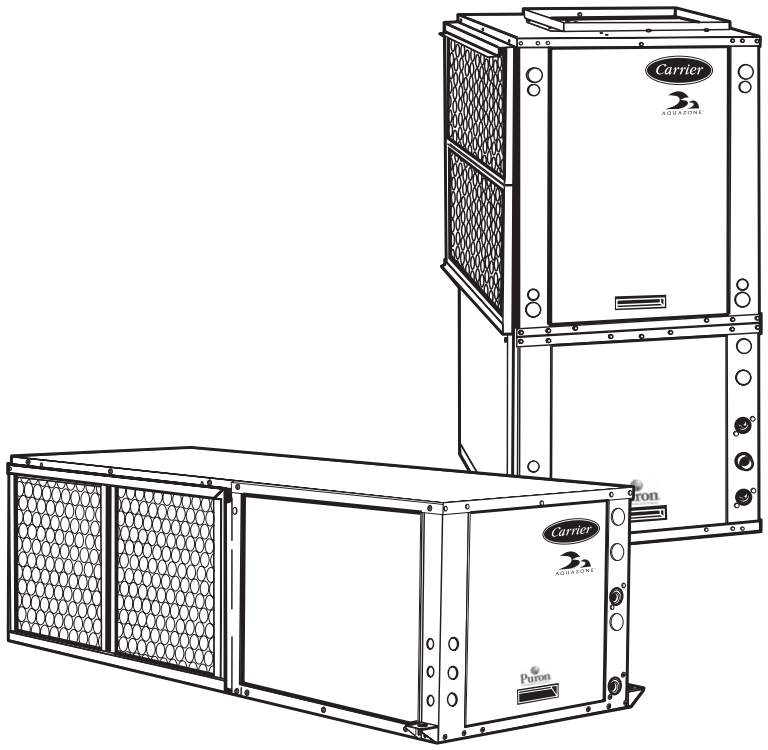
Carrier®

Product Data

AQUAZONE™ 50PTH, PTV, PTD026-072 Two-Stage Water Source Heat Pumps with PURON® Refrigerant (R-410A)

2 to 6 Nominal Tons

AQUAZONE™



ASHRAE 90.1 COMPLIANT

Well exceeds ASHRAE 90.1 and Energy Star Standards.

Puron®
the environmentally sound refrigerant

Single-package horizontally and vertically mounted water source heat pumps with electronic controls offer:

- Non-ozone depleting Puron refrigerant (R-410A)
- Two-stage unloading scroll compressor
- State-of-the-art variable speed blower motor
- Available e-coated air coil
- Exclusive double spring and grommet compressor isolation for ultra-quiet operation
- Available mute package for quieter operation
- Performance certified to ARI/ISO 13256-1
- Flexible and reliable multiple protocol WSHP Open controller can use BACnet™, Modbus®, N2, and LON (with a separate card) protocols for integrating energy efficiency and precise unit control
- Modulating hot water reheat (HWR) available for dehumidification capability

Features/Benefits

Carrier's Aquazone two-stage water source heat pump (WSHP) with Puron refrigerant (R-410A) is a high quality, ultra-efficient solution for all boiler/tower and geothermal design applications.

Operating efficiency

Carrier WSHPs are designed for quality and high performance over a lifetime of operation. Two-stage WSHP models with Puron refrigerant offer cooling EERs (Energy Efficiency Ratios) to 31.5 and heating COPs (Coefficiency of Performance) to 6.3.

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Features/Benefits (cont)

All efficiencies stated are in accordance with standard conditions under ISO (International Organization for Standardization) Standard 13256-1:1998 and provide among the highest ratings in the industry, exceeding ASHRAE (American Society of Heating, Refrigerant and Air Conditioning Engineers) 90.1 Energy Standards.

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 unit fabrication consists of heavy gage galvanized sheet metal cabinet construction designed for part standardization (i.e., minimal number of parts) and modular design. Compressor section interior surfaces are lined with $^1/_2$ in. thick, dual density, $1^3/_4$ lb per cubic ft acoustic type fiberglass insulation. Air-handling section interior surfaces are lined with $^1/_2$ in. thick, single density, $1^3/_4$ lb per cubic ft foil-backed fiber insulation for ease of cleaning. Insulation placement is designed to eliminate any exposed edges to prevent the introduction of glass fibers into the airstream.

Horizontal and vertical water source heat pumps are fabricated from heavy gage G90 galvanized steel with a powder coat paint finish. Compact cabinet dimensions are designed to fit tight space limitations in both horizontal and vertical configurations.

Compressor — Two-stage models with Puron® refrigerant (R-410A) offer a dual level vibration isolation system. The compressor is mounted on computer selected vibration isolation springs to a large heavy gage compressor mounting tray plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation. The compressor has thermal overload protection and is located in an insulated compartment away from the airstream to minimize sound transmission.

Blower and motor assembly — The blower has inlet rings to allow removal of the wheel and motor from one side without removing the housing. The fan motor is equipped with an ICM2 (integrally controlled motor 2) variable speed ball bearing type motor. The ICM2 fan motor provides soft starting, maintains constant airflow over its static operating range and provides airflow adjustment on its control board. The fan motor is isolated from the housing by rubber grommets, is permanently lubricated and has thermal overload protection. A special dehumidification mode is provided to allow lower airflows in cooling for efficient dehumidification.

Refrigeration/water circuit — All units contain sealed Puron® refrigerant (R-410A) circuits including a high-efficiency Copeland UltraTech™ two-stage compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum-lanced fin and rifled copper tube refrigerant-to-air heat exchanger, reversing valve, coaxial (tube-in-tube) refrigerant-to-water heat exchanger, and safety controls including a high-pressure switch, low-pressure switch, water coil low temperature sensor, and air coil low temperature sensor.

ARI/ISO — Aquazone units have ARI (Air Conditioning & Refrigeration Institute)/ISO, NRTL (Nationally Recognized Testing Lab), or ETL 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 of operation.

Quiet operation

Fan motor insulation and double isolated compressor are provided for sound isolation, cabinets are fully insulated to reduce noise transmission, low speed blowers are utilized for quiet operation through reduced outlet air velocities, and air-to-refrigerant coils are designed for lower airflow coil face velocities.

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Puron® refrigerant (R-410A)

Puron refrigerant (R-410A) is a non-chlorine based refrigerant. Puron refrigerant characteristics, compared to R-22, have:

- Binary and near azeotropic mixture of 50% R-32 and 50% R-125.
- Higher efficiencies (50 to 60% higher operating pressures).
- Non-ozone depleting potential and low global warming potential.
- Virtually no glide. Unlike other alternative refrigerants, the two components in Puron refrigerant have virtually the same leak rates. Therefore, refrigerant can be added if necessary without recovering the charge.

E-coated (electro-coated) air coils

Carrier's 50PTH, PTV, PTD units are available with an optional e-coated air coil. This electro-coating process will provide years of protection against corrosion from airborne chemicals. Modern building materials, such as countertops, floor coverings, paints and other materials, can "outgas" chemicals into the indoor air. Some of these chemicals are suspected of contributing to corrosion in the air coils found in both traditional and geothermal heating and cooling equipment. Corrosion often results in refrigerant leaks and eventual failure of the air coil costing hundreds of dollars to replace. Studies have also shown that these air coil coatings improve moisture shedding and therefore improve a units moisture removal capability resulting in a more comfortable indoor environment. The 50PTH, PTV, PTD units assure both maximum air coil life and comfort.

Copeland scroll compressor

Achieve a greater level of comfort. The Copeland UltraTech™ scroll compressor provides superior comfort than fixed-capacity compressors by incorporating a revolutionary two-step design. With a unique 67% part-load capacity step, systems with UltraTech compressor maintain precise temperature levels and lower relative humidity. This eliminates uneven peaks and valleys and allows for steady cooling comfort. Building operators and owners now have a better, more efficient way to power their heating and cooling system, raising their level of comfort, while lowering energy bills. A system with the Copeland UltraTech scroll compressor delivers higher efficiency than any other single compressor system — which can save hundreds of dollars a year in energy costs. The Copeland UltraTech scroll compressor is remarkably quiet at both full-load and part-load capacity. In fact, it is up to four times quieter than a reciprocating compressor. Two internal bypass ports enable the system to run at 67% part-load capacity for better efficiency and humidity control. Based on demand, the modulation ring is activated, sealing the bypass ports and instantly shifting capacity to 100%. Take advantage of "shift on the fly" stage changing (no stopping and starting required like other two-stage compressors). While Copeland UltraTech scroll compressor builds on established scroll technology, it is still a scroll at heart, which means it operates with fewer moving parts, no volumetric efficiency drop-off or compression leakage. The result is unsurpassed reliability and virtually silent operation for both indoor and outdoor applications. There is now a better, more efficient way to power heating and cooling systems, raising the comfort level, while lowering energy bills.

Design flexibility

Airflow configurations for horizontal units are available in four patterns including left or right return, and left, right, or back discharge. Horizontal and downflow units are field convertible from left or right discharge to back discharge. Vertical units are available in three airflow patterns including top discharge with right or left return. Standard entering water temperature is between 60 and 95 F. Extended entering water temperature range between 20 F and 120 F offers maximum design flexibility for all applications. Water flow rates as low as 1.5 gpm per ton assist with selection from a various range of circulating pumps. Factory-installed options are offered to meet specific design requirements.

Safe, reliable operation

Standard safety features for the refrigerant circuit include high-pressure switch, low-pressure sensor to detect loss of refrigerant, and low air temperature sensor to safeguard against freezing. Equipment safety features include water loop temperature monitoring, voltage protection, water coil freeze protection, and standard electronic condensate overflow shutdown. 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 and compressor feet. 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, with minimal time required for installation. All units are pre-wired and factory charged with refrigerant. Horizontal units are provided with factory-installed hangar isolation brackets. Vertical units are provided with an internally trapped condensate drain to reduce labor associated with installing an external trap for each unit. Water connections (FPT) and condensate drains (FPT) are anchored securely to the unit cabinet.

Simple maintenance and serviceability

The Aquazone water source heat pump (WSHP) units are constructed to provide ease of maintenance. Units allow access to the compressor section from 3 sides and 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. Blower inlet rings allow removal of the blower wheel without having to remove the housing or ductwork connections.

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.

Maximum control flexibility

Aquazone™ water source heat pumps provide reliable control operation using a standard microprocessor board with

Features/Benefits (cont)

flexible alternatives for many direct digital control (DDC) applications including the Carrier Comfort Network® (CCN) controls and open protocol systems.

Carrier's Aquazone™ standard unit solid-state control system, the Complete C, provides control of the unit compressor, reversing valve, fan, safety features, and troubleshooting fault indication features. The Complete C control system is one of the most user friendly, low cost, and advanced control boards found in the WSHP industry. Many features are field selectable to provide the ultimate in field installation flexibility. The overall features of this standard control system include:

50 va transformer — The transformer assists in accommodating accessory loads.

Anti-short cycle timer — Timer provides a minimum off time to prevent the unit from short cycling. The 5-minute timer energizes when the compressor is deenergized, resulting in a 5-minute delay before the unit can be restarted.

Random start relay — Random start relay ensures a random delay in energizing each different WSHP unit. This option minimizes peak electrical demand during start-up from different operating modes or after building power outages.

High and low pressure refrigerant protection — This protection safeguards against unreliable unit operation and prevents refrigerant from leaking.

Condensate overflow sensor — The electronic sensor is mounted to the drain pan. When condensate pan liquid reaches an unacceptable level, unit is automatically deactivated and placed in a lockout condition. Thirty continuous seconds of overflow is recognized as a fault by the sensor.

High and low voltage protection — Safety protection for excessive or low voltage conditions is included.

Automatic intelligent reset — Unit will automatically restart 5 minutes after shutdown if the fault has cleared. Should a fault occur 3 times sequentially, lockout will occur.

Accessory output — Twenty-four volt output is provided to cycle a motorized water valve or damper actuator with compressor in applications such as variable speed pumping arrangements.

Performance monitor (PM) — Unique feature monitors water temperatures to warn when the heat pump is operating inefficiently or beyond typical operating range. Field selectable switch initiates a warning code on the unit display.

Water coil freeze protection (selectable for water or antifreeze) — Field selectable switch for water and water/glycol solution systems initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Air coil freeze protection (check filter operation) — Field selectable switch for assessing excessive filter pressure drop initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Alarm relay setting — Selectable 24 v or pilot duty dry contact provides activation of a remote alarm.

Electric heat option — The output provided on the controller operates two stages of emergency electric heat.

Service Test mode with diagnostic LED (light-emitting diode) — The Test mode allows service personnel to check the operation of the WSHP and control system efficiently. Upon entering Test mode, time delays are sped up, and the Status LED will flash a code to indicate the last fault experienced for easy diagnosis. Based on the fault code flashed by the status LED, system diagnostics are assisted through the use of Carrier provided troubleshooting tables for easy reference to typical problems.

LED visual output — An LED panel indicates high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow, and control status.

WSHP Open multiple protocol controller — Carrier's state of the art water source heat pump multiple protocol controller is capable of communicating BACnet™, Modbus®*, N2, and LON (with a separate card) protocols. The controller is designed specifically for Carrier's WSHPs in order to bring more features and benefits to the units such as waterside economizer control, auxiliary heat, dehumidification, etc., in addition to independent compressor and fan operation. The WSHP Open controller can be used to actively monitor and control all modes of operation as well as monitor the following diagnostics and features: unit number, zone temperature, zone set point, zone humidity set point, discharge air temperatures, fan status, stages of heating, stages of cooling, outdoor-air temperature, leaving-air temperature, leaving water temperature, alarm status, and alarm lockout condition.

The controller also provides a proactive approach to maintenance and service enabling the unit to recognize and correct operating conditions outside of recommended operating conditions avoiding the need to manually restart equipment. From a system standpoint WSHP Open controller can accept both water and airside linkage.

Condenser water linkage provides optimized water loop operation using the UC (universal controller) Open XP loop controller. Loop pump operation is automatically controlled by WSHP equipment occupancy schedules, unoccupied demand and tenant override conditions. Positive pump status feedback prevents nuisance fault trips.

Airside linkage enables the WSHP equipment to be completely integrated with the Carrier's VVT® application as a system. The WSHP Open controller responds to individual zone demands rather than average temperature conditions to provide individual temperature control in each zone.

This controller has a 38.4 kilobaud communications capability and is compatible with i-Vu® Open building automation system controls and CCN controls. The addition of the Carrier CO_2 sensor in the conditioned space provides ASHRAE 62-99 compliance and demand controlled ventilation (DCV). A DCV control strategy is especially beneficial for a water source heat pump system to minimize the energy utilized to condition ventilation air. In combination with energy efficient Aquazone units, DCV may be the most energy efficient approach ever developed for a water source heat pump system.

The WSHP Open multiple protocol controller is designed specifically for constant volume (CV) and variable volume and temperature (VVT®) applications. This comprehensive controls system allows water source heat pumps to be linked together to create a fully functional HVAC (heating, ventilation, and air conditioning) automation system.

*Registered trademark of Schneider Electric.

PremierLink™ controller adds reliability, efficiency, and simplification

The PremierLink direct digital controller can be ordered as a factory-installed option. Designed and manufactured exclusively by Carrier, the controller can be used to actively monitor and control all modes of operation as well as monitor the following diagnostics and features: unit number, zone temperature, zone set point, zone humidity set point, discharge air temperatures, fan status, stages of heating, stages of cooling, outdoor-air temperature, leaving-air temperature, leaving water temperature, alarm status, and alarm lockout condition.

This controller has a 38.4 kilobaud communications capability and is compatible with i-Vu® Open building automation system controls and CCN controls. The addition of the Carrier CO_2 sensor in the conditioned space provides ASHRAE 62-99 compliance and demand controlled ventilation (DCV). A DCV control strategy is especially beneficial for a water source heat pump system to minimize the energy utilized to condition ventilation air. In combination with energy efficient Aquazone units, DCV may be the most energy efficient approach ever developed for a water source heat pump system.

The PremierLink peer-to-peer, Internet ready communicating control is designed specifically for constant volume (CV) and variable volume and temperature (VVT®) applications. This comprehensive controls system allows water source heat pumps to be linked together to create a fully functional HVAC (heating, ventilation, and air conditioning) automation system.

LON protocol for diverse control — The LON controller option is ideal when building automation requires interoperability across diverse control platforms. This LONMark® compliant offering can operate as standalone or as a part of Local Operating Network (LON) via the LONWORKS® FTT-10 Free Topology communication network. Factory completed, pre-engineered applications specific to Aquazone water source heat pumps and digital wall sensors communicating over Sensor Link (S-Link) communication protocol completes a system of networked control.

Humidity control — Aquazone 50PTH, PTV, PTD units provide very good latent capacity and are an excellent choice for controlling humidity within a zone in many applications. The latent capacity of the units can be increased based on zone conditions with either the use of fan speed control and a humidistat or with the modulating WSHP Open controller hot water reheat option. The Deluxe D controls option provides fan speed control based on relative humidity and is an effective, low-cost means of controlling humidity. For certain applications in which a significant amount of latent capacity is required, the modulating hot water reheat option is a good solution.

Model number nomenclature

50PTH,PTV,PTD PREMIUM EFFICIENCY

50PTV 026 J C C 3 0 1 3 0

Aquazone™ Two-Stage Water Source Heat Pump with Puron® Refrigerant (R-410A)
50PTD – Downflow Configuration
50PTH – Horizontal Configuration
50PTV – Vertical Configuration

Unit Size – Nominal Tons
026* – 2
038 – 3
049 – 4
064 – 5 1/2
072* – 6

Airflow Configuration
50PTH Units

Option	Return	Discharge
N –	Right	Left
P –	Right	Back
W –	Left	Right
Y –	Left	Back

50PTV Units

Option	Return	Discharge
J –	Left	Top
K –	Right	Top

50PTD Units

Option	Return	Discharge
J –	Left	Bottom
K –	Right	Bottom

Controls
C – Complete C Microprocessor Control
D – Deluxe D Microprocessor Control
L – Complete C with LON†
M – Deluxe D with LON†
P – Complete C with PremierLink™ Communicating Control
W – Complete C with WSHP Open Multiple Protocol Communicating Control
Y – Deluxe D with WSHP Open Multiple Protocol Communicating Control

Water Circuit Options
0 – None
2 – Hot Water Generator (HWG) Coil Only
8 – Auto Flow Regulator Sized for 2.5 GPM per Ton
9 – Auto Flow Regulator Sized for 3.0 GPM per Ton

Operating Range
1 – Extended Range (20 to 120 F)
2 – Extended Range (20 to 120 F) with Mute Package
3 – Standard Range (60 to 95 F)
4 – Standard Range (60 to 95 F) with Mute Package

Packing
1 – Single Pack, Domestic

Revision Code
0 – Current Revision

Voltage
3 – 208/230-1-60
5 – 208/230-3-60
6 – 460-3-60††

Heat Exchanger Options

Valve	Non-Coated Air Coil		Coated Air Coil	
	Copper	Cupronickel	Copper	Cupronickel
None	C	N	A	J
Motorized Valve	T	S	U	W
HWR**	E	N/A	D	N/A

LEGEND
HWG — Hot Water Generator
HWR — Hot Water Reheat

*Available with Option "3" voltage only.
†LON — LONWORKS® Open System Protocol.
**Must order Deluxe D when selecting HWR option. Units with the HWR option installed in an open loop application require an internal bronze pump. The cupronickel heat exchanger option, which includes a bronze pump, must be used. Failure to select this option could result in premature equipment failure. HWR is not recommended for applications with poor water quality. The copper heat exchanger with cast iron pump (standard modulating reheat option) is designed for closed loop systems. Not available on downflow units.
††The 460-v units using an ECM (electronically commutated motor) fan motor, modulating HWR, and/or an internal secondary pump will require a neutral wire from the supply side in order to feed the accessory with 265-v.

ENERGY STAR

INTERTEK ETL CM LISTED C US

ARI/ISO capacity ratings

50PTH, 50PTV, 50PTD WATER LOOP APPLICATIONS

UNIT 50PTH, PTV, PTD		PRESSURE DROP		GPM	COOLING EWT 86 F			HEATING EWT 68 F		
		PSI	Ft		CFM	TC	EER Btuh/W	CFM	TC	COP
026	FULL LOAD	3.5	6.4	8.0	850	25,300	15.9	950	30,800	5.3
	PART LOAD	2.8	6.4	7.0	725	19,400	18.3	825	22,400	6.1
038	FULL LOAD	4.5	10.3	9.0	1250	36,200	15.6	1250	44,800	5.3
	PART LOAD	3.8	8.8	8.0	1000	26,200	18.5	1000	30,800	6.3
049	FULL LOAD	3.6	8.2	12.0	1550	48,400	15.7	1650	59,900	5.2
	PART LOAD	3.2	7.3	11.0	1300	36,100	18.0	1400	44,300	6.2
064	FULL LOAD	3.6	8.2	15.0	1825	61,500	15.0	2050	72,300	5.0
	PART LOAD	3.0	7.0	14.0	1500	44,900	17.6	1650	51,100	5.7
072	FULL LOAD	6.5	15.0	18.0	1950	68,700	14.2	2100	88,600	4.9
	PART LOAD	6.5	15.0	17.0	1500	52,800	16.0	1650	65,200	5.1

LEGEND

ARI — Air Conditioning and Refrigeration Institute
CFM — Airflow Rate
COP — Coefficient Performance
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Water Flow Rate
ISO — International Organization for Standardization
TC — Total Capacity (Btuh)

NOTES:
1. A water-to-air heat pump using water or brine circulating in a common piping loop functioning as a heat source/heat sink.
2. The temperature of the water or brine loop is usually mechanically controlled within a temperature range of 60 F to 95 F.
3. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program.
4. Table does not reflect fan or pump power connections for ARI/ISO conditions.

50PTH, 50PTV, 50PTD GROUND WATER APPLICATIONS

UNIT 50PTH, PTV, PTD		PRESSURE DROP		GPM	COOLING EWT 59 F			HEATING EWT 50 F		
		PSI	Ft		CFM	TC	EER Btuh/W	CFM	TC	COP
026	FULL LOAD	3.5	6.4	8.0	850	28,900	24.5	950	25,700	4.8
	PART LOAD	2.8	6.4	7.0	725	22,200	30.8	825	18,600	5.1
038	FULL LOAD	4.5	10.3	9.0	1250	41,200	23.0	1250	36,700	4.7
	PART LOAD	3.8	8.8	8.0	1000	30,200	31.5	1000	24,800	5.1
049	FULL LOAD	3.6	8.2	12.0	1550	54,600	22.5	1650	48,300	4.7
	PART LOAD	3.2	7.3	11.0	1300	40,700	28.7	1400	35,400	5.1
064	FULL LOAD	3.6	8.2	15.0	1825	68,600	22.0	2050	59,600	4.4
	PART LOAD	3.0	7.0	14.0	1500	51,900	29.7	1650	41,800	4.7
072	FULL LOAD	6.5	15.0	18.0	1950	77,100	19.9	2100	70,200	4.3
	PART LOAD	6.5	15.0	17.0	1500	59,800	24.5	1650	51,700	4.3

LEGEND

ARI — Air Conditioning and Refrigeration Institute
CFM — Airflow Rate
COP — Coefficient of Performance
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Water Flow Rate
ISO — International Organization for Standardization
TC — Total Capacity (Btuh)

NOTES:
1. A brine-to-air heat pump using a brine solution circulating through a subsurface piping loop functioning as a heat source/heat sink.
2. The heat exchange loop may be placed in horizontal trenches or vertical bores, or be submerged in a body of surface water.
3. The temperature of the brine is related to the climatic conditions and may vary from 20 F to 120 F.
4. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program.
5. Table does not reflect fan or pump power connections for ARI/ISO conditions.

50PTH, 50PTV, 50PTD GROUND LOOP APPLICATIONS

UNIT 50PTH, PTV, PTD		PRESSURE DROP		GPM	COOLING EWT 77 F (Full Load), 68 F (Part Load)			HEATING EWT 32 F (Full Load), 41 F (Part Load)		
		PSI	Ft		CFM	TC	EER Btuh/W	CFM	TC	COP
026	FULL LOAD	3.5	6.4	8.0	850	26,600	18.5	950	19,800	4.0
	PART LOAD	2.8	6.4	7.0	725	21,300	26.0	825	16,500	4.6
038	FULL LOAD	4.5	10.3	9.0	1250	38,200	18.2	1250	29,000	4.0
	PART LOAD	3.8	8.8	8.0	1000	28,900	27.0	1000	22,100	4.5
049	FULL LOAD	3.6	8.2	12.0	1550	50,600	17.9	1650	37,500	4.0
	PART LOAD	3.2	7.3	11.0	1300	39,600	24.9	1400	31,200	4.6
064	FULL LOAD	3.6	8.2	15.0	1825	64,800	17.5	2050	48,000	3.9
	PART LOAD	3.0	7.0	14.0	1500	49,800	25.3	1650	37,500	4.3
072	FULL LOAD	6.5	15.0	18.0	1950	71,600	16.2	2100	54,100	3.6
	PART LOAD	6.5	15.0	17.0	1500	57,700	21.4	1650	45,400	3.9

LEGEND

ARI — Air Conditioning and Refrigeration Institute
CFM — Airflow Rate
COP — Coefficient of Performance
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Water Flow Rate
ISO — International Organization for Standardization
TC — Total Capacity (Btuh)

NOTES:
1. A brine-to-air heat pump using a brine solution circulating through a subsurface piping loop functioning as a heat source/heat sink.
2. The heat exchange loop may be placed in horizontal trenches or vertical bores, or be submerged in a body of surface water.
3. The temperature of the brine is related to the climatic conditions and may vary from 20 F to 120 F.
4. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program, with 15% antifreeze solution.
5. Table does not reflect fan or pump power connections for ARI/ISO conditions.

ARI PERFORMANCE CERTIFIED
ANSI/ARI/ASHRAE/ISO Standard 13256-1 60 Hz Water Source HP
www.ahridirectory.org

Physical data

PHYSICAL DATA — 50PTH, PTV, PTD026-072 UNITS

UNIT 50PTH, PTV, PTD	026	038	049	064	072
COMPRESSOR (1 each)	Two-Stage, Scroll				
FACTORY CHARGE R-410A (oz)	58	78	81	144	156
ICM2 FAN MOTOR AND BLOWER					
Fan Motor Type	VAR	VAR	VAR	VAR	VAR
Fan Motor (Hp)	1/2	1/2	1	1	1
Blower Wheel Size (D x W) (in.)	9 x 7	11 x 10	11x10	11x10	11x10
COAXIAL COIL VOLUME (gal.)	.76	.92	1.24	1.56	1.56
WATER CONNECTION SIZE (FPT) (in.)	3/4	3/4	1	1	1
HWG CONNECTION SIZE (FPT) (in.)	1/2	1/2	1/2	1/2	1/2
VERTICAL					
Air Coil					
Dimensions (H x W) (in.)	28 x 20	28 x 25	32 x 25	36 x 25	36 x 25
Filter Standard — 1-in. Throwaway (Qty — Size) (in.)	1 — 28 x 24	1 — 28 x 30	2 — 16 x 30	1 — 16 x 30 1 — 20 x 30	1 — 16 x 30 1 — 20 x 30
Weight (lb)					
Operating	266	327	416	443	443
Packaged	276	337	426	453	453
HORIZONTAL					
Air Coil					
Dimensions (H x W) (in.)	18 x 31	20 x 25	20 x 40	20 x 45	20 x 45
Filter Standard — 1-in. Throwaway (Qty — Size) (in.)	2 — 18 x 18	1 — 12 x 20 1 — 20 x 24	1 — 18 x 20 1 — 20 x 24	2 — 20 x 24	2 — 20 x 24
Weight (lb)					
Operating	266	327	416	443	443
Packaged	276	337	426	453	453

LEGEND

HWG — Hot Water Generator
ICM2 — Integrally Controlled Motor 2
VAR — Variable Speed

NOTES: All units have spring compressor mountings, TXV (thermostatic expansion valve) expansion devices, and 1/2 and 3/4-in. electrical knockouts.

Options and accessories

ITEM	FACTORY-INSTALLED OPTIONS	FIELD-INSTALLED ACCESSORIES
Aquazone™ System Control Panel		X
2-in. Filter Rack		X
Ball Valves (Brass Body)		X
Cupronickel Heat Exchangers	X	
Deluxe D Control System	X	
Extended Range Units	X	
Fire-Rated Hoses		X
Hose Kit Assemblies		X
Hot Water Generator	X	
PremierLink™ Intelligent Controller	X	
LONMark® Compliant Controller	X	
UC Open XP Loop Controller		X
Non-Programmable Thermostat		X
PremierLink Accessories		X
Programmable 5-Day Thermostat		X
Programmable 7-Day Flush-Mount Thermostat		X
Programmable 7-Day Light-Activated Thermostat		X
Programmable 7-Day Thermostat		X
Remote Sensors (SPT, CO_2, Humidity Sensors)		X
Solenoid Water Control Valves (Brass Body)		X
Sound Attenuation (Mute) Package	X	
Two-Way Motorized Control Valve	X	X
Y Strainers (Brass Body)		X
Modulating Hot Water Reheat	X	
Water Circuit Options	X	
2 in. Filter Rack with Closure		X
WSHP Open Multiple Protocol Controller	X	

Options and accessories (cont)

Factory-installed options

Cupronickel heat exchangers are 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.

Sound attenuation package (mute package) is available for applications that require especially low noise levels. With this option, a double application of sound attenuating material is applied, access panels are double dampened with $^1/_2$-in. thick density fiberglass insulation, and a unique application of special dampening material is applied to the curved portion of the blower. The mute package in combination with standard unit noise reduction features (i.e., as mentioned previously) provides sound levels and noise reduction to the highest degree.

Extended range units insulate the coaxial coil to prevent condensation, and therefore potential dripping problems, in applications where the entering water temperature is below the normal operating range (less than 60 F). Units are capable of operating at a range of 20 to 120 F.

Hot water generator coil and 125 F high temperature switch to generate hot water using the unit. Hot water pumps are not provided with this option.

Water circuit options provide internally mounted 2.5 or 3.0 gpm per ton automatic flow regulating valves for easier installation.

Modulating hot water reheat (HWR) diverts condenser water through a water-to-air coil that is placed after the evaporator coil. The modulating reheat valve automatically adjusts reheat capacity based upon leaving-air temperature and loop entering-water temperature to provide 100% reheat and neutral supply air to the space.

Two-way motorized control valve can be provided for applications involving open type systems or variable speed pumping. This valve will slowly open and close in conjunction with the compressor operation to shut off or turn on water to the unit.

Deluxe D control system provides the same functions as the Complete C control system while incorporating additional flexibility and functions to include:

Thermostat input capabilities accommodate emergency shutdown mode and night setback with override potential. Night setback from low temperature thermostat with 2-hour override is initiated by a momentary signal from the thermostat.

Compressor relay staging is used with dual stage units (units with 2 compressors and 2 Deluxe D controls) or in master/slave applications.

Boilerless electric heat control system allows automatic changeover to electric heat at low loop water temperature.

Intelligent reversing valve operation minimizes reversing valve operation for extended life and quiet operation.

Thermostat type select (Y, O or Y, W) provides ability to work and select heat pump or heat/cool thermostats (Y, W).

Reversing valve signal select (O or B) provides selection for heat pump O/B thermostats.

Dehumidistat input provides operation of fan control for dehumidification operation (facilitates HWR).

Multiple units on one thermostat/wall sensor provides for communication for up to three heat pumps on one thermostat.

Boilerless changeover temperature provides selection of boilerless changeover temperature set point.

Accessory relays allow configuration for multiple applications including fan and compressor cycling, digital night setback (NSB), mechanical night setback, water valve operation, and outside air damper operation.

WSHP Open multiple protocol controller is a proactive controller capable of communicating BACnet™, Modbus®*, N2, and LON (with a separate card) protocols. The controller is designed to allow users the access and ability to change and configure multiple settings and features including indoor air quality (IAQ), waterside economizer controls, etc.

PremierLink™ controller is compatible with the Carrier Comfort Network® (CCN) controls and other building automation systems (BAS). This control is designed to allow users the access and ability to change factory-defined settings, thus expanding the function of the standard unit.

LONMARK® compliant controller contains the factory-loaded Aquazone™ water source heat pump application for an interoperable control solution.

Field-installed accessories

Aquazone™ system control panel includes a preprogrammed, easy to use, Carrier Comfort Controller set up for a WSHP system.

- Panel coordinates and monitors loop water temperature and all water side ancillary equipment.
- The 50RLP model nomenclature is used to customize the control panel options to control all WSHP system requirements.
- Panel can be ordered to include 2, 4, 6, or 8 stages of system heat rejection.
- Panel can be ordered to include 2, 4, 6, or 8 stages of system heat addition.
- Panel can be ordered with unique WSHP zone operation capabilities for stand-alone systems (i.e., noncommunicating) to control 10 or 18 zones of WSHP units.
- Panel can be ordered to control variable frequency cooling tower fan operation.
- System pumping operation can be configured for start/stop, lead/lag, or variable frequency pump operation.
- Direct Digital Controls (DDC) compatible using the Carrier Comfort Network® (CCN) and WSHP units utilizing PremierLink™ CCN controllers.

Carrier's line of Aquazone™ thermostats are both attractive and multi-functional, accommodating stand-alone water source heat pump installations.

Programmable 7-day thermostat — Thermostat offers 2-stage heat, 2-stage cool, auto changeover, 7-day programmable with copy command, 4 settings per day, fully electronic, 24 vac, backlit LCD, keypad lockout, no batteries required, 5-minute compressor protection,

*Registered trademark of Schneider Electric.

Options and accessories (cont)

NEVERLOST™ memory, 3 security levels, temperature display in degrees F or C.

Programmable 7-day light-activated thermostat — Thermostat offers same features as the 7-day programmable thermostat and includes occupied comfort settings with lights on, unoccupied energy savings with lights off.

Programmable 7-day flush-mount thermostat — Thermostat offers same features as the 7-day programmable thermostat and includes locking coverplate with tamper proof screws, flush to wall mount, holiday/vacation programming, set point limiting, dual point with adjustable deadband, O or B terminal, and optional wall or duct-mounted remote sensor.

Programmable 5-day thermostat — Thermostat offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included, temperature display in degrees F or C, keypad lockout, backlit display, 5-1-1 programming, O or B terminal, dual set point with adjustable deadband, configurable display, self-prompting program, and 4 settings per day.

Non-programmable thermostat — Thermostat offers 2 heat stages, 2 cool stages, auto changeover, 5-minute built-in compressor protection, locking cover included, temperature display in degrees F or C, keypad lockout, large display, backlit display, O or B terminal, dual set point with adjustable deadband, and backplate with terminals.

UC Open XP loop controller with six stages (2 stages for heating and 4 stages for cooling) includes:

- Loop temperature alarms
- Two pump single loop flow monitoring with the ability to manually select the lead pump
- One common alarm signal and indicating light and one audible alarm
- Loop water temperature sensor test circuit
- Functional test simulation from operator keypad
- Real timeclock, industrial noise ratings
- Loop water temperature control switch
- Loop controller with six stages (2 stages for heating and 4 stages for cooling)

Filter rack (2 in.) is available in place of the standard 1-in. return air filter to enhance the filtration system of the water source heat pump. The 2-in. filter rack does not include filters.

Fire-rated hoses are 2 ft long and have a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits are provided with both a supply and return hose and can be either stainless steel or galvanized. Three sizes are available ($1/2$, $3/4$, 1 in.).

Ball valves (brass body) are used for shutoff and balancing water flow and are available with memory, memory stop, and pressure temperature ports. Ball valves consist of UL-listed brass body, ball and stem type with Teflon* seats and seals. Three sizes are available ($1/2$, $3/4$, 1 in.).

Y strainers (bronze body) are "Y" type strainers with a brass cap. With a maximum operating pressure rating of 450 psi, the strainer screen is made of stainless steel and is available with blow down valves. Three sizes are available ($1/2$, $3/4$, 1 in.).

Solenoid valves (brass body) offer 3.5 watt coil, 24 volt, 50/60 Hz, 740 amps inrush, .312 amps holding. Solenoid valves have slow operation for quiet system application. Three sizes are available ($1/2$, $3/4$, 1 in.).

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.

Remote sensors are available for Aquazone flush-mount thermostats and for wall (wired and wireless) or duct mounted applications.

SPT Standard offers space temperature sensor with communication port.

SPT Plus offers space temperature sensor with set point adjust, local override with indicating light and communication port.

SPT Pro offers space temperature sensor with LCD display, set point adjust, local override, alarm icon, outside air, and unit status with heating and cooling set points.

