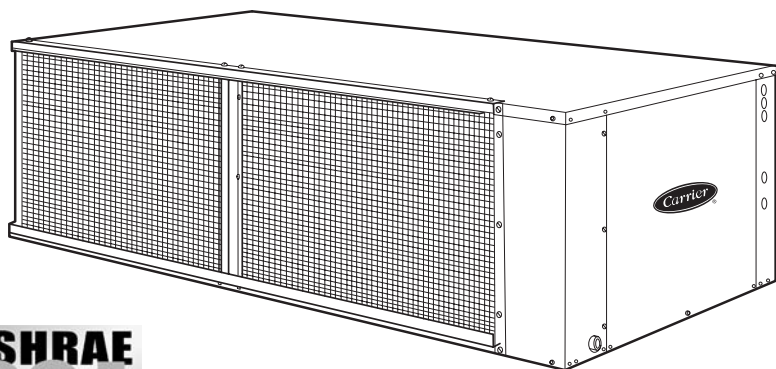
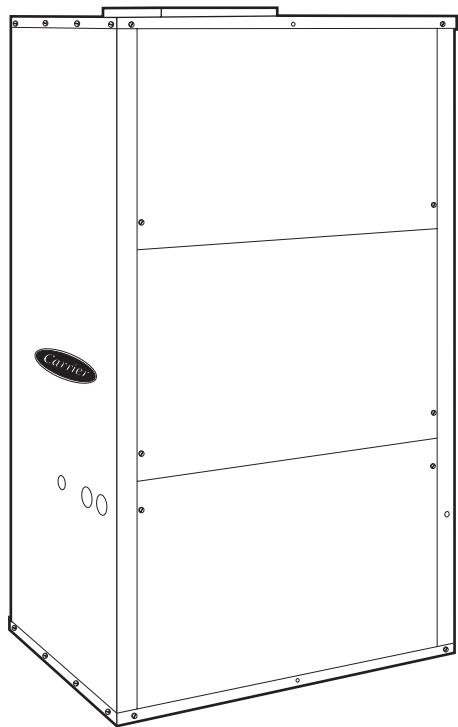




Product Data

50HQ,50VQ Large Capacity Water Source Heat Pumps

Horizontal — 6 to 10 Nominal Tons
Vertical — 6½ to 25 Nominal Tons



ASHRAE
90.1
COMPLIANT

Single-Package Horizontally and Vertically Mounted Water Source Heat Pumps with electronic controls.

- 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
- Dual 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 controls accommodate all systems

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 horizontal and large capacity vertical water source heat pumps (WSHP) are designed for quality and high performance over a lifetime of operation. Aquazone units offer cooling EER's (Energy Efficiency Ratio) to 14 and heating COP's (Coefficient of Performance) to 4.4. 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 Carrier 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 reciprocating compressors or 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 WSHF.

Refrigeration/water circuit — Units have a sealed refrigerant circuit including a reciprocating or 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 CSA (Canadian Standards Association) labels and are factory tested under normal operating conditions at nominal water flow rates. Quality assurance is provided via testing report cards shipped with each unit to indicate specific unit performance under cooling and heating modes of operation. Water source heat pumps are New York City MEA (Materials Equipment and Acceptance) 60-00-E rated.

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

Airflow configuration for Aquazone horizontal units is available as left return and right discharge. 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, horizontal and vertical units are both mounted on oversized pallets with lag bolts for sturdiness and maximum protection during transit.

Ease of installation

The Aquazone unit is packaged for simple low cost handling, with minimal time required for installation. All units are pre-wired and factory charged with refrigerant. Horizontal units are provided with factory-installed hangar isolation brackets. Water connections (FPT) and condensate drains (FPT) are anchored securely to the unit cabinet. High and low voltage knockouts are provided on all units.

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NRTL/C



As an ENERGY STAR Partner, Carrier Corporation has determined that this product meets the ENERGY STAR guidelines for energy efficiency.

Features/Benefits (cont)



Simple maintenance and serviceability

The Aquazone™ WSHP units are constructed to provide ease of maintenance. Horizontal units allow access to compressor section from 3 sides and vertical 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 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:

50VA 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 — Electronic sensor mounted to the drain pan. When condensate pan liquid reaches an unacceptable level, unit is automatically deactivated and placed in a lockout condition. Thirty continuous seconds of overflow is recognized as a fault by the sensor.

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

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

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

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

Water coil freeze protection (selectable for water or 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 — 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) — The Test mode allows service personnel to check the operation of the WSHP and control system efficiently. Upon entering Test mode, time delays are sped up, and the Status LED will flash a

code to indicate the last fault experienced for easy diagnosis. Based on the fault code flashed by the status LED, system diagnostics are assisted through the use of Carrier provided troubleshooting tables for easy reference to typical problems.

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

Carrier 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 38.4K baud communications capability and is compatible with ComfortLink™ Controls, CCN and ComfortVIEW™ Software. The Scrolling Marquee and Navigator are optional tools that can be used for programming and monitoring the unit for optimal performance. The addition of the Carrier CO₂ sensor in the conditioned space provides ASHRAE 62-99 compliance and Demand Control 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 and Variable Volume Temperature 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.

Model number nomenclature



50HQL HORIZONTAL UNITS

50HQL	096	S	C	C	5	0	1	A	1
50HQL – Horizontal Large Capacity Water Source Heat Pump									
Size – Nominal Tons 072 – 6 096 – 8 120 – 10									
Airflow Configuration Return Discharge S – Left Right									
Controls C – Complete C Control D – Deluxe D Control									
Heat Exchanger C – Copper N – Cupro/Nickel									
Operating Range/Sound Option 1 – Extended Range (20 F to 110 F) 2 – Extended Range and Mute Package 3 – Standard Range (60 F to 95 F) 4 – Standard Range and Mute Package									
Blower Drive Option 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 (Single Pack)									
Revision Code 0 – Current Revision									
V-Ph-Hz 5 – 208/230-3-60 6 – 460-3-60 1 – 575-3-60									

*Not available on size 072.

50VQA,VQD VERTICAL UNITS

50VQ	D	080	B	C	C	5	0	1	A
50VQ – Vertical Large Capacity Water Source Heat Pump									
Product Type A – Standard Temperature Range (60-95 F) D – Low Temperature Range (40-110 F)									
Size – Nominal Tons 080 – 6-1/2 100 – 8-1/2 120 – 10 160 – 13 200 – 17 240 – 20 300 – 25									
Airflow Configuration Without Mute Package Unit Sizes 080-240 Return Discharge B – Rear Top F – Front Top S – Rear Front Z – Front Rear With Mute Package Unit Sizes 080-240 Return Discharge N – Rear Top P – Rear Front H – Front Top U – Front Rear Unit Size 300 Return Discharge B – Rear Top F – Front Top Unit Size 300 Return Discharge N – Rear Top H – Front Top									
Blower Drive Option A – Standard RPM/Standard Motor B – Low RPM/Standard Motor C – High RPM/Standard Motor D – Standard RPM/Large Motor									
Packaging 1 – Domestic									
Revision Code 0 – Current Revision									
V-Ph-Hz 5 – 208/230-3-60 6 – 460-3-60 1 – 575-3-60									
Heat Exchanger C – Copper N – Cupro/Nickel									
Controls C – Complete C Control D – Deluxe D Control									

ARI* capacity ratings



50HQL072 UNITS

UNIT 50HQL	COOLING					HEATING				CFM	ESP	GPM	PD
	TC	TSC	THR	kW	EER	TC	THA	kW	COP				
072	70,000	49,975	91,712	6.36	11.0	91,000	67,676	6.84	4.0	2400	.25	18.3	10.2

50HQL096,120 UNITS

UNIT 50HQL	GPM	CFM	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	
			Total Capacity (Btuh)	EER (Btuh/W)	Total Capacity (Btuh)	COP	Total Capacity (Btuh)	EER (Btuh/W)	Total Capacity (Btuh)	COP	Total Capacity (Btuh)	EER (Btuh/W)	Total Capacity (Btuh)	COP
096	24	3200	94,600	12.8	108,700	4.4	101,900	17.4	91,000	4.0	96,700	14.2	72,600	3.4
120	30	4000	120,000	12.7	137,800	4.2	127,600	17.2	114,000	3.9	122,200	14.1	90,500	3.2

NOTES:

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

50VQA,VQD080-300 UNITS

UNIT 50VQA,VQD	COOLING					HEATING				CFM	ESP	GPM	PD
	TC	TSC	THR	kW	EER	TC	THA	kW	COP				
080	74,000	58,500	92,035	5.29	14.0	83,000	64,768	5.79	4.2	2600	.25	18.0	8.2
100	101,000	77,215	130,966	8.78	11.5	109,000	95,025	8.41	3.8	3500	.30	26.0	15.5
120	120,000	91,772	155,916	10.53	11.4	135,000	109,107	10.41	3.8	4200	.30	31.0	20.8
160	148,000	117,000	184,070	10.57	14.0	166,000	129,536	11.58	4.2	5200	.35	36.0	8.2
200	202,000	154,429	261,933	17.56	11.5	218,000	190,050	16.81	3.8	7000	.35	52.0	15.5
240	240,000	183,544	311,832	21.05	11.4	270,000	218,214	20.82	3.8	8400	.40	62.0	20.8
300	300,000	216,612	402,360	30.00	10.0	360,000	248,164	32.83	3.2	9000	.45	80.0	16.2

LEGEND

CFM — Cubic Feet Per Minute	PD — Pressure Drop (ft wg)
COP — Coefficient of Performance	TC — Total Capacity (Btuh)
db — Dry Bulb	THA — Total Heat of Absorption (Btuh)
EER — Energy Efficiency Ratio	THR — Total Heat of Rejection (Btuh)
ESP — External Static Pressure (in. wg)	TSC — Total Sensible Capacity (Btuh)
GPM — Gallons Per Minute	wb — Wet Bulb
kW — Total Power Input (kilowatts)	

*Air Conditioning and Refrigeration Institute.

NOTES:

- Ratings are in accordance with ARI Standard 320-93.
- Cooling Standard: 80 F db, 67 F wb indoor entering-air temperature, 85 F entering water and 95 F leaving water temperatures.
- Heating Standard: 70 F db indoor entering-air temperature, and 70 F entering water temperature.

Physical data



50HQL072 UNITS

UNIT 50HQL	072
NOMINAL CAPACITY (tons)	6
WEIGHT (lbs)	
Operating Weight	615
Shipping Weight	635
AIR COIL	Aluminum Fins, Copper Tubes
Total Face Area (sq ft)	6.66
Tube Size (in.)	$\frac{3}{8}$
Fin Spacing (FPI)	14
Number of Rows	2
REFRIGERANT CHARGE R-22 (oz/ckt)	36
NO. OF CIRCUITS	2
HIGH-VOLTAGE BUSHING (in.)	$1\frac{3}{8}$
FAN	
Qty...Wheel Size (D x W) (in.)	1...12 x 11
Range (rpm)	760-1014
Motor (hp)	1.5
REFRIGERANT-TO-WATER HEAT EXCHANGER	Steel-Copper or Steel-Cupronickel Tube-in-Tube
Connection (FPT) (in. ...TPI)	$1\frac{1}{4}$... $1\frac{1}{2}$
CONDENSATE DRAIN CONNECTION — FTP (in. ...TPI)	$\frac{3}{4}$...14
FILTER STANDARD — 1-in. Throwaway Qty...Size (H x W) (in.)	2...20 x $26\frac{1}{2}$

LEGEND

FPI — Fins per Inch
TPI — Threads per inch

50HQL096,120 UNITS

UNIT 50HQL	096	120
NOMINAL CAPACITY (tons)	8	10
Compressor (2 each)*	Scroll	Scroll
Factory Charge oz per Circuit†	50	80
WEIGHT (lbs)		
Operating Weight	560	610
Shipping Weight	580	630
AIR COIL		
Dimensions — H x W (in.)	2-20 x 30	2-20 x 30
Total Face Area (ft²)	8.33	8.33
Tube Size (in.)	$\frac{3}{8}$	$\frac{3}{8}$
Fin Spacing (FPI)	14	12
Number of Rows	3	4
Filter Qty...Standard — 1-in. Throwaway (in.)	4...16 x 20	4...16 x 20
FAN MOTOR		
Standard (hp)	2	2
Large (hp)	3	3
Qty...Wheel Size — D x W (in.)	2...10 x 10	2...11 x 10
WATER CONNECTION SIZE FPT (in.)	$1\frac{1}{4}$	$1\frac{1}{4}$
CONDENSATE CONNECTION SIZE FPT (in.)	$\frac{3}{4}$	$\frac{3}{4}$

LEGEND

FPI — Fins per Inch

*All units have grommet and spring compressor mountings, and $\frac{1}{2}$ -in. and $1\frac{3}{8}$ -in. electrical knockouts.

†Check unit label for refrigerant type (R-22 or R-407c).

50VQA,VQD080-300 UNITS

UNIT 50VQA,VQD	080	100	120	160	200	240	300
NOMINAL CAPACITY (tons)	$6\frac{1}{2}$	$8\frac{1}{2}$	10	13	17	20	25
WEIGHT (lbs)							
Operating Weight	595	685	735	1120	1265	1350	1465
Shipping Weight	610	695	745	1145	1275	1375	1475
AIR COIL	Aluminum Fins, Copper Tubes						
Total Face Area (sq ft)	9.00	8.75	9.38	18.00	17.50	18.75	18.75
Tube Size (in.)	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Fin Spacing (FPI)	14	15	15	14	15	15	15
Number of Rows	2	2	3	2	2	3	4
REFRIGERANT CHARGE R-22 /Ckt (oz)	110	118	144	110	118	144	175
NO. OF CIRCUITS	1	1	1	2	2	2	2
HIGH-VOLTAGE BUSHING (in.)	$1\frac{3}{8}$ - $1\frac{3}{4}$						2
FAN							
Qty...Wheel Size (D x W) (in.)	1...12 x 9	1...15 x 15	1...15 x 15	2...12 x 9	2...15 x 15	2...15 x 15	2...15 x 15
Motor (hp)	1.5	1.5	2.0	3.0	1.5	2.0	3.0
Range (rpm)	768-982	724-925	768-982	768-982	724-925	768-982	896-1110
REFRIGERANT-TO-WATER HEAT EXCHANGER	Steel-Copper or Steel-Cupronickel Tube-in-Tube						
Water Connection (FPT) (in. ...TPI)	$1\frac{1}{4}$... $1\frac{1}{2}$	$1\frac{1}{4}$... $1\frac{1}{2}$	$1\frac{1}{4}$... $1\frac{1}{2}$	$1\frac{1}{2}$... $1\frac{1}{2}$	$1\frac{1}{2}$... $1\frac{1}{2}$	$1\frac{1}{2}$... $1\frac{1}{2}$	$1\frac{1}{2}$... $1\frac{1}{2}$
CONDENSATE DRAIN CONNECTION (FPT) (in. ...TPI)	1... $1\frac{1}{2}$						
FILTER	1-in. Throwaway*						
Qty...Size (Height x Width) (in.)	2...20 x 25			4...20 x 25			

LEGEND

FPI — Fins per Inch
TPI — Threads per inch

*Two-inch filters are available as field-installed accessory.

Options and accessories



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 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 — Used with dual stage units (units with 2 compressors and 2 D controls) or in master/slave applications.

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

Intelligent reversing valve operation — Minimizes reversing valve operation for extended life and quiet operation.

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

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

Dehumidistat input — Provides operation of fan control for dehumidification operation.

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

Boilerless changeover temperature — Provides selection of boilerless changeover temperature set point.

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

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.

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, temperature display in degrees F or C.

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

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

Programmable 5-day thermostat — 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, 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, back-lit display, O or B terminal, dual set point with adjustable deadband, backplate with terminals.

Loop controller with six stages (2 stages for heating and 4 stages for heat rejection) which includes:

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

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

Options and accessories (cont)



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, $1\frac{1}{4}$, $1\frac{1}{2}$ in.).

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

Y strainers (bronze body) are “Y” type strainers with a brass cap. Maximum operating pressure rating of 450 psi. Strainer screen made of stainless steel. Available with blow down valves. Five sizes are available ($1/2$, $3/4$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ in.).

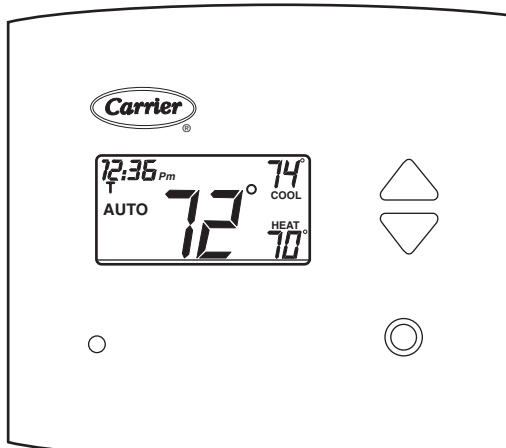
Solenoid valves (brass body) offer 3.5 watt coil, 24 volt, 50/60 Hz, 740 amps inrush, .312 amps holding. Slow operation for quiet system application. Five sizes are available ($1/2$, $3/4$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ in.).

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.

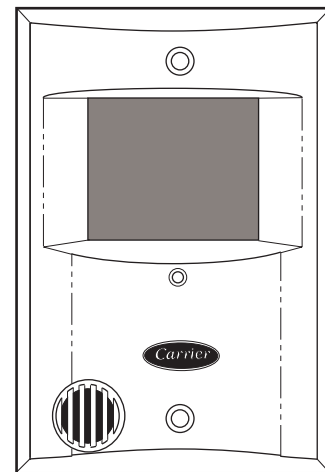
Remote sensors are available for Aquazone™ flush mount thermostats. Available sensors are for wall (wired and wireless) or duct mounted applications.

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, CO₂ sensors (for use in demand control ventilation), and linkage thermostats (to control multiple units from one thermostat).

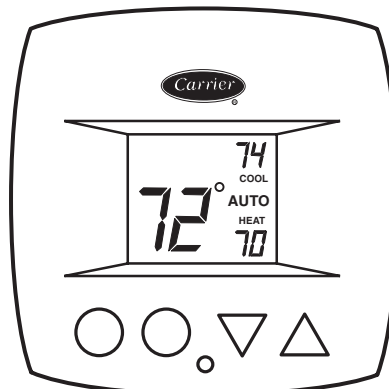
CARRIER AQUAZONE THERMOSTATS



7-DAY PROGRAMMABLE/LIGHT-ACTIVATED
PROGRAMMABLE

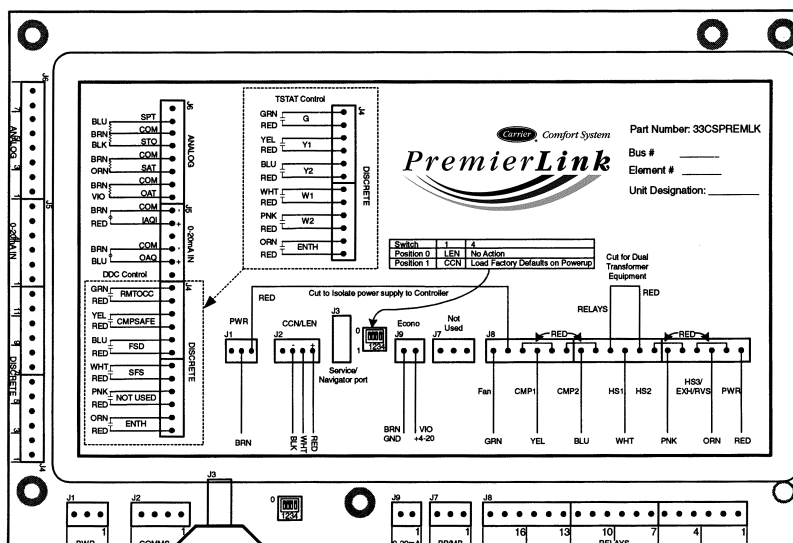


7-DAY PROGRAMMABLE FLUSH MOUNT



5-DAY PROGRAMMABLE/NON-PROGRAMMABLE

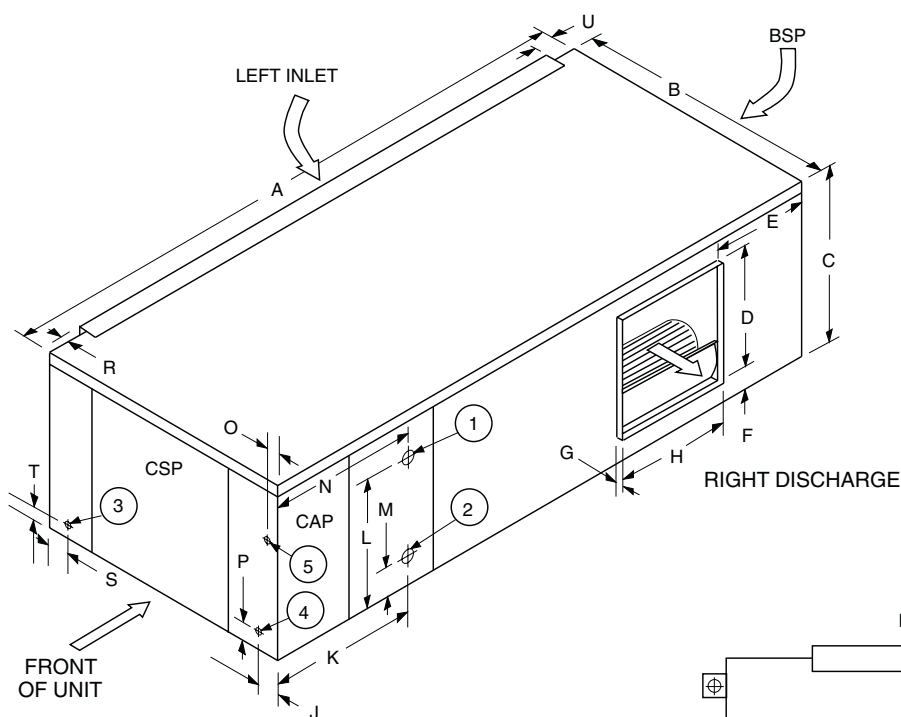
PREMIERLINK™ COMMUNICATING CONTROL



Base unit dimensions



50HQL072



CONNECTIONS

- | | |
|-----------------------|--------------------------------------|
| ① Water Outlet | 1 ¹ / ₄ " FPT |
| ② Water Inlet | 1 ¹ / ₄ " FPT |
| ③ Condensate Drain | 3/4" FPT |
| ④ High Voltage Access | 1 ³ / ₈ " K.O. |
| ⑤ Low Voltage Access | 1/2" DIA. |

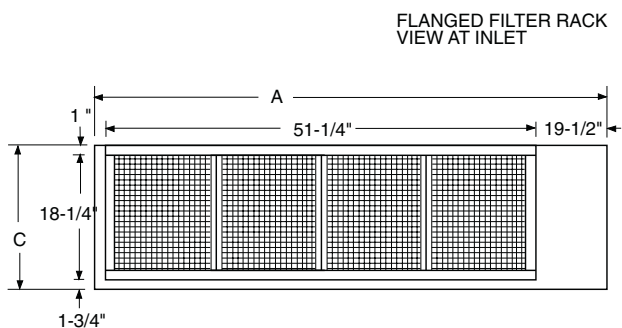
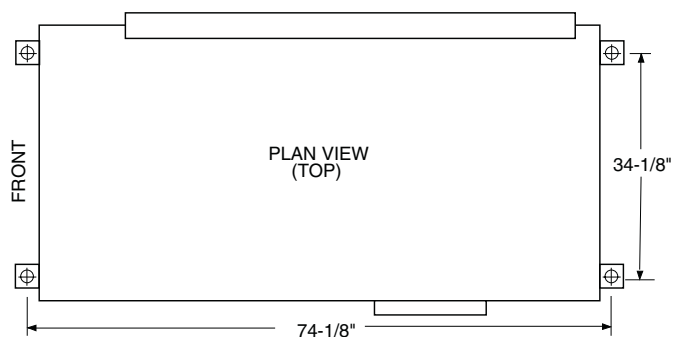
LEGEND

- BSP** — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel

NOTES:

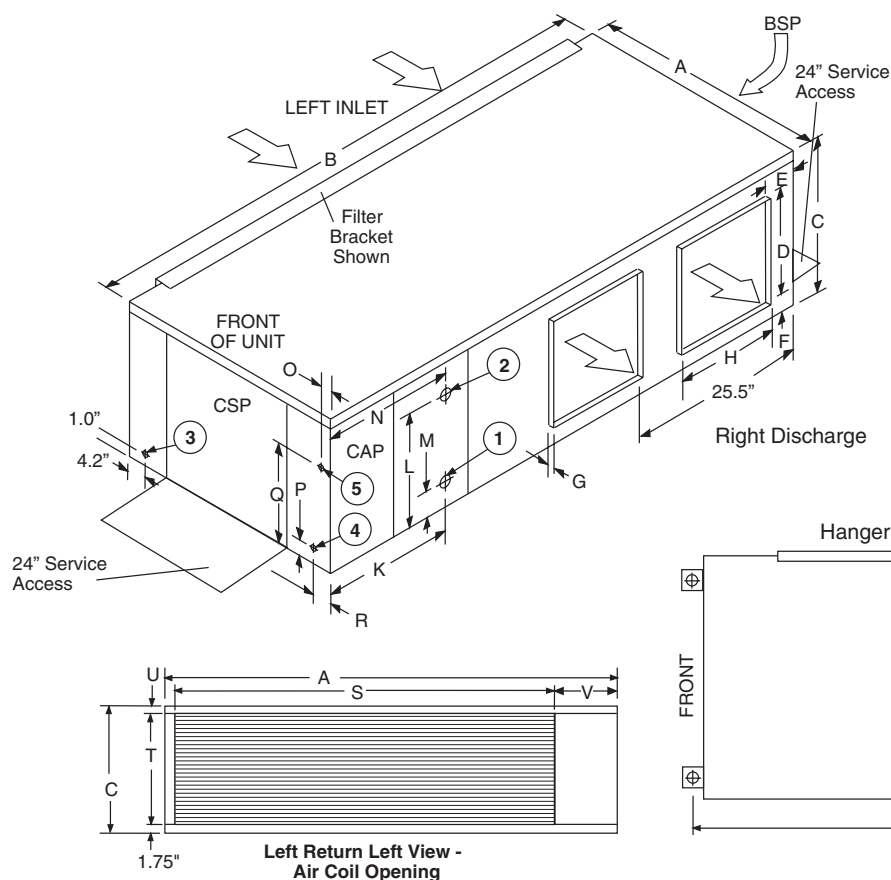
1. Return Air Duct Size: 18¹/₄" High x 51¹/₄" Wide.
2. Nominal Filter Size: 20" x 26¹/₂" x 1", Two Required.
3. Leave one end of the duct collar open for filter removal.
4. All side panels are removable.
5. Available in left return and right discharge only.
6. CSP and BSP require 24 in. for access.

