



## Specification Catalog

### *5 Series* **500A11**

Geothermal heat pump  
1-6 ton (single speed)  
2-6 ton (dual capacity)



## Table of Contents

---

Model Nomenclature .....	5
AHRI/ISO 13256-1 Performance Ratings .....	6
5 Series Design Features .....	9
The Aurora™ Control System .....	13
Operation Logic Data Table .....	22
Water Quality .....	22
Dimensional Data .....	23
Physical Data .....	27
Auxiliary Heat Ratings .....	29
Auxiliary Heat Electrical Data .....	29
Electrical Data .....	30
Blower Performance Data .....	32
Reference Calculations .....	37
Legend and Notes .....	37
Operating Limits .....	37
Antifreeze Corrections .....	38
Correction Factor Tables .....	39
Pressure Drop .....	40
Performance Data .....	41
Wiring Schematics .....	68
Engineering Guide Specifications .....	76
Revision Guide .....	79

# 5 Series

## 500A11 Geothermal Heat Pump



WaterFurnace Envision Series products established a new industry standard for efficiency, performance, reliability and quiet operation. The Envision Series was the first unit to achieve a certified GLHP rating of 30 EER and 5 COP in AHRI 13256-1. The 5 Series extends this innovation and performance with all new advanced controls and updated performance. The 5 Series is available in nine single speed sizes (1 to 6 ton) with Copeland Scroll™ (rotary in 012 and 018) compressors. The product is also available in five dual capacity sizes (2 to 6 ton) with Copeland Scroll UltraTech™ compressors.

These 5 Series units utilize ozone-safe R-410A refrigerant to meet the most stringent EPA requirements. Exclusive FormiShield Plus double coated air coils add durability and longer life. 5-Speed 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. A new sophisticated Aurora™ Control system is modular and designed to grow with the application. The Aurora 'Base' Control (ABC) features a microprocessor control to sequence all components during operation for optimum performance. Plus, the ABC provides easy-to-use troubleshooting features with fault lights, on-board diagnostics, and a hand held Aurora Interface Diagnostic (AID) Tool. The Aurora 'Advanced' Control adds the Aurora Expansion Board (AXB) to further extend the capability of the system to include compressor current monitoring, advanced loop and hot water generator pump control, as well as service, performance, and energy monitoring sensor kit capability. A swing-out control box provides serviceability. Unit configurations include vertical top, bottom, or rear discharge (left or right return) and horizontal units with left or right return a side or end 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, blue wave styling element, and 5 Series nameplate add a touch of elegance to the unit.

5 Series products are performance-certified to AHRI/ISO 13256-1 standards, ETL listed, ENERGY STAR® qualified, and tested in an ISO 17025 accredited testing lab.

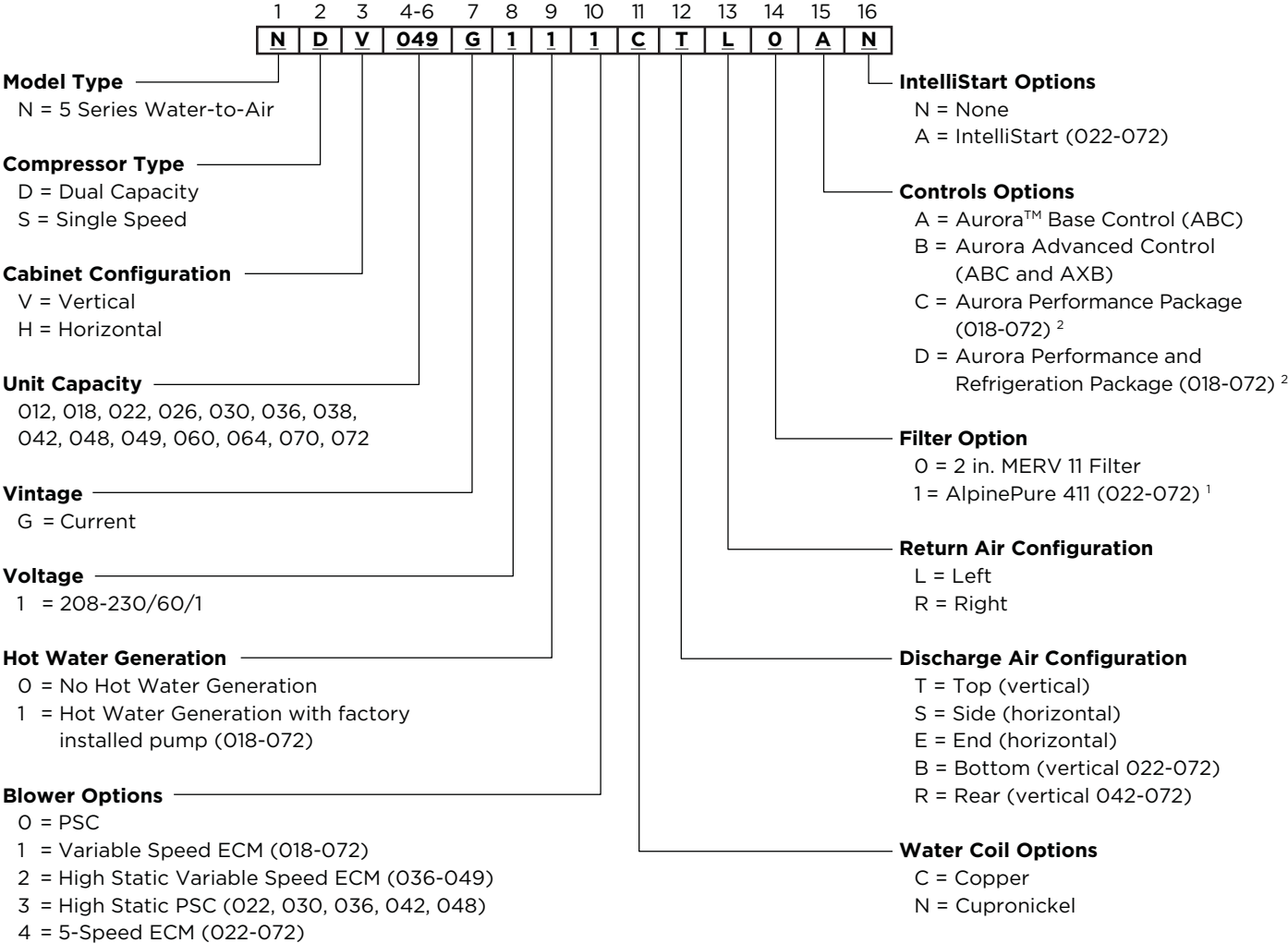
As a leader in the industry, WaterFurnace is dedicated to innovation, quality, and customer satisfaction. In fact, every unit built is exposed to a wide range of quality control procedures throughout the assembly process and is then subjected to a rigorous battery of computerized run tests to certify 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 ISO 9001:2008 and manufacturing facility is 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 5 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.

# Model Nomenclature



**NOTES:** All models include sound kits as standard equipment.  
<sup>1</sup> Available on vertical configurations only (not available on horizontal models).  
<sup>2</sup> Control option not available with PSC motor.

# AHRI/ISO 13256-1 Performance Ratings

## PSC Motors

AHRI/ASHRAE/ISO 13256-1  
English (IP) Units

Model	Capacity Modulation	Flow Rate		Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
				Cooling EWT 86°F		Heating EWT 68°F		Cooling EWT 59°F		Heating EWT 50°F		Cooling Brine Full Load 77°F Part Load 68°F		Heating Brine Full Load 32°F Part Load 41°F	
		gpm	cfm	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
012	Single	4	400	12,300	15.7	14,800	5.1	14,500	25.5	12,300	4.5	13,000	18.0	9,600	3.7
018	Single	5	600	18,000	15.6	23,000	5.1	21,000	25.5	19,000	4.4	18,500	18.0	14,700	3.8
022	Single	8	850	21,000	17.5	22,600	5.6	23,000	28.0	18,100	4.6	21,500	20.5	14,200	3.7
030	Single	8	900	27,600	18.2	30,600	5.4	30,800	27.1	24,400	4.7	29,200	21.1	19,800	3.8
036	Single	9	1200	34,100	17.6	37,900	5.6	36,300	25.7	28,200	4.7	34,600	19.6	24,100	4.0
042	Single	11	1300	40,100	16.6	42,800	5.1	44,600	24.5	34,900	4.3	41,600	18.6	27,500	3.7
048	Single	12	1500	46,400	15.5	53,100	4.9	51,600	22.5	43,400	4.2	48,900	17.3	35,000	3.6
060	Single	15	1800	61,300	15.4	69,000	5.0	68,700	23.2	55,100	4.4	65,500	18.2	43,200	3.7
070	Single	18	2000	67,000	14.5	81,800	4.6	75,900	21.6	66,100	4.0	70,600	17.0	52,000	3.4

