





# **Specification Catalog**

7 Series 700R11

Indoor Split Geothermal Heat Pump 033, 042, 050 ton Variable Speed

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# 7 Series

### 700R11 Indoor Split Geothermal Heat Pump

With Variable Speed Compressor Technology

The WaterFurnace 7 Series Indoor Split continues our level of innovation and performance in variable speed compressor technology. We have used all the great features and benefits first developed in 2012 with the launch of the 7 Series water to air package and incorporated them into a split system for flexibility in a variety of applications. Featuring the highest efficiencies for an indoor geothermal split system (Over 40 EER and 5.2 COP ISO/AHRH13256-



1 GLHP) available in AHRI. The 7 Series Split will feature matched compressor and air handler module in 3 variable speed capacity sizes (033, 042 and 050) with Danfoss Variable Speed Compressors. This system features high efficiency permanent magnet compressors coupled with high efficiency electronic drives to allow capacity variation between 20 and 100%. These 7 Series Indoor Split units utilize ozone-safe R-410A refrigerant to meet the most stringent EPA requirements. ECM blower motors bridge the gap of high efficiency ECM capability with great value. ECM blowers are used to increase comfort, efficiency, and airflow flexibility. The multi position air handler module includes 1" foil lined insulation as well as two composite condensate pans.

The sophisticated Aurora™ Control system is modular and designed for the most demanding application. The Aurora Control features a microprocessor control to sequence all components during operation for optimum performance. Plus, it provides easy-to-use troubleshooting features with fault lights, on-board diagnostics, and a hand held Aurora Interface Diagnostic (AID) Tool. The Aurora system includes advanced loop and hot water generator pump control, as well as service, performance, and energy monitoring sensor kit capability. Aurora Weblink (AWL) allows remote access to the thermostat via WiFi to the internet or smartphone as well as remote monitoring of the heat pump and receives lockout/fault info via text or email. A swing-out control box provides serviceability. Air handler configurations include top, bottom, horizontal left and right return discharge (field configurable air discharge). Heavy-gauge metal cabinets are fully insulated and coated with an attractive and durable gray paint for long lasting protection. The cabinet's rounded front corners, charcoal wave styling element, and 7 Series nameplate add a touch of elegance to the unit.

7 Series products are performance-certified to AHRI/ISO 13256-1 standards, ETL listed for safety, ENERGYSTAR® qualified with EnergyStar Most Efficient qualifications, and tested in an ISO 17025 accredited testing lab.

As a leader in the industry, WaterFurnace is dedicated to innovation, quality, and customer satisfaction. In fact, every unit built is exposed to a wide range of quality control procedures throughout the assembly process and is then subjected to a rigorous battery of computerized run tests to certify

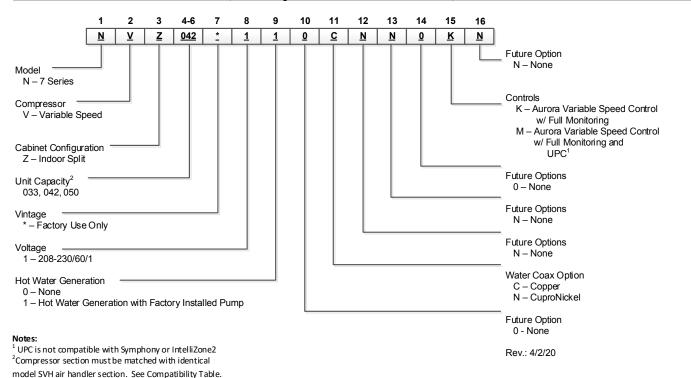


that it meets or exceeds performance standards for efficiency and safety, and will perform flawlessly at startup. As further affirmation of our quality standards, each unit carries our exclusive Quality Assurance emblem, signed by the final test technician.

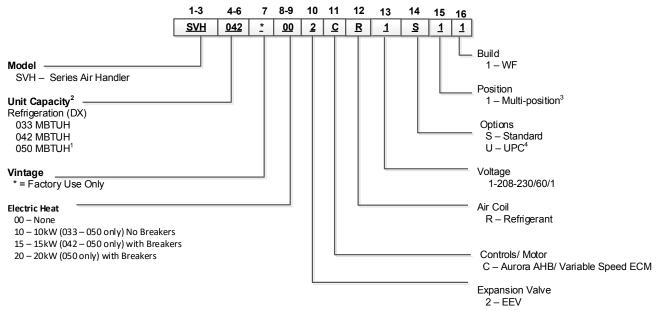
WaterFurnace International's corporate headquarters and ISO 9001:2015 certified manufacturing facility are both located in Fort Wayne, IN. A scenic three-acre pond located in front of the building serves as our geothermal heating and cooling source to comfort-condition our 110,000 square feet of manufacturing and office space. As a pioneer, and now a leader in the industry, the team of WaterFurnace engineers, customer support staff, and skilled assembly technicians is dedicated to providing the finest comfort systems available.

By choosing or specifying WaterFurnace 7 Series products, you can be assured that your customer is investing in the ultimate comfort system and peace of mind for many years to come.

# **Unit Nomenclature (Compressor Section)**



# **Unit Nomenclature (Air Handler)**



- $^{1}$  Air flow on the 050 unit in the horizontal configurations should be limited to 1900 cfm in cooling mode, or condensate blow off may occur.
- $^{2}$  Compressor section must be matched with identical model SVH air handler section. See Compatibility Table
- $^{\rm 3}\text{-}$  To field convert the SVH to bottomflow air discharge. The SAHBCK kit must be ordered separately.
- <sup>4</sup>- UPC is not compatible with Symphony or IntelliZone2.

Rev.: 4/2/20

# **AHRI/ISO 13256-1 Performance Ratings**

#### 7 Series Indoor Split Residential Series AHRI Data

**ECM Motor** 

AHRI/ASHRAE/ISO 13256-1

		Water Loop		er Loop F	leat Pump	at Pump Ground Water Heat Pump			Ground Loop Heat Pump					
Model	Capacity Modulation	Flow Rate Clg/Htg	Coo EWT	86°F	Heatin EWT 68	°F	Cool EWT !	59°F	Heatin EWT 50	)°F	Coo Full Loa Part Loa	id 77°F	Heatir Full Load Part Load	32°F
		cfm	Capacity Btuh	EER Btuh/W	Capacity Btuh	СОР	Capacity Btuh	EER Btuh/W	Capacity Btuh	СОР	Capacity Btuh	EER Btuh/W	Capacity Btuh	СОР
033	Full	1200/1500	31,600	16.8	49,800	5.2	37,000	29.2	40,700	4.5	33,300	20.3	31,700	3.4
033	Part	650/800	10,900	20.9	16,800	7.3	12,900	46.0	13,900	5.7	13,700	36.0	12,000	5.2
042	Full	1500/1800	39,500	16.4	66,100	4.9	46,200	28.2	54,100	4.2	41,600	19.7	42,700	3.5
042	Part	900/1100	15,600	22.4	23,800	7.5	17,300	52.0	18,800	5.8	17,500	40.8	15,800	5.1
050	Full	1800/2200	46,700	14.4	77,800	4.3	55,200	24.3	64,900	3.8	49,800	17.1	50,800	3.2
030	Part	950/1200	19,400	20.9	28,900	7.4	21,200	45.6	22,800	5.8	22,000	35.5	19,800	5.0

Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature Heating capacities based upon 68°F DB, 59°F WB entering air temperature All ratings based upon 208V operation

3/20/20

## **Energy Star Compliance Table**

Model	Tier 3			
Model	Ground Water	Ground Loop		
033	Yes	Yes		
042	Yes	Yes		
050	Yes	Yes		

10/31/19

#### **Energy Star Rating Criteria**

In order for water-source heat pumps to be Energy Star rated they must meet or exceed the minimum efficiency requirements listed below. Tier 3 represents the current minimum efficiency water source heat pumps must have in order to be Energy Start rated.

#### Tier 3: 1/1/2012 - No Effective End Date Published

5. 1/ 1/ ZOIZ NO ENCENTE ENG Date i abilished					
Water-to-Air	EER	COP			
Ground Loop	17.1	3.6			
Ground Water	21.1	4.1			
Water-to-Water					
Ground Loop	16.1	3.1			
Ground Water	20.1	3.5			





## AHRI/ISO 13256-1 Performance Ratings cont.

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

#### Unit of Measure: The Cooling COP

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

#### **Water Conditions Differences**

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

#### Air Conditions Differences

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

#### **Pump Power Correction Calculation**

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

Pump power correction = (gpm x 0.0631) x (Press Drop x 2990) / 300
 Where 'gpm' is waterflow in gpm and 'Press Drop' is the pressure drop through the unit heat exchanger at rated water flow in feet of head.

#### **Blower Power Correction Calculation**

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

Blower Power Correction = (cfm x 0.472) x (esp x 249) / 300
 Where 'cfm' is airflow in cfm and 'esp' is the external static pressure at rated airflow in inches of water gauge.

#### ISO Capacity and Efficiency Calculations

The following equations illustrate cooling calculations:

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

The following equations illustrate heating calculations:

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

#### **Comparison of Test Conditions**

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

NOTES: \* Flow rate is set by 10°F rise in standard cooling test

\*\* Flow rate is specified by the manufacturer

Part load entering water conditions not shown

WLHP = Water Loop Heat Pump; GWHP = Ground Water Heat Pump; GLHP = Ground Loop Heat Pump

#### Conversions:

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









- 1 VARIABLE SPEED COMPRESSOR: High efficiency permanent magnet scroll compressor mated with high efficiency electronic drive providing 20-100% variable capacity, soft starting, ultra high efficiency, and lowest operating noise
- 2 DOUBLE ISOLATED COMPRESSOR: Compressor is double isolation mounted to reduce noise and vibration
- 3 AURORA ADVANCED VARIABLE SPEED CONTROLS & AID TOOL: Aurora Controls with the AID Tool provide advanced service diagnostics; this device provides setup and configurations as well as real-time sensors for fault and lockout history, plus energy and refrigeration monitoring as standard features, that can all be monitored on the handheld AID Tool and much more
- 4 OPTIONAL HOT WATER ASSIST: Provides free hot water in cooling and very high efficiency hot water generation in heating mode
- (5) COAXIAL HEAT EXCHANGER: Standard large high efficiency copper (optional cupronickel) coax with our exclusive void-free and robotically applied ThermaShield insulation coating
- 6 ELECTRONIC EXPANSION VALVE: High efficiency electronic expansion valve provides the ultimate in accurate control for the highest efficiency at any condition

- 7 OIL SEPARATOR: Provides exceptional long term compressor reliabity
- 8 SWIVEL LOOP CONNECTIONS: Leak free swivel water connections provide a hand tight gasket connection that easily handles the temperature extremes of geothermal earth loops
- (9) INSULATION: Cleanable foil lined insulation to prevent mold growth
- (10) CABINET FINISH: Heavy gauge galvanized sheet metal cabinet has 1,000 hr. salt spray rated gray powder coat paint for long life
- (1) ACCESS PANELS: All access panels are lift out type for easier removal and servicing
- (2) HINGED CONTROL BOX: Hinged removable control box for ease of accessibility and serviceability
- (13) HOT WATER GENERATOR SWITCH & AID TOOL PORT: Hot water generator switch for easy enabling/disabling of the hot water generator pump; AID Tool port provides quick AID Tool connection





- (1) AID TOOL PORT: AID Tool port provides quick AID Tool connection with compressor section with field installed cable provided with air handler.
- 2 AURORA AHB The AHB is the air handler control module which communicates information with the other modules of the Aurora Advanced control system
- (3) FIELD SWITCHABLE DESIGN: Horizontal left, right vertical and bottomflow capable.
- (4) ONE CABINET SIZE: 033, 042, 050 all in one size cabinet
- (5) CABINET FINISH: Heavy gauge galvanized sheet metal cabinet has 1,000 hr. salt spray rated gray powder coat paint for long life
- 6 ACCESS PANELS: Lift out panels for easier removal and servicing
- (7) ELECTRONIC EXPANSION VALVE: High efficiency electronic expansion valve provides the ultimate in accurate control for the highest efficiency at any condition

- FACTORY INSTALLED ELECTRIC HEAT: Internal electric heat with circuit breakers on 15kw and 20kw models.
- (9) ECM BLOWER MOTOR: High efficiency and ultraflexible ECM blower motors provide ultra-quiet operation
- (10) FOIL LINED INSULATION: Cleanable 1" insulation
- (1) ALL ALUMINUM "A" AIR COIL: Provides long term reliability
- (2) COMPOSITE DRAIN PAN: Vertical and horizontal drain pan with primary and secondary connections.

#### **Introducing the 7 Series Split System**

- Highest AHRI/ISO 13256-1 Ratings.
  - Over 40 EER and 5.2 COP
- Latest technology compressors
  - High efficiency permanent magnet scroll compressor mated with high efficiency electronic variable speed drive providing 20-100% variable capacity, soft starting, ultra high efficiency and ultra low operating noise.
- Efficiency Variable speed compressor provides the highest AHRI Efficiencies and improved seasonal EER/ COP for reduced energy use.
- More Even Temperatures Nearly continuous operation results in more even temperatures in the home.
- Soft Start Variable Speed Compressor VS Drive Soft Start provides quieter starting and operation with no 'light flicker' commonly associated with air conditioning or heat pumps. No IntelliStart is required.
- Quieter Operation Typical operation is at lower compressor speed, and resulting lower airflow means quieter operation.
- Higher Heating Capacity The variable speed unit provides higher heating capacity than comparable dual capacity or single speed compressor unit for reduced loop length and equipment size for a given cooling capacity.
- 'Active' Dehumidification In active dehumidification mode, the VS unit monitors the air coil conditions and adjusts compressor speed and airflow operation to maximize the moisture removal based upon a dehumidistat call from the thermostat for improved dehumidification.
- 'SuperBoost' Mode Occasionally there can be a requirement for a short term 'boost' of cooling capacity during a large party etc. The user can then select 'SuperBoost' mode on the thermostat which will allow the variable speed system to ramp up extra cooling capacity if needed.
- Communicating Digital Thermostats The Aurora controls system features either mono-chromatic or color touch screen graphic display thermostats for user interface with the variable speed system. These displays not only feature easy to use graphical interface but display alerts and faults in plain English.
- Aurora Communicating Control Features
  - Traditional Safety Sensors HP, LP, condensate overflow, freeze detection loop, freeze detection air coil.
  - Variable Speed and EEV Watchdog Circuit Drive control continually monitors the VS compressor for proper operation and digitally notifies the Aurora Control of any faults.

- Communicating Modular Design Communicating modular design for flexibility and expandability.
- Intelligent hot water assist control The Aurora control determines operation of hot water assist dependent upon system parameters to maximize overall system efficiency. Selectable hot water set points through the AID Tool.
- Electronic Expansion Valve for improved refrigerant control and high efficiency.
- Loop Pump Linking for multiple units on one flow center with either variable speed, single, or dual capacity units. It even works with our legacy controls.
- Electric Heat Powered Blower And Controls Provides emergency heat in the event of an open compressor circuit breaker.

#### · Advanced Service Features

- Aurora Controls with the AID Tool or Symphony Contractor Connect Smart App provide advanced service diagnostics. This allows setup and configurations as well as real-time sensors, fault and lockout history can be monitored and much more. This device is required for setup and troubleshooting of the 7 Series Unit.
- The 7 Series features refrigeration service sensors as a standard feature. Now superheat, subcooling, refrigerant pressures and various temperatures needed to diagnose unit problems are readily available at your finger tips in the AID Tool right out of the box.
- Energy Monitoring With this standard sensor kit installation, the Aurora Control will feature power monitoring of the compressor, blower, and electric heat. The information can be displayed on AID Tool, selected thermostats or thru AWL.
- Performance Monitoring With this standard factory installed sensor kit, the Aurora controls can measure actual capacity and performance of the heat pump. The information can be displayed on AID Tool or thru AWL.
- Advanced communication to the VS drive with faults, electrical, and operational information for quick diagnosis.
- Aurora can be internet capable simply by adding the Aurora WebLink (AWL). This device will connect your Aurora system to web for remote monitoring and control. It also comes standard with an SD disc drive for storing operating and performance data. Providing 'black box' capability.
- Communicating Digital Thermostats The Aurora controls system features either mono-chromatic or color touch screen graphic display thermostats for user interface with the 7 Series system. These displays not only feature easy to use graphical interface but display alerts and faults in plain English.

- Cabinet Design Lift out access panels and hinged control box for ease of service.
- · Cupronickel Heat Exchanger
- Unitary Protocol Converter (UPC) for integration with Home Automation Systems (HAS)

#### **Application Flexibility**

- Safe, efficient operation in a wide range of liquid temperatures (20°F to 120°F) and flow rates (as low as 1.5 gpm/ton in open loop applications when EWT >50°F)
- Narrow cabinet for easy movement through doorways
- Corner-located electrical box for field wiring from two sides
- Circuit breaker protected loop pump power block for easy wiring
- 2 relays to control field-mounted accessories
- Field-selectable freeze detection setting for well or closed loop systems
- Loop pump linking feature allows multiple units to share one flow center (standard on variable speed systems)
- Field convertible, 4-position design (top, bottom, horizontal right and left discharge).

#### **Operating Efficiencies**

- AHRI/ISO 13256-1 rating for heating COPs, cooling EERs, and low water flow requirements
- Optional hot water generator with internal pump generates hot water at considerable savings while improving overall system efficiency
- High-stability electronic expansion valve delivers optimum refrigerant flow over a wide range of conditions
- · Efficient variable speed scroll compressors operate quietly
- Oversized coaxial tube water-to-refrigerant heat exchanger operates at low liquid pressure drops
- Convoluted copper water tube functions efficiently at low flow rates
- Utilizes the ozone-friendly R-410A refrigerant which produces higher efficiencies and warmer discharge air temperatures

#### **Service Advantages**

- Hinged/removable control box for added serviceability
- Removable panels: three for the compressor section to provide quick access to all internal components.
- Easily accessible electronic expansion valve
- Brass, swivel-type water connections for quick connection union, and elimination of wrenches and sealants during installation; sweat type connections are on the hot water generator
- Designed for front access in tight applications
- LED fault and status lights on the Aurora board with memory for easy diagnostics
- Aurora AID Tool provides enhanced service information via communication directly with the Aurora control including sensor inputs, fault history, and much more

- Detachable thermostat connection strip for wiring convenience
- Hot water generator pump shut-off switch for easy startup and service
- Control box has quick-attach wiring plugs for easy removal
- · High and low pressure service ports in refrigerant circuit
- High and low pressure sensors as well as discharge, suction, heating/cooling liquid lines, EWT and LWT temperature sensors for ease of service via the AID Tool
- View subcooling and superheat on the AID Tool
- Energy monitoring is standard on the 7 Series variable speed system; Easily check power consumption of the compressor, blower and auxiliary heat via the AID Tool or thermostat
- View heat of extraction/rejection on the AID Tool with the factory installed Performance option.

#### **Product Quality**

- Heavy-gauge steel cabinets are painted with durable powder coat paint for long lasting beauty and service
- Coaxial heat exchanger, refrigerant suction lines, hot water generator coil, and all water pipes are fully insulated to reduce condensation problems in low temperature operation
- Noise reduction features include double isolation mounted compressors and soft starting variable speed compressors; insulated compressor compartment; interior cabinet insulation using 1/2 in. coated glass fiber; all units include compressor blanket for quiet operation
- Safety features include high-pressure, low-pressure, and loss
  of charge refrigerant controls to protect the compressor,
  condensate overflow protection, freeze detection sensor
  to safeguard the coaxial heat exchanger, hot water highlimit hot water generator pump shutdown, compressor
  monitoring, and fault lockout enables emergency heat and
  prevents compressor operation until thermostat or circuit
  breaker is reset

#### **Microprocessor Benefits**

- Communicating monochromatic or color digital autochangeover thermostat with 3-stage heating/2-stage cooling holds precise temperature and provides varying blower speed control
- Component sequencing delays for quiet startup, shutdown, and timed staging of auxiliary electric heat
- Hot water limit prevents scalding, and pump shuts down automatically when full unit capacity is needed for heating
- Communication capability for future expansions

#### **Options and Accessories**

- · Communicating Digital Thermostats
  - Monochromatic Graphic Display Thermostats: For user interface with the Aurora system; these displays not only feature easy to use graphical interface but display alerts and faults in plain English. When Energy Monitoring is added, instantaneous usage is displayed on the thermostat itself.
  - Color Touch Screen Graphic Display Thermostats:
     For user interface with the Aurora system; these displays not only feature easy to use graphical interface but display alerts and faults in plain English. When Energy Monitoring is added not only instantaneous usage is displayed but also weekly and annual consumptions are stored and graphed. Other features include full color implementation, user loaded background photos, and USB port for easy configuration and software updates.
- IntelliZone2 Zone System The IntelliZone2 zoning system provides up to 6 zones (Variable Speed), 4 zones (Dual Capacity), or 2 zones (Single Speed) of individualized comfort via communication to the Aurora Control System.
- AID Tool The Aurora Interface and Diagnostics (AID)
   Tool is a plug-in configuration and troubleshooting tool for the Aurora Control System.
- Aurora WebLink (AWL) The Aurora Control System
  can be made internet capable simply by adding the
  Aurora WebLink (AWL) device. The AWL will connect
  your Aurora system to the web for remote monitoring
  and control. It also comes standard with an SD disc for
  storing operating and performance data providing true
  'black box' capability for troubleshooting.
- Optional Cupronickel Heat Exchangers for open loop applications.
- Optional Hot Water Generator with internally mounted pump and water heater plumbing connector.
- Closed Loop Variable Speed Flow Center
- Closed Loop Variable Speed Non-Pressurized Flow Center
- Open Loop Modulating Water Valve
- Hose Kits
- Additional Accessory Relay
- Aurora UPC for DDC applications for connection to HAS using BACnet protocol
- Aurora Touch Interface used with Aurora UPC provides ability to configure and diagnose equipment

#### **Manufacturing Quality**

- All units are computer run-tested, with conditioned source water, in all modes to ensure efficiency and reliability
- All refrigerant brazing is performed in a nitrogen atmosphere
- All units are deep evacuated to less than 150 microns prior to refrigerant charging
- All joints are helium leak-tested to ensure an annual leak rate of less than 1/4 ounce
- All major components bar coded; eliminating possibility of mismatched parts built into unit
- All assembly technicians thoroughly trained in proper quality procedures
- All units have model number and serial number embedded in control for local or remote retrieval
- WaterFurnace International, Inc. is an ISO 9001:2015 certified manufacturing facility
- WaterFurnace International, Inc. engineering labs are ISO 17025 accredited

#### **Air Coil**

Designed for R-410A refrigerant. Configured as an 'A' coil, aluminum tubes and enhanced corrugated lanced aluminum fins to provide high efficiencies at low face velocities.

#### **Cabinet**

Constructed of heavy gauge environmentally-responsible galvanized steel for maximum corrosion resistance. All units are painted with a powder coat finish. All interior surfaces are lined with 1" thick, foil lined acoustic type fiber insulation, applied in a manner that prevents the introduction of glass fibers into the air stream. Multiple knockouts in various sizes facilitate power and low voltage wiring. Multiple access panels for ease of service.

#### **Factory Sealed**

Achieves 2% or less total airflow leakage rate.

#### Installation Ease

Cabinets are shipped in one piece but can be separated for ease of installation in tight spaces.

#### **Auxiliary/ Emergency Electric Heat**

Electric heat packages can be factory or field installed. For field installed electric heat the Auxiliary Heat Compatibility table shows the available heater packages for the air handler.

#### **Configurations**

Cabinets are factory configured for upflow and horizontal right hand air discharge installation but can be easily configured for horizontal left hand or bottomflow air discharge.

#### **Drain Pans**

Two composite drain pans included. One for vertical and one for horizontal applications. The pans come equipped with primary and secondary drain connections.

#### **Electrical Disconnect**

Factory installed circuit breaker on 15kW/20kW heaters.

#### **Expansion Device**

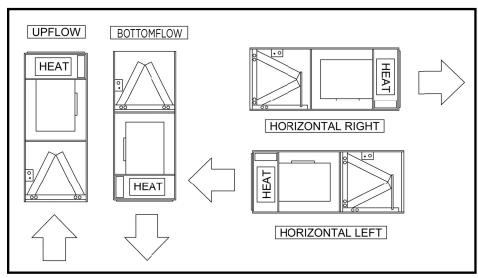
Factory installed EEV inside of cabinet.

#### **Refrigerant Connections**

Suction and liquid lines have sweat connections extended outside of cabinet for ease of connection.

#### **Controls**

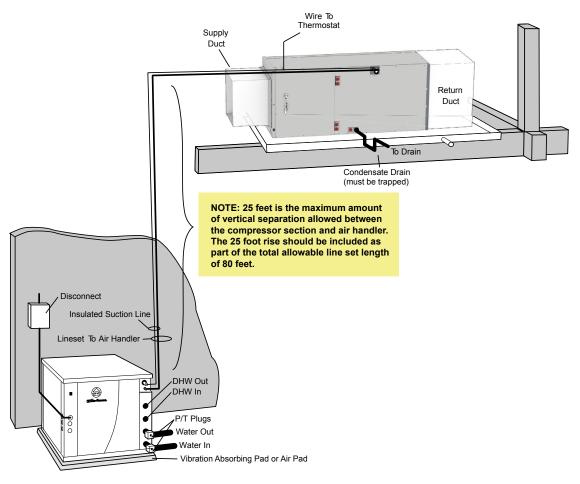
The AHB is part of the Aurora controls platform and communicates via modbus to the ABC. The AHB board controls the air handler's variable speed motor, auxiliary heat staging, provides condensate overflow protection, air coil freeze detection FP2, auxiliary heat and blower energy monitoring, and is Symphony compatible. EEV board provides control of the EEV and leaving air temperature.



