Product Data

Aquazone™

Water-to-Water Source Heat Pump

2 to 35 Nominal Tons

NOTE: 50PSW unit shown with special order unit mounted controller.

50PSW025-420 Water Source Heat Pump

Overview

Carrier's Aquazone™ WSHPs are a flexible, clean solution for tempering ventilation air or, in hydronic applications, as stand-alone boilers/ chillers.

Carrier's Aquazone™ water-to-water source heat pumps (WSHPs) are designed for quality and high performance over years of operation.

- Performance rated according to ISO 13256-2 and ASHRAE 90.1.
- Provides both chilled and hot water.
- Part load performance with 2-stage operation for sizes 025-122 and 240-420 (dual independent refrigerant circuits for sizes 122, 240-420). Size 180 and 210 are single stage units.
- High-efficiency scroll compressors.
- Thermostatic expansion valve (TXV).
- Available mute package.
- Standard low temperature insulation for extended range operation.
- For general service and access to the electrical panel as standard, 3 ft of clearance through the front of the unit is required. We also recommend 3 ft of clearance around the unit to gain access to the heat exchangers on the side and the TXV and liquid line filters on the back.
- Flexible and reliable controls accommodate all systems.
- 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.

High quality construction and testing

All units are manufactured to meet extensive quality control protocol from start to finish through an automated control system, which provides continuous monitoring of each unit and performs quality control checks as equipment progresses through the production process. Standard construction features of the Aquazone units include:

Cabinet

Standard cabinet construction consists of heavy gauge galvanized sheet metal that provides maximum strength. Cabinet interior surfaces are lined with 1/2 in. thick, 1-1/2 lb acoustic type insulation. All exterior sheet metal surfaces are powder-painted to increase corrosion protection and resilience for long term vitality. Cabinets are designed with service access panels on the front for easy accessibility.

Compressors

Standard high-efficiency scroll compressors are mounted on rubber grommets to large, heavy gage mounting tray plates, which are then isolated from the cabinet base with rubber grommets. This dual level vibration isolation system dramatically increases vibration attenuation.

Refrigeration circuit

All units contain sealed refrigerant (R-454B) circuit including features like:

- Thermal expansion valve — 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.

Refrigerant to water heat exchanger

50PSW units are offered with a Copper coaxial (tube-in-tube) refrigerant to water heat exchangers. Optional cupronickel coaxial heat exchanger is available for higher corrosion protection. 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.

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 provided controller (thermostat or third party DDC), or to be provided with a factory-installed Carrier i-Vu® WSHP Open DDC for advanced equipment control and monitoring. 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.

Safe, reliable operation

Standard safety features for the refrigerant circuit include a high-pressure switch and low-pressure sensor to detect loss of refrigerant. Equipment safety features include water loop temperature monitoring, voltage protection, and source freeze protection.

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 unit is shipped to provide internal and external equipment protection. Shipping supports are placed under the compressor feet.

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Overview (cont)

Ease of installation

The unit is packaged for simple low cost handling, with minimal time required for installation. All units are pre-wired and factory charged with refrigerant. Water connections utilize FPT (female pipe thread), high and low voltage knockouts, and an easily accessible design reduce installation time and save mechanical room space.

Simple maintenance and serviceability

For better flexibility in confined spaces, access for maintenance and service is provided from three sides of the unit. Large access panels on the top, side, and front of the unit maximize exposure for all components. 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. All maintenance and service can be completed through the front of the unit, allowing multiple units to be installed side-by-side.

Quiet operation

Rubber grommets are provided for sound isolation and cabinets are fully insulated to reduce noise transmission.

Design flexibility

Extended water temperature range between 25°F and 110°F offers maximum design flexibility for all applications. Factory-installed options are offered to meet specific design requirements.

Model number nomenclature

1 2 3 4 5	6 7 8	9	10	11	12	13	14	15	16
50PSW	360	C	D	C	5	B	C	A	A

Model Series (Pos 1-5)

50PSW – **Aquazone™ Water to Water Source WSHP**

Nominal Capacity (Pos 6-8)

025 – 2 Tons	**071** – 6 Tons	**240** – 20 Tons
035 – 3 Tons	**122** – 10 Tons	**360** – 30 Tons
049 – 4 Tons	**180** – 15 Tons	**420** – 35 Tons
061 – 5 Tons	**210** – 18 Tons	

Load Coil Material (Pos 9)

C – Copper
N – Cupro-Nickel

Control / Transformer Options (Pos 10)

A – Unit Protection Module (UPM) / 75 VA[a]
B – Unit Protection Module (UPM) / 100 VA
D – UPM + WSHP Open, 100 VA
G – UPM + Compressor Status Relay (SR), 75 VA xfer[a]
H – UPM + Compressor Status Relay (SR), 100 VA xfer
J – UPM + Pump Relay (PR), 75 VA xfer[a]
K – UPM + Pump Relay (PR), 100 VA xfer
L – UPM + EMS Relay (EMS), 75 VA xfer[a]
M – UPM + EMS Relay (EMS), 100 VA xfer
U – UPM + SR + PR, 75 VA xfer[a]
V – UPM + SR + PR, 100 VA xfer
W – UPM + EMS + SR, 75 VA xfer[a]
X – UPM + EMS + SR, 100 VA xfer
Y – UPM + EMS + PR, 75 VA xfer[a]
Z – UPM + EMS + PR, 100 VA xfer

Source Coil (Pos 11)

C – Copper
N – Cupro-Nickel

Refrigerant Leak Detection System (Pos 16)

X – No Refrigerant Leak Detection System
A – Refrigerant Leak Detection System Included[b,c]

Options (Pos 15)

A – None
D – DP Flow Switches
J – Mute Packages
K – Mute Package and DP Flow Switches

Refrigeration Options (Pos 14)

C – None
D – Heat Recovery Package (HWG)

Revision (Pos 13)

B – R-454B Refrigerant

Voltage (Pos 12)

1 – 575-3-60
3 – 208/230-1-60
4 – 265-1-60
5 – 208/230-3-60
6 – 460-3-60
G – 280/230-3-60 with Phase Monitor
H – 460-3-60 with Phase Monitor
J – 575-3-60 with Phase Monitor

NOTE(S):

a. 75 VA transformer only available on sizes 025-071.
b. Refrigerant Leak Detection System is standard on sizes 071-420.
c. Refrigerant Leak Detection System includes A2L sensor and exhaust fan.

LEGEND

CuNi — Cupro-Nickel
DP — Differential Pressure
EMS — EMS Relay
HWG — Hot Water Generator
PR — Pump Relay
SR — Compressor Status Relay
UPM — Unit Protection Module
WSHP — Water Source Heat Pump

AHRI/ISO capacity ratings

50PSW Capacity Unit Ratings[a,b]

50PSW UNIT SIZES	SOURCE FLUID FLOW RATE (GPM)	LOAD FLUID FLOW RATE (GPM)	WATER LOOP				GROUND WATER				GROUND LOOP			
			Cooling		Heating		Cooling		Heating		Cooling		Heating	
			Load Temp 53.6°F Source Temp 86°F		Load Temp 104°F Source Temp 68°F		Load Temp 53.6°F Source Temp 59°F		Load Temp 104°F Source Temp 50°F		Load Temp 53.6°F Source Temp 77°F		Load Temp 104°F Source Temp 32°F	
			Capacity (Btu/hr)	EER	Capacity (Btu/hr)	COP	Capacity (Btu/hr)	EER	Capacity (Btu/hr)	COP	Capacity (Btu/hr)	EER	Capacity (Btu/hr)	COP
025 Full	6	6	22,600	15.80	31,400	5.09	24,400	24.40	25,600	4.25	23,600	18.70	19,800	3.26
025 Part	6	6	16,500	17.00	22,800	5.48	18,100	29.20	17,900	4.05	17,900	25.00	15,800	3.46
035 Full	9	9	32,400	14.50	45,000	4.80	34,600	21.50	37,200	3.96	33,000	16.50	28,800	3.16
035 Part	9	9	22,400	14.70	31,600	4.90	25,000	24.90	25,600	3.86	24,600	21.20	22,200	3.26
049 Full	10	10	40,500	12.50	55,000	4.11	45,500	19.80	46,500	3.56	42,500	14.70	38,000	2.97
049 Part	10	10	27,200	12.80	37,400	4.21	32,000	22.80	31,200	3.36	30,800	19.10	27,200	2.97
061 Full	13	13	52,500	13.00	71,000	4.31	59,000	20.10	60,000	3.66	55,500	15.30	49,500	3.06
061 Part	13	13	38,500	13.60	52,500	4.41	43,600	22.90	44,000	3.66	42,000	19.50	39,500	3.26
071 Full	15	15	60,500	13.50	84,000	4.50	69,000	20.80	70,000	3.76	64,000	15.80	57,000	3.06
071 Part	15	15	45,500	13.70	63,000	4.50	52,500	23.40	52,000	3.66	51,000	19.80	46,000	3.16
122 Full	30	30	115,000	13.70	152,000	4.43	130,000	21.00	128,000	3.74	120,000	15.90	102,000	3.00
122 Part	30	30	57,500	12.90	76,000	4.23	65,000	19.40	64,500	3.58	63,500	16.40	57,500	3.20
180 Full	34	27	124,000	12.90	174,000	4.10	135,000	19.80	140,000	3.42	130,000	15.00	109,000	2.85
210 Full	40	32	156,000	12.30	224,000	4.10	172,000	18.80	182,000	3.43	162,000	14.20	146,000	2.78
240 Full	56	44	212,000	13.00	304,000	4.27	228,000	19.60	250,000	3.64	216,000	14.80	204,000	3.08
360 Full	68	54	244,000	13.00	348,000	4.27	276,000	20.50	284,000	3.56	256,000	15.20	226,000	2.92
420 Full	80	64	312,000	12.00	465,000	4.10	338,000	19.00	366,000	3.43	316,000	14.40	292,000	2.72

NOTE(S):

a. Rated in accordance with AHRI (Air-Conditioning, Heating and Refrigeration Institute) and ISO (International Organization of Standardization) Standard 13256-2 and ASHRAE (American Society of Heating, Refrigeration, and Air-Conditioning Engineers) Energy Standard 90.1 programs.
b. 50PSW units are AHRI certified up to 10 tons.

