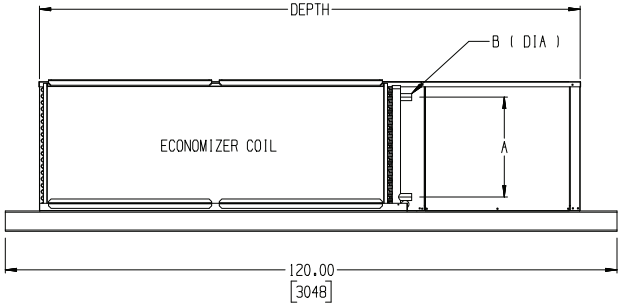




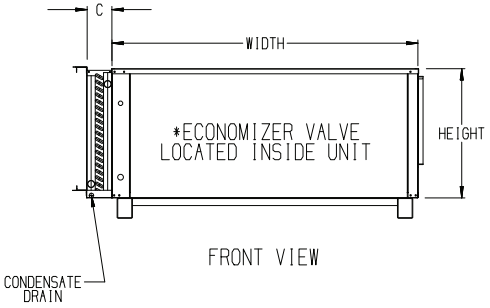
TOP VIEW



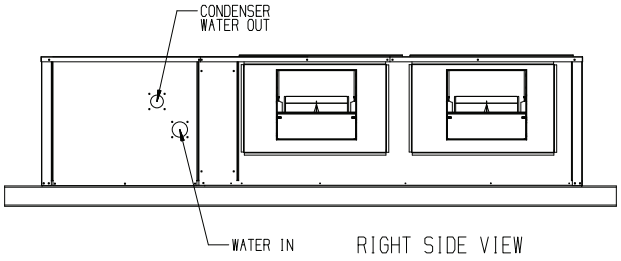
REAR VIEW



LEFT SIDE VIEW



FRONT VIEW

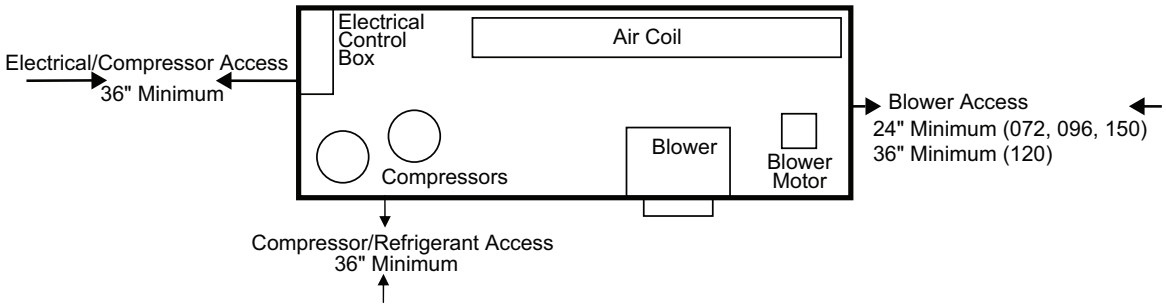


RIGHT SIDE VIEW

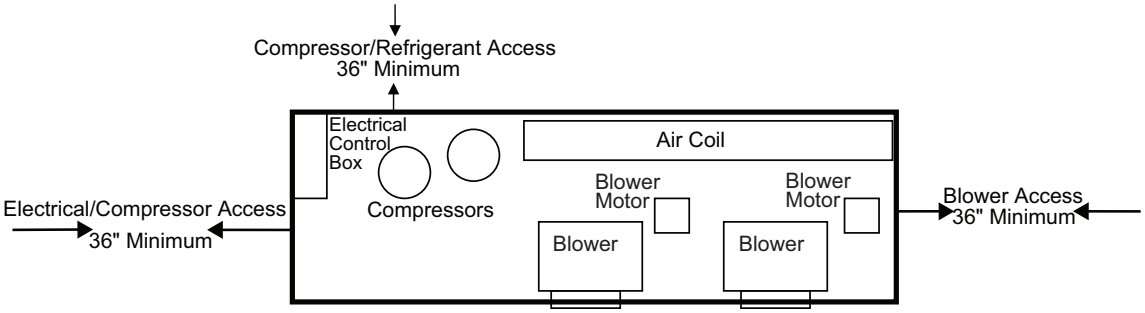
UNIT SIZE	HEIGHT	WIDTH	DEPTH	A	B	C	REPLACEMENT FILTER SIZE
180	25.25	60.25	106.50	15.62	1.38	5.00	24 X 34 (2)
242	36.00	60.25	106.50	29.5	2.12	5.50	17.25 X 34.5 (4)

Dimensions (cont)

50HQP072-150 Units Service Clearances

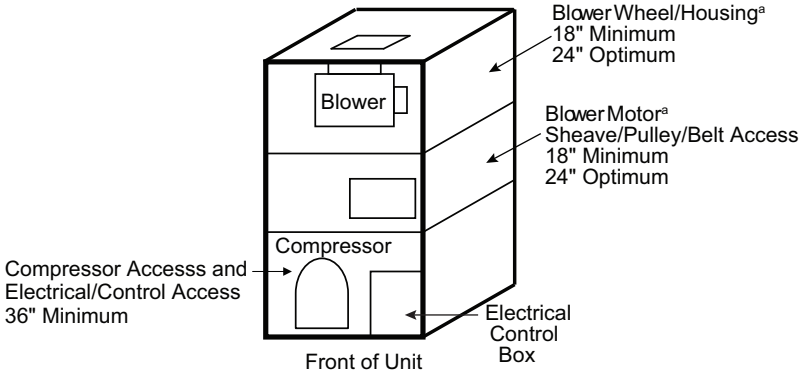


50HQP180-242 Units Service Clearances



NOTE: The local electric codes may require 36" or more clearance at all electrical control boxes.

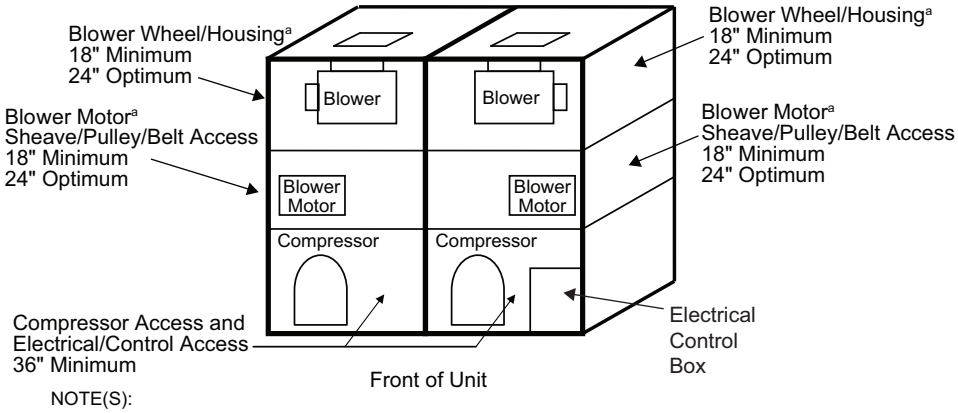
50VQP072-181 Units Service Clearances



NOTE(S):

a. Blower motor and blower housing access is required on both sides of the unit.

50VQP210-360 Units Service Clearances

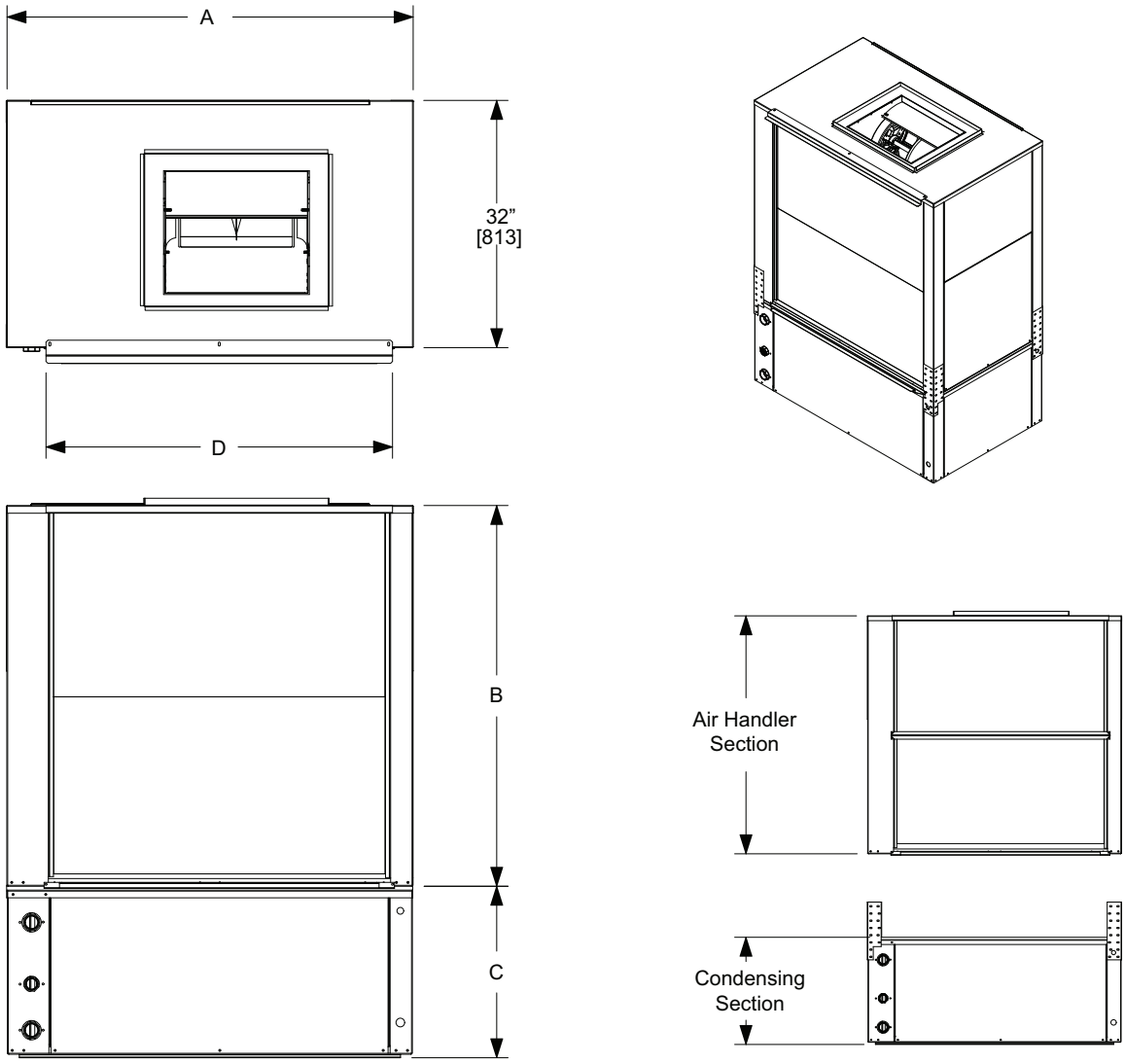


NOTE(S):

a. Blower motor and blower housing access is required on BOTH SIDES of the unit.

Dimensions (cont)

50VQP072-181 Units Take Apart Construction



MODEL	WIDTH (in.)	HEIGHT (in.)		FILTER RACK (in.)	WEIGHTS (lb)	
	A	B	C	D	AH	CS
50VQP072	42	42	22	33	204	396
50VQP096	42	42	22	33	242	468
50VQP120	42	42	22	33	264	511
50VQP151	52.50	50	22	45	330	640
50VQP181	52.50	50	22	45	360	700

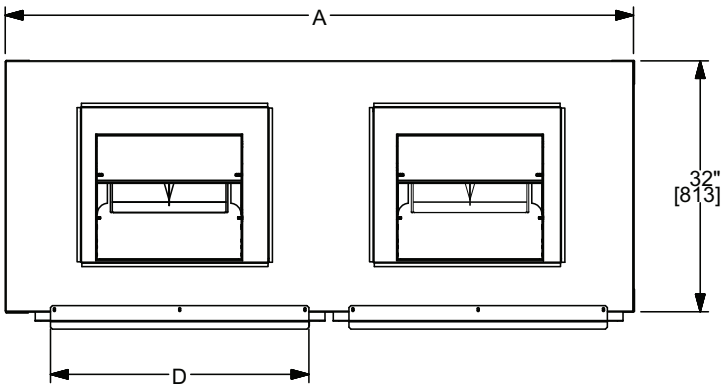
LEGEND

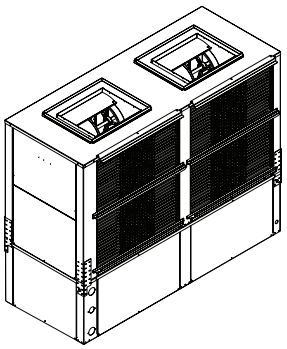
AH — Air Handler Section
CS — Condensing Section

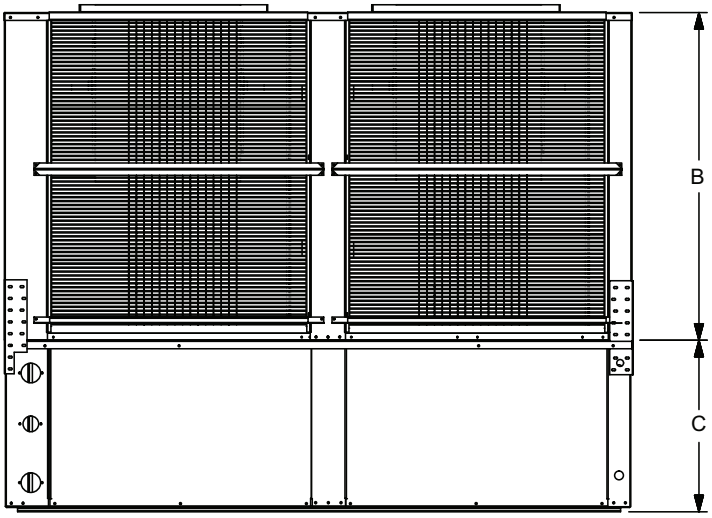
NOTE: Dimensions in [ ] are in millimeters.