Hanger Bracket Dimensions



UNIT 50HQL		DIMENSIONS																		
		A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	S	T	U
072	in.	72 ¹ / ₄	36	21	16	14 ¹ / ₂	3	1	16	17 ⁷ / ₈	19 ³ / ₄	16 ¹ / ₂	3 ¹ / ₄	21 ¹ / ₄	1 ¹ / ₂	2 ¹ / ₂	1	4 ¹ / ₄	13 ³ / ₈	3 ³ / ₄

50HQL096, 120



CONNECTIONS

- ① Water Outlet 1¹/₄" FPT
- ② Water Inlet 1¹/₄" FPT
- ③ Condensate Drain 3/4" FPT
- ④ High Voltage Access 1³/₈" K.O.
- ⑤ Low Voltage Access 1/2" DIA.

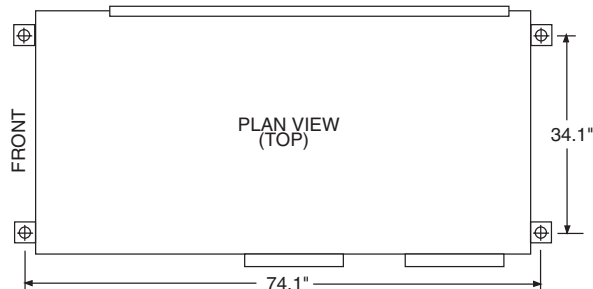
LEGEND

BSP — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel

NOTES:

1. All Dimensions in inches.
2. Flanged filter bracket shipped with unit. Leave one end of duct collar open for filter removal.
3. All side panels are removable.
4. Available in left return, right discharge only.
5. Condensate is 3/4" FPT copper.
6. Horizontal unit shipped with filter bracket only. This bracket should be removed for return duct connection.

Hanger Bracket Dimensions

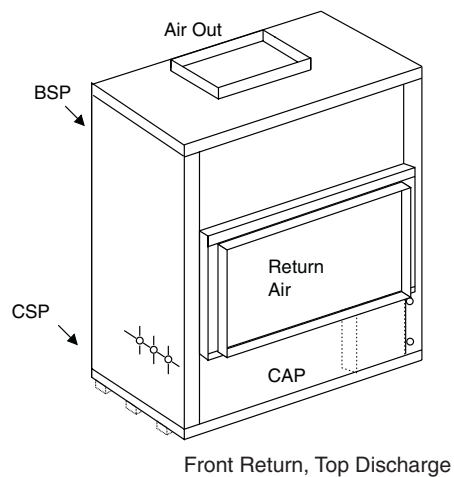
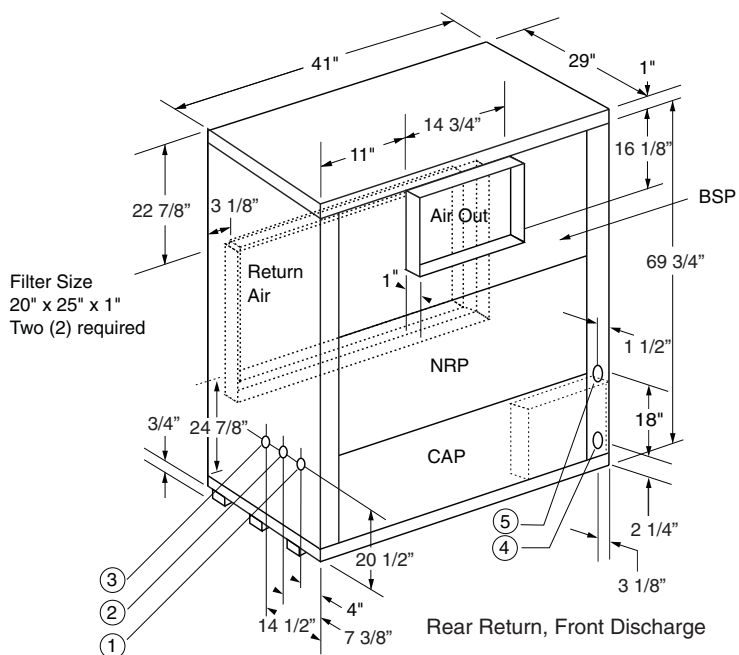


UNIT 50HQL	OVERALL CABINET (in.)			DISCHARGE CONNECTIONS (in.) (Duct Flange ± 0.10 in.)					WATER CONNECTIONS (in.)				ELECTRICAL KNOCKOUTS (in.)				RETURN AIR CONNECTIONS (in.) (Using Return Air Opening)			
	A Width	B Depth	C Height	D Supply Height	E	F	G	H Supply Depth	K	L	M	N	O	P	Q	R	S Return Depth	T Return Height	U	V
096	36.3	72.3	21.0	15.2	3.3	3.3	1.0	15.2	20.2	18.0	3.3	21.9	0.5	2.5	10.0	2.0	62.8	18.8	1.1	7.4
120	36.3	72.3	21.0	15.2	2.6	4.3	1.0	15.2	18.4	18.6	3.3	21.9	0.5	2.5	10.0	2.0	62.8	18.8	1.1	7.4

Base unit dimensions (cont)



50VQA,VQD080



CONNECTIONS

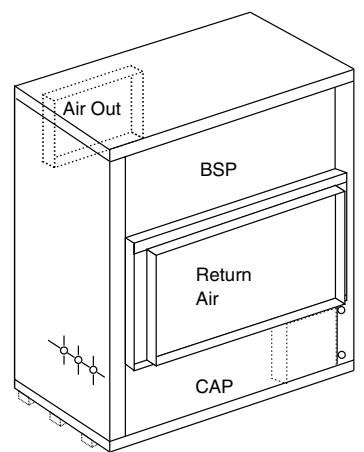
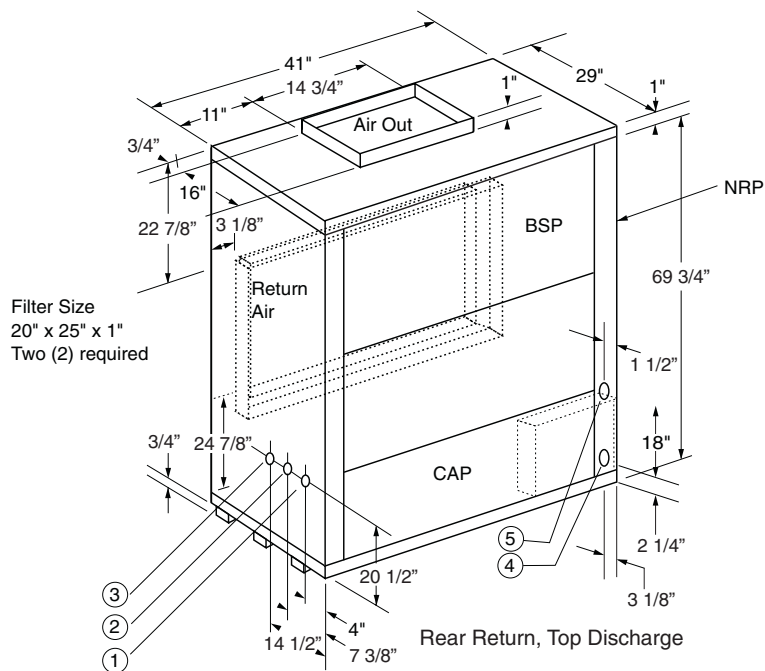
- | | |
|-----------------------|--------------------|
| ① Water Outlet | 1 1/4" FPT |
| ② Water Inlet | 1 1/4" FPT |
| ③ Condensate Drain | 1" FPT |
| ④ High Voltage Access | 1 3/8"-1 3/4" K.O. |
| ⑤ Low Voltage Access | 1/2" DIA. |

LEGEND

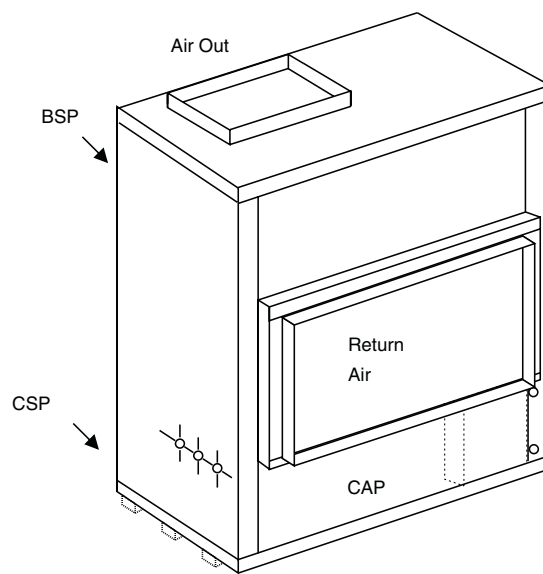
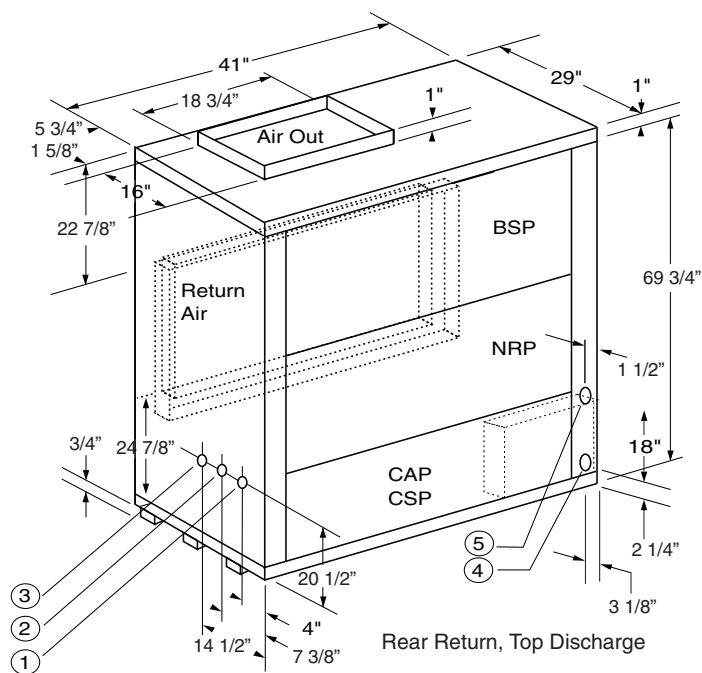
- BSP** — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel
NRP — Non-Removable Panel

NOTES:

- Units require 3' clearance for water connections, CAP, CSP and BSP service access.
- All side panels are removable except those identified by NRP (Non-Removable Panel).
- Return Air Duct Connection 23" x 34 3/4".



50VQA,VQD100, 120



Front Return, Top Discharge

CONNECTIONS

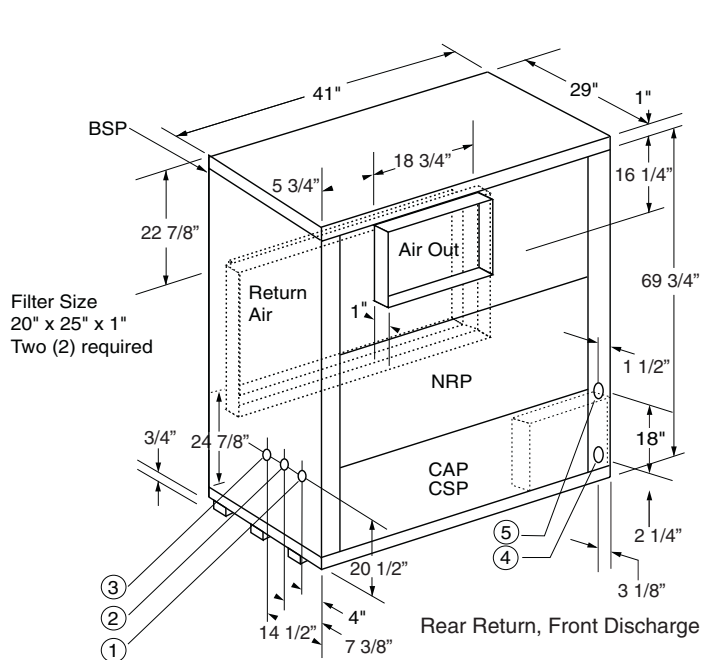
- | | |
|-----------------------|--------------------|
| ① Water Outlet | 1 1/4" FPT |
| ② Water Inlet | 1 1/4" FPT |
| ③ Condensate Drain | 1" FPT |
| ④ High Voltage Access | 1 3/8"-1 3/4" K.O. |
| ⑤ Low Voltage Access | 1/2" DIA. |

LEGEND

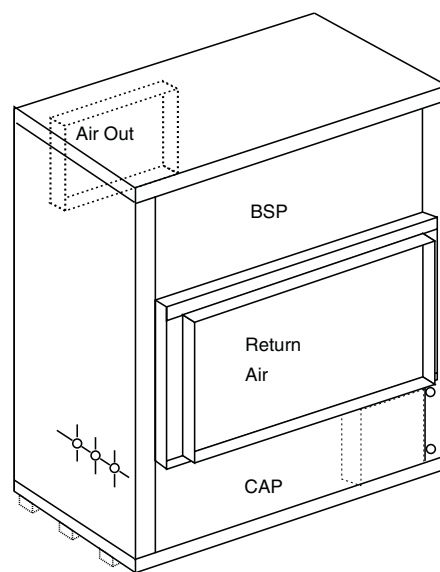
- BSP** — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel
NRP — Non-Removable Panel

NOTES:

- Units require 3' clearance for water connections, CAP, CSP and BSP service access.
- All side panels are removable except those identified by NRP (Non-Removable Panel).
- Return Air Duct Connection 23" x 34 3/4".



Rear Return, Front Discharge

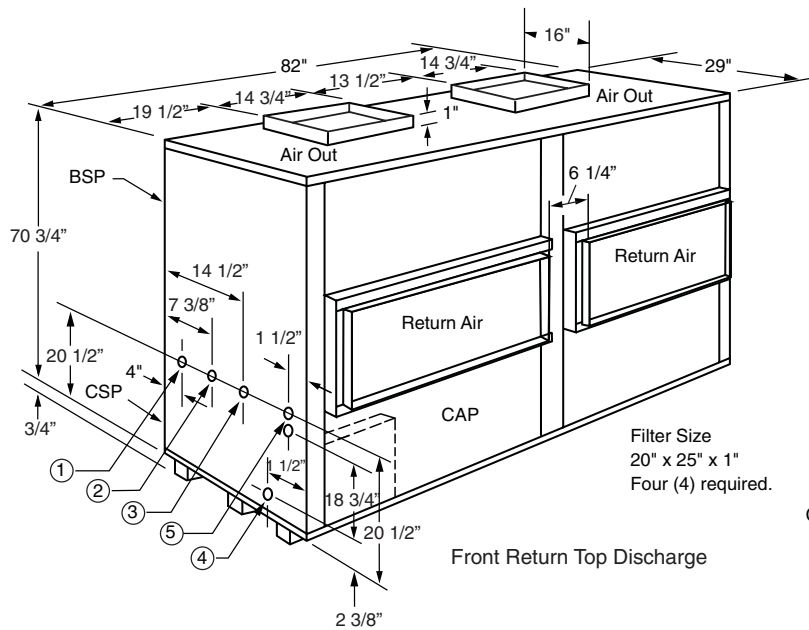


Front Return, Rear Discharge

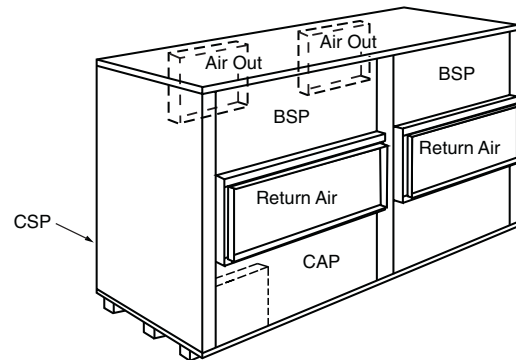
Base unit dimensions (cont)



50VQA,VQD160



Front Return Top Discharge



Front Return Rear Discharge

CONNECTIONS

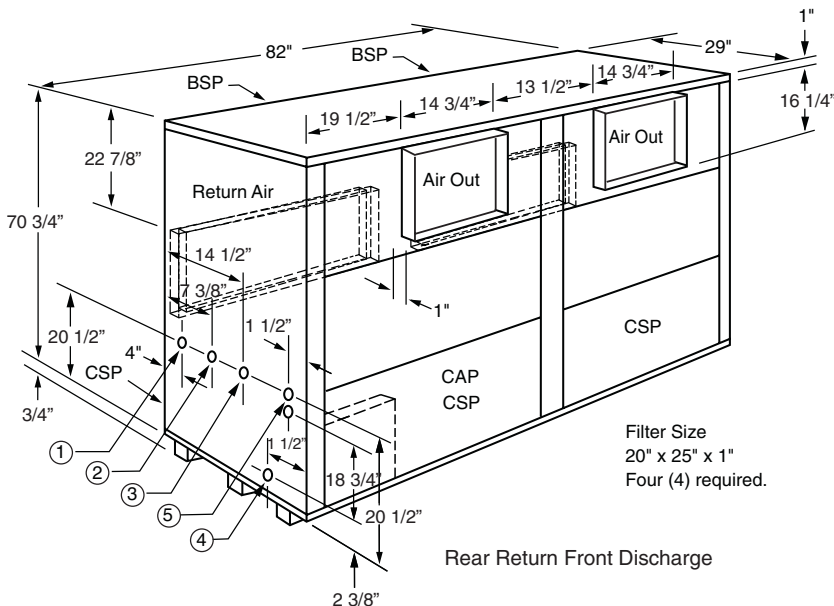
- | | |
|-----------------------|--------------------|
| ① Water Outlet | 1 1/2" FPT |
| ② Water Inlet | 1 1/2" FPT |
| ③ Condensate Drain | 1" FPT |
| ④ High Voltage Access | 1 3/8"-1 3/4" K.O. |
| ⑤ Low Voltage Access | 1/2" DIA. |

LEGEND

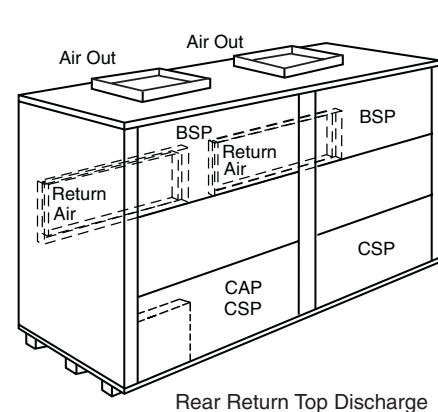
- BSP** — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel

NOTES:

1. All side panels are removable.
2. Return Air Duct Connection (2) 23" x 34 3/4".
3. Units require 3' clearance for water connections, CAP, CSP and BSP service access.



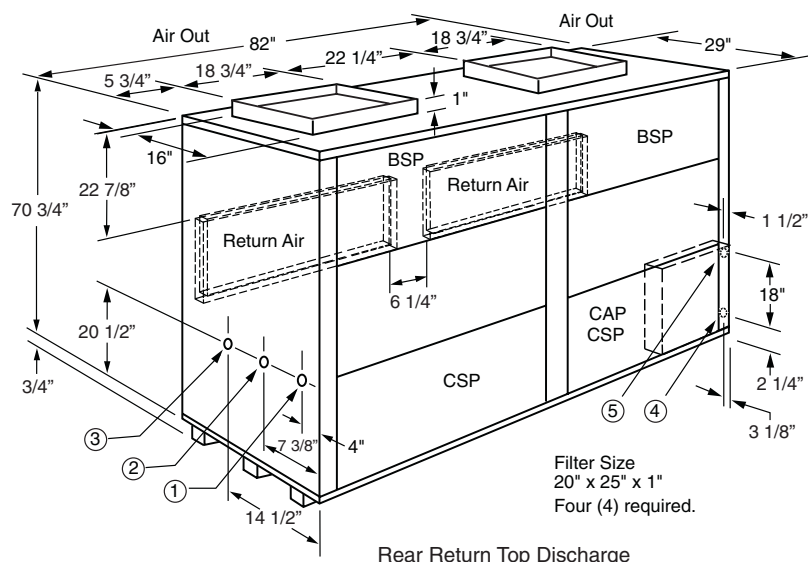
Rear Return Front Discharge



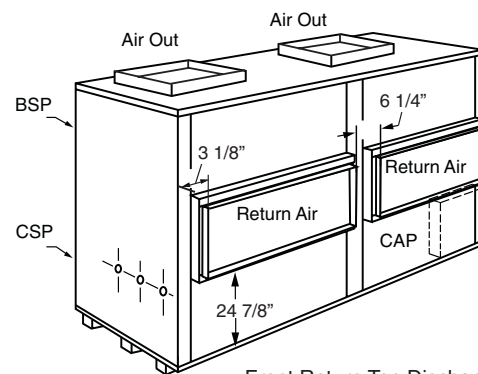
Rear Return Top Discharge

Filter Size
 20" x 25" x 1"
 Four (4) required.