SPT Pro+ offers space temperature sensor with LCD display, set point adjust, local override, alarm icon, outside air, unit status with heating and cooling set points, and fan speed control.

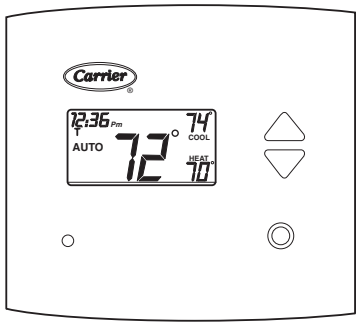
LON wall sensors are available in 3 models: sensor only, sensor with status override indicator, and sensor with set point, status adjustment override, and digital LCD display.

PremierLink™ accessories are available for providing a fully integrated WSHP DDC system. Accessories include supply air temperature sensors (with override and/or set point adjustment), communicating room sensors, CO_2 sensors (for use in demand control ventilation), and linkage thermostats (to control multiple units from one thermostat).

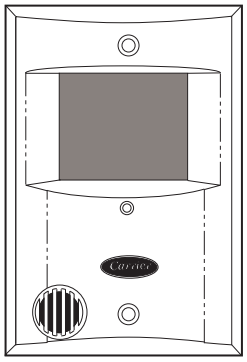
Two-way motorized control valve can be provided for applications involving open type systems or variable speed pumping. This valve will slowly open and close in conjunction with the compressor operation to shut off or turn on water to the unit.

*Teflon is a trademark of E. I. du Pont de Nemours and Company.

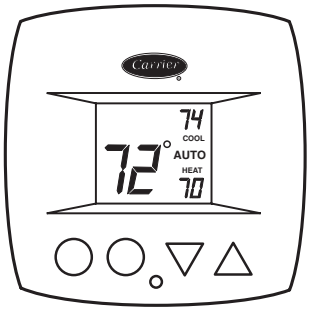
AQUAZONE™ THERMOSTATS



**7-DAY PROGRAMMABLE/
LIGHT-ACTIVATED PROGRAMMABLE**

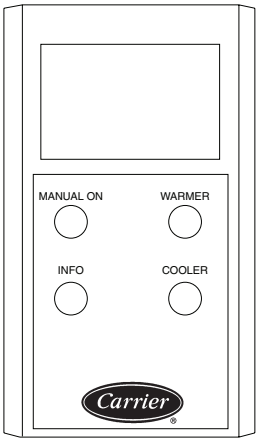


**7-DAY PROGRAMMABLE
FLUSH MOUNT**

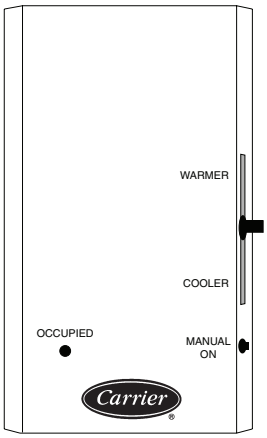


**5-DAY PROGRAMMABLE/
NON-PROGRAMMABLE**

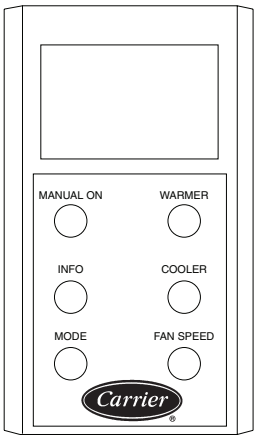
WSHP OPEN SENSORS



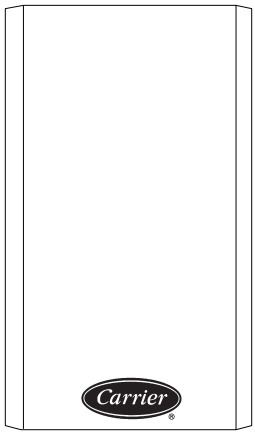
**SPACE TEMPERATURE
SENSOR WITH SET
POINT ADJUSTMENT
AND LOCAL OVERRIDE**



**SPACE TEMPERATURE
SENSOR WITH SLIDE SET
POINT ADJUSTMENT AND
LOCAL OVERRIDE**

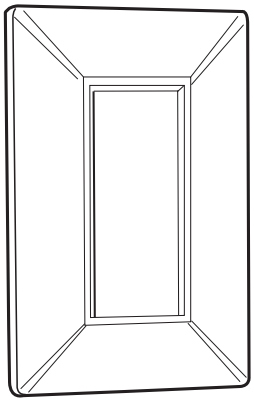


**SPACE TEMPERATURE
SENSOR WITH SET
POINT ADJUSTMENT,
FAN SPEED CONTROL,
AND LOCAL OVERRIDE**

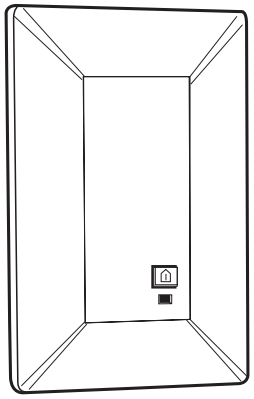


**SPACE TEMPERATURE
SENSOR ONLY**

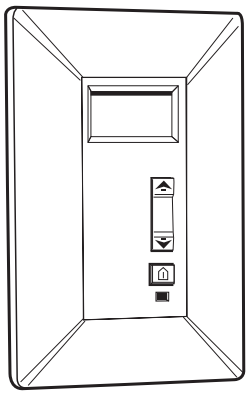
LON WALL SENSORS



SENSOR ONLY



SENSOR WITH OVERRIDE



**SENSOR WITH SET POINT ADJUSTMENT,
OVERRIDE AND DIGITAL LCD**

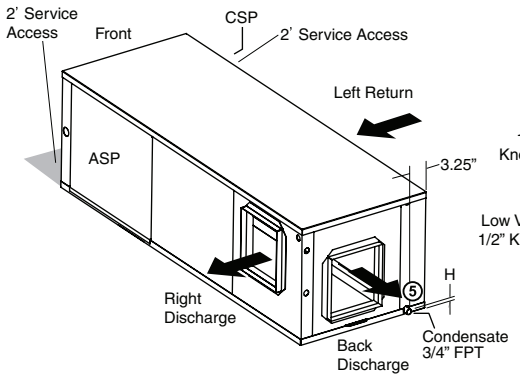
Dimensions

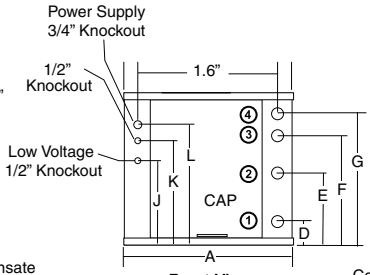
50PTH026-072 UNITS

LEGEND

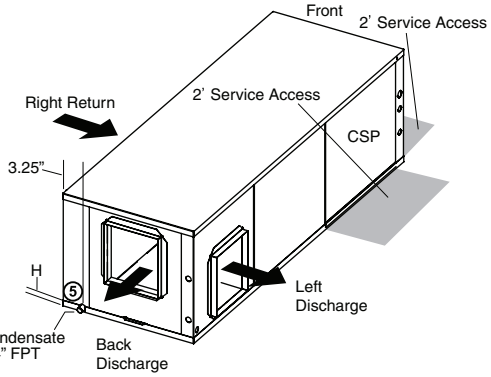
ASP — Alternate Service Panel
BSP — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel
FPT — Female Pipe Thread
HWG — Hot Water Generator
HWR — Hot Water Reheat

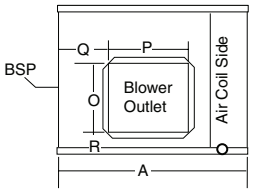
LEFT RETURN





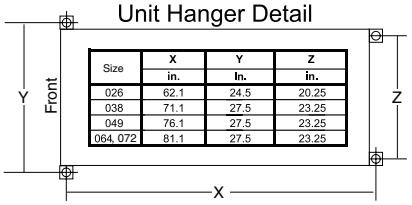
RIGHT RETURN



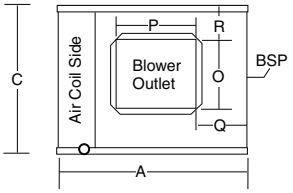


Y Configuration - Left Return/Back Discharge

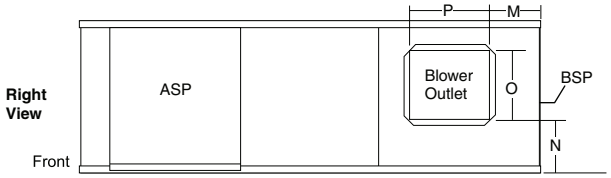
Unit Hanger Detail



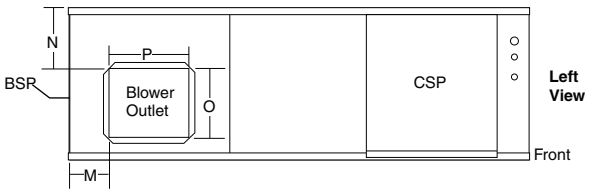
Size	X in.	Y In.	Z in.
026	62.1	24.5	20.25
038	71.1	27.5	23.25
049	76.1	27.5	23.25
064, 072	81.1	27.5	23.25



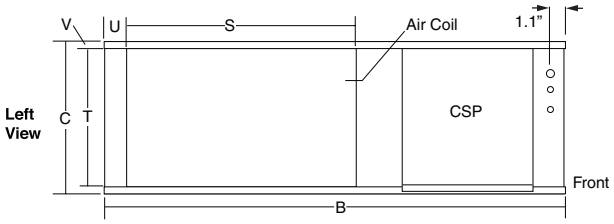
P Configuration - Right Return/Back Discharge - Air Coil Opening



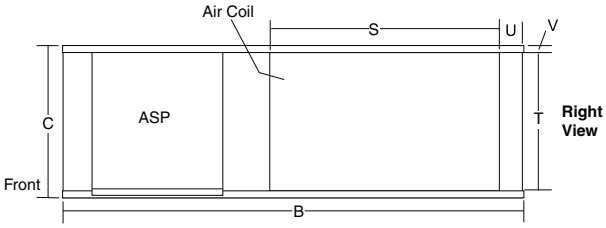
W Configuration - Left Return/Right Discharge - Air Coil Opening



N Configuration - Right Return/Left Discharge - Air Coil Opening



W Configuration - Left Return/Right Discharge - Air Coil Opening



N Configuration - Right Return/Left Discharge - Air Coil Opening

50PTH UNIT	OVERALL CABINET (in.)			WATER CONNECTIONS (in.)							WATER CONNECTIONS (in.) - UNITS WITH HWR		ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTIONS (in.) DUCT FLANGE INSTALLED (± 0.10 in.)						RETURN CONNECTION USING AIR COIL OPENING (in.)			
	A Width	B Depth	C Height	1	2	3	4	5	Loop Water FPT (in.)	HWG FPT (in.)	1	2	J 1/2-in. Cond	K 1/2-in. Cond	L 3/4-in. Cond	M (LH rtn)	N	O Supply Height	P Supply Width	Q (RH rtn)	R	S Return Width	T Return Height	U	V
				D In	E Out	F HWG In	G HWG Out	H Cond-ensate			Loop in D	Loop out E	Low Voltage	Ext Pump	Power Supply										
026	22.4	62.2	19.3	2.1	10.0	13.9	16.9	3.5	3/4	1/2	2.1	10.0	3.6	6.1	8.6	3.6	2.0	12.5	15.5	3.6	2.0	33.8	16.2	2.3	1.5
038	25.4	71.2	21.3	3.4	10.8	14.6	18.9	3.4	3/4	1/2	5.96	13.13	3.4	6.1	8.6	3.1	1.2	19.0	17.5	3.1	1.0	34.8	18.2	3.1	1.5
049	25.4	76.2	21.3	3.4	10.8	15.6	18.9	3.4	1	1/2	5.96	13.13	3.6	6.1	8.6	3.1	1.2	19.0	17.5	3.1	1.0	39.8	18.2	3.1	1.5
064,072	25.4	81.2	21.3	3.4	10.8	15.6	18.9	3.4	1	1/2	5.96	13.13	3.6	6.1	8.6	3.1	1.2	19.0	17.5	3.1	1.0	44.8	18.2	3.1	1.5

NOTES:
1. Condensate connection is stainless steel 3/4 in. female pipe thread (FPT).
2. Unit shipped with top and bottom filter rack and is not suitable for duct connection without additional support.
3. Discharge flange is factory-installed.
4. Hanger kit is factory-installed.
5. Shaded areas are recommended service areas, not required.
6. Discharge can be modified in field. Return cannot be modified.

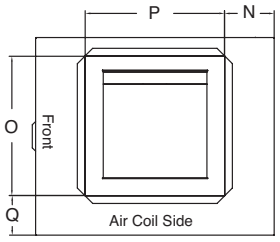
AIRFLOW CONFIGURATION

CODE	RETURN	DISCHARGE
N	Right	Left
P	Right	Back
W	Left	Right
Y	Left	Back

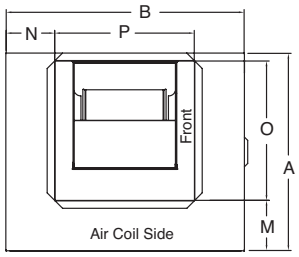
50PTV026-072 UNITS

LEGEND

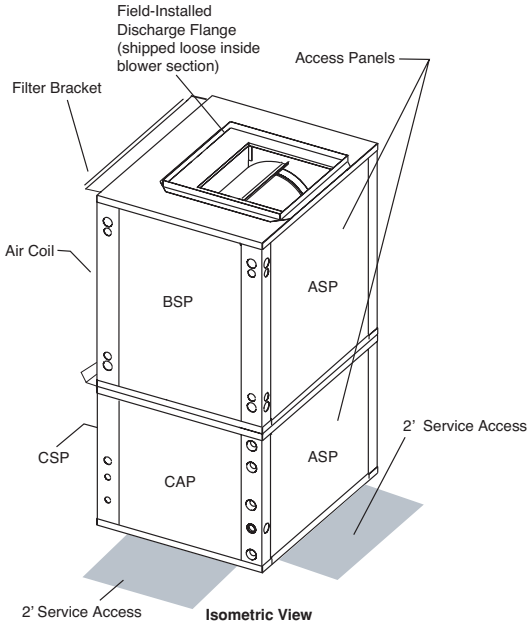
ASP — Alternate Service Panel
BSP — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel
FPT — Female Pipe Thread
HV — High Voltage
HWG — Hot Water Generator
HWR — Hot Water Reheat
LV — Low Voltage



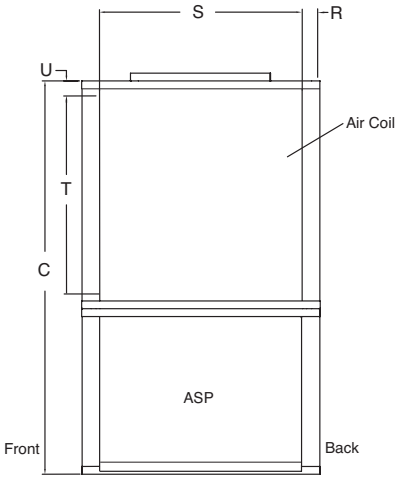
K - Configuration - Right Return /Top Discharge (Top View)



J - Configuration - Left Return /Top Discharge (Top View)

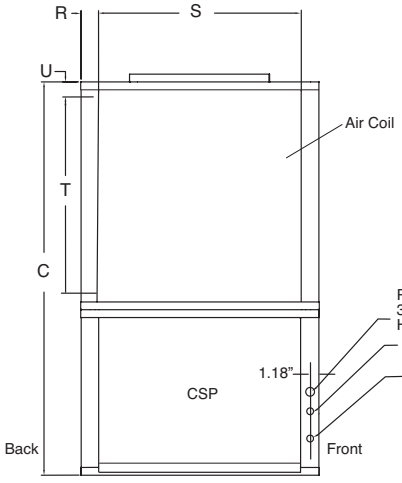


Isometric View



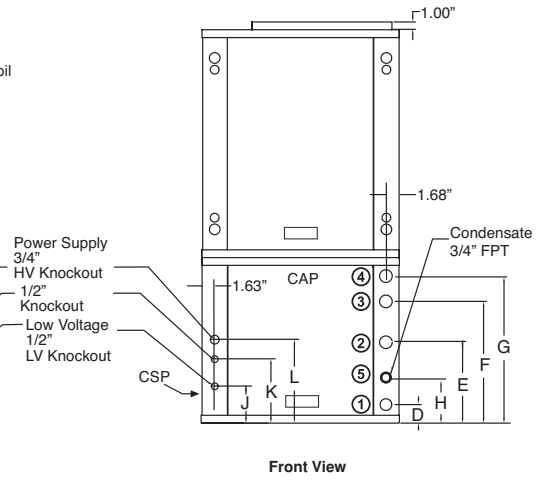
K - Configuration - Right Return - Air Coil Opening

(Right Side View)



J - Configuration - Left Return - Air Coil Opening

(Left Side View)



Front View

50PTV UNIT	OVERALL CABINET (in.)			WATER CONNECTIONS (in.)							WATER CONNECTIONS (in.) - UNITS WITH HWR		ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTIONS (in.) DUCT FLANGE INSTALLED (± 0.10 in.)					RETURN CONNECTION USING AIR COIL OPENING (in.)			
	A Width	B Depth	C Height	1 D In	2 E Out	3 F HWG In	4 G HWG Out	5 H Cond-ensate	Loop Water FPT (in.)	HWG FPT (in.)	1 Loop in D	2 Loop out E	J 1/2-in. Cond Low Voltage	K 1/2-in. Cond Ext Pump	L 3/4-in. Cond Power Supply	M (LH rtn)	N	O Supply Width	P Supply Depth	Q (RH rtn)	R	S Return Depth	T Return Height	U
026	22.4	25.6	48.5	2.1	10.0	13.9	16.9	7.8	3/4	1/2	2.1	10.0	3.6	6.1	8.6	7.2	5.8	14.0	14.0	4.9	2.2	21.1	27.2	1.0
038	25.4	30.6	50.5	3.4	10.8	15.6	18.9	7.8	3/4	1/2	5.96	13.13	3.6	6.1	8.6	6.4	6.3	18.0	18.0	5.3	2.2	26.1	27.2	1.0
049	25.4	30.6	54.5	3.4	10.8	15.6	18.9	7.8	1	1/2	5.96	13.13	3.6	6.1	8.6	6.4	6.3	18.0	18.0	5.3	2.2	26.1	31.2	1.0
064,072	25.4	30.6	58.5	3.4	10.8	15.6	18.9	7.8	1	1/2	5.96	13.13	3.6	6.1	8.6	6.4	6.3	18.0	18.0	5.3	2.2	26.1	35.2	1.0

NOTES:
1. Condensate connection is stainless steel 3/4 in. female pipe thread (FPT).
2. Unit shipped with top and bottom filter rack and is not suitable for duct connection without additional support.
3. Discharge flange is field-installed.
4. Shaded areas are recommended service areas, not required.

AIRFLOW CONFIGURATION

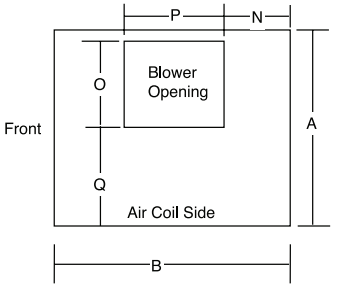
CODE	RETURN	DISCHARGE
J	Left	Top
K	Right	Top

Dimensions (cont)

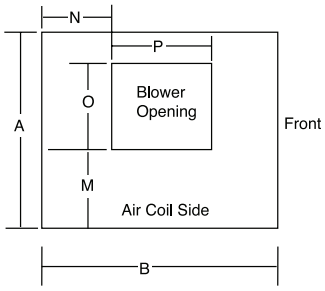
50PTD026-072 UNITS

LEGEND

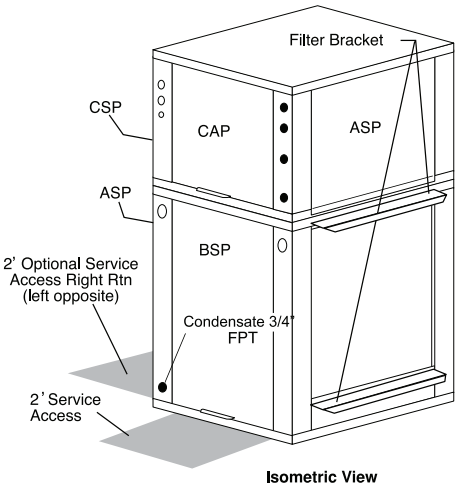
ASP — Alternate Service Panel
BSP — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel
FPT — Female Pipe Thread
HWG — Hot Water Generator
HWR — Hot Water Reheat



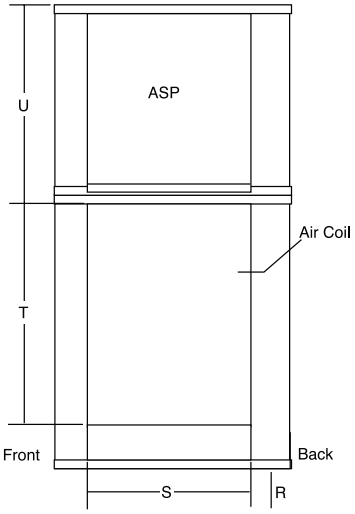
K Configuration - Right Return/Bottom Discharge (Top View)



J Configuration - Left Return/Bottom Discharge (Top View)

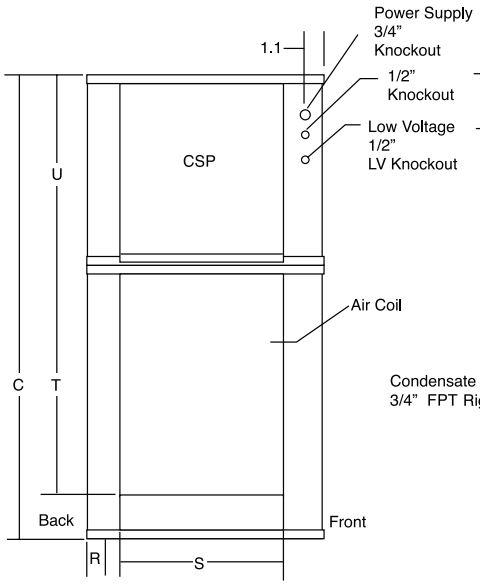


Isometric View



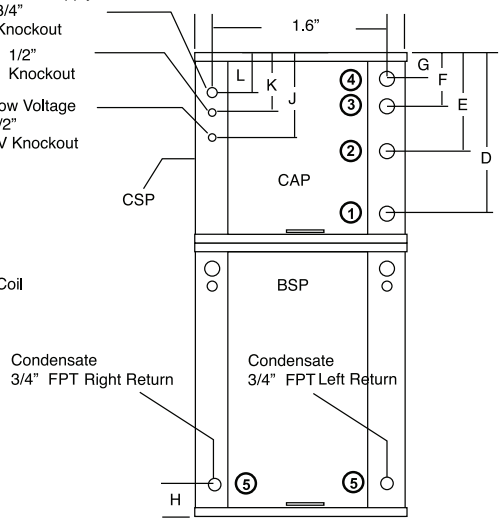
K Configuration - Right Return - Air Coil Opening

(Right Side View)



J Configuration - Left Return - Air Coil Opening

(Left Side View)



Front View

50PTD UNIT	OVERALL CABINET (in.)			WATER CONNECTIONS (in.)							WATER CONNECTIONS (in.) - UNITS WITH HWR		ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTIONS (in.) DUCT FLANGE INSTALLED (± 0.10 in.)					RETURN CONNECTION (in.) USING AIR COIL OPENING			
	A Width	B Depth	C Height	1	2	3	4	5	Loop Water FPT (in.)	HWG FPT (in.)	1	2	J 1/2-in. Cond	K 1/2-in. Cond	L 3/4-in. Cond	M (LH rtn)	N	O Supply Width	P Supply Depth	Q (RH rtn)	R	S Return Depth	T Return Height	U
				D In	E Out	F HWG In	G HWG Out	H Cond-ensate			Loop in D	Loop out E	Low Voltage	Ext Pump	Power Supply										
026	22.4	25.6	52.5	2.1	10.0	13.9	16.9	3.6	3/4	1/2	2.1	10.0	3.6	6.1	8.6	6.7	8.4	10.1	9.1	10.8	2.2	21.1	27.2	1.0
038	25.4	30.6	54.5	3.4	10.8	15.6	18.9	3.6	3/4	1/2	5.96	13.13	3.6	6.1	8.6	7.2	9.0	13.4	12.9	10.4	2.2	26.1	27.2	1.0
049	25.4	30.6	58.5	3.4	10.8	15.6	18.9	3.6	1	1/2	5.96	13.13	3.6	6.1	8.6	7.2	9.0	13.4	12.9	10.4	2.2	26.1	31.4	1.0
064,072	25.4	30.6	62.5	3.4	10.8	15.6	18.9	3.6	1	1/2	5.96	13.13	3.6	6.1	8.6	7.2	9.0	13.4	12.9	10.4	2.2	26.1	35.2	1.0

NOTES:
1. Condensate connection is stainless steel 3/4 in. female pipe thread (FPT).
2. Unit shipped with top and bottom filter rack and is not suitable for duct connection without additional support.
3. Downflow unit does not have discharge flange, and is rated for zero clearance installation.
4. Shaded areas are recommended service areas, not required.
5. Downflow units not available with HWR.

AIRFLOW CONFIGURATION

CODE	RETURN	DISCHARGE
J	Left	Bottom
K	Right	Bottom

Selection procedure (50PTH049 unit example)

I Determine the actual cooling and heating loads at the desired dry bulb and wet bulb conditions.

Given:

Total Cooling (TC) . . . . . .46,500 Btuh
Sensible Cooling (SC) . . . . . .34,900 Btuh
Entering-Air Temperature db . . . . . 80.6 F
Entering-Air Temperature wb. . . . . .65 F

II Determine the following design parameters from Performance Data tables.

Determine entering water temperature, water flow rate (gpm), airflow (cfm), water flow pressure drop and design wet and dry bulb temperatures (full load). Airflow cfm should be between 300 and 450 cfm per ton. Unit water pressure drop should be kept as close as possible to each other to make water balancing easier. For the 50PTH049 unit example, the given design parameters are as follows:

Given:

Entering Water Temperature . . . . . 90 F
Water Flow (Based upon
12 F rise in temperature) . . . . . .9.0 gpm
Airflow Cfm . . . . . .1364 cfm

III Select a unit based on total cooling and total sensible cooling conditions. Unit selected should be closest to but not larger than the actual cooling load.

Enter Performance Data tables at the design water flow and water temperature (full load). Read the total and sensible cooling capacities.

NOTE: Interpolation is permissible, extrapolation is not.

For example:

Enter the 50PTH049 Performance Table at design water flow and water temperature. Read Total Cooling, Sensible Cooling and Heat of Rejection capacities:

Total Cooling . . . . . .46,000 Btuh
Sensible Cooling. . . . . 30,200 Btuh
Heat of Rejection . . . . . .57,200 Btuh

Read the Heat Capacity. If the Heat Capacity exceeds the design criteria specified in the scope, it is acceptable.

NOTE: It is normal for water source heat pumps to be selected on cooling capacity only since the heating output is usually greater than the cooling capacity.

IV Determine the correction factors associated with the variable factors of dry bulb and wet bulb using the Correction Factors tables found in this book.

Using the following formulas to determine the correction factors of total cooling, sensible cooling, and heat of rejection:

a. Corrected Total Cooling = tabulated total cooling x wet bulb correction x airflow correction.
b. Corrected Sensible Cooling = tabulated sensible cooling x wet/dry bulb correction x airflow correction.
c. Corrected Heat of Rejection = tabulated heat of rejection x wet bulb correction x airflow correction.

V Determine entering air and airflow correction using the Correction Factors tables (Full Load) found in this book.

The nominal airflow for the 50PTH049 is 1550 cfm. The design parameter is 1364 cfm.

1550/1364 = 88% of nominal airflow:

Use the 88% row in the Full Load Airflow Correction Factors table.

The Entering Air Temperature is 65 F wb. Use the 65 F row in the Full Load Entering Air Correction Factors table.

Using the following formulas to determine the correction factors of entering air and airflow correction:

	Table		Ent Air		Airflow		Corrected
Corrected Total Cooling	= 46,000	x	0.975	x	0.983	=	44,088
Corrected Sensible Cooling	= 30,200	x	1.173	x	0.930	=	32,945
Corrected Heat of Rejection	= 57,200	x	0.979	x	0.979	=	54,823

Compare the corrected capacities to the load requirements established in Step I. If the capacities are within 10% of the load requirements, the equipment is acceptable. It is better to undersize than oversize as undersizing improves humidity control, reduces sound levels and extends the life of the equipment.

VI Calculate and assess the water temperature rise.

Calculate the water temperature rise and assess the selection using the following calculation:

$$\text{Actual Temperature Rise} = \frac{\text{Corrected Heat of Rejection}}{\text{GPM x 500}}$$

For example, using the Corrected Heat of Rejection from the last step:

$$\text{Actual Temperature Rise} = \frac{54{,}823}{9.0 \times 500} = 12.2 \text{ F}$$

If the units selected are not within 10% of the load calculations, review what effect changing the gpm, water temperature and/or airflow will have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat Steps I through VI.

Performance data

50PTH,PTV,PTD026

850 CFM NOMINAL AIRFLOW COOLING/950 CFM NOMINAL AIRFLOW HEATING — FULL LOAD

EWT (F)	GPM	PRESSURE DROP		COOLING							HEATING					
		PSI	ft wg	Airflow CFM	TC	TSC	Sens/Tot Ratio	kW	THR	EER	Airflow CFM	THC	kW	HE	LAT	COP
20	8.0	5.6	12.9	Operation Not Recommended							820	15.0	1.47	10.2	86.9	3.00
	8.0	5.6	12.9								950	15.3	1.41	10.6	84.9	3.19
30	4.0	1.5	3.5	730	30.2	17.9	0.59	0.97	33.4	31.0	820	17.8	1.53	12.7	90.1	3.41
	4.0	1.5	3.5	850	30.9	19.6	0.63	1.02	34.3	30.4	950	18.1	1.46	13.2	87.7	3.63
	6.0	3.1	7.2	730	30.3	17.9	0.59	0.93	33.4	32.7	820	18.6	1.54	13.5	91.0	3.53
	6.0	3.1	7.2	850	31.1	19.6	0.63	0.97	34.4	32.1	950	19.0	1.48	14.0	88.5	3.76
	8.0	5.1	11.7	730	30.5	17.9	0.59	0.91	33.5	33.7	820	19.1	1.55	13.9	91.5	3.59
	8.0	5.1	11.7	850	31.2	19.6	0.63	0.95	34.5	33.1	950	19.4	1.49	14.4	88.9	3.82
40	4.0	1.4	3.1	730	29.9	18.2	0.61	1.07	33.5	28.1	820	21.2	1.61	15.9	94.0	3.88
	4.0	1.4	3.1	850	30.6	20.0	0.65	1.11	34.4	27.5	950	21.6	1.54	16.4	91.1	4.12
	6.0	2.8	6.5	730	30.2	18.3	0.61	1.01	33.6	29.8	820	22.2	1.63	16.7	95.0	3.99
	6.0	2.8	6.5	850	30.9	20.0	0.65	1.06	34.5	29.2	950	22.6	1.56	17.3	92.0	4.24
	8.0	4.6	10.5	730	30.3	18.3	0.60	0.99	33.6	30.7	820	22.7	1.64	17.2	95.6	4.05
	8.0	4.6	10.5	850	31.0	20.0	0.65	1.03	34.5	30.1	950	23.1	1.57	17.8	92.5	4.31
50	4.0	1.3	2.9	730	29.1	18.3	0.63	1.17	33.1	24.8	820	24.4	1.69	18.7	97.5	4.24
	4.0	1.3	2.9	850	29.8	20.0	0.67	1.23	34.0	24.3	950	24.9	1.62	19.4	94.2	4.51
	6.0	2.6	6.1	730	29.6	18.4	0.62	1.11	33.4	26.7	820	25.4	1.71	19.6	98.7	4.34
	6.0	2.6	6.1	850	30.3	20.1	0.66	1.16	34.3	26.1	950	25.9	1.64	20.3	95.2	4.62
	8.0	4.3	9.9	730	29.9	18.4	0.62	1.08	33.5	27.6	820	25.9	1.73	20.1	99.3	4.40
	8.0	4.3	9.9	850	30.6	20.2	0.66	1.13	34.4	27.0	950	26.4	1.66	20.8	95.7	4.68
60	4.0	1.2	2.8	730	28.0	17.9	0.64	1.30	32.4	21.6	820	27.2	1.77	21.3	100.8	4.52
	4.0	1.2	2.8	850	28.6	19.6	0.69	1.35	33.3	21.2	950	27.8	1.69	22.0	97.1	4.81
	6.0	2.5	5.7	730	28.7	18.1	0.63	1.23	32.8	23.4	820	28.3	1.80	22.2	101.9	4.62
	6.0	2.5	5.7	850	29.3	19.9	0.68	1.28	33.7	22.9	950	28.8	1.72	23.0	98.1	4.91
	8.0	4.0	9.3	730	29.0	18.2	0.63	1.19	33.0	24.3	820	28.8	1.81	22.7	102.6	4.66
	8.0	4.0	9.3	850	29.7	20.0	0.67	1.24	33.9	23.8	950	29.4	1.74	23.5	98.6	4.96
70	4.0	1.1	2.6	730	26.6	17.3	0.65	1.43	31.4	18.5	820	29.9	1.84	23.6	103.7	4.75
	4.0	1.1	2.6	850	27.2	19.0	0.70	1.50	32.3	18.2	950	30.5	1.77	24.4	99.7	5.05
	6.0	2.3	5.4	730	27.4	17.7	0.65	1.36	31.9	20.2	820	31.0	1.88	24.6	105.0	4.83
	6.0	2.3	5.4	850	28.0	19.4	0.69	1.42	32.8	19.8	950	31.6	1.80	25.4	100.8	5.14
	8.0	3.8	8.7	730	27.7	17.8	0.64	1.32	32.2	21.0	820	31.5	1.90	25.1	105.6	4.87
	8.0	3.8	8.7	850	28.4	19.5	0.69	1.38	33.1	20.6	950	32.1	1.82	25.9	101.3	5.18
80	4.0	1.0	2.4	730	25.0	16.6	0.67	1.59	30.4	15.7	820	32.3	1.92	25.8	106.5	4.93
	4.0	1.0	2.4	850	25.6	18.3	0.71	1.66	31.2	15.4	950	33.0	1.84	26.7	102.1	5.24
	6.0	2.2	5.0	730	25.8	17.0	0.66	1.50	30.9	17.2	820	33.5	1.96	26.8	107.8	5.01
	6.0	2.2	5.0	850	26.4	18.7	0.71	1.57	31.8	16.8	950	34.1	1.88	27.7	103.2	5.32
	8.0	3.5	8.1	730	26.3	17.2	0.66	1.46	31.2	17.9	820	34.0	1.98	27.3	108.4	5.04
	8.0	3.5	8.1	850	26.9	18.9	0.70	1.53	32.1	17.6	950	34.7	1.90	28.2	103.8	5.36
85	4.0	1.0	2.4	730	24.2	16.3	0.67	1.68	29.9	14.4	820	33.5	1.96	26.8	107.9	5.01
	4.0	1.0	2.4	850	24.7	17.8	0.72	1.75	30.7	14.1	950	34.2	1.88	27.8	103.3	5.33
	6.0	2.1	4.9	730	25.0	16.7	0.67	1.59	30.4	15.7	820	34.7	2.00	27.8	109.1	5.08
	6.0	2.1	4.9	850	25.6	18.3	0.71	1.66	31.3	15.4	950	35.3	1.92	28.8	104.4	5.40
	8.0	3.4	7.9	730	25.4	16.8	0.66	1.55	30.7	16.5	820	35.2	2.02	28.4	109.8	5.12
	8.0	3.4	7.9	850	26.0	18.5	0.71	1.61	31.5	16.1	950	35.9	1.93	29.3	105.0	5.44
90	4.0	1.0	2.3	730	23.3	15.9	0.68	1.77	29.4	13.2	820	34.7	2.00	27.9	109.2	5.09
	4.0	1.0	2.3	850	23.9	17.4	0.73	1.84	30.2	13.0	950	35.4	1.92	28.8	104.5	5.41
	6.0	2.1	4.8	730	24.2	16.3	0.67	1.67	29.9	14.4	820	35.9	2.04	28.9	110.5	5.16
	6.0	2.1	4.8	850	24.7	17.9	0.72	1.75	30.7	14.2	950	36.6	1.95	29.9	105.6	5.48
	8.0	3.4	7.8	730	24.6	16.5	0.67	1.63	30.2	15.1	820	36.5	2.06	29.4	111.2	5.19
	8.0	3.4	7.8	850	25.2	18.1	0.72	1.70	31.0	14.8	950	37.2	1.97	30.4	106.2	5.52
100	4.0	1.0	2.2	730	21.7	15.2	0.70	1.97	28.4	11.0	Operation Not Recommended					
	4.0	1.0	2.2	850	22.2	16.7	0.75	2.05	29.2	10.8						
	6.0	2.0	4.6	730	22.5	15.5	0.69	1.86	28.9	12.1						
	6.0	2.0	4.6	850	23.0	17.0	0.74	1.95	29.7	11.8						
	8.0	3.2	7.4	730	22.9	15.7	0.69	1.81	29.1	12.6						
	8.0	3.2	7.4	850	23.4	17.2	0.74	1.89	29.9	12.4						
110	4.0	0.9	2.1	730	20.1	14.6	0.72	2.19	27.7	9.2						
	4.0	0.9	2.1	850	20.6	16.0	0.77	2.29	28.4	9.0						
	6.0	1.9	4.4	730	20.9	14.8	0.71	2.08	28.0	10.0						
	6.0	1.9	4.4	850	21.3	16.3	0.76	2.17	28.8	9.8						
	8.0	3.1	7.2	730	21.2	15.0	0.71	2.03	28.2	10.5						
	8.0	3.1	7.2	850	21.7	16.4	0.76	2.11	29.0	10.3						
120	4.0	0.9	2.0	730	18.8	14.1	0.75	2.45	27.2	7.7						
	4.0	0.9	2.0	850	19.2	15.5	0.80	2.55	28.0	7.5						
	6.0	1.8	4.2	730	19.4	14.3	0.74	2.32	27.4	8.3						
	6.0	1.8	4.2	850	19.8	15.7	0.79	2.43	28.2	8.2						
	8.0	3.0	6.9	730	19.7	14.4	0.73	2.26	27.5	8.7						
	8.0	3.0	6.9	850	20.2	15.8	0.78	2.36	28.3	8.5						

LEGEND

ARI — Air Conditioning and Refrigeration Institute
COP — Coefficient of Performance
db — Dry Bulb
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Gallons Per Minute
HE — Heat of Extraction (MBtuh)
ISO — International Organization for Standardization
LAT — Leaving Air Temperature (F)
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THC — Total Heating Capacity (MBtuh)
THR — Total Heat Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
wb — Wet Bulb

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 80 F db and 67 F wb in cooling, and 70 F db in heating. ARI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for ARI/ISO conditions.
4. All performance is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon a 15% antifreeze solution.
6. Operation below 60 F EWT requires optional insulated water/refrigerant circuit.
7. See performance correction tables for operating conditions other than those listed above.