TYPICAL INSTALLATION

Note: Air flow on the 050 unit in the horizontal configuration should be limited to 1900 CFM in cooling mode, or condensate blow off may occur.

#### Typical Split System Application with Remote Blower Coil



#### **Refrigerant Piping Limits**

The maximum refrigerant total line set length should not exceed 80 feet. The maximum vertical separation between the compressor section and air handler should not exceed 25 feet. As an example; if vertical separation is 25 feet then the rest of the line set can't exceed 55 feet in length, 25' + 55' = 80'. Friction loss of copper elbows or bends should be included in the calculation of the total line set length.

Longer line sets require more refrigerant that must be managed throughout the entire operating range of the application. Excess refrigerant in the compressor at start up, or condensed liquid refrigerant in the suction line at start up must be avoided for compressor reliability. Proper line set sizing is crucial for controlling oil return to the compressor and minimizing capacity losses. See Line Set Size table in this manual or Symphony Contractor Connect phone app for proper sizing. The liquid line should be no larger than 3/8" in diameter. Pressure drop in the suction line will increase power consumption and reduce system capacity. A commonly accepted value for the suction line in R-410A systems is 5PSI pressure drop.

The use of long radius elbows can reduce the equivalent length of a line and thus reduce the friction loss.

A factory installed filter drier is in the compressor section, do not add a drier or filter in series with the factory installed drier as the added pressure drop may cause "flashing" of liquid refrigerant.

**Tube Bend/Fitting Losses in Equivalent Feet** 

Tube Size	90° Standard	90° Long	45° Standard
O.D. (in)	Radius	Radius	Radius
3/8	1.3	0.8	0.3
1/2	1.4	0.9	0.4
5/8	1.5	1.0	0.5
3/4	1.9	1.3	0.6
7/8	2.3	1.5	0.7
1-1/8	2.7	1.8	0.9

#### **Aurora Advanced VS Control**

Aurora Advanced VS Control
System is a complete residential
and commercial comfort system
that brings all aspects of the HVAC
system into one cohesive module
network. The Aurora Advanced VS
Control features the Aurora
Base Control (ABC), the Aurora
Expansion Board (AXB), the Aurora
Air Handler Board (AHB) and
optional Unitary Protocol Converter
(UPC). The variable speed drive
communicates to the Aurora
Control and provides variable
capacity and envelope control. The



ABC features microprocessor control and HP, LP, loss of charge, condensate and freeze detection, over/under voltage faults, along with communicating thermostat capability for complete fault detection text at the thermostat. Aurora uses the Modbus communication protocol to communicate between modules. Each module contains the logic to control all features that are connected to the module. The ABC has two Modbus channels. The first channel is configured for connecting to devices such as a communicating thermostat, expansion board, or other devices. The second channel is configured for connecting the Aurora Interface Diagnostics Tool (AID Tool).

The Aurora AXB expands on the capability of the ABC control board. The additional features include active dehumidification, SuperBoost cooling mode, loop pump linking, intelligent hot water generator control, variable speed pump capability, and also allows for optional energy, refrigeration, and performance monitoring add-on sensor kits. The AXB also features a second field configurable accessory relay, and two home automation inputs that are AID configurable for different types of alarms from sump pumps to home security. The Smart Grid input is AID configurable with many options to react to Utility controlled relay operation for On Peak optimization. The AXB also expands the communication capability for IntelliZone2 ready operation as well as other expansion with the ClimateTalk protocol.

The SVH Air Handler with the 'Advanced' control option expands on the capability of the Aurora 'Advanced' Control (ABC and AXB) in the compressor section, by adding the AHB board in the air handler. The AHB features electric heat staging, energy monitoring, temperature and pressure inputs, ECM control, condensate overflow and freeze detection. The AHB also features, an AID Tool port, field configurable accessory relay, and two home automation inputs that are AID configurable for different types of alarms from sump pumps to home security. The AHB also offers another communication connection point for IntelliZone2.

Aurora Control Features	Description		
Advanced Microprocessor Features	Smart Grid, Home Automation Alarm Inputs, and Accessory2 Relay (HRV/ERV)	•	
Advanced Hot Water Generator Control	Microprocessor and separate power relay for Hot Water Generator Pump with digital temperature monitoring and multiple HWG setpoint selection.	•	
Advanced Speed Pump Control	Microprocessor and separate power relay for loop pump and inline circuit breakers and loop pump slaving.	•	
Variable Speed Pump	Capable of setup, monitoring and controlling a variable speed flow center.	•	
Active Dehumidification	Coil temperature is monitored and air flow is reduced for maximum latent moisture removal.	7 Series Variable Speed Only	
SuperBoost	Allow the variable speed compressor to ramp up extra cooling capacity if needed. This extra 'SuperBoost' will only be available for a 24 hr period and then the unit will revert to normal operation.	•	
Smart Grid/Utility Input	Allows simple input to externally enable of occupied/unoccupied mode for basic utility time of use programs.	Dry Contact x1	
Home Automation Alarm Input	Allows simple input to signal sump, security, or smoke/CO sensor alarms from other home automation or security systems. The two inputs can be field configured to a number of options and logic.	Dry Contact x2	
HAN/Smart Grid Com (AWL and Portal) Kit	Allows direct communication of the Aurora to Smart Meters, Home Automation Network and Internet.	Optional AWL	
IntelliZone2® Compatibility	IntelliZone2 communicates to the heat pump via the AXB board. IntelliZone requires traditional thermostat inputs and is not compatible with the 7 Series.	Optional IntelliZone2	

Service Device	Description	Aurora Advanced VS
Aurora Interface and Diagnostics	Allows setup, monitoring and troubleshooting of any Aurora Control. <b>NOTE:</b> Although the ABC has basic compatibility with all Aurora, new product features may not be available on older AID Tools. To simplify the basic compatibility ensure the version of AID is at least the same or greater than the ABC software version.	For Service (Ver. 2.10 or greater)
(AID) Tool		

Add On Control Feature Kits (field or factory Installed)	Description	Aurora Advanced VS
Geo Energy Monitoring Kit	Monitors real time power consumption of compressor, blower, aux heat and pump. Requires thermostat TPCM32U04A or TPCC32U01.	Standard
Refrigeration Monitoring Kit	Monitors real time pressures, temperatures, superheat, and subcooling.	Standard
Performance Monitoring Kit	Monitors air and water temperatures, and water flow rate and calculates heat of extraction/rejection.	Standard
Data Logging (AWL) Kit	Allows data logging of up to 12 months. Can also be temporarily installed.	Optional
HAN/Smart Grid Com (AWL and Portal) Kit	Allows direct communication of the Aurora to Smart Meters, HAN, and internet.	Optional

Add On Thermostats and Zoning	Description	Aurora Advanced VS
TPCM32U04A - MonoChrome Communicating Thermostat	Elite Stat with full English fault codes and alerts, communicating thermostat; Required for viewing Energy Monitoring. Monochrome thermostat allows instantaneous energy measurement only. Compatible with AWL, not compatible with IntelliZone2.	Optional
TPCC32U01 - Color Touchscreen Communicating Thermostat	4.3 in. color touchscreen communicating thermostat with full English fault codes and alerts; Required for viewing Energy Monitoring. Color thermostat allows instantaneous and 13 month history. Compatible with AWL.	Optional
Intellizone2® Zoning	Includes color main thermostat and up to 6 zones (with variable speed), 4 zones (with dual capacity), and 2 zones (with single speed). There are 4 thermostat options (MasterStat, SensorStat, ZoneStat and SensorStat-Remote). Compatible with AWL. IntelliZone2 is not compatible with UPC controls.	Optional

NOTES: The IntelliZone2 or one of the communicating thermostats shown above must be used to control the variable speed heat pump.

#### **Aurora Advanced VS Control Features**

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

#### **Control Features**

#### Software ABC VS SPL

- Random start at power up
- · Anti-short cycle protection
- · High and low pressure cutouts
- Loss of charge
- · Water coil freeze detection
- · Air coil freeze detection
- Over/under voltage protection
- Condensate overflow sensor
- Load shed
- Dehumidification (where applicable)
- Emergency shutdown
- Diagnostic LED
- Test mode push button switch
- · Two auxiliary electric heat outputs
- · Alarm output
- AWL compatible
- · Accessory output with N.O. and N.C.
- Modbus communication

# Advanced Hot Water Generator Control (Domestic Hot Water Option)

An AID Tool selectable temperature limit and microprocessor control of the process is featured. This will maximize hot water generation and prevent undesirable energy use. An alert will occur when the hot water input temperature is at or above the set point (130°F default) for 30 continuous seconds. This alert will appear as an E15 on the AID Tool and the hot water pump de-energizes. Hot water pump operations resume on the next compressor cycle or after 15 minutes of continuous compressor operation during the current thermostat demand cycle. Since compressor hot gas temperature is dependent on loop temperature in cooling mode, loop temperatures may be too low to allow proper heating of water. The control will monitor water and refrigerant temperatures to determine if conditions are satisfactory for heating water.

#### **VS Drive and Envelope Control**

The VS drive operates the compressor between 20 and 100% capacity. The VS drive communicates any out of refrigerant envelope conditions to the Aurora and will attempt to adjust the compressor speed to keep within the envelope. These conditions are measured using the discharge and suction pressure transducers, discharge temperature, and current sensors of the drive.

# IntelliZone2 Zoning Compatibility (Optional IntelliZone2 Communicating Zoning)

A dedicated input to connect and communicate with the IntelliZone2 (IZ2) zoning system is provided on P7 on the AXB control board. There is a dedicated communication port using a proprietary ModBus protocol. The AXB is standard on variable speed systems. Consult the IntelliZone2 literature for more information. Not compatible with UPC control option.

#### **Electronic Expansion Valve (EEV)**

The electronic expansion valve is operated by the EEV board and is set to maintain optimal superheat setting for maximum efficiency. All operation parameters are communicated to the VS drive and the Aurora system.

#### AWL - Aurora WebLink (Optional Accessory)

AWL is an add-on WiFi router that connects to the ABC and offers many features:

- Remote access to thermostat settings, schedules, etc. with your smartphone, tablet or laptop.
- · Receive Lockout/Fault info via text or email.
- View heat pump energy usage from the internet for the day, week, month, year or real-time.
- Internet AID Tool capability allows remote troubleshooting for the technician.
- Remote AID Tool capability at the heat pump with smartphone, tablet or laptop for the technician.
- Allows data acquisition of the heat pump through the internet, see graphs of performance and chart historical data for the technician.
- Stores historical data on SD card.
- Not compatible with UPC control option

#### Variable Speed Pump

This input and output are provided to drive and monitor a variable speed pump. The VS pump output is a PWM signal to drive the variable speed pump. The minimum and maximum level are set using the AID Tool. 50% and 100% are the default settings respectively. The VS data input allows a separate PWM signal to return from the pump giving fault and performance information. Fault received from the variable speed pump will be displayed as E16. Variable speed pump flow centers are recommended for use over fixed speed pumps with the 7 Series so the water flow is adjusted along with the compressor speed. Using fixed speed pumps with the 7 Series will cost considerably more to operate than variable speed pumps and may cause system faults because the flow isn't being adjusted as it needs in certain operating conditions.

#### **Modulating Water Valve**

This output is provided to drive a modulating water valve. Through advanced design the O-10VDC valve can be driven directly from the VS Pump output. The minimum and maximum level are set in the same way as the VS pump using the AID Tool. 50% and 100% are the default settings respectively. It is recommended to set the minimum no lower than 65% when using the modulating water valve.

#### **Loop Pump Linking**

This input and output are provided so that two units can be linked together with a common flow center. When either unit has a call for loop outputs, both unit's loop pump relays and variable speed pumps are energized. The flow center then can simply be wired to either unit. The output from one unit should be routed to the input of the other. If daisy chained, up to 16 heat pumps can be wired and linked together in this fashion.

#### **Advanced Communication Ports**

AXB Communication ports P6 and P8 will provide future expansion via dedicated protocols. These are for future use.

#### Smart Grid/On Peak (SG) Input

The 'Smart Grid/On Peak' input was designed to allow utilities to utilize simple radio controlled switches to control the On Electric Peak behavior of the 5 and 7 Series Geothermal Heat Pumps and provide demand reduction. With a closed contact signal, this input will limit the operation and thus the power consumption of the unit by disabling the compressor and electric heat as long as the signal is present. Code 7 will flash on the Green LED signifying the 'On Peak' mode. On Peak will also display on communicating thermostats.

#### **Home Automation 1 and 2 Inputs**

The Home Automation inputs are simple closed contact inputs that will trigger an AID Tool and thermostat alert for the homeowner. These would require optional sensors and or equipment for connection to the AXB board. With two inputs, two different sensors can be selected. The selected text will then be displayed on the AID Tool and communicating thermostats. These events will NOT alter functionality or operation of the heat pump/accessories and is for homeowner/service notification only.

#### Home Automation 1 - E23 HA1

With a closed dry contact signal, this input will cause an alarm and Alert Code 23 to indicate on the stat or flash on ABC. The AID Tool will allow configuration of this input between the following selections:

- No Action
- Home Automation Fault [no lockout info only] -Output from home automation system
- Security Alarm [no lockout info only] Output from home security
- Sump Alarm Fault [no lockout info only] Switch output from sump sensor
- Smoke/CO Alarm Fault [no lockout info only] -Switch output from Smoke/CO sensor
- Dirty Filter Alarm [no lockout info only] Output from dirty filter sensor

#### Home Automation 2 - E24 HA2

With a closed dry contact signal, this input will cause an alarm and Alert Code 24 to indicate on the stat or flash on ABC. The AID Tool will allow configuration of this input between the following selections:

- No Action
- Home Automation Fault [no lockout info only] -Output from home automation system
- Security Alarm [no lockout info only] Output from home security
- Sump Alarm Fault [no lockout info only] Switch output from sump sensor
- Smoke/CO Alarm Fault [no lockout info only] -Switch output from Smoke/CO sensor
- Dirty Filter Alarm [no lockout info only] Output from dirty filter sensor

## **Monitoring Sensor Kits**

# Energy Monitoring (Standard on all 7 Series units)

The Energy Monitoring Kit includes two current transducers (blower and electric heat on AHB board). The variable speed drive measures compressor drive power so that the complete power usage of the heat pump can be measured. The AID Tool provides configuration detail for the type of blower motor and a line voltage calibration procedure to improve the accuracy. This information can be displayed on the AID Tool or selected communicating thermostats. The TPCM32U04A will display instantaneous energy use while the color touchscreen TPCC32U01 will, in addition, display a 13 month history in graph form.

# Refrigerant Monitoring (Standard on all 7 Series units)

The optional Refrigerant Monitoring Kit includes two pressure transducers, and three temperature sensors, heating liquid line, suction temperature and existing cooling liquid line (FP1). These sensors allow the measurement of discharge and suction pressures, suction and liquid line temperatures as well as superheat and subcooling. This information will only be displayed on the AID Tool.

# Performance Monitoring (Standard on all 7 Series units)

The Performance Monitoring Kit includes three temperature sensors, entering and leaving water, leaving air temperature and a water flow rate sensor. With this kit heat of extraction and rejection will be calculated. This requires configuration using the AID Tool for selection of water or antifreeze.

# **Special Modes and Applications Communicating Digital Thermostats**

The Aurora VS controls system also requires either the monochromatic or color touch screen graphic display thermostats for user interface. These displays not only feature easy to use graphical interface but display alerts and faults in plain English.

#### 'SuperBoost' Cooling Mode

Occasionally there can be a requirement for a short term 'boost' of cooling capacity during a large party etc. The 7 Series allows the user to select 'SuperBoost' mode on the thermostat which will allow the 7 Series VS to ramp up extra cooling capacity if needed. This extra 'SuperBoost' will only be available for a 24 hr period and then the unit will revert to normal operation. The short term boost does not affect ground loop sizing since it is limited in operation. Continuous use of SuperBoost will result in overheating of the ground loop.

#### **Dehumidification - Active**

Active dehumidification will only activate during cooling operation and is based upon the humidity setpoint of the thermostat being at least 5% below the actual relative humidity and being within the temperature parameters described here. The green status LED will flash code 2 when active. The unit can operate a maximum of 1.5°F below the cooling setpoint. The compressor will ramp up and airflow will begin at a low level. Airflow is then reduced periodically until air coil temperature setpoint is reached. If coil temperature continues to drop, the airflow is increased until air coil setpoint is maintained. After 20 minutes of operation in the Active Dehumidification mode, normal cooling operation will resume for 5 minutes. This cycle continues until the dehumidification setpoint is reached, room temperature is more than 1.5°F below cooling setpoint, or more than 1°F above cooling setpoint (normal cooling takes over). In IntelliZone2 systems, active dehumidification is only enabled when system is operating on compressor speeds 4 or lower. Once active dehumidification is activated the main zone and any other active cooling zone will remain open.

# Field Hardware Selectable Options ABC Field Selectable Options via Button (SW1)

Test/Configuration Button (See SW1 Operation Table)

#### **Test Mode**

The control is placed in the test mode by holding the push button switch on the ABC 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 on the ABC 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.

#### **ABC DIP Switch (SW2)**

- **SW2-1** FP1 Selection Low water coil temperature limit setting for freeze detection. On = 30°F; Off = 15°F.
- **SW2-2** FP2 Selection Low air coil temperature limit setting for freeze detection. On = 30°F; Off = Not Used
- **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.
- SW2-4 Access Relay Operation (P2)
- and 2-5

Access Relay Operation	SW2-4	SW2-5
Cycle with Blower	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Cycle with Comm. T-stat Hum Cmd	OFF	ON

- **SW2-6** CC Operation selection of single or dual capacity compressor. On = Single Stage; Off = Dual Capacity **NOTE:** SW2-6 is not applicable to the 7 Series
- 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 NOTE: SW2-7 is not applicable to the 7 Series
- **SW2-8** Future Use

#### **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.

#### **Variable Speed ECM Blower Speeds**

The blower speeds can be changed either by using the variable speed ECM manual configurations mode method or by using the Aurora AID Tool directly (see Instruction Guide: Aurora Interface and Diagnostics (AID) Tool topic).

#### **AXB DIP Switch (SW1)**

**DIP 1 - ID:** This is the AXB ModBus ID and should always read On.

DIP 2 & 3 - Future Use

**DIP 4 & 5 - Accessory Relay2:** A second, DIP configurable, accessory relay is provided that can be cycled with the compressor 1 or 2, blower, or the Dehumidifier (DH) input. This is to complement the Accessory 1 Relay on the ABC board.

Position	DIP 4	DIP 5	Description
1	ON	ON	Cycles with blower or ECM (or G)
2	OFF	ON	Cycles with CC1 first stage of compressor or compressor spd 1-12
3	ON	OFF	Cycles with CC2 second stage of compressor or compressor spd 7-12
4	OFF	OFF	Cycles with DH input from ABC board

# Field Selectable Options via Software (Selectable via the Aurora AID Tool)

Many options are field selectable and configurable in Aurora software via the AID Tool. Consult the installation manual or Aurora documentation for further details.

#### **Basic Aurora 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 3 amp automotive type plug-in fuse provides protection against short circuit or overload conditions. Anti-Short Cycle Protection – 4 minute anti-short cycle protection for the compressor.

**Random Start** - 5 to 80 second random start upon power up.

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

Lockout – when locked out, the blower will operate continuously in "G" blower speed setting. The Alarm output (ALM) and Lockout output (L) will be turned on. The fault type identification display LED1 (Red) shall flash the fault code. To reset lockout conditions with SW2-8 On, the demand call must be removed for at least 30 seconds. To reset lockout conditions with SW2-8 Off, the demand call must be removed for at least 30 seconds. Lockout may also be reset by turning power off for at least 30 seconds or by enabling the emergency shutdown input for at least 30 seconds.



CAUTION: Frequent cycling of power to the drive can damage the drive! Wait at least 5 minutes between cycles (connecting and disconnecting power to the drive).

Lockout With Emergency Heat - if the control is locked out in the heating mode, and a call for emergency heat is received, the control will operate in the emergency heat mode while the compressor is locked out. The first emergency heat output will be energized 10 seconds after the W input is received, and the blower will shift to high speed. If the control remains locked out, and the W input is present, additional stage of emergency heat will stage on after 2 minutes. When the W input is removed, all of the emergency heat outputs will turn off, and the variable speed ECM blower will shift to low speed.

**High Pressure** – 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** - 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. A continuously open LPS shall not be recognized during the 2 minute startup bypass time.

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

**Condensate Overflow** - fault is recognized when the impedance between this line and 24 VAC common or chassis ground drops below 100K ohms for 30 seconds continuously.

Freeze Detection-Coax - set points shall be either 30°F or 15°F. 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. This fault will be ignored for the initial 2 minutes of the compressor run time.

**Freeze Detection-Air Coil** - Air Coil Freeze Detection will use the FP2 input to protect against ice formation on the air coil. The FP2 input will operate exactly like FP1 except that the set point is 30 degrees and is not field adjustable.

**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.

#### Other Lockouts and Alarms

Several other lockouts and alarms are shown in the Status LED1 (LED1, Red) table with the associated codes visible on the thermostat, ABC Fault LED, and in text in the AID Tool.

#### **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 4 minute anti-short cycle delay after the random start delay.

**Standby** - In standby mode the compressor, pump, and blower motor are not active. The RV may be active. The blower and compressor will be off.

Heating Operation - The unit will operate based upon demand as calculated by the room setpoint algorithm. The resulting compressor speed (1-12) will also select an appropriate blower speed for the selected compressor speed. Aux Heat will not be available (on IntelliZone2 Aux Heat is available on compressor speeds 10-12) until after the 12th compressor speed has been operational and still is not satisfying the thermostat, then auxiliary electric heat will be activated.

**Emergency Heat (W)** - The blower will be started on G speed, 10 seconds later the first stage of electric heat will be turned on. 5 seconds after the first stage of electric heat is energized the blower will shift to Aux speed. If the emergency heat demand is not satisfied after 2 minutes the second electric heat stage will be energized.

**Cooling Operation** - The unit will operate based upon demand as calculated by the room setpoint algorithm. The resulting compressor speed, speeds 1-9, (speeds 10-12 are reserved for SuperBoost mode only) will also select an appropriate blower speed. The blower mode will also have the cooling airflow adjustment applied. In all cooling operations, the reversing valve directly tracks the O input. Thus, anytime the O input is present, the reversing valve will be energized.

**Blower (G)** - The blower will start immediately upon receiving a thermostat G command. If there are no other commands from the thermostat the variable speed ECM will run on low speed until the G command is removed. Regardless of blower input (G) from the thermostat, the blower will remain on low speed for 30 seconds at the end of each heating, cooling, and emergency heat cycle.

*Emergency Shutdown* - Four (4) seconds after a valid ES input, P2-7 is present, all control outputs will be turned off and remain off until the emergency shutdown input is no longer present. The first time that the compressor is started after the control exits the emergency shutdown mode, there will be an anti-short cycle delay followed by a random start delay. Input must be tied to common to activate.

**Continuous Blower Operation** - The blower output will be energized any time the control has a G input present, unless the control has an emergency shutdown input present. The blower output will be turned off when G input is removed.

**Load Shed** - The LS input 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.

#### **Aurora Advanced VS Control LED Displays**

These three LEDs display the status, configuration, and fault codes for the control. These can also be read in plain English via the Aurora AID Tool. See the LED tables for further explanation.

#### **Aurora Interface and Diagnostics (AID) Tool**

The Aurora Interface and Diagnostics (AID) Tool is a device that is a member of the Aurora network. The AID Tool is used to troubleshoot equipment which uses the Aurora control via Modbus RTU communication. The AID Tool provides diagnostics,



fault management, variable speed ECM setup, and system configuration capabilities to the Aurora family of controls. An AID Tool is recommended, although not required, for variable speed ECM airflow settings. The AID Tool simply plugs into the exterior of the cabinet in the AID Tool port.

**NOTE:** The AID Tool is required when installing and servicing the 7 Series Indoor Split and Air Handler.

#### Status LED (LED3, Green)

Description of Operation	Fault LED, Green
Normal Mode	ON
Control is Non-functional	OFF
Test Mode	Slow Flash
Lockout Active	Fast Flash
Dehumidification Mode	Flash Code 2
Load Shed	Flash Code 5
Emergency Shutdown	Flash Code 6
On Peak Mode	Flash Code 7
Warning! VS Derated	Flash Code 8
Warning! VS SafeMode	Flash Code 9

#### Configuration LED (LED2, Yellow)

Description of Operation	Configuration LED, Yellow
No Software Overwritten	ECM Setting
DIP Switch Overwritten	Slow Flash
ECM Configuration Mode	Fast Flash
Reset Configuration Mode	OFF



The Aurora Unitary Protocol Converter (UPC) 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 UPC then converts internal Aurora Modbus protocol to BACnet MS/TP protocol and communicates to the HAS system. This provides the great benefit of complete control integration and a myriad of information available to the HAS from the heat pump control. Plus it also allows individual unit configuration such as ECM fan speeds or freeze protection setting directly over the HAS without the need for access to the actual heat pump.

The Aurora UPC is implemented with the Aurora Base Controller (ABC) heat pump control into our latest water source heat pumps. All internal Aurora points are accessible to the UPC via firmware providing an integrated solution. All zone temperatures and zone sensors are connected to the UPC on an RNet bus, simplifying hook up at the unit. RNet sensors can include a combination of zone temperature and humidity, CO2, and VOC sensors. The UPC includes built-in support for a custom configurable keypad/display unit.

