TruClimate 100

30 to 150 kW
Commercial Reversible Chiller - 50 Hz

TruClimate 100 10 - 50 Ton Installation Manual

Installation Information

Water Piping Connections

Electrical Data

Microprocessor Control

Startup Procedures

Preventive Maintenance



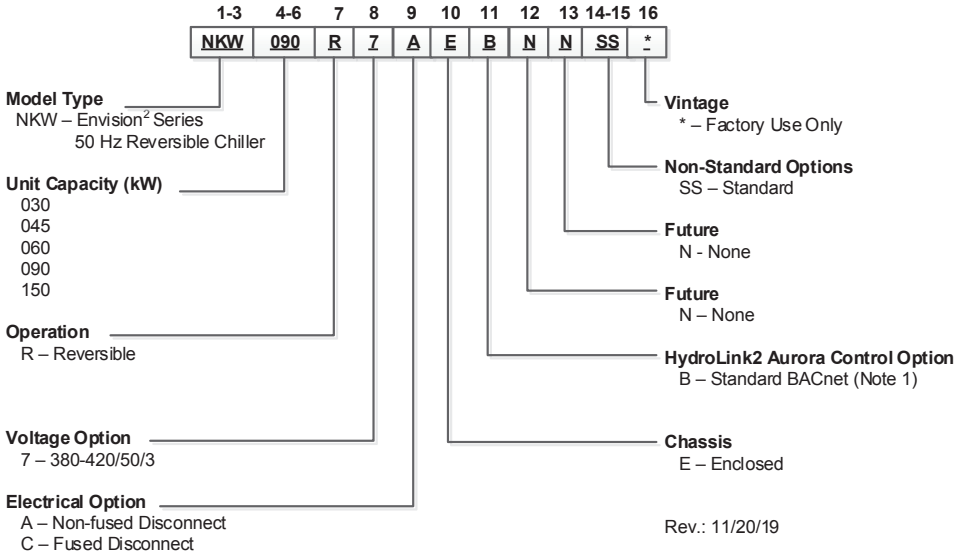
WaterFurnace
Commercial Solutions

IM2552WNB 06/23

Table of Contents

Model Nomenclature 4
Energy Labelling 4
Supervisory Control Nomenclature 5
General Installation Information 6
Physical Dimensions 8
Physical Data 11
Field Connected Water Piping 12
Typical Piping 13
Application Data 14
Water Quality 15
System Cleaning and Flushing 16
Electrical Data 17
Wiring Schematics 19
Field Wiring and Control Setup 24
HydroLink2 Supervisory Control 26
HydroLink2 Aurora Controls 28
Using the HydroLink2 Aurora Color Touch Tablet 35
Reference Calculations 60
Legend 60
Unit Startup 60
Operating Parameters 61
Pressure Drop 62
Compressor / Thermistor Resistance 63
Operating Limits 63
Troubleshooting 64
Heating and Cooling Cycle Analysis 64
Troubleshooting Form 66
Factory Start-up 67
Preventive Maintenance 70
Replacement Fuse Chart 70
Technical Documentation 71
Revision Guide 74

Model Nomenclature



Notes:
1. Standard controls option includes BACnet and standalone control.

Reversible Chiller Availability

Voltage	Chiller				
	030	045	060	090	150
380-420/50/3	•	•	•	•	•

Legend: 10/7/14
NA = Not Available
• = Voltage available in this size

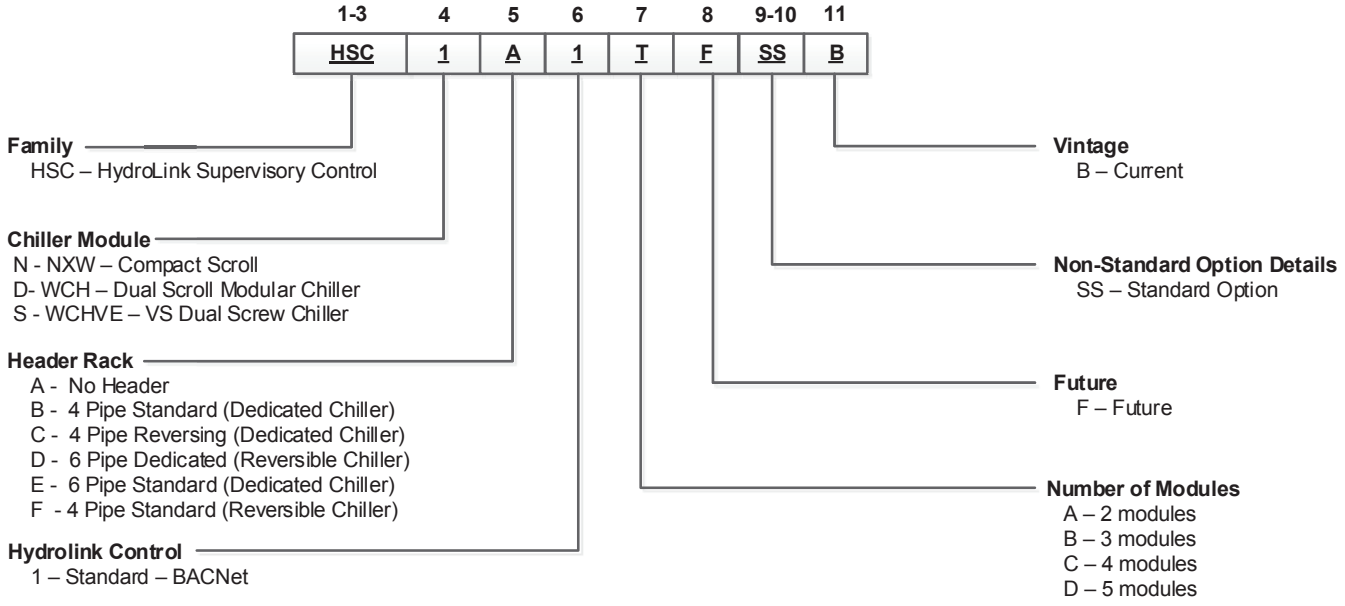
Energy Labelling

Supplier		WaterFurnace International, Inc.					
Model		NKW030		NKW045		NKW060	
Model hot water heater		-		-		-	
Temperature application	°C	35	55	35	55	35	55
Declared load profile for water heating		-		-		-	
Seasonal space heating energy efficiency class, average climate		A++	A+	A++	A+	A++	A+
Water heating energy efficiency class, average climate		-		-		-	
Rated heat output (Pdesignh), average climate	kW	29		43		54	
Annual energy consumption space heating, average climate	kWh	16,186	19,872	22,059	26,531	29,951	29,610
Annual energy consumption water heating, average climate	kWh	-		-		-	
Seasonal space heating energy efficiency, average climate	%	142	110	152	122	158	122
Water heating energy efficiency, average climate	%	-		-		-	
Sound power level LWA indoors	dB	62		64		64	
Rated heat output (Pdesignh), cold climate	kW	29		43		54	
Rated heat output (Pdesignh), warm climate	kW	29		43		54	
Sound power level LWA outdoors dB	dB	-		-		-	

3/18/2016

All TruClimate 100 10-50 Ton 50Hz product is safety tested to CE standards and performance tested in accordance with standard EN 14511-2.

HydroLink2 Supervisory Control Box Nomenclature



General Installation Information

Safety Considerations

Installing and servicing air conditioning and heating 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. 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 quenching cloth for brazing operations. Have fire extinguisher available for all brazing operations.

NOTE: Before installing, check voltage of unit(s) to ensure proper voltage.

WARNING: Before performing service or maintenance operations on the system, turn off main power switches to the unit. Electrical shock could cause serious personal injury.

Application

Units are not intended for heating domestic (potable water) by direct coupling. If used for this type of application, a secondary heat exchanger must be used.

Moving and Storage

Move units in the normal “Up” orientation as indicated by the labels on the unit packaging. When the equipment is received, all items should be carefully checked against the bill of lading to ensure that all crates and cartons have been received in good condition. Examine units for shipping damage, removing unit packaging if necessary to properly inspect unit. Units in question should also be internally inspected. If any damage is observed, the carrier should make the proper notation on delivery receipt acknowledging the damage. Units are to be stored in a location that provides adequate protection from dirt, debris and moisture.

WARNING: To avoid equipment damage, do not leave the system filled in a building without heat during cold weather, unless adequate freeze protection levels of antifreeze are used. Heat exchangers do not fully drain and will freeze unless protected, causing permanent damage.

Unit Location

Provide sufficient room to make water and electrical connections. If the unit is located in a confined space, provisions must be made for unit servicing. Locate the unit in an indoor area that allows easy removal of the access panels and has enough space for service personnel to perform maintenance or repair. These units are not approved for outdoor installation and, therefore, must be installed inside the structure being conditioned. Do not locate units in areas subject to freezing conditions.

WARNING: Do not store or install units in corrosive environments or in locations subject to temperature or humidity extremes (e.g. attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life.

WARNING: To avoid equipment damage and possible voiding of warranty, be sure that properly sized strainers are installed upstream of both brazed plate heat exchangers to protect them against particles in the fluid.

General Installation Information cont.

Mounting Units

Remove the unit from the wooden shipping skids (see physical dimensions). Units do not ship standard with vibration isolation hardware, however, non-standard options are selectable for the unit.
Non-standard options include:

- Rubber Isolators - Heavy-duty durometer rubber grommets for reduced sound transmitted through the floor via the frame.
- Spring Isolators - For increased sound attenuation, heavy-duty isolation springs can reduce sound levels by 3 dBA.

Rubber Isolators

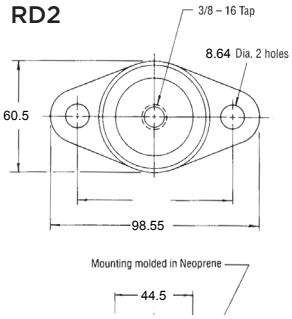
Part Number	Type	Color Code	Max Load, kg	Deflection, mm	Qty
99S502-01	RD2	Green	172	12.7	4

• Compatible with 030-045

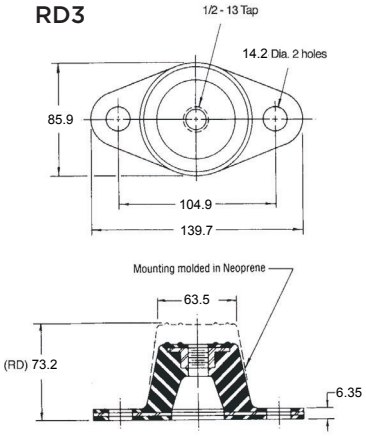
Part Number	Type	Color Code	Max Load, kg	Deflection, mm	Qty
99S502-02	RD3	Green	340	12.7	4

• Compatible with 060-150

RD2



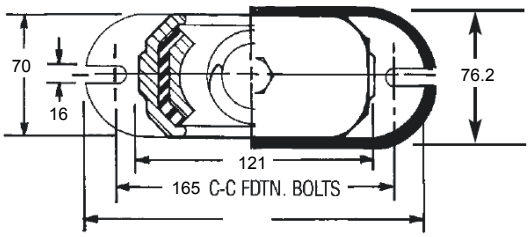
RD3

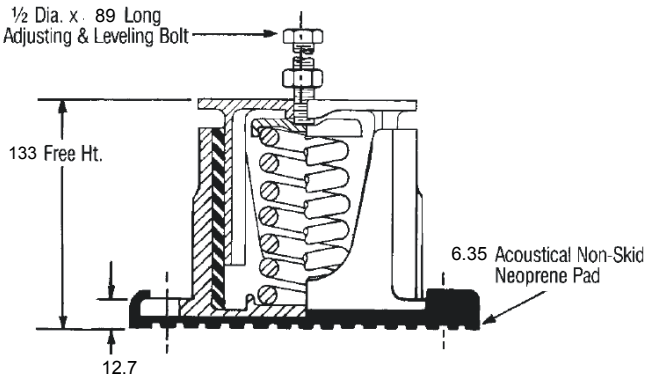


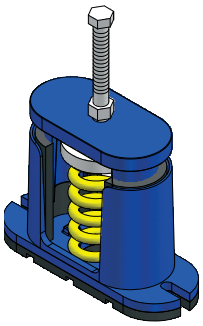


Spring Isolators

Number	Compatible With	Spring Color	Rated Capacity	Rated Deflection	Isolator Constant	Adjustment Bolt [in x mm]	Qty
IS-340-01	030-045	Red	147 kg	31 mm	4.72 kg/mm	1/2 x 89	4
IS-900-01	090-130	DK Green	340 kg	27 mm	12.65 kg/mm	1/2 x 89	4

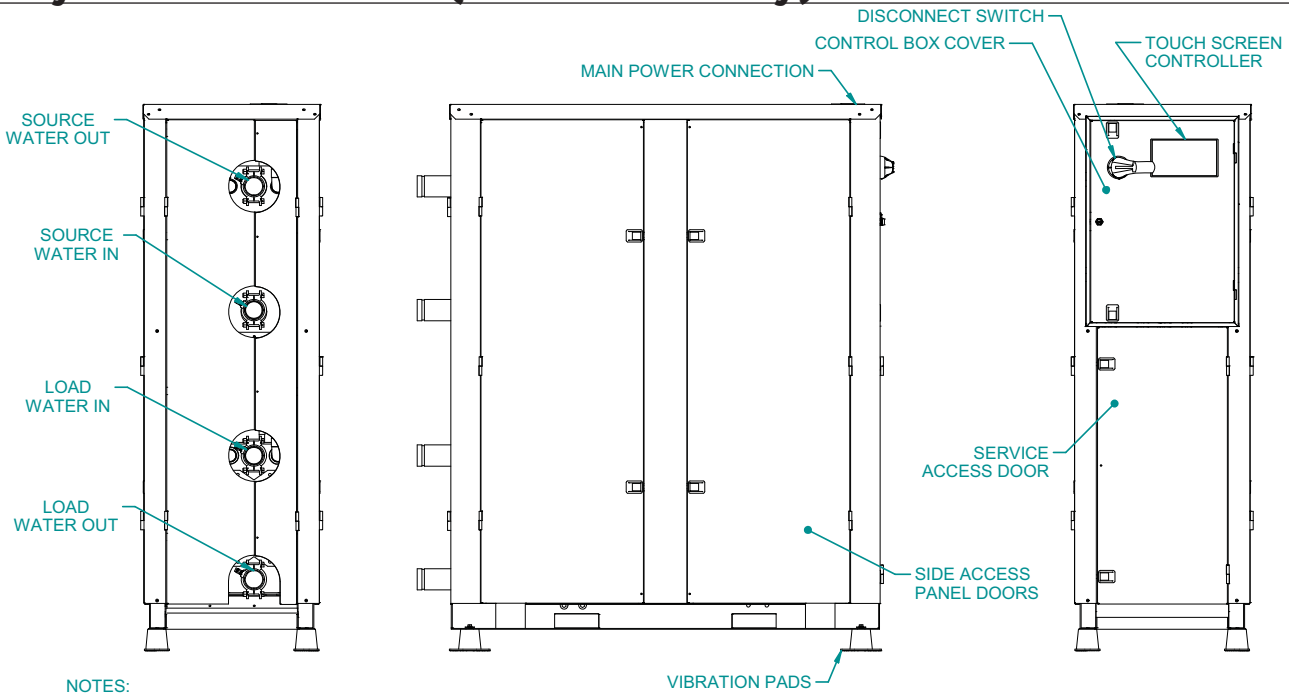






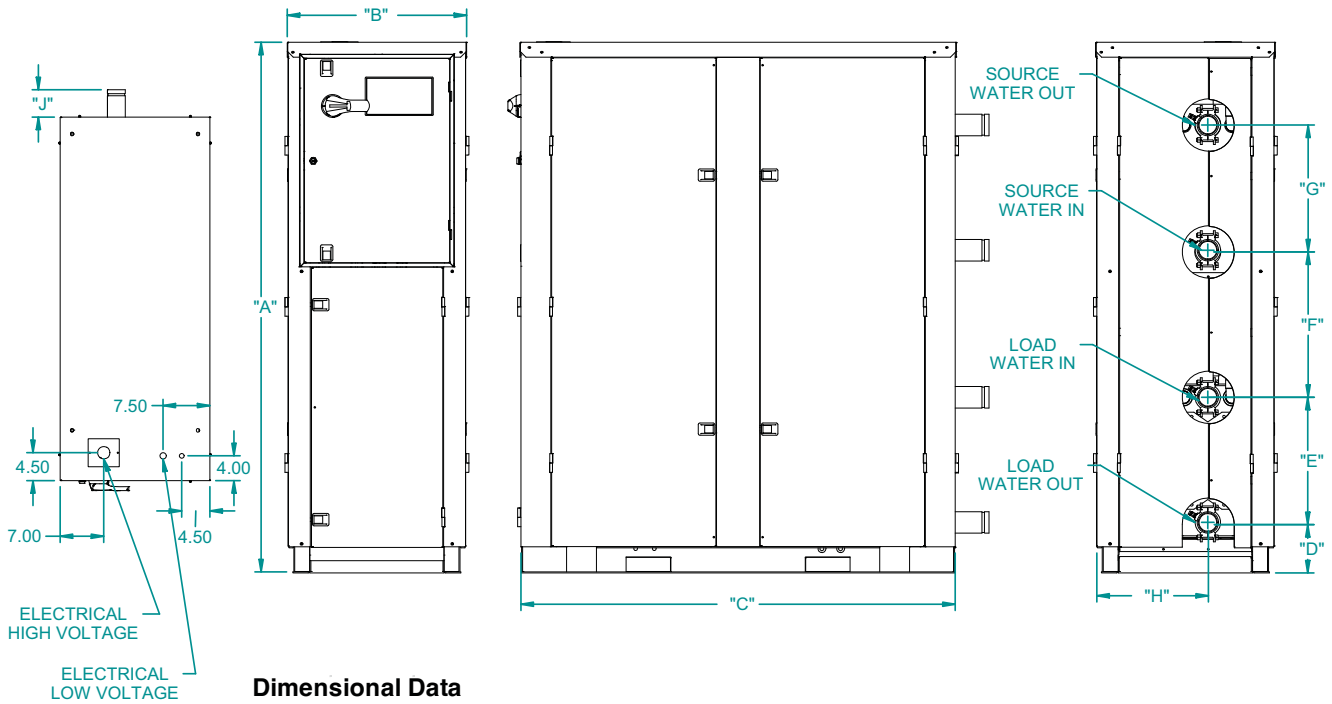


Physical Dimensions (Reversible only)



NOTES:

1. DO NOT SCALE DRAWING.
2. RECOMMENDED TO HAVE 24" CLEARANCE ON ALL SIDES.



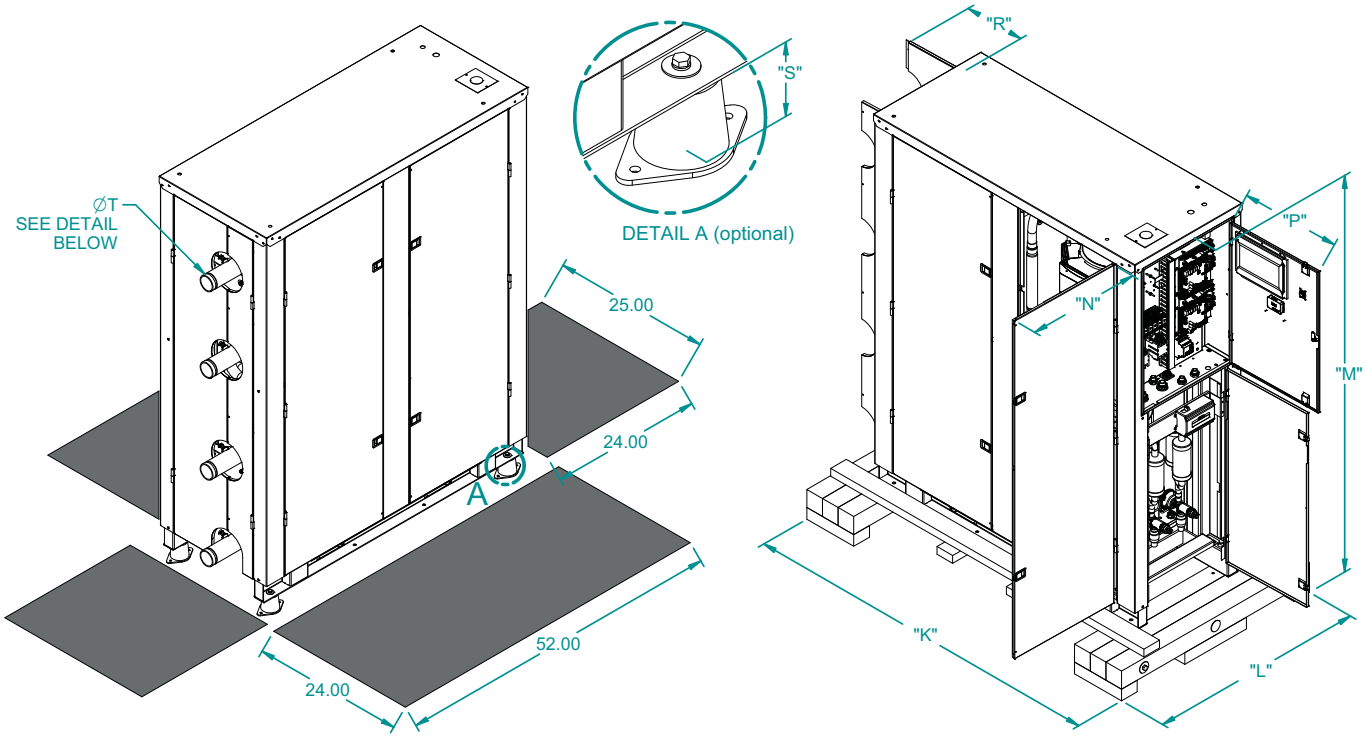
Dimensional Data

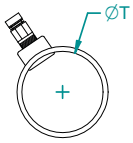
Dimensional Data for unit with enclosure

Model	A	B	C	D	E	F	G	H	J
120-180	57.3 [1455]	24.1 [612]	42.5 [1080]	5.0 [127]	17.0 [432]	8.8 [224]	17.0 [432]	11.9 [302]	5.8 [147]
240-360	64.2 [1631]	24.1 [612]	50.5 [1283]	6.9 [175]	17.0 [432]	13.9 [353]	17.0 [432]	12.1 [307]	4.8 [122]
600	71.1 [1806]	24.1 [610]	58.5 [1486]	6.5 [165]	17.0 [432]	19.5 [495]	17.0 [432]	15.0 [381]	4.4 [112]

All dimensions in inches, [mm]

Physical Dimensions (Reversible only) cont.





Dimensional Data

Dimensional Data for unit with enclosure

Model	K	L	M	N	P	R	S	*T
120-180	57.0 [1448]	42.0 [1067]	63.1 [1603]	15.9 [404]	19.5 [495]	9.7 [246]	1.3 [33]	2.0 [51]
240-360	65.0 [1651]	42.0 [1067]	69.9 [1775]	19.9 [505]	19.5 [495]	9.7 [246]	1.8 [46]	2.0 [51]
600	70.0 [1778]	42.0 [1067]	76.8 [1951]	22.0 [559]	19.5 [495]	12.7 [323]	1.8 [46]	2.5 [64]

All dimensions in inches, [mm]

*T - Units shipped with groove pipe connection

Physical Data

Model	Compressor	Refrigerant Charge*	Total Weight	
			Shipping	Installed
120	Scroll (2)	5.3	720	710
		[2.4]	[327]	[323]
180	Scroll (2)	7.8	838	844
		[3.5]	[381]	[384]
240	Scroll (2)	10.5	1130	1152
		[4.8]	[514]	[524]
360	Scroll (2)	17.9	1320	1388
		[8.1]	[600]	[631]
600	Scroll (2)	27.3	1748	1850
		[12.4]	[795]	[841]

Weights shown in Pounds, [kg] 1/30/2014

* Refrigerant per circuit in Pounds, [kg]

Add 32 lbs [15 kg] for fluid weight when full. (120)

Add 48 lbs [22 kg] for fluid weight when full. (180)

Add 64 lbs [29 kg] for fluid weight when full. (240)

Add 110 lbs [50 kg] for fluid weight when full. (360)

Add 144 lbs [65 kg] for fluid weight when full. (600)

NOTE: See page 12 for minimum fluid volume guidelines.

Field Connected Water Piping

General

System piping should be kept as simple as possible to minimize the pressure drop, but hand valves should be field installed to facilitate unit servicing. The piping installation should provide service personnel with the ability to measure and/or monitor water temperatures and pressures.

Source and load fluid connections are provided with 2-inch [50.8mm] Victaulic grooved nipples (see Figure 4). Each nipple will also have a PT port installed for test and balance purposes. It will be the installing contractor's responsibility to adequately support incoming piping to avoid damage to the unit's piping or heat exchangers. The water lines should be routed so as not to interfere with access to the unit.

For any installation where the transmission of vibration through the piping connections could cause unacceptable noise levels in occupied spaces it is important to provide adequate vibration damping.
NOTE: Units are factory run-tested using propylene glycol. Prior to connecting piping to unit, thoroughly flush heat exchangers.

Before final connection to the unit, the supply and return hose kits must be connected to each other, bypassing the unit, and the system flushed to remove dirt, piping chips and other foreign material. Normally, a combination balancing and close-off (ball) valve is installed at the return, and a rated gate or ball valve is installed at the supply. The return valve can be adjusted to obtain the proper water flow. The valves allow the unit to be removed for servicing.

The proper water flow must be delivered to each unit whenever the unit heats or cools. The proper flow rate cannot be accurately set without measuring the water pressure drop through the refrigerant-to-water heat exchanger. **A 3 GPM flow rate per ton [0.054 LPS per kW] of cooling capacity (2.25 GPM per ton [0.0404 LPS per kW] minimum) is required.**

NOTE: The placement and connection of the water circulating pump(s) must be taken into consideration prior to designing the final water piping systems.

Closed Loop Tower/Boiler Systems

The water loop is usually maintained between 60°F [15.5°C] and 90°F [32.2°C] for proper heating and cooling operation. This is accomplished with a cooling tower and a boiler.

To reject excess heat from the condenser water loop, the use of a closed-circuit evaporative cooler or an open type cooling tower with a secondary heat exchanger between the tower and the condenser water loop is recommended. If an open type cooling tower is used without a secondary heat exchanger, continuous chemical treatment and filtering of the water must be performed to ensure the water is free from damaging materials.

CAUTION: Water piping exposed to outside temperature may be subject to freezing.

Open Loop Well Water Systems

Installation of an open loop system is not recommended without using a secondary heat exchanger unless water quality guidelines are met.

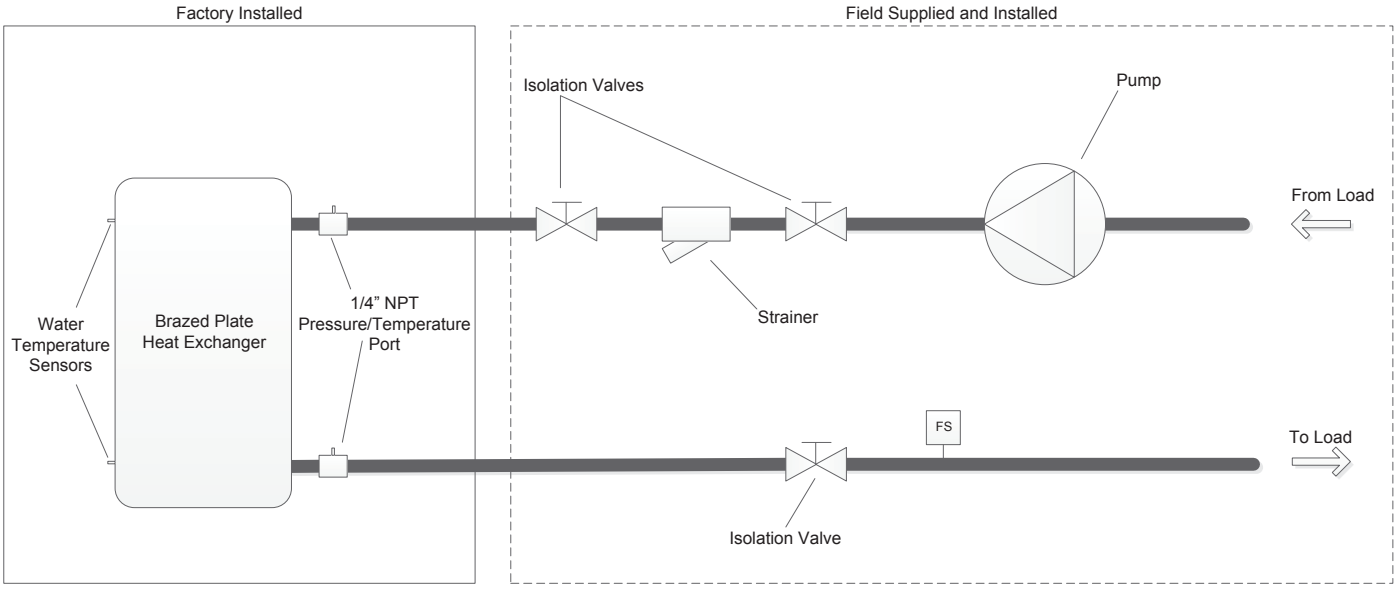
Earth Coupled Systems

All supply and return water piping should be insulated to prevent excess condensation from forming on the water lines. Ensure pumping system is capable of providing adequate flow rate at the system pressure drop, 3.0 GPM per ton [0.054 LPS per kW] (source side) is recommended. Antifreeze in the loop is strongly recommended.

