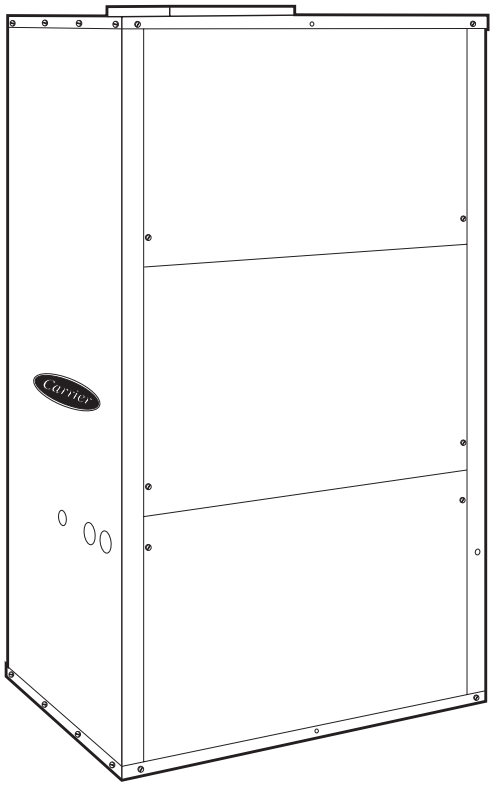
Product Data

AQUAZONE™ 50VQP084-300 Vertical Large Capacity Water Source Heat Pumps with PURON® Refrigerant (R-410A)

7 to 25 Nominal Tons

AQUAZONE™



ASHRAE 90.1 COMPLIANT

Puron®
the environmentally sound refrigerant

Single-package vertically mounted water source heat pumps (WSHPs) with electronic controls.

- Non-ozone depleting Puron refrigerant (R-410A)
- Performance certified to ARI/ISO/ASHRAE 13256-1
- Wide application use with operating temperature range of 20 F to 110 F
- Dual refrigerant circuits for 2-stage operation
- High-efficiency scroll compressors
- Thermostatic expansion valve (TXV) provides efficient and reliable refrigerant flow
- High-static capability available
- Available mute package for quiet operation
- Available low temperature insulation to prevent condensation
- Easy service access
- Flexible and reliable multiple protocol WSHP Open controller can use BACnet*, Modbus†, N2, and LON** (with separate card) protocols for integrating energy efficiency and precise unit control

Features/Benefits

Carrier's Aquazone™ large capacity units offer low cost, energy efficient solutions for all challenging water source heat pump applications.

Operating efficiency

Carrier's Aquazone large capacity vertical water source heat pumps are designed for quality and high performance over a lifetime of operation. Aquazone units offer cooling EERs (Energy Efficiency Ratio) to 21.4 and heating COPs (Coefficient of Performance) to 5.1.

Features/Benefits (cont)

Efficiencies stated are in accordance with standard conditions under ISO (International Organization for Standardization) Standard 13256-1 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 that provides maximum strength. Cabinet interior surfaces are lined with 1/2 in. thick, 1 1/2 lb acoustic type insulation. Sheet metal surfaces are treated for maximum corrosion protection to ensure resilience for long term vitality. The condensate pan is coated with baked-on enamel finish and insulated.

Compressor — Aquazone large capacity units include dual high capacity scroll compressors. Compressor isolating springs are specially selected for each compressor size. The external isolation springs are mounted on an isolated railing system to minimize vibrations to the unit structure.

Blower and motor assembly — Belt driven centrifugal blowers are provided with all units to satisfy many air distribution applications. Optional motor speeds and sizes are available to provide high static capability. Aquazone blower motors are designed to operate at lower temperatures to help improve the reliability of the WSHP.

Refrigeration/water circuit — Units have a sealed refrigerant circuit including a scroll compressor. Refrigerant circuits are provided with a standard thermostatic expansion valve (TXV) for higher accuracy and performance. Also standard are a reversing valve (4-way valve), water-to-refrigerant coaxial (tube-in-tube) coil, and enhanced aluminum fin/rifled copper tube air-to-refrigerant heat exchanger coil.

ARI/ISO — Carrier's 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.

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.

Quiet operation

Fan motor insulation and compressor springs 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.

Design flexibility

Aquazone vertical units are available in four airflow patterns including top or front discharge with right or left return. Extended water temperature range between 20 F and 110 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 and low-pressure sensor to detect loss of refrigerant. A low air temperature sensor safeguards against freezing. Equipment safety features include water loop temperature monitoring, voltage protection, water coil freeze protection, and standard electronic condensate overflow shutdown. All Aquazone safety features are tested 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, units are mounted on oversized pallets with lag bolts for sturdiness and maximum protection during transit.

Table of contents

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. Water connections (FPT) and condensate drains (FPT) are anchored securely to the unit cabinet. High and low voltage knockouts are provided on all units.

Simple maintenance and serviceability

The Aquazone WSHP units are constructed to provide ease of maintenance. Units have large removable panels for easy access. Additional panels are provided to access the blower and control box sections.

The blower housing assembly can be serviced without disconnecting ductwork from the dedicated blower access panel. Blower units are provided with permanently lubricated bearings for worry-free performance.

Electrical disconnection of the blower motor and control box is easily accomplished from quick disconnects on each component.

Easy removal of the control box from the unit provides access to all refrigeration components.

The refrigeration circuit is easily tested and serviced through the use of high and low pressure ports integral to the refrigeration circuit.

Maximum control flexibility

Aquazone water source heat pumps provide reliable control operation using a standard microprocessor board with flexible alternatives for many direct digital control (DDC) applications including the Carrier Comfort Network® (CCN) 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:

75-va transformer assists in accommodating accessory loads.

Anti-short cycle 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 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 safeguards against unreliable unit operation and prevents refrigerant from leaking.

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

High and low voltage protection safe guards against excessive or low voltage conditions.

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

Accessory output (24-v) is provided to cycle a motorized water valve or damper actuator with compressor in applications such as variable speed pumping arrangements.

Performance Monitor (PM) 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 anti-freeze) 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 is a selectable 24-v or pilot duty dry contact for providing activation of a remote alarm.

Electric heat option output provided on the controller for operating two stages of emergency electric heat.

Service test mode with diagnostic LED (Light-emitting diode) 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 indicates high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow, and control status on an LED panel.

Open protocol for diverse control (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 on Aquazone 50VQP units enables the units to provide very good latent capacity making them 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. The Deluxe D controls option provides fan speed control based on relative humidity and is an effective, low-cost means of controlling humidity.

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 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 water-side 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,

Features/Benefits (cont)

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.

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.

*Sponsored by ASHRAE (American Society of Heating, Refrigerant and Air Conditioning Engineers).
†Registered trademark of Schneider Electric.
**Registered trademark of Echelon Corporation.

Model number nomenclature

50VQP - Vertical Large Capacity
Water Source Heat Pump
with Puron® Refrigerant (R-410A)

Nominal Capacity - Tons
084 - 7 **192** - 16
096 - 8 **240** - 20
120 - 10 **300** - 25
150 - 12 1/2
168 - 14

Airflow Configuration

	Return	Discharge
B -	Rear	Top
F -	Front	Top
S -	Rear	Front
Z -	Front	Rear

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

Heat Exchanger Options
A - Coated, Copper
C - Non-Coated, Copper
J - Coated, Cupronickel
N - Non-Coated, Cupronickel

Operating Range and Sound Options
1 - Extended Range (20 to 110 F)
2 - Extended Range and Mute Package
3 - Standard Range (60 to 95 F)
4 - Standard Range and Mute Package

Blower Drive Options
A - Standard rpm/Standard Motor
B - Low rpm/Standard Motor
C - High rpm/Standard Motor
D - Standard rpm/Large Motor*
E - High rpm/Large Motor

Packaging
1 - Domestic

Revision
0 - Current Revision

Voltage
1 - 575-3-60
5 - 280/230-3-60
6 - 460-3-60

50VQP 180 B C C 5 0 1 A 1

LEGEND
LON — LonWorks Interface System

*Not available for unit size 240.

NOTES:
1. Standard cabinet is powder-painted.
2. 208/230 volt unit is wired for 208 volts, but can be field converted to 230 volts.
3. 1-in. return filter included.
4. 75-VA standard transformer included.

ARI/ISO capacity ratings

50VQP UNIT CAPACITY RATINGS

50VQP UNIT SIZE	WATER LOOP HEAT PUMP				GROUND WATER HEAT PUMP				GROUND LOOP HEAT PUMP			
	Cooling 86 F		Heating 68 F		Cooling 59 F		Heating 50 F		Cooling 77 F		Heating 32 F	
	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
084	82,000	15.2	101,000	4.8	87,500	21.0	83,500	4.3	83,000	16.5	65,500	3.6
096	94,000	15.0	118,000	4.7	102,500	20.5	96,500	4.2	97,500	16.5	76,500	3.6
120	118,000	15.0	144,000	5.0	133,000	21.0	118,000	4.2	120,000	16.5	93,000	3.7
150	150,000	14.0	186,000	4.7	170,000	20.0	155,000	4.2	156,000	15.8	122,000	3.6
168	166,000	15.5	204,020	4.9	177,000	21.4	169,000	4.4	168,000	16.8	132,500	3.7
192	190,000	15.3	238,360	4.8	207,000	20.9	195,000	4.3	197,000	16.8	155,000	3.7
240	238,500	15.3	291,000	5.1	269,000	21.4	238,500	4.3	242,500	16.8	188,000	3.8
300	300,000	14.0	372,000	4.7	340,000	20.0	310,000	4.2	312,000	15.8	244,000	3.6

LEGEND
COP — Coefficient of Performance
db — Dry Bulb
EER — Energy Efficiency Ratio
wb — Wet Bulb

NOTES:
1. Cooling capacities based upon 80.6 F db, 66.2 F wb entering air temperature.
2. Heating capacities based upon 68 F db, 59 F wb entering air temperature.
3. All ratings based upon operation at lower voltage of dual voltage rated models.

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

Physical data

50VQP UNIT PHYSICAL DATA

50VQP UNIT SIZE	084	096	120	150	168	192	240	300
NOMINAL AIRFLOW (cfm)	2,800	3,200	4,000	5,000	5,600	6,400	8,000	10,000
WEIGHT (lb)								
Operating	650		696	700	1300		1346	1404
Packaged	665		711	715	1330		1376	1434
COMPRESSOR (qty)	Scroll (1)				Scroll (2)			
REFRIGERANT	R-410A							
Charge (oz per circuit)	140	156	224	248	140	156	224	248
BLOWER MOTOR (Qty)	1							
Standard Motor (hp)	1	1.5	2	3	2	3	5	5
Large Motor (hp)	1.5	2	3	5	3	5	7.5	7.5
BLOWER (qty)	1				2			
Wheel Size (Depth x Width, in.)	15 x 11			15 x 15	15 x 11			15 x 15
WATER CONNECTION SIZE (in., FPT)	1 1/2			2				2 1/2
COAX VOLUME (gal)	2.19		2.48	3.46	4.83		6.36	7.39
CONDENSATE CONNECTION SIZE (in., FPT)	1							
AIR COIL								
Height x Width (in.) (Qty)	36 x 48 (1)				36 x 48 (2)			
Total Face Area (sq ft)	12				24			
Tube Size (in.)	3/8							
Fin Spacing (FPI)	14			12	14			12
Number of Rows	2		3	4	2		3	4
FILTER, THROWAWAY (in.)(qty)	18 x 25 (4)				18 x 25 (8)			

LEGEND

FPI — Fins per Inch
FPT — Female Pipe Thread

NOTES:

1. All units have grommet and spring compressor mountings, and 1/2 in. and 1 3/4 in. electrical knockouts.
2. Use the lowest maximum pressure rating when multiple options are combined:

OPTION	MAXIMUM PRESSURE (psig)
Base Unit	450
Motorized Water Valve	400
Internal Secondary Pump	145

Options and accessories

DESCRIPTION	FACTORY-INSTALLED OPTION	FIELD-INSTALLED ACCESSORY
Cupronickel Heat Exchangers	X	
Sound Attenuation Package (Mute Package)	X	
Extended Range	X	
High-Static Blower Drive Options	X	
Deluxe D Control System	X	
WSHP Open Multiple Protocol Controller	X	
PremierLink™ Controller	X	
LONMark Compliant Controller	X	
Aquazone™ Thermostats		X
Filters	X	X
Filter Rack	X	X
Fire-Rated Hoses		X
Ball Valves		X
Y Strainers		X
Solenoid Valves		X
Hose Kit Assemblies		X
Remote Sensors (SPT, CO_2, Humidity Sensors)		X
UC Open XP Loop Controller		X
PremierLink Accessories		X

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 provide an insulated water circuit for the coaxial coil and refrigerant circuit to prevent condensation, and therefore potential dripping problems, in applications where the entering water temperature is beyond the normal operating range (less than 60 F).

High-static blower drive options provide maximum flexibility for the most challenging applications. Three static range motors are available in low, standard, and high rpm configurations. An optional large motor arrangement is available for high-static designs.

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 (NSB) 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.

Multiple units on one thermostat/wall sensor provide 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 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) 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.

Filters are available in 2 in. or 4 in. (MERV 8) sizes.

Filter rack is available to accomodate one, 2, or 4 in. filters in place of the standard 1-in. return air filter to enhance the filtration system of the water source heat pump. The filter rack does not include filters.

Options and accessories (cont)

Field-installed accessories

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

Programmable 7-day 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, NEVERLOST™ memory, 3 security levels, and temperature display in degrees F or C.

Programmable 7-day light-activated thermostat offers the 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 offers the 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 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 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.

Filters are available in 2 in. or 4 in. (MERV 8) sizes.

Filter rack is available to accomodate one, 2, or 4 in. filters in place of the standard 1-in. return air filter to enhance the filtration system of the water source heat pump. The 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. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

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

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

Solenoid valves (brass body) offer 3.5 watt coil, 24 volt, 50/60 Hz, 740 amps inrush, and .312 amp holding. Valves operate slowly for quiet system application. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ 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.

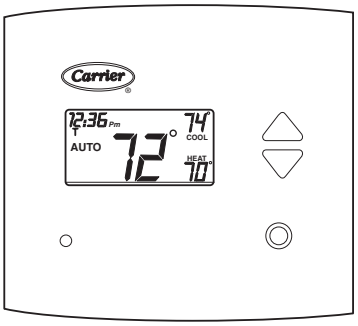
UC Open XP loop controller with six stages (2 stages for heating and 4 stages for cooling) includes:

- 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)

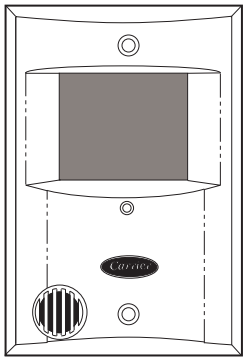
PremierLink™ accessories are available for providing a fully integrated WSHP DDC system. Accessories include supply air temperature sensors (with override and/or set-point adjustment), communicating room sensors, CO_2 sensors (for use in demand control ventilation), and linkage thermostats (to control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

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

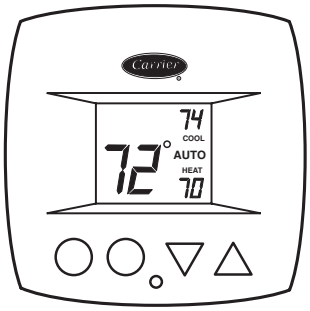
AQUAZONE™ THERMOSTATS



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

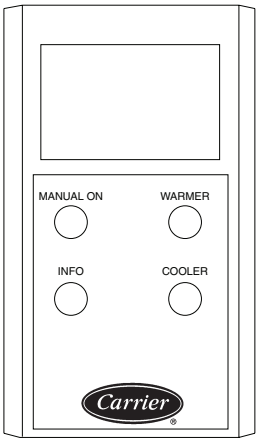


**7-DAY PROGRAMMABLE
FLUSH MOUNT**

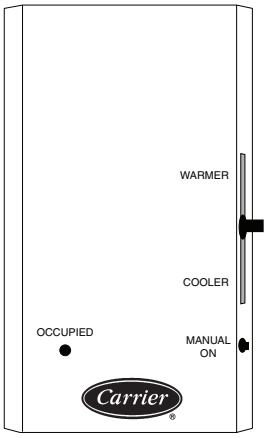


**5-DAY PROGRAMMABLE/
NON-PROGRAMMABLE**

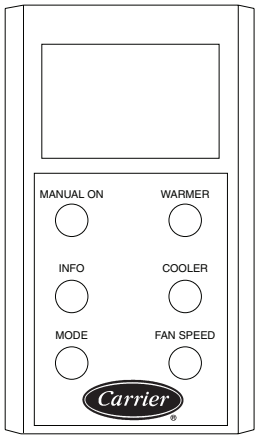
WSHP OPEN SENSORS



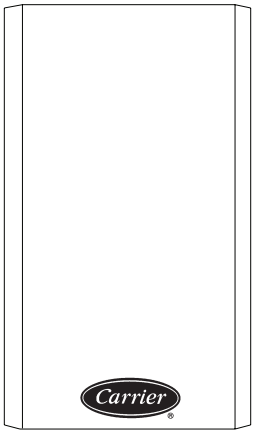
**SPACE TEMPERATURE
SENSOR WITH SET
POINT ADJUSTMENT
AND LOCAL OVERRIDE**



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

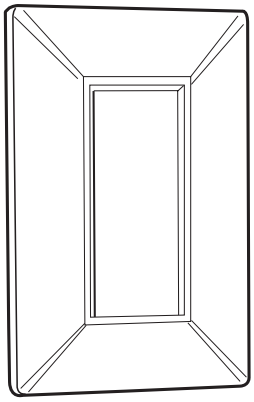


**SPACE TEMPERATURE
SENSOR WITH SET
POINT ADJUSTMENT,
FAN SPEED CONTROL,
AND LOCAL OVERRIDE**

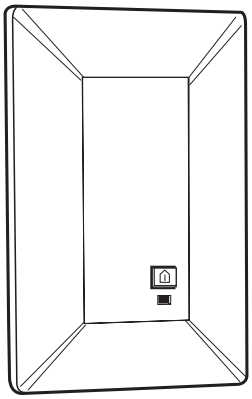


**SPACE TEMPERATURE
SENSOR ONLY**

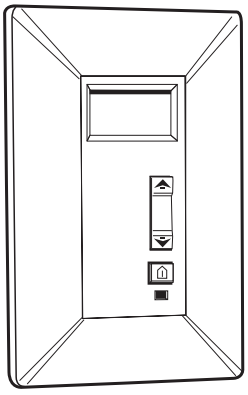
LON WALL SENSORS



SENSOR ONLY



SENSOR WITH OVERRIDE

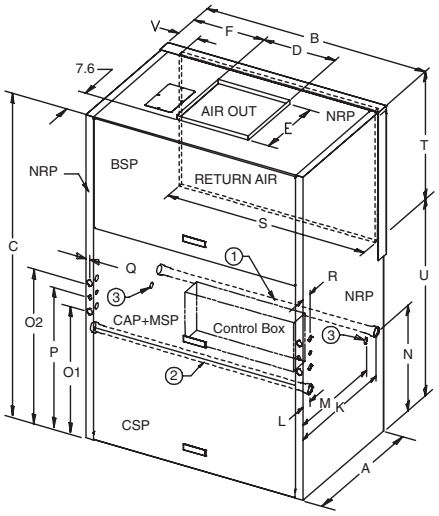


**SENSOR WITH SET POINT ADJUSTMENT,
OVERRIDE AND DIGITAL LCD**

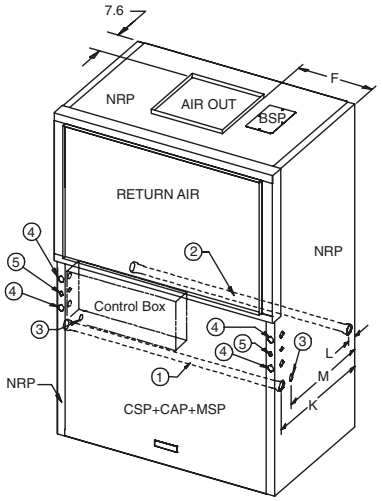
Dimensions

50VQP084-150 UNITS

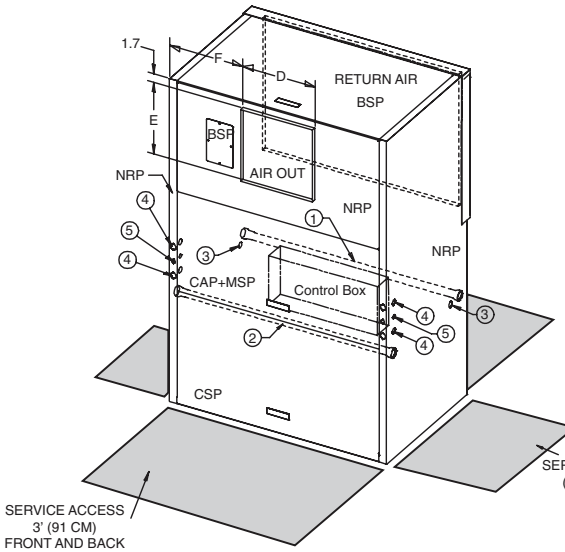
ALL CONFIGURATIONS REQUIRE SERVICE ACCESS AREA SHOWN BELOW



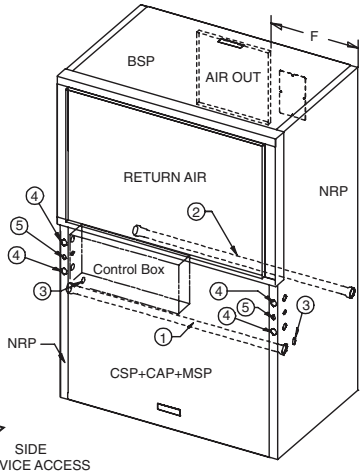
REAR RETURN TOP DISCHARGE



FRONT RETURN TOP DISCHARGE



REAR RETURN FRONT DISCHARGE



FRONT RETURN REAR DISCHARGE

LEGEND

BSP — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel
MSP — Motor Service Panel
NRP — Non-Removable Panel

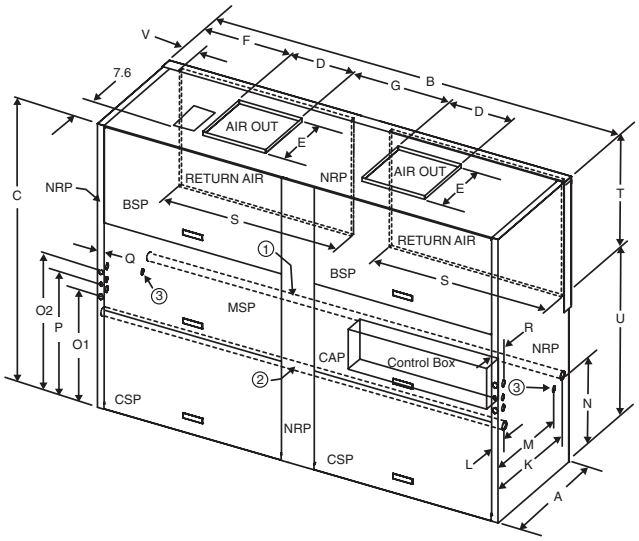
CONNECTIONS		50VQP084-120	50VQP150
1	Water Inlet (See Note 7)	1 1/2 in. FPT	2 in. FPT
2	Water Outlet (See Note 7)	1 1/2 in. FPT	2 in. FPT
3	Condensate Drain (See Note 8)	1 in. FPT	1 in. FPT
4	High Voltage Access (See Note 9)	1 3/8 in.	1 3/8 in.
5	Low Voltage Access (See Note 9)	7/8 in.	7/8 in.

NOTES:
1. All dimensions in inches.
2. Units require 3 ft clearance for water connections, CAP, CSP, MSP, and BSP service access.
3. Overall cabinet height dimension does not include duct flange when in top discharge configuration.
4. Overall cabinet width dimension does not include filter rack and duct flange when on front or back discharge configuration.
5. Side service access must be 3 ft on either side that connections are made. If no connections are made on a side, then service access can be 6 in. minimum.
6. While access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
7. Water inlet and water outlet connections are available on either side (left or right) of the unit. Two MPT plugs are shipped loose in a plastic bag tied to the water leg in front of the unit. Installer must plug water inlet/outlet side not being connected to.
8. Condensate drain is available on either side (left or right) of unit. Drain hose and drain connection will be tied inside the unit. Installer must untie the drain hose and connect to the condensate drain hole of installer's choice.
9. Electrical access is available on either side (left or right) of unit and is also available (left or right) in the front of the unit.
10. All configurations require service access area shown in the rear return front discharge figure above.