Optional Equipment Touch Cable kit

BACnet MS/

UPC Sensors & Thermostats	Description	Aurora 'Base'	Aurora 'Base'	Aurora 'Advanced'
ZS Standard	Local access port /No user control	Optional	Optional	Optional
ZS Plus	Local access port/Slide potentiometer to make the zone warmer or cooler /Control button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state/Green LED to Indicate occupied state.	Optional	Optional	Optional
ZS Pro	Local access port/LED display/Control button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state/Arrow UP and DOWN buttons to change any editable property, such as the setpoint temperature/ibutton to cycle through information defined in the control program/Green LED to Indicate occupied state.	Optional	Optional	Optional
ZS Pro-F	Local access port/LED display/Control button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state/Arrow UP and DOWN buttons to change any editable property, such as the setpoint temperature/ibutton to cycle through information defined in the control program/Green LED to Indicate occupied state/Mode button to turn on heating, cooling, or fan only, or to set auto control/ Fan button to adjust fan speed/ F/C button to set temperature to Fahrenheit of Celsius	Optional	Optional	Optional

NOTE: A ZS type sensor/thermostat is necessary for compatibility with UPC.

#### **Aurora UPC**

An optional Aurora UPC for DDC applications communicates directly with the entire Aurora system and provides DDC protocol of BACnet MS/TP for connection to the HAS providing a wide variety of points covering configurations, sensors, airflow and freeze protection. For more information on the Aurora UPC, please consult the Aurora UPC Application Guide for Variable Speed Applications.

NOTE: The UPC is not compatible with IntelliZone2 or Symphony.

#### **Aurora Touch Interface**

Utilizing the service technicians personal Android tablet (Android 4.0 or higher) along with Equipment Touch App (purchased from the Play Store) and our Aurora Touch Cable (part number ATCK01), a technician will have the ability to access the UPC to configure and diagnose equipment at the unit or from any room sensor. The technician will have full access to equipment status, parameter values, temperature, and humidity sensing as well as access to alarm history. The Equipment Touch App is easy to use and provides important insight into the system so it can operate as efficiently as possible.

8/6/2020

# The Aurora Advanced VS Control System cont.

					ABC Action	n AID Tool	IZ2 and Stat Display
Red Fault LED	LED Flash Code	LED Lock- Flash out	Remove	Fault Condition Summary	ABC ABC Green Fi Status L LED	ABC Red Fault Display and History LED	IZ2 & Thermostat Display
Normal - No Faults	Off	Н			$\vdash$		
Fault-Input	- 0	$^{+}$	$\neg$	Tstat input error. Auto	+	- 0	
Fault-Low Pressure	2 12	Yes	Hard or Soft	ort HP switch has tripped (>600 psi)  Cow Pressure Switch has tripped (<40 psi for 30 continous sec.)	Lockout	Code 2   Lockout - E2 High Press Code 3   Lockout - E3 Low Press	Lockout - E3 High Press Lockout - E3 Low Press
Fault-Freeze Detection FP2					_	-	Lockout - E4 Freeze Detection FP2
Fault-Freeze Detection FP1	P1 5	Yes	Hard or Soft		Lockout Co	Code 5 Lockout - E5 Freeze Detection FP1	Lockout - E5 Freeze Detection FP1
Fault-Reserved	9	Yes	Hard or Soft		Lockout	Code 6 Lockout - E6	Lockout - E6
				Hard or Soft Condensate switch has shown continuity for 30 continuous sec.	_	+	
B Fault-EP1 & 2 Spsr Frror	е = 2	NO.	Hard or Soft	Instantaneous Voltage is out of range. **Controls shut down until resolved.	Lockout	Code 8 Lockout - E8 Over/Under voltage	Lockout - E8 Over/Under voltage
Non-CriticAXBSnsrErr	13			Any Other Sensor	-	Alert - E13 Non-Critical AXB S	Alert - E13
	17	1 Yes	Hard or Soft	Sensor Err for EE	Lockout	Code 14 Lockout - E14 Critical AXB Sensor Error	Lockout - E14 Critical AXB Sensor Error
	15	8 2	Auto	HW over limit or logic lockout. HW pump deactivated.	Normal	-	No Display
Fault-ComTStat	17		-	Fault with any com Tstat. Autoreset upon condition removal.	+	Code 17 Alert - E17 Stat Communication Error	
Non-CritComErr	81			Any non-critical com error		-	
Fault-CritComErr	Н			lعا		+	
Alarm - Low Loop Pressure	۲.			S.	$\rightarrow$	+	No Display
Alarm - Home Automation	_ (	+	_		_	-	Alert - E23 Selected choice
Derate-DriveTemp	11 24	Z Z	Auto	Drive Temp has reached critical High Temp	Derated Co	Code 24   Alert - E24 Selected Choice Code 41   Warning! Derated - E41 DriveTemp	Warning! Derated - E41 DriveTemp
Derate-HiDisTemp	42	$\vdash$	L	Compressor Discharge isexceeded limit for 90 continuous sec	+	1	Warning! Derated - E42 HiDisTemp
Derate-LoSucPres	43	Н	Ц	Suction Pressure is critically low	-	Warning! Derated -	Warning! Derated - E43 LoSucPres
Derate-LoConPres	44	-	4		_	_	Warning! Derated - E44 LoConPress
Derate-HiConPres	45	+	4		_	-	Warning! Derated - E45 HiConPress
SefeMd-EEVINGCom	46	0 Z	Auto	Com with EEV is internated EEV has gone independent mode	SafeMode Co.	Code 46 Warning! Derated - E46 OutPwrLmt	Warning! Derated - E46 OutPwrLmt Warning! SafeMode - E47 FEVINGCom
SafeMd-FEVOutCom	1 4	+	$\downarrow$			+	Warning! SafeMode - E4/ EEVIII COIII
SafeMd-AmbTmpSnr	49	+	L			1	Warning! SafeMode - E49
	52		F F	Discharge Sensor (Sd) is > 280 F or invalid (-76 to 392 F) Suction Pressure (PO) is invalid (0 to 232 psi)		-	Lockout! - E51 DisTmpSnr Lockout! - E52 SucPrsSnr
VS Fault-ConPrsSnr	23	3 then Yes		Low condensing	Norm then Lockout	_	Lockout! - E53 ConPrsSnr
anto Fault-LowSupVolt	54	4 Yes	Hard or Soft	Supply Voltage is <175 V (190V to reset) or powered off/on too quickly (<30 sec.).	Lockout	Code 54 Lockout! - E54 LowSupVolt	Lockout! - E54 LowSupVolt
Third C-third	F.	X 10×	Hard or Coft		Norm	2 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	VelcoiO
במתו-סמיבוואפוסם	ń				+	$\rightarrow$	No Display
Fault-OverCurrnt	56	6 Yes	Hard or Soft		Lockout Coo	Code 56   Lockout! - E56 OverCurrnt	Lockout! - E56 OverCurrnt
Fault-Over/UnderVolt Fault-HiDrivTemp	57	7 Yes	Hard or Soft Hard or Soft	DC Link Voltage to compressor is >253V or at minimum Volt. Drive Temp has reached critical High Temp >239 F	Lockout Co	Code 57   Lockout! - E57 Over/Under Volt Code 58   Lockout! - E58HiDrivTemp	Lockout! - E57 Over/Under Volt Lockout! - E58HiDrivTemp
Fault-DrvintErr MOC/AOC				The MOC has er			Lockout! - E59 DrvIntErr
Fault-MultSafeMd	19	1 Yes	Hard or Soft		Lockout	Code 61 Lockout! - E61 MultSafeMd	Lockout! - E61 MultSafeMd
EEV2 Fault-LossofCharge				High superheat a of charge fault	Lockout	Code 71   Lockout! - E71 LossCharge	Lockout! - E71 LossCharge
	_	$\vdash$	Н	Suction Temperature Sensor is invalid (-76 to 392 F)		$\vdash$	Warning! SafeMode - E72 SucTmpSnr
EEV2 SafeMd-MaxOpPres	s 74	2 Z	Auto		SafeMode Co	Code 74 Marning! SafeMode - E74 MaxOpPress	No Display Warning! SafeMode - E74 MaxOpPress
S EEVI Fault-LossofCharge	75	2 Yes	Hard or Soft	oft High superheat and high EEV opening % for a long time will trigger a loss of charge fault	Lockout Co	Code 75 Lockout! - E75 Loss Charge	Lockout! - E75 Loss Charge
-	Н	$\dashv$	Ц	Suction Temperature Sensor is invalid (-76 to 392 F)		$\vdash$	Warning! SafeMode - E76 SucTmpSnr
EEVI SafeMd-LATSensor	+	+	4			-	No Display
ЕЕVI Sareмd-махоритея	/8	NO NO	Anto	Suction pressure has exceeded that maximum operating level for 90 sec.	SateModel Coo	Code /8   Warning! SateMode - E/8 MaxOpPress	Warning! SateMode - E/8 MaxOpPress

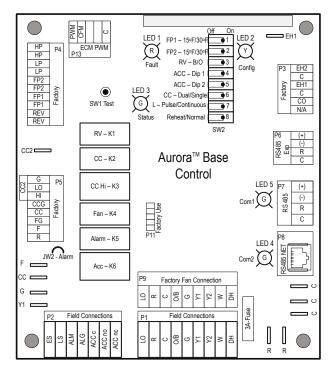
oces >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50 etc. will be skipped! Is a noncritical sensor or function that has failed. Normal operation of the heat pump is maintained but service is desired at some point.

ABC Green Status LED	LED Code	Full Description	Removal
Normal Mode	ON	Normal operation of the heat pump	-
Control non-functional	OFF	Microprocessor is not operational	Board replacement
Test Mode	Slow Flash	Speeds some timings for faster troubleshooting. Entered from pushed button on ABC	Auto after 20 min
LOCKOUT Active	Fast Flash	Lockout is active. Can be removed by hard or soft reset.	Hard or Soft Reset
Dehumidification Mode	Code 2	Unit has either Dehumidification Mode Call from dehumidistat (Active or Passive).	Remove Dehumid Call from Stat
Load Shed	Code 5	Active Load Shed (LS) input on ABC	Remove LS input
Emergency Shutdown	Code 6	Active Emergency Shutdown (ES) input on ABC	Remove ES input
On Peak Mode	Code 7	On Peak Mode is signalled from external source through Smart Grid Input (dig1) or through ext communication.	Remove Smart Grid Input or com
Warning! VS Derated	Code 8	Unit has encountered unacceptable condition and has moderated compressor speed to compensate.	Only automatic removal
Warning! VS SafeMode	Code 9	Unit has encountered unacceptable condition or lost EEV com and has adjusted operation to 2400 rpm and safe EEV %.	Only automatic removal

ABC Yellow Config LED	LED
No Override	ECM Setting
DIP Switch Overridden	Slow Flash
ECM Config Mode	Fast Flash
Reset Config Mode	OFF

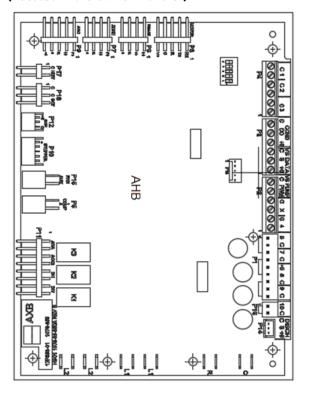
#### **ABC Control Board Layout**

(Located in the NVZ compressor section)



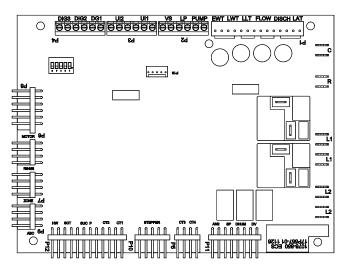
#### **AHB**

(Located in the SVH air handler)



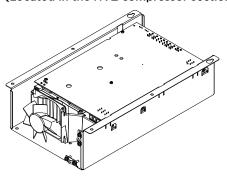
#### **AXB Control Board Layout**

(Located in the NVZ compressor section)



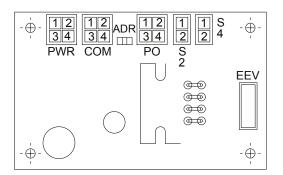
#### **Variable Speed Drive**

(Located in the NVZ compressor section)



#### **EEV Board Layout**

(EEV1 Located in NVZ compressor section) (EEV2 located in SVH air handler)



## **Operation Logic**

#### **Heating Mode**

When the variable speed controls determine that heating is needed in the space the blower will be turned on, the compressor will be ramped to speed 6 and the loop pump will be started. The compressor will continue to run at speed 6 for 60 seconds for oil circulation. During the 60 second oil circulation the controls will calculate what speed the compressor will need to operate at to maintain the set point in the space. If the compressor is operating at speed 12 and the unit is unable to maintain set point the controls will stage on the electric heat. Electric heat will not operate unless the compressor is already running at speed 12. Every 30 minutes if the compressor has been operating lower than speed 6, the controls will increase the compressor to speed 6 for one minute for oil circulation.

#### **Cooling Mode**

When the variable speed controls determine that cooling is needed in the space the blower will be turned on, the reversing valve will be enabled, the compressor will be ramped to speed 6, and the loop pump will be started. The compressor will continue to run at speed 6 for 60 seconds for oil circulation. During the 60 second oil circulation the controls will calculate what speed the compressor will need to operate at to maintain the set point in the space. The compressor will be limited to a maximum of speed 9 for cooling. If additional capacity is needed SuperBoost mode can be enabled from the thermostat allowing the compressor to run at speeds higher than 9 for a period of 24 hours. Every 30 minutes if the compressor has been operating lower than speed 6, the controls will increase the compressor to speed 6 for one minute for oil circulation.

#### **ECM Blower Motor**

The variable speed controls will vary the ECM blower output to maintain optimum air flow at each of the 12 compressor speeds. If dehumidification mode is selected during the cooling operation the airflow will be varied to allow for maximum moisture removal.

#### Variable Speed Loop Pump

The variable speed controls will operate the variable speed loop pump similar to the way the ECM blower motor operates. The speed of the pump will be increased as the compressor speed is increased to maintain adequate water flow.

#### Safe Mode

The system has encountered an unsafe operating condition that prevents automatic speed control, e.g. lost a sensor signal. To avoid damage to the system, the drive is running the compressor at a fixed speed of 2400 rpm awaiting the problem to be solved and eventually returning to normal operation. If the problem cannot be solved the drive stops and issues an alarm. (See fault/alarm table.)

#### **Derating**

The VS compressor utilizes 'envelope control' to maintain performance within operational limits and improve reliability. To accomplish this, pressure sensors for discharge and suction pressure as well as hot gas temperature sensing are used to monitor the conditions in which the compressor operates. The envelope does vary based upon operating speed (rpm). When operating out of these limits the control will attempt to improve the situation by moderating the compressor speed for a larger envelope. When this occurs it can be observed on the Aurora control as an 'E' code. The control will automatically try to resolve the situation. If the situation progresses, a fault and lockout will be generated by the control.

# **SVH Blower Performance Data**

#### Variable Speed ECM

Model	Max ESP	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7	Speed 8	Speed 9	Speed 10	Speed 11	Speed 12
033	0.75	250	400 G	550 L	650	750	850	1000	1150	1250 H	1350 Aux	1450	1600
042	0.75	250	450 G	650 L	800	950	1050	1200	1350	1450	1600 H	1750 Aux	1850
050	0.75	300	550 G	800 L	1000	1150	1300	1450	1600	1750	1900 H	2050 Aux	2200
**VS Com- pressor Speed				1-2	3-4		5-6	7-8		9-10	11-12		

4/15/2020

Factory settings are at recommended G, L, H and Aux positions

CFM is controlled within 5% up to the maximum ESP

<sup>\*\*</sup> VS Compressor speed is given for the factory default cfm settings. When the cfm default settings are changed it will change the relationship to the compressor speed that is shown in the table. In cooling mode compressor speeds 10-12 are only available when SuperBoost mode is selected at the thermostat.

<sup>&</sup>quot;G" may be located anywhere within the airflow table.

<sup>&</sup>quot;L" setting should be located within the boldface CFM range

<sup>&</sup>quot;H" setting MUST be located within the shaded CFM range

<sup>&</sup>quot;Aux" setting MUST be equal to or higher than factory setting shown in the table above

## **Line Set Sizes**

Unit	Air	20 1	feet	40	feet	60 1	feet	80	feet	NZ Factory	*Charge
Size	Handler	Suction	Liquid	Suction	Liquid	Suction	Liquid	Suction	Liquid	Charge (oz.)	Amount with SVH Air Handler (oz.)
NVZ033	SVH033	3/4" OD	3/8" OD	68	118						
NVZ042	SVH042	3/4" OD	3/8" OD	90	142						
NVZ050	SVH050	3/4" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	3/8" OD	7/8" OD	3/8" OD	92	152
1	ACITY IPLIER	1.0	00	0.9	985	0.9	97	0.9	955		

12/7/20

Notes: \* The "Charge Amount with SVH Air Handler" column is based on the charge amount for a SVH Air Handler + Compressor Section/Split.

Additional charge will need to be added accordingly for line set length.

After charge is added, additional adjustments can be made to get appropriate subcooling and superheat measurements. Additional charge for R410A is 0.50 oz. per ft. for 3/8" and 1.0 oz. per ft. for 1/2" tube.

**NOTE:** Manufacturer recommends the total line set length not to exceed 80 ft with no more than 25 ft of vertical separation between the compressor section and air handler.

#### **SVH Controls**

#### **SVH AHB Board**

The SVH Air Handler with the 'Advanced' control option expands on the capability of the Aurora 'Advanced' Control (ABC and AXB) in the compressor section, by adding the AHB board in the air handler.

The AHB board includes the following features:

#### **AHB DIP Switch**

**DIP 1 - ID**: This is the AHB ModBus ID and should always read Off

#### DIP 2 & 3 - Future Use

**DIP 4 & 5 - Accessory Relay2**: A second, DIP configurable, accessory relay is provided that can be cycled with the compressor 1 or 2, blower, or the Dehumidifier (DH) input. This is to complement the Accessory 1 Relay on the ABC board.

Position	DIP 4	DIP 5	Description
1	ON	ON	Cycles with Fan or ECM (or G)
2	OFF	ON	Cycles with CC1 first stage of compressor or compressor spd 1-6
3	ON	OFF	Cycles with CC2 second stage of compressor or compressor spd 7-12
4	OFF	OFF	Cycles with DH input from ABC board

# IntelliZone2 Zoning Compatibility (Optional IntelliZone2 Communicating Zoning)

A dedicated input to connect and communicate with the IntelliZone2 (IZ2) zoning system is provided on P7 on the AHB and AXB. This is a dedicated communication port using a proprietary ModBus protocol. An AXB in the compressor section or an AHB in the air handler is required. Consult the Intellizone2 literature for more information.

#### **Communicating Digital Thermostats**

The Aurora controls system also features either monochromatic or color touch screen graphic display thermostats for user interface. These displays not only feature easy to use graphical interface but display alerts and faults in plain English. Many of the features discussed here may not be applicable without these thermostats.

# Energy Monitoring (AXB Board Required in Compressor Section) (Standard Sensor Kit on 'Advanced' models)

The Energy Monitoring Kit includes two current transducers (blower and electric heat) so that the complete power usage of the air handler can be measured. The AID Tool provides configuration detail for the type of blower motor, power adjustment and a line voltage calibration procedure to improve the accuracy. The information can be displayed on the AID Tool or selected communicating thermostats. The TPCM32U04A(\*) will display instantaneous energy use while the color touchscreen TPCC32U01(\*) will in addition display a 13 month history in graph form. Refer to Compressor Section Start Up Energy Monitoring for configuration details.

**Freeze Detection (Air Coil)** – uses the FP2 input to protect against ice formation on the air coil. The FP2 input will operate exactly like FP1 except that the set point is 30 degrees and is not field adjustable.

**Condensate Overflow** - fault is recognized when the impedance between this line and 24 VAC common or chassis ground drops below 100K ohms for 30 seconds continuously.

# Leaving Air Temperature (AXB Board Required in Compressor Section)

A leaving air temperature (LAT) thermistor is located near the blower inlet and can be read via the AID tool.

#### **Electric Heat Staging**

The AHB board provides two stages of auxiliary heat operation. During normal operation, the first stage of electric heat is energized 10 seconds after the W command is received. If the demand continues the second stage is of electric heat will be energized after 5 minutes. In an Emergency heat operation the time delay between stage one and stage two will be 2 minutes.

#### **SVH Controls Cont.**

# Setting Blower Speed - Variable Speed ECM

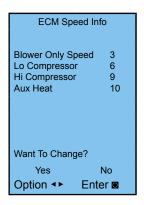
The ABC board's Yellow Config LED will flash the current ECM blower speed selections for "G", low, and high continuously with a short pause in between. The speeds can also be confirmed with the AID Tool under the Setup/ ECM Setup screen. The Aux will not be flashed but can be viewed in the AID Tool. The ECM blower motor speeds can be field adjusted with or without using an AID Tool.

#### **ECM Setup without an AID Tool**

The blower speeds for "G", Low (Y1) and High (Y2) can be adjusted directly at the Aurora ABC board which utilizes the push button (SW1) on the ABC board. This procedure is outlined in the ECM Configuration Mode portion of the Aurora 'Base' Control System section. The Aux blower speed will remain at default or current settings, and requires the AID tool for adjustments.

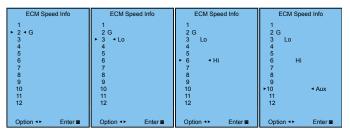
#### **ECM Setup with an AID Tool**

A much easier method utilizes the AID Tool to change the airflow using the procedure below. First navigate to the Setup screen and then select ECM Setup. This screen displays the current ECM settings. It allows the technician to enter the setup screens to change the ECM settings. Change the highlighted item using the ◀ and ▶ buttons and then press the ■ button to select the item.



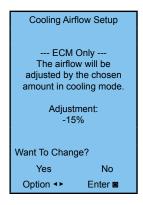
Selecting YES will enter ECM speed setup, while selecting NO will return to the previous screen.

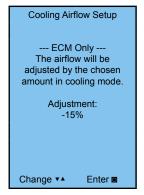
**ECM Speed Setup** - These screens allow the technician to select the "G", low, high, and auxiliary heat blower speed for the ECM blower motor. Change the highlighted item using the ▲ and ▼ buttons. Press the ■ button to select the speed.



After the auxiliary heat speed setting is selected the AID Tool will automatically transfer back to the ECM Setup screen.

**Cooling Airflow Setup** - These screens allow the technician to select -15%, -10%, -5%, None or +5%. Change the adjustment percentage using the ▲ and ▼ buttons. Press the ■ button to save the change.





## **Water Quality**

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

Heat pumps with cupronickel heat exchangers are recommended for open loop applications due to the increased resistance to build-up and corrosion, along with reduced wear caused by acid cleaning.

#### **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. Purchase of a pre-mix antifreeze could significantly improve system reliability if the water quality is controlled and there are additives in the mixture to inhibit corrosion. There are many examples of such fluids on the market today such as Environol™ 1000

(pre-mix ethanol), and others. 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 and water lines in the units are copper or cupronickel tube. There may be other materials in the buildings piping system that the designer may need to take into consideration when deciding the parameters of the water quality. If 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.

#### **Contaminated Water**

In applications where the water quality cannot be held to prescribed limits, the use of a secondary heat exchanger is recommended to separate the unit from the contaminated water. The 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.

#### Low Water Coil Limit

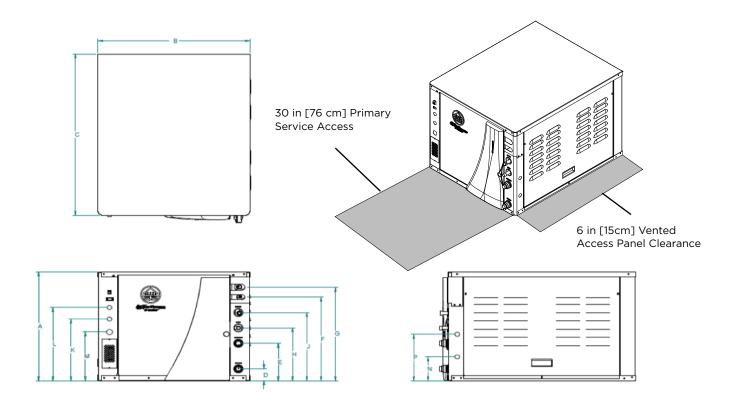
Set the freeze sensing switch SW2-1 on the Aurora Base Control (ABC) printed circuit board for applications using a closed loop antifreeze solution to "LOOP" (15°F). On applications using an open loop/ground water system (or closed loop no antifreeze), set this dip switch to "WELL" (30°F), the factory default setting. (Refer to the DIP Switch Settings table in the Aurora Control section.)