CAUTION: Remove the plastic protective caps in the ends of each of the four water pipes on the heat exchangers prior to piping connection. Failure to remove the caps will result in serious damage and could void the warranty.

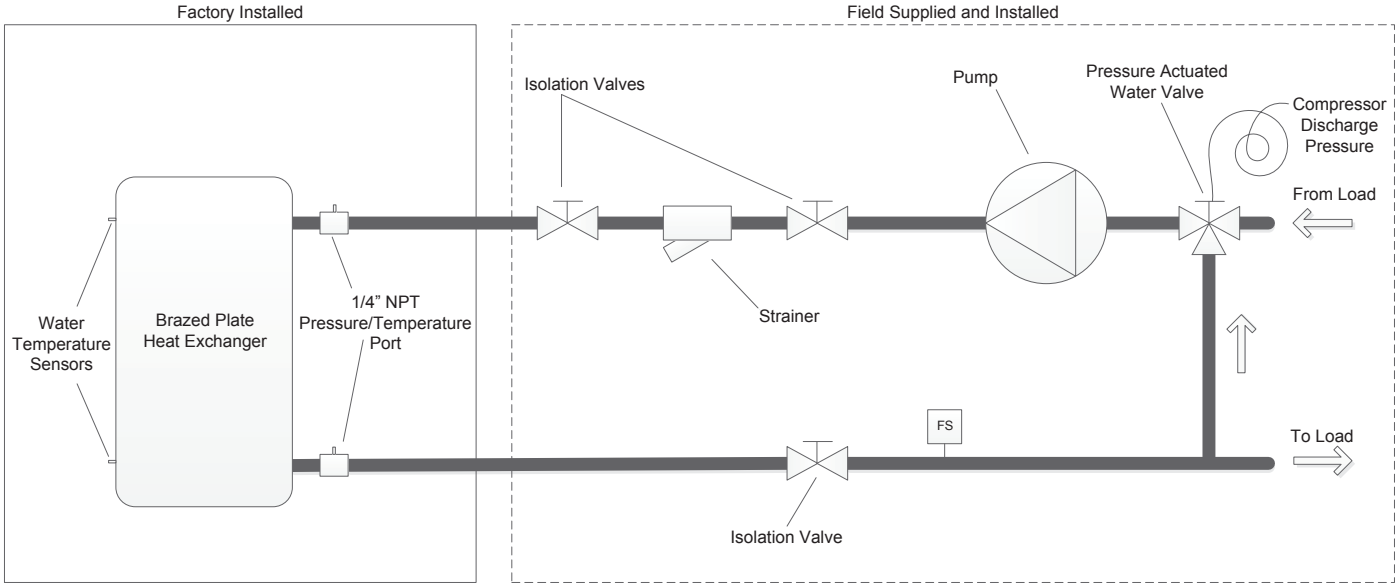
Typical Piping

Standard Piping



Note: System piping should have drain ports to enable flushing and cleaning of heat exchangers. On systems utilizing pumps with VFDs, an automatic flow control valve must be installed.

Pressure Regulated Piping



Note: System piping should have drain ports to enable flushing and cleaning of heat exchangers. On systems utilizing pumps with VFDs, an automatic flow control valve must be installed.

Application Data

1.0. Minimum Fluid Volume

A. Water-to-water heat pumps require a minimum amount of source and load side fluid volume to ensure accurate and stable temperatures during system operation. For normal air conditioning type applications, it is recommended to use at least 7.5 Liter per kW output.
B. Applications that require more precise temperature control or low loading will occur the minimum fluid volume shall be no less than 10.7 Liter per kW output. Installation of a buffer tank that will properly mix the fluid is recommended.

1.1. Water-to-Water Heat Pump Sizing

A. Heat pumps should be adequately sized for optimal system efficiency and run time. Oversizing by more than 15% can diminish performance resulting in higher power consumption, short cycling of compressors, and unstable conditioning temperatures.
B. In applications where the minimum load is significantly less than the design condition, it is better to install 2 smaller heat pumps for load matching rather than a single large heat pump.

1.2. Heat Pump Piping

A. Multiple heat pumps can be installed in series or parallel configurations. The preferred system design is to pipe the equipment in parallel due to its simplicity and flexibility. In parallel systems, the heat pump equipment can vary in size as long as flow rate and system volume are accounted for.
B. Piping equipment in series is not desired; however, it can be done if proper guidelines are followed. Always observe proper temperature and flow rate requirements for each unit. Sometimes this method is desired to achieve larger temperature differences.

1.3. Strainers

A. All brazed-plate heat exchangers shall have a strainer within 2.4 meters of the water/brine inlet. It is highly recommended to use a minimum of 60 mesh in order to provide maximum filtration. In any case, the strainers should never have a mesh size less than 20.
B. Failure to install proper stainers and perform regular service can result in serious damage to the unit, and cause degraded performance, reduced operating life and failed compressors. Improper installation of the unit (which includes not having proper strainers to protect the heat exchangers) can also result in voiding the warranty.
C. Strainers should be selected on the basis of acceptable pressure drop, and not on pipe diameter. The strainers selected should have a pressure drop at the nominal flow rate of the units; low enough to be within the pumping capacity of the pump being used.

1.4. Flow Sensing Devices

A. A flow switch or equivalent must be installed on the evaporator for each unit to be installed. If the unit is to operate as both modes (heating/cooling), a flow switch is needed on both heat exchangers.
B. A differential pressure switch can be used in place of a flow switch. The differential switch must be capable of pressure range as indicated in the pressure drop tables.

1.5. Water Quality

A. **General:** Reversible chiller systems may be successfully applied in a wide range of commercial and industrial applications. It is the responsibility of the system designer and installing contractor to ensure that acceptable water quality is present and that all applicable codes have been met in these installations.

B. **Water Treatment:** Do not use untreated or improperly treated water. Equipment damage may occur. The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The product warranty specifically excludes liability for corrosion, erosion or deterioration of equipment.

   The heat exchangers in the units are 316 stainless steel plates with copper brazing. The water piping in the heat exchanger is steel. There may be other materials in the building's piping system that the designer may need to take into consideration when deciding the parameters of the water quality.

   If an antifreeze or water treatment solution is to be used, the designer should confirm it does not have a detrimental effect on the materials in the system.

C. **Contaminated Water:** In applications where the water quality cannot be held to prescribed limits, the use of a secondary or intermediate heat exchanger is recommended to separate the unit from the contaminated water.

   The following table outlines the water quality guidelines for unit heat exchangers. If these conditions are exceeded, a secondary heat exchanger is required. Failure to supply a secondary heat exchanger where needed will result in a warranty exclusion for primary heat exchanger corrosion or failure.



WARNING: Must have intermediate heat exchanger when used in pool applications.

Application Data cont.

1.6. Insulation

A. Heat pumps are built with factory installed insulation on any surface that may be subject to temperatures below the room dew point.

Surface Condensation Chart

Room Ambient Condition	Surface Temperature		
	10°C	20°C	-18°C
Normal (Max 85°F, 70% RH)	12.7mm	19.1mm	25.4mm
Mild (Max 80°F, 50% RH)	3.2mm	6.4mm	12.7mm
Severe (Max 90°F, 80% RH)	19.1mm	25.4mm	50.8mm

1.7. Brine Applications

A. Applications where the leaving fluid temperature goes below 4.4°C a suitable brine solution must be used. Failure to do so can cause immediate damage to the system. The brine must be approved for use with heat exchangers. Automotive antifreeze solutions are not suitable for use in brazed plate heat exchangers.

B. The freeze detection must be adjusted appropriately for brine applications. The brine solution concentration should be at least -9.4°C below the lowest leaving fluid temperature.

Water Quality Guidelines

Material		316 Stainless Steel
pH	Acidity/Alkalinity	7 - 9
Scaling	Calcium and Magnesium Carbonate	(Total Hardness) less than 350 ppm
Corrosion	Hydrogen Sulfide	Less than 1 ppm
	Sulfates	Less than 200 ppm
	Chlorine	Less than 0.5 ppm
	Chlorides	Less than 300 ppm
	Carbon Dioxide	10 - 50 ppm
	Ammonia	Less than 20 ppm
	Ammonia Chloride	Less than 0.5 ppm
	Ammonia Nitrate	Less than 0.5 ppm
	Ammonia Hydroxide	Less than 0.5 ppm
	Ammonia Sulfate	Less than 0.5 ppm
	Total Dissolved Solids (TDS)	1000 - 1500 ppm
	LSI Index	+0.5 to -0.5
Iron Fouling (Biological Growth)	Iron, FE^{2}+ (Ferrous) Bacterial Iron Potential	< 0.2 ppm
	Iron Oxide	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
	Threshold Velocity (Fresh Water)	< 1.8 m/sec

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

10/07/14

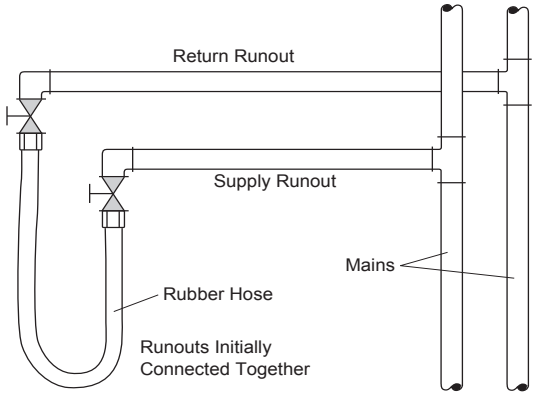
System Cleaning and Flushing

Cleaning and Flushing

Prior to start up of any heat pump, the water circulating system must be cleaned and flushed of all dirt and debris.

If the system is equipped with water shutoff valves, the supply and return runouts must be connected together at each unit location (This will prevent the introduction of dirt into the unit, see Flushing with Water Shutoff Valve Equipped Systems illustration). The system should be filled at the water make-up connection with all air vents open. After filling, vents should be closed.

Flushing with Water Shutoff Valve Equipped Systems



The contractor should start the main circulator with the pressure reducing valve makeup open. Vents should be checked in sequence to bleed off any trapped air and to verify circulation through all components of the system.

As water circulates through the system, the contractor should check and repair any leaks found in the piping system. Drain(s) at the lowest point(s) in the system should be opened for initial flush and blowdown, making sure water fill valves are set at the same rate. Check the pressure gauge at the pump suction and manually adjust the make-up water valve to hold the same positive pressure both before and after opening the drain valves. Flushing should continue for at least two hours, or longer if required, until drain water is clean and clear.

The supplemental heater and/or circulator pump, if used, should be shut off. All drains and vents should be opened to completely drain the system. Short-circuited supply and return runouts should now be connected to the unit supply and return connections.

Refill the system with clean water. Test the system water for acidity and treat as required to leave the water slightly alkaline (pH 7.5 to 8.5). The specified percentage of antifreeze may also be added at this time. Use commercial grade antifreeze designed for HVAC systems only. Environol™ brand antifreeze is recommended.

Once the system has been filled with clean water and antifreeze (if used), precautions should be taken to protect the system from dirty water conditions. Dirty water will result in system-wide degradation of performance, and solids may clog valves, strainers, flow regulators, etc. Additionally, the heat exchanger may become clogged which reduces compressor service life and can cause premature unit failure.

In boiler/tower application, set the loop control panel set points to desired temperatures. Supply power to all motors and start the circulating pumps. After full flow has been established through all components including the heat rejector (regardless of season), air vented and loop temperatures stabilized, each of the units will be ready for check, test and start up and for air and water balancing.

Ground Source Loop System Checkout

Once piping is completed between the unit pumping system and ground loop, final purging and charging of the loop is needed. A high pressure pump is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop itself. Antifreeze solution is used in most areas to prevent freezing. Flush the system adequately to remove as much air as possible; then pressurize the loop to a static pressure of 276-345 kPa (summer) or 345-517 kPa (winter). This is normally adequate for good system operation. Loop static pressure may decrease soon after initial installation, due to pipe expansion and loop temperature change. Run the unit for at least 30 minutes after the system has been completely purged of air. It may be necessary to adjust static loop pressure (by adding water) after the unit has run for the first time. Loop static pressure will also fluctuate with the seasons. Pressures will be higher in the winter months than during the cooling season. This fluctuation is normal and should be considered when charging the system initially.

Ensure the pump provides adequate flow through the unit by checking pressure drop across the heat exchanger. Usually 0.042-0.054 L/s per kW of cooling capacity is recommended in earth loop applications.

Electrical Data

Envision Chiller (30-150kW) Electrical Table

Model	Rated Voltage	Voltage Min/Max	Compressor[1]			Total Unit FLA	Min Circ Amp	Min Fuse/ HACR	Max Fuse/ HACR[2]
			MCC	RLA	LRA				
030	380-420/50/3	340/440	19.0	12.2	87.0	24.4	27.5	30.0	35
045	380-420/50/3	340/440	19.0	12.2	110.0	24.4	27.5	30.0	35
060	380-420/50/3	340/440	27.0	19.2	140.0	38.4	43.2	45.0	60
090	380-420/50/3	340/440	38.6	24.7	197.0	49.4	55.6	60.0	80
150	380-420/50/3	340/440	62.0	39.7	260.0	79.4	89.3	100.0	125

HACR circuit breaker in USA only 10/7/14

[1] - MCC, RLA, & LRA rating per compressor. Breaker & FLA sized for both compressors.

[2] - Equipment supplied with Class J fuses per minimum fuse size.

Compressor Protection Module

An electronic protection module is provided with compressors utilized in model size 150. This module will protect against phase reversal and phase loss at start-up. Protection is active for 5 seconds after the first second of compressor operation. In the event that either phase sequencing or phase loss has occurred the following blink sequence will display on the module.

In case of phase reverse error:

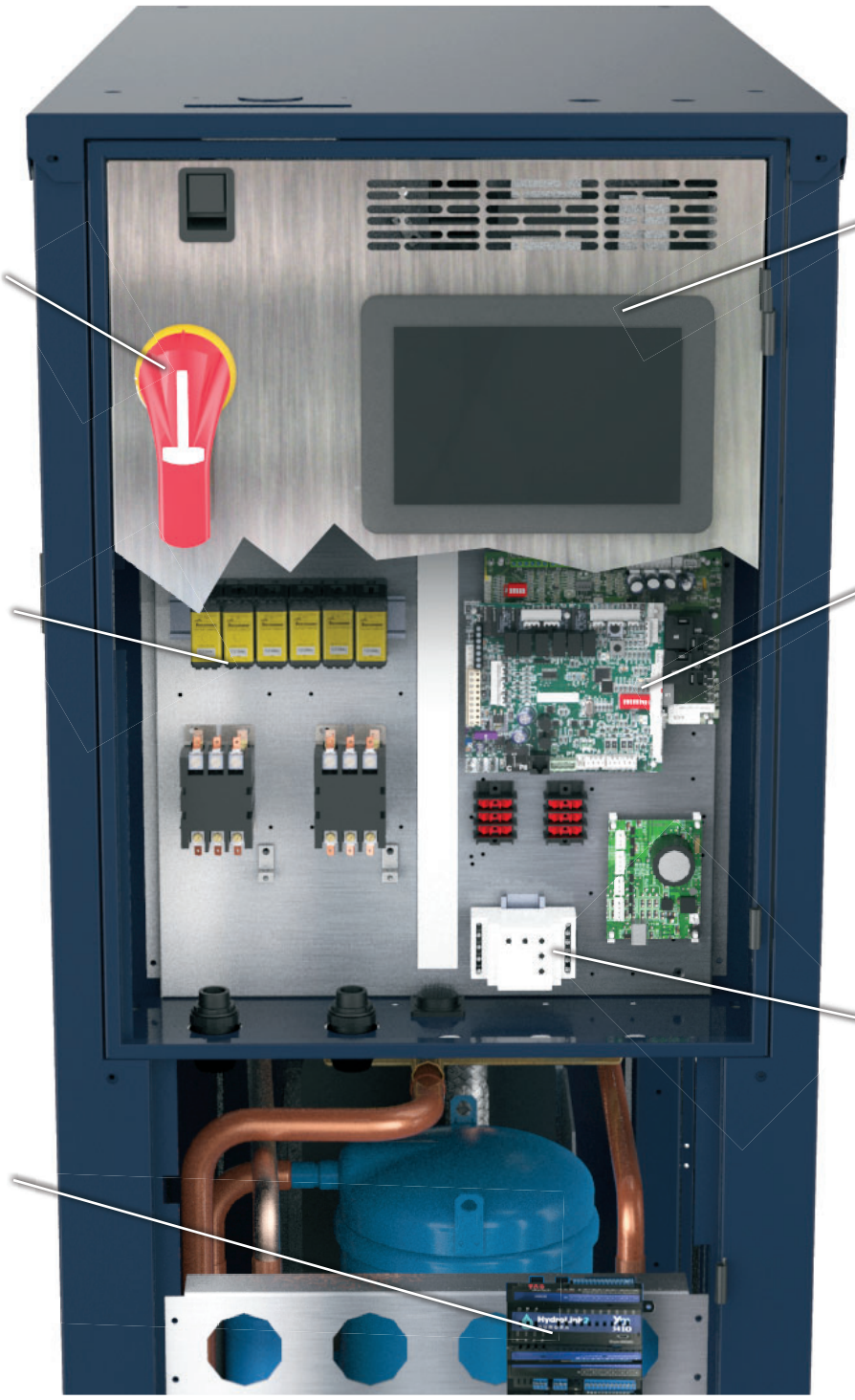


In case of phase loss error:



Electrical Data cont.

Figure 6: Control Box



Factory installed fused or non-fused disconnect to isolate electrical supply

Internal class J/CC fusing for protection of electrical components

HydroLink2 Controller provides system level staging user interface for diagnostics and setup

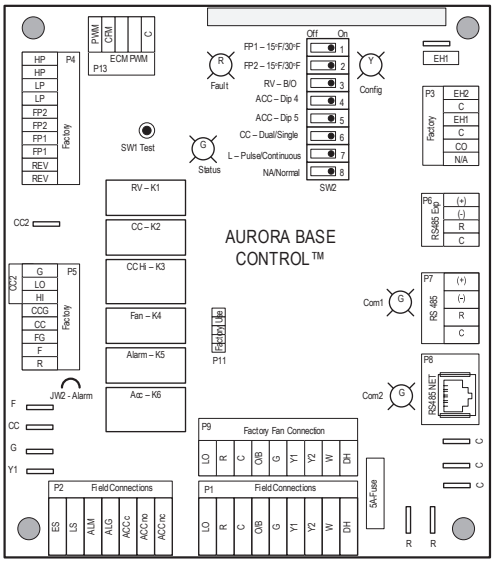
Color touchscreen tablet displays information from HydroLink2 Aurora Controls System providing configuration, operational and service information.

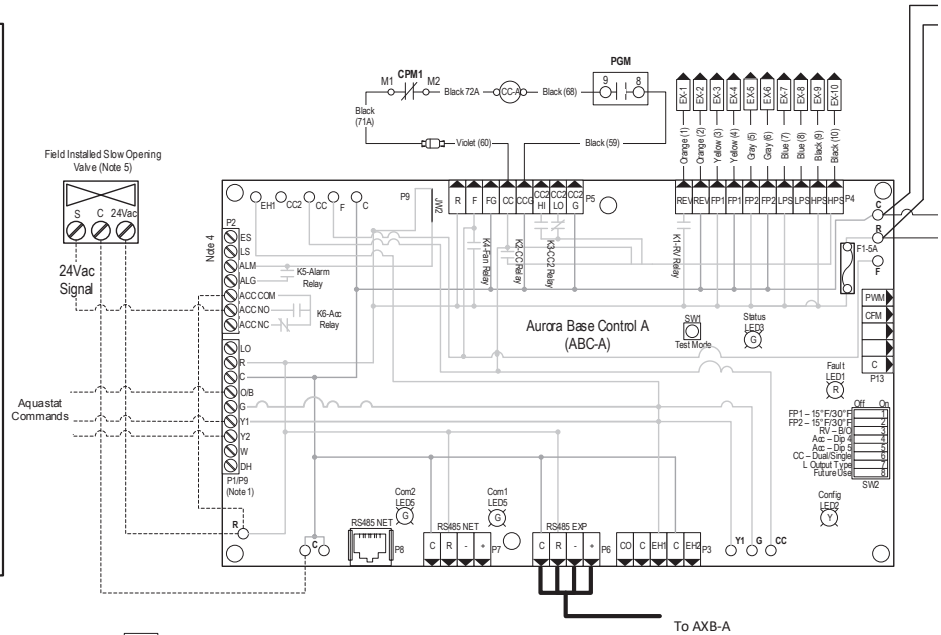
Aurora Advanced Controls to manage each refrigerant circuit

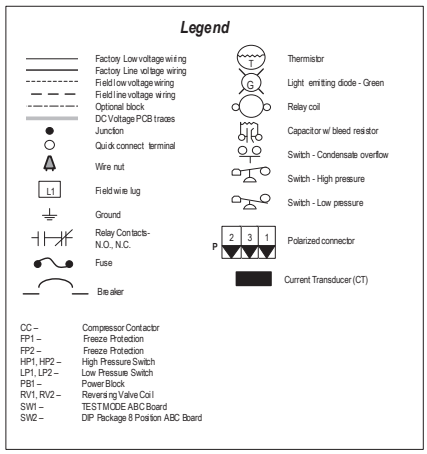
Phase Guard Protection Module

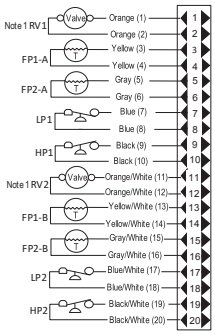
Wiring Schematics

Reversible Chiller HydroLink2 Aurora 120-600

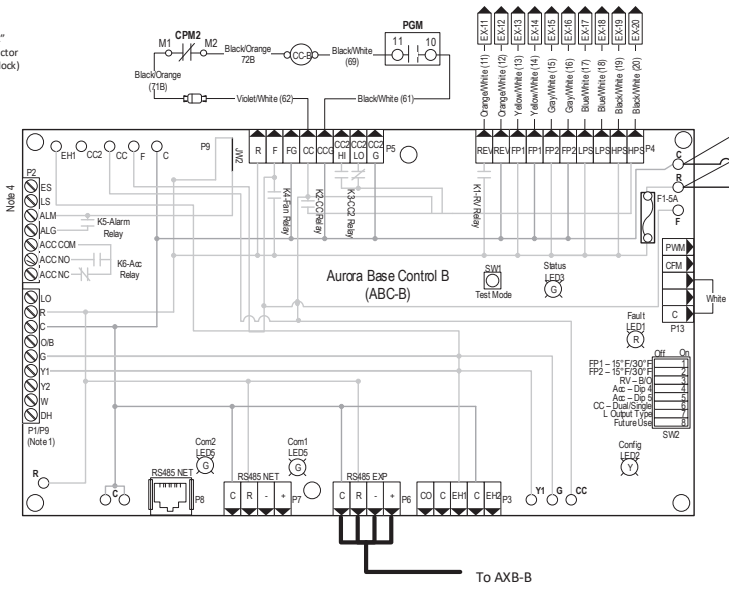








"EX" Connector (twist lock)



Notes

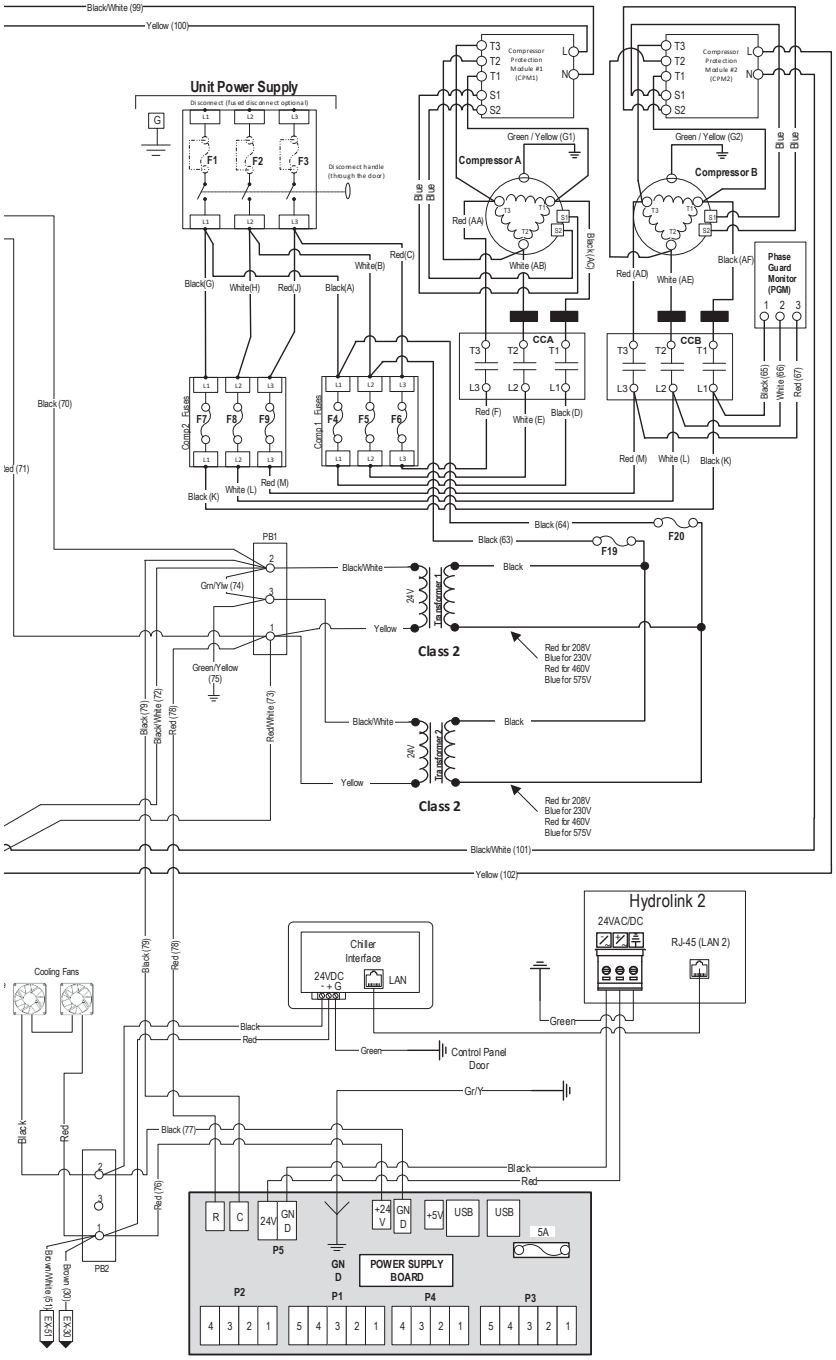
1 – Reversing Valve will be energized for heating mode.
2 – In Emergency Shutdown, line voltage is still present in control box. Emergency Switch is wired on low voltage circuit only.
3 – See additional schematic for HydroLink details.
4 – To activate ,"ES" and "LS" terminals must be connected to ground.
5 – Field wiring for slow opening valve or pump control relay. ABC SW2 must be set to "Water Valve slow opening".
The valve or pump may be wired to either ABC A or ABC B.