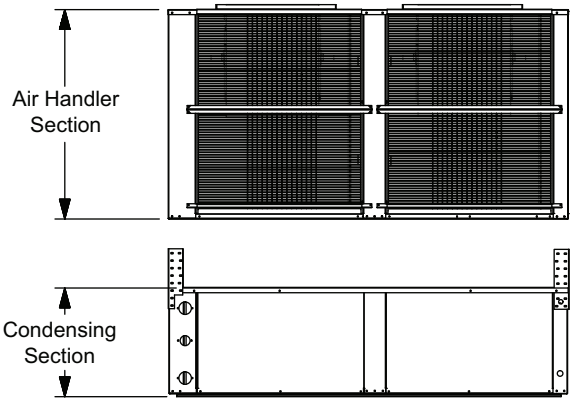
Dimensions (cont)

50VQP210-360 Units Take Apart Construction









	WIDTH (in.)	HEIGHT (in.)		FILTER RACK (in.)	WEIGHTS (in.)	
Model	**A**	**B**	**C**	**D**	**AH**	**CS**
50VQP210	80	42	22	33	408	792
50VQP240	80	42	26	33	460	890
50VQP300	80	42	26	33	500	970
50VQP360	80	62	27	33	595	1155

LEGEND

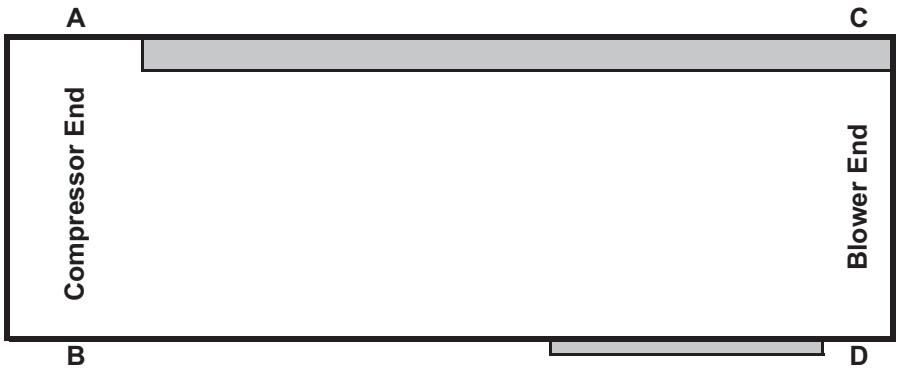
AH — Air Handler Section

CS — Condensing Section

NOTE: Dimensions in [ ] are in millimeters.

Dimensions (cont)

50HQP 072-242 Corner Weights



UNIT SIZE	UNITS	TOTAL WEIGHT	LEFT HAND EVAPORATOR				RIGHT HAND EVAPORATOR			
			Left Front[a]	Right Front[a]	Left Back	Right Back	Left Front[a]	Right Front[a]	Left Back	Right Back
072	lb	670	147	274	137	112	—	—	—	—
	kg	305	67	125	62	51	—	—	—	—
096	lb	702	155	287	143	117	—	—	—	—
	kg	319	70	130	65	53	—	—	—	—
120	lb	935	206	382	191	156	—	—	—	—
	kg	425	94	174	87	71	—	—	—	—
150	lb	1060	233	434	216	177	—	—	—	—
	kg	482	106	197	98	80	—	—	—	—
180	lb	1530	337	626	312	255	TBD	TBD	TBD	TBD
	kg	695	153	285	142	116	TBD	TBD	TBD	TBD
242	lb	1655	365	677	337	276	TBD	TBD	TBD	TBD
	kg	752	166	308	153	125	TBD	TBD	TBD	TBD

NOTE(S):

a. Front is control box end.

WSHP Operating Limits[a]

FLUID TYPE	LIMIT		COOLING	HEATING
Air	Minimum Ambient (°F)		50	40
	Maximum Ambient (°F)		100	85
	Rated Ambient (°F)		80	68
	Minimum Entering (°F db/wb)		65/57	45
	Maximum Entering (°F db/wb)		95/85	80
	Rated Entering (°F)		80/67	68/57
Liquid	Minimum Entering (°F)		45	20
	Max Entering (°F)		110	80
	Rated Entering (°F)	Water Loop	86	68
		Ground Loop	77	32
		Ground Water	59	50
	Anti-Freeze Requirement (LWT / EWT °F)		<40 / <50	
	Maximum Operating Water Pressure (psi/kPa)		400 psi/2,758 kPa (standard unit)	
	Minimum operating Flow Rate (gpm/ton)		1.5	

NOTE(S):

a. Units with waterside economizer options can operate with EWT <45°F, the LWT from WSE should be within the stated above conditions.

LEGEND

db — Dry Bulb
EWT — Entering Water Temperature
GPM — Gallons per Minute
LWT — Leaving Water Temperature
wb — Wet Bulb
WSE — Water Side Economizer
WSHP — Water Source Heat Pump

Performance data (cont)

Blower Performance

See the following tables for blower performance information.

50HQP072/50VQP072 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
2000	*606*	*0.35*	693	0.43	774	0.52	850	0.62	—	—	—	—	—	—	—	—
2500	706	0.61	780	0.72	850	0.82	916	*0.93*	*979*	*1.04*	*1040*	*1.16*	*1098*	*1.28*	—	—
3000	814	1.00	*877*	*1.12*	*938*	*1.24*	996	*1.37*	*1053*	*1.5*	*1107*	*1.63*	*1160*	*1.76*	*1211*	*1.9*
3500	*923*	*1.52*	*979*	*1.66*	*1033*	*1.8*	1085	*1.94*	*1135*	*2.09*	*1184*	*2.24*	*1232*	*2.39*	*1279*	*2.54*
4000	*1033*	*2.2*	*1083*	*2.36*	*1131*	*2.52*	1178	*2.68*	—	—	—	—	—	—	—	—

50HQP096/50VQP096 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
2000	—	—	685	0.43	766	0.51	843	0.61	915	0.71	—	—	—	—	—	—
2500	*695*	0.60	769	0.7	839	0.81	906	0.91	970	1.03	1031	1.14	*1090*	*1.27*	—	—
3000	801	0.97	865	1.09	926	1.22	985	1.34	1042	1.47	*1096*	*1.60*	*1149*	*1.74*	*1201*	*1.88*
3500	906	1.48	962	1.62	1017	1.76	*1069*	*1.90*	*1120*	*2.05*	*1170*	*2.19*	*1218*	*2.34*	*1265*	*2.5*
4000	1016	2.14	*1066*	*2.30*	*1115*	*2.46*	*1162*	*2.62*	*1208*	*2.79*	*1253*	*2.95*	—	—	—	—
4500	*1124*	*2.98*	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

50VQP120 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
2500	—	—	—	—	625	0.58	692	0.70	—	—	—	—	—	—	—	—
3000	—	—	—	—	661	0.80	723	0.94	780	1.08	**835**	**1.22**	—	—	—	—
3500	—	—	650	0.97	709	1.11	765	1.26	**818**	**1.41**	**869**	**1.57**	**918**	**1.74**	**965**	**1.90**
4000	648	1.16	704	1.32	758	1.49	**809**	**1.65**	**858**	**1.82**	**905**	**1.99**	**951**	**2.17**	**995**	**2.35**
4500	709	1.59	760	1.77	**810**	**1.95**	**857**	**2.13**	**902**	**2.32**	**946**	**2.51**	**989**	**2.70**	**1031**	**2.90**
5000	774	2.12	**821**	**2.32**	**866**	**2.52**	**909**	**2.72**	**952**	**2.92**	**993**	**3.13**	**1033**	**3.34**	**1072**	**3.55**
5500	**836**	**2.75**	**880**	**2.97**	**921**	**3.19**	**962**	**3.41**	**1002**	**3.63**	**1040**	**3.85**	**1078**	**4.08**	**1115**	**4.31**

50HQP120 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
2500	—	—	679	0.48	770	0.61	**854**	**0.75**	—	—	—	—	—	—	—	—
3000	639	0.54	729	0.68	**811**	**0.82**	**889**	**0.97**	**962**	**1.13**	**1031**	**1.3**	**1097**	**1.48**	—	—
3500	713	0.80	**793**	**0.95**	**867**	**1.11**	**938**	**1.28**	**1005**	**1.46**	**1069**	**1.64**	**1131**	**1.83**	*1191*	*2.03*
4000	784	1.12	**856**	**1.29**	**924**	**1.47**	**989**	**1.66**	**1052**	**1.85**	**1111**	**2.05**	**1169**	**2.25**	*1225*	*2.46*
4500	**857**	**1.51**	**923**	**1.71**	**985**	**1.91**	**1045**	**2.11**	**1103**	**2.32**	**1159**	**2.54**	*1213*	*2.76*	*1266*	*2.98*
5000	**934**	**2.01**	**994**	**2.23**	**1052**	**2.45**	**1107**	**2.67**	**1161**	**2.90**	*1213*	*3.13*	*1264*	*3.37*	*1314*	*3.61*
5500	**1009**	**2.60**	**1064**	**2.84**	**1118**	**3.08**	**1169**	**3.32**	*1220*	*3.56*	*1269*	*3.81*	*1317*	*4.07*	*1363*	*4.33*

NOTE: Blower performance tables are based on Wet Coil and Standard Filter (1" MERV 5).

LEGEND

	— Do not operate in shaded area.
Italics/underline	— Values indicates outside of standard drive package rpm range. Reach out application group for alternative drive package (ETO).
Bold	— Indicates 5 hp motor selection is required.
bhp	— Brake horse power (bhp) values are per unit. Refer to the physical data table for quantity of blowers and motors.

Performance data (cont)

50HQP150 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
3500	—	—	*617*	*0.89*	*677*	*1.03*	735	1.18	789	1.33	841	1.48	891	1.64	939	1.81
4000	*606*	*1.05*	*665*	*1.21*	*721*	*1.37*	773	1.53	824	1.70	872	1.87	919	2.05	964	2.23
4500	*663*	*1.44*	*717*	*1.62*	768	1.80	817	1.98	864	2.16	909	2.35	953	2.54	995	2.73
5000	*722*	*1.92*	771	2.11	818	2.31	864	2.51	907	2.71	950	2.91	991	3.12	1031	3.33
5500	780	2.48	825	2.70	869	2.91	911	3.13	952	3.35	992	3.57	1031	3.79	**1069**	**4.02**
6000	841	3.17	883	3.40	924	3.64	963	3.88	1002	4.11	1039	4.35	**1076**	**4.59**	*1111*	*4.84*
6500	901	3.96	940	4.22	978	4.47	1015	4.73	1051	4.98	1087	5.24	*1121*	*5.5*	*1155*	*5.76*

50VQP151 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
3500	—	—	—	—	*644*	*0.95*	*704*	*1.09*	760	1.24	813	1.40	864	1.56	913	1.72
4000	—	—	*624*	*1.1*	*682*	*1.26*	*737*	*1.42*	789	1.58	839	1.75	887	1.92	933	2.10
4500	*615*	*1.29*	*672*	*1.47*	*725*	*1.64*	775	1.82	824	2.0	871	2.19	916	2.37	959	2.56
5000	*670*	*1.72*	*722*	*1.92*	*771*	*2.11*	818	2.31	864	2.51	907	2.71	950	2.91	991	3.12
5500	*723*	*2.22*	*770*	*2.44*	816	2.65	860	2.87	903	3.09	944	3.31	984	3.53	1023	3.75
6000	779	2.84	824	3.07	866	3.31	908	3.54	947	3.78	986	4.02	1024	4.26	1061	4.50
6500	835	3.55	877	3.81	917	4.06	955	4.32	993	4.57	1030	4.83	**1066**	**5.09**	*1101*	*5.35*

50HQP180 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4500	*655*	*1.41*	*709*	*1.59*	*760*	*1.77*	*810*	*1.95*	857	2.13	902	2.32	946	2.51	989	2.70	1031	2.90	1071	3.10
5000	*712*	*1.88*	*762*	*2.07*	*809*	*2.27*	*855*	*2.47*	899	2.67	941	2.87	983	3.08	1023	3.29	1062	3.50	1101	3.71
5500	*770*	*2.44*	*816*	*2.65*	860	2.87	903	3.09	944	3.31	984	3.53	1023	3.75	1061	3.97	1098	4.20	**1135**	**4.43**
6000	*828*	*3.10*	870	3.33	912	3.57	951	3.80	990	4.04	1028	4.28	1065	4.52	1101	4.76	**1136**	**5.01**	**1171**	**5.25**
6500	889	3.89	928	4.14	967	4.40	1004	4.65	1041	4.91	1076	5.16	**1111**	**5.42**	**1145**	**5.68**	**1179**	**5.94**	**1211**	**6.21**
7000	946	4.77	984	5.05	1020	5.32	1055	5.60	1090	5.87	**1123**	**6.15**	**1156**	**6.43**	**1189**	**6.71**	**1221**	**6.99**	**1252**	**7.27**
7500	1005	5.80	1040	6.09	1074	6.39	1108	6.68	**1140**	**6.98**	**1172**	**7.27**	**1204**	**7.57**	**1235**	**7.86**	**1265**	**8.16**	**1295**	**8.46**

50VQP181 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4500	*669*	*0.97*	*748*	*1.16*	822	1.35	892	1.56	959	1.77	1023	2.00	—	—	—	—	—	—	—	—
5000	*721*	*1.27*	794	1.47	863	1.69	929	1.91	991	2.13	1052	2.37	*1110*	*2.62*	—	—	—	—	—	—
5500	776	1.63	844	1.86	908	2.09	969	2.32	1028	2.57	*1085*	*2.82*	*1141*	*3.08*	*1194*	*3.35*	*1246*	*3.62*	—	—
6000	830	2.05	893	2.30	953	2.55	1011	2.80	1066	3.06	*1120*	*3.32*	*1173*	*3.60*	*1224*	*3.88*	*1274*	*4.17*	*1322*	*4.47*
6500	886	2.55	944	2.82	1001	3.08	1055	3.35	*1108*	*3.63*	*1159*	*3.91*	*1209*	*4.20*	*1258*	*4.49*	*1305*	*4.8*	*1352*	*5.11*
7000	940	3.12	995	3.40	1048	3.69	*1100*	*3.98*	*1150*	*4.27*	*1199*	*4.57*	*1246*	*4.87*	*1293*	*5.18*	*1338*	*5.50*	*1383*	*5.82*
7500	996	3.77	1048	4.08	*1098*	*4.38*	*1147*	*4.69*	*1195*	*5.00*	*1241*	*5.31*	*1287*	*5.63*	*1331*	*5.96*	*1375*	*6.29*	*1417*	*6.63*

NOTE: Blower performance tables are based on Wet Coil and Standard Filter (1" MERV 5).