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

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

2/22/12

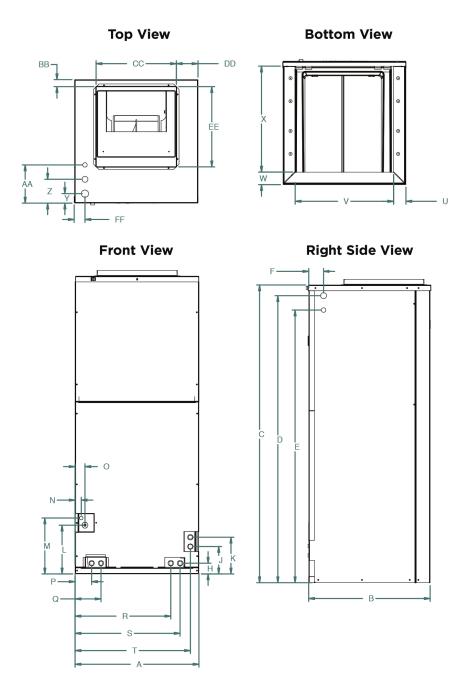
# **Compressor Section Dimensional Data**



				14 <i>0</i> 1-141-	D	Water	Water	Service	Valve	HWG	HWG	Low	External	Line	киоск	киоск
	Mode	ls	Height	Width	Depth	In	Out	Liquid	Gas	In	Out	Voltage	Pump	Voltage	OUT	OUT
l			Α	В	С	D	Е	F	G	Н	J	K	L	М	N	Р
ſ	033-050	in.	21.25	25.62	31.60	2.30	7.21	16.40	18.30	10.30	13.30	12.10	14.30	9.50	4.70	9.10
Į	033-030	cm.	54.00	65.10	80.30	5.80	18.50	41.70	46.50	26.20	33.80	30.70	36.30	24.10	11.90	23.10

# **Air Handler Dimensional Data - SVH Air Handler**

## **Top Flow/Horizontal Unit Configuration**



#### SVH Air Handler - Topflow/Horizontal

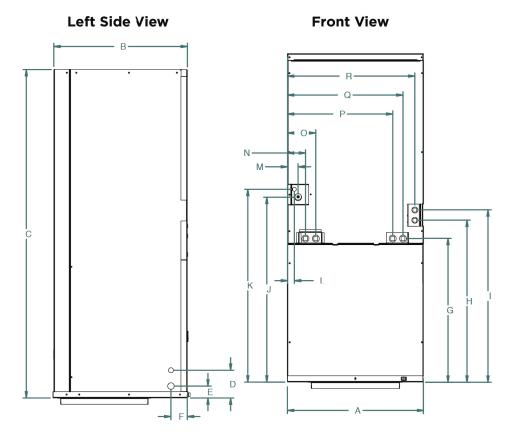
Topfl	owl	Overall Cabinet									Refrig																				
2000					D	E					Connections																				
Horizontal Configuration		Α	В	С	3/4" cond	1/2" cond	F	Н	J	K	L	М	N	0	Р	Q	R	S	T	U	٧	W	Х	Υ	Z	AA	BB	CC	DD	EE	FF
Configu			Denth	Height	Power	Low					Suction	Liquid												Power	Sunnh	Low					
		VVICIO	Бери	Hogik	Supply	Voltage			Juceon	Liquid												1 OWEI	Supply	Voltage							
033-050	in.	24.9	21.2	58.0	56.1	53.2	2.6	1.9	4.8	6.4	9.6	10.8	1.1	1.7	2.9	4.5	20.3	21.9	23.5	2.2	20.6	2.2	18.4	1.7	4.2	6.7	1.5	18.0	3.4	18.0	1.8
033-050	cm.	63.2	53.8	147.3	142.5	135.1	6.6	4.8	12.2	16.3	24.4	27.4	2.8	4.3	7.4	11.4	51.6	55.6	59.7	5.6	52.3	5.6	46.7	4.3	10.7	17.0	3.8	45.7	8.6	45.7	4.6
	Conden	sate is	plastic	3/4" FP	T																										_
	Discharge flange is field installed and extends 1" (25.4 mm) from cabinet													" Y" I	S 1 3/8	KNO	CKOUT	T HIGH	I VOLT	AGE											

Discharge flange is field installed and extends 1" (25.4 mm) from cabinet NOTE: Clearance for maintenance and servicing access - minimum 30" from front of unit recommended for blower motor/coil replacement. Condensate drain lines routed to clear filter and panel access. Pitter removal - minimum 30" recommended.

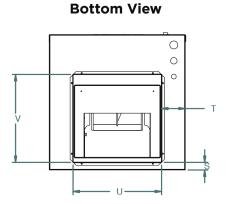
" Y" IS 1 3/8 KNOCKOUT HIGH VOLTAGE
"Z" IS 1 1/8 KNOCKOUT HIGH VOLTAGE
"AA" IS 7/8 KNOCKOUT LOW VOLTAGE

# <u>Air Handler Dimensional Data - SVH Air Handler</u>

#### **Bottom Flow Unit Configuration**



# Top View



#### **SVH Air Handler - Bottom flow**

Bott	omflo	ow	Ove	erall Ca	abinet	D	E	F	]				gerant ections															
Configuration		Α	В	С	1/2" cond	3/4" cond		G	Н	ı	J	K	L	М	N	0	Р	Q	R	S	Т	U	٧	w	Х	Υ	Z	
			Midth	Denth	th Height	Low	Power P	Power				Suction	Liquid															П
			vvidui	Берш	magni	Voltage	Supply	Supply				Suction	Liquiu															
033-0	50	in.	24.9	21.2	58.0	4.4	1.9	2.6	24.0	27.0	28.5	31.3	32.8	1.1	1.7	2.8	4.5	20.2	21.9	23.5	1.2	3.4	18.0	18.0	2.1	2.2	20.5	18.5
033-0.		cm.	63.2	53.8	147.3	11.2	4.8	6.6	61.0	68.6	72.4	79.5	83.3	2.8	4.3	7.1	11.4	51.3	55.6	59.7	3.0	8.6	45.7	45.7	5.3	5.6	52.1	47.0

Condensate is plastic 3/4" FPT

Discharge flange is field installed and extends 1" (25.4 mm) from cabinet

NOTE: Clearance for maintenance and servicing access - minimum 30° from front of unit recommended for blower motor/coil replacement. Condensate drain lines routed to clear filter and panel access. Filter removal - minimum 30° recommended.

# **Compressor Section Physical Data**

Model	NVZ033	NVZ042	NVZ050						
Compressor (1 each)	Va	Variable Speed Scroll							
Factory Charge R410a, oz [kg]	68 [1.93]	90 [2.55]	92 [2.61]						
Coax and Water Piping									
Water Connections Size - Swivel - in [mm]	1" [25.4]	1" [25.4]	1" [25.4]						
HWG Connection Size - Female Sweat I.D in [mm]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]						
Brass Service Valve - Liquid Line - in [mm]		3/8" [9.45]							
Brass Service Valve - Suction Line - in [mm]	3/4"	[19.1]	7/8" [22.23]						
Coax & Piping Water Volume - gal [l]	1.3 [4.9]	2.3 [8.7]	2.3 [8.7]						
Weight - Operating, lb [kg]	241 [109]	302 [137]	302 [137]						
Weight - Packaged, lb [kg]	261 [118]	322 [146]	322 [146]						

Notes: All units have an EEV and 1/2 in. [12.7mm], and 3/4 in. [19.1] electrical knockouts Brass services valves are sweat type valves

03/18/20

# **Air Handler Physical Data**

Air Handler Model	Number (Refrigerant)	033	042	050					
	Air Coil Total Face Area, ft2 [m2]	6.81 [0.63]							
	Tube outside diameter - in. [mm]	3/8 [9.52]							
Evaporator Coil	Number of rows		3						
Evaporator Coll	Fins per inch		12						
	Suction line connection - in. [mm] sweat	7/8 [22.23]							
	Liquid line connection - in. [mm] sweat	3/8 [9.45]							
Refrigerant		R-410a							
Condensate drain	connection - (FPT) in. [mm]	3/4 [19.05]							
Blower Wheel Siz	e (Dia x W), in. [mm]	11 × 10 [279 × 254]							
Blower motor typ	e/speeds	Variable Speed ECM							
Blower motor out	put - hp [W]	1 [746]							
Filter Standard - 1	" [51mm] Field Supplied.	22 X 20 [559 x 508]							
Electrical characte	eristics (60hz)	208/230 - 1ph							
Shipping weight -	lbs. [kg]	206 [93.4]							
Operating weight	- lbs. [kg]	188 [85.3]							

04/07/2020

## **Electrical Data**

#### Variable speed with external loop pump

Model	Rated Voltage	Voltage Min/Max	COMP LRA	COMP MCC	Drive RLA	Drive Internal Fuse	HWG Pump FLA	Ext Loop FLA	Total Unit FLA	Minimum Circuit Amp	Max Fuse HACR Breaker
033	208-230/60/1	187/253	10.2	18.0	22.0	30.0	0.4	5.4	27.8	33.3	35
042	208-230/60/1	187/253	12.0	23.5	28.0	35.0	0.4	5.4	33.8	40.8	45
050	208-230/60/1	187/253	12.0	30.0	33.0	40.0	0.4	5.4	38.8	47.1	50

Rated Voltage of 208/230/60/1 HACR circuit breaker in USA only All fuses Class RK-5 8/21/19

## **Air Handler Electrical Data**

Model	Electric Heat Capacity KW BTUH		Supply Circuit	! Minimum	l Rated	Voltage Min/Max	Fan Motor		ater acity		Unit -A	Minimum Circuit Ampacity		Maxi Fuse/	mum HACR
	240v	240v	J Juit	CFM	voltage	, ,	FLA	208v	240v	208v	240v	208v	240v	208v	240v
033	0	0	-				7.0	-	-	7.0	7.0	8.8	8.8	15	15
033	9.6	32,765	single	1,300			7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
	0	0	-				7.0	-	-	7.0	7.0	8.8	8.8	15	15
	9.6	32,765	single	1,300			7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
042	14.4	49,147	single	ļ			7.0	52.0	60.0	59.0	67.0	73.8	83.8	80	90
	14.4	49.147	L1/L2	1,700			7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
		43,147	L3/L4				-	17.3	20.0	17.3	20.0	21.6	25.0	25	25
	0	0	-		208-230/60/1	197/253	7.0	-	-	7.0	7.0	8.8	8.8	15	15
	9.6	32,765	single	1,300			7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
	14.4	49,147	single	ļ			7.0	52.0	60.0	59.0	67.0	73.8	83.8	80	90
050	14.4	49.147	L1/L2	1,700			7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
030	14.4	43,147	L3/L4				-	17.3	20.0	17.3	20.0	21.6	25.0	25	25
	19.2	65,530	single				7.0	69.3	80.0	76.3	87.0	95.4	108.8	100	110
	19.2	65,530	L1/L2	2,000		] [	7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
	15.2	05,550	L3/L4				-	34.7	40.0	34.7	40.0	43.4	50.0	50	50

1/29/20

Rated Voltage of 208/230/60/1 HACR circuit breaker in USA only

### **Reference Calculations**

Heating Calculations:	Cooling Calculations:
$LWT = EWT - \frac{HE}{gpm \times 500}$	LWT = EWT + $\frac{HR}{gpm \times 500}$
$LAT = EAT + \frac{HC}{cfm \times 1.08}$	LAT (DB) = EAT (DB) - $\frac{SC}{cfm \times 1.08}$
	LC = TC - SC
TH = HC + HW	$S/T = \frac{SC}{TC}$

### **Legend and Notes**

### **Abbreviations and Definitions**

cfm = airflow, cubic feet/minute

EWT = entering water temperature, Fahrenheit

gpm = water flow in gallons/minute

WPD = water pressure drop, psi and feet of water

EAT = entering air temperature, Fahrenheit (dry bulb/wet bulb)

HC = air heating capacity, MBtu/h
TC = total cooling capacity, MBtu/h
SC = sensible cooling capacity, MBtu/h
kW = total power unit input, kilowatts
HR = total heat of rejection, MBtu/h
HE = total heat of extraction, MBtu/h

HWC = hot water generator capacity, MBtu/h

EER = Energy Efficient Ratio = Btu output/Watt input

COP = Coefficient of Performance

= Btu output/Btu input

LWT = leaving water temperature, °F
LAT = leaving air temperature, °F
TH = total heating capacity, MBtu/h
LC = latent cooling capacity, MBtu/h
S/T = sensible to total cooling ratio

#### **Notes to Performance Data Tables**

The following notes apply to all performance data tables:

- Performance ratings are based on 80°F DB/67°F WB EAT for cooling and 70°F DB EAT for heating.
- Three flow rates are shown for each unit. The lowest flow rate shown is used for geothermal open loop/well water systems
  with a minimum of 50°F EWT. The middle flow rate shown is the minimum geothermal closed loop flow rate. The highest
  flow rate shown is optimum for geothermal closed loop systems and the suggested flow rate for boiler/tower applications.
- The hot water generator numbers are based on a flow rate of 0.4 gpm/ton of rated capacity with an EWT of 90°F.
- Entering water temperatures below 40°F assumes 15% antifreeze solution.
- For non-standard EAT conditions, apply the appropriate Correction Factor tables.
- · Interpolation between EWT, gpm, and cfm data is permissible, extrapolation is not.

### **Operating Limits**

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

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

# **Compressor Section Pressure Drop**

Madal	GPM		Press	ure Drop	(psi)	
Model	GPM	30° F	50° F	70°	90° F	110° F
	11.5	3.60	3.30	3.10	2.90	2.70
	9.0	2.30	2.10	2.00	1.90	1.70
033	7.0	2.10	2.00	1.80	1.80	1.60
	6.0	1.10	1.05	1.00	0.90	0.85
	4.5	0.70	0.66	0.64	0.60	0.55
	13.5	4.10	3.80	3.60	3.40	3.10
	10.5	1.90	1.80	1.70	1.60	1.50
042	7.5	1.70	1.50	1.40	1.30	1.20
	6.0	1.00	0.90	0.80	07	0.60
	4.0	0.40	0.38	0.36	0.34	0.30
	17.0	6.20	5.80	5.40	5.00	4.60
	13.5	3.90	3.70	3.50	3.10	2.90
050	9.5	1.90	1.80	1.70	1.60	1.50
	7.5	1.40	1.30	1.20	1.10	0.90
	5.0	0.60	0.55	0.50	0.45	0.40

8/21/2019

# **Compressor Section Thermistor Resistance**

for FP1, FP2, HV	stance (10k Ohm) VL, LWT and LLT ormance Option)	for compressor suction line, L	stance (1k Ohm) discharge line, AT, compressor and EWT
Thermistor	Thermistor	Thermistor	Thermistor
Temperature	Resistance	Temperature	Resistance
(°F)	(Ohms)	(°F)	(Ohms)
5	75757-70117	20	974.4-973.4
14	57392-53234	25	985.4-984.4
23	43865-40771	30	996.1-995.1
32	33809-31487	35	1007.0-1006.0
41	26269-24513	40	1017.8-1016.8
50	20570-19230	45	1028.6-1027.6
59	16226-15196	50	1039.5-1038.5
68	12889-12093	55	1050.2-1049.2
77	10310-9688	60	1061.2-1060.2
86	8300-7812	65	1072.9-1071.9
95	6723-6337	70	1082.7-1081.7
104	5480-5172	75	1093.4-1092.4
113	4490-4246	80	1103.0-1102.0
122	3700-3504	85	1115.5-1114.5
131	3067-2907	90	1126.2-1125.2
140	2554-2424	95	1136.6-1135.6
149	2149-2019	100	1147.2-1146.2
	4/24/12	105	1158.1-1157.1
		110	1168.8-1167.8
		115	1179.4-1178.4
		120	1190.1-1189.1
		125	1200.3-1199.3

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### **Antifreeze Corrections**

4/24/12

1212.2-1211.2

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

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

\i\

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

### **Antifreeze Correction Example**

Antifreeze solution is Propylene Glycol 20% by weight. Determine the corrected heating and cooling performance at 30°F and 90°F respectively as well as pressure drop at 30°F for a 033 operating at 100% capacity.

The corrected cooling capacity at 90°F would be: 30,500 Btu/h x 0.969 = 29,554 Btu/h

The corrected heating capacity at  $30^{\circ}F$  would be: 34,100 Btu/h x 0.913 = 31,133 Btu/h

The corrected pressure drop at 30°F and 11.5 gpm would be: 7.9 feet of head x 1.270 = 10.03 feet of head

## **Correction Factor Tables**

### Air Flow Corrections (Compressor Speeds 1-3)

Air	flow		Co	oling		Heating		
Airflow  CFM Per Ton % of Nominal Total 0		Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
240	60	0.940	0.740	0.967	0.951	0.943	1.106	0.902
275	69	0.950	0.783	0.973	0.959	0.953	1.088	0.918
300	75	0.960	0.827	0.978	0.967	0.962	1.070	0.935
325	81	0.970	0.870	0.984	0.975	0.972	1.053	0.951
350	88	0.980 0.913 0.989 0				0.981	1.035	0.967
375	94	0.990	0.957	0.995	0.992	0.991	1.018	0.984
400	100	1.000	1.000	1.000	1.000	1.000	1.000	1.000
425	106	1.030	1.022	1.024	1.026	1.009	0.982	1.016
450	113	1.060	1.045	1.048	1.051	1.019	0.965	1.033
475	119	1.091	1.067	1.071	1.077	1.028	0.947	1.049
500	125	1.121	1.089	1.095	1.103	1.038	0.930	1.065
520	130	1.151	1.111	1.110	1.129	1.047	0.912	1.082

6/29/12

#### Air Flow Corrections (Compressor Speeds 4-12)

Airl	low		Co	oling			Heating	
CFM Per Ton of Clg	% of Nominal	Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
240	60	0.928	0.747	0.936	0.929	0.961	1.097	0.938
275	69	0.940	0.789	0.946	0.941	0.967	1.081	0.948
300	75	0.952	0.831	0.957	0.953	0.974	1.064	0.959
325	81	0.964	0.873	0.968	0.965	0.980	1.048	0.969
350	88	0.976	0.916	0.979	0.976	0.987	1.032	0.979
375	94	0.988	0.958	0.989	0.988	0.993	1.016	0.990
400	100	1.000	1.000	1.000	1.000	1.000	1.000	1.000
425	106	1.020	1.023	1.004	1.018	1.010	0.966	1.018
450	113	1.056	1.042	1.008	1.035	1.020	0.932	1.036
475	119	1.072	1.079	1.011	1.053	1.029	0.898	1.054
500	125	1.087	1.095	1.015	1.070	1.039	0.865	1.071
520	130	1.099	1.113	1.019	1.088	1.049	0.831	1.089

6/14/12

### **Cooling Capacity Corrections**

<b>Entering Air</b>	Total Clg		Sensi	ble Coc	ling Ca	pacity	Multipli	ers - En	tering [	)B ° F		Power	Heat of
WB ° F	Cap	60	65	70	75	80	80.6	85	90	95	100	Input	Rejection
55	0.898	0.723	0.866	1.048	1.185	*	*	*	*	*	*	0.985	0.913
60	0.912		0.632	0.880	1.078	1.244	1.260	*	*	*	*	0.994	0.927
63	0.945			0.768	0.960	1.150	1.175	*	*	*	*	0.996	0.954
65	0.976			0.694	0.881	1.079	1.085	1.270	*	*	*	0.997	0.972
66.2	0.983			0.655	0.842	1.040	1.060	1.232	*	*	*	0.999	0.986
67	1.000			0.616	0.806	1.000	1.023	1.193	1.330	1.480	*	1.000	1.000
70	1.053				0.693	0.879	0.900	1.075	1.205	1.404	*	1.003	1.044
75	1.168					0.687	0.715	0.875	1.040	1.261	1.476	1.007	1.141

NOTE: \*Sensible capacity equals total capacity at conditions shown.

1/5/2017

### **Heating Capacity Corrections**

Ent Air DB °F	He	ating Corre	ctions
EIII AII DB F	Htg Cap	Power	Heat of Ext
45	1.062	0.739	1.158
50	1.050	0.790	1.130
55	1.037	0.842	1.096
60	1.025	0.893	1.064
65	1.012	0.945	1.030
68	1.005	0.976	1.012
70	1.000	1.000	1.000
75	0.987	1.048	0.970
80	0.975	1.099	0.930

1/5/17

# **Performance Data**

NVZ033 - 50% Part Load

		w		% Part			G - EAT	70°F					w	PD			COOL	NG - E	AT 80/6	57 °F		
EWT	Flow			Airflow	нс	Power	HE	LAT		HWC	EWT °F	Flow			Airflow	тс	sc	S/T	Power	HR		HWC
°F	gpm	PSI	FT	cfm	MBtuh	kW	MBtuh	°F	СОР	MBtuh	*F	gpm	PSI	FT	cfm	MBtuh		Ratio	kW	MBtuh	EER	MBtuh
	3.0 4.5	0.5	1.1		Oper	ration no	ot recom	mende	ed			2.5 3.5	0.2	0.5 1.1								
20	6.0	1.2	2.7	550 750	12.4 12.7	1.48	7.2 8.0	90.6 85.7	2.43	2.2	20	4.5	0.7	1.6		(	Operatio	on not r	ecomm	ended		
	7.0	٥٢	11	550	13.1	1.22	8.3	91.0	3.00	2.0		2.5	0.3	٥٢	500	17.8	12.8	0.72	0.54	18.8	31.6	-
	3.0	0.5	1.1	750	13.6	1.25	8.7	86.1	3.04	1.7		2.5	0.2	0.5	650	18.1	14.0	0.77	0.56	19.2	30.9	-
30	4.5	0.7	1.6	550 750	13.4 14.0	1.23	8.6 9.0	91.6 86.5	3.06	2.1 1.8	30	3.5	0.5	1.1	500 650	18.0	12.9 14.1	0.71 0.77	0.51	18.9 19.3	33.7 32.5	-
			0.0	550	14.6	1.39	9.0	93.1	2.89	2.2		4.5	0.7	1.0	500	18.1	12.9	0.71	0.50	19.0	34.9	-
	6.0	1.1	2.6	750	14.9	1.29	9.8	87.5	3.23	1.9		4.5	0.7	1.6	650	18.6	14.1	0.76	0.52	19.5	34.0	-
	3.0	0.4	1.0	550	15.6	1.27	11.0	95.8	3.55	2.0		2.5	0.2	0.5	500	19.3	13.2	0.68	0.59	20.4	31.1	-
				750 550	16.2 16.1	1.29 1.27	11.5 11.5	89.6 96.6	3.60	1.8 2.1					650 500	19.7 19.6	14.5 13.4	0.73 0.68	0.62	20.9	30.5 33.2	-
40	4.5	0.7	1.5	750	16.7	1.27	12.0	90.2	3.71	1.9	40	3.5	0.4	1.0	650	19.9	14.6	0.73	0.59	21.0	32.2	-
	6.0	1.1	2.5	550	17.0	1.30	12.2	98.1	3.76	2.2		4.5	0.7	1.5	500	19.7	13.4	0.68	0.55	20.6	34.5	-
	0.0	1.1	2.5	750	17.6	1.33	12.7	91.3	3.82	2.0		4.5	0.7	1.5	650	20.2	14.6	0.72	0.57	21.1	33.7	-
	3.0	0.4	1.0	550	18.2	1.31	13.7	100.6	4.06	2.5		2.5	0.2	0.5	500	20.6	13.2	0.64	0.63	21.8	31.2	-
				750 550	18.8 18.8	1.33	14.2 14.4	93.2 101.7	4.13	2.2					650 500	21.2	14.7 13.3	0.69 0.64	0.64	22.4	31.4 32.3	-
50	4.5	0.6	1.5	750	19.4	19.4 1.33 14.9 94.0 4.28 2.3				50	3.5	0.4	1.0	650	21.4	14.7	0.69	0.63	22.5	32.6	-	
	6.0	1.1	2.5	550	19.7	1.34	15.1	103.2	4.30	2.6		4.5	0.6	1.5	500	21.1	13.7	0.65	0.61	22.2	33.1	-
	0.0			750	20.3	1.36	15.7	95.1	4.37	2.4			0.0		650	21.7	15.1	0.70	0.62	22.8	33.4	17
	3.0	0.4	1.0	550 750	20.7 21.2	1.33	16.1 16.6	104.8 96.2	4.55	2.7 2.5		2.5	0.2	0.5	500 650	20.0	13.2 14.6	0.66 0.71	0.74	21.6 22.1	25.6 25.9	1.3 1.4
	4.5	0.0	1.4	550	21.5	1.33	17.0	106.2	4.74	2.8		7.		1.0	500	20.2	13.3	0.66	0.72	21.7	26.6	1.2
60	4.5	0.6	1.4	750	22.0	1.34	17.4	97.2	4.83	2.6	60	3.5	0.4	1.0	650	20.7	14.7	0.71	0.74	22.2	26.8	1.3
	6.0	1.0	2.4	550	22.3	1.36	17.6	107.5	4.80	2.9		4.5	0.6	1.4	500	20.5	13.6	0.66	0.72	22.0	27.2	1.1
				750 550	22.8	1.37	18.1 18.5	98.1 108.9	4.88 5.03	2.7 3.1					650 500	21.1 19.3	15.1 13.2	0.72 0.68	0.73	22.5	27.5 21.6	1.2 1.7
	3.0	0.4	0.9	750	23.6	1.32	19.1	99.1	5.24	2.8		2.5	0.2	0.5	650	19.9	14.6	0.08	0.83	21.9	21.7	1.7
70	4.5	0.6	1.4	550	24.1	1.34	19.6	110.6	5.27	3.2	70	3.5	0.4	0.9	500	19.5	13.2	0.68	0.83	21.4	22.3	1.6
/0	4.5	0.6	1.4	750	24.6	1.34	20.0	100.4	5.37	2.9	70	3.5	0.4	0.9	650	20.0	14.6	0.73	0.85	22.0	22.5	1.7
	6.0	1.0	2.3	550	24.8	1.37	20.1	111.7	5.29	3.3		4.5	0.6	1.4	500	19.8	13.6	0.68	0.82	21.7	22.9	1.5 1.7
				750 550	25.2 25.4	1.37	20.5	101.1 112.8	5.39	2.7 3.7					650 500	20.4 18.5	15.0 12.9	0.74	0.84	22.3	23.1 18.8	2.3
	3.0	0.4	0.9	750	25.8	1.33	21.2	101.8	5.68	3.4		2.5	0.2	0.4	650	19.0	14.3	0.75	0.95	21.3	19.0	2.5
80	4.5	0.6	1.3	550	26.6	1.33	22.1	114.9	5.87	3.9	80	3.5	0.4	0.9	500	18.6	13.0	0.69	0.91	20.9	19.5	2.2
				750	27.0 27.0	1.32	22.5	103.3 115.5	5.99	3.5			0		650	19.2	14.3	0.75 0.70	0.93	21.4	19.7 20.0	2.4
	6.0	1.0	2.2	550 750	27.0	1.36	22.4	103.7	5.84	4.0 3.7		4.5	0.6	1.3	500 650	19.0 19.5	13.3 14.7	0.75	0.90	21.7	20.0	2.0
	7.0	0.4	0.0	550	27.7	1.33	23.2	116.7	6.12	4.3		2.5	0.0	<u> </u>	500	17.6	12.6	0.71	1.02	20.3	16.5	3.0
	3.0	0.4	0.9	750	27.9	1.31	23.5	104.5	6.25	4.0		2.5	0.2	0.4	650	18.1	13.9	0.77	1.04	20.8	16.7	3.2
90	4.5	0.6	1.3	550	29.1	1.32	24.7	119.1	6.49	4.5	90	3.5	0.4	0.9	500	17.8	12.7	0.71	0.99	20.3	17.1	2.9
				750 550	29.3 29.3	1.30	24.9 24.7	106.2 119.3	6.63	4.1 4.6					650 500	18.3 17.6	14.0 12.3	0.77 0.70	1.01 1.17	20.9	17.3 14.4	3.1 2.8
	6.0	0.9	2.2	750	29.4	1.32	24.9	106.3	6.53	4.3		4.5	0.6	1.3	650	18.6	14.4	0.77	1.00	21.1	17.7	2.6
	3.0	0.4	0.8									2.5	0.2	0.4	500	16.7	12.4	0.74	1.34	20.5	11.9	3.6
	5.0	O. <del>-</del>	0.0									2.5	0.2	O. <del>-</del>	650	17.2	13.7	0.80	1.36	21.0	12.0	3.8
100	4.5	0.5	1.2								100	3.5	0.4	8.0	500 650	16.9 17.4	12.4 13.8	0.74 0.79	1.30	20.5 21.1	12.4 12.5	3.3 3.6
															500	17.4	12.8	0.74	1.29	20.7	12.7	3.0
	6.0	0.9	2.1				4.5	0.5	1.2	650	17.6	14.1	0.80	1.32	21.3	12.8	3.4					
	3.0	0.3	0.8				2.5	0.2	0.4	500	15.8	12.1	0.77	1.66	20.7	9.1	4.7					
												<u> </u>			650 500	16.3 16.0	13.4 12.2	0.83 0.76	1.69 1.61	21.3	9.2 9.4	5.0 4.4
110	4.5	0.5	1.2		Oper	ration no	ot recom	mende	ed		110	3.5	0.3	8.0	650	16.4	13.5	0.76	1.64	21.3	9.4	4.4
	6.0	0.9	20									1 -	0.5	1 2	500	16.2	12.5	0.77	1.60	20.9	9.7	4.1
	0.0	0.9	2.0									4.5	0.5	1.2	650	16.7	13.9	0.83	1.63	21.5	9.8	4.6
	3.0	0.3	0.8									2.5	0.2	0.4	500	13.2	12.1	0.92	1.95	19.2	6.4	6.2
														650 500	13.5 13.4	13.2 12.2	0.98	2.00 1.84	19.6 19.0	6.4	6.0 5.5	
120	4.5	0.5	1.2	2							120	3.5	0.3	8.0	650	13.6	13.2	0.97	1.89	19.4	6.8	5.9
	6.0	0.8	1.9									4.5	0.5	1.2	500	13.5	12.2	0.90	1.78	18.9	7.2	5.0
	5.0	0.0											0.0		650	13.8	13.2	0.96	1.84	19.4	7.1	5.6

Performance capacities shown in thousands of Btuh.