LEGEND

COP — Coefficient of Performance
EER — Energy Efficiency Ratio

Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to www.ahridirectory.org.

Physical data

50PSW025-420 Physical Data

50PSW SERIES	025	035	049	061	071	122	180	210	240	360	420
Compressor Type	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Compressor Qty (ckts)	1	1	1	1	1	2	1	1	2	2	2
Max Water Working Pressure (psig/kPa)	450/3100	450/3100	450/3100	450/3100	450/3100	450/3100	450/3100	450/3100	450/3100	450/3100	450/3100
Water Connection Size											
FPT	3/4"	3/4"	1"	1"	1"	1-1/4"	1-1/2"	1-1/2"	2"	2"	2"
Coaxial Coil Volume (gal)	0.49	0.49	0.64	0.77	1.05	1.00	3.31	3.31	1.00	3.31	3.31
Refrigeration Charge (oz/ckt)	49	46	50	60	74	71	238	224	150	236	216
Weight - Operating (lb)	240	250	280	310	430	720	850	890	1230	1550	1700
Weight - Shipping (lb)	260	270	300	330	450	740	870	910	1260	1580	1730

Options and accessories

Factory-installed options

Mute package (sound attenuation)

Mute package (sound attenuation) is available for applications that require especially low noise levels. With this option, a double application of sound attenuating material is applied. The mute package, in combination with standard unit noise reduction features, provides high levels of noise reduction.

Cupronickel water heat exchanger

The load and source heat exchangers are available in cupronickel as an option 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. Heat exchanger options are available for both the load and source coaxial heat exchangers.

Hot water generator (HWG) / Heat recovery package (HRP)

Hot water generator is available to generate hot water in the ranges of 110°F to 120°F. Coil is installed off of the discharge line from the compressor to provide heat for a domestic water supply. The coils is a vented, double wall coil, and also includes a circulating pump, high water temperature limit switch (set at 120°F), discharge gas temperature limit switch and an ON/OFF with built in circuit breaker. The coil is not factory wired to the unit controller.

Disconnect switch

Optional unit mounted non-fused disconnect switch is available for units. Conveniently positioned on the corner post of the unit. This switch allows for easy power interruption during field service.

Differential pressure switch / Flow proving switch

The differential pressure switch, also known as a flow proving switch, is a crucial device for verifying fluid flow in systems. By detecting pressure differences, it ensures accurate flow confirmation, enhancing overall system performance and efficiency across a range of applications.

Refrigerant leak detection system

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 exhaust fan to disperse any leaked refrigerant. The A2L leak detection feature is factory provided on unit sizes 071-420.

Field-installed accessories

Y strainers (bronze body)

Y strainers (bronze body) are “Y” type strainers with a brass cap. The strainer screen is made of stainless steel, is available with blow-down valves, and has a maximum operating pressure rating of 450 psig.

Ball valves (brass body)

Ball valves (brass body) are available for shutoff and balancing water flow. The valves are available with memory, memory stop, and pressure temperature ports.

Solenoid valves (brass body)

Solenoid valves (brass body) are available to provide slow operation for quiet system operation.

Hose kit assemblies

Hose kit assemblies provide all the necessary components to hook up a water-side system. Supply hose includes a ported ball valve with pressure temperature (P/T) plug ports, flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset automatic balancing valve (gpm) with two P/T ports, flexible stainless steel hose with a swivel and nipple, balancing valve, and low-pressure drop water control valve.

Controls options unit protection module (UPM)

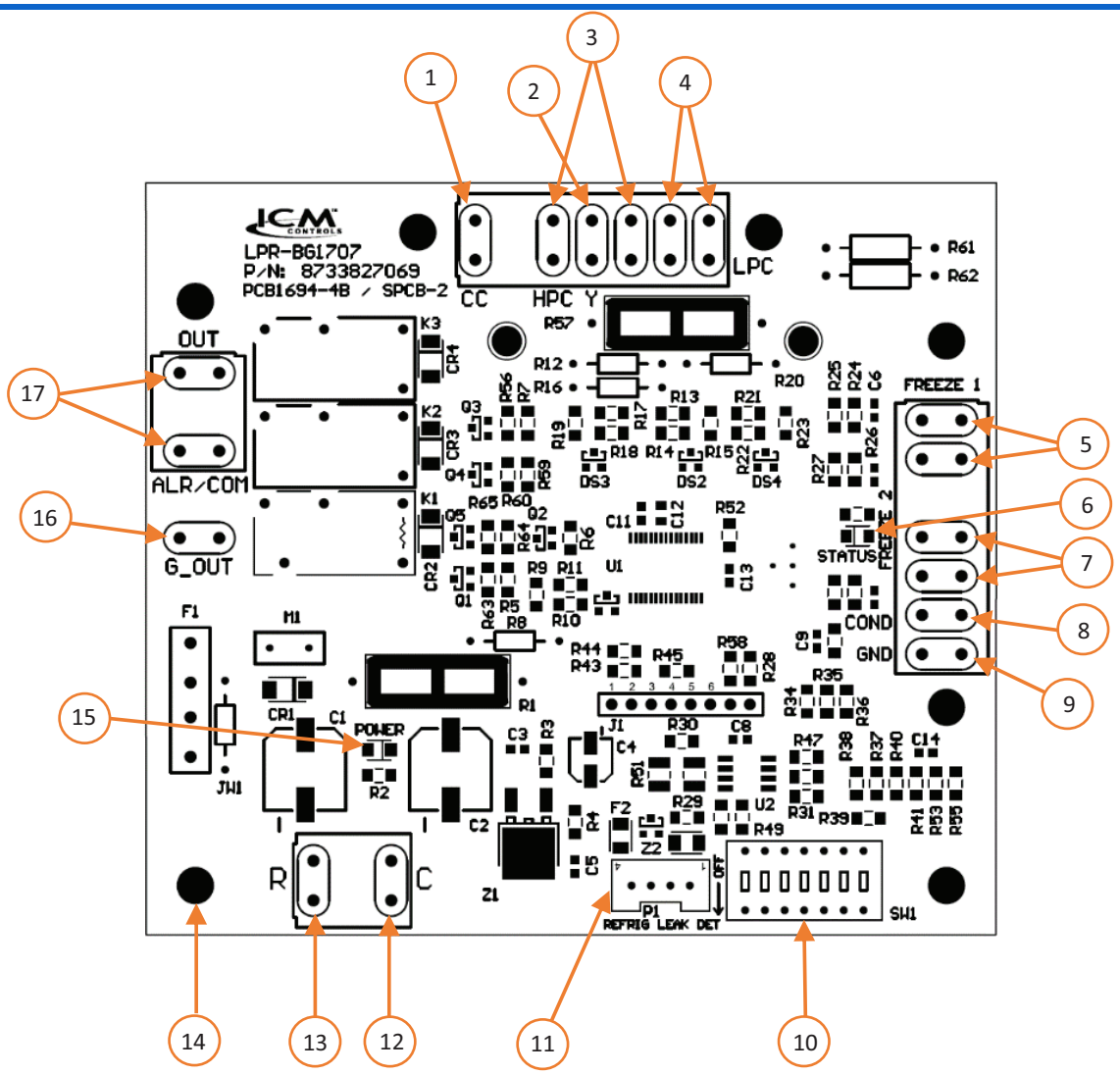
All Carrier WSHP units feature an advanced UPM which implements all the critical equipment safeties and allows for continuous safe and reliable operation. It is located in the control box.

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 120s upon the LPS opening. If the LPS is still open after 2 minutes the unit is shut down and put into soft lockout.
- Source/Load Water Coil Freeze Protection: Both the cooling and heating refrigerant liquid line temperatures are monitored to prevent freeze up of the water 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.
- 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 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.

Options and accessories (cont)

- 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 optional feature in cases where it is required by safety standards other than UL60335-2-40 standard with more stringent requirements.
- 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.



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 50PSW series water source heat pumps utilizes 24-v non-communicating controls and are suitable for control via most 24-v non-communicating single or two stage heat pump thermostats. Carrier has several 24-v non communicating thermostats that are well suited for pairing with water source heat pumps. Refer to "Thermostats" table for a summary of the available carrier thermostats and the general functionality/capability of each.

Control options to supplement thermostat

50PSW 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:

Energy management switch (EMS)

Enables a 24 vac external signal to control the operation of the WSHP.

Pump-valve relay

Provides a signal between an isolation valve and a secondary pump.

Compressor status relay

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

Phase monitor

Three-phase line monitor that protects against phase loss, phase reversal, and phase unbalance. Ideally suited to protect your unit's scroll compressor(s) from reverse rotation.

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**	**ComforVu 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 Push Button	LCD Touchscreen	
Onboard Sensors	Temperature	Temperature and Humidity (optional)	Temperature and Humidity	Temperature and Humidity	Temperature and Humidity	Temperature and Humidity	Temperature and Humidity	Temperature and Humidity	
Scheduling	✔	✔	✔	✔	✔	✔	✔	✔	
Occupancy (motion)	—	—	—	—	—	—	✔	✔	
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 / RSS / SAT / RAT	OAT / RSS	RH + OAT / RSS / SAT	OAT / RSS / SAT	RH + OAT / RSS / SAT	OAT / RSS / SAT	ECON / RSS / DEICE	ECON / RSS / 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.