50VQA,VQD200,240



Rear Return Top Discharge



Front Return Top Discharge

CONNECTIONS

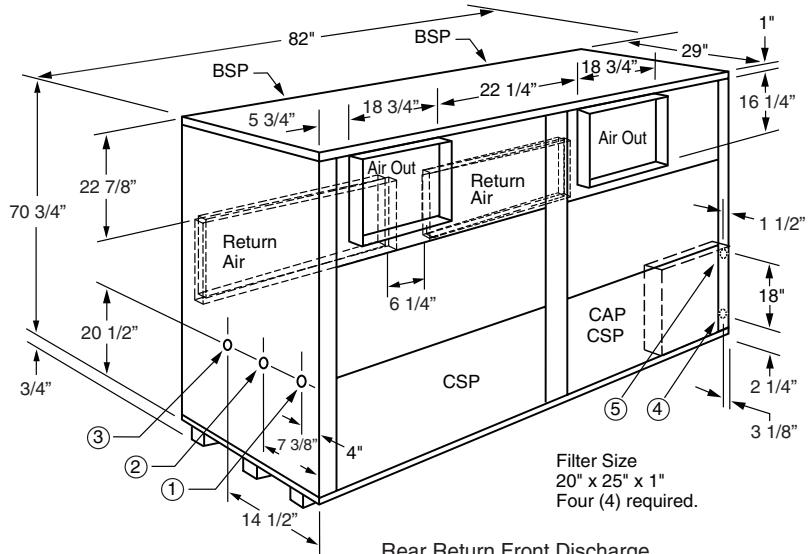
- | | |
|-----------------------|--------------|
| ① Water Outlet | 1½" FPT |
| ② Water Inlet | 1½" FPT |
| ③ Condensate Drain | 1" FPT |
| ④ High Voltage Access | 1⅜"-1¾" K.O. |
| ⑤ Low Voltage Access | ½" DIA. |

LEGEND

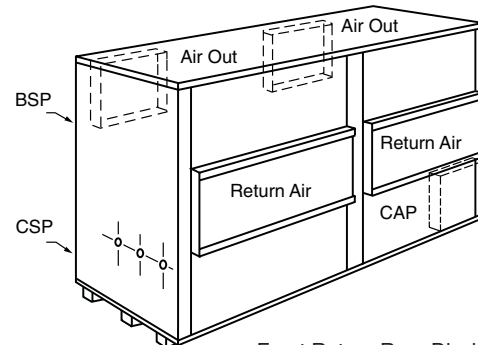
- BSP** — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel

NOTES:

1. All side panels are removable.
2. Return Air Duct Connection (2) 23" x 34³/₄".
3. Units require 3' clearance for water connections, CAP, CSP and BSP service access.



Rear Return Front Discharge

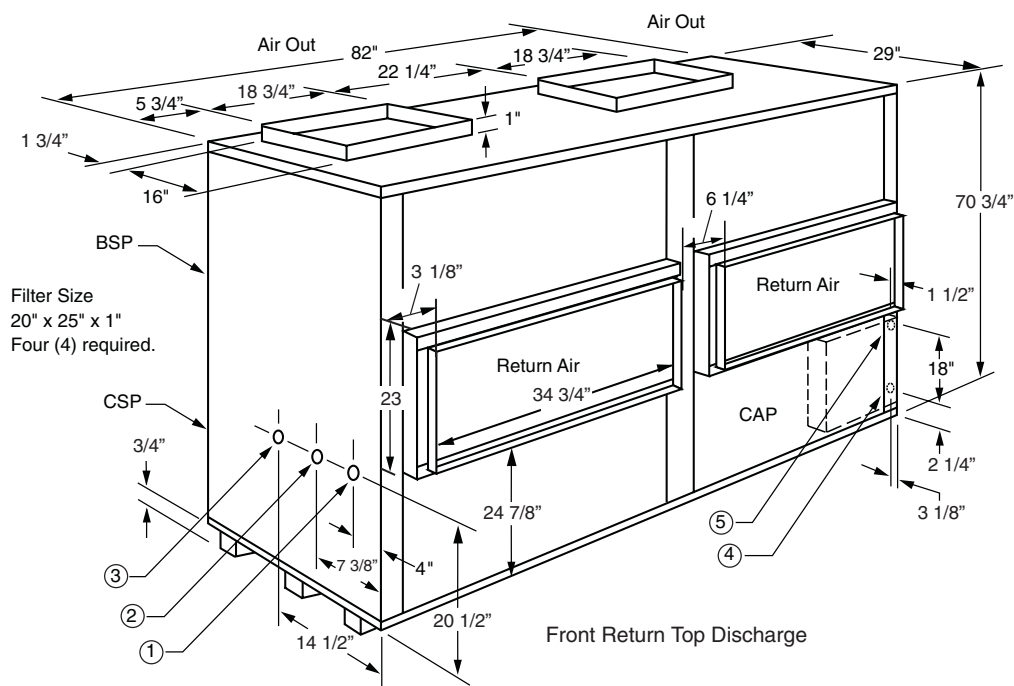


Front Return Rear Discharge

Base unit dimensions (cont)



50VQA,VQD300



CONNECTIONS

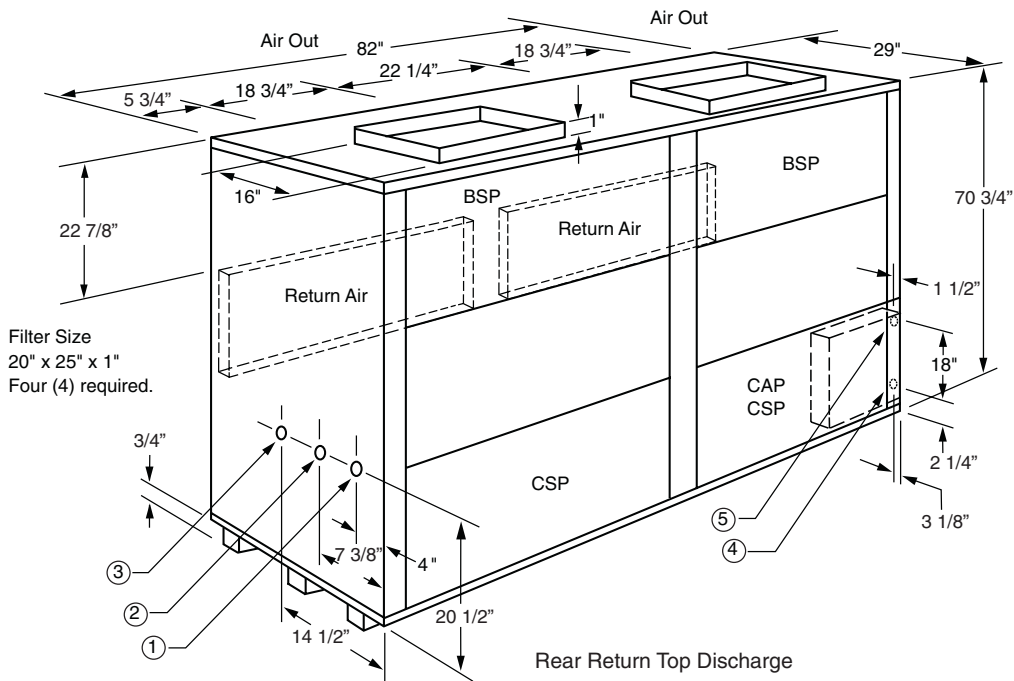
- | | |
|-----------------------|--------------------|
| ① Water Outlet | 1 1/2" FPT |
| ② Water Inlet | 1 1/2" FPT |
| ③ Condensate Drain | 1" FPT |
| ④ High Voltage Access | 1 3/8"-1 3/4" K.O. |
| ⑤ Low Voltage Access | 1/2" DIA. |

LEGEND

- BSP** — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel

NOTES:

1. All side panels are removable.
2. Return Air Duct Connection (2) 23" x 34 3/4".
3. Units require 3' clearance for water connections, CAP, CSP and BSP service access.



DO NOT USE HIGH EFFICIENCY FILTERS

Selection procedure with 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 90 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 50HQL096 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 69,600 Btuh
Heat of Rejection 122,500 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.

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 0.982 x 0.983	= 92,573
Corrected Sensible Cooling	=	69,600	x 1.091 x 0.963	= 73,124
Corrected Heat of Rejection	=	122,500	x 0.984 x 0.978	= 117,888

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:

$$\text{Actual Temperature Rise} = \frac{\text{Correction of Heat Rejection}}{\text{GPM} \times 500}$$

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

$$\text{Actual Temperature Rise} = \frac{117,888}{24 \times 500} = 10 \text{ F}$$

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.

Selection procedure with example (cont)



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 = 22.4 ft of head

Power input = 7,810 watts

Cooling Capacity = 92,573 Btuh

c) Perform Fan Power Correction Adjustment

Use the following formula to calculate Fan Power Correction:

Fan Power

$$\begin{aligned}\text{Correction} &= (\text{Cfm} \times 0.472) \times (\text{External Static Pressure} \times 249) / 300 = \text{Watts} \\ &= (2800 \times 0.472) \times (0.4 \times 249) / 300 \\ &= 439 \text{ Watts}\end{aligned}$$

d) Perform Pump Power Correction Adjustment

Use the following formula to calculate Pump Power Correction:

Pump Power

$$\begin{aligned}\text{Correction} &= (\text{GPM} \times 0.0631) \times (\text{Pressure Drop} \times 2,990) / 300 \\ &= \text{Watts} \\ &= (24 \times 0.0631) \times \\ &\quad (22.4 \times 2,990) / 300 \\ &= 338 \text{ Watts}\end{aligned}$$

e) Perform capacity and EER calculations

Use the following formula to calculate capacity and EER:

ISO Cooling

$$\begin{aligned}\text{Capacity} &= (\text{Cooling Capacity}) + (\text{Fan Power Correction} \times 3.412) \\ &= 92,573 + (439 \times 3.412) \\ &= 94,071 \text{ Btuh}\end{aligned}$$

f) Perform Corrections by using the ISO Equations

$$\begin{aligned}\text{ISO EER} &= (\text{ISO Cooling Capacity} / 3.412) / \\ &\quad (\text{Power Input} - \text{Fan Power Correction} + \text{Pump Power Correction}) \\ &= \text{Watts/Watts}\end{aligned}$$

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

$$\begin{aligned}&= (94,071 / 3.412) / (7,810 - 439 + 338) \\ &= 3.58 \text{ Watts/Watt} \\ &= 12.2 \text{ Btuh/Watt}\end{aligned}$$

Performance data



50HQL072 2400 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP (ft)	COOLING CAPACITY				HEATING CAPACITY		
			TC	TSC	THR	kW	TC	THA	kW
40	9.9	3.5	83,246	54,960	99,768	4842	Operation Not Recommended		
	14.4	7.1	84,322	55,537	100,247	4667			
	18.3	10.2	85,255	56,037	100,663	4516			
	23.4	14.3	86,475	56,691	101,206	4317			
50	9.9	3.5	79,849	53,709	97,814	5265	71,917	51,017	6126
	14.4	7.1	80,925	54,286	98,294	5090	73,835	52,749	6180
	18.3	10.2	81,858	54,786	98,709	4939	75,497	54,250	6227
	23.4	14.3	83,078	55,440	99,252	4740	77,671	56,213	6289
60	9.9	3.5	76,787	52,600	96,050	5644	77,000	55,334	6350
	14.4	7.1	77,528	53,035	96,340	5513	80,596	58,530	6467
	18.3	10.2	78,461	53,535	96,755	5362	82,258	60,032	6514
	23.4	14.3	78,500	54,400	96,181	5182	84,000	61,549	6580
65	9.9	3.5	75,251	51,548	94,129	5531	79,310	56,994	6541
	14.4	7.1	75,977	51,974	94,413	5403	83,014	60,286	6661
	18.3	10.2	76,892	52,464	94,820	5255	84,726	61,833	6709
	23.4	14.3	76,930	53,312	94,257	5078	86,520	63,395	6777
70	9.9	3.5	73,055	51,207	93,907	6111	85,700	62,703	6740
	14.4	7.1	74,131	51,784	94,050	5836	87,357	64,312	6754
	18.3	10.2	74,900	51,900	94,340	5696	91,000	67,676	6836
	23.4	14.3	76,284	52,938	95,344	5586	91,193	67,776	6863
85	9.9	3.5	67,400	49,500	90,458	6758	95,581	71,253	7130
	14.4	7.1	69,036	49,908	91,456	6571	97,498	72,985	7185
	18.3	10.2	70,000	49,975	91,712	6363	101,000	76,297	7240
	23.4	14.3	71,000	51,100	92,335	6253	101,334	76,449	7293
90	9.9	3.5	66,261	48,705	90,000	6957	—	—	—
	14.4	7.1	67,337	49,282	90,479	6782			
	18.3	10.2	69,400	49,760	91,010	6432			
	23.4	14.3	69,490	50,436	91,437	6332			
95	9.9	3.5	63,400	48,099	87,888	7177	—	—	—
	14.4	7.1	65,639	48,657	89,502	6994			
	18.3	10.2	66,572	49,157	89,917	6842			
	23.4	14.3	68,531	50,100	91,460	6720			
100	9.9	3.5	62,864	47,454	88,046	7380	—	—	—
	14.4	7.1	63,940	48,031	88,525	7205			
	18.3	10.2	64,873	48,531	88,940	7054			
	23.4	14.3	66,093	49,185	89,483	6855			
110	9.9	3.5	Operation Not Recommended				—	—	—
	14.4	7.1							
	18.3	10.2	61,518	45,873	86,251	7196			
	23.4	14.3	63,500	46,730	86,465	7203			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
kW — Total Power (Kilowatts)
TC — Total Capacity (Btuh)
THA — Total Heat of Absorption (Btuh)
THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)

NOTES:

- Interpolation is permissible, extrapolation is not.

- All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
- ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
- All performance data is based upon the lower voltage of dual voltage rated units.
- Operation below 60 F EWT requires optional insulated water circuit.
- Operation below 40 F EWT is based upon 15% antifreeze solution.
- See Correction Factor tables for operating conditions other than those listed above.
- Performance capacities shown in Btuh.

CORRECTION FACTORS — ENTERING AIR — 50HQL072 UNIT

EAT WB (F)	TC	COOLING						HEATING			
		Sensible Cooling Capacity Entering DB (F)					THR	EAT DB (F)	TC	THA	kW
		70	75	80	85	90					
61	0.910	0.871	1.072	1.243	*	*	0.956	60	1.035	1.052	0.948
64	0.955	0.702	0.919	1.136	*	*	0.978	65	1.018	1.026	0.974
67	1.000	0.532	0.766	1.000	1.221	*	1.000	70	1.000	1.000	1.000
70	1.045	—	0.611	0.864	1.101	1.334	1.021	75	0.984	0.982	1.030
73	1.090	—	0.455	0.727	0.981	1.234	1.043	80	0.969	0.965	1.061

*Sensible capacity equals total capacity.

CORRECTION FACTORS — NOMINAL CFM — 50HQL072 UNIT

NOMINAL CFM	COOLING				HEATING		
	TC	TSC	THR	kW	TC	THA	kW
1800	0.936	0.940	0.948	0.978	0.935	0.928	1.022
2100	0.968	0.970	0.974	0.991	0.967	0.963	1.011
2250	0.984	0.985	0.987	0.998	0.984	0.982	1.006
2400	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2700	1.033	1.030	1.026	1.018	1.034	1.038	0.989
3000	1.065	1.060	1.050	1.032	1.070	1.077	0.979

LEGEND

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

NOTES:

- 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.
- Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db (bold print for comparison only).

Performance data (cont)



50HQL096

3200 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	FT WG	TC	TSC	kW	THR	TC	kW	THA
20	12	6.0	13.8	Operation Not Recommended				Operation Not Recommended		
	18	8.0	18.5							
	24	10.7	24.7					65.7	6.41	43.8
30	12	5.9	13.6	Operation Not Recommended				70.2	6.49	48.0
	18	7.9	18.2					72.4	6.55	50.1
	24	10.6	24.4					73.7	6.58	51.2
40	12	5.8	13.4	109.0	74.1	5.62	128.1	78.9	6.73	55.9
	18	7.8	17.9	111.8	75.1	5.23	129.7	82.0	6.82	58.7
	24	10.4	24.0	113.4	75.7	5.02	130.6	83.7	6.88	60.3
50	12	5.7	13.2	105.4	72.8	6.14	126.4	88.8	7.04	64.7
	18	7.7	17.7	107.9	73.7	5.77	127.6	92.6	7.17	68.2
	24	10.3	23.7	109.2	74.2	5.58	128.3	94.7	7.24	70.0
60	12	5.6	13.0	102.2	71.8	6.66	124.9	99.0	7.39	73.8
	18	7.6	17.4	104.4	72.5	6.29	125.9	103.3	7.54	77.6
	24	10.1	23.3	105.6	72.9	6.11	126.4	105.6	7.61	79.6
70	12	5.6	12.8	99.1	70.7	7.21	123.7	108.8	7.73	82.4
	18	7.5	17.2	101.2	71.4	6.82	124.5	113.1	7.87	86.2
	24	10.0	23.0	102.3	71.8	6.64	125.0	115.2	7.95	88.1
80	12	5.5	12.7	95.8	69.6	7.82	122.5	117.3	8.02	89.9
	18	7.3	16.9	98.1	70.4	7.39	123.3	120.8	8.13	93.0
	24	9.8	22.7	99.2	70.8	7.19	123.7	122.3	8.18	94.4
†85	12	5.5	12.7	94.0	68.9	8.17	121.9	120.3	8.11	92.6
	18	7.3	16.9	96.4	69.8	7.72	122.7	123.0	8.19	95.0
	24	9.8	22.7	97.5	70.2	7.50	123.1	123.9	8.21	95.9
90	12	5.4	12.5	92.2	68.3	8.52	121.2	123.4	8.21	95.4
	18	7.2	16.7	94.7	69.2	8.04	122.1	125.2	8.24	97.0
	24	9.7	22.4	95.9	69.6	7.81	122.5	125.6	8.24	97.5
100	12	5.3	12.3	88.0	66.5	9.34	119.8	Operation Not Recommended		
	18	7.1	16.5	90.9	67.7	8.78	120.8			
	24	9.6	22.0	92.2	68.3	8.52	121.3			
110	12	5.3	12.1	82.9	64.2	10.31	118.1	Operation Not Recommended		
	18	7.0	16.2	86.4	65.8	9.65	119.3			
	24	9.4	21.7	87.9	66.5	9.35	119.8			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
kW — Total Power (Kilowatts)
TC — Total Capacity (Btuh)
THA — Total Heat of Absorption (Btuh)
THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)

NOTES:

- Interpolation is permissible, extrapolation is not.

- All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
- ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
- All performance data is based upon the lower voltage of dual voltage rated units.
- Operation below 60 F EWT requires optional insulated water circuit.
- Operation below 40 F EWT is based upon 15% antifreeze solution.
- See Correction Factor tables for operating conditions other than those listed above.
- Performance capacities shown in Btuh.

CORRECTION FACTORS — ENTERING AIR — 50HQL096 UNIT

EAT WB (F)	TC	COOLING									HEATING			
		Sensible Cooling Capacity Entering DB (F)							kW	THR	EAT DB (F)	TC	kW	THA
		70	75	80	80.6	85	90	95						
60	0.955	0.887	1.102	*	*	*	*	*	0.990	0.960	45	1.032	0.817	1.106
65	0.982	0.665	0.876	1.091	1.116	*	*	*	0.996	0.984	50	1.025	0.849	1.086
66.2	0.993	0.612	0.822	1.037	1.062	1.245	*	*	0.998	0.993	55	1.018	0.884	1.065
67	1.000	0.577	0.786	1.000	1.025	1.210	*	*	1.000	1.000	60	1.012	0.920	1.044
70	1.027	0.445	0.652	0.864	0.889	1.079	1.297	*	1.005	1.023	65	1.005	0.959	1.022
75	1.097	—	0.430	0.637	0.662	0.848	1.067	1.285	1.021	1.084	68	1.002	0.984	1.009
											70	1.000	1.000	1.000
											75	0.996	1.046	0.978
											80	0.991	1.094	0.956

*Sensible capacity equals total capacity.

CORRECTION FACTORS — NOMINAL CFM — 50HQL096 UNIT

AIRFLOW		COOLING				HEATING		
CFM	% of Nominal	TC	TSC	kW	THR	TC	kW	THA
325	81%	0.971	0.940	0.971	0.964	0.978	1.026	0.975
350	88%	0.983	0.963	0.981	0.978	0.985	1.017	0.987
375	94%	0.992	0.982	0.990	0.989	0.992	1.009	0.994
400	100%	1.000	1.000	1.000	1.000	1.000	1.000	1.000
425	106%	1.005	1.013	1.010	1.009	1.008	0.991	1.005
450	113%	1.010	1.027	1.019	1.019	1.017	0.983	1.010
475	119%	1.012	1.033	1.029	1.026	1.022	0.974	1.011

NOTE: 400 CFM per ton is Nominal Airflow.

LEGEND

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

NOTES:

- 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.
- Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db (bold print for comparison only).



50HQL120
4000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	FT WG	TC	TSC	kW	THR	TC	kW	THA
20	15	5.2	11.9	Operation Not Recommended				Operation Not Recommended		
	23	8.6	19.8							
	30	14.3	32.9					83.5	8.45	54.6
30	15	5.1	11.7	Operation Not Recommended				89.1	8.37	60.6
	23	8.5	19.5					92.0	8.38	63.4
	30	14.1	32.4					93.6	8.40	64.9
40	15	5.0	11.5	135.1	83.5	7.20	159.7	100.1	8.51	71.1
	23	8.3	19.2	138.6	84.2	7.02	162.6	104.2	8.61	74.8
	30	13.8	31.9	140.6	84.5	6.99	164.4	106.5	8.67	76.9
50	15	4.9	11.4	130.9	82.2	7.69	157.2	112.9	8.85	82.7
	23	8.2	18.9	133.8	83.1	7.31	158.8	118.2	9.01	87.5
	30	13.6	31.5	135.4	83.5	7.17	159.9	121.2	9.10	90.2
60	15	4.9	11.2	127.2	80.9	8.44	156.0	126.8	9.27	95.2
	23	8.1	18.6	129.8	81.8	7.90	156.7	133.2	9.45	101.0
	30	13.4	31.0	131.1	82.3	7.66	157.3	136.8	9.55	104.2
70	15	4.8	11.0	123.7	79.6	9.37	155.7	141.1	9.66	108.2
	23	7.9	18.3	126.1	80.5	8.71	155.8	148.4	9.81	114.9
	30	13.2	30.5	127.4	80.9	8.40	156.0	152.3	9.87	118.6
80	15	4.7	10.8	120.1	78.3	10.41	155.6	155.2	9.91	121.4
	23	7.8	18.0	122.6	79.2	9.68	155.7	162.9	9.95	129.0
	30	13.0	30.0	123.9	79.6	9.33	155.7	167.0	9.94	133.1
†85	15	4.7	10.8	118.1	77.8	10.94	155.5	161.8	9.92	128.0
	23	7.8	17.9	120.8	78.6	10.21	155.6	169.5	9.85	135.9
	30	12.9	29.8	122.1	79.0	9.85	155.7	173.5	9.77	140.1
90	15	4.6	10.7	116.1	77.2	11.48	155.3	168.4	9.92	134.6
	23	7.7	17.8	118.9	78.0	10.74	155.6	176.1	9.76	142.8
	30	12.8	29.6	120.3	78.4	10.37	155.6	179.9	9.60	147.2
100	15	4.6	10.5	111.4	76.2	12.52	154.1	Operation Not Recommended		
	23	7.6	17.5	114.7	76.9	11.81	155.0			
	30	12.6	29.1	116.3	77.3	11.44	155.3			
110	15	4.5	10.4	105.6	75.0	13.44	151.5	Operation Not Recommended		
	23	7.5	17.2	109.6	75.8	12.83	153.4			
	30	12.4	28.7	111.5	76.2	12.49	154.1			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
kW — Total Power (Kilowatts)
TC — Total Capacity (Btuh)
THA — Total Heat of Absorption (Btuh)
THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)

NOTES:

- Interpolation is permissible, extrapolation is not.

- All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
- ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
- All performance data is based upon the lower voltage of dual voltage rated units.
- Operation below 60 F EWT requires optional insulated water circuit.
- Operation below 40 F EWT is based upon 15% antifreeze solution.
- See Correction Factor tables for operating conditions other than those listed above.
- Performance capacities shown in Btuh.