### **NVZ033 - 100% Full Load**

F)4:-		W	PD			HEATIN	NG - EAT	Г 70°F				F1 -	w	PD		C	OOLING	- EAT	80/67 °	F		
°F	Flow gpm	PSI	FT	Airflow cfm	HC MBtuh	Power kW	HE MBtuh	LAT °F	СОР	HWC MBtuh	°F	Flow gpm	PSI	FT	Airflow cfm	TC MBtuh	SC MBtuh	S/T Ratio	Power kW	HR MBtuh	EER	HWC MBtuh
	6.0	1.5	3.5 5.4		Оре	eration i	not reco	mmeno	ded			4.5 6.5	0.7	1.6 3.5								
20	9.0	2.3 4.1	9.5	1150 1500	27.6	2.94	17.6 19.1	92.2 87.7	2.75	3.0	20	9.0	2.3	5.4			Operati	on not	recomm	nended		
	6.0	1.5	3.4	1150	31.7	2.70	22.5	95.5	3.44	3.1		4.5	0.7	1.6	1000	34.6	22.1	0.64	1.14	38.5	30.4	-
				1500 1150	32.6 32.5	2.79	23.1	90.1 96.2	3.42 3.48	2.8 3.2					1200 1000	35.2 35.1	24.3	0.69	1.18	39.3 38.7	29.8 32.5	-
30	9.0	2.3	5.3	1500	33.4	2.82	23.8	90.6	3.47	2.9	30	6.5	1.5	3.4	1200	35.6	24.4	0.68	1.14	39.5	31.3	-
	12.0	4.0	9.2	1150 1500	32.8 34.1	2.99	22.6 24.4	96.4 91.0	3.22 3.51	3.2 2.9		9.0	2.3	5.3	1000 1200	35.2 36.1	22.3	0.63	1.05	38.8 39.9	33.6 32.8	-
	6.0	1.4	3.3	1150	35.4	2.84	25.7	98.5	3.66	3.3		4.5	0.7	1.5	1000	35.4	23.6	0.67	1.31	39.9	27.1	-
	0.0			1500 1150	36.5 36.5	2.91	26.5 26.7	92.5 99.4	3.67 3.70	3.1			0.,		1200 1000	36.1 35.8	25.9 23.9	0.72	1.36	40.7 40.1	26.5 28.8	-
40	9.0	2.2	5.1	1500	37.7	2.96	27.6	93.2	3.73	3.1	40	6.5	1.4	3.3	1200	36.5	26.1	0.71	1.30	40.1	28.0	-
	12.0	3.9	8.9	1150	500 38.5 2.99 28.3 9			100.0	3.74	3.5		9.0	2.2	5.1	1000	36.1	23.9	0.66	1.20	40.2	30.0	-
		1.4	7.0	1150	39.2	2.99	29.0	93.7	3.78 3.85	3.2					1200 1000	36.9 34.7	26.1 23.1	0.71 0.66	1.26 1.47	41.2 39.7	29.3 23.6	-
	6.0	1.4	3.2	1500	40.3 3.02 30.0 94.9 3.91 3.4				3.4		4.5	0.6	1.5	1200	36.5	25.7	0.70	1.55	41.8	23.6	-	
50	9.0	2.1	4.9	1150 1500	40.6 41.9	3.05	30.2 31.3	102.7 95.9	3.90 3.97	3.8	50	6.5	1.4	3.2	1000 1200	35.5 37.3	23.4 25.9	0.66 0.70	1.39	40.2 42.2	25.6 25.6	-
	12.0	3.7	8.6	1150	41.5	3.08	31.0	103.4	3.95	3.9		9.0	2.1	4.9	1000	35.8	24.9	0.70	1.35	40.4	26.5	-
	12.0	3.7	0.0	1500	42.8	3.12	32.2	96.4	4.02	3.6		9.0	2.1	4.5	1200	37.7	27.7	0.73	1.42	42.5	26.5	-
	6.0	1.3	3.1	1150 1500	43.4 44.8	3.03	33.1 34.4	105.0 97.7	4.20	4.1 3.8		4.5	0.6	1.4	1000 1200	32.9 34.5	23.4	0.71 0.75	1.68 1.75	38.6 40.4	19.6 19.7	1.9 2.1
60	9.0	2.1	4.8	1150	45.4	3.11	34.7	106.5	4.27	4.3	60	6.5	1.3	3.1	1000	33.6	23.7	0.70	1.59	39.1	21.1	1.8
				1500 1150	46.8 46.5	3.13	36.1 35.7	98.9 107.4	4.38	3.9 4.4			-		1200 1000	35.2 34.0	26.2 24.9	0.74	1.66 1.55	40.9 39.3	21.2 21.9	2.0 1.7
	12.0	3.6	8.4	1500	48.0	3.16	37.2	99.6	4.45	4.0		9.0	2.1	4.8	1200	35.7	27.7	0.78	1.63	41.2	21.9	1.9
	6.0	1.3	3.0	1150	47.7	3.07	37.2	108.4	4.55	4.6		4.5	0.6	1.4	1000	31.0	23.7	0.76	1.92	37.6	16.2	2.4
		0.0	4.0	1500 1150	49.1 50.2	3.15	38.4 39.3	100.3	4.57	4.3		6.5	1.7	7.0	1200 1000	32.1 31.8	25.4 24.0	0.79 0.75	1.98	38.9 38.0	16.2 17.7	2.5
70	9.0	2.0	4.6	1500	51.8	3.17	41.0	102.0	4.78	4.4	70	6.5	1.3	3.0	1200	33.2	26.5	0.80	1.87	39.6	17.8	2.4
	12.0	3.5	8.1	1150 1500	51.4 53.2	3.21	40.5	111.4 102.8	4.69 4.87	4.9 4.5		9.0	2.0	4.6	1000 1200	32.2 33.6	24.9 27.6	0.77 0.82	1.76	38.2 39.8	18.3 18.4	2.0
	6.0	1.3	2.9	1150	51.0	3.18	40.1	111.1	4.70	5.2		4.5	0.6	1.3	1000	29.6	23.5	0.79	2.14	36.9	13.8	2.9
	0.0	1.5	2.3	1500	52.8	3.16	42.0 42.7	102.6	4.90 4.78	4.9 5.4		4.5	0.0	1.5	1200 1000	30.8	26.2	0.85 0.78	2.21	38.4	14.0 14.7	3.1 2.7
80	9.0	1.9	4.5	1150 1500	53.9 55.8	3.31	44.6	113.4 104.4	4.78	5.0	80	6.5	1.3	2.9	1200	30.5 31.7	23.8 26.4	0.78	2.07	37.5 38.9	14.7	3.0
	12.0	3.4	7.8	1150	55.5	3.35	44.1	114.7	4.86	5.6		9.0	1.9	4.5	1000	30.8	24.4	0.79	2.02	37.7	15.2	2.5
				1500 1150	57.4 54.3	3.30	46.1 43.1	105.4	5.10 4.84	5.1 5.9					1200 1000	32.1 28.3	27.1	0.84	2.09	39.2 36.4	15.4 11.8	2.8 3.7
	6.0	1.2	2.8	1500	56.2	3.24	45.2	104.7	5.09	5.5		4.5	0.6	1.3	1200	29.3	26.0	0.89	2.46	37.6	11.9	3.9
90	9.0	1.9	4.3	1150 1500	57.7 59.8	3.44	46.0 48.3	116.5 106.9	4.92	6.1 5.7	90	6.5	1.2	2.8	1000 1200	29.1 30.2	23.7	0.82 0.87	2.33	37.0 38.3	12.5 12.6	3.4 3.7
	12.0	77	7.5	1150	59.6	3.49	47.7	117.9	5.19 5.01	6.3		0.0	10	4.7	1000	29.8	24.0	0.81	2.33	37.7	12.8	3.2
	12.0	3.3	7.5	1500	61.6	3.40	50.0	108.0	5.31	5.8		9.0	1.9	4.3	1200	30.5	26.5	0.87	2.34	38.5	13.0	4.1
	6.0	1.2	2.7									4.5	0.5	1.2	1000 1200	26.8 27.6	23.2 25.7	0.87	2.73	36.1 37.1	9.8 9.9	4.4 4.8
100	9.0	1.8	4.2								100	6.5	1.2	2.7	1000	27.7	23.5	0.85	2.68	36.8	10.3	4.1
.00	3.0	1.0	7.2									0.5	1.2	2.7	1200 1000	28.6	26.1 23.4	0.91 0.84	2.72	37.9	10.5	4.5
	12.0	3.1	7.3									9.0	1.8	4.2	1200	28.0 28.9	25.4	0.84	2.63 2.68	37.0 38.0	10.6 10.8	3.8 4.3
	6.0	1.1	2.6				4.5	0.5	1.2	1000	25.3	23.0	0.91	3.06	35.8	8.3	5.6					
				Operation not recommended											1200 1000	26.0 26.3	25.5 23.2	0.98	3.10	36.6 36.7	8.4 8.7	5.9 5.2
110	9.0	1.7	4.0								110	6.5	1.1	2.6	1200	27.0	25.8	0.96	3.05	37.4	8.9	5.6
	12.0	3.0	7.0									9.0	1.7	4.0	1000 1200	26.6 27.3	22.9 25.3	0.86	2.98 3.01	36.7 37.6	8.9 9.1	4.8 5.3
	6.0	1.1	2.5									4.5	0.5	1.2	1000	24.4	22.1	0.90	3.60	36.7	6.8	6.7
	0.0	1.1	∠.5	_								4.5	0.5	1.2	1200	25.0	24.1	0.97	3.69	37.5	6.8	7.1
120	9.0	1.7	3.8								120	6.5	1.1	2.5	1000 1200	24.7 25.2	22.3	0.90	3.41	36.4 37.1	7.3 7.2	6.2 6.7
	12.0	2.9	6.7									9.0	1.7	3.8	1000	25.0	22.3	0.89	3.30	36.2	7.6	6.4
												~	<u></u>		1200	25.5	24.2	0.95	3.40	37.1	7.5	7.1

Performance capacities shown in thousands of Btuh.

NVZ042 - 50% Part Load

		W	PD			HEATII	NG - EA	T 70°F					w	PD			COOL	ING - E	EAT 80/	67 °F		
°F	Flow gpm	PSI	FT	Airflow		Power	1	LAT	СОР	HWC	°F	Flow gpm	PSI	FT	Airflow		sc	S/T	Power		EER	HWC
	3.7	0.4	0.8	cfm	MBtuh	kW	MBtuh	°F		MBtuh		3.0	0.2	0.5	cfm	MBtuh	MBtuh	Ratio	kW	MBtuh		MBtuh
	5.2	0.4	1.6		Ope	eration	not reco	mmen	ded			4.4	0.2	1.4								
20	6.7	1.2	2.7	700	16.6	1.73	10.7	91.9	2.81	2.7	20	5.8	0.9	2.2		(	Operati	on not	recomn	nended		
	0.7	1.2	2.7	900	16.9	1.66	11.2	87.4	2.98	2.3		3.6	0.5	2.2	CEO	07.7	15.7	0.67	0.50		77.0	
	3.7	0.3	0.8	700 900	17.1 17.7	1.56 1.59	11.8 12.2	92.6 88.2	3.20 3.26	2.6		3.0	0.2	0.5	650 750	23.3	15.7 17.2	0.67	0.59	24.2	37.8 36.9	-
30	5.2	0.7	1.6	700	18.5	1.63	12.9	94.4	3.31	2.7	30	4.4	0.6	1.3	650	23.7	15.9	0.67	0.56	24.4	40.3	-
				900 700	19.0 19.2	1.65 1.74	13.4 13.3	89.6 95.4	3.39	2.3		ļ	0.0		750 650	24.0	17.3 15.9	0.72	0.59	24.9 24.5	38.8 41.7	-
	6.7	1.1	2.6	900	19.2	1.67	13.9	90.2	3.44	2.4		5.8	0.9	2.1	750	24.4	17.3	0.67	0.54	25.1	40.7	-
	3.7	0.3	0.8	700	19.9	1.60	14.4	96.3	3.64	2.8		3.0	0.2	0.5	650	24.4	16.1	0.66	0.67	25.5	34.4	-
				900 700	20.5	1.61 1.66	15.0 15.8	91.1 98.4	3.73 3.78	2.4					750 650	24.9	17.6 16.2	0.71	0.70	26.1 25.7	33.7 36.7	-
40	5.2	0.7	1.5	900	22.2	1.66	16.5	92.8	3.91	2.5	40	4.4	0.6	1.3	750	25.1	17.7	0.70	0.67	26.2	35.6	-
	6.7	1.1	2.5	700 22.1 1.67 16.4 99.3 3.88 3.0 900 22.9 1.69 17.2 93.6 3.98 2.6 700 22.7 1.64 17.1 100.0 4.06 3.1								5.8	0.9	2.0	650	24.9	16.2	0.65	0.62	25.8	38.1	-
												3.0			750 650	25.4 25.0	17.7 15.3	0.70	0.65	26.4 26.7	37.2 27.9	-
	3.7	0.3	0.7	900	900 23.4 1.64 17.8 94.1 4.19 2.8								0.2	0.5	750	25.8	18.0	0.70	0.89	27.6	27.6	-
50	5.2	0.6	1.5	700	24.4	1.69	18.7	102.3	4.24	3.3	50	4.4	0.5	1.2	650	25.5	15.3	0.60	0.74	26.8	33.0	-
				900 700	25.4     1.68     19.6     96.1     4.43     2.9       25.4     1.70     19.6     103.6     4.37     3.4							<u> </u>			750 650	26.3 25.7	18.1 15.3	0.69	0.77	27.7 26.8	32.4 35.2	-
	6.7	1.1	2.5	900	26.2	1.70	20.4	97.0	4.52	3.0		5.8	0.9	2.0	750	26.5	18.1	0.68	0.73	27.7	34.5	-
	3.7	0.3	0.7	700 900	25.2 26.1	1.68 1.67	19.4 20.4	103.3 96.8	4.39 4.58	2.9		3.0	0.2	0.5	650 750	23.6	15.0 17.7	0.64	1.03	25.9 26.7	22.8 22.5	1.3
		0.0	1.4	700	27.2	1.72	21.4	106.0	4.64	3.0		<b>-</b>	٥.	10	650	24.4	15.1	0.73	0.88	25.9	26.1	1.2
60	5.2	0.6	1.4	900	28.3	1.70	22.5	99.1	4.88	2.6	60	4.4	0.5	1.2	750	24.8	17.8	0.72	0.92	26.7	25.7	1.4
	6.7	1.0	2.4	700 900	28.4	1.74 1.72	22.5	107.6 100.2	4.79 5.02	3.2 2.7		5.8	0.8	1.9	650 750	24.3	15.2 17.9	0.62	0.83	26.0 26.8	27.8 27.4	1.1
	77	0.7	0.7	700	27.7	1.72	21.8	106.6	4.72	3.4		7.0	00	٥٢	650	22.3	14.8	0.66	1.12	25.1	18.9	2.2
	3.7	0.3	0.7	900	30.5	1.72	24.6	101.4	5.20	3.0		3.0	0.2	0.5	750	22.9	16.5	0.72	1.18	25.8	18.5	2.3
70	5.2	0.6	1.4	700 900	30.0 31.2	1.75 1.72	24.1 25.4	109.7 102.1	5.03	3.6	70	4.4	0.5	1.2	650 750	22.5	14.9 17.6	0.66 0.76	1.02	24.9 25.8	21.1 20.8	2.0
	C 7	10	2.3	700	31.4	1.77	25.4	111.6	5.20	3.8			0.0	1.0	650	22.9	15.0	0.66	0.97	25.1	22.5	1.8
	6.7	1.0	2.5	900	32.6	1.73	26.7	103.5	5.52	3.5		5.8	0.8	1.8	750	23.6	17.6	0.75	1.01	25.9	22.3	2.0
	3.7	0.3	0.7	700 900	29.7 30.8	1.77 1.74	23.6 24.9	109.2 101.7	4.91 5.19	4.2 3.7		3.0	0.2	0.4	650 750	20.8	13.7 16.1	0.66	1.30	24.2 25.1	15.3 15.1	2.3
80	5.2	0.6	1.3	700	32.2	1.79	26.1	112.6	5.27	4.4	80	4.4	0.5	1.1	650	20.9	13.9	0.66	1.20	24.0	16.6	2.0
80	5.2	0.6	1.3	900	33.5	1.74	27.6	104.5	5.63	3.9	80	4.4	0.5	1.1	750	21.5	16.3	0.76	1.25	24.8	16.4	2.4
	6.7	1.0	2.2	700 900	33.8 35.2	1.81 1.76	27.7 29.2	114.8 106.2	5.48 5.86	4.6 4.1		5.8	0.8	1.8	650 750	21.4 22.1	14.0 16.4	0.65	1.15	24.3 25.1	17.7 17.5	1.8 2.2
	3.7	0.3	0.6	700	31.6	1.82	25.4	111.8	5.09	5.1		3.0	0.2	0.4	650	19.3	12.7	0.66	1.47	23.4	12.6	3.7
	5.7	0.5	0.0	900	32.9	1.78	26.8	103.8	5.41	4.6		3.0	0.2	0.4	750	19.9	14.9	0.75	1.52	24.2	12.5	4.0
90	5.2	0.6	1.3	700 900	34.4 35.8	1.83	28.1 29.8	115.5 106.8	5.51 5.93	5.4 4.8	90	4.4	0.5	1.1	650 750	19.3 19.9	12.8 15.1	0.66	1.39	23.1 23.8	13.2 13.1	3.3
	6.7	0.9	2.2	700	36.3	1.85	30.0	118.0	5.75	5.6		5.8	0.7	1.7	650	19.8	14.1	0.71	1.37	23.6	13.8	3.0
				900	37.8	1.79	31.7	108.9	6.19	5.0					750 650	20.5 17.8	15.2 12.0	0.74	1.39 1.68	24.2	14.0 10.1	3.5 5.1
	3.7	0.3	0.6									3.0	0.2	0.4	750	18.4	14.1	0.07	1.75	23.5	10.0	5.7
100	5.2	0.5	1.2								100	4.4	0.4	1.0	650	17.7	12.2	0.69	1.64	22.4	10.3	4.7
															750 650	18.2 18.4	14.3 12.3	0.78	1.70 1.58	23.2	10.2 11.1	5.3
	6.7	0.9	2.1					5.8	0.7	1.7	750	18.9	14.5	0.77	1.65	23.6	10.9	4.9				
	3.7	0.3	0.6				3.0	0.2	0.4	650 750	16.3	11.4 13.3	0.70	1.89 1.97	22.0 22.7	8.2	7.3 7.8					
110		0.5	1 2		0	ratio.	not ::-	m	dod		110		C 4	1.0	650	16.8 16.1	11.5	0.79	1.88	21.7	8.1 8.1	6.8
110	5.2	0.5	1.2		Ope	eration	not reco	inmen	uea		110	4.4	0.4	1.0	750	16.6	13.5	0.81	1.96	22.5	8.1	7.5
	6.7	0.9	2.0									5.8	0.7	1.6	650 750	16.9 17.3	11.7 13.8	0.70	1.82	22.3	8.8 8.7	6.2 7.0
	77	0.2	0.0	5								7.0	0.2	0.4	650	14.2	12.3	0.79	2.32	21.4	5.8	10.4
	3.7	0.2	0.6	_								3.0	0.2	0.4	750	14.5	13.4	0.92	2.38	21.9	5.8	10.9
120	5.2	0.5	1.2	2						120	4.4	0.4	1.0	650 750	14.4 14.6	12.4 13.4	0.86	2.19	21.2 21.6	6.2 6.2	9.3	
	6.7	0.8	1.9	,								5.8	0.7	15	650	14.5	12.4	0.85	2.12	21.1	6.5	8.0
	0.7	0.0	1.5									J.0	Ü.,	.7 1.5 750 14.8 13.4 0.91 2.19 21.6 6.4				9.1				

Performance capacities shown in thousands of Btuh.