50PTH,PTV,PTD026 (cont)

725 CFM NOMINAL AIRFLOW COOLING/825 CFM NOMINAL AIRFLOW HEATING — PART LOAD

EWT (F)	GPM	PRESSURE DROP		COOLING							HEATING					
		PSI	ft wg	Airflow CFM	TC	TSC	Sens/Tot Ratio	kW	THR	EER	Airflow CFM	THC	kW	HE	LAT	COP
20	7.0	4.5	10.3	Operation Not Recommended							710	11.6	1.05	8.2	85.1	3.25
	7.0	4.5	10.3								825	11.7	1.02	8.4	83.2	3.38
30	3.5	1.2	2.8	620	22.2	14.0	0.63	0.58	24.1	38.3	710	13.6	1.09	10.1	87.8	3.66
	3.5	1.2	2.8	725	22.5	14.7	0.65	0.59	24.4	38.3	825	13.8	1.06	10.3	85.5	3.81
	5.8	2.9	6.6	620	22.4	14.0	0.63	0.57	24.3	39.2	710	14.2	1.09	10.7	88.5	3.81
	5.8	2.9	6.6	725	22.7	14.7	0.65	0.58	24.7	39.2	825	14.4	1.06	10.9	86.1	3.97
	7.0	4.1	9.4	620	22.5	14.0	0.62	0.56	24.4	39.8	710	14.4	1.09	10.9	88.8	3.86
	7.0	4.1	9.4	725	22.8	14.7	0.65	0.57	24.7	39.8	825	14.6	1.06	11.1	86.3	4.02
40	3.5	1.1	2.5	620	22.9	15.1	0.66	0.65	25.1	35.3	710	16.1	1.15	12.3	90.9	4.08
	3.5	1.1	2.5	725	23.3	15.8	0.68	0.66	25.5	35.3	825	16.2	1.12	12.6	88.2	4.25
	5.8	2.6	5.9	620	23.1	15.1	0.65	0.61	25.2	37.9	710	16.7	1.15	13.0	91.8	4.25
	5.8	2.6	5.9	725	23.4	15.9	0.68	0.62	25.5	37.9	825	16.9	1.12	13.3	89.0	4.42
	7.0	3.6	8.4	620	23.2	15.1	0.65	0.60	25.2	38.3	710	16.9	1.16	13.2	92.1	4.30
	7.0	3.6	8.4	725	23.5	15.9	0.68	0.61	25.6	38.3	825	17.1	1.12	13.5	89.2	4.47
50	3.5	1.0	2.3	620	22.7	15.4	0.68	0.74	25.2	30.7	710	18.3	1.18	14.5	93.9	4.56
	3.5	1.0	2.3	725	23.0	16.2	0.70	0.75	25.6	30.7	825	18.5	1.14	14.8	90.8	4.75
	5.8	2.4	5.6	620	22.9	15.5	0.67	0.69	25.3	33.4	710	19.1	1.18	15.2	94.8	4.73
	5.8	2.4	5.6	725	23.3	16.3	0.70	0.70	25.6	33.4	825	19.3	1.15	15.5	91.6	4.93
	7.0	3.4	7.9	620	23.0	15.5	0.67	0.67	25.3	34.1	710	19.3	1.18	15.4	95.1	4.78
	7.0	3.4	7.9	725	23.3	16.3	0.70	0.68	25.6	34.1	825	19.5	1.15	15.7	91.9	4.98
60	3.5	1.0	2.2	620	21.9	15.3	0.70	0.85	24.8	25.9	710	20.4	1.21	16.5	96.6	4.93
	3.5	1.0	2.2	725	22.2	16.1	0.73	0.86	25.1	25.9	825	20.6	1.18	16.8	93.2	5.13
	5.8	2.3	5.2	620	22.4	15.5	0.69	0.78	25.1	28.6	710	21.2	1.22	17.3	97.7	5.10
	5.8	2.3	5.2	725	22.7	16.3	0.72	0.80	25.4	28.6	825	21.5	1.18	17.6	94.1	5.31
	7.0	3.2	7.4	620	22.5	15.5	0.69	0.77	25.1	29.4	710	21.5	1.22	17.5	98.0	5.15
	7.0	3.2	7.4	725	22.9	16.3	0.71	0.78	25.5	29.4	825	21.7	1.19	17.8	94.3	5.36
70	3.5	0.9	2.1	620	20.7	14.8	0.72	0.97	24.0	21.4	710	22.4	1.23	18.4	99.2	5.35
	3.5	0.9	2.1	725	21.0	15.6	0.74	0.98	24.3	21.4	825	22.7	1.19	18.8	95.4	5.57
	5.8	2.1	4.9	620	21.4	15.1	0.71	0.90	24.4	23.8	710	23.3	1.24	19.3	100.4	5.52
	5.8	2.1	4.9	725	21.7	15.9	0.73	0.91	24.8	23.8	825	23.5	1.20	19.6	96.4	5.75
	7.0	3.0	7.0	620	21.6	15.2	0.71	0.88	24.6	24.5	710	23.5	1.24	19.5	100.7	5.57
	7.0	3.0	7.0	725	21.9	16.0	0.73	0.89	24.9	24.5	825	23.8	1.20	19.9	96.7	5.80
80	3.5	0.8	1.9	620	19.3	14.2	0.73	1.10	23.1	17.5	710	24.4	1.25	20.3	101.8	5.73
	3.5	0.8	1.9	725	19.6	14.9	0.76	1.12	23.4	17.5	825	24.6	1.21	20.7	97.7	5.97
	5.8	2.0	4.6	620	20.1	14.5	0.72	1.03	23.6	19.5	710	25.3	1.26	21.2	103.0	5.90
	5.8	2.0	4.6	725	20.4	15.3	0.75	1.04	23.9	19.5	825	25.6	1.22	21.6	98.7	6.15
	7.0	2.8	6.5	620	20.3	14.6	0.72	1.01	23.7	20.1	710	25.6	1.26	21.5	103.4	5.95
	7.0	2.8	6.5	725	20.6	15.4	0.75	1.02	24.0	20.1	825	25.9	1.22	21.9	99.0	6.20
85	3.5	0.8	1.9	620	18.7	13.9	0.75	1.18	22.7	15.9	710	25.3	1.26	21.2	103.0	5.91
	3.5	0.8	1.9	725	18.9	14.6	0.77	1.19	23.0	15.9	825	25.6	1.22	21.7	98.7	6.15
	5.8	1.9	4.5	620	19.3	14.2	0.73	1.10	23.1	17.5	710	26.3	1.27	22.2	104.3	6.08
	5.8	1.9	4.5	725	19.6	14.9	0.76	1.12	23.4	17.5	825	26.6	1.23	22.6	99.9	6.33
	7.0	2.7	6.3	620	19.5	14.3	0.73	1.08	23.2	18.0	710	26.6	1.27	22.5	104.7	6.13
	7.0	2.7	6.3	725	19.8	15.0	0.76	1.10	23.6	18.0	825	26.9	1.24	22.9	100.2	6.38
90	3.5	0.8	1.8	620	18.0	13.7	0.76	1.25	22.3	14.4	710	26.3	1.27	22.2	104.3	6.08
	3.5	0.8	1.8	725	18.3	14.4	0.78	1.27	22.6	14.4	825	26.6	1.23	22.6	99.8	6.33
	5.8	1.9	4.4	620	18.6	13.8	0.74	1.18	22.6	15.8	710	27.3	1.28	23.1	105.6	6.25
	5.8	1.9	4.4	725	18.9	14.6	0.77	1.20	22.9	15.8	825	27.6	1.24	23.6	101.0	6.51
	7.0	2.7	6.2	620	18.8	13.9	0.74	1.16	22.7	16.3	710	27.6	1.28	23.4	106.0	6.30
	7.0	2.7	6.2	725	19.1	14.7	0.77	1.17	23.1	16.3	825	27.9	1.25	23.9	101.3	6.56
100	3.5	0.8	1.8	620	16.6	13.0	0.78	1.41	21.4	11.7	Operation Not Recommended					
	3.5	0.8	1.8	725	16.8	13.7	0.81	1.43	21.7	11.7						
	5.8	1.8	4.2	620	17.1	13.2	0.77	1.34	21.7	12.7						
	5.8	1.8	4.2	725	17.4	13.8	0.80	1.36	22.0	12.7						
	7.0	2.6	6.0	620	17.3	13.3	0.77	1.32	21.8	13.1						
	7.0	2.6	6.0	725	17.5	13.9	0.79	1.34	22.1	13.1						
110	3.5	0.7	1.7	620	15.5	12.7	0.82	1.59	20.9	9.7						
	3.5	0.7	1.7	725	15.7	13.4	0.85	1.61	21.2	9.7						
	5.8	1.7	4.0	620	15.8	12.7	0.80	1.53	21.0	10.3						
	5.8	1.7	4.0	725	16.0	13.3	0.83	1.55	21.3	10.3						
	7.0	2.5	5.7	620	16.0	12.7	0.80	1.50	21.1	10.6						
	7.0	2.5	5.7	725	16.2	13.4	0.83	1.52	21.4	10.6						
120	3.5	0.7	1.6	620	14.5	12.6	0.87	1.84	20.8	7.9						
	3.5	0.7	1.6	725	14.7	13.3	0.90	1.86	21.1	7.9						
	5.8	1.7	3.9	620	14.8	12.5	0.85	1.73	20.7	8.6						
	5.8	1.7	3.9	725	15.0	13.2	0.88	1.76	21.0	8.6						
	7.0	2.4	5.5	620	14.9	12.5	0.84	1.71	20.7	8.7						
	7.0	2.4	5.5	725	15.1	13.2	0.87	1.73	21.0	8.7						

LEGEND

ARI — Air Conditioning and Refrigeration Institute
COP — Coefficient of Performance
db — Dry Bulb
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Gallons Per Minute
HE — Heat of Extraction (MBtuh)
ISO — International Organization for Standardization
LAT — Leaving Air Temperature (F)
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THC — Total Heating Capacity (MBtuh)
THR — Total Heat Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
wb — Wet Bulb

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 80 F db and 67 F wb in cooling, and 70 F db in heating. ARI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for ARI/ISO conditions.
4. All performance is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon a 15% antifreeze solution.
6. Operation below 60 F EWT requires optional insulated water/refrigerant circuit.
7. See performance correction tables for operating conditions other than those listed above.

Performance data (cont)

50PTH,PTV,PTD038

1250 CFM NOMINAL AIRFLOW COOLING/1250 CFM NOMINAL AIRFLOW HEATING — FULL LOAD

EWT (F)	GPM	PRESSURE DROP		COOLING							HEATING					
		PSI	ft wg	Airflow CFM	TC	TSC	Sens/Tot Ratio	kW	THR	EER	Airflow CFM	THC	kW	HE	LAT	COP
20	9.0	5.9	13.7	Operation Not Recommended							1080	25.7	2.28	18.2	92.0	3.30
	9.0	5.9	13.7								1250	26.2	2.18	18.8	89.4	3.51
30	4.5	1.7	3.9	1080	43.1	27.4	0.64	1.55	48.3	27.9	1080	27.9	2.32	20.2	93.9	3.52
	4.5	1.7	3.9	1250	44.1	30.1	0.68	1.61	49.6	27.3	1250	28.4	2.22	20.9	91.1	3.75
	6.8	3.3	7.7	1080	43.3	27.5	0.63	1.44	48.1	30.0	1080	29.2	2.35	21.4	95.0	3.64
	6.8	3.3	7.7	1250	44.3	30.1	0.68	1.51	49.4	29.4	1250	29.7	2.25	22.1	92.0	3.87
	9.0	5.7	13.1	1080	43.4	27.5	0.63	1.39	48.1	31.2	1080	29.9	2.36	22.0	95.6	3.71
	9.0	5.7	13.1	1250	44.4	30.1	0.68	1.45	49.4	30.6	1250	30.4	2.26	22.8	92.5	3.94
40	4.5	1.5	3.5	1080	42.3	27.5	0.65	1.69	48.0	25.0	1080	31.8	2.40	23.8	97.2	3.88
	4.5	1.5	3.5	1250	43.3	30.1	0.69	1.77	49.4	24.5	1250	32.4	2.30	24.6	94.0	4.12
	6.8	3.2	7.4	1080	42.9	27.6	0.64	1.59	48.2	27.1	1080	33.3	2.44	25.2	98.6	4.01
	6.8	3.2	7.4	1250	43.9	30.2	0.69	1.66	49.6	26.5	1250	33.9	2.34	26.0	95.1	4.26
	9.0	5.4	12.5	1080	43.1	27.6	0.64	1.53	48.3	28.1	1080	34.1	2.46	25.9	99.3	4.08
	9.0	5.4	12.5	1250	44.1	30.3	0.69	1.60	49.6	27.6	1250	34.8	2.35	26.8	95.8	4.33
50	4.5	1.3	3.1	1080	41.1	27.1	0.66	1.85	47.4	22.2	1080	35.7	2.49	27.4	100.6	4.20
	4.5	1.3	3.1	1250	42.1	29.7	0.70	1.93	48.7	21.8	1250	36.4	2.39	28.3	97.0	4.47
	6.8	3.1	7.2	1080	42.0	27.4	0.65	1.74	47.9	24.2	1080	37.5	2.54	29.0	102.2	4.34
	6.8	3.1	7.2	1250	43.0	30.0	0.70	1.81	49.2	23.7	1250	38.3	2.43	30.0	98.3	4.61
	9.0	5.2	12.0	1080	42.4	27.5	0.65	1.68	48.1	25.2	1080	38.5	2.56	29.9	103.0	4.41
	9.0	5.2	12.0	1250	43.4	30.1	0.69	1.75	49.4	24.8	1250	39.3	2.46	30.9	99.1	4.68
60	4.5	1.2	2.8	1080	39.6	26.4	0.67	2.02	46.4	19.6	1080	39.8	2.60	31.0	104.1	4.50
	4.5	1.2	2.8	1250	40.5	29.0	0.72	2.11	47.7	19.2	1250	40.6	2.49	32.1	100.1	4.78
	6.8	3.0	6.9	1080	40.7	26.9	0.66	1.90	47.1	21.4	1080	41.9	2.65	32.9	105.9	4.63
	6.8	3.0	6.9	1250	41.7	29.5	0.71	1.98	48.4	21.0	1250	42.7	2.54	34.1	101.6	4.92
	9.0	5.0	11.6	1080	41.2	27.1	0.66	1.84	47.4	22.4	1080	43.1	2.69	34.0	106.9	4.70
	9.0	5.0	11.6	1250	42.2	29.7	0.70	1.92	48.7	22.0	1250	43.9	2.58	35.1	102.5	5.00
70	4.5	1.1	2.5	1080	37.8	25.7	0.68	2.22	45.3	17.0	1080	44.0	2.71	34.8	107.7	4.75
	4.5	1.1	2.5	1250	38.7	28.2	0.73	2.32	46.6	16.7	1250	44.8	2.60	36.0	103.2	5.05
	6.8	2.9	6.7	1080	39.1	26.2	0.67	2.08	46.1	18.8	1080	46.4	2.79	36.9	109.8	4.88
	6.8	2.9	6.7	1250	40.0	28.8	0.72	2.17	47.4	18.4	1250	47.3	2.67	38.2	105.0	5.19
	9.0	4.8	11.0	1080	39.7	26.5	0.67	2.01	46.5	19.7	1080	47.8	2.83	38.2	111.0	4.95
	9.0	4.8	11.0	1250	40.6	29.0	0.72	2.10	47.8	19.3	1250	48.7	2.71	39.5	106.1	5.27
80	4.5	1.0	2.3	1080	35.8	24.8	0.69	2.44	44.2	14.7	1080	48.3	2.84	38.6	111.4	4.98
	4.5	1.0	2.3	1250	36.7	27.2	0.74	2.55	45.4	14.4	1250	49.2	2.73	39.9	106.5	5.29
	6.8	2.8	6.6	1080	37.2	25.4	0.68	2.29	45.0	16.3	1080	51.1	2.93	41.1	113.8	5.10
	6.8	2.8	6.6	1250	38.0	27.9	0.73	2.39	46.2	15.9	1250	52.1	2.81	42.5	108.6	5.43
	9.0	4.5	10.4	1080	37.8	25.7	0.68	2.21	45.4	17.1	1080	52.7	2.99	42.4	115.1	5.17
	9.0	4.5	10.4	1250	38.7	28.2	0.73	2.31	46.6	16.8	1250	53.7	2.86	43.9	109.8	5.50
85	4.5	1.0	2.2	1080	34.8	24.3	0.70	2.57	43.6	13.6	1080	50.5	2.92	40.6	113.3	5.08
	4.5	1.0	2.2	1250	35.6	26.7	0.75	2.68	44.8	13.3	1250	51.5	2.80	41.9	108.1	5.40
	6.8	2.8	6.4	1080	36.2	25.0	0.69	2.40	44.4	15.0	1080	53.5	3.02	43.2	115.9	5.20
	6.8	2.8	6.4	1250	37.0	27.4	0.74	2.51	45.6	14.7	1250	54.5	2.89	44.7	110.4	5.53
	9.0	4.5	10.3	1080	36.8	25.3	0.69	2.33	44.8	15.8	1080	55.2	3.07	44.7	117.3	5.26
	9.0	4.5	10.3	1250	37.7	27.7	0.73	2.43	46.0	15.5	1250	56.3	2.95	46.2	111.7	5.59
90	4.5	0.9	2.1	1080	33.8	23.9	0.71	2.70	43.0	12.5	1080	52.7	2.99	42.5	115.2	5.17
	4.5	0.9	2.1	1250	34.6	26.2	0.76	2.81	44.2	12.3	1250	53.7	2.86	44.0	109.8	5.50
	6.8	2.7	6.2	1080	35.1	24.5	0.70	2.52	43.8	13.9	1080	55.9	3.10	45.3	117.9	5.29
	6.8	2.7	6.2	1250	36.0	26.9	0.75	2.63	45.0	13.7	1250	57.0	2.97	46.9	112.2	5.62
	9.0	4.4	10.2	1080	35.8	24.8	0.69	2.44	44.2	14.7	1080	57.7	3.16	46.9	119.5	5.35
	9.0	4.4	10.2	1250	36.7	27.2	0.74	2.55	45.4	14.4	1250	58.8	3.03	48.5	113.6	5.69
100	4.5	0.8	1.9	1080	31.8	22.9	0.72	2.99	42.0	10.6	Operation Not Recommended					
	4.5	0.8	1.9	1250	32.5	25.2	0.77	3.12	43.2	10.4						
	6.8	2.6	6.1	1080	33.1	23.5	0.71	2.80	42.6	11.8						
	6.8	2.6	6.1	1250	33.8	25.8	0.76	2.92	43.8	11.6						
	9.0	4.2	9.7	1080	33.7	23.9	0.71	2.70	43.0	12.5						
	9.0	4.2	9.7	1250	34.5	26.2	0.76	2.82	44.2	12.2						
110	4.5	0.8	1.8	1080	29.8	22.1	0.74	3.34	41.3	8.9						
	4.5	0.8	1.8	1250	30.5	24.2	0.79	3.49	42.4	8.7						
	6.8	2.5	5.9	1080	31.0	22.6	0.73	3.12	41.7	10.0						
	6.8	2.5	5.9	1250	31.7	24.8	0.78	3.25	42.9	9.8						
	9.0	4.0	9.2	1080	31.7	22.9	0.72	3.01	42.0	10.5						
	9.0	4.0	9.2	1250	32.4	25.1	0.77	3.14	43.1	10.3						
120	4.5	0.7	1.6	1080	28.0	21.3	0.76	3.74	40.9	7.5						
	4.5	0.7	1.6	1250	28.7	23.3	0.81	3.91	42.0	7.3						
	6.8	2.5	5.9	1080	29.1	21.7	0.75	3.49	41.1	8.3						
	6.8	2.5	5.9	1250	29.8	23.8	0.80	3.64	42.2	8.2						
	9.0	3.8	8.8	1080	29.7	22.0	0.74	3.36	41.2	8.8						
	9.0	3.8	8.8	1250	30.4	24.1	0.79	3.51	42.4	8.6						

LEGEND

ARI — Air Conditioning and Refrigeration Institute
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EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Gallons Per Minute
HE — Heat of Extraction (MBtuh)
ISO — International Organization for Standardization
LAT — Leaving Air Temperature (F)
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THC — Total Heating Capacity (MBtuh)
THR — Total Heat Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
wb — Wet Bulb

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 80 F db and 67 F wb in cooling, and 70 F db in heating. ARI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for ARI/ISO conditions.
4. All performance is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon a 15% antifreeze solution.
6. Operation below 60 F EWT requires optional insulated water/refrigerant circuit.
7. See performance correction tables for operating conditions other than those listed above.

50PTH,PTV,PTD038 (cont)

1000 CFM NOMINAL AIRFLOW COOLING/1000 CFM NOMINAL AIRFLOW HEATING — PART LOAD

EWT (F)	GPM	PRESSURE DROP		COOLING							HEATING					
		PSI	ft wg	Airflow CFM	TC	TSC	Sens/Tot Ratio	kW	THR	EER	Airflow CFM	THC	kW	HE	LAT	COP
20	8.0	4.7	10.9	Operation Not Recommended							860	17.5	1.60	12.4	88.9	3.21
	8.0	4.7	10.9								1000	17.7	1.55	12.6	86.4	3.34
30	4.0	1.2	2.8	860	30.4	19.2	0.63	0.79	33.0	38.3	860	19.3	1.61	14.1	90.8	3.52
	4.0	1.2	2.8	1000	30.8	20.2	0.66	0.80	33.5	38.3	1000	19.5	1.56	14.4	88.1	3.67
	6.0	2.6	6.1	860	30.7	19.2	0.63	0.75	33.2	40.9	860	20.0	1.61	14.8	91.5	3.64
	6.0	2.6	6.1	1000	31.1	20.2	0.65	0.76	33.6	40.9	1000	20.2	1.56	15.1	88.7	3.79
	8.0	4.5	10.4	860	30.9	19.3	0.63	0.73	33.3	42.2	860	20.4	1.61	15.2	91.9	3.70
	8.0	4.5	10.4	1000	31.3	20.3	0.65	0.74	33.8	42.2	1000	20.6	1.57	15.5	89.1	3.85
40	4.0	1.1	2.5	860	31.1	20.8	0.67	0.90	34.1	34.5	860	22.0	1.62	16.8	93.7	3.98
	4.0	1.1	2.5	1000	31.6	21.8	0.69	0.91	34.6	34.5	1000	22.3	1.57	17.1	90.6	4.15
	6.0	2.6	5.9	860	31.3	20.8	0.66	0.84	34.2	37.3	860	22.9	1.63	17.6	94.6	4.12
	6.0	2.6	5.9	1000	31.8	21.9	0.69	0.85	34.6	37.3	1000	23.1	1.58	18.0	91.4	4.30
	8.0	4.4	10.2	860	31.5	20.8	0.66	0.81	34.2	38.8	860	23.3	1.63	18.1	95.1	4.20
	8.0	4.4	10.2	1000	32.0	21.9	0.69	0.82	34.7	38.8	1000	23.6	1.58	18.4	91.9	4.37
50	4.0	1.0	2.2	860	30.9	21.4	0.69	1.04	34.4	29.8	860	24.9	1.64	19.6	96.8	4.45
	4.0	1.0	2.2	1000	31.3	22.5	0.72	1.05	34.8	29.8	1000	25.2	1.59	20.0	93.3	4.64
	6.0	2.5	5.7	860	31.2	21.6	0.69	0.96	34.4	32.6	860	25.9	1.64	20.6	97.9	4.62
	6.0	2.5	5.7	1000	31.7	22.7	0.72	0.97	34.9	32.6	1000	26.2	1.60	21.0	94.3	4.81
	8.0	4.2	9.7	860	31.4	21.6	0.69	0.92	34.5	34.1	860	26.5	1.65	21.1	98.5	4.70
	8.0	4.2	9.7	1000	31.8	22.7	0.71	0.93	35.0	34.1	1000	26.8	1.60	21.5	94.8	4.89
60	4.0	0.9	2.0	860	29.7	21.5	0.72	1.19	33.8	25.0	860	27.8	1.66	22.5	100.0	4.93
	4.0	0.9	2.0	1000	30.2	22.6	0.75	1.21	34.2	25.0	1000	28.1	1.61	22.9	96.1	5.13
	6.0	2.4	5.5	860	30.4	21.7	0.71	1.10	34.2	27.7	860	29.0	1.66	23.7	101.3	5.12
	6.0	2.4	5.5	1000	30.9	22.8	0.74	1.11	34.6	27.7	1000	29.4	1.62	24.1	97.2	5.33
	8.0	4.1	9.5	860	30.7	21.7	0.71	1.06	34.3	29.1	860	29.7	1.67	24.3	102.0	5.22
	8.0	4.1	9.5	1000	31.2	22.8	0.73	1.07	34.8	29.1	1000	30.0	1.62	24.8	97.8	5.44
70	4.0	0.8	1.8	860	28.2	20.9	0.74	1.37	32.8	20.6	860	30.9	1.68	25.4	103.2	5.40
	4.0	0.8	1.8	1000	28.6	22.0	0.77	1.39	33.3	20.6	1000	31.2	1.63	25.9	98.9	5.63
	6.0	2.3	5.3	860	29.1	21.3	0.73	1.27	33.4	23.0	860	32.3	1.68	26.8	104.8	5.62
	6.0	2.3	5.3	1000	29.5	22.4	0.76	1.28	33.8	23.0	1000	32.7	1.64	27.4	100.3	5.85
	8.0	4.0	9.2	860	29.5	21.4	0.73	1.22	33.6	24.3	860	33.1	1.69	27.6	105.6	5.74
	8.0	4.0	9.2	1000	29.9	22.5	0.75	1.23	34.1	24.3	1000	33.5	1.64	28.1	101.0	5.98
80	4.0	0.7	1.7	860	26.4	20.1	0.76	1.56	31.7	16.9	860	34.0	1.70	28.5	106.7	5.88
	4.0	0.7	1.7	1000	26.8	21.2	0.79	1.59	32.2	16.9	1000	34.4	1.65	29.1	101.9	6.13
	6.0	2.3	5.2	860	27.4	20.6	0.75	1.45	32.3	18.8	860	35.7	1.71	30.2	108.4	6.13
	6.0	2.3	5.2	1000	27.8	21.6	0.78	1.47	32.8	18.8	1000	36.1	1.66	30.7	103.4	6.38
	8.0	3.9	9.0	860	27.9	20.8	0.75	1.40	32.6	19.9	860	36.6	1.71	31.0	109.4	6.27
	8.0	3.9	9.0	1000	28.3	21.8	0.77	1.42	33.1	19.9	1000	37.0	1.66	31.7	104.3	6.53
85	4.0	0.7	1.6	860	25.5	19.7	0.77	1.67	31.2	15.3	860	35.7	1.71	30.1	108.4	6.13
	4.0	0.7	1.6	1000	25.9	20.8	0.80	1.70	31.7	15.3	1000	36.1	1.66	30.7	103.4	6.38
	6.0	2.2	5.1	860	26.5	20.2	0.76	1.56	31.8	17.0	860	37.5	1.72	31.9	110.3	6.39
	6.0	2.2	5.1	1000	26.9	21.2	0.79	1.58	32.2	17.0	1000	37.9	1.67	32.5	105.1	6.66
	8.0	3.8	8.8	860	27.0	20.4	0.76	1.50	32.1	17.9	860	38.5	1.73	32.8	111.4	6.54
	8.0	3.8	8.8	1000	27.4	21.4	0.78	1.53	32.5	17.9	1000	38.9	1.67	33.5	106.0	6.81
90	4.0	0.7	1.5	860	24.7	19.3	0.78	1.79	30.7	13.8	860	37.3	1.72	31.7	110.2	6.37
	4.0	0.7	1.5	1000	25.0	20.3	0.81	1.81	31.2	13.8	1000	37.7	1.67	32.3	104.9	6.63
	6.0	2.1	4.9	860	25.6	19.7	0.77	1.67	31.2	15.3	860	39.2	1.73	33.6	112.2	6.65
	6.0	2.1	4.9	1000	25.9	20.8	0.80	1.69	31.7	15.3	1000	39.7	1.68	34.2	106.7	6.92
	8.0	3.7	8.5	860	26.1	20.0	0.77	1.61	31.5	16.2	860	40.3	1.74	34.6	113.4	6.80
	8.0	3.7	8.5	1000	26.4	21.0	0.79	1.63	32.0	16.2	1000	40.8	1.69	35.3	107.7	7.08
100	4.0	0.6	1.4	860	23.1	18.8	0.81	2.03	30.0	11.4	Operation Not Recommended					
	4.0	0.6	1.4	1000	23.4	19.7	0.84	2.06	30.4	11.4						
	6.0	2.1	4.8	860	23.8	19.0	0.80	1.90	30.3	12.5						
	6.0	2.1	4.8	1000	24.2	20.0	0.83	1.93	30.8	12.5						
	8.0	3.6	8.3	860	24.3	19.2	0.79	1.84	30.5	13.2						
	8.0	3.6	8.3	1000	24.6	20.2	0.82	1.87	31.0	13.2						
110	4.0	0.6	1.3	860	21.9	18.6	0.85	2.30	29.7	9.5						
	4.0	0.6	1.3	1000	22.2	19.6	0.88	2.34	30.2	9.5						
	6.0	2.0	4.6	860	22.4	18.6	0.83	2.16	29.8	10.4						
	6.0	2.0	4.6	1000	22.7	19.6	0.86	2.19	30.2	10.4						
	8.0	3.4	7.9	860	22.7	18.7	0.82	2.10	29.9	10.8						
	8.0	3.4	7.9	1000	23.0	19.6	0.85	2.13	30.3	10.8						
120	4.0	0.5	1.2	860	21.0	18.2	0.87	2.58	29.9	8.2						
	4.0	0.5	1.2	1000	21.3	19.2	0.90	2.61	30.3	8.2						
	6.0	1.9	4.5	860	21.5	18.6	0.87	2.45	29.9	8.8						
	6.0	1.9	4.5	1000	21.8	19.6	0.90	2.49	30.3	8.8						
	8.0	3.3	7.7	860	21.7	18.7	0.86	2.41	29.9	9.0						
	8.0	3.3	7.7	1000	22.0	19.7	0.90	2.45	30.3	9.0						

LEGEND

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COP — Coefficient of Performance
db — Dry Bulb
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Gallons Per Minute
HE — Heat of Extraction (MBtuh)
ISO — International Organization for Standardization
LAT — Leaving Air Temperature (F)
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THC — Total Heating Capacity (MBtuh)
THR — Total Heat Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
wb — Wet Bulb

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 80 F db and 67 F wb in cooling, and 70 F db in heating. ARI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for ARI/ISO conditions.
4. All performance is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon a 15% antifreeze solution.
6. Operation below 60 F EWT requires optional insulated water/refrigerant circuit.
7. See performance correction tables for operating conditions other than those listed above.

