YORK®
Heating and Air Conditioning

SPECIFICATION CATALOG

AFFINITY CONSOLE
COMMERCIAL GEOTHERMAL/
WATER SOURCE HEAT PUMPS
SINGLE CAPACITY

MODELS:
YC09 - 18
(.75 THRU 1.5 NOMINAL TONS)

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

ETL LISTED®

Due to continuous product improvement, specifications are subject to change without notice.

Visit us on the web at www.yorkgeothermal.com

Additional rating information can found at
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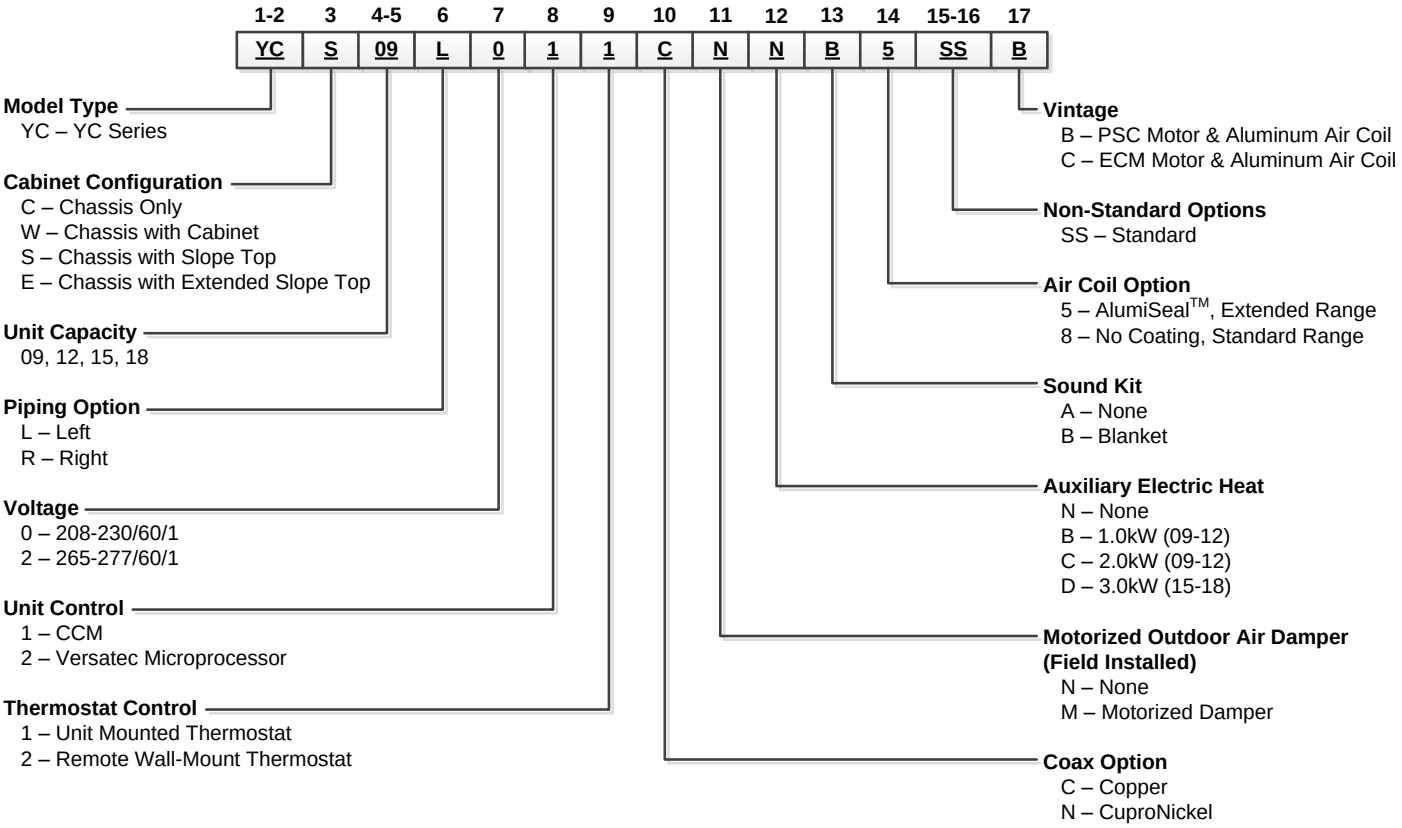
Model Nomenclature



Note: Chassis only available with left piping option

Rev.: 02 March 2014D

All Affinity Console Series product is Safety listed under UL1995 thru ETL and performance listed with AHRI in accordance with standard 13256-1.

AHRI Data

PSC & ECM Motors

AHRI/ASHRAE/ISO 13256-1

English (IP) Units

Model	Flow Rate		Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
			Cooling EWT 86°F		Heating EWT 68°F		Cooling EWT 59°F		Heating EWT 50°F		Cooling EWT 77°F		Heating EWT 32°F	
	gpm	cfm	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
09	2.5	300	8,500	13.4	10,500	4.4	10,200	22.5	8,700	3.8	9,000	16.0	6,700	3.1
12	3.5	350	10,500	12.3	14,400	4.3	12,400	19.5	11,800	3.7	11,000	14.2	9,500	3.5
15	4.5	450	13,500	13.6	17,000	4.9	16,200	22.0	14,000	4.1	14,200	15.9	10,500	3.4
18	5.5	500	16,200	12.5	21,000	4.4	19,000	19.6	17,000	3.7	16,600	15.1	13,300	3.1

12/14/09

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 the lower voltage of dual voltage rated models.

AHRI Data cont.

The performance standard AHRI/ASHRAE/ISO 13256-1 became effective January 1, 2000 and replaces ARI Standards 320, 325, and 330. This new standard has three major categories: Water Loop (comparable to ARI 320), Ground Water (ARI 325), and Ground Loop (ARI 330). Although these standards are similar there are some differences:

Unit of Measure: The Cooling COP

The cooling efficiency is measured in EER (US version measured in Btuh per Watt. The Metric version is measured in a cooling COP (Watt per Watt) similar to the traditional COP measurement.

Water Conditions Differences

Entering water temperatures have changed to reflect the centigrade temperature scale. For instance the water loop heating test is performed with 68°F (20°C) water rounded down from the old 70°F (21.1°C).

Air Conditions Differences

Entering air temperatures have also changed (rounded down) to reflect the centigrade temperature scale. For instance the cooling tests are performed with 80.6°F (27°C) dry bulb and 66.2°F (19°C) wet bulb entering air instead of the traditional 80°F (26.7°C) DB and 67°F (19.4°C) WB entering air temperatures. 80.6/66.2 data may be converted to 80/67 using the entering air correction table. This represents a significantly lower relative humidity than the old 80/67 of 50% and will result in lower latent capacities.

Pump Power Correction Calculation

Within each model, only one water flow rate is specified for all three groups and pumping Watts are calculated using the following formula. This additional power is added onto the existing power consumption.

• Pump power correction = (gpm x 0.0631) x (Press Drop x 2990) / 300

Where 'gpm' is waterflow in gpm and 'Press Drop' is the pressure drop through the unit heat exchanger at rated water flow in feet of head.

Blower Power Correction Calculation

Blower power is corrected to zero external static pressure using the following equation. The nominal airflow is rated at a specific external static pressure. This effectively reduces the power consumption of the unit and increases cooling capacity but decreases heating capacity. These Watts are significant enough in most cases to increase EER and COPs fairly dramatically over ARI 320, 325, and 330 ratings.

• Blower Power Correction = (cfm x 0.472) x (esp x 249) / 300

Where 'cfm' is airflow in cfm and 'esp' is the external static pressure at rated airflow in inches of water gauge.

ISO Capacity and Efficiency Calculations

The following equations illustrate cooling calculations:

• ISO Cooling Capacity = Cooling Capacity (Btuh) + (Blower Power Correction (Watts) x 3.412)

• ISO EER Efficiency (W/W) = ISO Cooling Capacity (Btuh) x 3.412 / [Power Input (Watts) - Blower Power Correction (Watts) + Pump Power Correction (Watt)]

The following equations illustrate heating calculations:

• ISO Heating Capacity = Heating Capacity (Btuh) - (Blower Power Correction (Watts) x 3.412)

• ISO COP Efficiency (W/W) = ISO Heating Capacity (Btuh) x 3.412 / [Power Input (Watts) - Blower Power Correction (Watts) + Pump Power Correction (Watt)]

Comparison of Test Conditions

	ARI 320	ISO/AHRI 13256-1 WLHP	ARI 325	ISO/AHRI 13256-1 GWHP	ARI 330	ISO/AHRI 13256-1 GLHP
Cooling						
Entering Air - DB/WB °F	80/67	80.6/66.2	80/67	80.6/66.2	80/67	80.6/66.2
Entering Water - °F	85	86	50/70	59	77	77
Fluid Flow Rate	*	**	**	**	**	**
Heating						
Entering Air - DB/WB °F	70	68	70	68	70	68
Entering Water - °F	70	68	50/70	50	32	32
Fluid Flow Rate	*	**	**	**	**	**

Note *: Flow rate is set by 10°F rise in standard cooling test Note **: Flow rate is specified by the manufacturer
Part load entering water conditions not shown.
WLHP = Water Loop Heat Pump; GWHP = Ground Water Heat Pump; GLHP = Ground Loop Heat Pump

Conversions:

Airflow (lps) = CFM x 0.472; WaterFlow (lps) = GPM x 0.0631;
ESP (Pascals) = ESP (in wg) x 249; Press Drop (Pascals) = Press Drop (ft hd) x 2990

The Affinity Console

The Affinity Console Series provides:
- Highest efficiencies and lowest operating costs
- Broadest R410A product line
- Standard or extended range (geothermal) operation
- Quiet operation
- Flexible control options

Affinity Console Series Console Models

YCC 09-18 (3/4-1.5 tons) Chassis Only
YCW 09-18 (3/4-1.5 tons) Flat top cabinet
YCS 09-18 (3/4-1.5 tons) Slope top cabinet
YCE 09-18 (3/4-1.5 tons) Extended Slope Top cabinet

High Efficiency

Affinity Console Series is the highest efficiency units available. Large oversized air coils, water to refrigerant heat exchangers and rotary compressors provide extremely efficient operation. This efficiency means the Affinity Console Series requires less loop than any product on the market. This can mean significant savings on commercial projects.

Quiet Operation

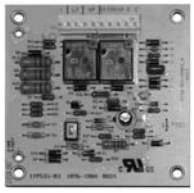
All Affinity Console Series Console product is ARI 350 sound rated using third party sound testing. Room Noise Criteria Curves (NC Curve) may be calculated using data from the ARI 350 ratings giving the engineer total flexibility in assuring a quiet environment.

Standard Features
- Slope and Flat top configurations
- Extended cabinet options
- Footprint matches “legacy” products for easy retrofits.
- Attractive rounded corners heavy gauge cabinet.
- Quiet rotary compressors in all models.
- 2-dimension refrigerant piping vibration loops to isolate the compressor.
- All interior cabinet surfaces including the compressor compartment are insulated with 1/2˝ [12.7mm] thick
- 1-1/2lb [681g] density, surface coated, acoustic type glass fiber insulation.

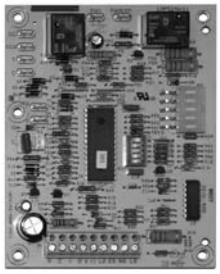
Flexible Control Options

The **standard CCM** (compressor control module) is a more reliable replacement for electro-mechanical control applications. It features a small microprocessor board that handles the lockout function of the unit. A second microprocessor handles the unit mounted dial thermostat for maintaining accurate room temperature. Thermostat options include unit mounted or remote thermostat.

The **optional Versatec** microprocessor control board provides complete monitoring and control with optional field monitoring fault, status and I/O LED indication for easy servicing. The Versatec features a robust microprocessor control that monitors LP, HP, Condensate, field selectable thermistor freeze detection, while providing a flexible accessory relay and fault output scheme. Thermostat options include unit mounted or remote thermostat.



CCM



VERSATEC

Easy Maintenance and Service Advantages
- 2 removable compressor access panels
- Separate air handler and compressor section access panels permit service testing without bypass.
- Easy access to low voltage connector for easy thermostat wiring (remote & thermostat option).
- Quick attach wiring harnesses are used throughout for fast servicing.
- High and low pressure refrigerant service ports.
- Internal slide out blowers.

Factory Quality
- All refrigerant brazing is performed in a nitrogen environment.
- Computer controlled deep vacuum and refrigerant charging system.
- All joints are leak detected for maximum leak rate of less than 1/4 oz. per year.
- Computer bar code equipped assembly line insures all components are correct.
- All units are computer run-tested with water to verify both function and performance.

Inside the Affinity Console

Refrigerant

Affinity Console Series products all feature zero ozone depletion and low global warming potential refrigerant R-410A.

Cabinet

All units are all constructed of corrosion resistant galvanized sheet metal with white polyester powder coat paint rated for more than 1000 hours of salt spray. Refrigerant circuit is designed to allow primary serviceability from the front. One access panel allows servicing of the blower motor, blower, and drain pan. Cabinet is designed to match "industry" foot print for ease of replacement.

Drain Pan

All condensate connections are welded stainless steel tubes for economical corrosion free connections. Bacteria resistant stainless steel drain pan is designed to promote complete drainage and will never rust or corrode. Complete drainage helps to inhibit bacterial or microbial growth. Units feature an internally trapped condensate line.

Compressors

High efficiency R-410A rotary compressors are used on every model. Rotary compressors (available in 208-230V & 265V 60Hz Single Phase) provide both the highest efficiency available and great reliability.

Electrical Box

Unit controls feature quick connect wiring harnesses for easy servicing. Large 75VA transformer assures adequate controls power for accessories.

Thermostatic Expansion Valve

All Affinity Console Series models utilize a balanced port bi-directional thermostatic expansion valve (TXV) for refrigerant metering. This allows precise refrigerant flow in a wide range of entering water variation (20 to 120°F [-7 to 49 °C]) found in geothermal systems.

Water to Refrigerant Coaxial Heat Exchanger Coil

Large oversized coaxial refrigerant to water heat exchangers provide unparalleled efficiency. The coaxes are designed for low pressure drop and low flow rates. All coaxes are pressure rated to 450 psi water side and 600 psi on the refrigerant side. Optional ThermaShield coated water-to-refrigerant coaxial heat exchanger is available to prevent condensation in low temperature loop operation.

Service Connections and Serviceability

Two Schrader service ports are provided in every unit. The suction side and discharge side ports are for field charging and servicing access. All valves are 7/16˝ SAE connections. All water and electrical connections are made from the front of the unit. Unit is designed for front access serviceability.

4-Way Reversing Valve

Affinity Console Series units feature a reliable all-brass pilot operated refrigerant reversing valve. The reversing valve operation is limited to change of mode by the control to enhance reliability. (Versatec Control Only).

Air Coil

Large low velocity air coils are constructed of lanced fin and riffled tube. Each model features 3 - 4 rows for added moisture removal. An optional FormiShield™ air coil coating is available to further inhibit formicary corrosion.

Blower Motor and Housing

High efficiency low rpm galvanized direct drive blowers featuring 2 speed permanently split capacitor (PSC) motor. All PSC motors have speed selection switch on the control cover for easy speed change. All motors are vibration isolated to reduce noise.

3-Speed ECM Constant Torque Motors

The 3-speed ECM is a ‘Constant Torque’ ECM motor and delivers air flow similar to a PSC but operates as efficiently as a variable speed ECM motor. Because it is an ECM motor, the 3-speed ECM can ramp slowly up or down like the variable speed ECM motor. There are 3 possible speed taps available on the 3-speed ECM motor with #1 being the lowest airflow and #3 being the highest airflow. These speed selections are preset at the time of manufacture and are easily changed in the field if necessary.

NEW!: All-Aluminum Air Coil

Beginning in Spring of 2014, all models in the Affinity line began shipping with all-aluminum air coils. These air coils are constructed of lanced fin and rifled tube aluminum that is not susceptible to formicary corrosion. For additional condensate runoff and meeting project specifications, an optional AlumiSeal e-coating is available.

Controls

Control	General Description	Application	Display/Interface	Protocol	Thermostat Options
CCM Control 	The CCM (Compressor control module) is a more reliable replacement for electro-mechanical control applications. It features a small microprocessor board that handles the lockout function of the unit. A second microprocessor handles the unit mounted thermostat for maintaining accurate room temperature.	Residential and commercial applications requiring minimal but reliable controls. Includes Random Start, High and low pressure switches and auto changeover capability.	Dial thermostat with Hi and Low blower speeds, and auto changeover or cont blower selection switches.	None	**Unit Mounted Digital Dial Thermostat** **Remote Mounted Standard Thermostat**
Versatec Control 	The Versatec Control is a microprocessor based board that adds the features of emergency shutdown (ES), night setback (NS), water freeze detection (FS), Load Shed (LS) and condensate overflow (CO). The Versatec Control also features Optional Field servicing LED's for mode, Fault and diagnostic indication.	Residential and commercial applications requiring more controls features than CCM and Includes Random Start, High and low pressure switches, auto changeover capability, emergency shutdown (ES), night setback (NS), load shed (LS), water freeze detection (FS), and condensate overflow (CO).	Optional field servicing LED board for mode, fault and diagnostic indication	None	**Unit Mounted Digital Dial Thermostat** **Remote Mounted Standard Thermostat**

Standard CCM Control Features

Compressor control module (CCM) controls are standard on the Affinity Console Series console heat pump. This control features unit mounted thermostat and switches,

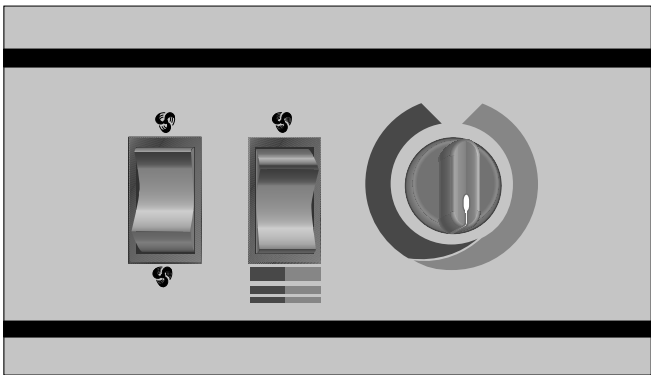
Features of the standard control are:

- Easy to understand color coded thermostat adjustment markings.
- Large, rocker type mode and blower switches.
- Internally mounted blower switch to choose cycled or constant blower operation.
- High pressure and low pressure safety controls to protect the unit components.
- Lockout circuit to shut down unit operation upon receipt of a fault indicator from the safety controls.
- A 24 volt control circuit allows for safe and easy diagnosis.