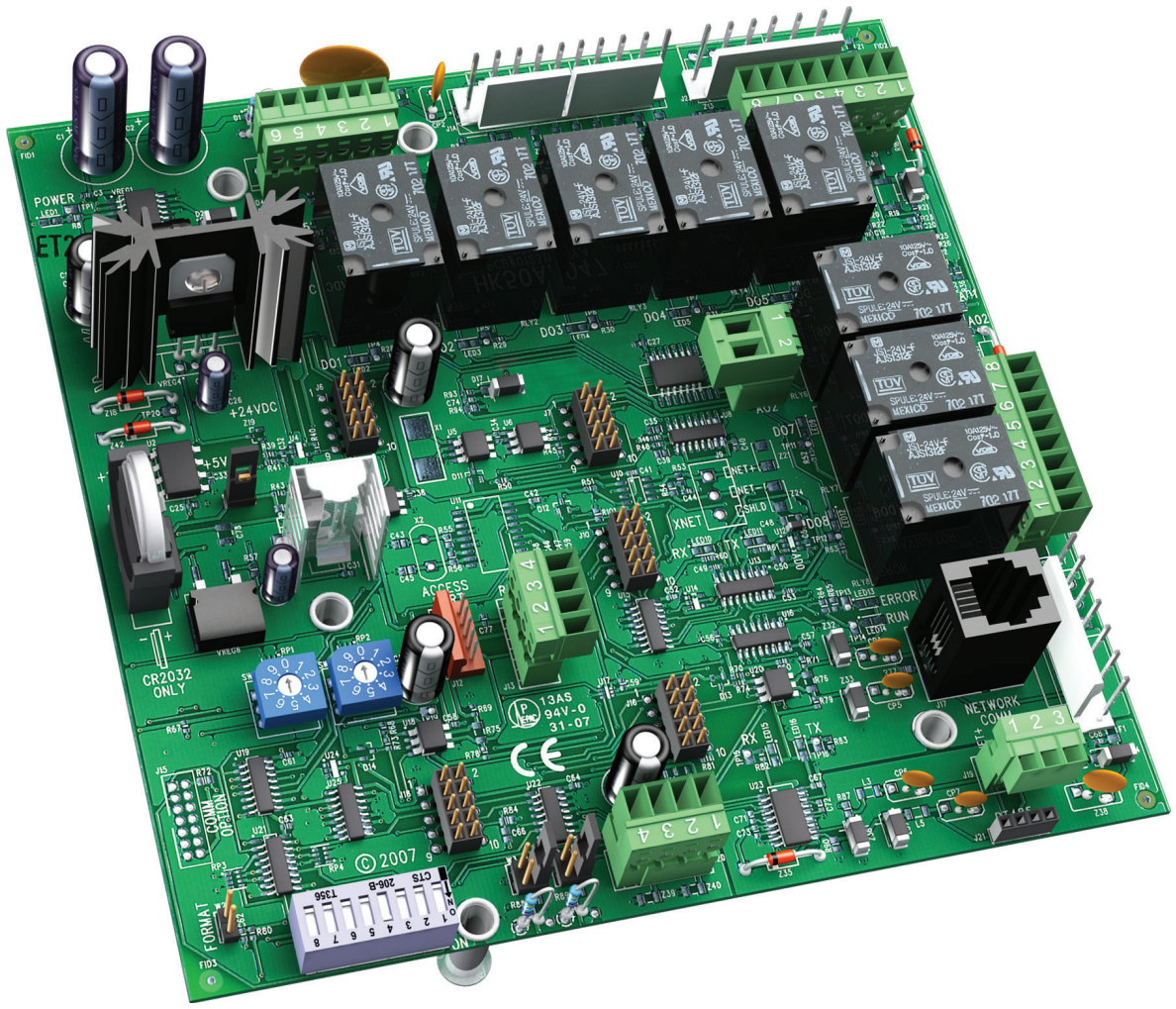
Options and accessories (cont)

WSHP water-to-water open controller

The Water-to-Water (W2W) Open controller continuously monitors and regulates heat pump operation with reliability and precision. This advanced controller features a sophisticated, factory-engineered control program that provides optimum performance and energy efficiency. For added flexibility, the W2W Open controller is capable of standalone operation. It can also be integrated with any Building Automation System using the BACnet®[1], Modbus®[1], LonWorks®[1], or N2®[1] protocol. For larger installations, a total of up to 8 stages may be controlled as a singular heating or cooling source. One controller will operate as the master, coordinating others in the system.

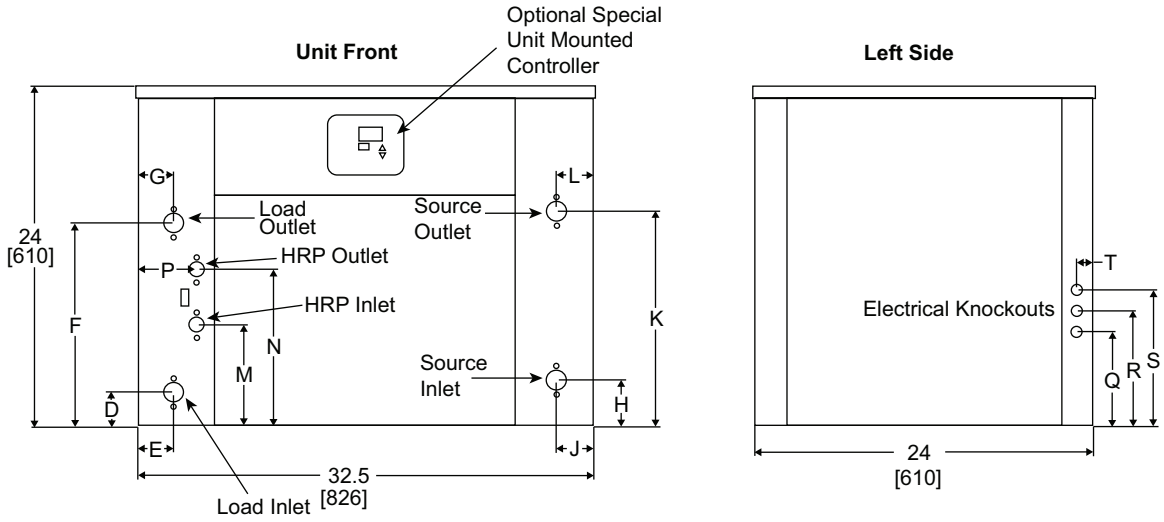
1. Third-party trademarks and logos are the property of their respective owners.

WSHP Water-to-Water Open Controller



Dimensions

50PSW025-071 Unit



NOTE: Dimensions in inches [mm].

50PSW UNIT SIZE	DIMENSIONS (in.)[a,b]															WATER CONN. (FPT)[c]	HRP CONN. (FPT)
	Load Side Water In Height	Left Side to Load Side Water In	Load Side Water Out Height	Left Side to Load Side Water Out	Source Side Water In Height	Right Side to Source Side Water Out	Source Side Water Out Height	Right Side to Source Side Water Out	HRP Water In Height	HRP Water Out Height	Left Side to HRP Water Out	Electrical Knockout Heights			Left Side to Electrical Knockouts		
	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T		
025	2.20	1.70	13.20	1.70	3.75	1.50	14.25	1.95	7.15	11.00	4.25	6.55	8.05	9.55	1.25	3/4	1/2
035	2.30	2.30	14.30	2.50	3.70	2.55	15.70	2.55	7.15	11.00	4.25	6.55	8.05	9.55	1.25	3/4	1/2
049	2.30	2.10	14.30	2.65	2.75	2.65	14.75	2.65	7.15	11.00	4.25	6.55	8.05	9.55	1.25	1	1/2
061	2.80	1.38	14.80	2.63	2.51	2.00	14.38	3.40	7.15	11.00	4.25	6.55	8.05	9.55	1.25	1	1/2
071	3.00	2.25	17.25	2.25	3.25	2.25	17.00	2.25	7.15	11.00	4.25	6.55	8.05	9.55	1.25	1	1/2

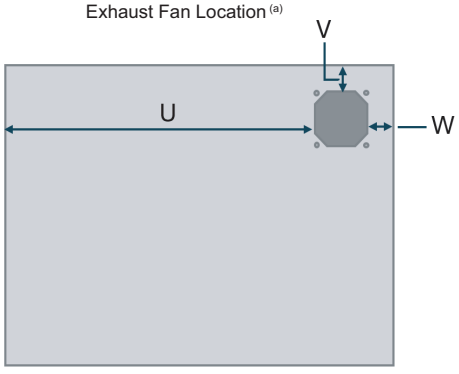
NOTE(S):

a. All dimensions are within ± 0.125 in.
b. Specifications subject to change without notice.
c. Refers to both load and source fluid connections.

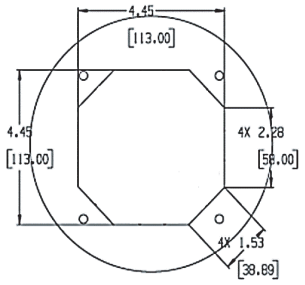
LEGEND

HRP — Heat Recovery Package

Exhaust Fan Location [a]



Duct Location [a]



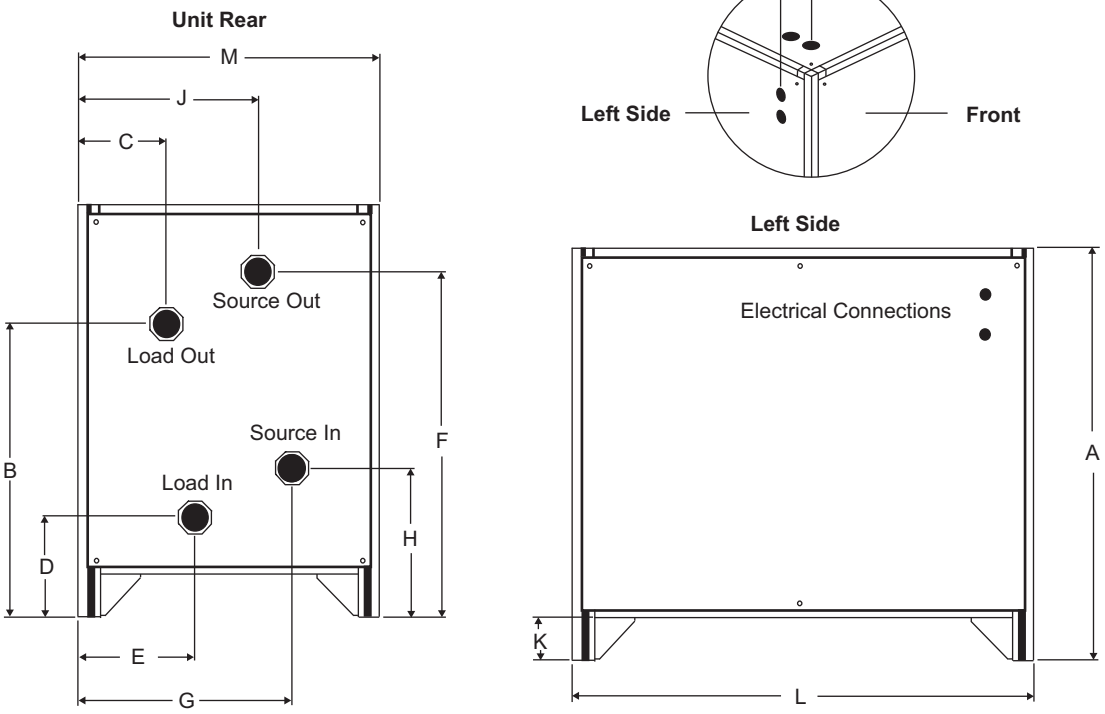
50PSW UNIT SIZE[a]	FAN LOCATION FROM LEFT	FAN LOCATION FROM BACK	FAN LOCATION FROM RIGHT
	U	V	W
025	25.96	2.07	2.07
035	25.96	2.07	2.07
049	25.96	2.07	2.07
061	25.96	2.07	2.07
071	25.96	2.07	2.07