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

2/13/12

## Variable Speed ECM or 5-Speed ECM Motor

AHRI/ASHRAE/ISO 13256-1  
English (IP) Units

Model	Capacity Modulation	Flow Rate		Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
				Cooling EWT 86°F		Heating EWT 68°F		Cooling EWT 59°F		Heating EWT 50°F		Cooling Brine Full Load 77°F Part Load 68°F		Heating Brine Full Load 32°F Part Load 41°F	
		gpm	cfm	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
026	Full	8	950	26,000	17.3	30,300	5.5	29,000	24.0	25,100	5.0	27,700	20.4	19,500	4.3
	Part	7	750	20,000	19.5	22,300	6.4	22,600	32.7	18,300	5.3	22,000	27.9	16,300	4.8
038	Full	9	1300	39,000	18.0	40,300	5.4	39,400	24.1	33,600	4.8	40,200	21.0	26,700	4.1
	Part	8	1150	28,500	20.3	29,100	6.3	31,500	35.4	24,000	5.1	30,100	30.0	22,000	4.8
049	Full	12	1600	50,300	17.1	56,100	5.2	56,200	24.5	46,300	4.6	52,000	20.0	37,400	4.0
	Part	11	1400	37,200	19.2	39,800	5.8	41,500	33.0	32,300	4.7	40,600	28.5	30,000	4.6
064	Full	16	1800	62,000	16.3	70,600	5.2	70,100	23.9	58,000	4.7	65,100	18.7	47,100	4.0
	Part	14	1500	45,000	18.0	50,100	5.8	51,500	29.9	41,300	5.0	50,000	25.9	37,000	4.4
072	Full	18	2000	69,000	15.0	81,900	4.8	78,500	22.0	67,500	4.3	71,600	17.0	54,200	3.7
	Part	16	1500	52,800	16.0	61,400	5.2	61,000	27.0	49,400	4.4	59,000	23.4	45,000	4.1
018	Single	5	600	18,000	16.5	23,000	5.3	21,000	26.8	19,000	4.7	18,500	19.0	14,700	4.1
022	Single	8	800	21,900	19.5	22,800	5.7	24,800	30.0	18,200	4.8	23,000	23.0	14,200	3.9
030	Single	8	1000	27,800	19.2	30,600	5.7	31,200	29.5	24,400	4.8	29,400	21.9	20,000	4.0
036	Single	9	1200	34,900	21.6	34,200	6.0	38,000	30.1	28,200	5.1	35,400	22.4	24,100	4.4
042	Single	11	1300	40,800	20.0	42,800	5.7	46,200	29.5	35,000	4.9	42,000	21.8	27,500	4.2
048	Single	12	1500	47,300	18.5	53,100	5.4	53,000	26.1	43,400	4.7	49,300	20.1	35,000	3.9
060	Single	15	1800	61,300	16.6	69,000	5.3	69,000	24.7	57,000	4.7	65,500	19.2	45,000	4.0
070	Single	18	2000	67,000	15.4	81,800	5.0	77,400	23.8	67,000	4.4	70,600	18.0	52,500	3.7

NOTE: 018 not available with 5-Speed ECM motor

2/13/12

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

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

### Energy Star Compliance Table

Model	Tier 3	
	Ground Water	Ground Loop
012	P	P
018	E, P	E, P
022	E, X, P	E, X, P
026	E, X	E, X
030	E, X, P	E, X, P
036	E, X, P	E, X, P
038	E, X	E, X
042	E, X, P	E, X, P
048	E, X, P	E, X, P
049	E, X	E, X
060	E, X, P	E, X, P
064	E, X	E, X
070	E, X	E, X
072	E, X	E, X

E - Unit with Variable Speed ECM Blower  
 X - Unit with 5-Speed ECM Blower  
 P - Unit with PSC Blower

1/29/12

### 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 Star rated.

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

	EER	COP
<b>Water-to-Air</b>		
Ground Loop	17.1	3.6
Ground Water	21.1	4.1
<b>Water-to-Water</b>		
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

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

**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;

WaterFlow (lps) = gpm x 0.0631;

ESP (Pascals) = ESP (in wg) x 249;

Press Drop (Pascals) = Press Drop (ft hd) x 2990



## 5 Series Design Features



- ① **COMPRESSOR:** Rotary (012-018), Copeland Scroll™ (022-070 single speed) and Copeland Scroll UltraTech™ (dual capacity) represent the latest technology
- ② **DOUBLE ISOLATED COMPRESSOR:** Double isolated compressor mounting to reduce noise and vibration
- ③ **AURORA CONTROLS & AID TOOL:** Aurora 'Base' Control, Aurora 'Advanced' Control, and Aurora AID Tool
- 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 **BALANCED PORT/BIDIRECTIONAL EXPANSION VALVE:** Balanced port bidirectional expansion valve for rock steady superheat control and reliable efficiency and operation at any condition
- ⑦ **AIR COIL:** Large air coil is designed for maximum efficiency and moisture removal; exclusive FormiShield Plus double coated for superior protection from formicary corrosion and patented 11 element fin design
- ⑧ **DISCHARGE MUFFLER:** Helps quiet compressor gas pulsations
- ⑨ **PSC/5-Speed/ECM BLOWER MOTOR OPTIONS:** Choice of standard PSC, high efficiency 5-Speed ECM, or high efficiency and ultra-flexible ECM blower motors
- ⑩ **FILTER RACK:** Filter rack holds 1 in. or 2 in. filters (field changeable) with exclusive snap on filter door
- ⑪ **FILTER:** High holding capacity 2 in. pleated MERV 11 filter is standard and 4 in. pleated MERV 11 is optional
- ⑫ **SWIVEL LOOP CONNECTIONS:** Leak free swivel water connections provide a hand tight gasket connection that easily handles the temperature extremes of geothermal earth loops
- ⑬ **INTELLISTART®:** Optional single phase soft starter
- ⑭ **INSULATION:** Cleanable foil lined insulation to prevent mold growth; corrosion resistant composite drain pan
- ⑮ **CABINET FINISH:** Heavy gauge galvanized sheet metal cabinet has 1,000 hr. salt spray rated gray powder coat paint for long life
- ⑯ **ACCESS PANELS:** Lift out front bottom access panel, lift out panels for easier removal and servicing
- ⑰ **HINGED CONTROL BOX:** Hinged removable control box
- ⑱ **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

## 5 Series Design Features cont.

### What's New?

- Highest AHRI/ISO 13256-1 Ratings for traditional geothermal
  - 30 EER and 4.8 COP
- Latest technology compressors
  - LG Rotary in single speed units (sizes 012 and 018)
  - Copeland K5 Scrolls™ in single speed units (sizes 022, 030, 036, 042, 048, 060, 070)
  - Copeland UltraTech™ K5 Compressors in dual capacity units (sizes 026, 038, 049, 064, 072)
- Discharge line mufflers on models 022-072 to help quiet compressor discharge gas pulsations.
- PSC/5-Speed ECM/Varibale Speed ECM blower motor options
  - Standard PSC for low cost and solid performance
  - 5-Speed ECM for high efficiency
  - Variable Speed ECM blower motors for the highest in efficiency and airflow flexibility
- Communicating Digital Thermostats: The Aurora controls system features either monochromatic or color touch screen graphic display thermostats for user interface with the 5 Series 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
  - *Communicating Modular Design:* Communicating modular design for flexibility and expandability
  - *Intelligent Hot Water Generator Control:* The Aurora Advanced control determines operation of hot water assist dependent upon system parameters to maximize overall system efficiency
  - *Loop pump slaving:* For multiple units on one flow center with either variable speed, single, or dual capacity units (with Aurora Advanced Control); even works with our legacy controls
  - *Electric Heat Powered Blower and Controls:* Prevents the compressor from tripping out and disabling heat in the house
  - *Internet Ready:* With optional Aurora WebLink (AWL) device and Tendril Web Portal (Future Availability)
- Advanced Service Features
  - Aurora Controls with the AID Tool provide advanced service diagnostics. With this device setup and configurations as well as real-time sensors fault and lockout history can be monitored and much more.
  - 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 drive for storing operating and performance data. Providing 'black box' capability. (Future Availability)
- Complete air flow control throughout the unit's operating range
- Cabinet Design – Improved design of access panels, control box and filter rack
- Cabinet Configurations – Vertical left or right return, downflow left or right return; Horizontal left or right return with either end or side air discharge
- Monitoring Sensor Kits
  - *Energy Monitoring:* With this standard sensor kit, the Aurora Advanced Control will feature power monitoring of the compressor, blower, and electric heat; the information can be displayed on AID Tool, selected thermostats, or through AWL
  - *Refrigerant Monitoring:* The 5 Series features refrigeration service sensors as an optional 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
  - *Performance Monitoring:* With this optional sensor kit installation, the Aurora controls can measure actual capacity and efficiency performance of the heat pump; the information can be displayed on AID Tool or thru AWL
- Cupronickel heat exchanger
- High static blower on some models