Controls cont.

The user selects either “Heat/Cool” or “Fan Only” on the mode switch, then either “High” or “Low” at the blower speed switch. The temperature can be controlled by rotating the thermostat control knob.

Figure 6: Unit Mounted Control



The “Fan Only” setting provides constant blower operation.

In the “Heat” mode, a call for heat by the thermostat closes the compressor contactor contacts, energizing the compressor, which will run until the thermostat is satisfied.

In the “Cool” mode, a call for cooling by the thermostat energizes the reversing valve and closes the compressor contactor contacts, energizing the compressor, which will run until the thermostat is satisfied.

The emergency electric heat operation in the “Heat/Cool” mode is subject to the setting of the internally mounted mode switch. The optional, factory installed electric heat will operate when the internally mounted mode switch is in the “Emergency Heat” mode. In the “Heat” mode, a call for heating energizes the blower and electric heater contactor, energizing the electric heat elements and blower, which will run until the thermostat is satisfied. When the internally mounted mode switch is in the “Normal/Boilerless” mode the unit operates in its normal “Heat/Cool” operation, unless there is an aquastat controller. When the normally open circuit of the aquastat closes and the unit is in the heating mode, it will switch to the “Emergency Heat” condition until the thermostat is satisfied or the aquastat opens restarting the compressor.

If either the low or high pressure safety switches are opened, the compressor and reversing valve are disabled by the lockout relay. Unit operation will resume only after the voltage to the unit is interrupted or the mode switch is placed in the “Off” position.

If the electric heat limit switches are opened, the electric heat is disabled.

Optional Versatec Microprocessor Control Features

The Versatec microprocessor board provides control of the entire unit as well as outputs for status modes, faults and diagnostics.

The control system is a microprocessor-based control board that is located in the unit control box. This feature is available for either unit mounted controls or optional remote wall mounted thermostat. A 9-pin low voltage terminal strip provides all necessary terminals for the wall mounted thermostat.

Startup

The unit will not operate until all the inputs and safety controls are checked for normal operating conditions.

Fault Retry

All faults are retried twice before finally locking the unit out to prevent nuisance service calls.

Component Sequencing Delays

Components are sequenced and delayed for optimum unit performance.

Short Cycle Protection and Random Start

The control allows a minimum on or off time of 5 minutes for short cycle protection. A random time delay of 0 to 30 seconds is generated after each power-up to prevent simultaneous start up of all units within a building after the release from an unoccupied cycle or power loss.

Night Setback

A grounded signal to common or connecting 24 VAC to the NS terminal will initiate the night setback mode.

Load Shed

A grounded signal to common or connecting 24 VAC to the LS terminal places the controller into the load shed mode. The compressor will become disabled and the blower will start upon a thermostat call for heating or cooling.

Emergency Shutdown

A grounded signal to common or connecting 24 VAC to the ES terminal places the controller into the emergency shutdown mode. The compressor and blower operation are suspended while in the emergency shutdown mode.

Condensate Overflow Protection

The board incorporates an impedance liquid sensor at the top of the condensate drain pan. Upon a continuous 30-second sensing of the condensate, the cooling operation of the unit is suspended.

Safety Controls

The microprocessor board receives separate signals from a high pressure switch for safety, a low pressure switch to prevent loss of refrigerant charge and a low suction temperature thermistor for freeze detection. Upon a continuous 30-second measurement of the fault (immediate for high pressure), compressor operation is stopped.

Controls cont.

Control Tables for Optional Versatec Microprocessor

Logic Board DIP Switch Settings

Switch	OFF	ON
SW1 - 1	Test - Selected timings sped up to facilitate troubleshooting	Normal - Standard timings
SW1 - 2	Loop - Closed loop freeze detection setting (15°F)	Well - Open loop freeze detection setting (30°F)
SW1 - 3	Commercial - Enables NS features when TA32U02 thermostat is used	Normal - Standard thermostat operation
SW1 - 4	IO Display* - Enables Input/Output display on external LED board	Normal* - Unit status display
SW1 - 5	Configures board for 2-speed compressor without blower	Configures board for 2-speed compressor with blower

Normal Control Timing

Blower off delay	30 seconds
Compressor on delay	10 seconds
Short cycle delay	5 minutes
Miniumum compressor on time	2 minutes (except for fault condition)
High pressure fault recognition delay	Less than 1 second
low pressure fault recognition delay	30 seconds
Freeze detection fault recognition delay	30 seconds
Condensate overflow fault recognition delay	30 seconds
Low pressure fault bypass delay	2 minutes
Freeze detection fault bypass delay	2 minutes
Power on delay	5 minutes

Operational Logic

Mode	Inputs	Blower	Comp	RV
Htg	Y	ON	ON	OFF
Clg	Y,O	ON	ON	ON
Blower	G	ON	OFF	OFF

Test Control Timing

Blower off delay	5 seconds
Compressor on delay	2 seconds
Short cycle delay	15 seconds
Miniumum compressor on time	5 seconds (except for fault condition)
High pressure fault recognition delay	Less than 1 second
low pressure fault recognition delay	30 seconds
Freeze detection fault recognition delay	30 seconds
Condensate overflow fault recognition delay	30 seconds
Low pressure fault bypass delay	0 seconds
Freeze detection fault bypass delay	0 seconds
Power on delay	15 seconds
Fault off time	5 minutes

Diagnostic Modes

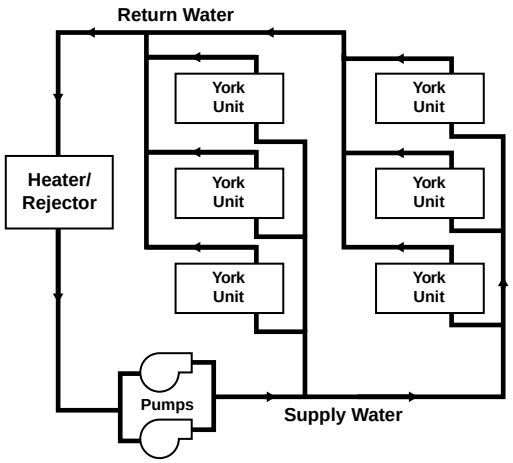
LED	Current Fault Status SW1 - #4 On, SW2 On	Inputs SW1 - #4 Off, SW2 Off	Outputs SW1 - #4 Off, SW2 On
Drain	Drain pan overflow	Y	Compressor
Water Flow	FS thermistor (loop <15°F, well <30°F)	G	Blower
High Press	High pressure >600 PSI	O	O
Low Press	Low pressure <40 PSI	ES	ES
Air Flow	Not used	NS	NS
Status	Not used	LS	LS
DHW Limit	Not used	Not used	Not used
HWD	SW2 in the On position	Off position	On position

Application Notes

The Closed Loop Heat Pump Concept

The basic principle of a water source heat pump is the transfer of heat into water from the space during cooling, or the transfer of heat from water into the space during heating. Extremely high levels of energy efficiency are achieved as electricity is used only to move heat, not to produce it. Using a typical Affinity Console Series, one unit of electricity will move four to five units of heat.

When multiple water source heat pumps are combined on a common circulating loop, the ultimate in energy efficiency is created: Units on cooling mode are adding heat to the loop which the units in heating mode can absorb, thus removing heat from the area where cooling is needed, recovering and redistributing that heat for possible utilization elsewhere in the system. In modern commercial structures, this characteristic of heat recovery from core area heat generated by lighting, office equipment, computers, solar radiation, people or other sources, is an important factor in the high efficiency and low operating costs of closed source heat pump systems.



In the event that a building's net heating and cooling requirements create loop temperature extremes, Affinity Console Series units have the extended range capacity and versatility to maintain a comfortable environment for all building areas. Excess heat can be stored for later utilization or be added or removed in one of three ways; by ground-source heat exchanger loops: plate heat exchangers connected to other water sources, or conventional cooler/boiler configurations. Your representative has the expertise and computer software to assist in determining optimum system type for specific applications.

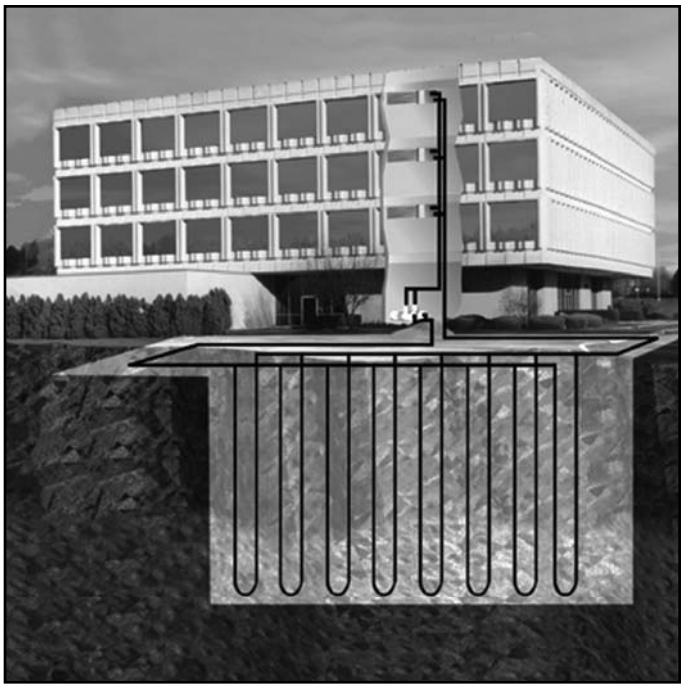
The Closed Loop Advantage

A properly applied water source heat pump system offers many advantages over other systems. First costs are low because units can be added to the loop on an “as needed basis”- perfect for speculative buildings. Installed costs are low since units are self-contained and can be located adjacent to the occupied space, requiring minimal ductwork. Maintenance can be done on individual units without system shut-down. Conditions remain comfortable since each unit operates separately, allowing cooling in one area and heating in another. Tenant spaces can be finished and added as needed. Power billing to tenants is also convenient since each unit can be individually metered: each pays for what each uses. Nighttime and/or weekend uses of certain areas are possible without heating or cooling the entire facility. A decentralized system also means if one unit should fault, the rest of the system will continue to operate normally, as well as eliminating air cross-contamination problems and expensive high pressure duct systems requiring an inefficient electric resistance reheat mode.

The Affinity Console Series Approach

There are a number of proven choices in the type of Affinity Console Series system which would be best for any given application. Most often considered are:

Vertical - Closed Loop/Ground Source



• ***Closed Loop/Ground-Source Systems*** utilize the stable temperatures of the earth to maintain proper water source temperatures (via vertical or horizontal closed loop heat exchangers) for Affinity Console Series extended range heat pump system. Sizes range from a single unit through many hundreds of units. When net cooling requirements cause closed loop water temperatures to rise, heat is dissipated into the cooler earth through buried high strength plastic pipe “heat exchangers.” Conversely if net space heating demands cause loop heat absorption beyond that heat recovered from building core areas, the loop temperature will fall causing heat to be extracted from the earth. Due to the extended loop temperatures, AHRI/ISO 13256-1 Ground Loop Heat Pumps are required for this application.

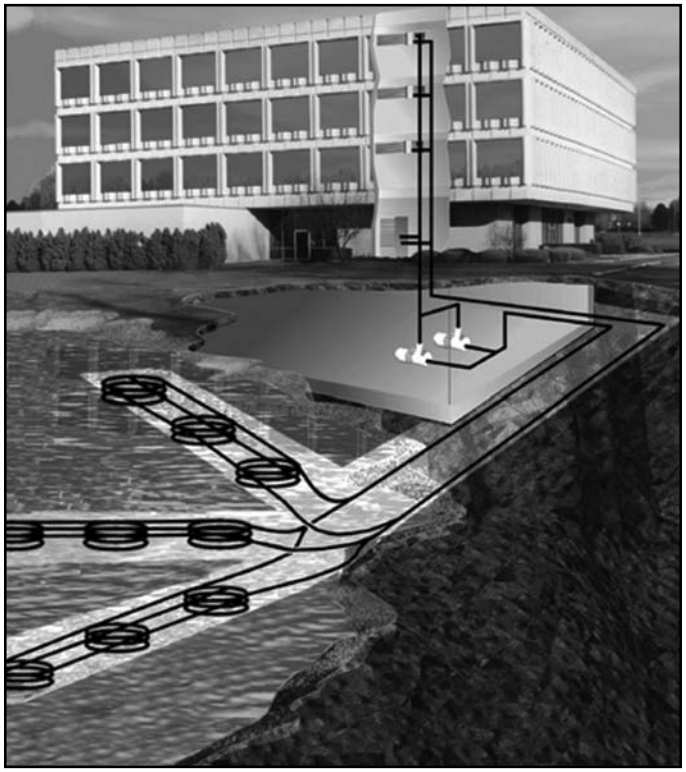
Application Notes cont.

Because auxiliary equipment such as a fossil fuel boiler and cooling tower are not required to maintain the loop temperature, operating and maintenance costs are very low.

Ground-source systems are most applicable in residential and light commercial buildings where both heating and cooling are desired, and on larger envelope dominated structures where core heat recovery will not meet overall heating loads. Both vertical and horizontally installed closed-loops can be used. The land space required for the “heat exchangers” is 100-250 sq. ft./ton on vertical (drilled) installations and 750-1500 sq. ft./ton for horizontal (trenched) installations. Closed loop heat exchangers can be located under parking areas or even under the building itself.

On large multi-unit systems, sizing the closed loop heat exchanger to meet only the net heating loads and assisting cooling loads with a closed circuit cooling tower may be the most cost effective choice.

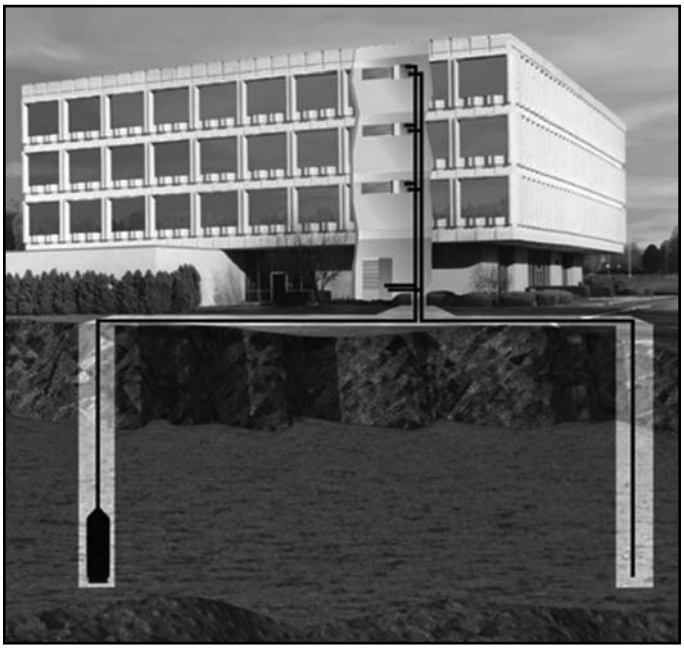
Surface Water - Closed Loop/Ground Source



• ***Closed Loop/Ground-Source Surface Water Systems*** also utilize the stable temperatures of Surface Water to maintain proper water source temperatures for Affinity Console Series extended range heat pump systems. These systems have all of the advantages of horizontal and vertical closed loop systems. Due to the extended loop temperatures, AHRI/ISO 13256-1 Ground Water or Ground Loop Heat Pumps are required for this application.

In cooling dominated structures, the ground-source surface water systems can be very cost effective especially where local building codes require water retention ponds for short term storage of surface run-off. Sizing requirements for the surface water is a minimum of 500 sq. ft./lon of surface area at a minimum depth of 8 feet. York should be contacted when designs for heating dominated structures are required.

Plate Heat Exchanger - Closed Loop/Ground Water •

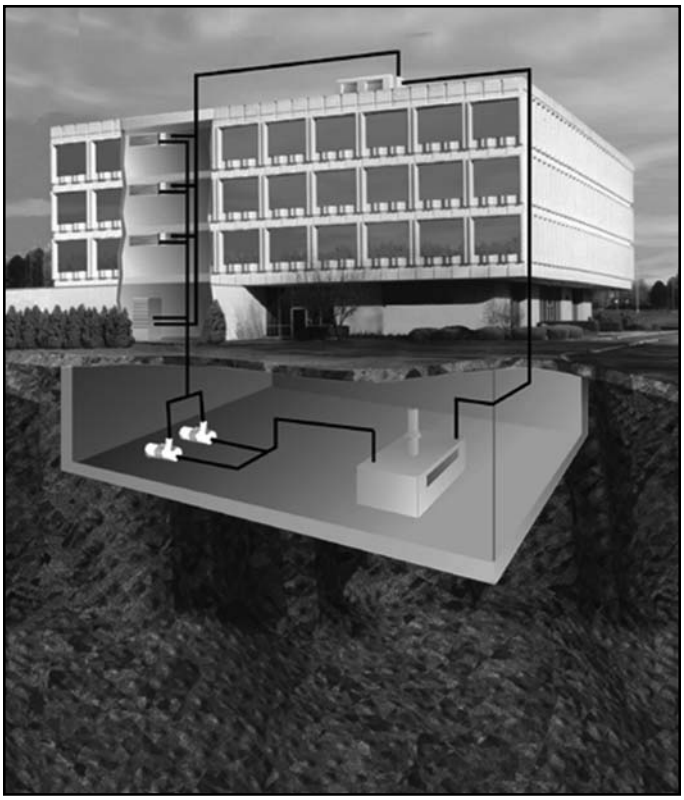


Closed Loop/Ground Water Plate Heat Exchanger Systems utilize lake, ocean, well water or other water sources to maintain closed loop water temperatures in multi-unit Affinity Console Series systems. A plate frame heat exchanger isolates the units from any contaminating effects of the water source, and allows periodic cleaning of the heat exchanger during off peak hours.