NOTE(S):

a. Included with Refrigerant Leak detection system only.

Dimensions (cont)

50PSW122-210 Unit

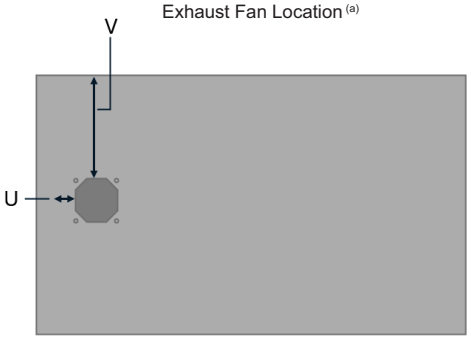


50PSW UNIT SIZE	DIMENSIONS (in.)[a,b]												WATER CONN. (FPT)[c]
	Height	Load Water Out Height	Right Side to Load	Load Water In Height	Right Side to Load Water In	Source Water Out Height	Right Side to Source Water In	Source Water In Height	Right Side to Source Water Out	Unit Leg Height	Depth	Width	
	A	B	C	D	E	F	G	H	J	K	L	M	
122	37.5	27.62	8.5	8.37	10.5	32.25	19.5	13.5	17.5	3.5	46	28	1-1/4
180	37.5	27.62	4.5	8.37	10.5	32.25	23.5	13.5	17.5	3.5	46	28	1-1/2
210	37.5	27.62	4.5	8.37	10.5	32.25	23.5	13.5	17.5	3.5	46	28	1-1/2

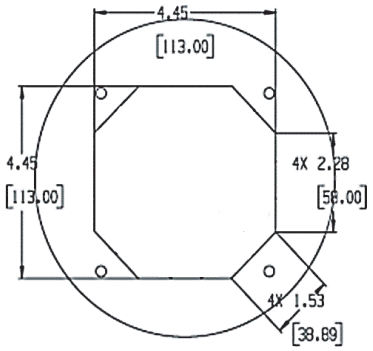
NOTE(S):

a. All dimensions are within ± 0.125 in.
b. Specifications subject to change without notice.
c. Refers to both load and source fluid connections.

Exhaust Fan Location [(a)]



Duct Location [(a)]



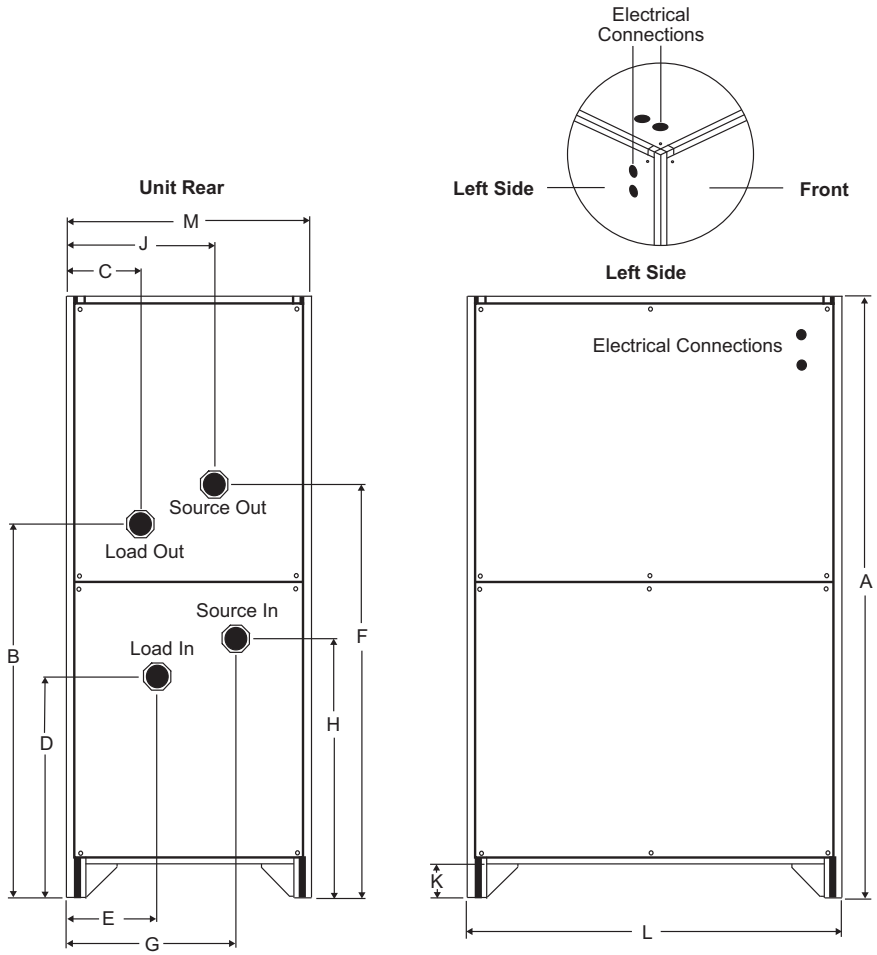
50PSW UNIT SIZE[a]	FAN LOCATION DEPTH FROM BACK	FAN LOCATION WIDTH RIGHT
	U	V
122	4.15	10.51
180	4.15	10.51
210	4.15	10.51

NOTE(S):

a. Included with Refrigerant Leak detection system only.

Dimensions (cont)

50PSW240-420 Unit

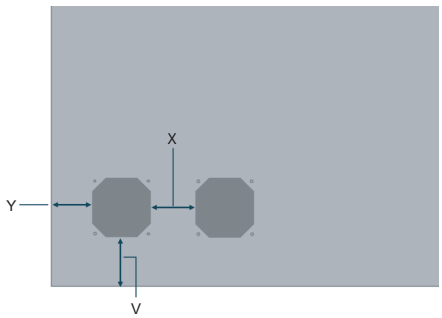


50PSW UNIT SIZE	DIMENSIONS (in.)[a,b]												WATER CONN. (FPT)[c]
	Height	Load Water Out Height	Right Side to Load	Load Water In Height	Right Side to Load Water In	Source Water Out Height	Right Side to Source Water In	Source Water In Height	Right Side to Source Water Out	Unit Leg Height	Depth	Width	
	A	B	C	D	E	F	G	H	J	K	L	M	
240	70	43.5	8.5	24.5	10.5	48.5	19.5	29.25	17.5	3.5	46	28	2
360	70	43.5	4.5	24.5	10.5	48.5	23.5	29.25	17.5	3.5	46	28	2
420	70	43.5	4.5	24.5	10.5	48.5	23.5	29.25	17.5	3.5	46	28	2

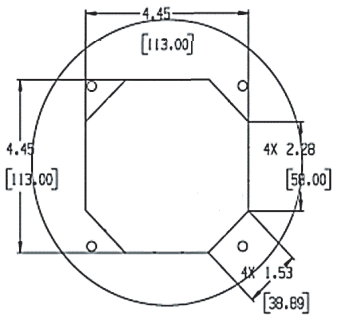
NOTE(S):

a. All dimensions are within ± 0.125 in.
b. Specifications subject to change without notice.
c. Refers to both load and source fluid connections.

Exhaust Fan Location [(a)]



Duct Location [(a)]



50PSW UNIT SIZE[a]	FAN LOCATION WIDTH RIGHT	DISTANCE BETWEEN FANS	FAN LOCATION DEPTH FROM FRONT
	V	X	Y
240	3.83	3.43	3.11
360	3.83	3.43	3.11
420	3.83	3.43	3.11

NOTE(S):

a. Included with Refrigerant Leak detection system only.

50PSW Operating Limits

LIMIT[a]			COOLING	HEATING
Minimum Ambient Air			50°F	40°F
Maximum Ambient Air			100°F	85°F
Rated Ambient Air			80°F	68°F
Antifreeze Protection Required LWT / EWT			—	< 40/< 50°F
Source Side	Minimum Water Coil Entering Fluid		50°F	30°F
	Maximum Water Coil Entering Fluid		110°F	90°F
Load Side	Minimum Water Coil Entering Fluid		50°F	60°F
	Maximum Water Coil Entering Fluid		90°F	120°F
Rated Water Coil Entering Fluid	Water Loop Application	Load	53.6°F	104°F
		Source	86°F	68°F
	Ground Loop Application	Load	53.6°F	104°F
		Source	77°F / 68°F (PL)	32°F / 41°F (PL)
	Ground Water Application	Load	53.6°F	104°F
		Source	59°F	50°F
Maximum Operating Water Pressure			450 PSI / 3103 kPa	
Minimum Operating Water Flow Rate			1.5 Gpm per Ton	

NOTE(S):

a. Maximum and minimum operating limits may not be combined. If one value is at either maximum or minimum, the other value(s) must be within normal operating range.