### 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)
- Top or rear air discharge for upflow, or bottom discharge for counterflow installations in vertical units, side or end discharge for horizontal units
- True left or right return air locations—vertical units include filter rack/duct collar
- Variable-speed ECM blowers permit various duct applications with flexible airflow selection; optional 5-Speed ECM blower motors provide ECM efficiency at PSC capability; optional PSC motors available on single speed units.
- Narrow cabinet for easy movement through doorways
- Internally trapped condensate piping on vertical units for neat, compact installation
- Optional field-installed auxiliary electric heater
- Corner-located electrical box for field wiring from two sides
- Circuit breaker protected loop pump power block for easy wiring
- Relay to control field-mounted accessories
- Field-selectable freeze detection setting for well or closed loop systems
- Loop pump slaving feature allows multiple units to share one flow center (requires Aurora 'Advanced' Control option)

## 5 Series Design Features cont.

### 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 expansion valve delivers optimum refrigerant flow over a wide range of conditions and provides bidirectional operation without troublesome check valves
- Efficient rotary and 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
- Oversized rifled copper tube/lanced aluminum fin air-to-refrigerant heat exchanger provides high efficiencies at low-face velocity with patented 11 element fin design
- Large, low-RPM blowers with Variable Speed ECM or 5-Speed ECM motors provide quiet and efficient air movement with high static capability; optional 3-Speed PSC motors available on single speed units
- 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 compartment and one (on horizontals) or two (on verticals) for the air handling compartment to provide quick access to all internal components with ductwork in place
- Easily accessible thermal 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
- Insulated divider and separate air handling/compressor access panels permit service testing without air bypass
- 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 pump shut-off switch for easy startup and service
- Control box and blower motors have quick-attach wiring plugs for easy removal
- Internal drop-out blower with permanently-lubricated ball bearing motor
- High- and low-pressure service ports in refrigerant circuit.
- Blower and transformer powered from auxiliary heat supply (when installed) to provide emergency heat with open compressor circuit breaker

### 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
- FormiShield Plus™ air coils are double coated for extended life
- Noise reduction features include double isolation mounted compressors and soft starting blower motors; 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- and low-pressure refrigerant controls to protect the compressor, condensate overflow protection, freeze detection sensor to safeguard the coaxial heat exchanger and air coils, blower start detection, hot water high-limit 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 auto-changeover 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
- ECM blower speed control provides higher supply air temperature in heating, better dehumidification in cooling, and quiet operation at reduced airflows in all modes
- Hot water limit prevents scalding, and pump shuts down automatically when full unit capacity is needed for heating
- Communication capability for future expansions

## 5 Series Design Features cont.

### 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) (*Future Availability*): 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 Aurora 'Advanced' Controls (see controls description)
- Optional cupronickel heat exchangers for open loop applications
- Optional hot water generator with internally mounted pump and water heater plumbing connector
- Optional 3-speed PSC motors available on single speed units (4-speed on 012)
- Optional 5-Speed ECM motors available (022-072)
- Optional high static PSC blower motor for high static applications on single speed units (022-048)
- Optional high static ECM blower motor for high static applications on all units from 036 to 049

- Electronic auto-changeover thermostat with 3-stage heating/2-stage cooling and indicator LEDs (non-communicating)
- 24 Volt 1 in. electronic air cleaner
- 90% efficient, cleanable electrostatic filters
- Closed loop flow center in several sizes
- Auxiliary electric heater
- Hose kits
- Additional accessory relay
- AlpinePure 2 in. MERV 13 filter
- AlpinePure 4 in. MERV 11 filter
- IntelliStart soft starter

### 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 9001:2008 certified manufacturing facility
- WaterFurnace International, Inc. engineering labs are ISO 17025 accredited

# The Aurora™ Control System

## Aurora ‘Base’ Control

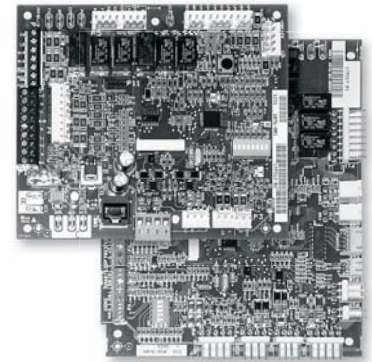
The Aurora ‘Base’ Control (ABC) System is a complete residential and commercial comfort system that brings all aspects of the HVAC system into one cohesive module network. The ABC features microprocessor control and HP, LP, condensate and freeze detection, over/under voltage faults, along with communicating 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 Aurora ‘Base’ Control (ABC) has two Modbus channels. The first channel is configured as a master for connecting to devices such as a communicating thermostat, expansion board, or other slave devices. The second channel is configured as a slave for connecting the Aurora Interface Diagnostics Tool (AID Tool).


## Aurora ‘Advanced’ Control

The Aurora ‘Advanced’ Control expands on the capability of the Aurora ‘Base’ Control (ABC) System by adding the Aurora Expansion Board (AXB). The additional features include compressor current monitoring, loop pump slaving, intelligent hot water generator control, variable speed pump capability, and also allows for optional energy, refrigeration, and performance monitoring factory installed 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.

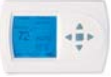






Aurora Control Features	Description	Aurora ‘Base’	Aurora ‘Advanced’
<b>Microprocessor Compressor Control</b>	Microprocessor control of compressor for timings with FP1, HP, LP, Condensate, assignable Acc relay	•	•
<b>Advanced Microprocessor Features</b>	Smart Grid, Home Automation Alarm Inputs, and Accessory2 Relay (HRV/ERV)	-	•
<b>Base Hot Water Generator Operation</b>	Compressor Contactor powers Hot Water Generator Pump with inline circuit breaker and thermostat limit.	•	See below
<b>Advanced Hot Water Generator Control</b>	Microprocessor and separate power relay for Hot Water Generator Pump with digital temperature monitoring and multiple HWG setpoint selection.	-	•
<b>Base Loop Pump Control</b>	Compressor Contactor powers Loop Pump with inline circuit breaker and no loop pump slaving capability.	•	See below
<b>Advanced Speed Pump Control</b>	Microprocessor and separate power relay for loop pump and inline circuit breakers and loop pump slaving.	-	•
<b>Variable Speed Pump</b>	Capable of setup, monitoring and controlling a variable speed flow center.	-	•
<b>Compressor Monitoring</b>	Control monitors compressor starts for high current, missing leg etc.	-	•
<b>Active Dehumidification</b>	Coil temperature is monitored and air flow is reduced for maximum latent moisture removal.	-	7 Series Variable Speed Only
<b>Smart Grid/Utility Input</b>	Allows simple input to externally enable of occupied/unoccupied mode for basic utility time of use programs.	-	Dry Contact x1
<b>Home Automation Alarm Input</b>	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
<b>HAN/Smart Grid Com (AWL and Portal) Kit</b>	Allows direct communication of the Aurora to Smart Meters, Home Automation Network and Internet.	-	Optional AWL
<b>IntelliZone2® Compatibility</b>	IntelliZone requires traditional TStat inputs. IntelliZone2 communicates to the heat pump via the AXB board.	With Optional AXB kit and IntelliZone2	Optional IntelliZone2

## The Aurora Control System cont.

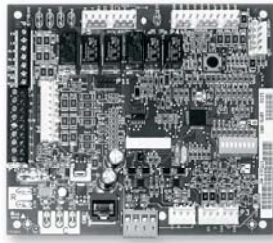
Service Device	Description	Aurora 'Base'	Aurora 'Advanced'
 <p><b>Aurora Interface and Diagnostics (AID) Tool</b></p>	<p>Allows setup, monitoring and troubleshooting of any Aurora Control.</p> <p><b>NOTE:</b> Although the ABC has basic compatibility with all Aurora, new product features may not be available 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.</p>	For Service (Ver. 1.xx or greater)	For Service (Ver. 2.xx or greater)