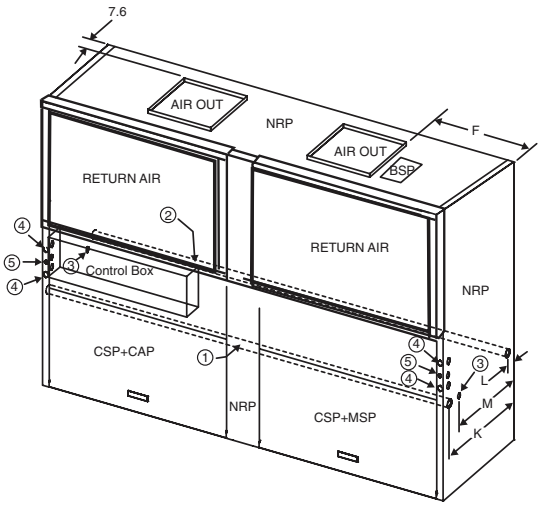
UNIT 50VQP	OVERALL CABINET (in.)			DISCHARGE CONNECTIONS (in.) Duct Flange			WATER CONNECTIONS (in.)				ELECTRICAL KNOCKOUTS (in.)					RETURN AIR CONNECTIONS (in.) (Using Return Air Opening)			
	A Depth	B Width	C Height	D Supply Width	E Supply Depth	F	K 1-Water Inlet	L 1-Water Outlet	M 3-Condensate	N	O1	O2	P	Q	R	S Return Depth	T Return Height	U	V
084-120	34.0	53.1	79.0	17.5	17.6	17.8	31.0	3.0	27.0	25.6	31.0	38.0	34.6	1.0	3.0	48.0	32.4	44.6	2.7
150	34.0	53.1	79.0	21.4	17.6	17.8	31.0	3.0	27.0	25.6	31.0	38.0	34.6	1.0	3.0	48.0	32.4	44.6	2.7

50VQP168-300 UNITS

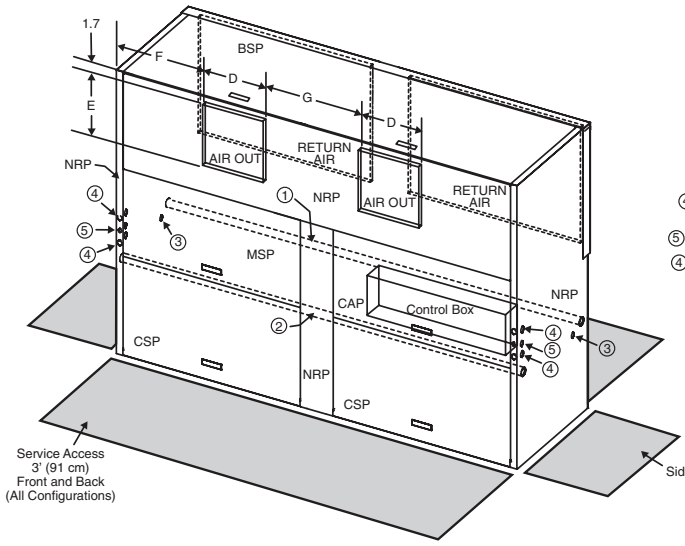
ALL CONFIGURATIONS REQUIRE SERVICE ACCESS



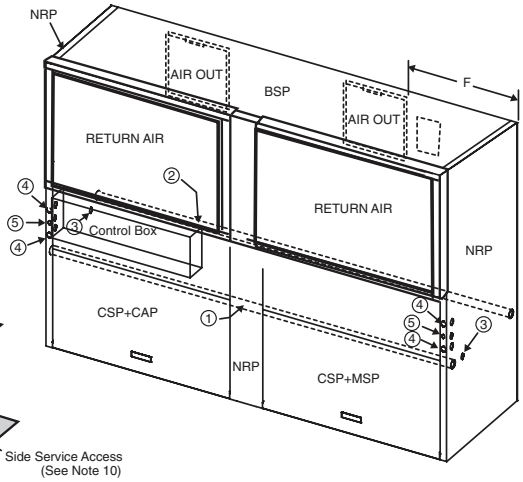
REAR RETURN TOP DISCHARGE



FRONT RETURN TOP DISCHARGE



REAR RETURN FRONT DISCHARGE



FRONT RETURN REAR DISCHARGE

LEGEND

BSP — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel
MSP — Motor Service Panel
NRP — Non-Removable Panel

CONNECTIONS		50VQP168-240	50VQP300
1	Water Inlet (See Note 7)	2 in. FPT	2 1/2 in. FPT
2	Water Outlet (See Note 7)	2 in. FPT	2 1/2 in. FPT
3	Condensate Drain (See Note 8)	1 in. FPT	1 in. FPT
4	High Voltage Access (See Note 9)	1 3/8 in.	1 3/8 in.
5	Low Voltage Access (See Note 9)	7/8 in.	7/8 in.

NOTES:
1. All dimensions in inches.
2. Units require 3 ft clearance for water connections, CAP, CSP, MSP, and BSP service access.
3. Overall cabinet height dimension does not include duct flange when in top discharge configuration.
4. Overall cabinet width dimension does not include filter rack and duct flange when on front or back discharge configuration.
5. Side service access must be 3 ft on either side that connections are made. If no connections are made on a side, then service access can be 6 in. minimum.
6. While access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
7. Water inlet and water outlet connections are available on either side (left or right) of the unit. Two MPT plugs are shipped loose in a plastic bag tied to the water leg in front of the unit. Installer must plug water inlet/outlet side not being connected to.
8. Condensate drain is available on either side (left or right) of unit. Drain hose and drain connection will be tied inside the unit. Installer must untie the drain hose and connect to the condensate drain hole of installer's choice.
9. Electrical access is available on either side (left or right) of unit and is also available (left or right) in the front of the unit.
10. All configurations require service access area shown in the rear return front discharge figure above.

UNIT 50VQP	OVERALL CABINET (in.)			DISCHARGE CONNECTIONS (in.) Duct Flange				WATER CONNECTIONS (in.)				ELECTRICAL KNOCKOUTS (in.)					RETURN AIR CONNECTIONS (in.) (Using Return Air Opening)			
	A Depth	B Width	C Height	D Supply Width	E Supply Depth	F	G	K 1-Water Inlet	L 1-Water Outlet	M 3-Condensate	N	O1	O2	P	Q	R	S Return Depth	T Return Height	U	V
168-240	34.0	106.7	79.0	17.5	17.6	17.8	31.3	31.0	3.0	27.0	25.6	31.0	38.0	34.6	1.0	3.0	48.0	32.4	44.6	2.7
300	34.0	106.7	79.0	21.4	17.6	17.8	23.4	31.0	3.0	27.0	25.6	31.0	38.0	34.6	1.0	3.0	48.0	32.4	44.6	2.7

Selection procedure (50VQP096 unit example)

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

Assume cooling load at desired dry bulb 80 F and wet bulb 65 F conditions are as follows:

Given:

Total Cooling (TC). . . . . .95,100 Btuh

Sensible Cooling (SC) . . . . . .70,000 Btuh

Entering-Air Temperature db . . . . . .80 F

Entering-Air Temperature wb . . . . . .65 F

II Determine the following design parameters.

Entering water temperature, water flow rate (gpm), airflow (cfm), water flow pressure drop and design wet and dry bulb temperatures. 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. Enter the appropriate Performance Data tables and find the proper indicated water flow and water temperature.

For example:

Entering Water Temp . . . . . .85 F

Water Flow . . . . . 24 gpm

Airflow cfm . . . . . .2800 cfm (350 cfm per ton)

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 tables at the design water flow and water temperature. Read the total and sensible cooling capacities.

NOTE: Interpolation is permissible, extrapolation is not.

For example:

Enter the 50VQP096 Performance Table at design water flow and water temperature. Read Total Cooling, Sensible Cooling and Heat of Rejection capacities:

Total Cooling . . . . . .95,900 Btuh

Sensible Cooling . . . . . .68,800 Btuh

Heat of Rejection . . . . . .118,600 Btuh

NOTE: It is quite 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 Corrections Factor tables found in this book.

Using the following formulas to determine the correction factors of dry bulb and wet bulb:

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.

V Determine entering air and airflow correction using the Corrections Factor tables found in this book.

The nominal airflow for the 50VQP096 is 3200 cfm. The design parameter is 2800 cfm.

2800/3200 = 88% of nominal airflow:

Use the 88% row in the Airflow Correction Table.

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

	Table		Ent Air		Airflow		Corrected
Corrected Total Cooling	= 95,900	x	0.975	x	0.982	=	91,819
Corrected Sensible Cooling	= 68,800	x	1.096	x	0.940	=	70,881
Corrected Heat of Rejection	= 118,600	x	0.979	x	0.980	=	113,787

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 Water temperature rise calculation and assessment.

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

$$\text{Actual Temperature Rise} = \frac{\text{Correction of Heat of Rejection}}{\text{gpm x 500}}$$

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

$$\text{Actual Temperature Rise} = \frac{113{,}787}{24 \times 500} = 9.5 \text{ F}$$

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.

VII ARI/ISO/ASHRAE 13256-1 Conversion

Performance standard ARI/ISO/ASHRAE 13256-1 became effective on January 1, 2000 and replaced the existing ARI Standards 320 Water-Loop Heat Pumps (WLHP), 325 Ground-Water Heat Pumps (GWHP), and 330 Ground-Loop Heat Pumps (GLHP).

The ARI/ISO Standard incorporates a consistent rating methodology for including fan and pump energy for calculating cooling capacity, heating capacity, and energy efficiency ratios (EER). This simplifies the use of rating data for heat pump performance modeling in seasonal energy analysis calculations, and allows for direct rating comparisons across applications.

a) ISO Capacity and Efficiency Equations

The following equations are used to calculate and correct cooling capacity, heating capacity, and respective EER:

ISO Cooling Capacity = (Cooling Capacity in Btuh) + (Fan Power Correction in Watts x 3.412)

ISO Cooling EER = (ISO Cooling Capacity in Btuh/3.412)/(Power Input in watts – fan power correction in watts + pump power correction in watts) = Watts/Watts

NOTE: Do not divide ISO Cooling Capacity by 3.412 to obtain Btuh/Watts.

ISO Heating Capacity = (Heating Capacity in Btuh) – (Fan Power Correction in Watts x 3.412)

ISO Heating EER = (ISO Heating Capacity in Btuh/3.412)/(Power Input in watts – fan power correction in watts + pump power correction in watts) = Watts/Watts

NOTE: Do not divide ISO Heating Capacity by 3.412 to obtain Btuh/Watts.

b) Identify the design conditions corrected for air and water conditions.

Airflow cfm = 2800 cfm

Water Flow
(Based upon 12 F rise in temp) = 24 gpm

External Static Pressure = 0.4 in. wg

Water Pressure Drop = 20 ft of head

Power input = 6,600 watts

Cooling Capacity = 91,819 Btuh

c) Perform Fan Power Correction Adjustment

Use the following formula to calculate Fan Power Correction:

Fan Power Correction = (cfm x 0.472) x (External Static Pressure x 249)/300 = Watts
= (2800 x 0.472) x (0.4 x 249)/300
= 439 Watts

d) Perform Pump Power Correction Adjustment

Use the following formula to calculate Pump Power Correction:

Pump Power Correction = (gpm x 0.0631) x (Pressure Drop x 2,990)/300
= Watts
= (24 x 0.0631) x (20 x 2,990)/300
= 302 Watts

e) Perform capacity and EER calculations

Use the following formula to calculate capacity and EER:

ISO Cooling Capacity = (Cooling Capacity) + (Fan Power Correction x 3.412)
= 91,819 + (439 x 3.412)
= 93,317 Btuh

f) Perform Corrections by using the ISO Equations

ISO EER = (ISO Cooling Capacity/3.412)/(Power Input – Fan Power Correction + Pump Power Correction)
= Watts/Watts

NOTE: Do not divide ISO Cooling Capacity by 3.412 to obtain Btuh/Watts.

= (93,317/3.412)/(6,600 – 439 + 302)
= 4.23 Watts/Watt
= 14.4 Btuh/Watt

Performance data

50VQP084

2800 CFM NOMINAL AIRFLOW

EWT (F)	GPM	WPD*		COOLING CAPACITY, EAT 80/67 F					HEATING CAPACITY, EAT 70 F				
		psig	ft wg	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	21.00	10.0	23.1	Operation Not Recommended					58.0	5.3	39.7	86.7	3.2
30	10.50	2.4	5.5	81.7	57.1	3.8	94.7	21.4	63.2	5.5	44.5	89.9	3.4
	15.75	5.5	12.6	77.1	53.5	3.5	89.1	22.0	65.8	5.6	46.9	90.8	3.5
	21.00	9.2	21.3	74.5	51.5	3.4	86.0	22.1	67.3	5.6	48.2	91.2	3.5
40	10.50	2.1	4.9	86.4	61.0	4.3	101.1	20.2	72.6	5.7	53.0	93.2	3.7
	15.75	5.0	11.4	84.0	58.8	4.0	97.6	21.0	76.0	5.8	56.1	94.3	3.8
	21.00	8.4	19.5	82.3	57.5	3.9	95.5	21.3	77.9	5.9	57.9	95.0	3.9
50	10.50	2.0	4.5	88.0	62.8	4.7	104.1	18.7	82.7	6.0	62.2	96.4	4.0
	15.75	4.6	10.7	87.3	61.8	4.4	102.4	19.7	87.0	6.1	66.1	97.8	4.2
	21.00	7.9	18.4	86.5	61.1	4.3	101.2	20.1	89.4	6.2	68.3	98.6	4.2
60	10.50	1.3	3.1	87.0	62.8	5.1	104.5	17.0	93.3	6.3	71.8	100.2	4.3
	15.75	3.6	8.3	87.6	62.7	4.8	104.1	18.1	98.2	6.4	76.3	101.8	4.5
	21.00	6.5	14.9	87.6	62.4	4.7	103.7	18.6	100.9	6.5	78.8	102.7	4.6
70	10.50	1.2	2.8	84.8	62.2	5.6	103.8	15.2	103.7	6.6	81.3	103.9	4.6
	15.75	3.4	7.8	86.4	62.7	5.3	104.4	16.4	109.2	6.7	86.2	105.7	4.8
	21.00	6.2	14.2	87.0	62.8	5.1	104.5	17.0	112.1	6.8	88.9	106.7	4.8
80	10.50	1.1	2.6	81.9	61.0	6.1	102.6	13.5	113.8	6.9	90.4	107.2	4.9
	15.75	3.1	7.3	84.2	61.9	5.7	103.7	14.7	119.4	7.0	95.5	109.1	5.0
	21.00	5.8	13.5	85.2	62.3	5.6	104.2	15.3	122.2	7.1	98.0	110.0	5.0
85	10.50	1.1	2.5	79.9	60.1	6.3	101.5	12.7	118.4	7.0	94.6	108.7	5.0
	15.75	3.1	7.2	82.3	61.1	6.0	102.8	13.8	123.8	7.2	99.4	110.5	5.1
	21.00	5.7	13.3	83.4	61.5	5.8	103.3	14.4	126.5	7.2	101.8	111.4	5.1
90	10.50	1.1	2.4	77.8	59.3	6.6	100.3	11.8	123.0	7.1	98.7	110.3	5.1
	10.50	1.1	2.4	80.5	60.4	6.2	101.8	12.9	128.2	7.3	103.3	112.0	5.2
	21.00	5.7	13.1	81.7	60.9	6.1	102.4	13.5	130.7	7.4	105.5	112.8	5.2
100	10.50	1.0	2.3	73.5	57.5	7.2	98.2	10.2	Operation Not Recommended				
	15.75	2.9	6.8	76.2	58.6	6.8	99.5	11.2					
	21.00	5.5	12.8	77.6	59.2	6.6	100.2	11.7					
110	10.50	0.9	2.1	69.2	55.8	8.0	96.4	8.7					
	15.75	2.8	6.5	71.8	56.8	7.5	97.4	9.6					
	21.00	5.4	12.4	73.2	57.4	7.3	98.0	10.1					
120	10.50	0.9	2.0	65.3	54.6	8.8	95.5	7.4					
	15.75	2.7	6.3	67.6	55.3	8.3	95.9	8.1					
	21.00	5.2	12.1	68.8	55.7	8.0	96.3	8.6					

LEGEND

COP — Coefficient of Performance
Cv — Coefficient of Velocity
EAT — Entering Air Temperature (F)
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature (F)
HC — Heating Capacity (MBtuh)
HE — Heat of Extraction (MBtuh)
HR — Heat of Rejection (MBtuh)
kW — Total Power (Kilowatts)
MBtuh — Btuh in Thousands
MOPD — Maximum Opening Pressure Difference
LAT — Leaving Air Temperature (F)
SC — Sensible Cooling Capacity (MBtuh)
TC — Total Cooling Capacity (MBtuh)
WPD — Water Pressure Differential

NOTES:

1. Interpolation is permissable, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See performance correction tables for operating conditions other than those listed above.
5. For operation in the shaded area when water is used in lieu of an antifreeze solution, the LWT (leaving water temperature) must be calculated. Flow must be maintained to a level so that the LWT is maintained above 42 F when the JW3 jumper is not clipped. Because the refrigerant temperature can potentially reach as low as 32 F with 40 F LWT, a nuisance cutout could occur due to the activation of the low temperature protection. The JW3 jumper should never be clipped for standard range equipment or systems without antifreeze.

***WPD ADDER FOR MOTORIZED WATER VALVE, 50VQP084 UNIT (Cv = 37, MOPD = 150 psig)**

GPM	WPD Adder	
	PSIG	FT
10.50	0.08	0.2
15.75	0.18	0.4
21.00	0.32	0.7

50VQP096

3200 CFM NOMINAL AIRFLOW

EWT (F)	GPM	WPD*		COOLING CAPACITY, EAT 80/67 F					HEATING CAPACITY, EAT 70 F				
		psig	ft wg	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	24	14.1	32.6	Operation Not Recommended					64.6	6.2	43.3	88.3	3.0
30	12	3.8	8.7	89.1	62.2	3.9	102.5	22.8	71.0	6.4	49.2	90.2	3.3
	18	8.0	18.6	79.1	54.9	3.2	90.0	24.7	74.1	6.5	52.0	91.1	3.4
	24	13.0	29.9	73.7	51.1	2.9	83.5	25.8	75.8	6.5	53.5	91.5	3.4
40	12	3.4	7.8	99.8	69.8	4.9	116.4	20.5	82.0	6.7	59.1	93.3	3.6
	18	7.2	16.7	94.6	66.1	4.3	109.4	21.8	85.9	6.8	62.7	94.5	3.7
	24	11.8	27.2	91.2	63.6	4.1	105.1	22.5	88.1	6.9	64.7	95.1	3.8
50	12	3.1	7.2	103.1	72.3	5.5	121.8	18.8	93.7	7.0	69.6	96.7	3.9
	18	6.8	15.6	101.6	71.1	5.1	119.0	19.9	98.5	7.2	74.0	98.1	4.0
	24	11.2	25.9	100.1	70.0	4.9	116.8	20.5	101.1	7.2	76.5	98.8	4.1
60	12	2.4	5.6	102.2	72.0	6.0	122.6	17.1	105.9	7.4	80.6	100.4	4.2
	18	5.6	12.9	103.2	72.5	5.7	122.5	18.3	111.6	7.5	85.8	102.0	4.3
	24	9.6	22.2	103.2	72.3	5.5	121.9	18.8	114.7	7.6	88.7	103.0	4.4
70	12	2.3	5.2	98.7	70.1	6.4	120.6	15.4	118.2	7.7	91.8	104.1	4.5
	18	5.3	12.2	101.2	71.5	6.1	122.1	16.6	124.7	7.9	97.7	106.0	4.6
	24	9.2	21.2	102.2	72.0	6.0	122.5	17.1	128.3	8.0	100.9	107.0	4.7
80	12	2.1	4.8	93.7	67.6	6.9	117.1	13.6	130.4	8.1	102.8	107.6	4.7
	18	5.0	11.5	97.0	69.3	6.6	119.4	14.8	137.5	8.3	109.2	109.7	4.9
	24	8.7	20.2	98.5	70.1	6.4	120.4	15.4	141.3	8.4	112.7	110.8	4.9
85	12	2.1	4.8	90.9	66.3	7.1	115.3	12.8	136.3	8.3	108.1	109.4	4.8
	18	4.9	11.3	94.3	67.9	6.8	117.5	13.9	143.6	8.5	114.7	111.5	5.0
	24	8.6	20.0	95.9	68.8	6.6	118.6	14.5	147.5	8.6	118.2	112.7	5.0
90	12	2.0	4.7	88.1	65.0	7.4	113.5	11.9	142.2	8.4	113.5	111.1	4.9
	18	4.8	11.2	91.5	66.6	7.1	115.6	13.0	149.8	8.7	120.2	113.3	5.1
	24	8.6	19.8	93.3	67.5	6.9	116.8	13.6	153.8	8.8	123.7	114.5	5.1
100	12	1.9	4.5	83.2	63.2	8.1	110.9	10.2	Operation Not Recommended				
	18	4.7	10.9	86.2	64.2	7.7	112.4	11.2					
	24	8.4	19.4	87.9	64.9	7.5	113.3	11.8					
110	12	1.9	4.3	79.5	62.7	9.1	110.5	8.8					
	18	4.6	10.5	81.6	62.8	8.5	110.5	9.6					
	24	8.2	18.9	82.9	63.1	8.2	110.9	10.1					
120	12	1.8	4.1	78.3	65.0	10.4	113.8	7.5					
	18	4.4	10.2	78.7	63.2	9.5	111.2	8.3					
	24	8.0	18.5	79.3	62.8	9.2	110.6	8.7					

LEGEND

COP — Coefficient of Performance
Cv — Coefficient of Velocity
EAT — Entering Air Temperature (F)
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature (F)
HC — Heating Capacity (MBtuh)
HE — Heat of Extraction (MBtuh)
HR — Heat of Rejection (MBtuh)
kW — Total Power (Kilowatts)
MBtuh — Btuh in Thousands
MOPD — Maximum Opening Pressure Difference
LAT — Leaving Air Temperature (F)
SC — Sensible Cooling Capacity (MBtuh)
TC — Total Cooling Capacity (MBtuh)
WPD — Water Pressure Differential

NOTES:
1. Interpolation is permissable, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See performance correction tables for operating conditions other than those listed above.
5. For operation in the shaded area when water is used in lieu of an antifreeze solution, the LWT (leaving water temperature) must be calculated. Flow must be maintained to a level so that the LWT is maintained above 42 F when the JW3 jumper is not clipped. Because the refrigerant temperature can potentially reach as low as 32 F with 40 F LWT, a nuisance cutout could occur due to the activation of the low temperature protection. The JW3 jumper should never be clipped for standard range equipment or systems without antifreeze.

***WPD ADDER FOR MOTORIZED WATER VALVE, 50VQP096 UNIT (Cv = 37, MOPD = 150 psig)**

GPM	WPD Adder	
	PSIG	FT
12	0.11	0.3
18	0.24	0.5
24	0.42	1.0

Performance data (cont)

50VQP120

4000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	WPD*		COOLING CAPACITY, EAT 80/67 F					HEATING CAPACITY, EAT 70 F				
		psig	ft wg	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	30.0	10.2	23.5	Operation Not Recommended					82.0	7.7	55.7	88.6	3.1
30	15.0	2.1	4.8	142.3	97.1	6.3	163.6	22.8	88.8	7.9	61.9	90.2	3.3
	22.5	5.3	12.2	144.2	97.0	6.0	164.7	24.1	92.1	7.9	65.0	90.9	3.4
	30.0	9.4	21.6	144.9	96.7	5.9	164.9	24.7	93.9	8.0	66.7	91.4	3.4
40	15.0	1.9	4.3	138.6	96.0	6.6	161.3	20.8	100.9	8.1	73.1	93.0	3.6
	22.5	4.8	11.1	141.5	96.9	6.3	163.2	22.3	105.4	8.2	77.3	94.0	3.7
	30.0	8.6	19.8	142.7	97.1	6.2	163.9	23.0	107.8	8.3	79.5	94.6	3.8
50	15.0	1.7	4.0	133.9	94.0	7.1	158.1	18.8	114.4	8.5	85.6	96.0	4.0
	22.5	4.4	10.1	137.5	95.6	6.8	160.6	20.3	120.0	8.6	90.8	97.3	4.1
	30.0	8.1	18.8	139.1	96.2	6.6	161.7	21.0	123.1	8.6	93.7	98.1	4.2
60	15.0	1.3	3.0	128.4	91.4	7.6	154.4	16.8	129.7	8.8	99.7	99.6	4.3
	22.5	3.7	8.6	132.4	93.3	7.3	157.1	18.2	136.4	8.9	106.0	101.1	4.5
	30.0	7.0	16.2	134.3	94.2	7.1	158.5	19.0	140.2	9.0	109.5	102.0	4.6
70	15.0	1.2	2.7	122.1	88.2	8.2	150.2	14.8	145.5	9.1	114.4	103.2	4.7
	22.5	3.5	8.1	126.4	90.3	7.8	153.1	16.2	153.4	9.3	121.7	105.0	4.8
	30.0	6.7	15.4	128.5	91.3	7.6	154.5	16.9	157.7	9.4	125.7	106.0	4.9
80	15.0	1.1	2.4	115.4	85.0	9.0	145.9	12.9	160.5	9.4	128.2	106.6	5.0
	22.5	3.3	7.6	119.6	87.0	8.5	148.5	14.1	169.1	9.6	136.2	108.6	5.1
	30.0	6.4	14.7	121.8	88.1	8.2	149.9	14.8	173.8	9.8	140.5	109.7	5.2
85	15.0	1.1	2.4	111.9	83.5	9.4	143.8	12.0	169.9	9.7	136.8	109.0	5.1
	22.5	3.2	7.4	116.2	85.5	8.9	146.4	13.2	174.6	9.5	142.0	110.6	5.4
	30.0	6.3	14.4	118.3	86.5	8.6	147.7	13.8	177.2	9.5	144.8	111.4	5.5
90	15.0	1.0	2.3	108.5	81.9	9.8	141.7	11.1	179.4	10.0	145.3	111.4	5.3
	22.5	3.2	7.4	112.7	83.9	9.2	144.2	12.2	180.0	9.4	147.8	112.5	5.6
	30.0	6.2	14.3	114.9	84.9	9.0	145.5	12.8	180.5	9.2	149.1	113.1	5.8
100	15.0	0.9	2.2	102.1	79.3	10.7	138.5	9.6	Operation Not Recommended				
	22.5	3.1	7.2	106.1	80.9	10.1	140.5	10.5					
	30.0	6.0	13.9	108.2	81.8	9.8	141.6	11.0					
110	15.0	0.9	2.0	96.1	77.2	11.7	136.1	8.2					
	22.5	3.0	6.9	99.7	78.4	11.1	137.5	9.0					
	30.0	5.8	13.4	101.7	79.1	10.8	138.4	9.5					
120	15.0	0.8	1.9	90.6	76.0	12.9	134.7	7.0					
	22.5	2.9	6.7	93.8	76.6	12.2	135.4	7.7					
	30.0	5.6	13.0	95.5	77.0	11.8	135.9	8.1					

LEGEND

COP — Coefficient of Performance
Cv — Coefficient of Velocity
EAT — Entering Air Temperature (F)
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature (F)
HC — Heating Capacity (MBtuh)
HE — Heat of Extraction (MBtuh)
HR — Heat of Rejection (MBtuh)
kW — Total Power (Kilowatts)
MBtuh — Btuh in Thousands
MOPD — Maximum Opening Pressure Difference
LAT — Leaving Air Temperature (F)
SC — Sensible Cooling Capacity (MBtuh)
TC — Total Cooling Capacity (MBtuh)
WPD — Water Pressure Differential

NOTES:

1. Interpolation is permissable, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See performance correction tables for operating conditions other than those listed above.
5. For operation in the shaded area when water is used in lieu of an antifreeze solution, the LWT (leaving water temperature) must be calculated. Flow must be maintained to a level so that the LWT is maintained above 42 F when the JW3 jumper is not clipped. Because the refrigerant temperature can potentially reach as low as 32 F with 40 F LWT, a nuisance cutout could occur due to the activation of the low temperature protection. The JW3 jumper should never be clipped for standard range equipment or systems without antifreeze.