LEGEND

	—	Do not operate in shaded area.
Italics/underline	—	Values indicates outside of standard drive package rpm range. Reach out application group for alternative drive package (ETO).
Bold	—	Indicates 5 hp motor selection is required.
bhp	—	Brake horse power (bhp) values are per unit. Refer to the physical data table for quantity of blowers and motors.

Performance data (cont)

50VQP210 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5500	—	—	—	—	*638*	*1.35*	*702*	*1.60*	763	1.87	—	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	*661*	*1.61*	*723*	*1.88*	780	2.15	835	2.44	—	—	—	—	—	—	—	—
6500	—	—	*620*	*1.61*	*682*	*1.88*	*741*	*2.16*	796	2.46	849	2.76	900	3.08	949	3.40	—	—	—	—
7000	—	—	*647*	*1.92*	*706*	*2.20*	762	2.50	815	2.81	866	3.13	915	3.45	963	3.79	**1008**	**4.14**	—	—
7500	*612*	*1.94*	*672*	*2.24*	*728*	*2.55*	782	2.86	833	3.18	882	3.51	929	3.85	**975**	**4.20**	**1020**	**4.56**	**1063**	**4.94**
8000	*642*	*2.30*	*699*	*2.61*	*753*	*2.94*	804	3.27	853	3.61	901	3.95	947	4.31	**991**	**4.67**	**1034**	**5.05**	**1076**	**5.43**
8500	*672*	*2.69*	*726*	*3.03*	777	3.37	827	3.72	874	4.07	920	4.43	964	4.80	**1007**	**5.18**	**1049**	**5.57**	*1090*	*5.96*

50VQP240 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg Wet coil and standard filter 1" MERV 5)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
6500	—	—	*633*	*1.67*	*694*	*1.94*	*752*	*2.22*	807	2.52	860	2.82	910	3.14	—	—	—	—	—	—
7000	*601*	*1.70*	*663*	*1.99*	*721*	*2.28*	776	2.58	828	2.89	879	3.21	927	3.54	974	3.88	**1020**	**4.23**	—	—
7500	*627*	*2.01*	*686*	*2.32*	*742*	*2.62*	795	2.94	845	3.26	894	3.60	941	3.94	**986**	**4.29**	**1031**	**4.66**	**1073**	**5.03**
8000	*659*	*2.39*	*715*	*2.71*	768	3.04	819	3.37	868	3.71	915	4.06	960	4.42	**1004**	**4.78**	**1047**	**5.16**	*1088*	*5.55*
8500	*691*	*2.81*	*744*	*3.15*	795	3.49	844	3.84	890	4.20	936	4.56	**980**	**4.94**	**1022**	**5.32**	**1063**	**5.71**	*1104*	*6.10*
9000	*725*	*3.29*	775	3.64	824	4.01	871	4.37	916	4.75	959	5.13	**1002**	**5.52**	**1043**	**5.91**	1083	6.32	*1122*	*6.73*
9500	758	3.81	806	4.19	853	4.57	898	4.95	941	5.34	**983**	**5.74**	**1024**	**6.15**	**1064**	**6.56**	1103	6.98	*1141*	*7.41*

50HQP242 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
6500	*630*	*1.65*	*691*	*1.92*	*749*	*2.21*	804	2.50	857	2.81	907	3.12	975	3.61	**1020**	**3.92**	—	—	—	—
7000	*668*	*2.02*	*726*	*2.31*	781	2.61	834	2.92	884	3.24	932	3.57	**979**	**3.91**	**1024**	**4.27**	—	—	—	—
7500	*703*	*2.41*	758	2.72	810	3.04	860	3.36	908	3.70	955	4.05	**1000**	**4.40**	**1044**	**4.77**	**1086**	**5.14**	—	—
8000	*739*	*2.86*	791	3.19	841	3.52	889	3.87	935	4.22	**980**	**4.58**	**1023**	**4.95**	**1065**	**5.33**	**1107**	**5.72**	**1147**	**6.12**
8500	777	3.37	827	3.72	874	4.07	920	4.43	964	4.80	**1007**	**5.18**	**1049**	**5.57**	**1090**	**5.96**	**1129**	**6.37**	**1168**	**6.78**
9000	814	3.93	861	4.30	907	4.67	951	5.05	**993**	**5.44**	**1035**	**5.83**	**1075**	**6.24**	**1114**	**6.65**	**1153**	**7.07**	**1190**	**7.49**
9500	850	4.55	895	4.93	939	5.33	**981**	**5.72**	**1022**	**6.13**	**1062**	**6.54**	**1101**	**6.96**	**1139**	**7.38**	**1176**	**7.82**	**1213**	**8.26**

50VQP300 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8500	782	3.40	832	3.75	879	4.11	925	4.47	969	4.84	**1012**	**5.22**	**1053**	**5.61**	*1094*	*6.00*	*1133*	*6.41*	*1172*	*6.82*
9000	822	3.99	868	4.36	913	4.73	957	5.11	**1000**	**5.50**	**1041**	**5.89**	*1081*	*6.30*	*1120*	*6.71*	*1158*	*7.13*	*1196*	*7.56*
9500	862	4.64	906	5.03	949	5.42	**991**	**5.82**	**1032**	**6.23**	**1072**	**6.64**	*1110*	*7.06*	*1148*	*7.49*	*1185*	*7.93*	*1222*	*8.37*
10000	899	5.34	941	5.74	**983**	**6.16**	**1023**	**6.57**	**1062**	**7.00**	*1101*	*7.43*	*1138*	*7.86*	*1175*	*8.31*	*1210*	*8.76*	—	—
10500	937	6.11	**978**	**6.54**	**1018**	**6.97**	**1056**	**7.40**	*1094*	*7.84*	*1131*	*8.29*	*1167*	*8.75*	*1203*	*9.21*	*1237*	*9.67*	—	—
11000	**978**	**6.99**	**1017**	**7.43**	**1055**	**7.88**	*1093*	*8.34*	*1129*	*8.80*	*1165*	*9.26*	1200	9.74	—	—	—	—	—	—
11500	**1014**	**7.89**	**1052**	**8.35**	*1089*	*8.82*	*1125*	*9.29*	*1160*	*9.77*	—	—	—	—	—	—	—	—	—	—

NOTE: Blower performance tables are based on Wet Coil and Standard Filter (1" MERV 5).

LEGEND

	—	Do not operate in shaded area.
Italics/underline	—	Values indicates outside of standard drive package rpm range. Reach out application group for alternative drive package (ETO).
Bold	—	Indicates 5 hp motor selection is required.
bhp	—	Brake horse power (bhp) values are per unit. Refer to the physical data table for quantity of blowers and motors.

Performance data (cont)

50VQP360 Blower Performance

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg wet coil and standard filter 1" MERV 5)																					
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0		2.2	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10500	*740*	*4.28*	*788*	*4.69*	834	5.11	878	5.52	920	5.94	962	6.36	1002	6.79	1041	7.23	1079	7.67	1116	8.11	1153	8.56
11000	*768*	*4.86*	814	5.29	858	5.72	901	6.15	942	6.59	982	7.03	1021	7.48	1059	7.93	1096	8.38	1133	8.84	—	—
11500	*798*	*5.50*	842	5.95	885	6.40	926	6.86	966	7.31	1005	7.77	1043	8.23	1080	8.70	—	—	—	—	—	—
12000	828	6.19	870	6.66	912	7.14	951	7.61	990	8.08	1028	8.56	—	—	—	—	—	—	—	—	—	—
12500	857	6.94	898	7.43	938	7.92	977	8.41	1014	8.91	—	—	—	—	—	—	—	—	—	—	—	—
13000	887	7.74	926	8.26	965	8.77	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
13500	916	8.60	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE: Blower performance tables are based on Wet Coil and Standard Filter (1" MERV 5).

LEGEND

	—	Do not operate in shaded area.
Italics/underline	—	Values indicates outside of standard drive package rpm range. Reach out application group for alternative drive package (ETO).
Bold	—	Indicates 5 hp motor selection is required.
bhp	—	Brake horse power (bhp) values are per unit. Refer to the physical data table for quantity of blowers and motors.

Electrical data

50HQP072-242 — Standard Duty Motor (without VFD) — Electrical Data

MODELS	RATED VOLTAGE	VOLTAGE MIN/MAX	COMPRESSOR			MOTOR			MCA	MOCP
			Qty	RLA (each)	LRA (each)	Qty	Hp	FLA		
072	208-230/1/60	197/253	2	16.7	93.5	1	1.0	7.0	44.6	60
	208-230/1/60	197/253	2	16.7	93.5	1	1.5	8.5	46.1	60
	208-230/1/60	197/253	2	16.7	93.5	1	2.0	9.8	47.4	60
096	208-230/1/60	197/253	2	22.4	126.0	1	1.5	8.5	58.9	80
	208-230/1/60	197/253	2	22.4	126.0	1	2.0	9.8	60.2	80
	575/3/60	518/632	2	5.7	41.0	1	1.5	2.0	14.8	20
	575/3/60	518/632	2	5.7	41.0	1	2.0	2.6	15.4	20
120	575/3/60	518/632	2	7.7	47.8	1	3.0	3.7	21.0	25
	575/3/60	518/632	2	7.7	47.8	1	5.0	5.4	22.7	30
150	575/3/60	518/632	2	7.7	47.8	1	3.0	3.7	21.0	25
	575/3/60	518/632	2	7.7	47.8	1	5.0	5.4	22.7	30
180	575/3/60	518/632	2	7.2	54.0	2	2.0	2.6	21.4	25
	575/3/60	518/632	2	7.2	54.0	2	3.0	3.7	23.6	30
	575/3/60	518/632	2	7.2	54.0	2	5.0	5.4	27.0	30
242	575/3/60	518/632	2	10.7	93.7	2	2.0	2.6	29.3	35
	575/3/60	518/632	2	10.7	93.7	2	3.0	3.7	31.5	40
	575/3/60	518/632	2	10.7	93.7	2	5.0	5.4	34.9	45

50VQP072-360 — Standard Duty Motor (without VFD) — Electrical Data

MODELS	RATED VOLTAGE	VOLTAGE MIN/MAX	COMPRESSOR			MOTOR			MCA	MOCP
			Qty	RLA (each)	LRA (each)	Qty	HP	FLA		
072	208-230/1/60	197/253	2	16.7	93.5	1	1.0	7.0	44.6	60
	208-230/1/60	197/253	2	16.7	93.5	1	1.5	8.5	46.1	60
	208-230/1/60	197/253	2	16.7	93.5	1	2.0	9.8	47.4	60
096	208-230/1/60	197/253	2	22.4	126.0	1	1.5	8.5	58.9	80
	208-230/1/60	197/253	2	22.4	126.0	1	2.0	9.8	60.2	80
	575/3/60	518/632	2	5.8	41.0	1	1.5	2.0	14.8	20
	575/3/60	518/632	2	5.8	41.0	1	2.0	2.6	15.4	20
	575/3/60	518/632	2	5.8	41.0	1	3.0	3.7	16.5	20
120	208-230/1/60	197/253	2	25.6	126.0	1	2.0	9.8	67.4	90
	575/3/60	518/632	2	7.7	47.8	1	2.0	2.6	19.9	25
	575/3/60	518/632	2	7.7	47.8	1	3.0	3.7	21.0	25
	575/3/60	518/632	2	7.7	47.8	1	5.0	5.4	22.7	30
151	575/3/60	518/632	2	7.7	47.8	1	3.0	3.7	21.0	25
	575/3/60	518/632	2	7.7	47.8	1	5.0	5.4	22.7	30
181	575/3/60	518/632	2	7.2	54.0	1	5.0	5.4	21.6	25
210	575/3/60	518/632	2	9.0	78.0	2	1.5	2.0	24.2	30
	575/3/60	518/632	2	9.0	78.0	2	2.0	2.6	25.4	30
	575/3/60	518/632	2	9.0	78.0	2	3.0	3.7	27.6	35
	575/3/60	518/632	2	9.0	78.0	2	5.0	5.4	31.0	35
240	575/3/60	518/632	2	10.7	93.7	2	2.0	2.6	29.3	35
	575/3/60	518/632	2	10.7	93.7	2	3.0	3.7	31.5	40
	575/3/60	518/632	2	10.7	93.7	2	5.0	5.4	34.9	45
300	575/3/60	518/632	2	13.7	109.0	2	3.0	3.7	38.2	50
	575/3/60	518/632	2	13.7	109.0	2	5.0	5.4	41.6	50
360	575/3/60	518/632	2	19.2	131.0	2	5.0	5.4	54.0	70

Electrical data (cont)