Add On Control Feature Kits (field or factory installed)	Description	Aurora 'Base'	Aurora 'Advanced'
<b>Geo Energy Monitoring Kit</b>	Monitors realtime power consumption of compressor, blower, aux heat and pump. Requires thermostat TPCM32U03, TPCM32U04, or TPCC32U01. AXB required.	-	Standard
<b>Refrigeration Monitoring Kit</b>	Monitors realtime pressures, temperatures, superheat, and subcooling. AXB required.	-	Optional Sensor Kit
<b>Performance Monitoring Kit</b>	Monitors air and water temperatures, and water flow rate and calculates heat of extraction/rejection. AXB required.	-	Optional Sensor Kit
<b>Data Logging (AWL) Kit</b>	Allows data logging of up to 12 months. AXB required. Can also be temporarily installed.	-	Optional
<b>HAN/Smart Grid Com (AWL and Portal) Kit</b>	Allows direct communication of the Aurora to Smart Meters, HAN, and internet. AXB required.	-	Optional
<b>AXB Kit</b> for advanced hot water generator control, slaving, variable speed pump, IntelliZone2	Added to 5 Series for key features of advanced hot water generator control, advanced loop control/slaving, IntelliZone2 communication, and variable speed pump control.	Optional (field Kit)	Standard

Add On Thermostats and Zoning	Description	Aurora 'Base'	Aurora 'Advanced'
 <p><b>TP32U03/04 - MonoChrome Traditional Y1, Y2 Thermostat</b></p>	Elite Stat with full English fault codes and alerts, traditional Y1, Y2 thermostat	Optional	Optional
 <p><b>TP32S01/02 - Traditional Y1, Y2 Thermostat</b></p>	Traditional Y1, Y2 thermostat	Optional	Optional
 <p><b>TPCM32U03/04 - MonoChrome Communicating Thermostat</b></p>	Elite Stat with full English fault codes and alerts, communicating thermostat. Monochrome thermostat allows instantaneous energy measurement only	Optional	Optional
 <p><b>TPCC32U01 - Color Touchscreen Communicating Thermostat</b></p>	4.3 in. color touchscreen communicating thermostat with full English fault codes and alerts. Color thermostat allows instantaneous energy measurement and 13 month energy usage history.	Optional	Optional
<b>IntelliZone® Zoning Compatibility</b>	IntelliZone® is a non-communicating zoning system requiring Y1, Y2 signals and controls the ECM blower motor directly.	Optional (ECM Preferred)	Optional (IntelliZone2 Preferred)
 <p><b>IntelliZone2® Zoning</b></p>	IntelliZone2® is a communicating zoning system that 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 3 thermostat options (MasterStat, SensorStat, ZoneStat). Requires AXB.	-	Optional (IntelliZone2 Preferred)

## The Aurora 'Base' Control System cont.

### Aurora 'Base' Control



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

### Control Features

#### Software ABC Standard Version 2.0

#### Single or Dual Capacity Compressors

Either single or dual capacity compressors can be operated.

#### Variable Speed ECM Blower Motor Option

A Variable Speed ECM blower motor can be driven directly using the onboard PWM output. Four blower speeds are available based upon the G, Y1, Y2, and W input signals to the board. The blower speeds can be changed either by the ECM manual configurations mode method or by using the Aurora AID Tool directly. All four blower speeds can be set to the same speed if desired.

#### 5-Speed ECM Blower Motor Option

A 5-Speed ECM blower motor will be driven directly using the thermostat connections. Any of the G, Y1, or Y2/W signals can drive any of the 5 available pre-programmed blower speeds on the motor. All 5 Series "G" vintage units will be wired this way at the factory.

### Other Control Features

- 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
- Hot gas reheat operation (where applicable)
- Diagnostic LED
- Test mode push button switch
- Two auxiliary electric heat outputs
- Alarm output
- Accessory output with N.O. and N.C.
- Modbus communication (master)
- Modbus communication (slave)

### Field Selectable Options via Hardware

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

#### Test Mode

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

#### ECM Configuration Mode

The control is placed in the ECM configuration mode by holding the pushbutton switch SW1 for 5 to 10 seconds, the high, low, and "G" ECM speeds can be selected by following the LED display lights. LED2 (yellow) will fast flash when entering the ECM configuration. When setting "G" speed LED3 (green) will be continuously lit, for low speed LED1 (red) will be continuously lit, and for high speed both LED3 (green) and LED1 (red) will be continuously lit. During the ECM configuration mode LED2 (yellow) will flash each of the 12 possible blower speeds 3 times. When the desired speed is flashed press SW1, LED2 will fast flash until SW1 is released. "G" speed has now been selected. Next select low speed, and high speed blower selections following the same process above. After third selection has been made, the control will exit the ECM configuration mode. Aux fan speed will remain at default or current setting and requires the AID Tool for adjustment.

#### Reset Configuration Mode

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

#### DIP Switch (SW2)

- SW2-1** FP1 Selection – Low water coil temperature limit setting for freeze detection. On = 30°F; Off = 15°F.
- SW2-2** FP2 Selection – On = 30°F; Off = N/A
- 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 and 2-5** Access Relay Operation (P2)

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

## The Aurora 'Base' Control System cont.

**Cycle with Blower** - The accessory relay will cycle with the blower output.

**Cycle with Compressor** - The accessory relay will cycle with the compressor output.

**Water Valve Slow Opening** - The accessory relay will cycle and delay both the blower and compressor output for 90 seconds.

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

**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

**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.

### ECM Blower Speeds

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

### Field Selectable Options via Software

(Selectable via the Aurora AID Tool)

#### ECM Blower Speeds

An ECM blower motor can be driven directly using the onboard PWM output. Four blower speeds are available, based upon the "G", Y1 (low), Y2 (high), and Aux input signals to the board. The blower speeds can be changed either by the ECM manual configurations mode method (see ECM Configuration Mode topic) or by using the Aurora AID Tool directly. All four blower speeds can be set to the same speed if desired. Aux blower speed will remain at default or current setting and requires the AID Tool for adjustment.

### 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 Y input 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 Y input call, then the control will go to Lockout mode.

**Lockout** - when locked out, the blower will operate continuously in "G" speed, and PSC blower motor output will remain on. 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, thermostat inputs "Y1", "Y2", and "W" must be removed for at least 3 seconds. To reset lockout conditions with SW2-8 Off, thermostat inputs "Y1", "Y2", "W", and "DH" must be removed for at least 3 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 3 seconds.

**Lockout With Emergency Heat** - if the control is locked out in the heating mode, and a Y2 or W input 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 ECM blower will shift to "G" speed and PSC blower motor output will remain on.

**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 hard-wired 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)** - 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.



## The Aurora 'Base' Control System cont.

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

### Operation Description

**Power Up** - The unit will not operate until all the inputs and safety controls are checked for normal conditions. The unit has a 5 to 80 second random start delay at power up. Then the compressor has a 4 minute anti-short cycle delay after the random start delay.

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

### Heating Operation

**Heating, 1st Stage (Y1)** - The blower is started on "G" speed immediately and the compressor is energized 10 seconds after the Y1 input is received. The ECM blower motor is switched to low speed 15 seconds after the Y1 input.

**Heating, 2nd Stage (Y1, Y2)** - The compressor will be staged to full capacity 20 seconds after Y2 input is received. The ECM blower will shift to high speed 15 seconds after the Y2 input is received.

**Heating, 3rd Stage (Y1, Y2, W)** - The hot water pump is de-energized and the first stage of electric heat is energized 10 seconds after the W command is received. If the demand continues the second stage of electric heat will be energized after 5 minutes.

**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.

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

### Cooling Operation

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.

**Cooling, 1st Stage (Y1, O)** - The blower is started on "G" speed immediately and the compressor is energized 10 seconds after the Y1 input is received. The ECM blower motor is switched to low speed 15 seconds after the Y1 input.

**Cooling, 2nd Stage (Y1, Y2, O)** - The compressor will be staged to full capacity 20 seconds after Y2 input is received. The ECM blower will shift to high speed 15 seconds after the Y2 input is received.

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

**Dehumidification (Y1, O, DH or Y1, Y2, O, DH)** - When a DH command is received from the thermostat during a compressor call for cooling the ECM blower speed will be reduced by 15% to increase dehumidification.