Operation and benefits are similar to those for ground-source systems. Due to the extended loop temperatures, AHRI/ISO 13256-1 Ground Loop Heat Pumps are required for this application. Closed loop plate heat exchanger systems are applicable in commercial, marine, or industrial structures where the many benefits of a water source heat pump system are desired, regardless of whether the load is heating or cooling dominated.

Application Notes cont.

Cooler/Boiler - Closed Loop



• ***Closed Loop /Cooler-Boiler Systems*** utilize a closed heat recovering loop with multiple water source heat pumps in the more conventional manner. Typically a boiler is employed to maintain closed loop temperatures above 60°r and a cooling tower to maintain loop temperatures below 90°F. These systems are applicable in medium to large buildings regardless of whether the load is heating or cooling dominated. Due to the moderate loop temperatures, AHRI/ISO 13256-1 Water Loop Heat Pumps are required for this application.

Water Quality

In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, a closed loop system is recommended. The heat exchanger coils in ground water systems may, over a period of time, lose heat exchange capabilities due to a buildup of mineral deposits inside. These can be cleaned, but only by a qualified service mechanic, as special solutions and pumping equipment are required. Hot water generator coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the owner should be informed that the heat exchanger may require occasional flushing.

Units with cupronickel heat exchangers are recommended for open loop applications due to the increased resistance to build-up and corrosion, along with reduced wear caused by acid cleaning. Failure to adhere to the guidelines in the water quality table could result in loss of warranty.

Material		Copper	90/10 Cupronickel	316 Stainless Steel
pH	**Acidity/Alkalinity**	7 - 9	7 - 9	7 - 9
Scaling	Calcium and Magnesium Carbonate	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm
Corrosion	Hydrogen Sulfide	Less than 0.5 ppm (rotten egg smell appears at 0.5 ppm)	10 - 50 ppm	Less than 1 ppm
	Sulfates	Less than 125 ppm	Less than 125 ppm	Less than 200 ppm
	Chlorine	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Chlorides	Less than 20 ppm	Less than 125 ppm	Less than 300 ppm
	Carbon Dioxide	Less than 50 ppm	10 - 50 ppm	10 - 50 ppm
	Ammonia	Less than 2 ppm	Less than 2 ppm	Less than 20 ppm
	Ammonia Chloride	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Nitrate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Hydroxide	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Sulfate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Total Dissolved Solids (TDS)	Less than 1000 ppm	1000 - 1500 ppm	1000 - 1500 ppm
	LSI Index	+0.5 to -0.5	+0.5 to -0.5	+0.5 to -0.5
Iron Fouling (Biological Growth)	Iron, FE^{2}+ (Ferrous) Bacterial Iron Potential	< 0.2 ppm	< 0.2 ppm	< 0.2 ppm
	Iron Oxide	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur
Erosion	Suspended Solids	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size
	Threshold Velocity (Fresh Water)	< 6 ft/sec	< 6 ft/sec	< 6 ft/sec

NOTES: Grains = ppm divided by 17
mg/L is equivalent to ppm

2/22/12

Installation Notes

Typical Unit Installation

Unit Location

Locate the unit in an indoor area that allows for easy removal of the filter and access panels. Location should have enough space for service personnel to perform maintenance or repair. Provide sufficient room to make water and electrical connection(s). Any access panel screws that would be difficult to remove after the unit is installed should be removed prior to setting the unit. **Care should be taken when units are located in unconditioned spaces to prevent damage from frozen water lines and excessive heat that could damage electrical components.**

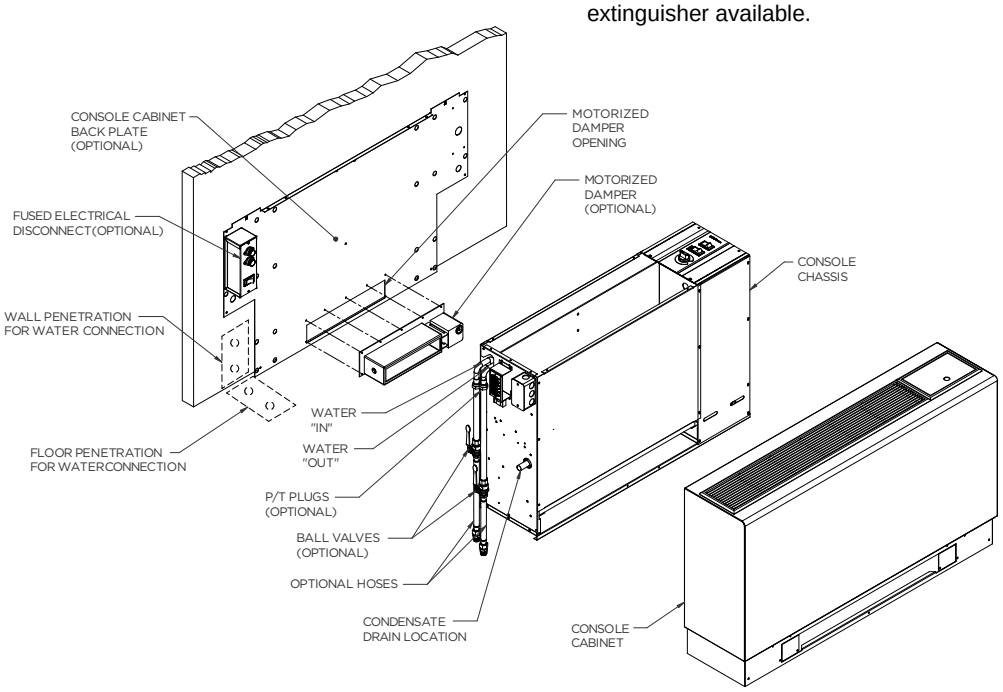
Installing Console Units

Console units are available in left or right air return configurations. Units should be mounted level on the floor. It is not necessary to anchor the unit to the floor.

WARNING: Before performing service or maintenance operations on a system, turn off main power switches to the indoor unit. If applicable, turn off the accessory heater power switch. Electrical shock could cause personal injury.

Installing and servicing heating and air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service heating and air conditioning equipment. Untrained personnel can perform the basic maintenance functions of cleaning coils and cleaning and replacing filters.

All other operations should be performed by trained service personnel. When working on heating and air conditioning equipment, observe precautions in the literature, tags and labels attached to the unit and other safety precautions that may apply. Follow all safety codes. Wear safety glasses and work gloves. Use a quenching cloth for brazing operations and have a fire extinguisher available.



Water Piping

Piping is usually design as ‘reverse return’ to equalize flow paths through each unit. A short flexible pressure rated hose is used to make connection to the fixed building piping system. This hose is typically stainless steel braid and includes a swivel fitting on one end for easy removal and is flexible to help isolate the unit for quieter operation . Isolation valves for servicing, y-strainers for filtering and memory-stop flow valve or a balancing valve can be provided for consistent water flow through the unit.

All unit source water connections are fittings that accept a male pipe thread (MPT). Insert the connectors by hand, then tighten the fitting with a wrench to provide a leakproof joint. The open and closed loop piping system should include pressure/temperature ports for serviceability. The proper water flow must be provided to each unit whenever the unit operates. To assure proper flow, use pressure/temperature ports to determine the flow rate. These ports should be located at the supply and return water connections on the unit. The proper flow rate cannot be accurately set without measuring the water pressure drop through the refrigerant-to-water heat exchanger. Check carefully for water leaks.

Condensate Drain

On console units, the internal condensate drain assembly consists of a drain tube which is connected to the drain pan. A condensate tube is inside all cabinets as a trapping loop; therefore, an external trap is not necessary.

Selection Example

To achieve optimal performance, proper selection of each heat pump is essential. A building load program should be used to determine the heating and cooling load of each zone. A computer software selection program can then be used to develop an accurate and complete heat pump schedule. Software can be obtained from your local representative.

While a computer software program is the easiest and most accurate method to size and select equipment, however, selection can still be accomplished manually using this manual and the following selection procedure. Sizing so that the actual sensible capacity of the equipment will satisfy the sensible capacity of the zone is the recommended method for best results.

Boiler/Tower Application

Typical boiler/tower application will result in entering water temperatures of 60-90°F with 70°F for heating and 90°F for cooling. Water to refrigerant insulation option would not be required. Flow rates are 2.5 to 3 gpm per ton with 2.5 gpm per ton often representing an economical design point.

Geothermal Application

Typical geothermal application can result in a wide entering water temperature range of 30-100°F. Typically minimum heating entering water temperatures can range from 30 to 50°F depending upon loop type and geographical location. Cooling performance should be calculated using a maximum loop temperature of 100°F in most loop applications. Water flow is typically 2.5 to 3 gpm per ton with 3 gpm per ton recommended with the more extreme loop temperatures. **PLEASE NOTE THAT WATER COIL INSULATION OPTION SHOULD BE SELECTED WHEN ENTERING WATER TEMPERATURES ARE EXPECTED TO BE BELOW 45-50°F.**

Geothermal Selection Example

Step 1: Determine the actual heating and cooling loads at the desired dry bulb and wet bulb conditions.

Step 2: Obtain the following de sign parameters: Entering water temperature, water flow rate in GPM, air flow in CFM, water flow pressure drop and design wet and dry bulb temperatures. Air flow 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. Go to the appropriate tables and find the proper indicated water flow and water temperature.

Step 3: Select a unit based on total and sensible cooling conditions. Select a unit which is closest to, but no larger than, the actual cooling load.

Step 4: Enter tables at the design water flow and water temperature. Read the total and sensible cooling capacities (Note: interpolation is permissible, extrapolation is not).

Step 5: Read the heating capacity. If it exceeds the design criteria it is acceptable. 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.

Step 6: Determine the correction factors associated with the variable factors of dry bulb and wet bulb.
Corrected Total Cooling = tabulated total cooling x wet bulb correction.
Corrected Sensible Cooling = tabulated sensible cooling x wet/dry bulb correction.

Step 7: Compare the corrected capacities to the load requirements. Normally if the capacities are within 10% of the loads, 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.

Step 8: When complete, calculate water temperature rise and assess the selection. If the units selected are not within 10% of the load calculations, then review what effect changing the GPM, water temperature and/or air flow and air temperature would have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat the procedure. Remember, when in doubt, undersize slightly for best performance.

Example Equipment Selection - Cooling

1. Load Determination:
Assume we have determined that the appropriate cooling load at the desired dry bulb 75°F and wet bulb 60°F conditions is as follows:
Total Cooling..... 14,800 BTUH
Sensible Cooling.....11,200 BTUH
Entering Air Temp .....75°F Dry Bulb / 60°F Wet Bulb

2. Design Conditions:
Similarly, we have also obtained the following design parameters:
Entering Water Temp.....100°F
Water Flow (Based upon 10°F rise in temp.) 5.5 GPM
Air Flow Required..... 450 CFM

3, 4 & 5. HP Selection:
After making our preliminary selection (YC18), we enter the tables at design water flow and water temperature and read
Total Cooling, Sens. Cooling and Heat of Rej. capacities:
Total Cooling..... 16,600 BTUH
Sensible Cooling..... 12,600 BTUH
Heat of Rejection..... 21,400 BTUH

6 & 7. Entering Air and Airflow Corrections:
Next, we determine our correction factors. (Refer to Correction Factor Tables - Air Flow and Entering Air correction tables — using 450 cfm. or 450÷500 nom. = 90%).
Corrected Total Cooling = 16,600 x 0.982 x 0.897 = 14,622
Corrected Sens Cooling = 12,600 x 0.933 x 0.995 = 11,697
Corrected Heat of Reject = 21,400 x 0.980 x 0.895 = 18,770

8. Water Temperature Rise Calculation & Assessment:
NOTE: 500 = parameters for water & 485 = parameters for antifreeze solutions to 30% weight.

Selection Example cont.

When we compare the Corrected Total Cooling and Corrected Sensible Cooling figures with our load requirements stated in Step 1, we discover that our selection is within +10% of our sensible load requirement. Further more, we see that our Corrected Total Cooling figure is within 1,000 Btuh of the actual indicated load.

$$HR = 500 \times GPM \times (T_{in} - T_{out})$$

$$\frac{HR}{500 \times GPM} = (Tin - Tout) \text{ or } \Delta T \text{ Rise}$$

$$\frac{18{,}770}{500 \times 5.5} = 6.83\ ^\circ F \text{ Rise}$$

Antifreeze Corrections

Catalog performance can be corrected for antifreeze use. Please use the following table and note the example given.

Antifreeze Type	Antifreeze % by wt	Cooling Capacity	Heating Capacity	Pressure Drop
EWT - degF [DegC]		**90 [32.2]**	**30 [-1.1]**	**30 [-1.1]**
Water	0	1.000	1.000	1.000
Ethylene Glycol	10	0.991	0.973	1.075
	20	0.979	0.943	1.163
	30	0.965	0.917	1.225
	40	0.955	0.890	1.324
	50	0.943	0.865	1.419
Propylene Glycol	10	0.981	0.958	1.130
	20	0.969	0.913	1.270
	30	0.950	0.854	1.433
	40	0.937	0.813	1.614
	50	0.922	0.770	1.816
Ethanol	10	0.991	0.927	1.242
	20	0.972	0.887	1.343
	30	0.947	0.856	1.383
	40	0.930	0.815	1.523
	50	0.911	0.779	1.639
Methanol	10	0.986	0.957	1.127
	20	0.970	0.924	1.197
	30	0.951	0.895	1.235
	40	0.936	0.863	1.323
	50	0.920	0.833	1.399

***Warning**: Gray area represents antifreeze concentrations greater than 35% by weight and should be avoided due to the extreme performance penalty they represent.*

Antifreeze Correction Example

Antifreeze solution is Propylene Glycol 20% by weight. Determine the corrected heating and cooling performance at 30°F and 90°F respectively as well as pressure drop at 30°F for an Affinity Console Series YC*18.

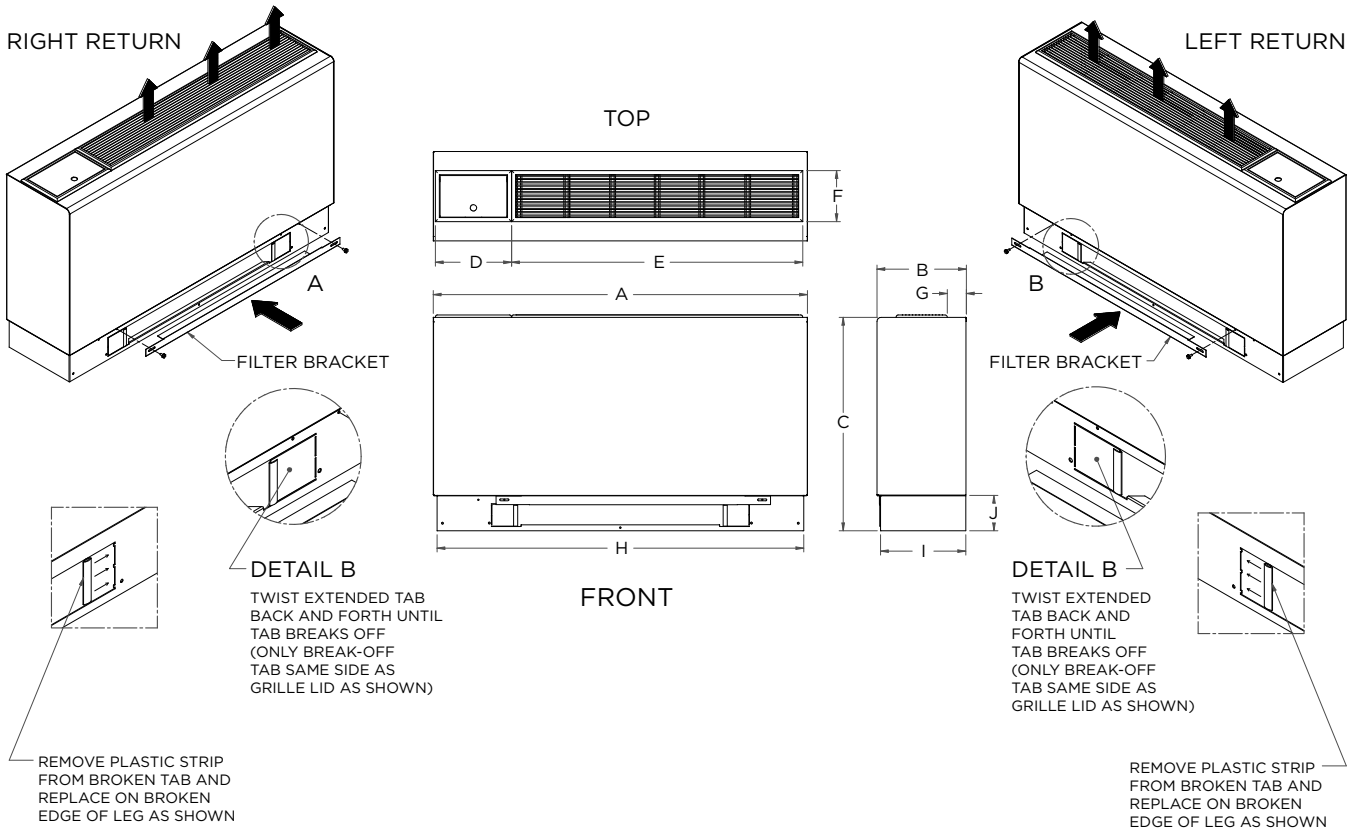
The corrected cooling capacity at 90°F would be: 17,100 MBtuh x 0.969 = 16,569 MBtuh