### **NVZ042 - 100% Full Load**

NVZ		_	PD	% Fui				L	WI	PD	<u> </u>		COOL	ING - E	AT 80/	67 °F						
EWT	Flow			Airflow	нс	Power	HE	LAT		HWC	EWT	Flow			Airflow	тс	sc	S/T	Power	HR		нwс
°F		PSI		cfm	MBtuh		MBtuh	°F	СОР	MBtuh	°F	gpm	PSI	FT	cfm		MBtuh		kW	MBtuh	EER	MBtuh
	9.0 12.0	1.9 3.5	4.3 8.1		Ope	ration	not reco	mmen	ded			6.0 8.5	0.9 1.6	3.8								
20	15.0		11.6	1600 1800	36.8 37.4	3.84 3.84	23.7	91.3 89.2	2.81 2.85	3.5 3.1	20	11.0	2.5	5.7		C	Operatio	on not i	recomn	nended		
	9.0	1.8	12	1600	37.8	3.68	25.3	91.9	3.01	3.5		6.0	0.9	2.1	1200	38.7	24.1	0.62	1.40	43.5	27.6	-
	9.0	1.0	4.2	1800	39.1	3.74	26.4	90.1	3.07	3.2		0.0	0.9	2.1	1400	39.4	26.5	0.67	1.46	44.4	27.0	-
30	12.0	3.4	7.9	1600 1800	40.9	3.85 3.88	27.7 28.9	93.7 91.7	3.11 3.19	3.7	30	8.5	1.6	3.7	1200 1400	39.2 39.9	24.3	0.62	1.34	43.8 44.7	29.4 28.3	-
	15.0	4.0	11 7	1600	42.7	3.93	29.3	94.7	3.18	3.9	İ	11.0	2.4		1200	39.4	24.3	0.62	1.30	43.9	30.4	-
	15.0	4.9	11.3	1800	43.4	3.93	30.0	92.3	3.24	3.4		11.0	2.4	5.5	1400	40.4	26.6	0.66	1.36	45.0	29.7	-
	9.0	1.8	4.1	1600 1800	43.0	3.81 3.84	30.0 31.3	94.9 92.8	3.31 3.39	3.8		6.0	0.9	2.0	1200 1400	42.3 43.1	28.0 30.6	0.66	1.61 1.68	47.8 48.9	26.2 25.7	-
				1600	46.4	3.96	32.9	96.8	3.44	4.2	١				1200	42.8	28.3	0.71	1.53	48.0	27.9	-
40	12.0	3.3	7.6	1800	48.0	3.96	34.5	94.7	3.56	3.7	40	8.5	1.5	3.6	1400	43.6	30.9	0.71	1.61	49.1	27.1	-
	15.0	4.7	11.0	1600	47.9	3.98	34.3	97.7	3.53	4.4	ļ	11.0	2.3	5.3	1200	43.1	28.3	0.66	1.49	48.2	29.0	-
				1800 1600	49.6 48.2	4.01 3.94	35.9 34.8	95.5 97.9	3.62 3.59	3.9 4.4	_				1400 1200	44.1 45.1	30.9 29.6	0.70	1.56 2.04	49.4 52.1	28.4 22.1	-
	9.0	1.7	3.9	1800	49.7	3.94	36.3	95.6	3.70	4.0	ĺ	6.0	0.9	2.0	1400	46.5	35.0	0.75	2.13	53.8	21.9	-
50	12.0	3.2	7.4	1600	51.9	4.06	38.1	100.1	3.75	4.8	50	8.5	1.5	3.5	1200	46.1	29.8	0.65	1.77	52.1	26.1	-
30	12.0	5.2	7.4	1800	53.9	4.04	40.2	97.7	3.91	4.4	٦٠	0.5	1.5	5.5	1400	47.5	35.1	0.74	1.85	53.8	25.6	-
	15.0	4.6	10.6	1600 1800	53.9 55.7	4.09	40.0	101.2 98.7	3.86 3.99	5.1 4.6	1	11.0	2.2	5.2	1200 1400	46.4 47.8	29.8 35.1	0.64	1.66 1.75	52.1 53.8	27.9 27.3	-
	00	17	7.0	1600	53.3	4.09	39.4	100.8	3.82	5.2		60	0.0	1.0	1200	43.4	28.8	0.66	2.25	51.1	19.3	2.6
	9.0	1.7	3.8	1800	55.2	4.06	41.4	98.4	3.98	4.7		6.0	0.8	1.9	1400	44.7	34.0	0.76	2.35	52.8	19.0	2.7
60	12.0	3.1	7.2	1600	57.7 59.9	4.19 4.14	43.4 45.8	103.4	4.04	5.6 5.1	60	8.5	1.4	3.3	1200	44.1 45.5	29.0 34.2	0.66	2.00	50.9 52.6	22.1 21.8	2.4
				1800 1600	60.1	4.14	45.8	100.8 104.8	4.24 4.17	6.0	l				1400 1200	44.6	29.1	0.75	1.90	51.1	23.5	2.0
	15.0	4.4	10.3	1800	62.3	4.18	48.0	102.0	4.37	5.4		11.0	2.2	5.0	1400	46.0	34.3	0.75	1.98	52.7	23.2	2.4
	9.0	1.6	3.7	1600	58.4	4.24	44.0	103.8	4.04	6.0		6.0	0.8	1.8	1200	41.6	28.0	0.67	2.46	50.0	16.9	3.4
				1800 1600	65.4 63.4	4.20	51.1 48.7	103.6 106.7	4.56 4.31	5.5 6.5	l				1400 1200	44.0	33.1 28.3	0.75 0.67	2.42	52.3 49.7	18.2 18.9	3.6 3.1
70	12.0	3.0	6.9	1800	65.9	4.24	51.4	103.9	4.56	6.0	70	8.5	1.4	3.2	1400	43.4	33.3	0.07	2.33	51.3	18.7	3.4
	15.0	4.3	9.9	1600	63.7	4.28	49.1	106.9	4.36	6.9	1	11.0	2.5	4.9	1200	42.8	28.4	0.66	2.13	50.0	20.1	2.8
	15.0	4.5	3.3	1800	68.8	4.26	54.3	105.4	4.73	7.2		11.0	2.5	4.5	1400	44.1	33.4	0.76	2.21	51.6	20.0	3.2
	9.0	1.5	3.6	1600 1800	61.8	4.38 4.31	46.8 49.5	105.8	4.13 4.37	7.1 6.5		6.0	0.8	1.8	1200 1400	38.4 39.6	27.1 31.8	0.70	2.73	47.7 49.3	14.1 13.9	4.5 4.8
	10.0	0.0	67	1600	67.1	4.43	52.0	108.8	4.44	7.6		0.5	1.4	7.1	1200	38.6	27.4	0.71	2.53	47.3	15.2	4.1
80	12.0	2.9	6.7	1800	69.8	4.32	55.1	105.9	4.73	7.0	80	8.5	1.4	3.1	1400	39.8	32.2	0.81	2.63	48.8	15.1	4.4
	15.0	4.2	9.6	1600	70.5	4.48	55.2	110.8	4.61	8.1 7.5	ļ	11.0	2.0	4.7	1200	39.5	27.6	0.70	2.42	47.8	16.3	3.8
				1800 1600	73.4 65.2	4.36 4.53	58.5 49.7	107.7 107.7	4.93 4.21	8.4	$\vdash$				1400 1200	40.7 35.2	32.4 26.1	0.80	2.53	49.3 45.4	16.1 11.8	4.2 6.0
	9.0	1.5	3.4	1800	67.7	4.44	52.6	104.8	4.48	7.7	İ	6.0	0.7	1.7	1400	36.3	30.7	0.84	3.12	46.9	11.7	6.3
90	12.0	2.8	6.5	1600	70.9	4.56	55.3	111.0	4.55	8.9	90	8.5	1.3	3.0	1200	35.2	26.4	0.75	2.84	44.9	12.4	5.3
	.2.0		0.0	1800 1600	73.8	4.41 4.61	58.7 59.0	108.0 113.3	4.90 4.75	8.2 9.5	"				1400 1200	36.2 36.1	31.1 29.2	0.86	2.94	46.2 45.6	12.3 12.9	5.8 5.0
	15.0	4.0	9.3	1800	77.9	4.46	62.7	110.1	5.12	8.7	ĺ	11.0	2.0	4.5	1400	37.3	31.4	0.84	2.79	47.0	13.1	6.3
	9.0	1.4	3.3									6.0	0.7	1.7	1200	32.6	24.4	0.75	3.32	43.9	9.8	7.0
	3.0	1.4	3.3	ļ								0.0	0.7	1.7	1400	33.6	28.7	0.85	3.46	45.4	9.7	7.5
100	12.0	2.7	6.2								100	8.5	1.3	2.9	1200 1400	32.4 33.4	24.7 29.1	0.76	3.23	43.4 44.8	10.0 9.9	6.7 7.3
	15.0	7.0		1							İ	11.0	1.0		1200	33.6	25.1	0.75	3.11	44.2	10.8	6.3
	15.0	3.9	8.9									11.0	1.9	4.4	1400	34.6	29.5	0.85	3.25	45.6	10.6	7.1
	9.0	1.4	3.2									6.0	0.7	1.6	1200	30.0	22.7	0.76		42.4	8.2	9.0
															1400 1200	30.8 29.5	26.7 23.0	0.87	3.79 3.62	43.7 41.9	8.1 8.2	9.8 8.6
110	12.0	2.6	6.0		Ope	ration	not reco	mmen	ded		110	8.5	1.2	2.8	1400	30.5	27.1	0.78	3.77	43.4	8.1	9.4
	15.0	3.7	8.6									11.0	1.8	4.2	1200	30.9	23.4	0.76	3.51	42.9	8.8	8.2
															1400 1200	31.8 26.7	27.5 23.9	0.86	3.66 4.35	44.3	8.7	9.2 11.9
	9.0	1.3	3.1									6.0	0.7	1.5	1400	27.2	26.1	0.90	4.45	42.4	6.1 6.1	12.4
120	12.0	2.5	5 Ω								120	8.5	1.2	2.7	1200	27.0	24.1	0.89	4.11	41.0	6.6	11.1
120	12.0	2.5	5.0								'2'	0.5	1.2	۷.٠/	1400	27.5	26.2	0.95	4.21	41.9	6.5	12.0
	15.0	3.6	8.2									11.0	1.7	4.0	1200 1400	27.2 27.8	24.1	0.89	3.97 4.10	40.8 41.8	6.8	10.2 11.4
	-	5.0 3.6 8.2									$\Box$		1400	27.0		0.54	<del></del> .10	1 41.0	0.0	1 11.4		

Performance capacities shown in thousands of Btuh.

NVZ050 - 50% Part Load

F\4.*		w	PD		LOad		3 - EAT	70°F			<b>-</b> >		WI	PD			COOLI	NG - E	AT 80/6	7 °F		
°F	Flow gpm	PSI	FT	Airflow cfm	HC MBtuh	Power kW	HE MBtuh	LAT °F	СОР	HWC MBtuh	°F	Flow gpm	PSI	FT	Airflow cfm	TC MBtuh	SC MBtuh	S/T Ratio	Power kW	HR MBtuh	EER	HWC MBtuh
	3.7		0.3	Cim			ot recom		led	мьши		3.2	0.1	0.3	Cilii	MBtull	MBtull	Ratio	KVV	MBtull		MBtull
20	5.1		1.4	850	21.5	2.29	14.0	93.7	2.78	3.9	20	4.6	0.5			C	Operatio	n not r	ecomme	ended		
	7.5	1.2	2.7	980	21.6	2.20	14.1	90.4	2.88	3.7		6.0	0.8	1.9		1	1				1	
	3.7	0.1	0.3	850 980	23.8 24.7	2.32	15.0 15.7	95.0 92.4	2.90	4.0 3.6		3.2	0.1	0.3	750 850	23.2	15.5 17.0	0.67	0.64 0.67	24.3	34.6 33.8	-
30	5.1	0.6	1.3	850	23.7	2.35	14.8	94.8	2.84	4.1	30	4.6	0.5	1.1	750	23.6	15.7	0.66	0.61	24.5	36.8	-
30	J.1	0.0	1.5	980 850	24.6 25.3	2.38	15.5 16.1	92.3 96.8	2.90	3.7 4.1	30	4.0	0.5	1.1	850 750	23.9	17.1 15.7	0.72	0.64 0.59	25.0 24.6	35.5 38.2	-
	7.5	1.1	2.6	980	25.4	2.38	16.3	93.1	3.00	3.5		6.0	0.8	1.8	850	24.3	17.1	0.71	0.62	25.2	37.3	-
	3.7	0.1	0.3	850	28.2	2.39	19.1	99.7	3.35	4.2		3.2	0.1	0.3	750	27.0	18.4	0.68	0.86	28.6	30.0	-
			4 -	980 850	29.1 28.4	2.40	19.9 19.2	96.5 99.9	3.43	3.8 4.3	40				850 750	27.5 27.3	20.1 18.6	0.73	0.89 0.81	29.3 28.8	29.4 32.0	-
40	5.1	0.6	1.3	980	29.2	2.43	19.9	96.7	3.40	3.9	40	4.6	0.4	1.0	850	27.8	20.3	0.73	0.85	29.4	31.1	-
	7.5	1.1	2.5	850 980	29.4 30.2	2.43	20.0	100.9 97.5	3.41	4.4 4.0		6.0	0.8	1.8	750 850	27.5 28.1	18.6 20.3	0.67	0.79 0.83	28.9 29.6	33.2 32.5	-
	77	01	0.2	850	32.6	2.45	23.2	104.4	_	4.5		7.2	0.1	0.2	750	31.0	20.5	0.66	1.04	33.0	28.4	-
	3.7	0.1	0.2	980	33.5	2.45	24.1	100.7		4.2		3.2	0.1	0.2	850	31.9	23.2	0.73	1.10	34.1	27.7	-
50	5.1	0.5	1.2	850 980	33.1 33.9	2.50 2.48	23.6 24.3	105.0 101.0	_	4.7 4.3	50	4.6	0.4	1.0	750 850	31.0 31.9	20.6 23.4	0.67	1.00 1.05	33.0 34.0	29.5 29.0	-
	7.5	1.1	2.5	850	34.1	2.52	24.5	106.0	3.85	4.8		6.0	0.7	1.7	750	31.1	20.6	0.66	0.98	33.0	30.2	-
	7.5	1	2.5	980	34.9	2.50	25.3		3.96	4.4		0.0	0.7	1.7	850	32.0	23.4	0.73	1.03	34.0	29.6	-
	3.7	0.1	0.2	850 980	36.4 37.2	2.53 2.51	26.6 27.5	104.0	4.08	4.3 3.9		3.2	0.1	0.2	750 850	30.0 30.9	20.0 22.6	0.67	1.26 1.32	32.9 34.0	22.7	2.4
60	5.1	0.5	1.2	850	37.5	2.57	27.6	109.6	_	4.4	60	4.6	0.4	1.0	750	30.2	20.2	0.67	1.22	32.9	23.5	2.3
				980 850	38.1 38.4	2.54	28.3 28.4	104.9 110.5	4.27	4.0 4.6					850 750	31.1 30.3	22.8 20.2	0.73	1.27 1.20	33.9 32.9	23.2	2.5 2.2
	7.5	1.0	2.4	980	39.0	2.56	29.1	105.7	_	4.1		6.0	0.7	1.7	850	31.2	22.8	0.73	1.25	34.0	23.8	2.4
	3.7	0.1	0.2	850	40.1	2.61	30.0	112.4	_	4.8		3.2	0.1	0.2	750	29.1	19.5	0.67	1.48	32.8	18.7	3.3
	<b>-</b>			980 850	39.4 41.8	2.57 2.65	29.3 31.5	114.2	4.34	4.4 5.0				_	850 750	29.6 29.3	22.1 19.7	0.74	1.66 1.44	33.9 32.8	17.0 19.4	3.4 3.1
70	5.1	0.5	1.2	980	42.3	2.59	32.2	108.8	4.64	4.6	70	4.6	0.4	0.9	850	30.2	22.2	0.74	1.50	33.9	19.1	3.3
	7.5	1.0	2.3	850 980	42.6 43.1	2.68	32.2 32.9	115.1 109.5	4.53	5.2 4.8		6.0	0.7	1.6	750 850	29.4 30.3	19.8 22.3	0.67	1.41 1.47	32.8 33.9	19.9 19.7	2.9 3.1
	77	0.1	0.2	850	43.5	2.68	30.1	112.7	4.29	5.7		7.0	0.1	0.2	750	27.2	19.5	0.73	1.75	31.9	14.8	3.4
	3.7	0.1	0.2	980	43.9	2.62	30.6	107.4	_	5.2		3.2	0.1	0.2	850	28.0	21.7	0.74	1.81	32.9	14.7	3.7
80	5.1	0.5	1.1	850 980	46.0 46.2	2.72 2.64	32.2 32.6	115.2 109.4	4.46	5.9 5.4	80	4.6	0.4	0.9	750 850	27.5 28.3	19.7 22.0	0.68	1.71 1.77	32.0 33.0	15.3 15.2	3.1 3.5
	7.5	1.0	2.2	850	46.5	2.76	32.5	115.7	4.45	6.1		6.0	0.7	1.6	750	27.6	19.8	0.68	1.68	32.1	15.7	2.9
	7.5	1.0	2.2	980	46.7	2.68	33.0		4.60	5.6		0.0	0.7	1.0	850	28.5	22.2	0.74	1.74	33.1	15.6	3.3
	3.7	0.1	0.2	850 980	46.9 47.0	2.75 2.68	30.2 30.5	113.1 107.5	4.21	6.6 6.1		3.2	0.1	0.2	750 850	25.4 26.1	19.4 21.6	0.69	2.02	31.0 32.0	11.9	4.8 5.1
90	5.1	0.5	1.1	850	50.1	2.80	32.7	116.0		6.9	90	4.6	0.4	0.9	750	25.6	19.6	0.69	1.98	31.2	12.4	4.4
				980 850	50.1 50.4	2.70 2.84	33.0 32.8	109.9 116.3	4.59 4.38	6.3 7.1					850 750	26.4 25.9	21.9 19.7	0.75	2.04 1.97	32.1 31.4	12.3 12.5	4.9 4.1
	7.5	0.9	2.2	980	50.3	2.74	33.1	110.1	4.54	6.5		6.0	0.7	1.5	850	26.7	22.1	0.74	2.01	32.3	12.6	4.6
	3.7	0.1	0.2									3.2	0.1	0.2	750	24.1	18.5	0.73	2.32	30.9	9.9	6.2
				1										_	850 750	24.8	20.4 18.7	0.78	2.38	31.7 31.0	9.9	6.8 5.8
100	5.1	0.4	1.0								100	4.6	0.4	0.8	850	25.1	20.7	0.78	2.35	31.9	10.2	6.4
	7.5	0.9	2.1									6.0	0.6	1.5	750 850	24.6 25.4	18.9 20.9	0.73 0.78	2.26 2.31	31.1 32.1	10.4	5.4 6.0
	77	0.1	0.2	1								7.0	0.1	0.2	750	22.8	17.5	0.77	2.62	30.7	8.3	8.4
	3.7	0.1	0.2									3.2	0.1	0.2	850	23.5	19.3	0.82	2.67	31.5	8.4	8.9
110	5.1	0.4	1.0		Oper	ation no	ot recom	nmend	led		110	4.6	0.3	0.8	750 850	23.1 23.8	17.7 19.5	0.77	2.60 2.65	30.9 31.7	8.5	7.9 8.6
	7.5	0 a	2.0									6.0	0.6	14	750	23.4	18.0	0.77	2.56	31.0	8.7	7.3
	۲.۰	0.3	2.0									5.0	0.0		850 750	24.2	19.7	0.82	2.61	31.9	8.8	8.1
	3.7	0.1	0.2									3.2	0.1	0.2	750 850	21.4 21.9	17.4 18.9	0.81	3.18 3.25	31.3 32.0	6.4	11.5 12.0
120	5.1	0.4	1.0								120	4.6	0.3	0.8	750	21.7	17.5	0.81	3.01	30.9	6.9	10.4
· <del>-</del>	-														850 750	22.1 21.9	19.0 17.5	0.86	3.08 2.91	31.6 30.8	6.8 7.2	11.1 9.1
	7.5	0.8	1.9									6.0	0.6	1.3	850	22.4	19.0	0.85	3.00	31.5	7.1	10.2

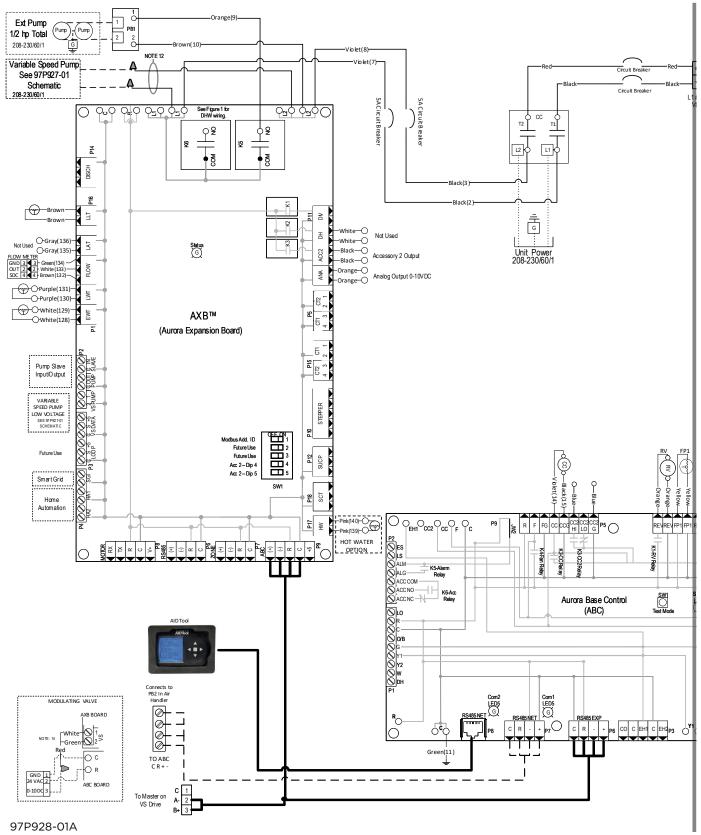
Performance capacities shown in thousands of Btuh.

### **NVZ050 - 100% Full Load**

NVZ		$\overline{}$		⁄о Full						l	I	WPD COOLING - EAT 80/67 °F										
EWT	Flow	WI	PD			IEATIN	G - EAT	70°F			EWT	Flow	W	PD			COOL	ING - E	AT 80/	67 °F		
°F	gpm	PSI	FT	Airflow	нс	Power	HE	LAT	СОР	HWC	۰F	gpm	PSI	FT	Airflow	TC	sc	S/T	Power	HR	EER	HWC
	J	F 31	' '	cfm	MBtuh	kW	MBtuh	°F	СОГ	MBtuh		J	F 31		cfm	MBtuh	MBtuh	Ratio	kW	MBtuh	LLK	MBtuh
	9.0	-	4.6	ļ	Oper	ation n	ot reco	mmeno	ded			9.0	0.8	1.9								
20	13.5		10.5	1800	47.3	5.16	29.6	94.3	2.68	5.5	20	11.5	2.0	4.6		C	peratio	on not	recomn	nended		
	18.0	7.2	16.7	2200	49.6	5.21	31.8	90.9	2.79	5.0		14.0	3.2	7.3								
	9.0	1.9	4.5	1800	51.5	4.97	34.5	96.5	3.03	5.6		9.0	0.8	1.8	1400	46.9	29.7	0.63	1.88	53.4	25.0	-
	3.0	1.5	4.5	2200	52.7	5.23	34.8	92.2	2.95	5.0		3.0	0.0	1.0	1600	47.8	32.5	0.68	1.96	54.5	24.4	-
30	13.5	4.4	10.2	1800 2200	55.1 56.6	5.02	38.0 38.4	98.3 93.8	3.22 3.11	5.7 5.2	30	11.5	1.9	4.5	1400 1600	47.6 48.4	29.9 32.7	0.63	1.79 1.88	53.7 54.8	26.6 25.7	-
	10.0			1800	54.5	5.34	36.3	98.0	2.99	5.9		440			1400	47.8	29.9	0.63	1.73	53.7	27.6	-
	18.0	7.0	16.2	2200	57.2	5.39	38.8	94.1	3.11	5.3		14.0	3.1	7.1	1600	49.0	32.7	0.67	1.82	55.2	26.9	-
	9.0	1.9	4.3	1800	58.7	5.23	40.8	100.2	3.29	6.0		9.0	0.8	1.8	1400	51.0	33.0	0.65	2.15	58.4	23.8	-
	-			2200 1800	60.0 62.4	5.44 5.31	41.4 44.2	95.2 102.1	3.23	5.6 6.3					1600 1400	52.0 51.6	36.1 33.3	0.69	2.24	59.7 58.6	23.3 25.3	-
40	13.5	4.3	9.9	2200	63.8	5.54	44.9	96.8	3.38	5.8	40	11.5	1.9	4.3	1600	52.6	36.4	0.69	2.04	59.9	24.6	-
	18.0	6.8	15 7	1800	63.3	5.40	44.9	102.6	3.44	6.5		14.0	3.0	6.9	1400	52.0	33.3	0.64	1.98	58.8	26.3	-
	10.0	0.0	15.7	2200	64.8	5.59	45.7	97.3	3.39	5.9		14.0	3.0	0.9	1600	53.2	36.4	0.68	2.07	60.3	25.7	-
	9.0	1.8	4.2	1800	65.8 67.2	5.48 5.65	47.1 47.9	103.9 98.3	3.52	6.8		9.0	0.7	1.7	1400 1600	55.2	36.2	0.66	2.27	62.9 64.5	24.3	-
				2200 1800	69.6	5.59	50.6	105.8	3.48 3.65	6.3 7.0			<b>.</b>		1400	56.3 55.7	39.4 36.5	0.70	2.41	63.3	23.3 25.1	-
50	13.5	4.2	9.6	2200	71.0	5.73	51.5	99.9	3.63	6.4	50	11.5	1.8	4.2	1600	56.8	39.8	0.70	2.36	64.9	24.1	-
	18.0	6.6	15.2	1800	70.8	5.65	51.5	106.4	3.67	7.2		14.0	2.9	6.7	1400	56.3	36.9	0.66	2.18	63.7	25.8	1.7
	10.0	0.0		2200	72.3	5.79	52.5	100.4		6.6				0.,	1600	57.4	40.1	0.70	2.32	65.3	24.7	1.9
	9.0	1.8	4.1	1800 2200	74.2 75.8	5.77 5.87	54.5 55.8	108.2 101.9	3.76 3.78	7.6 7.0		9.0	0.7	1.7	1400 1600	52.7 54.0	35.4 38.5	0.67	2.54 2.70	61.3 63.2	20.8	3.0
60	17.5	4.0	0.7	1800	77.6	5.87	57.6	109.9	3.87	7.8		11 5	10	4.1	1400	53.2	35.7	0.67	2.49	61.7	21.4	2.8
60	13.5	4.0	9.3	2200	79.3	5.95	59.0	103.4	3.91	7.2	60	11.5	1.8	4.1	1600	54.6	38.8	0.71	2.64	63.6	20.7	3.0
	18.0	6.4	14.7	1800	79.3	5.94	59.0	110.8	3.91	8.1		14.0	2.8	6.5	1400	53.7	36.1	0.67	2.44	62.1	22.0	2.6
-				2200 1800	81.1 82.5	6.01	60.6 61.9	104.1 112.5	3.96 3.99	7.4 8.5					1600 1400	55.1 50.2	39.2 34.6	0.71	2.60	64.0 59.8	21.2 17.9	2.8 3.8
	9.0	1.7	3.9	2200	83.4	6.10	62.6	105.1	4.01	7.9		9.0	1.6	1.6	1600	52.3	38.2	0.73	3.08	62.8	17.0	4.0
70	13.5	3.9	٩n	1800	85.6	6.15	64.6	114.0	4.08	8.8	70	11.5	2.6	3.9	1400	50.7	34.9	0.69	2.75	60.1	18.4	3.5
/ •	10.0	0.5	5.0	2200	87.5	6.16	66.5	106.8	4.16	8.1	'	11.0	2.0	0.5	1600	52.3	37.9	0.72	2.93	62.3	17.9	3.8
	18.0	6.2	14.3	1800 2200	87.7 89.8	6.22	66.5 68.6	115.1 107.8	4.13 4.23	9.1 8.3		14.0	3.6	6.2	1400 1600	51.2 52.8	35.2 38.3	0.69	2.71 2.88	60.4 62.6	18.9 18.3	3.2
	00	1.0	7.0	1800	88.0	6.19	66.9	115.3	4.17	9.6		0.0	0.7	1.0	1400	47.2	33.7	0.71	3.22	58.2	14.7	4.9
	9.0	1.6	3.8	2200	90.0	6.15	69.0	107.9	4.29	8.9		9.0	0.7	1.6	1600	48.9	36.6	0.75	3.43	60.7	14.3	5.2
80	13.5	3.8	8.7	1800	90.1	6.27	68.7	116.3	4.21	9.9	80	11.5	1.6	3.8	1400	47.7	34.0	0.71	3.16	58.5	15.1	4.5
				2200 1800	92.2 92.8	6.20	71.1 71.2	108.8 117.8	4.36 4.29	9.1			$\vdash$		1600 1400	49.4 48.2	37.0 34.4	0.75	3.36 3.10	60.9 58.7	14.7 15.5	4.8
	18.0	6.0	13.8	2200	95.2	6.27	73.8	110.0	4.45	9.4		14.0	2.6	6.0	1600	50.0	37.4	0.75	3.31	61.2	15.1	4.6
	9.0	1.6	3.7	1800	93.4	6.31	71.9	118.1	4.34	10.7		9.0	0.7	1.5	1400	44.2	32.9	0.74	3.63	56.6	12.2	6.4
	9.0	1.0	3.7	2200	95.7	6.22	74.5	110.3	4.51	9.9		9.0	0.7	1.5	1600	46.2	35.7	0.77	3.87	59.4	11.9	6.7
90	13.5	3.6	8.4	1800 2200	94.7 97.0	6.38	72.9 75.7	118.7 110.8	4.35 4.55	11.1	90	11.5	1.6	3.7	1400 1600	44.7 46.6	33.1 36.1	0.74	3.56 3.79	56.9 59.5	12.6 12.3	5.7 6.2
	40.0			1800	97.9	6.46	75.9	120.4	4.44	11.4		440			1400	45.7	34.1	0.75	3.65	58.2	12.5	5.4
	18.0	5.7	13.3	2200	100.5	6.31	79.0	112.3	4.67	10.6		14.0	2.5	5.8	1600	47.1	36.4	0.77	3.73	59.8	12.6	6.5
	9.0	1.5	3.5									9.0	0.6	1.5	1400	41.3	31.9	0.77	4.13	55.4	10.0	8.1
															1600 1400	43.3 41.7	34.7 32.2	0.80	4.40 4.05	58.3 55.5	9.8	8.6 7.8
100	13.5	3.5	8.1								100	11.5	1.5	3.5	1600	43.7	35.0	0.80	4.31	58.4	10.3	8.4
	18.0	5.5	12 0	]								14.0	2.4	5.6	1400	42.1	32.6	0.77	3.97	55.7	10.6	7.4
	10.0	5.5	12.0									14.0	2.4	5.6	1600	44.2	35.4	0.80	4.24	58.6	10.4	8.2
	9.0	1.5	3.4									9.0	0.6	1.4	1400	38.3	30.9	0.81	4.63	54.1	8.3	10.1
		<b>-</b>													1600 1400	40.4 38.8	33.6 31.2	0.83	4.93 4.53	57.2 54.2	8.2 8.6	10.9 9.7
110	13.5	3.4	7.8		Oper	ation n	ot reco	mmend	ded		110	11.5	1.5	3.4	1600	40.8	33.9	0.83	4.83	57.3	8.5	10.5
	18.0	5.3	12.3									14.0	2.3	5.4	1400	39.1	31.6	0.81	4.45	54.3	8.8	9.3
															1600	41.2	34.3	0.83	4.75	57.4 52.8	8.7	10.3
	9.0	1.4	3.3									9.0	0.6	1.3	1400 1600	33.6 34.3	32.8		5.65 5.78	54.0	5.9 5.9	13.0 13.5
120	17 5	7 2	75								120	11 =	1 4	77	1400	34.0	30.3	0.89	5.34	52.2	6.4	12.2
120	13.5	3.2	7.5								120	11.5	1.4	3.5	1600	34.6	32.9	0.95	5.48	53.3	6.3	13.1
	18.0	5.1	11.8									14.0	2.2	5.2	1400	34.3	30.3	0.88	5.17	51.9	6.6	11.3
	l	L											I		1600	35.0	32.9	0.94	5.33	53.2	6.6	12.5