LEGEND

EWT — Entering Water Temperature
GPM — Gallons per Minute
LWT — Leaving Water Temperature
WSHP — Water Source Heat Pump

Electrical data

50PSW Electrical Data[a]

50PSW UNIT SIZE	VOLTAGE/HZ/PH	VOLTAGE MIN/MAX	COMPRESSOR			TOTAL FLA	MCA	MOCP
			Quantity	RLA	LRA			
025	208-230/1/60	197/253	1	10.3	62.0	10.3	12.8	20
	265-277/1/60	239/291	1	7.8	52.0	7.8	9.8	15
	208-230/3/60	197/253	1	6.3	56.0	6.3	7.9	15
	460/3/60	414/506	1	3.8	29.0	3.8	4.7	15
035	208-230/1/60	197/253	1	14.6	90.0	14.6	18.2	30
	265-277/1/60	239/291	1	12.5	79.0	12.5	15.6	25
	208-230/3/60	197/253	1	9.9	82.0	9.9	12.3	20
	460/3/60	414/506	1	4.8	44.3	4.8	6.0	15
049	208-230/1/60	197/253	1	18.3	138.0	18.3	22.9	40
	208-230/3/60	197/253	1	11.9	112.0	11.9	14.9	25
	460/3/60	414/506	1	6.8	61.8	6.8	8.5	15
061	208-230/1/60	197/253	1	25.2	147.3	25.2	31.5	50
	208-230/3/60	197/253	1	13.8	161.0	13.8	17.2	30
	460/3/60	414/506	1	6.9	58.0	6.9	8.6	15
071	208-230/1/60	197/253	1	28.0	166.0	28.0	35.0	60
	208-230/3/60	197/253	1	18.9	162.3	18.9	23.6	40
	460/3/60	414/506	1	9.1	70.8	9.1	11.4	20
122	208-230/1/60	197/253	2	27.6	170.0	27.6	62.1	80
	208-230/3/60	197/253	2	19.2	156.5	19.2	43.2	60
	460/3/60	414/506	2	9.0	74.8	9.0	20.3	25
	575/3/60	518/632	2	7.7	47.8	7.7	17.3	25
180	208-230/3/60	197/253	1	40.8	270.0	40.8	51.0	90
	460/3/60	414/506	1	19.4	147.0	19.4	24.3	40
	575/3/60	518/632	1	13.7	109.0	13.7	17.1	30
210	208-230/3/60	197/253	1	49.0	386.3	49.0	61.3	110
	460/3/60	414/506	1	24.0	182.0	24.0	30.0	50
	575/3/60	518/632	1	19.2	131.0	19.2	24.0	40
240	208-230/3/60	197/253	2	33.3	255.0	33.3	74.9	100
	460/3/60	414/506	2	15.4	140.0	15.4	34.7	50
	575/3/60	518/632	2	12.9	107.6	12.9	29.0	40
360	208-230/3/60	197/253	2	40.8	270.0	40.8	91.8	125
	460/3/60	414/506	2	19.4	147.0	19.4	43.7	60
	575/3/60	518/632	2	13.7	109.0	13.7	30.8	40
420	208-230/3/60	197/253	2	49.0	386.3	49.0	110.3	150
	460/3/60	414/506	2	24.0	182.0	24.0	54.0	70
	575/3/60	518/632	2	19.2	131.0	19.2	43.2	60

NOTE(S):

a. Resistance value tolerance ± 7%. All resistance values must be measured with compressor at room temperature.

LEGEND

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

Application data

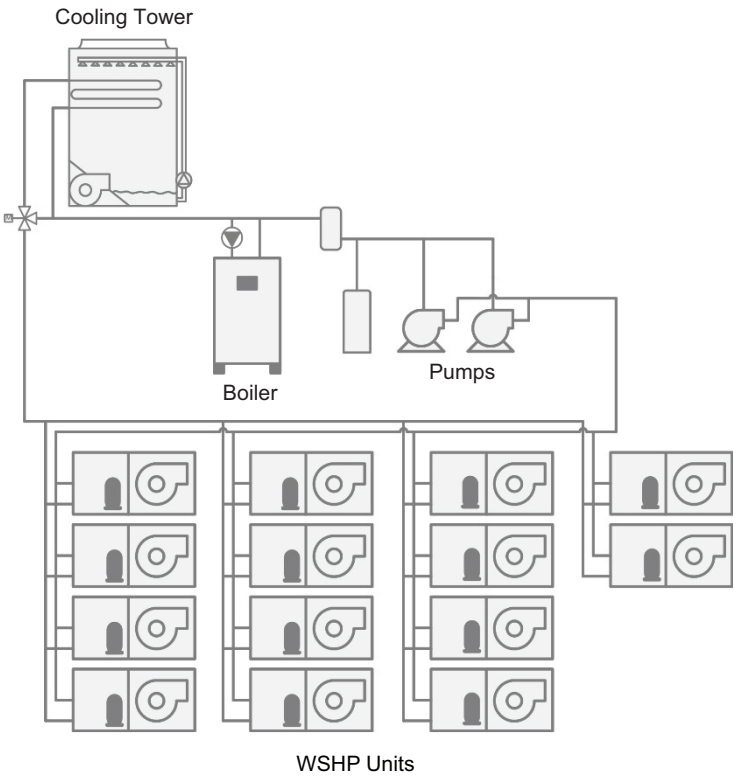
Aquazone™ water source heat pumps are available in a flexible, efficient array of models and sizes, which can be used for extensive variety of commercial building types that has several temperature control zones, some of which need to be heated while others need to be cooled. The WSHP system is an especially 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°F 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



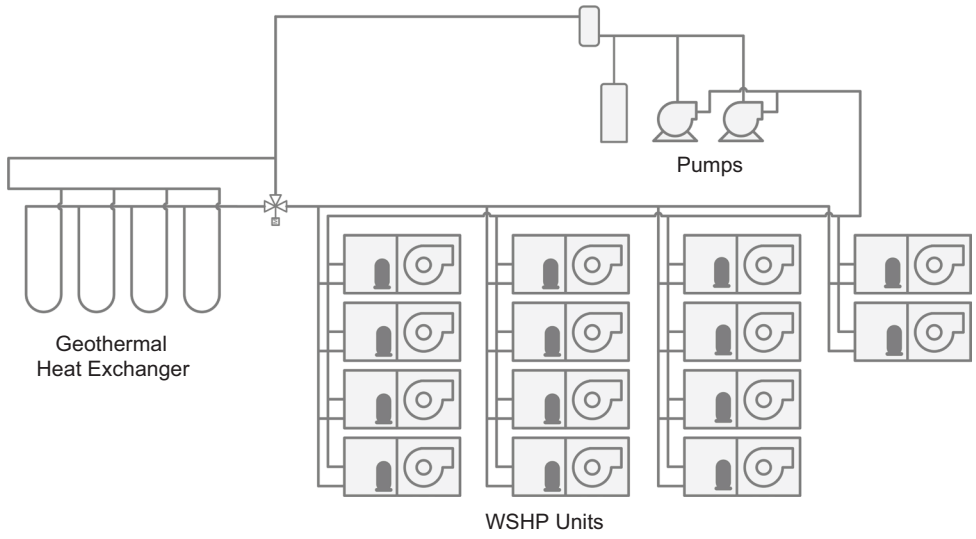
Application data (cont)

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

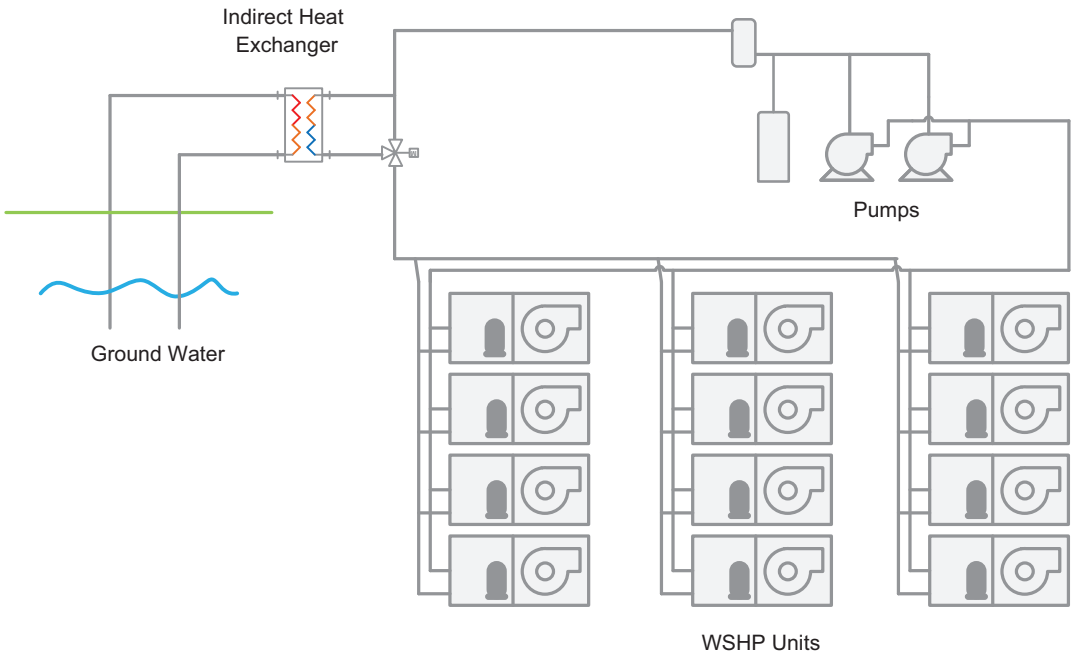


Application data (cont)

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°F 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)

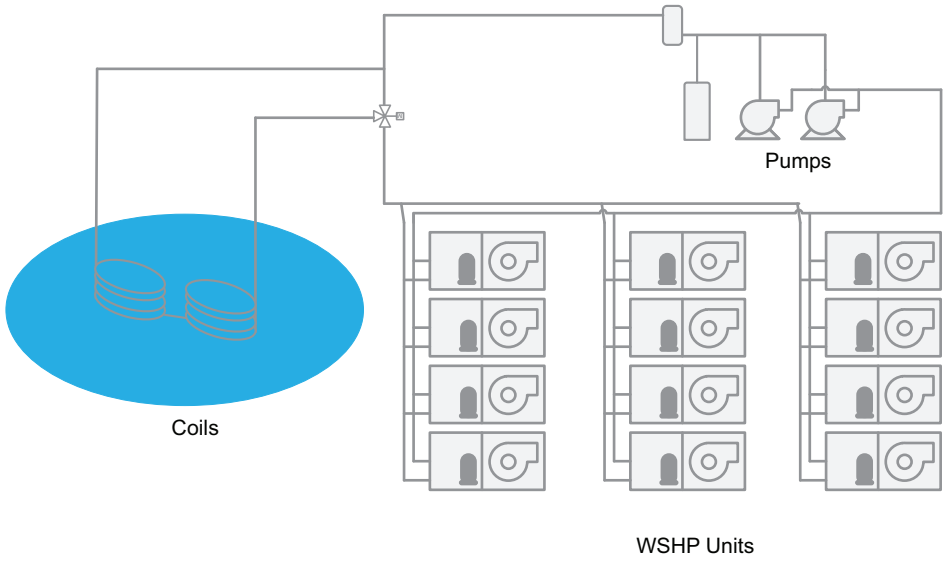
Surface water system

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.