50HQP072-242 — Inverter Duty Motor (with VFD) — Electrical Data

UNIT SIZE	v/Ph/Hz	VOLTAGE		COMPRESSOR			MOTOR			MCA	MOCP
		Min	Max	Qty	RLA (each)	LRA (each)	Qty	Hp	FLA		
072	208/230-3-60	197	253	2	12.2	97.5	1	2.0	10.6	38.1	50
								3.0	10.6	38.1	50
	460-3-60	414	506	2	5.8	44.3	1	2.0	4.8	17.9	20
								3.0	4.8	17.9	20
096	208/230-3-60	197	253	2	12.8	120.4	1	2.0	10.6	39.4	50
								3.0	10.6	39.4	50
	460-3-60	414	506	2	6.0	49.4	1	2.0	4.8	18.3	20
								3.0	4.8	18.3	20
120	208/230-3-60	197	253	2	18.6	155.0	1	3.0	10.6	52.5	70
								5.0	16.7	55.4	70
	460-3-60	414	506	2	8.3	58.1	1	3.0	4.8	23.0	30
								5.0	7.6	24.9	30
150	208/230-3-60	197	253	2	19.2	156.5	1	3.0	10.6	53.8	70
								5.0	16.7	59.9	70
	460-3-60	414	506	2	9.0	74.8	1	3.0	4.8	25.1	30
								5.0	7.6	27.9	35
180	208/230-3-60	197	253	2	22.3	166.2	2	2.0	16.7	66.9	80
								3.0	24.2	74.9	90
								5.0	30.8	83.1	110
	460-3-60	414	506	2	8.8	74.6	2	2.0	7.6	27.4	35
								3.0	12.0	32.6	40
								5.0	14.0	35.1	45
242	208/230-3-60	197	253	2	28.5	255.0	2	2.0	16.7	80.8	100
								3.0	24.2	88.3	110
								5.0	30.8	95.5	125
	460-3-60	414	506	2	13.4	123.0	2	2.0	3.1	37.6	50
								3.0	4.3	42.2	50
								5.0	6.2	44.3	50

Electrical data (cont)

50VQP072-360 — Inverter Duty Motor (with VFD) — Electrical Data

UNIT SIZE	v/Ph/Hz	VOLTAGE		COMPRESSOR			MOTOR			MCA	MOCP
		Min	Max	Qty	RLA (each)	LRA (each)	Qty	Hp	FLA		
072	208/230-3-60	197	253	2	12.2	97.5	1	2.0	10.6	38.1	50
								3.0	10.6	38.1	50
	460-3-60	414	506	2	5.8	44.3	1	2.0	4.8	17.9	20
								3.0	4.8	17.9	20
096	208/230-3-60	197	253	2	12.8	120.4	1	2.0	10.6	39.4	50
								3.0	10.6	39.4	50
	460-3-60	414	506	2	6.0	49.4	1	2.0	4.8	18.3	20
								3.0	4.8	18.3	20
120	208/230-3-60	197	253	2	18.6	155.0	1	2.0	10.6	52.5	70
	460-3-60	414	506	2	8.3	58.1	1	2.0	4.8	23.5	30
120	208/230-3-60	197	253	2	18.6	155.0	1	3.0	10.6	52.5	70
								5.0	16.7	58.6	70
	460-3-60	414	506	2	8.3	58.1	1	3.0	4.8	23.5	30
								5.0	7.6	26.3	30
151	208/230-3-60	197	253	2	19.2	156.5	1	3.0	10.6	53.8	70
								5.0	16.7	59.9	70
	460-3-60	414	506	2	9.0	74.8	1	3.0	4.8	25.1	30
								5.0	7.6	27.9	35
181	208/230-3-60	197	253	2	22.3	166.2	1	5.0	16.7	66.9	80
	460-3-60	414	506	2	8.8	74.6	1	5.0	7.6	27.4	35
210	208/230-3-60	197	253	2	28.7	207.5	2	2.0	16.7	81.1	100
								3.0	24.2	88.6	110
								5.0	30.8	95.7	125
	460-3-60	414	506	2	12.4	100.2	2	2.0	7.6	35.5	45
								3.0	12.0	39.9	50
								5.0	14.0	42.3	50
240	208/230-3-60	197	253	2	28.5	255.0	2	2.0	16.7	80.8	100
								3.0	24.2	88.3	110
								5.0	30.8	95.5	125
	460/3/60	414	506	2	13.4	123.0	2	2.0	7.6	37.8	50
								3.0	12.0	42.2	50
								5.0	14.0	44.3	50
300	208/230-3-60	197	253	2	40.7	270.0	2	3.0	24.2	115.8	150
								5.0	30.8	122.4	150
	460/3/60	414	506	2	19.4	147.0	2	3.0	12.0	55.7	70
								5.0	14.0	57.7	70
360	208/230-3-60	197	253	2	48.9	386.3	2	5.0	24.2	134.2	175
	460/3/60	414	506	2	23.9	182.0	2	5.0	14.0	67.8	90

LEGEND

FLA — Full Load Amps
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection
RLA — Rated Load Amps

Application data

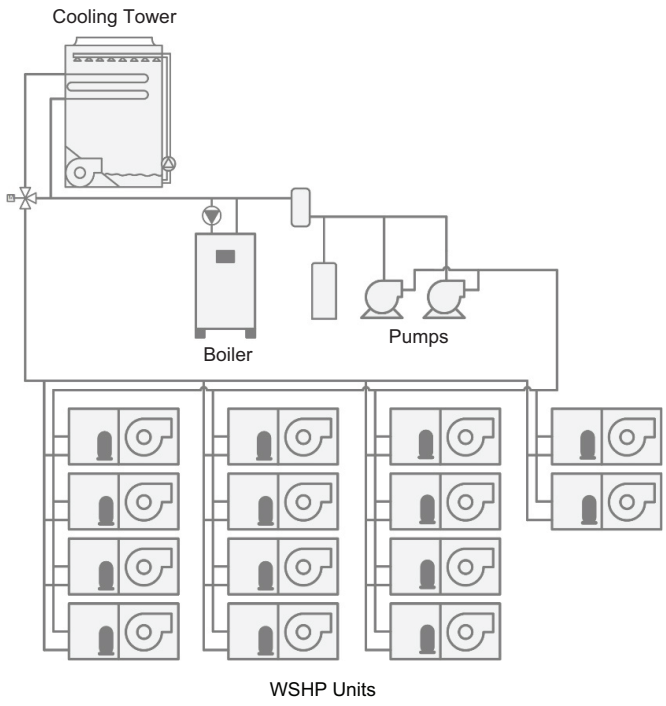
Aquazone™ water source heat pumps are available in a flexible, efficient array of models and sizes, which can be used for an extensive variety of commercial building types with several temperature control zones, some of which need to be heated while others need to be cooled. The WSHP system is an especially good choice for potential energy savings from heat-recovery capabilities to efficiently transfer heat between areas.

The design of WSHP units is adaptable, making them suitable for various water loop, ground water, and ground loop systems. Aquazone products provide optimal energy efficient solutions and adapt to the most challenging design requirements.

Water loop system

Water loop (or boiler/tower) system applications typically include a number of units plumbed to a common piping system. For optimal performance, this system should be designed between 1.5 and 4 gpm per ton of cooling capacity. The system is comprised of highly efficient packaged reverse cycle heat pump units interconnected by a water loop. The water circuit serves as both a sink and source for heat absorption and rejection and is designed for entering water temperatures between 50 and 80°F. Within this temperature range units can heat or cool as required from the same water source. Transferring heat from warm to cold spaces in the building, whenever they coexist, conserves energy rather than creating new heat.

Typical Water Loop (Boiler/Cooling Tower) Application



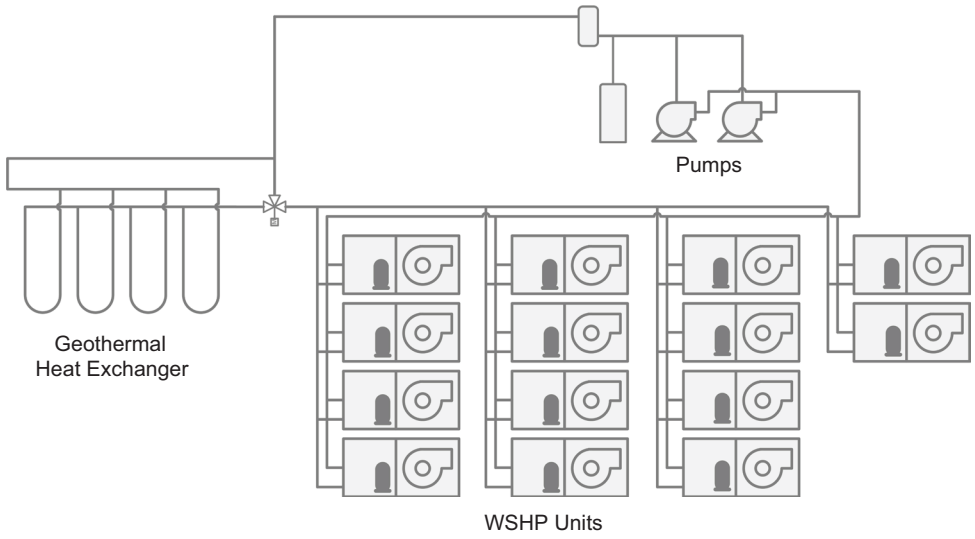
Application data (cont)

Ground loop systems

The benefit of ground source applications lies in utilizing the earth's stable temperatures to maintain appropriate water loop temperatures. There are many commonly specified designs for ground loop applications. Typical designs include vertical and horizontal loops:

- Horizontal ground loop. This system is used when adequate space is available, and trenching can be easily accomplished. A series of parallel pipes are laid out in trenches 3 to 6 ft below the ground surface, and then back-filled. Often, multiple pipes are used to maximize the heat transfer capability of each trench. The amount of pipe and the size of the ground loop field are based on ground conditions, heating and cooling requirements of the application, and system design.
- Vertical ground loop. This system is used in vertical borehole applications. This design is well suited for retrofit applications when space is limited or where landscaping is already complete and minimum disruption of the site is desired. The vertical ground loop system contains a single loop of pipe inserted into a hole. The hole is back-filled and grouted after the pipe is inserted. The completed loop is concealed below ground. The number of loops required depends on ground conditions, heating and cooling requirements, and the depth of each hole.

Typical Ground Loop / Geothermal Application

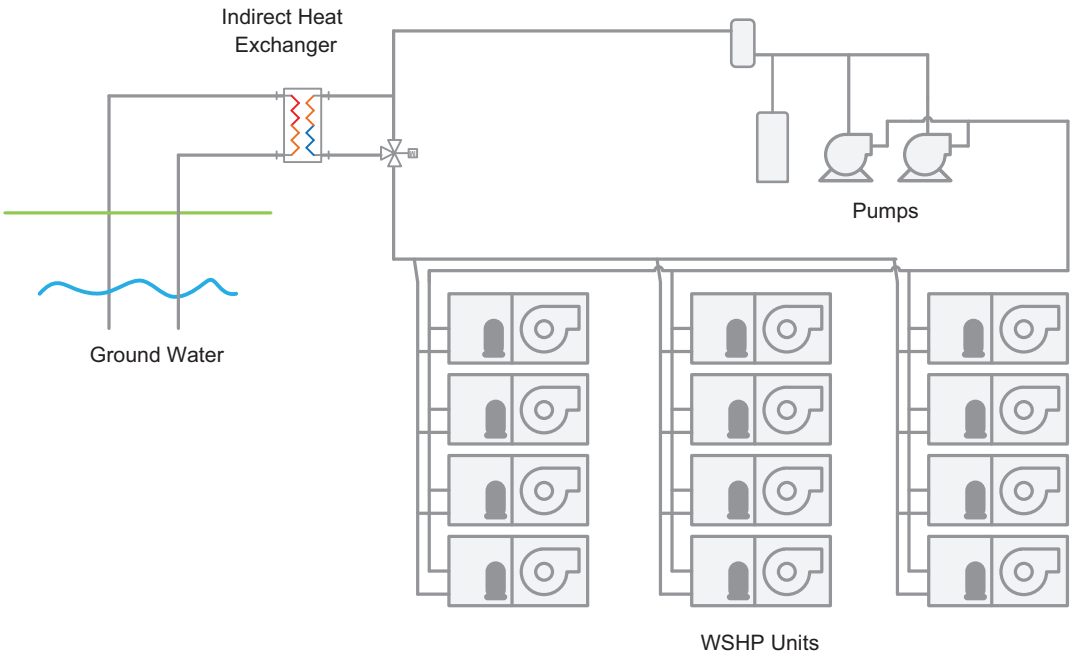


Application data (cont)

Ground water systems

This system is used where ground water is plentiful. In this application, ground water is pumped through supply piping from the well to the building. The water is then pumped back into the ground through a discharge well as it leaves the building. An additional heat exchanger is usually installed between the building water piping system and the ground water piping system to isolate WSHP units from contamination. This design limits the amount of piping and excavation required. Aquazone units come with an extended range coil (20 to 110°F) for open or closed loop systems. To conserve water on this type of system, a slow opening/closing solenoid valve is recommended. Depending on loop water temperatures, a water regulating valve may be needed.

Ground Water Application

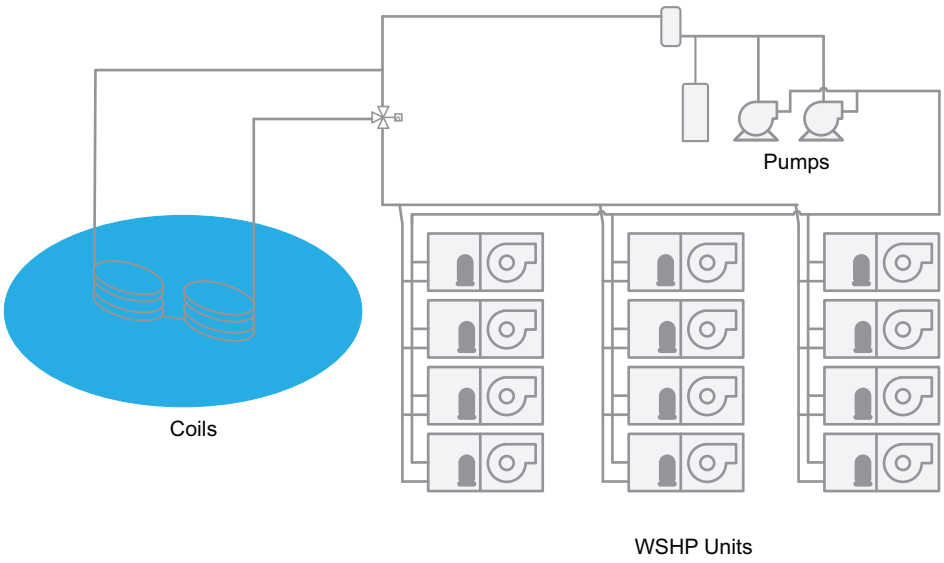


Application data (cont)

Surface water system

This system is typically located near a lake, pond, well, or other water sources to maintain closed loop water temperatures. In this application, the loop can be submerged in a series of coils beneath the water surface. The number of coils required depends on system load and design. This application requires minimum piping and excavation.