CORRECTION FACTORS — ENTERING AIR — 50HQL120 UNIT

EAT WB (F)	TC	COOLING									HEATING			
		Sensible Cooling Capacity Entering DB (F)							kW	THR	EAT DB (F)	TC	kW	THA
		70	75	80	80.6	85	90	95						
60	0.955	0.887	1.102	*	*	*	*	*	0.990	0.960	45	1.032	0.817	1.106
65	0.982	0.665	0.876	1.091	1.116	*	*	*	0.996	0.984	50	1.025	0.849	1.086
66.2	0.993	0.612	0.822	1.037	1.062	1.245	*	*	0.998	0.993	55	1.018	0.884	1.065
67	1.000	0.577	0.786	1.000	1.025	1.210	*	*	1.000	1.000	60	1.012	0.920	1.044
70	1.027	0.445	0.652	0.864	0.889	1.079	1.297	*	1.005	1.023	65	1.005	0.959	1.022
75	1.097	—	0.430	0.637	0.662	0.848	1.067	1.285	1.021	1.084	68	1.002	0.984	1.009
											70	1.000	1.000	1.000
											75	0.996	1.046	0.978
											80	0.991	1.094	0.956

*Sensible capacity equals total capacity.

**CORRECTION FACTORS —
NOMINAL CFM — 50HQL120 UNIT**

AIRFLOW		COOLING				HEATING			
CFM	% of Nominal	TC	TSC	kW	THR	TC	kW	THA	
325	81%	0.971	0.940	0.971	0.964	0.978	1.026	0.975	
350	88%	0.983	0.963	0.981	0.978	0.985	1.017	0.987	
375	94%	0.992	0.982	0.990	0.989	0.992	1.009	0.994	
400	100%	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
425	106%	1.005	1.013	1.010	1.009	1.008	0.991	1.005	
450	113%	1.010	1.027	1.019	1.019	1.017	0.983	1.010	
475	119%	1.012	1.033	1.029	1.026	1.022	0.974	1.011	

NOTE: 400 CFM per ton is Nominal Airflow.

LEGEND

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

NOTES:

- 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.
- Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db (bold print for comparison only).

Performance data (cont)



50VQA,VQD080

2600 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP (ft)	COOLING CAPACITY				HEATING CAPACITY		
			TC	TSC	THR	kW	TC	THA	kW
40	9	3.7	80,722	58,822	93,790	3,830	Operation Not Recommended		
	13.5	5.2	81,696	59,159	94,157	3,652			
	18	8.2	82,200	59,217	94,364	3,565	61,058	42,951	5,307
	23	12.6	82,410	59,566	94,488	3,540	61,685	43,526	5,322
50	9	3.7	79,292	58,928	93,578	4,187	65,436	46,953	5,417
	13.5	5.2	80,320	59,278	93,985	4,005	67,517	48,867	5,466
	18	8.2	80,852	59,413	94,248	3,926	68,615	49,876	5,492
	23	12.6	81,168	59,548	94,400	3,878	69,364	50,564	5,510
60	9	3.7	77,741	59,042	93,307	4,562	72,873	53,759	5,602
	13.5	5.2	78,853	59,421	93,777	4,374	75,153	55,844	5,659
	18	8.2	79,467	59,581	94,111	4,292	76,382	56,961	5,692
	23	12.6	79,832	59,691	94,289	4,237	77,227	57,727	5,715
70	9	3.7	75,616	58,775	92,509	4,951	80,665	60,841	5,810
	13.5	5.2	76,780	59,154	92,987	4,750	83,305	63,352	5,848
	18	8.2	77,440	59,328	93,354	4,664	84,851	64,768	5,886
	23	12.6	77,812	59,479	93,538	4,609	85,887	65,712	5,913
80	9	3.7	73,329	58,072	91,665	5,374	88,670	68,089	6,032
	13.5	5.2	74,443	58,616	92,052	5,161	92,032	71,140	6,123
	18	8.2	75,124	58,788	92,419	5,069	93,916	72,871	6,168
	23	12.6	75,495	58,936	92,589	5,010	94,976	73,791	6,209
90	9	3.7	71,735	58,559	91,811	5,884	—	—	—
	13.5	5.2	72,214	57,878	91,407	5,625			
	18	8.2	72,822	58,212	91,697	5,532			
	23	12.6	73,178	58,346	91,842	5,470			
100	9	3.7	68,996	57,420	90,942	6,432	—	—	—
	13.5	5.2	70,186	57,904	91,218	6,164			
	18	8.2	70,876	58,160	91,539	6,056			
	23	12.6	71,221	58,316	91,642	5,985			
110	9	3.7	Operation Not Recommended				—	—	—
	13.5	5.2							
	18	8.2	67,954	57,113	90,617	6,642			
	23	12.6	68,318	57,275	90,694	6,558			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
kW — Total Power (Kilowatts)
TC — Total Capacity (Btuh)
THA — Total Heat of Absorption (Btuh)
THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)

NOTES:

1. Interpolation is permissible, extrapolation is not.

- All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
- ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
- All performance data is based upon the lower voltage of dual voltage rated units.
- Operation below 60 F EWT requires optional insulated water circuit.
- Operation below 40 F EWT is based upon 15% antifreeze solution.
- See Correction Factor tables for operating conditions other than those listed above.
- Performance capacities shown in Btuh.

CORRECTION FACTORS — ENTERING AIR — 50VQA,VQD080 UNIT

EAT WB (F)	TC	COOLING					THR	HEATING			
		Sensible Cooling Capacity Entering DB (F)						EAT DB (F)	TC	THA	kW
		70	75	80	85	90					
57	0.982	1.017	*	*	*	*	0.985	55	1.018	1.063	0.872
61	0.983	0.825	1.061	*	*	*	0.985	60	1.012	1.043	0.911
64	0.980	0.686	0.912	1.145	*	*	0.983	65	1.006	1.022	0.954
67	1.000	0.549	0.771	1.000	1.230	*	1.000	70	1.000	1.000	1.000
70	1.045	0.417	0.631	0.856	1.104	1.315	1.038	75	0.991	0.974	1.046

*Sensible capacity equals total capacity.

LEGEND

ARI — Air Conditioning and Refrigeration Institute
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db — Dry Bulb
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THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)
wb — Wet Bulb

NOTES:

- 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.
- Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db.

CORRECTION FACTORS — NOMINAL CFM — 50VQA,VQD080 UNIT

TOTAL CFM	COOLING				HEATING		
	TC	TSC	THR	kW	TC	THA	kW
2300	0.987	0.937	0.951	0.980	0.989	0.989	0.991
2500	0.995	0.976	0.975	0.991	0.995	0.997	0.989
2600	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2700	1.002	1.011	1.002	1.002	1.002	1.004	0.995
2900	1.019	1.067	1.037	1.022	1.009	1.010	1.006
3100	1.022	1.096	1.071	1.032	1.016	1.014	1.023
3300	1.023	1.123	1.110	1.040	1.024	1.018	1.045



50VQA,VQD100
3500 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP (ft)	COOLING CAPACITY				HEATING CAPACITY		
			TC	TSC	THR	kW	TC	THA	kW
40	13	5.0	112,510	79,307	135,435	6,719	Operation Not Recommended		
	19	9.0	114,044	79,912	136,109	6,467			
	26	15.5	114,951	80,259	136,542	6,328	84,719	58,583	7,660
	33	23.1	115,377	80,553	136,695	6,248	85,933	59,599	7,718
50	13	5.0	110,921	79,479	135,757	7,279	92,859	65,300	8,077
	19	9.0	112,634	80,129	136,607	7,026	96,440	68,236	8,266
	26	15.5	113,674	80,509	137,169	6,886	97,933	69,306	8,390
	33	23.1	114,287	80,782	137,506	6,805	101,678	72,935	8,424
60	13	5.0	107,916	79,182	134,659	7,838	106,253	76,343	8,766
	19	9.0	109,777	79,838	135,671	7,589	110,586	79,868	9,003
	26	15.5	110,938	80,225	136,354	7,449	113,454	82,282	9,136
	33	23.1	111,595	80,495	136,738	7,369	115,367	83,902	9,222
70	13	5.0	104,361	78,074	132,868	8,355	120,154	87,791	9,485
	19	9.0	106,308	78,760	134,013	8,120	125,464	92,136	9,768
	26	15.5	107,340	79,328	134,616	7,994	128,930	95,025	9,937
	33	23.1	108,019	79,598	135,032	7,917	130,817	96,533	10,048
80	13	5.0	100,084	76,763	130,307	8,858	134,872	99,950	10,235
	19	9.0	101,874	77,656	131,381	8,648	141,443	105,245	10,609
	26	15.5	103,343	77,864	132,389	8,513	145,332	108,397	10,825
	33	23.1	104,029	78,132	132,833	8,442	147,681	110,299	10,956
90	13	5.0	95,447	75,747	127,400	9,365	—	—	—
	19	9.0	97,483	76,383	128,740	9,161			
	26	15.5	98,930	76,565	129,764	9,037			
	33	23.1	99,414	77,034	130,067	8,984			
100	13	5.0	90,207	74,118	123,740	9,828	—	—	—
	19	9.0	92,255	74,671	125,136	9,637			
	26	15.5	93,528	75,030	126,048	9,531			
	33	23.1	94,195	75,273	126,520	9,474			
110	13	5.0	Operation Not Recommended				—	—	—
	19	9.0							
	26	15.5	88,243	73,183	122,346	9,995			
	33	23.1	88,842	73,542	122,785	9,948			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
kW — Total Power (Kilowatts)
TC — Total Capacity (Btuh)
THA — Total Heat of Absorption (Btuh)
THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)

NOTES:

1. Interpolation is permissible, extrapolation is not.

- All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
- ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
- All performance data is based upon the lower voltage of dual voltage rated units.
- Operation below 60 F EWT requires optional insulated water circuit.
- Operation below 40 F EWT is based upon 15% antifreeze solution.
- See Correction Factor tables for operating conditions other than those listed above.
- Performance capacities shown in Btuh.

CORRECTION FACTORS — ENTERING AIR — 50VQA,VQD100 UNIT

EAT WB (F)	TC	COOLING						HEATING			
		Sensible Cooling Capacity Entering DB (F)					THR	EAT DB (F)	TC	THA	kW
		70	75	80	85	90					
57	0.994	1.017	*	*	*	*	0.995	55	1.048	1.091	0.928
61	0.995	0.820	1.055	*	*	*	0.995	60	1.033	1.061	0.953
64	0.975	0.683	0.915	1.143	*	*	0.978	65	1.018	1.032	0.978
67	1.000	0.548	0.776	1.000	1.235	*	1.000	70	1.000	1.000	1.000
70	1.048	0.426	0.633	0.857	1.087	1.331	1.042	75	0.986	0.973	1.022

*Sensible capacity equals total capacity.

LEGEND

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

NOTES:

- 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.
- Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db.

**CORRECTION FACTORS —
NOMINAL CFM — 50VQA,VQD100 UNIT**

TOTAL CFM	COOLING				HEATING		
	TC	TSC	THR	kW	TC	THA	kW
3000	0.978	0.930	0.971	0.949	0.986	0.984	0.993
3200	0.989	0.955	0.984	0.968	0.994	0.994	0.996
3400	0.995	0.984	0.994	0.989	1.001	1.002	1.000
3500	1.000	1.000	1.000	1.000	1.000	1.000	1.000
3600	1.005	1.010	1.005	1.005	1.008	1.009	1.006
3800	1.011	1.037	1.016	1.034	1.015	1.015	1.015
4000	1.015	1.068	1.025	1.061	1.022	1.021	1.026
4200	1.019	1.088	1.034	1.085	1.027	1.022	1.039

Performance data (cont)



50VQA,VQD120 4200 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP (ft)	COOLING CAPACITY				HEATING CAPACITY		
			TC	TSC	THR	kW	TC	THA	kW
40	16	6.8	134,875	94,734	162,823	8,191	Operation Not Recommended		
	23.5	13.1	136,536	95,620	163,498	7,902			
	31	20.8	137,636	95,938	164,052	7,742	98,467	67,916	8,954
	39	30.7	138,472	96,396	164,676	7,680	99,697	68,948	9,012
50	16	6.8	132,539	94,806	162,725	8,847	108,216	75,904	9,470
	23.5	13.1	134,595	95,609	163,805	8,561	112,099	79,146	9,658
	31	20.8	135,769	96,033	164,481	8,415	113,936	80,649	9,756
	39	30.7	136,517	96,368	164,908	8,321	115,810	82,308	9,819
60	16	6.8	128,865	94,109	161,166	9,467	123,170	88,351	10,205
	23.5	13.1	131,074	94,941	162,447	9,195	127,917	92,330	10,430
	31	20.8	132,352	95,393	163,248	9,055	130,554	94,568	10,547
	39	30.7	133,135	95,730	163,727	8,966	132,333	96,053	10,633
70	16	6.8	124,158	92,810	158,445	10,049	139,080	101,623	10,978
	23.5	13.1	126,466	93,649	159,880	9,793	144,668	106,263	11,256
	31	20.8	127,817	94,114	160,784	9,662	147,973	109,107	11,391
	39	30.7	128,620	94,447	161,300	9,578	149,708	110,446	11,507
80	16	6.8	118,686	91,460	154,915	10,618	155,767	115,587	11,776
	23.5	13.1	121,264	91,980	156,633	10,366	162,571	121,173	12,133
	31	20.8	122,653	92,441	157,606	10,244	166,138	124,129	12,312
	39	30.7	123,464	92,766	158,150	10,166	168,733	126,329	12,428
90	16	6.8	113,267	89,850	151,379	11,170	—	—	—
	23.5	13.1	115,890	90,302	153,190	10,932			
	31	20.8	117,055	91,103	154,021	10,834			
	39	30.7	117,885	91,374	154,602	10,761			
100	16	6.8	107,709	88,140	147,732	11,730	—	—	—
	23.5	13.1	110,061	89,039	149,350	11,515			
	31	20.8	111,438	89,549	150,359	11,407			
	39	30.7	112,213	89,875	150,902	11,339			
110	16	6.8	Operation Not Recommended				—	—	—
	23.5	13.1							
	31	20.8	104,884	87,126	145,709	11,965			
	39	30.7	105,663	87,446	146,269	11,901			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
kW — Total Power (Kilowatts)
TC — Total Capacity (Btuh)
THA — Total Heat of Absorption (Btuh)
THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)

NOTES:

- Interpolation is permissible, extrapolation is not.

- All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
- ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
- All performance data is based upon the lower voltage of dual voltage rated units.
- Operation below 60 F EWT requires optional insulated water circuit.
- Operation below 40 F EWT is based upon 15% antifreeze solution.
- See Correction Factor tables for operating conditions other than those listed above.
- Performance capacities shown in Btuh.

CORRECTION FACTORS — ENTERING AIR — 50VQA,VQD120 UNIT

EAT WB (F)	TC	COOLING						HEATING			
		Sensible Cooling Capacity Entering DB (F)					THR	EAT DB (F)	TC	THA	kW
		70	75	80	85	90					
57	0.974	1.010	*	*	*	*	0.978	55	1.046	1.088	0.927
61	0.975	0.823	1.055	*	*	*	0.977	60	1.033	1.062	0.951
64	0.965	0.690	0.915	1.143	*	*	0.973	65	1.015	1.028	0.978
67	1.000	0.556	0.776	1.000	1.235	*	1.005	70	1.000	1.000	1.000
70	1.049	0.431	0.633	0.857	1.092	1.322	1.042	75	0.984	0.970	1.024

*Sensible capacity equals total capacity.

LEGEND

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

NOTES:

- 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.
- Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db.

CORRECTION FACTORS — NOMINAL CFM — 50VQA,VQD120 UNIT

TOTAL CFM	COOLING				HEATING		
	TC	TSC	THR	kW	TC	THA	kW
3500	0.978	0.925	0.935	0.968	0.977	0.975	0.983
3700	0.986	0.949	0.953	0.978	0.982	0.980	0.986
3900	0.994	0.969	0.971	0.989	0.990	0.990	0.989
4100	0.999	0.991	0.991	0.997	0.996	0.997	0.996
4200	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4300	1.002	1.016	1.012	1.004	1.001	1.000	1.004
4500	1.005	1.037	1.034	1.011	1.006	1.003	1.013
4700	1.013	1.065	1.059	1.023	1.014	1.010	1.024



50VQA,VQD160
5200 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP (ft)	COOLING CAPACITY				HEATING CAPACITY		
			TC	TSC	THR	kW	TC	THA	kW
40	18	3.7	161,444	117,644	187,580	7,660	Operation Not Recommended		
	27	5.2	163,392	118,318	188,313	7,304			
	36	8.2	164,400	118,434	188,728	7,130	122,117	85,902	10,614
	46	12.6	164,820	119,132	188,977	7,080	123,369	87,052	10,644
50	18	3.7	158,584	117,856	187,156	8,374	130,872	93,906	10,834
	27	5.2	160,640	118,556	187,970	8,010	135,034	97,734	10,932
	36	8.2	161,704	118,826	188,495	7,852	137,229	99,752	10,984
	46	12.6	162,336	119,096	188,799	7,756	138,728	101,128	11,020
60	18	3.7	155,482	118,084	186,613	9,124	145,746	107,518	11,204
	27	5.2	157,706	118,842	187,554	8,748	150,305	111,688	11,318
	36	8.2	158,934	119,162	188,223	8,584	152,764	113,922	11,384
	46	12.6	159,664	119,382	188,577	8,474	154,453	115,454	11,430
70	18	3.7	151,232	117,550	185,018	9,902	161,329	121,682	11,620
	27	5.2	153,560	118,308	185,974	9,500	166,611	126,704	11,696
	36	8.2	154,880	118,656	186,707	9,328	169,702	129,536	11,772
	46	12.6	155,624	118,958	187,076	9,218	171,774	131,424	11,826
80	18	3.7	146,658	116,144	183,330	10,748	177,340	136,178	12,064
	27	5.2	148,886	117,232	184,105	10,322	184,063	142,280	12,246
	36	8.2	150,248	117,576	184,839	10,138	187,832	145,742	12,336
	46	12.7	150,990	117,872	185,178	10,020	189,952	147,582	12,418
90	18	3.7	143,470	117,118	183,622	11,768	—	—	—
	27	5.2	144,428	117,756	182,813	11,250			
	36	8.2	145,644	116,424	183,394	11,064			
	46	12.6	146,356	116,692	183,683	10,940			
100	18	3.7	137,992	114,840	181,884	12,864	—	—	—
	27	5.2	140,372	115,808	182,435	12,328			
	36	8.2	141,752	116,320	183,078	12,112			
	46	12.6	142,442	116,632	183,284	11,970			
110	18	3.7	Operation Not Recommended				—	—	—
	27	5.2							
	36	8.2	135,908	114,226	181,233	13,284			
	46	12.6	136,636	114,550	181,388	13,116			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
kW — Total Power (Kilowatts)
TC — Total Capacity (Btuh)
THA — Total Heat of Absorption (Btuh)
THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)

NOTES:

- Interpolation is permissible, extrapolation is not.

- All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
- ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
- All performance data is based upon the lower voltage of dual voltage rated units.
- Operation below 60 F EWT requires optional insulated water circuit.
- Operation below 40 F EWT is based upon 15% antifreeze solution.
- See Correction Factor tables for operating conditions other than those listed above.
- Performance capacities shown in Btuh.

CORRECTION FACTORS — ENTERING AIR — 50VQA,VQD160 UNIT

EAT WB (F)	TC	COOLING						HEATING			
		Sensible Cooling Capacity Entering DB (F)					THR	EAT DB (F)	TC	THA	kW
		70	75	80	85	90					
57	0.982	1.017	*	*	*	*	0.985	55	1.018	1.063	0.872
61	0.983	0.825	1.061	*	*	*	0.985	60	1.012	1.043	0.911
64	0.980	0.686	0.912	1.145	*	*	0.983	65	1.006	1.022	0.954
67	1.000	0.549	0.771	1.000	1.230	*	1.000	70	1.000	1.000	1.000
70	1.045	0.417	0.631	0.856	1.104	1.315	1.038	75	0.991	0.974	1.046

*Sensible capacity equals total capacity.

LEGEND

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

NOTES:

- 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.
- Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db.

**CORRECTION FACTORS —
NOMINAL CFM — 50VQA,VQD160 UNIT**

TOTAL CFM	COOLING				HEATING		
	TC	TSC	THR	kW	TC	THA	kW
4600	0.987	0.937	0.951	0.980	0.989	0.989	0.991
5000	0.995	0.976	0.975	0.991	0.995	0.997	0.989
5200	1.000	1.000	1.000	1.000	1.000	1.000	1.000
5400	1.002	1.011	1.002	1.002	1.002	1.004	0.995
5800	1.019	1.067	1.037	1.022	1.009	1.010	1.006
6200	1.022	1.096	1.071	1.032	1.016	1.014	1.023
6600	1.023	1.123	1.110	1.040	1.024	1.018	1.045

Performance data (cont)



50VQA,VQD200

7000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP (ft)	COOLING CAPACITY				HEATING CAPACITY		
			TC	TSC	THR	kW	TC	THA	kW
40	26	5.0	225,020	158,614	270,870	13,438	Operation Not Recommended		
	38	9.0	228,088	159,824	272,219	12,934			
	52	15.5	229,902	160,518	273,084	12,656	169,438	117,166	15,320
	66	23.1	230,754	161,106	273,390	12,496	171,866	119,198	15,436
50	26	5.0	221,842	158,958	271,514	14,558	185,717	130,600	16,154
	38	9.0	225,268	160,258	273,213	14,052	192,879	136,472	16,532
	52	15.5	227,348	161,018	274,338	13,772	195,865	138,612	16,780
	66	23.1	228,574	161,564	275,011	13,610	203,355	145,870	16,848
60	26	5.0	215,832	158,364	269,319	15,676	212,505	152,686	17,532
	38	9.0	219,554	159,676	271,341	15,178	221,172	159,736	18,006
	52	15.5	221,876	160,450	272,708	14,898	226,908	164,564	18,272
	66	23.1	223,190	160,990	273,476	14,738	230,735	167,804	18,444
70	26	5.0	208,722	156,148	265,737	16,710	240,308	175,582	18,970
	38	9.0	212,616	157,520	268,027	16,240	250,929	184,272	19,536
	52	15.5	214,680	158,656	269,231	15,988	257,860	190,050	19,874
	66	23.1	216,038	159,196	270,064	15,834	261,634	193,066	20,096
80	26	5.0	200,168	153,526	260,615	17,716	269,744	199,900	20,470
	38	9.0	203,748	155,312	262,762	17,296	282,886	210,490	21,218
	52	15.5	206,686	155,728	264,779	17,026	290,664	216,794	21,650
	66	23.1	208,058	156,264	265,666	16,884	295,362	220,598	21,912
90	26	5.0	190,894	151,494	254,801	18,730	—	—	—
	38	9.0	194,966	152,766	257,481	18,322			
	52	15.5	197,860	153,130	259,528	18,074			
	66	23.1	198,828	154,068	260,135	17,968			
100	26	5.0	180,414	148,236	247,480	19,656	—	—	—
	38	9.0	184,510	149,342	250,273	19,274			
	52	15.5	187,056	150,060	252,096	19,062			
	66	23.1	188,390	150,546	253,041	18,948			
110	26	5.0	Operation Not Recommended				—	—	—
	38	9.0							
	52	15.5	176,486	146,366	244,692	19,990			
	66	23.1	177,684	147,084	245,569	19,896			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
kW — Total Power (Kilowatts)
TC — Total Capacity (Btuh)
THA — Total Heat of Absorption (Btuh)
THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)

NOTES:

- Interpolation is permissible, extrapolation is not.

- All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
- ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
- All performance data is based upon the lower voltage of dual voltage rated units.
- Operation below 60 F EWT requires optional insulated water circuit.
- Operation below 40 F EWT is based upon 15% antifreeze solution.
- See Correction Factor tables for operating conditions other than those listed above.
- Performance capacities shown in Btuh.

CORRECTION FACTORS — ENTERING AIR — 50VQA,VQD200 UNIT

EAT WB (F)	TC	COOLING					THR	HEATING			
		Sensible Cooling Capacity Entering DB (F)						EAT DB (F)	TC	THA	kW
		70	75	80	85	90					
57	0.994	1.017	*	*	*	*	0.995	55	1.048	1.091	0.928
61	0.995	0.820	1.068	*	*	*	0.995	60	1.033	1.061	0.953
64	0.975	0.683	0.910	1.154	*	*	0.978	65	1.018	1.032	0.978
67	1.000	0.548	0.770	1.000	1.243	*	1.000	70	1.000	1.000	1.000
70	1.048	0.426	0.633	0.857	1.087	1.331	1.042	75	0.986	0.973	1.022

*Sensible capacity equals total capacity.