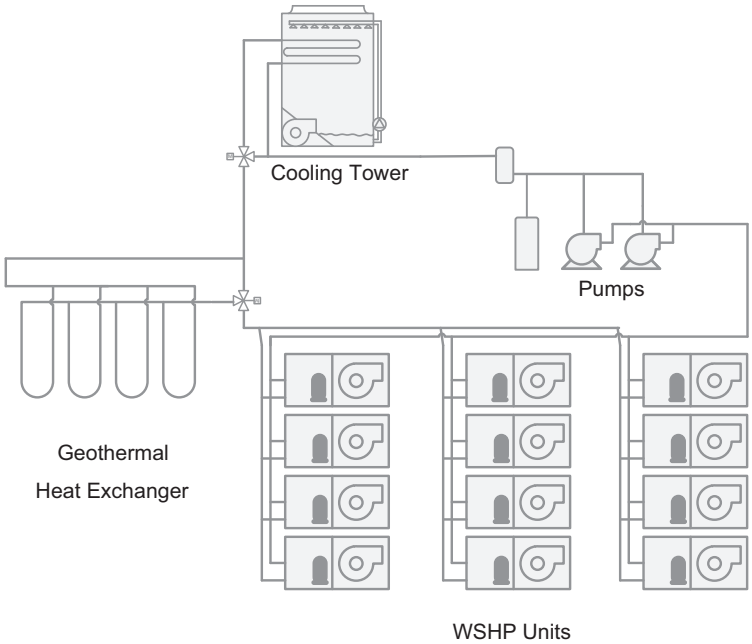
Hybrid systems

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.

Surface Water Application



Hybrid System (geothermal loop/cooling tower) Application



Application data (cont)

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. 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 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 HWG applications, and at 90°F for indirect HX use. A monitoring plan should be implemented.					
Ryznar Stability Index	All	N/A	6.0 - 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 HWG and 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 - 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 - 8.5 Monitor/treat as needed.	6 - 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 okay to <0.5 ppm.		
Ammonia Ion as Hydroxide, Chloride, Nitrate and Sulfate Compounds	All	N/A	<0.5 ppm		
Maximum Chloride Levels	Copper	N/A	50°F (10°C)[e] <20 ppm	75°F (24°C)[e] NR	100°F (38°C)[e] NR
	Cupronickel	N/A	<150 ppm	NR	NR
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 and cupronickel.
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 can 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.
e. Maximum allowable at maximum water temperature.

LEGEND

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

Application data (cont)

Coaxial Heat Exchanger Corrosion Resistance

The following resistance guide is an attempt to give a picture of the corrosion resistance of stainless steel of type **AISI 316** and **pure copper** (99.9%) in water to a number of important chemical factors. The actual corrosion is, however, a very complex process influenced by many different factors in combination. The following table is a considerable simplification and should not be overvalued.

CHEMICAL FACTORS	CONCENTRATION (mg/l or ppm)	TIME LIMITS ANALYZE	AISI 316 STAINLESS STEEL	COPPER	CUPRONICKEL
Alkalinity (HCO_3^-)	<70	Within 24 hours	+	0	+
	70-300		+	+	+
	>300		+	0/+	+
Sulfate (SO_4^{2-})	<70	No limit	+	+	+
	70-300		+	0/–	+
	>300		0	–	+
HCO_3^-/ SO_4^{2-}	>1.0	No limit	+	+	+
	<1.0		+	0/–	+
Electrical Conductivity	<10 mS/cm	No limit	+	0	+
	10 - 500 mS/cm		+	+	+
	>500 mS/cm		+	0	+
pH	<6.0	Within 24 hours	0	0	+
	6.0-7.5		+	0	+
	7.5-8.5		+	+	+
	>8.5		+	0	+
Ammonium (NH_4^+)	<2	Within 24 hours	+	+	+
	2-20		+	0	+
	>20		+	–	+
Chlorides (Cl) **Please see Chloride Content table.**	<20	No limit	+	+	+
	>20		+	0/+	+
Free Chlorine (Cl_2)	<1	Within 5 hours	+	+	+
	1-5		+	0	+
	>5		+	0/–	+
Hydrogen Sulfide (H_2S)	<0.5	No limit	+	+	+
	>0.5		+	0/–	+
Free (aggressive) Carbon Dioxide (CO_2)	<5	No limit	+	+	+
	5-20		+	0	+
	>20		+	–	+
Total Hardness (°dH)	4.0 - 8.5	No limit	+	+	+
Nitrate (NO_3)	<100	No limit	+	+	+
	>100		+	0	+
Iron (Fe)	<0.2	No limit	+	+	+
	>0.2		+	0	+
Aluminum (Al)	<0.2	No limit	+	+	+
	>0.2		+	0	+
Manganese (Mn)	<0.1	No limit	+	+	+
	>0.1		+	0	+

LEGEND

AISI — American Iron and Steel Institute
+ — Good resistance under normal conditions
0 — Corrosion problems may occur especially when more factors are valued 0
– — Use is not recommended

Application data (cont)

Chloride Content[a]

CHLORIDE CONTENT	MAXIMUM TEMPERATURE OF WATER LOOP			
	60°C	80°C	120°C	130°C
= 10 ppm	SS 304	SS 304	SS 304	SS 316
= 25 ppm	SS 304	SS 304	SS 316	SS 316
= 50 ppm	SS 304	SS 316	SS 316	Ti/SS 316
= 80 ppm	SS 316	SS 316	SS 316	Ti/SS 316
= 150 ppm	SS 316	SS 316	Ti/SS 316	Ti/SS 316
= 300 ppm	SS 316	Ti/SS 316	Ti/SS 316	Ti/SS 316
> 300 ppm	Ti/SS 316	Ti/SS 316	Ti/SS 316	Ti/SS 316

NOTE(S):

a. Titanium is not an available option for the 50PSW unit. It is shown here for comparative purposes.

LEGEND

SS — Stainless Steel
Ti — Titanium

Solenoid valves

In applications using variable flow pumping, solenoid valves can be field installed and operated from the control board in the Aquazone™ WSHP unit.

Freeze protection

Application systems exposed to outdoor temperatures below freezing (32°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 utilized 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.

Antifreeze Correction Table

ANTIFREEZE TYPE	%	COOLING EWT 90°F			HEATING EWT 30°F		WPD EWT 30°F
		TC	SC	Power	HC	Power	
Water	0	1.000	1.000	1.000	1.000	1.000	1.000
Propylene Glycol	5	0.995	0.995	1.003	0.989	0.997	1.070
	15	0.986	0.986	1.009	0.968	0.990	1.210
	25	0.978	0.978	1.014	0.947	0.983	1.360
Methanol	5	0.997	0.997	1.002	0.989	0.997	1.070
	15	0.990	0.990	1.007	0.968	0.990	1.160
	25	0.982	0.982	1.012	0.949	0.984	1.220
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.140
	15	0.994	0.994	1.005	0.944	0.983	1.300
	25	0.986	0.986	1.009	0.917	0.974	1.360
Ethylene Glycol	5	0.998	0.998	1.002	0.993	0.998	1.040
	15	0.994	0.994	1.004	0.980	0.994	1.120
	25	0.988	0.988	1.008	0.966	0.990	1.200

LEGEND

EWT — Entering Water Temperature
HC — Heating Capacity
SC — Sensible Capacity
TC — Total Capacity
WPD — Water Pressure Drop

Source vs. load heat exchanger

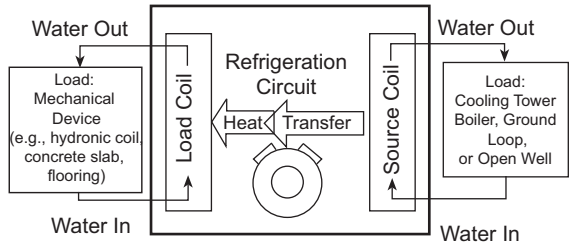
Both the load and source heat exchangers are water-to-refrigerant heat exchangers. The water for the source heat exchanger is supplied from a ground loop, open loop (well water), or water loop (boiler/tower) system. Heat from the refrigeration circuit is exchanged between the load and source heat exchangers. The water for the load heat exchanger can be used in many applications to provide chilled or hot water for air-handling units, fan coils, hydronic baseboards, or radiant in-slab piping.