The corrected heating capacity at 30°F would be: 14,300 MBtuh x 0.913 = 13,056 MBtuh

The corrected pressure drop at 30°F and 5.5 GPM would be: 18.2 feet of head x 1.270 = 23.1 feet of head

Dimensional Data - Flat Top Cabinet

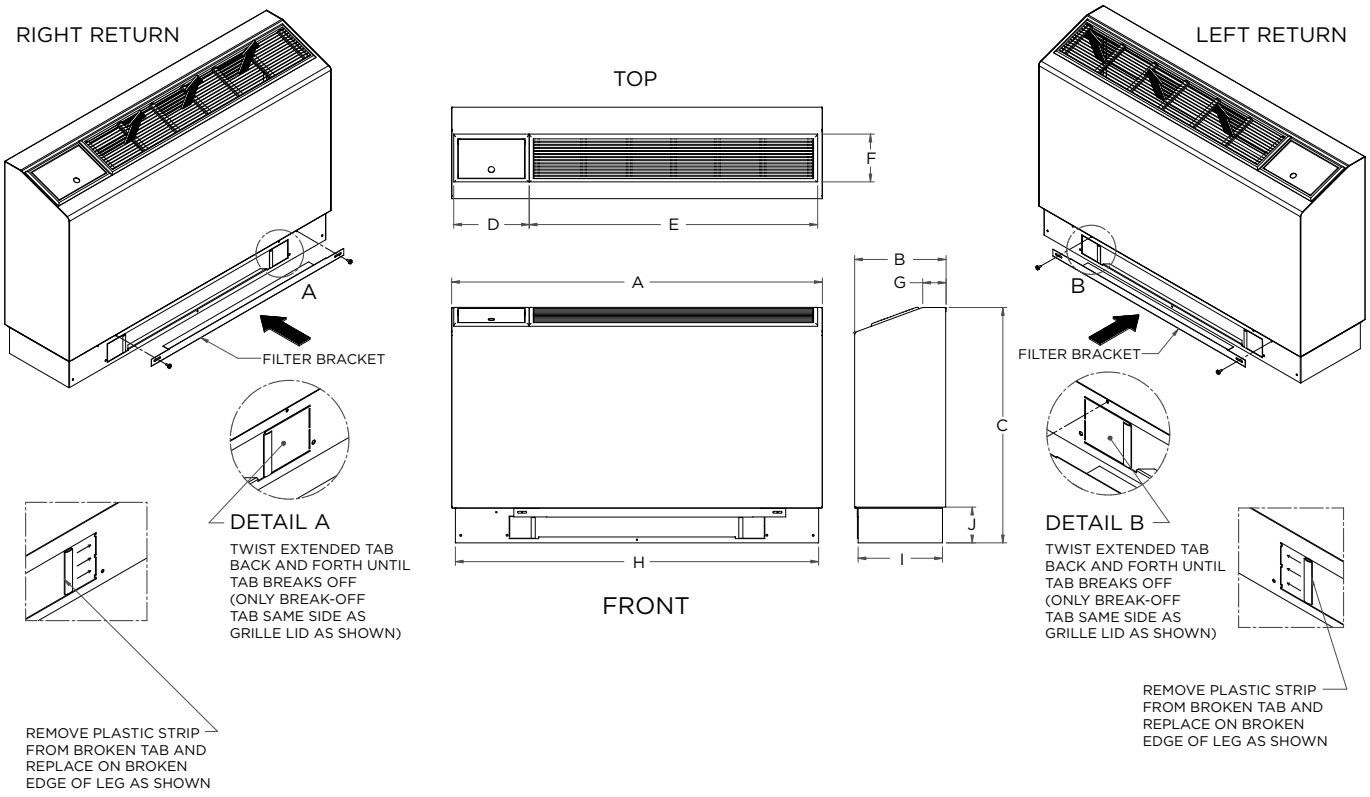
YCW09-18



Flat Top Configuration		Overall Cabinet									
		A	B	C	D	E	F	G	H	I	J
		Width	Depth	Height	Grille Lid	Grille Length	Grille Width				
09-12	in.	45.0	10.8	25.7	9.2	35.0	6.1	2.3	44.1	10.3	4.3
	cm.	114.3	27.3	65.2	23.4	88.9	15.6	5.8	112.0	26.0	10.9
15-18	in.	50.0	12.3	25.7	9.2	35.0	6.1	3.3	49.1	11.8	4.3
	cm.	127.0	31.1	65.2	23.4	88.9	15.6	8.3	124.7	29.8	10.9

Dimensional Data - Slope Top Cabinet

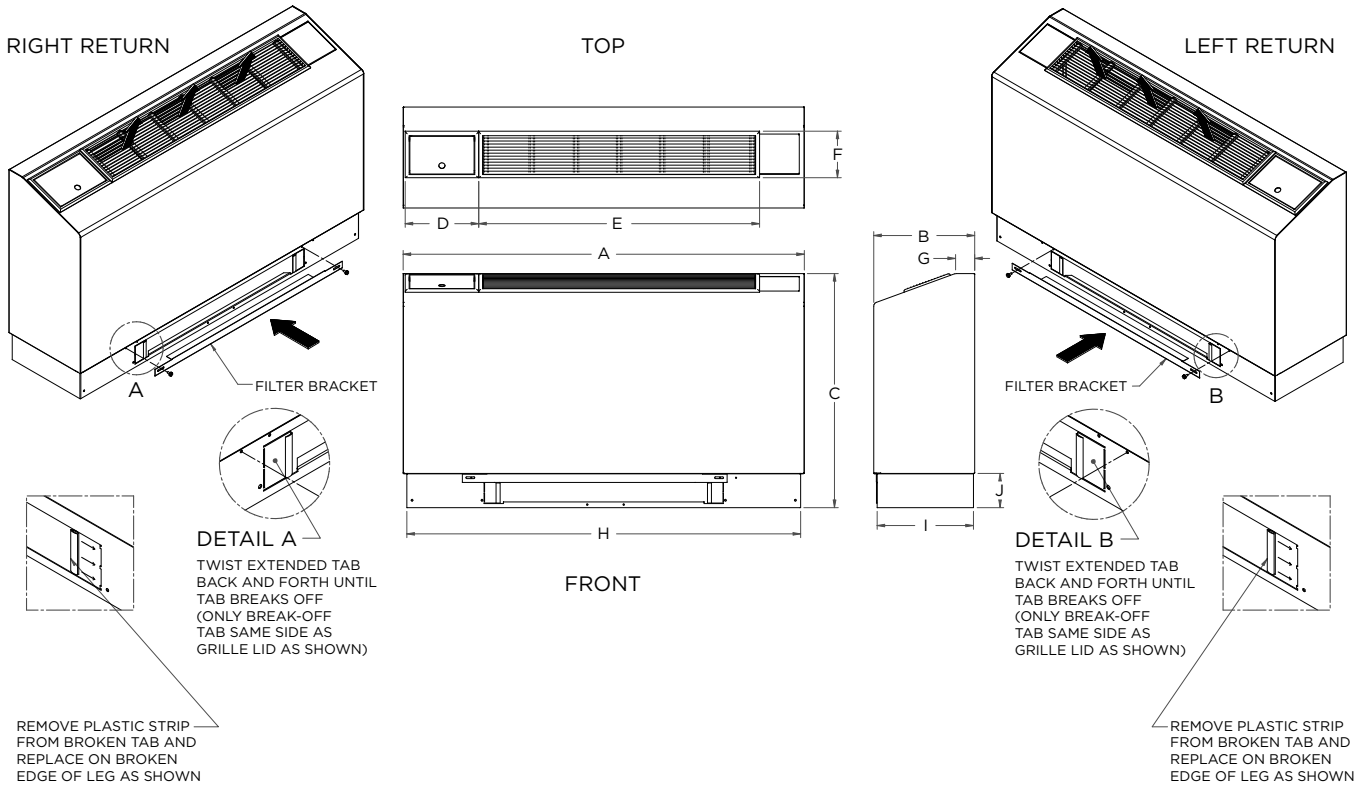
YCS09-18



Slope Top Configuration		Overall Cabinet									
		A	B	C	D	E	F	G	H	I	J
		Width	Depth	Height	Grille Lid	Grille Length	Grille Width				
09-12	in.	45.0	11.1	28.6	9.2	35.0	6.1	2.8	44.1	10.3	4.3
	cm.	114.3	28.2	72.6	23.4	88.9	15.6	7.2	112.0	26.0	10.9
15-18	in.	50.0	12.6	29.1	9.2	35.0	6.1	2.5	49.1	11.8	4.3
	cm.	127.0	32.0	73.9	23.4	88.9	15.6	6.4	124.7	29.8	10.9

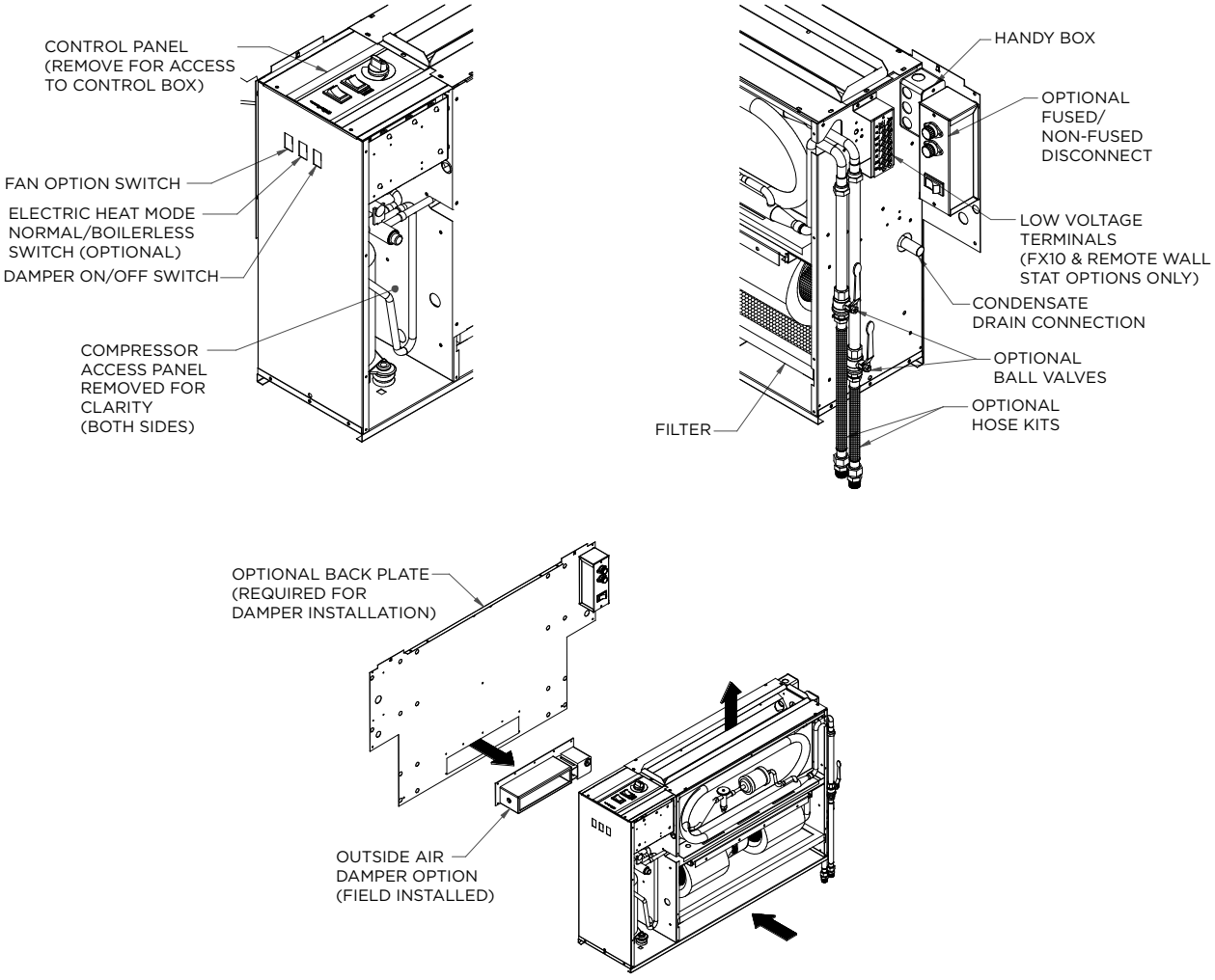
Dimensional Data - Extended Slope Top Cabinet

YCE09-18



Ext. Slope Top Configuration		Overall Cabinet										
		A	B	C	D	E	F	G	H	I	J
		Width	Depth	Height	Grille Lid	Grille Length	Grille Width				
09-12	in.	50.0	12.6	29.1	9.2	35.0	6.1	2.4	49.1	12.0	4.3
	cm.	127.0	32.0	73.9	23.4	88.9	15.6	6.1	124.7	30.5	10.9
15-18	in.	55.0	12.6	29.1	9.2	35.0	6.1	2.5	54.1	11.8	4.3
	cm.	139.7	32.0	73.9	23.4	88.9	15.6	6.4	137.4	29.8	10.9

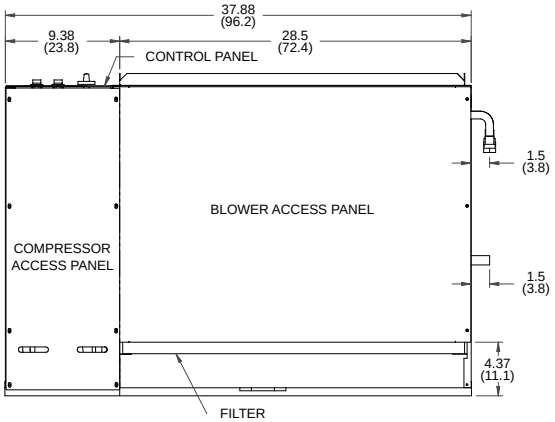
Dimensional Data - Right Return Controls Detail

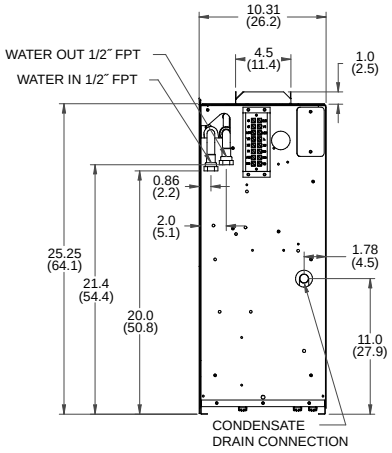


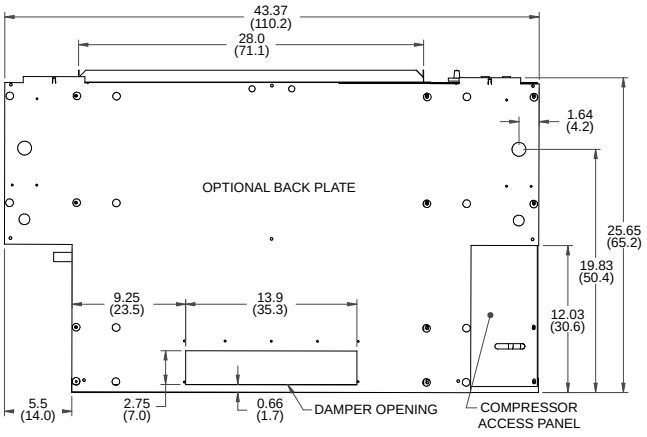
Dimensional Data - Right Return Chassis

Data = inches (cm)