ABC SW2 Accessory Relay		
DESCRIPTION	**SW2-4**	**SW2-5**
Not Used	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Not Used	OFF	ON

97P897-42

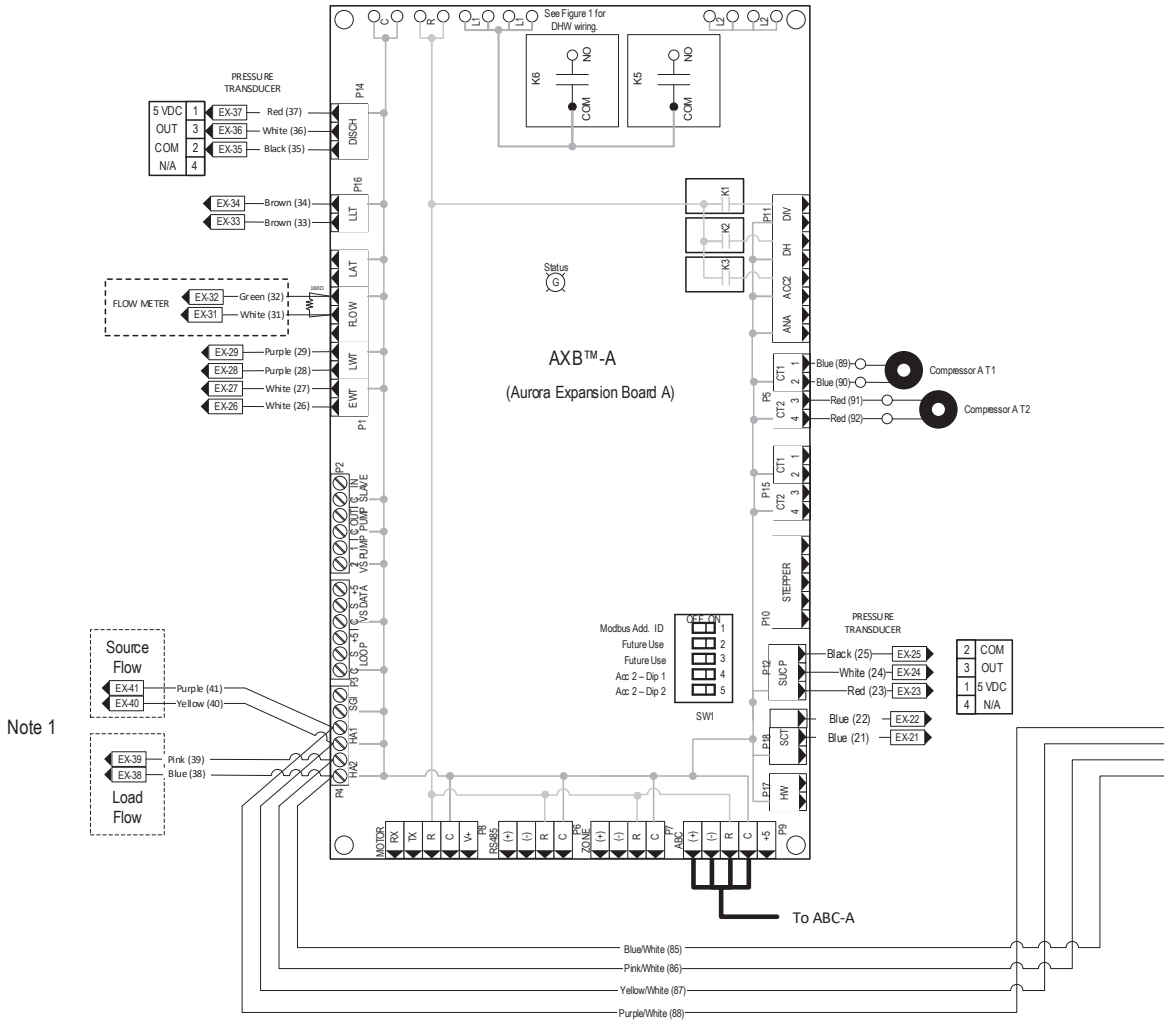
Wiring Schematics cont.

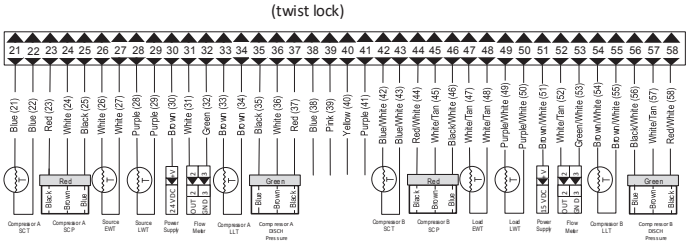
Reversible Chiller HydroLink2 Aurora 120-600



Wiring Schematics cont.

Reversible Chiller HydroLink2 Aurora 600 Series

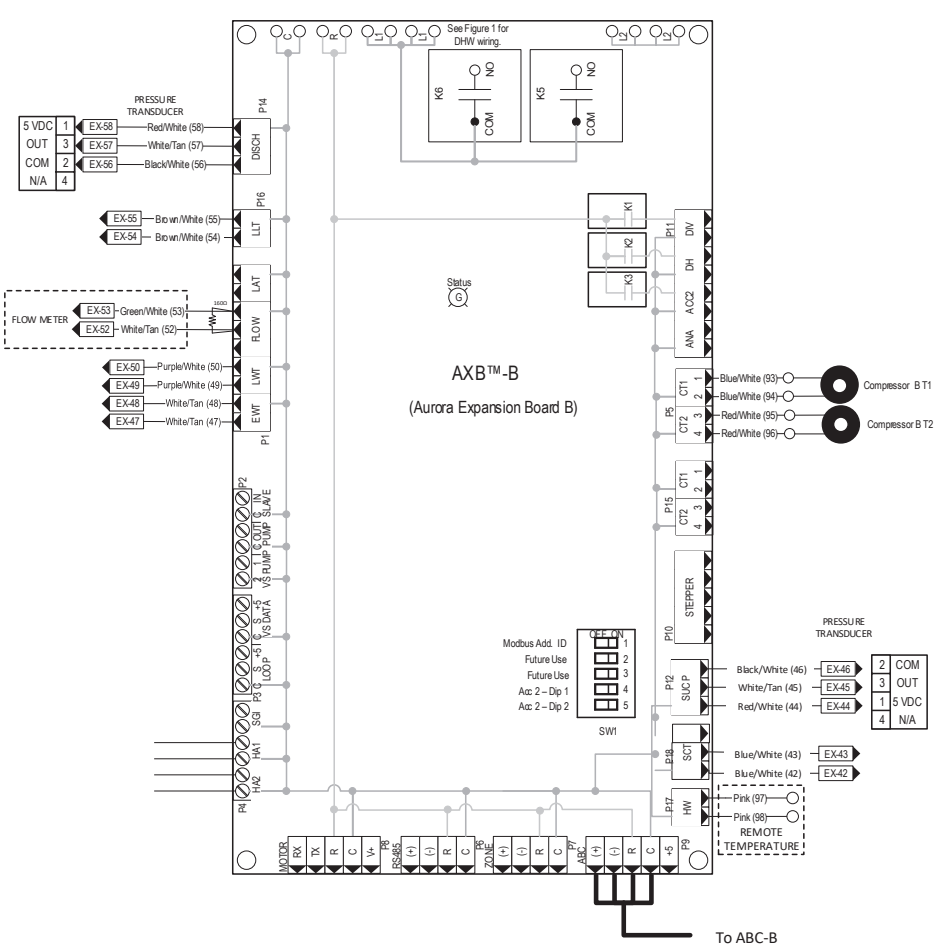


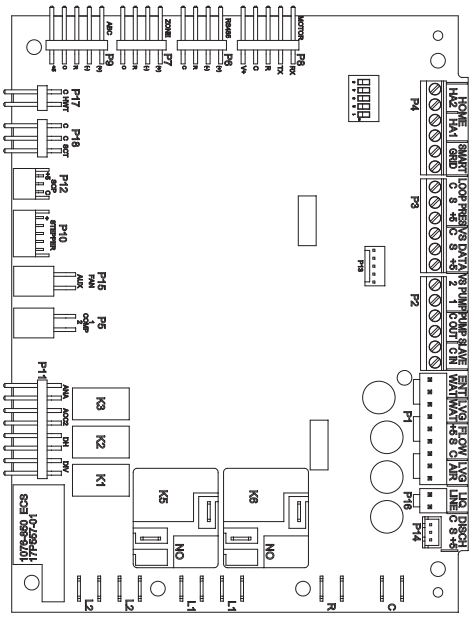


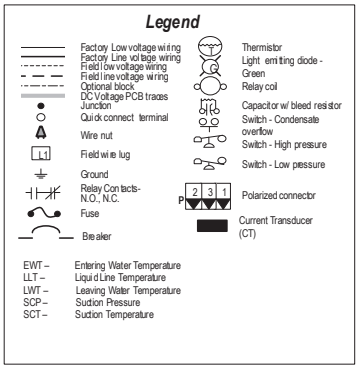
97P897-14A

Wiring Schematics cont.

Reversible Chiller HydroLink2 Aurora 600 Series







Notes

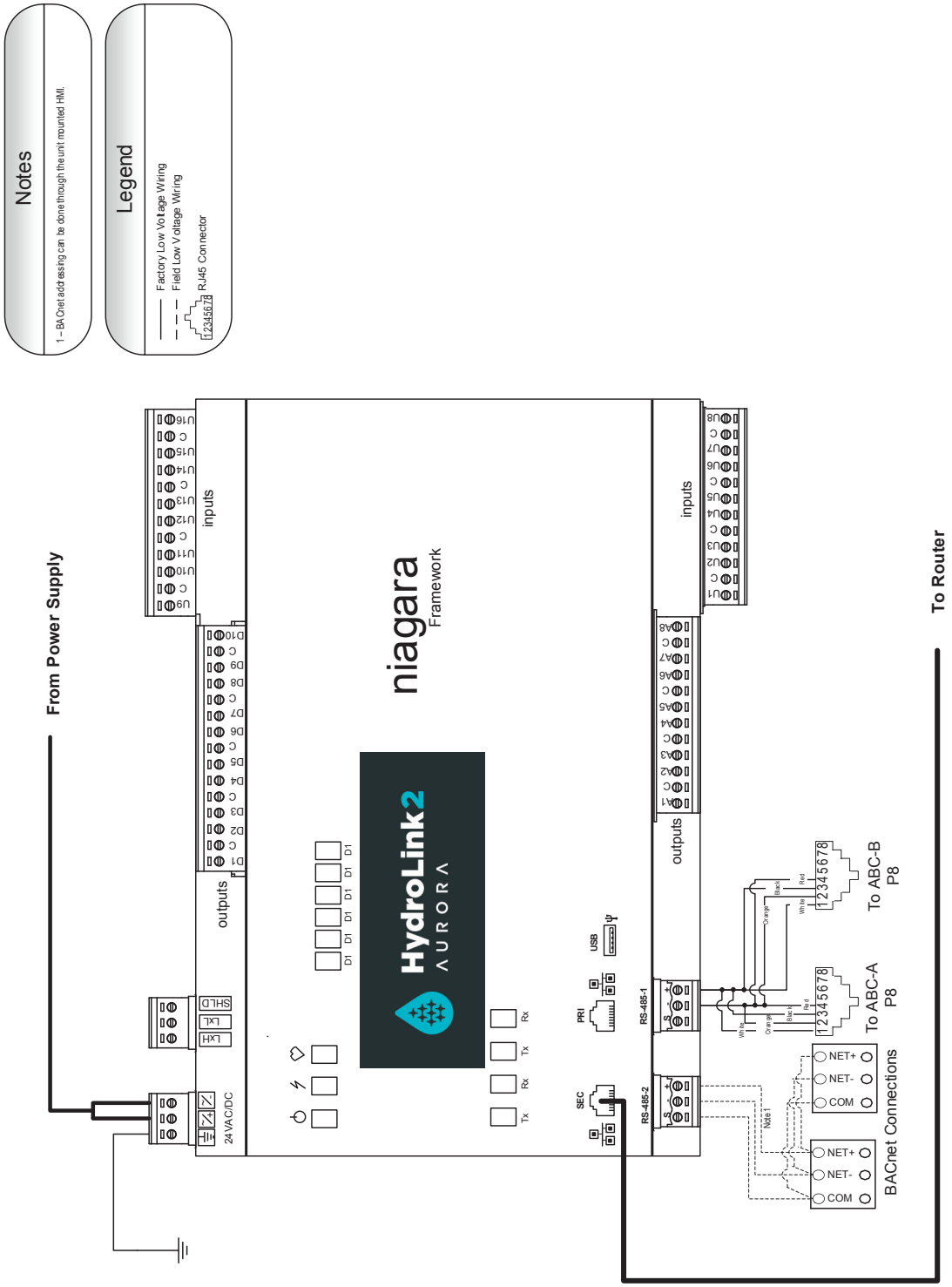
1 - A field installed flow switch is required for the load and source side and must be connected to AXB HA1 and HA2 for the unit to operate. HA1- Source and HA2 – Load.

AXB Accessory 2 DIP Settings		
SW1-4	**SW1-5**	**DESCRIPTION**
ON	ON	Not Used
OFF	ON	Cycles with CC (Normal)
ON	OFF	Not Used
OFF	OFF	Not Used

97P897-14A

Wiring Schematics cont.

HydroLink2 Aurora Control

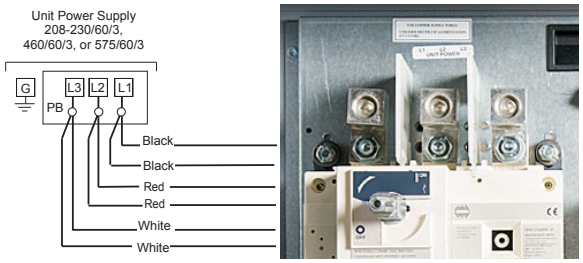


Field Wiring and Control Setup

Line Voltage

Power supply wiring connects directly to lugs on the top of the electrical disconnect. In 208-230V applications, heat pumps are factory wired for 208V supply. In the case of 230V supply, the blue and red wires from the primary of the transformer will need to be swapped.

High Voltage Connections



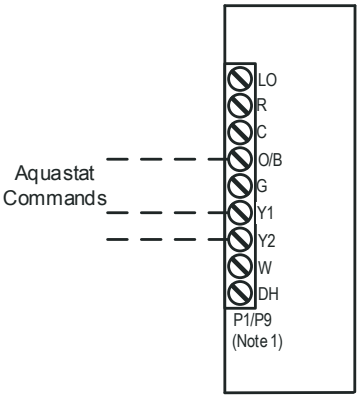
Low Voltage Operation

Low Voltage Connections

Connect low voltage wiring as shown in Figure 9. Connections shown are for typical aquastat. Actual connections may vary with specific device used.

NOTE: If a separate transformer is used to supply a Y1, Y2, or B signal to the unit controls, isolation relays must be used.

Low Voltage Connections



CAUTION: Use only copper conductors for field installed wiring. Terminals in the unit are not designed for other types of conductors.

WARNING: All wiring must comply with local and state codes. Disconnect the power supply before beginning to wire to prevent electrical shock or equipment damage.

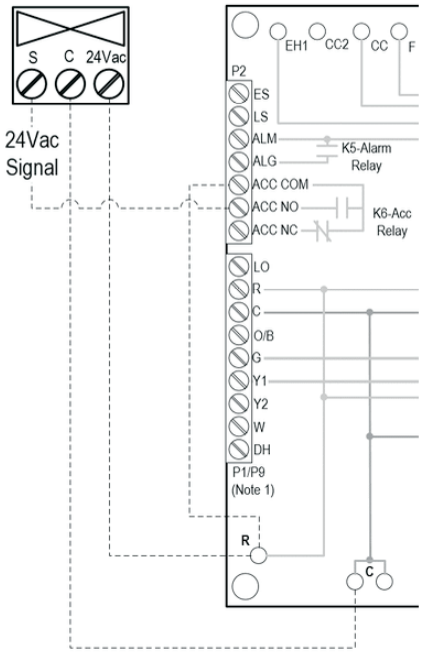
NOTE: Accessory 1 output is selectable as on with compressor or off with compressor using the unit display. on with compressor is the factory default setting.

Pump Control

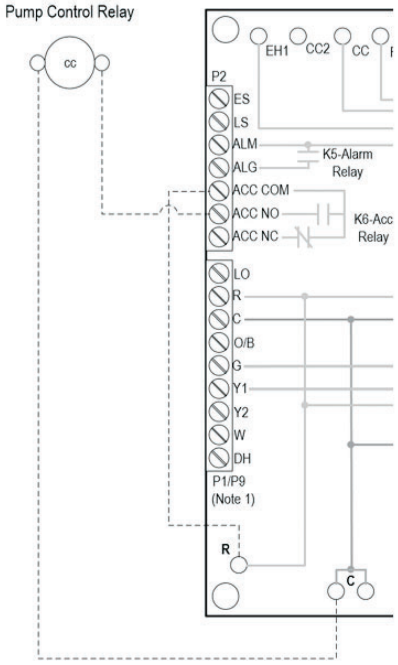
Slow Opening Valve Wiring

The accessory output on either one of the ABC Aurora boards can be used to control either a slow opening valve or a pump control relay. The accessory output provides a 24Vac control output. The DIP-Switch on ABC board must be set to “Slow Opening Valve” for valve.

Field Installed Slow Opening

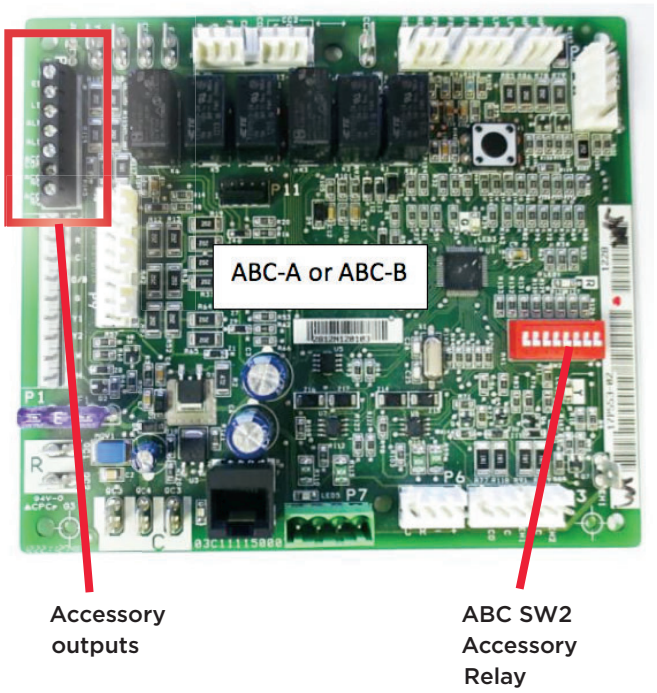


Pump Control Relay



Field Wiring and Control Setup cont.

Slow Opening Valve Wiring cont.



ABC SW2 Accessory Relay		
Description	**SW2-4**	**SW2-5**
Not used	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Not used	OFF	ON

Flow Switch Operation

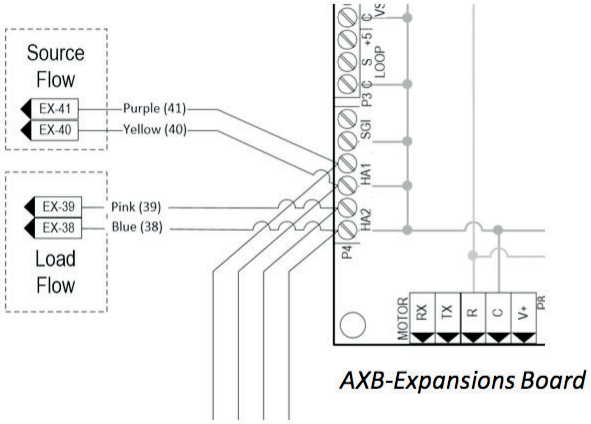
Source Flow Switch (SFS)

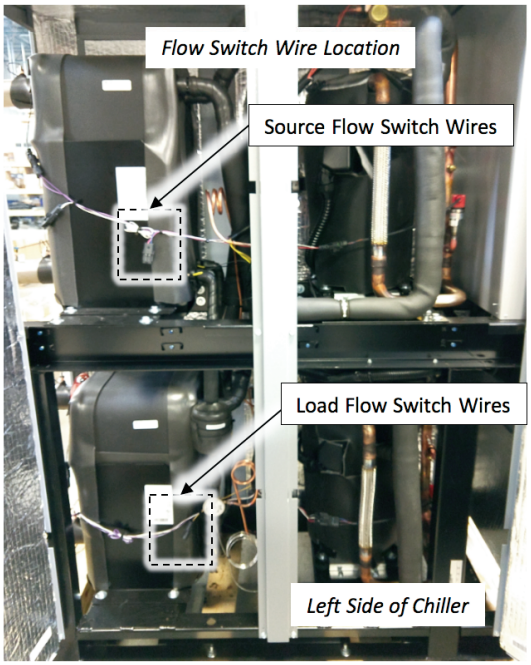
Unit is factory shipped with no connections on Flow Switch wires from HA1 off AXB-A (entering). If flow proving switch is required, hook up as shown in the figure and Note 1. The unit will not operate without flow proving inputs open.

Load Flow Switch (LFS)

Unit is factory shipped with no connections on Flow Switch pins wires from HA2 off AXB-A (leaving). If flow proving switch is required, hook up as shown in the figure and Note 1. The unit will not operate without flow proving inputs open.

ATTENTION: Flow Switch inputs must be made before unit will operate!





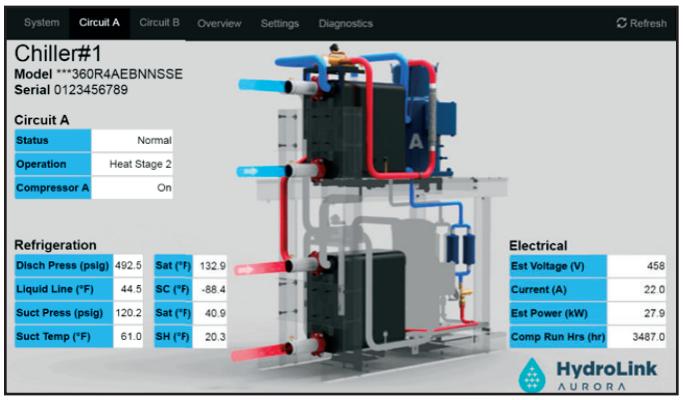
HydroLink2 Supervisory Control

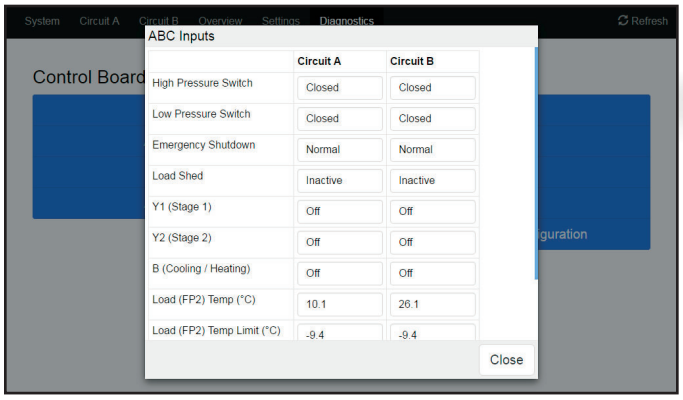
The HydroLink2 Supervisory Control is a Niagara AX based control, designed to consolidate all Chiller mechanical room chillers and hydronic components into one supervisory control. By consolidating all components into one control complete plant room management can be obtained to insure proper operation and easier servicing with a turn-ley solution. It features a Niagara AX based control with its own I/O and a 10" color touchscreen tablet as a user interface. Turn-key custom programming of the Supervisory Control will be provided based upon your specific requirements for the whole chiller mechanical room to manage not only the chillers but also the pumps and other hydronics specialties. The many benefits of the HydroLink2 Supervisory control are:

- Control is based upon the powerful and flexible Niagara AX software platform.
- Customized supervisory control programming to meet your specific site specifications.
- Allows the engineer to specify graphics required for ease in monitoring and troubleshooting.
- Improves the integration of mechanical room components such as variable speed pumps and other hydronic specialties of the plant room into the site BAS.
- Guaranteed compatibility of the Supervisory Controller with the Unit Controllers.
- The sophistication of the Niagara based control allows better equipment support and servicing.
- Customer benefits from our experience in providing custom Supervisory Controllers.
- Enables tight integration to peripheral devices such as pump and valve controllers for reliable sequencing especially for vital processes such as liquid flow etc...
- Improved system visibility from the BAS.

The HydroLink2 Supervisory Control is the perfect match to manage your complete chiller mechanical room.

Machine Interface - 10" ColorTouch Tablet



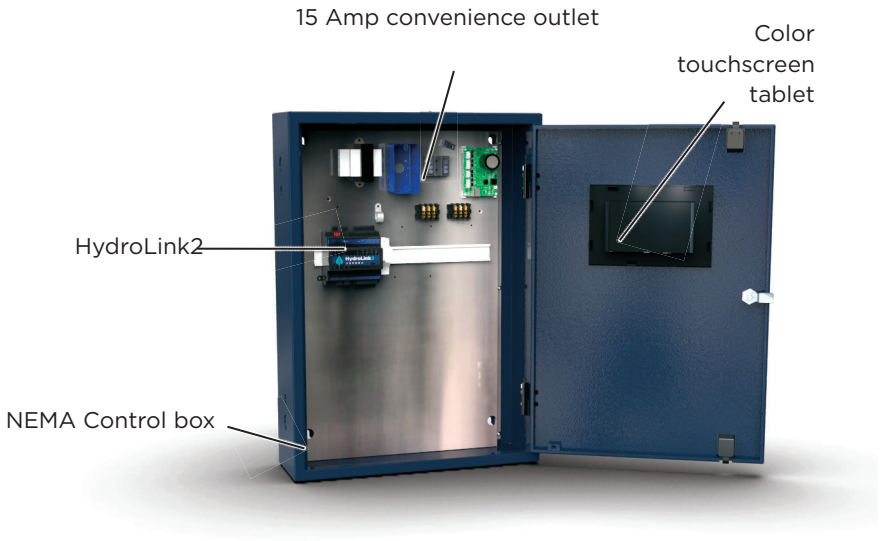




HydroLink2 Supervisory Control

HydroLink2 Supervisory Control cont.

- HydroLink2 Control uses powerful NIAGARA AX software Platform.
- HydroLink2 Control with standard I/O 34 and up to two optional I/O 34 modules can be added for flexibility.
- Internal power supply and 120V convenience outlet (15 Amp)
- Over 2 sq. ft. [0.19 m^2 of control mounting area for custom controls such as relays, or other controllers.
- Provides for a custom programmed turnkey solution.





HydroLink2 Supervisory Control



HydroLink2 Aurora Controls

Overview

The HydroLink2 Aurora Control is the ultimate chiller control system that accurately controls fluid temperatures while providing technical information about the system in a simple, readable format thru a large 10" touchscreen tablet. The backbone of the system is the dedicated HVAC input/output control boards known as the Aurora control system. The Aurora Controls communicate using the ModBus protocols and quickly pass information from sensors up to the HydroLink2 controller. The HydroLink2 controller is a powerful controller that does compressor staging and then communicates over the network via BACnet or thru the NiagaraAX platform.

This system is the best combination of a proven, robust safety coupled with a flexible yet powerful system level controller. High end, graphic browser images are hosted on the HydroLink2 controller and displayed on the factory mounted touchscreen tablet. Each chiller is equipped with a small Wi-Fi router or a hardwire Ethernet connection that offers additional connectivity options to display chiller information without tapping in the BAS network.

There are several factory installed components so that each chiller has built-in refrigeration, energy, and performance monitoring capabilities.

HydroLink2 Control

The HydroLink2 Control is a NiagaraAX control that functions as a master control communicating to ABC "A" for compressor A and to ABC "B" for compressor B via Modbus protocol. The HydroLink2 controls all higher functions as a master control managing lead/lag, user interface and other functions of each ABC/AXB combination by communicating via Modbus. The HydroLink2 also manages all BAS and 10" color touchscreen tablet communications.

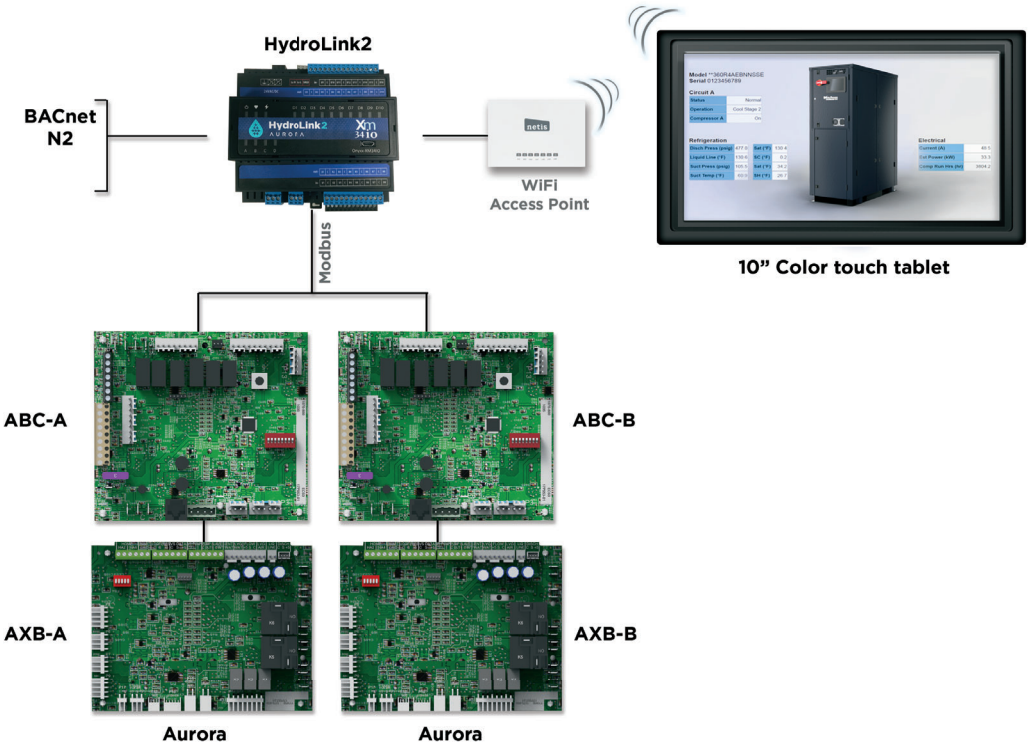
Aurora 'Base' Control (ABC)

The Base Control functions as a microprocessor compressor monitoring device and handles all compressor timings, and control. One board is dedicated to each compressor and is labeled for circuit A and B.