Performance data (cont)

50PTH,PTV,PTD049

1550 CFM NOMINAL AIRFLOW COOLING/1650 CFM NOMINAL AIRFLOW HEATING — FULL LOAD

EWT (F)	GPM	PRESSURE DROP		COOLING							HEATING					
		PSI	ft wg	Airflow CFM	TC	TSC	Sens/Tot Ratio	kW	THR	EER	Airflow CFM	THC	kW	HE	LAT	COP
20	12.0	4.8	11.0	Operation Not Recommended							1430	31.6	2.90	22.1	90.5	3.20
	12.0	4.8	11.0								1650	32.3	2.78	22.9	88.1	3.40
30	6.0	1.3	2.9	1330	56.1	32.1	0.57	2.13	63.2	26.4	1430	34.7	2.98	24.9	92.5	3.41
	6.0	1.3	2.9	1550	57.4	35.1	0.61	2.22	65.0	25.9	1650	35.4	2.86	25.7	89.9	3.62
	9.0	2.7	6.1	1330	56.5	32.1	0.57	2.01	63.2	28.2	1430	36.3	3.03	26.3	93.5	3.51
	9.0	2.7	6.1	1550	57.9	35.2	0.61	2.09	65.0	27.6	1650	37.0	2.90	27.2	90.8	3.73
	12.0	4.6	10.5	1330	56.8	32.1	0.57	1.94	63.3	29.3	1430	37.2	3.05	27.0	94.1	3.57
	12.0	4.6	10.5	1550	58.2	35.2	0.61	2.03	65.1	28.7	1650	37.9	2.93	28.0	91.3	3.79
40	6.0	1.1	2.7	1330	55.8	33.0	0.59	2.32	63.6	24.1	1430	40.0	3.13	29.6	95.9	3.75
	6.0	1.1	2.7	1550	57.1	36.2	0.63	2.42	65.4	23.6	1650	40.8	3.00	30.6	92.9	3.99
	9.0	2.6	5.9	1330	56.4	33.0	0.59	2.19	63.7	25.8	1430	42.0	3.18	31.4	97.2	3.87
	9.0	2.6	5.9	1550	57.7	36.2	0.63	2.28	65.5	25.3	1650	42.8	3.05	32.4	94.0	4.11
	12.0	4.4	10.1	1330	56.6	33.0	0.58	2.12	63.8	26.7	1430	43.1	3.21	32.4	97.9	3.94
	12.0	4.4	10.1	1550	58.0	36.2	0.62	2.22	65.5	26.2	1650	43.9	3.08	33.5	94.6	4.19
50	6.0	1.1	2.5	1330	54.5	33.3	0.61	2.51	63.0	21.8	1430	45.5	3.27	34.6	99.5	4.08
	6.0	1.1	2.5	1550	55.8	36.5	0.65	2.62	64.7	21.3	1650	46.4	3.14	35.8	96.0	4.34
	9.0	2.5	5.7	1330	55.6	33.4	0.60	2.37	63.6	23.5	1430	48.0	3.33	36.8	101.1	4.22
	9.0	2.5	5.7	1550	56.9	36.6	0.64	2.47	65.4	23.0	1650	48.9	3.20	38.0	97.4	4.48
	12.0	4.2	9.6	1330	56.0	33.4	0.60	2.30	63.7	24.3	1430	49.3	3.37	38.0	101.9	4.29
	12.0	4.2	9.6	1550	57.3	36.7	0.64	2.40	65.5	23.8	1650	50.3	3.23	39.3	98.2	4.56
60	6.0	1.0	2.3	1330	52.5	32.6	0.62	2.71	61.7	19.4	1430	51.3	3.42	39.8	103.2	4.39
	6.0	1.0	2.3	1550	53.7	35.8	0.67	2.82	63.4	19.0	1650	52.3	3.28	41.1	99.3	4.67
	9.0	2.4	5.5	1330	54.0	33.1	0.61	2.56	62.7	21.1	1430	54.2	3.50	42.4	105.1	4.54
	9.0	2.4	5.5	1550	55.3	36.3	0.66	2.67	64.4	20.7	1650	55.2	3.36	43.8	101.0	4.83
	12.0	4.0	9.2	1330	54.7	33.3	0.61	2.49	63.1	21.9	1430	55.8	3.54	43.8	106.1	4.62
	12.0	4.0	9.2	1550	55.9	36.5	0.65	2.60	64.8	21.5	1650	56.9	3.40	45.3	101.9	4.91
70	6.0	0.9	2.2	1330	49.9	31.7	0.64	2.93	59.9	17.1	1430	57.2	3.58	45.1	107.1	4.68
	6.0	0.9	2.2	1550	51.1	34.8	0.68	3.06	61.6	16.7	1650	58.3	3.44	46.6	102.7	4.98
	9.0	2.3	5.4	1330	51.7	32.4	0.63	2.77	61.1	18.7	1430	60.6	3.68	48.1	109.2	4.83
	9.0	2.3	5.4	1550	53.0	35.5	0.67	2.89	62.8	18.3	1650	61.7	3.53	49.7	104.7	5.13
	12.0	3.8	8.8	1330	52.6	32.7	0.62	2.70	61.7	19.5	1430	62.4	3.73	49.7	110.4	4.90
	12.0	3.8	8.8	1550	53.8	35.8	0.67	2.81	63.4	19.1	1650	63.6	3.58	51.4	105.7	5.21
80	6.0	0.9	2.1	1330	47.1	30.6	0.65	3.18	57.9	14.8	1430	63.2	3.76	50.5	111.0	4.94
	6.0	0.9	2.1	1550	48.2	33.6	0.70	3.32	59.5	14.5	1650	64.5	3.60	52.2	106.2	5.25
	9.0	2.3	5.2	1330	49.0	31.4	0.64	3.01	59.3	16.3	1430	67.0	3.87	53.8	113.4	5.07
	9.0	2.3	5.2	1550	50.2	34.4	0.69	3.14	60.9	16.0	1650	68.3	3.71	55.7	108.3	5.39
	12.0	3.6	8.3	1330	50.0	31.7	0.63	2.92	59.9	17.1	1430	69.1	3.94	55.7	114.8	5.14
	12.0	3.6	8.3	1550	51.2	34.8	0.68	3.05	61.6	16.8	1650	70.5	3.78	57.6	109.5	5.47
85	6.0	0.9	2.0	1330	45.5	30.1	0.66	3.32	56.9	13.7	1430	66.3	3.85	53.2	112.9	5.04
	6.0	0.9	2.0	1550	46.6	33.0	0.71	3.47	58.5	13.4	1650	67.6	3.69	55.0	107.9	5.36
	9.0	2.2	5.1	1330	47.5	30.8	0.65	3.14	58.2	15.1	1430	70.3	3.98	56.7	115.5	5.18
	9.0	2.2	5.1	1550	48.6	33.8	0.69	3.28	59.8	14.8	1650	71.6	3.82	58.6	110.2	5.50
	12.0	3.6	8.2	1330	48.5	31.2	0.64	3.05	58.9	15.9	1430	72.5	4.06	58.6	116.9	5.24
	12.0	3.6	8.2	1550	49.6	34.2	0.69	3.19	60.5	15.6	1650	73.9	3.89	60.6	111.5	5.57
90	6.0	0.9	2.0	1330	44.0	29.5	0.67	3.47	55.9	12.7	1430	69.3	3.95	55.8	114.9	5.15
	6.0	0.9	2.0	1550	45.0	32.4	0.72	3.62	57.4	12.4	1650	70.7	3.78	57.7	109.7	5.47
	9.0	2.2	5.0	1330	46.0	30.2	0.66	3.28	57.2	14.0	1430	73.5	4.09	59.5	117.6	5.27
	9.0	2.2	5.0	1550	47.1	33.2	0.70	3.42	58.8	13.8	1650	74.9	3.92	61.6	112.1	5.60
	12.0	3.5	8.1	1330	47.0	30.6	0.65	3.18	57.9	14.8	1430	75.8	4.17	61.5	119.1	5.33
	12.0	3.5	8.1	1550	48.1	33.6	0.70	3.32	59.5	14.5	1650	77.3	4.00	63.6	113.4	5.66
100	6.0	0.8	1.9	1330	40.9	28.5	0.70	3.80	53.9	10.7	Operation Not Recommended					
	6.0	0.8	1.9	1550	41.8	31.2	0.75	3.97	55.4	10.5						
	9.0	2.1	4.8	1330	42.8	29.1	0.68	3.59	55.1	11.9						
	9.0	2.1	4.8	1550	43.8	31.9	0.73	3.74	56.6	11.7						
	12.0	3.3	7.7	1330	43.8	29.4	0.67	3.48	55.8	12.6						
	12.0	3.3	7.7	1550	44.9	32.3	0.72	3.64	57.3	12.3						
110	6.0	0.8	1.8	1330	37.8	27.6	0.73	4.19	52.2	9.0						
	6.0	0.8	1.8	1550	38.7	30.2	0.78	4.38	53.7	8.8						
	9.0	2.0	4.7	1330	39.6	28.1	0.71	3.95	53.2	10.0						
	9.0	2.0	4.7	1550	40.6	30.8	0.76	4.12	54.7	9.8						
	12.0	3.2	7.3	1330	40.6	28.4	0.70	3.83	53.7	10.6						
	12.0	3.2	7.3	1550	41.5	31.1	0.75	4.00	55.2	10.4						
120	6.0	0.8	1.7	1330	34.9	27.0	0.77	4.65	51.0	7.5						
	6.0	0.8	1.7	1550	35.8	29.6	0.83	4.86	52.4	7.4						
	9.0	2.0	4.5	1330	36.6	27.3	0.75	4.37	51.6	8.4						
	9.0	2.0	4.5	1550	37.4	29.9	0.80	4.57	53.1	8.2						
	12.0	3.0	7.0	1330	37.4	27.5	0.73	4.24	52.0	8.8						
	12.0	3.0	7.0	1550	38.3	30.1	0.79	4.43	53.5	8.7						

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wb — Wet Bulb

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 80 F db and 67 F wb in cooling, and 70 F db in heating. ARI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for ARI/ISO conditions.
4. All performance is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon a 15% antifreeze solution.
6. Operation below 60 F EWT requires optional insulated water/refrigerant circuit.
7. See performance correction tables for operating conditions other than those listed above.

50PTH,PTV,PTD049 (cont)

1300 CFM NOMINAL AIRFLOW COOLING/1400 CFM NOMINAL AIRFLOW HEATING — PART LOAD

EWT (F)	GPM	PRESSURE DROP		COOLING							HEATING					
		PSI	ft wg	Airflow CFM	TC	TSC	Sens/Tot Ratio	kW	THR	EER	Airflow CFM	THC	kW	HE	LAT	COP
20	11.0	4.0	9.3	Operation Not Recommended							1200	23.2	2.16	16.2	87.9	3.14
	11.0	4.0	9.3								1400	23.5	2.10	16.6	85.5	3.27
30	5.5	1.1	2.5	1120	38.6	24.0	0.62	1.20	42.6	32.0	1200	25.6	2.20	18.6	89.8	3.42
	5.5	1.1	2.5	1300	39.1	25.2	0.64	1.22	43.3	32.0	1400	25.9	2.14	18.9	87.2	3.56
	8.3	2.3	5.2	1120	38.8	24.0	0.62	1.14	42.6	34.2	1200	26.6	2.21	19.4	90.5	3.52
	8.3	2.3	5.2	1300	39.4	25.3	0.64	1.15	43.2	34.2	1400	26.9	2.15	19.8	87.8	3.67
	11.0	3.9	8.9	1120	39.0	24.0	0.61	1.10	42.7	35.4	1200	27.1	2.22	19.9	90.9	3.58
	11.0	3.9	8.9	1300	39.6	25.2	0.64	1.12	43.3	35.4	1400	27.4	2.15	20.3	88.1	3.73
40	5.5	1.0	2.3	1120	40.8	26.2	0.64	1.37	45.5	29.9	1200	29.6	2.24	22.4	92.9	3.88
	5.5	1.0	2.3	1300	41.4	27.6	0.67	1.38	46.1	29.9	1400	30.0	2.18	22.9	89.8	4.04
	8.3	2.2	5.0	1120	41.2	26.3	0.64	1.28	45.5	32.1	1200	30.9	2.25	23.6	93.8	4.02
	8.3	2.2	5.0	1300	41.8	27.6	0.66	1.30	46.2	32.1	1400	31.2	2.19	24.1	90.7	4.19
	11.0	3.7	8.6	1120	41.3	26.3	0.64	1.25	45.5	32.9	1200	31.6	2.26	24.3	94.4	4.10
	11.0	3.7	8.6	1300	41.9	27.6	0.66	1.27	46.1	32.9	1400	31.9	2.19	24.8	91.1	4.27
50	5.5	0.9	2.1	1120	40.8	26.8	0.66	1.49	45.9	27.3	1200	34.0	2.28	26.7	96.3	4.38
	5.5	0.9	2.1	1300	41.4	28.2	0.68	1.51	46.5	27.3	1400	34.4	2.21	27.2	92.8	4.56
	8.3	2.1	4.9	1120	41.2	26.9	0.65	1.41	45.9	29.1	1200	35.6	2.29	28.2	97.5	4.56
	8.3	2.1	4.9	1300	41.7	28.2	0.68	1.43	46.6	29.1	1400	36.0	2.23	28.8	93.8	4.74
	11.0	3.6	8.3	1120	41.3	26.9	0.65	1.40	46.0	29.4	1200	36.5	2.30	29.1	98.2	4.65
	11.0	3.6	8.3	1300	41.9	28.3	0.67	1.42	46.7	29.4	1400	36.9	2.23	29.6	94.4	4.85
60	5.5	0.8	2.0	1120	40.0	27.1	0.68	1.73	45.9	23.2	1200	38.7	2.32	31.2	99.8	4.89
	5.5	0.8	2.0	1300	40.6	28.5	0.70	1.75	46.5	23.2	1400	39.1	2.25	31.8	95.9	5.09
	8.3	2.0	4.7	1120	40.7	27.2	0.67	1.62	46.2	25.1	1200	40.6	2.33	33.0	101.3	5.10
	8.3	2.0	4.7	1300	41.3	28.6	0.69	1.64	46.9	25.1	1400	41.1	2.27	33.7	97.2	5.31
	11.0	3.5	8.1	1120	41.0	27.2	0.67	1.57	46.3	26.1	1200	41.7	2.34	34.1	102.1	5.21
	11.0	3.5	8.1	1300	41.5	28.7	0.69	1.59	46.9	26.1	1400	42.1	2.27	34.7	97.9	5.43
70	5.5	0.8	1.8	1120	38.2	26.5	0.69	1.94	44.8	19.7	1200	43.4	2.36	35.7	103.5	5.39
	5.5	0.8	1.8	1300	38.8	27.9	0.72	1.97	45.4	19.7	1400	43.9	2.29	36.4	99.0	5.62
	8.3	2.0	4.6	1120	39.3	26.9	0.68	1.82	45.5	21.6	1200	45.6	2.38	37.9	105.2	5.62
	8.3	2.0	4.6	1300	39.9	28.3	0.71	1.85	46.1	21.6	1400	46.1	2.31	38.6	100.5	5.85
	11.0	3.3	7.5	1120	39.8	27.1	0.68	1.76	45.7	22.6	1200	46.8	2.39	39.0	106.1	5.73
	11.0	3.3	7.5	1300	40.3	28.4	0.71	1.79	46.4	22.6	1400	47.3	2.32	39.7	101.3	5.97
80	5.5	0.7	1.7	1120	35.9	25.7	0.71	2.17	43.3	16.5	1200	48.0	2.40	40.2	107.1	5.86
	5.5	0.7	1.7	1300	36.5	27.0	0.74	2.20	43.9	16.5	1400	48.6	2.33	41.0	102.1	6.10
	8.3	1.9	4.5	1120	37.2	26.2	0.70	2.04	44.2	18.2	1200	50.4	2.43	42.5	108.9	6.07
	8.3	1.9	4.5	1300	37.7	27.5	0.73	2.07	44.8	18.2	1400	50.9	2.36	43.3	103.7	6.33
	11.0	3.2	7.3	1120	37.8	26.4	0.70	1.98	44.6	19.1	1200	51.6	2.45	43.7	109.8	6.18
	11.0	3.2	7.3	1300	38.4	27.8	0.72	2.01	45.2	19.1	1400	52.2	2.38	44.5	104.5	6.44
85	5.5	0.7	1.7	1120	34.7	25.2	0.73	2.30	42.5	15.0	1200	50.2	2.43	42.3	108.8	6.06
	5.5	0.7	1.7	1300	35.2	26.5	0.75	2.34	43.1	15.0	1400	50.8	2.36	43.1	103.6	6.31
	8.3	1.9	4.3	1120	36.0	25.7	0.71	2.17	43.4	16.6	1200	52.6	2.46	44.6	110.6	6.26
	8.3	1.9	4.3	1300	36.5	27.0	0.74	2.20	44.0	16.6	1400	53.2	2.39	45.4	105.2	6.52
	11.0	3.1	7.3	1120	36.6	25.9	0.71	2.10	43.8	17.4	1200	53.8	2.48	45.7	111.5	6.35
	11.0	3.1	7.3	1300	37.1	27.3	0.73	2.13	44.4	17.4	1400	54.4	2.41	46.6	106.0	6.62
90	5.5	0.7	1.6	1120	33.4	24.7	0.74	2.44	41.7	13.7	1200	52.4	2.46	44.4	110.5	6.25
	5.5	0.7	1.6	1300	33.9	25.9	0.77	2.47	42.3	13.7	1400	53.0	2.39	45.3	105.1	6.51
	8.3	1.8	4.2	1120	34.7	25.2	0.73	2.30	42.6	15.1	1200	54.8	2.50	46.7	112.3	6.44
	8.3	1.8	4.2	1300	35.2	26.5	0.75	2.33	43.2	15.1	1400	55.4	2.42	47.6	106.7	6.70
	11.0	3.1	7.2	1120	35.4	25.5	0.72	2.23	43.0	15.9	1200	56.0	2.52	47.8	113.2	6.52
	11.0	3.1	7.2	1300	35.9	26.8	0.75	2.26	43.6	15.9	1400	56.7	2.45	48.8	107.5	6.79
100	5.5	0.7	1.5	1120	30.9	23.7	0.77	2.73	40.2	11.3	Operation Not Recommended					
	5.5	0.7	1.5	1300	31.3	24.9	0.80	2.77	40.7	11.3						
	8.3	1.8	4.1	1120	32.1	24.2	0.75	2.58	40.9	12.5						
	8.3	1.8	4.1	1300	32.6	25.4	0.78	2.62	41.5	12.5						
	11.0	3.0	6.8	1120	32.8	24.4	0.74	2.50	41.3	13.1						
	11.0	3.0	6.8	1300	33.3	25.7	0.77	2.54	41.9	13.1						
110	5.5	0.6	1.5	1120	28.5	22.9	0.80	3.07	39.0	9.3						
	5.5	0.6	1.5	1300	28.9	24.1	0.83	3.11	39.6	9.3						
	8.3	1.7	4.0	1120	29.6	23.3	0.79	2.90	39.5	10.2						
	8.3	1.7	4.0	1300	30.0	24.5	0.81	2.94	40.1	10.2						
	11.0	2.8	6.6	1120	30.2	23.5	0.78	2.82	39.8	10.7						
	11.0	2.8	6.6	1300	30.6	24.7	0.81	2.86	40.4	10.7						
120	5.5	0.6	1.4	1120	26.7	22.7	0.85	3.45	38.4	7.7						
	5.5	0.6	1.4	1300	27.0	23.8	0.88	3.50	39.0	7.7						
	8.3	1.7	3.8	1120	27.5	22.7	0.83	3.26	38.6	8.4						
	8.3	1.7	3.8	1300	27.9	23.9	0.86	3.31	39.2	8.4						
	11.0	2.7	6.3	1120	27.9	22.8	0.82	3.17	38.8	8.8						
	11.0	2.7	6.3	1300	28.3	24.0	0.85	3.22	39.3	8.8						

LEGEND

ARI — Air Conditioning and Refrigeration Institute
COP — Coefficient of Performance
db — Dry Bulb
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Gallons Per Minute
HE — Heat of Extraction (MBtuh)
ISO — International Organization for Standardization
LAT — Leaving Air Temperature (F)
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THC — Total Heating Capacity (MBtuh)
THR — Total Heat Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
wb — Wet Bulb

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 80 F db and 67 F wb in cooling, and 70 F db in heating. ARI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for ARI/ISO conditions.
4. All performance is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon a 15% antifreeze solution.
6. Operation below 60 F EWT requires optional insulated water/refrigerant circuit.
7. See performance correction tables for operating conditions other than those listed above.

Performance data (cont)

Carrier®

50PTH,PTV,PTD064

1825 CFM NOMINAL AIRFLOW COOLING/2050 CFM NOMINAL AIRFLOW HEATING — FULL LOAD

EWT (F)	GPM	PRESSURE DROP		COOLING							HEATING					
		PSI	ft wg	Airflow CFM	TC	TSC	Sens/Tot Ratio	kW	THR	EER	Airflow CFM	THC	kW	HE	LAT	COP
20	15.0	5.0	11.6	Operation Not Recommended							1750	41.0	3.87	28.3	91.7	3.10
	15.0	5.0	11.6								2050	41.8	3.71	29.2	88.9	3.30
30	7.5	0.6	1.5	1580	65.8	41.6	0.63	2.78	75.1	23.7	1750	44.6	3.96	31.5	93.6	3.29
	7.5	0.6	1.5	1825	67.3	45.6	0.68	2.90	77.2	23.2	2050	45.4	3.80	32.6	90.5	3.50
	11.3	2.3	5.3	1580	66.7	42.1	0.63	2.65	75.7	25.2	1750	46.4	4.01	33.1	94.6	3.39
	11.3	2.3	5.3	1825	68.3	46.2	0.68	2.77	77.8	24.7	2050	47.3	3.85	34.3	91.4	3.60
	15.0	4.8	11.0	1580	68.1	42.9	0.63	2.60	76.8	26.2	1750	47.4	4.04	34.0	95.1	3.44
	15.0	4.8	11.0	1825	69.7	47.1	0.68	2.71	78.9	25.7	2050	48.3	3.88	35.2	91.8	3.65
40	7.5	0.5	1.2	1580	67.5	43.1	0.64	3.00	77.6	22.5	1750	50.6	4.13	36.9	96.8	3.59
	7.5	0.5	1.2	1825	69.1	47.3	0.68	3.13	79.8	22.0	2050	51.5	3.96	38.1	93.3	3.82
	11.3	2.2	5.1	1580	68.4	43.4	0.63	2.85	78.0	24.0	1750	52.8	4.19	38.8	97.9	3.69
	11.3	2.2	5.1	1825	70.0	47.6	0.68	2.98	80.2	23.5	2050	53.8	4.02	40.2	94.3	3.92
	15.0	4.5	10.4	1580	68.7	43.5	0.63	2.78	78.0	24.7	1750	53.9	4.22	39.9	98.5	3.74
	15.0	4.5	10.4	1825	70.3	47.7	0.68	2.90	80.2	24.2	2050	55.0	4.05	41.3	94.8	3.98
50	7.5	0.4	1.0	1580	67.7	43.9	0.65	3.27	78.7	20.7	1750	56.7	4.30	42.4	100.0	3.86
	7.5	0.4	1.0	1825	69.3	48.1	0.69	3.41	80.9	20.3	2050	57.8	4.12	43.8	96.1	4.11
	11.3	2.1	4.9	1580	68.4	43.9	0.64	3.08	78.8	22.2	1750	59.3	4.37	44.7	101.4	3.97
	11.3	2.1	4.9	1825	70.1	48.1	0.69	3.21	81.0	21.8	2050	60.4	4.19	46.2	97.3	4.22
	15.0	4.3	9.9	1580	68.8	43.9	0.64	2.99	78.9	23.0	1750	60.7	4.41	45.9	102.1	4.03
	15.0	4.3	9.9	1825	70.4	48.2	0.68	3.13	81.1	22.5	2050	61.8	4.23	47.5	97.9	4.28
60	7.5	0.4	0.8	1580	65.8	43.4	0.66	3.56	77.9	18.5	1750	63.0	4.48	48.0	103.3	4.12
	7.5	0.4	0.8	1825	67.3	47.6	0.71	3.72	80.0	18.1	2050	64.2	4.30	49.6	99.0	4.38
	11.3	2.1	4.8	1580	67.2	43.8	0.65	3.35	78.6	20.1	1750	66.0	4.57	50.6	104.9	4.23
	11.3	2.1	4.8	1825	68.8	48.0	0.70	3.49	80.7	19.7	2050	67.3	4.38	52.4	100.4	4.50
	15.0	4.1	9.4	1580	67.8	43.9	0.65	3.25	78.8	20.9	1750	67.6	4.62	52.1	105.8	4.29
	15.0	4.1	9.4	1825	69.4	48.1	0.69	3.39	80.9	20.5	2050	68.9	4.43	53.9	101.1	4.57
70	7.5	0.3	0.7	1580	63.1	42.5	0.67	3.91	76.4	16.1	1750	69.4	4.67	53.7	106.7	4.36
	7.5	0.3	0.7	1825	64.6	46.7	0.72	4.08	78.5	15.8	2050	70.8	4.48	55.6	102.0	4.63
	11.3	2.0	4.6	1580	65.0	43.2	0.66	3.66	77.5	17.8	1750	72.9	4.78	56.8	108.6	4.48
	11.3	2.0	4.6	1825	66.6	47.3	0.71	3.82	79.6	17.4	2050	74.4	4.58	58.8	103.6	4.76
	15.0	3.9	8.9	1580	65.9	43.4	0.66	3.54	77.9	18.6	1750	74.9	4.83	58.6	109.6	4.54
	15.0	3.9	8.9	1825	67.5	47.6	0.71	3.70	80.1	18.2	2050	76.3	4.63	60.6	104.5	4.83
80	7.5	0.2	0.5	1580	59.8	41.4	0.69	4.31	74.5	13.9	1750	76.1	4.87	59.7	110.3	4.58
	7.5	0.2	0.5	1825	61.2	45.4	0.74	4.50	76.6	13.6	2050	77.6	4.67	61.7	105.1	4.87
	11.3	2.0	4.5	1580	62.1	42.2	0.68	4.03	75.8	15.4	1750	80.2	5.00	63.3	112.4	4.70
	11.3	2.0	4.5	1825	63.6	46.3	0.73	4.21	77.9	15.1	2050	81.8	4.79	65.4	106.9	5.00
	15.0	3.7	8.4	1580	63.2	42.6	0.67	3.90	76.4	16.2	1750	82.5	5.07	65.3	113.6	4.77
	15.0	3.7	8.4	1825	64.7	46.7	0.72	4.07	78.6	15.9	2050	84.1	4.86	67.5	108.0	5.07
85	7.5	0.2	0.5	1580	58.0	40.7	0.70	4.54	73.6	12.8	1750	79.6	4.98	62.8	112.1	4.69
	7.5	0.2	0.5	1825	59.4	44.7	0.75	4.74	75.6	12.5	2050	81.2	4.78	64.9	106.7	4.98
	11.3	1.9	4.4	1580	60.4	41.6	0.69	4.24	74.9	14.2	1750	84.0	5.12	66.6	114.5	4.81
	11.3	1.9	4.4	1825	61.8	45.6	0.74	4.43	76.9	14.0	2050	85.6	4.91	68.9	108.7	5.11
	15.0	3.6	8.2	1580	61.5	42.0	0.68	4.10	75.5	15.0	1750	86.5	5.20	68.8	115.8	4.88
	15.0	3.6	8.2	1825	63.0	46.1	0.73	4.28	77.6	14.7	2050	88.1	4.98	71.2	109.8	5.19
90	7.5	0.2	0.4	1580	56.2	40.1	0.71	4.78	72.6	11.8	1750	83.1	5.09	65.9	114.0	4.79
	7.5	0.2	0.4	1825	57.5	43.9	0.76	4.99	74.6	11.5	2050	84.7	4.88	68.1	108.3	5.09
	11.3	1.9	4.3	1580	58.7	41.0	0.70	4.46	73.9	13.2	1750	87.8	5.24	70.0	116.5	4.91
	11.3	1.9	4.3	1825	60.0	44.9	0.75	4.65	75.9	12.9	2050	89.5	5.02	72.4	110.4	5.22
	15.0	3.5	8.0	1580	59.9	41.4	0.69	4.31	74.6	13.9	1750	90.5	5.32	72.3	117.9	4.98
	15.0	3.5	8.0	1825	61.3	45.4	0.74	4.49	76.6	13.6	2050	92.2	5.10	74.8	111.7	5.30
100	7.5	0.1	0.3	1580	52.4	38.6	0.74	5.32	70.7	9.8	Operation Not Recommended					
	7.5	0.1	0.3	1825	53.6	42.3	0.79	5.55	72.6	9.7						
	11.3	1.8	4.2	1580	54.9	39.6	0.72	4.96	71.9	11.1						
	11.3	1.8	4.2	1825	56.2	43.4	0.77	5.18	73.9	10.9						
	15.0	3.3	7.6	1580	56.1	40.1	0.71	4.79	72.5	11.7						
	15.0	3.3	7.6	1825	57.5	43.9	0.76	5.00	74.6	11.5						
110	7.5	0.1	0.2	1580	48.6	37.1	0.76	5.95	69.0	8.2						
	7.5	0.1	0.2	1825	49.7	40.7	0.82	6.21	71.0	8.0						
	11.3	1.8	4.0	1580	51.0	38.1	0.75	5.54	70.0	9.2						
	11.3	1.8	4.0	1825	52.2	41.7	0.80	5.78	72.0	9.0						
	15.0	3.1	7.2	1580	52.2	38.6	0.74	5.34	70.6	9.8						
	15.0	3.1	7.2	1825	53.5	42.3	0.79	5.58	72.5	9.6						
120	7.5	0.1	0.1	1580	44.9	35.7	0.80	6.67	67.9	6.7						
	7.5	0.1	0.1	1825	46.0	39.2	0.85	6.97	69.8	6.6						
	11.3	1.7	3.9	1580	47.1	36.6	0.78	6.21	68.5	7.6						
	11.3	1.7	3.9	1825	48.3	40.1	0.83	6.48	70.5	7.4						
	15.0	2.9	6.8	1580	48.3	37.0	0.77	5.99	69.0	8.1						
	15.0	2.9	6.8	1825	49.5	40.6	0.82	6.25	70.9	7.9						

LEGEND

ARI — Air Conditioning and Refrigeration Institute
COP — Coefficient of Performance
db — Dry Bulb
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Gallons Per Minute
HE — Heat of Extraction (MBtuh)
ISO — International Organization for Standardization
LAT — Leaving Air Temperature (F)
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THC — Total Heating Capacity (MBtuh)
THR — Total Heat Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
wb — Wet Bulb

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 80 F db and 67 F wb in cooling, and 70 F db in heating. ARI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for ARI/ISO conditions.
4. All performance is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon a 15% antifreeze solution.
6. Operation below 60 F EWT requires optional insulated water/refrigerant circuit.
7. See performance correction tables for operating conditions other than those listed above.

50PTH,PTV,PTD064 (cont)

1500 CFM NOMINAL AIRFLOW COOLING/1650 CFM NOMINAL AIRFLOW HEATING — PART LOAD

EWT (F)	GPM	PRESSURE DROP		COOLING							HEATING					
		PSI	ft wg	Airflow CFM	TC	TSC	Sens/Tot Ratio	kW	THR	EER	Airflow CFM	THC	kW	HE	LAT	COP
20	14.0	4.1	9.4	Operation Not Recommended							1430	28.7	2.85	19.5	88.6	2.95
	14.0	4.1	9.4								1650	29.0	2.77	19.9	86.3	3.07
30	7.0	0.5	1.1	1280	49.1	33.2	0.68	1.54	54.2	31.8	1430	31.7	2.87	22.5	90.5	3.24
	7.0	0.5	1.1	1500	49.7	35.0	0.70	1.56	55.0	31.8	1650	32.0	2.78	22.9	88.0	3.37
	10.5	1.9	4.4	1280	50.1	33.6	0.67	1.50	55.1	33.4	1430	32.7	2.87	23.4	91.2	3.34
	10.5	1.9	4.4	1500	50.8	35.3	0.70	1.52	55.9	33.4	1650	33.0	2.79	23.9	88.5	3.47
	14.0	3.9	9.0	1280	51.6	34.4	0.67	1.48	56.6	34.7	1430	33.2	2.87	24.0	91.5	3.39
	14.0	3.9	9.0	1500	52.3	36.2	0.69	1.51	57.4	34.7	1650	33.6	2.79	24.4	88.8	3.53
40	7.0	0.4	0.9	1280	51.9	35.8	0.69	1.68	57.6	30.9	1430	36.1	2.89	26.8	93.4	3.67
	7.0	0.4	0.9	1500	52.7	37.6	0.71	1.71	58.4	30.9	1650	36.5	2.80	27.4	90.5	3.82
	10.5	1.8	4.3	1280	52.3	35.8	0.68	1.60	57.7	32.7	1430	37.4	2.89	28.1	94.2	3.79
	10.5	1.8	4.3	1500	53.1	37.7	0.71	1.63	58.5	32.7	1650	37.8	2.81	28.6	91.2	3.95
	14.0	3.7	8.6	1280	52.7	35.9	0.68	1.57	57.9	33.6	1430	38.1	2.90	28.8	94.7	3.86
	14.0	3.7	8.6	1500	53.4	37.7	0.71	1.59	58.8	33.6	1650	38.5	2.81	29.3	91.6	4.02
50	7.0	0.3	0.7	1280	52.0	36.5	0.70	1.88	58.4	27.7	1430	40.9	2.91	31.5	96.5	4.11
	7.0	0.3	0.7	1500	52.8	38.4	0.73	1.91	59.2	27.7	1650	41.3	2.83	32.1	93.2	4.28
	10.5	1.8	4.1	1280	52.6	36.5	0.69	1.76	58.5	29.8	1430	42.4	2.92	33.0	97.5	4.26
	10.5	1.8	4.1	1500	53.3	38.4	0.72	1.79	59.3	29.8	1650	42.9	2.83	33.6	94.1	4.43
	14.0	3.6	8.2	1280	52.7	36.5	0.69	1.71	58.5	30.8	1430	43.2	2.92	33.8	98.0	4.33
	14.0	3.6	8.2	1500	53.5	38.4	0.72	1.74	59.4	30.8	1650	43.7	2.84	34.4	94.5	4.51
60	7.0	0.3	0.6	1280	50.2	35.8	0.71	2.12	57.3	23.7	1430	45.7	2.94	36.2	99.6	4.55
	7.0	0.3	0.6	1500	50.9	37.6	0.74	2.15	58.2	23.7	1650	46.2	2.86	36.9	95.9	4.74
	10.5	1.7	4.0	1280	51.3	36.2	0.71	1.98	58.0	25.9	1430	47.5	2.96	37.9	100.8	4.71
	10.5	1.7	4.0	1500	52.0	38.1	0.73	2.01	58.8	25.9	1650	48.0	2.87	38.7	97.0	4.91
	14.0	3.4	7.8	1280	51.8	36.4	0.70	1.91	58.3	27.1	1430	48.5	2.96	38.9	101.4	4.79
	14.0	3.4	7.8	1500	52.5	38.3	0.73	1.94	59.1	27.1	1650	49.0	2.88	39.6	97.5	4.99
70	7.0	0.2	0.5	1280	47.5	34.5	0.73	2.41	55.7	19.8	1430	50.6	2.98	40.9	102.8	4.97
	7.0	0.2	0.5	1500	48.2	36.3	0.75	2.44	56.5	19.8	1650	51.2	2.90	41.7	98.7	5.18
	10.5	1.7	3.9	1280	49.1	35.2	0.72	2.24	56.7	21.9	1430	52.6	3.01	42.9	104.1	5.13
	10.5	1.7	3.9	1500	49.7	37.1	0.74	2.28	57.5	21.9	1650	53.2	2.92	43.7	99.9	5.35
	14.0	3.3	7.5	1280	49.8	35.6	0.71	2.17	57.1	23.0	1430	53.7	3.02	43.9	104.8	5.22
	14.0	3.3	7.5	1500	50.5	37.4	0.74	2.20	57.9	23.0	1650	54.3	2.93	44.8	100.5	5.43
80	7.0	0.2	0.4	1280	44.5	33.0	0.74	2.74	53.8	16.2	1430	55.4	3.04	45.6	105.9	5.35
	7.0	0.2	0.4	1500	45.1	34.7	0.77	2.78	54.5	16.2	1650	56.1	2.95	46.5	101.5	5.57
	10.5	1.6	3.8	1280	46.1	33.8	0.73	2.56	54.8	18.0	1430	57.6	3.07	47.7	107.3	5.50
	10.5	1.6	3.8	1500	46.8	35.6	0.76	2.59	55.6	18.0	1650	58.3	2.98	48.6	102.7	5.73
	14.0	3.1	7.2	1280	46.9	34.2	0.73	2.47	55.3	19.0	1430	58.8	3.09	48.8	108.1	5.58
	14.0	3.1	7.2	1500	47.6	36.0	0.76	2.51	56.1	19.0	1650	59.5	3.00	49.7	103.4	5.81
85	7.0	0.2	0.4	1280	42.8	32.3	0.75	2.93	52.8	14.6	1430	57.8	3.08	47.8	107.4	5.51
	7.0	0.2	0.4	1500	43.5	34.0	0.78	2.97	53.6	14.6	1650	58.4	2.99	48.7	102.8	5.73
	10.5	1.6	3.7	1280	44.5	33.1	0.74	2.74	53.8	16.2	1430	60.0	3.11	49.9	108.9	5.65
	10.5	1.6	3.7	1500	45.1	34.8	0.77	2.78	54.6	16.2	1650	60.7	3.02	50.9	104.1	5.88
	14.0	3.0	7.0	1280	45.3	33.5	0.74	2.65	54.3	17.1	1430	61.2	3.14	51.0	109.6	5.72
	14.0	3.0	7.0	1500	46.0	35.2	0.77	2.68	55.1	17.1	1650	61.9	3.04	52.0	104.7	5.96
90	7.0	0.1	0.3	1280	41.2	31.6	0.77	3.12	51.8	13.2	1430	60.1	3.11	50.0	108.9	5.66
	7.0	0.1	0.3	1500	41.8	33.2	0.79	3.16	52.6	13.2	1650	60.8	3.02	51.0	104.1	5.90
	10.5	1.5	3.6	1280	42.9	32.3	0.75	2.92	52.8	14.7	1430	62.4	3.16	52.1	110.4	5.80
	10.5	1.5	3.6	1500	43.5	34.0	0.78	2.96	53.6	14.7	1650	63.1	3.06	53.2	105.4	6.04
	14.0	3.0	6.8	1280	43.7	32.7	0.75	2.82	53.3	15.5	1430	63.6	3.18	53.2	111.2	5.86
	14.0	3.0	6.8	1500	44.3	34.4	0.78	2.86	54.1	15.5	1650	64.3	3.09	54.3	106.1	6.10
100	7.0	0.1	0.2	1280	38.1	30.3	0.79	3.54	50.2	10.8	Operation Not Recommended					
	7.0	0.1	0.2	1500	38.7	31.9	0.82	3.59	50.9	10.8						
	10.5	1.5	3.5	1280	39.6	30.9	0.78	3.33	51.0	11.9						
	10.5	1.5	3.5	1500	40.2	32.5	0.81	3.38	51.7	11.9						
	14.0	2.8	6.5	1280	40.4	31.2	0.77	3.22	51.4	12.5						
	14.0	2.8	6.5	1500	41.0	32.8	0.80	3.27	52.1	12.5						
110	7.0	0.1	0.2	1280	35.5	29.6	0.83	4.02	49.3	8.8						
	7.0	0.1	0.2	1500	36.0	31.1	0.86	4.08	49.9	8.8						
	10.5	1.5	3.3	1280	36.7	29.8	0.81	3.79	49.6	9.7						
	10.5	1.5	3.3	1500	37.2	31.4	0.84	3.84	50.3	9.7						
	14.0	2.7	6.2	1280	37.3	30.0	0.80	3.67	49.9	10.2						
	14.0	2.7	6.2	1500	37.9	31.6	0.83	3.73	50.6	10.2						
120	7.0	0.1	0.1	1280	33.7	29.2	0.87	4.57	49.3	7.4						
	7.0	0.1	0.1	1500	34.2	30.7	0.90	4.63	50.0	7.4						
	10.5	1.4	3.2	1280	34.4	29.3	0.85	4.30	49.1	8.0						
	10.5	1.4	3.2	1500	34.9	30.8	0.88	4.36	49.8	8.0						
	14.0	2.6	6.0	1280	34.9	29.5	0.85	4.18	49.1	8.3						
	14.0	2.6	6.0	1500	35.4	31.0	0.88	4.24	49.8	8.3						

LEGEND

ARI — Air Conditioning and Refrigeration Institute
COP — Coefficient of Performance
db — Dry Bulb
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Gallons Per Minute
HE — Heat of Extraction (MBtuh)
ISO — International Organization for Standardization
LAT — Leaving Air Temperature (F)
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THC — Total Heating Capacity (MBtuh)
THR — Total Heat Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
wb — Wet Bulb

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 80 F db and 67 F wb in cooling, and 70 F db in heating. ARI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for ARI/ISO conditions.
4. All performance is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon a 15% antifreeze solution.
6. Operation below 60 F EWT requires optional insulated water/refrigerant circuit.
7. See performance correction tables for operating conditions other than those listed above.