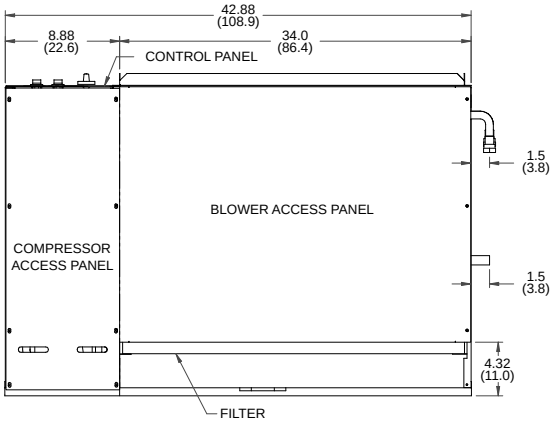
Models 09-12

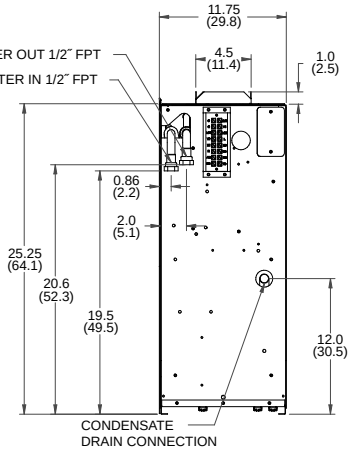


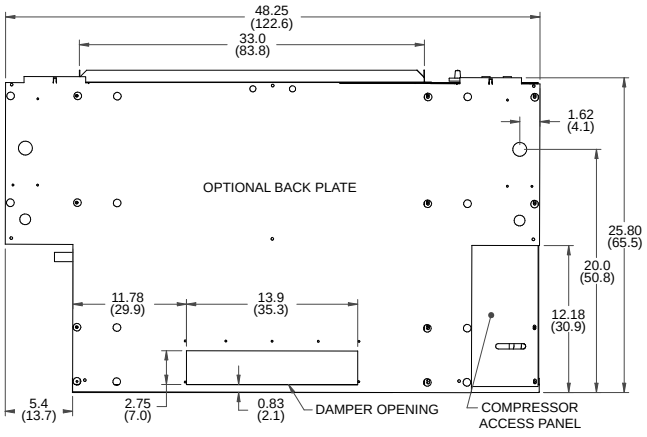




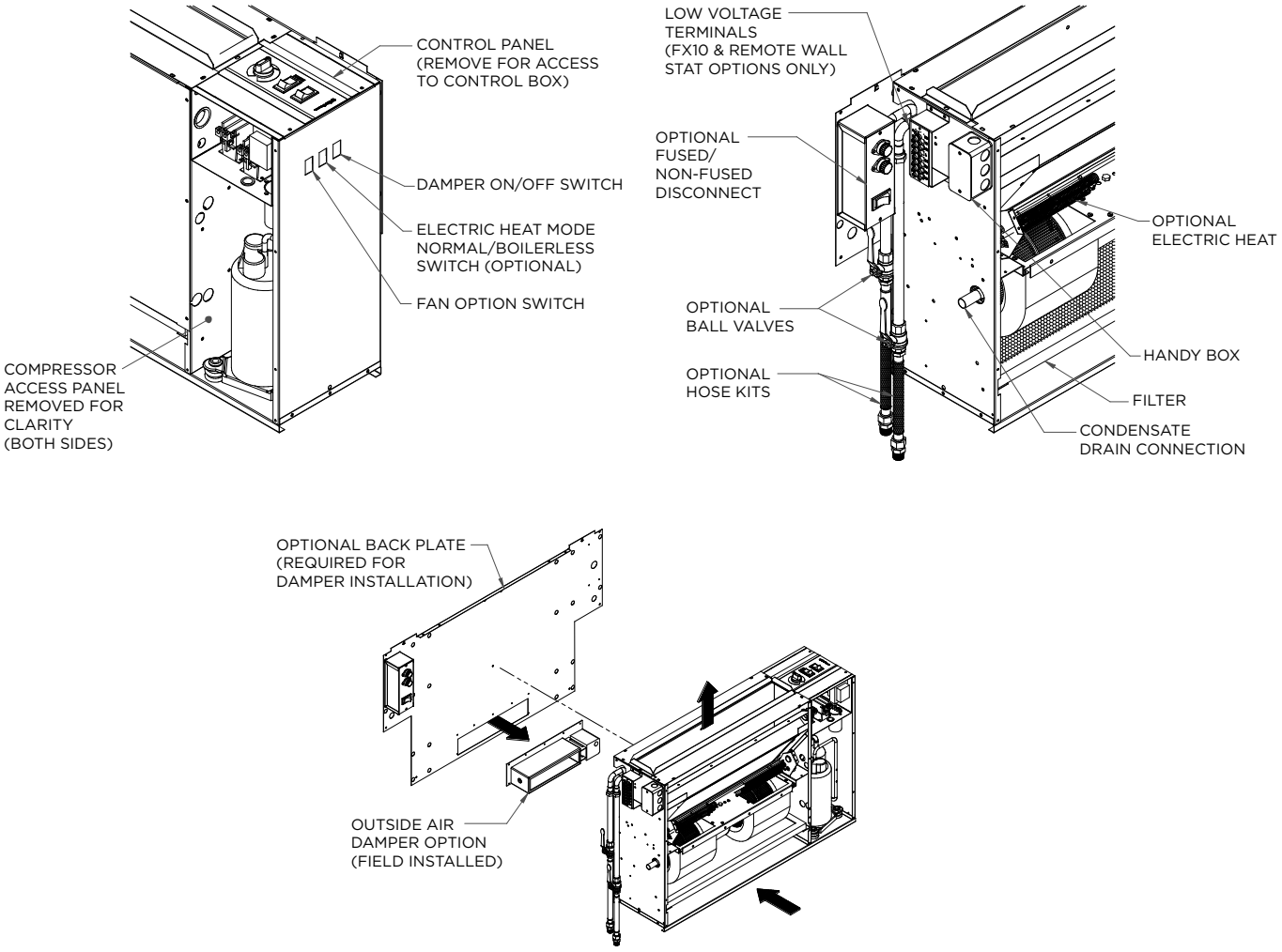
Models 15-18







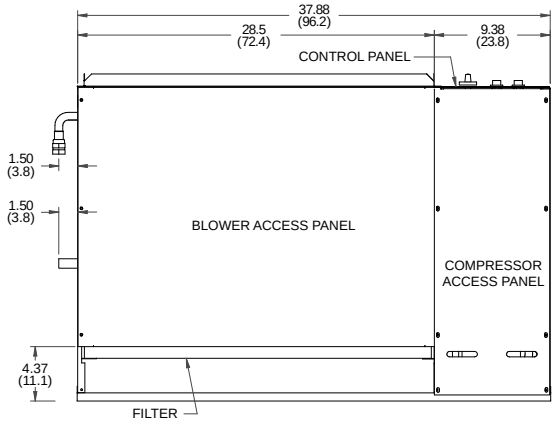
Dimensional Data - Left Return Controls Detail

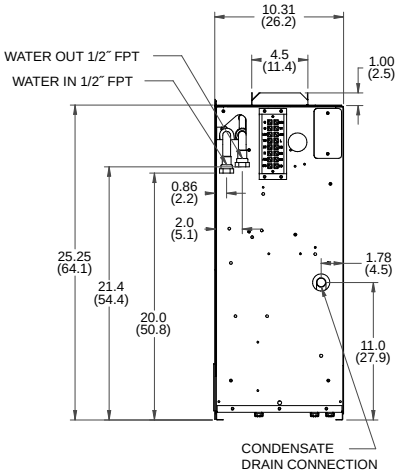


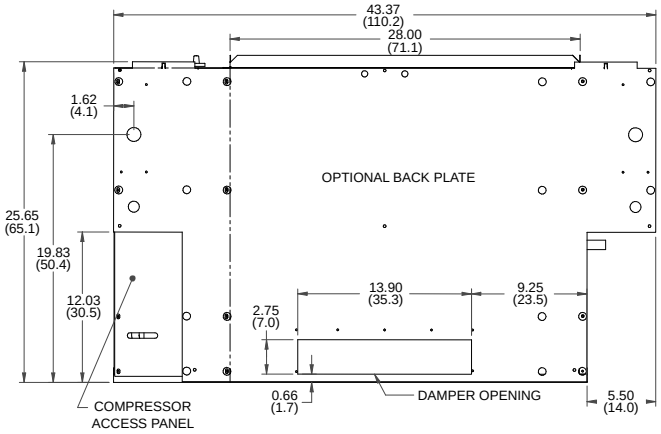
Dimensional Data - Left Return Chassis

Data = inches (cm)

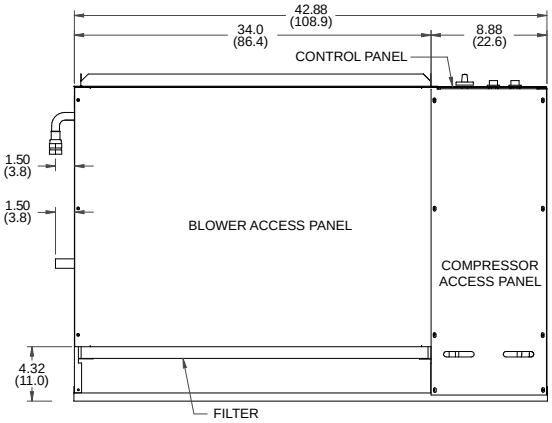
Models 09-12

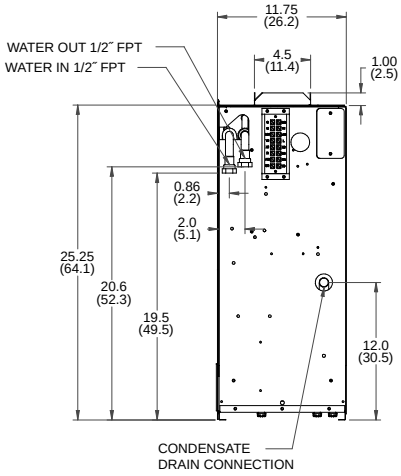


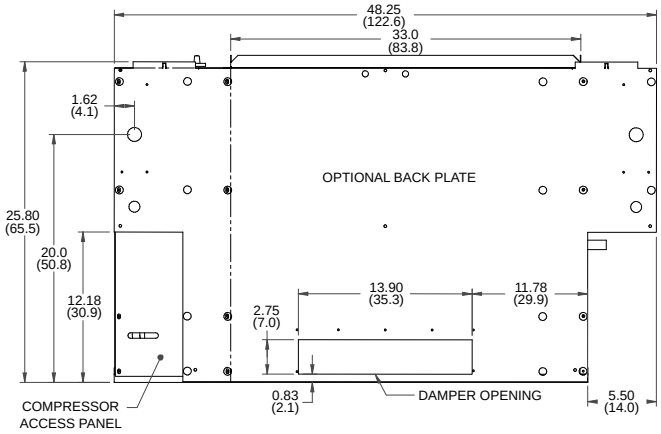




Models 15-18







Physical Data

Model		Consoles			
		09	12	15	18
Compressor (1 each)		Rotary			
Factory Charge R410A, oz [kg]		27 [0.77]	27 [0.77]	36 [1.02]	34 [0.96]
Fan Motor & Blower					
Fan Motor Type/Speeds	PSC	2 Speeds			
	ECM	3 Speeds			
Fan Motor- hp [W]	PSC	1/20 [37]	1/20 [37]	1/12 [62]	1/12 [62]
	ECM	0.25 [186]	0.25 [186]	0.25 [186]	0.25 [186]
Blower Wheel Size (Dia x W), in. [mm]	PSC	5.75 x 5.5 [146 x 140]	5.75 x 5.5 [146 x 140]	6.0 x 6.5 [152 x 165]	6.0 x 6.5 [152 x 165]
	ECM	5.75 x 5.5 [146 x 140]	5.75 x 5.5 [146 x 140]	6.0 x 6.5 [152 x 165]	6.0 x 6.5 [152 x 165]
Coax and Water Piping					
Water Connections Size - FPT - in [mm]		1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]
Coax & Piping Water Volume - gal [l]		0.15 [0.6]	0.18 [0.7]	0.35 [1.3]	0.35 [1.3]
Consoles					
Air Coil Dimensions (H x W), in. [mm]		8 x 22 [203 x 559]	8 x 22 [203 x 559]	8 x 30 [203 x 762]	8 x 30 [203 x 762]
Air Coil Total Face Area, ft2 [m2]		1.2 [0.114]	1.2 [0.114]	1.7 [0.155]	1.7 [0.155]
Air Coil Tube Size, in [mm]		3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	4	4
Filter Standard - 1" [25.44mm]		1 - 10 x 28 [254 x 711]	1 - 10 x 28 [254 x 711]	1 - 12 x 33 [305 x 838]	1 - 12 x 33 [305 x 838]
Weight - Operating, lb [kg]		210 [91]	210 [95]	230 [102]	235 [107]
Weight - Packaged, lb [kg]		220 [100]	220 [100]	240 [109]	245 [111]

1/20/14

Electrical Data

ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor			Fan Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA				
09	115/60/1	104/127	12.5	8.0	50.0	4.25	12.3	14.3	20
	208-230/60/1	187/253	6.4	4.1	21.0	2.6	6.7	7.7	10/15
	265/60/1	238/292	6.7	4.3	22.0	2.5	6.8	7.9	10/15
12	115/60/1	104/127	14.8	9.5	50.0	4.25	13.8	16.1	25
	208-230/60/1	187/253	7.7	4.9	25.0	2.6	7.5	8.8	10/15
	265/60/1	238/292	7.0	4.5	22.0	2.5	7.0	8.1	10/15
15	208-230/60/1	187/253	9.2	5.9	29.0	2.6	8.5	10.0	15
	265/60/1	238/292	7.8	5.0	28.0	2.5	7.5	8.8	10/15
18	208-230/60/1	187/253	10.4	6.7	33.5	2.6	9.3	10.9	15
	265/60/1	238/292	8.7	5.6	28.0	2.5	8.1	9.5	15

HACR circuit breaker in USA only 1/20/14

PSC Motors

Model	Rated Voltage	Voltage Min/Max	Compressor			Fan Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA				
09	115/60/1	104/127	12.5	8.0	50.0	0.92	8.9	10.9	25
	208-230/60/1	187/253	6.4	4.1	21.0	0.50	4.6	5.6	10/15
	265/60/1	238/292	6.7	4.3	22.0	0.50	4.8	5.9	10/15
12	115/60/1	104/127	14.8	9.5	50.0	0.92	10.4	12.8	30
	208-230/60/1	187/253	7.7	4.9	25.0	0.50	5.4	6.6	10/15
	265/60/1	238/292	7.0	4.5	22.0	0.50	5.0	6.1	10/15
15	208-230/60/1	187/253	9.2	5.9	29.0	0.69	6.6	8.1	10/15
	265/60/1	238/292	7.8	5.0	28.0	0.65	5.7	6.9	10/15
18	208-230/60/1	187/253	10.4	6.7	33.5	0.69	7.4	9.1	15
	265/60/1	238/292	8.7	5.6	28.0	0.65	6.3	7.7	10/15

HACR circuit breaker in USA only 1/20/14

Auxiliary Heat Ratings

ECM Motors

Model	Rated Voltage	Voltage Min./Max.	Heater Element Watts	Fan Motor FLA	Heater Element FLA	Total Unit FLA	Min. Circuit Amp.	Max. Fuse/ Brkr.
09-12 (1 kW)	208/60/1	197/254	818	2.45	3.93	6.4	8.0	10
	230/60/1	197/254	1000	2.60	4.35	7.0	8.7	15
	265/60/1	239/291	1000	2.50	3.77	6.3	7.8	10
09-12 (2 kW)	208/60/1	197/254	1636	2.45	7.86	10.3	12.9	20
	230/60/1	197/254	2000	2.60	8.70	11.3	14.1	25
	265/60/1	239/292	2000	2.50	7.55	10.1	12.6	20
15-18 (3 kW)	208/60/1	197/254	2454	2.45	11.80	14.3	17.8	30
	230/60/1	197/254	3000	2.60	13.04	15.6	19.6	35
	265/60/1	239/292	3000	2.50	11.32	13.8	17.3	30

Always refer to unit nameplate data prior to installation. 10/5/10

PSC Motors

Model	Rated Voltage	Voltage Min./Max.	Heater Element Watts	Fan Motor FLA	Heater Element FLA	Total Unit FLA	Min. Circuit Amp.	Max. Fuse/ Brkr.
09-12 (1 kW)	208/60/1	197/254	818	0.50	3.93	4.4	5.5	10
	230/60/1	197/254	1000	0.50	4.35	4.9	6.1	10
	265/60/1	239/291	1000	0.50	3.77	4.3	5.3	10
09-12 (2 kW)	208/60/1	197/254	1636	0.50	7.86	8.4	10.5	15
	230/60/1	197/254	2000	0.50	8.70	9.2	11.5	20
	265/60/1	239/292	2000	0.50	7.55	8.1	10.1	15
15-18 (3 kW)	208/60/1	197/254	2454	0.69	11.80	12.5	15.6	25
	230/60/1	197/254	3000	0.69	13.04	13.7	17.2	30
	265/60/1	239/292	3000	0.65	11.32	12.0	15.0	25

10/5/10

Blower Performance Data

PSC Motors

Model	CFM	
	Low Speed	High Speed
09	300	350
12	300	350
15	450	500
18	450	500

Factory settings are in Bold
Air flow values are with dry coil and standard filter.

ECM Motors

Model	CFM		
	Low Speed	Medium Speed	High Speed
09	300	325	400
12	300	325	400
15	350	450	600
18	350	450	600

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 0.12in. wg. and 500 fpm by 0.16 in. wg.

Pressure Drop

Model	GPM	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F
09	1.2	1.0	0.9	0.8	0.7	0.6
	1.8	2.3	2.2	2.0	1.9	1.8
	2.5	3.8	3.7	3.5	3.3	3.1
12	1.5	0.9	0.8	0.7	0.6	0.5
	2.3	1.7	1.5	1.4	1.3	1.1
	3.5	3.0	2.7	2.5	2.4	2.2
15	2.0	1.7	1.6	1.5	1.4	1.3
	3.0	3.3	3.2	3.0	2.9	2.8
	4.5	5.7	5.5	5.3	5.1	4.9
18	3.0	1.7	1.6	1.5	1.4	1.3
	4.0	4.1	4.0	3.9	3.7	3.6
	5.5	7.9	7.6	7.4	7.2	6.9

12/14/09

Correction Factor Tables

Cooling Capacity Corrections

Entering Air WB ºF	Total Clg Cap	Sensible Cooling Capacity Multipliers - Entering DB ºF										Power Input	Heat of Rejection
		60	65	70	75	**80**	80.6	85	90	95	100		
45	0.719	0.891	1.058	1.128	*	*	*	*	*	*	*	0.898	0.741
50	0.719	0.893	0.980	1.106	*	*	*	*	*	*	*	0.898	0.741
55	0.812	0.629	0.844	1.026	1.172	*	*	*	*	*	*	0.922	0.819
60	0.897			0.820	0.995	1.206	1.238	*	*	*	*	0.955	0.895
65	0.960			0.568	0.810	1.004	1.052	1.227	*	*	*	0.982	0.951
66.2	0.984			0.505	0.743	1.002	1.027	1.151	*	*	*	0.993	0.980
67	**1.000**			0.463	0.699	**1.000**	1.011	1.101	1.310	*	*	**1.000**	**1.000**
70	1.047				0.599	0.865	0.879	1.007	1.225	1.433	*	1.018	1.029
75	1.148					0.567	0.584	0.734	0.956	1.261	1.476	1.056	1.118

Note: * Sensible capacity equals total capacity at conditions shown.