Aurora Expansion Board (AXB)

The AXB functions as an I/O expander for the ABC Most of the Circuit A I/O is for the compressor circuit however some additional sensors also function with the Source heat exchanger. The B Circuit AXB in turn handles circuit B compressor plus some I/O dedicated to the Load heat exchanger.

NOTE: Refer to the Aurora Base Control Application and Troubleshooting Guide and the Instruction Guide: Aurora Interface and Diagnostics (AID) Tool for additional information.



HydroLink2 Aurora Controls cont.

Field Selectable Options via Hardware

DIP Switch (SW1) – Test/Configuration Button (See SW1 Operation Table)

Test Mode

The control is placed in the test mode by holding the push button switch SW1 for 2 - 5 seconds. In test mode most of the control timings will be shortened by a factor of sixteen (16). LED3 (green) will flash at 1 second on and 1 second off. Additionally, when entering test mode LED1 (red) will flash the last lockout one time. Test mode will automatically time out after 30 minutes. Test mode can be exited by pressing and holding the SW1 button for 2 to 5 seconds or by cycling the power. NOTE: Test mode will automatically be exited after 30 minutes.

Reset Configuration Mode

The control is placed in reset configuration mode by holding the push button switch SW1 for 50 to 60 seconds. This will reset all configuration settings and the EEPROM back to the factory default settings. LED3 (green) will turn off when entering reset configuration mode. Once LED3 (green) turns off, release SW1 and the control will reset.

DIP Switch (SW2)

SW2-1 FP1 Selection – Low water coil temperature limit setting for freeze detection. On = 30°F [-1.1 °C]; Off = 15°F [-9.4°C]. On is default.
SW2-2 FP2 Selection – On = 30°F [-1.1 °C]; Off = N/A. On is default.
SW2-3 RV – O/B - Reversing Valve Position. Normally cooling "B" or normally heating "O" On = O; Off = B. B is default.
SW2-4 and 2-5 Access Relay Operation (P2). On and Off is default.
SW2-6 CC Operation – selection of single or dual capacity compressor. On = Single Stage; Off = Dual Capacity. On is default.

Access Relay Operation	SW2-4	SW2-5
Not Used	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
(Reserved)	OFF	ON

SW2-7 Lockout and Alarm Outputs (P2) – selection of a continuous or pulsed output for both the LO and ALM Outputs. On = Continuous; Off = Pulsed. On is default.
SW2-8 Future Use. On is default.

Alarm Jumper Clip Selection

From the factory, ALM is connected to 24 VAC via JW2. By cutting JW2, ALM becomes a dry contact connected to ALG.

Software Features

Safety Features

The following safety features are provided to protect the compressor, heat exchangers, wiring and other components from damage caused by operation outside of design conditions.

Fuse – a 5 amp automotive type plug-in fuse and each ABC provides protection against a low Voltage short circuit or overload conditions.

Lead/Lag Operation - The lead/lag circuit will switch between circuit A and B at every start up to even run time between circuits. Therefore Stage 1 can energize Circuit A or B depending upon the state of the lead/lag circuit.

Anti-Short Cycle Protection – 5 minute anti-short cycle protection for the compressor.

Compressor Minimum On Time - 5 minute minimum on-time protection for the compressor to insure oil circulation for each compressor cycle.

Random Start – 5 to 80 second random start upon power up and return from load shed or emergency shutdown.

Fault Retry – in the fault condition, the control will stage off the outputs and then “try again” to satisfy the compressor input call. Once the input calls are satisfied, the control will continue on as if no fault occurred. If 3 consecutive faults occur without satisfying the compressor input call, then the control will go to lockout mode.

Lockout – when locked out, the Alarm output (ALM) and Lockout output (L) will be turned on. The fault type identification display LED1 (Red) shall flash the fault code. Lockout may also be reset by turning power off for at least 30 seconds or through HMI or BACnet.

High Pressure – The E2 fault is recognized when the Normally Closed High Pressure Switch, P4-9/10 opens, no matter how momentarily. The High Pressure Switch is electrically in series with the Compressor Contactor and serves as a hardwired limit switch if an overpressure condition should occur.

Low Pressure OR Loss of Charge - The E6 fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is continuously open for 30 seconds. Closure of the LPS any time during the 30 second recognition time restarts the 30 second continuous open requirement.

In a Loss of Charge, the E3 fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is open prior to the compressor starting.

HydroLink2 Aurora Controls cont.

Freeze Detection - Refrigerant (Source – E5 or Load HX E4) – Freeze detection can be triggered by either a 30 sec. recognition of the FP1 (Source HX) or FP2 (Load HX) temperature OR a 30 sec recognition of saturation temperature (using Suction pressure) below setpoint of 30 degrees. For the FP sensors, set points shall be either 30°F [-1.1 °C] or 15°F [-9.4°C] for the refrigerant temperature (can also be adjusted between these points). When the thermistor temperature drops below the selected set point, the control shall begin counting down the 30 seconds delay. If the thermistor value rises above the selected set point, then the count should reset. The resistance value must remain below the selected set point for the entire length of the appropriate delay to be recognized as a fault.

For the Saturation Temperature, the suction pressure sensor is monitored and when the resulting saturation temperature is below 30°F [-1.1°C] for 30 continuous seconds a fault is triggered in a similar fashion. There is no indication which condition has triggered the fault other than sensor readings at the time of the event.

Water Temp Fault EST/ELT – HX fluid (Source or Load HX) – An E26 alarm can be triggered by a 30 sec. recognition of the EST (Source or Load HX) temperature below specified limit. An E27 alarm can be triggered by a 30 sec. recognition of the EST (Source or Load HX) temperature above specified limit. It is recommended that the Alarms be set 1-2 degrees off of the Fault set points so that the Alarm will trigger first prior to generating the faults or Lockouts.

Water Temp Fault LST/LLT – HX fluid (Source or Load HX) – An E28 alarm can be triggered by a 30 sec. recognition of the EST (Source or Load HX) temperature below specified limit. An E29 alarm can be triggered by a 30 sec. recognition of the EST (Source or Load HX) temperature above specified limit. It is recommended that the Alarms be set 1-2 degrees off of the Fault set points so that the Alarm will trigger first prior to generating the faults or Lockouts.

		Source HX	Load HX
Entering Temp	Low Fault	E26	E26
	High Fault	E27	E27
Leaving Temp	Low Fault	E28	E28
	High Fault	E29	E29

Over/Under Voltage Shutdown - An over/under voltage condition exists when the control voltage is outside the range of 18 VAC to 30 VAC. If the over/under voltage shutdown lasts for 15 minutes, the lockout and alarm relay will be energized. Over/under voltage shutdown is self-resetting in that if the voltage comes back within range of 18 VAC to 30 VAC for at least 0.5 seconds, then normal operation is restored.

Operation Description

Power Up - The unit will not operate until all the inputs and safety controls are checked for normal conditions. The unit has a 5 to 80 second random start delay at power up. Then the compressor has a 5 minute anti-short cycle delay after the random start delay.

Standby - In standby mode, Y1, Y2, W, DH, and G are not active. Input O/B may be active. The compressor will be off.

Heating Operation

This product generally utilizes a "B" reverse cycle selection of the O/B reversing valve operation. In all heating operations, the reversing valve directly tracks the B input. Thus, anytime the B input is present, the reversing valve will be energized for heating mode. This means a failure of the reversing valve will still allow cooling mode operation. The lead/lag circuit will switch between circuit A and B at every start up to even run time between circuits. Therefore Stage 1 can energize Circuit A or B depending upon the state of the lead/lag circuit.

Dual Compressor Heating, 1st Stage (Stage 1, B)
The stage 1 compressor will be staged to full capacity 20 seconds after Y1 input is received at ABC A.

Dual Compressor Heating, 2nd Stage (Stage 1, Stage 2, B)
The stage 2 compressor will be engaged to full capacity 30 seconds after Y2 input is received at the ABC A board.

Cooling Operation

This product generally utilizes a "B" reverse cycle selection of the O/B reversing valve operation. In all cooling operations, the reversing valve inversely tracks the B input. Thus, anytime the B input is NOT present, the reversing valve will be de-energized for cooling mode. This means a failure of the reversing valve will still allow cooling mode operation. The lead/lag circuit will switch between circuit A and B at every start up to even run time between circuits. Therefore Stage 1 can energize Circuit A or B depending upon the state of the lead/lag circuit.

Dual Compressor Heating, 1st Stage (Stage 1, B) - The stage 1 compressor will be staged to full capacity 20 seconds after Y1 input is received at the ABC A board.

Dual Compressor Heating, 2nd Stage (Stage 1, Stage 2, B) - The stage 2 compressor will be engaged to full capacity 30 seconds after Y2 input is received at the ABC A board.

HydroLink2 Aurora Controls cont.

Other Modes of Operation

Load Shed - The LS input or communicated signal disables all outputs with the exception of the blower output. When the LS input has been cleared, the anti-short cycle timer and random start timer will be initiated. Input must be tied to common to activate. These feature can be applied to Circuit A or B individually.

Aurora 'Base' Control LED Displays - Although the HydroLink2 Aurora comes with a 10" color touch tablet, the ABC does have LED's for reading basic status and fault codes. These three LEDs display the status, configuration, and fault codes for the control. These can also be read in plain English via the HydroLink2 Touch Display.

Status LED (LED3, Green)
Description of Operation Fault LED, Green Normal Mode
ON Control is functional
OFF Control is Non-Functional
Slow Flash is Test Mode
Fast Flash Dehumidification Mode
Flash Code 2 (Future Use)
Flash Code 3 (Future Use)
Flash Code 4 Load Shed
Flash Code 5 ESD
Flash Code 6 (Future Use)
Flash Code 7 (Future Use)

Configuration LED (LED2, Yellow)
Description of Operation Configuration LED, Yellow
Not used.

Fast Flash Fault LED (LED1, Red) Red Fault LED
See Fault Table for flash codes.

HydroLink2 Aurora in BAS Applications

The HydroLink2 Aurora is designed to allow chillers to be integrated into Building Automation Systems (BAS) with ease. The HydroLink2 Aurora is an integrated solution and communicates directly with the Aurora Heat Pump Controls and allows access/control of a variety of internal Aurora heat pump operations such as sensors, relay operation, faults and other information. In turn, the HydroLink2 then converts internal Aurora Modbus protocol to BACnet MS/TP and communicates to the BAS system. This provides the great benefit of complete control integration and a myriad of information available to the BAS from the heat pump control. Plus it also allows individual unit configuration such as freeze protection setting directly over the BAS without the need for access to the actual heat pump. The HydroLink2 Aurora is programmed using the powerful NiagaraAX language.. This will allow for a BAS to integrate and communicate to the heat pump through BACnet MSTP. The HydroLink2 Aurora includes a configurable wireless 10" color touch tablet. There are an extensive number of points that the HydoLink2 Aurora has available over the network for integration into the BAS. Control programmers need to carefully determine which points they want to add into the BAS database. Consult your factory representative for more information on BAS integration.

HydroLink2 Aurora Controls cont.

HydroLink2 Aurora Features

- Built-in surge transient protection circuitry
- Operating range of -20° to 140°F [-28.9°C to 60°C]; 10 to 95% relative humidity, non-condensing
- BACnet MS/TP
- Status of all unit operating conditions and fault lockouts
- Visual color high definition display for status of power, network communication, processor operation, and faults etc.
- Provides gateway into Aurora heat pump controls for unsurpassed control flexibility
- Network point for commanding unit into load shed
- Network point for commanding unit into emergency shutdown
- Network points for freeze protection settings
- Heating and cooling control from a remotely located sensor
- FCC, UL and CE listed. BTL Certification

Advanced Features

- AID Tool for Aurora ABC configuration and troubleshooting.
- The display includes full color high definition graphics display for easier diagnostics.
- Built-in 802.11g wi-fi router for wireless connectivity.
- The built in Aurora AXB expansion board and provides added user I/O.
- Refrigeration Monitoring – provides Suction and discharge pressure, Suction, liquid line temps and superheat and subcooling.
- Energy Monitoring – provides real-time power measurement (Watt) of compressor
- Performance Monitoring – provides entering and leaving loop water temperatures, loop flow rate as well as heat of extraction or rejection rate into the loop. (requires optional field mounted flow meters.

HydroLink2 Aurora Touch Interface

Utilizing a wireless 10” color touch-screen interface, the HydroLink2 provides a technician the ability to configure and diagnose equipment at the unit. The technician will have full access to equipment status, parameter values, temperature, as well as access to alarms history. With website-like navigation, the HydroLink2 Aurora Touch Interface is easy to use and provides important insight into the system so your building can operate as efficiently as possible



10” Color touch tablet

Available BAS Points

Nearly every internal input and output used in the control and monitoring of the system is available as a point on the BAS system. BACnet points list boasts nearly 100 points available to the BAS system. Please consult the appropriate points list for your specific network.

Compressor Proving Sensors – Are installed on each compressor from the factory.

Fault, Configuration, and Status Codes – The codes can be visible to the BAS if desired Fault LED (LED1, Red) Red Fault LED

HydroLink2 Aurora Controls cont.

Fault, Configuration and Status Codes

Red Fault LED	Fault Code		LED Flash Code *	Lockout	Reset/ Remove	Fault Condition Summary
ABC & AXB Basic Faults	-	Normal - No Faults	Off			
	1	Fault-Input	1	No	Auto	Tstat input error. Autoreset upon condition removal.
	2	Fault-High Pressure	2	Yes	Hard or Soft	HP switch has tripped (>600 psi) [4.1 MPa]
	3	Fault-Low Pressure	3	Yes	Hard or Soft	Low Pressure Switch has tripped (<40 psi [0.28 MPa] for 30 continous sec.)
	4	Fault-Freeze Detection FP2	4	Yes	Hard or Soft	Freeze protection sensor or low Sat temp has tripped (<15˚F [-9.4°C] or 30˚F [-1.1°C] for 30 continuous sec.)
	5	Fault-Freeze Detection FP1	5	Yes	Hard or Soft	Freeze protection sensor or low Sat temp has tripped (<15˚F [-9.4°C] or 30˚F [-1.1°C] for 30 continuous sec.)
	6	Fault-Loss of Charge	6	Yes	Hard or Soft	Low Pressure Switch open prior to compressor start (UPC Only)
	7	Fault-Condensate Overflow	7	Yes	Hard or Soft	Condensate switch has shown continuity for 30 continuous sec.
	8	Fault-Over/Under Voltage	8	No**	Auto	Instantaneous Voltage is out of range. **Controls shut down until resolved.
	9	Not Used	9	Yes	Hard or Soft	Not used
	10	Fault-Compressor Monitor	10	Yes	Hard or Soft	Open Crkt, Run, Start or welded cont
	11	Not Used	11	Yes	Hard or Soft	Not used
ABC & AXB Advanced Faults	12	Not Used	12	-	-	Not Used
	13	Non-CriticAXBSnsrErr	13	No	Auto	Any Other Sensor Err
	14	CriticAXBSnsrErr	14	Yes	Hard or Soft	Sensor Err for EEV or HW
	15	Alarm-HotWtr	15	No	Auto	HW over limit or logic lockout. HW pump deactivated.
	16	Fault-VarSpdPump	16	No	Auto	Alert is read from PWM feedback.
	17	Not Used	17	No	Auto	Not used
	18	Non-CritComErr	18	No	Auto	Any non-critical com error
	19	Fault-CritComErr	19	No	Auto	Any critical com error. Auto reset upon condition removal
	20	ABC Com Loss	20	Yes	Auto	HydroLink2ABC communication loss (UPC or HydroLink2 Only)
	21	Alarm - Low Loop Pressure	21	No	Auto	Loop pressure is below 3 psi for more than 3 minutes
	2	Not Used	2	-	-	Not used
	23	Not Used	23	No	Auto	Not used
	24	Not Used	24	No	Auto	Not used
	25	Not Used	25	-	-	Not used
	26	Ent Source/Load Low Limit	26	Yes	Auto	Entering Source/Load Low Water Temperature Limit
	27	Ent Source/Load High Limit	27	Yes	Auto	Entering Source/Load High Water Temperature Limit
	28	Lvg Source/Load Low Limit	28	Yes	Auto	Leaving Source/Load Low Water Temperature Limit
	29	Lvg Source/Load High Limit	29	Yes	Auto	Leaving Source/Load High Water Temperature Limit
	31	Src Flow Switch	31	Yes	Auto	Source Flow Switch Fault
	32	Ld Flow Switch	32	Yes	Auto	Load Flow Switch Fault

HydroLink2 Aurora Controls cont.

Other User Defined Field I/O

Field Temp 1 and 2 - Can display the temperature of a field supplied 10k Ohm NTC thermistor connected to AXB A or B P1-LVG Air.

Field Temp 3 - Can display the temperature of a field supplied 10k Ohm NTC thermistor connected to AXB A P17-HWT.

Field Press 1 and 2 - Can display the pressure of a field supplied pressure transducer connected to AXB A P3-Loop Pres. Consult technical support for more details.
Both Circuit A and Circuit B are shown on screen.

Field DI 1 and 2 - Can display the logic (Off/On) of the Field DI 1 and 2 input on the AXB A and B pin P4 – Smart Grid. Consult technical support for application details.

Flow Switch Inputs (HA1-Source, HA2-Load) - All flow switch inputs will be checked 5 seconds prior to either compressor starting. If the flow switches are not closed the compressor(s) will not start. While the compressor(s) is operating if either flow switch opens for 5 continuous seconds the compressor(s) will be immediately shut down until flow returns. If flow does not return within 60 seconds the controller will issue an E-31 fault code for Source Flow or an E-32 fault code for Load Flow. If at any time the flow returns for 15 continuous seconds the flow fault will automatically reset and the controls will be allowed to resume normal operation**.**

Field Amps 1 and 2 - Can display the current draw using a field installed current transducer on the AXB A and B pin P10 – Fan. Consult technical support for application details.

VS Pump % (Source/Load) - Can display the PWM output (0-100%) of the optional field installed source and load VS Pump. Outputs are connected to AXB A and B P2-VS Pmp. Consult technical support for application details.

Field AO 1 and 2 - Can display the output (0-10V) of the optional field installed analog output device. Outputs are connect to AXB A and B P11-ANA. Consult technical support for application details.

Field Relay 1 and 2 – This shows the state of the Field Relay 1 and 2 on AXB A and B (labeled DH). When Field Relay is “ON” the Field Relay 1 and 2 will be engaged. The output is wired to AXB A and B P11 – DH.

Field Relay 3 and 4 – This shows the state of the Field Relay 3 and 4 on AXB A and B (labeled DIV). When Field Relay is “ON” the Field Relay 1 and 2 will be engaged. The output is wired to AXB A and B P11 – DIV.

Field Relay 5 and 6 – This shows the state of the Field Relay 5 and 6 on AXB A and B (labeled K5). When Field Relay is “ON” the Field Relay 1 and 2 will be engaged. The output is wired directly to top of relay on AXB A and B K5

Field Relay 7 and 8 – This shows the state of the Field Relay 7 and 8 on AXB A and B (labeled K6). When Field Relay is “ON” the Field Relay 1 and 2 will be engaged. The output is wired directly to top of relay on AXB A and B K6

ACC2 (A and B) - This shows the state of the ACC 2 relay on the two AXB’s. When ACC 2 is “ON” the ACC 2 relay will be engaged.

Access Relay Operation	SW1-4	SW1-4
Not Used	ON	ON
Cycle with CC	OFF	ON
Cycle with CC2	ON	OFF
Cycle with DH from ABC Board	OFF	OFF

Using the HydroLink2 Aurora Color Touch Tablet



Color Touch Tablet

The Color Touch Tablet utilizes a touch-screen interface and HydroLink2 Aurora provides technicians with the ability to configure and diagnose equipment at the unit. Technicians have full access to equipment status, parameter values, temperature, and humidity sensing as well as access to alarm and trend history. With website-like navigation, the HydroLink2 Aurora Touch Interface is easy to use and provides important insight into the system so your building can operate as efficiently as possible.

Using the HydroLink2 Aurora Color Touch Tablet cont.

System Screen

Displays chiller status, operation, compressor status, source/load fluid temperatures, and control method. This screen gives an overview of the chiller with ability to change the mode and set point condition directly from this screen.



- Indicates a variable that can be changed via a single tap on the text box area.

Status – "Normal" for normal operation or "Lockout" indicating the unit has locked out due to a fault. The "Fault" causing the "Lockout" reason will be prominently displayed.

Operation – Displays the current operating condition of the unit such as "standby" or "cooling stage 2"

Compressor – Denotes the specific compressor that is operating. "A" for the top compressor circuit and "B" for the bottom. If both are active, "A + B" will be displayed.

Mode – Since this product is a reversible chiller, this displays whether it is "Heating" or "Cooling". In "Heating Mode" the source is the evaporator and load is the Condenser, and in "Cooling Mode" it is reversed.

Method – Displays the control method current selected to operate the system. The three options include, Setpoint Control using selectable onboard sensors and a PID loop, Aquastat mode using external (field supplied) 24V temperature sensor and 24VAC commands directly to the unit, Network Mode with operation commands directly thru BACnet communication. See Temperature Control Method Section for more detail.

Input – The selected temperature sensor for the control method.

Setpoint – The selected setpoint the unit is trying to maintain.

Control Temp – The current temperature of the control sensor.

Source Fluid:

Leaving (°F) – The leaving source temperature in °F or °C.
Entering (°F) – The entering source temperature in °F or °C.
Flow – The source fluid flow in GPM or l/s
HE/HR – The source heat of extraction (heating mode) or rejection (cooling mode) in MBtuh or kW.

Load Fluid:

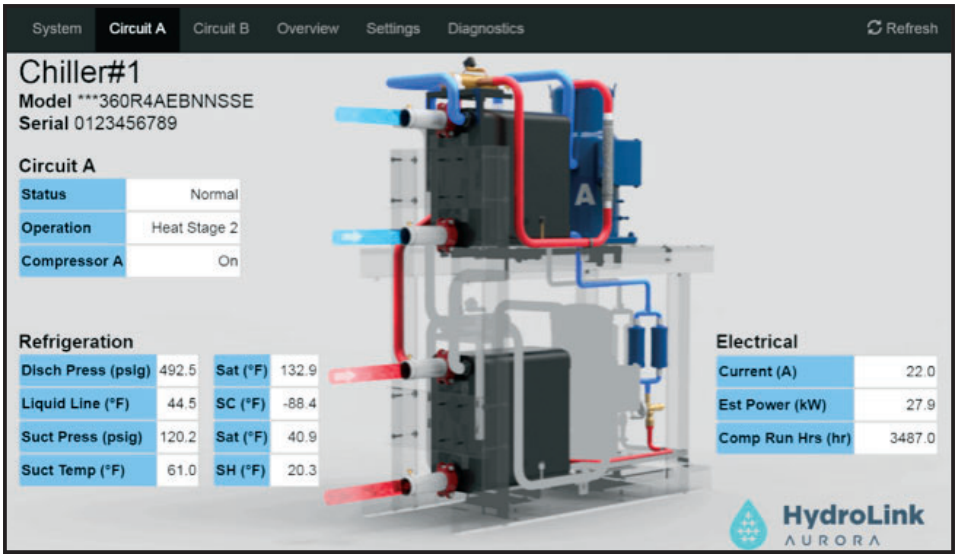
Leaving (°F) – The leaving load temperature in °F or °C.
Entering (°F) – The entering load temperature in °F or °C.
Flow – The load fluid flow in GPM or l/s
Capacity – The Load Capacity in MBtuh or kW.

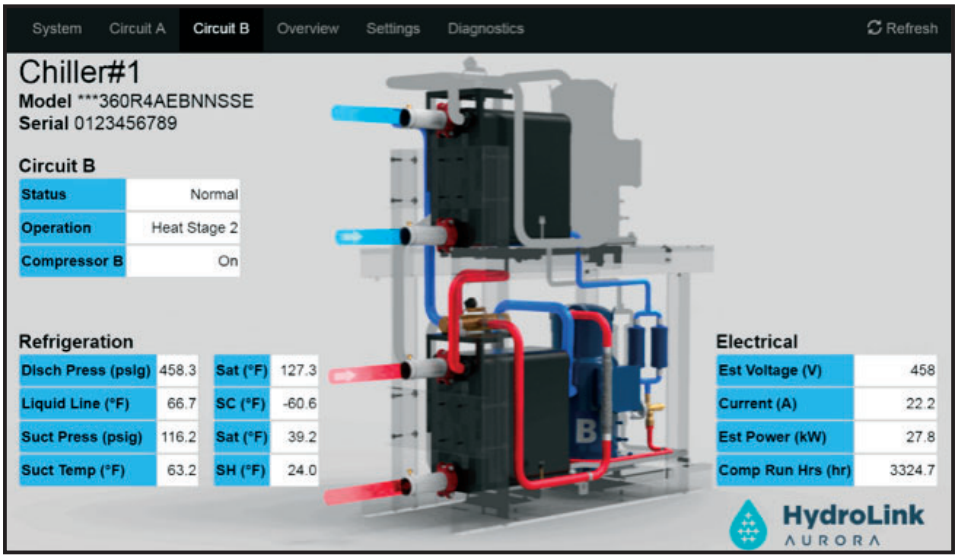
NOTE: N/A – Is displayed in the "Flow", "HE/HR", and "Capacity" dialogue boxes when an optional field installed flow meter is not connected to the HydroLink2 Aurora. Compatible flow meters must be used for accurate flow measurement. Consult your factory representative for more information on this option.

Using the HydroLink2 Aurora Color Touch Tablet cont.

Circuit A/Circuit B Screens

As the title suggests, these screen display information regarding the compressor circuit of interest. From this screen, refrigerant pressure and temperature values are displayed along with superheat, subcooling, and refrigerant saturation values. Compressor amperage, run hours, and estimated power are also displayed here. For information on “Est Power (kW)” please see “Diagnostics” section later in this manual.

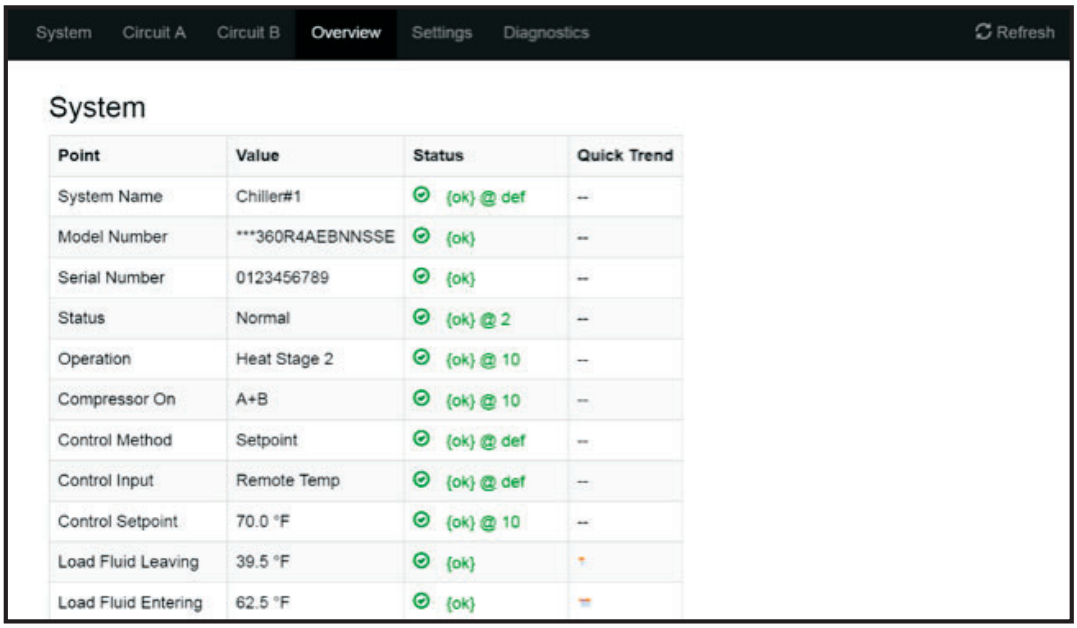




Using the HydroLink2 Aurora Color Touch Tablet cont.