Parallel operation

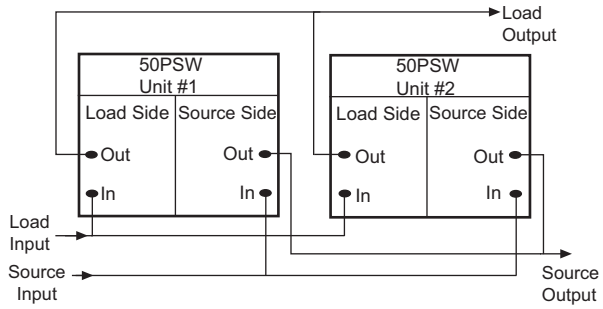
Multiple units can be piped in a parallel operation to satisfy heating and/or cooling loads that cannot be accomplished from a single 50PSW water-to-water unit.

Cycling one or more of the units on or off will provide capacity control through staging of multiple unit combinations. In a parallel operation, the total pressure drop through the load heat exchanger of multiple units is the same as the drop through a single unit.

Source vs. Load Heat Exchanger



Parallel Operation



Application data (cont)

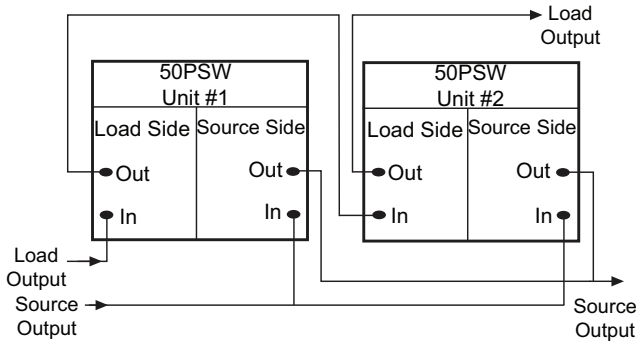
Series operation

Multiple units can be piped in a series type operation to satisfy lower cooling leaving water temperature.

In a series operation, the leaving load water temperature of the first unit becomes the load entering water temperature of the second unit. This arrangement provides an additional decrease in water temperature beyond the capability of a single unit. For example, a typical drop of 10°F to 15°F can be accomplished with one 50PSW unit. When 2 or more units are piped in series, the water temperature drop ranges between 20°F and 25°F. Capacity control is provided by cycling one or more of the units on or off to provide staging of the leaving water temperature from the units.

When the load coils are piped in series, the total water pressure drop through the load heat exchanger of the units should include both units. This is a consideration when sizing the overall system, since an increase in pump horsepower may be require.

Series Operation



Tempering ventilation air in air handlers

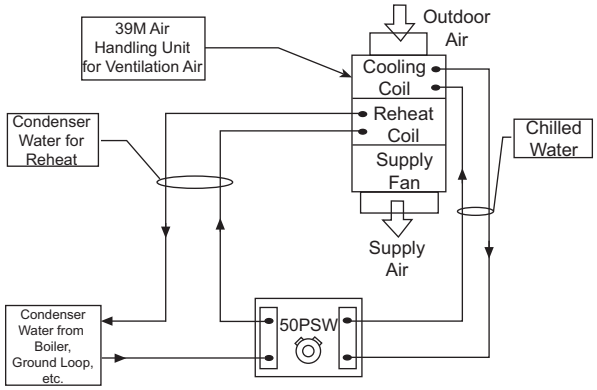
The load heat exchanger in a water-to-water unit provides chilled water during the cooling season and hot water during the heating season. The source heat exchanger is used to provide warm water for ventilation air reheat during the cooling season. In the heating season, the source heat exchanger uses heat from building exhaust to efficiently produce hot water for heating ventilation air in the air-handling unit. The cooling and heating systems can be either piped together for tempering ventilation air as part of an overall integrated system with water-to-water units, or implemented separately depending on the particular design requirements for the ventilation air system.

NOTE: Depending on the system hydronic design, circulation pumps may be required for the source and load of the water-to-water heat pumps in both heating and cooling season operations.

Cooling season

On the load side of the 50PSW unit, chilled water is circulated to the air-handling unit where it cools and dehumidifies ventilation air. The water absorbs heat from the ventilation air and returns to the 50PSW unit, where the heat is removed via the refrigeration circuit and then transferred to the source heat exchanger. Heated water from the source heat exchanger is used to reheat air in the ventilation unit. The heat is then absorbed from the water by the air in the reheat coil and, if necessary, is returned to the cooling tower, boiler, or ground loop for further heat rejection.

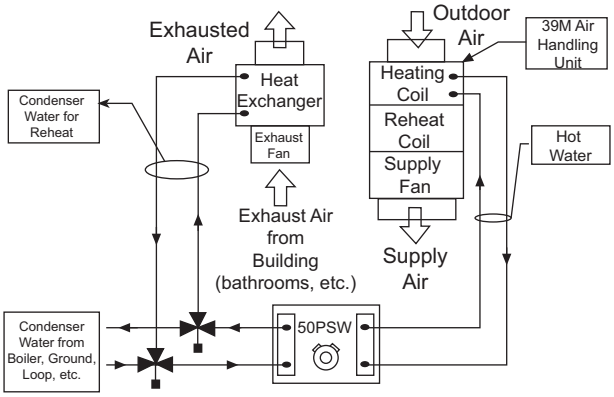
Cooling Season



Heating season

Building exhaust heat is used by the water-to-water unit for hot water generation. On the load side of the heat exchanger, hot water is circulated to the air-handling unit for heating ventilation air. As the heat from the water is released to the air, the water is circulated back to the 50PSW unit. On the source side of the unit, water is circulated through the heat recovery coil, picks up heat from the exhaust air stream, and then circulates to the 50PSW unit. A pair of control valves is required to maximize the process of extracting the heat from the exhaust. Control valves on the source heat exchanger supply and return water from the main water loop to minimize (or possibly eliminate) the need for additional heat injection by system boilers.

Heating Season



Application data (cont)

Hydronic heating/cooling system with storage tank

In some cooling or heating applications, the addition of a storage tank may be necessary. The tank allows hot or chilled water temperatures to fluctuate, allowing the water-to-water heat pump to operate more consistently.

In heating applications, this prevents equipment short cycling and allows different flow rates through the water-to-water unit rather than through the hydronic heating delivery system.

A storage tank is also required for cooling applications if the water-to-water unit is 20% larger than the cooling load and/or multiple fan coil units in the same application.

NOTE: In cooling applications where only one fan coil is utilized, water-to-water units may be able to operate without a storage tank.

The size of the storage tank should be based upon the primary use of the application. For heating, storage tanks should be sized at one U.S. gallon per 1,000 Btuh of heating capacity at the maximum entering source water temperature and the minimum entering load water temperature. For cooling, storage tanks should be sized at one U.S. gallon per 1,000 Btuh of cooling capacity at the minimum entering source water temperature and the maximum entering load water temperature. The selection of the storage tank should be based upon the larger of the heating or cooling calculations.

NOTE: When the water-to-water units do not have sufficient capacity to handle the required heating load, supplementary heating such as electric heat or a boiler may be required.

Snow melting systems

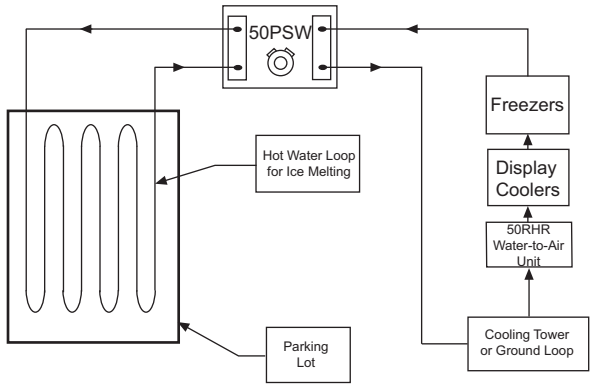
Snow melting systems use water-to-water heat pumps to melt snow and ice. The water-to-water heat pumps circulate hot water through a piping loop in a slab to melt ice and snow. This system is especially energy efficient when coupled with a geothermal ground loop for heat addition/rejection. The size of the water-to-water heat pumps is based on the amount of heat needed to melt the snow across the surface.

NOTE: Consult the ASHRAE HVAC Applications Handbook for slab piping design and temperature requirements.

The 50PSW units can be configured with a field-supplied control system for ice and snow melting. In commercial applications where fast ice removal is required, keeping the slab at a stationary temperature just below the freezing point and then gradually increasing the hot water temperature may reduce melting time.

NOTE: To prevent thermal expansion of the slab due to extreme temperature differences, hot water temperature should be slowly increased.

Snow Melting Systems



Water Temperature Change (°F) Through Heat Exchanger

WATER FLOW RATE (GPM)	RISE (°F) (Cooling)	DROP (°F) (Heating)
For Closed Loop: Ground Source or Cooler/Boiler Systems at 3 Gpm/Ton	9-12	4-8
For Open Loop: Ground Water Systems at 1.5 Gpm/Ton	20-26	10-17

Selection procedure

The electronic catalog (eCAT) selection tool is a web-based selection program recommend 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 V/Ph/Hz 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

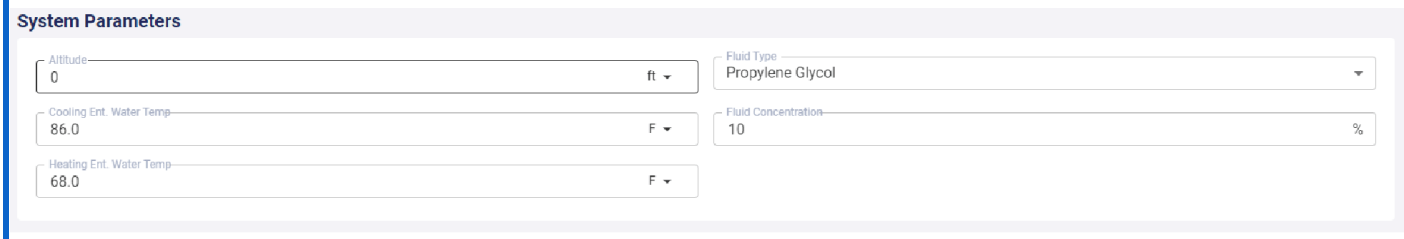
When the altitude is defined the program will automatically apply any derates to the unit capacity associated with the varying air conditions.