***WPD ADDER FOR MOTORIZED WATER VALVE, 50VQP120 UNIT (Cv = 37, MOPD = 150 psig)**

GPM	WPD Adder	
	PSIG	FT
15.0	0.16	0.4
22.5	0.37	0.9
30.0	0.66	1.5

50VQP150

5000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	WPD*		COOLING CAPACITY, EAT 80/67 F					HEATING CAPACITY, EAT 70 F				
		psig	ft wg	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	38	12.0	27.6	Operation Not Recommended					105.5	10.3	70.5	89.0	3.0
30	19	2.7	6.3	175.0	131.8	8.3	203.4	21.0	115.1	10.5	79.1	90.7	3.2
	28	6.2	14.3	173.8	138.0	7.9	200.8	21.9	119.5	10.7	83.1	91.5	3.3
	38	11.0	25.4	172.3	141.6	7.7	198.6	22.4	122.2	10.7	85.5	92.0	3.3
40	19	2.3	5.4	173.5	123.9	8.9	204.0	19.4	131.5	11.0	94.0	93.7	3.5
	28	5.6	12.8	174.8	129.0	8.5	203.9	20.6	137.2	11.1	99.2	94.8	3.6
	38	10.0	23.2	174.9	132.2	8.3	203.1	21.1	140.7	11.2	102.5	95.4	3.7
50	19	2.1	4.9	169.2	117.6	9.5	201.8	17.8	149.0	11.4	110.1	96.9	3.8
	28	5.2	12.0	172.4	121.6	9.1	203.4	19.0	156.0	11.5	116.6	98.2	4.0
	38	9.5	21.9	173.6	124.2	8.9	203.9	19.6	160.3	11.6	120.6	99.0	4.0
60	19	1.7	3.8	163.0	112.7	10.2	197.7	16.0	167.9	11.8	127.5	100.5	4.2
	28	4.3	9.9	167.3	115.8	9.7	200.5	17.2	176.1	12.0	135.1	102.0	4.3
	38	8.0	18.5	169.5	117.8	9.5	201.8	17.9	181.1	12.1	139.7	103.0	4.4
70	19	1.5	3.5	155.5	108.5	11.0	192.9	14.2	187.1	12.3	145.1	104.2	4.5
	28	4.1	9.4	160.6	111.0	10.4	196.2	15.4	196.3	12.5	153.6	105.9	4.6
	38	7.7	17.8	163.3	112.6	10.2	198.0	16.1	201.9	12.7	158.7	106.9	4.7
80	19	1.4	3.2	147.2	104.9	11.8	187.6	12.4	205.2	12.7	161.7	107.5	4.7
	28	3.8	8.8	152.6	107.1	11.3	191.0	13.5	215.0	13.0	170.6	109.4	4.8
	38	7.4	17.0	155.6	108.4	11.0	193.0	14.2	220.8	13.2	175.8	110.4	4.9
85	19	1.4	3.1	142.9	103.2	12.4	185.0	11.6	213.8	13.0	169.5	109.1	4.8
	28	3.8	8.7	148.2	105.3	11.8	188.3	12.7	223.7	13.3	178.3	111.0	4.9
	38	7.3	16.7	151.3	106.5	11.4	190.2	13.3	229.3	13.5	183.3	112.0	5.0
90	19	1.3	3.0	138.6	101.6	12.9	182.4	10.8	222.4	13.2	177.3	110.7	4.9
	28	3.7	8.5	143.9	103.5	12.2	185.6	11.8	232.3	13.6	186.0	112.5	5.0
	38	7.2	16.6	146.9	104.7	11.9	187.5	12.4	237.9	13.8	190.9	113.6	5.1
100	19	1.2	2.9	130.3	98.4	14.0	178.1	9.3	Operation Not Recommended				
	28	3.6	8.2	135.2	100.3	13.3	180.6	10.2					
	38	7.0	16.1	138.1	101.4	12.9	182.2	10.7					
110	19	1.2	2.7	123.0	95.5	15.4	175.4	8.0					
	28	3.4	7.9	127.2	97.2	14.5	176.8	8.7					
	38	6.8	15.6	129.8	98.2	14.1	177.9	9.2					
120	19	1.1	2.5	117.3	93.0	17.0	175.2	6.9					
	28	3.3	7.7	120.4	94.4	16.0	175.0	7.5					
	38	6.5	15.1	122.4	95.3	15.5	175.3	7.9					

LEGEND

COP — Coefficient of Performance
Cv — Coefficient of Velocity
EAT — Entering Air Temperature (F)
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature (F)
HC — Heating Capacity (MBtuh)
HE — Heat of Extraction (MBtuh)
HR — Heat of Rejection (MBtuh)
kW — Total Power (Kilowatts)
MBtuh — Btuh in Thousands
MOPD — Maximum Opening Pressure Difference
LAT — Leaving Air Temperature (F)
SC — Sensible Cooling Capacity (MBtuh)
TC — Total Cooling Capacity (MBtuh)
WPD — Water Pressure Differential

NOTES:
1. Interpolation is permissable, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See performance correction tables for operating conditions other than those listed above.
5. For operation in the shaded area when water is used in lieu of an antifreeze solution, the LWT (leaving water temperature) must be calculated. Flow must be maintained to a level so that the LWT is maintained above 42 F when the JW3 jumper is not clipped. Because the refrigerant temperature can potentially reach as low as 32 F with 40 F LWT, a nuisance cutout could occur due to the activation of the low temperature protection. The JW3 jumper should never be clipped for standard range equipment or systems without antifreeze.

***WPD ADDER FOR MOTORIZED WATER VALVE, 50VQP150 UNIT (Cv = 57, MOPD = 150 psig)**

GPM	WPD Adder	
	PSIG	FT
19	0.11	0.3
28	0.24	0.6
38	0.44	1.0

Performance data (cont)

50VQP168

5600 CFM NOMINAL AIRFLOW

EWT (F)	GPM	WPD*		COOLING CAPACITY, EAT 80/67 F					HEATING CAPACITY, EAT 70 F				
		psig	ft wg	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	42.0	11.3	26.0	Operation Not Recommended					116.0	10.7	79.5	86.7	3.2
30	21.0	2.7	6.2	163.5	114.1	7.6	189.5	21.3	126.5	11.0	89.1	88.4	3.4
	31.5	6.1	14.2	154.3	107.0	7.0	178.2	21.9	131.7	11.1	93.7	89.2	3.4
	42.0	10.4	24.0	149.0	103.1	6.7	172.0	22.0	134.5	11.2	96.4	89.6	3.5
40	21.0	2.4	5.5	172.9	122.0	8.6	202.1	20.1	145.2	11.5	106.0	91.3	3.7
	31.5	5.6	12.9	167.9	117.7	8.0	195.2	20.9	152.0	11.7	112.3	92.4	3.8
	42.0	9.5	21.9	164.6	115.0	7.7	191.0	21.2	155.9	11.8	115.8	93.1	3.9
50	21.0	2.2	5.1	176.0	125.6	9.4	208.1	18.6	165.5	12.0	124.5	94.6	4.0
	31.5	5.2	12.0	174.5	123.6	8.9	204.8	19.6	174.0	12.2	132.3	96.0	4.1
	42.0	8.9	20.6	173.0	122.1	8.6	202.4	20.0	178.7	12.4	136.6	96.7	4.2
60	21.0	1.5	3.5	173.9	125.5	10.3	208.9	16.9	186.5	12.6	143.6	98.0	4.3
	31.5	4.0	9.3	175.2	125.3	9.7	208.3	18.0	196.5	12.8	152.7	99.6	4.5
	42.0	7.3	16.8	175.2	124.8	9.4	207.4	18.6	201.9	13.0	157.6	100.4	4.5
70	21.0	1.4	3.2	169.6	124.3	11.2	207.6	15.2	207.5	13.2	162.6	101.3	4.6
	31.5	3.8	8.7	172.8	125.3	10.6	208.8	16.3	218.4	13.5	172.5	103.1	4.8
	42.0	6.9	16.0	174.0	125.6	10.3	209.0	16.9	224.2	13.6	177.7	104.0	4.8
80	21.0	1.3	2.9	163.8	122.0	12.1	205.1	13.4	227.6	13.7	180.9	104.6	4.9
	31.5	3.5	8.2	168.3	123.8	11.5	207.5	14.6	238.8	14.0	190.9	106.4	5.0
	42.0	6.6	15.2	170.4	124.6	11.2	208.5	15.2	244.6	14.2	196.0	107.3	5.0
85	21.0	1.3	2.8	159.7	120.2	12.7	202.9	12.6	236.8	14.0	189.1	106.1	5.0
	31.5	3.5	8.0	164.6	122.3	12.0	205.5	13.7	247.6	14.3	198.8	107.8	5.1
	42.0	6.5	15.0	166.9	123.2	11.7	206.7	14.3	252.9	14.5	203.5	108.6	5.1
90	21.0	1.2	2.7	155.6	118.5	13.2	200.7	11.7	246.0	14.3	197.4	107.5	5.1
	31.5	3.4	7.9	160.9	120.7	12.5	203.5	12.8	256.4	14.6	206.7	109.2	5.1
	42.0	6.4	14.8	163.4	121.8	12.1	204.9	13.4	261.4	14.8	211.1	110.0	5.2
100	21.0	1.1	2.6	147.0	114.9	14.5	196.3	10.1	Operation Not Recommended				
	31.5	3.3	7.6	152.5	117.2	13.7	199.1	11.1					
	42.0	6.2	14.4	155.2	118.3	13.3	200.5	11.6					
110	21.0	1.0	2.4	138.4	111.6	15.9	192.8	8.6					
	31.5	3.2	7.3	143.7	113.6	15.0	194.9	9.5					
	42.0	6.1	14.0	146.4	114.7	14.6	196.1	10.0					
120	21.0	1.0	2.2	130.6	109.2	17.7	191.0	7.3					
	31.5	3.0	7.0	135.2	110.5	16.6	191.8	8.1					
	42.0	5.9	13.6	137.7	111.4	16.1	192.6	8.5					

LEGEND

COP — Coefficient of Performance
Cv — Coefficient of Velocity
EAT — Entering Air Temperature (F)
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature (F)
HC — Heating Capacity (MBtuh)
HE — Heat of Extraction (MBtuh)
HR — Heat of Rejection (MBtuh)
kW — Total Power (Kilowatts)
MBtuh — Btuh in Thousands
MOPD — Maximum Opening Pressure Difference
LAT — Leaving Air Temperature (F)
SC — Sensible Cooling Capacity (MBtuh)
TC — Total Cooling Capacity (MBtuh)
WPD — Water Pressure Differential

NOTES:

1. Interpolation is permissable, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See performance correction tables for operating conditions other than those listed above.
5. For operation in the shaded area when water is used in lieu of an antifreeze solution, the LWT (leaving water temperature) must be calculated. Flow must be maintained to a level so that the LWT is maintained above 42 F when the JW3 jumper is not clipped. Because the refrigerant temperature can potentially reach as low as 32 F with 40 F LWT, a nuisance cutout could occur due to the activation of the low temperature protection. The JW3 jumper should never be clipped for standard range equipment or systems without antifreeze.

***WPD ADDER FOR MOTORIZED WATER VALVE, 50VQP168 UNIT (Cv = 37, MOPD = 150 psig)**

GPM	WPD Adder	
	PSIG	FT
21.0	0.08	0.2
31.5	0.18	0.4
42.0	0.32	0.7

50VQP192
6400 CFM NOMINAL AIRFLOW

EWT (F)	GPM	WPD*		COOLING CAPACITY, EAT 80/67 F					HEATING CAPACITY, EAT 70 F				
		psig	ft wg	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	48	15.9	36.7	Operation Not Recommended					129.2	12.5	86.6	86.4	3.0
30	24	4.2	9.8	178.3	124.3	7.8	205.0	22.8	142.1	12.8	98.5	88.3	3.2
	36	9.0	20.9	158.1	109.8	6.4	180.0	24.7	148.2	13.0	104.0	89.1	3.3
	48	14.6	33.7	147.4	102.1	5.7	166.9	25.8	151.5	13.0	107.0	89.6	3.4
40	24	3.8	8.7	199.6	139.6	9.7	232.7	20.5	164.0	13.4	118.3	91.4	3.6
	36	8.1	18.8	189.3	132.1	8.7	218.9	21.8	171.9	13.6	125.4	92.5	3.7
	48	13.3	30.6	182.5	127.2	8.1	210.2	22.5	176.2	13.7	129.3	93.1	3.7
50	24	3.5	8.1	206.1	144.7	11.0	243.6	18.7	187.3	14.1	139.3	94.7	3.9
	36	7.6	17.6	203.2	142.3	10.2	238.0	19.9	196.9	14.3	148.1	96.1	4.0
	48	12.6	29.1	200.2	140.0	9.8	233.5	20.4	202.3	14.5	152.9	96.8	4.1
60	24	2.7	6.3	204.4	144.1	11.9	245.1	17.0	211.7	14.8	161.3	98.1	4.2
	36	6.3	14.5	206.5	144.9	11.3	245.0	18.2	223.1	15.1	171.7	99.7	4.4
	48	10.8	24.9	206.4	144.7	11.0	243.8	18.7	229.4	15.2	177.4	100.6	4.4
70	24	2.6	5.9	197.4	140.3	12.8	241.1	15.3	236.5	15.5	183.6	101.6	4.5
	36	6.0	13.8	202.5	143.0	12.2	244.2	16.4	249.5	15.8	195.4	103.4	4.6
	48	10.3	23.8	204.4	143.9	11.9	245.1	17.0	256.6	16.0	201.8	104.4	4.7
80	24	2.4	5.5	187.4	135.1	13.7	234.3	13.6	260.7	16.2	205.6	105.0	4.8
	36	5.6	13.0	194.0	138.5	13.1	238.7	14.7	275.0	16.6	218.4	107.0	4.9
	48	9.8	22.7	197.0	140.1	12.8	240.8	15.3	282.7	16.8	225.3	108.1	5.0
85	24	2.4	5.4	181.8	132.6	14.3	230.6	12.7	272.6	16.5	216.2	106.7	4.9
	36	5.6	12.8	188.5	135.9	13.6	235.0	13.8	287.2	17.0	229.4	108.8	5.0
	48	9.7	22.4	191.8	137.5	13.3	237.2	14.4	295.1	17.2	236.4	109.9	5.1
90	24	2.3	5.3	176.3	130.1	14.8	226.9	11.8	284.4	16.9	226.9	108.4	5.0
	36	5.5	12.6	183.1	133.3	14.1	231.2	12.9	299.5	17.3	240.3	110.5	5.1
	48	9.6	22.3	186.6	135.0	13.8	233.5	13.5	307.5	17.6	247.4	111.6	5.2
100	24	2.2	5.1	166.4	126.3	16.3	221.9	10.2	Operation Not Recommended				
	36	5.3	12.2	172.4	128.5	15.3	224.8	11.2					
	48	9.4	21.8	175.8	129.9	14.9	226.7	11.7					
110	24	2.1	4.9	159.0	125.4	18.1	220.9	8.7					
	36	5.1	11.9	163.2	125.6	16.9	220.9	9.6					
	48	9.2	21.3	165.8	126.2	16.4	221.7	10.1					
120	24	2.0	4.7	156.6	130.1	20.8	227.6	7.5					
	36	5.0	11.5	157.4	126.4	19.1	222.4	8.2					
	48	9.0	20.8	158.7	125.6	18.3	221.3	8.6					

LEGEND

COP — Coefficient of Performance
Cv — Coefficient of Velocity
EAT — Entering Air Temperature (F)
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature (F)
HC — Heating Capacity (MBtuh)
HE — Heat of Extraction (MBtuh)
HR — Heat of Rejection (MBtuh)
kW — Total Power (Kilowatts)
MBtuh — Btuh in Thousands
MOPD — Maximum Opening Pressure Difference
LAT — Leaving Air Temperature (F)
SC — Sensible Cooling Capacity (MBtuh)
TC — Total Cooling Capacity (MBtuh)
WPD — Water Pressure Differential

NOTES:
1. Interpolation is permissable, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See performance correction tables for operating conditions other than those listed above.
5. For operation in the shaded area when water is used in lieu of an antifreeze solution, the LWT (leaving water temperature) must be calculated. Flow must be maintained to a level so that the LWT is maintained above 42 F when the JW3 jumper is not clipped. Because the refrigerant temperature can potentially reach as low as 32 F with 40 F LWT, a nuisance cutout could occur due to the activation of the low temperature protection. The JW3 jumper should never be clipped for standard range equipment or systems without antifreeze.

***WPD ADDER FOR MOTORIZED WATER VALVE, 50VQP192 UNIT (Cv = 37, MOPD = 150 psig)**

GPM	WPD Adder	
	PSIG	FT
24	0.11	0.3
36	0.24	0.5
48	0.42	1.0

Performance data (cont)

50VQP240

8000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	WPD*		COOLING CAPACITY, EAT 80/67 F					HEATING CAPACITY, EAT 70 F				
		psig	ft wg	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	60	11.4	26.4	Operation Not Recommended					164.1	15.5	111.3	86.7	3.1
30	30	2.4	5.4	284.5	194.1	12.5	327.2	22.8	177.5	15.7	123.8	88.3	3.3
	45	5.9	13.7	288.5	194.0	12.0	329.4	24.1	184.1	15.9	129.9	89.0	3.4
	60	10.5	24.3	289.9	193.3	11.7	329.9	24.7	187.8	16.0	133.3	89.4	3.4
40	30	2.1	4.9	277.2	192.1	13.3	322.6	20.8	201.9	16.3	146.3	91.0	3.6
	45	5.4	12.5	283.0	193.8	12.7	326.4	22.3	210.7	16.5	154.5	92.1	3.7
	60	9.7	22.3	285.5	194.2	12.4	327.9	23.0	215.6	16.6	159.1	92.6	3.8
50	30	1.9	4.5	267.8	188.1	14.2	316.3	18.8	228.9	16.9	171.2	94.1	4.0
	45	4.9	11.4	274.9	191.1	13.5	321.1	20.2	240.0	17.1	181.6	95.4	4.1
	60	9.2	21.1	278.2	192.3	13.2	323.3	21.0	246.2	17.3	187.4	96.1	4.2
60	30	1.4	3.3	256.7	182.8	15.3	308.8	16.7	259.3	17.6	199.4	97.3	4.3
	45	4.2	9.7	264.8	186.6	14.5	314.3	18.1	272.8	17.8	212.0	98.9	4.5
	60	7.9	18.2	268.6	188.3	14.2	316.9	18.9	280.3	18.0	219.0	99.7	4.6
70	30	1.3	3.0	244.2	176.4	16.5	300.5	14.7	291.1	18.3	228.8	100.7	4.7
	45	3.9	9.1	252.7	180.6	15.6	306.1	16.0	306.8	18.6	243.4	102.4	4.8
	60	7.5	17.4	256.9	182.7	15.2	308.9	16.7	315.4	18.8	251.3	103.4	4.9
80	30	1.2	2.7	230.7	169.9	17.9	291.8	12.8	320.9	18.9	256.5	104.0	5.0
	45	3.7	8.6	239.3	174.1	17.0	297.1	14.0	338.3	19.3	272.5	106.0	5.1
	60	7.2	16.5	243.5	176.2	16.5	299.8	14.7	347.7	19.5	281.0	107.0	5.2
85	30	1.2	2.7	223.8	166.9	18.7	287.7	11.9	339.9	19.4	273.6	105.7	5.1
	45	3.7	8.5	232.3	170.9	17.7	292.7	13.1	349.2	19.1	284.0	107.7	5.2
	60	7.0	16.3	236.6	173.0	17.2	295.4	13.7	354.3	19.0	289.7	108.7	5.3
90	30	1.1	2.6	216.9	163.9	19.5	283.5	11.1	358.8	20.0	290.7	107.3	5.2
	45	3.6	8.3	225.4	167.7	18.5	288.3	12.2	360.1	18.9	295.6	109.4	5.4
	60	7.0	16.1	229.7	169.8	17.9	291.0	12.7	361.0	18.4	298.3	110.4	5.4
100	30	1.1	2.4	204.2	158.6	21.3	277.0	9.5	Operation Not Recommended				
	45	3.5	8.1	212.2	161.8	20.2	281.0	10.5					
	60	6.7	15.6	216.3	163.6	19.6	283.3	11.0					
110	30	1.0	2.3	192.2	154.4	23.4	272.2	8.1					
	45	3.4	7.8	199.5	156.8	22.1	275.0	9.0					
	60	6.5	15.1	203.3	158.3	21.5	276.7	9.4					
120	30	0.9	2.2	181.2	151.9	25.8	269.4	7.0					
	45	3.3	7.6	187.6	153.2	24.4	270.8	7.6					
	60	6.3	14.6	191.0	154.1	23.7	271.8	8.0					

LEGEND

COP — Coefficient of Performance
Cv — Coefficient of Velocity
EAT — Entering Air Temperature (F)
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature (F)
HC — Heating Capacity (MBtuh)
HE — Heat of Extraction (MBtuh)
HR — Heat of Rejection (MBtuh)
kW — Total Power (Kilowatts)
MBtuh — Btuh in Thousands
MOPD — Maximum Opening Pressure Difference
LAT — Leaving Air Temperature (F)
SC — Sensible Cooling Capacity (MBtuh)
TC — Total Cooling Capacity (MBtuh)
WPD — Water Pressure Differential

NOTES:

1. Interpolation is permissable, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See performance correction tables for operating conditions other than those listed above.
5. For operation in the shaded area when water is used in lieu of an antifreeze solution, the LWT (leaving water temperature) must be calculated. Flow must be maintained to a level so that the LWT is maintained above 42 F when the JW3 jumper is not clipped. Because the refrigerant temperature can potentially reach as low as 32 F with 40 F LWT, a nuisance cutout could occur due to the activation of the low temperature protection. The JW3 jumper should never be clipped for standard range equipment or systems without antifreeze.

***WPD ADDER FOR MOTORIZED WATER VALVE, 50VQP240 UNIT (Cv = 37, MOPD = 150 psig)**

GPM	WPD Adder	
	PSIG	FT
30	0.16	0.4
45	0.37	0.9
60	0.66	1.5

50VQP300
10,000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	WPD*		COOLING CAPACITY, EAT 80/67 F					HEATING CAPACITY, EAT 70 F				
		psig	ft wg	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	76	13.5	31.2	Operation Not Recommended					211.0	20.5	141.0	87.1	3.0
30	38	3.1	7.1	350.0	263.5	16.7	406.9	21.0	230.1	21.1	158.2	88.9	3.2
	56	7.0	16.1	347.6	276.0	15.9	401.7	22.0	238.9	21.3	166.1	89.7	3.3
	76	12.4	28.7	344.6	283.3	15.4	397.1	22.4	244.3	21.5	171.0	90.1	3.3
40	38	2.6	6.1	347.1	247.7	17.8	408.0	19.4	262.9	22.0	188.0	91.8	3.5
	56	6.3	14.5	349.7	258.0	17.0	407.7	20.5	274.3	22.2	198.5	92.9	3.6
	76	11.3	26.2	349.8	264.4	16.6	406.2	21.1	281.3	22.4	204.9	93.5	3.7
50	38	2.4	5.6	338.5	235.2	19.1	403.5	17.7	298.0	22.8	220.3	95.0	3.8
	56	5.9	13.6	344.8	243.3	18.2	406.8	18.9	312.0	23.1	233.2	96.3	4.0
	76	10.7	24.7	347.3	248.4	17.7	407.7	19.5	320.6	23.3	241.2	97.1	4.0
60	38	1.9	4.3	325.9	225.3	20.4	395.4	15.9	335.8	23.7	255.0	98.3	4.2
	56	4.8	11.2	334.7	231.6	19.4	401.0	17.1	352.3	24.0	270.3	99.8	4.3
	76	9.1	20.9	338.9	235.6	18.9	403.5	17.8	362.3	24.3	279.5	100.7	4.4
70	38	1.7	4.0	311.0	217.0	21.9	385.7	14.1	374.2	24.6	290.2	101.7	4.5
	56	4.6	10.6	321.2	222.1	20.9	392.5	15.3	392.7	25.0	307.2	103.3	4.6
	76	8.7	20.1	326.6	225.2	20.3	396.0	15.9	403.7	25.3	317.3	104.3	4.7
80	38	1.6	3.6	294.4	209.7	23.7	375.1	12.4	410.4	25.5	323.4	104.9	4.7
	56	4.3	9.9	305.2	214.1	22.5	382.1	13.5	430.1	26.0	341.3	106.7	4.8
	76	8.3	19.2	311.2	216.7	21.9	386.0	14.1	441.6	26.4	351.6	107.7	4.9
85	38	1.6	3.5	285.8	206.4	24.7	370.0	11.5	427.6	26.0	339.0	106.5	4.8
	56	4.3	9.8	296.5	210.6	23.5	376.6	12.6	447.4	26.6	356.7	108.2	4.9
	76	8.2	18.9	302.5	213.1	22.9	380.5	13.2	458.7	27.0	366.7	109.3	5.0
90	38	1.5	3.4	277.1	203.1	25.7	364.9	10.7	444.9	26.5	354.6	108.0	4.9
	56	4.2	9.6	287.8	207.1	24.4	371.2	11.7	464.7	27.1	372.1	109.8	5.0
	76	8.1	18.7	293.9	209.4	23.8	375.0	12.3	475.8	27.6	381.7	110.8	5.1
100	38	1.4	3.2	260.7	196.9	28.0	356.3	9.3	Operation Not Recommended				
	56	4.0	9.3	270.5	200.6	26.6	361.2	10.1					
	76	7.9	18.1	276.3	202.8	25.8	364.4	10.7					
110	38	1.3	3.0	246.0	191.0	30.7	350.9	8.0					
	56	3.9	9.0	254.4	194.5	29.1	353.6	8.7					
	76	7.6	17.6	259.5	196.5	28.2	355.8	9.2					
120	38	1.2	2.9	234.6	186.0	33.9	350.4	6.9					
	56	3.7	8.6	240.8	188.8	32.0	349.9	7.5					
	76	7.4	17.1	244.9	190.6	31.0	350.6	7.9					

LEGEND

COP — Coefficient of Performance
Cv — Coefficient of Velocity
EAT — Entering Air Temperature (F)
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature (F)
HC — Heating Capacity (MBtuh)
HE — Heat of Extraction (MBtuh)
HR — Heat of Rejection (MBtuh)
kW — Total Power (Kilowatts)
MBtuh — Btuh in Thousands
MOPD — Maximum Opening Pressure Difference
LAT — Leaving Air Temperature (F)
SC — Sensible Cooling Capacity (MBtuh)
TC — Total Cooling Capacity (MBtuh)
WPD — Water Pressure Differential

NOTES:
1. Interpolation is permissable, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See performance correction tables for operating conditions other than those listed above.
5. For operation in the shaded area when water is used in lieu of an antifreeze solution, the LWT (leaving water temperature) must be calculated. Flow must be maintained to a level so that the LWT is maintained above 42 F when the JW3 jumper is not clipped. Because the refrigerant temperature can potentially reach as low as 32 F with 40 F LWT, a nuisance cutout could occur due to the activation of the low temperature protection. The JW3 jumper should never be clipped for standard range equipment or systems without antifreeze.