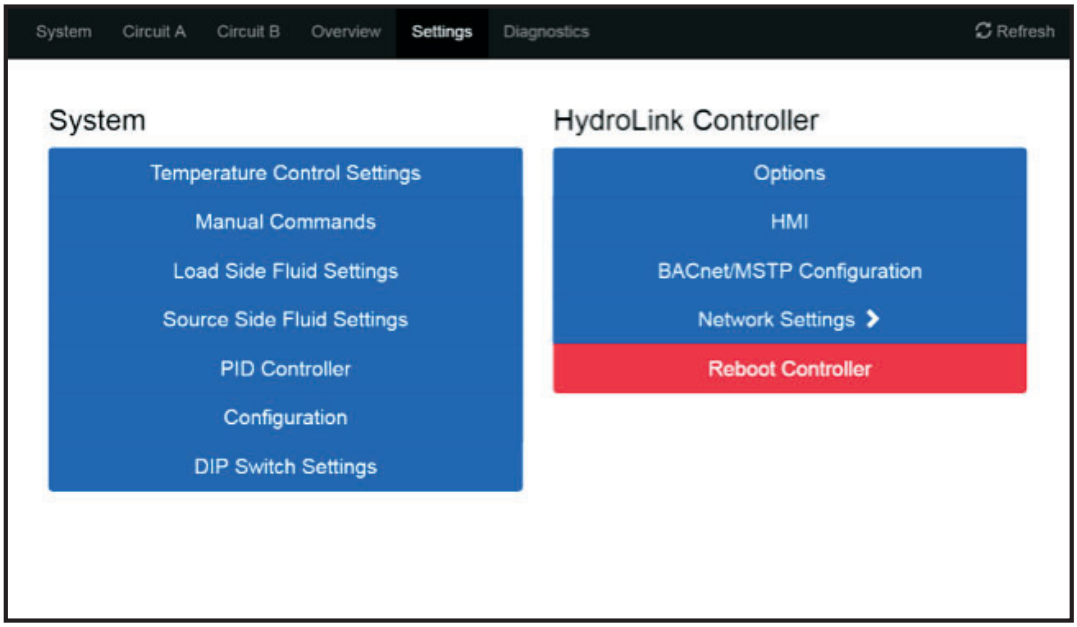
Overview Screen

The overview screen provides a binary snapshot of all system variables available to the HydroLink2 Aurora Control system. This screen is arguably the most powerful of all the screens and provides the technician with the value and status for every point in the system. As an added bonus, the "Quick Trend" column displays on current readings for various systems points so that the technician can have access to data readings without changing screens.



Settings Screen

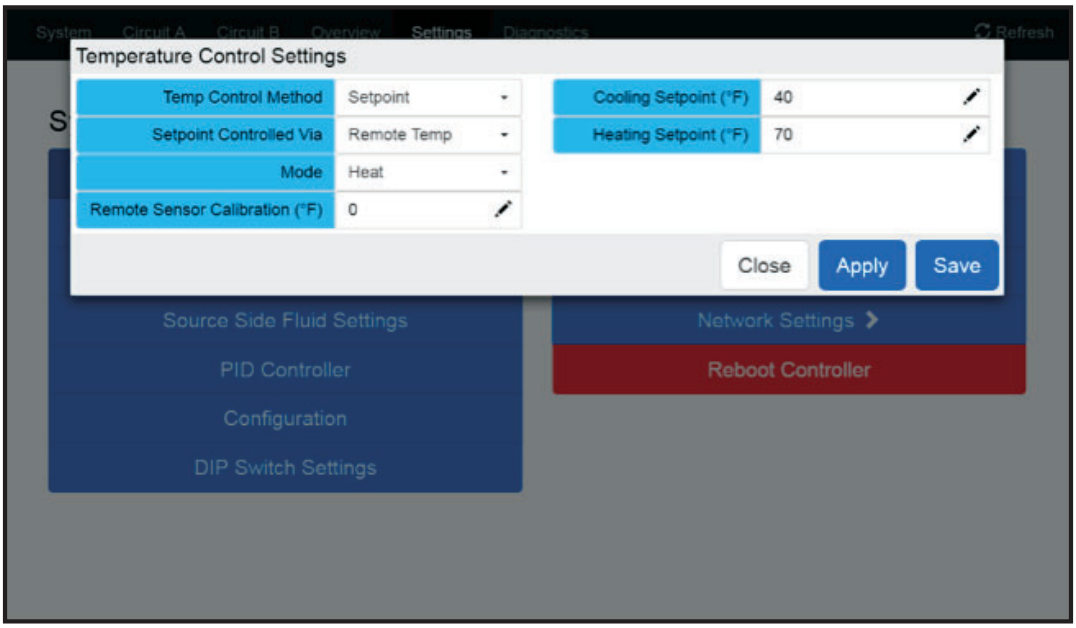
All temperature, network, or DIPswitch settings for the system or HydroLink2 controller can be accessed or changed thru the "Settings" screen. The method of temperature control, mode of operation, and manual operation all take place in this screen.



Using the HydroLink2 Aurora Color Touch Tablet cont.

Temperature Control Settings Screen

The unit will operate with 3 different control methods. The three options include, Setpoint Control using selectable onboard sensors and a PID loop, Aquastat mode using external (field supplied) 24V temperature sensor and 24VAC commands directly to the unit, Network Mode with operation commands directly thru BACnet communication. These are selectable in the Temperature control Settings Window.



Setpoint Control Method

In Setpoint control the unit will maintain setpoint based upon the internal (and modifiable) PID algorithm. In this mode several sensors can be selected and used for sensing. The entering load temperature (ELT), or leaving load temperature (LLT) are onboard sensors that can be selected for this use. The remote sensor, a 10k NTC thermistor that is hooked up to P17-HW inputs (bare wire provided) on the AXB-B board, allows for an external sensor application. The last option is the Network Sensor that can be selected and communicated thru BACnet and used as the controlling sensor. The network sensor also relies on the internal PID algorithm as the other 3. The compressors will have lead/lag capability in this method.

AquaStat Control Method

In Aquastat control the unit will operate based upon 24VAC control signals into the Y1 (stage 1), Y2 (stage 2), and B (heating) P1 inputs on ABC-A using an external to the unit aquastat temperature sensing and setpoint control system. The compressors will have lead/lag capability.

Network Control Method

In Network Control the unit will operate based upon communicated Y1 (stage 1), Y2 (stage 2), and B (heating) points thru the BACnet system. See BACnet Points lists for specifics. The compressors will have lead/lag capability.

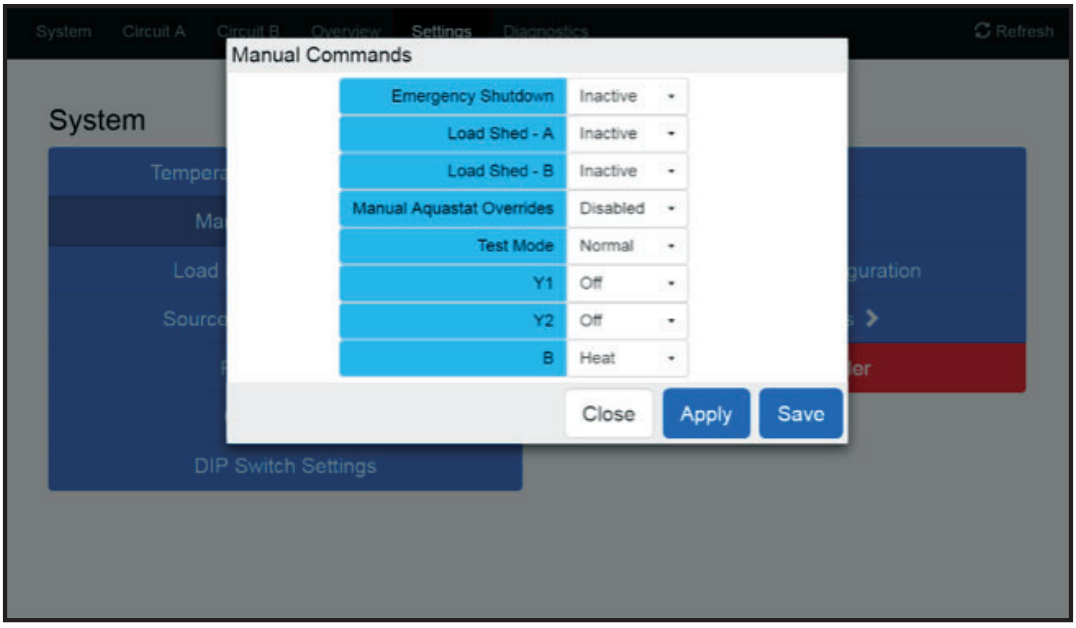
The following are only available for selection in Setpoint Mode.

- **Mode –** Allows the selection of heating, cooling, and auto. Remote Sensor Calibration.
- **Remote Sensor Calibration –** Allows the remote sensor to be 'calibrated' using an offset temperature. Enter -1 to lower the reading to match a reference measurement and 1 to raise the reading by a degree.
- **Heating and Cooling Setpoint –** These are the setpoints respectively for heating and cooling. Only one can be selected at a time.

Using the HydroLink2 Aurora Color Touch Tablet cont.

Manual Commands Screen

HydroLink2 Aurora allows several manuals commands that can either be 'network communicated' or in some cases even hardwired to the boards using a daisy chained grounding signal.



Emergency Shutdown – This command, either hard-wired as a grounded signal to P2 on either ABC-A or ABC-B or network communicated (Emerg Shutdown), will immediately (5 sec) shutdown all compressor and any other outputs. This screen shows whether it is active or not.

Load Shed A – This command, either hard wired as a grounded signal to P2 on ABC-A for Compressor A or network communicated (Load Shed A), will immediately shutdown (5 sec) the appropriate compressor operation all other outputs are unaffected. This screen shows whether it is active or not.

Load Shed B – This command, either hard wired as a grounded signal to P2 on ABC-B for Compressor B or network communicated (Load Shed B), will immediately shutdown (5 sec) the appropriate compressor operation all other outputs are unaffected. This screen shows whether it is active or not.

Manual Aquastat Override – When enabled allows manual operation of the unit using the following direct commands.

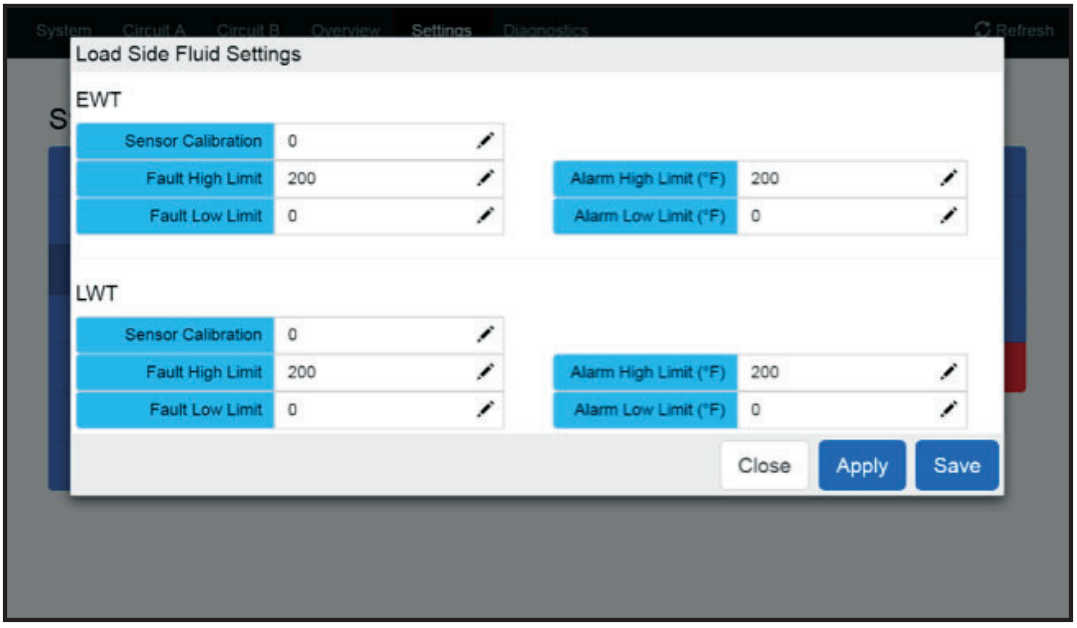
Test Mode – This network communicated command only will speed up all timings by 16 times to aid in troubleshooting. If Active this display will show Active and the ABC Board's Green LED will also fast flash when Test Mode is active. If Test Mode is inactive this will show 'normal'.

Circuit A, Circuit B and B (Heating) Commands – These commands allow manual operation of the unit. If activated (ON), Circuit A will engage the A compressor. Circuit B and B (Heating) work similarly. This is a handy way to manually turn on the compressor stages and check reversing valve operation.

Using the HydroLink2 Aurora Color Touch Tablet cont.

Load Side Fluid Settings Screen

Load Side Fluid Settings window allows calibration and Load Side Fluid Fault and Alarm settings.



ELT - Sensor Calibration – This allows adjustment up or down of the ELT sensor for better calibration. Enter -1 (minus 1) to lower the reading to match a reference measurement and 1 to raise the reading by a degree.

ELT - Fault High Limit and Low Limit – These boundaries can be user set. When the ELT temperature is above the high limit or below the low limit for 1 sec. a fault code (E26 for low limit and E27 for high limit) network point is generated. After 3x of unsuccessful operation the unit is locked out on an E26 for low limit or E27 for high limit.

ELT – Alarm High Limit and Alarm Low Limit – These boundaries can be the user set and serve as a first level warning. When the ELT temperature is above the high alarm limit or below the low alarm limit for 1 sec. a warning screen and Network point is generated. It is recommended that the Alarms be set 1-2 degrees off of the Fault set points so that the Alarm will trigger first prior to generating the faults or Lockouts.

LLT - Sensor Calibration – This allows adjustment up or down of the LLT sensor for better calibration. Enter -1 (minus 1) to lower the reading to match a reference measurement and 1 to raise the reading by a degree.

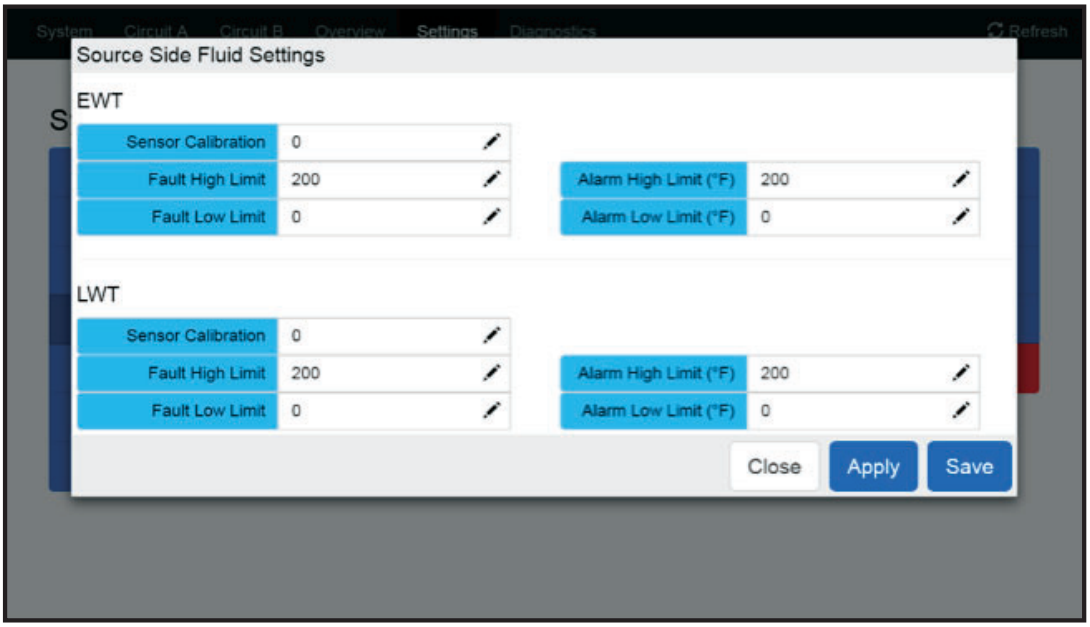
LLT - Fault High Limit and Low Limit – These boundaries can be user set. When the LLT temperature is above the high limit or below the low limit for 1 sec. a fault code (E28 for low limit and E29 for high limit) network point is generated. After 3x of unsuccessful operation the unit is locked out on an E28 for low limit or E29 for high limit.

LLT – Alarm High Limit and Alarm Low Limit – These boundaries can be the user set and serve as a first level warning. When the LLT temperature is above the high alarm limit or below the low alarm limit for 1 sec. a warning screen and Network point is generated. It is recommended that the Alarms be set 1-2 degrees off of the Fault set points so that the Alarm will trigger first prior to generating the faults or Lockouts.

Using the HydroLink2 Aurora Color Touch Tablet cont.

Source Side Fluid Settings Screen

Source Side Fluid Settings window allows calibration and Source Side Fluid Fault and Alarm settings.



EST - Sensor Calibration – This allows adjustment up or down of the EST sensor for better calibration. Enter -1 (minus 1) to lower the reading to match a reference measurement and 1 to raise the reading by a degree.

EST - Fault High Limit and Low Limit – These boundaries can be user set. When the EST temperature is above the high limit or below the low limit for 1 sec. a fault code (E26 for low limit and E27 for high limit) network point is generated. After 3x of unsuccessful operation the unit is locked out on an E26 for low limit or E27 for high limit.

EST – Alarm High Limit and Alarm Low Limit – These boundaries can be the user set and serve as a first level warning. When the EST temperature is above the high alarm limit or below the low alarm limit for 1 sec. a warning screen and Network point is generated. *It is recommended that the Alarms be set 1-2 degrees off of the Fault set points so that the Alarm will trigger first prior to generating the faults or Lockouts.*

LST - Sensor Calibration – This allows adjustment up or down of the LST sensor for better calibration. Enter -1 to lower the reading to match a reference measurement and 1 to raise the reading by a degree.

LST - Fault High Limit and Low Limit – These boundaries can be user set. When the LST temperature is above the high limit or below the low limit for 1 sec. a fault code (E28 for low limit and E29 for high limit) network point is generated. After 3x of unsuccessful operation the unit is locked out on an E28 for low limit or E29 for high limit.

LST – Alarm High Limit and Alarm Low Limit – These boundaries can be the user set and serve as a first level warning. When the LST temperature is above the high alarm limit or below the low alarm limit for 1 sec. a warning screen and Network point is generated. *It is recommended that the Alarms be set 1-2 degrees off of the Fault set points so that the Alarm will trigger first prior to generating the faults or Lockouts.*

		Source HX	Load HX
Entering Temp	Low Fault	E26	E26
	High Fault	E27	E27
Leaving Temp	Low Fault	E28	E28
	High Fault	E29	E29

NOTE: In the cooling mode, Freeze protection also includes the E5 Freeze protection fault that is based upon both the suction temperature and the saturated suction pressure setpoints when cooling. These are not user adjustable, have retry and can lockout the unit on an E5 Fault code. Note: In the heating mode, Freeze protection also includes the E4 Freeze protection fault that is based upon both the suction temperature and the saturated suction pressure setpoints. These are not user adjustable, have retry and can lockout the unit on an E4 Fault code.

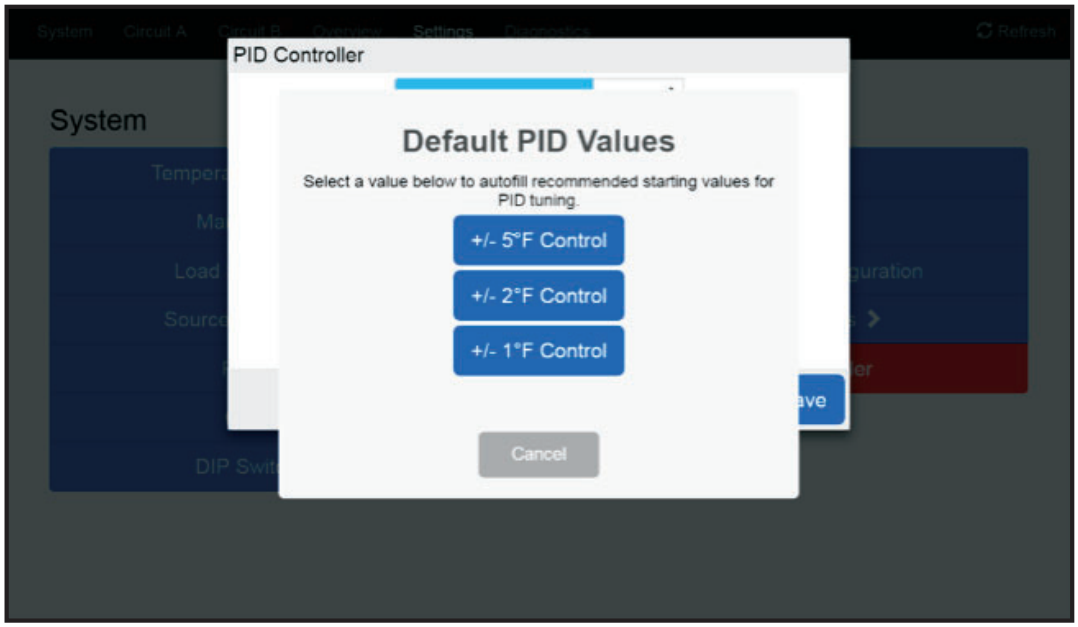
Using the HydroLink2 Aurora Color Touch Tablet cont.

PID Controller Screen

The setpoint control method utilizes an internal PID (proportional integral derivative) algorithms. The PID is commonly used as a control feedback loop to maintain a temperature setpoint. Three control accuracy defaults have been setup. Simply select the temperature control accuracy desired. Please consult our technical support if further PID fine tuning is desired.

	Control Accuracy		
	± 5˚F [± 3˚C]	± 2˚F [± 1˚C]	± 1˚F [± 0.5˚C]
Proportional Constant	8	20	40
Integral Constant	0.07	0.1	0.2
Derivative Constant	0	0	0
Execute Time	15	15	15
Cooling Differential	2.5	1	0.5
Heating Differential	2.5	1	0.5

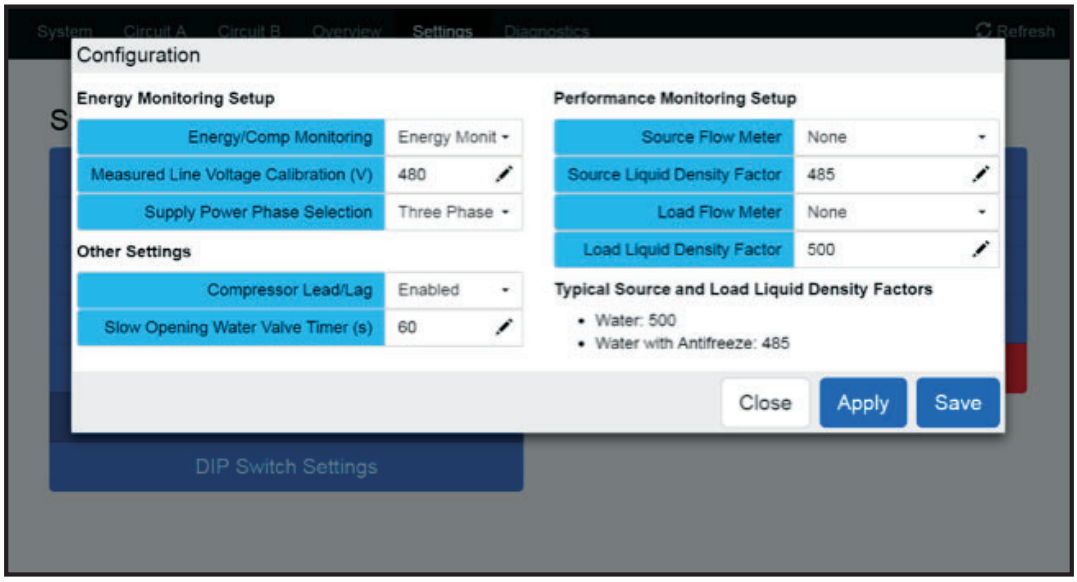




Using the HydroLink2 Aurora Color Touch Tablet cont.

Configuration Screen

The configuration window allows setup of the energy and performance monitoring as well as other settings such as lead/lag and water valve timing.



Energy Monitoring

Energy Compressor Monitoring – In Comp Monitoring the current transducers are only used for compressor locked rotor start timing or welded contact fault monitoring of the compressor contactor producing an E10 fault. In Energy monitoring adds power measurement to Comp monitoring and displays operating power of each compressor in Watts.

Measured Line Voltage Calibration – The HydroLink2 Aurora monitors the line Voltage of the unit after the control transformer. Upon installation, it is required that the supply Voltage be measured with the unit operating with one stage compressor. Enter this measured Voltage value into this cell. The control will track the line Voltage as it fluctuates using this calibration factor.

Supply Power Phase Selection – the selection of the unit supply power for use in unit power calculation.

Performance Monitoring

Source Flow Meter – An optional field installed flow meter for the source fluid is available to measure fluid flow of the unit. The meter has an accuracy of ±3%. The flow meter is required to calculate HE/HR. Use this to select the appropriate flow meter model.

Source Liquid Density – Select the appropriate liquid density factor of the source fluid. Typically 500 [4.2] is used for pure water and 485 [4.1] is used for antifreezes solutions. 500 [4.2] is the default

Load Flow Meter – An optional field installed flow meter for the load fluid is available to measure fluid flow of the unit. The meter has an accuracy of ±3%. The flow meter is required to calculate unit capacity at the load. Use this to select the appropriate flow meter model.

Load Liquid Density – Select the appropriate liquid density factor of the load fluid. Typically 500 [4.2] is used for pure water and 485 [4.1] is used for antifreezes solutions. 500 [4.2] is the default.

Other Settings

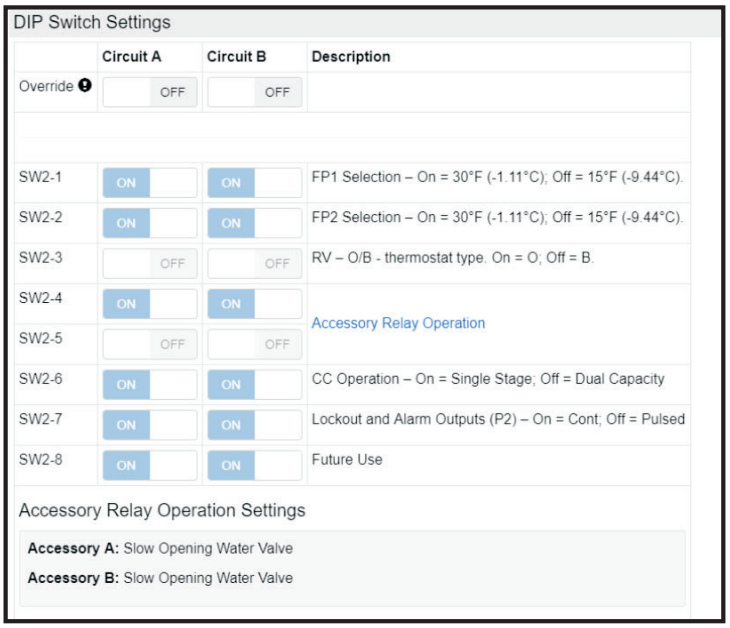
Compressor Lead/Lag – here you can enable or disable the compressor lead/lag algorithm. Lead/Lag is based upon simple alternation.

Slow Opening Water Valve Timer – This number represents the time it takes the water valve to open and establish 100% water flow and the delay on engaging the compressor. 60 sec is the default.

Using the HydroLink2 Aurora Color Touch Tablet cont.

Dip Switch Settings Screen

Each compressor has on its ABC board an 8 pin DIP allowing custom configurations of the operation. Both Circuit A and Circuit B are shown on screen.



Override - The DIP switch's physical selection can be electronically overridden by selecting Override and then changing the DIP switch position electronically. This is convenient in large multi-unit installations where SW2-1 Freeze protection has been inadvertently left in Water position at installation and needs to be switched to antifreeze. Thru this entry or BAS network the unit can be switched to Antifreeze without the need to physically go to the unit and flip the DIP switch. When overridden, the Yellow LED2 on the ABC will slowly flash indicating the physical position of the DIP has been overridden.