Surface Water Application

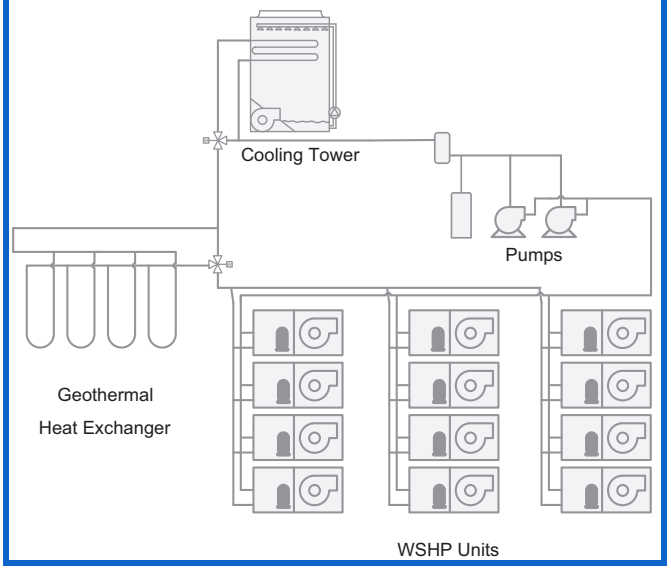


Application data (cont)

Hybrid systems

In some applications, it may be beneficial to incorporate a cooling tower or boiler into the ground loop system to reduce the overall cost. A hybrid system discards excess heat into the air and increases the cooling performance of the ground loop.

Hybrid System (Geothermal Loop/Cooling Tower) Application



Freeze protection

Applications where systems are exposed to outdoor temperatures below freezing (32°F) or leaving water temperatures drop below 40°F must be protected from freezing. The most common method of protecting water systems from freezing is adding glycol concentrations into the water. Design care should be used when selecting both the type and concentrations of glycol used due to the following:

- Equipment and performance may suffer with high concentrations of glycol and other antifreeze solutions.
- Loss of piping pressure may increase greatly, resulting in higher pumping costs.
- Higher viscosity of the mixture may cause excess corrosion and wear on the entire system.
- Acidity of the water may be greatly increased, promoting corrosion.
- Glycol promotes galvanic corrosion in systems of dissimilar metals. The result is corrosion of one metal by the other, causing leaks.

Water quality

In some applications, maintaining proper water quality may require higher corrosion protection for the water-to-refrigerant heat exchanger heat exchanger. Water quality varies from location to location and is unique for each job. Water characteristics such as pH value, alkalinity, hardness, and specific conductance are important when considering any WSHP application. Water typically includes impurities and hardness that must be removed. The required treatment will depend on the water quality as well as type of system. Water problems fall into three main categories:

- Scale formation caused by hard water reduces the heat transfer rate and increases the water pressure drop through the heat exchanger. As water is heated, minerals and salts are precipitated from a solution and deposited on the inside surface of the pipe or tube.
- Corrosion is caused by absorption of gases from the air coupled with water on exposed metal. Corrosion is also common in salt-water areas.
- Organic growths such as algae can reduce the heat transfer rate by forming an insulating coating on the inside tube surface. Algae can also promote corrosion by pitting.

NOTE: In most commercial water loop applications, Aquazone WSHP units use a copper water-to-refrigerant heat exchanger. Units can and should be equipped with a cupronickel heat exchanger for applications where water is outside the standard contaminant limits for a copper heat exchanger.

Application data (cont)

Water Quality Guidelines

CONDITION	HX MATERIAL[a]	CLOSED RECIRCULATING[b]	OPEN LOOP AND RECIRCULATING WELL[c]		
Scaling Potential — Primary Measurement **Above the given limits, scaling is likely to occur. Scaling indexes should be calculated using the limits below.**					
pH/Calcium Hardness Method	All	N/A	pH < 7.5 and Ca Hardness, <100 ppm		
Index Limits for Probable Scaling Situations (Operation outside these limits is not recommended.)					
Scaling indexes should be calculated at 150°F for direct use and at 90°F for indirect HX use. A monitoring plan should be implemented.					
Ryznar Stability Index	All	N/A	6.0 to 7.5 If >7.5 minimize steel pipe use.		
Langelier Saturation Index	All	N/A	–0.5 to +0.5 If <=0.5 minimize steel pipe use. Based upon 150°F direct well, 85°F indirect well HX.		
Iron Fouling					
Iron Fe^{2+} (Ferrous) (Bacterial Iron Potential)	All	N/A	<0.2 ppm (Ferrous) If Fe^{2+} (ferrous) >0.2 ppm with pH 6 to 8, O_2<5 ppm, check for iron bacteria.		
Iron Fouling	All	N/A	<0.5 ppm of Oxygen Above this level deposition will occur.		
Corrosion Prevention[d]					
pH	All	6 to 8.5 Monitor/treat as needed.	6 to 8.5 Minimize steel pipe below 7 and no open tanks with pH <8.		
Hydrogen Sulfide (H_2S)	All	N/A	<0.5 ppm At H_2S>0.2 ppm, avoid use of copper and cupronickel piping or HXs. Rotten egg smell appears at 0.5 ppm level. Copper alloy (bronze or brass) cast components are acceptable to <0.5 ppm.		
Ammonia Ion as Hydroxide, Chloride, Nitrate and Sulfate Compounds	All	N/A	<0.5 ppm		
Maximum Chloride Levels			Maximum allowable at maximum water temperature.		
			50°F (10°C)	75°F (24°C)	100°F (38°C)
	Copper	N/A	<20 ppm	NR	NR
	Cupronickel	N/A	<150 ppm	NR	NR
	304 SS	N/A	<400 ppm	<250 ppm	<150 ppm
	316 SS	N/A	<1000 ppm	<550 ppm	<375 ppm
	Titanium	N/A	>1000 ppm	>550 ppm	>375 ppm
Erosion and Clogging					
Particulate Size and Erosion	All	<10 ppm of particles and a maximum velocity of 6 fps. Filtered for maximum 800 micron size.	<10 ppm (<1 ppm “sandfree” for reinjection) of particles and a maximum velocity of 6 fps. Filtered for maximum 800 micron size. Any particulate that is not removed can potentially clog components.		
Brackish	All	N/A	Use cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)		

NOTE(S):

a. Heat exchanger materials considered are copper, cupronickel, 304 SS (stainless steel), 316 SS, titanium.
b. Closed recirculating system is identified by a closed pressurized piping system.
c. Recirculating open wells should observe the open recirculating design considerations.
d. If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists.
Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water registers a pH of 7.0.
To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

LEGEND

HX — Heat Exchanger
N/A — Design Limits Not Applicable Considering Recirculating Potable Water
NR — Application Not Recommended
SS — Stainless Steel

Application data (cont)

Condensate drainage

Venting

Properly vent condensate lines to prevent fan pressure from causing water to hang up in the piping. Condensate lines should be pitched to assure full drainage of condensate under all load conditions. Use chemical treatment to remove algae in the condensate pans and drains in geographical areas that are conducive to algae growth.

Trapping

Condensate trapping is a necessity on every water source heat pump unit. A trap is provided to prevent the backflow of moisture from the condensate pan and into the fan intake or downstream into the mechanical system. The water seal or the length of the trap depends on the positive or negative pressure on the drain pan. As a rule of thumb, size the water seal 1 in. for every 1 in. of negative pressure on the unit. The water seal is the distance from the bottom of the unit condensate piping connection to the bottom of the condensate drain line run-out piping. Therefore, the trap size should be double the water seal dimension.

Horizontal units

Horizontal units should be sloped toward the drain at a 1/4 in. per foot pitch. If it is not possible to meet the pitch requirement, a condensate pump should be designed and installed at the unit to pump condensate to a building drain. Horizontal units are not internally trapped, therefore an external trap is necessary. Each unit must be installed with its own individual trap and means to flush or blow out the condensate drain. It is not acceptable to use a common trap or vent for multiple units. The condensate piping system should not be designed with a pipe size smaller than the drain connection pipe size.

Vertical units

All vertical units require installation of an external trap.

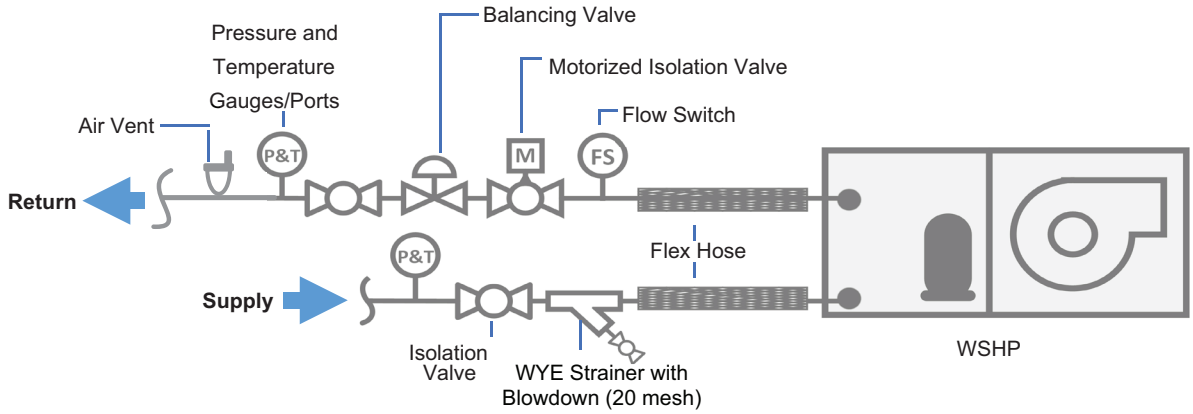
Water piping connections

The most basic type of hose kits are used to connect the fixed building water supply and return piping system to the water inlets and outlets of the unit. Flexible hoses not only simplify the connection but also play a role in minimizing vibration between the unit and the rigid central piping system. For ease of implementation, typical hose kits can include most hydronic devices such as isolation valves, y-strainer filter, balancing valve, or pressure/temperature ports.

Flow balancing

Water source heat pumps are designed and selected to provide a specific amount of cooling and heating capacity at specific operating conditions. While all HVAC equipment is designed around specific return and supply air conditions, WSHPs differentiate themselves by also requiring specific water loop conditions. As a result, it is extremely important that these water loop conditions remain as constant as possible during operation of the WSHP to ensure that both cooling and heating demands are met. One major component of these water loop conditions is the water loop flow rate, often referenced as the GPM or gallons per minute. One method of controlling the GPM is by manually balancing each WSHP, however this is often very time consuming (each WSHP requires manual balancing), and the flow rate through a manually balanced valve tends to fluctuate over time, often requiring frequent re-balancing. A better method to ensure a constant water loop flow rate at each WSHP is to use an automatic flow control device, or an auto-flow regulator. An auto-flow regulator is a pressure independent automatic flow limiting valve, with the main component being an internal flow cartridge that is factory set to a specific flow rate, or GPM. Auto-flow regulators are utilized at each WSHP (each WSHP will have its own auto-flow regulator) and the auto-flow regulator will maintain the designed GPM over a wide water loop pressure differential. Thus, as the water loop pressure changes (which can be common in systems as different WSHPs on the same water loop are turning on/off and their isolation valves open/close as a result), the water loop flow rate to each WSHP remains constant. Additionally, the system installation is much easier with autoflow regulators compared to manually balanced systems, and the "fluctuation" seen in manually balanced systems is no longer an issue.