***WPD ADDER FOR MOTORIZED WATER VALVE, 50VQP300 UNIT (Cv = 57, MOPD = 150 psig)**

GPM	WPD Adder	
	PSIG	FT
38	0.11	0.3
56	0.24	0.6
76	0.44	1.0

Performance data (cont)

AIRFLOW CORRECTION TABLE

PERCENTAGE OF RATE AIRFLOW	COOLING				HEATING		
	TC	SC	kW	HR	HC	kW	HE
75	0.957	0.868	0.944	0.954	0.960	1.045	0.938
81	0.970	0.901	0.957	0.967	0.971	1.027	0.956
88	0.982	0.940	0.971	0.980	0.983	1.015	0.974
94	0.991	0.970	0.985	0.990	0.991	1.007	0.987
100	1.000	1.000	1.000	1.000	1.000	1.000	1.000
106	1.002	1.025	1.013	1.004	1.006	0.999	1.009
113	1.004	1.050	1.026	1.009	1.013	0.998	1.019
119	1.008	1.073	1.042	1.015	1.021	0.997	1.028
125	1.013	1.095	1.058	1.022	1.029	0.996	1.038

LEGEND

HC — Heating Capacity
HE — Heat of Extraction
HR — Heat of Rejection
kW — Total Power
SC — Sensible Cooling Capacity
TC — Total Cooling Capacity

ENTERING AIR CORRECTION TABLE — HEATING

EAT (db, F)	HC	kW	HE
60	1.022	0.916	1.051
65	1.010	0.957	1.025
68	1.004	0.982	1.010
70	1.000	1.000	1.000
75	0.991	1.045	0.976
80	0.982	1.101	0.948

LEGEND

db — Dry Bulb
EAT — Entering Air Temperature
HC — Heating Capacity
HE — Heat of Extraction
kW — Total Power

ENTERING AIR CORRECTION TABLE — COOLING

EAT (wb, F)	TC	SENSIBLE COOLING CAPACITY MULTIPLIER, ENTERING (db, F)							kW	HR
		70	75	80	80.6	85	90	95		
60.0	0.954	0.866	1.076	1.211	1.233	*	*	*	0.991	0.962
65.0	0.975	0.657	0.872	1.096	1.115	1.279	*	*	0.995	0.979
66.2	0.988	0.603	0.818	1.043	1.064	1.246	*	*	0.998	0.990
67.0	1.000	0.568	0.782	1.006	1.027	1.213	1.350	1.421	1.000	1.000
70.0	1.045	—	0.647	0.871	0.889	1.084	1.295	1.421	1.009	1.037
75.0	1.122	—	—	0.644	0.658	0.855	1.076	1.294	1.025	1.103

LEGEND

ARI — Air Conditioning and Refrigeration Institute
ASRAHE — American Society of Heating, Refrigeration and Air Conditioning Engineers
db — Dry Bulb
EAT — Entering Air Temperature
HR — Heat of Rejection
ISO — International Organization for Standardization
kW — Total Power
TC — Total Capacity
wb — Wet Bulb

*Sensible capacity equals total capacity.
NOTE: 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 entering air temperature.

ANTIFREEZE CORRECTION TABLE

ANTIFREEZE TYPE	ANTIFREEZE PERCENTAGE	COOLING			HEATING		WATER PRESSURE DROP, EWT 30 F
		EWT 90F			EWT 30 F		
		Total Capacity	Sensible Capacity	kW	Heating Capacity	kW	
Water	0	1.000	1.000	1.000	—	—	1.00
Propylene Glycol	5	0.995	0.995	1.003	0.989	0.997	1.07
	15	0.986	0.986	1.009	0.968	0.990	1.21
	25	0.978	0.978	1.014	0.947	0.983	1.36
Methanol	5	0.997	0.997	1.002	0.989	0.997	1.07
	15	0.990	0.990	1.007	0.968	0.990	1.16
	25	0.982	0.982	1.012	0.949	0.984	1.22
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.14
	15	0.994	0.994	1.005	0.944	0.983	1.30
	25	0.986	0.986	1.009	0.917	0.974	1.36
Ethylene Glycol	5	0.998	0.998	1.002	0.993	0.998	1.04
	15	0.994	0.994	1.004	0.980	0.994	1.12
	25	0.988	0.988	1.008	0.966	0.990	1.20

LEGEND

EWT — Entering Water Temperature

DRY COIL TO WET COIL CONVERSION TABLE

AIR COIL FACE VELOCITY (FPM)	REQUIRED BHP MULTIPLIER	REQUIRED RPM MULTIPLIER
175	1.00	1.00
250	0.99	0.99
325	0.99	0.98
400	0.98	0.97
475	0.98	0.96
550	0.97	0.95

LEGEND

bhp — Brake Horsepower

NOTES:

1. Sheave turns and RPM relationship is unchanged; use original blower performance table to find correct turns based upon new RPM.
2. Example: 50VQP084 dry coil performance is 0.92 bhp, 867 rpm at 2600 cfm (or 2600 cfm/9 sq ft coil = 290 fpm). Wet coil performance would be 0.92 x 0.99 = 0.91 bhp required and 867 rpm x 0.98 = 850 rpm required.

Performance data (cont)

50VQP084 BLOWER PERFORMANCE DATA

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
2100	bhp	—	—	0.24	0.29	0.34	0.37	0.41	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84
	Sheave/Motor	—	—	B	B	B	A	A	A	A	A	A	C	C	C	C	C
	rpm	—	—	410	457	499	537	577	612	647	678	710	737	764	791	815	838
	Turns Open	—	—	5.0	3.5	4.5	6.0	5.0	4.0	3.0	2.5	1.5	6.0	5.5	4.5	4.0	3.0
2200	bhp	—	—	0.28	0.32	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84	0.9
	Sheave/Motor	—	—	B	B	B	A	A	A	A	A	A	C	C	C	C	C
	rpm	—	—	424	467	507	548	584	621	653	684	716	743	772	797	821	847
	Turns Open	—	—	4.5	3.5	4.5	5.5	5.0	4.0	3.0	2.0	1.5	6.0	5.0	4.5	3.5	3.0
2300	bhp	—	—	0.29	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84	0.89	0.94
	Sheave/Motor	—	—	B	B	B	A	A	A	A	A	A	C	C	C	C	C
	rpm	—	—	435	476	518	555	590	627	659	692	721	751	777	803	829	853
	Turns Open	—	—	4.5	3.0	4.0	5.5	4.5	3.5	2.5	2.0	1.5	5.5	5.0	4.0	3.5	2.5
2400	bhp	—	0.29	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84	0.89	0.94	0.99
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	rpm	—	403	446	485	527	563	600	633	665	697	726	756	783	811	835	858
	Turns Open	—	5.0	4.0	3.0	6.0	5.5	4.5	3.5	2.5	1.5	1.0	5.5	4.5	4.0	3.0	2.5
2500	bhp	—	0.31	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.74	0.79	0.84	0.89	0.94	0.99	1.04
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	A	C	C	C	C	E
	rpm	—	411	452	495	532	567	604	636	670	700	729	759	786	813	838	864
	Turns Open	—	5.0	4.0	2.5	6.0	5.5	4.0	3.5	2.5	1.5	1.0	5.5	4.5	3.5	3.0	2.5
2600	bhp	—	0.34	0.43	0.48	0.53	0.58	0.63	0.68	0.73	0.78	0.83	0.88	0.93	1.03	1.08	1.13
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	A	C	C	E	E	E
	rpm	—	420	460	500	536	570	606	638	671	701	729	759	786	814	839	865
	Turns Open	—	4.5	3.5	2.5	6.0	5.0	4.0	3.0	2.0	1.5	1.0	5.0	4.0	4.0	3.0	2.5
2700	bhp	—	0.38	0.43	0.48	0.53	0.59	0.64	0.69	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.14
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	A	C	C	E	E	E
	rpm	—	423	463	504	539	576	609	641	674	703	734	762	788	816	841	867
	Turns Open	—	4.5	3.5	2.0	5.5	5.0	4.0	3.0	2.0	1.5	1.0	5.0	4.0	4.0	3.0	2.5
2800	bhp	—	0.39	0.44	0.49	0.54	0.64	0.69	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.12	1.22
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	A	C	E	E	E	E
	rpm	—	431	474	510	545	581	613	647	677	706	737	764	793	818	843	869
	Turns Open	—	4.5	3.0	2.0	5.5	5.0	4.0	3.0	2.0	1.5	5.5	1.0	4.5	4.0	3.0	2.5
2900	bhp	—	0.44	0.49	0.54	0.59	0.64	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	C	E	E	E	E	E
	rpm	—	440	481	517	551	586	618	651	681	710	740	767	795	821	845	872
	Turns Open	—	4.0	3.0	2.0	5.5	4.5	3.5	2.5	1.5	1.0	5.5	5.5	4.5	3.5	3.0	2.0
3000	bhp	0.43	0.49	0.54	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24	1.29
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	D	E	E	E	E	E
	rpm	412	455	492	526	563	595	628	658	687	718	745	774	800	826	852	876
	Turns Open	5.0	3.5	2.5	6.0	5.5	4.5	3.5	2.5	1.5	1.5	1.0	5.0	4.5	3.5	3.0	2.0
3100	bhp	0.44	0.53	0.59	0.64	0.69	0.74	0.84	0.89	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.39
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	D	E	E	E	E	E
	rpm	421	459	499	533	569	600	633	663	691	722	749	777	803	828	854	878
	Turns Open	4.5	3.5	2.5	6.0	5.0	4.0	3.0	2.0	1.5	1.5	1.0	5.0	4.0	3.5	2.5	2.0
3200	bhp	0.49	0.54	0.64	0.69	0.74	0.84	0.89	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.39	1.44
	Sheave/Motor	B	B	B	A	A	A	A	A	A	D	E	E	E	E	E	E
	rpm	441	478	513	549	581	614	644	672	703	730	759	785	810	837	861	887
	Turns Open	4.0	3.0	2.0	5.5	5.0	4.0	3.0	2.0	1.5	1.5	5.5	4.5	4.0	3.0	2.5	2.0
3300	bhp	0.54	0.64	0.69	0.74	0.83	0.89	0.94	0.99	1.04	1.14	1.23	1.29	1.34	1.44	1.49	—
	Sheave/Motor	B	B	A	A	A	A	A	A	D	D	E	E	E	E	E	—
	rpm	456	495	529	561	595	625	656	685	712	741	767	795	820	844	870	—
	Turns Open	3.5	2.5	6.0	5.0	4.5	3.5	2.5	2.0	1.5	1.0	5.0	4.5	3.5	3.0	2.5	—
3400	bhp	0.63	0.69	0.74	0.79	0.84	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.44	1.49	—	—
	Sheave/Motor	B	B	A	A	A	A	A	D	D	D	E	E	E	E	—	—
	rpm	471	506	539	574	604	633	664	692	721	747	773	800	825	851	—	—
	Turns Open	3.0	2.0	5.5	5.0	4.0	3.5	2.5	2.0	1.5	1.0	5.0	4.0	3.5	2.5	—	—
3500	bhp	0.64	0.74	0.79	0.84	0.94	0.99	1.04	1.14	1.23	1.29	1.34	1.44	1.49	—	—	—
	Sheave/Motor	B	A	A	A	A	A	D	D	D	E	E	E	E	—	—	—
	rpm	486	520	555	586	615	647	674	704	730	756	784	808	835	—	—	—
	Turns Open	2.5	6.0	5.5	4.5	4.0	3.0	2.5	1.5	1.0	5.5	4.5	4.0	3.0	—	—	—

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:
1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

50VQP096 BLOWER PERFORMANCE DATA

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
2400	bhp	—	0.29	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84	0.89	0.94	0.99
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	rpm	—	403	446	485	527	563	600	633	665	697	726	756	783	811	835	858
	Turns Open	—	5.0	4.0	3.0	6.0	5.5	4.5	3.5	2.5	1.5	1.0	5.5	5.0	4.0	3.5	3.0
2500	bhp	—	0.31	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.74	0.79	0.84	0.89	0.94	0.99	1.04
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	rpm	—	411	452	495	532	567	604	636	670	700	729	759	786	813	838	864
	Turns Open	—	5.0	4.0	2.5	6.0	5.5	4.0	3.5	2.5	1.5	1.0	5.5	5.0	4.0	3.0	3.0
2600	bhp	—	0.34	0.43	0.48	0.53	0.58	0.63	0.68	0.73	0.78	0.83	0.88	0.93	1.03	1.08	1.13
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	rpm	—	420	460	500	536	570	606	638	671	701	729	759	786	814	839	865
	Turns Open	—	4.5	3.5	2.5	6.0	5.0	4.0	3.0	2.0	1.5	1.0	5.0	5.0	4.0	3.0	2.5
2700	bhp	—	0.38	0.43	0.48	0.53	0.59	0.64	0.69	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.14
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	rpm	—	423	463	504	539	576	609	641	674	703	734	762	788	816	841	867
	Turns Open	—	4.5	3.5	2.0	5.5	5.0	4.0	3.0	2.0	1.5	1.0	5.0	4.5	4.0	3.0	2.5
2800	bhp	—	0.39	0.44	0.49	0.54	0.64	0.69	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.12	1.22
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	C	C	C	C	C	C
	rpm	—	431	474	510	545	581	613	647	677	706	737	764	793	818	843	869
	Turns Open	—	4.5	3.0	2.0	5.5	5.0	4.0	3.0	2.0	1.5	5.5	5.0	4.5	3.5	3.0	2.5
2900	bhp	—	0.44	0.49	0.54	0.59	0.64	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	C	C	C	C	C	C
	rpm	—	440	481	517	551	586	618	651	681	710	740	767	795	821	845	872
	Turns Open	—	4.0	3.0	2.0	5.5	4.5	3.5	2.5	1.5	1.0	5.5	5.0	4.5	3.5	2.5	2.5
3000	bhp	0.43	0.49	0.54	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24	1.29
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C	C
	rpm	412	455	492	526	563	595	628	658	687	718	745	774	800	826	852	876
	Turns Open	5.0	3.5	2.5	6.0	5.5	4.5	3.5	2.5	1.5	1.5	6.0	5.0	4.0	3.5	2.5	2.0
3100	bhp	0.44	0.53	0.59	0.64	0.69	0.74	0.84	0.89	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.39
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C	C
	rpm	421	459	499	533	569	600	633	663	691	722	749	777	803	828	854	878
	Turns Open	4.5	3.5	2.5	6.0	5.0	4.0	3.0	2.0	1.5	1.5	6.0	4.5	4.0	3.0	2.5	2.0
3200	bhp	0.49	0.54	0.64	0.69	0.74	0.84	0.89	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.39	1.44
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C	C
	rpm	441	478	513	549	581	614	644	672	703	730	759	785	810	837	861	887
	Turns Open	4.0	3.0	2.0	5.5	5.0	4.0	3.0	2.0	1.5	1.5	5.5	4.5	4.0	3.0	2.5	2.0
3300	bhp	0.54	0.64	0.69	0.74	0.83	0.89	0.94	0.99	1.04	1.14	1.23	1.29	1.34	1.44	1.49	1.54
	Sheave/Motor	B	B	A	A	A	A	A	A	A	A	C	C	C	C	C	E
	rpm	456	495	529	561	595	625	656	685	712	741	767	795	820	844	870	893
	Turns Open	3.5	2.5	6.0	5.0	4.5	3.5	2.5	2.0	1.5	1.0	5.0	4.5	3.5	3.0	2.0	2.0
3400	bhp	0.63	0.69	0.74	0.79	0.84	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.44	1.49	1.54	1.64
	Sheave/Motor	B	B	A	A	A	A	A	A	A	A	C	C	C	C	E	E
	rpm	471	506	539	574	604	633	664	692	721	747	773	800	825	851	875	898
	Turns Open	3.0	2.0	5.5	5.0	4.0	3.5	2.5	2.0	1.5	1.0	5.0	4.0	3.5	2.5	2.5	2.0
3500	bhp	0.64	0.74	0.79	0.84	0.94	0.99	1.04	1.14	1.23	1.29	1.34	1.44	1.49	1.54	1.64	1.74
	Sheave/Motor	B	A	A	A	A	A	A	A	A	C	C	C	C	E	E	E
	rpm	486	520	555	586	615	647	674	704	730	756	784	808	835	858	883	906
	Turns Open	2.5	6.0	5.5	4.5	4.0	3.0	2.5	1.5	1.0	5.5	4.5	4.0	3.0	2.5	2.5	1.5
3600	bhp	0.74	0.79	0.84	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.83
	Sheave/Motor	B	A	A	A	A	A	A	A	A	C	C	C	E	E	E	E
	rpm	495	528	562	593	624	652	680	708	734	762	787	812	838	861	886	909
	Turns Open	2.5	6.0	5.0	4.5	3.5	3.0	2.0	1.5	1.0	5.5	4.5	4.0	3.0	2.5	2.5	1.5
3700	bhp	0.79	0.84	0.93	0.99	1.04	1.14	1.19	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.79	1.84
	Sheave/Motor	B	A	A	A	A	A	A	A	A	C	C	E	E	E	E	E
	rpm	506	541	572	605	633	661	690	716	744	769	793	820	843	868	891	913
	Turns Open	2.0	5.5	5.0	4.0	3.5	3.0	2.0	1.5	1.0	5.0	4.5	3.5	3.0	2.5	2.0	1.5
3800	bhp	0.84	0.89	0.94	1.04	1.13	1.19	1.24	1.34	1.43	1.49	1.54	1.64	1.73	1.79	1.84	1.94
	Sheave/Motor	B	A	A	A	A	A	A	A	C	C	E	E	E	E	E	E
	rpm	515	549	580	611	640	667	696	721	749	773	798	823	847	872	894	918
	Turns Open	2.0	5.5	4.5	4.0	3.5	2.5	1.5	1.5	5.5	5.0	4.0	3.5	3.0	2.5	2.0	1.0
3900	bhp	0.89	0.94	1.04	1.09	1.14	1.24	1.34	1.39	1.44	1.54	1.64	1.69	1.74	1.84	1.94	—
	Sheave/Motor	A	A	A	A	A	A	A	A	C	E	E	E	E	E	E	—
	rpm	525	556	586	617	645	674	701	726	753	778	804	827	850	875	897	—
	Turns Open	6.0	5.5	4.5	4.0	3.0	2.5	1.5	1.0	5.5	5.0	4.0	3.5	2.5	2.0	2.0	—
4000	bhp	0.94	1.04	1.09	1.14	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.79	1.84	1.94	—	—
	Sheave/Motor	A	A	A	A	A	A	A	A	E	E	E	E	E	E	—	—
	rpm	539	569	601	629	659	685	711	738	763	789	812	835	860	882	—	—
	Turns Open	5.5	5.0	4.5	3.5	3.0	2.0	1.0	1.0	5.0	4.5	3.5	3.0	2.5	2.0	—	—

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:

1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

Performance data (cont)

50VQP120 BLOWER PERFORMANCE DATA

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
3000	bhp	—		0.54	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24	1.34
	Sheave/Motor	—		B	B	B	B	A	A	A	A	A	A	A	A	C	C
	rpm	—		491	529	563	595	626	659	689	717	745	774	801	826	851	877
	Turns Open	—		5.0	4.0	3.0	2.0	6.0	5.0	4.0	3.5	3.0	2.0	1.5	1.0	6.0	5.5
3100	bhp	—	0.54	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24	1.34	1.44
	Sheave/Motor	—	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	rpm	—	469	504	542	575	607	637	670	699	726	754	783	809	834	859	884
	Turns Open	—	5.5	5.0	3.5	2.5	6.0	5.5	4.5	4.0	3.5	2.5	2.0	1.5	6.0	6.0	5.0
3200	bhp	—	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.24	1.29	1.34	1.44	1.53
	Sheave/Motor	—	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	rpm	—	485	520	556	588	619	649	680	708	736	765	791	817	841	868	891
	Turns Open	—	5.0	4.5	3.0	2.0	6.0	5.0	4.5	3.5	3.0	2.5	1.5	1.0	6.0	5.5	5.0
3300	bhp	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.24	1.29	1.34	1.44	1.49	1.54
	Sheave/Motor	B	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	rpm	464	500	537	570	601	631	662	691	718	745	774	799	824	849	875	898
	Turns Open	6.0	5.0	4.0	2.5	2.0	5.5	5.0	4.0	3.5	2.5	2.0	1.5	1.0	5.5	5.0	4.5
3400	bhp	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.24	1.29	1.34	1.44	1.49	1.54	1.64
	Sheave/Motor	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
	rpm	480	515	551	583	613	642	674	701	728	754	783	808	833	857	882	905
	Turns Open	5.5	4.5	3.5	2.5	6.0	5.5	4.5	3.5	3.0	2.5	2.0	1.0	6.0	5.5	5.0	4.5
3500	bhp	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.24	1.29	1.34	1.44	1.54	1.59	1.64	1.74
	Sheave/Motor	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
	rpm	496	530	565	596	625	654	684	711	738	766	792	816	841	867	890	913
	Turns Open	5.0	4.0	3.0	2.0	6.0	5.0	4.0	3.5	3.0	2.5	1.5	1.0	6.0	5.5	5.0	4.0
3600	bhp	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.24	1.34	1.39	1.44	1.54	1.59	1.64	1.74	1.84
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C	C
	rpm	511	544	578	608	637	668	695	722	748	776	800	825	849	874	897	920
	Turns Open	4.5	3.5	2.5	6.0	5.5	4.5	4.0	3.5	2.5	2.0	1.0	6.0	6.0	5.0	4.5	4.0
3700	bhp	0.84	0.89	0.94	1.04	1.14	1.19	1.24	1.34	1.39	1.44	1.54	1.64	1.69	1.74	1.84	1.94
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C	C
	rpm	526	561	592	621	649	679	706	732	758	785	809	833	857	882	905	927
	Turns Open	4.0	3.0	2.0	6.0	5.0	4.5	3.5	3.0	2.5	1.5	1.0	6.0	5.5	5.0	4.5	4.0
3800	bhp	0.89	0.94	1.04	1.09	1.14	1.24	1.34	1.39	1.44	1.54	1.64	1.69	1.74	1.84	1.94	2.04
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C	E
	rpm	544	575	605	633	661	691	717	742	767	794	818	842	867	890	912	934
	Turns Open	3.5	2.5	1.5	5.5	5.0	4.0	3.5	2.5	2.0	1.5	1.0	6.0	5.5	4.5	4.0	3.5
3900	bhp	0.94	1.04	1.14	1.19	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.79	1.84	1.94	2.04	2.14
	Sheave/Motor	B	B	A	A	A	A	A	A	A	A	C	C	C	C	E	E
	rpm	555	589	618	646	676	702	728	753	779	803	827	850	875	898	920	941
	Turns Open	3.0	2.0	6.0	5.0	4.5	3.5	3.0	2.5	2.0	1.0	6.0	5.5	5.0	4.5	4.0	3.5
4000	bhp	1.04	1.09	1.14	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.79	1.84	1.94	2.04	2.14	2.24
	Sheave/Motor	B	B	A	A	A	A	A	A	A	A	C	C	C	E	E	E
	rpm	572	601	630	657	686	712	737	762	789	812	836	859	883	905	927	948
	Turns Open	2.5	2.0	5.5	5.0	4.0	3.5	3.0	2.0	1.5	1.0	6.0	5.5	5.0	4.5	4.0	3.5

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:

1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

50VQP120 BLOWER PERFORMANCE DATA (cont)

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
4100	bhp	1.14	1.19	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.84	1.89	1.94	2.04	2.14	2.24	2.34
	Sheave/Motor	B	A	A	A	A	A	A	A	A	C	C	C	E	E	E	E
	rpm	589	617	645	672	700	726	751	775	801	824	847	872	894	915	937	960
	Turns Open	2.0	6.0	5.0	4.5	4.0	3.0	2.5	2.0	1.0	6.0	5.5	5.0	4.5	4.0	3.5	3.0
4200	bhp	1.24	1.29	1.34	1.44	1.54	1.59	1.64	1.74	1.84	2	2.04	2.09	2.14	2.24	2.34	2.44
	Sheave/Motor	A	A	A	A	A	A	A	A	A	E	E	E	E	E	E	E
	rpm	605	633	660	689	714	739	763	790	813	836	858	882	904	925	946	969
	Turns Open	6.0	5.5	5.0	4.0	3.5	2.5	2.5	1.5	1.0	6.0	5.5	5.5	4.5	4.0	3.5	3.0
4300	bhp	1.29	1.34	1.44	1.54	1.64	1.69	1.74	1.84	2	2.04	2.14	2.24	2.29	2.34	2.44	2.54
	Sheave/Motor	A	A	A	A	A	A	A	A	E	E	E	E	E	E	E	E
	rpm	621	649	675	703	728	752	776	802	827	847	869	893	914	935	956	979
	Turns Open	6.0	5.0	4.5	3.5	3.0	2.5	2.0	1.0	6.0	6.0	5.5	5.0	4.5	4.0	3.0	2.5
4400	bhp	1.39	1.44	1.54	1.64	1.74	1.84	1.89	2	2.04	2.14	2.24	2.34	2.44	2.49	2.54	2.64
	Sheave/Motor	A	A	A	A	A	A	A	D	E	E	E	E	E	E	E	E
	rpm	637	664	690	717	742	766	791	814	836	858	882	904	925	945	968	988
	Turns Open	5.5	4.5	4.0	3.5	2.5	2.0	1.5	1.0	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5
4500	bhp	1.49	1.54	1.64	1.74	1.84	1.94	2.04	2.09	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84
	Sheave/Motor	A	A	A	A	A	A	D	D	E	E	E	E	E	E	E	E
	rpm	653	679	707	731	755	779	804	826	848	870	893	914	935	955	978	997
	Turns Open	5.0	4.5	3.5	3.0	2.0	1.5	1.5	1.0	6.0	5.5	5.0	4.5	4.0	3.5	2.5	2.0
4600	bhp	1.59	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.39	2.44	2.54	2.64	2.74	2.84	2.94
	Sheave/Motor	A	A	A	A	A	D	D	E	E	E	E	E	E	E	E	E
	rpm	668	694	721	745	768	791	816	838	860	883	904	925	945	967	987	1007
	Turns Open	4.5	4.0	3.0	2.5	2.0	1.5	1.0	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0
4700	bhp	1.74	1.84	1.89	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.69	2.74	2.84	2.94	—
	Sheave/Motor	A	A	A	A	D	D	E	E	E	E	E	E	E	E	E	—
	rpm	683	711	735	758	782	806	828	850	871	894	915	935	955	977	997	—
	Turns Open	4.0	3.5	2.5	2.0	2.0	1.0	6.0	6.0	5.5	5.0	4.5	3.5	3.5	3.0	2.0	—
4800	bhp	1.84	1.94	1.99	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	—	—	—
	Sheave/Motor	A	A	A	D	D	D	E	E	E	E	E	E	E	—	—	—
	rpm	698	725	749	772	795	819	836	862	883	906	926	946	968	—	—	—
	Turns Open	3.5	3.0	2.5	2.0	1.5	1.0	6.0	5.5	5.0	4.5	4.0	3.5	3.0	—	—	—
4900	bhp	1.94	2.04	2.14	2.24	2.34	2.44	2.49	2.54	2.64	2.74	2.84	2.94	—	—	—	—
	Sheave/Motor	A	D	D	D	D	E	E	E	E	E	E	E	—	—	—	—
	rpm	715	739	762	785	810	831	853	874	896	917	937	956	—	—	—	—
	Turns Open	3.0	3.0	2.5	2.0	1.0	6.0	5.5	5.5	5.0	4.0	3.5	3.0	—	—	—	—
5000	bhp	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	—	—	—	—	—	—
	Sheave/Motor	D	D	D	D	E	E	E	E	E	E	—	—	—	—	—	—
	rpm	730	753	776	798	822	844	865	885	908	928	—	—	—	—	—	—
	Turns Open	3.0	2.5	2.0	1.5	6.0	6.0	5.5	5.0	4.5	4.0	—	—	—	—	—	—