SW2-1 FP1 Selection – Source temperature limit setting for freeze detection. On = 30°F [-1.1°C] Water; Off = 15°F [-9.4°C] Antifreeze. Default is On=30°F [-1.1°C] Water.

SW2-2 FP2 Selection – Load temperature limit setting for freeze detection. On = 30°F [-1.1°C] Water; Off = 15°F [-9.4°C] Antifreeze. Default is On=30°F [-1.1°C] Water.

SW2-3 RV – O/B - thermostat type. Heat pump thermostats with "O" output in cooling or "B" output in Heating can be selected. On = O; Off = B. Default is Off=B.

Access Relay Operation	SW2-4	SW2-5
Not Used	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
(Reserved)	OFF	ON

SW2-4 Access Relay Operation (P2) and 2-5 Default is OFF/OFF Cycle with Compressor.
Cycle with Blower - The accessory relay will cycle with the blower output. Not used.
Cycle with Compressor - The accessory relay will cycle with the compressor output.
Water Valve Slow Opening - The accessory relay will cycle and delay both the blower and compressor output for 90 seconds.

SW2-6 CC Operation – selection of single or dual capacity compressor. On = Single Stage; Off = Dual Capacity. *Default is On=Single Stage.*

SW2-7 Lockout and Alarm Outputs (P2) – selection of a continuous or pulsed output for both the LO and ALM Outputs. On = Continuous; Off = Pulsed. *Default is On=Continuous.*

SW2-8 Future Use – *Default is On=Normal.*

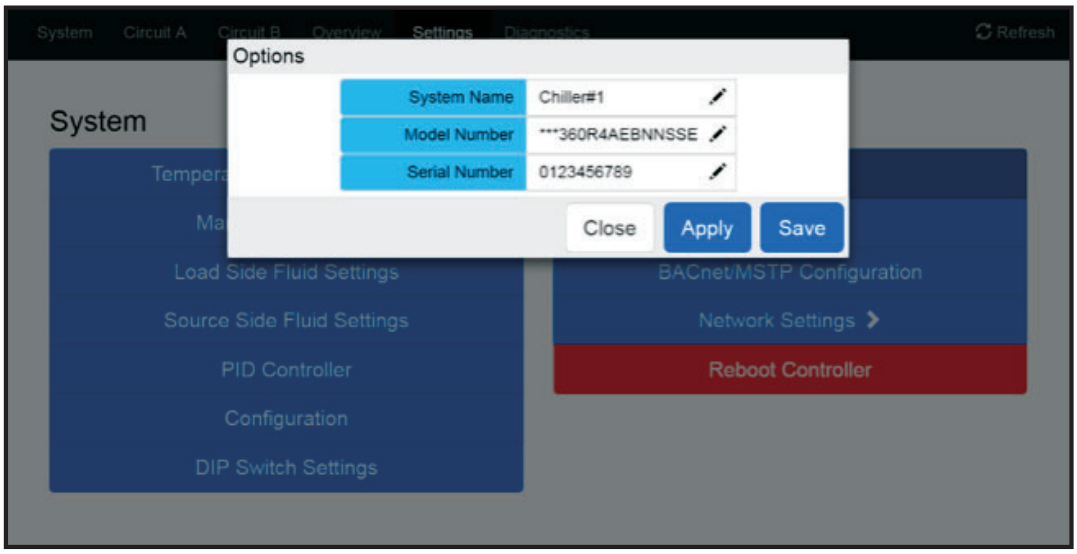
Using the HydroLink2 Aurora Color Touch Tablet cont.

System Name Options Screen

System Name - Each unit can have a custom alphanumeric name to better identify it in the BAS or local wifi displays. For example a name such as Mech Rm 2 – Chiller #1 could be entered.

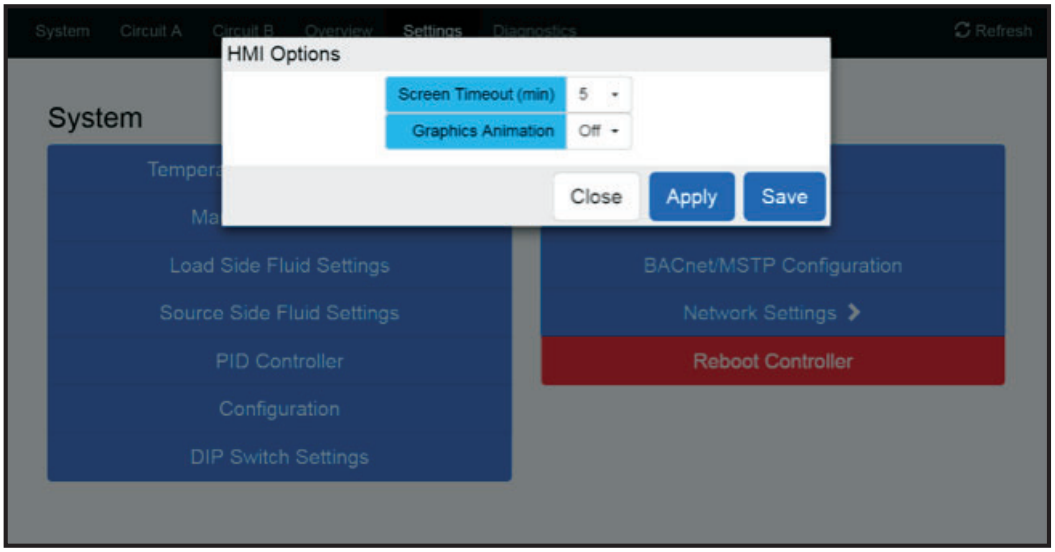
Model Number – The Model number of the unit. This field is entered at the factory and should never need to be changed except in an extreme case in which all controls have been field replaced. Otherwise replacing any one control the other controls should retain both the model and serial number.

Serial Number – The serial number of the unit. This field is entered at the factory and should never need to be changed except in an extreme case in which all controls have been field replaced. Otherwise replacing any one control the other controls should retain both the model and serial number.



Screen Options Screen

Screen Timeout – Typical Screen Timeout of the color touch display. Select desired time after use for screen to sleep.
Graphics Animation – The Graphics animation can be turned off in lower speed/performance environments. This will not effect the operation of the control or unit.



Using the HydroLink2 Aurora Color Touch Tablet cont.

BACnet/MSTP Configuration

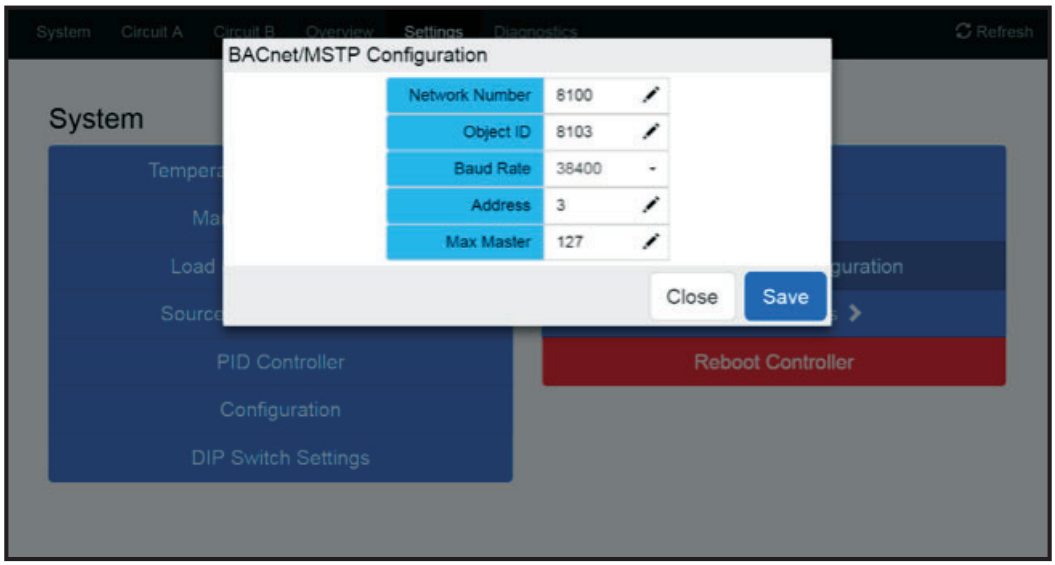
Network Number – The network number can be assigned from 8100 thru 8199. BACnet only allows a maximum of 99 id's per trunk.

Object ID - The object ID can be assigned from 8100 thru 8199. BACnet only allows a limited number of object ID's.

Baud Rate – Selectable from several speeds.

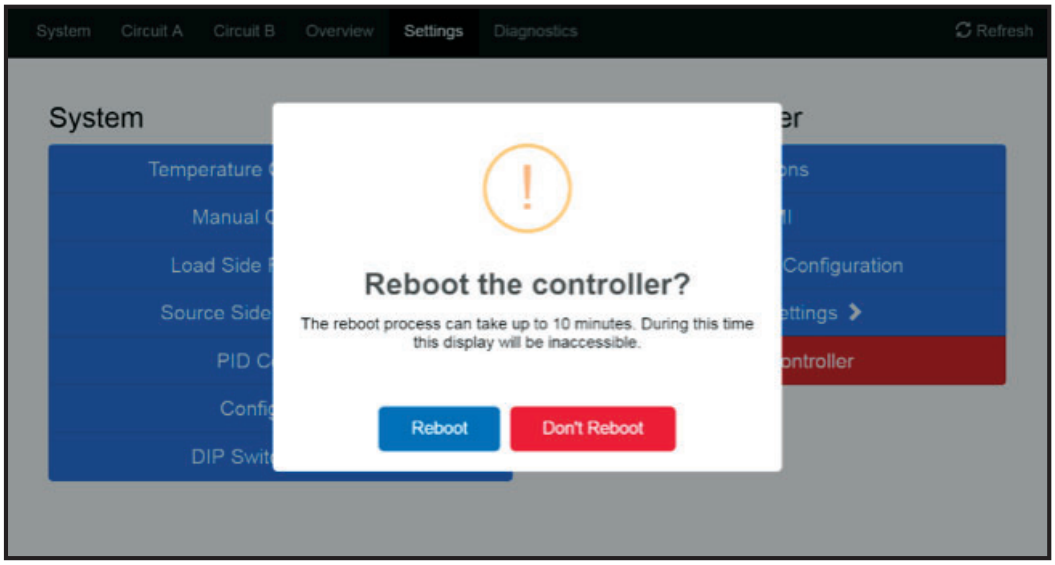
Address – Unique MAC Address

Max Master – Highest network number available.



Reboot Screen

Reboot The Controller – The reboot process can take up to 10 minutes and should not be interrupted.



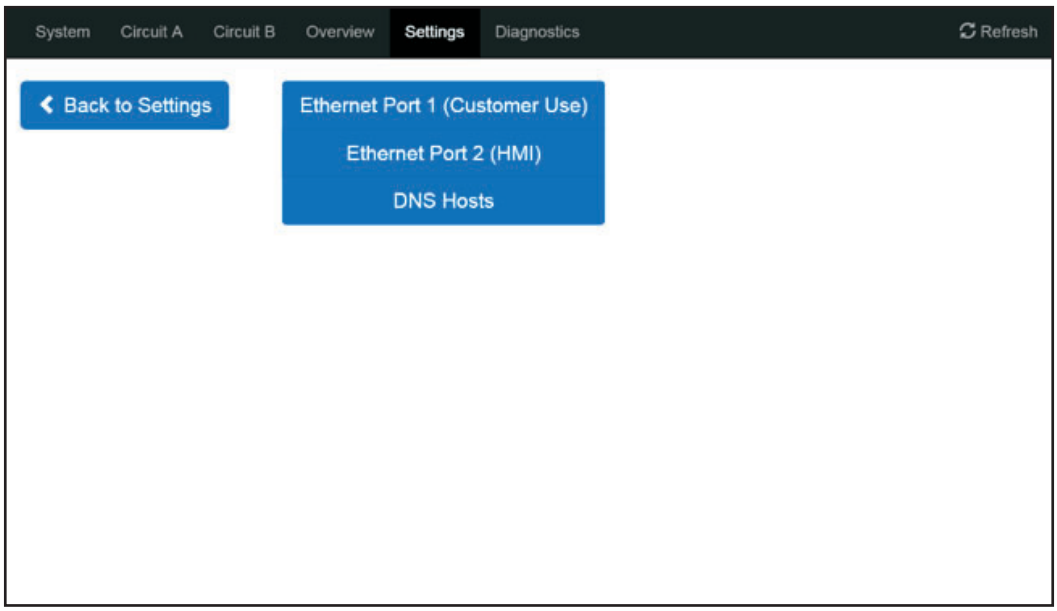
Using the HydroLink2 Aurora Color Touch Tablet cont.

Network Settings

Ethernet Port 1 (Customer Use) – This port is not used from the factory and can be setup for field use to connect such as connecting to another local area network router.

Ethernet Port 2 (HMI) – This port is configured in the factory to communicate via Wi-Fi router to the 10" [254mm] touch-screen tablet which displays HMI screens.

DNS Hosts – These values can be used if the field implementation requires the use of local Domain Name Service Hosts.



Using the HydroLink2 Aurora Color Touch Tablet cont.

Ethernet Port 1 & 2

WARNING: Changing Ethernet Port 2 (en1) settings may cause the touchscreen tablet to stop functioning correctly.

Addressing Mode – This setting is dependent upon the setup of the field implementation network. Static IP addressing is used to assign an unchanging IP address. Dynamic IP addressing should be used if the field implemented network will assign an IP address using DHCP (Dynamic Host Configuration Protocol).

IP Address – (Static Addressing Mode Only) The IP Address assigned to the HydroLink2 server.

Subnet Mask – (Static Addressing Mode Only) The subnet to which the the HydroLink2 server is assigned. (NOTE: Subnet Mask 1 and 2 must be different.

Default Gateway – The IP address of the Default Gateway. Used if the field implementation network requires a Default Gateway to which network traffic should be routed.



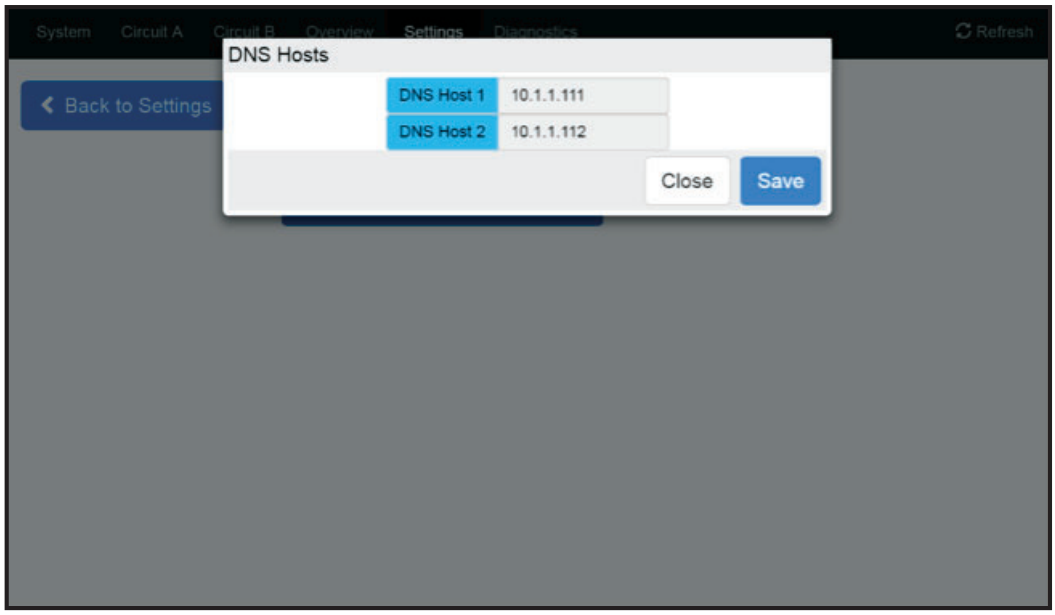


Using the HydroLink2 Aurora Color Touch Tablet cont.

DNS Hosts

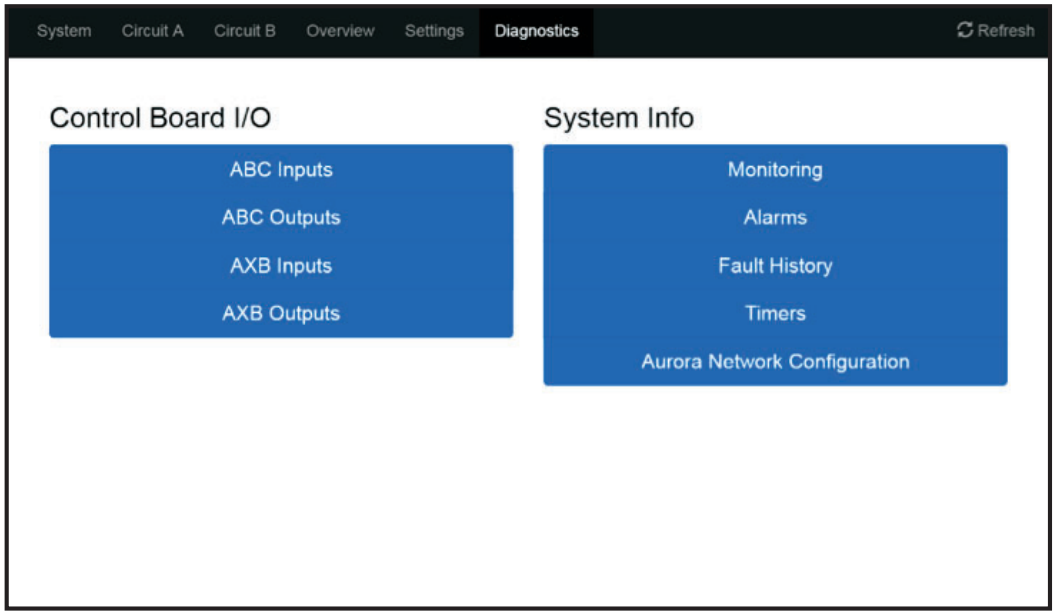
DNS Host 1 – The IP Address of DNS Host 1.

DNS Host 2 – The IP Address of DNS Host 2.



Diagnostic Screens

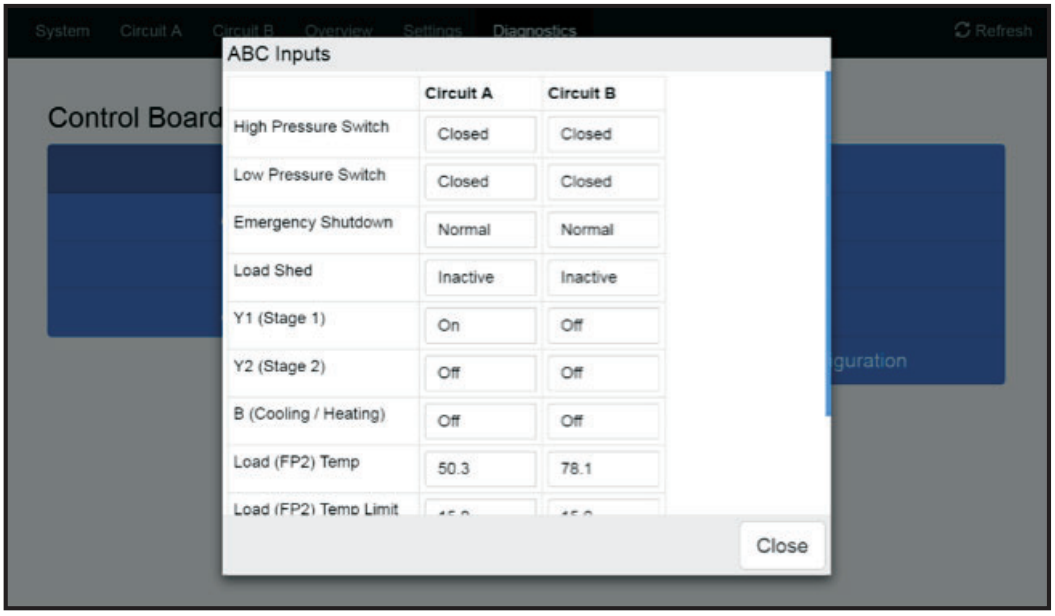
As the name suggests, the “Diagnostic” screen is summarized screen to make servicing of the chiller easier. This is the location where most of the detailed information and settings lie of the Aurora System.



Using the HydroLink2 Aurora Color Touch Tablet cont.

ABC Inputs Screen

Both Circuit A and Circuit B are shown on screen.



High Pressure Switch – The HP switch displays the position of the High pressure switch on the compressor discharge. Closed is the normal operation position, and open is a fault.

Low Pressure Switch – The LP switch displays the position of the low pressure switch on the compressor suction line. Closed is the normal operation position, and open is a fault.

Emergency Shutdown – Normal is displayed when NO grounded signal or Emergency Shutdown (ES) command is present. Active is displayed when an ES grounded signal or ES command is present. All

Load Shed Shutdown – Normal is displayed when NO grounded signal or load Shed (LS) command is present. Active is displayed when an LS grounded signal or LS command is present. Either Compressor A be B can be deactivated.

Y1 (Stage 1) – Y1 will be active when first stage compressor call is engaged either Comp A or B depending upon lead/lag selection.

Y2 (Stage 2) – Y2 will be active when second stage compressor call is engaged either Comp A or B depending upon lead/lag selection.

B (Cooling/Heating) – The "B" signal will be present when heating the load. Circuit A and B should always be the same.

Load (FP2) Temp – This displays the actual temperature of the FP2 Sensor.

Load (FP2) Temp Limit – This displays the actual limit of the FP2 Sensor. This is a user editable cell. Generally there is a 30 second recognition when FP2 is below this limit before a fault (E5) is recognized.

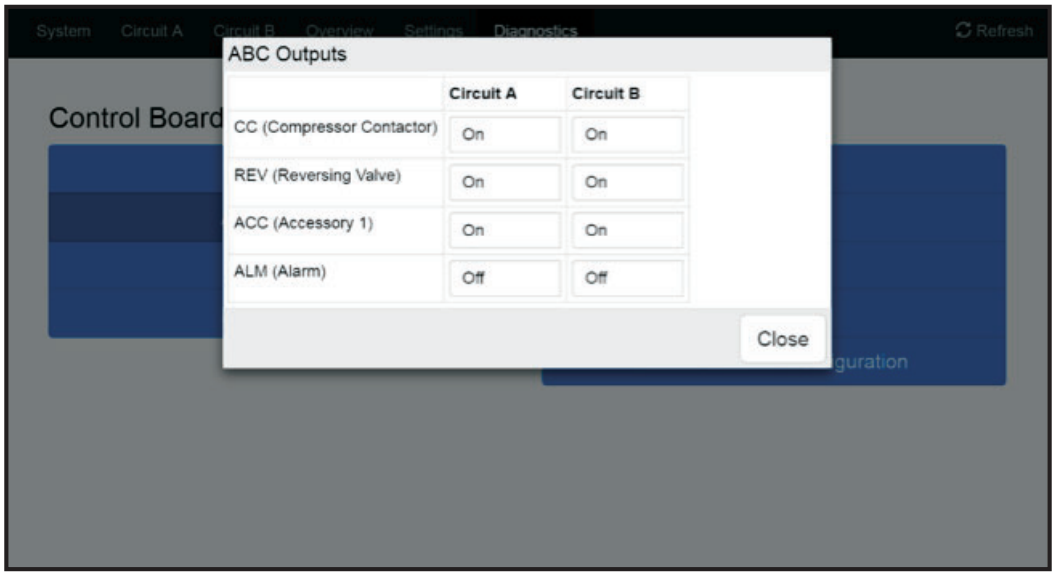
Source (FP1) Temp – This displays the actual temperature of the FP1 Sensor.

Source (FP1) Temp Limit – This displays the actual limit of the FP1 Sensor. This is a user editable cell. Generally there is a 30 second recognition when FP1 is below this limit before a fault (E5) is recognized.

Using the HydroLink2 Aurora Color Touch Tablet cont.

ABC Outputs Screen

Both Circuit A and Circuit B are shown on screen.



CC (Compressor Contactor) – This shows the state of the CC relay on the two ABC's. When CC is "ON" the compressor power contactor should be engaged.

REV (Reversing Valve) – This shows the state of the RV relay on the two ABC's. When RV is "ON" the unit should be in heating mode.

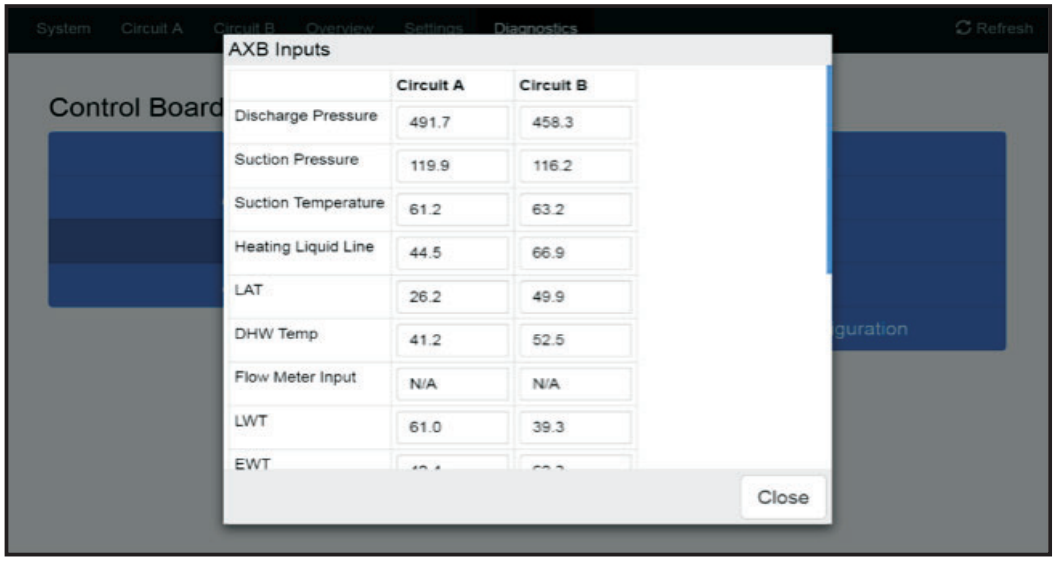
ACC (A and B) – This shows the state of the ACC relay on the two ABC's. When ACC is "ON" the ACC relay will be engaged.

ALM (Alarm) – This shows the state of the ALM relay on the two ABC's. When ALM is "ON" the ALM relay will be engaged. Note there is a DIP option to have this output pulse the lockout code. For instance an E3 would cause this relay to close for 0.5 sec three times then remain off for 2 sec. and continue repeating.

Access Relay Operation	SW2-4	SW2-5
Not Used	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
(Reserved)	OFF	ON

Using the HydroLink2 Aurora Color Touch Tablet cont.

AXB Inputs Screen



Both Circuit A and Circuit B are shown on screen.
Discharge Pressure - Displays the value of the discharge pressure transducers.
Suction Pressure - Displays the value of the suction pressure transducers.
Suction Temperature - Displays the temperature of the suction line near the compressors.
Heating Liquid Line - Displays the temperature of the liquid line on the condenser side of the expansion device. In the heating mode it is the sensor labeled Htg LL and in Cooling it is FP1. This will switch sensor readings automatically between modes.
Field Temp 1 and 2 - Displays the temperature of a field supplied 10k Ohm NTC thermistor connected to AXB A or B P1-LVG Air.
Field Temp 3 - Displays the temperature of a field supplied 10k Ohm NTC thermistor connected to AXB A P17-HWT.
External Temperature Sensor - Displays the temperature of a field supplied 10k Ohm NTC thermistor connected to AXB B P17-HWT.