Performance data (cont)

Carrier®

50PTH,PTV,PTD072

1950 CFM NOMINAL AIRFLOW COOLING/2100 CFM NOMINAL AIRFLOW HEATING — FULL LOAD

EWT (F)	GPM	PRESSURE DROP		COOLING							HEATING					
		PSI	ft wg	Airflow CFM	TC	TSC	Sens/Tot Ratio	kW	THR	EER	Airflow CFM	THC	kW	HE	LAT	COP
20	17.00	10.1	23.3	Operation Not Recommended							1850	44.6	4.82	28.8	92.3	2.7
	17.00	10.1	23.3								2100	45.3	4.67	29.6	90.0	2.8
30	8.50	2.2	5.1	1830	74.3	47.4	0.6	3.20	85.2	23.2	1850	49.0	4.89	32.8	94.5	2.9
	8.50	2.2	5.1	1950	74.9	49.2	0.7	3.26	86.0	23.0	2100	49.7	4.47	33.7	91.9	3.1
	12.75	5.0	11.6	1830	74.8	47.9	0.6	3.07	85.2	24.3	1850	51.1	4.94	34.8	95.6	3.0
	12.75	5.0	11.6	1950	75.4	49.6	0.7	3.13	86.1	24.1	2100	51.9	4.78	35.7	92.9	3.2
	17.00	8.9	20.6	1830	75.4	48.3	0.6	2.95	84.5	25.5	1850	52.3	4.96	35.8	96.2	3.1
	17.00	8.9	20.6	1950	76.0	50.0	0.7	3.01	86.3	25.3	2100	53.1	4.81	36.8	93.4	3.2
40	8.50	2.1	4.9	1830	78.6	49.6	0.6	3.40	90.1	23.1	1850	56.8	5.06	40.0	98.4	3.3
	8.50	2.1	4.9	1950	79.2	51.4	0.6	3.46	91.0	22.9	2100	57.7	4.90	41.1	95.4	3.4
	12.75	4.7	10.9	1830	79.1	50.0	0.6	3.29	90.2	24.0	1850	59.7	5.13	42.7	99.9	3.4
	12.75	4.7	10.9	1950	79.7	51.8	0.6	3.35	91.1	23.8	2100	60.6	4.97	43.8	96.7	3.6
	17.00	8.3	19.2	1830	79.6	50.3	0.6	3.17	90.3	25.1	1850	61.4	5.17	44.2	100.7	3.5
	17.00	8.3	19.2	1950	80.2	52.2	0.7	3.23	91.2	24.8	2100	62.3	5.01	45.3	97.5	3.6
50	8.50	1.9	4.4	1830	79.5	49.9	0.6	3.89	97.2	20.4	1850	65.5	5.27	47.9	102.8	3.6
	8.50	1.9	4.4	1950	80.1	51.7	0.6	3.96	93.7	20.2	2100	66.5	5.11	49.1	99.3	3.8
	12.75	4.3	9.9	1830	80.1	50.6	0.6	3.74	92.9	21.4	1850	69.3	5.37	51.3	104.7	3.8
	12.75	4.3	9.9	1950	80.8	52.5	0.6	3.81	93.8	21.2	2100	70.3	5.21	52.7	101.0	4.0
	17.00	7.7	17.8	1830	80.7	51.1	0.6	3.61	92.9	22.3	1850	71.4	5.43	53.2	105.7	3.9
	17.00	7.7	17.8	1950	81.3	53.0	0.7	3.68	93.9	21.3	2100	72.5	5.26	54.6	102.0	4.0
60	8.50	1.7	3.9	1830	77.4	49.0	0.6	4.43	92.5	17.5	1850	74.7	5.52	56.1	107.4	4.0
	8.50	1.7	3.9	1950	78.0	50.8	0.7	4.51	93.4	17.3	2100	75.8	5.35	57.6	103.4	4.2
	12.75	3.9	9.0	1830	78.2	49.6	0.6	4.24	92.7	18.5	1850	79.2	5.66	60.2	109.7	4.1
	12.75	3.9	9.0	1950	78.9	51.4	0.7	4.31	93.6	18.3	2100	80.5	5.49	61.8	105.5	4.3
	17.00	7.0	16.2	1830	79.1	50.0	0.6	4.17	93.2	19.0	1850	81.8	5.74	62.4	110.9	4.2
	17.00	7.0	16.2	1950	79.7	51.8	0.6	4.24	94.2	18.8	2100	83.0	5.56	64.1	106.6	4.4
70	8.50	1.7	3.9	1830	71.9	48.6	0.7	4.78	88.2	15.0	1850	84.0	5.81	64.4	112.0	4.2
	8.50	1.7	3.9	1950	72.5	50.3	0.7	4.86	89.1	14.9	2100	85.3	5.63	66.1	107.6	4.4
	12.75	3.9	9.0	1830	74.4	48.9	0.7	4.52	89.8	16.5	1850	89.2	5.99	68.9	114.6	4.4
	12.75	3.9	9.0	1950	75.0	50.7	0.7	4.60	90.8	16.3	2100	90.5	5.80	70.7	109.9	4.6
	17.00	6.9	15.9	1830	75.5	49.1	0.7	4.41	90.5	17.1	1850	92.0	6.09	71.3	116.0	4.4
	17.00	6.9	15.9	1950	76.1	50.8	0.7	4.49	91.4	16.9	2100	93.4	5.90	73.2	111.2	4.6
80	8.50	1.6	3.7	1830	67.5	48.0	0.7	5.21	85.4	13.0	1850	93.1	6.13	72.3	116.6	4.5
	8.50	1.6	3.7	1950	68.1	49.8	0.7	5.31	86.2	12.8	2100	94.5	5.94	74.3	111.7	4.7
	12.75	3.6	8.3	1830	70.6	48.4	0.7	4.91	87.4	14.4	1850	98.6	6.34	77.0	119.3	4.6
	12.75	3.6	8.3	1950	71.2	50.2	0.7	4.99	88.2	14.2	2100	100.1	6.15	79.1	114.1	4.8
	17.00	6.5	15.0	1830	72.0	48.6	0.7	4.77	88.3	15.1	1850	101.4	6.46	79.4	120.7	4.6
	17.00	6.5	15.0	1950	72.6	50.4	0.7	4.85	89.2	15.0	2100	102.9	6.26	81.5	115.4	4.8
85	8.50	1.6	3.7	1830	65.2	47.6	0.7	5.47	83.9	12.0	1850	97.4	6.30	76.0	118.7	4.5
	8.50	1.6	3.7	1950	65.7	49.3	0.7	5.57	84.8	11.9	2100	98.9	6.11	78.0	113.6	4.7
	12.75	3.6	8.3	1830	68.3	48.1	0.7	5.14	85.9	13.3	1850	102.7	6.53	80.5	121.4	4.6
	12.75	3.6	8.3	1950	68.8	49.8	0.7	5.24	86.7	13.2	2100	104.3	6.33	82.7	116.0	4.8
	17.00	6.5	15.0	1830	69.8	48.3	0.7	4.99	86.9	14.0	1850	105.4	6.67	82.8	122.8	4.6
	17.00	6.5	15.0	1950	70.4	50.1	0.7	5.08	87.7	13.9	2100	107.0	6.46	85.0	117.2	4.9
90	8.50	1.6	3.7	1830	62.9	47.1	0.7	5.72	82.5	11.0	1850	101.6	6.48	79.6	120.9	4.6
	8.50	1.6	3.7	1950	63.4	48.8	0.8	5.83	83.3	10.9	2100	103.2	6.27	81.8	115.5	4.8
	12.75	3.6	8.3	1830	66.0	47.8	0.7	5.38	84.4	12.3	1850	106.9	6.73	84.0	123.5	4.7
	12.75	3.6	8.3	1950	66.5	49.5	0.7	5.48	85.2	12.1	2100	108.5	6.52	86.3	117.9	4.9
	17.00	6.5	15.0	1830	67.6	48.0	0.7	5.21	85.4	13.0	1850	109.5	6.87	81.1	124.8	4.7
	17.00	6.5	15.0	1950	68.1	49.8	0.7	5.31	86.3	12.8	2100	111.1	6.65	88.4	119.0	4.9
100	8.50	1.5	3.5	1830	58.4	45.7	0.8	6.29	80.0	9.3	Operation Not Recommended					
	8.50	1.5	3.5	1950	58.8	47.3	0.8	6.41	80.8	9.2						
	12.75	3.4	7.9	1830	61.2	46.6	0.8	5.92	81.5	10.3						
	12.75	3.4	7.9	1950	61.7	48.3	0.8	6.03	82.3	10.2						
	17.00	6.1	14.1	1830	62.7	47.1	0.8	5.74	82.4	10.9						
	17.00	6.1	14.1	1950	63.2	48.8	0.8	5.85	83.2	10.8						
110	8.50	1.4	3.2	1830	54.7	43.8	0.8	6.93	78.5	7.9						
	8.50	1.4	3.2	1950	55.1	45.4	0.8	7.06	79.3	7.8						
	12.75	3.3	7.6	1830	56.8	45.0	0.8	6.53	79.3	8.7						
	12.75	3.3	7.6	1950	57.3	46.6	0.8	6.65	80.1	8.6						
	17.00	5.8	13.4	1830	58.1	45.6	0.8	6.33	79.9	9.2						
	17.00	5.8	13.4	1950	58.6	47.2	0.8	6.45	80.7	9.1						
120	8.50	1.4	3.2	1830	52.5	41.8	0.8	7.63	78.7	6.9						
	8.50	1.4	3.2	1950	52.9	43.3	0.8	7.77	79.5	6.8						
	12.75	3.1	7.2	1830	53.6	43.0	0.8	7.19	78.3	7.5						
	12.75	3.1	7.2	1950	54.0	44.6	0.8	7.32	79.1	7.4						
	17.00	5.6	12.9	1830	54.4	43.7	0.8	6.98	78.4	7.8						
	17.00	5.6	12.9	1950	54.9	45.2	0.8	7.11	79.2	7.7						

LEGEND

ARI — Air Conditioning and Refrigeration Institute
COP — Coefficient of Performance
db — Dry Bulb
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Gallons Per Minute
HE — Heat of Extraction (MBtuh)
ISO — International Organization for Standardization
LAT — Leaving Air Temperature (F)
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THC — Total Heating Capacity (MBtuh)
THR — Total Heat Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
wb — Wet Bulb

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 80 F db and 67 F wb in cooling, and 70 F db in heating. ARI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for ARI/ISO conditions.
4. All performance is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon a 15% antifreeze solution.
6. Operation below 60 F EWT requires optional insulated water/refrigerant circuit.
7. See performance correction tables for operating conditions other than those listed above.

50PTH,PTV,PTD072 (cont)

1500 CFM NOMINAL AIRFLOW COOLING/1650 CFM NOMINAL AIRFLOW HEATING — PART LOAD

EWT (F)	GPM	PRESSURE DROP		COOLING							HEATING					
		PSI	ft wg	Airflow CFM	TC	TSC	Sens/Tot Ratio	kW	THR	EER	Airflow CFM	THC	kW	HE	LAT	COP
20	15.00	10.1	23.3	Operation Not Recommended							1400	32.5	3.69	20.4	91.5	2.58
	15.00	10.1	23.3								1600	33.0	3.57	20.9	89.1	2.70
30	7.50	1.7	3.9	1400	58.2	39.3	0.7	2.15	65.5	27.1	1400	36.3	3.75	24.0	94.0	2.84
	7.50	1.7	3.9	1500	58.7	40.7	0.7	2.19	66.2	26.8	1600	36.9	3.64	24.6	91.3	2.97
	11.25	3.9	9.0	1400	59.1	39.7	0.7	2.05	66.0	28.9	1400	37.7	3.77	25.2	94.9	2.93
	11.25	3.9	9.0	1500	59.6	41.2	0.7	2.08	66.7	28.4	1600	38.3	3.66	25.9	92.1	3.07
	15.00	6.9	15.9	1400	60.1	40.2	0.7	2.01	66.8	30.0	1400	38.4	3.78	25.9	95.4	2.98
	15.00	6.9	15.9	1500	60.5	41.7	0.7	2.04	67.5	29.4	1600	39.0	3.67	26.6	92.6	3.12
40	7.50	1.6	3.7	1400	60.2	40.2	0.7	2.34	68.1	25.7	1400	42.4	3.84	29.7	98.1	3.24
	7.50	1.6	3.7	1500	60.7	41.6	0.7	2.39	68.8	25.2	1600	43.1	3.73	30.5	94.9	3.39
	11.25	3.6	8.3	1400	60.9	40.6	0.7	2.22	68.4	27.4	1400	44.3	3.87	31.5	99.3	3.35
	11.25	3.6	8.3	1500	61.4	42.1	0.7	2.26	69.1	27.0	1600	45.0	3.75	32.3	96.0	3.52
	15.00	6.5	15.0	1400	61.5	40.9	0.7	2.16	68.8	28.5	1400	45.4	3.89	32.4	100.0	3.42
	15.00	6.5	15.0	1500	62.0	42.4	0.7	2.20	69.5	28.0	1600	46.1	3.77	33.3	96.7	3.58
50	7.50	1.5	3.5	1400	61.0	40.6	0.7	2.59	69.8	23.5	1400	49.1	3.94	35.9	102.5	3.65
	7.50	1.5	3.5	1500	61.5	42.1	0.7	2.64	70.5	23.1	1600	49.9	3.82	36.9	89.9	3.82
	11.25	3.4	7.9	1400	61.7	41.0	0.7	2.44	69.9	25.3	1400	51.5	3.98	38.2	104.1	3.80
	11.25	3.4	7.9	1500	62.2	42.5	0.7	2.48	70.6	24.9	1600	52.3	3.86	39.2	100.3	3.98
	15.00	6.0	13.9	1400	62.0	41.1	0.7	2.36	70.0	26.2	1400	52.9	4.00	39.5	105.0	3.88
	15.00	6.0	13.9	1500	62.5	42.6	0.7	2.41	70.7	25.8	1600	53.7	3.88	40.5	101.1	4.06
60	7.50	1.4	3.2	1400	58.8	39.6	0.7	2.88	68.6	20.4	1400	56.1	4.05	42.5	107.1	4.06
	7.50	1.4	3.2	1500	59.3	41.0	0.7	2.93	69.3	20.1	1600	56.9	3.92	43.6	103.0	4.25
	11.25	3.1	7.2	1400	60.3	40.3	0.7	2.70	69.4	22.4	1400	59.0	4.09	45.2	109.0	4.22
	11.25	3.1	7.2	1500	60.7	41.7	0.7	2.75	70.1	22.0	1600	59.9	3.97	46.4	104.7	4.43
	15.00	5.4	12.5	1400	60.9	40.6	0.7	2.61	69.7	23.3	1400	60.6	4.12	46.7	110.1	4.31
	15.00	5.4	12.5	1500	61.3	42.0	0.7	2.66	70.4	22.9	1600	61.6	3.99	48.0	105.6	4.52
70	7.50	1.3	3.0	1400	55.9	38.2	0.7	3.21	66.9	17.4	1400	63.1	4.16	49.0	111.8	4.45
	7.50	1.3	3.0	1500	56.4	39.6	0.7	3.27	67.5	17.1	1600	64.1	4.03	50.3	107.1	4.66
	11.25	3.0	6.9	1400	57.8	39.0	0.7	3.00	68.0	19.2	1400	66.5	4.22	52.1	114.0	4.62
	11.25	3.0	6.9	1500	58.2	40.5	0.7	3.06	68.7	18.9	1600	67.5	4.09	53.5	109.1	4.84
	15.00	5.4	12.5	1400	58.6	39.4	0.7	2.90	68.5	20.2	1400	68.3	4.25	53.8	115.2	4.71
	15.00	5.4	12.5	1500	59.1	40.9	0.7	2.96	69.2	19.8	1600	69.3	4.12	55.3	110.1	4.94
80	7.50	1.3	3.0	1400	52.5	36.8	0.7	3.59	64.8	14.7	1400	70.0	4.28	55.4	116.3	4.80
	7.50	1.3	3.0	1500	53.0	38.1	0.7	3.65	65.5	14.4	1600	71.1	4.15	56.9	111.1	5.02
	11.25	2.8	6.5	1400	54.6	37.6	0.7	3.36	66.0	16.3	1400	73.6	4.35	58.7	118.7	4.96
	11.25	2.8	6.5	1500	55.0	39.0	0.7	3.42	66.7	16.0	1600	74.7	4.21	60.3	113.2	5.20
	15.00	5.0	11.6	1400	55.6	38.1	0.7	3.25	66.6	17.1	1400	75.5	4.38	60.5	119.9	5.05
	15.00	5.0	11.6	1500	56.0	39.4	0.7	3.31	67.3	16.8	1600	76.6	4.25	62.1	114.4	5.29
85	7.50	1.3	3.0	1400	50.8	36.1	0.7	3.80	63.8	13.4	1400	73.3	4.34	58.4	118.5	4.95
	7.50	1.3	3.0	1500	51.2	37.4	0.7	3.87	64.4	13.2	1600	74.4	4.21	60.0	113.1	5.18
	11.25	2.8	6.5	1400	52.8	36.9	0.7	3.56	65.0	14.9	1400	76.9	4.42	61.7	120.8	5.10
	11.25	2.8	6.5	1500	53.2	38.2	0.7	3.63	65.6	14.6	1600	78.0	4.28	63.4	115.2	5.34
	15.00	5.0	11.6	1400	53.8	37.3	0.7	3.44	65.6	15.7	1400	78.7	4.46	63.4	122.0	5.17
	15.00	5.0	11.6	1500	54.2	38.7	0.7	3.51	66.2	15.4	1600	79.9	4.32	65.1	116.2	5.42
90	7.50	1.3	3.0	1400	49.0	35.4	0.7	4.02	62.7	12.2	1400	76.5	4.41	61.4	120.6	5.09
	7.50	1.3	3.0	1500	49.4	36.6	0.7	4.09	63.3	12.0	1600	77.7	4.27	63.1	115.0	5.33
	11.25	2.8	6.5	1400	51.0	36.1	0.7	3.76	63.9	13.5	1400	80.1	4.49	64.7	123.0	5.23
	11.25	2.8	6.5	1500	51.4	37.5	0.7	3.83	64.5	13.3	1600	81.3	4.35	66.4	117.1	5.48
	15.00	5.0	11.6	1400	52.1	36.6	0.7	3.64	64.5	14.3	1400	81.9	4.53	66.3	124.2	5.30
	15.00	5.0	11.6	1500	52.5	37.9	0.7	3.71	65.2	14.0	1600	83.1	4.39	68.1	118.1	5.55
100	7.50	1.2	2.8	1400	45.4	34.1	0.8	4.51	60.9	10.1	Operation Not Recommended					
	7.50	1.2	2.8	1500	45.8	35.4	0.8	4.59	61.5	9.9						
	11.25	2.7	6.2	1400	47.3	34.8	0.7	4.23	61.8	11.2						
	11.25	2.7	6.2	1500	47.7	36.0	0.8	4.31	62.5	11.0						
	15.00	4.8	11.1	1400	48.4	35.1	0.7	4.09	62.4	11.8						
	15.00	4.8	11.1	1500	48.7	36.4	0.7	4.17	63.0	11.6						
110	7.50	1.1	2.5	1400	42.2	33.3	0.8	5.06	59.6	8.3						
	7.50	1.1	2.5	1500	42.6	34.5	0.8	5.15	60.2	8.2						
	11.25	2.5	5.8	1400	43.9	33.7	0.8	4.75	60.2	9.2						
	11.25	2.5	5.8	1500	44.2	34.9	0.8	4.84	60.8	9.1						
	15.00	4.5	10.4	1400	44.8	34.0	0.8	4.61	60.6	9.7						
	15.00	4.5	10.4	1500	45.1	35.2	0.8	4.69	61.2	9.6						
120	7.50	1.1	2.5	1400	39.6	33.1	0.8	5.70	59.2	7.0						
	7.50	1.1	2.5	1500	40.0	34.3	0.9	5.80	59.8	6.8						
	11.25	2.4	5.5	1400	40.9	33.1	0.8	5.35	59.3	7.6						
	11.25	2.4	5.5	1500	41.2	34.3	0.8	5.45	59.9	7.5						
	15.00	4.3	9.9	1400	41.6	33.2	0.8	5.19	59.4	8.0						
	15.00	4.3	9.9	1500	42.0	34.4	0.8	5.28	60.0	7.9						

LEGEND

ARI — Air Conditioning and Refrigeration Institute
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db — Dry Bulb
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
GPM — Gallons Per Minute
HE — Heat of Extraction (MBtuh)
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LAT — Leaving Air Temperature (F)
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THC — Total Heating Capacity (MBtuh)
THR — Total Heat Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
wb — Wet Bulb

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 80 F db and 67 F wb in cooling, and 70 F db in heating. ARI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for ARI/ISO conditions.
4. All performance is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon a 15% antifreeze solution.
6. Operation below 60 F EWT requires optional insulated water/refrigerant circuit.
7. See performance correction tables for operating conditions other than those listed above.

Performance data (cont)

FULL LOAD AIRFLOW CORRECTION FACTORS TABLE

AIRFLOW		HEATING			COOLING			
CFM Per Nominal Ton	% of Nominal	TC	kW	THR	TC	TSC	kW	THR
240	60	0.946	1.153	0.896	0.925	0.788	0.913	0.922
275	69	0.959	1.107	0.924	0.946	0.829	0.926	0.942
300	75	0.969	1.078	0.942	0.960	0.861	0.937	0.955
325	81	0.977	1.053	0.959	0.972	0.895	0.950	0.968
350	88	0.985	1.032	0.974	0.983	0.930	0.965	0.979
375	94	0.993	1.014	0.988	0.992	0.965	0.982	0.990
400	100	1.000	1.000	1.000	1.000	1.000	1.000	1.000
425	106	1.006	0.989	1.011	1.007	1.033	1.020	1.009
450	113	1.012	0.982	1.019	1.012	1.064	1.042	1.018
475	119	1.018	0.979	1.027	1.016	1.092	1.066	1.025
500	125	1.022	0.977	1.033	1.018	1.116	1.091	1.032
520	130	1.026	0.975	1.038	1.019	1.132	1.112	1.037

LEGEND

kW — Total Power Input
TC — Total Capacity
THR — Total Heat of Rejection
TSC — Total Sensible Capacity

PART LOAD AIRFLOW CORRECTION FACTORS TABLE

AIRFLOW		HEATING			COOLING			
CFM Per Nominal Ton	% of Nominal	TC	kW	THR	TC	TSC	kW	THR
240	60	0.946	1.241	0.881	0.920	0.781	0.959	0.927
275	69	0.960	1.163	0.915	0.942	0.832	0.964	0.946
300	75	0.969	1.115	0.937	0.956	0.867	0.969	0.959
325	81	0.978	1.076	0.956	0.969	0.901	0.975	0.970
350	88	0.986	1.043	0.973	0.981	0.934	0.982	0.981
375	94	0.993	1.018	0.988	0.991	0.967	0.990	0.991
400	100	1.000	1.000	1.000	1.000	1.000	1.000	1.000
425	106	1.006	0.990	1.010	1.007	1.033	1.011	1.008
450	113	1.012	0.986	1.017	1.013	1.065	1.023	1.015
475	119	1.017	0.983	1.024	1.018	1.098	1.036	1.021
500	125	1.021	0.981	1.030	1.021	1.131	1.051	1.026
520	130	1.024	0.979	1.034	1.023	1.159	1.063	1.030

LEGEND

kW — Total Power Input
TC — Total Capacity
THR — Total Heat of Rejection
TSC — Total Sensible Capacity

FULL LOAD ENTERING AIR CORRECTION FACTORS TABLE

HEATING CORRECTIONS				COOLING CORRECTIONS													
EAT DB (F)	TC	kW	THA	EAT WB (F)	TC	Sensible Cooling Capacity Entering Dry Bulb (F)										kW	THR
						60	65	70	75	80	80.6	85	90	95	100		
40	1.052	0.779	1.120	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	1.043	0.808	1.120	45	0.832	1.346	1.461	1.603	*	*	*	*	*	*	*	0.946	0.853
50	1.035	0.841	1.084	50	0.850	1.004	1.174	1.357	*	*	*	*	*	*	*	0.958	0.870
55	1.027	0.877	1.065	55	0.880	0.694	0.902	1.115	1.331	*	*	*	*	*	*	0.964	0.896
60	1.019	0.915	1.045	60	0.922	—	0.646	0.875	1.103	1.329	1.356	*	*	*	*	0.977	0.932
65	1.010	0.957	1.023	65	0.975	—	—	0.639	0.869	1.096	1.173	1.320	*	*	*	0.993	0.979
68	**1.004**	**0.982**	**1.010**	**66.2**	**0.990**	—	—	0.582	0.812	1.039	**1.066**	1.262	1.482	*	*	**0.997**	**0.991**
70	1.000	1.000	1.000	67	1.000	—	—	0.545	0.774	1.000	1.027	1.223	1.444	*	*	1.000	1.000
75	0.989	1.045	0.974	70	1.040	—	—	—	0.630	0.853	0.880	1.075	1.297	1.517	*	1.011	1.035
80	0.976	1.093	0.946	75	1.117	—	—	—	—	0.601	0.627	0.821	1.046	1.275	1.510	1.033	1.101

LEGEND

ARI — Air Conditioning and Refrigeration Institute
ASHRAE — American Society of Heating, Refrigeration and Air Conditioning Engineers
db — Dry Bulb
EAT — Entering-Air Temperature (F)
ISO — International Organization for Standardization
kW — Total Power Input
TC — Total Capacity)
THA — Total Heat of Absorption
THR — Total Heat of Rejection
wb — Wet Bulb

Sensible capacity equals total capacity (no latent capacity at conditions shown as "") ARI/ISO/ASHRAE 13256-1 uses entering air conditions of:

Cooling — 80.6 F db/66.2 F wb and
Heating — 68 F db/59 F wb (bold print for comparison only).

PART LOAD ENTERING AIR CORRECTION FACTORS TABLE

HEATING CORRECTIONS				COOLING CORRECTIONS													
EAT DB (F)	TC	kW	THA	EAT WB (F)	TC	Sensible Cooling Capacity Entering Dry Bulb (F)										kW	THR
						60	65	70	75	80	80.6	85	90	95	100		
40	1.084	0.732	1.161	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	1.073	0.764	1.140	45	0.876	1.286	1.302	1.389	*	*	*	*	*	*	*	0.981	0.895
50	1.060	0.802	1.117	50	0.883	1.002	1.099	1.241	*	*	*	*	*	*	*	0.985	0.901
55	1.046	0.846	1.090	55	0.903	0.706	0.871	1.060	1.271	*	*	*	*	*	*	0.989	0.918
60	1.031	0.893	1.061	60	0.935	—	0.617	0.844	1.079	1.319	1.349	*	*	*	*	0.993	0.945
65	1.016	0.945	1.031	65	0.979	—	—	0.595	0.849	1.096	1.028	1.342	*	*	*	0.998	0.982
68	**1.006**	**1.978**	**1.013**	**66.2**	**0.991**	—	—	0.531	0.789	1.040	**1.070**	1.284	1.522	*	*	**0.999**	**0.993**
70	1.000	1.000	1.000	67	1.000	—	—	0.480	0.747	1.000	1.030	1.245	1.481	*	*	1.000	1.000
75	0.984	1.058	0.968	70	1.035	—	—	—	0.583	0.842	0.873	1.090	1.327	1.552	*	1.003	1.030
80	0.968	1.117	0.936	75	1.105	—	—	—	—	0.584	0.584	0.811	1.057	1.290	1.510	1.008	1.088

LEGEND

ARI — Air Conditioning and Refrigeration Institute
ASHRAE — American Society of Heating, Refrigeration and Air Conditioning Engineers
db — Dry Bulb
EAT — Entering-Air Temperature (F)
ISO — International Organization for Standardization
kW — Total Power Input
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection
wb — Wet Bulb

Sensible capacity equals total capacity (no latent capacity at conditions shown as "") ARI/ISO/ASHRAE 13256-1 uses entering air conditions of:

Cooling — 80.6 F db/66.2 F wb and
Heating — 68 F db/59 F wb (bold print for comparison only).

Performance data (cont)

FULL LOAD BLOWER PERFORMANCE DATA

50PTH, PTV, PTD UNITS	MODE	FAN SPEED	RATED AIRFLOW (Cfm)	MIN AIRFLOW (Cfm)	AIRFLOW (Cfm) External Static Pressure (in. wg)															
					0.0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
026	DEHUMIDIFICATION	Low	850	570	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Med Low	850	570	570	570	570	570	570	570	570	570	570	570	570	511	—	—	—	—
		Med Hi	850	570	660	660	660	660	660	660	660	660	660	660	660	592	—	—	—	—
		Hi	850	570	740	740	740	740	740	740	740	740	740	740	740	664	—	—	—	—
	COOLING	Low	850	570	610	610	610	610	610	610	610	610	610	610	610	547	—	—	—	—
		Med Low	850	570	730	730	730	730	730	730	730	730	730	730	730	654	—	—	—	—
		Med Hi	850	570	850	850	850	850	850	850	850	850	850	850	850	762	—	—	—	—
		Hi	850	570	950	950	950	950	950	950	950	950	950	950	950	852	—	—	—	—
	HEATING	Low	950	690	690	690	690	690	690	690	690	690	690	690	690	619	—	—	—	—
		Med Low	950	690	820	820	820	820	820	820	820	820	820	820	820	735	—	—	—	—
		Med Hi	950	690	950	950	950	950	950	950	950	950	950	950	950	852	—	—	—	—
		Hi	950	690	1060	1060	1060	1060	1060	1060	1060	1060	1060	1060	1060	950	—	—	—	—
038	DEHUMIDIFICATION	Low	1250	840	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Med Low	1250	840	840	840	840	840	840	840	840	840	840	840	840	754	—	—	—	—
		Med Hi	1250	840	980	980	980	980	980	980	980	980	980	980	980	879	—	—	—	—
		Hi	1250	840	1090	1090	1090	1090	1090	1090	1090	1090	1090	1090	1090	978	—	—	—	—
	COOLING	Low	1250	840	900	900	900	900	900	900	900	900	900	900	900	808	—	—	—	—
		Med Low	1250	840	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	969	—	—	—	—
		Med Hi	1250	840	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1122	—	—	—	—
		Hi	1250	840	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1256	—	—	—	—
	HEATING	Low	1250	900	900	900	900	900	900	900	900	900	900	900	900	808	—	—	—	—
		Med Low	1250	900	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	969	—	—	—	—
		Med Hi	1250	900	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1122	—	—	—	—
		Hi	1250	900	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1256	—	—	—	—
049	DEHUMIDIFICATION	Low	1550	1040	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Med Low	1550	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	964	—	—
		Med Hi	1550	1040	1210	1210	1210	1210	1210	1210	1210	1210	1210	1210	1210	1210	1210	1122	—	—
		Hi	1550	1040	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1252	—	—
	COOLING	Low	1550	1040	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1038	—	—
		Med Low	1550	1040	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1233	—	—
		Med Hi	1550	1040	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1437	—	—
		Hi	1550	1040	1730	1730	1730	1730	1730	1730	1730	1730	1730	1730	1730	1730	1730	1604	—	—
	HEATING	Low	1650	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1112	—	—
		Med Low	1650	1200	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1326	—	—
		Med Hi	1650	1200	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1529	—	—
		Hi	1650	1200	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1715	—	—
064	DEHUMIDIFICATION	Low	1825	1230	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Med Low	1825	1230	1230	1230	1230	1230	1230	1230	1230	1230	1230	1230	1230	1230	1230	1141	—	—
		Med Hi	1825	1230	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1326	—	—
		Hi	1825	1230	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1483	—	—
	COOLING	Low	1825	1230	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1224	—	—
		Med Low	1825	1230	1580	1580	1580	1580	1580	1580	1580	1580	1580	1580	1580	1580	1580	1465	—	—
		Med Hi	1825	1230	1825	1825	1825	1825	1825	1825	1825	1825	1825	1825	1825	1825	1825	1692	—	—
		Hi	1825	1230	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	1900	—	—
	HEATING	Low	2050	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1470	1363	—	—
		Med Low	2050	1470	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1622	—	—
		Med Hi	2050	1470	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	1825	1825	1825	1692	—	—
		Hi	2050	1470	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2114	—	—
072	DEHUMIDIFICATION	Low	1950	1420	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Med Low	1950	1420	1420	1420	1420	1420	1420	1420	1420	1420	1420	1420	1420	1420	1420	1317	—	—
		Med Hi	1950	1420	1520	1520	1520	1520	1520	1520	1520	1520	1520	1520	1520	1520	1520	1409	—	—
		Hi	1950	1420	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1529	—	—
	COOLING	Low	1950	1420	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1576	—	—
		Med Low	1950	1420	1830	1830	1830	1830	1830	1830	1830	1830	1830	1830	1830	1830	1830	1697	—	—
		Med Hi	1950	1420	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1808	—	—
		Hi	1950	1420	2190	2190	2190	2190	2190	2190	2190	2190	2190	2190	2190	2190	2190	2030	—	—
	HEATING	Low	2100	1620	1620	1620	1620	1620	1620	1620	1620	1620	1620	1620	1620	1620	1620	1502	—	—
		Med Low	2100	1620	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1715	—	—
		Med Hi	2100	1620	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	1947	—	—
		Hi	2100	1620	2230	2230	2230	2230	2230	2230	2230	2230	2230	2230	2230	2230	2230	2068	—	—

LEGEND

— — Operation Not Recommended

NOTE: Units have an electronically commutated motor (ECM) fan motor as a standard feature. The small additional pressure drop of the reheat coil causes the ECM motor to slightly increase rpm to overcome the added pressure drop and maintain selected cfm up to maximum ESP (external static pressure).