LEGEND

A — Standard rpm/Standard Motor
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bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:

1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

Performance data (cont)

50VQP150 BLOWER PERFORMANCE DATA

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
3800	bhp	—	—	—	—	—	1.04	1.14	1.24	1.29	1.34	1.44	1.54	1.64	1.74	1.84	1.94
	Sheave/Motor	—	—	—	—	—	B	B	B	A	A	A	A	A	A	A	A
	rpm	—	—	—	—	—	659	688	718	746	774	802	829	855	879	905	931
	Turns Open	—	—	—	—	—	5.5	4.5	3.5	6.0	5.0	4.5	4.0	3.0	2.5	2.0	1.0
3900	bhp	—	—	—	—	1.04	1.14	1.19	1.24	1.34	1.44	1.54	1.64	1.74	1.84	1.94	2.03
	Sheave/Motor	—	—	—	—	B	B	B	B	A	A	A	A	A	A	A	A
	rpm	—	—	—	—	639	669	702	729	757	785	811	838	862	887	913	938
	Turns Open	—	—	—	—	1.14	1.19	1.24	1.34	1.44	1.54	1.64	1.69	1.74	1.84	1.94	2.04
4000	bhp	—	—	—	—	6.0	5.0	4.0	3.0	5.5	5.0	4.0	3.5	3.0	2.0	1.5	1.0
	Sheave/Motor	—	—	—	—	B	B	B	A	A	A	A	A	A	A	A	C
	rpm	—	—	—	—	651	683	710	739	767	794	821	845	870	895	920	945
	Turns Open	—	—	—	—	5.5	4.5	4.0	6.0	5.5	4.5	4.0	3.5	2.5	2.0	1.5	6.0
4100	bhp	—	—	—	1.09	1.14	1.24	1.34	1.44	1.54	1.64	1.69	1.74	1.84	1.94	2.04	2.14
	Sheave/Motor	—	—	—	B	B	B	B	A	A	A	A	A	A	A	A	C
	rpm	—	—	—	631	661	692	722	750	778	804	831	854	879	904	928	951
	Turns Open	—	—	—	6.0	5.5	4.5	3.5	5.5	5.0	4.5	3.5	3.0	2.5	1.5	1.0	6.0
4200	bhp	—	—	—	1.14	1.24	1.34	1.44	1.54	1.59	1.64	1.74	1.84	1.94	2.04	2.14	2.24
	Sheave/Motor	—	—	—	B	B	B	B	A	A	A	A	A	A	A	A	C
	rpm	—	—	—	640	673	703	733	761	788	812	838	863	888	912	934	958
	Turns Open	—	—	—	6.0	5.0	4.0	3.0	5.5	4.5	4.0	3.5	3.0	2.0	1.5	1.0	5.5
4300	bhp	—	—	—	1.24	1.34	1.44	1.54	1.59	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34
	Sheave/Motor	—	—	—	B	B	B	A	A	A	A	A	A	A	A	C	C
	rpm	—	—	—	653	685	715	744	771	796	822	847	872	896	919	942	966
	Turns Open	—	—	—	5.5	4.5	3.5	6.0	5.0	4.5	4.0	3.0	2.5	2.0	1.0	6.0	5.5
4400	bhp	—	—	1.24	1.34	1.44	1.54	1.59	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44
	Sheave/Motor	—	—	B	B	B	B	A	A	A	A	A	A	A	A	C	C
	rpm	—	—	633	666	697	726	755	782	806	832	857	881	904	927	950	973
	Turns Open	—	—	6.0	5.0	4.0	3.0	5.5	5.0	4.0	3.5	3.0	2.5	1.5	1.0	6.0	5.5
4500	bhp	—	—	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2	2.1	2.2	2.3	2.4	2.5	2.6
	Sheave/Motor	—	—	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	rpm	—	—	646	678	706	735	763	791	817	842	867	889	912	935	958	980
	Turns Open	—	—	5.5	4.5	4.0	6.0	5.5	4.5	4.0	3.5	2.5	2.0	1.5	6.0	6.0	5.0
4600	bhp	—	—	1.34	1.44	1.54	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64
	Sheave/Motor	—	—	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	rpm	—	—	656	687	715	744	772	799	825	850	872	896	919	942	963	987
	Turns Open	—	—	5.5	4.5	3.5	6.0	5.0	4.5	3.5	3.0	2.5	2.0	1.0	6.0	5.5	5.0
4700	bhp	—	1.34	1.44	1.54	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74
	Sheave/Motor	—	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	rpm	—	637	666	697	727	755	783	809	835	858	882	905	928	951	973	994
	Turns Open	—	6.0	5.0	4.0	3.0	5.5	5.0	4.0	3.5	3.0	2.0	1.5	1.0	6.0	5.5	4.5
4800	bhp	—	1.44	1.54	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84
	Sheave/Motor	—	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
	rpm	—	647	678	708	738	766	793	819	844	867	891	914	937	959	980	1001
	Turns Open	—	5.5	4.5	3.5	6.0	5.0	4.5	4.0	3.5	2.5	2.0	1.5	6.0	5.5	5.0	4.5
4900	bhp	1.44	1.54	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94
	Sheave/Motor	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
	rpm	631	662	690	720	749	777	803	827	852	877	900	923	946	966	988	1009
	Turns Open	6.0	5.0	4.0	3.5	5.5	5.0	4.5	3.5	3.0	2.5	2.0	1.0	6.0	5.5	5.0	4.5
5000	bhp	1.54	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	3.04
	Sheave/Motor	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	E
	rpm	642	672	702	731	760	785	811	837	862	886	909	932	953	975	996	1017
	Turns Open	5.5	5.0	3.5	3.0	5.5	4.5	4.0	3.5	3.0	2.0	1.5	1.0	6.0	5.0	4.5	4.5

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:

1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

50VQP150 BLOWER PERFORMANCE DATA (cont)

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
5100	bhp	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	3.04	3.19
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	A	C	C	C	E	E
	rpm	655	685	714	743	769	798	822	847	872	896	917	940	962	983	1005	1025
	Turns Open	5.5	4.5	3.5	6.0	5.0	4.5	4.0	3.0	2.5	2.0	1.5	6.0	5.5	5.0	5.0	4.5
5200	bhp	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	3.09	3.19	3.29
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	A	C	C	E	E	E
	rpm	668	697	726	752	782	806	832	857	882	903	926	949	971	992	1013	1032
	Turns Open	5.0	4.0	3.0	5.5	5.0	4.0	3.5	3.0	2.0	1.5	1.0	6.0	5.5	5.0	4.5	4.0
5300	bhp	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	3.09	3.19	3.29	3.39
	Sheave/Motor	B	B	A	A	A	A	A	A	A	A	C	C	E	E	E	E
	rpm	680	709	737	763	790	817	842	867	889	912	935	957	979	1000	1021	1042
	Turns Open	4.5	3.5	6.0	5.5	4.5	4.0	3.5	2.5	2.0	1.5	6.0	0.0	5.5	5.0	4.5	4.0
5400	bhp	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	3.09	3.19	3.29	3.39	3.49
	Sheave/Motor	B	B	A	A	A	A	A	A	A	A	C	E	E	E	E	E
	rpm	691	717	745	772	799	825	850	873	897	920	943	965	986	1006	1026	1047
	Turns Open	4.0	3.5	5.5	5.0	4.5	3.5	3.0	2.5	1.5	1.0	6.0	6.0	5.0	4.5	4.0	3.5
5500	bhp	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	3.09	3.14	3.24	3.34	3.44	3.54	3.69
	Sheave/Motor	B	A	A	A	A	A	A	A	A	D	E	E	E	E	E	E
	rpm	704	729	756	783	810	836	859	883	907	929	952	972	993	1014	1035	1055
	Turns Open	4.0	6.0	5.5	4.5	4.0	3.5	3.0	2.0	1.5	1.0	6.0	5.5	5.0	4.5	4.0	3.5
5600	bhp	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	3	3.14	3.24	3.34	3.44	3.54	3.69	3.79
	Sheave/Motor	B	A	A	A	A	A	A	A	D	D	E	E	E	E	E	E
	rpm	714	740	767	794	818	844	868	892	916	938	959	981	1002	1023	1043	1063
	Turns Open	3.5	6.0	5.0	4.5	4.0	3.0	2.5	2.0	1.5	1.0	6.0	5.5	4.5	4.0	3.5	3.0
5700	bhp	2.24	2.34	2.44	2.54	2.64	2.74	2.89	3.04	3.14	3.24	3.34	3.44	3.59	3.74	3.84	3.94
	Sheave/Motor	B	A	A	A	A	A	A	D	D	E	E	E	E	E	E	E
	rpm	726	752	779	803	829	854	878	902	925	948	970	990	1011	1031	1051	1071
	Turns Open	3.0	5.5	5.0	4.0	3.5	3.0	2.0	2.0	1.0	6.0	5.5	5.0	4.5	4.0	3.5	3.0
5800	bhp	2.34	2.44	2.54	2.64	2.74	2.84	3	3.14	3.24	3.34	3.44	3.59	3.74	3.84	3.94	4.04
	Sheave/Motor	A	A	A	A	A	A	D	D	D	E	E	E	E	E	E	E
	rpm	738	763	788	813	839	864	888	911	934	955	977	998	1019	1039	1058	1077
	Turns Open	6.0	5.0	4.5	4.0	3.5	2.5	2.0	1.5	1.0	6.0	5.5	5.0	4.5	4.0	3.5	2.5
5900	bhp	2.44	2.54	2.64	2.74	2.89	3.04	3.14	3.24	3.34	3.49	3.64	3.74	3.84	3.94	4.09	4.19
	Sheave/Motor	A	A	A	A	A	D	D	D	E	E	E	E	E	E	E	E
	rpm	750	775	799	824	849	874	898	921	944	964	986	1007	1027	1046	1068	1086
	Turns Open	5.5	5.0	4.0	3.5	3.0	2.5	2.0	1.5	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5
6000	bhp	2.54	2.64	2.74	2.89	3.04	3.14	3.24	3.34	3.49	3.64	3.74	3.84	3.99	4.14	4.24	4.34
	Sheave/Motor	A	A	A	A	D	D	D	D	E	E	E	E	E	E	E	E
	rpm	758	783	808	833	858	880	904	927	950	972	993	1014	1033	1053	1073	1092
	Turns Open	5.5	4.5	4.0	3.5	3.0	2.5	1.5	1.0	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5
6100	bhp	2.64	2.74	2.89	3.04	3.14	3.24	3.34	3.49	3.64	3.74	3.84	3.99	4.14	1.24	4.34	4.49
	Sheave/Motor	A	A	A	D	D	D	D	D	E	E	E	E	E	E	E	E
	rpm	769	794	819	843	866	890	913	936	958	980	1000	1021	1041	1061	1081	1099
	Turns Open	5.0	4.5	3.5	3.5	2.5	2.0	1.5	1.0	6.0	5.5	4.5	4.0	3.5	3.0	2.5	2.0
6200	bhp	2.84	2.94	3.04	3.14	3.24	3.39	3.54	3.64	3.74	3.89	4.04	4.14	4.24	4.39	4.54	4.64
	Sheave/Motor	A	A	D	D	D	D	D	E	E	E	E	E	E	E	E	E
	rpm	781	815	830	854	878	900	923	946	968	988	1009	1030	1050	1070	1089	1107
	Turns Open	4.5	4.0	3.5	3.0	2.5	2.0	1.0	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0
6300	bhp	2.94	3.04	3.14	3.29	3.44	3.54	3.64	3.79	3.94	4.04	4.14	4.29	4.44	4.54	4.69	4.84
	Sheave/Motor	A	D	D	D	D	D	D	E	E	E	E	E	E	E	E	E
	rpm	793	817	841	863	886	910	933	955	977	997	1018	1038	1058	1078	1097	1115
	Turns Open	4.5	4.0	3.5	3.0	2.0	1.5	0.0	6.0	5.5	5.0	4.5	4.0	3.0	2.5	2.0	1.5

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:

1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

Performance data (cont)

50VQP168 BLOWER PERFORMANCE DATA

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
4200	bhp	—	—	—	0.58	0.68	0.74	0.82	0.88	0.98	1.08	1.18	1.28	1.38	1.48	1.58	1.68
	Sheave/Motor	—	—	—	B	B	B	B	A	A	A	A	A	A	A	A	C
	rpm	—	—	—	457	499	537	577	612	647	678	710	737	764	791	815	838
	Turns Open	—	—	—	6.0	5.0	3.5	2.5	6.0	5.5	4.5	3.5	3.0	2.0	1.5	1.0	3.0
4400	bhp	—	—	—	0.63	0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.38	1.48	1.58	1.68	1.8
	Sheave/Motor	—	—	—	B	B	B	B	A	A	A	A	A	A	A	C	C
	rpm	—	—	—	467	507	548	584	621	653	684	716	743	772	797	821	847
	Turns Open	—	—	—	5.5	4.5	3.5	2.5	6.0	5.0	4.0	3.5	2.5	2.0	1.0	3.5	3.0
4600	bhp	—	—	—	0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.38	1.48	1.58	1.68	1.78	1.88
	Sheave/Motor	—	—	—	B	B	B	B	A	A	A	A	A	A	A	C	C
	rpm	—	—	—	476	518	555	590	627	659	692	721	751	777	803	829	853
	Turns Open	—	—	—	5.5	4.5	3.0	2.0	5.5	5.0	4.0	3.0	2.5	1.5	1.0	3.5	2.5
4800	bhp	—	—	0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.38	1.48	1.58	1.68	1.78	1.88	1.98
	Sheave/Motor	—	—	B	B	B	B	B	A	A	A	A	A	A	C	C	C
	rpm	—	—	446	485	527	563	600	633	665	697	726	756	783	811	835	858
	Turns Open	—	—	6.0	5.0	4.0	3.0	1.5	5.5	4.5	4.0	3.0	2.5	1.5	4.0	3.0	2.5
5000	bhp	—	—	0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.48	1.58	1.68	1.78	1.88	1.98	2.08
	Sheave/Motor	—	—	B	B	B	B	B	A	A	A	A	A	A	C	C	C
	rpm	—	—	452	495	532	567	604	636	670	700	729	759	786	813	838	864
	Turns Open	—	—	6.0	5.0	4.0	2.5	1.5	5.5	4.5	3.5	3.0	2.0	1.5	4.0	3.0	2.5
5200	bhp	—	—	0.86	0.96	1.06	1.16	1.26	1.36	1.46	1.56	1.66	1.76	1.86	2.06	2.16	2.26
	Sheave/Motor	—	—	B	B	B	B	A	A	A	A	A	A	A	E	C	E
	rpm	—	—	460	500	536	570	606	638	671	701	729	759	786	814	839	865
	Turns Open	—	—	6.0	4.5	3.5	2.5	6.0	5.5	4.5	3.5	2.5	2.0	1.0	4.0	3.5	2.5
5400	bhp	—	—	0.86	0.96	1.06	1.18	1.28	1.38	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.28
	Sheave/Motor	—	—	B	B	B	B	A	A	A	A	A	A	A	E	E	E
	rpm	—	—	463	504	539	576	609	641	674	703	734	762	788	816	841	867
	Turns Open	—	—	5.5	4.5	3.5	2.5	6.0	5.0	4.5	3.5	2.5	2.0	1.0	4.0	3.5	2.5
5600	bhp	—	—	0.88	0.98	1.08	1.28	1.38	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.24	2.44
	Sheave/Motor	—	—	B	B	B	B	A	A	A	A	A	A	D	E	E	E
	rpm	—	—	474	510	545	581	613	647	677	706	737	764	793	818	843	869
	Turns Open	—	—	5.5	4.0	3.0	2.0	6.0	5.0	4.0	3.0	2.5	1.5	1.5	4.0	3.5	2.5
5800	bhp	—	0.88	0.98	1.08	1.18	1.28	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48
	Sheave/Motor	—	B	B	B	B	B	A	A	A	A	A	D	D	E	E	E
	rpm	—	440	481	517	551	586	618	651	681	710	740	767	795	821	845	872
	Turns Open	—	6.0	5.0	4.0	3.0	2.0	5.5	4.5	4.0	3.0	2.0	2.0	1.5	3.5	3.0	2.0
6000	bhp	—	0.98	1.08	1.18	1.28	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48	2.58
	Sheave/Motor	—	B	B	B	B	B	A	A	A	A	D	D	D	E	E	E
	rpm	—	455	492	526	563	595	628	658	687	718	745	774	800	826	852	876
	Turns Open	—	6.0	5.0	3.5	2.5	1.5	5.5	4.5	3.5	3.0	2.5	2.0	1.5	3.5	3.0	2.0
6200	bhp	—	1.06	1.18	1.28	1.38	1.48	1.68	1.78	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.78
	Sheave/Motor	—	B	B	B	B	B	A	A	A	A	D	D	D	E	E	E
	rpm	—	459	499	533	569	600	633	663	691	722	749	777	803	828	854	878
	Turns Open	—	5.5	4.5	3.5	2.5	1.5	5.5	4.0	3.5	2.5	2.5	2.0	1.0	3.5	3.0	2.0
6400	bhp	0.98	1.08	1.28	1.38	1.48	1.68	1.78	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.78	2.88
	Sheave/Motor	B	B	B	B	B	A	A	A	A	D	D	D	D	E	E	E
	rpm	441	478	513	549	581	614	644	672	703	730	759	785	810	837	861	887
	Turns Open	6.0	5.5	4.0	3.0	2.0	6.0	5.0	4.0	3.5	3.0	2.5	1.5	1.0	3.0	2.5	2.0
6600	bhp	1.08	1.28	1.38	1.48	1.66	1.78	1.88	1.98	2.08	2.28	2.46	2.58	2.68	2.88	2.98	—
	Sheave/Motor	B	B	B	B	B	A	A	A	D	D	D	D	E	E	E	—
	rpm	456	495	529	561	595	625	656	685	712	741	767	795	820	844	870	—
	Turns Open	6.0	5.0	3.5	2.5	2.0	5.5	4.5	4.0	3.5	3.0	2.0	1.5	3.5	3.0	2.5	—
6800	bhp	1.26	1.38	1.48	1.58	1.68	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.88	2.98	—	—
	Sheave/Motor	B	B	B	B	A	A	A	D	D	D	D	D	E	E	—	—
	rpm	471	506	539	574	604	633	664	692	721	747	773	800	825	851	—	—
	Turns Open	5.5	4.5	3.5	2.5	6.0	5.5	4.5	4.0	3.0	2.5	2.0	1.0	3.5	2.5	—	—
7000	bhp	1.28	1.48	1.58	1.68	1.88	1.98	2.08	2.28	2.46	2.58	2.68	2.88	2.98	—	—	—
	Sheave/Motor	B	B	B	B	A	A	D	D	D	D	D	D	E	—	—	—
	rpm	486	520	555	586	615	647	674	704	730	756	784	808	835	—	—	—
	Turns Open	5.0	4.0	3.0	2.0	6.0	5.0	4.5	3.5	3.0	2.5	1.5	1.0	3.0	—	—	—

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:
1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

50VQP192 BLOWER PERFORMANCE DATA

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
4800	bhp	—	—	0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.38	1.48	1.58	1.68	1.78	1.88	1.98
	Sheave/Motor	—	—	B	B	B	B	B	A	A	A	A	A	A	C	C	C
	rpm	—	—	446	485	527	563	600	633	665	697	726	756	783	811	835	858
	Turns Open	—	—	6.0	5.0	4.0	3.0	1.5	5.5	4.5	4.0	3.0	2.5	1.5	3.5	3.0	2.5
5000	bhp	—	—	0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.48	1.58	1.68	1.78	1.88	1.98	2.08
	Sheave/Motor	—	—	B	B	B	B	B	A	A	A	A	A	A	C	C	C
	rpm	—	—	452	495	532	567	604	636	670	700	729	759	786	813	838	864
	Turns Open	—	—	6.0	5.0	4.0	2.5	1.5	5.5	4.5	3.5	3.0	2.5	1.5	3.5	3.0	2.5
5200	bhp	—	—	0.86	0.96	1.06	1.16	1.26	1.36	1.46	1.56	1.66	1.76	1.86	2.06	2.16	2.26
	Sheave/Motor	—	—	B	B	B	B	B	A	A	A	A	A	A	C	C	C
	rpm	—	—	460	500	536	570	606	638	671	701	729	759	786	814	838	864
	Turns Open	—	—	6.0	5.0	3.5	2.5	1.5	5.0	4.5	3.5	3.0	2.5	1.0	4.0	3.0	2.5
5400	bhp	—	—	0.86	0.96	1.06	1.18	1.28	1.38	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.28
	Sheave/Motor	—	—	B	B	B	B	A	A	A	A	A	A	A	C	C	C
	rpm	—	—	463	504	539	576	609	641	674	703	734	762	788	816	839	865
	Turns Open	—	—	5.5	4.5	3.5	2.5	6.0	5.0	4.0	3.5	2.5	2.0	1.0	4.0	3.0	2.5
5600	bhp	—	—	0.88	0.98	1.08	1.28	1.38	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.24	2.44
	Sheave/Motor	—	—	B	B	B	B	A	A	A	A	A	A	A	C	C	C
	rpm	—	—	474	510	545	581	613	647	677	706	737	764	793	818	841	867
	Turns Open	—	—	5.5	4.5	3.0	2.0	6.0	5.0	4.0	3.5	2.5	2.0	1.5	4.0	3.0	2.5
5800	bhp	—	0.88	0.98	1.08	1.18	1.28	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.28	2.28	2.48
	Sheave/Motor	—	B	B	B	B	B	A	A	A	A	A	A	A	C	C	C
	rpm	—	440	481	517	551	586	618	651	681	710	740	767	795	821	845	872
	Turns Open	—	6.0	5.0	4.0	3.0	2.0	6.0	4.5	4.0	3.0	2.5	2.0	1.5	3.5	3.0	2.5
6000	bhp	—	0.98	1.08	1.18	1.28	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48	2.58
	Sheave/Motor	—	B	B	B	B	B	A	A	A	A	A	A	A	C	C	C
	rpm	—	455	492	526	563	595	628	658	687	718	745	774	800	826	852	876
	Turns Open	—	6.0	5.0	4.0	2.5	1.5	5.5	4.5	3.5	3.0	2.5	2.0	1.5	3.5	3.0	2.0
6200	bhp	—	1.06	1.18	1.28	1.38	1.48	1.68	1.78	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.78
	Sheave/Motor	—	B	B	B	B	B	A	A	A	A	A	A	A	C	C	C
	rpm	—	459	499	533	569	600	633	663	691	722	749	777	803	828	854	878
	Turns Open	—	6.0	4.5	3.5	2.5	1.5	5.5	4.5	3.5	3.0	2.0	1.5	1.0	3.5	3.0	2.0
6400	bhp	0.98	1.08	1.28	1.38	1.48	1.68	1.78	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.78	2.88
	Sheave/Motor	B	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	rpm	441	478	513	549	581	614	644	672	703	730	759	785	810	837	861	887
	Turns Open	6.0	5.0	4.5	3.0	2.0	6.0	5.0	4.0	3.5	2.5	2.0	1.5	1.0	3.5	2.5	2.0
6600	bhp	1.08	1.28	1.38	1.48	1.66	1.78	1.88	1.98	2.08	2.28	2.46	2.58	2.68	2.88	2.98	3.08
	Sheave/Motor	B	B	B	B	B	A	A	A	A	A	A	A	C	C	C	E
	rpm	456	495	529	561	595	625	656	685	712	741	767	795	820	844	870	893
	Turns Open	6.0	5.0	4.0	3.0	2.0	6.0	4.5	4.0	3.5	2.5	2.0	1.5	3.5	3.0	2.5	2.0
6800	bhp	1.26	1.38	1.48	1.58	1.68	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.88	2.98	3.08	3.28
	Sheave/Motor	B	B	B	B	A	A	A	A	A	A	A	A	C	C	E	E
	rpm	471	506	539	574	604	633	664	692	721	747	773	800	825	851	875	898
	Turns Open	5.5	4.5	3.5	2.5	6.0	5.5	4.5	4.0	3.0	2.5	2.0	1.5	3.5	3.0	2.0	1.5
7000	bhp	1.28	1.48	1.58	1.68	1.88	1.98	2.08	2.28	2.46	2.58	2.68	2.88	2.98	3.08	3.28	3.48
	Sheave/Motor	B	B	B	B	A	A	A	A	A	A	A	C	C	E	E	E
	rpm	486	520	555	586	615	647	674	704	730	756	784	808	835	858	883	906
	Turns Open	5.0	4.0	3.0	2.0	6.0	5.0	4.5	3.5	3.0	2.0	1.5	3.5	3.0	2.5	2.0	1.5
7200	bhp	1.48	1.58	1.68	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.66
	Sheave/Motor	B	B	B	B	A	A	A	A	A	A	A	C	E	E	E	E
	rpm	495	528	562	593	624	652	680	708	734	762	787	812	838	861	886	909
	Turns Open	4.5	4.0	2.5	1.5	6.0	5.0	4.0	3.5	3.0	2.0	1.5	4.0	3.0	2.5	2.0	1.5
7400	bhp	1.58	1.68	1.86	1.98	2.08	2.28	2.38	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.58	3.68
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	A	E	E	E	E	E
	rpm	506	541	572	605	633	661	690	716	744	769	793	820	843	868	891	913
	Turns Open	4.5	3.5	2.5	6.0	5.5	4.5	4.0	3.0	2.5	2.0	1.5	4.0	3.0	2.5	1.5	1.0
7600	bhp	1.68	1.78	1.88	2.08	2.26	2.38	2.48	2.68	2.86	2.98	3.08	3.28	3.46	3.58	3.68	3.88
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	D	E	E	E	E	E
	rpm	515	549	580	611	640	667	696	721	749	773	798	823	847	872	894	918
	Turns Open	4.0	3.0	2.0	6.0	5.5	4.5	3.5	3.0	2.5	2.0	1.0	3.5	3.0	2.0	1.5	1.0
7800	bhp	1.78	1.88	2.08	2.18	2.28	2.48	2.68	2.78	2.88	3.08	3.28	3.38	3.48	3.68	3.88	4.08
	Sheave/Motor	B	B	B	A	A	A	A	A	A	D	D	E	E	E	E	E
	rpm	525	556	586	617	645	674	701	726	753	778	804	827	850	875	897	921
	Turns Open	4.0	2.5	2.0	5.5	5.0	4.0	3.5	3.0	2.5	1.5	1.0	3.5	2.5	2.0	1.5	1.0
8000	bhp	1.88	2.08	2.18	2.28	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.58	3.68	3.88	4.08	4.28
	Sheave/Motor	B	B	B	A	A	A	A	A	D	D	E	E	E	E	E	E
	rpm	539	569	601	629	659	685	711	738	763	789	812	835	860	882	906	927
	Turns Open	3.0	2.5	1.5	5.5	4.5	4.0	3.0	2.5	2.0	1.5	4.0	3.0	2.5	2.0	1.5	1.0