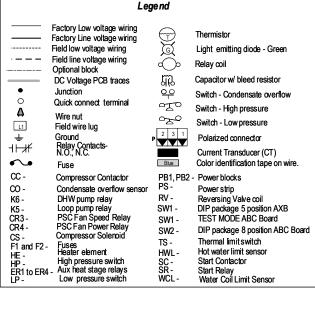
Performance capacities shown in thousands of Btuh.

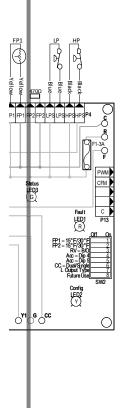
### **Aurora Variable Speed Indoor Split**

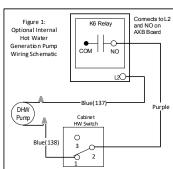


### **Aurora Variable Speed Indoor Split**





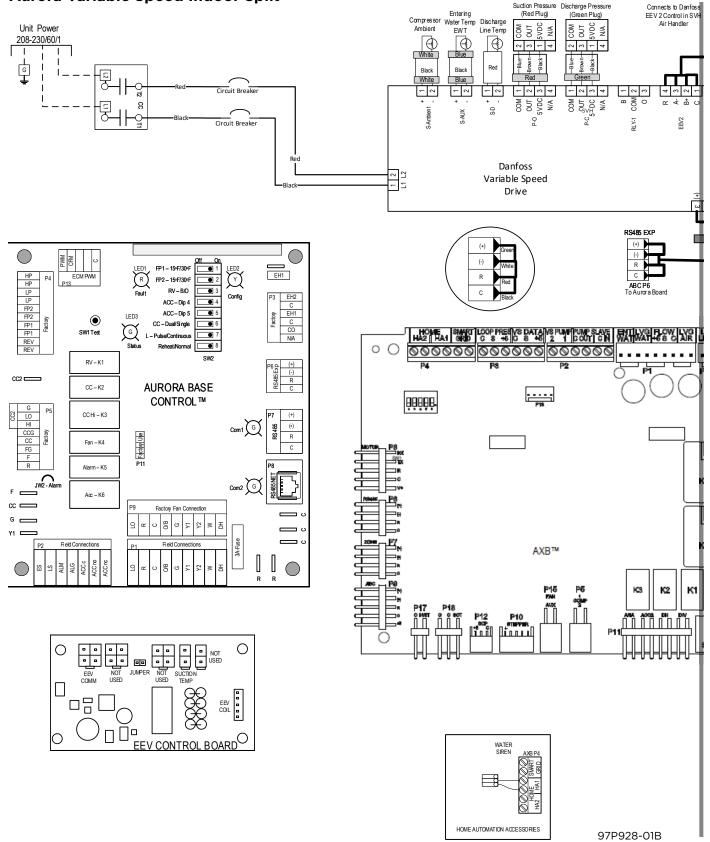




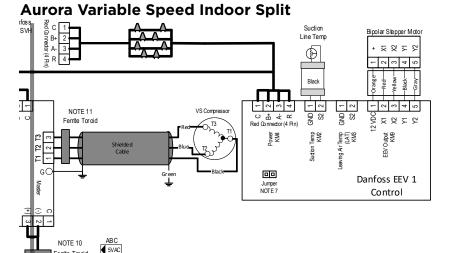
### Notes

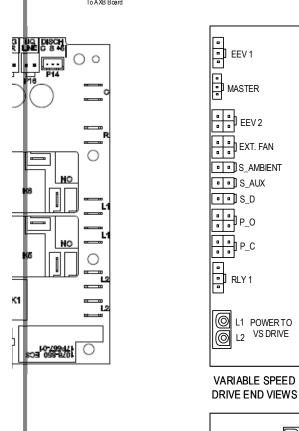
- 4 Variable speed pump low voltage harness provided with Variable Speed Flow Center
- 5 Low voltage wiring CLASS 2. 7 EEV board JUMPER must be removed.
- 10 Communication cable routed through Ferrite Toroid four times.
- 11 Compressor power cable routed through Ferrite Toroid three times.
- 12 Variable speed pump power wires to connect the pump to L1 and L2 on the
- AXB board are provided with Variable Speed Flow Center.
- 14 Wiring harness supplied with valve.





### compressor section wiring senematics con





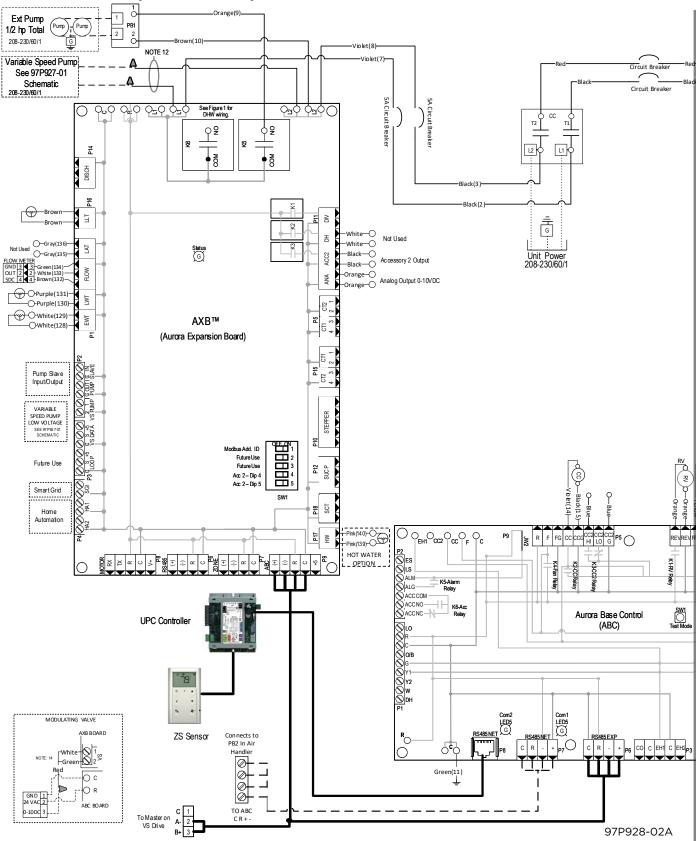
		Aurora LE	D Flash Codes			
Slow Flash	1 second on and 1 second o	ff				
Fast Flash	100 milliseconds on and 10	0 milliseconds off				
Flash Code			ff with a 2 second pause before repeating			
	Fault LED (LED 1, Red	)	Random Start Delay (Alterna	ting Colors)		
Normal Mod	e	OFF	Status LED (LED1, Green)	Fast Flash		
Input Fault L	ockaut	Flash Code 1	Configuration LED (LED 2, Yellow)	Fast Flash		
High Pressu	ıre Lockout	Flash Code 2	Fault LED (LED 3, Red)	Fast Flash		
Low Pressu	re Lockout	Flash Code 3	Configuration LED (LED 2	Yellow)		
Freeze Dete	ection- FP2	Flash Code 4	No Software Overide	OFF		
Freeze Deta	ection - FP1	Flash Code 5	DIP Switch Overide	Slow Flash		
Reserved		Flash Code 6	Status LED (LED 3, Gre	reen)		
Condensate	e Overflow Lockout	Flash Code 7	Normal Mode	ON		
Over/Under	r Voltage Shutdown	Flash Code 8	Control is Non - Functional	OFF		
Future Use		Flash Code 9	Test Mode	Slow Flash		
			Lockout Active	Fast Flash		
Fault- FP1	and FP2 Sensor Error	Flash Code 11	Dehumidification Mode	Flash Code 2		
Future Use		Flash Code 12	Future Use	Flash Code 3		
Non-Critica	I AXB Sensor Error	Flash Code 13	Future Use	Flash Code 4		
Critical AXE	Sensor Error	Flash Code 14	Load Shed	Flash Code 5		
Alarm - Hot	Water	Flash Code 15	ESD	Flash Code 6		
Fault Variat	ole Speed Pump	Flash Code 16	Future Use	Flash Code 7		
Future Use		Flash Code 17	Fault LED (LED 1, Red)	Cont.		
Non-Critica	l Communication Error	Flash Code 18	Safe Mode - Ambient Temp Sensor	Flash Code 49		
Fault - Criti	cal Communication Error	Flash Code 19	Fault - Discharge Temperature Sensor	Flash Code 51		
Alarm - Low	/ Loop Pressure	Flash Code 21	Fault - Suction Pressure Sensor	Flash Code 52		
Fault - Comm	unication ECM Fan Motor Erro	Flash Code 22	Fault - Condensing Pressure Sensor	Flash Code 53		
Alarm - Hon	ne Automation 1	Flash Code 23	Fault - Low Supply Voltage	Flash Code 54		
Alarm - Hon	ne Automation 2	Flash Code 24	Fault - Compressor Out of Envelope	Flash Code 55		
Fault - EEV	Error	Flash Code 25	Fault - Over Current	Flash Code 56		
Derate - Dri	ive Temperature	Flash Code 41	Fault - Over/Under Voltage	Flash Code 57		
Derate - Hi	gh Discharge Temperature	Flash Code 42	Fault - High Drive Temperature	Flash Code 58		
Derate - Lo	w Suction Temperature	Flash Code 43	Fault - Drive Internal Error MOC/AOC	Flash Code 59		
Derate - Lo	w Condensing Pressure	Flash Code 44	Fault - Multiple Safe Modes	Flash Code 61		
Derate - Hi	gh Condensing Pressure	Flash Code 45	EEV2 Fault - Loss of Charge	Flash Code 71		
Derate - Ou	iter Power Limit	Flash Code 46	EEV2 Safe Mode - Suc Temp Sensor	Flash Code 72		
Safe Mode -	EEV (Indoor) Communication	Flash Code 47	EEV2 Safe Mode - LAT Temp Sensor	Flash Code 73		
Safe Mode - E	EV (Outdoor) Communication	Flash Code 48	EEV2 Safe Mode - Max Op Pressure	Flash Code 74		
			EEV1 Fault - Loss of Charge	Flash Code 75		
			EEV1Safe Mode - Suction Temp Sensor	Flash Code 76		
			EEV1Safe Mode - LAT Temp Sensor	Flash Code 77		
			EEV1 Safe Mode - Max Op Pressure	Flash Code 78		

I			AXB Accessory 2 DIP Settings
	SW1-4	SW1-5	DESCRIPTION
ſ	ON	ON	Cycles with Blower
ſ	OFF	ON	Cycles with CC first stage compressor or compressor spd 1-12
ſ	ON	OFF	Cycles with CC2 second stage of compressor or comp spd 7-12
[	OFF	OFF	Cycles with DH from ABC board

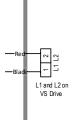
ABC SW2 Accessory Relay		
DESCRIPTION	SW2-4	SW2-5
Cycle with Blower	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Cycle with Comm. T-stat Hum Cmd	OFF	ON

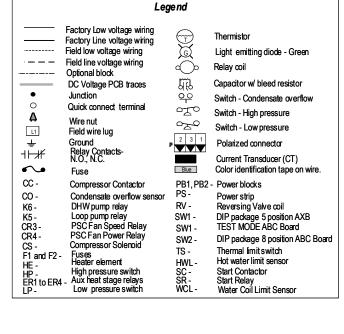
POWER TO COMPRESSOR T2

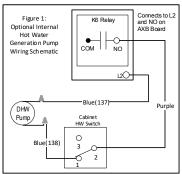
### **Aurora Variable Speed Indoor Split with UPC**

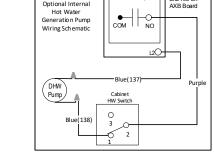


### **Aurora Variable Speed Indoor Split with UPC**



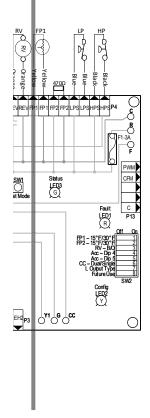






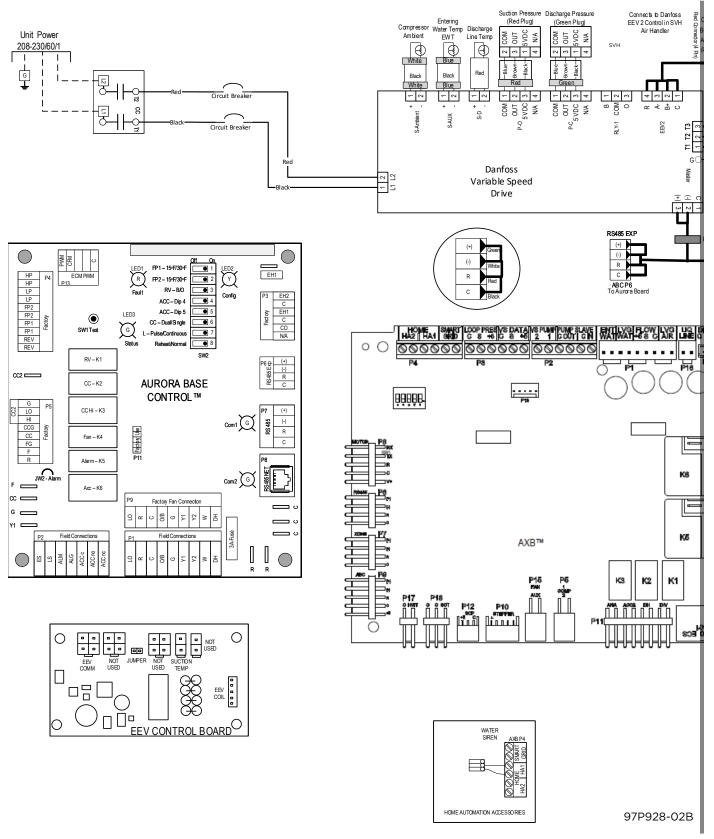
### **Notes**

- 4 Variable speed pump low voltage harness provided with Variable Speed Flow Center.
- 5 Low voltage wiring CLASS 2.7 EEV board JUMPER must be removed.
- 10 Communication cable routed through Ferrite Toroid four times.
- 11 Compressor power cable routed through Ferrite Toroid three times.
- 12 Variable speed pump power wires to connect the pump to L1 and L2 on the
- AXB board are provided with Variable Speed Flow Center.
- 14 Wiring harness supplied with valve.

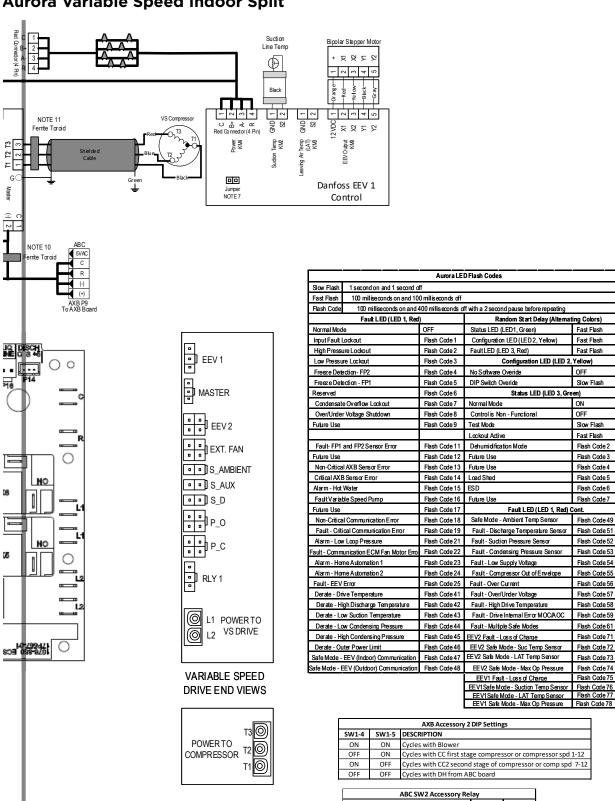


97P928-02A

### **Aurora Variable Speed Indoor Split**



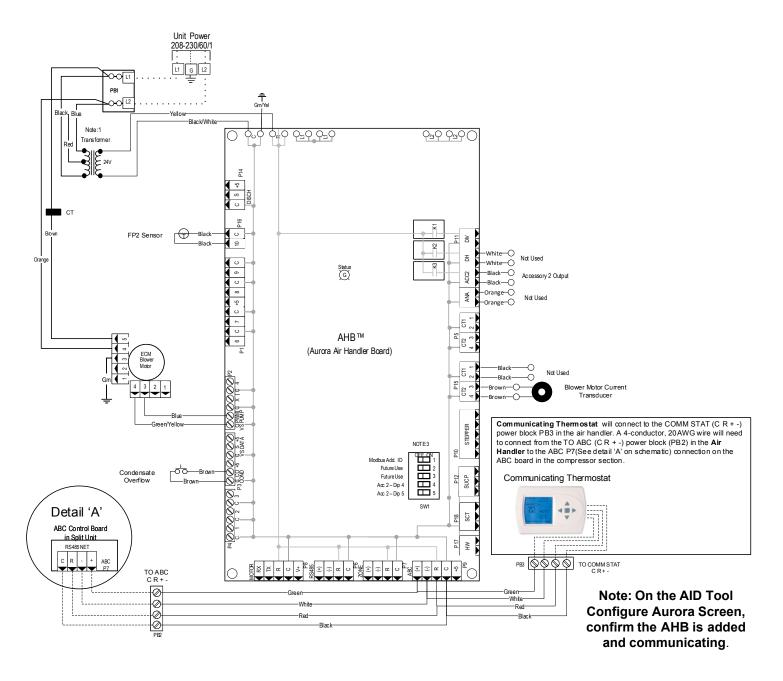
### **Aurora Variable Speed Indoor Split**



		AXB Accessory 2 DIP Settings
SW1-4	SW1-5	DESCRIPTION DESCRIPTION
ON	ON	Cycles with Blower
OFF	ON	Cycles with CC first stage compressor or compressor spd 1-12
ON	OFF	Cycles with CC2 second stage of compressor or comp spd 7-12
OFF	OFF	Cycles with DU from ABC heard

ABC SW2 Accessory Relay												
DESCRIPTION	SW2-4	SW2-5										
Cycle with Blower	ON	ON										
Cycle with Compressor	OFF	OFF										
Water Valve Slow Opening	ON	OFF										
Cycle with Comm. T-stat Hum Cmd	OFF	ON										

SVH Air Handler: No Electric Heat



#### 97P929-01 1/28/2020

	7 SeriesAir Handler Air Flow														
Model	Max ESP	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7	Speed 8	Speed 9	Speed 10	Speed 11	Speed 12		
033	0.75	250	400 G	550 L	650	750	850	1000	1150	1250 H	1350 Aux	1450	1600		
042	0.75	250	450 G	650 L	800	950	1050	1200	1350	1450	1600 H	1750 Aux	1850		
050	0.75	300	550 G	800 L	1000	1150	1300	1450	1600	1750	1900 H	2050 Aux	2200		
**VS Compressor Speed				1-2	3-4		5-6	7-8		9-10	11-12				

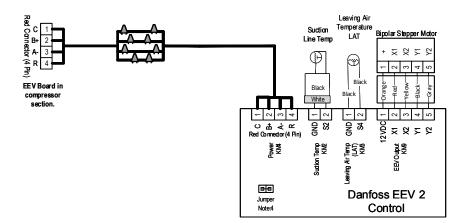
11/29/2018

\*\* VS Compressor speed is given for the factory default cfm settings. When the cfm default settings are changed it will change the relationship to the compressor speed that is shown in the table. In cooling mode compressor speeds 10-12 are only available when SuperBoost mode is selected at the thermostat.

Factory settings are at recommended G, L, H and Aux positions

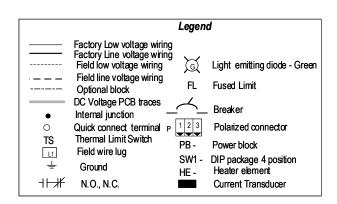
"G" may be located anywhere within the airflow table.

CFM is controlled within 5% up to the maximum ESP



#### Notes:

- 1 To operate in 208V mode replace the blue transformer wire connected to PB1-L2 with red transformer wire.
- 2 Low voltage wiring CLASS 2.
- 3 DIP switch 1 on SW1 must be set in the OFF position.
- $4-\mbox{Jumper}$  must be in place on Air Handler EEV. DO NOT REMOVE.