**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.

# The Aurora 'Base' Control System cont.

## Aurora 'Base' 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.

### 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
(Future Use)	Flash Code 3
(Future Use)	Flash Code 4
Load Shed	Flash Code 5
ESD	Flash Code 6
(Future Use)	Flash Code 7

### Configuration LED (LED2, Yellow)

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

### Fault LED (LED1, Red)

Red Fault LED		LED Flash Code*	Lockout	Reset/Remove
ABC Basic Faults	Normal - No Faults	OFF	-	
	Fault - Input	1	No	Auto
	Fault - High Pressure	2	Yes	Hard or Soft
	Fault - Low Pressure	3	Yes	Hard or Soft
	Fault - Freeze Detection FP2	4	Yes	Hard or Soft
	Fault - Freeze Detection FP1	5	Yes	Hard or Soft
	Fault - Condensate Overflow	7	Yes	Hard or Soft
	Fault - Over/Under Voltage	8	No	Auto
	Fault - FP1 & FP2 Sensor Error	11	Yes	Hard or Soft

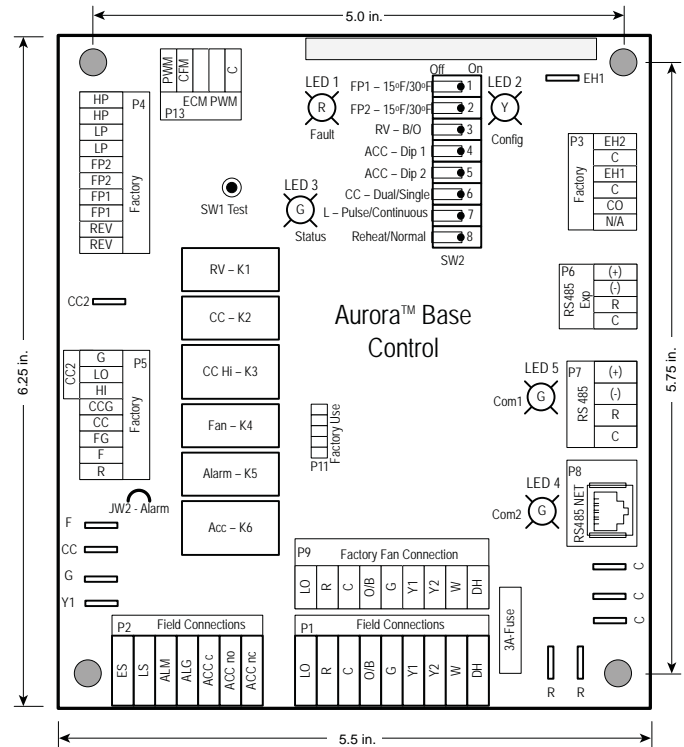
**NOTE:** All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50, etc. are skipped.

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



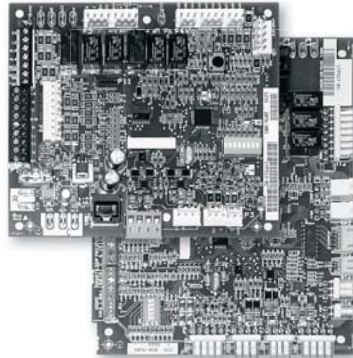
## ABC Control Board Layout



# The Aurora 'Advanced' Control System

## Aurora 'Advanced' Control Features

The Aurora 'Advanced' Control system expands on the capability of the Aurora 'Base' Control (ABC) by adding the Aurora Expansion Board (AXB). All of the preceding features of the Aurora 'Base' Control are included. The following control description is of the additional features and capability of the Aurora advanced control.



It is highly recommended the installing/servicing contractor obtain an Aurora Interface and Diagnostic Tool (AID) and specialized training before attempting to install or service an Aurora 'Advanced' control system.



The additional AXB features include the following:

### AXB DIP Switch

**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 Fan 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

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

In lieu of the 'Base Hot Water Generator Control', the Advanced features an AID Tool selectable temperature limit and microprocessor control of the process. 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 setpoint (100°F - 140°F) for 30 continuous seconds (130°F is the default setting). 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. LED1 (red LED) will flash code 15 when the DHW limit is reached and when conditions are not favorable for water heating. Error code 15 will also be displayed on the AID Tool in the fault screen. This flash code is a noncritical alert and does not necessarily indicate a problem.

### Compressor Monitoring

The AXB includes two current transducers to monitor the compressor current and starting characteristics. High locked rotor amps, open circuits or welded contactor faults will be detected. A fault will produce an E10 code.

### IntelliZone2 Zoning Compatibility (Optional IntelliZone2 Zoning)

A dedicated input to connect and communicate with the IntelliZone2 (IZ2) zoning system is provided on P7. This is a dedicated communication port using a proprietary ModBus protocol. An AXB can be added to other selected ABC-only systems as well. Then an advanced communicating IntelliZone2 zoning system can be added to ABC-only systems. Consult the IntelliZone2 literature for more information.

### 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. 75% 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.

### Modulating Water Valve

This output is provided to drive a modulating water valve. Through advanced design the 0-10VDC 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. 75% and 100% are the default settings respectively.

### Loop Pump Slaving

This input and output are provided so that two units can be slaved together with a common flow center. When either unit has a call for loop pump, 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 slaved together in this fashion.

## The Aurora 'Advanced' Control System cont.

### Advanced Communication Ports

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

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

The '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. With a closed contact signal, this input will limit the operation and thus the power consumption of the unit by one of the below selections. The AID Tool will allow configuration of this input for the action of:

- No Action
- Disable compressor operation until removed
- Go to On Peak thermostat settings until removed [Requires Com T-Stat] (Future Release)
- Compressor limited to 50% or low cap until removed [dual capacity or variable speed only] (Future Release)
- Disable compressor operation for 1/2 hr (can be removed immediately) (Future Release)

Then Flash Code 7 on the Green LED for the 'On Peak' mode. And On Peak will 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 Sensor Kit on 'Advanced' models)

The Energy Monitoring Kit includes two current transducers (blower and electric heat) added to the existing two compressor sensors 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 TPCM32U03/04 will display instantaneous energy use while the color touchscreen TPCC32U01 will in addition display a 13 month history in graph form.

### Refrigerant Monitoring (optional sensor kit)

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 (optional sensor kit)

The optional 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.

# The Aurora ‘Advanced’ Control System cont.

## Special Modes and Applications

### 5-Speed ECM Blower Motor

Normally the 5-Speed ECM motor can be driven off of thermostat signals and the ABC connector P9. Communicating thermostats, however present a special problem in this application since they operate without 24 VAC thermostat signals. The ABC board is wired to operate these systems from the alternate relay output signals CC1, CC2, Fan, and EH1 and should be wired for this.

### 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.

### Dehumidification - Passive

In passive dehumidification mode, the airflow is reduced by 15% from the heating airflow setting. If cooling airflow is set to +5, -5 or -10% of heating airflow it will automatically be set to -15% of heating airflow whenever the dehumidification call is present in the communicating stat or from the thermostat input DH. If the airflow for cooling is already set to -15% no airflow change will be noticed from normal cooling. Dehumidification mode will be shown on the ABC and the communicating thermostats.

## Aurora ‘Advanced’ 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.

### 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
(Future Use)	Flash Code 8
(Future Use)	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

### Fault LED (LED1, Red)

Red Fault LED	LED Flash Code *	Lockout	Reset/Remove	Fault Condition Summary	
Normal - No Faults	Off	-			
ABC Basic Faults	Fault-Input	1	No	Auto	Tstat input error. Autoreset upon condition removal.
	Fault-High Pressure	2	Yes	Hard or Soft	HP switch has tripped (>600 psi)
	Fault-Low Pressure	3	Yes	Hard or Soft	Low Pressure Switch has tripped (<40 psi for 30 continuous sec.)
	Fault-Freeze Detection FP2	4	Yes	Hard or Soft	Freeze protection sensor has tripped (<15 or 30 degF for 30 continuous sec.)
	Fault-Freeze Detection FP1	5	Yes	Hard or Soft	Freeze protection sensor has tripped (<15 or 30 degF for 30 continuous sec.)
	Fault-Condensate Overflow	7	Yes	Hard or Soft	Condensate switch has shown continuity for 30 continuous sec.
	Fault-Over/Under Voltage	8	No	Auto	Instantaneous voltage is out of range. **Controls shut down until resolved.
	Fault-FP1 & 2 Snsr Error	11	Yes	Hard or Soft	If FP1 or 2 Sensor Error
ABC & AXB Advanced Faults	Fault-Compressor Monitor	10	Yes	Hard or Soft	Open Crkt, Run, Start or welded cont
	Non-CriticAXBSnsrErr	13	No	Auto	Any Other Sensor Error
	CriticAXBSnsrErr	14	Yes	Hard or Soft	Sensor Error for EEV or HW
	Alert-HotWtr	15	No	Auto	HW over limit or logic lockout. HW pump deactivated.
	Fault-VarSpdPump	16	No	Auto	Alert is read from PWM feedback.
	Not Used	17	No	Auto	I22 Com Fault. Autoreset upon condition removal.
	Non-CritComErr	18	No	Auto	Any non-critical com error
	Fault-CritComErr	19	No	Auto	Any critical com error. Auto reset upon condition removal
	Alarm - Low Loop Pressure	21	No	Auto	Loop pressure is below 3 psi for more than 3 minutes
	Alarm - Home Automation 1	23	No	Auto	Closed contact input is present on Dig 2 input - Text is configurable
Alarm - Home Automation 2	24	No	Auto	Closed contact input is present on Dig 3 input - Text is configurable	

**NOTES:**

\*All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50 etc. are skipped! Alert' is a noncritical sensor or function that has failed. Normal operation of the heat pump is maintained but service is desired at some point.