PART LOAD BLOWER PERFORMANCE DATA

50PTH, PTV, PTD UNITS	MODE	FAN SPEED	RATED AIRFLOW (Cfm)	MIN AIRFLOW (Cfm)	AIRFLOW (Cfm) External Static Pressure (in. wg)														
					0.0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
026	DEHUMIDIFICATION	Low	725	490	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Med Low	725	490	490	490	490	490	490	490	490	490	490	490	490	439	—	—	—	—
		Med Hi	725	490	560	560	560	560	560	560	560	560	560	560	560	502	—	—	—	—
		Hi	725	490	630	630	630	630	630	630	630	630	630	630	630	565	—	—	—	—
	COOLING	Low	725	490	520	520	520	520	520	520	520	520	520	520	520	466	—	—	—	—
		Med Low	725	490	620	620	620	620	620	620	620	620	620	620	620	556	—	—	—	—
		Med Hi	725	490	725	725	725	725	725	725	725	725	725	725	725	650	—	—	—	—
		Hi	725	490	810	810	810	810	810	810	810	810	810	810	810	726	—	—	—	—
	HEATING	Low	825	600	600	600	600	600	600	600	600	600	600	600	600	538	—	—	—	—
		Med Low	825	600	710	710	710	710	710	710	710	710	710	710	710	637	—	—	—	—
		Med Hi	825	600	825	825	825	825	825	825	825	825	825	825	825	740	—	—	—	—
		Hi	825	600	920	920	920	920	920	920	920	920	920	920	920	825	—	—	—	—
038	DEHUMIDIFICATION	Low	1000	670	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Med Low	1000	670	670	670	670	670	670	670	670	670	670	670	670	601	—	—	—	—
		Med Hi	1000	670	780	780	780	780	780	780	780	780	780	780	780	700	—	—	—	—
		Hi	1000	670	870	870	870	870	870	870	870	870	870	870	870	780	—	—	—	—
	COOLING	Low	1000	670	730	730	730	730	730	730	730	730	730	730	730	655	—	—	—	—
		Med Low	1000	670	860	860	860	860	860	860	860	860	860	860	860	772	—	—	—	—
		Med Hi	1000	670	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	897	—	—	—	—
		Hi	1000	670	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1005	—	—	—	—
	HEATING	Low	1000	730	730	730	730	730	730	730	730	730	730	730	730	655	—	—	—	—
		Med Low	1000	730	860	860	860	860	860	860	860	860	860	860	860	772	—	—	—	—
		Med Hi	1000	730	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	897	—	—	—	—
		Hi	1000	730	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1005	—	—	—	—
049	DEHUMIDIFICATION	Low	1300	870	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Med Low	1300	870	870	870	870	870	870	870	870	870	870	870	870	870	870	806	—	—
		Med Hi	1300	870	1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	946	—	—
		Hi	1300	870	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140	1058	—	—
	COOLING	Low	1300	870	940	940	940	940	940	940	940	940	940	940	940	940	940	871	—	—
		Med Low	1300	870	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	1039	—	—
		Med Hi	1300	870	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1206	—	—
		Hi	1300	870	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1353	—	—
	HEATING	Low	1400	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	936	—	—
		Med Low	1400	1010	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1112	—	—
		Med Hi	1400	1010	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1289	—	—
		Hi	1400	1010	1560	1560	1560	1560	1560	1560	1560	1560	1560	1560	1560	1560	1560	1446	—	—
064	DEHUMIDIFICATION	Low	1500	1000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Med Low	1500	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	927	—	—
		Med Hi	1500	1000	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1076	—	—
		Hi	1500	1000	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1205	—	—
	COOLING	Low	1500	1000	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1001	—	—
		Med Low	1500	1000	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1187	—	—
		Med Hi	1500	1000	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1390	—	—
		Hi	1500	1000	1670	1670	1670	1670	1670	1670	1670	1670	1670	1670	1670	1670	1670	1548	—	—
	HEATING	Low	1650	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1112	—	—
		Med Low	1650	1200	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1430	1326	—	—
		Med Hi	1650	1200	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1500	1500	1500	1390	—	—
		Hi	1650	1200	1860	1860	1860	1860	1860	1860	1860	1860	1860	1860	1860	1860	1860	1724	—	—
072	DEHUMIDIFICATION	Low	1500	1100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		Med Low	1500	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1020	—	—
		Med Hi	1500	1100	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1085	—	—
		Hi	1500	1100	1270	1270	1270	1270	1270	1270	1270	1270	1270	1270	1270	1270	1270	1177	—	—
	COOLING	Low	1500	1100	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1224	—	—
		Med Low	1500	1100	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1298	—	—
		Med Hi	1500	1100	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1391	—	—
		Hi	1500	1100	1620	1620	1620	1620	1620	1620	1620	1620	1620	1620	1620	1620	1620	1501	—	—
	HEATING	Low	1500	1100	1240	1240	1240	1240	1240	1240	1240	1240	1240	1240	1240	1240	1240	1150	—	—
		Med Low	1600	1240	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1298	—	—
		Med Hi	1600	1240	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1483	—	—
		Hi	1600	1240	1690	1690	1690	1690	1690	1690	1690	1690	1690	1690	1690	1690	1690	1567	—	—

LEGEND

— — Operation Not Recommended

NOTE: Units have an electronically commutated motor (ECM) fan motor as a standard feature. The small additional pressure drop of the reheat coil causes the ECM motor to slightly increase rpm to overcome the added pressure drop and maintain selected cfm up to maximum ESP (external static pressure).

Performance data (cont)

OCTAVE BAND SOUND POWER LEVEL (dB re 1PW)
STANDARD UNIT — TESTED IN ACCORDANCE WITH ARI 260

50PTH, PTV,PTD UNITS	MODE	DUCTED DISCHARGE OCTAVE BAND FREQUENCY, Hz							FREE AIR INLET COMBINED WITH CASING (CABINET) RADIATED OCTAVE BAND FREQUENCY, Hz						
		125	250	500	1000	2000	4000	8000	125	250	500	1000	2000	4000	8000
026	Fan Only	49	49	48	44	37	36	35	56	52	53	45	42	37	32
	Cooling: Part Load	49	51	51	48	44	43	36	61	55	56	50	48	43	36
	Cooling: Full Load	45	46	53	46	43	42	34	54	48	55	49	44	39	34
	Heating: Part Load	55	53	54	50	46	45	35	67	58	60	52	47	45	38
	Heating: Full Load	49	49	55	48	46	56	39	62	51	58	53	47	43	40
038	Fan Only	54	51	50	46	39	35	33	58	53	48	42	40	34	30
	Cooling: Part Load	57	53	53	51	46	43	36	61	55	52	48	44	40	35
	Cooling: Full Load	60	56	57	55	51	50	41	63	57	55	50	45	43	37
	Heating: Part Load	60	55	55	52	48	44	36	65	58	57	50	44	42	39
	Heating: Full Load	64	58	59	57	53	61	43	68	59	57	53	48	46	42
049	Fan Only	62	55	54	50	43	41	40	62	58	53	46	43	39	35
	Cooling: Part Load	60	57	57	54	50	49	43	72	63	61	53	50	46	43
	Cooling: Full Load	60	58	59	57	53	53	45	63	57	57	52	47	45	41
	Heating: Part Load	64	59	57	55	51	50	38	71	64	63	53	48	47	45
	Heating: Full Load	64	60	61	59	55	65	49	68	60	60	54	49	47	45
064	Fan Only	56	53	52	50	44	41	33	62	56	51	46	42	39	31
	Cooling: Part Load	62	59	59	56	52	51	44	66	60	64	53	50	48	41
	Cooling: Full Load	65	60	60	58	54	53	46	68	64	65	55	52	50	44
	Heating: Part Load	66	64	62	60	57	55	49	68	64	62	56	54	52	46
	Heating: Full Load	70	68	66	65	62	60	54	72	68	66	61	59	58	52

NOTES:
1. All sound power level performance is expressed in dB with reference to 1 picoWatt.
2. Data based on sound measurements made in a reverberant room on representative units from each cabinet size in accordance with ARI 260.
3. All data is third party tested and verified.

MUTE CONSTRUCTION — TESTED IN ACCORDANCE WITH ARI 260

50PTH, PTV,PTD UNITS	MODE	DUCTED DISCHARGE OCTAVE BAND FREQUENCY, Hz							FREE AIR INLET COMBINED WITH CASING (CABINET) RADIATED OCTAVE BAND FREQUENCY, Hz						
		125	250	500	1000	2000	4000	8000	125	250	500	1000	2000	4000	8000
026	Fan Only	—	—	—	—	—	—	—	55	52	51	43	39	35	32
	Cooling: Part Load	—	—	—	—	—	—	—	60	52	55	47	45	39	31
	Cooling: Full Load	—	—	—	—	—	—	—	52	45	54	46	40	36	30
	Heating: Part Load	—	—	—	—	—	—	—	65	55	59	50	44	41	33
	Heating: Full Load	—	—	—	—	—	—	—	60	49	57	50	44	40	38
038	Fan Only	—	—	—	—	—	—	—	57	53	46	40	37	32	30
	Cooling: Part Load	—	—	—	—	—	—	—	60	52	51	45	41	36	30
	Cooling: Full Load	—	—	—	—	—	—	—	61	54	53	47	42	39	33
	Heating: Part Load	—	—	—	—	—	—	—	63	55	56	47	41	38	34
	Heating: Full Load	—	—	—	—	—	—	—	66	57	56	50	45	42	40
049	Fan Only	—	—	—	—	—	—	—	61	58	51	44	40	37	35
	Cooling: Part Load	—	—	—	—	—	—	—	70	60	59	50	47	42	38
	Cooling: Full Load	—	—	—	—	—	—	—	61	54	56	49	43	42	36
	Heating: Part Load	—	—	—	—	—	—	—	69	61	61	51	45	43	40
	Heating: Full Load	—	—	—	—	—	—	—	66	58	59	51	46	44	44
064	Fan Only	—	—	—	—	—	—	—	61	56	49	44	39	36	31
	Cooling: Part Load	—	—	—	—	—	—	—	64	57	62	50	47	44	36
	Cooling: Full Load	—	—	—	—	—	—	—	66	61	64	52	48	47	40
	Heating: Part Load	—	—	—	—	—	—	—	67	61	61	54	51	48	41
	Heating: Full Load	—	—	—	—	—	—	—	70	66	64	58	55	54	51

LEGEND
— — Data not available.

NOTES:
1. All sound power level performance is expressed in dB with reference to 1 picoWatt.
2. Data based on sound measurements made in a reverberant room on representative units from each cabinet size in accordance with ARI 260.
3. All data is third party tested and verified.

Electrical data

50PTH,PTV,PTD ELECTRICAL DATA

50PTH, PTV, PTD UNITS	V-PH-Hz*	VOLTAGE MIN/MAX	COMPRESSOR		FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMPS	MAX FUSE/ HACR	UNITS WITH HWR			
			RLA	LRA					REHEAT PUMP FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE/ HACR
026	208/230-1-60	197/254	10.3	52.0	4.3	14.6	17.2	25	0.8	15.4	18.0	25
038	208/230-1-60	197/254	16.7	82.0	4.3	21.0	25.2	40	0.8	21.8	26.0	40
	208/230-3-60	197/254	11.2	58.0	4.3	15.5	18.3	25	0.8	16.3	19.1	30
	460-3-60	414/506	4.5	29.0	4.1	8.6	9.7	15	0.7	9.3	10.4	15
049	208/230-1-60	197/254	21.2	96.0	7.0	28.2	33.5	50	1.07	29.3	34.6	50
	208/230-3-60	197/254	13.5	88.0	7.0	20.5	23.9	35	1.07	21.6	24.9	35
	460-3-60	414/506	6.4	41.0	6.9	13.3	14.9	20	1.07	14.4	16.0	20
064	208/230-1-60	197/254	25.6	118.0	7.0	32.6	39.0	60	1.07	33.7	40.1	60
	208/230-3-60	197/254	17.6	123.0	7.0	24.6	29.0	45	1.07	25.7	30.1	45
	460-3-60	414/506	9.0	62.0	6.9	15.9	18.2	25	1.07	17.7	19.2	25
072	208/230-1-60	197/254	27.2	150.0	7.0	34.2	41.0	60	1.07	35.3	42.1	60

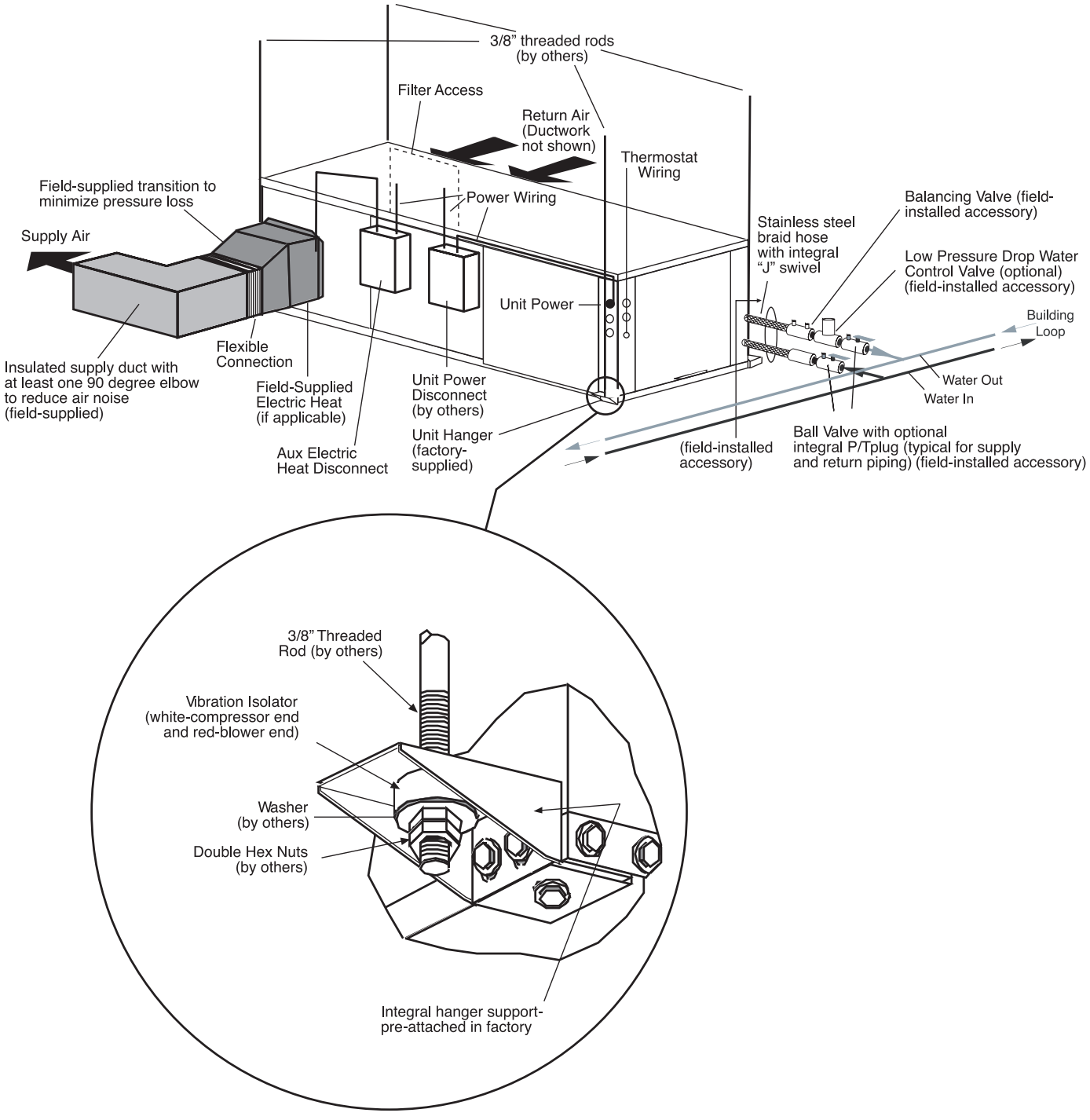
LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
HWR — Hot Water Reheat
LRA — Locked Rotor Amps
MIN — Minimum
RLA — Rated Load Amps

*The 460-v units using an ECM (electronically commutated motor) fan motor, modulating HWR, and/or an internal secondary pump will require a neutral wire from the supply side in order to feed the accessory with 265-v.

Typical piping and wiring

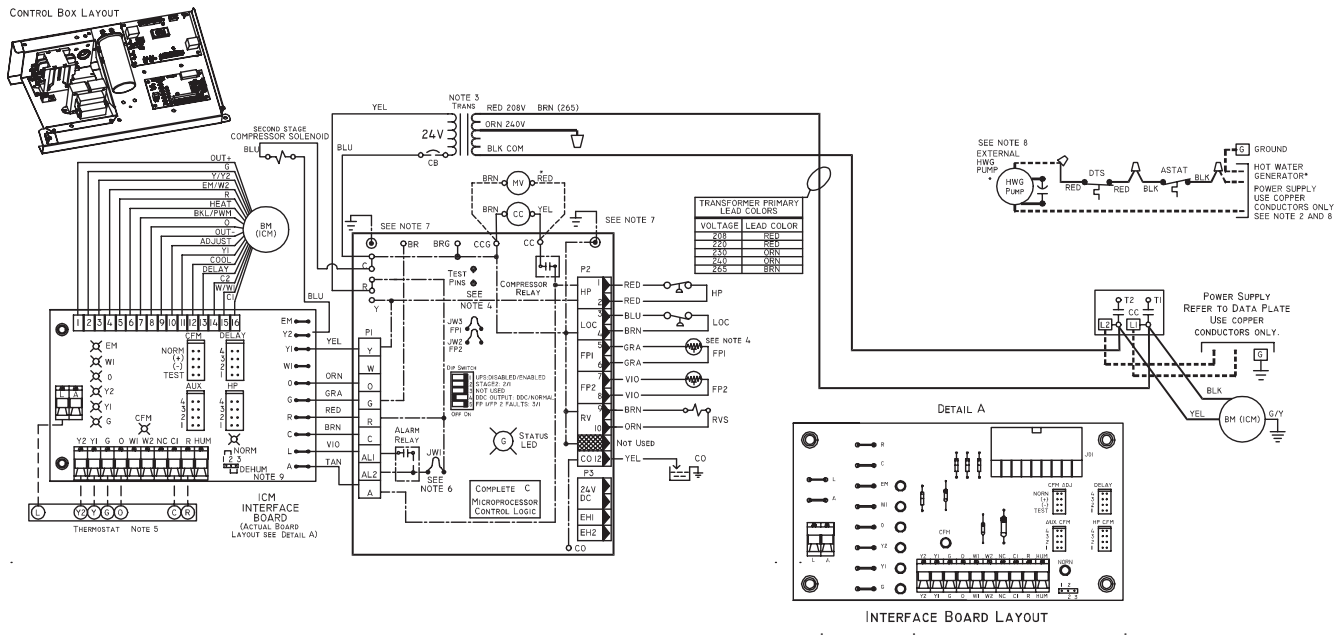
TYPICAL PIPING AND WIRING INSTALLATION



UNIT HANGER ISOLATION DETAIL

Typical control wiring schematics

UNITS WITH COMPLETE C CONTROLLER, SINGLE-PHASE



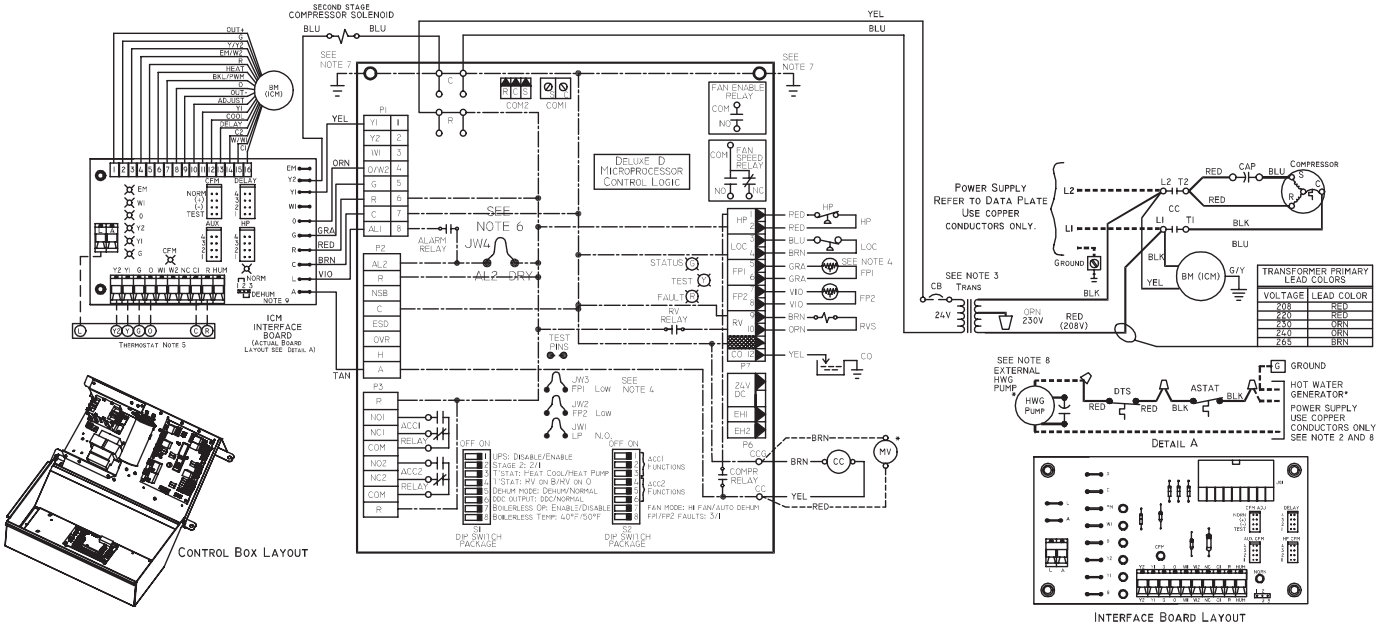
LEGEND

AL	— Alarm Relay Contacts	**LOC**	— Loss of Charge Pressure Switch
ASTAT	— Aquastat	**MV**	— Motorized Valve
BM	— Blower Motor	**NEC**	— National Electrical Code
BR	— Blower Relay	**P1**	— Field Wiring Terminal Block
CB	— Circuit Breaker	**RVS**	— Reversing Valve Solenoid
CC	— Compressor Contactor	**TRANS**	— Transformer
CO	— Sensor, Condensate Overflow		Field Line Voltage Wiring
DTS	— Discharge Temp Switch		Field Low Voltage Wiring
FP1	— Sensor, Water Coil Freeze Protection		Printed Circuit Trace
FP2	— Sensor, Air Coil Freeze Protection		Optional Wiring
HP	— High-Pressure Switch		Relay/Contactor Coil
HWG	— Hot Water Generator		Condensate Pan
ICM	— Integrally Controlled Motor		Solenoid Coil
JW1	— Jumper, Alarm		Temperature Switch
			Thermistor
			Ground
			Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer for 208/230 v will be connected for 208 v operation. For 230 v operation, disconnect RED lead at L1 and attach ORN lead to L1. Insulate open end of RED lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone™ thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Complete C board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Aquastat is field-supplied and must be wired in series with the hot leg to the pump. Aquastat is rated for voltage up to 277 v.
9. Place jumpers on 2 and 3, ICM board, when dehumidification mode is used.

Typical control wiring schematics (cont)

UNITS WITH DELUXE D CONTROLLER, SINGLE-PHASE



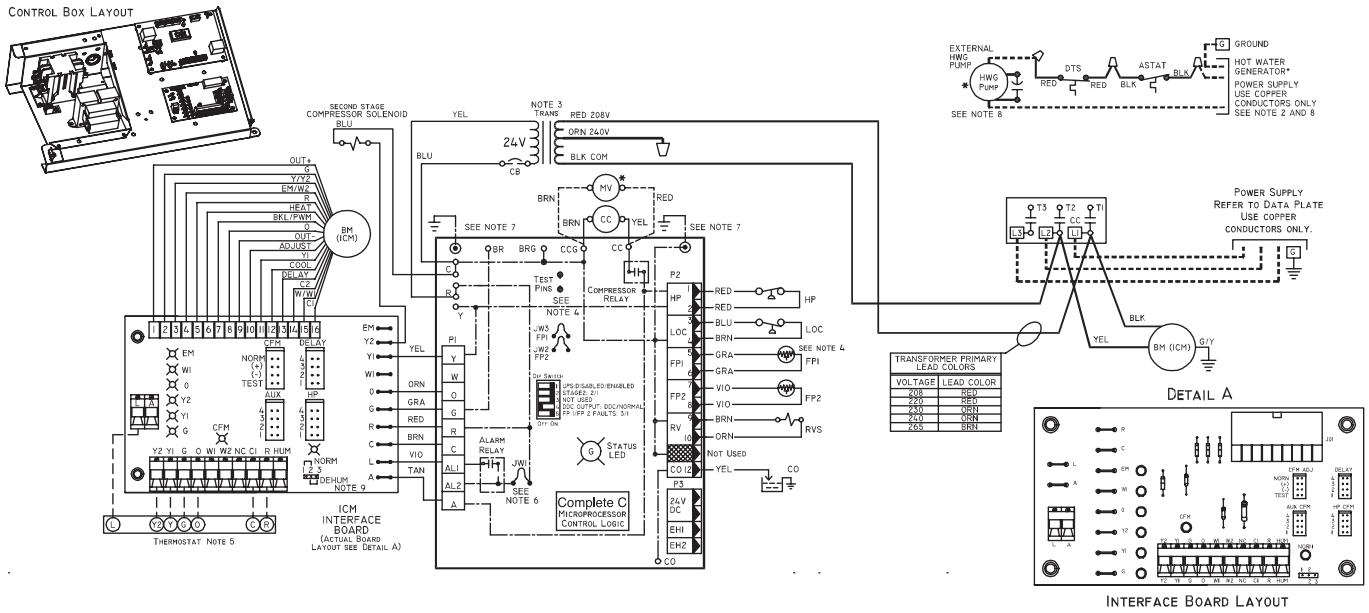
LEGEND

AL	— Alarm Relay Contacts	**JW1**	— Jumper, Alarm
ASTAT	— Aquastat	**NSB**	— Digital Night Setback
BM	— Blower Motor	**LOC**	— Loss of Charge Pressure Switch
CAP	— Capacitor	**MV**	— Motorized Valve
CB	— Circuit Breaker	**NEC**	— National Electrical Code
CC	— Compressor Contactor	**P1**	— Field Wiring Terminal Block
CO	— Sensor, Condensate Overflow	**RVS**	— Reversing Valve Solenoid
DTS	— Discharge Temp Switch	**TRANS**	— Transformer
FP1	— Sensor, Water Coil Freeze Protection	▬▬▬	Field Line Voltage Wiring
FP2	— Sensor, Air Coil Freeze Protection	- - - -	Field Low Voltage Wiring
HP	— High-Pressure Switch	—·—	Printed Circuit Trace
HWG	— Hot Water Generator		
ICM	— Integrally Controlled Motor		

Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Thermistor
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer for 208/230 v will be connected for 208 v operation. For 230 v operation, disconnect RED lead at L1 and attach ORN lead to L1. Insulate open end of RED lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone™ thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut AL2 dry jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Deluxe D board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Aquastat is field-supplied and must be wired in series with the hot leg to the pump. Aquastat is rated for voltage up to 277 v.
9. Place jumpers on 2 and 3, ICM board, when dehumidification mode is used.

UNITS WITH COMPLETE C CONTROLLER, THREE-PHASE (208/230 V)



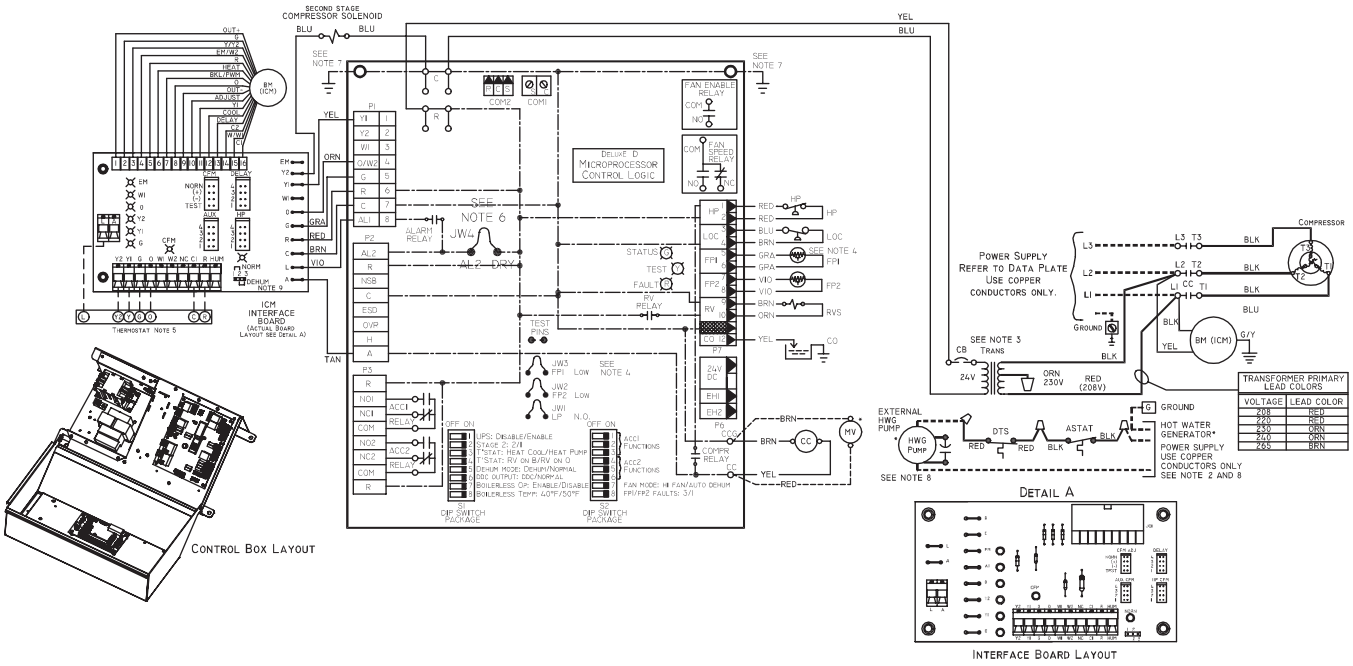
LEGEND

AL	— Alarm Relay Contacts	**LOC**	— Loss of Charge Pressure Switch
ASTAT	— Aquastat	**MV**	— Motorized Valve
BM	— Blower Motor	**NEC**	— National Electrical Code
BR	— Blower Relay	**P1**	— Field Wiring Terminal Block
CB	— Circuit Breaker	**RVS**	— Reversing Valve Solenoid
CC	— Compressor Contactor	**TRANS**	— Transformer
CO	— Sensor, Condensate Overflow	▬▬▬	Field Line Voltage Wiring
DTS	— Discharge Temp Switch	- - - -	Field Low Voltage Wiring
FP1	— Sensor, Water Coil Freeze Protection	—·—	Printed Circuit Trace
FP2	— Sensor, Air Coil Freeze Protection	—··—	Optional Wiring
HP	— High-Pressure Switch		Relay/Contactor Coil
HWG	— Hot Water Generator		Condensate Pan
ICM	— Integrally Controlled Motor		Solenoid Coil
JW1	— Jumper, Alarm		Temperature Switch
			Thermistor
			Ground
			Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer for 208/230 v will be connected for 208 v operation. For 230 v operation, disconnect RED lead at L1 and attach ORN lead to L1. Insulate open end of RED lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone™ thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Complete C board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Aquastat is field-supplied and must be wired in series with the hot leg to the pump. Aquastat is rated for voltage up to 277 v.
9. Place jumpers on 2 and 3, ICM board, when dehumidification mode is used.

Typical control wiring schematics (cont)

UNITS WITH DELUXE D CONTROLLER, THREE-PHASE (208/230 V)



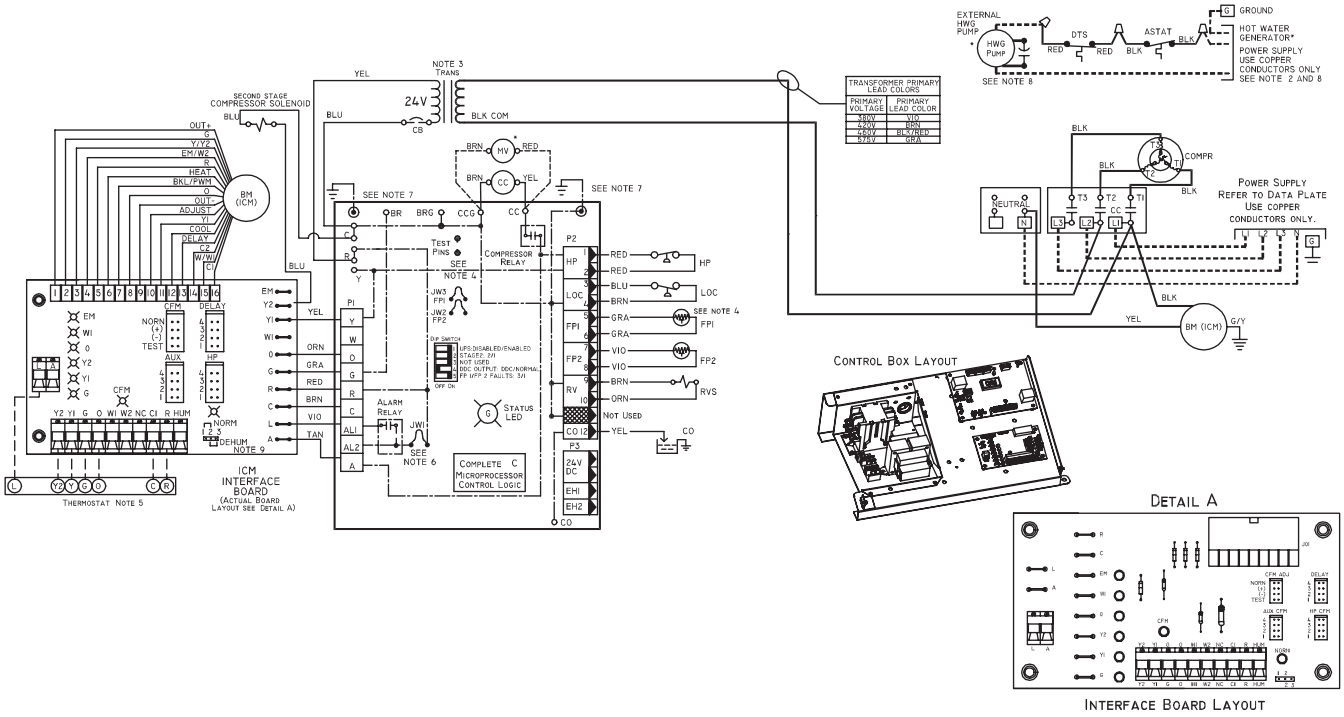
LEGEND

AL	— Alarm Relay Contacts	**JW1**	— Jumper, Alarm
ASTAT	— Aquastat	**NSB**	— Digital Night Setback
BM	— Blower Motor	**LOC**	— Loss of Charge Pressure Switch
CB	— Circuit Breaker	**MV**	— Motorized Valve
CC	— Compressor Contactor	**NEC**	— National Electrical Code
CO	— Sensor, Condensate Overflow	**P1**	— Field Wiring Terminal Block
DTS	— Discharge Temp Switch	**RVS**	— Reversing Valve Solenoid
FP1	— Sensor, Water Coil Freeze Protection	**TRANS**	— Transformer
FP2	— Sensor, Air Coil Freeze Protection		Field Line Voltage Wiring
HP	— High-Pressure Switch		Field Low Voltage Wiring
HWG	— Hot Water Generator		Printed Circuit Trace
ICM	— Integrally Controlled Motor		

Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Thermistor
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer for 208/230 v will be connected for 208 v operation. For 230 v operation, disconnect RED lead at L1 and attach ORN lead to L1. Insulate open end of RED lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone™ thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut AL2 dry jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Deluxe D board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Aquastat is field-supplied and must be wired in series with the hot leg to the pump. Aquastat is rated for voltage up to 277 v.
9. Place jumpers on 2 and 3, ICM board, when dehumidification mode is used.