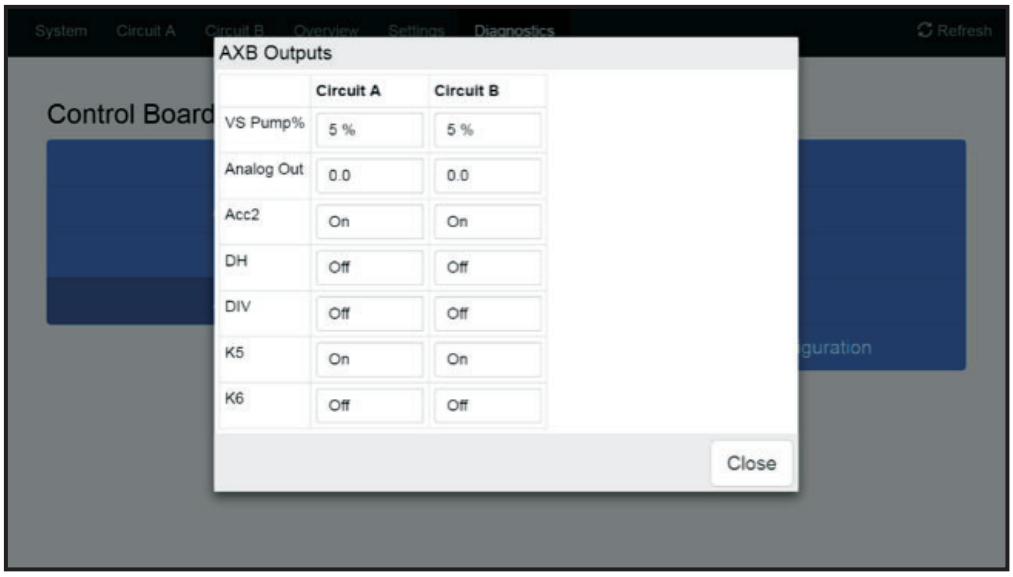
Both Circuit A and Circuit B are shown on screen. Here the Circ A represents Source fluid and B represents Load fluid sensors.
Flow Meter Input - Displays the Optional field installed flow meter. Circuit A is Source Flow and Circuit B is Load Flow. NA is displayed if the flow meter is not installed or configured. Flow Meter is wired to AXB A or B P1-Flow.
Leaving Water Temp (LWT) - Displays the temperature of the source and load leaving water temperatures on the AXB A and B pin P1 – Lvg Wtr.
Entering Water Temp (EWT) - Displays the temperature of the source and load entering water temperatures on the AXB A and B pin P1 – Ent Wtr.
Entering Water Temp (EWT) - Displays the temperature of the source and load entering water temperatures on the AXB A and B pin P1 – Ent Wtr.
Field Press 1 and 2 - Displays the pressure of a field supplied pressure transducer connected to AXB A P3-Loop Pres. Consult technical support for more details.

Both Circuit A and Circuit B are shown on screen.
Field DI 1 and 2 - Displays the logic (Off/On) of the Field DI 1 and 2 input on the AXB A and B pin P4 – Smart Grid. Consult technical support for application details.
Field DI 3 and 4 - Displays the logic (Off/On) of the Field DI 3 and 4 input on the AXB A and B pin P4 – HA1. Consult technical support for application details.
Field DI 5 and 6 - Displays the logic (Off/On) of the Field DI 5 and 6 input on the AXB A and B pin P4 – HA2. Consult technical support for application details.
Field Amps 1 and 2 - Displays the current draw using a field installed current transducer on the AXB A and B pin P10 – Fan. Consult technical support for application details.

Using the HydroLink2 Aurora Color Touch Tablet cont.

AXB Outputs Screen

Both Circuit A and Circuit B are shown on screen.



VS Pump % (Source/Load) - Displays the PWM output (0-100%) of the optional field installed source and load VS Pump. Outputs are connect to AXB A and B P2-VS Pmp. Consult technical support for application details.

Field AO 1 and 2 - Displays the output (0-10V) of the optional field installed analog output device. Outputs are connect to AXB A and B P11-ANA. Consult technical support for application details.

ACC2 (A and B) This shows the state of the ACC 2 relay on the two AXB's. When ACC 2 is "ON" the ACC 2 relay will be engaged.

Field Relay 1 and 2 – This shows the state of the Field Relay 1 and 2 on AXB A and B (labeled DH). When Field Relay is "ON" the

Access Relay Operation	SW1-4	SW1-5
Not Used	ON	ON
Cycle with CC or Variable Speed 1-12	OFF	OFF
Cycle with CC2 or Variable Speed 7-12	ON	OFF
Cycles with DH from ABC Board	OFF	ON

Field Relay 1 and 2 will be engaged. The output is wired to AXB A and B P11 – DH.

Field Relay 3 and 4 – This shows the state of the Field Relay 3 and 4 on AXB A and B (labeled DIV). When Field Relay is "ON" the Field Relay 1 and 2 will be engaged. The output is wired to AXB A and B P11 – DIV.

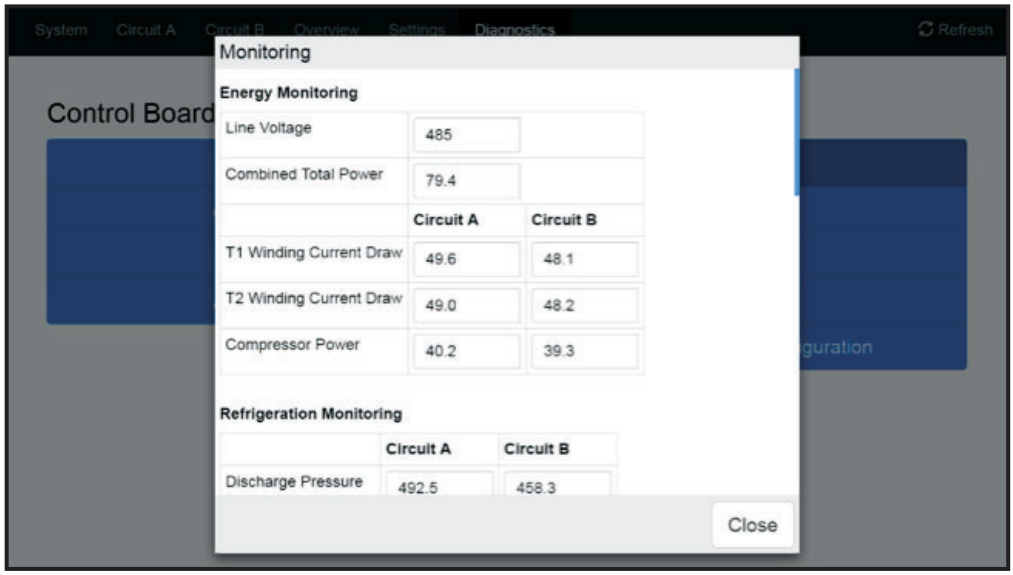
Field Relay 5 and 6 – This shows the state of the Field Relay 5 and 6 on AXB A and B (labeled K5). When Field Relay is "ON" the Field Relay 1 and 2 will be engaged. The output is wired directly to top of relay on AXB A and B K5

Field Relay 7 and 8 – This shows the state of the Field Relay 7 and 8 on AXB A and B (labeled K6). When Field Relay is "ON" the Field Relay 1 and 2 will be engaged. The output is wired directly to top of relay on AXB A and B K6

Using the HydroLink2 Aurora Color Touch Tablet cont.

Monitoring Screen

Both Circuit A and Circuit B are shown on screen where applicable.



Energy Monitoring

Line Voltage – Displays the calibrated Line Voltage as monitored by the Aurora Control after the transformer.

Combined Total Power – Displays the combined power of compressors as monitored by the Aurora Control. The power factor is estimated and current and Voltage measured for the calculation.

T1 Winding Current (A + B) – Displays the T1 Line Compressor Current measured using the current transducer connected at AXB A or B P5-Comp1.

T2 Winding Current (A + B) – Displays the T2 Line Compressor Current measured using the current transducer connected at AXB A or B P5-Comp2.

Compressor Power (A + B) – Displays the total power of each compressor as monitored by the Aurora Control. The power factor is estimated, and current is corrected for three phase applications and Voltage is measured for input into the calculation.

Refrigeration Monitoring

Discharge Pressure (A + B) – Displays the refrigerant discharge pressure of circuit A and B. The Pressure transducer is connected to the AXB A and B P14-Disch.

Suction Pressure (A + B) – Displays the refrigerant suction pressure of circuit A and B. The Pressure transducer is connected to the AXB A and B P12-Scp.

Suction Temp (A + B) – Displays the suction temperature of circuit A and B. The thermistor is connected to the AXB A and B P18-Sct.

Heating Liquid Line (A + B) - Displays the temperature of the liquid line on the condenser side of the expansion device. In the heating mode it is the sensor labeled Htg LL.

Cooling Liquid Line (A + B) - Displays the temperature of the liquid line on the condenser side of the expansion device. In the Cooling it is FP1.

Saturated Evaporator (A + B) – this value is calculated from the suction pressure and used in the superheat calculation.

Saturated Condenser (A + B) – this value is calculated from the discharge pressure and used in the subcooling calculation.

Superheat (A + B) – This value is calculated by subtracting the saturated evaporator temperature from the actual suction temperature. The result is superheat at the compressor inlet.

Subcooling (A + B) – This value is calculated by subtracting the liquid line temperature from saturated condenser temperature. The result is subcooling after the condenser.

Using the HydroLink2 Aurora Color Touch Tablet cont.

Performance Monitoring

Both Circuit A and Circuit B are shown on screen.

Entering Source Temp (EST) - Displays the temperature of the source entering water temperatures on the AXB A pin P1 – Ent Wtr.

Leaving Source Temp (LST) - Displays the temperature of the source leaving water temperatures on the AXB A pin P1 – Lvg Wtr.

Source Water Flow - Displays the Optional field installed flow meter. NA is displayed if the flow meter is not installed or configured. Flow Meter is wired to AXB A P1-Flow.

Source Liquid Density – Displays the liquid density factor selected of the source fluid. Typically 500 [4.2] is used for pure water and 485 [4.1] is used for antifreezes solutions.

Field Press 1 - Displays the pressure of a field supplied pressure transducer connected to AXB A P3-Loop Pres. Consult technical support for more details.

Entering Load Temp (ELT) - Displays the temperature of the load entering water temperatures on the AXB B pin P1 – Ent Wtr.

Leaving Load Temp (LLT) - Displays the temperature of the load leaving water temperatures on the AXB B pin P1 – Lvg Wtr.

Load Water Flow - Displays the optional field installed flow meter. NA is displayed if the flow meter is not installed or configured. Flow Meter is wired to AXB B P1-Flow.

Load Liquid Density – Displays the liquid density factor selected of the load fluid. Typically 500 [4.2] is used for pure water and 485 4.1] is used for antifreezes solutions.

Field Press 2 - Displays the pressure of a field supplied pressure transducer connected to AXB B P3-Loop Pres. Consult technical support for more details.

Heat of Extraction/Rejection – The source heat of extraction (heating mode) or rejection (cooling mode) in MBtuh or kW.

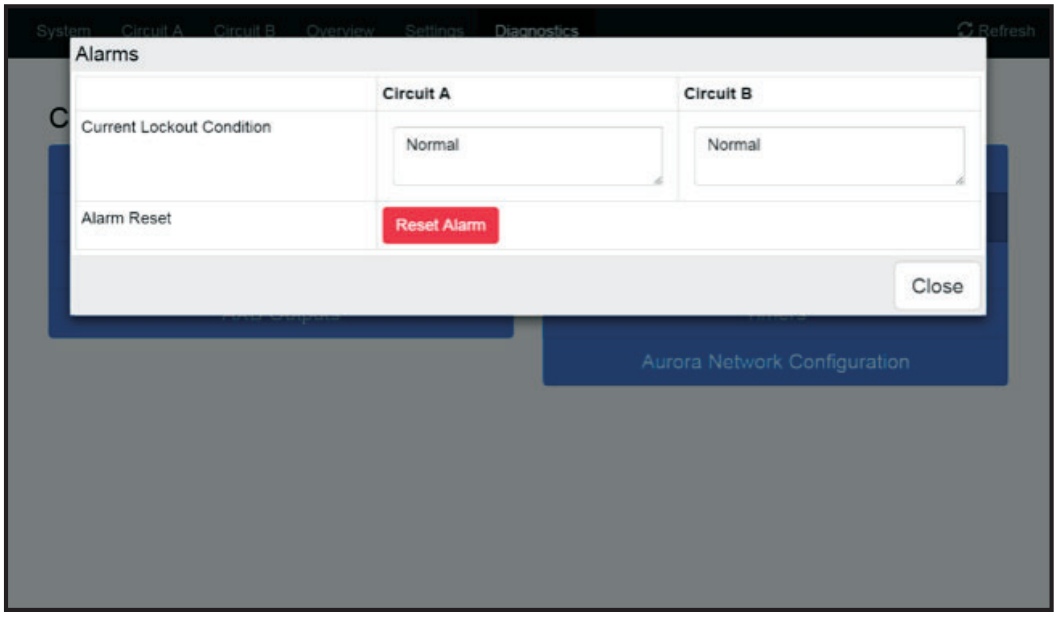
Total Capacity – The Load Capacity of both circuits in MBtuh or kW.

NOTE: N/A – Is displayed in the “Flow”, “HE/HR”, and “Capacity” dialogue boxes when an optional field installed flow meter is not connected to the HydroLink2 Aurora. Compatible flow meters must be used

Using the HydroLink2 Aurora Color Touch Tablet cont.

Alarms Screen

Both Circuit A and Circuit B are shown on screen where applicable.



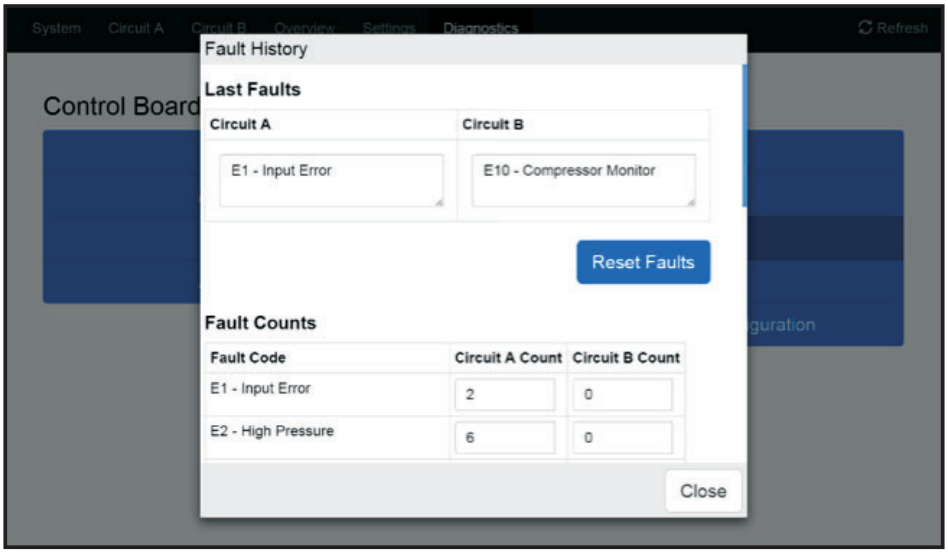
Current Lockouts – Displays the current lockout condition.

Alarm Reset – button allows resetting of the alarm.

NOTE: For a comprehensive list of Alarms/Fault Codes, please reference the "Faults, Configuration and Status Codes" Table located on page 21 of this manual.

Using the HydroLink2 Aurora Color Touch Tablet cont.

Fault history Screen



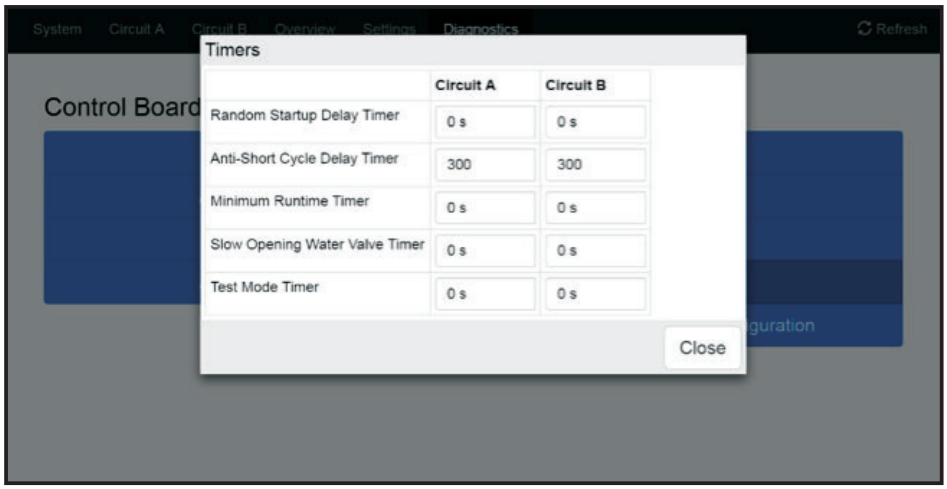
Last Faults – Displays the last fault seen by the Circuit A or Circuit B ABC controller.

Fault Counts – Displays the number of Faults of all types by either circuit.

Reset Faults button – Pushing this button clears the fault history.

Timers Screen

These timers will all count down to zero showing the reason for any compressor delay.



Random Startup Delay Timer (A + B) – After a building power up, his 0-90 sec. random startup delay prevents all units from simultaneously starting.

Anti-Short Cycle Delay Timer (A + B) – Prior to starting this 300 sec. anti-short cycle delay prevents all units from restarting immediately and prevents short cycling of the compressor.

Minimum Runtime Timer (A + B) – Once operating this timer insures a minimum 120 sec. operation of the compressor.

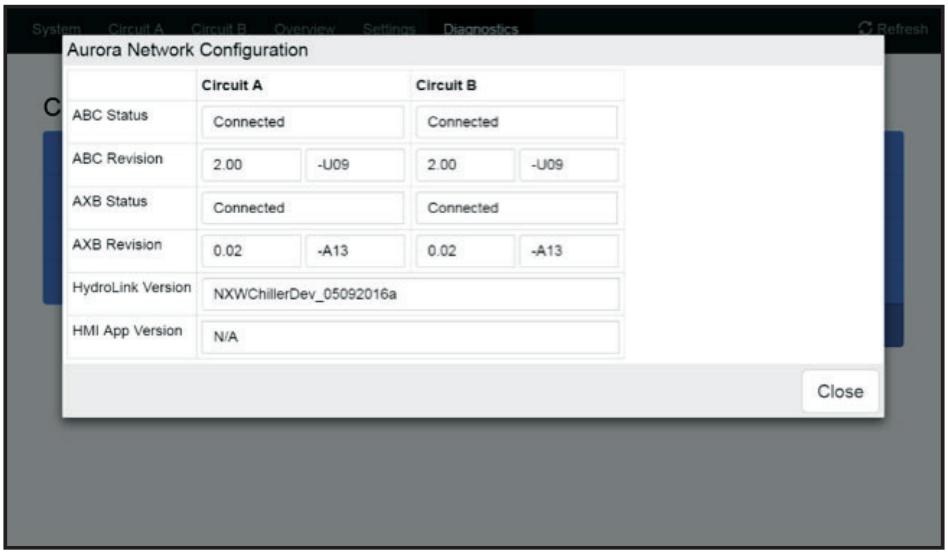
Slow Opening Water Valve (A + B) – This 90 sec. timer prevents the compressor from turning on prior to the water valves complete opening with insufficient water flow.

Test mode Timer (A + B) – Once Test mode is engaged this timer prevents the technician from forgetting to return the unit to normal operation by automatically ending the test mode operation after 1800 sec.

Using the HydroLink2 Aurora Color Touch Tablet cont.

Aurora Network Configuration Screen

This screen shows the proper communication status and software revision of each communicating board. The HydroLink2 Aurora controller software and App version is also shown.



Reference Calculations

Heating Calculations:	Cooling Calculations:
$LWT = EWT - \frac{HE}{L/S \times 4.2^*}$	$LWT = EWT + \frac{HR}{L/S \times 4.2^*}$

NOTE: * When using water. Use 4.1 for 15% methanol/water or Environol solution.

Legend

ABBREVIATIONS AND DEFINITIONS:

COP = coefficient of performance
EER = cooling energy efficiency (TC/kW)
ELT = entering load fluid temperature
EST = entering source fluid temperature to heat pump
FLA = full load amps
FtHd = pressure drop in feet of head
gpm = US gallon per minute
HC = heating capacity in kW
HE = heat of extraction in kW
HR = heat rejected in kW
kPa = kilopascal
kW = kilowatt
L/s = liters per second
LLT = leaving load fluid temperature from heat pump
LRA = locked rotor amps (starting current)
LST = leaving source fluid temperature from heat pump
LWPD = load heat exchanger water pressure drop
MCC = maximum continuous current
PD = pressure drop
psi = pressure drop in pounds per square inch
P/T = Pressure/Temperature
RLA = run load amps
TC = total cooling capacity in kW
W = Watt

CONVERSIONS:

x°F = (*x* - 32)/1.8°C
1 bar = 100 kPa
1 gpm = 0.0631 L/s
1 US Gallon = 3.785412 L
1 Btu/h = 0.29037 W

Unit Startup

Verify the following:

- High voltage is correct and matches nameplate
- Fuses, breakers and wire size are correct
- Low voltage wiring is complete
- Piping is complete and the water system has been cleaned and flushed
- Air is purged from closed loop system
- Isolation valves are open and water control valves or loop pumps are wired
- Service/access panels are in place
- Transformer has been switched to lower voltage tap if needed (380/420 volt units only)
- Unit controls are in “off” position
- Flow switches are installed and ready or wires are jumpered
- Freeze detection setpoints have been set in the microprocessor

WARNING: Verify ALL water controls are open and allow water flow PRIOR to engaging the compressor. Failure to do so can result in freezing the heat exchanger or water lines causing permanent damage to the unit.

Startup Steps

- Set aquastat control above cooling setpoint.
- Set aquastat control in cooling mode.
- Slowly reduce the control setting until both the compressor and water control valve/loop pumps are activated. Verify that the compressor is on and that the water flow rate is correct by measuring pressure drop through the heat exchanger and comparing to the Pressure Drop table (page 32). Check for correct rotation of scroll compressors. Switch any two power leads at the L1, L2, and L3 line voltage termination block if incorrect.
- Perform a cooling capacity test by multiplying L/S x ΔT x 4.1 (antifreeze/water). Use 4.2 for 100% water. Check capacity against catalog data at same conditions.
- Set control to “OFF” position.
- Leave unit “OFF” for approximately five (5) minutes to allow pressure to equalize.
- Adjust control below heating setpoint.
- Set control in “HEAT” position mode.
- Slowly increase the control setting until both compressor and water control valve/loop pumps are activated. The reversing valve should be heard changing over.
- Perform a heating capacity test by multiplying L/S x ΔT x 4.1 (antifreeze/water). Use 4.2 for 100% water. Check capacity against catalog data at same conditions.
- Check for vibrations, noise and water leaks.
- Set system to maintain desired setpoint.
- Instruct the owner/operator of correct control and system operation.

Operating Parameters

Heating Mode

Entering Load Temp (°C)	Entering Source Temp (°C)	Suction Pressure (kPa)	Discharge Pressure (kPa)	Superheat (°C)	Subcooling (°C)
15	0	517-690	1379-1482	6-7	6-7
	10	690-862	1379-1482	7-8	4-7
	20	862-1034	1482-1586	8-10	4-7
	30	1034-1138	1586-1758	14-17	4-7
25	0	517-690	1965-2069	6-7	6-7
	10	690-862	2069-2172	7-8	4-7
	20	862-1034	2172-2275	8-10	4-7
	30	1034-1138	2275-2379	14-17	4-7
40	0	586-758	2517-2620	6-7	4-6
	10	758-931	2655-2758	7-8	4-6
	20	931-1138	2758-2861	8-10	2-4
50	10	758-931	3344-3448	7-8	4-6
	20	931-1138	3448-3551	8-10	2-4

Note: Operating data based on normal conditions with 4.3 L/min per kW for the load and source. 10/7/14

Cooling Mode

Entering Load Temp (°C)	Entering Source Temp (°C)	Suction Pressure (kPa)	Discharge Pressure (kPa)	Superheat (°C)	Subcooling (°C)
10	0	552-621	965-1207	8-11	2-3
	10	621-690	1379-1620	6-8	3-5
	20	690-758	1724-1965	6-8	5-7
	30	690-827	2275-2517	4-7	7-8
	45	758-896	2965-3206	4-7	8-11
20	0	552-621	1034-1276	8-11	2-3
	10	621-690	1448-1689	6-8	3-5
	20	690-758	1793-2034	6-8	5-7
	30	758-827	2344-2586	4-7	7-8
	45	758-965	3034-3344	4-7	8-11
30	0	552-621	1034-1276	8-11	2-3
	10	621-690	1448-1689	6-8	3-5
	20	690-758	1793-2034	6-8	5-7
	30	758-827	2344-2586	4-7	7-8
45	0	621-690	1103-1345	22-25	2-3
	10	758-896	1517-1758	17-22	3-5

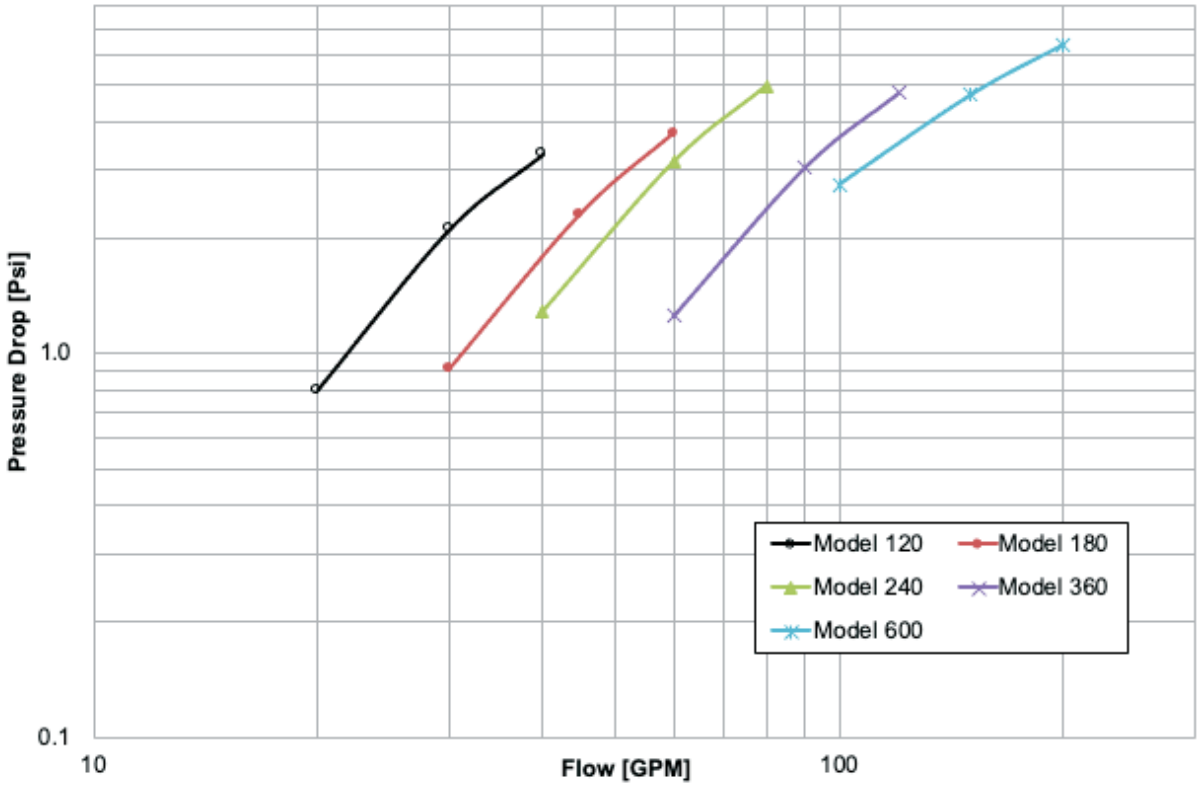
Note: Operating data based on normal conditions with 4.3 L/min per kW for the load and source. 10/7/14

Pressure Drop

Model	L/s	Pressure Drop (kPa)				
		0°C	10°C	20°C	30°C	45°C
030	1.3	5.5	4.8	4.1	4.1	3.4
	1.9	14.5	13.1	12.4	11.7	10.3
	2.5	22.8	21.4	20.0	19.3	17.2
045	1.9	6.3	5.5	5.1	4.9	4.0
	2.8	15.9	14.8	13.8	13.4	12.4
	3.8	25.7	24.1	23.0	22.1	20.1
060	2.5	8.9	8.2	7.9	7.5	6.6
	3.8	21.7	20.7	20.0	19.3	17.9
	5.1	34.3	32.6	31.4	30.6	28.6
090	3.8	8.6	7.9	7.4	6.9	6.1
	5.7	21.0	20.0	19.3	18.6	16.5
	7.6	32.9	31.4	30.3	29.6	27.2
150	6.3	19.0	17.6	16.5	15.4	14.0
	9.5	32.4	31.0	30.3	27.8	26.8
	12.6	43.9	42.5	41.8	39.3	38.3

10/7/14

Reversible Chiller
Water Pressure Drop vs. Flow at 30˚F



Note: Pressure drop is the same for load and source heat exchangers at 30°F [-1.1°C] fluid temperature.

Compressor Resistance

Model	208-230	380	460	575
120	.539 / .528 /.528	.575 / .575 / .575	2.116 / 2.088 / 2.072	3.333 / 3.289 / 3.263
180	.32 / .32 / .33	N/A	1.29 / 1.28 / 1.33	1.99 / 1.96 / 2.05
240	.33 / .33 / .33	N/A	1.13 / 1.11 / 1.10	1.73 / 1.66 / 1.75
360	.20 / .20 / .20	0.57 / 0.57 / 0.57	.83 / .83 / .83	1.32 / 1.32 / 1.32
600	.13/.13/.13	.36 / .36 / .36	0.52 / .52 / .52	.82 / .82 / .82

Resistance values listed in ohms and measured at 25C between phases 1-2, 1-3, 2-3, respectively. 8/18/2016
Specialized measurement device should be used for accurate resistance readings due to low resistance values.