Typical Hydronic Accessories



Application data (cont)

Acoustical considerations

Sound power levels represent the sound as it is produced by the source, the WSHP unit, with no regard to attenuation between the source and the space. Acoustical design goals are necessary to provide criteria for occupied spaces where people can be comfortable and communicate effectively over the background noise of the air-conditioning system and other background noise sources. Acoustical design goals are desirable sound pressure levels within a given conditioned space and are represented by noise criteria (NC) curves. The NC curve levels represent a peak over a full spectrum of frequencies. A high value in a low frequency band has the same effect on NC level as a lower value in a high frequency band. It is important that sound levels be balanced over the entire spectrum relative to the NC curve. The lower the NC criteria curve, the more stringent the room acoustical design must be to meet the design goals. It is important to know how to convert NC levels from the unit ratings in terms of sound power (Lw). This conversion depends on the specifics of the acoustical environment of the installation. The resulting calculations are compared to the NC curve selected for the area to assess the acoustical design. Some of the factors that affect conversion of sound power to sound pressure and consequent NC level include:

- type of acoustical ceiling
- use of metal or flex duct
- absorption in the occupied space
- location in the occupied space
- open or closed layout plan
- use of open or ducted returns
- orientation of unit to occupant
- use of lined or unlined duct

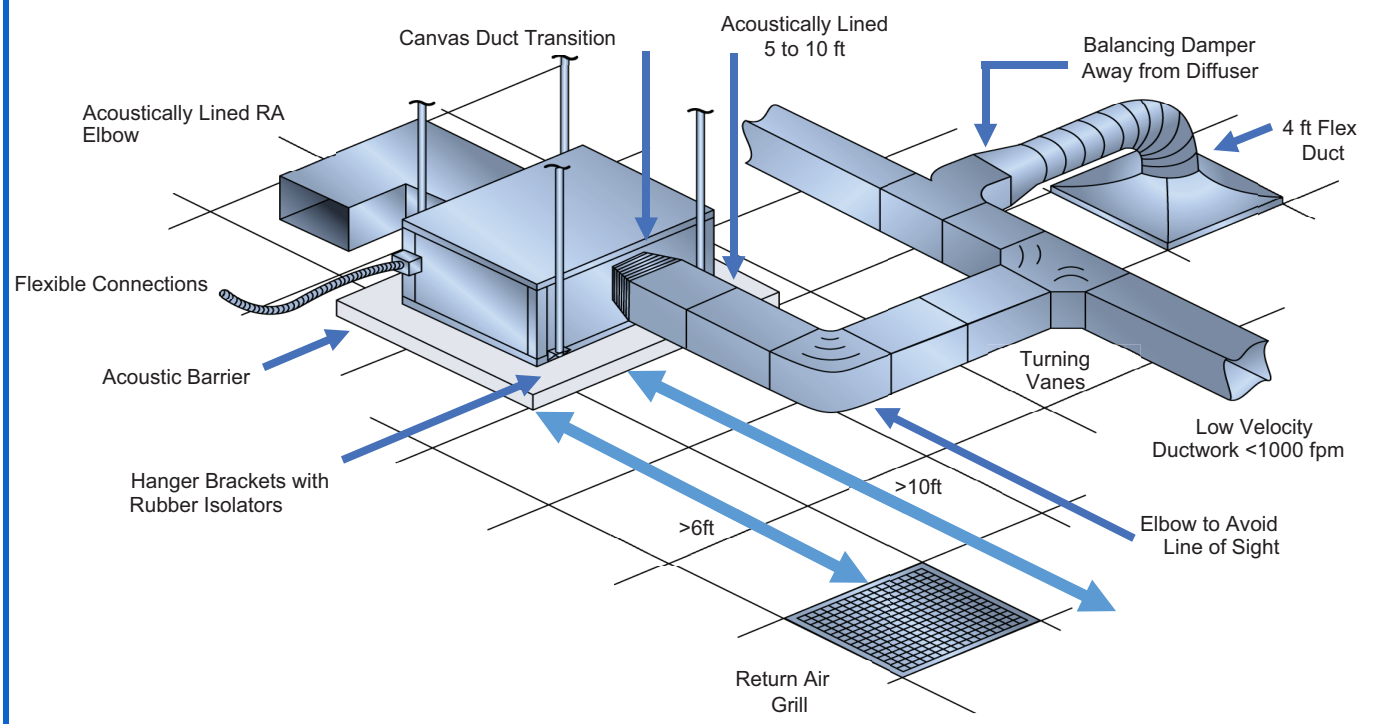
Horizontal units

General recommendations:

- Maximize the height of the unit above the ceiling.
- Make sure the WSHP unit is located at least 6 feet away from any ceiling return grille to prevent line-of-sight casing noise to reach the space below.
- Suspend the WSHP unit from the ceiling with hangers that utilize spring or neoprene type isolators to reduce vibration transmission.
- Utilize flexible – not rigid – electrical connections to the WSHP unit.
- Utilize flexible loop water and condensate piping connections to the WSHP unit.
- Use a canvas duct connector to connect the WSHP discharge to the downstream duct system. This reduces vibration-induced noise.
- Provide acoustic interior lining for the first 20 feet of discharge duct, or until the first elbow is reached. The elbow prevents line-of-site sound transmission in the discharge duct.
- Provide “turning” vanes in ductwork elbows and tees to reduce air turbulence.
- Size the sheet metal supply duct with velocities no greater than 1000 fpm.
- Make ductwork as stiff as possible.
- Use round duct whenever possible – it is less noisy.
- Allow at least 3 equivalent duct diameters of straight duct upstream and downstream of the unit before allowing any fittings, transitions, etc.
- Seal all penetrations around duct entering the space.
- Provide a four-foot runout duct made of flexible material to connect a diffuser to the supply trunk duct. The flex duct provides an “attenuating end-effect” and reduces duct transmitted sound before it reaches the space. Typically a 6 db sound reduction can be accomplished with the use of flex duct.
- Locate the runout duct balancing damper as far away from the outlet diffuser as possible. Locating the balancing damper at the trunk duct exit is best.
- If return air is drawn through a ceiling plenum, provide an acoustically lined return duct elbow or “L” shaped boot at the WSHP to eliminate line-of-sight noise into the ceiling cavity and possible through ceiling return air grilles. Face the elbow or boot away from the nearest adjacent WSHP unit to prevent additive noise.
- Do not hang the suspended ceiling from the ductwork.

Application data (cont)

Horizontal Units



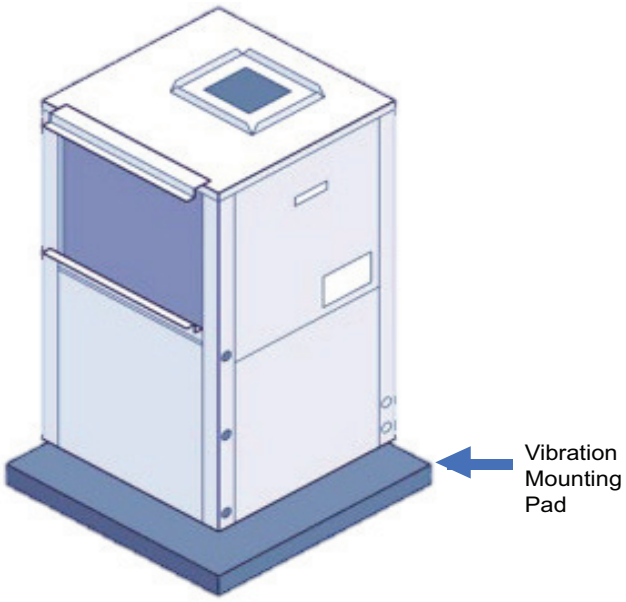
Application data (cont)

Vertical units

All the suggestions made for horizontal units equally apply for vertical units. However, due to the fact that vertical units tend to be installed in small equipment rooms or closets, a few more suggestions apply.

- Mount the unit on a pad made of high-density sound absorbing material such as rubber or cork. Extend the pad beyond the WSHP unit footprint by at least 6 inches in each direction.
- Since the units return air flows through a grille mounted in a closet door, provide a sound barrier or some other modification of the closet to prevent line-of-site noise into the space.
- Follow good duct design practice in sizing and locating the connection of the WSHP discharge to the supply duct system. Use an elbow with turning vanes, bent in the direction of the fan rotation to minimize turbulence. Make any duct transitions as smooth and as gradual as possible to again minimize turbulence and loss of fan static pressure.

Vertical Units



Hot gas reheat

Hot gas reheat (HGRH) allows a WSHP to dehumidify the space when the space temperature is satisfied but the space humidity is high. High humidity can promote mold and bacteria growth, create poor indoor air quality (IAQ), and cause occupant discomfort. Possible causes of excess humidity could be a byproduct of the unit having to operate under a widely varying load, an oversized unit that is short cycling, a high percentage of unconditioned outside air being introduced into the space, a high latent load in the space, or any location where humidity infiltration is a problem. A properly sized WSHP unit operating in cooling mode will dehumidify the air as it cools. Once the space temperature is satisfied and cooling mode is disabled, the unit no longer dehumidifies. Operating the unit in cooling mode for the sole purpose of dehumidifying will cause the space to become cold and uncomfortable. HGRH allows the unit to continue dehumidifying the space without over cooling the space. Dehumidification with HGRH requires a control system with dehumidification capabilities, such as a thermostat with dehumidification output, a thermostat with separate humidistat, or a DDC controller with humidity sensor and dehumidification output. Once the space temperature is satisfied but the space humidity is above the desired set point, the control system sends a dehumidification command (H input) to the WSHP. The WSHP is now in dehumidification mode. In dehumidification mode, the fan, reversing valve, HGRH valve, and compressor are all enabled. The reversing valve directs cold refrigerant liquid to the indoor air coil and the HGRH valve directs warm refrigerant vapor to the HGRH coil. As the fan draws warm, humid air into the unit, the air passes through the indoor air coil where it is cooled and dehumidified, due to the cold liquid refrigerant flowing in the coil. The cooled and dehumidified air then passes through the HGRH coil where it is reheated to a neutral temperature (68 to 78°F typical), due to the warm refrigerant vapor flowing in the coil. The air exits the unit at a neutral temperature and low humidity (dry). The unit will remain in dehumidification mode until the space humidity is reduced below the set point or there is a call for space cooling, which is prioritized over dehumidification mode. The moisture removal capacity of a WSHP in a specific application will depend on multiple factors including the WSHP sizing, the nominal latent capacity, the application airflow, the application temperatures and humidity, and the application fluid flow and fluid temperature. WSHP Builder can be utilized to simulate the performance of WSHP units with HGRH under the desired application conditions and will specify the unit leaving air dry bulb temperature and wet bulb temperature, which can be used to determine the leaving air relative and absolute humidity levels. The target leaving air dry bulb temperature for unit with HGRH in dehumidification mode is between 68 and 78°F. The target leaving air wet bulb temperature should result in a relative humidity of between 40 and 60%, based on the dry bulb temperature. If the relative humidity is too high, reduce the fan speed or increase the unit size until the desired conditions are met. Alternate methods of dehumidification with WSHPs include fan speed control and condenser water reheat. Fan speed control is one of the simplest and most efficient methods of dehumidification, but only provides dehumidification when the unit is in cooling mode. Condenser water reheat can be an effective method of dehumidification in boiler/tower applications, but is not very efficient. Condenser water reheat requires hot loop temperatures (which reduces cooling efficiency) to achieve a neutral discharge air temperature and requires an extra pump which adds to the unit power consumption. Condenser water reheat coils often have a higher airside pressure drop than HGRH coils, which results in higher fan energy consumption.

Waterside economizer

When considering providing waterside economizer with units, several key factors come into play to ensure optimal performance and efficiency. The geographical and climatic conditions of the installation site play a pivotal role, as waterside economizers are particularly effective in North/mild climates and geothermal or hybrid systems where low loop temperatures (40 to 60°F) can be sustained during low ambient conditions. The suitability of the system is heightened in cooling-dominant buildings with a constant cooling demand, maximizing energy savings. It is crucial to weigh the benefits of cooling savings from free cooling against any potential impacts on the airside and waterside pressure drops, as well as heating impact on units. Additionally, compliance with energy codes should guide the selection of the waterside economizer to align with regulatory standards and promote sustainable practices. These considerations collectively contribute to the successful application suitable for the waterside economizer, unlocking significant energy savings while advancing environmental sustainability goals.

Application data (cont)

A2L leak detection considerations

All WSHP units utilizing A2L classified refrigerants must follow UL Standard 60335-2-40. This standard ensures the safe design and use of equipment with A2L refrigerants by limiting refrigerant concentration in a space in the event of a leak. The standard specifies minimum installation area, refrigerant charge limits, and minimum circulation airflow and/or ventilation airflow requirements, and restricts the use of ignition sources in ductwork and spaces. Additionally, the standard may require a refrigerant leak detection system provided with the unit. For equipment using R-454B refrigerant with charge amounts of 64 oz. or less per circuit, UL 60335-2-40 does not require an installation area limit, or refrigerant leak detection system, circulation airflow, or ventilation airflow mitigation strategies. However, it is essential to evaluate ignition sources in ductwork. Depending on the application, ANSI/ASHRAE Standard 15, Safety Standard for Refrigeration Systems, may impose more stringent requirements than UL 60335-2-40 and therefore require the above mentioned mitigation measures.

Selection procedure

The electronic catalog (eCAT) selection tool is a web-based selection program recommended for all WSHP equipment selections. The tool provides guided configuration of WSHP units, all associated performance data, and comprehensive and professional equipment reports/submittals.

Selection Inputs

The following is a list of the primary information needed to select a water source heat pump unit.

Electrical

WSHP units are available in a variety of electrical configurations. The Voltage / Phase/ Hertz requirements for the project will need to be defined for the WSHP unit.

System Parameters

Entering Water Temperature (EWT)

The design entering water temperature will typically be the same for all units within the same source water loop meaning there will be a single set of design cooling and heating source water loop setpoints.

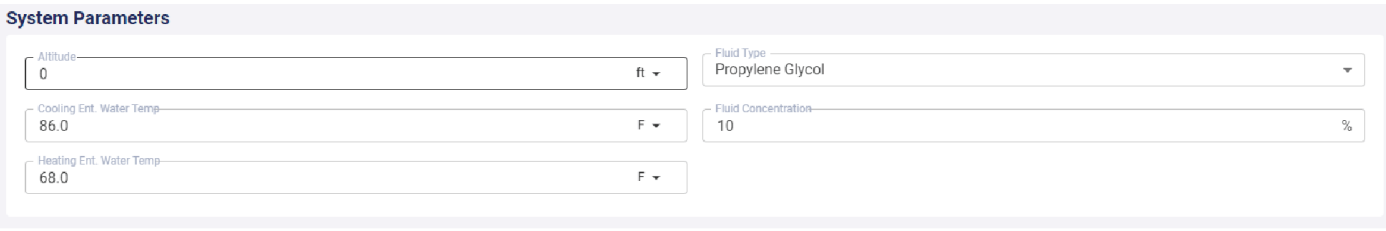
Fluid Type

The fluid type needs to be defined for the source water loop. This will typically be 100% water or a percentage of antifreeze concentration.

Altitude

When the altitude is defined the program will automatically apply any derates to the unit capacity associated with the varying air conditions.

System Parameters Screen



Design Parameters

Entering Air Temperature (EAT)

The design entering air temperature for both heating and cooling is required. For cooling this will be both a wet bulb and dry bulb temperature and for heating this will be dry bulb only. If outdoor air is being mixed in with the return air of the unit, the EAT will need to be the mixed air condition.

Airflow Rate

Typically, a single airflow rate will be defined for both heating and cooling operation. In general, these units are constant air volume units meaning they are not varying the airflow as a means of capacity or supply air temperature control. Airflow rates are often selected to maintain around 400 CFM/nominal cooling ton.