7/20/06

Heating Capacity Corrections

	Heating Corrections		
Ent Air DB °F	Htg Cap	Power	Heat of Ext
45	1.050	0.749	1.158
50	1.059	0.859	1.130
55	1.043	0.894	1.096
60	1.033	0.947	1.064
65	1.023	0.974	1.030
68	1.009	0.990	1.012
70	**1.000**	**1.000**	**1.000**
75	1.011	1.123	0.970
80	1.000	1.196	0.930

7/20/06

Reference Calculations

Heating Calculations:

$$LWT = EWT - \frac{HE}{GPM \times 500}$$

$$LAT = EAT + \frac{HC}{CFM \times 1.08}$$

$$TH = HC + HW$$

Cooling Calculations:

$$LWT = EWT + \frac{HR}{GPM \times 500}$$

$$LAT\ (DB) = EAT\ (DB) - \frac{SC}{CFM \times 1.08}$$

$$LC = TC - SC$$

$$S/T = \frac{SC}{TC}$$

Legend and Notes

ABBREVIATIONS AND DEFINITIONS:

CFM = airflow, cubic feet/minute
EWT = entering water temperature, Fahrenheit
GPM = water flow in gallons/minute
WPD = water pressure drop, PSI and feet of water
EAT = entering air temperature, Fahrenheit (dry bulb/wet bulb)
HC = air heating capacity, MBTUH
TC = total cooling capacity, MBTUH
SC = sensible cooling capacity, MBTUH
KW = total power unit input, kilowatts
HR = total heat of rejection, MBTUH
HE = total heat of extraction, MBTUH
HW = desuperheater capacity, MBTUH
EER = Energy Efficient Ratio = BTU output/Watt input
COP = Coefficient of Performance = BTU output/BTU input
LWT = leaving water temperature, °F
LAT = leaving air temperature, °F
TH = total heating capacity, MBTUH
LC = latent cooling capacity, MBTUH
S/T = sensible to total cooling ratio

Notes to Performance Data Tables

- Performance ratings are based on 80°F DB / 67°F WB EAT for cooling and 70°F DB EAT for heating.
- Three flow rates are shown for each unit. The lowest flow rate shown is used for geothermal open loop/well water systems with a minimum of 50°F EWT. The middle flow rate shown is the minimum geothermal closed loop flow rate. The highest flow rate shown is optimum for geothermal closed loop systems and the suggested flow rate for boiler/ tower applications.
- The desuperheater numbers are based on a flow rate of 0.4 GPM/ton of rated capacity with an EWT of 90°F.
- Entering water temperatures below 40°F assumes 15% antifreeze solution.
- For non-standard EAT conditions, apply the appropriate correction factors on (Refer to Correction Factor Tables).
- Interpolation between EWT, GPM and CFM data is permissible.

Operating Limits

Operating Limits	Cooling		Heating	
	(°F)	(°C)	(°F)	(°C)
Air Limits				
Min. Ambient Air	45	7.2	45	7.2
Rated Ambient Air	80	26.7	70	21.1
Max. Ambient Air	100	37.8	85	29.4
Min. Entering Air	50	10.0	40	4.4
Rated Entering Air db/wb	80.6/66.2	27/19	68	20.0
Max. Entering Air db/wb	110/83	43/28.3	80	26.7
Water Limits				
Min. Entering Water	30	-1.1	20	-6.7
Normal Entering Water	50-110	10-43.3	30-70	-1.1
Max. Entering Water	120	48.9	90	32.2

NOTE: Minimum/maximum limits are only for start-up conditions, and are meant for bringing the space up to occupancy temperature. Units are not designed to operate at the minimum/maximum conditions on a regular basis. The operating limits are dependent upon three primary factors: 1) water temperature, 2) return air temperature, and 3) ambient temperature. When any of the factors are at the minimum or maximum levels, the other two factors must be at the normal level for proper and reliable unit operation.

YC09 - Performance Data

300 Rated CFM Heating / Cooling

Performance capacities shown in thousands of Btuh.

EWT °F	Flow Rate GPM	Water Pressure Drop		HEATING - EAT 70 °F					COOLING - EAT 80/67 °F					
		PSI	FT/HD	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER
20	1.2	1.1	2.5	Operation not recommended					Operation not recommended					
	1.8	2.4	5.6											
	2.5	3.8	8.8	6.8	0.60	4.8	89.0	3.35						
30	1.2	1.0	2.3	Operation not recommended					Operation not recommended					
	1.8	2.3	5.4	6.9	0.60	4.8	89.3	3.38	12.1	7.3	0.61	0.38	13.4	31.8
	2.5	3.8	8.8	7.3	0.63	5.1	90.5	3.40	12.2	7.4	0.61	0.36	13.4	33.9
40	1.2	1.0	2.2	7.6	0.62	5.5	91.5	3.63	Operation not recommended					
	1.8	2.3	5.2	7.9	0.62	5.8	92.4	3.72	11.5	7.1	0.62	0.41	12.9	28.1
	2.5	3.8	8.7	8.3	0.64	6.1	93.7	3.80	11.6	7.2	0.62	0.39	12.9	30.0
50	1.2	0.9	2.1	8.8	0.65	6.6	95.2	4.00	10.7	6.8	0.63	0.45	12.3	23.6
	1.8	2.2	5.1	9.1	0.65	6.9	96.0	4.08	10.9	6.9	0.63	0.44	12.3	24.9
	2.5	3.7	8.5	9.4	0.66	7.1	97.0	4.17	11.0	7.0	0.64	0.41	12.4	26.6
60	1.2	0.9	2.0	10.3	0.68	8.0	99.8	4.46	10.4	6.7	0.64	0.52	12.1	19.9
	1.8	2.1	4.9	10.5	0.68	8.2	100.5	4.53	10.5	6.7	0.64	0.50	12.2	21.0
	2.5	3.6	8.3	10.8	0.69	8.5	101.3	4.60	10.7	6.9	0.64	0.47	12.3	22.4
70	1.2	0.8	1.8	11.8	0.71	9.4	104.5	4.88	10.0	6.5	0.65	0.59	12.0	17.1
	1.8	2.0	4.7	12.0	0.71	9.6	105.0	4.93	10.1	6.6	0.65	0.56	12.1	18.0
	2.5	3.5	8.1	12.2	0.72	9.8	105.7	4.99	10.3	6.7	0.65	0.54	12.1	19.2
80	1.2	0.8	1.7	12.7	0.73	10.2	107.3	5.11	9.5	6.3	0.67	0.65	11.7	14.5
	1.8	2.0	4.6	12.9	0.74	10.4	107.9	5.12	9.6	6.5	0.67	0.62	11.7	15.5
	2.5	3.4	7.9	13.1	0.75	10.5	108.4	5.13	9.9	6.5	0.66	0.60	11.9	16.4
90	1.2	0.7	1.6	13.6	0.76	11.0	110.0	5.24	9.2	6.1	0.67	0.72	11.6	12.7
	1.8	1.9	4.4	13.8	0.77	11.2	110.6	5.25	9.3	6.2	0.67	0.69	11.7	13.5
	2.5	3.3	7.6	14.0	0.78	11.3	111.2	5.26	9.4	6.3	0.67	0.67	11.7	14.1
100	1.2	0.7	1.5	Operation not recommended					Operation not recommended					
	1.8	1.8	4.3						9.0	6.0	0.67	0.76	11.6	11.8
	2.5	3.2	7.4						9.1	6.1	0.67	0.74	11.6	12.3
110	1.2	0.6	1.5						Operation not recommended					
	1.8	1.8	4.1						8.6	5.8	0.67	0.83	11.5	10.4
	2.5	3.1	7.2						8.7	5.9	0.68	0.81	11.5	10.7
120	1.2	0.6	1.4						Operation not recommended					
	1.8	1.7	4.0						8.2	5.5	0.67	0.90	11.3	9.1
	2.5	3.0	6.9						8.3	5.6	0.68	0.88	11.3	9.5

YC12 - Performance Data

350 Rated CFM Heating / Cooling

Performance capacities shown in thousands of Btuh.

EWT °F	Flow Rate GPM	Water Pressure Drop		HEATING - EAT 70 °F					COOLING - EAT 80/67 °F					
		PSI	FT/HD	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER
20	1.5	1.0	2.3	Operation not recommended					Operation not recommended					
	2.3	1.7	4.0											
	3.5	3.2	7.4	8.6	0.80	5.9	90.8	3.15						
30	1.5	0.9	2.1	Operation not recommended					Operation not recommended					
	2.3	1.7	3.8	10.0	0.85	7.1	94.3	3.44	14.2	9.8	0.69	0.45	15.8	31.6
	3.5	3.0	6.9	10.2	0.86	7.3	95.1	3.48	14.4	10.0	0.69	0.42	15.9	34.1
40	1.5	0.9	2.0	10.8	0.88	7.8	96.7	3.62	Operation not recommended					
	2.3	1.6	3.7	11.0	0.88	8.0	97.0	3.66	13.7	9.5	0.70	0.54	15.5	25.5
	3.5	2.9	6.6	11.3	0.89	8.2	97.8	3.72	13.9	9.7	0.70	0.50	15.6	27.6
50	1.5	0.8	1.8	11.9	0.91	8.8	99.6	3.86	13.0	9.1	0.70	0.64	15.2	20.2
	2.3	1.5	3.5	12.1	0.91	9.0	100.0	3.89	13.1	9.2	0.71	0.62	15.2	21.1
	3.5	2.7	6.2	12.3	0.92	9.2	100.6	3.94	13.3	9.4	0.71	0.58	15.3	22.8
60	1.5	0.8	1.7	13.2	0.94	10.0	103.0	4.14	12.1	8.6	0.71	0.71	14.5	17.0
	2.3	1.4	3.3	13.4	0.94	10.2	103.4	4.16	12.2	8.7	0.71	0.68	14.5	17.8
	3.5	2.6	6.0	13.7	0.96	10.4	104.2	4.19	12.4	8.9	0.71	0.65	14.6	19.2
70	1.5	0.7	1.6	14.5	0.97	11.2	106.4	4.39	11.1	8.0	0.72	0.77	13.8	14.4
	2.3	1.4	3.2	14.7	0.98	11.4	106.9	4.40	11.3	8.1	0.72	0.75	13.8	15.0
	3.5	2.5	5.8	15.0	1.00	11.6	107.7	4.41	11.5	8.3	0.72	0.71	13.9	16.3
80	1.5	0.7	1.5	15.6	1.03	12.1	109.4	4.45	10.6	7.8	0.73	0.84	13.5	12.6
	2.3	1.3	3.0	15.9	1.04	12.3	110.0	4.48	10.9	7.9	0.73	0.80	13.6	13.5
	3.5	2.5	5.7	16.1	1.05	12.5	110.6	4.50	11.0	8.0	0.73	0.78	13.7	14.1
90	1.5	0.6	1.4	16.7	1.07	13.0	112.1	4.55	10.2	7.5	0.73	0.92	13.4	11.1
	2.3	1.3	2.9	16.9	1.09	13.2	112.8	4.56	10.4	7.6	0.74	0.88	13.4	11.8
	3.5	2.4	5.5	17.2	1.10	13.4	113.5	4.57	10.5	7.7	0.73	0.85	13.4	12.4
100	1.5	0.6	1.3	Operation not recommended					Operation not recommended					
	2.3	1.2	2.8						9.7	7.3	0.75	1.00	13.1	9.7
	3.5	2.3	5.3						9.8	7.4	0.75	0.97	13.1	10.1
110	1.5	0.5	1.2						Operation not recommended					
	2.3	1.1	2.6						8.9	6.9	0.77	1.11	12.7	8.1
	3.5	2.2	5.1						9.1	7.0	0.77	1.08	12.8	8.4
120	1.5	0.5	1.2						Operation not recommended					
	2.3	1.1	2.5						8.5	6.7	0.79	1.21	12.6	7.0
	3.5	2.1	4.9						8.7	6.8	0.78	1.18	12.7	7.4

YC15 - Performance Data

450 Rated CFM Heating / Cooling

Performance capacities shown in thousands of Btuh.

EWT °F	Flow Rate GPM	Water Pressure Drop		HEATING - EAT 70 °F					COOLING - EAT 80/67 °F					
		PSI	FT/HD	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER
20	2.0	1.8	4.1	Operation not recommended					Operation not recommended					
	3.0	3.4	7.8											
	4.5	5.9	13.6	10.7	0.93	7.5	90.0	3.37						
30	2.0	1.7	3.9	Operation not recommended					Operation not recommended					
	3.0	3.3	7.6	11.8	0.95	8.5	92.2	3.62	17.1	12.2	0.71	0.48	18.7	35.6
	4.5	5.7	13.2	12.3	0.97	9.0	93.3	3.72	17.3	12.4	0.71	0.45	18.9	38.4
40	2.0	1.7	3.8	12.7	0.95	9.4	94.1	3.93	Operation not recommended					
	3.0	3.2	7.5	12.9	0.96	9.6	94.6	3.94	16.7	12.0	0.72	0.60	18.8	27.8
	4.5	5.6	12.9	13.4	0.98	10.1	95.6	4.02	17.0	12.2	0.72	0.57	18.9	30.0
50	2.0	1.6	3.7	13.9	0.95	10.6	96.5	4.27	16.2	11.7	0.72	0.75	18.8	21.5
	3.0	3.2	7.3	14.1	0.97	10.8	97.1	4.28	16.4	11.8	0.72	0.72	18.8	22.6
	4.5	5.5	12.7	14.6	0.99	11.2	97.9	4.31	16.6	12.0	0.72	0.68	18.9	24.4
60	2.0	1.6	3.6	15.2	0.96	12.0	99.4	4.66	15.5	11.4	0.74	0.84	18.3	18.3
	3.0	3.1	7.1	15.6	0.97	12.2	100.0	4.69	15.6	11.5	0.74	0.81	18.4	19.2
	4.5	5.4	12.5	16.1	1.00	12.7	101.0	4.72	15.9	11.8	0.74	0.77	18.5	20.7
70	2.0	1.5	3.5	16.6	0.96	13.3	102.2	5.05	14.7	11.1	0.76	0.94	17.9	15.7
	3.0	3.0	7.0	17.0	0.98	13.7	103.0	5.08	14.9	11.3	0.76	0.90	18.0	16.5
	4.5	5.3	12.2	17.6	1.00	14.1	104.1	5.12	15.2	11.5	0.76	0.86	18.1	17.8
80	2.0	1.5	3.4	18.3	1.03	14.8	105.7	5.22	14.2	10.9	0.77	1.00	17.6	14.1
	3.0	3.0	6.8	18.6	1.04	15.1	106.3	5.24	14.5	11.1	0.77	0.96	17.7	15.1
	4.5	5.2	12.0	18.9	1.05	15.3	106.8	5.26	14.7	11.2	0.76	0.93	17.8	15.8
90	2.0	1.4	3.2	19.6	1.07	15.9	108.3	5.35	13.7	10.6	0.77	1.08	17.4	12.7
	3.0	2.9	6.7	19.9	1.09	16.2	108.9	5.36	13.9	10.8	0.78	1.03	17.4	13.5
	4.5	5.1	11.8	20.2	1.10	16.4	109.5	5.38	14.1	10.9	0.77	1.00	17.5	14.1
100	2.0	1.4	3.1	Operation not recommended					Operation not recommended					
	3.0	2.8	6.5						13.4	10.5	0.78	1.14	17.3	11.8
	4.5	5.0	11.6						13.6	10.6	0.78	1.10	17.3	12.3
110	2.0	1.3	3.0						Operation not recommended					
	3.0	2.8	6.4						12.8	10.1	0.79	1.23	17.0	10.4
	4.5	4.9	11.3						13.0	10.3	0.79	1.20	17.1	10.8
120	2.0	1.3	2.9						Operation not recommended					
	3.0	2.7	6.2						11.3	9.2	0.81	1.39	16.0	8.1
	4.5	4.8	11.1						11.5	9.3	0.81	1.35	16.1	8.5

YC18 - Performance Data

500 Rated CFM Heating / Cooling

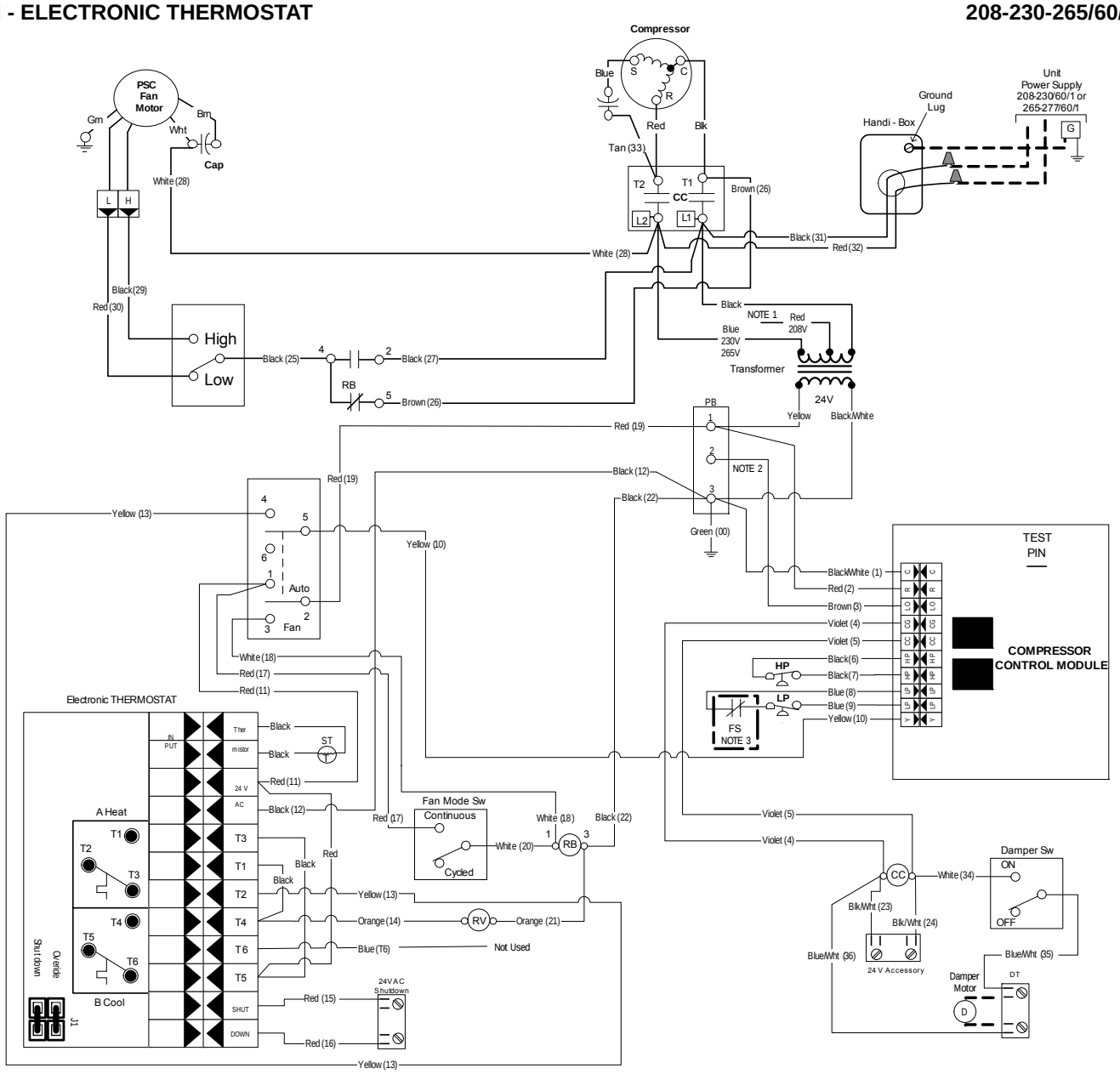
Performance capacities shown in thousands of Btuh.