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:
1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

Performance data (cont)

50VQP240 BLOWER PERFORMANCE DATA

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
6,000	bhp	—	—	—	1.18	1.28	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48	2.68
	Sheave/Motor	—	—	—	B	B	B	B	A	A	A	A	A	A	A	A	C
	rpm	—	—	—	529	563	595	626	659	689	717	745	774	801	826	851	877
	Turns Open	—	—	—	6.0	5.0	4.0	3.0	6.0	5.0	4.5	4.0	3.5	2.5	2.0	1.0	5.5
6,200	bhp	—	—	—	1.28	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48	2.68	2.88
	Sheave/Motor	—	—	—	B	B	B	B	A	A	A	A	A	A	A	A	C
	rpm	—	—	—	542	575	607	637	670	699	726	754	783	809	834	859	884
	Turns Open	—	—	—	5.5	4.5	3.5	3.0	5.5	5.0	4.5	3.5	3.0	2.5	1.5	1.0	5.0
6,400	bhp	—	—	1.28	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.48	2.58	2.68	2.88	3.06
	Sheave/Motor	—	—	B	B	B	B	A	A	A	A	A	A	A	A	C	C
	rpm	—	—	520	556	588	619	649	680	708	736	765	791	817	841	868	891
	Turns Open	—	—	6.0	5.0	4.0	3.5	6.0	5.5	4.5	4.0	3.5	2.5	2.0	1.5	5.5	5.0
6,600	bhp	—	—	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.48	2.58	2.68	2.88	2.98	3.08
	Sheave/Motor	—	—	B	B	B	B	A	A	A	A	A	A	A	A	C	C
	rpm	—	—	537	570	601	631	662	691	718	745	774	799	824	849	875	898
	Turns Open	—	—	5.5	4.5	4.0	3.0	5.5	5.0	4.5	3.5	3.0	2.5	2.0	1.0	5.0	4.5
6,800	bhp	—	—	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.48	2.58	2.68	2.88	2.98	3.08	3.28
	Sheave/Motor	—	—	B	B	B	B	A	A	A	A	A	A	A	A	C	C
	rpm	—	—	551	583	613	642	674	701	728	754	783	808	833	857	875	898
	Turns Open	—	—	5.5	4.5	3.5	2.5	5.5	5.0	4.0	3.5	3.0	2.0	1.5	1.0	5.0	4.5
7,000	bhp	—	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.48	2.58	2.68	2.88	3.08	3.18	3.28	3.48
	Sheave/Motor	—	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	rpm	—	530	565	596	625	654	684	711	738	766	792	816	841	867	890	913
	Turns Open	—	6.0	5.0	4.0	3.0	6.0	5.0	4.5	4.0	3.0	2.5	2.0	1.5	5.5	4.5	4.0
7,200	bhp	—	1.68	1.78	1.88	2.08	2.18	2.28	2.48	2.68	2.78	2.88	3.08	3.18	3.28	3.48	3.68
	Sheave/Motor	—	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	rpm	—	544	578	608	637	668	695	722	748	776	800	825	849	874	897	920
	Turns Open	—	5.5	4.5	3.5	2.5	5.5	5.0	4.5	3.5	3.0	2.5	1.5	1.0	5.0	4.5	4.0
7,400	bhp	—	1.78	1.88	2.08	2.28	2.38	2.48	2.68	2.78	2.88	3.08	3.28	3.38	3.48	3.68	3.88
	Sheave/Motor	—	B	B	B	B	A	A	A	A	A	A	A	C	C	C	C
	rpm	—	561	592	621	649	679	706	732	758	785	809	833	857	882	905	927
	Turns Open	—	5.0	4.0	3.0	2.5	5.5	4.5	4.0	3.5	2.5	2.0	1.5	5.5	5.0	4.5	3.5
7,600	bhp	1.78	1.88	2.08	2.18	2.28	2.48	2.68	2.78	2.88	3.08	3.28	3.38	3.48	3.68	3.88	4.08
	Sheave/Motor	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
	rpm	544	575	605	633	661	691	717	742	767	794	818	842	867	890	912	934
	Turns Open	5.5	4.5	3.5	3.0	5.5	5.0	4.5	4.0	3.0	2.5	2.0	1.0	5.5	5.0	4.0	3.5
7,800	bhp	1.88	2.08	2.28	2.38	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.58	3.68	3.88	4.08	4.28
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	A	A	C	C	C	C
	rpm	555	589	618	646	676	702	728	753	779	803	827	850	875	898	920	941
	Turns Open	5.0	4.0	3.0	6.0	5.5	4.5	4.0	3.5	3.0	2.0	1.5	1.0	5.0	4.5	4.0	3.5
8,000	bhp	2.08	2.18	2.28	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.58	3.68	3.88	4.08	4.28	4.48
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C	C
	rpm	572	601	630	657	686	712	737	762	789	812	836	859	883	905	927	948
	Turns Open	4.5	3.5	3.0	5.5	5.0	4.5	4.0	3.0	2.5	2.0	1.5	5.5	5.0	4.5	4.0	3.5

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:

1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

50VQP240 BLOWER PERFORMANCE DATA (cont)

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
8,200	bhp	2.28	2.38	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.68	3.78	3.88	4.08	4.28	4.48	4.68
	Sheave/Motor	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C	C
	rpm	589	617	645	672	700	726	751	775	801	824	847	872	894	915	937	960
	Turns Open	4.0	3.5	2.5	5.5	4.5	4.0	3.5	3.0	2.5	1.5	1.0	5.5	5.0	4.5	4.0	3.0
8,400	bhp	2.48	2.58	2.68	2.88	3.08	3.18	3.28	3.48	3.68	4	4.08	4.18	4.28	4.48	4.68	4.88
	Sheave/Motor	B	B	A	A	A	A	A	A	A	A	A	C	C	C	C	C
	rpm	605	633	660	689	714	739	763	790	813	836	858	882	904	925	946	969
	Turns Open	3.5	3.0	5.5	5.0	4.5	4.0	3.0	2.5	2.0	1.5	1.0	5.0	4.5	4.0	3.5	3.0
8,600	bhp	2.58	2.68	2.88	3.08	3.28	3.38	3.48	3.68	4	4.08	4.28	4.48	4.58	4.68	4.88	5.08
	Sheave/Motor	B	A	A	A	A	A	A	A	A	A	C	C	C	C	C	E
	rpm	621	649	675	703	728	752	776	802	827	847	869	893	914	935	956	979
	Turns Open	3.0	6.0	5.5	4.5	4.0	3.5	3.0	2.5	2.0	1.0	5.5	5.0	4.5	4.0	3.5	2.5
8,800	bhp	2.78	2.88	3.08	3.28	3.48	3.68	3.78	4	4.08	4.28	4.48	4.68	4.88	4.98	5.08	5.28
	Sheave/Motor	B	A	A	A	A	A	A	A	A	A	C	C	C	C	E	E
	rpm	637	664	690	717	742	766	791	814	836	858	882	904	925	945	968	988
	Turns Open	2.5	5.5	5.0	4.5	3.5	3.0	2.5	2.0	1.5	1.0	5.0	4.5	4.0	3.5	3.0	2.5
9,000	bhp	2.98	3.08	3.28	3.48	3.68	3.88	4.08	4.18	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68
	Sheave/Motor	A	A	A	A	A	A	A	A	A	C	C	C	E	E	E	E
	rpm	653	679	707	731	755	779	804	826	848	870	893	914	935	955	978	997
	Turns Open	6.0	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	5.5	5.0	4.5	4.0	3.5	2.5	2.0
9,200	bhp	3.18	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.78	4.88	5.08	5.28	5.48	5.68	5.88
	Sheave/Motor	A	A	A	A	A	A	A	A	A	C	C	E	E	E	E	E
	rpm	668	694	721	745	768	791	816	838	860	883	904	925	945	967	987	1007
	Turns Open	5.5	5.0	4.0	3.5	3.0	2.5	2.0	1.5	1.0	5.0	4.5	4.0	3.5	3.0	2.5	2.0
9,400	bhp	3.48	3.68	3.78	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.38	5.48	5.68	5.88	6.08
	Sheave/Motor	A	A	A	A	A	A	A	A	C	E	E	E	E	E	E	E
	rpm	683	711	735	758	782	806	828	850	871	894	915	935	955	977	997	1016
	Turns Open	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.0	5.5	5.0	4.5	4.0	3.5	3.0	2.0	2.0
9,600	bhp	3.68	3.88	3.98	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.08	6.28	6.48
	Sheave/Motor	A	A	A	A	A	A	A	A	E	E	E	E	E	E	E	E
	rpm	698	725	749	772	795	819	836	862	883	906	926	946	968	987	1007	1025
	Turns Open	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5
8,800	bhp	3.88	4.08	4.28	4.48	4.68	4.88	4.98	5.08	5.28	5.48	5.68	5.88	6.08	6.28	6.48	6.68
	Sheave/Motor	A	A	A	A	A	A	A	E	E	E	E	E	E	E	E	E
	rpm	715	739	762	785	810	831	853	874	896	917	937	956	978	997	1016	1035
	Turns Open	4.5	4.0	3.5	3.0	2.5	1.5	1.0	5.5	4.5	4.5	3.5	3.0	3.0	2.5	2.0	1.5
10,000	bhp	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.08	6.28	6.48	6.68	6.78	6.88
	Sheave/Motor	A	A	A	A	A	E	E	E	E	E	E	E	E	E	E	E
	rpm	730	753	776	798	822	844	865	885	908	928	948	967	988	1007	1026	1044
	Turns Open	4.0	3.5	3.0	2.5	2.0	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:

1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

Performance data (cont)

50VQP300 BLOWER PERFORMANCE DATA

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
7,600	bhp	—	—	—	—	—	2.08	2.28	2.48	2.58	2.68	2.88	3.08	3.28	3.48	3.68	3.88
	Sheave/Motor	—	—	—	—	—	B	B	B	B	A	A	A	A	A	A	A
	rpm	—	—	—	—	—	659	688	718	746	774	802	829	855	879	905	931
	Turns Open	—	—	—	—	—	5.5	4.5	3.5	3.0	6.0	5.0	4.5	3.5	3.0	2.0	1.5
7,800	bhp	—	—	—	—	2.08	2.28	2.38	2.48	2.68	2.88	3.08	3.28	3.48	3.68	3.88	4.06
	Sheave/Motor	—	—	—	—	B	B	B	B	B	A	A	A	A	A	A	A
	rpm	—	—	—	—	639	669	702	729	757	785	811	838	862	887	913	938
	Turns Open	—	—	—	—	5.5	5.0	4.0	3.0	2.5	5.5	5.0	4.0	3.5	2.5	2.0	1.0
8,000	bhp	—	—	—	—	2.28	2.38	2.48	2.68	2.88	3.08	3.28	3.38	3.48	3.68	3.88	4.08
	Sheave/Motor	—	—	—	—	B	B	B	B	B	A	A	A	A	A	A	A
	rpm	—	—	—	—	651	683	710	739	767	794	821	845	870	895	920	945
	Turns Open	—	—	—	—	5.5	4.5	3.5	3.0	2.0	5.5	4.5	4.0	3.0	2.5	1.5	1.0
8,200	bhp	—	—	—	2.18	2.28	2.48	2.68	2.88	3.08	3.28	3.38	3.48	3.68	3.88	4.08	4.28
	Sheave/Motor	—	—	—	B	B	B	B	B	A	A	A	A	A	A	A	C
	rpm	—	—	—	631	661	692	722	750	778	804	831	854	879	904	928	951
	Turns Open	—	—	—	6.0	5.0	4.0	3.5	2.5	6.0	5.0	4.5	3.5	3.0	2.0	1.5	3.5
8,400	bhp	—	—	—	2.28	2.48	2.68	2.88	3.08	3.18	3.28	3.48	3.68	3.88	4.08	4.28	4.48
	Sheave/Motor	—	—	—	B	B	B	B	B	A	A	A	A	A	A	A	C
	rpm	—	—	—	640	673	703	733	761	788	812	838	863	888	912	934	958
	Turns Open	—	—	—	5.5	5.0	4.0	3.0	2.0	5.5	5.0	4.0	3.5	2.5	2.0	1.0	3.0
8,600	bhp	—	—	—	2.48	2.68	2.88	3.08	3.18	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68
	Sheave/Motor	—	—	—	B	B	B	B	A	A	A	A	A	A	A	A	C
	rpm	—	—	—	653	685	715	744	771	796	822	847	872	896	919	942	966
	Turns Open	—	—	—	5.5	4.5	3.5	2.5	6.0	5.5	4.5	4.0	3.0	2.5	1.5	1.0	3.0
8,800	bhp	—	—	2.48	2.68	2.88	3.08	3.18	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88
	Sheave/Motor	—	—	B	B	B	B	B	A	A	A	A	A	A	A	C	C
	rpm	—	—	633	666	697	726	755	782	806	832	857	881	904	927	950	973
	Turns Open	—	—	6.0	5.0	4.0	3.0	2.5	5.5	5.0	4.0	3.5	3.0	2.0	1.5	3.5	2.5
9,000	bhp	—	—	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2
	Sheave/Motor	—	—	B	B	B	B	B	A	A	A	A	A	A	A	C	E
	rpm	—	—	646	678	706	735	763	791	817	842	867	889	912	935	958	980
	Turns Open	—	—	5.5	4.5	3.5	3.0	2.0	5.5	4.5	4.0	3.0	2.5	2.0	1.0	3.0	2.5
9,200	bhp	—	—	2.68	2.88	3.08	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28
	Sheave/Motor	—	—	B	B	B	B	A	A	A	A	A	A	A	A	E	E
	rpm	—	—	656	687	715	744	772	799	825	850	872	896	919	942	963	987
	Turns Open	—	—	5.5	4.5	3.5	2.5	6.0	5.0	4.5	3.5	3.0	2.5	1.5	1.0	3.0	2.5
9,400	bhp	—	2.68	2.88	3.08	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48
	Sheave/Motor	—	B	B	B	B	B	A	A	A	A	A	A	A	E	E	E
	rpm	—	637	666	697	727	755	783	809	835	858	882	905	928	951	973	994
	Turns Open	—	6.0	5.0	4.0	3.0	2.5	5.5	5.0	4.0	3.5	2.5	2.0	1.5	3.5	3.0	2.0
9,600	bhp	—	2.88	3.08	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68
	Sheave/Motor	—	B	B	B	B	A	A	A	A	A	A	A	D	E	E	E
	rpm	—	647	678	708	738	766	793	819	844	867	891	914	937	959	980	1001
	Turns Open	—	5.5	4.5	3.5	3.0	6.0	5.0	4.5	4.0	3.0	2.5	2.0	1.0	3.0	2.5	2.0
9,800	bhp	2.88	3.08	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88
	Sheave/Motor	B	B	B	B	B	A	A	A	A	A	A	D	E	E	E	E
	rpm	631	662	690	720	749	777	803	827	852	877	900	923	946	966	988	1009
	Turns Open	6.0	5.0	4.0	3.5	2.5	5.5	5.0	4.5	3.5	2.5	2.0	1.5	3.5	3.0	2.5	2.0
10,000	bhp	3.08	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.08
	Sheave/Motor	B	B	B	B	B	A	A	A	A	A	D	D	E	E	E	E
	rpm	642	672	702	731	760	785	811	837	862	886	909	932	953	975	996	1017
	Turns Open	5.5	4.5	4.0	3.0	2.0	5.5	4.5	4.0	3.5	2.5	2.0	1.0	3.0	2.5	2.0	2.0

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:

1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

50VQP300 BLOWER PERFORMANCE DATA (cont)

AIRFLOW (cfm)	ESP	AIRFLOW (cfm) AT EXTERNAL STATIC PRESSURE (in. wg)															
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
10,200	bhp	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.08	6.38
	Sheave/Motor	B	B	B	B	A	A	A	A	A	D	D	D	E	E	E	E
	rpm	655	685	714	743	769	798	822	847	872	896	917	940	962	983	1005	1025
	Turns Open	5.0	4.5	3.5	2.5	6.0	5.0	4.5	3.5	3.0	2.5	1.5	1.0	3.0	2.5	2.0	1.5
10,400	bhp	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.18	6.38	6.58
	Sheave/Motor	B	B	B	B	A	A	A	A	D	D	E	E	E	E	E	E
	rpm	668	697	726	752	782	806	832	857	882	903	926	949	971	992	1013	1032
	Turns Open	5.0	4.0	3.0	2.5	5.5	5.0	4.0	3.5	2.5	2.0	1.5	3.5	3.0	2.5	2.0	1.5
10,600	bhp	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.18	6.38	6.58	6.78
	Sheave/Motor	B	B	B	B	A	A	A	D	D	D	D	E	E	E	E	E
	rpm	680	709	737	763	790	817	842	867	889	912	935	957	979	1000	1021	1042
	Turns Open	4.5	3.5	3.0	2.0	5.5	4.5	4.0	3.0	2.5	2.0	1.0	3.0	2.5	2.0	1.5	1.0
10,800	bhp	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.18	6.38	6.58	6.78	6.98
	Sheave/Motor	B	B	B	A	A	A	D	D	D	D	E	E	E	E	E	E
	rpm	691	717	745	772	799	825	850	873	897	920	943	965	986	1006	1026	1047
	Turns Open	4.5	3.5	2.5	6.0	5.0	4.5	3.5	3.0	2.0	1.5	3.5	3.0	2.5	2.0	1.5	1.0
11,000	bhp	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	6.18	6.28	6.48	6.68	6.88	7.08	7.38
	Sheave/Motor	B	B	B	A	A	D	D	D	D	D	E	E	E	E	E	E
	rpm	704	729	756	783	810	836	859	883	907	929	952	972	993	1014	1035	1055
	Turns Open	3.5	3.0	2.0	5.5	5.0	4.0	3.0	2.5	2.0	1.5	3.5	3.0	2.5	2.0	1.0	0.5
11,200	bhp	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	6	6.28	6.48	6.68	6.88	7.08	7.38	—
	Sheave/Motor	B	B	A	A	D	D	D	D	D	D	E	E	E	E	E	—
	rpm	714	740	767	794	818	844	868	892	916	938	959	981	1002	1023	1043	—
	Turns Open	3.5	2.5	6.0	5.5	4.5	3.5	3.0	2.5	1.5	1.0	3.0	2.5	2.0	1.5	1.0	—
11,400	bhp	4.48	4.68	4.88	5.08	5.28	5.48	5.78	6.08	6.28	6.48	6.68	6.88	7.18	7.48	—	—
	Sheave/Motor	B	B	A	D	D	D	D	D	D	D	E	E	E	E	—	—
	rpm	726	752	779	803	829	854	878	902	925	948	970	990	1011	1031	—	—
	Turns Open	3.0	2.0	5.5	5.0	4.5	3.5	3.0	2.0	1.5	1.0	3.0	2.5	2.0	1.5	—	—
11,600	bhp	4.68	4.88	5.08	5.28	5.48	5.68	6	6.28	6.48	6.68	6.88	7.18	7.48	—	—	—
	Sheave/Motor	B	A	D	D	D	D	D	D	D	E	E	E	E	—	—	—
	rpm	738	763	788	813	839	864	888	911	934	955	977	998	1019	—	—	—
	Turns Open	2.5	6.0	5.5	4.5	4.0	3.0	2.5	2.0	1.0	3.5	2.5	2.0	1.5	—	—	—
11,800	bhp	4.88	5.08	5.28	5.48	5.78	6.08	6.28	6.48	6.68	6.98	7.28	7.48	—	—	—	—
	Sheave/Motor	B	D	D	D	D	D	D	D	D	E	E	E	—	—	—	—
	rpm	750	775	799	824	849	874	898	921	944	964	986	1007	—	—	—	—
	Turns Open	2.0	5.5	5.0	4.0	3.5	3.0	2.5	2.0	1.0	3.0	2.5	2.0	—	—	—	—
12,000	bhp	5.08	5.28	5.48	5.78	6.08	6.28	6.48	6.68	6.98	7.28	7.48	—	—	—	—	—
	Sheave/Motor	D	D	D	D	D	D	D	D	E	E	E	—	—	—	—	—
	rpm	758	783	808	833	858	880	904	927	950	972	993	—	—	—	—	—
	Turns Open	6.0	5.5	4.5	4.0	3.5	2.5	2.0	1.5	3.5	3.0	2.5	—	—	—	—	—
12,200	bhp	5.28	5.48	5.78	6.08	6.28	6.48	6.68	6.98	7.28	7.48	—	—	—	—	—	—
	Sheave/Motor	D	D	D	D	D	D	D	D	E	E	—	—	—	—	—	—
	rpm	769	794	819	843	866	890	913	936	958	980	—	—	—	—	—	—
	Turns Open	6.0	5.0	4.5	4.0	3.0	2.5	2.0	1.5	3.0	2.5	—	—	—	—	—	—
12,400	bhp	5.68	5.88	6.08	6.28	6.48	6.78	7.08	7.28	7.48	—	—	—	—	—	—	—
	Sheave/Motor	D	D	D	D	D	D	D	D	E	—	—	—	—	—	—	—
	rpm	781	815	830	854	878	900	923	946	968	—	—	—	—	—	—	—
	Turns Open	5.5	4.5	4.5	3.5	3.0	2.0	1.5	1.0	3.0	—	—	—	—	—	—	—
12,600	bhp	5.88	6.08	6.28	6.58	6.88	7.08	7.28	—	—	—	—	—	—	—	—	—
	Sheave/Motor	D	D	D	D	D	D	D	—	—	—	—	—	—	—	—	—
	rpm	793	817	841	863	886	910	933	—	—	—	—	—	—	—	—	—
	Turns Open	5.0	4.5	4.0	3.0	2.5	2.0	1.5	—	—	—	—	—	—	—	—	—

LEGEND

A — Standard rpm/Standard Motor
B — Low rpm/Standard Motor
bhp — Brake Horsepower
C — High rpm/Standard Motor
D — Standard rpm/Large Motor
E — High rpm/Large Motor
ESP — External Static Pressure

NOTES:
1. Unit is factory shipped with standard static sheave and drive at 2.5 turns open. Other speeds require field selection.
2. For applications requiring higher static pressures, contact your local Carrier representative. Performance data does not include drive losses and is based on sea level conditions.
3. All airflow is rated at lowest voltage. If unit is dual voltage rated, data is based on lowest voltage.
4. Data shown is for wet coil performance. For dry coil performance, calculate the face velocity of the air coil (face velocity [fpm] = airflow [cfm]/face area [sq ft]), then use Dry Coil to Wet Coil Conversion Table.

Electrical data

Carrier®

ELECTRICAL DATA — STANDARD UNIT

50VQP UNIT SIZE	VOLTAGE (V-Ph-Hz)	MIN/MAX VOLTAGE	BLOWER OPTION	COMPRESSOR			FAN MOTOR FLA	TOTAL UNIT FLA	MCA	MAX FUSE/ HACR
				qty	RLA	LRA				
084	208/230-3-60	197/254	A, B, C	1	23.2	164	4.0	27.2	33.0	50
			D,E	1	23.2	164	5.0	28.2	34.0	50
	460-3-60	414/506	A, B, C	1	11.2	75	2.0	13.2	16.0	25
			D, E	1	11.2	75	2.4	13.6	16.4	25
	575-3-60	518/633	A, B, C	1	7.9	54	1.4	9.3	11.3	15
			D, E	1	7.9	54	1.9	9.8	11.8	15
096	208/230-3-60	197/254	A, B, C	1	25.0	164	5.0	30.0	36.3	60
			D, E	1	25.0	164	6.2	31.2	37.5	60
	460-3-60	414/506	A, B, C	1	12.2	100	2.4	14.6	17.6	25
			D, E	1	12.2	100	3.1	15.3	18.4	30
	575-3-60	518/633	A, B, C	1	9.0	78	1.9	10.9	13.1	20
			D, E	1	9.0	78	2.3	11.3	13.6	20
120	208/230-3-60	197/254	A, B, C	1	30.1	225	6.2	36.3	43.8	70
			D, E	1	30.1	225	9.2	39.3	46.8	70
	460-3-60	414/506	A, B, C	1	16.7	114	3.1	19.8	24.0	40
			D, E	1	16.7	114	4.3	21.0	25.2	40
	575-3-60	518/633	A, B, C	1	12.2	80	2.3	14.5	17.5	25
			D, E	1	12.2	80	3.4	15.6	18.6	30
150	208/230-3-60	197/254	A, B, C	1	48.1	245	9.2	57.3	69.3	110
			D, E	1	48.1	245	14.1	62.2	74.2	110
	460-3-60	414/506	A, B, C	1	18.6	125	4.3	22.9	27.6	45
			D, E	1	18.6	125	7.0	25.6	30.3	45
	575-3-60	518/633	A, B, C	1	14.7	100	3.4	18.1	21.8	35
			D, E	1	14.7	100	5.2	19.9	23.6	35
168	208/230-3-60	197/254	A, B, C	2	23.2	164	6.2	52.6	58.4	80
			D, E	2	23.2	164	9.2	55.6	61.4	80
	460-3-60	414/506	A, B, C	2	11.2	75	3.1	25.5	28.3	35
			D, E	2	11.2	75	4.3	26.7	29.5	40
	575-3-60	518/633	A, B, C	2	7.9	54	2.3	18.1	20.1	25
			D, E	2	7.9	54	3.4	19.2	21.2	25
192	208/230-3-60	197/254	A, B, C	2	25.0	164	9.2	59.2	65.4	90
			D, E	2	25.0	164	14.1	64.1	70.3	90
	460-3-60	414/506	A, B, C	2	12.2	100	4.3	28.7	31.8	40
			D, E	2	12.2	100	7.0	31.4	34.5	45
	575-3-60	518/633	A, B, C	2	9.0	78	3.4	21.4	23.6	30
			D, E	2	9.0	78	5.2	23.2	25.5	30
240	208/230-3-60	197/254	A, B, C	2	30.1	225	14.1	74.3	81.8	110
			D, E	2	30.1	225	21.7	81.9	89.4	110
	460-3-60	414/506	A, B, C	2	16.7	114	7.0	40.4	44.6	60
			D, E	2	16.7	114	10.0	43.4	47.6	60
	575-3-60	518/633	A, B, C	2	12.2	80	5.2	29.6	32.6	40
			D, E	2	12.2	80	7.7	32.1	35.1	45
300	208/230-3-60	197/254	A, B, C	2	48.1	245	14.1	110.3	122.3	150
			D, E	2	48.1	245	21.7	117.9	129.9	175
	460-3-60	414/506	A, B, C	2	18.6	125	7.0	44.2	48.9	60
			D, E	2	18.6	125	10.0	47.2	51.9	70
	575-3-60	518/633	A, B, C	2	14.7	100	5.2	34.6	38.3	50
			D, E	2	14.7	100	7.7	37.1	40.8	50

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning, and Refrigeration
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
RLA — Rated Load Amps

NOTES:
1. HACR circuit breaker in U.S.A. only.
2. All fuses Class RK-5.
3. The 460-v units using an internal secondary pump will require a neutral wire from the supply side in order to feed the accessory with 265-v.