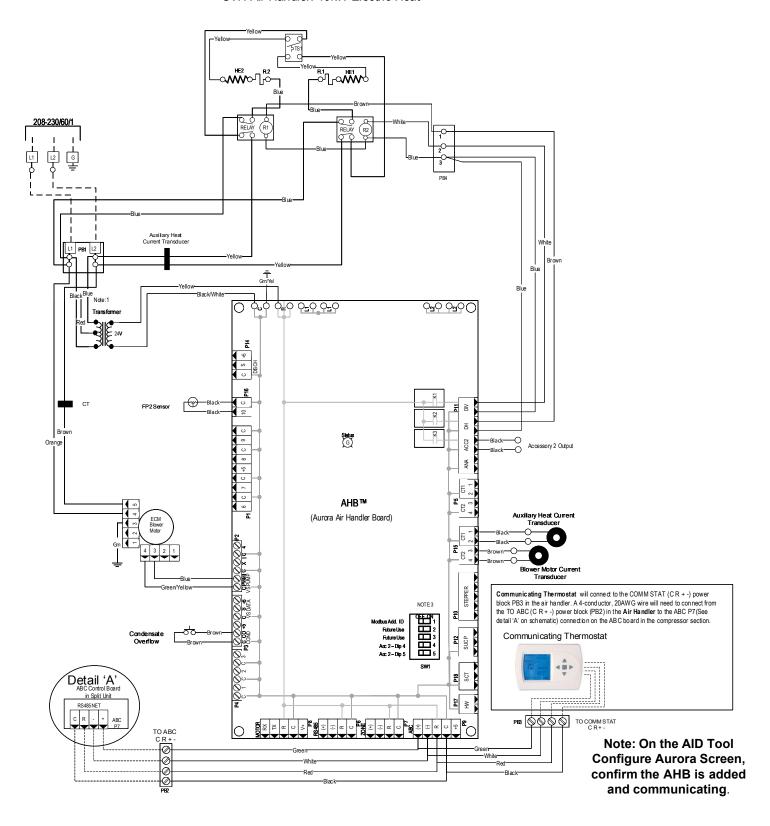


<sup>&</sup>quot;L" setting should be located within the boldface CFM range

<sup>&</sup>quot;H" setting MUST be located within the shaded CFM range

<sup>&</sup>quot;Aux" setting MUST be equal to or greater than "H" setting

SVH Air Handler: 10kW Electric Heat

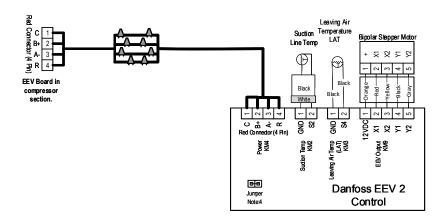


#### 97P929-02 1/28/2020

7 SeriesAir Handler Air Flow														
Model	Max ESP	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7	Speed 8	Speed 9	Speed 10	Speed 11	Speed 12	
033	0.75	250	400 G	550 L	650	750	850	1000	1150	1250 H	1350 Aux	1450	1600	
042	0.75	250	450 G	650 L	800	950	1050	1200	1350	1450	1600 H	1750 Aux	1850	
050	0.75	300	550 G	800 L	1000	1150	1300	1450	1600	1750	1900 H	2050 Aux	2200	
**VS Compressor Speed				1-2	3-4		5-6	7-8		9-10	11-12			
													11/29/2018	

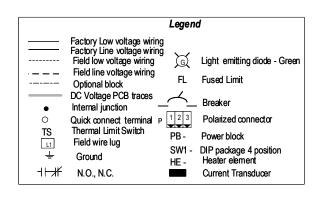
\*\* VS Compressor speed is given for the factory default cfm settings. When the cfm default settings are changed it will change the relationship to the compressor speed that is shown in the table. In

CFM is controlled within 5% up to the maximum ESP



#### Notes:

- To operate in 208V mode replace the blue transformer wire connected to PB1-L2 with red transformer wire.
- 2 Low voltage wiring CLASS 2.
- 3 DIP switch 1 on SW1 must be set in the OFF
- 4 Jumper must be in place on Air Handler EEV. DO NOT REMOVE.



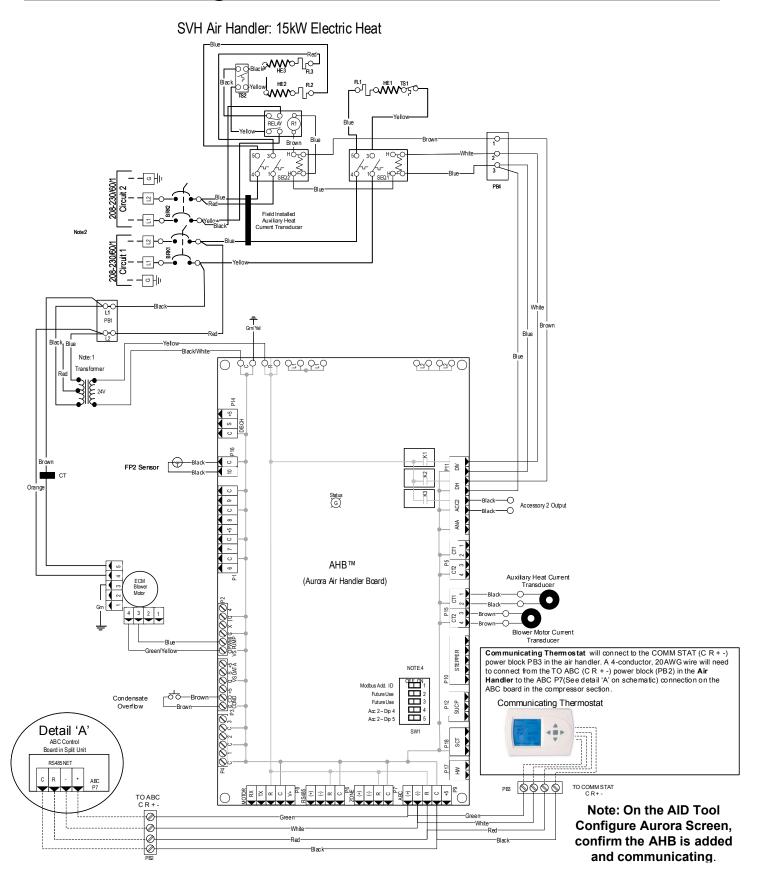
cooling mode compressor speeds 10-12 are only available when SuperBoost mode is selected at the thermostat. Factory settings are at recommended G, L, H and Aux positions

<sup>&</sup>quot;G" may be located anywhere within the airflow table.

<sup>&</sup>quot;L" setting should be located within the boldface CFM range

<sup>&</sup>quot;H" setting MUST be located within the shaded CFM range

<sup>&</sup>quot;Aux" setting MUST be equal to or greater than "H" setting

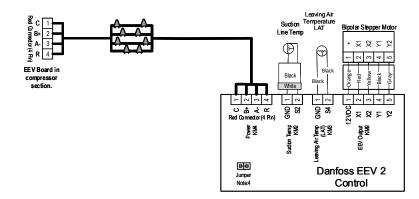


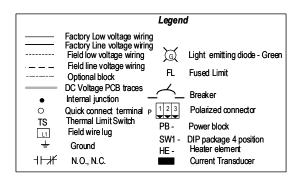
#### 97P929-03 1/28/2020

	7 SeriesAir Handler Air Flow														
Model	Max ESP	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7	Speed 8	Speed 9	Speed 10	Speed 11	Speed 12		
033	0.75	250	400 G	550 L	650	750	850	1000	1150	1250 H	1350 Aux	1450	1600		
042	0.75	250	450 G	650 L	800	950	1050	1200	1350	1450	1600 H	1750 Aux	1850		
050	0.75	300	550 G	800 L	1000	1150	1300	1450	1600	1750	1900 H	2050 Aux	2200		
**VS Compressor Speed				1-2	3-4		5-6	7-8		9-10	11-12				
													11/29/2018		

Factory settings are at recommended G, L, H and Aux positions

CFM is controlled within 5% up to the maximum ESP





#### Notes:

- 1 To operate in 208V mode replace the blue transformer wire connected to PB1-L2 with red transformer wire. 2 - Use manufacturer's part number 19P592-01
- (jumper bar assembly) when single source power is required.
- 3 DIP switch 1 on SW1 must be set in the OFF position.
- 4 Jumper must be in place on Air Handler EEV. DO NOT REMOVE.
- 5 Low voltage wiring CLASS 2.

#### **Dual Power Supply Connections**

If two separate circuits are used to supply power to the auxiliary heat kit, the Installer will need to verify that each leg of the auxiliary heat circuit breakers are wired from the power supply correctly in order for the electric heat kit to operate properly. This can be done by measuring the supply side voltage of the auxiliary heat circuit breakers. Put a voltmeter on the L2 side of Circuit Breaker One and on the L2 side of Circuit Breaker Two. The voltmeter should read approximately 0 volts. If the meter reads high voltage, the auxiliary heat breakers need to be rewired so that breakers in the auxiliary heat kit match the wiring of the Disconnect Panel breakers. Meaning. L1 and L2 from one breaker in the disconnect panel must connect to L1 and L2 at one of the auxiliary heat circuit breakers and L1 and L2 from the other breaker in the disconnect panel must connect to L1 and L2 of the other auxiliary heat circuit breaker, making sure that the L1 and L2 from each disconnect breaker matches the L1 and L2 at each of the auxiliary heat breakers.

<sup>\*\*</sup> VS Compressor speed is given for the factory default cfm settings. When the cfm default settings are changed it will change the relationship to the compressor speed that is shown in the table. In cooling mode compressor speeds 10-12 are only available when SuperBoost mode is selected at the thermostat.

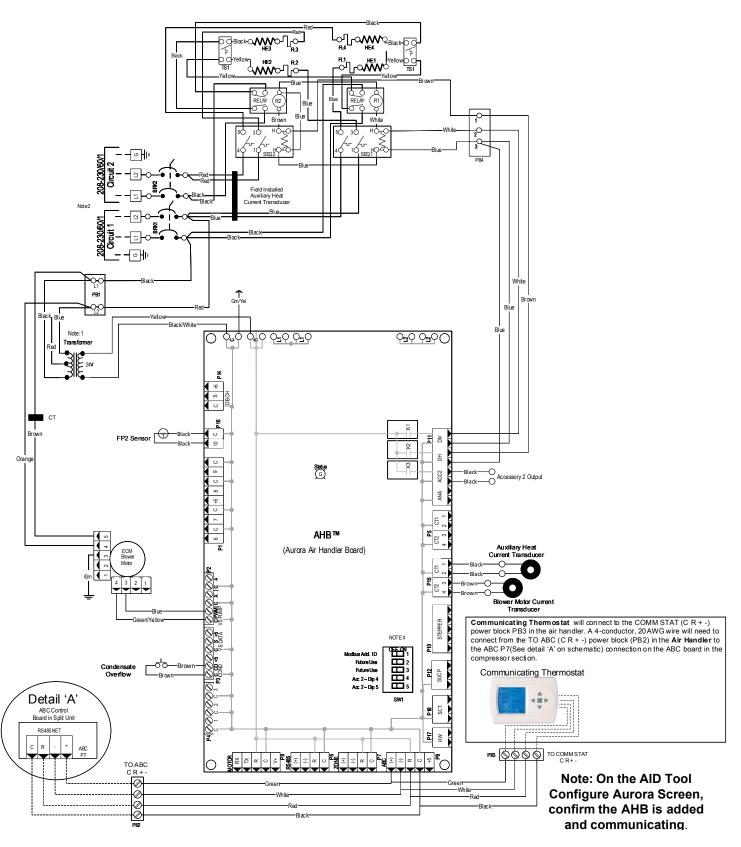
<sup>&</sup>quot;G" may be located anywhere within the airflow table.

<sup>&</sup>quot;L" setting should be located within the boldface CFM range

<sup>&</sup>quot;H" setting MUST be located within the shaded CFM range

<sup>&</sup>quot;Aux" setting MUST be equal to or greater than "H" setting

SVH Air Handler: 20kW Electric Heat

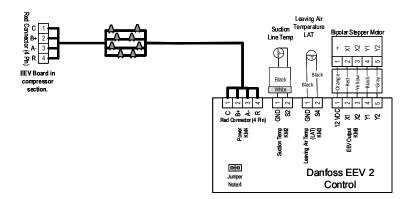


#### 97P929-04 1/28/2020

	7 SeriesAir Handler Air Flow														
Model	Max ESP	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7	Speed 8	Speed 9	Speed 10	Speed 11	Speed 12		
033	0.75	250	400 G	550 L	650	750	850	1000	1150	1250 H	1350 Aux	1450	1600		
042	0.75	250	450 G	650 L	800	950	1050	1200	1350	1450	1600 H	1750 Aux	1850		
050	0.75	300	550 G	800 L	1000	1150	1300	1450	1600	1750	1900 H	2050 Aux	2200		
**VS Compressor Speed				1-2	3-4		5-6	7-8		9-10	11-12				
													11/29/2018		

11/23/2010

<sup>&</sup>quot;Aux" setting MUST be equal to or greater than "H" setting CFM is controlled within 5% up to the maximum ESP

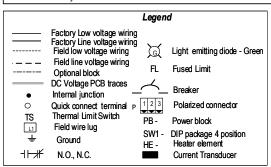


#### Notes:

- 1 To operate in 208V mode replace the blue transformer wire connected to PB1-L2 with red transformer wire.
- Use manufacturer's part number 19P592-01
   (jumper bar assembly) when single source power is required.
- 3 DIP switch 1 on SW1 must be set in the OFF position.
- 4 Jumper must be in place on Air Handler EEV. DO NOT REMOVE.
- 5 Low voltage wiring CLASS 2.

### **Dual Power Supply Connections**

If two separate circuits are used to supply power to the auxiliary heat kit, the Installer will need to verify that each leg of the auxiliary heat circuit breakers are wired from the power supply correctly in order for the electric heat kit to operate properly. This can be done by measuring the supply side voltage of the auxiliary heat circuit breakers. Put a voltmeter on the L2 side of Circuit Breaker One and on the L2 side of Circuit Breaker Two. The voltmeter should read approximately 0 volts. If the meter reads high voltage, the auxiliary heat breakers need to be rewired so that breakers in the auxiliary heat kit match the wiring of the Disconnect Panel breakers. Meaning, L1 and L2 from one breaker in the disconnect panel must connect to L1 and L2 at one of the auxiliary heat circuit breakers and L1 and L2 from the other breaker in the disconnect panel must connect to L1 and L2 of the other auxiliary heat circuit breaker, making sure that the L1 and L2 from each disconnect breaker matches the L1 and L2 at each of the auxiliary heat breakers.



<sup>\*\*</sup> VS Compressor speed is given for the factory default cfm settings. When the cfm default settings are changed it will change the relationship to the compressor speed that is shown in the table. In cooling mode compressor speeds 10-12 are only available when SuperBoost mode is selected at the thermostat.

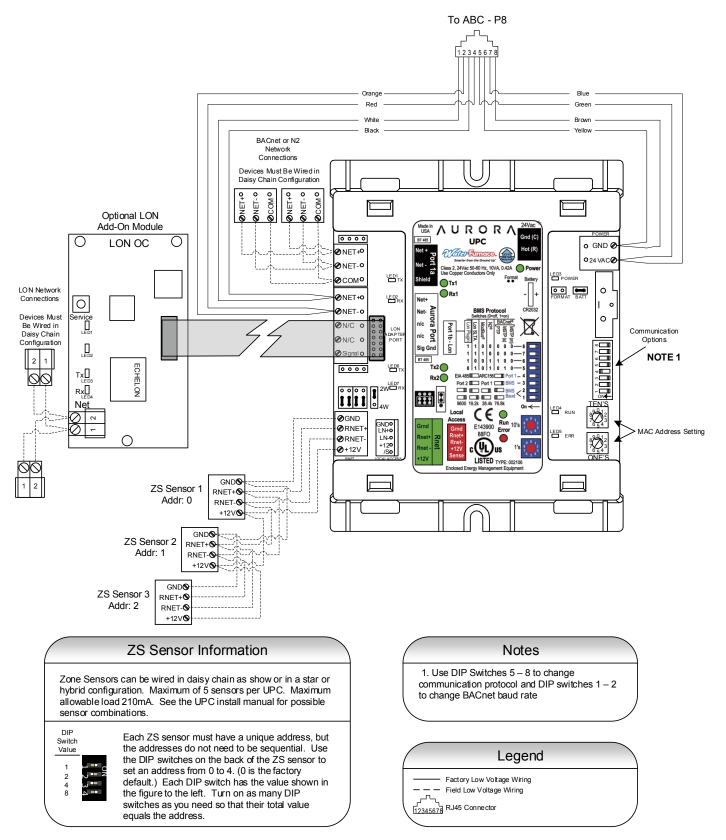
Factory settings are at recommended  $\mathsf{G},\mathsf{L}$  ,  $\mathsf{H}$  and  $\mathsf{Aux}$  positions

<sup>&</sup>quot;G" may be located anywhere within the airflow table.

<sup>&</sup>quot;L" setting should be located within the boldface CFM range

<sup>&</sup>quot;H" setting MUST be located within the shaded CFM range

### **Aurora UPC**



### **Engineering Guide Specifications**

#### General

Furnish and install WaterFurnace Water Source Heat Pumps, as indicated on the plans. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow. The reverse cycle heating/cooling units shall be either suspended type with horizontal air inlet and discharge or floor mounted type with horizontal air inlet and vertical upflow, or downflow air discharge. Units shall be AHRI/ISO 13256-1 certified and listed by a nationally recognized safety-testing laboratory or agency, such as ETL Testing Laboratory. Each unit shall be computer runtested at the factory with conditioned water and operation verified to catalog data. Each unit shall be mounted on a pallet and shipped in a corrugated box or stretch-wrapped. The units shall be designed to operate with entering liquid temperature between 20°F and 120°F [-6.7°C and 48.9°C].

### Casing and Cabinet

The cabinet shall be fabricated from heavy-gauge galvanized steel and finished with corrosion-resistant powder coating. This corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117. The interior shall be insulated with 1/2-inch thick, multi-density, cleanable aluminum foil coated glass fiber with edges sealed or tucked under flanges to prevent the introduction of glass fibers into the discharge air. Standard cabinet panel insulation must meet NFPA 90A requirements, air erosion and mold growth limits of UL- 181, stringent fungal resistance test per ASTM-C1071 and ASTM G21, and shall meet zero level bacteria growth per ASTM G22. Unit insulation must meet these stringent requirements or unit(s) will not be accepted.

Three compressor compartment access panels shall be 'lift-out' removable. The front access panel shall be lift-out to provide easy access to the electrical/compressor section. The control box shall be hinged and removable to allow easy access to the compressor. The internal component layout shall provide for service access from the front side for restricted installations.

The air handler shall be provided with two large access panels and shall be removable with supply and return ductwork in place. The internal components layout shall provide for major service with the unit in-place for restricted access installations. The blower assembly access shall be slide-out serviceable via a 'works-in-a-drawer' design. The cabinet shall be convertible to horizontal or downflow applications by reconfiguring the cabinet using only a nut driver. The unit shall be 'zero clearance' approved on any of its external surfaces. A duct collar shall be provided for field installation on the supply air opening. The air handler shall be supplied with an integral return air filter rack (air filter is field supplied).

#### **Refrigerant Circuit**

All units shall contain a sealed refrigerant circuit including a hermetic motor-compressor, oil seperator, electronic expansion valve, reversing valve, coaxial tube water-to-refrigerant heat exchanger, optional hot water generator

coil, and service ports. Compressors shall be high-efficiency variable speed scroll type designed for heat pump duty and mounted on double vibration isolators. Compressor motors shall be permanent magnet type. All air handlers shall provide an electronic expansion valve, enhanced fin and tube air-to-refrigerant heat exchanger of the "A" coil design. The finned tube coil shall be sized for low-face velocity and constructed of lanced aluminum fins bonded to aluminum tubes in a staggered pattern. The coil shall include a composite drain pan.

Both electronic expansion valves shall provide proper superheat over the entire liquid temperature range with minimal "hunting."

Refrigerant to air heat exchangers shall utilize aluminum tube construction rated to withstand 600 psig (4135 kPa) refrigerant working pressure. Refrigerant to water heat exchangers shall be of copper (cupronickel optional) inner water tube and steel refrigerant outer tube design, rated to withstand 600 psig (4135 kPa) working refrigerant pressure and 450 psig (3101 kPa) working water pressure.

All units shall have the source coaxial tube refrigerant-to water heat exchanger and the optional hot water generator coil coated with ThermaShield insulation. Refrigerant suction lines shall be insulated to prevent condensation at low liquid temperatures.

### **Blower Motor and Assembly**

The blower shall be an oversized direct drive centrifugal type with a dynamically balanced wheel. The housing and wheel shall be designed for quiet low outlet velocity operation and of galvanized or galvalume steel construction. Tight blower housing geometry shall not be permitted. The blower housing shall be removable from the cabinet without disconnecting the supply air ductwork for servicing of the blower motor through a 'works-in-a-drawer' design. The high efficiency blower motor shall be a variable speed ECM type. The blower motor shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated ball bearings and have thermal overload protection.

### **Electrical**

A control box shall be located within the compressor and air handler compartments (air handler shall contain a 100VA transformer) and the compressor compartment shall contain a 24 Volt activated, 2 pole compressor contactor, circuit breakers for protecting loop pumps and compressor drive, removable terminal block for thermostat wiring, variable speed compressor drive and solid-state controller for complete unit operation. Electromechanical operation WILL NOT be accepted. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be communicating type and provide heating or cooling as required by the remote thermostat/sensor. An Aurora Advanced VS Control, a microprocessor based controller, interfaces with a digital communicating thermostat to monitor and control unit operation shall be provided. The control shall provide operational sequencing, blower speed

### **Engineering Guide Specifications cont.**

control, blower failure, high and low pressure switch monitoring, freeze detection, hot water limit thermistor sensing, condensate overflow sensing, auxiliary heat staging, lockout mode control, hot water and loop pump control, LED status and fault indicators, fault memory, field selectable options, compressor envelope management, energy consumption measurement, and accessory output. The fault signals shall be plain English text and displayed on the thermostat. The Aurora Advanced VS Control shall also feature an On Peak input signal for utility controlled demand programs, intelligent hot water generation with user adjustable temperature limit, loop pump linking for multiple units driving a common flow center and up to two optional home automation inputs to drive dedicated alarms for sump pump, security system, and smoke/CO2 or dirty air filter sensors. As standard, the energy, performance and refrigerant monitoring kits will provide real time data including total power consumption, entering and leaving water temperature, flow rate and heat of extraction/rejection capacity data, refrigerant superheat and subcooling. The capability for communicating to advanced zoning packages with up to six zones shall also be provided with complete fault and information display on the zoning MasterStat.

A detachable terminal block with screw terminals will be provided for field control wiring. All units shall have knockouts for entrance of low and line voltage wiring. The blower motor and control box shall be harness plug wired for easy removal.

The air handler shall contain integral circuit breakers on all units employing 15 kW or 20 kW electric heat. The 100VA transformer shall be protected by internal circuit breaker.

An Aurora Interface Diagnostic (AID) Tool shall communicate with the Aurora control allowing quick and easy access to setup, monitoring, and troubleshooting of any Aurora control. The device shall include the features of ECM airflow setup, VS pump and modulating water valve setup, fault description and history, manual operation capability, sensor readings, timings, and other diagnostic tools.

Option: An Aurora Unitary Protocol Converter (UPC) shall be included that communicates directly with the Aurora Heat Pump Control 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 UPC shall convert the internal Aurora Modbus protocol to BACnet MS/TP protocol for communication over a HAS system. Additional individual unit configuration items such as ECM fan speeds or freeze detection settings shall be directly available over the HAS without the need for access to the actual heat pump.

### **Piping**

Supply and return water connections shall be 1 in. [25.4 mm] FPT brass swivel fittings, which provide a union and eliminate the need for pipe wrenches and sealants when making field connections. The optional hot water generator shall have sweat type connections. All source water piping shall be insulated to prevent condensation at low liquid temperatures. Refrigeration connections shall be made using sweat copper joints. The air handler condensate connections shall be a 3/4 in NPT.

# **Options and Accessories**

### **Cupronickel Heat Exchanger**

An optional cupronickel water-to-refrigerant heat exchanger shall be provided.

#### **Hot Water Generator**

An optional ThermaShield coated heat reclaiming hot water generator coil of vented double-wall copper construction suitable for potable water shall be provided. The coil and hot water circulating pump shall be factory mounted inside the unit with integral electronic high limit temperature monitoring and external on/off switch. Hot water set point is selectable through the AID Tool.

#### Thermostat (field-installed)

A communicating auto-changeover electronic digital thermostat shall be provided. The thermostat shall offer variable speed heating and cooling staging with precise temperature control. An OFF-HEAT-AUTO-COOL-EMERG system switch, OFF-AUTO-INTERMITTENT blower switch, and indicating display shall be provided. The thermostat shall display in °F or °C. The thermostat shall provide real time energy consumption data of the unit.

#### Color Touchscreen Thermostat (field-installed)

A color touchscreen communicating auto-changeover electronic digital thermostat shall be provided. The thermostat shall offer variable speed heating and cooling staging with precise temperature control. An OFF-HEAT-AUTO-COOL-EMERG system switch, OFF-AUTO-INTERMITTENT blower switch, and indicating display shall be provided. The thermostat shall display in °F or °C. The thermostat shall provide real time and historical energy consumption data of the unit.

#### Earth Loop Flow Center (field-installed)

A self-contained module shall provide all liquid flow, fill and connection requirements for ground source closed loop systems up to 20 gpm. The pumps shall be wired to a power block located in the nearest unit. The heat pump units shall contain low voltage pump linking control so that two units may share one flow center.

# **Revision Guide**

Pages:	Description:	Date:	Ву:
26	Updated line set length	12 Dec 2020	MA
All	Document Created	Feb 2020	MA



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