Design Parameters

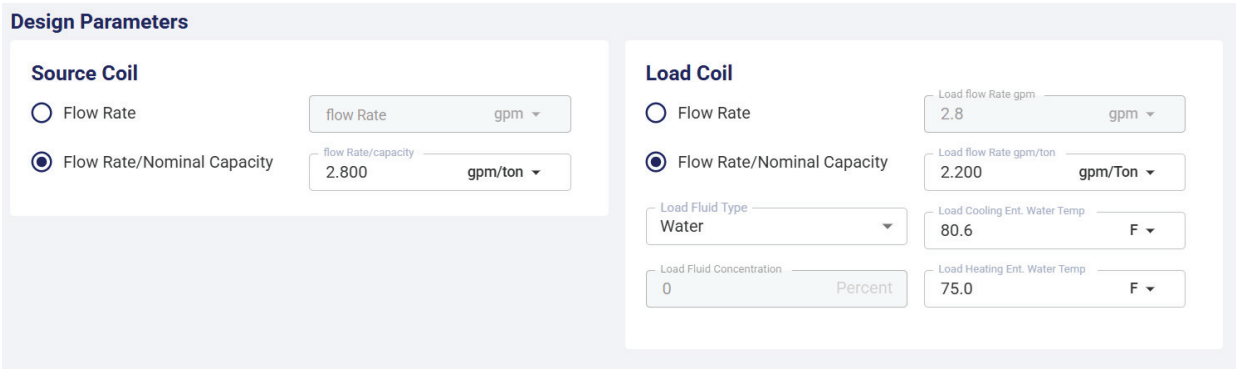
Water Flow Rate

Water flow rate (source/load) 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.

System Parameters Screen



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.

Selection Outputs / Reports

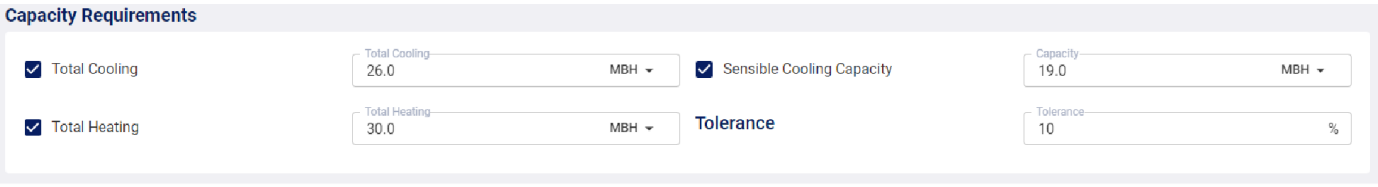
Performance Report

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.

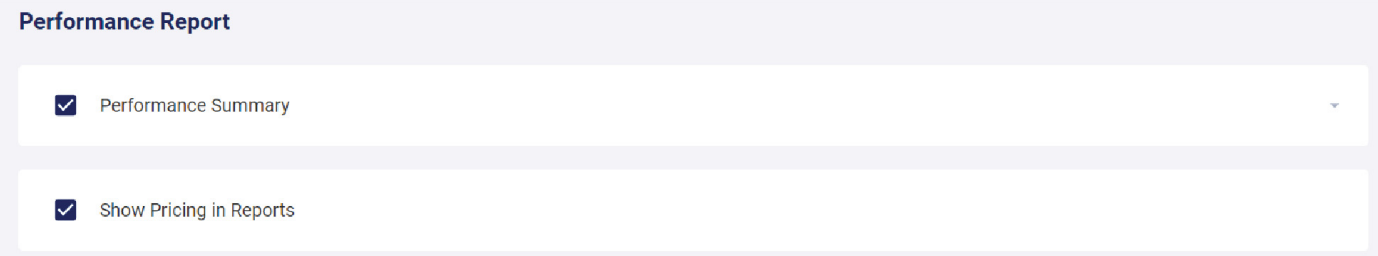
Submittal Report

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.

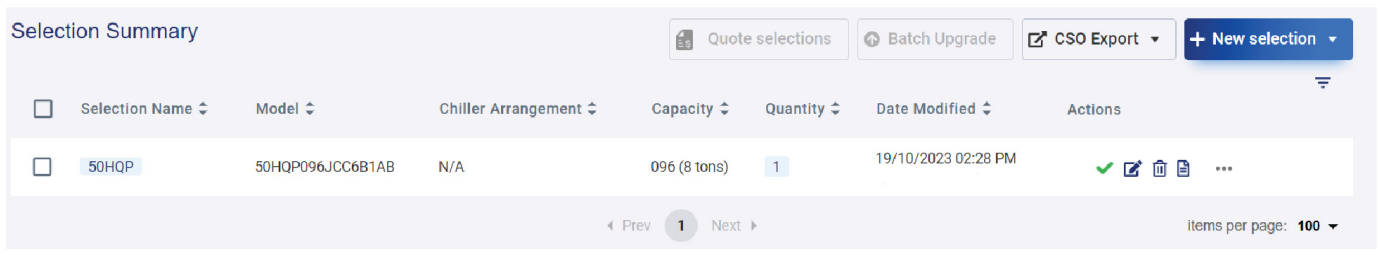
Capacity Requirements Screen



Performance Report



Submittal Report



Selection procedure (cont)

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.

Commercial Water-to-Water Heat Pump Unit

HVAC Guide Specifications

Size Range: **2 to 35 Tons, Nominal**

Carrier Model Number: **50PSW**

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. 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) 13256-2. 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 30°F 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 with wooden skid covered 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 13256-2 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:

Factory-tested and assembled single-piece water source heat pump units shall be factory wired, charged with R-454B, contain refrigerant-to-water heat exchanger, 4-way reversing valve, compressor, metering device, and all internal controls and safety devices.

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, 1-3/4 lb per cu ft 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.
2. Unit shall have separate entrances for high and low-voltage electrical supplies.
3. Unit shall be constructed of heavy gauge, powder-painted, galvanized sheet metal with removable service panels (2).
4. Supply and return water connections shall be copper FPT (female pipe thread) fittings, terminating out the top of the unit to facilitate heading on multiple units side-by-side.
5. [Optional] Mute Package shall consist of compressor blanket installed in the unit for additional sound attenuation.

C. Refrigerant Components:

1. Units shall use R-454B refrigerant. All units shall have a factory sealed and fully charged refrigerant circuit.
2. Units sizes 122, and 240-420 shall have two independent refrigeration circuits with single stage compressors, sizes 025-071 shall have single compressor with 2 stages, sizes 180 and 210 shall have single compressor with single stage.
3. Unit shall have heat pump duty, scroll compressors with internal and external isolation.
4. Refrigeration circuit components shall include liquid line service valve, suction line service valve, reversing valve, a full charge of compressor oil, and a holding charge of refrigerant.
5. Thermostatic expansion valves shall be provided for refrigerant metering. Reversing valve shall be 4-way solenoid activated that defaults to heating.

6. 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 625 psig working refrigerant pressure and 450 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.
7. [Optional] Cupronickel refrigerant-to-water heat exchanger shall be used for open loop applications, or where water quality cannot be maintained as specified by manufacturer.
8. [Optional] Heat recovery package/Hot water generator: Unit shall be equipped with factory installed internal heat recovery kit for domestic hot water production. This kit shall include an internally protected hot water circulation pump, copper double wall vented coaxial water-to-refrigerant heat exchanger, 140°F hot water temperature limit switch and an on/off switch/ circuit breaker.
9. Refrigerant Leak Detection System shall be provided with the unit sizes 071-420 for the refrigerant leak detection system.

D. Hydronic Factory Installed Options:
1. Extended Range: Unit shall operate at entering water temperature of 30°F to 110°F. Extended range adds closed cell insulation to internal water lines and provides insulation on suction side refrigeration tubing including refrigerant-to-water heat exchangers.
2. [Optional] Flow proving switch (differential pressure switch) shall energize relay and disable unit operation when no water flow to the unit.

E. Electrical:
1. A control box shall be located within the unit compressor compartment and shall contain a 75 or 100 va transformer, 24-v activated, 2 or 3 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Electro-mechanical operation WILL NOT be accepted.
2. Units shall be name-plated for use with time-delay fuses or HACR circuit breakers.
3. Unit controls shall be 24-v and provide heating or cooling as required by the remote controller.
4. [Optional] A larger transformer rated for at least 100 VA shall be available (standard option for units with factory-installed WSHP Open controller) and have a push button reset circuit breaker on the secondary power.
5. [Optional] Non-fused electrical disconnect shall be installed on the unit.
6. [Optional] Phase monitor shall be provided with the unit.

F. Controls and Safeties:
1. All units shall have a Unit Protection Module (UPM) printed circuit board which implements following equipment safeties:
   a. anti-short cycle time delay (5-minute delay on break)
   b. Random start time delay on initial power.
   c. Brownout / surge / power interruption protection.
   d. 120 second low pressure switch bypass timer.
   e. High refrigerant pressure shutdown.
   f. Low refrigerant pressure shutdown.
   g. Water coil freeze protection shutdown.
   h. 24 VAC alarm output for remote fault indication.
   i. Refrigerant leak shutdown.
   j. Intelligent alarm reset

   The UPM shall automatically reset after a safety shutdown. Restart the unit if the cause of the shut-down no longer exists. Should a fault reoccur within 60 minutes after reset, then a “hard” lockout will occur. A light-emitting diode (LED) shall annunciate the following alarms: brownout, high refrigerant pressure, low refrigerant pressure, low water temperature, 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 dis-play 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) Water coil freeze limit trip.
2. The W2W Open controller continuously monitors and regulates heat pump operation reliably and precisely. This controller features a sophisticated, factory-engineered control program that provides optimum performance and energy efficiency. For added flexibility, the W2W Open controller is capable of stand-alone

operation. It can also be integrated with any Building Automation System using the BACnet®[1], Modbus, LonWorks, or N2 protocol.

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.

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 7-day programmable/non-prog; 4.3 in. 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® System.

4) Non-Branded Wi-Fi 7-day programmable/non-prog; 4.3 in. 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®[1] 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 WSHP Open 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.

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