ELECTRICAL DATA — DUAL POINT POWER UNIT

50VQP UNIT SIZE	VOLTAGE	MIN/MAX VOLTAGE	BLOWER OPTION	COMPRESSOR						EMERGENCY POWER SUPPLY		
				qty	RLA	LRA	FLA	MCA	MAX FUSE/ HACR	TOTAL UNIT FLA	MCA	MAX FUSE/ HACR
084	208/230-3-60	197/254	A, B, C	1	23.2	164	23.2	29.0	50	4.0	5.0	15
			D, E	1	23.2	164	23.2	29.0	50	5.0	6.3	15
	460-3-60	414/506	A, B, C	1	11.2	75	11.2	38.0	25	2.0	2.5	15
			D, E	1	11.2	75	11.2	38.0	25	2.4	3.0	15
	575-3-60	518/633	A, B, C	1	7.9	54	7.9	9.9	15	1.4	1.8	15
			D, E	1	7.9	54	7.9	9.9	15	1.9	2.4	15
096	208/230-3-60	197/254	A, B, C	1	25.0	164	25.0	31.3	50	5.0	6.3	15
			D, E	1	25.0	164	25.0	31.3	50	6.2	7.8	15
	460-3-60	414/506	A, B, C	1	12.2	100	12.2	15.3	25	2.4	3.0	15
			D, E	1	12.2	100	12.2	15.3	25	3.1	3.9	15
	575-3-60	518/633	A, B, C	1	9.0	78	9.0	11.3	20	1.9	2.4	15
			D, E	1	9.0	78	9.0	11.3	20	2.3	2.9	15
120	208/230-3-60	197/254	A, B, C	1	30.1	225	30.1	37.6	60	6.2	7.8	15
			D, E	1	30.1	225	30.1	37.6	60	9.2	11.5	20
	460-3-60	414/506	A, B, C	1	16.7	114	16.7	20.9	35	3.1	3.9	15
			D, E	1	16.7	114	16.7	20.9	35	4.3	5.4	15
	575-3-60	518/633	A, B, C	1	12.2	80	12.2	15.3	25	2.3	2.9	15
			D, E	1	12.2	80	12.2	15.3	25	3.4	4.3	15
150	208/230-3-60	197/254	A, B, C	1	48.1	245	48.1	60.1	100	9.2	11.5	20
			D, E	1	48.1	245	48.1	60.1	100	14.1	17.6	30
	460-3-60	414/506	A, B, C	1	18.6	125	18.6	23.3	40	4.3	5.4	15
			D, E	1	18.6	125	18.6	23.3	40	7.0	8.8	15
	575-3-60	518/633	A, B, C	1	14.7	100	14.7	18.4	30	3.4	4.3	15
			D, E	1	14.7	100	14.7	18.4	30	5.2	6.5	15
168	208/230-3-60	197/254	A, B, C	2	23.2	164	46.4	52.2	70	6.2	7.8	15
			D, E	2	23.2	164	46.4	52.2	70	9.2	11.5	20
	460-3-60	414/506	A, B, C	2	11.2	75	22.4	25.2	35	3.1	3.9	15
			D, E	2	11.2	75	22.4	25.2	35	4.3	5.4	15
	575-3-60	518/633	A, B, C	2	7.9	54	15.8	17.8	25	2.3	2.9	15
			D, E	2	7.9	54	15.8	17.8	25	3.4	4.3	15
192	208/230-3-60	197/254	A, B, C	2	25.0	164	50.0	56.3	80	9.2	11.5	20
			D, E	2	25.0	164	50.0	56.3	80	14.1	17.6	30
	460-3-60	414/506	A, B, C	2	12.2	100	24.4	27.4	35	4.3	5.4	15
			D, E	2	12.2	100	24.4	27.4	35	7.0	8.8	15
	575-3-60	518/633	A, B, C	2	9.0	78	18.0	20.3	25	3.4	4.3	15
			D, E	2	9.0	78	18.0	20.3	25	5.2	6.5	15
240	208/230-3-60	197/254	A, B, C	2	30.1	225	60.2	67.7	90	14.1	17.6	30
			D, E	2	30.1	225	60.2	67.7	90	21.7	27.1	45
	460-3-60	414/506	A, B, C	2	16.7	114	33.4	37.6	50	7.0	8.8	15
			D, E	2	16.7	114	33.4	37.6	50	10.0	12.5	20
	575-3-60	518/633	A, B, C	2	12.2	80	24.4	27.4	35	5.2	6.5	15
			D, E	2	12.2	80	24.4	27.4	35	7.7	9.6	15
300	208/230-3-60	197/254	A, B, C	2	48.1	245	96.2	108.2	150	14.1	17.6	30
			D, E	2	48.1	245	96.2	108.2	150	21.7	27.1	45
	460-3-60	414/506	A, B, C	2	18.6	125	37.2	41.9	60	7.0	8.8	15
			D, E	2	18.6	125	37.2	41.9	60	10.0	12.5	20
	575-3-60	518/633	A, B, C	2	14.7	100	29.4	33.1	45	5.2	6.5	15
			D, E	2	14.7	100	29.4	33.1	45	7.7	9.6	15

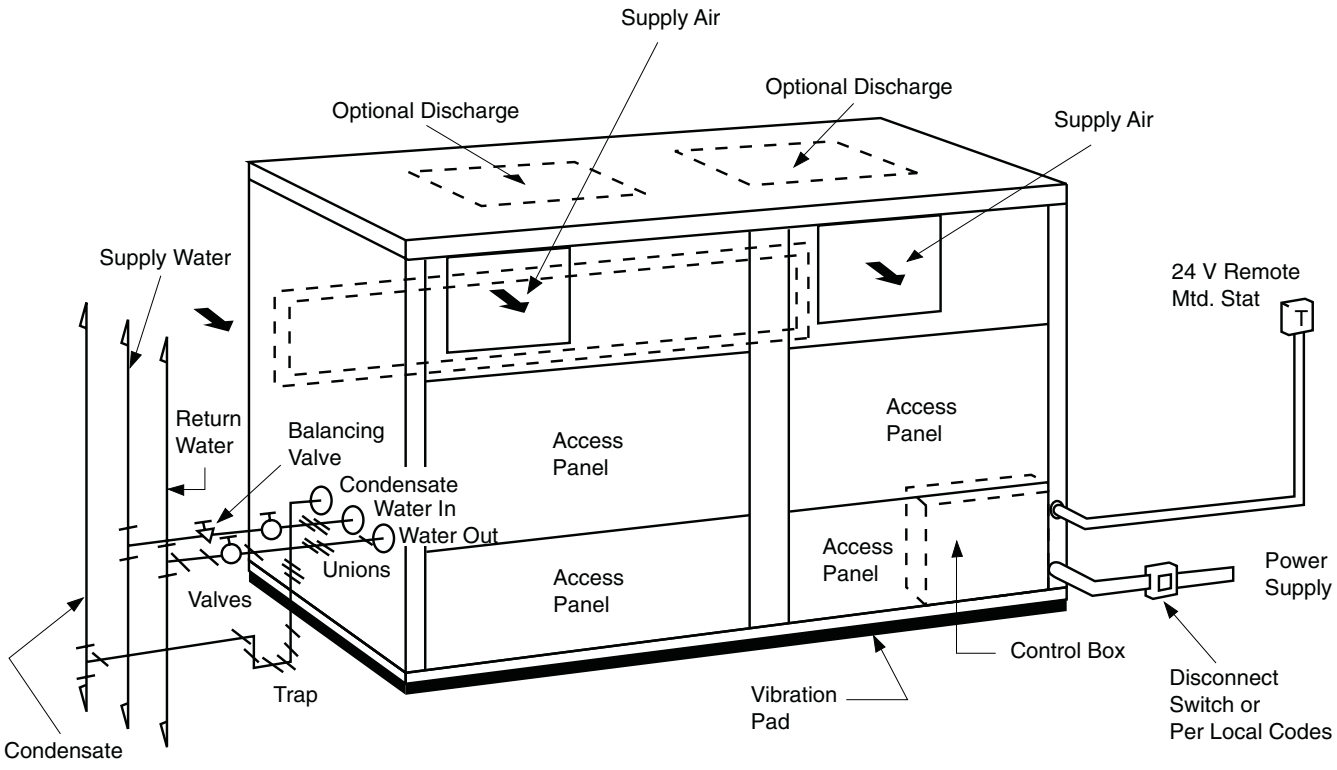
LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning, and Refrigeration
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
RLA — Rated Load Amps

NOTES:
1. HACR circuit breaker in U.S.A. only.
2. All fuses Class RK-5.
3. The 460-v units using 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

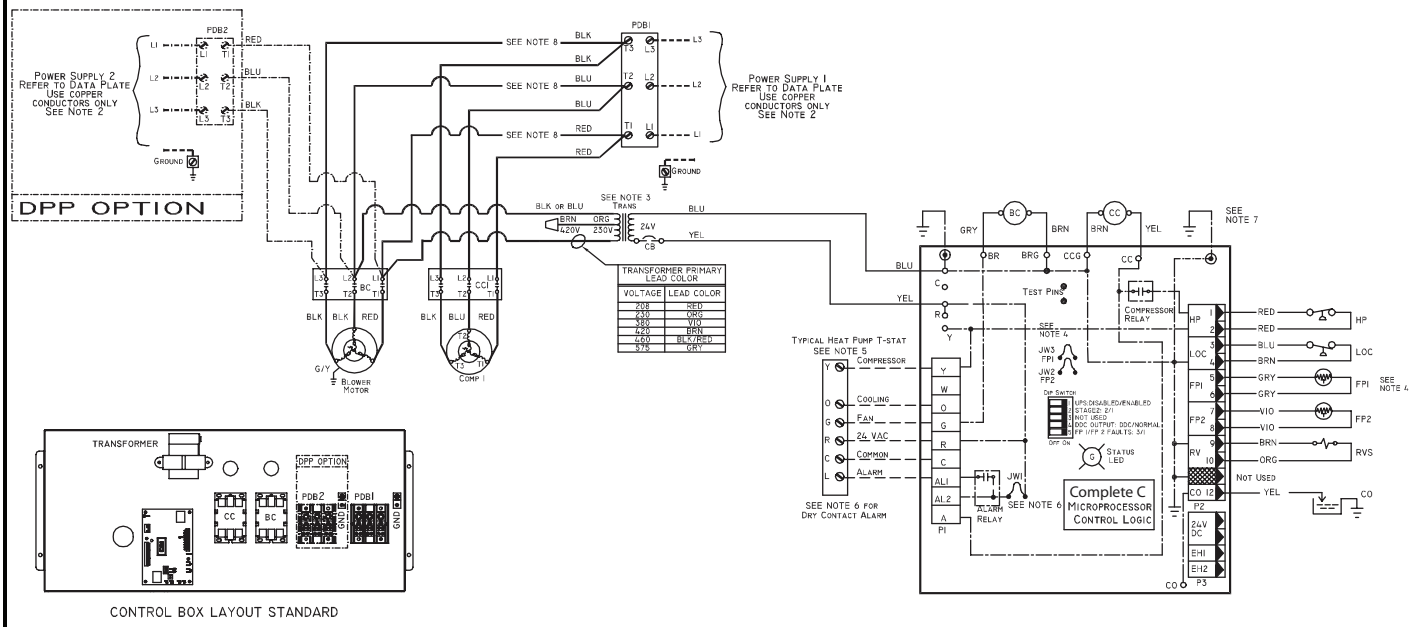
50VQP



NOTES:
1. Wiring and piping are general guides only. They are not intended for or to include all details for a specific installation.
2. Return air ductwork can be field installed if desired. See base unit dimensions for return air duct pilot hole locations.
3. All wiring must comply with applicable local and national codes.
4. All piping must follow standard refrigerant piping techniques. Refer to Carrier System Design Manual, Part 3, for details.
5. For maximum working pressure, see installation instructions.

Typical control wiring schematics

50VQP084-168 WITH COMPLETE C CONTROL (TYPICAL)



CONTROL BOX LAYOUT STANDARD

LEGEND

AL	— Alarm Relay
BC	— Blower Contactor
CB	— Circuit Breaker
CC	— Compressor Contactor
CO	— Sensor, Condensate Overflow
DPP	— Dual Point Power
FP1	— Sensor, Water Coil Freeze Protection
FP2	— Sensor, Air Coil Freeze Protection
HP	— High-Pressure Switch
JW3	— Clippable Field Selection Jumper
LOC	— Loss of Charge Pressure Switch
PDB1	— Power Distribution Block
PDB2	— Power Distribution Block Dual Point Option
RVS	— Reversing Valve Solenoid
TRANS	— Transformer

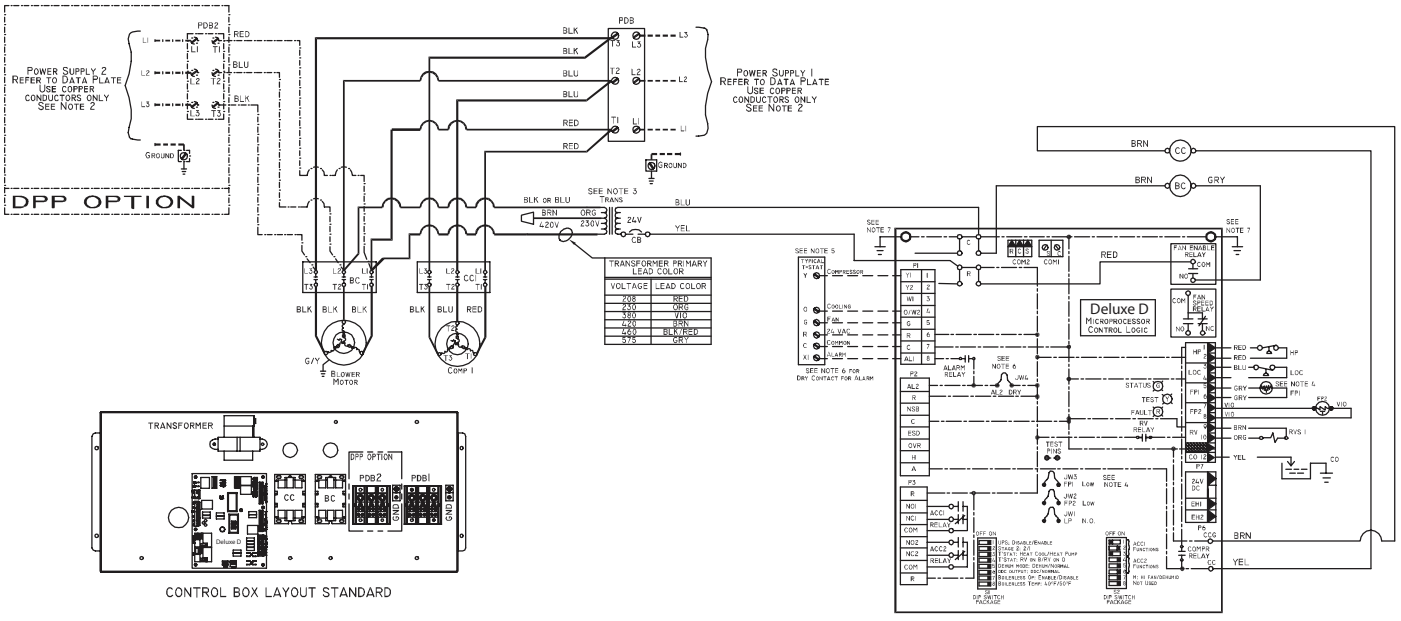
	Factory Line Voltage Wiring
	Factory Low Voltage Wiring
	Field Line Voltage Wiring
	Field Low Voltage Wiring
	Printed Circuit Trace
	Optional Wiring
	Relay/Contactor Coil
	Thermistor
	Condensate Pan
	Circuit Breaker
	Ground
	Solenoid Coil
	Relay Contacts - N.O.
	Relay Contacts - N.C.
	Temperature Switch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

NOTES:

1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC (National Electrical Code) and local codes.
3. 208/230-v transformers will be connected for 208-v operation. For 230-v operation, disconnect RED lead at L1, and attach ORG lead to L1. Close open end of RED lead with insulating tape.
4. FPI jumper provides low temperature protection for WATER. When using ANTIFREEZE solutions, cut JW3 jumper.
5. Typical heat pump 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. For dual point power option, blower wires (3 qty) will go to PDB2 only.

Typical control wiring schematics (cont)

50VQP084-168 WITH DELUXE D CONTROL (TYPICAL)



CONTROL BOX LAYOUT STANDARD

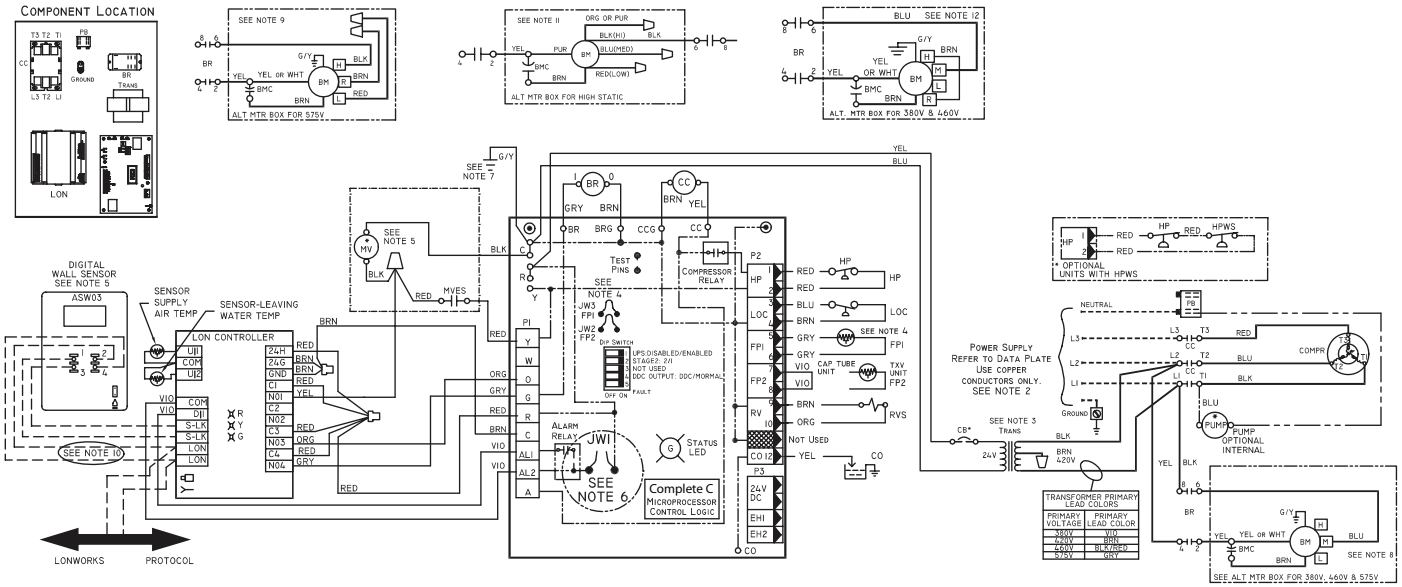
LEGEND

AL — Alarm Relay
BC — Blower Contactor
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
DPP — Dual Point Power
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch
JW3 — Clippable Field Selection Jumper
LOC — Loss of Charge Pressure Switch
PDB1 — Power Distribution Block
PDB2 — Power Distribution Block Dual Point Option
RVS — Reversing Valve Solenoid
TRANS — Transformer

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

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC (National Electrical Code) and local codes.
3. 208/230-v transformer will be connected for 208-v operation. For 230-v operation, disconnect RED lead at L1, and attach ORG lead to L1. Insulate open end of RED lead with insulating tape.
4. FP1 thermistor provides freeze protection for WATER. When using ANTIFREEZE solution, cut JW3 jumper.
5. Typical heat pump 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 (JW4) 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. For dual point power option, blower wires (3 qty) will go to PDB2 only.

50VQP084-300 UNITS WITH COMPLETE C AND LON CONTROLLER (460 V)



LEGEND

AL — Alarm Relay Contacts
BM — Blower Motor
BMC — Blower Motor Capacitor
BR — Blower Relay
CAP — Compressor Capacitor
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
FP1 — Sensor, Low Temperature Protection, Water Coil
FP2 — Sensor, Low Temperature Protection, Air Coil
HP — High-Pressure Switch
HPWS — High-Pressure Water Switch
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

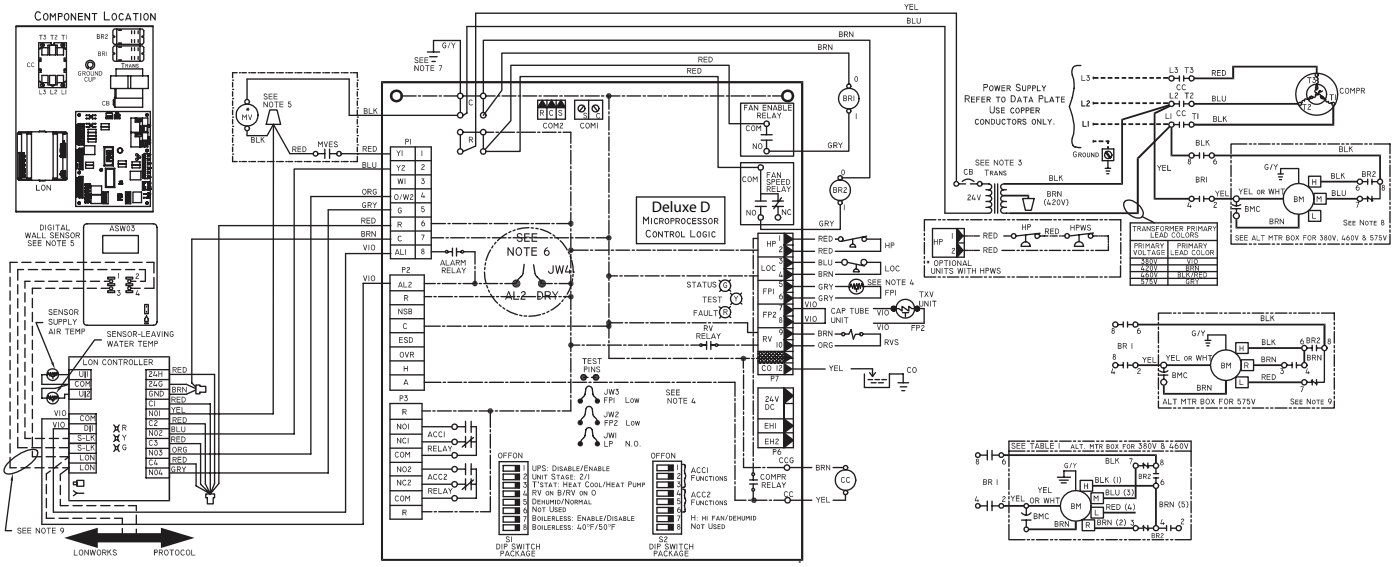
Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Temperature Switch

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 low temperature protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Refer to microprocessor control, LON, or thermostat installation instructions for wiring to the unit. Wire “N01” from LON to “Y1” Complete C when a motorized valve is not used. Low voltage 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 green wire with yellow strip from “C” terminal to control box.
8. 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.
9. For low speed, remove BLK wire from BR “6” and replace with RED. Connect BLK and BRN wires together.
10. Optional LON wires. Only connect if LON connection is desired at the wall sensor.
11. 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”.
12. Blower motor factory wired to medium speed. For low speed remove BLU wire from medium tap and connect to low speed tap. For high speed, remove BLU wire from exisiting speed tap and remove BRN jumper wire from high speed tap. Connect BLU wire to high speed tap. Tape off unconnected end of BRN jumper.
13. The 460-v units using 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)

50VQP084-300 UNITS WITH DELUXE D AND LON CONTROLLER (460 V)



LEGEND

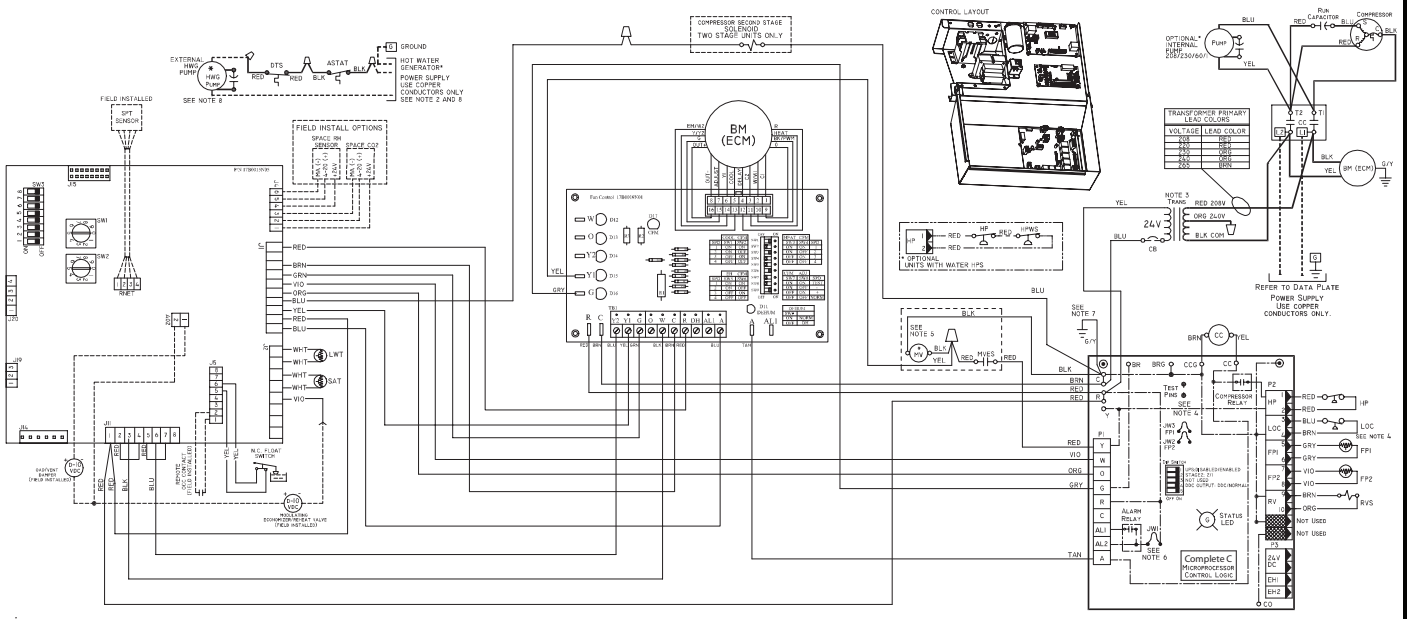
AL — Alarm Relay Contacts
BM — Blower Motor
BMC — Blower Motor Capacitor
BR — Blower Relay
CAP — Compressor Capacitor
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
FP1 — Sensor, Low Temperature Protection, Water Coil
FP2 — Sensor, Low Temperature Protection, Air Coil
HP — High-Pressure Switch
HPWS — High-Pressure Water Switch
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 low temperature protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Refer to microprocessor control, LON, thermostat installation instructions for wiring to the unit. Wire “N01” from LON to “Y1” Deluxe D when motorized valve is not used. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. Factory cut JW4 jumper. 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. Blower motor is factory wired for medium and high speeds. For any other combination of speeds, attach black wire to the higher of the two desired speed taps at the motor, and attach the blue wire to the lower of the two desired speed taps.
9. Blower motor is factory wired for high and low speeds. No other combination is available.
10. Optional LON wires. Only connect if LON connection is desired at the wall sensor.
11. The 460-v units using an internal secondary pump will require a neutral wire from the supply side in order to feed the accessory with 265-v.