## Operation Logic Data Table

Operation Logic Table	Heating					Cooling			
	STG1	STG2	STG3	EMERG	Fan Only	STG1	STG2	Reheat	Fan Only
Compressor	On	On	On	Off	Off	On	On	On	Off
Reversing Valve	Off	Off	Off	Off	Off	On	On	On	On
Aux Heat	Off	Off	Staged	Staged	Off	Off	Off	Off	Off
Acc Relay	On	On	On	Off	Off	On	On	On	Off
Fan Relay (PSC)	On	On	On	On	On	On	On	On	On
Loop Pump	On	On	On	Off	Off	On	On	On	Off
Hot Water	On	On	Off	Off	Off	On	On	NA	Off
5-Speed ECM Speed	Med Low	Med High	High	High	Low	Med Low	Med High	High	Low
ECM Speed	Med	High	Aux	Aux	Low	Med	High	High	Low
T-Stat Signal	Y1	Y1,Y2	Y1,Y2,W	W	G	Y1,O	Y1,Y2,O	DH	G

5/11/12

## Water Quality

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

with extremely hard water, the owner should be informed that the heat exchanger may require occasional flushing.

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

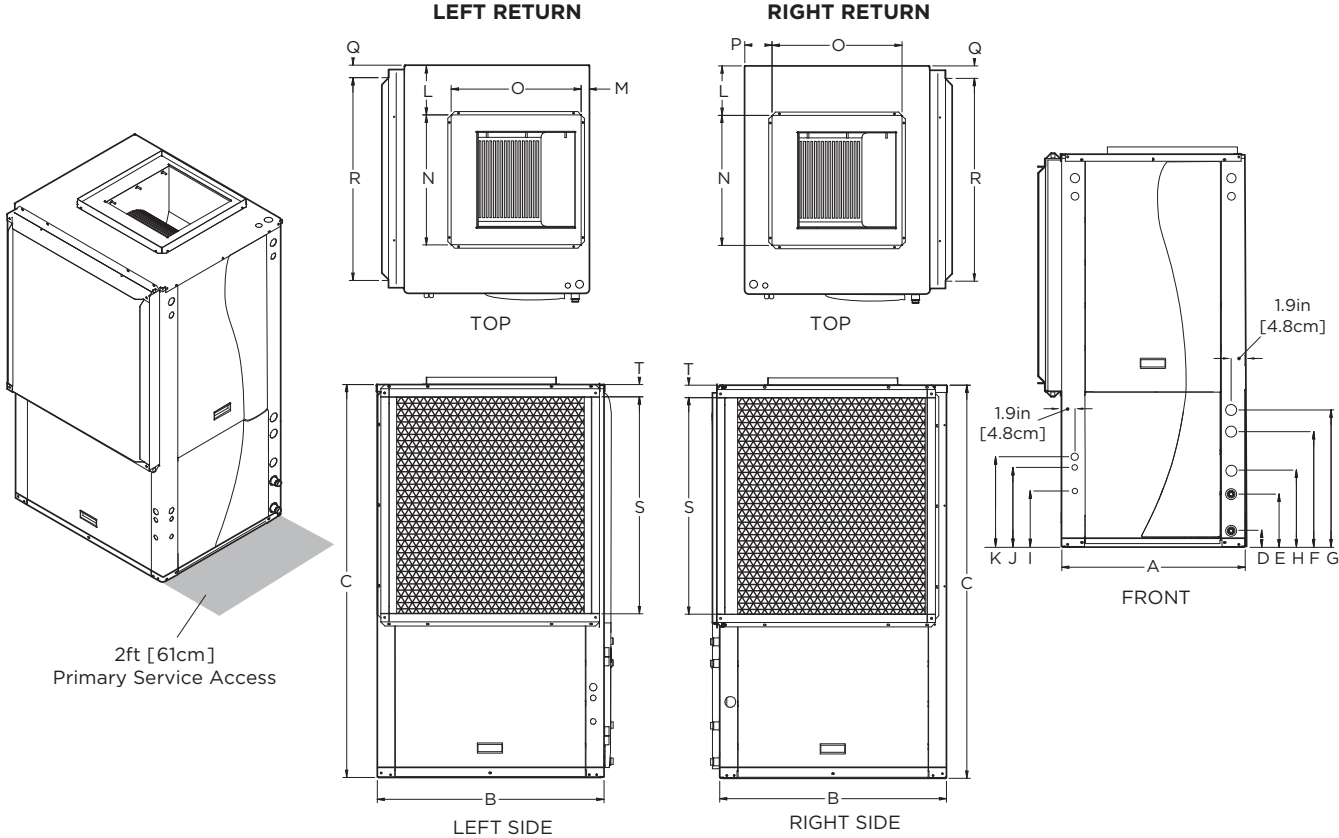
Material		Copper	90/10 Cupronickel	316 Stainless Steel
pH	Acidity/Alkalinity	7 - 9	7 - 9	7 - 9
Scaling	Calcium and Magnesium Carbonate	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm
Corrosion	Hydrogen Sulfide	Less than 0.5 ppm (rotten egg smell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

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

2/22/12

# Vertical Dimensional Data

## Top Air Discharge



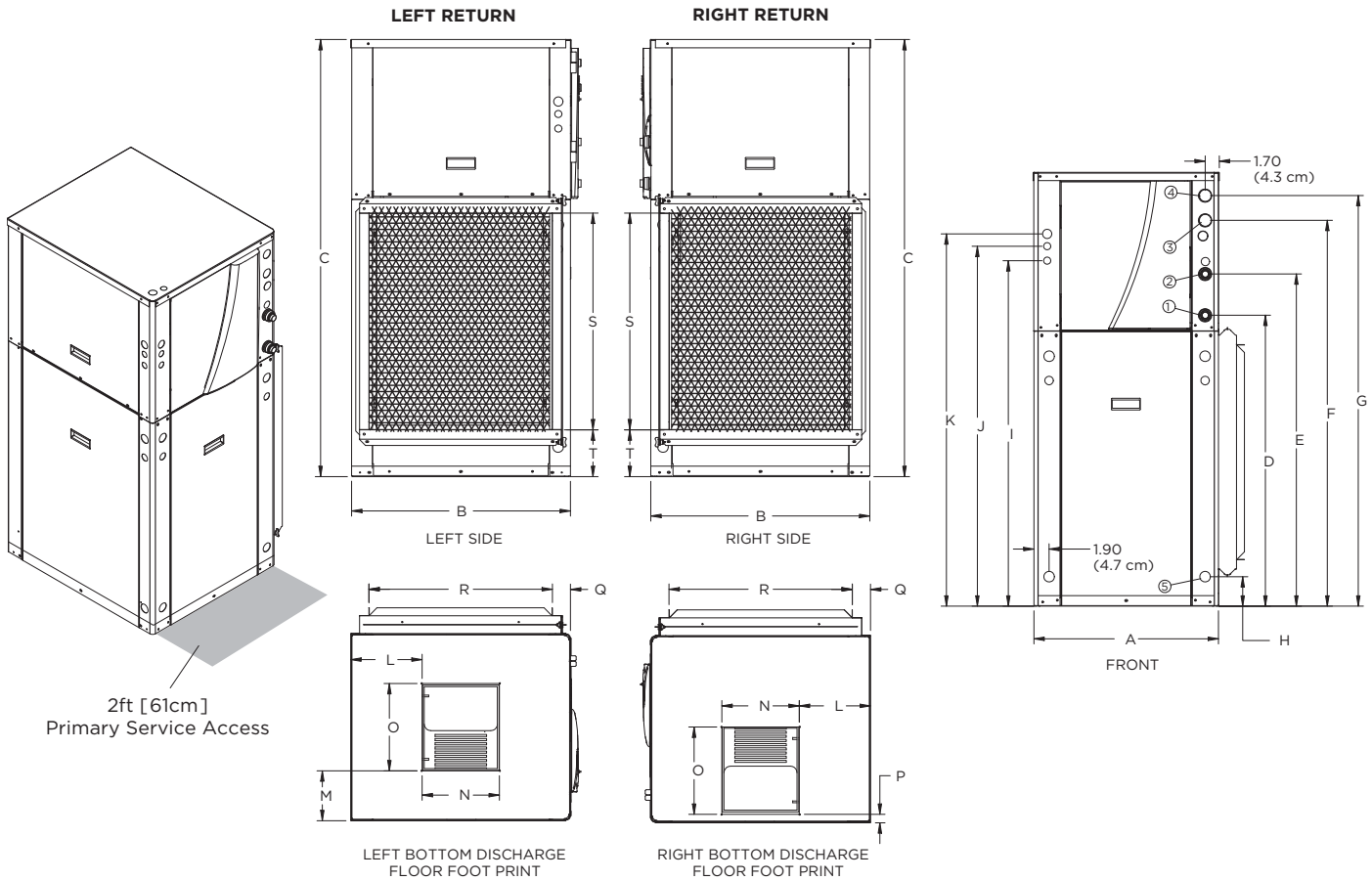
Vertical Top Flow Model	Overall Cabinet			Water Connections							Electrical Connections			Discharge Connection duct flange installed (±0.10 in)					Return Connection using std deluxe filter rack (±0.10 in)				
											I	J	K										
	A	B	C	D	E	F	G	H	Loop Water FPT	HWG Sweat (I.D.)	3/4 in. cond	1/2 in. cond	1/2 in. cond	L	M	N	O	P	Q	R	S	T	
	Width	Depth	Height	Loop In	Loop Out	HWG In	HWG Out	Condensate			Power Supply	Ext Pump	Low Voltage			Supply Width	Supply Depth			Return Depth	Return Height		
012	in.	22.2	22.5	34.5	2.3	5.3	11.9	14.9	8.6	1 in.	1/2 in.	6.9	9.4	11.7	6.1	3.7	10.0	10.0	0.7	2.4	18.1	14.2	1.7
	cm.	56.4	57.2	87.6	5.9	13.5	30.2	37.8	21.8	Swivel	Female	17.5	23.9	29.7	15.5	9.4	25.4	25.4	1.8	6.1	46.0	36.1	4.3
018	in.	22.5	26.5	39.4	2.3	5.3	13.4	16.4	9.6	1 in.	1/2 in.	6.9	9.4	11.7	6.3	0.7	14.0	14.0	2.7	2.3	22.0	18.0	2.0
	cm.	57.2	67.3	100.1	5.8	13.5	34.0	41.7	24.4	Swivel	Female	17.5	23.9	29.7	16.0	1.8	35.6	35.6	6.9	5.8	55.9	45.7	5.1
022-030	in.	22.5	26.5	48.5	2.0	7.0	13.5	16.5	10.2	1 in.	1/2 in.	9.5	12.1	14.3	6.1	0.8	14.0	14.0	4.4	1.7	22.2	26.0	1.7
	cm.	57.2	67.3	123.2	5.1	17.8	34.3	41.9	25.9	Swivel	Female	24.1	30.7	36.3	15.5	2.0	35.6	35.6	11.2	4.3	56.4	66.0	4.3
036-038	in.	25.6	31.6	50.4	2.3	7.3	15.9	18.9	10.6	1 in.	1/2 in.	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	1.7	28.1	26.0	1.7
	cm.	65.0	80.3	128.0	5.8	18.5	40.4	48.0	26.9	Swivel	Female	24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	4.3	71.4	66.0	4.3
042-049	in.	25.6	31.6	54.4	2.3	7.3	15.9	18.9	10.6	1 in.	1/2 in.	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	1.7	28.1	30.0	1.7
	cm.	65.0	80.3	138.2	5.8	18.5	40.4	48.0	26.9	Swivel	Female	24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	4.3	71.4	76.2	4.3
060-072	in.	25.6	31.6	58.4	2.3	7.3	15.9	18.9	10.6	1 in.	1/2 in.	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	1.7	28.1	34.0	1.7
	cm.	65.0	80.3	148.3	5.8	18.5	40.4	48.0	26.9	Swivel	Female	24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	4.3	71.4	86.4	4.3