LEGEND

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

NOTES:

- 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.
- Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db.

CORRECTION FACTORS — NOMINAL CFM — 50VQA,VQD200 UNIT

TOTAL CFM	COOLING				HEATING		
	TC	TSC	THR	kW	TC	THA	kW
6000	0.977	0.929	0.951	0.971	0.987	0.984	0.995
6400	0.989	0.955	0.968	0.984	0.994	0.994	0.996
6800	0.995	0.984	0.989	0.994	1.001	1.002	1.000
7000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
7200	1.004	1.008	1.008	1.005	0.737	1.009	1.005
7600	1.007	1.037	1.031	1.012	1.015	1.015	1.013
8000	1.011	1.061	1.054	1.021	1.021	1.021	1.023
8400	1.013	1.085	1.078	1.028	1.025	1.022	1.034



50VQA,VQD240
8400 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP (ft)	COOLING CAPACITY				HEATING CAPACITY		
			TC	TSC	THR	kW	TC	THA	kW
40	32	6.8	269,750	189,468	325,645	16,382	Operation Not Recommended		
	47	13.1	273,072	191,240	326,995	15,804			
	62	20.8	275,272	191,876	328,103	15,484	196,934	135,832	17,908
	78	30.7	276,944	192,792	329,352	15,360	199,394	137,896	18,024
50	32	6.8	265,078	189,612	325,450	17,694	216,431	151,808	18,940
	47	13.1	269,190	191,218	327,610	17,122	224,198	158,292	19,316
	62	20.8	271,538	192,066	328,962	16,830	227,873	161,298	19,512
	78	30.7	273,034	192,736	329,817	16,642	231,621	164,616	19,638
60	32	6.8	257,730	188,218	322,333	18,934	246,341	176,702	20,410
	47	13.1	262,148	189,882	324,895	18,390	255,834	184,660	20,860
	62	20.8	264,704	190,786	326,495	18,110	261,109	189,136	21,094
	78	30.7	266,270	191,460	327,454	17,932	264,666	192,106	21,266
70	32	6.8	248,316	185,620	316,890	20,098	278,160	203,246	21,956
	47	13.1	252,932	187,298	319,759	19,586	289,337	212,526	22,512
	62	20.8	255,634	188,228	321,567	19,324	295,946	218,214	22,782
	78	30.7	257,240	188,894	322,600	19,156	299,416	220,892	23,014
80	32	6.8	237,372	182,920	309,829	21,236	311,533	231,174	23,552
	47	13.1	242,528	183,960	313,266	20,732	325,142	242,346	24,266
	62	20.8	245,306	184,882	315,211	20,488	332,275	248,258	24,624
	78	30.7	246,928	185,532	316,301	20,332	337,467	252,658	24,856
90	32	6.8	226,534	179,700	302,758	22,340	—	—	—
	47	13.1	231,780	180,604	306,380	21,864			
	62	20.8	234,110	182,206	308,041	21,668			
	78	30.7	235,770	182,748	309,203	21,522			
100	32	6.8	215,418	176,280	295,464	23,460	—	—	—
	47	13.1	220,122	178,078	298,700	23,030			
	62	20.8	222,876	179,098	300,717	22,814			
	78	30.7	224,426	179,750	301,803	22,678			
110	32	6.8	Operation Not Recommended				—	—	—
	47	13.1							
	62	20.8	209,768	174,252	291,417	23,930			
	78	30.7	211,326	174,892	292,538	23,802			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
kW — Total Power (Kilowatts)
TC — Total Capacity (Btuh)
THA — Total Heat of Absorption (Btuh)
THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)

NOTES:

- Interpolation is permissible, extrapolation is not.

- All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
- ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
- All performance data is based upon the lower voltage of dual voltage rated units.
- Operation below 60 F EWT requires optional insulated water circuit.
- Operation below 40 F EWT is based upon 15% antifreeze solution.
- See Correction Factor tables for operating conditions other than those listed above.
- Performance capacities shown in Btuh.

CORRECTION FACTORS — ENTERING AIR — 50VQA,VQD240 UNIT

EAT WB (F)	TC	COOLING						HEATING			
		Sensible Cooling Capacity Entering DB (F)					THR	EAT DB (F)	TC	THA	kW
		70	75	80	85	90					
57	0.974	1.010	*	*	*	*	0.978	55	1.046	1.088	0.927
61	0.975	0.823	1.055	*	*	*	0.977	60	1.033	1.062	0.951
64	0.965	0.690	0.915	1.143	*	*	0.973	65	1.015	1.028	0.978
67	1.000	0.556	0.776	1.000	1.235	*	1.005	70	1.000	1.000	1.000
70	1.049	0.431	0.633	0.857	1.092	1.322	1.042	75	0.984	0.970	1.024

*Sensible capacity equals total capacity.

**CORRECTION FACTORS —
NOMINAL CFM — 50VQA,VQD240 UNIT**

TOTAL CFM	COOLING				HEATING		
	TC	TSC	THR	kW	TC	THA	kW
7000	0.978	0.924	0.937	0.968	0.977	0.975	0.984
7400	0.985	0.948	0.955	0.978	0.982	0.980	0.988
7800	0.994	0.968	0.972	0.989	0.991	0.990	0.991
8200	0.999	0.991	0.991	0.997	0.996	0.997	0.996
8400	1.000	1.000	1.000	1.000	1.000	1.000	1.000
8600	1.002	1.016	1.012	1.004	1.001	1.000	1.003
9000	1.005	1.038	1.033	1.011	1.006	1.003	1.013
9400	1.013	1.065	1.057	1.023	1.014	1.010	1.023

LEGEND

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THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)
wb — Wet Bulb

NOTES:

- 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.
- Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db.

Performance data (cont)



50VQA,VQD300

9000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP (ft)	COOLING CAPACITY				HEATING CAPACITY		
			TC	TSC	THR	kW	TC	THA	kW
40	40	5.1	344,094	233,156	427,169	24,348	Operation Not Recommended		
	60	9.9	348,878	235,058	429,367	23,590			
	80	16.2	351,452	236,178	430,720	23,232	253,967	164,320	26,274
	100	23.5	352,516	238,782	431,743	23,220	256,321	166,196	26,414
50	40	5.1	333,454	228,686	421,299	25,746	275,817	181,502	27,642
	60	9.9	342,214	237,548	427,999	25,142	284,168	188,134	28,146
	80	16.2	344,532	238,730	429,034	24,766	288,515	191,614	28,400
	100	23.5	346,080	239,618	429,947	24,580	291,344	193,870	28,568
60	40	5.1	322,286	224,422	415,236	27,242	308,451	207,258	29,658
	60	9.9	327,544	226,596	417,962	26,500	318,428	215,140	30,272
	80	16.2	330,466	227,708	419,649	26,138	323,463	219,138	30,576
	100	23.5	331,560	228,938	420,149	25,964	326,634	221,572	30,792
70	40	5.1	310,102	219,830	408,217	28,756	341,627	233,398	31,720
	60	9.9	315,606	222,048	411,238	28,028	353,969	243,134	32,484
	80	16.2	318,692	223,234	413,102	27,670	360,255	248,164	32,852
	100	23.5	320,386	223,978	414,100	27,466	364,176	251,212	33,108
80	40	5.1	296,306	215,642	399,778	30,326	374,790	259,178	33,884
	60	9.9	302,578	217,160	403,491	29,576	389,475	270,860	34,764
	80	16.2	305,852	218,394	405,557	29,222	396,775	276,632	35,212
	100	23.5	307,600	219,150	406,623	29,022	401,688	280,494	35,520
90	40	5.1	284,618	210,794	393,277	31,846	—	—	—
	60	9.9	290,034	213,668	396,502	31,204			
	80	16.2	293,354	214,830	398,676	30,868			
	100	23.5	295,088	215,544	399,775	30,682			
100	40	5.1	271,612	206,156	385,580	33,402	—	—	—
	60	9.9	277,406	208,562	389,176	32,758			
	80	16.2	278,988	209,408	389,571	32,410			
	100	23.5	280,724	210,066	390,706	32,234			
110	40	5.1	Operation Not Recommended				—	—	—
	60	9.9							
	80	16.2	265,652	203,988	381,721	34,018			
	100	23.5	267,356	204,744	382,859	33,852			

LEGEND

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THR — Total Heat of Rejection (Btuh)
TSC — Total Sensible Capacity (Btuh)

NOTES:

1. Interpolation is permissible, extrapolation is not.

- All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
- ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
- All performance data is based upon the lower voltage of dual voltage rated units.
- Operation below 60 F EWT requires optional insulated water circuit.
- Operation below 40 F EWT is based upon 15% antifreeze solution.
- See Correction Factor tables for operating conditions other than those listed above.
- Performance capacities shown in Btuh.

CORRECTION FACTORS — ENTERING AIR — 50VQA,VQD300 UNIT

EAT WB (F)	TC	COOLING						HEATING			
		Sensible Cooling Capacity Entering DB (F)					THR	EAT DB (F)	TC	THA	kW
		70	75	80	85	90					
57	0.953	1.012	*	*	*	*	0.959	55	1.033	1.078	0.932
61	0.939	0.839	1.055	1.277	*	*	0.948	60	1.022	1.053	0.954
64	0.961	0.708	0.919	1.138	1.359	*	0.967	65	1.010	1.025	0.977
67	1.000	0.583	0.787	1.000	1.221	1.441	1.000	70	1.000	1.000	1.000
70	1.045	0.462	0.659	0.871	1.085	1.303	1.040	75	0.986	0.970	1.022

*Sensible capacity equals total capacity.

LEGEND

ARI — Air Conditioning and Refrigeration Institute
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db — Dry Bulb
EAT — Entering-Air Temperature (F)
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TSC — Total Sensible Capacity (Btuh)
wb — Wet Bulb

NOTES:

- 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.
- Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db.

50HQL072 BLOWER DATA

RATED CFM		EXTERNAL STATIC PRESSURE (in. wg)													
		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
1800	BHP	0.335	0.378	0.424	0.472	0.524									
	RPM	599	646	692	737	781									
	Turns Open	3	2	1.5	5	4									
2000	BHP	0.425	0.474	0.524	0.576	0.629	0.683	0.739							
	RPM	637	680	723	766	807	849	890							
	Turns Open	2.5	1.5	0.5	4.5	3.5	3	2							
2200	BHP	0.539	0.588	0.639	0.693	0.749	0.808	0.870	0.934	1.001					
	RPM	678	718	758	796	834	871	907	943	978					
	Turns Open	1.5	1	4.5	4	3	2.5	1.5	1	0.5					
2400	BHP	0.676	0.728	0.782	0.837	0.895	0.955	1.017	1.081	1.148	1.216				
	RPM	724	759	794	829	863	897	931	964	997	1029				
	Turns Open	0.5	4.5	4	3	2.5	2	1	0.5	4	3.5				
2600	BHP	0.833	0.890	0.949	1.009	1.072	1.135	1.201	1.268	1.337	1.408	1.480	1.554	1.630	
	RPM	765	800	835	869	902	934	966	997	1028	1059	1090	1120	1151	
	Turns Open	4.5	3.5	3	2.5	1.5	1	0.5	4	3.5	3.5	3	2.5	2	
2800	BHP	1.014	1.075	1.137	1.201	1.267	1.334	1.403	1.474	1.546	1.619	1.693	1.769	1.846	1.924
	RPM	811	844	876	908	939	969	1000	1029	1059	1088	1117	1145	1174	1202
	Turns Open	3.5	3	2	1.5	1	0.5	4	3.5	3.5	3	2.5	2	1.5	1
3000	BHP	1.218	1.283	1.350	1.418	1.487	1.558	1.630	1.703	1.777	1.853	1.931	OPERATION NOT RECOMMENDED		
	RPM	856	887	918	948	977	1006	1035	1062	1090	1118	1145			
	Turns Open	2.5	2	1.5	1	0.5	4	3.5	3	3	2	2			

OPERATION
NOT RECOMMENDED

50HQL096 BLOWER DATA

RATED CFM		EXTERNAL STATIC PRESSURE (in. wg)													
		0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3
2600	BHP	—	—	0.84	0.91	0.97	1.04	1.10	1.17	1.24	1.31	1.37	1.44	1.51	1.58
	RPM	—	—	1048	1095	1140	1184	1226	1267	1308	1346	1384	1421	1457	1493
	Turns Open	—	—	4.0	3.0	2.0	1.0	0.0	4.0	3.5	2.5	2.0	1.5	1.0	0.5
2800	BHP	0.87	0.94	1.01	1.08	1.15	1.22	1.29	1.36	1.43	1.51	1.58	1.65	1.73	1.80
	RPM	1012	1058	1104	1148	1191	1232	1273	1313	1351	1389	1426	1461	1497	1531
	Turns Open	4.5	3.5	2.5	2.0	1.0	4.5	4.0	3.5	2.5	2.0	1.5	1.0	0.5	0.0
3000	BHP	1.05	1.12	1.20	1.27	1.35	1.42	1.50	1.57	1.65	1.73	1.80	1.88	1.96	2.04
	RPM	1070	1114	1157	1199	1239	1280	1319	1356	1394	1430	1465	1501	1534	1568
	Turns Open	3.5	2.5	1.5	0.5	4.5	4.0	3.0	2.5	2.0	1.5	0.5	0.0	4.0	3.5
3200	BHP	1.25	1.32	1.40	1.48	1.56	1.64	1.72	1.80	1.88	2.00	2.04	2.13	2.21	2.29
	RPM	1126	1167	1208	1248	1287	1325	1362	1400	1435	1470	1505	1538	1571	1604
	Turns Open	2.5	1.5	0.5	4.5	3.5	3.0	2.5	2.0	1.0	0.5	0.0	4.0	3.5	3.0
3400	BHP	1.46	1.54	1.62	1.71	1.79	1.88	1.96	2.05	2.13	2.22	2.31	2.39	2.48	2.57
	RPM	1179	1219	1257	1296	1333	1369	1406	1441	1475	1510	1543	1576	1608	1639
	Turns Open	1.0	0.5	4.5	3.5	3.0	2.5	1.5	1.0	0.5	0.0	4.0	3.5	3.0	2.5
3600	BHP	1.69	1.78	1.87	1.95	2.04	2.13	2.22	2.31	2.40	2.49	2.58	2.67	2.76	2.85
	RPM	1230	1268	1305	1341	1377	1413	1447	1481	1515	1548	1580	1612	1643	1674
	Turns Open	4.5	4.0	3.5	3.0	2.0	1.5	1.0	0.5	0.0	4.0	3.5	3.0	2.5	2.0
3800	BHP	1.94	2.03	2.13	2.22	2.31	2.41	2.50	2.59	2.69	2.78	2.88	2.97	—	—
	RPM	1280	1316	1351	1387	1421	1455	1488	1521	1553	1586	1617	1648	—	—
	Turns Open	4.0	3.0	2.5	2.0	1.5	1.0	0.5	4.0	3.5	3.0	3.0	2.5	—	—

LEGEND

- — Operation Not Recommended
- BHP — Brake Horsepower
- ESP — External Static Pressure
- RPM — Revolutions Per Minute
- A — Units with Standard RPM/Standard Motor Option
- B — Units with Low RPM/Standard Motor Option
- C — Units with High RPM/Standard Motor Option
- D — Units with Standard RPM/Large Motor Option
- E — Units with High RPM/Large Motor Option

NOTES:

1. Boldface requires large hp motor.
2. Units factory shipped with standard static sheave and drive at 2.5 turns open (3200 cfm at 0.6 in. ESP). Other speeds require field selection.

3. ISO/ARI rating point with standard static sheave and drive at 3.5 turns open (3200 cfm at 0.4 in. ESP). Other speeds require field selection.
4. For applications requiring higher static pressures, contact your local representative.
5. Based on 2-10x10(R) blowers.
6. Performance data does not include drive losses and is based on sea level conditions.
7. All airflow is rated at lowest voltage if unit is dual voltage rated, i.e., 208V for 208-230V units.
8. For wet coil performance first calculate the face velocity of the air coil (Face Velocity [fpm] = Airflow [cfm] / Face Area [sq ft]). Then for velocities of 200 fpm reduce the static capability by 0.03 in. wg, 300 fpm by 0.08 in. wg, 400 fpm by 0.12 in. wg and 500 fpm by 0.16 in. wg.
9. Large motor size is 2 hp for 50HQL072 and 3 hp for 50HQL096.

Performance data (cont)



50HQL120 BLOWER DATA

RATED CFM		EXTERNAL STATIC PRESSURE (in. wg)															
		0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
3400	BHP	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.54	1.59	1.63	1.68	1.73	1.77	1.82
	RPM	1014	1043	1072	1102	1129	1156	1183	1209	1234	1260	1285	1309	1333	1356	1380	1403
	Turns Open	3.0	2.5	2.0	1.0	0.5	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0	4.5	4.0	4.0
3600	BHP	1.26	1.31	1.37	1.42	1.48	1.53	1.58	1.63	1.68	1.74	1.79	1.84	1.89	1.94	1.99	2.04
	RPM	1052	1081	1109	1136	1163	1190	1216	1241	1266	1291	1315	1338	1362	1385	1408	1430
	Turns Open	2.5	1.5	1.0	0.5	4.0	3.5	3.0	2.5	2.5	2.0	1.5	1.0	4.5	4.0	3.5	3.5
3800	BHP	1.44	1.50	1.56	1.61	1.67	1.73	1.78	1.84	1.89	1.95	2.00	2.06	2.11	2.16	2.21	2.26
	RPM	1090	1118	1145	1172	1199	1223	1248	1273	1298	1321	1345	1368	1391	1413	1435	1457
	Turns Open	1.5	1.0	0.0	4.0	3.5	3.0	2.5	2.0	1.5	1.0	1.0	0.5	0.0	3.5	3.5	3.0
4000	BHP	1.63	1.70	1.76	1.82	1.88	1.94	2.00	2.06	2.11	2.17	2.22	2.28	2.34	2.39	2.45	2.50
	RPM	1127	1154	1181	1207	1232	1257	1281	1306	1329	1352	1375	1398	1420	1441	1463	1485
	Turns Open	0.5	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0	0.5	0.0	0.0	3.5	3.0	3.0	2.5
4200	BHP	1.84	1.91	1.98	2.04	2.10	2.16	2.22	2.28	2.34	2.40	2.47	2.53	2.59	2.65	2.71	2.77
	RPM	1164	1191	1217	1241	1266	1291	1314	1337	1360	1383	1406	1427	1449	1470	1492	1513
	Turns Open	4.0	3.5	3.0	2.5	2.5	2.0	1.5	1.0	0.5	0.0	3.5	3.5	3.0	2.5	2.5	2.0
4400	BHP	2.07	2.13	2.20	2.27	2.33	2.40	2.46	2.53	2.60	2.66	2.73	2.79	2.86	2.93	2.99	—
	RPM	1202	1227	1251	1276	1300	1323	1346	1369	1392	1414	1435	1457	1478	1500	1520	—
	Turns Open	3.5	3.0	2.5	2.0	1.5	1.0	1.0	0.5	0.0	3.5	3.5	3.0	2.5	2.5	2.0	—
4600	BHP	2.30	2.37	2.44	2.51	2.59	2.66	2.73	2.80	2.87	2.95	—	—	—	—	—	—
	RPM	1237	1262	1287	1310	1333	1356	1379	1402	1423	1444	—	—	—	—	—	—
	Turns Open	3.0	2.5	2.0	1.5	1.0	0.5	0.0	4.0	3.5	3.0	—	—	—	—	—	—

LEGEND

— — Operation Not Recommended

BHP — Brake Horsepower

ESP — External Static Pressure

RPM — Revolutions Per Minute

A — Units with Standard RPM/Standard Motor Option

B — Units with Low RPM/Standard Motor Option

C — Units with High RPM/Standard Motor Option

D — Units with Standard RPM/Large 3 Hp Motor Option

E — Units with High RPM/Large 3 Hp Motor Option

NOTES:

1. Boldface requires 3 hp motor.
2. Units factory shipped at ISO/ARI setting with standard static sheave and drive at 2.5 turns open (4000 cfm at 0.5 in. ESP). Other speeds require field selection.

3. ISO/ARI rating point with standard static sheave and drive at 3.5 turns open (3200 cfm at 0.4 in. ESP). Other speeds require field selection.
4. For applications requiring higher static pressures, contact your local representative.
5. Based on 2-11x10(R) blowers.
6. Performance data does not include drive losses and is based on sea level conditions.
7. All airflow is rated at lowest voltage if unit is dual voltage rated, i.e., 208V for 208-230V units.
8. For wet coil performance first calculate the face velocity of the air coil (Face Velocity [fpm] = Airflow [cfm] / Face Area [sq ft]). Then for velocities of 200 fpm reduce the static capability by 0.03 in. wg, 300 fpm by 0.08 in. wg, 400 fpm by 0.12 in. wg and 500 fpm by 0.16 in. wg.



50VQA,VQD080 BLOWER DATA

RATED CFM		EXTERNAL STATIC PRESSURE (in. wg)													
		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
2300	BHP	0.44	0.48	0.52	0.56	0.60	0.65	0.69	0.74	0.79	0.83	0.88	0.93	0.99	1.04
	RPM	618	657	694	730	765	799	833	866	898	929	960	990	1020	1049
2500	BHP	0.54	0.59	0.63	0.67	0.72	0.77	0.81	0.86	0.91	0.96	1.02	1.07	1.12	1.18
	RPM	657	693	728	762	795	827	859	890	920	950	980	1009	1037	1065
2700	BHP	0.67	0.71	0.76	0.81	0.86	0.91	0.96	1.01	1.06	1.11	1.17	1.22	1.28	1.33
	RPM	697	730	763	795	826	857	887	916	945	974	1002	1030	1057	1084
2900	BHP	0.81	0.86	0.91	0.96	1.01	1.06	1.11	1.17	1.22	1.28	1.34	1.39	1.45	1.51
	RPM	737	768	799	829	859	888	916	945	972	999	1026	1053	1079	1105
3100	BHP	0.97	1.02	1.07	1.13	1.18	1.24	1.29	1.35	1.41	1.47	1.52	1.58	1.64	1.71
	RPM	778	807	836	865	893	920	948	974	1001	1027	1052	1078	1103	1127
3300	BHP	1.15	1.21	1.26	1.32	1.38	1.43	1.49	1.55	1.61	1.67	1.73	1.80	1.86	1.92
	RPM	819	846	874	901	928	954	980	1005	1031	1056	1080	1104	1128	1152

LEGEND

- A** — Standard Sheave RPM Range
B — Low Sheave RPM Range
C — High Sheave RPM Range
BHP — Brake Horsepower
RPM — Revolutions Per Minute

NOTE: Bold numbers require 2 horsepower motor.

MOTOR PULLEY SETTINGS

MOTOR PULLEY TURNS OPEN	5	4.5	4	3.5	3	2.5	2	1.5	1	.5	0
"A" RPM Range	768	790	811	832	854	875	896	918	939	960	982
"B" RPM Range	591	614	636	659	682	705	727	750	773	795	818
"C" RPM Range	890	919	949	979	1008	1038	1068	1097	1127	1157	1186

50VQA,VQD100 BLOWER DATA

RATED CFM		EXTERNAL STATIC PRESSURE (in. wg)													
		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
3000	BHP	0.52	0.58	0.65	0.71	0.78	0.85	0.92	1.0	1.07	1.15	1.24	1.32	1.41	1.50
	RPM	534	571	607	641	675	708	740	771	802	832	861	890	918	946
3200	BHP	0.61	0.68	0.74	0.81	0.88	0.95	1.03	1.11	1.19	1.27	1.35	1.44	1.53	1.62
	RPM	558	593	627	660	692	724	754	784	814	843	871	899	926	953
3400	BHP	0.71	0.78	0.85	0.92	0.99	1.07	1.15	1.23	1.31	1.39	1.48	1.57	1.66	1.75
	RPM	582	615	647	679	710	740	770	799	827	855	883	910	936	962
3600	BHP	0.82	0.89	0.97	1.04	1.12	1.20	1.28	1.36	1.44	1.53	1.62	1.71	1.80	1.89
	RPM	606	638	669	699	729	758	786	814	842	868	895	921	947	972
3800	BHP	0.95	1.02	1.10	1.17	1.25	1.33	1.42	1.50	1.59	1.68	1.77	1.86	1.95	—
	RPM	630	661	690	719	748	776	803	830	857	883	908	934	959	—
4000	BHP	1.08	1.16	1.24	1.32	1.40	1.48	1.57	1.66	1.75	1.84	1.93	—	—	—
	RPM	655	684	713	740	768	795	821	847	873	898	923	—	—	—
4200	BHP	1.23	1.31	1.39	1.48	1.56	1.65	1.74	1.83	1.92	—	—	—	—	—
	RPM	680	708	735	762	788	814	840	865	890	—	—	—	—	—

LEGEND

- A** — Standard Sheave RPM Range
B — Low Sheave RPM Range
C — High Sheave RPM Range
BHP — Brake Horsepower
RPM — Revolutions Per Minute

NOTE: Bold numbers require 2 horsepower motor.