50VQP UNIT WITH COMPLETE C AND WSHP OPEN CONTROLLER (208/230 V)



LEGEND

AL — Alarm Relay Contacts
ASTAT — Aquastat
BM — Blower Motor
BMC — Blower Motor Capacitor
BR — Blower Relay
CAP — Compressor Capacitor
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
DTS — Discharge Temperature Switch
ECM — Electronically Commutated Motor
FP1 — Sensor, Low Temperature Protection, Water Coil
FP2 — Sensor, Low Temperature Protection, Air Coil
HP — High-Pressure Switch
HPWS — High-Pressure Water Switch
HWG — Hot Water Gage
JW1 — Clippable Field Selection Jumper
LOC — Loss of Charge Pressure Switch
LWT — Leaving Water Temperature
***Optional Wiring.

MV — Motorized Valve
MVES — Motorized Valve End Switch
NEC — National Electrical Code
P1 — Field Wiring Terminal Block
RVS — Reversing Valve Solenoid
TRANS — Transformer

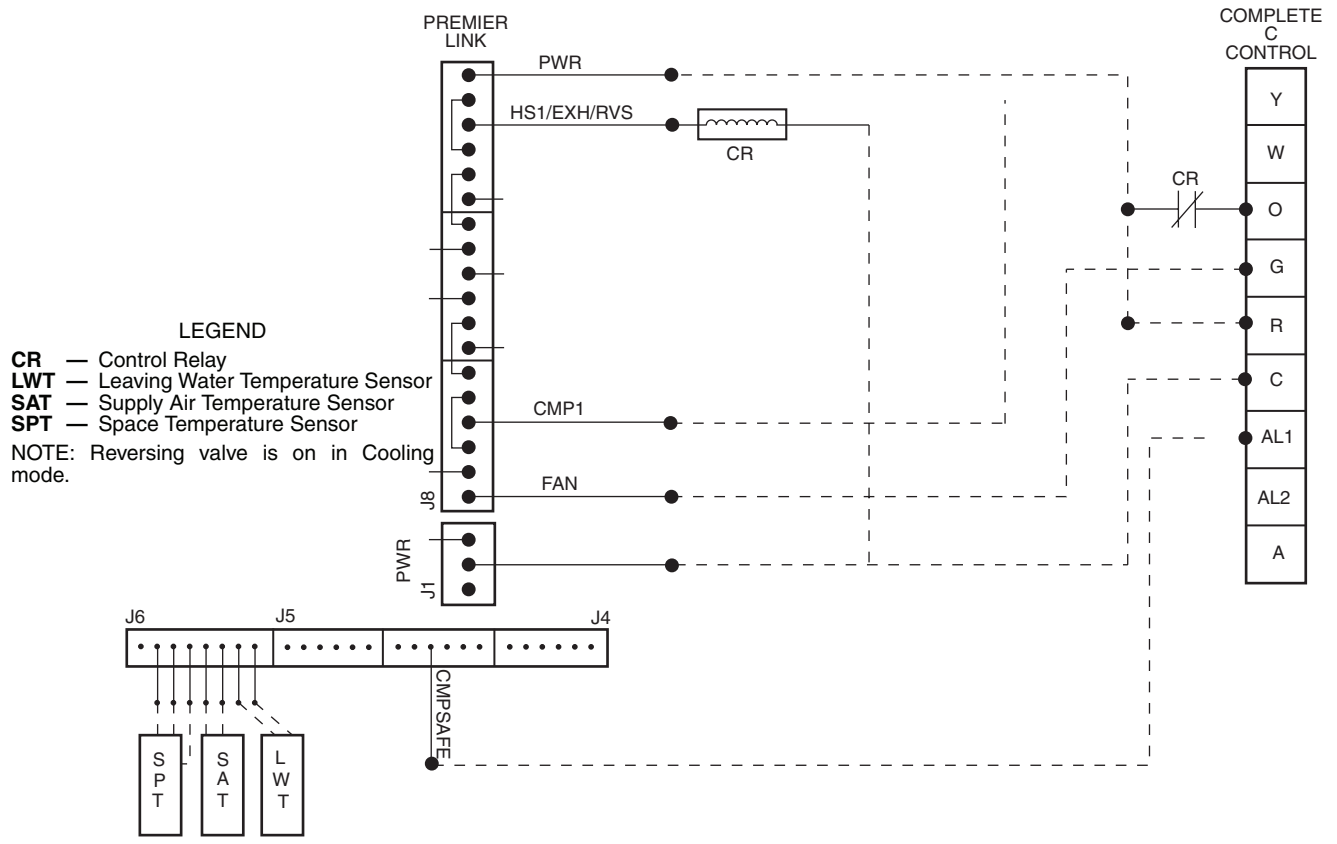
Factory Low Voltage Wiring
Factory Line Voltage Wiring
Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil
Condensate Pan
Solenoid Coil

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

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. 208/230-v units are wired for 208-v operation. For 230-v operation, switch RED wire to ORG wire. 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 thermostat installation instructions for control wiring to the unit. Wire ECM to Y Complete C when a motorized valve is not used. 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. 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 277-v.

Typical control wiring schematics (cont)

PREMIERLINK™ CONTROLLER APPLICATIONS WITH COMPLETE C CONTROL

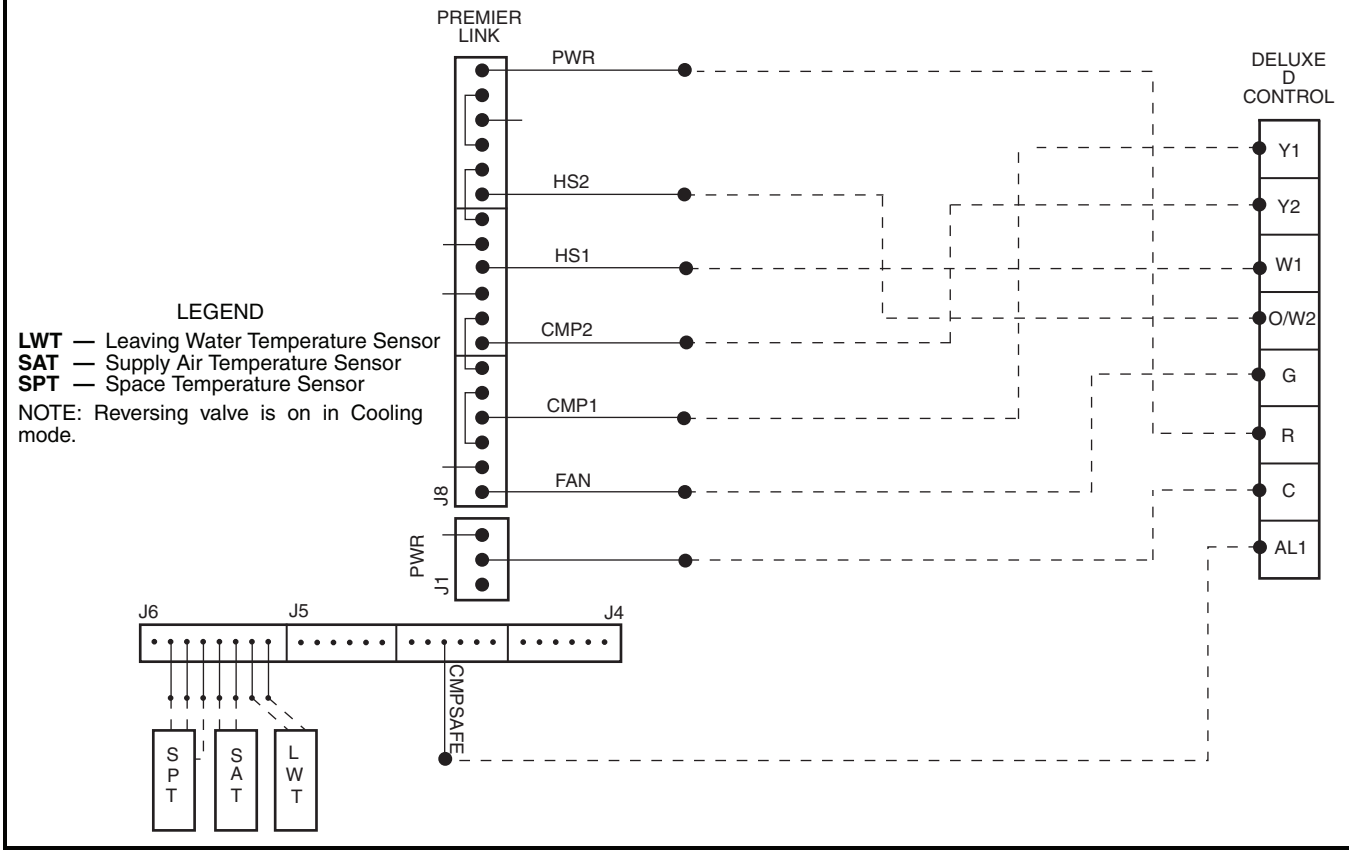


LEGEND

CR — Control Relay
LWT — Leaving Water Temperature Sensor
SAT — Supply Air Temperature Sensor
SPT — Space Temperature Sensor

NOTE: Reversing valve is on in Cooling mode.

PREMIERLINK CONTROLLER APPLICATIONS WITH DELUXE D CONTROL

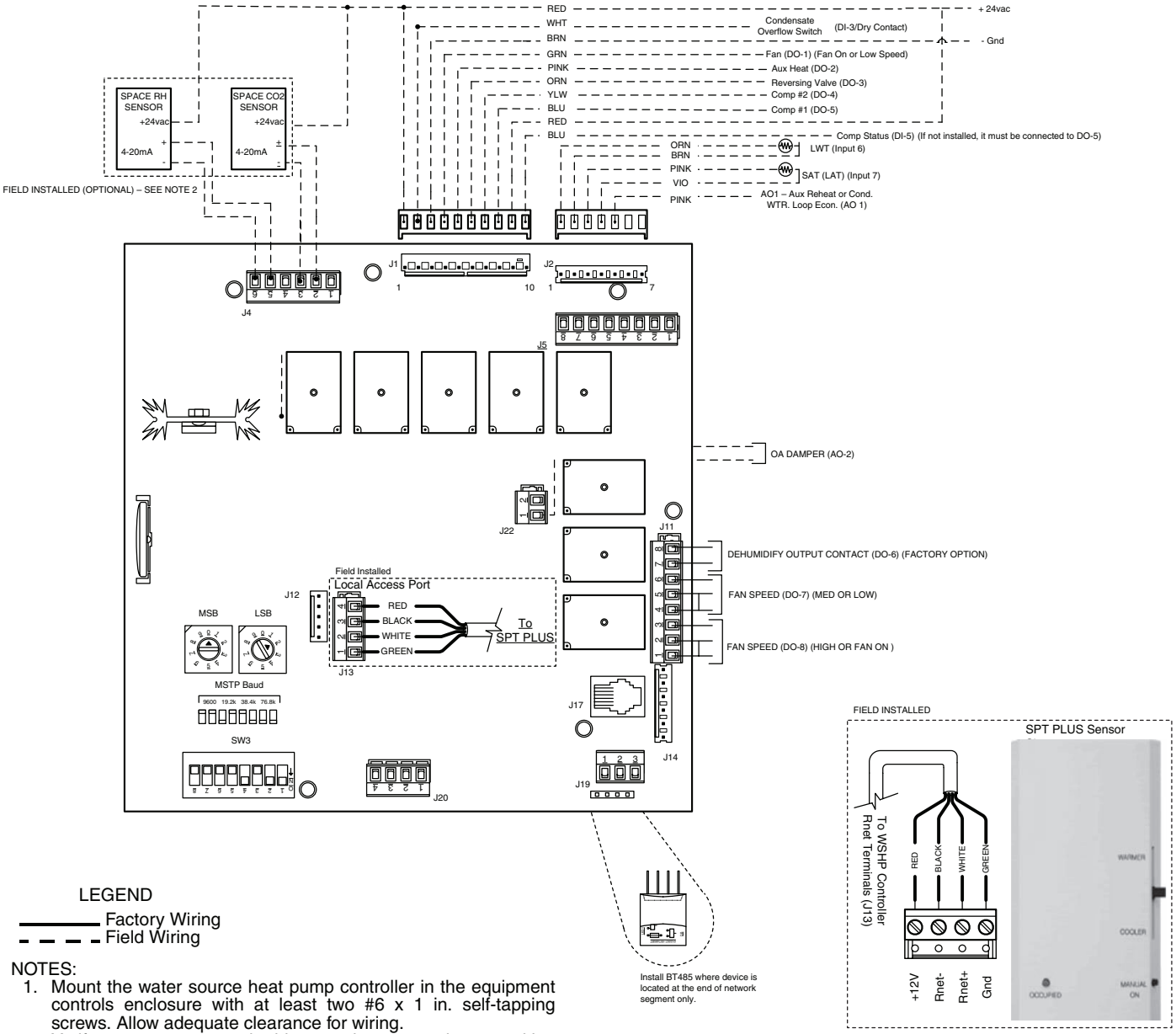


LEGEND

LWT — Leaving Water Temperature Sensor
SAT — Supply Air Temperature Sensor
SPT — Space Temperature Sensor

NOTE: Reversing valve is on in Cooling mode.

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) 7-25 (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 3-30	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, 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 stand alone, DDC, DCV, and VVT® controls.
- WSHP Efficiency/Operational Cost Comparison chart.
- System variations such as a system without a boiler, variable pumping, and 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 feet below the ground surface, and then backfilled. 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.

Each unit must be installed with its own individual trap, vent, and means to flush or blowout the condensate drain lines. Do not install units with a common trap or vent.

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.

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 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

OCTAVE BAND SOUND PRESSURE LEVEL (Lp) ASSOCIATED WITH NC CURVES

NOISE CRITERIA CURVES	OCTAVE BAND SOUND PRESSURE LEVEL (Lp) Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
NC-15	49	36	26	17	17	14	12	11
NC-20	52	41	33	27	22	19	17	16
NC-25	54	45	38	31	27	24	22	21
NC-30	58	49	41	36	31	29	28	27
NC-35	61	53	45	40	36	34	33	32
NC-40	64	57	50	45	41	39	38	37
NC-45	67	61	54	49	46	44	43	42
NC-50	71	64	58	54	51	49	48	47
NC-55	74	68	63	58	56	54	53	52
NC-60	77	71	67	63	61	59	58	57
NC-65	80	75	71	68	66	64	63	62

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 unit sound design are provided to design around the WSHP units.

Use the following guidelines for layout of Aquazone WSHP 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.

If installing unit 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-site 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.

OPERATING LIMITS

AIR LIMITS	COOLING (F)	HEATING (F)
Min. Ambient Air	45	45
Rated Ambient Air	80	70
Max. Ambient Air	100	85
Min. Ent. Air	50	40
Normal Entering Air db/wb	75/63-80/67	70
Max. Entering Air db/wb	110/83	80
WATER LIMITS		
Min. Entering Water	*30	45 (*20)
Normal Entering Water	40-90	40-90
Max. Entering Water	110	90

LEGEND

db — Dry Bulb
wb — Wet Bulb

*With antifreeze, optional extended range insulation and low temperature cutout jumper clipped for antifreeze.

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.

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.

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.

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 shutdown 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 control 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

Commercial Vertical Water Source Heat Pump Units with Puron® Refrigerant (R-410A)

HVAC Guide Specifications

Size Range: **84,000 to 300,000 Btuh Cooling Capacity**

Carrier Model Number: **50VQP**

Part 1 — General

1.01 SYSTEM DESCRIPTION

A. Heat pump units are designed to operate with 60 to 95 F water temperature or 20 to 110 F water temperature when the extended range option is selected. Units shall consist of high-efficiency scroll compressor(s) and shall have 2 independent refrigeration circuits where appropriate. The air discharge and return are as specified on drawings.

B. Units shall be individually packaged with wooden skid covered with protective corner posts and plastic stretch wrapping for maximum protection.

1.02 QUALITY ASSURANCE

A. Basic unit shall be rated and certified in accordance with ARI/ISO/ASHRAE Standards.

B. Units shall have insulation and adhesive which meet NFPA 90A requirements for flame spread and smoke generation, and assembled units shall be ETL certified, US and Canada, and meet UL-181 standards.

C. Units shall be factory tested under normal operating conditions at nominal water flow rates to assure proper operation of all components and safety devices.

Part 2 — Product

2.01 EQUIPMENT

A. Heat Pump Assembly:

Factory-tested and assembled single-piece water source heat pump units shall be factory wired, charged with Puron refrigerant (R-410A), contain refrigerant-to-water heat exchanger, refrigerant-to-air heat exchanger, 4-way reversing valve, fan motor assembly, compressor, metering device, and all internal controls and safety devices.

B. Unit Cabinet:

1. Unit shall be constructed of heavy gage galvanized sheet metal with powder coat paint finish and with removable service panels, hanging brackets, and insulated galvanized steel condensate pan of welded construction.
2. Supply and return water connections shall be copper FTP, flush-mounted and rigidly connected to prevent damage to tubing and/or noise generation.
3. Cabinet construction shall permit service testing without air bypass on coil and shall incorporate factory-installed supply ductwork connections. Direct connection to fan housing is not recommended due to sound considerations.
4. Unit shall have separate entrances for high and low-voltage electrical supplies.
5. One-in. wide filter bracket and 1-in. fiberglass disposable filter shall be provided on each unit.
6. All interior surfaces shall be lined with $^1/_2$-in. thick, $1^1/_2$ lb per cu ft density acoustic type fiberglass insulation. All fiberglass shall be coated and all edges shall be tucked under flanges to prevent the introduction of glass fibers in the airstream.

C. Fan and Motor Assembly:

1. Units shall have belt driven single or dual centrifugal fans. The fan motor shall be permanently lubricated with internal overload protection.
2. Fan motor shall be isolated from the fan housing by flexible rubber isolation grommets.

D. Compressors:

Unit shall have heat pump duty, high-efficiency scroll compressor(s) with internal and external isolation.

E. Heat Exchangers:

1. Refrigerant-to-air coil shall be aluminum/copper finned-tube construction type rated for 625 psig and shall be fully degreased at the factory to prevent possible condensate blowoff.
2. Refrigerant-to-water heat exchanger shall be steel/copper tube-in-tube type rated for 625 psig refrigerant, 500 psig water-side pressures.
3. Optional steel/cupronickel refrigerant-to-water heat exchanger shall be used for open loop applications, or where water quality cannot be maintained as specified by manufacturer.

F. Refrigerant Components:

1. Refrigeration circuit components shall include liquid line service valve, suction line service valve, reversing valve, a full charge of compressor oil, and a holding charge of refrigerant.
2. Thermostatic expansion valve shall be provided for refrigerant metering.

G. Controls and Safeties:

1. Safety devices on all units shall include low-pressure sensor or loss-of-charge switch, high-pressure switch, low water temperature sensor, and condensate overflow switch.
2. The standard Complete C electronic control system shall interface with a heat pump (Y,O) wall thermostat (mechanical or electronic). The control system shall have the following features:
   a. 75 VA transformer.
   b. Anti-short cycle time delay on compressor operation; time delay shall be 5 minutes minimum.
   c. Random start on power-up.
   d. Low voltage protection.

e. High voltage protection.
f. Condensate overflow shutdown.
g. Unit shutdown on low refrigerant pressures.
h. Unit shutdown on high or low water temperature (selectable for antifreeze solutions).
i. Option to reset unit at thermostat or disconnect. Fault type shall be retained in memory if reset at thermostat.
j. Automatic intelligent reset. Unit shall automatically restart 5 minutes after shutdown if the fault has cleared. Should a fault occur 3 times sequentially, then lockout will occur.
k. Ability to defeat time delays for servicing.
l. Light-emitting diode (LED) to indicate high pressure, low pressure, improper voltage, water coil freeze protection, air coil freeze protection, condensate overflow, and control status.
m. Unit Performance Monitor to indicate inefficient operating conditions prior to unit lockout.
n. Remote fault type indication at thermostat.
o. Single harness connection for all safety devices.
p. Selectable 24-v or pilot duty dry contact alarm output.
q. 24-v output to cycle a motorized water valve with compressor contactor.

3. The optional Deluxe D electronic control shall have all the features of the Complete C control, with the following additional features:
   a. A removable thermostat connector.
   b. Random start on return from night setback.
   c. Minimized reversing value operation for extended life and quiet operation.
   d. Night setback control from low temperature thermostat, with 2-hour override initiated by a momentary signal from the thermostat.
   e. Dry contact night setback output for digital night setback thermostats.
   f. Ability to work with heat/cool (Y, W) thermostats.
   g. Ability to work with heat pump thermostats using O or B reversing valve control.
   h. Single grounded wire to initiate night setback or emergency shutdown.
   i. Boilerless system control can switch automatically to electric heat at low loop water temperature.
   j. Control board shall allow up to 3 units to be operated from one thermostat without any auxiliary controls.
   k. A relay to operate an external damper. The control to be such that the damper will not open until 30 minutes after the unit comes back from Unoccupied mode.
   l. A relay to restart a central pump or control a 24-v motorized water valve.

4. 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 BACview[6] 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

5. PremierLink™ Controller:

   This control will function with Carrier Comfort Network® (CCN) 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 control ventilation (DCV) ready. The communication rate must be 38.4K or faster. It shall include an integrated economizer controller.

6. 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.

H. Electrical:

1. A control box shall be located within the unit compressor compartment and shall contain a 75 va transformer, 24-volt activated, 3-pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Electro-mechanical operation WILL NOT be accepted.
2. Units shall be nameplated for use with time-delay fuses or HACR circuit breakers.
3. Unit controls shall be 24-volt and provide heating or cooling as required by the remote thermostat.

I. Sound Attenuation Package (Mute Package):

Consists of attenuation material that is applied to the cabinet to reduce noise. Attenuation material shall be applied to the basepan, compressor access panels, and blower housing.

J. High-Static Blower:

The optional high-static blower provides increased airflow at various static pressure conditions.

K. Special Features:

1. Aquazone™ Thermostat Controls:
   a. Programmable multi-stage thermostat offers 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, and 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, and included locking cover.
   e. Non-programmable thermostat offers 2 heat stages, 2 cool stages, auto changeover, 5-minute built-in compressor protection, and included locking cover.
2. Aquazone™ system loop control panel shall include a pre-programmed, easy to use, Carrier Comfort Controller set up for a WSHP system. The features of the loop control panel shall be configured for the specific installation to include the following:
   a. The loop control panel shall coordinate, monitor, or control all WSHP units and ancillary equipment including cooling towers, boilers, and system pumps.
   b. Panel shall be provided with 2, 4, 6, or 8 stages of system heat rejection.
   c. Panel shall be provided with 2, 4, 6, or 8 stages of system heat addition.
   d. Panel shall be provided with stand-alone (i.e., non-communicating) operation with the ability to control 10 or 18 zones of WSHP units.
   e. Panel shall be provided to control variable frequency cooling tower fan operation.
   f. System pumping operation shall be configured for start/stop, lead/lag, or variable frequency pump operation.
   g. Loop panel shall be direct digital control compatible using the CCN and WSHP units using PremierLink CCN controllers.
3. Filters:

   Filters are available in 2 in. or 4 in. (MERV 8) sizes.
4. Filter Rack:

   Filter rack for one, 2, or 4 in. filters enhances the filtration system of the water source heat pump.

   NOTE: Filter rack does not include filters.

5. Fire-Rated Hose Kits:

   Kits include 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.

6. Ball Valves (Brass Body):

   Valves are for shutoff and balancing water flow. Available with memory, memory stop, and pressure temperature ports.

7. Y Strainers (Bronze Body):

   Strainers are "Y" type configuration with a brass cap. Maximum operating pressure rating of strainers is 450 psig. Strainer screen made of stainless steel.

8. Solenoid Valves (Brass Body):

   Valves provide slow operation for quiet system application.

9. Hose Kit Assemblies:

   Assemblies include a ported ball valve with pressure temperature (P/T) plug ports and flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset measure flow (gpm) with two P/T ports, and flexible stainless steel hose with a swivel and nipple.

10. 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.

11. PremierLink™ Accessories:

    Accessories include supply air temperature sensors, communicating room sensors, CO_2 sensors, and linkage thermostats to provide a fully integrated DDC (direct digital control) system.

12. Extended Range:

    Extended range units provide an insulated water circuit for the coaxial coil and refrigerant circuit to prevent condensation, and therefore potential dripping problems, in applications where the entering water temperature is beyond the normal operating range.

13. 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.