Condensate is 3/4 in. PVC female glue socket and is switchable from side to front  
 Unit shipped with deluxe 2 in. (field adjustable to 1 in.) duct collar/filter rack extending from unit 3.25 in. and is suitable for duct connection.  
 Discharge flange is field installed and extends 1 in. [25.4 mm] from cabinet  
 Decorative molding and/or water connections extend 1.2 in. [30.5 mm] beyond front of cabinet.  
 Top panel has 1.375 in. and 1.125 in. knockouts for electrical connections.

7/11/12

# Vertical Dimensional Data cont.

## Bottom Air Discharge



Bottom Flow Models	Overall Cabinet			Water Connections						Electrical Knockouts			Discharge Connection duct flange installed (±0.10 in)					Return Connection using std deluxe filter rack (±0.10 in)					
				1	2	3	4	5	I 3/4 in. cond	J 1/2 in. cond	K 1/2 in. cond												
	A	B	C	D	E	F	G	H	Loop Water FPT	HWG Sweat (I.D.)	Power Supply	Ext Pump	Low Voltage	L	M	N Supply Width	O Supply Depth	P	Q	R Return Depth	S Return Height	T	
<b>022-</b>	in.	22.5	26.5	52.5	35.3	40.2	46.7	49.7	3.6	1 in.	1/2 in.	41.9	43.6	45.1	8.6	6.0	9.3	10.5	1.0	2.2	22.2	26.0	5.6
<b>030</b>	cm.	57.2	67.3	133.4	89.7	102.1	118.6	126.2	9.1	Swivel	Female	106.4	110.7	114.6	21.8	15.2	23.6	26.7	2.5	5.6	56.4	66.0	14.2
<b>036-</b>	in.	25.5	31.5	62.5	43.4	48.4	57.0	60.0	3.6	1 in.	1/2 in.	48.9	50.8	52.2	9.1	4.8	13.4	13.6	1.5	1.8	28.1	34.0	5.6
<b>072</b>	cm.	64.8	80.0	158.8	110.2	122.9	144.8	152.4	9.1	Swivel	Female	124.2	129.0	132.6	23.1	12.2	34.0	34.5	3.8	4.6	71.4	86.4	14.2

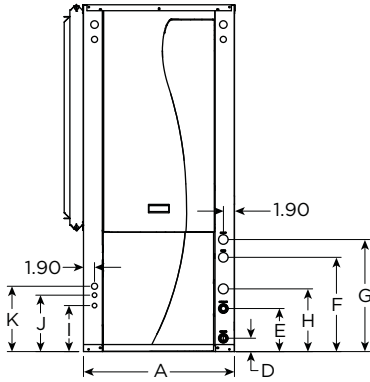
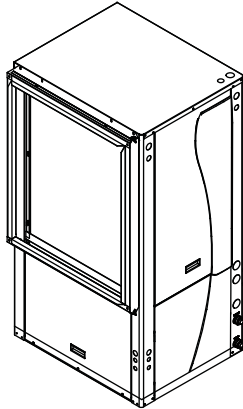
Condensate is 3/4 in. PVC female glue socket and is switchable from side to front  
 Vertical bottom flow unit shipped with deluxe 2 in. (field adjustable to 1 in.) duct collar/filter rack extending from unit 3.25 in. and is suitable for duct connection.  
 Decorative molding and water connections extend 1.2 in. (30.5mm) beyond front of cabinet.  
 Top panel has 1.375 in. and 1.125 in. knockouts for electrical connections.