MOTOR PULLEY SETTINGS

MOTOR PULLEY TURNS OPEN	5	4.5	4	3.5	3	2.5	2	1.5	1	.5	0
"A" RPM Range	724	744	764	784	805	825	845	865	885	905	925
"B" RPM Range	523	543	563	583	603	624	644	664	684	704	724
"C" RPM Range	761	786	812	837	862	888	913	938	964	989	1014

Performance data (cont)



50VQA,VQD120 BLOWER DATA

RATED AIRFLOW		EXTERNAL STATIC PRESSURE (in. wg)													
		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
3500	BHP	0.82	0.89	0.96	1.04	1.11	1.19	1.27	1.36	1.44	1.53	1.62	1.71	1.80	—
	RPM	619	651	682	713	742	772	800	828	856	883	910	936	961	—
3700	BHP	0.95	1.02	1.10	1.17	1.25	1.33	1.42	1.50	1.59	1.68	1.77	1.86	1.96	—
	RPM	645	675	705	734	763	791	818	845	872	898	924	949	974	—
3900	BHP	1.09	1.16	1.24	1.32	1.40	1.49	1.57	1.66	1.75	1.84	1.94	2.03	—	—
	RPM	671	700	729	757	784	811	837	863	889	914	939	964	—	—
4100	BHP	1.24	1.32	1.40	1.48	1.57	1.66	1.74	1.84	1.93	2.02	—	—	—	—
	RPM	697	725	752	779	806	832	857	882	907	937	—	—	—	—
4300	BHP	1.40	1.49	1.57	1.66	1.75	1.84	1.93	2.02	—	—	—	—	—	—
	RPM	724	750	776	802	828	853	877	902	—	—	—	—	—	—
4500	BHP	1.59	1.67	1.76	1.85	1.94	2.04	—	—	—	—	—	—	—	—
	RPM	750	776	801	826	850	874	—	—	—	—	—	—	—	—
4700	BHP	1.78	1.87	1.96	—	—	—	—	—	—	—	—	—	—	—
	RPM	777	801	825	—	—	—	—	—	—	—	—	—	—	—

LEGEND

- A** — Standard Sheave RPM Range
B — Low Sheave RPM Range
BHP — Brake Horsepower
RPM — Revolutions Per Minute

NOTE: Bold numbers require 2 horsepower motor.

MOTOR PULLEY SETTINGS

MOTOR PULLEY TURNS OPEN	5	4.5	4	3.5	3	2.5	2	1.5	1	.5	0
"A" RPM Range	768	790	811	832	854	875	896	918	939	960	982
"B" RPM Range	603	624	644	664	684	704	724	744	764	784	805

50VQA,VQD160 BLOWER DATA

RATED AIRFLOW		EXTERNAL STATIC PRESSURE (in. wg)													
		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
4600	BHP RPM	0.87 618	0.95 657	1.04 694	1.12 730	1.21 765	1.29 799	1.38 833	1.48 866	1.57 898	1.67 929	1.77 960	1.87 990	1.97 1020	2.08 1049
5000	BHP RPM	1.09 657	1.17 693	1.25 728	1.35 762	1.44 795	1.53 827	1.63 859	1.73 890	1.83 920	1.93 950	2.03 980	2.14 1009	2.24 1027	2.35 1065
5400	BHP RPM	1.33 697	1.42 730	1.52 763	1.61 795	1.71 826	1.81 857	1.91 887	2.01 916	2.12 945	2.22 974	2.33 1002	2.44 1030	2.55 1057	2.67 1084
5800	BHP RPM	1.62 737	1.71 768	1.81 799	1.91 829	2.02 859	2.12 888	2.23 916	2.34 945	2.45 972	2.56 999	2.67 1026	2.78 1053	2.90 1079	— —
6200	BHP RPM	1.94 778	2.04 807	2.15 836	2.26 865	2.36 893	2.47 920	2.59 948	2.70 974	2.81 1001	2.93 1027	— —	— —	— —	— —
6600	BHP RPM	2.30 819	2.41 846	2.52 874	2.64 901	2.75 928	2.87 954	2.99 980	— —	— —	— —	— —	— —	— —	— —
7000	BHP RPM	2.71 860	2.82 886	2.94 912	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —

LEGEND

- A** — Standard Sheave RPM Range
B — Low Sheave RPM Range
C — High Sheave RPM Range
BHP — Brake Horsepower
RPM — Revolutions Per Minute

NOTE: Bold numbers require 2 horsepower motor.

MOTOR PULLEY SETTINGS

MOTOR PULLEY TURNS OPEN	5	4.5	4	3.5	3	2.5	2	1.5	1	.5	0
"A" RPM Range	768	790	811	832	854	875	896	918	939	960	982
"B" RPM Range	591	614	636	659	682	705	727	750	773	795	818
"C" RPM Range	890	919	949	979	1008	1038	1068	1097	1127	1157	1186



50VQA,VQD200 BLOWER DATA

RATED CFM		EXTERNAL STATIC PRESSURE (in. wg)													
		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
6000	BHP	0.52	0.58	0.65	0.71	0.78	0.85	0.92	1.0	1.07	1.15	1.24	1.32	1.41	1.50
	RPM	534	571	607	641	675	708	740	771	802	832	861	890	918	946
6400	BHP	0.61	0.68	0.74	0.81	0.88	0.95	1.03	1.11	1.19	1.27	1.35	1.44	1.53	1.62
	RPM	558	593	627	660	692	724	754	784	814	843	871	899	926	953
6800	BHP	0.71	0.78	0.85	0.92	0.99	1.07	1.15	1.23	1.31	1.39	1.48	1.57	1.66	1.75
	RPM	582	615	647	679	710	740	770	799	827	855	883	910	936	962
7200	BHP	0.82	0.89	0.97	1.04	1.12	1.20	1.28	1.36	1.44	1.53	1.62	1.71	1.80	1.89
	RPM	606	638	669	699	729	758	786	814	842	868	895	921	947	972
7600	BHP	0.95	1.02	1.10	1.17	1.25	1.33	1.42	1.50	1.59	1.68	1.77	1.86	1.95	—
	RPM	630	661	690	719	748	776	803	830	857	883	908	934	959	—
8000	BHP	1.08	1.16	1.24	1.32	1.40	1.48	1.57	1.66	1.75	1.84	1.93	—	—	—
	RPM	655	684	713	740	768	795	821	847	873	898	923	—	—	—
8400	BHP	1.23	1.31	1.39	1.48	1.56	1.65	1.74	1.83	1.92	—	—	—	—	—
	RPM	680	708	735	762	788	814	840	865	890	—	—	—	—	—

LEGEND

- A** — Standard Sheave RPM Range
B — Low Sheave RPM Range
C — High Sheave RPM Range
BHP — Brake Horsepower
RPM — Revolutions Per Minute

NOTES:

1. Bold numbers require 2 horsepower motor.
2. Values are per blower and motor; 2 blowers and motors required.

MOTOR PULLEY SETTINGS

MOTOR PULLEY TURNS OPEN	5	4.5	4	3.5	3	2.5	2	1.5	1	.5	0
"A" RPM Range	724	744	764	784	805	825	845	865	885	905	925
"B" RPM Range	523	543	563	583	603	624	644	664	684	704	724
"C" RPM Range	761	786	812	837	862	888	913	938	964	989	1014

50VQA,VQD240 BLOWER DATA

RATED CFM		EXTERNAL STATIC PRESSURE (in. wg)													
		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
7000	BHP	0.82	0.89	0.96	1.04	1.11	1.19	1.27	1.36	1.44	1.53	1.62	1.71	1.80	—
	RPM	619	651	682	713	742	772	800	828	856	883	910	936	961	—
7400	BHP	0.95	1.02	1.10	1.17	1.25	1.33	1.42	1.50	1.59	1.68	1.77	1.86	1.96	—
	RPM	645	675	705	734	763	791	818	845	872	898	924	949	974	—
7800	BHP	1.09	1.16	1.24	1.32	1.40	1.49	1.57	1.66	1.75	1.84	1.94	2.03	—	—
	RPM	671	700	729	757	784	811	837	863	889	914	939	964	—	—
8200	BHP	1.24	1.32	1.40	1.48	1.57	1.66	1.74	1.84	1.93	2.02	—	—	—	—
	RPM	697	725	752	779	806	832	857	882	907	937	—	—	—	—
8600	BHP	1.40	1.49	1.57	1.66	1.75	1.84	1.93	2.02	—	—	—	—	—	—
	RPM	724	750	776	802	828	853	877	902	—	—	—	—	—	—
9000	BHP	1.59	1.67	1.76	1.85	1.94	2.04	—	—	—	—	—	—	—	—
	RPM	750	776	801	826	850	874	—	—	—	—	—	—	—	—
9400	BHP	1.78	1.87	1.96	—	—	—	—	—	—	—	—	—	—	—
	RPM	777	801	825	—	—	—	—	—	—	—	—	—	—	—

LEGEND

- A** — Standard Sheave RPM Range
B — Low Sheave RPM Range
C — High Sheave RPM Range
BHP — Brake Horsepower
RPM — Revolutions Per Minute

NOTES:

1. Bold numbers require 2 horsepower motor.
2. Values are per blower and motor; 2 blowers and motors required.

MOTOR PULLEY SETTINGS

MOTOR PULLEY TURNS OPEN	5	4.5	4	3.5	3	2.5	2	1.5	1	.5	0
"A" RPM Range	768	790	811	832	854	875	896	918	939	960	982
"B" RPM Range	603	624	644	664	684	704	724	744	764	784	805

Performance data (cont)



50VQA,VQD300 BLOWER DATA

RATED AIRFLOW		EXTERNAL STATIC PRESSURE (in. wg)													
		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
8,000	BHP	1.24	1.32	1.40	1.48	1.57	1.66	1.75	1.84	1.93	2.03	2.12	2.22	2.32	2.42
	RPM	713	740	768	795	821	847	873	898	923	947	971	995	1019	1042
8,500	BHP	1.45	1.54	1.62	1.71	1.71	1.80	1.99	2.08	2.18	2.28	2.38	2.48	2.58	2.69
	RPM	747	773	799	825	850	875	900	924	947	971	994	1017	1040	1062
9,000	BHP	1.69	1.78	1.87	1.96	2.06	2.15	2.25	2.35	2.45	2.55	2.65	2.76	2.86	2.97
	RPM	782	807	831	856	880	904	927	950	973	996	1018	1040	1062	1083
9,500	BHP	1.96	2.05	2.15	2.24	2.34	2.44	2.54	2.64	2.74	2.85	2.96	—	—	—
	RPM	816	840	864	887	910	933	955	978	999	1021	1043	—	—	—
10,000	BHP	2.25	2.35	2.45	2.55	2.64	2.75	2.85	2.96	—	—	—	—	—	—
	RPM	851	874	897	919	941	963	984	1006	—	—	—	—	—	—
10,500	BHP	2.57	2.67	2.77	2.88	2.98	—	—	—	—	—	—	—	—	—
	RPM	886	908	930	951	972	—	—	—	—	—	—	—	—	—
11,000	BHP	2.92	—	—	—	—	—	—	—	—	—	—	—	—	—
	RPM	921	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

- A** — Standard Sheave RPM Range
B — Low Sheave RPM Range
BHP — Brake Horsepower
RPM — Revolutions Per Minute

NOTE: Values are per blower and motor; 2 blower and motors required.

MOTOR PULLEY SETTINGS

MOTOR PULLEY TURNS OPEN	5	4.5	4	3.5	3	2.5	2	1.5	1	.5	0
"A" RPM Range	896	918	939	960	982	1003	1024	1046	1067	1088	1110
"B" RPM Range	682	705	727	750	773	795	818	841	864	886	909

Electrical data



50HQL072,096,120

UNIT 50HQL	VOLTAGE (3 Ph — 60 Hz)	VOLTAGE RANGE		BLOWER MOTOR FACTORY- INSTALLED OPTION	COMPRESSOR			FAN MOTOR		TOTAL FLA	MCA	MOCP*
		Min	Max		Qty	RLA	LRA	HP	FLA			
072	208/230	187	253	—	2	10.6	59.5	1.5	5.7	26.9	29.6	40
	460	414	506	—	2	4.6	30.7	1.5	2.6	11.8	13.0	15
096	208/230	187	253	Standard Large	2	14.3	91.0	2.0	6.5	35.1	38.7	50
					2	14.3	91.0	3.0	8.8	37.4	41.0	50
	460	414	506	Standard Large	2	7.2	46.0	2.0	3.1	17.5	19.3	25
					2	7.2	46.0	3.0	4.2	18.6	20.4	25
	575	518	633	Standard Large	2	5.7	37.0	2.0	2.8	14.2	15.6	20
					2	5.7	37.0	3.0	3.4	14.8	16.2	20
120	208/230	187	253	Standard Large	2	19.3	123.0	2.0	6.5	45.1	49.9	60
					2	19.3	123.0	3.0	8.8	47.4	52.2	70
	460	414	506	Standard Large	2	7.5	49.5	2.0	3.1	18.1	20.0	25
					2	7.5	49.5	3.0	4.2	19.2	21.1	25
	575	518	633	Standard Large	2	6.4	40.0	2.0	2.8	15.6	17.2	20
					2	6.4	40.0	3.0	3.4	16.2	17.8	20

LEGEND

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



*Time-delay fuse or HACR circuit breaker.

50VQA,VQD080-300

UNIT 50VQA,VQD	VOLTAGE (3 Ph — 60 Hz)	COMPRESSOR (EACH)			FAN MOTOR (EACH)			MCA	TOTAL FLA	MOCP*
		QTY	RLA	LRA	QTY	HP	FLA			
080	208/230	1	20.7	156.0	1	1.5	6.1	32.0	26.8	50
	460	1	10.0	70.0	1	1.5	3.0	15.5	13.0	25
	575	1	8.2	54.0	1	1.5	2.4	12.7	10.6	20
100	208/230	1	28.4	183.0	1	1.5	6.0	41.5	34.4	60
	460	1	14.2	91.1	1	1.5	3.3	21.1	17.5	30
	575	1	11.4	73.3	1	1.5	2.4	16.7	13.8	25
120	208/230	1	31.8	193.0	1	2	7.2	50.3	39.0	80
	460	1	15.9	96.5	1	2	3.6	25.2	19.5	40
	575	1	13.3	77.2	1	2	2.8	19.4	16.1	30
160	208/230	2	20.7	156.0	1	3	9.5	56.1	50.9	70
	460	2	10.0	70.0	1	3	4.8	27.3	24.8	35
	575	2	8.2	54.0	1	3	3.9	22.4	20.3	30
200	208/230	2	28.4	183.0	2	1.5	6.0	75.9	68.8	100
	460	2	14.2	91.1	2	1.5	3.3	38.6	35.0	50
	575	2	11.4	73.3	2	1.5	2.4	30.5	27.6	40
240	208/230	2	31.8	193.0	2	2	7.2	92.0	78.0	125
	460	2	15.9	96.5	2	2	3.6	46.1	39.0	60
	575	2	13.3	77.2	2	2	2.8	35.5	32.2	45
300	208/230	2	42.0	267.0	2	3	9.5	113.5	103.0	150
	460	2	27.5	135.0	2	3	4.8	71.5	64.6	90
	575	2	22.0	108.0	2	3	3.9	57.3	51.8	70

LEGEND

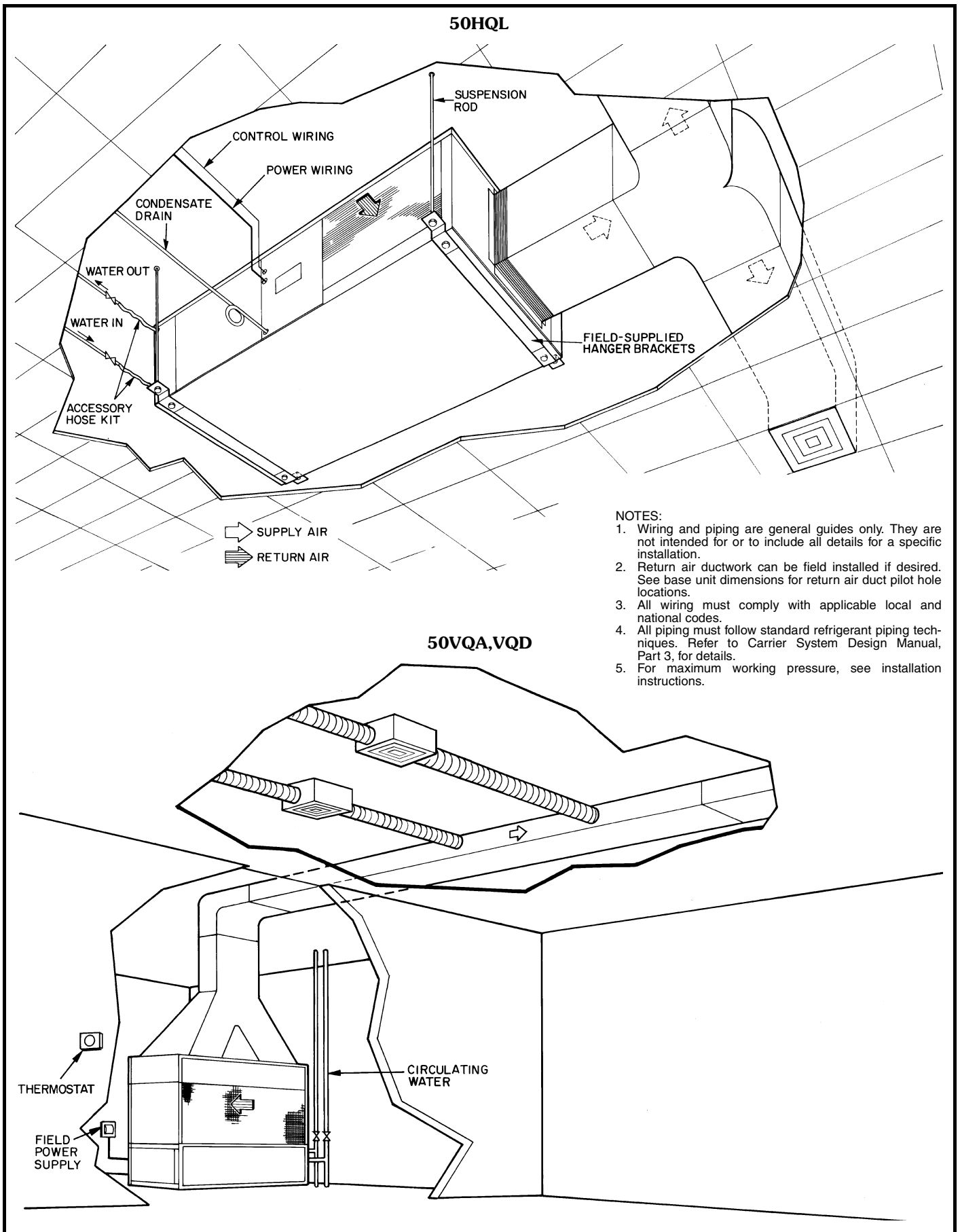
FLA — Full Load Amps
HACR — Heating, Air Conditioning, and Refrigeration
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Minimum Over Current Protection
RLA — Rated Load Amps



*Time-delay fuse or HACR circuit breaker.

NOTE: Contact factory for electrical data with optional oversize blower motor.

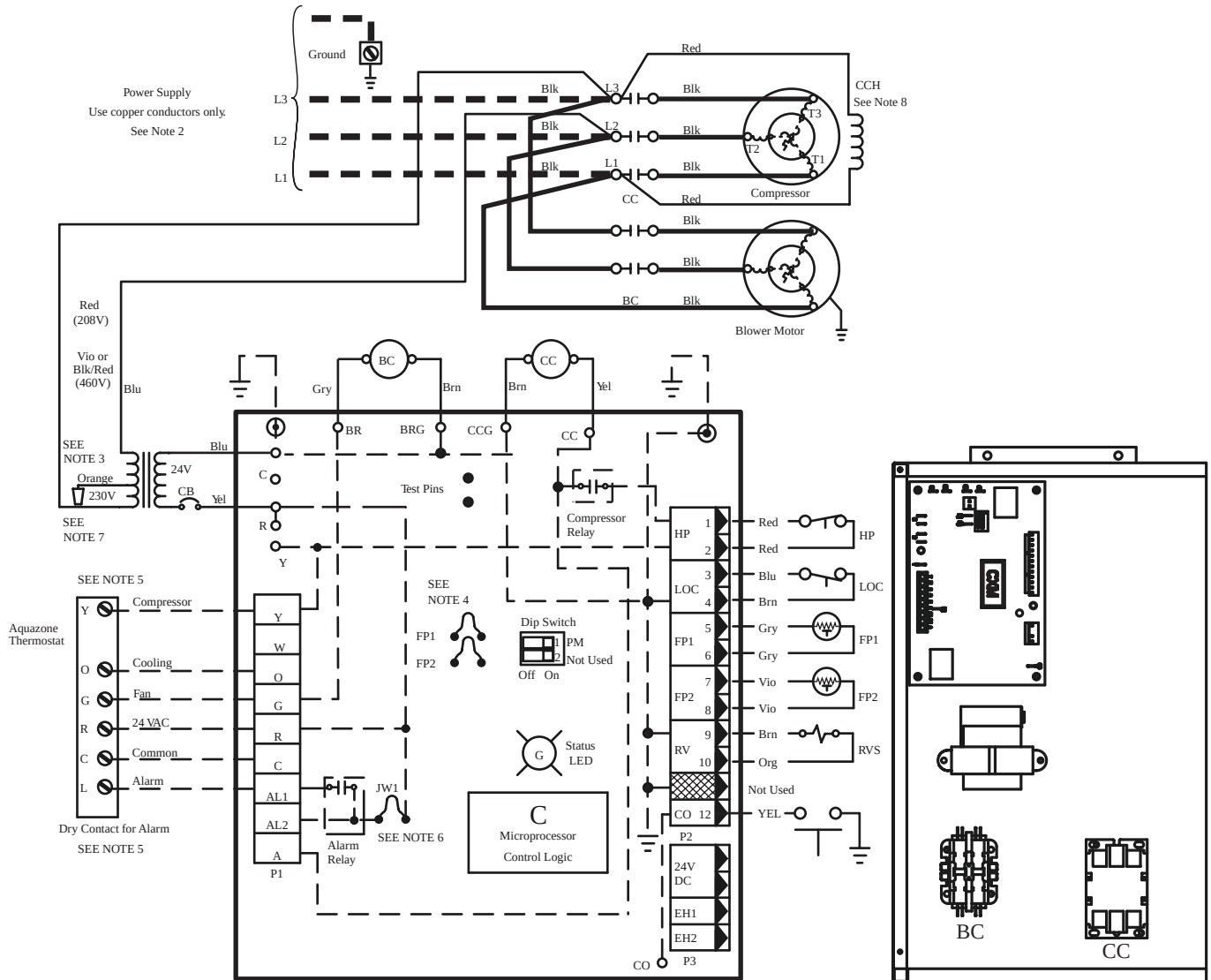
Typical piping and wiring



Typical wiring schematics



TYPICAL AQUAZONE™ COMPLETE C CONTROL WIRING



LEGEND

AL — Alarm Relay Contacts
BC — Blower Motor Contactor
BR — Blower Relay
CB — Circuit Breaker
CC — Compressor Contactor
CCH — Crankcase Heater
CO — Sensor, Condensate Overflow
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch

JW1 — Jumper, Alarm
LOC — Loss of Charge Pressure Switch
NEC — National Electrical Code
P1 — Field Wiring Terminal Block
PM — Performance Monitor
RVS — Reversing Valve Solenoid
 - - - - 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

*Optional wiring.