Thermistor Resistance

Thermistor Temperature (°F)	Microprocessor Resistance (Ohms)
5	75757-70117
14	57392-53234
23	43865-40771
32	33809-31487
41	26269-24513
50	20570-19230
59	16226-15196
68	12889-12093
77	10310-9688
86	8300-7812
95	6723-6337
104	5480-5172
113	4490-4246
122	3700-3504
131	3067-2907
140	2554-2424
149	2149-2019

08/18/2016

Operating Limits

Operating Limits	Cooling		Heating	
	(°F)	(°C)	(°F)	(°C)
Source Side Water Limits				
Min. Entering Water	30	-1.1	30	-1.1
Normal Entering Water	85	29.4	60	15.6
Max. Entering Water	110	43.3	90	32.2
Load Side Water Limits				
Min. Entering Water	50	10.0	60	15.6
Normal Entering Water	60	15.6	100	37.8
Max. Entering Water	90	32.2	120	48.9

Notes:

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 dependant upon three primary factors: 1) entering source temperature, 2) entering load temperature, and 3) flow rate (gpm). 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. Consult the Capacity Tables for each model to determine allowable normal operating conditions. Units are not designed for outdoor installation.

Troubleshooting

Should a major problem develop, refer to the following information for possible causes and corrective steps.

If compressor won't run:

1. The fuse may be open or the circuit breaker is tripped. Check electrical circuits and motor windings for shorts or grounds. Investigate for possible overloading. Replace fuse or reset circuit breakers after fault is corrected.
2. Supply voltage may be too low. Check it with a volt meter.
3. Control system may be faulty. Check control for correct wiring of aquastat and check the 24 volt transformer for proper voltage.
4. Wires may be loose or broken. Replace or tighten.
5. The low pressure switch may have tripped due to one or more of the following:
    a) Heating
        1) Plugged heat exchanger on source side
        2) Water flow source side -(Low)
        3) Water too cold source side
        4) Low refrigerant
    b) Cooling
        1) Plugged heat exchanger on load side
        2) Water flow load side - (Low)
        3) Water too cold load side
        4) Low refrigerant
6. The high pressure switch may have tripped due to one or more of the following:
    a) Heating
        1) Plugged heat exchanger on load side
        2) Low water flow load side
        3) Water too warm load side
    b) Cooling
        1) Plugged heat exchanger on source side
        2) Low water flow on source side
        3) Water too warm source side
7. The compressor overload protection may be open. Disconnect power. Remove S1 & S2 wires from the compressor protection module. Measure the resistance between the S1 & S2 wires. If the resistance measures > 2750 ohms, then the internal compressor resistance has tripped the compressor protection module. The compressor protection module will reset after a 30 minute delay and the resistance measures < 2250 ohms. Cycling the power off for a minimum of 3 seconds will manually reset the compressor module. The internal compressor resistance must measure < 2250 ohms for the compressor module to reset.
8. The internal winding of the compressor motor may be grounded to the compressor shell. If so, replace the compressor.
9. The compressor winding may be open or shorted. Disconnect power. Check continuity with ohm meter. If the winding is open, replace the compressor.

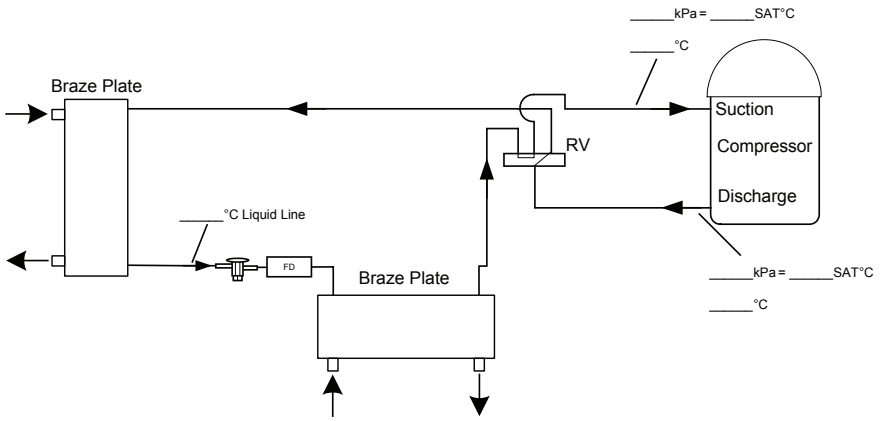
If sufficient cooling or heating is not obtained:

1. Check control for improper location or setting.
2. Check for restriction in water flow.
3. Check refrigerant subcooling and superheat for proper refrigerant charge and expansion valve operation.
4. The reversing valve may be defective and creating a bypass of refrigerant. If the unit will not heat, check the reversing valve coil.

If the unit operation is noisy:

1. Check compressor for loosened mounting bolts. Make sure compressor is floating free on its isolator mounts. Check for tubing contact with the compressor or other surfaces. Readjust it by bending slightly.
2. Check screws on all panels.
3. Check for chattering or humming in the contactor or relays due to low voltage or a defective holding coil. Replace the component.
4. Check for proper installation of vibration absorbing material under the unit.
5. Check for abnormally high discharge pressures.
6. Compressor rotation incorrect

Heating Cycle Analysis



Unit Amp Draw _____

Line Voltage _____

Loop:_____ Open _____ Closed

Subcooling _____

Superheat _____

Entering Source Water _____°C

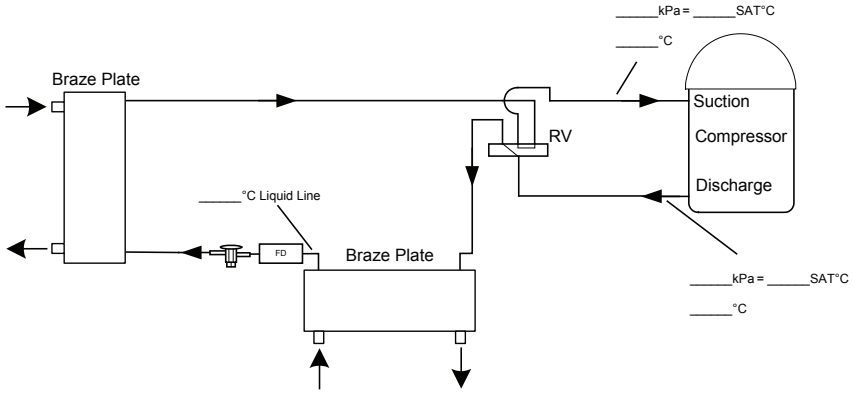
Entering Water Pressure Drop _____ kPa

Leaving Source Water _____°C

Leaving Water Pressure Drop _____ kPa

NOTE: Do not attach refrigerant gauges unless a problem is suspected!

Cooling Cycle Analysis



Unit Amp Draw _____

Line Voltage _____

Loop:_____ Open _____ Closed

Subcooling _____

Superheat _____

Entering Source Water _____°C

Entering Water Pressure Drop _____ kPa

Leaving Source Water _____°C

Leaving Water Pressure Drop _____ kPa

NOTE: Do not attach refrigerant gauges unless a problem is suspected!

Troubleshooting Form

Company Name: _____ Company Phone No: _____
Technician Name: _____ Date: _____
Model No: _____ Serial No: _____
Owner's Name: _____ Open or Closed Loop: _____
Installation Address: _____ Installation Date: _____

Check One
❑ Start up/Check-out for new installation ❑ Troubleshooting Problem: _____

1. FLOW RATE IN L/s (SOURCE SIDE HEAT EXCHANGER)

Water In Pressure:	a._____	kPa
Water Out Pressure:	b._____	kPa
Pressure Drop = a - b	c._____	kPa
Convert Pressure Drop to Flow Rate (refer to *Pressure Drop* table)	d._____	L/s

2. TEMPERATURE RISE OR DROP ACROSS SOURCE SIDE HEAT EXCHANGER

	COOLING		HEATING	
Water In Temperature:	e._____	°C	e._____	°C
Water Out Temperature:	f. _____	°C	f. _____	°C
Temperature Difference:	g._____	°C	g._____	°C

3. TEMPERATURE RISE OR DROP ACROSS LOAD SIDE HEAT EXCHANGER

	COOLING		HEATING	
Water In Temperature:	h._____	°C	h._____	°C
Water Out Temperature:	i. _____	°C	i. _____	°C
Temperature Difference:	j. _____	°C	j. _____	°C

4. HEAT OF REJECTION (HR) / HEAT OF EXTRACTION (HE) CALCULATION

HR or HE = Flow Rate x Temperature Difference x Brine Factor*
d. (above) x g. (above) x 4.1 for Methanol or Environol, 4.2 for water*
Heat of Extraction (Heating Mode) = _____ kW/hr
Heat of Rejection (Cooling Mode) = _____ kW/hr
Compare results to Capacity Data Tables

Note: Steps 5 through 8 need only be completed if a problem is suspected

5. WATTS

	COOLING		HEATING		HYDRONIC	
Volts:	m._____	VOLTS	m._____	VOLTS	m. _____	VOLTS
Total Amps (Comp. + Fan):	n. _____	AMPS	n. _____	AMPS	n. _____	AMPS
Watts = m. x n. x 0.85	o. _____	WATTS	o. _____	WATTS	o. _____	WATTS

6. CAPACITY

Cooling Capacity = HR. - o.	p. _____	kW/hr
Heating Capacity= HE. + o.	p. _____	kW/hr

7. EFFICIENCY

Cooling EER = p. / o.	q. _____	COP
Heating COP = p. / o.	q. _____	COP

8. SUPERHEAT (S.H.) / SUBCOOLING (S.C.)

COOLING	COOLING		HEATING		HYDRONIC	
Suction Pressure:	r. _____	kPa	r. _____	kPa	r. _____	kPa
Suction Saturation Temperature:	s. _____	°C	s. _____	°C	s. _____	°C
Suction Line Temperature:	t. _____	°C	t. _____	°C	t. _____	°C
Superheat = t. - s.	u. _____	°C	u. _____	°C	u. _____	°C
Head Pressure:	v. _____	kPa	v. _____	kPa	v. _____	kPa
High Pressure Saturation Temp.:	w. _____	°C	w. _____	°C	w. _____	°C
Liquid Line Temperature*:	x. _____	°C	x. _____	°C	x. _____	°C
Subcooling = w. - x.	y. _____	°C	y. _____	°C	y. _____	°C

* Note: Liquid line is between the source heat exchanger and the expansion valve in the cooling mode; between the load heat exchanger and the expansion valve in the heating mode.

Factory Startup

Job Site Recording Process

1. Complete the top of the Start-Up Form for each unit.

   *Be sure to note the mode (Heat/Cool) you will be testing the unit in as well as freeze protection details of type and concentration (Test to Verify). If starting-up in both heating and cooling modes, a start-up form for each mode will need to be completed.

   *The unit must be tested in both heating and cooling modes.

2. Take the unit offline (disconnect the aqua stat or BAS system) to obtain full control of the compressors from the MUI (Controls contractor must disable all external controls).

   a. Place load/source pumps in “Hand” position so they can be manually controlled. (Mechanical contractor must enable pumps).

   b. Check the incoming power supply voltage and record it.

   c. On 380-420V units verify that the transformer is set correctly prior to testing.

3. Energize line power to the unit and record Thermistor Checks prior to energizing the compressors or water flow.

4. Start Pumps and verify flow through the heat exchangers by recording the pressure drop in the Evaporator/ Condenser Flow Analysis section.

5. Locate the maintenance menu in the MUI and enable Y1, compressor 1. If lead/lag is enabled, compressor 1 might not always be the first compressor to start.

6. Allow the unit to run for a minimum of 10 minutes so that the refrigeration circuit can balance itself out before recording any of the data. Ideally the unit should be operating at anticipated operating conditions. In other words if the unit is spec’d to run with a entering water temperature of 90° on the load side, we would like to see the start-up data recorded with the unit operating at these conditions, however this may not be possible.

7. Once the unit reaches desired load conditions, record the amp draw on the compressor that is running.

8. Record the entering and leaving water temps on the load and source side and record the load and source freeze temps for the circuit that is running.

9. Disable Y1 and enable the Y2 call and repeat steps 6, 7, and 8 for compressor 2.

Pre-Start-Up Checklist

CHILLER PRE-START-UP CHECKLIST Date: _____

Project Name:		Mechanical Contractor:	
Address:		Contact Name:	
City/State/Zip:		Telephone:	
WaterFurnace Order #:		Purchase Order #:	

Prior to starting the chiller(s), the mechanical contractor is responsible for reviewing all of the installation and operational information supplied by the manufacturer to ensure that the system is ready to be started. Failure to do so may result in additional delays and expenses charged back to the mechanical contractor. The contractor is to provide necessary equipment to gain access to all units and have a service technician on site with the factory technician at all times.

A. Installation/Serviceability

1. Building completely enclosed with a consistent indoor space temperature of between 10˚ and 32˚ C
2. Minimum 1 meter of service clearance around chiller(s) to allow proper access from all sides
3. Chiller mounting and vibration isolation complete
4. Chiller(s) ordered with proper voltage rating for application

B. Water Piping

1. Load side water piping installed between unit, pumps, and load supply/return
2. Source side water piping installed between unit, pumps, and source supply/return
3. Flow switch installed
4. All specialty components including water strainer(s) and isolation/control/balance valve(s) installed

C. Electrical Wiring

1. Wiring completed from chiller to main power supply
2. Wiring completed for disconnects and circuit overload protection
3. Wiring completed for load and source water pumps and proper rotation of each verified

D. Controls

1. Building automation control network installed and functional
2. Brand/Model | Comm. (BacNet, Open N2, LON)

E. Preparation

1. Arrangements made for service technician to be onsite with factory technician at all times
2. Arrangements made for controls contractor to be onsite and available during normal working hours

The undersigned, and the entity he or she represents, hereby accepts responsibility for the accuracy of the information provided herein, and thus agrees to compensate WaterFurnace International, Inc. in full for all expenses incurred by WaterFurnace International, Inc. and its representatives that are directly related to the accuracy of said information.

Signature (Hand Written) _____ Date _____

Name and Title (Please Print) _____

Start-Up Form

Start-up Date		**Unit Model #**		**Size:**	
Unit Tag #		**Unit Serial #**			
Start-up Company				**Start-Up Mode**	
Employee Name				**Cooling / Heating**	
Job Name					
Electrical Data	**Voltage across L1-L2**				
	Voltage across L2-L3			**Water Side Balance Complete**	
	Voltage across L1-L3			**YES / NO**	
		Circuit 1	**Circuit 2**	**208/230V Transformer Configuration**	
	Compressor Amps (Red Wire)			**208**	**230**
	Compressor Amps (White Wire)			**380/420V Transformer Configuration**	
	Compressor Amps (Black Wire)			**380**	**420**
		Circuit 1	**Circuit 2**	**Antifreeze Installed (Select)**	
Thermistor Checks, Prior to Starting Compressors	**Entering Load Water Temperature with no Compressors running**			**Load**	**Source**
	Leaving Load Water Temperature with no Compressors Running			**None Prop. Glycol Methanol Ethanol**	**None Prop. Glycol Methanol Ethanol**
	Entering Source Water Temperature with no Compressors running				
	Leaving Source Water Temperature with no Compressors running			**Freeze Protection Setpoint in The MUI.**	
	Source Freeze Temperature Water Flowing thru unit only (No compressors on)			**LOAD**	**SOURCE**
	Load Freeze Temperature Water Flowing thru unit only (No compressors on)			**0.5° / -9.4°**	**0.5° / -9.4°**
Compressors Energized	**Entering Load Water Temperature**			**Fluid Samples Taken**	
	Leaving Load Water Temperature			**LOAD NO / YES**	**SOURCE NO / YES**
	Entering Source Water Temperature			**Antifreeze Concentration (%)**	
	Leaving Source Water Temperature			**LOAD**	**SOURCE**
Evaporator/ Condenser Flow Analysis	**Entering Water Pressure on Source Heat Exchanger**		**Source Flow Rate (L/S)**		
	Leaving Water Pressure on Source Heat Exchanger				
	Entering Water Pressure on Load Heat Exchanger		**Load Flow Rate (L/S)**		
	Leaving Water Pressure on Load Heat Exchanger				
		Circuit 1	**Circuit 2**		
Refrigerant Thermistors, Compressors Running	**Source Freeze Temperature**				
	Load Freeze Temperature				
General Notes					

Preventive Maintenance

Unit Heat Exchanger Maintenance

1. Keep all air out of the water or antifreeze solution.
2. Keep the system under pressure at all times. Closed loop systems must have positive static pressure or air vents may draw air into the system.

NOTES: If the installation is in an area with a known high mineral content in the water, it is best to establish with the owner a periodic maintenance schedule for checking the water-to-refrigerant heat exchanger on a regular basis. Should periodic cleaning be necessary, use standard cleaning procedures. Generally, the more water flowing through the unit, the less chance there is for scaling. Low GPM flow rates produce higher temperatures through the heat exchanger. To avoid excessive pressure drop and the possibility of metal erosion, do not exceed flow rate as shown on the specification sheets for each unit.

Replacement Procedures

When contacting the company for service or replacement parts, refer to the model number and serial number of the unit as stamped on the serial plate attached to the unit. If replacement parts are required, mention the date of installation of the unit and the date of failure, along with an explanation of the malfunctions and a description of the replacement parts required.

In-Warranty Material Return

Material may not be returned except by permission of authorized warranty personnel. Contact your local distributor for warranty return authorization and assistance.

Replacement Fuse Chart

Model Size	Line Voltage/ Frequency/ Phase	Disconnect Fuse (if applicable)			Branch Circuit Fuse			Transformer Primary Fuse		
		Size (A)	Type	Part #	Size (A)	Type	Part #	Size (A)	Type	Part #
150	220-240/50/3									
	380/50/3	110	Class J, Blade	19P605-10	60	Cube*	19P602-09	1.6	Class CC	19P600-10
	420/50/3	100	Class J, Blade	19P605-09	50	Cube*	19P602-08	1.25	Class CC	19P600-06
	575/50/3	70	Class J, Blade	19P605-07	40	Cube*	19P602-06	1.0	Class CC	19P600-04
90	220-240/50/3	110	Class J, Blade	19P605-10	60	Cube*	19P602-09	3.0	Class CC	19P600-12
	380/50/3	80	Class J, Blade	19P605-08	45	Cube*	19P602-07	1.6	Class CC	19P600-10
	420/50/3	60	Class J, Round	19P605-06	35	Cube*	19P602-05	1.25	Class CC	19P600-06
	575/50/3	60	Class J, Round	19P605-06	30	Cube*	19P602-04	1.0	Class CC	19P600-04
60	220-240/50/3	80	Class J, Blade	19P605-08	45	Cube*	19P602-07	3.0	Class CC	19P600-12
	380/50/3									
	420/50/3	45	Class J, Round	19P605-05	25	Cube*	19P602-03	1.25	Class CC	19P600-06
	575/50/3	35	Class J, Round	19P605-04	20	Cube*	19P602-02	1.0	Class CC	19P600-04
45	220-240/50/3	70	Class J, Blade	19P605-07	40	Cube*	19P602-06	3.0	Class CC	19P600-12
	380/50/3	45	Class J, Round	19P605-05	25	Cube*	19P602-03	0.8	Class CC	19P600-03
	420/50/3	30	Class J, Round	19P605-03	20	Cube*	19P602-02	1.25	Class CC	19P600-06
	575/50/3	25	Class J, Round	19P605-02	15	Cube*	19P602-01	1.0	Class CC	19P600-04
30	220-240/50/3	60	Class J, Round	19P605-06	30	Cube*	19P602-04	3.0	Class CC	19P600-12
	380/50/3	30	Class J, Round	19P605-03	20	Cube*	19P602-02	1.6	Class CC	19P600-10
	420/50/3	30	Class J, Round	19P605-03	20	Cube*	19P602-02	1.25	Class CC	19P600-06
	575/50/3	20	Class J, Round	19P605-01	15	Cube*	19P602-01	1.0	Class CC	19P600-04

* Meets Class J requirements

Technical Documentation-030

Model		NKW030					
Type of heat pump		☐ Air-water ☐ Exhaust-water ☑ Brine-water ☐ Water-water					
Low-temperature heat pump Yes No		☑ Yes	☐ No				
Integrated immersion heater for additional heat		☐ Yes	☑ No				
Heat pump combination heater Yes No		☐ Yes	☑ No				
Climate		☑ Average	☐ Cold	☐ Warm			
Temperature application		☑ Average (55°C)	☐ Low (35°C)				
Applied standards		EN-14825					
Rated heat output	Prated	28.40	kW	**Seasonal space heating energy efficiency**	n_c	110	%
Declared capacity for space heating at part load and at outdoor temperature Tj				Declared coefficient of performance for space heating at part load and at outdoor temperature Tj			
Tj = -7 °C	Pdh	28.10	kW	Tj = -7 °C	COPd	2.43	
Tj = +2 °C	Pdh	29.32	kW	Tj = +2 °C	COPd	2.94	
Tj = +7 °C	Pdh	29.87	kW	Tj = +7 °C	COPd	3.22	
Tj = +12 °C	Pdh	30.37	kW	Tj = +12 °C	COPd	3.51	
Tj = biv	Pdh	28.40	kW	Tj = biv	COPd	2.50	
Tj = TOL	Pdh	28.40	kW	Tj = TOL	COPd	2.50	
Tj = -15 °C (if TOL < -20 °C)	Pdh	-	kW	Tj = -15 °C (if TOL < -20 °C)	COPd	-	
Bivalent temperature	T_{biv}	-10	°C	Min. outdoor air temperature	TOL	-10	°C
Cycling interval capacity	Pcych	-	kW	Cycling interval efficiency	COPcyc	-	-
Degradation coefficient	Cdh	1.00	-	Max supply temperature	WTOL	55.0	°C
Power consumption in modes other than active mode **Additional heat**				**Additional heat**			
Off mode	POFF	0.010	kW	Rated heat output	Psup	-	kW
Thermostat-off mode	PTO	0.005	kW				
Standby mode	PSB	0.007	kW	Type of energy input		-	
Crankcase heater mode	PCK	-	kW				
Other items							
Capacity control		Fixed		Rated airflow (air-water)		-	m3/h
Sound power level, indoors/outdoors	L_{WA}	62/0	dB	Nominal heating medium flow		6.84	m3/h
Annual energy consumption	Q_{HE}	19872	kWh	Brine flow brine-water or water-water heat pumps		9.00	m3/h

3/18/2016

Technical Documentation-045

Model		NKW045						
Type of heat pump		☐ Air-water ☐ Exhaust-water ☑ Brine-water ☐ Water-water						
Low-temperature heat pump Yes No		☑ Yes ☐ No						
Integrated immersion heater for additional heat		☐ Yes ☑ No						
Heat pump combination heater Yes No		☐ Yes ☑ No						
Climate		☑ Average ☐ Cold ☐ Warm						
Temperature application		☑ Average (55°C) ☐ Low (35°C)						
Applied standards		EN-14825						
Rated heat output	Prated	41.80	kW	**Seasonal space heating energy efficiency**	nc	122	%	
Declared capacity for space heating at part load and at outdoor temperature Tj				Declared coefficient of performance for space heating at part load and at outdoor temperature Tj				
Tj = -7 °C	Pdh	41.04	kW	Tj = -7 °C	COPd	2.74		
Tj = +2 °C	Pdh	42.55	kW	Tj = +2 °C	COPd	3.24		
Tj = +7 °C	Pdh	43.22	kW	Tj = +7 °C	COPd	3.51		
Tj = +12 °C	Pdh	43.84	kW	Tj = +12 °C	COPd	3.80		
Tj = biv	Pdh	41.80	kW	Tj = biv	COPd	2.80		
Tj = TOL	Pdh	41.80	kW	Tj = TOL	COPd	2.80		
Tj = -15 °C (if TOL < -20 °C)	Pdh	-	kW	Tj = -15 °C (if TOL < -20 °C)	COPd	-		
Bivalent temperature	Tbiv	-10	°C	Min. outdoor air temperature	TOL	-10	°C	
Cycling interval capacity	Pcych	-	kW	Cycling interval efficiency	COPcyc	-	-	
Degradation coefficient	Cdh	1.00	-	Max supply temperature	WTOL	55.0	°C	
Power consumption in modes other than active mode				***Additional heat***				
Off mode	P_{OFF}	0.010	kW	Rated heat output	Psup	-	kW	
Thermostat-off mode	P_{TO}	0.005	kW					
Standby mode	P_{SB}	0.007	kW	Type of energy input		-		
Crankcase heater mode	P_{CK}	-	kW					
Other items								
Capacity control		Fixed		Rated airflow (air-water)		-	m^3/h	
Sound power level, indoors/outdoors	L_{WA}	64/0	dB	Nominal heating medium flow		10.08	m^3/h	
Annual energy consumption	Q_{HE}	26531	kWh	Brine flow brine-water or water-water heat pumps		13.68	m^3/h	

3/18/2016

Technical Documentation-060

Model	NKW060
Type of heat pump	☐ Air-water ☐ Exhaust-water ☑ Brine-water ☐ Water-water
Low-temperature heat pump Yes No	☑ Yes ☐ No
Integrated immersion heater for additional heat	☐ Yes ☑ No
Heat pump combination heater Yes No	☐ Yes ☑ No
Climate	☑ Average ☐ Cold ☐ Warm
Temperature application	☑ Average (55°C) ☐ Low (35°C)
Applied standards	EN-14825

Rated heat output	Prated	46.70	kW
Declared capacity for space heating at part load and at outdoor temperature Tj			
Tj = -7 °C	Pdh	47.40	kW
Tj = +2 °C	Pdh	50.95	kW
Tj = +7 °C	Pdh	52.97	kW
Tj = +12 °C	Pdh	54.34	kW
Tj = biv	Pdh	46.70	kW
Tj = TOL	Pdh	46.70	kW
Tj = -15 °C (if TOL < -20 °C)	Pdh	-	kW
Bivalent temperature	Tbiv	-10	°C
Cycling interval capacity	Pcych	-	kW
Degradation coefficient	Cdh	1.00	-

Seasonal space heating energy efficiency	nc	122	%
Declared coefficient of performance for space heating at part load and at outdoor temperature Tj			
Tj = -7 °C	COPd	2.64	
Tj = +2 °C	COPd	3.24	
Tj = +7 °C	COPd	3.59	
Tj = +12 °C	COPd	3.93	
Tj = biv	COPd	2.50	
Tj = TOL	COPd	2.50	
Tj = -15 °C (if TOL < -20 °C)	COPd	-	
Min. outdoor air temperature	TOL	-10	°C
Cycling interval efficiency	COPcyc	-	-
Max supply temperature	WTOL	55.0	°C

Power consumption in modes other than active mode Additional heat			
Off mode	P_{OFF}	0.010	kW
Thermostat-off mode	P_{TO}	0.005	kW
Standby mode	P_{SB}	0.007	kW
Crankcase heater mode	P_{CK}	-	kW

Additional heat			
Rated heat output	Psup	-	kW
Type of energy input	-		

Other items			
Capacity control	Fixed		
Sound power level, indoors/outdoors	L_{WA}	64/0	dB
Annual energy consumption	Q_{HE}	29610	kWh

Rated airflow (air-water)		-	m^3/h
Nominal heating medium flow		13.68	m^3/h
Brine flow brine-water or water-water heat pumps		18.36	m^3/h

3/18/2016

Revision Guide

Pages:	Description:	Date:	By:
7	Changed vibration isolation content	02 June 2023	MA
Cover	Naming Update	10 Feb 2022	JM
Misc.	Updated nomenclature	10 Feb 2020	MA
Misc.	Updated to HydroLink2, updated product renders	20 Feb 2019	MA
All	Removed FX10 Control, Added HydroLink Aurora Information	Aug 2016	MA
2-7	Added Energy Labelling and Technical Documentation	18 Mar 2016	MA
4	Inserted Updated MCS/KIWA Logo	14 Oct 2015	MA
All	First Published	06 Nov 2014	MA

Commercial Solutions

Manufactured by
WaterFurnace International, Inc.
9000 Conservation Way
Fort Wayne, IN 46809
www.waterfurnace.com

IM2552WNB 06/23

Product:	**TruClimate 100**
Type:	Reversible Chiller - 50 Hz
Size:	30-150 kW
Document:	Installation Manual

©2023 WaterFurnace International, Inc., 9000 Conservation Way, Fort Wayne, IN 46809-9794. WaterFurnace has a policy of continual product research and development and reserves the right to change design and specifications without notice.