UNITS WITH COMPLETE C CONTROLLER, THREE-PHASE (460 V)



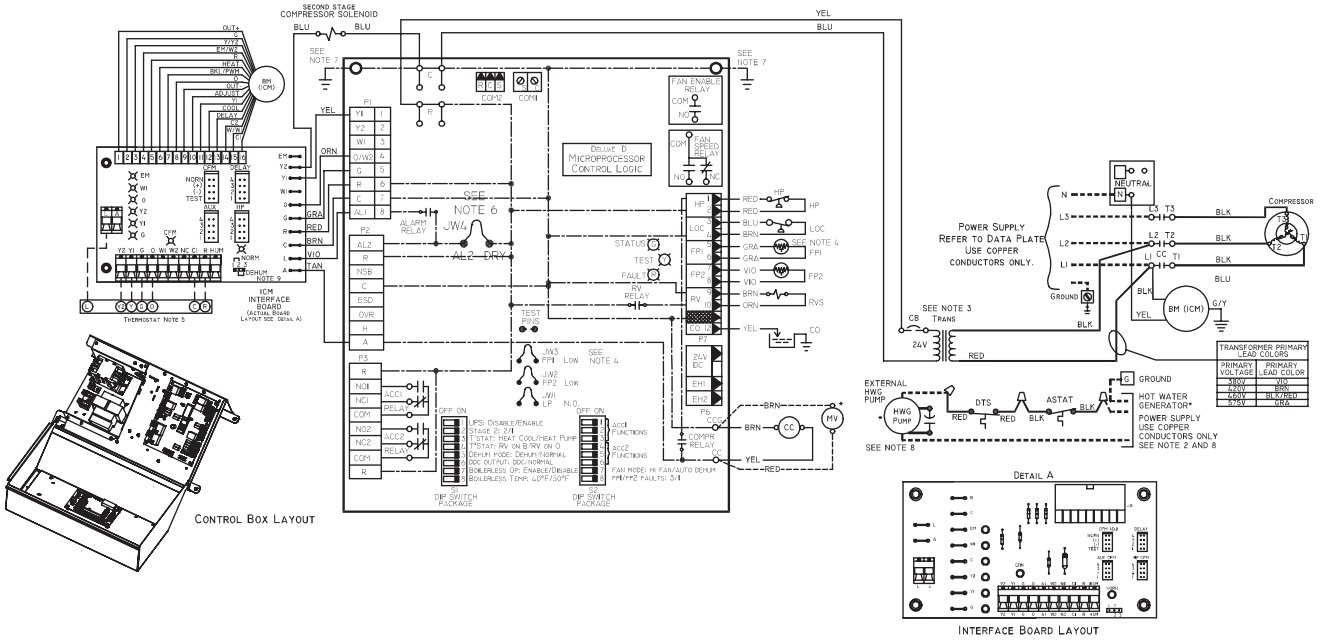
LEGEND

AL	— Alarm Relay Contacts	**JW1**	— Jumper, Alarm
ASTAT	— Aquastat	**LOC**	— Loss of Charge Pressure Switch
BM	— Blower Motor	**MV**	— Motorized Valve
BR	— Blower Relay	**NEC**	— National Electrical Code
CB	— Circuit Breaker	**P1**	— Field Wiring Terminal Block
CC	— Compressor Contactor	**RVS**	— Reversing Valve Solenoid
CO	— Sensor, Condensate Overflow	**TRANS**	— Transformer
COMPR	— Compressor		Field Line Voltage Wiring
DTS	— Discharge Temp Switch		Field Low Voltage Wiring
FP1	— Sensor, Water Coil Freeze Protection		Printed Circuit Trace
FP2	— Sensor, Air Coil Freeze Protection		Optional Wiring
HP	— High-Pressure Switch		Relay/Contactor Coil
HWG	— Hot Water Generator		Condensate Pan
ICM	— Integrally Controlled Motor		Solenoid Coil
			Temperature Switch
			Thermistor
			Ground
			Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone™ thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Complete C board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Aquastat is field-supplied and must be wired in series with the hot leg to the pump. Aquastat is rated for voltage up to 277-v.
9. Place jumpers on 2 and 3, ICM board, when dehumidification mode is used.
10. The 460-v units using an ECM (electronically commutated motor) fan motor, modulating HWR, and/or an internal secondary pump will require a neutral wire from the supply side in order to feed the accessory with 265-v.

Typical control wiring schematics (cont)

UNITS WITH DELUXE D CONTROLLER, THREE-PHASE (460 V)



LEGEND

AL — Alarm Relay Contacts
ASTAT — Aquastat
BM — Blower Motor
BR — Blower Relay
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
DTS — Discharge Temp Switch
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch
HWG — Hot Water Generator
ICM — Integrally Controlled Motor

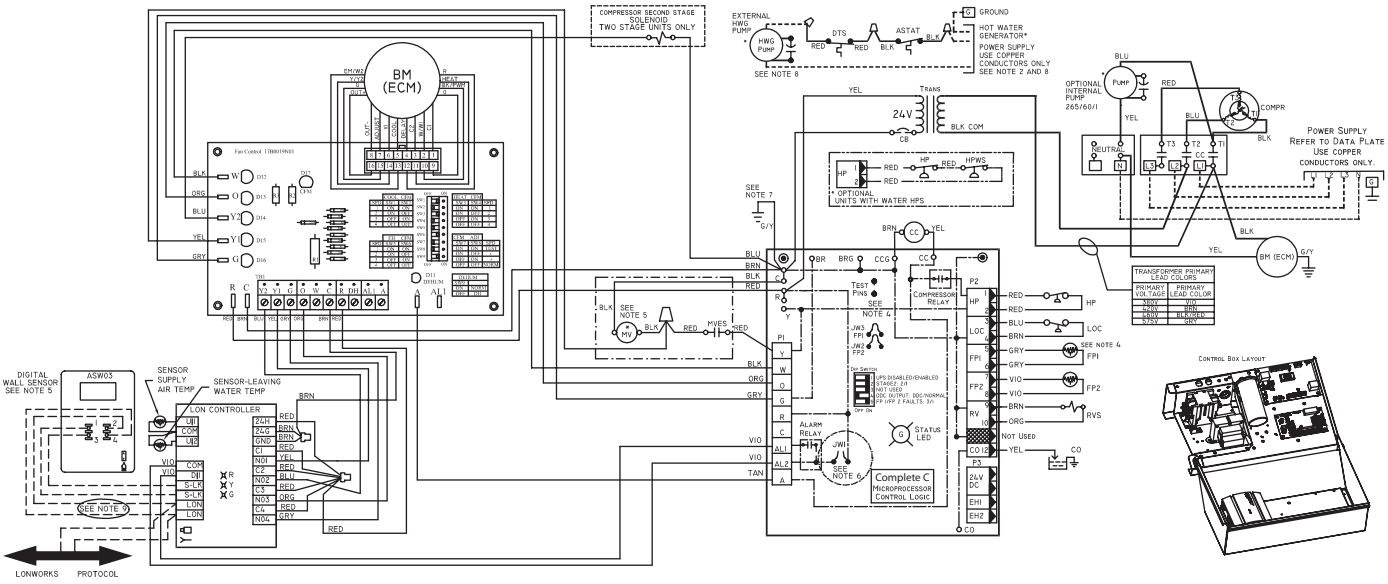
JW1 — Jumper, Alarm
NSB — Digital Night Setback
LOC — Loss of Charge Pressure Switch
MV — Motorized Valve
NEC — National Electrical Code
P1 — Field Wiring Terminal Block
RVS — Reversing Valve Solenoid
TRANS — Transformer

Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace

Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Thermistor
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 460 v (BLK/RED) lead for 460/3/60 units. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone™ thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut AL2 dry jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Deluxe D board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Fan motors are factory wired for medium speed. For high or low speed, remove BLU wire from fan motor speed tap “M” or “3” and connect to “H” or “2” for high speed or “L” or “4” for low speed.
9. Place jumpers on 2 and 3, ICM board, when dehumidification mode is used.
10. The 460-v units using an ECM (electronically commutated motor) fan motor, modulating HWR, and/or an internal secondary pump will require a neutral wire from the supply side in order to feed the accessory with 265-v.

UNITS WITH ECM, COMPLETE C AND LON CONTROLLER (460 V)



LEGEND

AL — Alarm Relay Contacts
ASTAT — Aquastat
BM — Blower Motor
BMC — Blower Motor Capacitor
BR — Blower Relay
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
DTS — Discharge Temperature Switch
ECM — Electronically Commutated Motor
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch
HPWS — High-Pressure Water Switch
HWG — Hot Water Generator
JW1 — Clippable Field Selection Jumper
LOC — Loss of Charge Pressure Switch
LON — Local Operating Network
MV — Motorized Valve
MVES — Motorized Valve End Switch
***Optional Wiring.

NEC — National Electrical Code
P1 — Field Wiring Terminal Block
RVS — Reversing Valve Solenoid
TRANS — Transformer

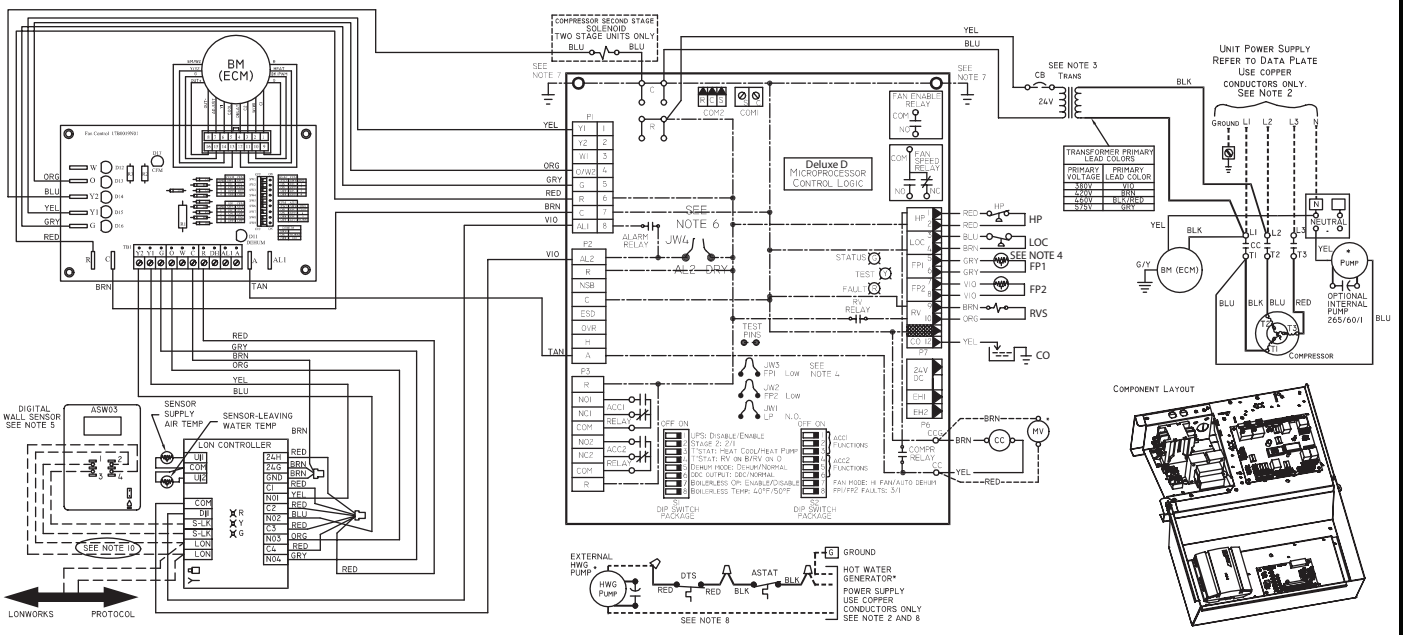
Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Temperature Switch
Thermistor
Ground

Wire Nut
Relay Contacts - N.C.
Relay Contacts - N.O.
Low Pressure Switch
High Pressure Switch
Splice Cap
Circuit Breaker

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 460 v (BLK/RED) lead for 460/3/60 units. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. Factory cut JW1 jumper. Dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Complete C board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Aquastat is supplied with unit and must be wired in series with the hot leg to the pump. Aquastat is rated for voltages up to 277-v.
9. Optional LON wires. Only connect if LON connection is desired at the wall sensor.
10. Fan motors are factory wired for medium speed. For high or low speed, remove BLU wire from fan motor speed tap “M” and connect to “H” for high speed or “L” for low speed.
11. For low speed, remove BLK wire from BR “6” and replace with RED. Connect BLK and BRN wires together.
12. For blower motors with leads. For medium or low speed, disconnect BLK wire from BR “6”. Connect BLK and ORG/PUR wire together. Connect RED for low or BLU for medium to BR “6”.
13. The 460-v units using an ECM (electronically commutated motor) fan motor, modulating HWR, and/or an internal secondary pump will require a neutral wire from the supply side in order to feed the accessory with 265-v.

Typical control wiring schematics (cont)

UNITS WITH ECM, DELUXE D AND LON CONTROLLER (460 V)



LEGEND

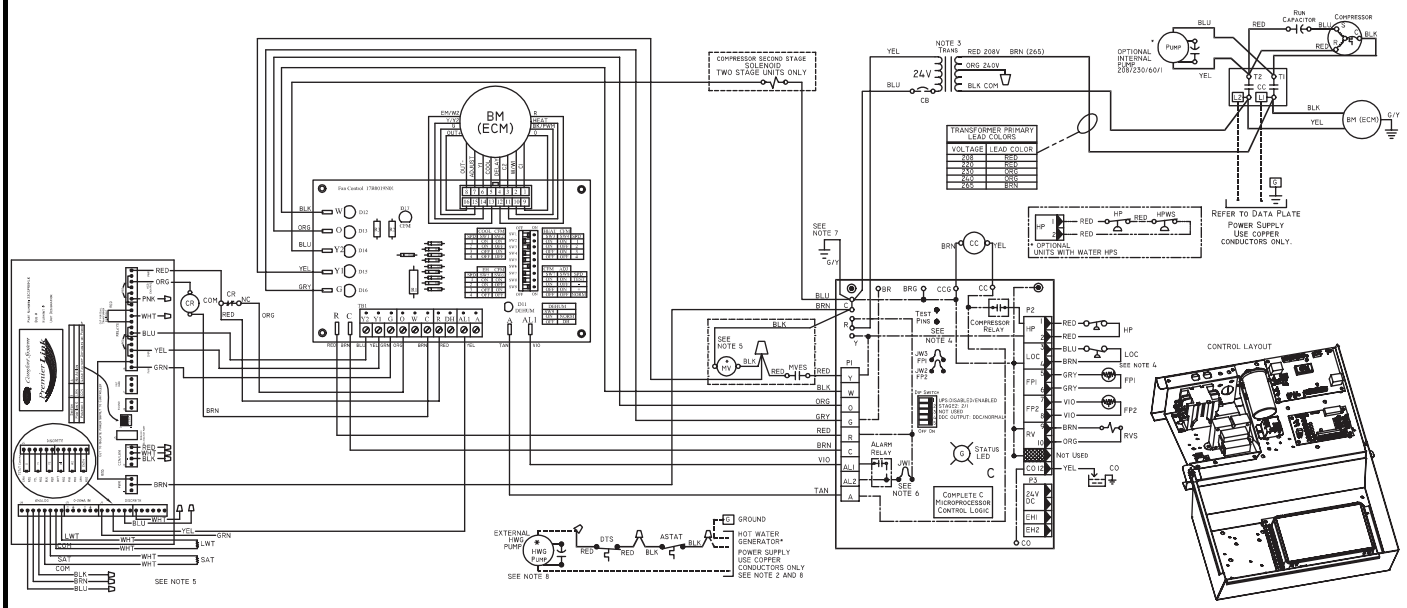
AL — Alarm Relay Contacts
ASTAT — Aquastat
BM — Blower Motor
BMC — Blower Motor Capacitor
BR — Blower Relay
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
DTS — Discharge Temperature Switch
ECM — Electronically Commutated Motor
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch
HPWS — High-Pressure Water Switch
HWG — Hot Water Generator
JW1 — Clippable Field Selection Jumper
LOC — Loss of Charge Pressure Switch
LON — Local Operating Network
MV — Motorized Valve
NEC — National Electrical Code
***Optional Wiring.

P1 — Field Wiring Terminal Block
RVS — Reversing Valve Solenoid
TRANS — Transformer
Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Temperature Switch
Thermistor
Ground

Wire Nut
Relay Contacts - N.C.
Relay Contacts - N.O.
Low Pressure Switch
High Pressure Switch
Splice Cap
Circuit Breaker

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 460 v (BLK/RED) lead for 460/3/60 units. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. Factory cut JW1 jumper. Dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Deluxe D board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Aquastat is supplied with unit and must be wired in series with the hot leg to the pump. Aquastat is rated for voltages up to 277-v.
9. Place jumpers on 2 and 3, ICM board, when dehumidification mode is used.
10. Optional LON wires. Only connect if LON connection is desired at the wall sensor.
11. Blower motor is factory wired for medium and high speeds. For any other combination of speeds, at the motor attach the BLK wire to the higher of the two desired speed taps and the BLU wire to the lower of the two desired speed taps.
12. Blower motor is factory wired for high and low speeds. No other combination is available.
13. The 460-v units using an ECM (electronically commutated motor) fan motor, modulating HWR, and/or an internal secondary pump will require a neutral wire from the supply side in order to feed the accessory with 265-v.

UNITS WITH COMPLETE C AND PREMIERLINK™ CONTROLLER, SINGLE-PHASE (208/230 V)



LEGEND

AL — Alarm Relay Contacts
ASTAT — Aquastat
BM — Blower Motor
BR — Blower Relay
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
CR — Cooling Relay
DTS — Discharge Temp Switch
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High Pressure Switch
HPWS — High Pressure Water Switch
JW — Jumper Wire
LOC — Loss of Charge Pressure Switch
LWT — Leaving Water Temperature
MV — Motorized Valve
MVES — Motorized Valve End Switch
P1 — Field Wiring Terminal Block
RVS — Reversing Valve Solenoid
TRANS — Transformer
*Optional Wiring.

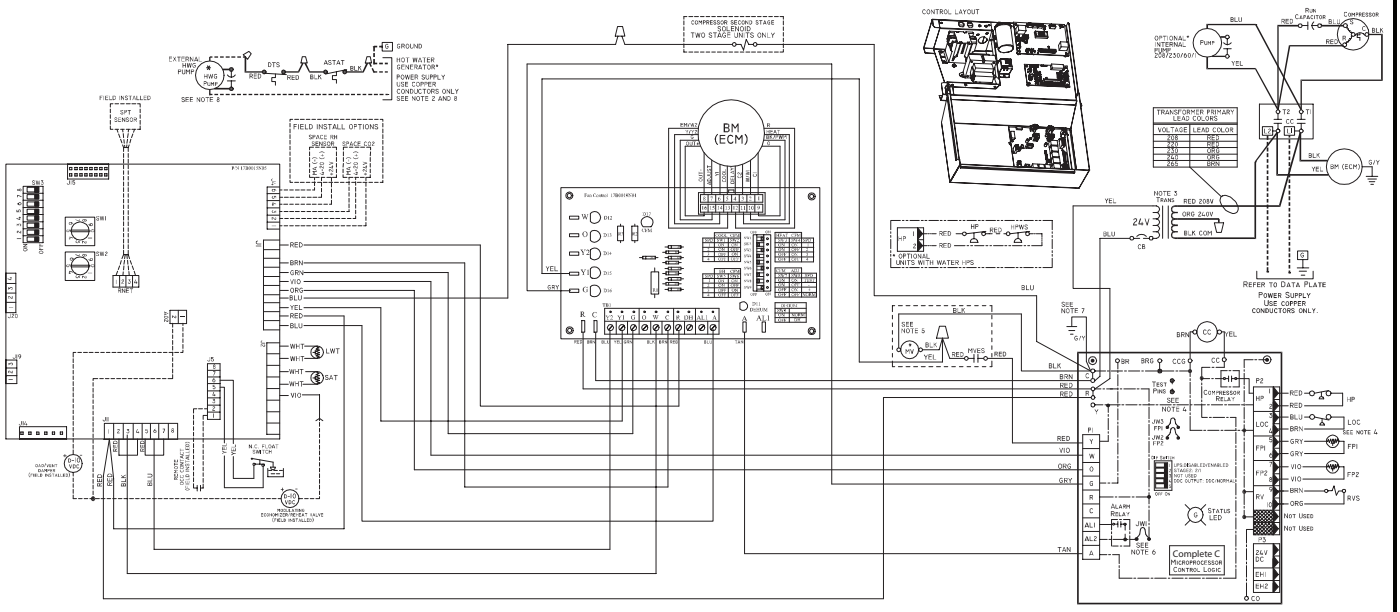
Factory Line Voltage Wiring
Factory Low Voltage Wiring
Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Temperature Switch
Thermistor
Ground

Wire Nut
Relay Contacts - N.C.
Relay Contacts - N.O.
Low Pressure Switch
High Pressure Switch
Splice Cap
Circuit Breaker
Capacitor
LED

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. 208-240 60 Hz units are wired for 208v operation. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides low temperature protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Refer to multiple protocol controller (MPC), LON, or TSTAT Installation, Application, and Operation Manual for control wiring to the wire from PremierLink controller to “Y” Complete C when motorized valve is not used. Thermostat wiring must be “Class 1” and voltage rating equal to or greater than unit supply voltage.
6. 24v alarm signal shown. For dry contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via green wire with yellow stripe from “C” terminal to control box.
8. Aquastat is supplied with unit and must be wired in series with the hot leg to the pump. Aquastat is rated for voltages up to 277v.

Typical control wiring schematics (cont)

UNITS WITH COMPLETE C AND WSHP OPEN CONTROLS, SINGLE PHASE (208/230 V)



LEGEND

AL	— Alarm Relay Contacts
ASTAT	— Aquastat
BM	— Blower Motor
BR	— Blower Relay
CB	— Circuit Breaker
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TRANS	— Transformer

*Optional Wiring.

- Factory Line Voltage Wiring
- Factory Low Voltage Wiring
- Field Line Voltage Wiring
- Field Low Voltage Wiring
- Printed Circuit Trace
- Optional Wiring
- Relay/Contactor Coil
- Condensate Pan
- Solenoid Coil
- Temperature Switch
- Thermistor
- Ground
- Wire Nut
- Relay Contacts - N.C.
- Relay Contacts - N.O.
- Low Pressure Switch
- High Pressure Switch
- Splice Cap
- Circuit Breaker
- Capacitor
- LED

NOTES:

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2. All wiring to the unit must comply with NEC and local codes.
3. 208-240 60 Hz units are wired for 208v operation. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides low temperature protection for water. When using antifreeze solutions, cut JW3 jumper.
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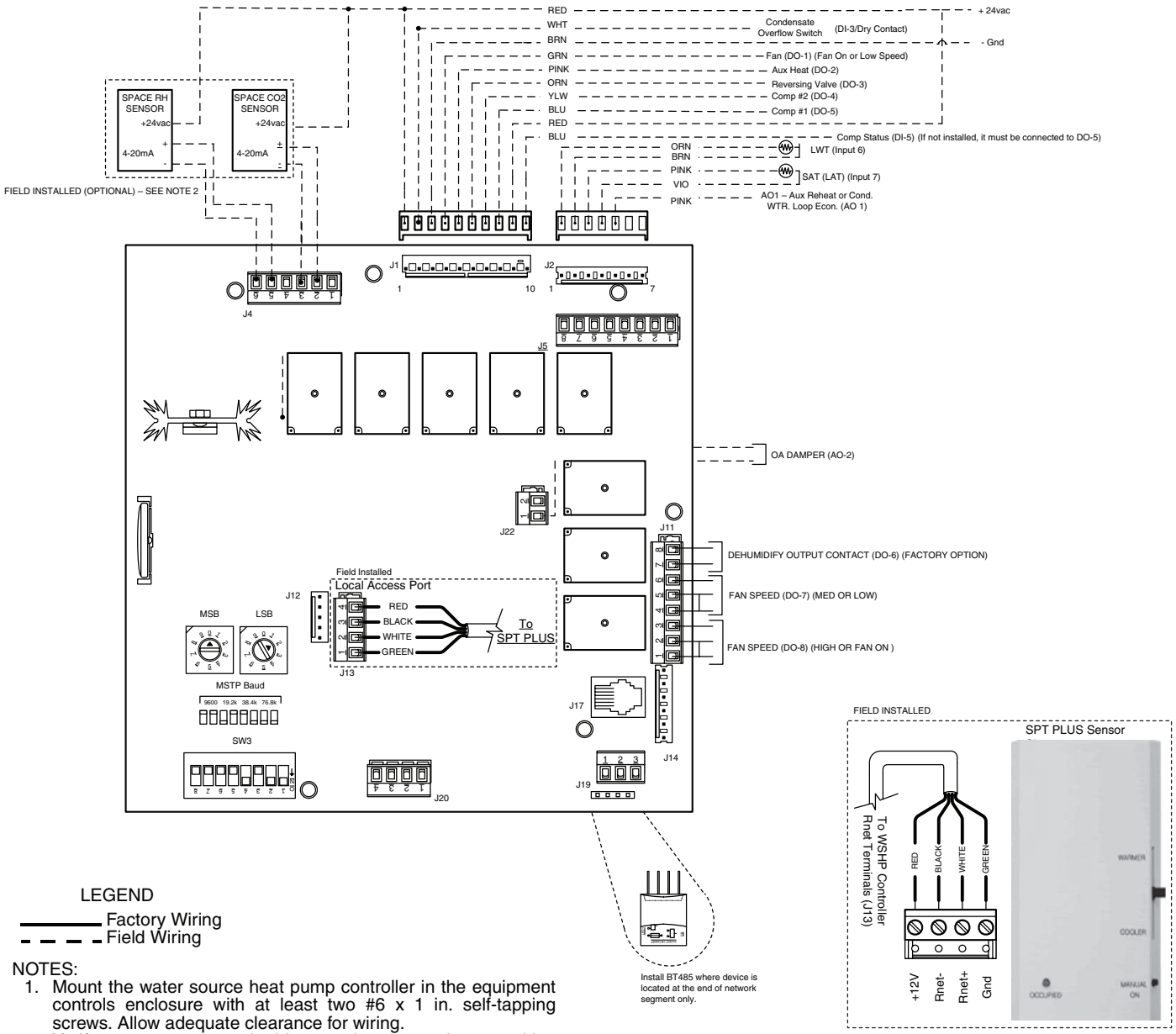
WSHP OPEN CONTROL



LEGEND

Factory Wiring
Field Wiring

NOTES:

1. Mount the water source heat pump controller in the equipment controls enclosure with at least two #6 x 1 in. self-tapping screws. Allow adequate clearance for wiring.
2. Verify sensor power and wiring requirements prior to making any terminations. Sensors requiring a separate isolated 24 vac power source will not utilize WSHP terminals J4-1, or 4.

Application data

Aquazone™ water source heat pump products are available in a flexible, efficient array of models, which can be used in all types of water loop, ground water, and ground loop type systems. Utilize Aquazone products to provide optimal energy efficient solutions and adapt to the most challenging design requirements.

AQUAZONE PRODUCT GUIDE

50 SERIES	TYPE SIZE (tons)	APPLICATION
50HQP,VQP	Large Capacity 6-10 (HQP) $6^1/_2$-25 (VQP)	Environmentally sound unit with Puron® refrigerant (R-410A) designed to handle large zoned areas for all geothermal and boiler/tower applications.
50PC	Compact $1^1/_4$-5	Compact WSHP with Puron refrigerant (R-410A) for boiler/tower, ground water, or ground loop systems.
50PS	Premium Efficiency $^1/_2$-6	Premium, ultra efficient unit with Puron refrigerant (R-410A) for new boiler/tower, ground water, or ground loop systems
50PEC	High Efficiency Console $^3/_4$-$1^1/_2$	Efficient console unit with Puron refrigerant (R-410A) and attractive design for finished interior, under-window installations.
50PT	Premium Efficiency 2-6	Premium, ultra efficient 2-stage unit with Puron refrigerant (R-410A) for new boiler/tower, ground water, or ground loop systems
50PSW	Water-to-Water 3-28	Efficient unit with Puron refrigerant (R-410A) serves as an alternative to preheat or cool air. Unit can be used as a stand-alone or supplemental boiler/chiller in most hydronic heating applications. Also conditions process fluids, lubricants, and refrigerants.
50RTG	Rooftop 3-20	Economical solution for indoor air quality (IAQ) problems and tempering ventilation air.
50VS	Premium Efficiency Vertical Stack Heat Pump $^3/_4$ to 3 Tons	Ultra efficient unit with environmentally sound Puron refrigerant (R-410A) for boiler/tower and geothermal applications (condominiums, hotels, etc.). Stacked design allows for common piping and simplistic design.

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 2.25 and 3 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 60 F and 90 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.

Refer to the **Carrier Water Source Heat Pump System Design Guide** for assistance with the design of water loop systems. The guide includes a practical approach for the latest and most current design recommendations including:

- product application, including horizontal, vertical, console, rooftop and water-to-water applications
- ventilation methods and system design, including energy recovery
- acoustical considerations for different product types
- addressing indoor air quality (IAQ) issues such as condensate removal and humidity control
- air distribution design including diffuser selection/layout and ductwork design
- hydronic system design including pipe sizing/layout and boiler/tower sizing
- control configurations such as standalone, DDC, DCV, and VVT® controls
- Water Source Heat Pump Efficiency/Operational Cost Comparison chart
- system variations such as a system without a boiler, variable pumping, and variable air volume (VAV) for interior use

Ground water systems

To utilize Aquazone units in ground water applications, extended range should be specified. This will provide factory-installed insulation on the coaxial coil to prevent condensate from dripping when entering water temperatures are below 60 F. In addition, the copper coaxial coil installed on the Aquazone units may not be suitable for all water conditions. Refer to the Water Conditioning section for proper coaxial coil material selection.

Surface water system — This system is typically located near a lake or pond. 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.

Open loop system — 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. This design limits the amount of piping and excavation required.

Aquazone units are provided with a standard TXV and are rated to extremely low temperatures to self-adjust the refrigeration circuit, therefore water regulating valves are not required on open loop systems. To conserve water on this type of system, a slow opening/closing solenoid valve is recommended.

Ground loop systems

There are many commonly specified designs for ground loop applications. Typical designs include vertical loops and horizontal loops. In some applications, water is piped from the ground or lake directly to the water source heat pump. Piping is limited to the amount of pipe required to get the water from the source to the unit.

NOTE: When utilizing Aquazone water source heat pumps in ground loop systems, refer to design considerations in the ground water system section.

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.

Hybrid systems — In some applications, it may be beneficial to incorporate a cooling tower 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.

Condensate drainage

Venting — Condensate lines should be properly vented 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. Chemical treatment should be provided to remove algae in the condensate pans and drains in geographical areas that are conducive to algae growth.

Trapping — Condensate trapping is an essential 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, the water seal should be sized for 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. The design of a common trap or vent for multiple units is not acceptable. The condensate piping system should not be designed with a pipe size smaller than the drain connection pipe size.

Vertical units — Vertical units utilize a condensate hose inside the cabinet that acts as a trapping loop, therefore an external trap is not necessary. Each unit must be installed with its own vent and means to flush or blow out the condensate drain lines. Do not install a common trap or vent on vertical units.

Water conditioning

In some applications, maintaining proper water quality may require the use of 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 of importance 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:

1. 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.
2. Corrosion is caused by absorption of gases from the air coupled with water on exposed metal. Corrosion is also common in salt-water areas.
3. 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 also 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*	CLOSED RECIRCULATING†	OPEN LOOP AND RECIRCULATING WELL**		
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††					
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			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.)		

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

*Heat exchanger materials considered are copper, cupronickel, 304 SS (stainless steel), 316 SS, titanium.

†Closed recirculating system is identified by a closed pressurized piping system.

**Recirculating open wells should observe the open recirculating design considerations.

††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 contains a pH of 7.0.

To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

COMPLETE C AND DELUXE D ELECTRONIC CONTROL FEATURES COMPARISON

BASIC FEATURES	COMPLETE C	COMPLETE C WITH LON	DELUXE D	DELUXE D WITH LON	COMPLETE C OR DELUXE D WITH WSHP OPEN CONTROLLER
High and Low Refrigerant Pressure Protection	S	S	S	S	S
Water Coil Freeze Protection	S	S	S	S	S
True 24 VA Thermostat Signals	S	S	S	S	S
Thermostat Inputs Compatible with Triacs	S	S	S	S	S
Condensate Overflow Sensor	S	S	S	S	S
Anti-Short-Cycle Time Delay	S	S	S	S	S
Random Start	S	S	S	S	S
Alarm (selectable dry contact or 24 VA)	S	S	S	S	S
Water Valve Relay	S	S	S	S	S
Water Valve Relay with Compressor Delay	N/A	N/A	S	S	S
Emergency Shutdown	N/A	DDC	S	DDC	DDC
Night Setback with Override	N/A	DDC	S	DDC	DDC
Outdoor Air Damper Control	N/A	N/A	S	S	S
ADVANCED FEATURES					
Intelligent Reset	S	S	S	S	S
High and Low Voltage Protection	S	S	S	S	S
Air Coil Freeze Protection	S	S	S	S	S
Freeze Set Point Field Select (water, antifreeze)	S	S	S	S	S
Electric Heat Control Outputs	S	S	S	S	S
Boilerless Electric Heat Control	N/A	N/A	S	S	S
Intelligent Reversing Valve Operation	N/A	DDC	S	S	S
High/Low Fan Speed Outputs	N/A	N/A	S	S	S
Intelligent Fan Speed Control	N/A	N/A	S	S	S
Thermostat Type Select (Y,O or Y,W)	N/A	N/A	S	N/A	N/A
Reversing Valve Signal Select (O or B)	N/A	N/A	S	N/A	N/A
Dehumidistat Input	N/A	N/A	S	S	S
Reheat Dehumidification Control	N/A	N/A	O	O	O
Multiple Units on One Thermostat/Wall Sensor	N/A	DDC	S	DDC	DDC
Condenser Waterside/Airside Linkage	N/A	N/A	N/A	N/A	S
Waterside Economizer	N/A	N/A	N/A	N/A	S
Proactive Diagnostics	N/A	N/A	N/A	N/A	S
CO_2 Sensor Capable	N/A	N/A	N/A	N/A	S
IAQ Capable	N/A	N/A	N/A	N/A	S
SERVICE AND RELIABILITY FEATURES					
Service Test Mode	S	S	S	S	S
LED Fault and Status Lights	S	S	S	S	S
Fault Memory After Reset	S	S	S	S	S
Unit Performance Sentinel	S	S	S	S	S
Harness-Type Factory Wiring Connections	S	S	S	S	S
Fully Noise-Tested Design	S	S	S	S	S
CE Approval	S	S	S	S	S
Removable Low Voltage Connector	N/A	N/A	S	S	S
DDC/ENERGY MANAGEMENT FEATURES					
LONMark® Compliant	N/A	S	N/A	S	S
BACnet™ Compliant	N/A	N/A	N/A	N/A	S
Johnson N2 Compliant	N/A	N/A	N/A	N/A	S
Modbus Compliant	N/A	N/A	N/A	N/A	S
Leaving Air and Water Temperature Sensor	N/A	S	N/A	S	S
Digital Wall Sensor	N/A	O	N/A	O	O

LEGEND

Complete C — Complete C Control System
DDC — Direct Digital Controls
Deluxe D — Deluxe D Control System
IAQ — Indoor Air Quality
LON — LONMark® Controller
N/A — Not Available
O — Optional
S — Standard

Application data (cont)

Acoustical design

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. Noise Criteria (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

WSHP sound control

The analysis of the projected sound level in the conditioned space caused by a WSHP unit located in a ceiling plenum is quite involved. The key is to have good sound power ratings (Lw) in dB on the equipment to determine the sound attenuation effect of the ductwork, ceiling and room. In combination with utilizing standard Aquazone™ equipment attenuating features or the advanced mute package features, suggestions for horizontal and vertical unit sound design are provided to design around the WSHP units.

Horizontal units

Use the following guidelines for layout of Aquazone horizontal units to minimize noise:

1. Obtain sound power ratings in accordance with latest standards from manufacturers to select quietest equipment.
2. Do not locate units over a space with a required NC of 40 or less. Instead, locate units above less sensitive noise areas such as above or in equipment rooms, utility closets, restrooms, storage rooms, or above corridors.
3. Provide at least 10 feet between WSHP units to avoid the additive effect of two noise sources.
4. Provide an acoustical pad underneath the WSHP unit in applications where the unit must be mounted above noise sensitive areas such as private offices or conference rooms. The pad attenuates radiated noise. Be sure the pad has an area at least twice that of the WSHP footprint.
5. Maximize the installed height above the suspended ceiling.
6. Be 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.
7. Suspend the WSHP unit from the ceiling with hangers that utilize spring or neoprene type isolators to reduce vibration transmission.
8. Utilize flexible electrical connections to the WSHP unit. DO NOT USE NOT RIGID CONNECTIONS.
9. Utilize flexible loop water and condensate piping connections to the WSHP unit.
10. Use a canvas duct connector to connect the WSHP discharge to the downstream duct system. This reduces vibration-induced noise.
11. 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.
12. Provide turning vanes in ductwork elbows and tees to reduce air turbulence.
13. Size the sheet metal supply duct with velocities no greater than 1000 fpm.
14. Ensure ductwork is rigid.
15. Use round duct whenever possible to further reduce noise.
16. Allow at least 3 equivalent duct diameters of straight duct upstream and downstream of the unit before allowing any fittings, transitions, etc.
17. Seal all penetrations around duct entering the space.
18. Provide a 4-ft run-out 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.
19. Locate the run-out duct balancing damper as far away from the outlet diffuser as possible. Locating the balancing damper at the trunk duct exit is the best location.
20. 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.
21. Do not hang suspended ceiling from the ductwork.