NOTES:

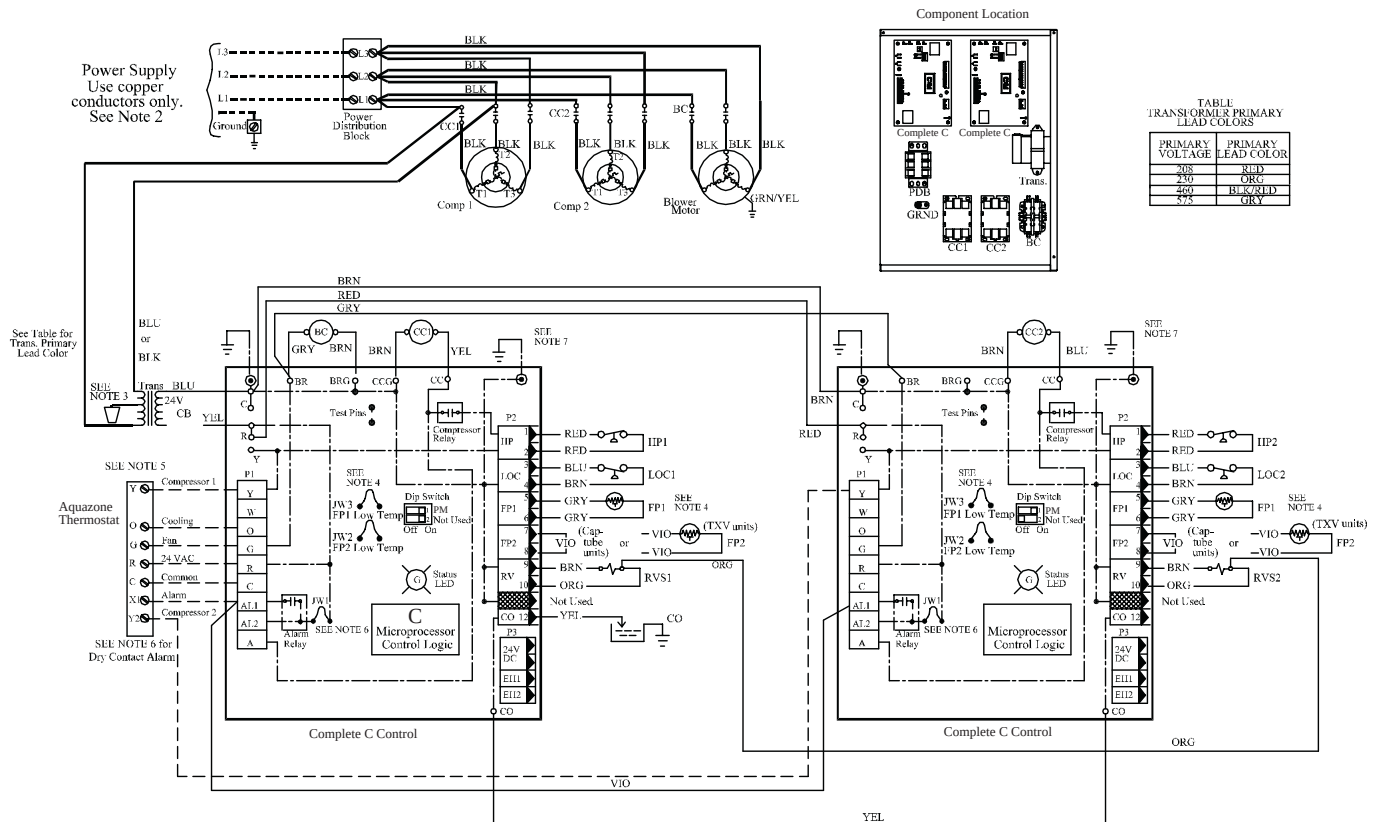
- Compressor and blower motor thermally protected internally.
- All wiring to the unit must comply with NEC and local codes.
- 208/230 v transformers will be connected for 208 v operations. For 230 v operations, disconnect RED lead at L1, and attach ORANGE lead to L1. Close open end of RED lead with insulating tape.
- Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for ANTIFREEZE solutions, cut FP1 jumper.

- 24-v Alarm Signal shown. For Dry Alarm Contact, cut JW1 jumper and wiring to the unit.
- 24-v Alarm Signal shown. For Dry Alarm Contact, cut JW1 jumper and Dry Contact will be available between AL1 and AL2.
- For 460 v transformer primary leads are VIO and BLU. For 575 v transformer primary leads are GRV and BLU.
- Crankcase Heat used on size 100 and 120.

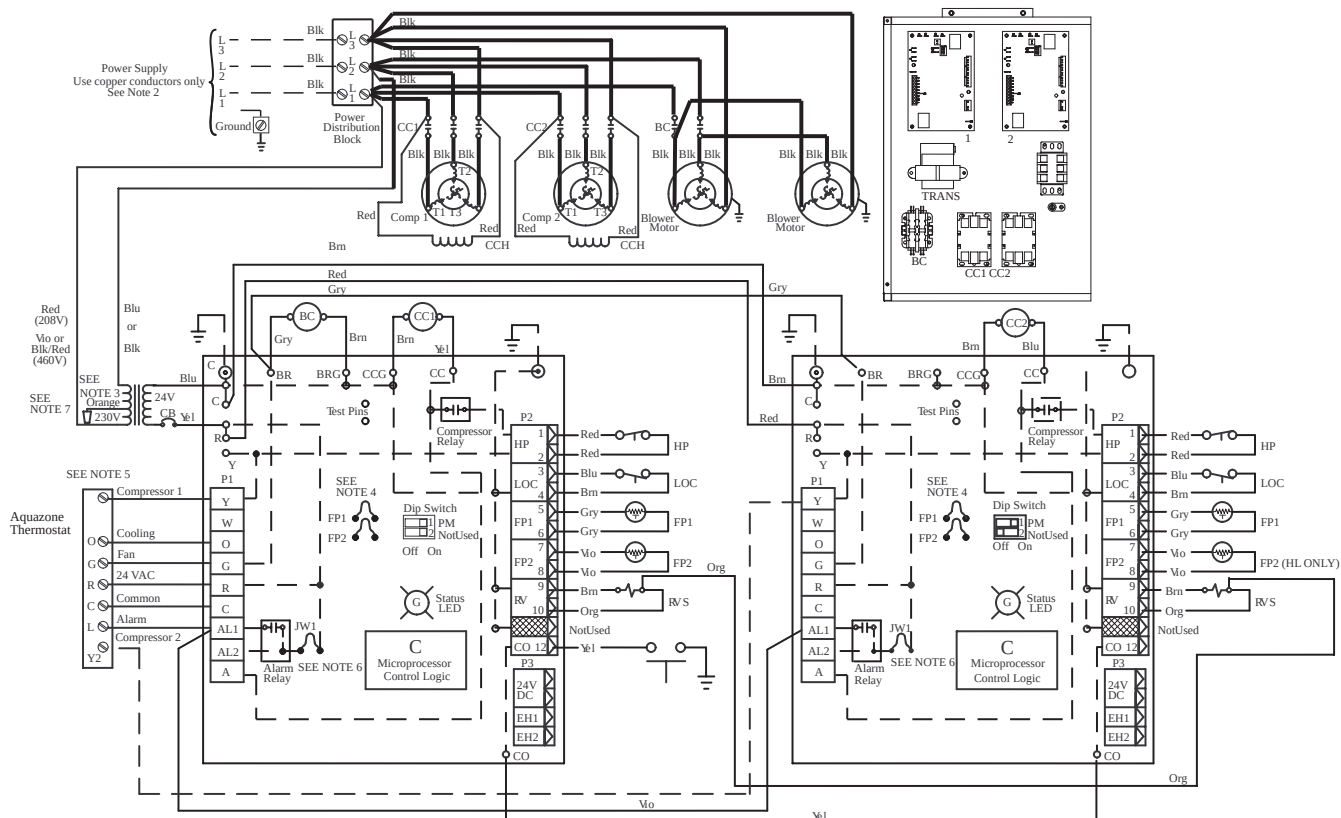
Typical wiring schematics (cont)



TYPICAL AQUAZONE™ COMPLETE C CONTROL WIRING — DUAL COMPRESSORS



TYPICAL AQUAZONE™ COMPLETE C WIRING — DUAL COMPRESSOR AND BLOWER



LEGEND

AL — Alarm Relay Contacts
BC — Blower Motor Contactor
BR — Blower Relay
CB — Circuit Breaker
CC — Compressor Contactor
CCH — Crankcase Heater
CO — Sensor, Condensate Overflow
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch

*Optional wiring.

JW1 — Jumper, Alarm
LOC — Loss of Charge Pressure Switch
NEC — National Electrical Code
P1 — Field Wiring Terminal Block
PM — Performance Monitor
RVS — Reversing Valve Solenoid
 - - - - - 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

NOTES:

- Compressor and blower motor thermally protected internally.
- All wiring to the unit must comply with NEC and local codes.
- 208/230 v transformers will be connected for 208 v operation. For 230 v operation, disconnect RED lead at L1, and attach ORANGE lead to L1. Close open end of RED lead with insulating tape.
- JW3 jumper provides freeze protection for WATER. When using ANTIFREEZE solutions, cut JW3 jumper.

- Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to unit.
- 24-v Alarm Signal shown. For Dry Alarm Contact, cut JW1 jumper and Dry Alarm Contact will be available between AL1 and AL2.
- For 460 v transformer primary leads are VIO and BLU. For 575 v transformer primary leads are GRY and BLU.

Typical wiring schematics (cont)



TYPICAL AQUAZONE™ DELUXE D CONTROL WIRING

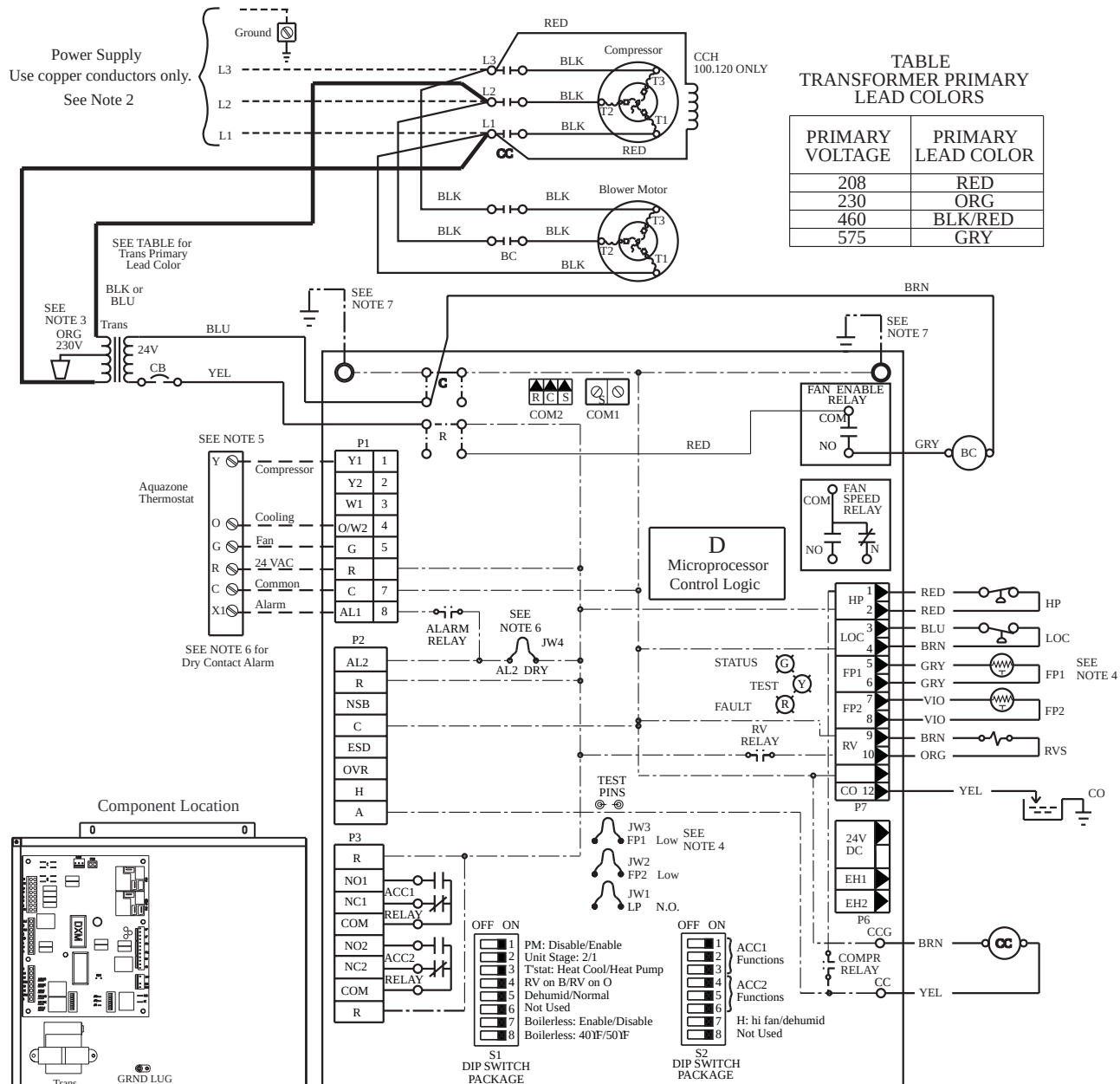


TABLE
TRANSFORMER PRIMARY
LEAD COLORS

PRIMARY VOLTAGE	PRIMARY LEAD COLOR
208	RED
230	ORG
460	BLK/RED
575	GRY

LEGEND

NEC	— National Electrical Code
P1	— Field Wiring Terminal Block
PM	— Performance Monitor
RVS	— Reversing Valve Solenoid
Trans	— Transformer
—	— Factory Low Voltage Wiring
—	— Factory Line Voltage Wiring
- - -	— Field Low Voltage Wiring
- - -	— Field Line Voltage Wiring
- · - · -	— Printed Circuit Trace
○	— Relay/Contactor Coil
□	— Condensate Pan

⎓	Switch-Temperature
⎓	Switch-High Pressure
⎓	Switch-Low Pressure
⎓	Thermistor
⎓	Ground
⎓	Circuit Breaker
⎓	Relay Contacts — N.O.
⎓	Relay Contacts — N.C.
⎓	Wire Nut
⎓	Solenoid Coil

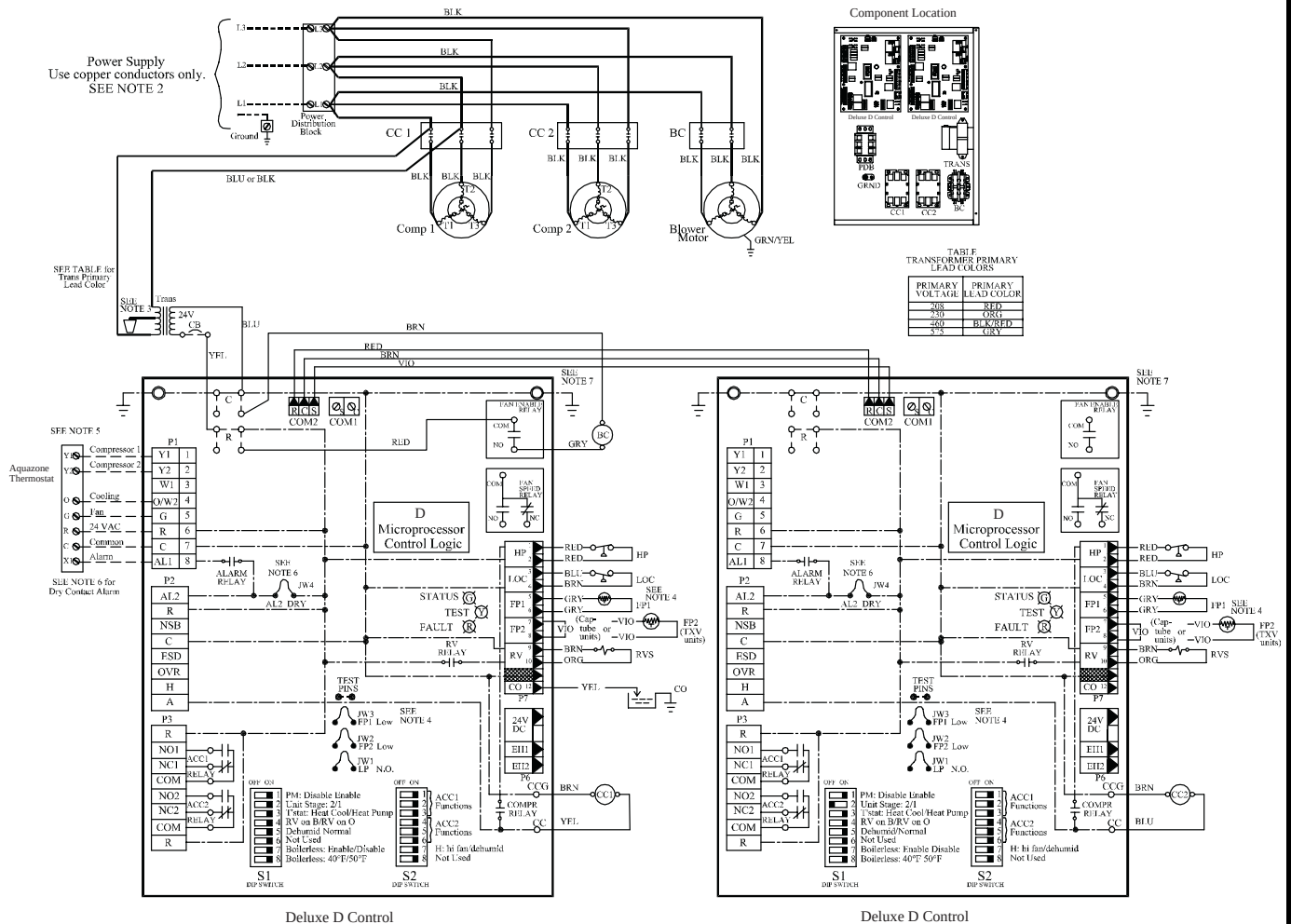
AL	— Alarm Relay Contacts
BC	— Blower Contactor
CB	— Circuit Breaker
CC	— Compressor Contactor
CO	— Sensor, Condensate Overflow
COMP	— Compressor
EH	— Emergency Heat
FP1	— Sensor, Water Coil Freeze Protection
FP2	— Sensor, Air Coil Freeze Protection
HP	— High-Pressure Switch
JW3	— Clippable Field Selection Jumper
LOC	— Loss of Charge Pressure Switch

NOTES:

- Compressor and blower motor thermally protected internally.
- All wiring to the unit must comply with NEC and local codes.
- 208/230-v transformers will be connected for 208-v operations. For 230-v operations, disconnect RED lead at L1, and attach ORG lead to L1. Close open end of RED lead with insulating tape.
- FP1 thermistor provides freeze protection for WATER. When using ANTIFREEZE solution, cut JW3 jumper.

- Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be "Class 1" and voltage rating equal to or greater than unit supply voltage.
- 24-v Alarm Signal shown. For Dry Alarm Contact, cut AL2 DRY (JW4) jumper and Dry Contact will be available between AL1 and AL2.
- Transformer secondary ground via control board standoffs and screws to Control Box. (Ground available from top two standoffs as shown.)

TYPICAL AQUAZONE™ COMPLETE D CONTROL WIRING — DUAL COMPRESSORS



LEGEND

AL — Alarm Relay Contacts
BC — Blower Contactor
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
COMP — Compressor
EH — Emergency Heat
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
NEC — National Electrical Code
P1 — Field Wiring Terminal Block
PM — Performance Monitor

RVS — Reversing Valve Solenoid
Trans — Transformer
 — Factory Low Voltage Wiring
 — Factory Line Voltage Wiring
 - - - Field Low Voltage Wiring
 - - - Field Line Voltage Wiring
 - · - Printed Circuit Trace
 Relay/Contactor Coil
 Condensate Pan
 Switch-Temperature

Switch-High Pressure
 Switch-Low Pressure
 Thermistor
 Ground
 Circuit Breaker
 Relay Contacts — N.O.
 Relay Contacts — N.C.
 Wire Nut
 Solenoid Coil

NOTES:

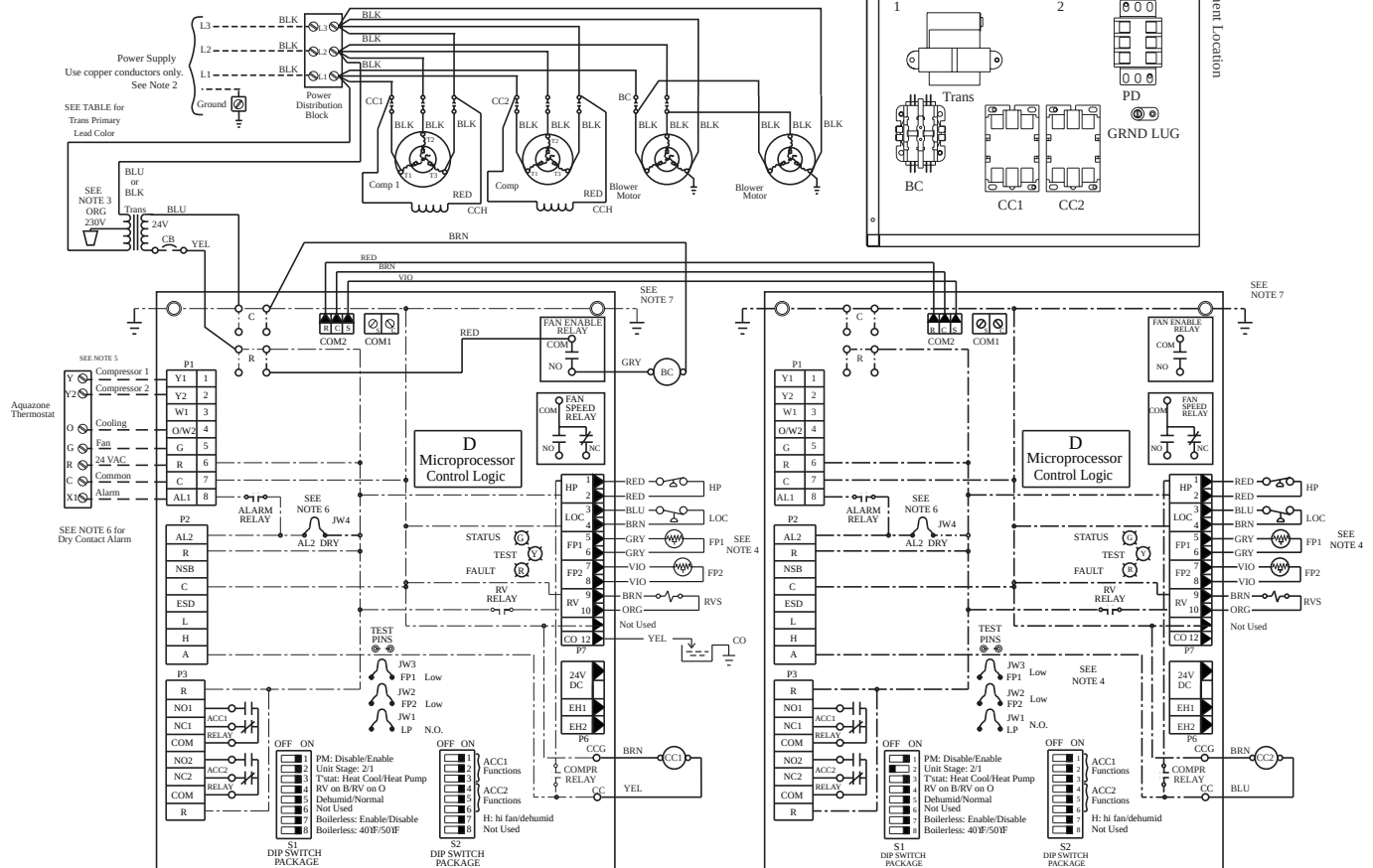
- Compressor and blower motor thermally protected internally.
- All wiring to the unit must comply with NEC and local codes.
- 208-230-v transformers will be connected for 208-v operation. For 230-v operation, disconnect RED lead at L1, and attach ORG lead to L1. Insulate open end of RED lead. 380-420-v transformers will be connected for 380-v operation. For 420-v operation, disconnect VIO lead at L1 and attach BRN lead to L1. Insulate open end of VIO lead.
- FP1 thermistor provides freeze protection for WATER. When using ANTIFREEZE solution, cut JW3 jumper.

- Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be "Class 1" and voltage rating equal to or greater than unit supply voltage.
- 24-v Alarm Signal shown. For Dry Alarm Contact, cut AL2 DRY (JW4) jumper and Dry Contact will be available between AL1 and AL2.
- Transformer secondary ground via Deluxe D board standoffs and screws to Control Box. (Ground available from top two standoffs as shown.)

Carrier

TRANSFORMER PRIMARY LEAD COLORS

PRIMARY VOLTAGE	PRIMARY LEAD COLOR
208	RED
230	ORG
460	BLK/RED
575	GRY



- AL** — Alarm Relay Contacts
- BC** — Blower Contactor
- CB** — Circuit Breaker
- CC** — Compressor Contactor
- CO** — Crankcase Heater
- CCH** — Sensor, Condensate Overflow
- COMP** — Compressor
- EH** — Emergency Heat
- 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
- NEC** — National Electrical Code
- P1** — Field Wiring Terminal Block

PM	—	Performance Monitor
RVS	—	Reversing Valve Solenoid
Trans	—	Transformer
		Factory Low Voltage Wiring
		Factory Line Voltage Wiring
		Field Low Voltage Wiring
		Field Line Voltage Wiring
		Printed Circuit Trace
		Relay/Contactor Coil
		Condensate Pan
		Switch-Temperature

	Switch-High Pressure
	Switch-Low Pressure
	Thermistor
	Ground
	Circuit Breaker
	Relay Contacts — N.O.
	Relay Contacts — N.C.
	Wire Nut
	Solenoid Coil

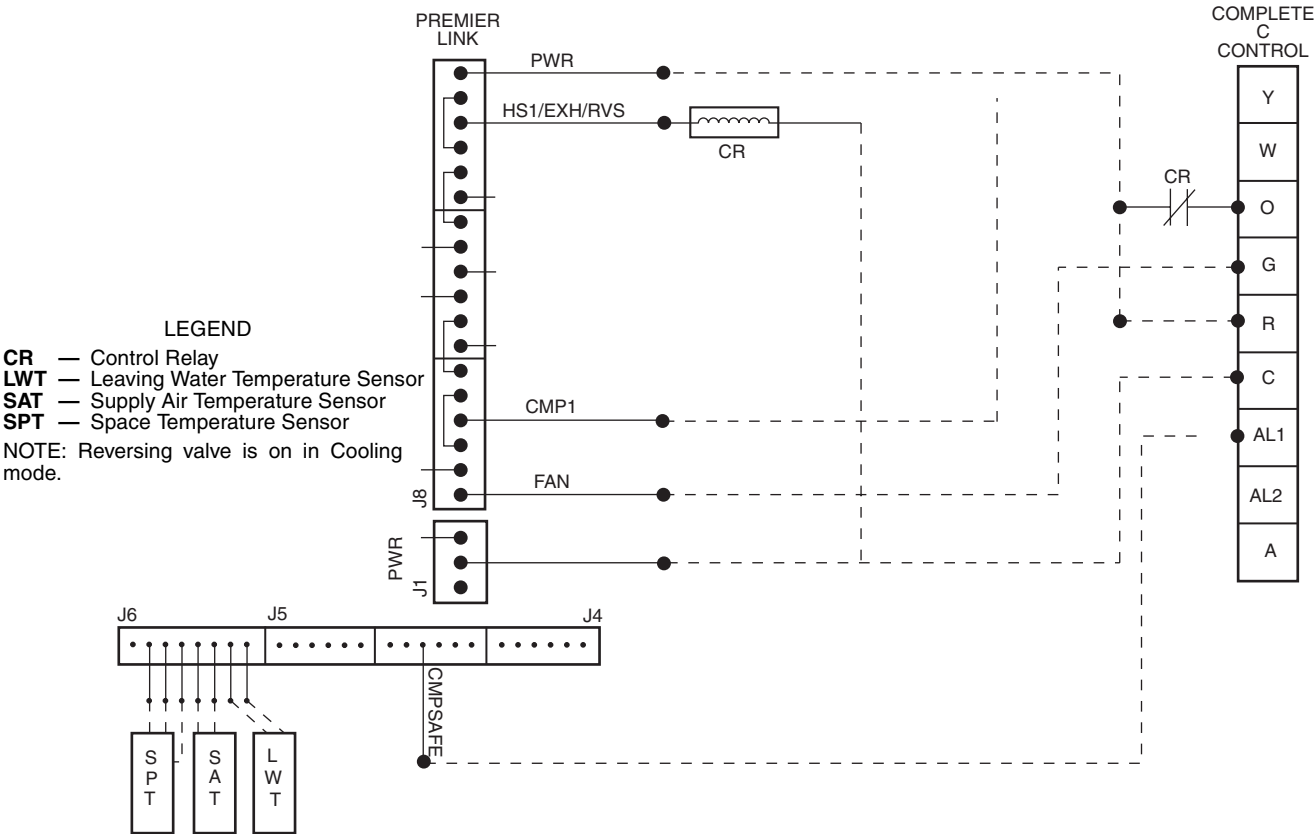
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. All 230-v transformers will be connected for 208-v operation. For 230-v operation, disconnect RED lead at L1, and attach ORG lead to L1. Close open end of RED lead with insulating tape.
4. FP1 thermostat provides freeze protection for WATER. When using ANTIFREEZE solutions, cut JW3 jumper.

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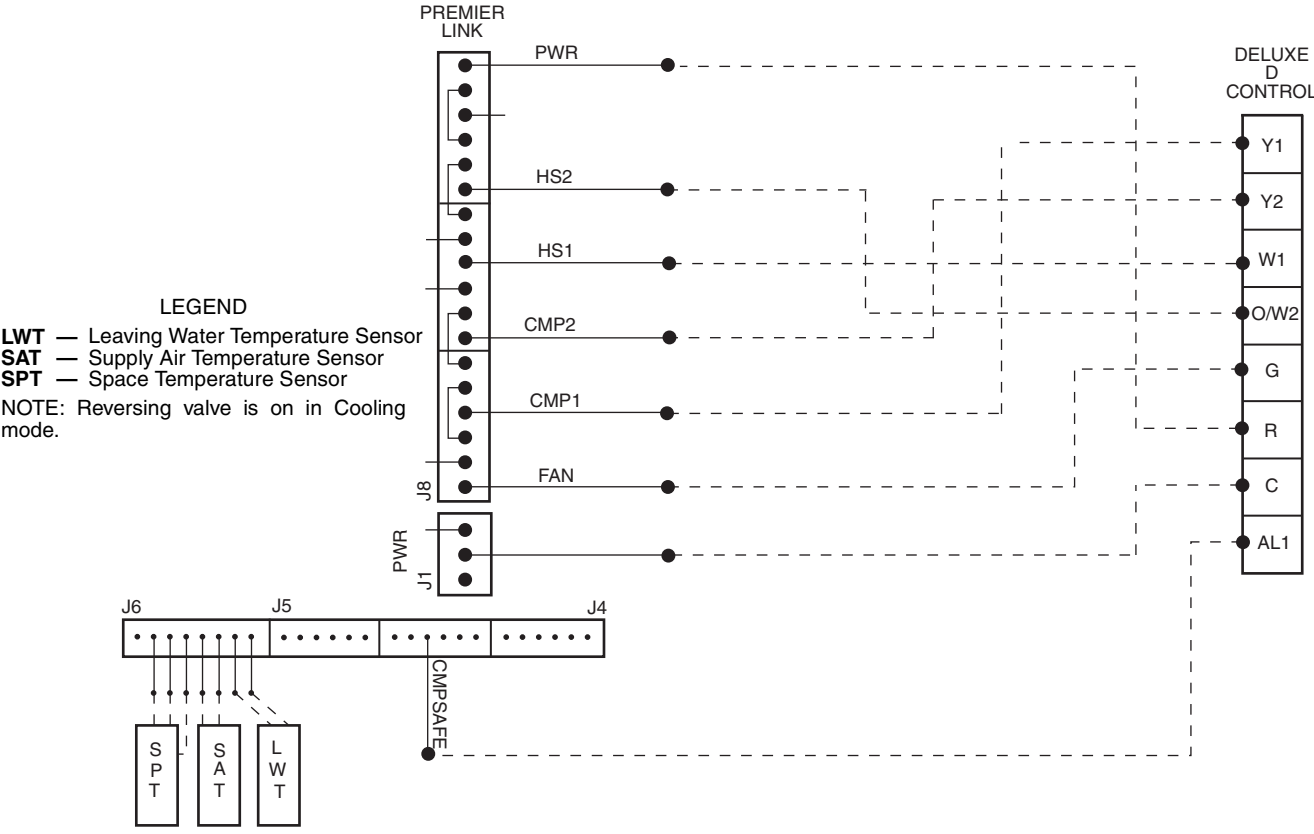
Typical control wiring



PREMIERLINK™ CONTROLLER APPLICATIONS WITH COMPLETE C CONTROL



PREMIERLINK CONTROLLER APPLICATIONS WITH DELUXE D CONTROL



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
50RHC,RVC Horizontal/Vertical	Standard Efficiency 1/2-5	Efficient, compact, low cost alternative for retrofit or new boiler/tower systems.
50RHR,RVR Horizontal/Vertical	High Efficiency 1/2-5	Efficient, adaptable unit for new boiler/tower, ground water, or ground loop systems.
50RHS,RVS Horizontal/Vertical	Premium Efficiency 1 1/4-6	Premium, ultra efficient unit for new boiler/tower, ground water, or ground loop systems.
50HQ,VQ Horizontal/Vertical	Large Capacity 6 1/2-25	Designed to handle large zoned areas for all applications.
50KQ	Console 1/2-1 1/2	Attractive design for finished interior, under-window installations.
50RTG	Rooftop 3-20	Economical solution for IAQ problems and tempering ventilation air.
50RWS	Water-to-Water 3-10	Used to pre-heat or cool air and can be used as a stand-alone or supplemental boiler/chiller in most hydronic heating applications. Also conditions process fluids, lubricants and refrigerants.

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 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®.
- 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 back-filled. Often, multiple pipes are used to maximize the heat transfer capability of each trench. The amount of pipe and the size of the ground loop field are based on ground conditions, heating, and cooling requirements of the application and system design.

Vertical ground loop — This system is used in vertical borehole applications. This design is well suited for retrofit applications when space is limited or where landscaping is already complete and minimum disruption of the site is desired. The vertical ground loop system contains a single loop of pipe inserted into a hole. The hole is back-filled and grouted after the pipe is inserted. The completed loop is concealed below ground. The number of loops required depends on ground conditions, heating and cooling requirements, and the depth of each hole.

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

Condensate drainage

Venting — Condensate lines should be properly vented to prevent fan pressure from causing water to hang up in the piping. Condensate lines should be pitched to assure full drainage of condensate under all load conditions. Chemical treatment should be provided to remove algae in the condensate pans and drains in geographical areas that are conducive to algae growth.

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

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

Vertical units — 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, Aqua-zone™ WSHP units use copper water-to-refrigerant heat exchanger. Units can also be equipped with a Cupro-nickel heat exchanger for applications where water is outside the standard contaminant limits for a copper heat exchanger.

WATER QUALITY GUIDELINES

CONDITION	ACCEPTABLE LEVEL		
pH	7 to 9 range for copper. Cupro-nickel may be used in the 5 to 9 range.		
Total Hardness	Calcium and magnesium carbonate should not exceed 20 grains per gallon (350 ppm).		
Iron Oxides	Less than 1 ppm.		
Iron Bacteria	No level allowable.		
Corrosion*	Ammonia,	Max Allowable Level	Coaxial Metal
	Ammonium Hydroxide	0.5 ppm	Cu
	Ammonium Chloride,	0.5 ppm	Cu
	Ammonium Nitrate	0.5 ppm	Cu
	Ammonium Sulfate	0.5 ppm	CuNi
	Chlorine/Chlorides	0.5 ppm	—
	Hydrogen Sulfide†	None Allowable	—
Brackish	Use Cupro-nickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)		

*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.

NOTE: 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 (NC) curve levels represent a peak over a full spectrum of frequencies.

Application data (cont)



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 horizontal and vertical unit sound design are provided to design around the WSHP units.

Horizontal units

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

1. Obtain sound power ratings in accordance with latest standards from manufacturers to select quietest equipment.

2. Do not locate units over a space with a required NC of 40 or less. Instead, locate units above less sensitive noise areas such as above or in equipment rooms, utility closets, restrooms, storage rooms, or above corridors.
3. Provide at least 10 feet between WSHP units to avoid the additive effect of two noise sources.
4. Provide an acoustical pad underneath the WSHP unit in applications where the unit must be mounted above noise sensitive areas such as private offices or conference rooms. The pad attenuates radiated noise. Be sure the pad has an area at least twice that of the WSHP footprint.
5. Maximize the installed height above the suspended ceiling.
6. Be sure the WSHP unit is located at least 6 feet away from any ceiling return grille to prevent line-of-sight casing noise to reach the space below.
7. Suspend the WSHP unit from the ceiling with hangers that utilize spring or neoprene type isolators to reduce vibration transmission.
8. Utilize flexible electrical connections to the WSHP unit. DO NOT USE NOT RIGID CONNECTIONS.
9. Utilize flexible loop water and condensate piping connections to the WSHP unit.
10. Use a canvas duct connector to connect the WSHP discharge to the downstream duct system. This reduces vibration-induced noise.
11. Provide acoustic interior lining for the first 20 feet of discharge duct, or until the first elbow is reached. The elbow prevents line-of-site sound transmission in the discharge duct.
12. Provide turning vanes in ductwork elbows and tees to reduce air turbulence.
13. Size the sheet metal supply duct with velocities no greater than 1000 fpm.
14. Ensure ductwork is rigid.
15. Use round duct whenever possible to further reduce noise.
16. Allow at least 3 equivalent duct diameters of straight duct upstream and downstream of the unit before allowing any fittings, transitions, etc.
17. Seal all penetrations around duct entering the space.
18. Provide a 4-ft. run-out duct made of flexible material to connect a diffuser to the supply trunk duct. The flex duct provides an "attenuating end-effect" and reduces duct-transmitted sound before it reaches the space. Typically a 6 db sound reduction can be accomplished with the use of flex duct.
19. Locate the run-out duct balancing damper as far away from the outlet diffuser as possible. Locating the balancing damper at the trunk duct exit is the best location.



20. If return air is drawn through a ceiling plenum, provide an acoustically lined return duct elbow or “L” shaped boot at the WSHP to eliminate line-of-sight noise into the ceiling cavity and possible through ceiling return air grilles. Face the elbow or boot away from the nearest adjacent WSHP unit to prevent additive noise.

21. Do not hang suspended ceiling from the ductwork.

Vertical units

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

1. Mount the unit on a pad made of high-density sound absorbing material such as rubber or cork. Extend the pad beyond the WSHP unit footprint by at least 6 inches in each direction.
2. Since the unit returns airflow through a grille mounted in a closet door, provide a sound barrier or some other modification of the closet to prevent line-of-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 50HQL072 UNITS

AIR LIMITS	COOLING (F)	HEATING (F)
Min. Ambient Air	40	40
Rated Ambient Air	80	70
Max. Ambient Air	100	85
Min. Ent. Air	50	40
Rated Entering Air db/wb	80/67	70
Max. Entering Air db/wb	110/83	80
WATER LIMITS		
Min. Entering Water	40	40
Normal Entering Water	85	70
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.

OPERATING LIMITS 50HQL096,120 UNITS

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

OPERATING LIMITS 50VQA,VQD080-300 UNITS

AIR LIMITS	COOLING (F)	HEATING (F)
Min. Ambient Air	40	40
Rated Ambient Air	80	70
Max. Ambient Air	100	85
Min. Ent. Air db/wb	70/61	40
Rated Entering Air db/wb	80/67	70
Max. Entering Air db/wb	95/76	80
WATER LIMITS		
Min. Entering Water	40	40
Normal Entering Water	85	70
Max. Entering Water	110	90

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.

Commercial Horizontal Water Source Heat Pump Units

HVAC Guide Specifications

Size Range: **70,000 to 120,000 Btuh Cooling Capacity**

Carrier Model Number: **50HQL, Size 072, 096, 120**

Part 1 — General

1.01 SYSTEM DESCRIPTION

- A. Heat pump units designed to operate with 20 to 110 F water temperature. Units shall consist of fully hermetic type or high efficiency scroll compressor(s) and shall have single or dual independent refrigeration circuits. The air discharge is horizontal with right/left discharge 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 UL and CSA certified.
- 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 non-CFC R-22, 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 gauge galvanized sheet metal 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/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 air stream.

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 isolation grommets.

D. Compressors:

Unit shall have heat pump duty, fully hermetic type or 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 450 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 450 psig refrigerant, 450 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. 50 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. 75 va transformer.
 - b. A removable thermostat connector.
 - c. Random start on return from night setback.
 - d. Minimized reversing valve operation for extended life and quiet operation.
 - e. Night setback control from low temperature thermostat, with 2-hour override initiated by a momentary signal from the thermostat.
 - f. Dry contact night setback output for digital night setback thermostats.
 - g. Ability to work with heat/cool (Y, W) thermostats.
 - h. Ability to work with heat pump thermostats using O or B reversing valve control.
 - i. Single grounded wire to initiate night setback or emergency shutdown.
 - j. Boilerless system control can switch automatically to electric heat at low loop water temperature.
 - k. Control board shall allow up to 3 units to be operated from one thermostat without any auxiliary controls.
 - l. 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.
 - m. Fan speed selection at thermostat.
 - n. A relay to restart a central pump or control a 24-v motorized water valve.
 - o. Intelligent fan speed selection based upon thermostat demand and/or dehumidistat signal.
4. Carrier PremierLink™ Controller:
- This control will function with CCN and ComfortVIEW™ software. It shall also be compatible with ComfortLink™ controllers. It shall be ASHRAE 62-99 compliant and Internet ready. It shall accept a CO₂ sensor in the conditioned space and be Demand Control Ventilation (DCV) ready. The communication rate must be 38.4K or faster.
- H. Electrical
- 1. A control box shall be located within the unit compressor compartment and shall contain a 50 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.
- J. High Static Blower:
- Provides increased airflow at various static pressure conditions.
- K. Field-Installed Accessories:
- 1. Aquazone™ Thermostat Controls:
 - a. Programmable multi-stage thermostat with 7-day clock, holiday scheduling, large backlit display and remote sensor capability.
 - b. Programmable 7-Day Light-Activated Thermostat offers occupied comfort settings with lights on, unoccupied energy savings with lights off.
 - c. Programmable 7-Day Flush-Mount Thermostat offers locking coverplate with tamper-proof screws, flush to wall mount, dual point with adjustable deadband, O or B terminal, and optional remote sensor.
 - d. Programmable 5-Day Thermostat offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included.
 - e. Non-programmable Thermostat with 2 heat stages, 2 cool stages, auto changeover, 5-minute built-in compressor protection, locking cover included.

Guide specifications — 50HQL072,096,120 (cont)



2. Loop Controller with six stages (2 stages for heating and 4 stages for heat rejection).
3. Filter Rack (2 in.) to enhance the filtration system of the water source heat pump.

NOTE: Filter rack does not include filters.

4. Fire-Rated Hoses kits with a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits can be either stainless steel or galvanized.
5. Ball Valves (Brass Body) for shutoff and balancing water flow. Available with memory, memory stop, and pressure temperature ports.

6. Y Strainers (Bronze Body) “Y” type configuration with a brass cap. Maximum operating pressure rating of 450 psi. Strainer screen made of stainless steel.
7. Solenoid Valves (Brass Body) provides slow operation for quiet system application.
8. Hose Kit Assemblies includes a ported ball valve with pressure temperature (P/T) plug ports, flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset measure flow (gpm) with two P/T ports, flexible stainless steel hose with a swivel and nipple.

Commercial Vertical Water Source Heat Pump Units

HVAC Guide Specifications

Size Range: **70,000 to 300,000 Btuh Cooling Capacity**

Carrier Model Number: **50VQA,VQD, Sizes 080-300**

Part 1 — General

1.01 SYSTEM DESCRIPTION

- A. Heat pump units designed to operate with 60 to 95 F water temperature for standard units and 40 to 110 F water temperature for low temperature units. Units shall consist of hermetic or high efficiency scroll compressors and shall have 2 independent refrigeration circuits where appropriate. The air discharge is vertical with discharge 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 UL and CSA certified.
- 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 non-CFC R-22, 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 gauge galvanized sheet metal 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/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 air stream.

C. Fan and Motor Assembly:

1. Units shall have belt driven 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 isolation grommets.

D. Compressors:

Unit shall have heat pump duty, fully hermetic scroll compressors with internal and external isolation.

E. Heat Exchangers:

1. Refrigerant-to-air coil shall be aluminum/copper finned-tube construction type rated for 450 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 450 psig refrigerant, 450 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. Anti-short cycle time delay on compressor operation; time delay shall be 5 minutes minimum.
 - b. Random start on power-up.
 - c. Low voltage protection.
 - d. High voltage protection.
 - e. Condensate overflow shutdown.
 - f. Unit shutdown on low refrigerant pressures.
 - g. Unit shutdown on high or low water temperature (selectable for antifreeze solutions).



- h. Option to reset unit at thermostat or disconnect. Fault type shall be retained in memory if reset at thermostat.
 - i. 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.
 - j. Ability to defeat time delays for servicing.
 - k. 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.
 - l. Unit Performance Monitor to indicate inefficient operating conditions prior to unit lockout.
 - m. Remote fault type indication at thermostat.
 - n. Single harness connection for all safety devices.
 - o. Selectable 24-v or pilot duty dry contact alarm output.
 - p. 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 valve 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. Fan speed selection at thermostat.
 - m. A relay to restart a central pump or control a 24-v motorized water valve.

- n. Intelligent fan speed selection based upon thermostat demand and/or dehumidistat signal.

4. Carrier PremierLink™ Controller:

This control will function with CCN and ComfortVIEW™ software. It shall also be compatible with ComfortLink™ controllers. It shall be ASHRAE 62-99 compliant and Internet ready. It shall accept a CO₂ 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.

H. Electrical

- 1. A control box shall be located within the unit compressor compartment and shall contain a 50 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.

J. High Static Blower:

Provides increased airflow at various static pressure conditions.

K. Field-Installed Accessories:

1. Aquazone™ Thermostat Controls:

- a. Programmable multi-stage thermostat with 7-day clock, holiday scheduling, large backlit display and remote sensor capability.
- b. Programmable 7-Day Light-Activated Thermostat offers occupied comfort settings with lights on, unoccupied energy savings with lights off.
- c. Programmable 7-Day Flush-Mount Thermostat offers locking coverplate with tamper proof screws, flush to wall mount, dual point with adjustable deadband, O or B terminal, and optional remote sensor.
- d. Programmable 5-Day Thermostat offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included.
- e. Non-programmable Thermostat with 2 heat stages, 2 cool stages, auto changeover, 5-minute built-in compressor protection, locking cover included.

2. Loop Controller with six stages (2 stages for heating and 4 stages for heat rejection).
3. Filter Rack (2 in.) to enhance the filtration system of the water source heat pump.

NOTE: Filter rack does not include filters.

4. Fire-Rated Hoses kits with a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits can be either stainless steel or galvanized.
5. Ball Valves (Brass Body) for shutoff and balancing water flow. Available with memory, memory stop, and pressure temperature ports.

6. Y Strainers (Bronze Body) "Y" type configuration with a brass cap. Maximum operating pressure rating of 450 psi. Strainer screen made of stainless steel.
7. Solenoid Valves (Brass Body) provides slow operation for quiet system application.
8. Hose Kit Assemblies includes a ported ball valve with pressure temperature (P/T) plug ports, flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset measure flow (gpm) with two P/T ports, flexible stainless steel hose with a swivel and nipple.



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