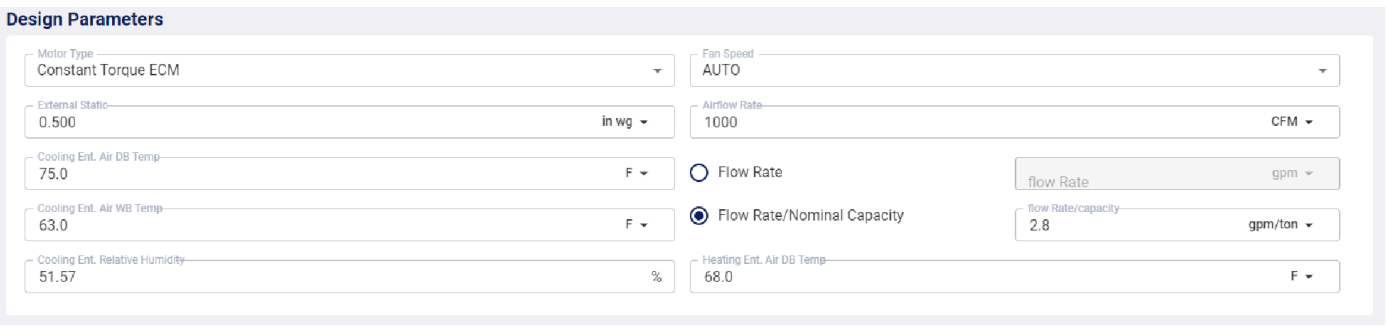
External Static Pressure

The external static pressure at the design airflow rate is required. ECAT will automatically factor in the airside pressure drop of optional airside components when evaluating fan performance.

Water Flow Rate

Water flow rate will vary among each unit in a system and is typically selected to maintain a target temperature difference or gpm/nominal ton for either cooling or heating operation.

Design Parameters Screen



Selection procedure (cont)

Capacity Requirements

Heating and Cooling Loads

Although both heating and cooling loads need to be considered when selecting WSHP units, they are often chosen based on cooling capacity, given that heating output is generally higher.

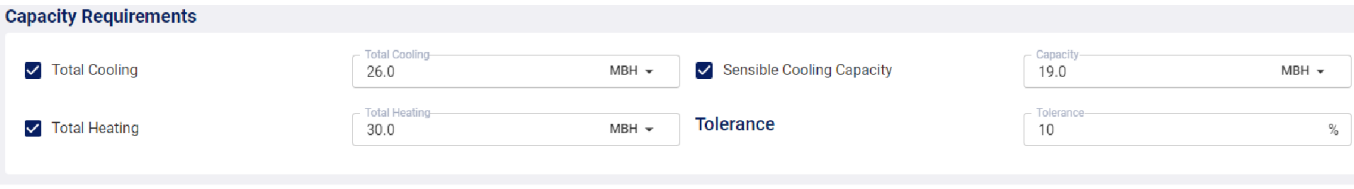
Unit Configuration

WSHP units are highly configurable with a wide variety of factory installed options and air/water flow configurations. The ECAT selection program will present the available options and configurations available to the particular unit of selection.

Accessories/Warranties/Start-Up

The electronic catalog (eCAT) selection tool integrates a range of field-installed accessories to meet the specific needs of each project. The selection of accessories includes hose kits, isolation/balancing valves, strainers, electric duct heaters, sensors, and thermostats. Beyond the unit's configuration and accessories, the selection process extends to warranty choices and equipment start-up options. This ensures a comprehensive and tailored approach to WSHP systems, allowing for customization based on the unique requirements of each project.

Capacity Requirements Screen

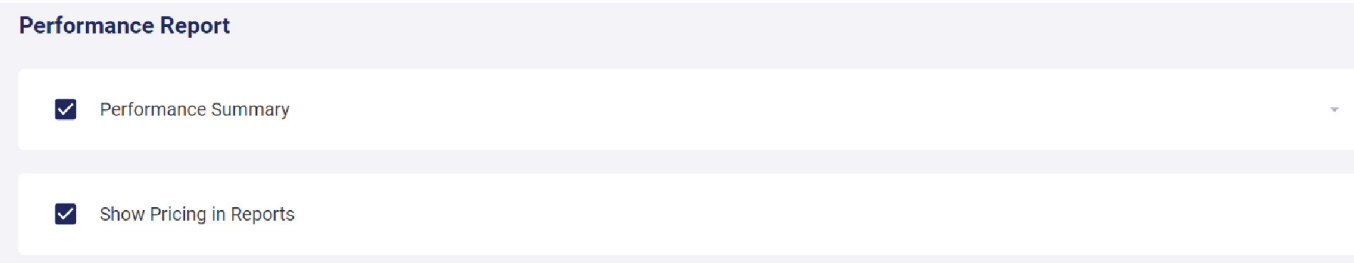


Selection Outputs / Reports

Performance Report

Upon completing the selection process, the eCAT tool delivers a concise performance report. This report encompasses key unit parameters such as size, model number, and system conditions. Additionally, it includes crucial electrical data and unit performance metrics based on the specified conditions. The report goes a step further by incorporating the unit's fan curve, offering a visual representation of its airflow characteristics. This concise performance report ensures that users have a clear and easily digestible overview of the chosen WSHP unit, facilitating informed decision-making and streamlined documentation for project evaluation.

Performance Report

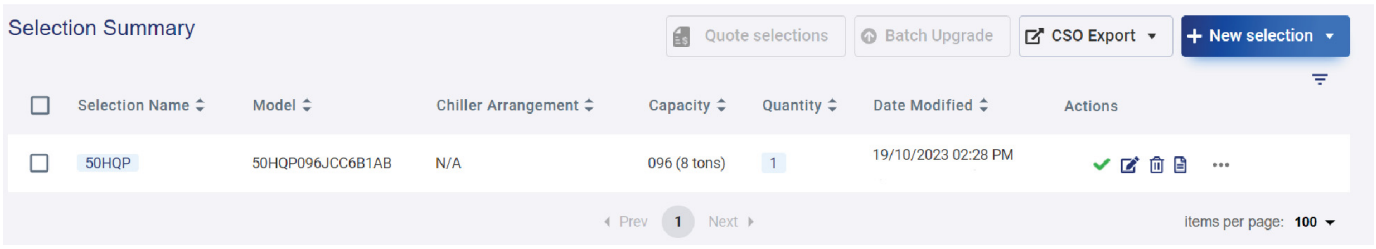


Selection procedure (cont)

Submittal report

Within the project overview section of the eCAT, users have the option to generate a tailored submittal report. This customizable report features selectable sections to include essential project documentation.

Submittal Report



Selectable Sections

- Cover Sheet — Includes project name, tag name and report's generated date.
- Unit Report — Offers detailed insights into the selected water source heat pump (WSHP), including size, model number, unit size, overall dimensions, weight, electrical data, selected options and accessories and warranty information.
- Certified Drawings — Provides detailed dimensional information about the unit.
- Detailed Performance Report — Offers a comprehensive overview of the WSHP's electrical and performance data, along with its fan curve.
- Guide Specifications — Outlines key installed options and unit's details.
- Acoustical Report — Provides rated sound data of the unit.

Packaged Water Source Heat Pumps

Engineering Guide Specifications

Size Range: **HQP 72,000 to 242,000 Btuh Cooling Capacity**
VQP 72,000 to 360,000 Btuh Cooling Capacity

Carrier Model Number: **50HQP, VQP**

Part 1 — General

1.01 SYSTEM DESCRIPTION

A. Install water source heat pumps, as indicated on the plans with capacities and characteristics as listed in the schedule and the specifications that follow. Units shall be horizontal or vertical configurations. All equipment shall be rated and certified in accordance with ANSI/AHRI/ASHRAE/ISO (American National Standard Institute/Air-Conditioning, Heating and Refrigeration Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers/International Organization for Standardization) 13256-1. All equipment shall be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL-60335-2-40 for the United States and CSA C22.2 No. 60335-2-40 for Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI/ISO and ETL-US-C labels.

B. Units shall be supplied completely factory built and capable of operation with an entering water temperature range from 20 to 110°F. Quality control system shall automatically perform via computer: triple leak check, pressure tests, evacuation and accurately charging of system, detailed heating and cooling mode tests, and quality cross checking all operational and test conditions to pass/fail criteria.

C. Units shall be individually packaged on wooden skids with protective corner posts and plastic stretch wrapping for maximum protection.

1.02 QUALITY ASSURANCE

A. All equipment listed in this section must be rated in accordance with ANSI/AHRI/ASHRAE/ISO 13256-1 performance standard, latest edition. The applicable units shall have an AHRI/ISO label. Standard cabinet panel insulation shall meet NFPA (National Fire Protection Association) 90A requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM-C1071 and ASTM G21 and shall meet zero level bacteria growth per ASTM (American Society for Testing and Materials) G22.

B. All units shall be factory tested in all operating modes and safety switch operation shall be verified.

C. Serial numbers will be recorded by the factory and furnished to the contractor for ease of unit warranty status.

1.03 WARRANTY:

The manufacturer shall warranty the unit's parts for a period of 12 months from start-up or 18 months from shipping (whichever occurs first). The manufacturer shall warranty the compressor (parts only) for a period of up to 5 years from shipping.

[Optional] Units shall have the option for an extended warranty.

Part 2 — Product

2.01 EQUIPMENT

A. General: Units shall be completely assembled, piped, internally wired, and fully charged at the factory.

B. Basic Construction:

1. The cabinet shall be fabricated from heavy gauge galvanized steel for superior corrosion protection. All interior surfaces shall be lined with 1/2 in. thick, multi-density, coated, fiberglass insulation. Insulation must be non-combustible, non-hydroscopic and anti-fungal. Insulation must meet NFPA 90A and 90B for fire protection as well as Fire Hazard classification 25/50 (per ASTM E84 and UL 723 and CAN/ULC S102-M88), ASTM C1071, erosion requirements of UL181 and be certified to meet GREENGUARD indoor air quality standards for low emitting products. One blower access panel and two compressor compartment access panels shall be removable with supply and return air ductwork in place.
2. [Optional] Closed cell foam (CCF): CCF shall be installed on interior surfaces of water source heat pump and shall meet the density and compression requirements of ASTM D 1056, the water absorption requirements of ASTM D-1667 and the tensile and elongation requirements of ASTM D-412. Closed cell foam shall meet the flammability requirements of FMVSS302, UL94 and ASTM E84.
3. Units shall have the following airflow arrangements available. The contractor shall be responsible for all extra costs incurred as a result of the unavailability of these airflow arrangements. Additionally, the discharge and return connections cannot be reconfigured in the field, as this can compromise the structural integrity of the unit and will void the warranty.
   a. Horizontal units: Left Return/Right Discharge, Left Return/Back Discharge, Right Return/Left Discharge.
   b. Vertical units: Front Return/Top Discharge, Front Return/Rear Discharge, Rear Return/Top Discharge, Rear return/Front Discharge, Rear Return/Rear discharge.
4. All units shall have a stainless-steel drain pan as standard to comply with this project's IAQ (indoor air quality) requirements. Painted steel or plastic is not acceptable. Drain pan must include a condensate overflow safety switch that will shut the unit down in an overflow event.
5. All units shall have a factory-installed 1 in. two-sided filter rack capable of accepting 1 in. filters. Units shall have a 1 in. thick throwaway type

fiberglass filter as standard. The filter rack shall incorporate a 1 in. duct flange.

6. [Optional] Units shall have 4-sided 2 in filter rack with a 1 in. thick throwaway type fiberglass filter (MERV 5) for ducted return connection. The filter rack shall incorporate a 1 in. duct flange.
7. Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. Supply and return water connections shall be brass female pipe thread (FPT) fittings and mounted flush to cabinet exterior. Connections that require a backup wrench or that extrude past the unit corner post are not acceptable. Condensate connection will be stainless steel female pipe thread fittings. Plastic is not acceptable.
8. Horizontal units shall be provided with integral angle iron frames (qty 2) that include mounting holes, allowing the unit to be suspended from the ceiling using rods.
9. [Optional] Mute Package shall consist of compressor blanket installed in the unit for additional sound attenuation.
10. [Optional] Take Apart Construction option shall be provided for vertical units, providing an opportunity to divide the unit into two sections: an evaporator coil/fan and condenser coil/compressor sections in the field. Units with this option are shipped as a single piece and include pre-cut interconnecting piping and coiled-up blower motor wiring for field connection. Each section is factory charged with nitrogen, and refrigerant is added to the unit in the field per unit data plate in the field.

C. Fan and Motor Assembly:

1. The fan(s) shall be belt driven DWDI forward curved type with dynamically balanced wheel(s). The fan motor(s) shall be 1725 or 3450 rpm 56 frame sealed ball bearing type. The motor(s) shall be permanently lubricated and have thermal overload protection.
2. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule. External static pressure rating of the unit shall be based on a wet coil. Ratings based on a dry coil shall not be acceptable.
3. Motors shall be rated for use with variable frequency drives (VFDs) (except 575V units and motors below 2 hp).
4. [Optional] Variable Frequency Drive (VFD) shall be factory installed and include the following:
   a. [Variable air volume (VAV) units only] VFD motor control device, factory-mounted, wired and tested. The VFD shall control motor speed to maintain set point static pressure at the supply duct sensor location.
   b. [Variable air volume (VAV) units only] Supply air temperature and duct static pressure sensors shall be factory supplied (ships in control enclosure) for field installation for units with SCU Open controller.
   c. [For Constant volume (CV) units only] VFD shall be wired for 2-speed staged air volume operation.