EWT °F	Flow Rate GPM	Water Pressure Drop		HEATING - EAT 70 °F					COOLING - EAT 80/67 °F					
		PSI	FT/HD	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER
20	3.0	1.8	4.1	Operation not recommended					Operation not recommended					
	4.0	4.2	9.7											
	5.5	8.0	18.5	13.0	1.20	8.9	92.0	3.16						
30	3.0	1.7	3.9	Operation not recommended					Operation not recommended					
	4.0	4.1	9.6	14.2	1.24	10.0	94.3	3.35	22.2	16.0	0.72	0.69	24.6	32.1
	5.5	7.9	18.2	14.3	1.25	10.1	94.5	3.36	22.5	16.3	0.72	0.65	24.7	34.6
40	3.0	1.7	3.8	15.5	1.26	11.2	96.7	3.60	Operation not recommended					
	4.0	4.1	9.4	15.8	1.27	11.5	97.3	3.65	21.3	15.5	0.72	0.79	24.1	26.9
	5.5	7.8	17.9	16.2	1.28	11.8	98.0	3.71	21.7	15.8	0.73	0.75	24.2	29.1
50	3.0	1.6	3.7	17.2	1.28	12.8	99.9	3.93	20.3	14.8	0.73	0.93	23.5	21.9
	4.0	4.0	9.2	17.6	1.29	13.2	100.5	3.98	20.5	14.9	0.73	0.89	23.5	23.0
	5.5	7.6	17.6	18.1	1.31	13.6	101.5	4.05	20.8	15.2	0.73	0.84	23.7	24.8
60	3.0	1.6	3.6	19.2	1.30	14.8	103.6	4.33	19.0	13.9	0.73	1.01	22.4	18.7
	4.0	3.9	9.1	19.7	1.32	15.2	104.4	4.37	19.2	14.1	0.73	0.97	22.5	19.7
	5.5	7.5	17.3	20.3	1.34	15.7	105.6	4.43	19.5	14.4	0.74	0.92	22.6	21.2
70	3.0	1.5	3.5	21.3	1.32	16.8	107.4	4.71	17.6	13.1	0.74	1.09	21.3	16.1
	4.0	3.9	8.9	21.8	1.34	17.2	108.3	4.75	17.8	13.2	0.74	1.06	21.5	16.9
	5.5	7.4	17.1	22.5	1.37	17.8	109.7	4.80	18.2	13.5	0.74	1.00	21.6	18.2
80	3.0	1.5	3.4	23.3	1.40	18.6	111.2	4.88	17.1	12.9	0.75	1.25	21.3	13.7
	4.0	3.8	8.8	23.7	1.41	18.9	111.9	4.92	17.4	13.1	0.75	1.19	21.5	14.7
	5.5	7.3	16.9	24.0	1.43	19.1	112.4	4.93	17.7	13.2	0.75	1.15	21.6	15.3
90	3.0	1.4	3.2	24.7	1.44	19.8	113.8	5.03	16.6	12.6	0.76	1.41	21.4	11.8
	4.0	3.7	8.6	25.1	1.46	20.1	114.5	5.04	16.9	12.8	0.76	1.34	21.5	12.6
	5.5	7.2	16.6	25.5	1.48	20.5	115.2	5.06	17.1	12.9	0.75	1.30	21.5	13.2
100	3.0	1.4	3.1	Operation not recommended					Operation not recommended					
	4.0	3.7	8.5						16.4	12.5	0.76	1.49	21.5	11.0
	5.5	7.1	16.3						16.6	12.6	0.76	1.44	21.5	11.5
110	3.0	1.3	3.0						Operation not recommended					
	4.0	3.6	8.3						15.8	12.1	0.77	1.62	21.3	9.7
	5.5	6.9	15.9						16.0	12.3	0.77	1.58	21.4	10.1
120	3.0	1.3	2.9						Operation not recommended					
	4.0	3.5	8.2						14.7	11.7	0.80	1.77	20.8	8.3
	5.5	6.8	15.7						15.0	11.9	0.79	1.72	20.9	8.7

Wiring Schematics

CCM - ELECTRONIC THERMOSTAT

208-230-265/60/1



Legend

- Factory low voltage wiring
- Factory line voltage wiring
- Field low voltage wiring
- Field line voltage wiring
- Quick connect terminal
- Wire nut

CC - Compressor Contactor
DT - Damper Terminal Block
FS - Freeze Sensing Device
HP - High Pressure Switch
LP - Low Pressure Switch
PB - Power Block
RB - Blower Relay
RV - Reversing Valve Coil
ST - Entering Air Temperature Sensor

- L1 — Field wire lug
- Earth Ground
- Relay Contacts- N.O., N.C.
- P — Polarized connector
- HP — Switch - High Pressure
- LP — Switch - Low Pressure
- Relay coil
- Capacitor
- Thermistor
- Temperature Switch

Notes:

1. Switch Red and Blue wires for 208 volt operation
2. Terminal C of 24 V PB is used as "L" output for Brown wire3 for Lockout
3. Optional field installed freeze sensing device.

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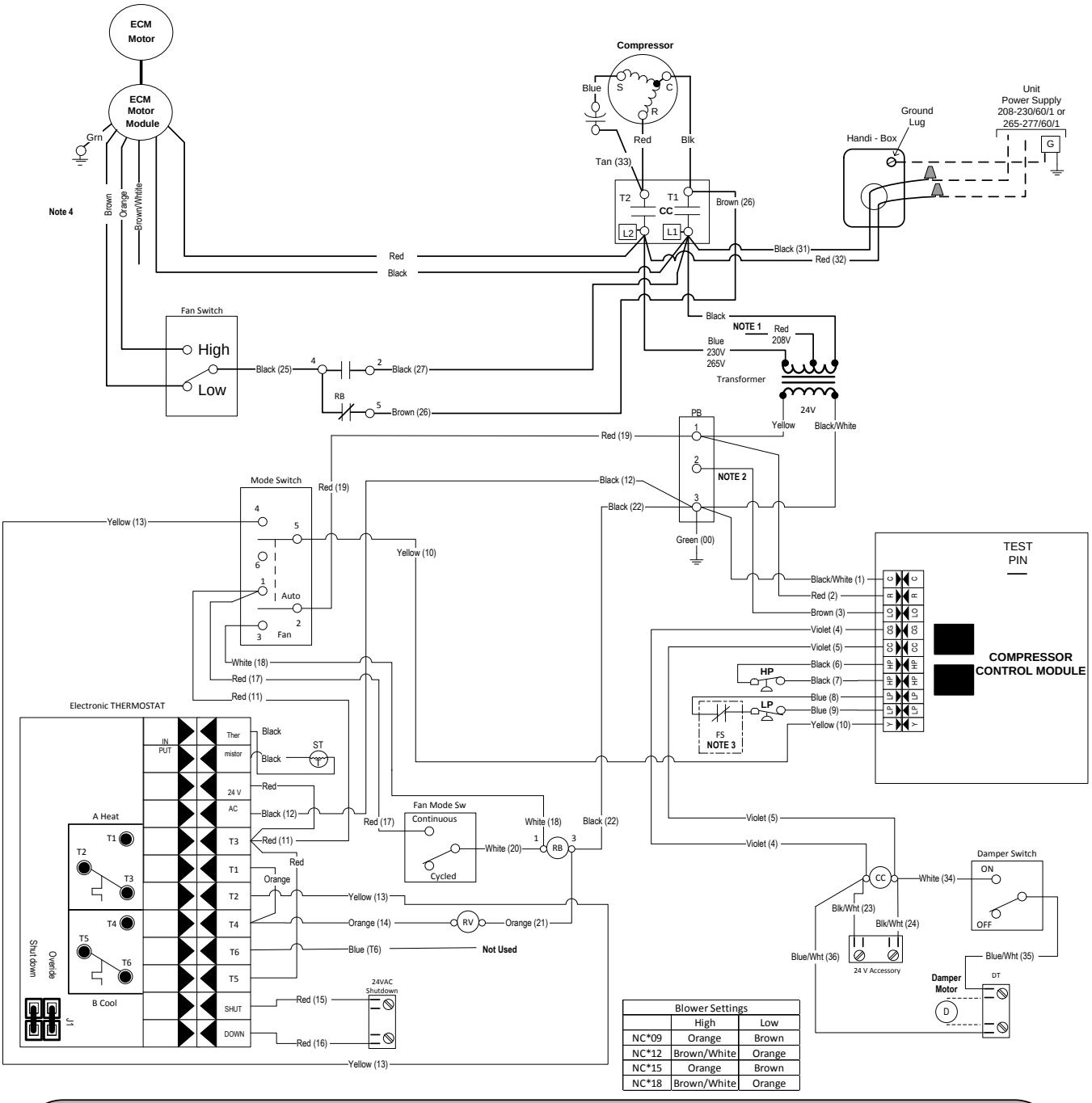
Wiring Schematics cont.

CCM w/ECM - ELECTRONIC THERMOSTAT **208-230-265/60/1**



Blower Settings		
	High	Low
NC*09	Orange	Brown
NC*12	Brown/White	Orange
NC*15	Orange	Brown
NC*18	Brown/White	Orange

Legend

- Factory low voltage wiring
- Factory line voltage wiring
- Field low voltage wiring
- Field line voltage wiring
- Quick connect terminal
- Wire nut

CC - Compressor Contactor
DT - Damper Terminal Block
FS - Freeze Sensing Device
HP - High Pressure Switch
LP - Low Pressure Switch
PB - Power Block
RB - Blower Relay
RV - Reversing Valve Coil
ST - Entering Air Temperature Sensor

- L1 — Field wire lug
- Earth Ground
- Relay Contacts - N.O., N.C.
- P 2 3 1 — Polarized connector

- HP — Switch - High Pressure
- LP — Switch - Low Pressure
- Relay coil
- Capacitor
- Thermistor
- Temperature Switch

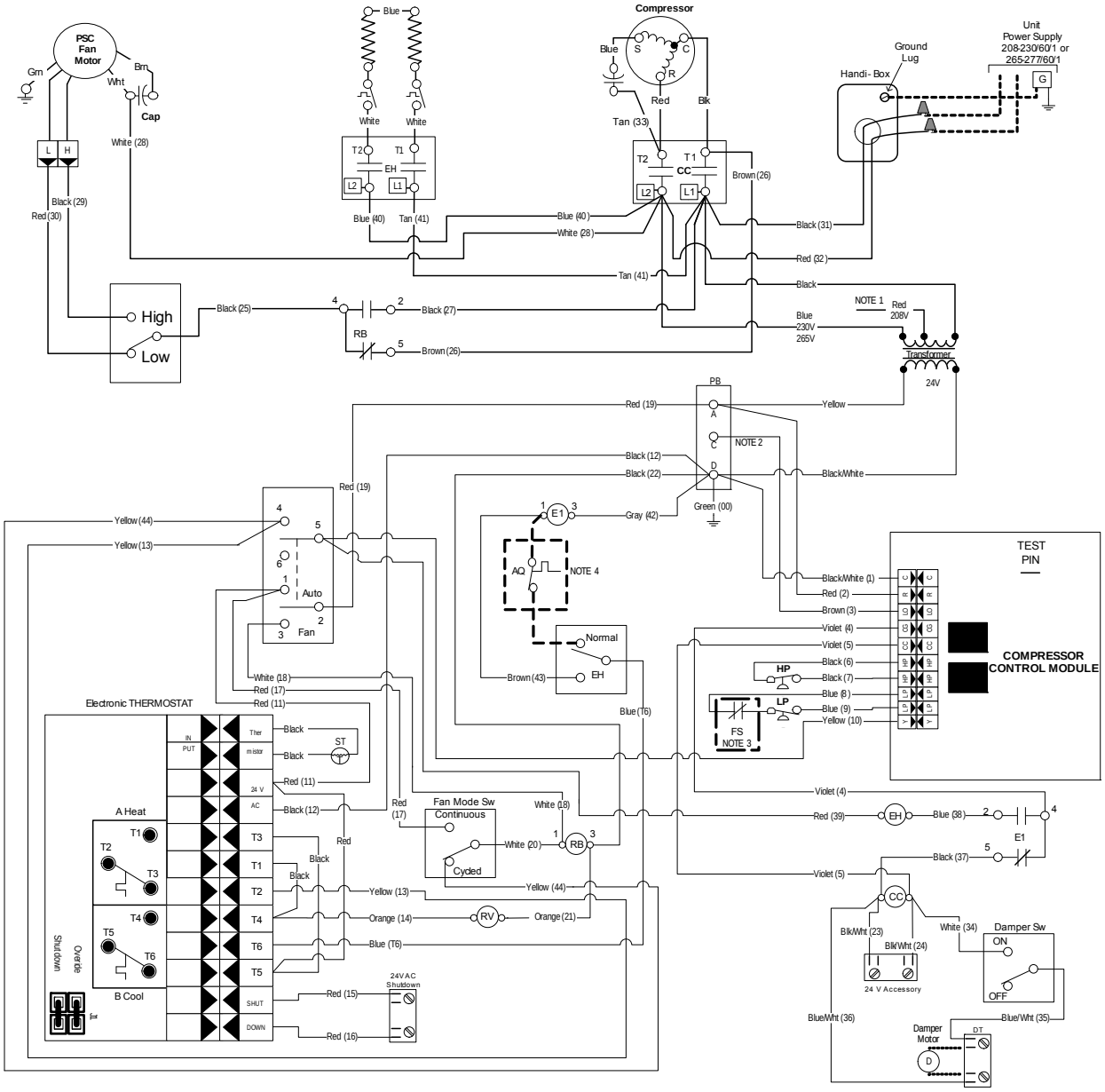
Notes:

1. Switch Red and Blue wires for 208 volt operation
2. Terminal C of 24 V PB is used as "L" output for Brown wire 3 for Lockout.
3. Optional field installed freeze sensing device.
4. Factory wired. Refer to blower table settings.

Wiring Schematics cont.

CCM w/EH - ELECTRONIC THERMOSTAT

208-230-265/60/1



Legend

- Factory low voltage wiring
- Factory line voltage wiring
- Field low voltage wiring
- Field line voltage wiring
- Quick connect terminal
- Wire nut

AQ - Aquastat
CC - Compressor Contactor
DT - Damper Terminal Block
E1 - Electric Heat Relay
EH - Electric Heat Contactor
FS - Freeze Sensing Device
HP - High Pressure Switch
LP - Low Pressure Switch
PB - Power Block
RB - Blower Relay
RV - Reversing Valve Coil
ST - Entering Air Temperature Sensor

- L1 — Field wire lug
- Earth Ground
- Relay Contacts N.O., N.C.
- P — Polarized connector (2, 3, 1)

- HP — Switch - High Pressure
- LP — Switch - Low Pressure
- Relay coil
- Capacitor
- Thermistor
- Temperature Switch

Notes:

1. Switch Red and Blue wires for 208 volt operation
2. Terminal C of 24 V PB is used as "L" output for Brown wire 3 for Lockout
3. Optional field installed freeze sensing device.
4. Optional field installed aquastat

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Wiring Schematics cont.

VERSATEC CONTROL - EH & REMOTE WALL THERMOSTAT 208-230-265/60/1

Legend for Schematic [A]

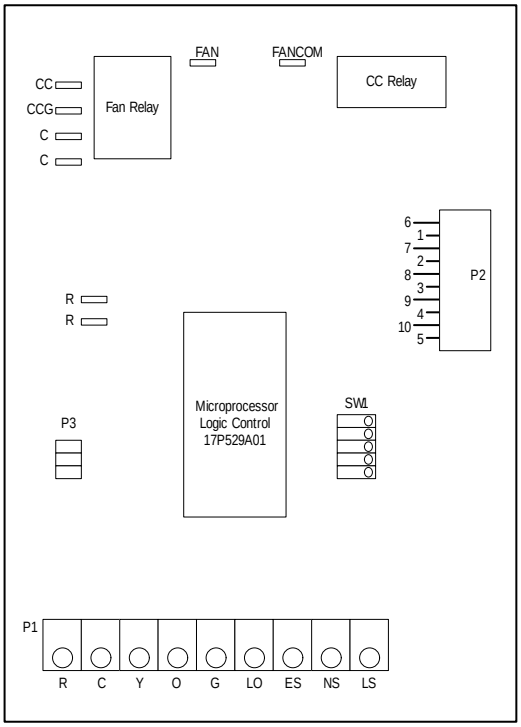
Normal Control Timing Table

Blower off delay	30 seconds
Compressor on delay	10 seconds
Short cycle delay	5 minutes
Minimum compressor on time	60 seconds (except for fault condition)
High pressure fault recognition delay	Less than 1 second
Low pressure fault recognition delay	30 seconds
Freeze sensing fault recognition delay	30 seconds
Condensate overflow fault recognition delay	30 seconds
Low pressure fault bypass delay	2 minutes
Freeze sensing fault bypass delay	2 minutes
Motorized valve delay	90 seconds
Random start delay	0 - 25 seconds

Test Control Timing Table

Blower off delay	5 seconds
Compressor on delay	2 seconds
Short cycle delay	15 seconds
Minimum compressor on time	5 seconds (except for fault condition)
High pressure fault recognition delay	Less than 1 second
Low pressure fault recognition delay	30 seconds
Freeze sensing fault recognition delay	30 seconds
Condensate overflow fault recognition delay	30 seconds
Low pressure fault bypass delay	0 seconds
Freeze sensing fault bypass delay	0 seconds
Motorized valve delay	90 seconds
Random start delay	0 seconds

Versatec Logic Board Physical Layout



LED Display Mode Table

LED	Normal Display Mode
	SW1 - #4 On, SW2 Off
Drain	Drain pan overflow lockout
Water Flow	FS thermistor (loop <15°F, well <30°F) lockout
High Press	High pressure >600 PSI lockout
Low Press	Low pressure < 40 PSI lockout
Air Flow	Not used
Status	Microprocessor malfunction*
DHW Limit	Not Used
HWD	SW2 status (Off = down position, On = up position)

Diagnostic Modes			
LED	Current Fault Status	Inputs	Outputs
	SW1- #4 On, SW2 On	SW1- #4 Off, SW2 Off	SW1- #4 Off, SW2 On
Drain	Drain pan overflow	Y	Compressor
Water Flow	FS thermistor (loop <15°F, well <30°F)	G	FAN
High Press	High pressure >600 PSI	O	O
Low Press	Low pressure < 40 PSI	ES	ES
Air Flow	Not used	NS	NS
Status	Not used	LS	LS
DHW Limit	Not used	Not Used	Not Used
HWD	SW2 in the On position	Off position	On position

*Flashing Status light indicates microprocessor is functioning properly Solid "on" indicates a microprocessor malfunction.