Vertical units

All guidelines established for horizontal units also apply for vertical units. In addition, since vertical units tend to be installed in small equipment rooms or closets, the following additional guidelines apply:

1. 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.
2. Since the unit returns airflow through a grille mounted in a closet door, provide a sound barrier or some other modification of the closet to prevent line-of-sight noise into the space.
3. 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 and 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.

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

Applications where systems are 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.

Dehumidification

For dehumidification, Carrier has provided a modulating hot water reheat (HWR) function that meets and exceeds those specifications that call for hot gas reheat (HGR). Modulating HWR is a relatively new design that controls dehumidification by providing modulating HWR based on the desired leaving air temperature set point. Unlike the complicated refrigerant circuitry used in HGR, Carrier's HWR utilizes the condenser water and a water-to-air reheat coil, placed after the evaporator coil, to reheat the return air after it is conditioned by the air-to-refrigerant evaporator coil, providing 100% reheat regardless of season and water temperature.

Heat pumps with HWR having a sensible-to-total (S/T) ratio of .72 to .76 dedicate 25% of their total cooling capacity to moisture removal. When selecting a unit for both sensible and latent cooling, it is necessary to pay close attention to the latent cooling of the unit to ensure that the latent cooling load is satisfied by the unit selection. If the latent cooling load is not satisfied, than a larger unit with enough latent cooling is required for that specific application.

Unlike most hot gas reheat options, the HWR option will operate over a wide range of entering-water temperatures (EWTs). Special flow regulation (water regulating valve) is not required for low EWT conditions. However, below 55 F, supply-air temperatures cannot be maintained at 72 F because the cooling capacity exceeds the reheat coil capacity at low water temperatures. Below 55 F, essentially all water is diverted to the reheat coil (no heat of rejection to the building loop). Although the HWR option will work fine with low EWTs, overcooling of the space may result with well water systems or, on rare occasions, with ground loop (geothermal) systems. (NOTE: Extended range units are required for well water and ground loop systems.) Since dehumidification is generally only required in cooling, most ground loop systems will not experience overcooling of the supply-air temperature. If overcooling of the space is a concern (e.g., computer room well water application), auxiliary heating may be required to maintain space temperature when the unit is operating in the dehumidification mode. Water source heat pumps with HWR should not be used as makeup air units. These applications should use equipment specifically designed for makeup air.

WSHP Open sequence of operation

The WSHP Open multi-protocol controller will control mechanical cooling, heating and waterside economizer outputs based on its own space temperature input and set points. An optional CO_2 IAQ (indoor air quality) sensor mounted in the space can maximize the occupant comfort. The WSHP Open controller has its own hardware clock that is automatically set when the heat pump software is downloaded to the board. Occupancy types are described in the scheduling section below. The following sections describe the functionality of the WSHP Open multi-protocol controller. All point objects referred to in this sequence of operation will be referenced to the objects as viewed in the BACview6 handheld user interface.

Scheduling — Scheduling is used to start/stop the unit based on a time period to control the space temperature to specified occupied heating and cooling set points. The controller is defaulted to control by occupied set points all the time, until either a time schedule is configured with BACview6, Field Assistant, i-Vu® Open, or a third party control system to enable/disable the BAS (Building Automation System) on/off point. The local time and date must be set for these functions to operate properly. The occupancy source can be changed to one of the following:

Occupancy schedules — The controller will be occupied 24/7 until a time schedule has been configured using either Field Assistant, i-Vu Open, BACview6 or a third party control system to enable/disable the BAS on/off point. The BAS point can be disabled by going to Config, then Unit, then Occupancy Schedules and changing the point from enable to disable then clicking OK.

NOTE: This point must be enabled in order for the i-Vu Open, Field Assistant, or BACview6 control system to assign a time schedule to the controller.

Schedule_schedule — The unit will operate according to the schedule configured and stored in the unit. The schedule is accessible via the BACview6 Handheld tool, i-Vu Open, or Field Assistant control system. The daily schedule consists of a start/stop time (standard or 24-hour mode) and seven days of the week, starting with Monday and ending on Sunday. To enter a daily schedule, navigate to Config, then Sched, then enter BACview6 Admin Password (1111), then go to schedule_schedule. From here, enter either a Weekly or Exception schedule for the unit.

Occupancy input contact — The WSHP Open controller has the capability to use an external dry contact closure to determine the occupancy status of the unit. The Occupancy Schedules will need to be disabled in order to utilize the occupancy contact input.

NOTE: Scheduling can only be controlled from one source.

BAS (Building Automation System) on/off — A BAS system that supports network scheduling can control the unit through a network communication and the BAS scheduling function once the Occupancy Schedules have been disabled.

NOTE: Scheduling can either be controlled via the unit or the BAS, but not both.

Indoor fan — The indoor fan will operate in any one of three modes depending on the user configuration selected.

Fan mode can be selected as Auto, Continuous, or Always On. In Auto mode, the fan is in intermittent operation during both occupied and unoccupied periods. Continuous fan mode is intermittent during unoccupied periods and continuous during occupied periods. Always On mode operates the fan continuously during both occupied and unoccupied periods. In the default mode, Continuous, the fan will be turned on whenever any one of the following is true:

- The unit is in occupied mode as determined by its occupancy status.
- There is a demand for cooling or heating in the unoccupied mode.
- There is a call for dehumidification (optional).

When power is reapplied after a power outage, there will be a configured time delay of 5 to 600 seconds before starting the fan. There are also configured fan delays for Fan On and Fan Off. The Fan On delay defines the delay time (0 to 30 seconds; default 10) before the fan begins to operate after heating or cooling is started while the Fan Off delay defines the delay time (0 to 180 seconds; default 45) the fan will continue to operate after heating or cooling is stopped. The fan will continue to run as long as the compressors, heating stages, or the dehumidification relays are on. If the SPT failure alarm or condensate overflow alarm is active; the fan will be shut down immediately regardless of occupancy state or demand.

Automatic fan speed control — The WSHP Open controller is capable of controlling up to three fan speeds using the ECM (electronically commutated motor). The motor will operate at the lowest speed possible to provide quiet and efficient fan operation with the best latent capability. The motor will increase speed if additional cooling or heating is required to obtain the desired space temperature set point. The control increases the motor's speed as the space temperature rises above the cooling or below the heating set point. The amount of space temperature increase above or below the set point required to increase the fan speed is user configurable in the set point. Also, the control will increase the fan speed as the supply-air temperature approaches the configured minimum or maximum limits.

Fan speed control (during heating) — Whenever heat is required and active, the control continuously monitors the supply-air temperature to verify it does not rise above the configured maximum heating SAT limit (110 F default). As the SAT approaches this value, the control will increase the fan speed as required to ensure the SAT will remain within the limit. This feature provides the most quiet and efficient operation by operating the fan at the lowest speed possible.

Fan speed control (during cooling) — Whenever mechanical cooling is required and active, the control continuously monitors the supply-air temperature to verify it does not fall below the configured minimum cooling SAT limit (50 F default). As the SAT approaches this value, the control will increase the fan speed as required to ensure the SAT will remain within the limit. The fan will operate at lowest speed to maximize latent capacity during cooling.

Cooling — The WSHP Open controller will operate one or two stages of compression to maintain the desired cooling set point. The compressor outputs are controlled by the PI (proportional-integral) cooling loop and cooling stages capacity algorithm. They will be used to calculate the desired number of stages needed to satisfy the space by comparing the space temperature (SPT) to the appropriate cooling set point. The water side economizer, if applicable, will be used for first stage cooling in addition to the compressor(s). The following conditions must be true in order for the cooling algorithm to run:

- Cooling is set to Enable.
- Heating mode is not active and the compressor time guard has expired.
- Condensate overflow input is normal.
- If occupied, the SPT is greater than the occupied cooling set point.
- Space temperature reading is valid.
- If unoccupied, the SPT is greater than the unoccupied cooling set point.
- If economizer cooling is available and active and the economizer alone is insufficient to provide enough cooling.
- OAT (if available) is greater than the cooling lockout temperature.

If all the above conditions are met, the compressors will be energized as required, otherwise they will be deenergized. If cooling is active and should the SAT approach the minimum SAT limit, the fan will be indexed to the next higher speed. Should this be insufficient and if the SAT falls further (equal to the minimum SAT limit), the fan will be indexed to the maximum speed. If the SAT continues to fall 5° F below the minimum SAT limit, all cooling stages will be disabled.

During Cooling mode, the reversing valve output will be held in the cooling position (either B or O type as configured) even after the compressor is stopped. The valve will not switch position until the Heating mode is required.

The configuration screens contain the minimum SAT parameter as well as cooling lockout based on outdoor-air temperature (OAT). Both can be adjusted to meet various specifications.

There is a 5-minute off time for the compressor as well as a 5-minute time delay when staging up to allow the SAT to achieve a stable temperature before energizing a second stage of capacity. Likewise, a 45-second delay is used when staging down.

After a compressor is staged off, it may be restarted again after a normal time-guard period of 5 minutes and if the supply-air temperature has increase above the minimum supply-air temperature limit.

The WSHP Open controller provides a status input to monitor the compressor operation. The status is monitored to determine if the compressor status matches the commanded state. This input is used to determine if a refrigerant safety switch or other safety device has tripped and caused the compressor to stop operating normally. If this should occur, an alarm will be generated to indicate the faulted compressor condition.

Heating — The WSHP Open controller will operate one or two stages of compression to maintain the desired heating set point. The compressor outputs are controlled by the heating PI (proportional-integral) loop and heating stages capacity algorithm. They will be used to calculate the desired number of stages needed to satisfy the space by comparing the space temperature (SPT) to the appropriate heating set point. The following conditions must be true in order for the heating algorithm to run:

- Heating is set to Enable.
- Cooling mode is not active and the compressor time guard has expired.
- Condensate overflow input is normal.
- If occupied, the SPT is less than the occupied heating set point.
- Space temperature reading is valid.
- If unoccupied, the SPT is less than the unoccupied heating set point.
- OAT (if available) is less than the heating lockout temperature.

If all the above conditions are met, the heating outputs will be energized as required, otherwise they will be deenergized. If the heating is active and should the SAT approach the maximum SAT limit, the fan will be indexed to the next higher speed. Should this be insufficient, and the SAT rises further reaching the maximum heating SAT limit, the fan will be indexed to the maximum speed. If the SAT still continues to rise 5° F above the maximum limit, all heating stages will be disabled.

During Heating mode, the reversing valve output will be held in the heating position (either B or O type as configured) even after the compressor is stopped. The valve will not switch position until the Cooling mode is required.

The configuration screens contain the maximum SAT parameter as well as heating lockout based on outdoor-air temperature (OAT); both can be adjusted to meet various specifications.

There is a 5-minute off time for the compressor as well as a 5-minute time delay when staging up to allow the SAT to achieve a stable temperature before energizing a second stage of capacity. Likewise, a 45-second delay is used when staging down.

After a compressor is staged off, it may be restarted again after a normal time-guard period of 5 minutes and if the supply-air temperature has fallen below the maximum supply air temperature limit.

The WSHP Open controller provides a status input to monitor the compressor operation. The status is monitored to determine if the compressor status matches the commanded state. This input is used to determine if a refrigerant safety switch or other safety device has tripped and caused the compressor to stop operating normally. If this should occur, an alarm will be generated to indicate the faulted compressor condition. Also, if auxiliary heat is available (see below), the auxiliary heat will operate to replace the reverse cycle heating and maintain the space temperature as required.

Auxiliary heat — The WSHP Open controller can control a two-position, modulating water, or steam valve

connected to a coil on the discharge side of the unit and supplied by a boiler or a single-stage ducted electric heater in order to maintain the desired heating set point. Should the compressor capacity be insufficient or a compressor failure occurs, the auxiliary heat will be used. Unless the compressor fails, the auxiliary heat will only operate to supplement the heat provided by the compressor if the space temperature falls more than one degree below the desired heating set point (the amount is configurable). The heat will be controlled so the SAT will not exceed the maximum heating SAT limit.

Auxiliary modulating hot water/steam heating reheat — The control can modulate a hot water or steam valve connected to a coil on the discharge side of the unit and supplied by a boiler in order to maintain the desired heating set point should the compressor capacity be insufficient or a compressor failure occurs. Unless a compressor fault condition exists, the valve will only operate to supplement the heat provided by the compressor if the space temperature falls more than one degree below the desired heating set point. The valve will be controlled so the SAT will not exceed the maximum heating SAT limit.

Two-position hot water/steam heating reheat — The control can operate a two-position, NO or NC, hot water or steam valve connected to a coil on the discharge side of the unit and supplied by a boiler in order to maintain the desired heating set point should the compressor capacity be insufficient or a compressor failure occurs. Unless a compressor fault condition exists, the valve will only open to supplement the heat provided by the compressor if the space temperature falls more than one degree below the desired heating set point. The valve will be controlled so the SAT will not exceed the maximum heating SAT limit. The heat stage will also be subject to a 2-minute minimum OFF time to prevent excessive valve cycling.

Single stage electric auxiliary heat — The control can operate a field-installed single stage of electric heat installed on the discharge side of the unit in order to maintain the desired heating set point should the compressor capacity be insufficient or a compressor failure occurs. Unless a compressor fault condition exists, the heat stage will only operate to supplement the heat provided by the compressor if the space temperature falls more than one degree below the desired heating set point. The heat stage will be controlled so the SAT will not exceed the maximum heating SAT limit. The heat stage will also be subject to a 2-minute minimum OFF time to prevent excessive cycling.

Indoor air quality (IAQ) and demand controlled ventilation (DCV) — If the optional indoor air quality sensor is installed, the WSHP Open controller can maintain indoor air quality via a modulating OA damper providing demand controlled ventilation. The control operates the modulating OA damper during occupied periods. The control monitors the CO_2 level and compares it to the configured set points, adjusting the ventilation rate as required. The control provides proportional ventilation to meet the requirements of ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) specifications by providing a base ventilation rate and then increasing the rate as the CO_2 level increases. The control will begin to proportionally increase ventilation when the CO_2 level rises above the start ventilation set point and will reach the full ventilation rate when the CO_2 level is at or above the maximum set point. A user-configurable minimum damper position ensures that proper base ventilation is delivered when occupants are not present. The IAQ configurations can be accessed through the configuration screen. The following conditions must be true in order for this algorithm to run:

- Damper control is configured for DCV.
- The unit is in an occupied mode.
- The IAQ sensor reading is greater than the DCV start control set point.

The control has four user adjustable set points: DCV start control set point, DCV maximum control set point, minimum damper position, and DCV maximum damper position.

Two-position OA damper — The control can be configured to operate a ventilation damper in a two-position ventilation mode to provide the minimum ventilation requirements during occupied periods.

Dehumidifcation — The WSHP Open controller will provide occupied and unoccupied dehumidification only on units that are equipped with the modulating hot water reheat (HWR) option. This function requires an accessory space relative humidity sensor. When using a relative humidity sensor to control dehumidification during occupied or unoccupied times, the dehumidification set points are used accordingly. When the indoor relative humidity becomes greater then the dehumidification set point, a dehumidification demand will be acknowledged. Once acknowledged, the dehumidification output will be energized, bringing on the supply fan (medium speed), mechanical cooling, and the integral hot water reheat coil. The controls will engage Cooling mode and waste heat from the compressor cooling cycle will be returned to the reheat coil simultaneously, meaning that the reversing valve is causing the compressor to operate in the Cooling mode. During Cooling mode, the unit cools, dehumidifies, and disables the HWR coil; however, once the call for cooling has been satisfied and there is still a call for dehumidification, the unit will continue to operate using the reheat mode and HWR coil.

Waterside economizer — The WSHP Open controller has the capability of providing modulating or two-position water economizer operation (for a field-installed economizer coil mounted to the entering air side of the unit and connected to the condenser water loop) in order to provide free cooling (or preheating) when water conditions are optimal. Water economizer settings can be accessed through the equipment status screen. The following conditions must be true for economizer operation:

- SAT reading is available.
- EWT reading is available.
- If occupied, the SPT is greater than the occupied cooling set point or less than the occupied heating set point and the condenser water is suitable.
- Space temperature reading is valid.

- If unoccupied, the SPT is greater than the unoccupied cooling set point or less than the unoccupied heating set point and the condenser water is suitable.

Modulating water economizer control — The control has the capability to modulate a water valve to control condenser water flowing through a coil on the entering air side of the unit.

Cooling — The purpose is to provide an economizer cooling function by using the water loop when the entering water loop temperature is suitable (at least 5° F below space temperature). If the water loop conditions are suitable, then the valve will modulate open as required to maintain a supply-air temperature that meets the load conditions. Should the economizer coil capacity alone be insufficient for a period greater than 5 minutes, or should a high humidity condition occur, then the compressor will also be started to satisfy the load. Should the SAT approach the minimum cooling SAT limit, the economizer valve will modulate closed during compressor operation.

Heating — Additionally, the control will modulate the water valve should the entering water loop temperature be suitable for heating (at least 5° F above space temperature) and heat is required. The valve will be controlled in a similar manner except to satisfy the heating requirement. Should the economizer coil capacity alone be insufficient to satisfy the space load conditions for more than 5 minutes, then the compressor will be started to satisfy the load. Should the SAT approach the maximum heating SAT limit, the economizer valve will modulate closed during compressor operation.

Two-position water economizer control — The control has the capability to control a NO or NC, two-position water valve to control condenser water flow through a coil on the entering air side of the unit.

Cooling — The purpose is to provide a cooling economizer function directly from the condenser water loop when the entering water loop temperature is suitable (at least 5° F below space temperature). If the optional coil is provided and the water loop conditions are suitable, then the valve will open to provide cooling to the space when required. Should the capacity be insufficient for a period greater than 5 minutes, or should a high humidity condition occur, then the compressor will be started to satisfy the load. Should the SAT reach the minimum cooling SAT limit, the economizer valve will close during compressor operation.

Heating — Additionally, the economizer control will open the water valve should the entering water loop temperature be suitable for heating (at least 5° F above space temperature) and heat is required. The valve will be controlled in a similar manner except to satisfy the heating requirement. Should the coil capacity be insufficient to satisfy the space load for more than 5 minutes, then the compressor will be started to satisfy the load. Should the SAT reach the maximum heating SAT limit, the economizer valve will close during compressor operation.

Demand limit — The WSHP Open controller has the ability to accept three levels of demand limit from the network. In response to a demand limit, the unit will decrease its heating set point and increase its cooling set point to widen the range in order to immediately lower the electrical demand. The amount of temperature adjustment in response is user adjustable for both heating and cooling and for each demand level. The response to a particular demand level may also be set to zero.

Condenser water linkage — The control provides optimized water loop operation using an universal controller (UC) open loop controller. Loop pump operation is automatically controlled by WSHP equipment occupancy schedules, unoccupied demand and tenant override conditions. Positive pump status feedback prevents nuisance fault trips. The condenser water linkage operates when a request for condenser water pump operation is sent from each WSHP to the loop controller. This request is generated whenever any WSHP is scheduled to be occupied, is starting during optimal start (for warm-up or pull down prior to occupancy), there is an unoccupied heating or cooling demand, or a tenant pushbutton override. At each WSHP, the water loop temperature and the loop pump status is given. The WSHP will NOT start a compressor until the loop pumps are running or will shut down the compressors should the pumps stop. This prevents the WSHP from operating without water flow and thus tripping out on refrigerant pressure, causing a lockout condition. The WSHP Open controller will prevent this from occurring. Also, the loop controller can be configured to start the pumps only after a configurable number of WSHPs are requesting operation (from 1-"N"). This can be used to prevent starting the entire loop operation for only one WSHP. Meanwhile, the WSHPs will not operate if the loop pump status is off and therefore the WSHP compressor will not run.

Guide specifications

Two-Stage Water Source Heat Pumps with Puron® Refrigerant (R-410A)

HVAC Guide Specifications

Size Range: **18,800 to 81,300 Btuh Cooling Capacity**
15,000 to 111,000 Btuh Heating Capacity

Carrier Model Number: **50PTH, 50PTV, 50PTD**

Part 1 — General

1.01 SYSTEM DESCRIPTION

A. Single-package horizontally and vertically mounted water source heat pump with Puron refrigerant (R-410A) and electronic controls.

B. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the guide specifications that follow.

1.02 QUALITY ASSURANCE

A. All equipment listed in this section must be rated and certified in accordance with ARI/ISO, latest edition, and ETL listed to UL standard 1995. The units shall have ARI/ISO and ETL labels.

B. All units shall be fully quality tested by factory run testing under normal operating conditions and water flow rates as described herein. Quality control system shall automatically perform via computer: triple leak check, pressure tests, evacuate and accurately charge system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail data base. A detailed report card will ship with each unit displaying all test performance data.

NOTE: If unit fails on any cross check, system shall not allow unit to ship.

C. Serial numbers will be recorded by factory and furnished to contractor on report card for ease of unit warranty status. Units tested without water flow are not acceptable. Units shall be prewired and precharged in factory.

Part 2 — Product

2.01 EQUIPMENT

A. General:

Units shall be supplied completely factory built for an entering water temperature range from 60 to 95 F as standard. Equivalent units from other manufacturers can be proposed provided approval to bid is given 10 days prior to bid closing.

B. Unit Cabinets:

1. Holes and Knockouts:

Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring.

2. Horizontal Units:

a. Horizontal units shall have one of the following airflow arrangements: left inlet/right discharge; right inlet/left discharge; left inlet/back discharge; or right inlet/back discharge as shown on the plans.

b. Horizontal units must have the ability to be field convertible from side to back or back to side discharge with no additional parts or unit structure modification. Units will have factory-installed hanger brackets with rubber isolation grommets packaged separately.

3. Vertical Units:

Vertical units shall have one of the following air flow arrangements: left return/top discharge, right return/top discharge, left return/bottom discharge, right return/bottom discharge as shown on the plans.

4. Unit Arrangements:

If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades.

C. Access Panels:

All units (horizontal and vertical) must have a minimum of three access panels for serviceability of compressor compartment. Units having only one access panel to compressor, heat exchangers, expansion device, or refrigerant piping shall not be acceptable.

D. Insulation:

Standard cabinet panel insulation must meet NFPA 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 G22. Unit insulation must meet these stringent requirements or unit(s) will not be accepted.

E. Factory-Installed Wiring:

All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules.

F. Unit Removal:

Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

G. Compressor:

1. Compressor section interior surfaces shall be lined with $^1/_2$ in. thick, dual density, $1^3/_4$ lb per cubic ft acoustic type fiberglass insulation. Air-handling section interior surfaces shall be lined with $^1/_2$ in. thick, single density, $1^3/_4$ lb per cubic ft foil-backed fiber insulation for ease of cleaning.

2. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the airstream. Units without foil-backed insulation in the air-handling section will not be accepted.

3. The compressor shall have a dual level vibration isolation system.
4. The compressor will be mounted on computer-selected vibration isolation springs to a large heavy gage compressor mounting tray plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation.
5. Compressor shall be located in an insulated compartment away from airstream to minimize sound transmission.
6. Compressor shall have thermal overload protection.
7. The heat pumps shall be fabricated from heavy gage G90 galvanized steel with powder coat paint finish. Both sides of the steel shall be painted for added protection.
8. All units must have an insulated panel separating the fan compartment from the compressor compartment.
9. Units with the compressor in the airstream are not acceptable.

H. Fan and Motor Assembly:
1. Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing.
2. Units shall have a direct-drive centrifugal fan. The fan motor shall be an ICM2 (Integrally Controlled Motor 2) variable speed ball bearing type motor. The ICM2 fan motor shall provide soft starting, maintain constant cfm over its static operating range and provide airflow adjustment on its control board.
3. The fan motor shall be isolated from the housing by rubber grommets.
4. The motor shall be permanently lubricated and have thermal overload protection.
5. A special dehumidification mode shall be provided to allow lower airflows in cooling for better dehumidification. The dehumidification mode shall be selectable via a jumper on the control board or may be controlled externally from a humidistat.
6. Airflow/static pressure rating of the unit shall be based on a wet coil and a clean filter in place. Ratings based on a dry coil and/or no filter, or on an ESP (external static pressure) less than 0.50 in. wg shall NOT be acceptable.

I. Refrigerant Circuit:
1. All units shall contain a Puron® refrigerant (R-410A) sealed circuit including a high-efficiency Copeland UltraTech™ two-stage compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant-to air-heat exchanger, reversing valve, coaxial (tube-in-tube) refrigerant to water heat exchanger, and safety controls, including a high-pressure switch, low-pressure switch (loss of charge), water coil low temperature sensor, and air coil low temperature sensor.
2. Access fittings shall be factory-installed on high and low pressure refrigerant lines to facilitate field service.
3. Refrigerant metering shall be accomplished by thermostatic expansion valve only.

J. Drain Pan:
1. The drain pan shall be constructed of 304 stainless steel to inhibit corrosion. This corrosion protection system shall meet the stringent 1000-hour salt spray test per ASTM B117. If plastic type material is used, it must be HDPE (high density polyethylene) to avoid thermal cycling shock stress failure over the lifetime of the unit.
2. Drain pan shall be fully insulated.
3. Drain outlet shall be located at pan as to allow complete and unobstructed drainage of condensate. Drain outlet for horizontal units shall be connected from pan directly to FPT fitting. No hidden internal tubing extensions from pan outlet extending to unit casing (that can create drainage problems) will be accepted.
4. The unit as standard will be supplied with solid-state electronic condensate overflow protection. A mechanical float switch will be used with the WSHP Open multiple protocol controller option.
5. Vertical units shall be furnished with a PVC slip condensate drain connection and an internal factory-installed condensate trap. If units without an internal trap are used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for the subcontractor to install these provisions.

K. Filter:
1. Units shall have a factory-installed 1 in. wide filter bracket for filter removal from either side. Units shall have a 1 in. thick throwaway type fiberglass filter.
2. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up.
3. Filters shall be standard sizes. If units utilize non-standard filter sizes, then the contractor shall provide 12 spare filters for each unit.

L. Thermostatic Expansion Valve:
1. Expansion valves shall be dual port balanced types with external equalizer for optimum refrigerant metering.
2. Units shall be designed and tested for operating ranges of entering water temperatures from 20 to 120 F.

3. Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low temperature thermostat must be provided to prevent overcooling an already cold room.

M. Controls and Safeties:

1. Electrical:
   a. A control box shall be located within the unit compressor compartment and shall contain a 50 va transformer, 24-volt activated, 2 or 3-pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation.
   b. Reversing valve and fan motor wiring shall be routed through this electronic controller.
   c. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24-volt and provide heating or cooling as required by the remote thermostat/sensor.
2. Unit Controls:
   a. Safety controls including a high-pressure switch, a low-pressure sensor, and a low water and low air temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service.
   b. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout shall be reset at the thermostat or at the contractor-supplied disconnect switch.
   c. Units which may be reset only at the disconnect switch only shall not be acceptable.
3. Complete C Controls:

   The standard Complete C electronic control system shall interface with a heat pump (Y,O) wall thermostat (mechanical or electronic). The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall have the following features:
   a. 50 va transformer.
   b. Performance Monitor (PM). The PM warns when the heat pump is running inefficiently.
   c. Anti-short cycle time delay on compressor operation time delay shall be 5 minutes minimum.
   d. Random start on power up mode.
   e. Low voltage protection.
   f. High voltage protection.
   g. Unit shutdown on high or low refrigerant pressures.
   h. Unit shutdown on low water temperature.
   i. Water coil freeze protection (selectable for water or antifreeze).
   j. Air coil freeze protection (check filter switch).
   k. Condensate overflow shutdown.
   l. Option to reset unit at thermostat or disconnect. Fault type shall be retained in memory if reset at thermostat.
   m. Automatic intelligent reset. Unit shall automatically reset 5 minutes after trip if the fault has cleared. Should a fault reoccur 3 times sequentially, lockout requiring manual reset will occur.
   n. Ability to defeat time delays for servicing.
   o. Light-emitting diodes (LED) to indicate high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow and control status.
   p. The low-pressure switch SHALL NOT be monitored for the first 90 seconds after a compressor start command to prevent nuisance safety trips.
   q. Remote fault type indication at thermostat.
   r. Selectable 24-v or pilot duty dry contact alarm output.
   s. 24-v output to cycle a motorized water valve with compressor contactor.
   t. Electric heat output to control two stages of electric heat (emergency heat).
   u. Service test mode for troubleshooting and service.
   v. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.

   Units not providing the 8 safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge), air coil freeze, water coil freeze, and condensate overflow protections will not be accepted.
4. Deluxe D controls:

   Optional electronic Deluxe D control shall have all the features of the Complete C control with the following additional features:
   a. 75 va transformer.
   b. A removable thermostat connector.
   c. Random start on return from night setback.
   d. Intelligent reversing valve operation for extended life and quiet operation.
   e. Night setback control from low temperature thermostat, with 2-hour override initiated by a momentary signal from the thermostat.
   f. Dry contact night setback output for digital night setback thermostats.

g. Ability to work with heat/cool (Y, W) thermostats.

h. Ability to work with heat pump thermostats using O or B reversing valve control.

i. Single grounded wire to initiate night setback, or emergency shutdown.

j. Boilerless system control can switch automatically to electric heat at low loop water temperature.

k. Dehumidistat input providing fan control for dehumidification operating.

l. Multiple units connected to one sensor providing communication for up to 3 water source heat pumps.

m. Selection of boilerless changeover temperature set point.

n. Compressor relay staging for dual stage units or in master/slave applications.

Units not having automatic low sensible heat ratio cooling will not be accepted; as an alternate, a hot gas reheat coil may be provided with control system for automatic activation.

5. WSHP Open Multiple Protocol Control:

Units shall have all the features above (either C or D boards) and the state of the art WSHP Open multiple protocol interface board. All point objects will have the ability to be viewed in the BACview6 Handheld user interface. This will permit all units to be daisy chain connected by a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

a. space temperature

b. leaving water temperature

c. discharge air temperature

d. command of space temperature set point

e. cooling status

f. heating status

g. low temperature sensor alarm

h. high pressure switch alarm

i. fan on/off position of space thermostat

j. unoccupied/occupied command

k. cooling demand

l. heating demand

m. fan “ON/AUTO” command

n. fault prevention with auto reset

o. itemized fault code viewed with BACview interface

Additional WSHP Open multiple protocol control features shall include:

a. two-position OA damper

b. modulating OA damper with DCV

c. auxiliary modulating hot water/steam heating

d. two-position hot water/steam heating

e. single stage electric auxiliary heat

f. auto fan speed control (heating/cooling)

g. power fail restart delay

h. dehumidification

i. modulating water economizer control

j. two-position water economizer control

6. PremierLink™ Controller:

This optional control will function with CCN (Carrier Comfort Network®) and ComfortVIEW™ software. It shall also be compatible with *Comfort*Link™ controllers. It shall be ASHRAE 62-99 compliant and Internet ready. It shall accept a CO_2 sensor in the conditioned space and be demand controlled ventilation (DCV) ready. The communication rate must be 38.4K or faster. It shall include an integrated economizer controller.

7. LONWORKS® Interface System:

Units shall have all features listed above (either Complete C or Deluxe D) and the control board shall be supplied with a LONWORKS interface board, which is LONMark certified. This will permit all units to be daisy chained via a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

a. space temperature

b. leaving-water temperature

c. discharge-air temperature

d. command of space temperature set point

e. cooling status

f. heating status

g. low temperature sensor alarm

h. low pressure sensor alarm

i. high pressure switch alarm

j. condensate sensor alarm

k. high/low voltage alarm

l. fan "ON/AUTO" position of space thermostat

m. unoccupied / occupied command

n. cooling command

o. heating command

p. fan "ON/AUTO" command

q. fault reset command

r. itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75 va control transformer with load side short circuit and overload protection via a built in circuit breaker.

Guide specifications (cont)

N. Piping:
   1. Supply and return water connections shall be copper FPT fittings and shall be securely mounted flush to the cabinet corner post allowing for connection to a flexible hose without the use of a back-up wrench.
   2. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature.

O. Solid-State Integrally Controlled Motor 2 (ICM2) Fan Control Board:
   1. Airflow selection shall be accomplished via 3 jumper switches on the ICM2 control board. Actual airflow shall be indicated by the cfm LED with each 100 cfm being represented by one flash of the LED.
   2. Airflow shall be automatically maintained (±5%) by the ICM2 motor regardless of external static pressure up to its maximum output capacity.
   3. A jumper shall allow selection of a special dehumidification mode, which reduces airflow in cooling by 25% to increase the latent capacity of the unit. A terminal shall be provided on the control board to allow an external humidistat to activate dehumidification mode.
   4. To achieve full benefit of the two-stage compressor and ICM2 fan, a 2-stage heat/2-stage cool thermostat (or a 3-stage heat/2-stage cool thermostat when electric backup heat is required) should be employed.

P. Remote Service Sentinel (Complete C/Deluxe D):
   1. Solid-state control system shall communicate with thermostat to display (at the thermostat) the unit status, fault status, and specific fault condition, as well as retrieve previously stored fault that caused unit shutdown.
   2. The remote service sentinel allows building maintenance personnel or service personnel to diagnose unit from the wall thermostat.
   3. The control board shall provide a signal to the thermostat fault light, indicating a lockout.
   4. Upon cycling the G (fan) input 3 times within a 60-second time period, the fault light shall display the specific code as indicated by a sequence of flashes. A detailed flashing code shall be provided at the thermostat LED to display unit status and specific fault status such as over/under voltage fault, high pressure fault, low pressure fault, low water temperature fault, condensate overflow fault, etc.
   5. Units that do not provide this remote service sentinel shall not be acceptable.

Q. Special Features:
   1. Cupronickel coaxial water-to-refrigerant heat exchangers for higher corrosion protection.
   2. Sound attenuation (mute) package consists of high technology sound attenuating materials strategically applied to the cabinet, in addition to the standard system, to further dampen sound.
   3. Extended range for units operating with entering water temperatures below dew point. Extended entering water temperatures range from 20 to 120 F.
   4. Two-way motorized water control valve shall operate in conjunction with the compressor to shut off or turn on water to the unit.
   5. Water circuit options shall provide internally mounted 2.5 or 3.0 gmp per ton automatic flow regulating valves.
   6. Hot water generator coil and high temperature switch shall generate hot water within the unit.
   7. Modulating hot water reheat (HWR), composed of supply air sensor, motorized valve, proportional controller, loop pump, and hydronic coil.
   8. Aquazone™ Thermostat Controls:
      a. Programmable multi-stage thermostat with 7-day clock, holiday scheduling, large backlit display and remote sensor capability.
      b. Programmable 7-day light-activated thermostat offers occupied comfort settings with lights on, unoccupied energy savings with lights off.
      c. Programmable 7-day flush-mount thermostat offers locking coverplate with tamper proof screws, flush to wall mount, dual point with adjustable deadband, O or B terminal, and optional remote sensor.
      d. Programmable 5-day thermostat offers 2-stage heat/2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included.
      e. Non-programmable thermostat with 2-stage heat/2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included.
   9. Loop controller with six stages (2 stages for heating and 4 stages for heat rejection).
   10. Filter rack (2 in.) with or without closure to enhance the filtration system of the water source heat pump. Filter rack with closure facilitates maintenance and change out.

       NOTE: Filter rack does not include filters.
   11. Fire-rated hoses kits with a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits can be either stainless steel or galvanized.

12. Ball valves (brass body) for shut off and balancing water flow. Available with memory, with memory stop, and pressure temperature ports.
13. Y strainers (bronze body) "Y" type configuration with a brass cap. Maximum operating pressure rating of 450 psi. Strainer screen made of stainless steel.
14. Solenoid valves (brass body) provide slow operation for quiet system application.
15. Hose kit assemblies 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 measure flow (gpm) with two P/T ports, flexible stainless steel hose with a swivel and nipple.
16. Multiple-protocol WSHP Open controller remote sensors for Aquazone flush-mount thermostats and DDC control options. Only Carrier sensors can be used with the WSHP Open controller. Sensors are available as follows:
    a. SPT Standard offers space temperature sensor with communication port.
    b. SPT Plus offers space temperature sensor with set point adjust, local override with indicating light and communication port.
    c. SPT Pro offers space temperature sensor with LCD display, set point adjust, local override, alarm icon, outside air, and unit status with heating and cooling set points.
    d. SPT Pro+ offers space temperature sensor with LCD display, set point adjust, local override, alarm icon, outside air, unit status with heating and cooling set points, and fan speed control.
17. PremierLink™ accessories for providing a fully integrated DDC system. Accessories include supply air temperature sensors, communicating room sensors, CO_2 sensors, and linkage thermostats.
18. An Aquazone system control panel as specified in 50RLP Product Data (525-00040) is available.
19. LON wall sensors are available in 3 models: sensor only, sensor with status override indicator, and sensor with set point, status adjustment override, and digital LCD display.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.