D. Refrigerant Components:

1. Units shall use R-454B refrigerant. All units shall have a factory sealed and fully charged refrigerant circuit.
2. Hermetic Compressor:

   Hermetic scroll compressors shall be specifically designed for R-454B refrigerant and shall be internally sprung, externally isolated and with thermal overload protection. Unit compressors shall have rubber isolators to prevent transmission of vibration to the structure.
3. Refrigerant metering shall be accomplished with a thermostatic expansion valve. Units with only capillary tubes are not acceptable.
4. The finned tube heat exchanger shall be constructed of lanced aluminum fins not exceeding sixteen fins per inch bonded to rifled copper tubes in a staggered pattern and will have a 600 psig working refrigerant pressure. The heat exchanger shall have aluminum end sheets.
5. [Optional] The finned tube heat exchanger shall have an optional protective coil coating. This corrosion protection shall consist of tin-plated copper tubing with coated aluminum fins that must pass 1,000 hours of ASTM B117 salt fog testing. Painted, dipped or e-coated heat exchangers are not acceptable.
6. Reversing Valve: Reversing valves shall be four-way solenoid activated refrigerant valves that will fail in the heating operation should the solenoid fail to function. Reversing valves that fail to the cooling operation shall not be allowed.
7. Coaxial (tube in tube) refrigerant-to-water heat exchanger. Refrigerant-to-water heat exchangers shall be of copper inner water tube and steel outer refrigerant tube design rated to withstand 600 psig working refrigerant pressure and 400 psig working water pressure. Shell and tube style refrigerant to water heat exchangers shall be treated as pressure vessels and shall require refrigerant pressure relief valves piped to the exterior of the building. The contractor supplying the water source heat pumps with shell and tube heat exchangers shall be responsible for any additional installation costs. Brazed plate water-to-refrigerant heat exchangers shall require additional centrifugal separators added to the supply water piping at each unit. Each separator shall have an automated clean out valve piped to a waste line. The contractor supplying water source heat pumps with brazed plate heat exchangers shall be responsible for any additional costs.

8. A2L refrigerant leak detection shall be provided with units exceeding refrigerant charge 64 oz. per circuit for the refrigerant leak detection system.
9. [Optional] Cupronickel coaxial water-to-refrigerant heat exchangers shall be provided, with cupronickel inner water tube construction.
10. [Optional] Hot Gas Reheat (HGRH) for Constant volume (CV) or Staged Air Volume (SAV) units: Units shall be equipped with optional hot gas reheat coil. On/Off HGRH shall be controlled by a thermostat with dehumidification output, humidistat, or DDC control connected to the unit H terminal and shall start the unit in the reheat mode should the humidity be above the set point once the space temperature is satisfied. Cooling or heating requirements shall take precedent over HGRH.
11. [Optional] Modulating Hot Gas Reheat for Variable Air Volume (VAV) units: Units shall be equipped with fully modulating hot gas reheat (MHGRH). The MHGRH valve shall be controlled by the unit DDC controls to help control discharge air conditions.
12. [Optional] Hot Gas Bypass: Units shall be supplied with an ETL listed hot gas bypass valve with factory supplied and installed controls to prevent air coils from frost development by taking hot gas and bypassing the water coil and expansion device and reintroducing the hot gas into the refrigeration line prior to the air coil. The hot gas bypass valve shall maintain a minimum refrigerant suction pressure to allow for a light load cooling module or a low entering air temperature cooling mode. The HGBP valve shall be factory set for opening pressure to 105 psig (sizes 072-120), and 120 psig (sizes 150-360), and this set point can be adjusted on sizes 072-120 (95-115 psig), and sizes 150-360 (75-150 psig) in the field.
13. Safety controls shall include both a high pressure and low-pressure switch. Temperature sensors shall not replace these safety switches.
14. Refrigerant pressure test ports shall be factory installed on high and low-pressure refrigerant lines to facilitate field service. Unit shall be equipped with a dedicated access panel for the test ports not requiring removal of the primary cabinet panels to access the test ports.
15. Activation of any safety device shall prevent compressor operation via a lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. Units which may be reset at the disconnect switch only shall not be acceptable.
16. [Optional] Condenserless option shall be included with the unit, allowing the unit to be paired with a field provided remote condenser. The unit with this option is provided without water to refrigerant condenser coil. The field provided condenser must be dual-circuit and must be sized based on total heat of rejection.
17. [Optional] Cooling only option shall be included with the unit, which excludes a reversing valve from the refrigerant circuit.

E. Hydronic Factory Installed Options:
   1. [Optional] Waterside Economizer: Waterside economizer shall be completely installed at the factory, with an additional condensate drain pan, motorized 3-way valve, and all internal electric controls. Waterside economizer assembly shall be rated at minimum 450 psig and UL (Underwriters Laboratories) listed for applications with the heat pump. This option is externally mounted outside the unit.
   2. [Optional] Hot water coil shall be factory-installed on the inlet side of the direct expansion cooling coils with field piping connections on the side of the unit. The hot water control valve is to be provided in the field by other parties.

F. Controls and Safeties:
   1. Electrical:
      a. Controls and safety devices will be factory wired and mounted within the unit. Controls shall include fan relay, compressor contactor, 24-v transformer, reversing valve coil, and Unit Protection Module (UPM). The standard transformer shall be rated for a minimum 75 VA, and 100 VA for units with HGRH, or WSE, or Boilerless E-heat option, or TruVu™ controller, or SCU Open controller. All units shall be name plated for use with time-delay fuses or HACR circuit breakers. Unit controls shall be 24-v and provide heating or cooling as required by the remote thermostat/sensor.
      b. All units shall have a factory installed and labeled terminal strip input for field provided thermostat or DDC controller.
      c. Units shall include a factory provided wiring diagram on the inside of the control access panel.
      d. Units shall have a short circuit current rating (SCCR) of no less than 5 kA.
      e. All units shall have a Unit Protection Module (UPM) printed circuit board which implements following equipment safeties:
         1) Anti-short cycle time delay (5-minute delay on break).
         2) Random start time delay on initial power.
         3) Brownout/surge/power interruption protection.
         4) 120 second low pressure switch bypass timer.
         5) High refrigerant pressure shutdown.
         6) Low refrigerant pressure shutdown.

7) Water coil freeze protection shutdown.
8) Air coil freeze protection shutdown.
9) High condensate level shutdown.
10) 24 vac alarm output for remote fault indication.
11) Refrigerant leak shutdown.
12) Intelligent alarm reset

f. The UPM shall automatically reset after a safety shutdown. Restart the unit if the cause of the shutdown no longer exists (except for low temperature and high condensate level shutdowns). Should a fault re-occur within 60 minutes after reset, then a "hard" lockout will occur. A light-emitting diode (LED) shall indicate the following alarms: brownout, high refrigerant pressure, low refrigerant pressure, low water temperature and a high level of condensate in the drain pan, refrigerant leak fault. The LED will display each fault condition as soon as the fault occurs. If a hard lockout occurs, then the fault LED will display the type of fault until the unit is reset.

The UPM shall feature the following field configurable adjustments:

1) Lock out reset on thermostat interruption or power reset.
2) Two or four restart attempts before a hard lockout.
3) Test mode (reduces all time delays to 5 seconds for diagnostic work).
4) Air/water coil freeze limit trip.

g. [Optional] Units shall have all the UPM features above and additionally TruVu™ DDC controller shall have an advanced controls logic and include following features:

1) Three-speed fan control. Controller shall automatically, based upon space temperature input, operate the fan at the lowest of 3 selectable speeds to achieve space temperature set point. (Exception: 575V units with motor and units without VFD)
2) Two-position OA (outdoor air) damper
3) Modulating OA damper with DCV (demand controlled ventilation)
4) Hot gas reheat solenoid valve
5) Two-position water economizer control
6) Modulating water economizer control
7) Two stage electric auxiliary heat control
8) Scheduling
9) Adaptive optimal start
10) Equipment performance monitoring
11) Alarm status

TruVu™ controller must be capable of communicating over BACnet®[1] IP, supporting direct connection or daisy chain topologies using BACnet®/IP for seamless integration into building automation systems, and shall have the ability to be viewed in the TruVu™ Equipment Touch (ET), or field assistant user interface.

h. [Optional] Units shall have all the UPM features above and additionally SCU Open DDC controller shall have an advanced controls logic and include following features:

1) Variable air volume (VAV) control
2) High/Low static lockout
3) Supply Fan Status
4) UPM Alarm
5) Filter Status
6) Fire/Smoke Detector alarm
7) Condenser Water Temperature alarm
8) Static Pressure Sensor Failure alarm
9) High and low supply air temperature alarm

i. [Optional] Boilerless control shall activate an electric heater and disable compressor when water temperature drop below set point.

j. [Optional] Energy management switch to enable remote operation of WSHP (water source heat pump).

k. [Optional] Pump-valve relay to enable a pump/valve operation when calling for compressor operation.

l. [Optional] Compressor status relay shall be provided to monitor a status of the compressor via normally open set of dry contact.

G. Accessories:

1. Hydronic accessories:

a. Hose Kits

All units shall be connected to main water supply and return headers with hoses. The hoses shall be 2 or 3 feet long, braided stainless steel rated to 400 psig at 265°F. Hoses may contain optional ball valves with P/T ports, Y strainers with blow down valves and/or auto flow regulators as specified in the schedule.

b. Two-position motorized isolation valve (2-way solenoid valve)

Two-position motorized isolation valve (2-way solenoid valve) with end switch is available for field installation. The two-way motorized solenoid valve is rated for a 125 psig working pressure. The valve shall be field wired to open with compressor operation.

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c. Ball Valves (Brass Body)

Valves shall be available for shutoff and balancing water flow. Available with memory, memory stop, and pressure temperature ports (600WOG at 325°F).

d. Y Strainers (Bronze Body)

Strainers are "Y" type configuration with a brass cap. Strainer screen shall be made of stainless steel (600WOG at 325°F).

2. Controls accessories:

a. Carrier commercial thermostat controls are available as follows:

1) Edge® Pro 7-day programmable thermostat offers 2-stage heat, 2-stage cool, remote contact input, remote sensor capability, pre-occupancy purge, soft start, manual/auto changeover, 4 settings per day, 24 vac, backlit LCD, keypad lockout, no batteries required, 5-minute compressor protection, never lost memory, 3 security levels, and temperature display in degrees F or C.

2) Comfort Pro Programmable Thermostat, 2-stage Heat /2-stage Cool G/E plus 1-stage auxiliary or emergency heat HP and WSHP, or 2-stage cool/heat only, Touch n Go™ prog. (OCC/UNOCC/LIMIT), Passcode protection, remote sensor capability with override, random start, Manual /Auto-Changeover, Outdoor/supply/return temp, hospitality mode, option battery powered.

3) Carrier Connect™ Wi-Fi®[1] 7-day programmable/non-prog; 4.3" touch screen, web enabled (portal), smartphone app, 1-2 stage heat/1-3 stage cool, G/E, HP (with 2-stage aux heat), remote sensor capability, manual / auto-changeover, humidify / dehumidify / Humidi-MiZer®.

4) Non-Branded Wi-Fi®[1] 7-day programmable/non-prog; 4.3" touch screen, web enabled (portal), smartphone app, 1-2 stage heat/1-3 stage cool, G/E, HP (with up to 2-stage aux heat), remote sensor capability, manual / auto-changeover, humidify / dehumidify / Humidi-MiZer®.

5) ComfortVu BACnet® Thermostat, 24 vac Thermostat, offers a large backlit LCD display and intuitive push-button controls for easy operation, BACnet MS/TP port, 2 universal inputs, 2 universal outputs, and 4 relay outputs. It allows control over up to 3 stages of heating and 2 stages of cooling, along with up to 3 fan speeds.

b. ZS sensors for TruVu™ DDC (direct digital controls) control option. Sensors are available as follows, and all sensors below offer monitoring of space temperature only, or space temperature and CO_2, or space temperature and humidity, or space temperature and CO_2 and humidity.

1) ZS Standard sensor with a communication port.

2) ZS Plus sensor with communication port, occupancy status indicator, local occupancy override and set point adjustment.

3) ZS Pro sensor with communication port, occupancy status indicator, local occupancy override, set point adjustment, LCD (liquid crystal diode) display, alarm indicator and fan speed control.

4) ZS Pro-F sensor with communication port, occupancy status indicator, local occupancy override, set point adjustment, LCD display, alarm indicator, fan speed control, cooling/heating/fan only mode control and °F to °C conversion.

c. TruVu™ Equipment Touch (ET) for unit start-up and commissioning shall be available in 7" and 10" touch screen sizes for panel or wall mounting. All point objects will have the ability to be viewed in the TruVu™ ET user interface.

3. Electric Duct Heaters:

a. Duct heater shall be slip-in type and shall be UL approved for zero clearance to combustible surfaces. The heater shall bear a UL/CSA label. Control panel and element housing shall be constructed of heavy gauge galvanized steel. All heating elements shall be made of nickel/chromium resistance wire with ends terminated by means of staking and heliarc welding to machine screws. Heating element support structure shall consist of galvanized steel wire formed and constructed to support ceramic bushings through which the heating element passes. Control cabinet shall be constructed of heavy gauge galvanized steel with multiple knockouts for field wiring. Control cabinet shall have a solid cover also of heavy gauge galvanized steel and held in place with hinges and tool-release latches.

b. Duct heater shall be supplied with primary over-temperature protection by built in disc type automatic reset thermal cutouts and secondary over-temperature protection by built in disc type manually resettable thermal cutouts. These devices must function independently of one another and are not acceptable if series connected in the control circuit wiring. A disconnecting magnetic control circuit is required. All duct heaters

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will require either a fan interlock circuit or an airflow switch.

c. Over-current protection by means of factory-installed fusing within the control cabinet shall be provided for heaters rated at more than 48 amps. Heating elements shall be subdivided and fused accordingly.

d. All wiring, component sizing, component spacing and protective devices within the control cabinet shall be factory installed and comply with UL standards. All heaters shall function properly with a 60 Hz power supply.

e. A wiring diagram depicting layout and connections of electrical components within the control cabinet shall be affixed to the inside of the control cabinet cover.

f. A rating plate label shall be affixed to the exterior of the control cabinet cover which states model number, serial number, volts, amps, phase, frequency, control volts, volt-amps and minimum airflow requirements.

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