Logic Board DIP Switch Settings

Switch	OFF	ON
SW1 - 1	Test - Selected timings sped up to facilitate troubleshooting	Normal - Standard timings
SW1 - 2	Loop - Closed loop freeze sensing setting (15°F)	Well - Open loop freeze sensing setting (30°F)
SW1 - 3	Enables NS features	Normal - Standard thermostat operation
SW1 - 4	IO Display * - Enables Input/Output display on external LED board*	Normal * - Unit status display
SW1 - 5	Motorized Valve - 1.5 minute compressor on delay	Normal - Standard delay on call from compressor used
SW2	OFF * - Normal or Input display mode activated	ON * - Current fault or Output display mode activated

*Refer to LED Display Mode table for position of SW1-4 and SW2

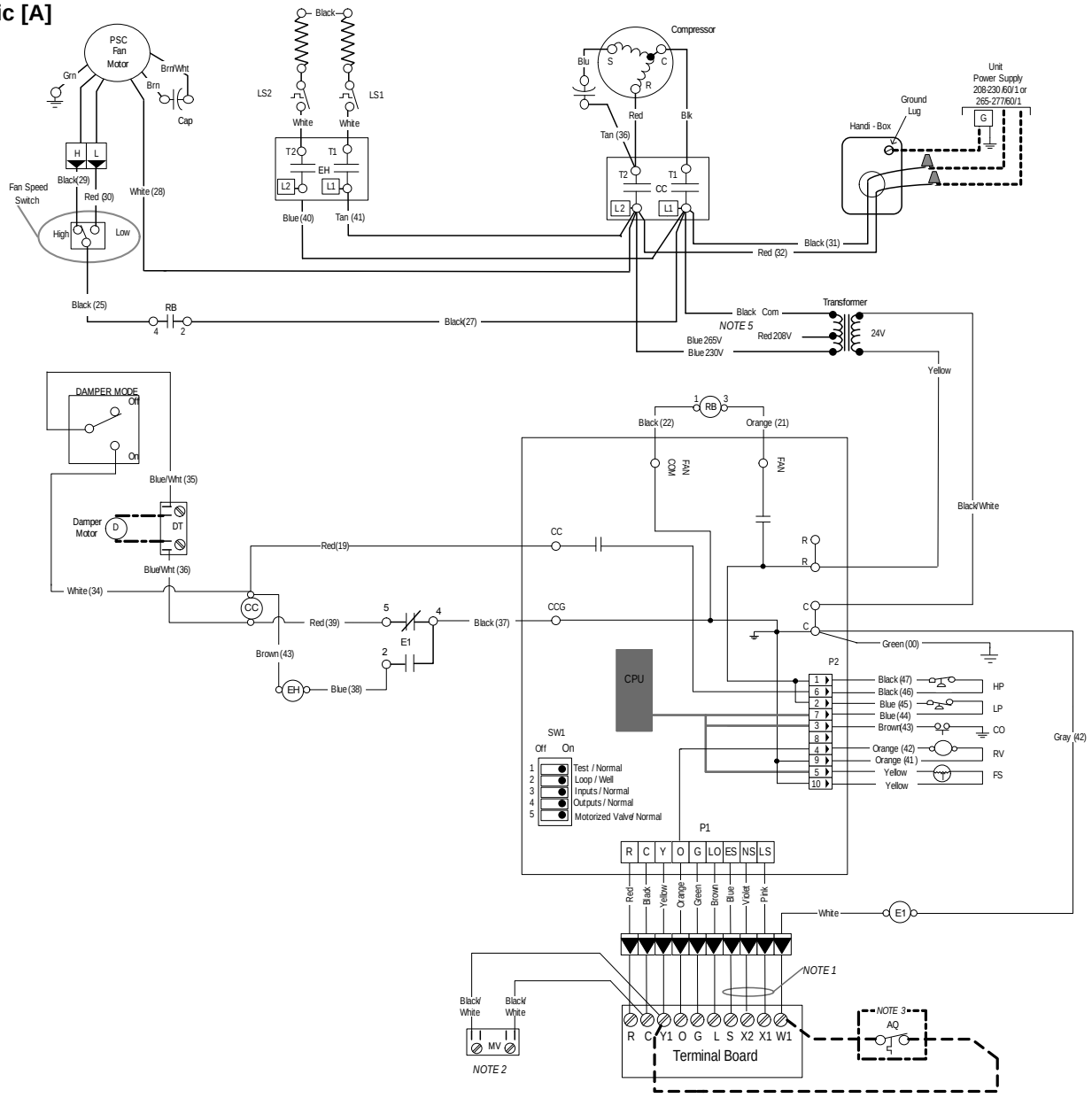
Operational Logic Table

Mode	Inputs	Fan	Comp	RV
Htg	Y	ON	ON	OFF
Clg	Y,O	ON	ON	ON
Fan	G	ON	OFF	OFF

Wiring Schematics cont.

VERSATEC CONTROL - EH & REMOTE WALL THERMOSTAT 208-230-265/60/1

Schematic [A]



Legend

Factory low voltage wiring Factory line voltage wiring Field low voltage wiring Field line voltage wiring DC voltage PCB traces Internal junction Quick connect terminal Wire nut L1 Field wire lug Ground	Relay Contacts N.O., N.C. Thermistor Relay coil	Switch - High pressure Switch - Low pressure P 1 2 3 Polarized connector Condensate Overflow	AQ – Aquastat CC – Compressor Contactor CO – Condensate Overflow DT – Damper Terminal Block E1 – Electric Heat Relay EH – Electric Heat Contactor ES – Emergency Shutdown FS – Freeze Sensing Device HP – High Pressure Switch LP – Low Pressure Switch LS – Loadshed MV – Motorized Valve NS – Night Setback RB – Blower Power Relay RV – Reversing Valve Coil SW1 – DIP Switch #1	Notes 1 - Requires common connection or24 VAC for activation. 2 - When field installed 24VAC motorized valve is used, connect to C and Y or SV terminals 3 - Optional field installed aquastat for use with single heat 4 - Check installation wiring information for specific thermostat hookup instructions 5 - Switch blue and red wires for208/ operation.

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Engineering Guide Specifications

General

Furnish and install York Water Source Heat Pumps, as indicated on the plans. Equipment shall be completely assembled, piped and internally wired. Chassis shall be installed with factory built cabinet or other approved custom cabinet. Chassis SHALL NOT be installed without an approved cabinet enclosure. Capacities and characteristics as listed in the schedule and the specifications that follow. The reverse cycle heating/cooling units shall be floor mounted console type with horizontal air inlet and up-flow air discharge. Units shall be AHRI/ISO 13256-1 certified and listed by a nationally recognized safety-testing laboratory or agency, such as ETL Testing Laboratory. Each unit shall be computer run-tested at the factory with conditioned water and operation verified to catalog data. Each unit shall be mounted on a pallet and shipped in a corrugated box or stretch-wrapped. The units shall be designed to operate with entering liquid temperature between 20°F and 120°F [-6.7°C and 48.9°C].

Chassis & Cabinet

The cabinet shall be fabricated from heavy-gauge galvanized steel and finished with a beige textured epoxy powder coating on both sides for added protection. This corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117.

The cabinet shall be easily removable to allow for ease of service to the controls compartment, chassis, and piping. The top of the cabinet and grille is a horizontally flat (optional sloped) surface with a hinged control door cover. The return air filter shall be 1" (25.4 mm) fiberglass disposable type media.

The return and supply air sections are insulated with a 1/4" (6.4 mm) thick, dual density, 2 lb/ft3 (32 kg/m3) coated mat glass fiber with edges sealed or tucked under flanges to prevent the introduction of glass fibers into the discharge supply air through the aluminum grille. Standard cabinet panel insulation must meet NFPA 90A requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM-C1071 and ASTM G21, and shall meet zero level bacteria growth per ASTM G22. Unit insulation must meet these stringent requirements or unit(s) will not be accepted.

Option: A Super Quiet Sound package shall include multi-density full coverage compressor blanket.

Option: Shipped with motorized outside air damper and damper assembly for 25% make-up air.

The drain pan shall be of stainless steel construction to inhibit corrosion and bacterial growth. Drain outlet shall be located on pan as to allow complete and unobstructed drainage of condensate. The unit as standard will be supplied with solid-state electronic condensate overflow protection with microprocessor. Mechanical float switches WILL NOT be accepted. Condensate tube shall be constructed of stainless steel and have an internal factory installed condensate trap.

Refrigerant Circuit

All units shall utilize the non-ozone depleting and low global warming potential refrigerant R410A. All units shall contain a sealed refrigerant circuit including a hermetic motor-compressor, bi-directional thermostatic expansion valve, finned tube air-to-refrigerant heat exchanger, reversing valve, coaxial tube water-to-refrigerant heat exchanger, and service ports.

Compressors shall be high-efficiency single speed rotary type designed for heat pump duty and mounted on durometer grommets to provide vibration free compressor mounting. Compressor motors shall be single-phase PSC with external overload protection.

The air coil shall be sized for low-face velocity and constructed of lanced aluminum fins bonded to rifled aluminum tubes in a staggered pattern not less than three rows deep for enhanced performance.

Option: AlumiSeal electro-coated air coil.

The coaxial water-to-refrigerant heat exchanger shall be designed for low water pressure drop and constructed of a convoluted copper (cupronickel option) inner tube and a steel outer tube. Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled aluminum tube construction rated to withstand 600 psig (4135 kPa) refrigerant working pressure. Refrigerant-to-water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 600 psig (4135 kPa) working refrigerant pressure and 450 psig (3101 kPa) working water pressure. The thermostatic expansion valve shall provide proper superheat over the entire liquid temperature range with minimal "hunting." The valve shall operate bi-directionally without the use of check valves.

Option: Cupro-nickel refrigerant to water heat exchanger shall be of copper-nickel inner water tube and steel refrigerant outer tube design, rated to withstand 600 PSIG (4135 kPa) working refrigerant pressure and 450 PSIG (3101 kPa) working water pressure. Water lines shall also be of cupronickel construction.

Option: ThermaShield coated water-to-refrigerant heat exchanger, water lines and refrigerant suction lines shall be insulated to prevent condensation at low liquid temperatures below 50°F.

Blower Motor & Assembly

The blower shall be a direct drive centrifugal type with a twin dynamically balanced wheel. The housing and wheel shall be designed for quiet, low outlet velocity operation. The blower housing shall be constructed of galvanized steel and shall be removable from the unit for servicing of the blower motor. The blower motor shall be a two-speed type and shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated and have thermal overload protection.

Electrical

A control box shall be located within the unit compressor compartment and shall contain a 75VA transformer, 24 Volt activated, 2 pole compressor contactor, and solid-state controller for complete unit operation. Units shall be name-plated for use with

Engineering Guide Specifications cont.

time delay fuses or HACR circuit breakers. Unit controls shall be 24 Volt and provide heating or cooling as required by the remote thermostat/sensor.

Unit mounted controls shall consist of switches for “OFF”, “FAN”, and “AUTO” or “HEAT/COOL”. An additional switch is provided for blower speed setting of “HI” or “LO”. The unit shall be equipped with a blower switch on the side of the control to provide “CONTINUOUS” or “CYCLED” blower operation. “CYCLED” blower will turn the blower on with the compressor. A unit-mounted electronic thermostat with a remote electronic thermistor located in the return air will control compressor operation in heating and cooling modes. Unit mounted thermostat shall be the standard thermostat option. All unit mounted thermostats shall be auto changeover. Manual changeover WILL NOT be accepted. Electromechanical operation WILL NOT be accepted.

Controls

Standard: A compressor control module (CCM) shall be included to disable compressor operation in the event of a trip of any of the safety switches and to send a signal to activate a fault indicator light at the thermostat. The CCM shall be capable of being reset from the thermostat or from the unit main disconnect switch. A terminal block with screw terminals shall be provided for field connection of all low-voltage wiring.

Option: Versatec microprocessor-based controller will provide operational sequencing; high and low pressure switch monitoring, freeze detection, lockout mode control, emergency shutdown mode, random start, short cycle protection, LED mode and fault indicators, fault memory, input and output diagnostics, and field selectable options, and condensate overflow sensing.

Option: Remote mounted thermostat is available for CCM & Versatec. A terminal block with screw terminals will be provided for field control wiring.

Piping

Supply and return water connections shall be 1/2 in. [12.7 mm] FPT copper threaded fittings. All water piping shall be insulated to prevent condensation at low liquid temperatures.

A stainless steel tube stubbed out from the chassis is provided for condensate drain attachment. A short piece of polyvinyl hose is supplied to assist in adapting to drain.

Accessories

Hose Kits – Ball Valves (field-installed)

A flexible steel braid hose featuring Kevlar® reinforced EPDM core with ANSI 302/304 stainless steel outer braid and fire rated materials per ASTM E 84-00 (NFPA 255, ANSI/UL 723 & UBC 8-1). Ball valve at one end; swivel connector with adapter at the other end (swivel to adapter connection via fiber or EPDM gasket). Swivel connection provides union between heat pump and piping system. The hoses feature brass fittings, stainless steel ferrules. A full port ball valve shall be provided with integral P/T (pressure/temperature) port on supply hose. Specifications: Temperature range of 35°F [2°C] to 180°F [82°C]. Max. working pressure of 400 psi [2757 kPa] for 1/2˝ and 3/4˝ hose kits; max. working pressure of 350 psi [kPa] for 1˝ and 1-1/4˝ hose kits.

Hose Kits - Automatic Balancing and Ball Valves (field-installed)

A flexible steel braid hose featuring Kevlar® reinforced EPDM core with ANSI 302/304 stainless steel outer braid and fire rated materials per ASTM E 84-00 (NFPA 255, ANSI/UL 723 & UBC 8-1). Ball valve at one end; swivel connector with adapter at the other end (swivel to adapter connection via fiber or EPDM gasket). Swivel connection provides union between heat pump and piping system. The hoses feature brass fittings, stainless steel ferrules. A full port ball valve shall be provided with integral P/T (pressure/temperature) port on supply hose and automatic balancing valve with integral P/T ports and full port ball valve on return hose.
Specifications:

- Temperature range of 35°F [2°C] to 180°F [82°C].
- Max. working pressure of 400 psi [2757 kPa] for 1/2˝ and 3/4˝ hose kits; max. working pressure of 350 psi [2413 kPa] for 1˝ and 1-1/4˝ hose kits.
- Minimum burst pressure of four times working pressure.

Hose Kits – Automatic Balancing and Ball Valves with ‘Y’ strainer (field-installed)

A flexible steel braid hose featuring Kevlar® reinforced EPDM core with ANSI 302/304 stainless steel outer braid and fire rated materials per ASTM E 84-00 (NFPA 255, ANSI/UL 723 & UBC 8-1). Ball valve at one end; swivel connector with adapter at the other end (swivel to adapter connection via fiber or EPDM gasket). Swivel connection provides union between heat pump and piping system. The hoses feature brass fittings, stainless steel ferrules. A “y” strainer is provided on one end for fluid straining and integral “blowdown” valve.. A full port ball valve shall be provided with integral P/T (pressure/temperature) port on supply hose and automatic balancing valve with integral P/T ports and full port ball valve on return hose.
Specifications:

- Temperature range of 35°F [2°C] to 180°F [82°C].
- Max. working pressure of 400 psi [2757 kPa] for 1/2˝ and 3/4˝ hose kits; max. working pressure of 350 psi [2413 kPa] for 1˝ and 1-1/4˝ hose kits.
- Minimum burst pressure of four times working pressure.

Auxiliary Heater (field-installed 208-230V units only)

An electric resistance heater shall provide supplemental and/or emergency heating capability. A manual switch shall be mounted on the side of the control compartment with “NORMAL” or “BOILERLESS” mode. “NORMAL” will run the compressor when there is a call for heating or cooling. “BOILERLESS” mode operation will run electric heat whenever there is a call for heating and run the compressor for a cooling call.

Notes

Revision Guide

Pages:	Description:	Date:	By:
All	Updated with All-Aluminum Air Coils	10 Mar 2014	DS
All	First Published	30 Oct 2013	DS

Product:	**Affinity Console Series**
Type:	Geothermal/Water Source Heat Pumps
Size:	0.75-1.5 Ton
Document Type:	Specification Catalog
Part Number:	SC101CK6
Release Date:	03/14