7/11/12

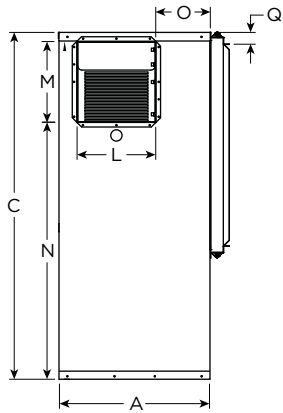


# Vertical Dimensional Data cont.

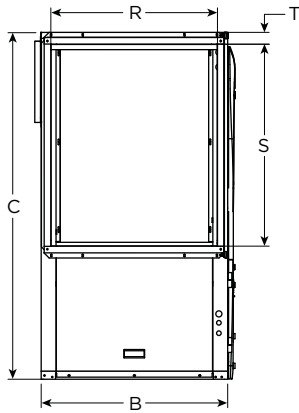
## Rear Air Discharge



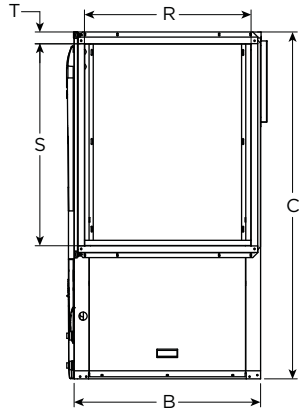
FRONT



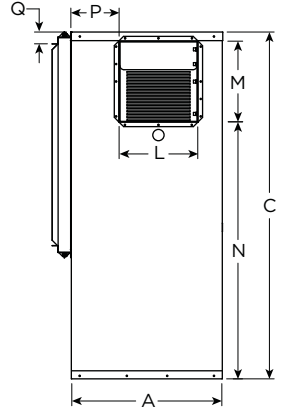
REAR VIEW  
LEFT RETURN



SIDE VIEW  
LEFT RETURN



SIDE VIEW  
RIGHT RETURN



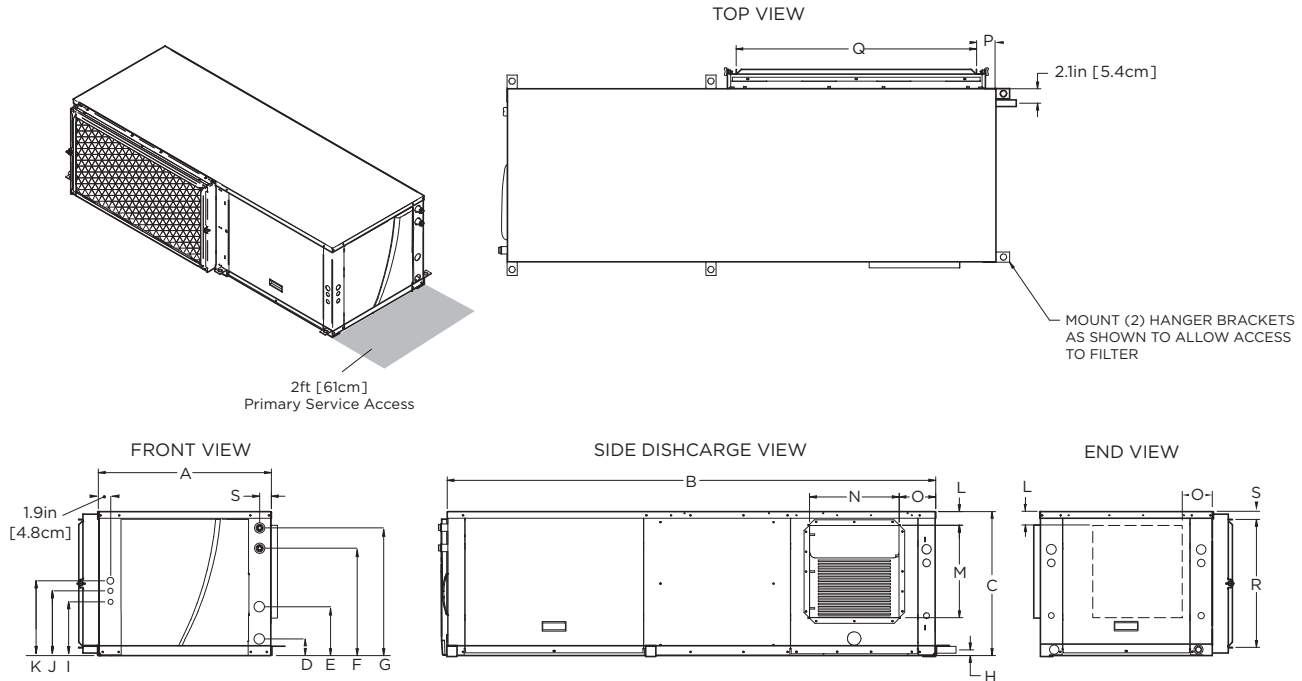
REAR VIEW  
RIGHT RETURN

Vertical Rear Discharge Models	Overall Cabinet			Water Connections							Electrical Connections			Discharge Connection duct flange installed (±0.10 in)					Return Connection using std deluxe filter rack (±0.10 in)				
	A	B	C	D	E	F	G	H	Loop Water FPT	HWG Sweat (I.D.)	I	J	K	L	M	N	O	P	Q	R	S	T	
	Width	Depth	Height	Loop In	Loop Out	HWG In	HWG Out	Condensate			3/4 in. cond	1/2 in. cond	1/2 in. cond										Supply Width
	in.	cm.	in.	cm.	in.	cm.	in.	cm.	in.	cm.	in.	cm.	in.	cm.	in.	cm.	in.	cm.	in.	cm.	in.	cm.	in.
<b>042-</b>	in.	25.6	31.6	54.4	2.3	7.3	15.9	18.9	10.6	1"	1/2"	9.5	12.1	14.3	13.3	13.6	39.4	9.1	8.1	1.7	28.1	30.0	1.7
<b>049</b>	cm.	65.0	80.3	138.2	5.8	18.5	40.4	48.0	26.9			Swivel	female	24.1	30.7	36.3	33.8	34.5	100.1	23.1	20.6	4.3	71.4
<b>060-</b>	in.	25.6	31.6	58.4	2.3	7.3	15.9	18.9	10.6	1"	1/2"	9.5	12.1	14.3	13.3	13.6	43.4	9.1	8.1	1.7	28.1	34.0	1.7
<b>072</b>	cm.	65.0	80.3	148.3	5.8	18.5	40.4	48.0	26.9			Swivel	female	24.1	30.7	36.3	33.8	34.5	110.2	23.1	20.6	4.3	71.4

Condensate is 3/4 in. PVC female glue socket and is switchable from side to front  
 Unit shipped with deluxe 2 in. (field adjustable to 1 in.) duct collar/filter rack extending from unit 3.25 in. and is suitable for duct connection.  
 Discharge flange is field installed and extends 1 in. [25.4mm] from cabinet  
 Decorative molding and water connections extend 1.2 in. [30.5mm] beyond front of cabinet.  
 Top panel has 1.375 in. and 1.125 in. knockouts for electrical connections.

7/11/12

# Horizontal Dimensional Data



AS SHOWN LR UNIT (RR UNIT ON OPPOSITE SIDE—SAME DIMENSIONS)

Horizontal Model	Overall Cabinet			Water Connections								Electrical Connections			Discharge Connection duct flange installed (±0.10 in)				Return Connection using std deluxe filter rack (±0.10 in)			
	A	B	C	D	E	F	G	H	Loop Water FPT	HWG Sweat (I.D.)	I 3/4 in. cond Power Supply	J 1/2 in. cond Ext Pump	K 1/2 in. cond Low Voltage	L	M	N	O	P	Q	R	S	
	Width	Depth	Height	In	Out	HWG In	HWG Out	Condensate							Supply Height	Supply Depth			Return Depth	Return Height		
012	in.	22.5	44.0	17.3	2.3	5.3	11.9	8.0	1 in.	1/2 in.	6.9	9.5	11.7	4.1	7.3	9.7	5.8	1.7	17.8	14.6	1.4	
	cm.	57.2	111.8	43.9	5.8	13.5	30.2	37.8	20.3	Swivel	Female	17.5	24.1	29.7	10.4	18.5	24.6	14.7	4.3	45.2	37.1	3.6
018	in.	22.5	53.0	19.3	2.3	5.3	13.8	16.8	8.0	1 in.	1/2 in.	6.9	9.5	11.7	1.8	10.5	9.5	8.2	2.2	21.8	16.5	1.5
	cm.	57.2	134.6	49.0	5.8	13.5	35.1	42.7	20.3	Swivel	Female	17.5	24.1	29.7	4.6	26.7	24.1	20.8	5.6	55.4	41.9	3.8
022-030	in.	22.5	63.0	19.3	2.0	7.0	13.5	16.5	0.8	1 in.	1/2 in.	9.5	12.1	14.3	2.3	10.5	9.4	5.8	2.8	30.5	16.9	1.3
	cm.	57.2	160.0	49.0	5.1	17.8	34.3	41.9	2.0	Swivel	Female	24.1	30.7	36.3	5.8	26.7	23.9	14.7	7.1	77.5	42.9	3.3
036-038	in.	25.6	72.0	21.3	2.3	7.3	15.9	18.9	0.8	1 in.	1/2 in.	9.5	12.1	14.3	SEE	13.6	13.2	SEE	2.8	35.5	18.9	1.3
	cm.	65.0	182.9	54.1	5.8	18.5	40.4	48.0	2.0	Swivel	Female	24.1	30.7	36.3	CHART	34.5	33.5	CHART	7.1	90.2	48.0	3.3
042-049	in.	25.6	77.0	21.3	2.3	7.3	15.9	18.9	0.8	1 in.	1/2 in.	9.5	12.1	14.3	SEE	13.6	13.2	SEE	2.8	40.4	18.9	1.3
	cm.	65.0	195.6	54.1	5.8	18.5	40.4	48.0	2.0	Swivel	Female	24.1	30.7	36.3	CHART	34.5	33.5	CHART	7.1	102.6	48.0	3.3
060-072	in.	25.6	82.0	21.3	2.3	7.3	15.9	18.9	0.8	1 in.	1/2 in.	9.5	12.1	14.3	SEE	13.6	13.2	SEE	2.8	45.4	18.9	1.3
	cm.	65.0	208.3	54.1	5.8	18.5	40.4	48.0	2.0	Swivel	Female	24.1	30.7	36.3	CHART	34.5	33.5	CHART	7.1	115.3	48.0	3.3

Condensate is 3/4 in. PVC female glue socket and is switchable from side to front  
 Unit shipped with deluxe 2 in. (field adjustable to 1 in.) duct collar/filter rack extending from unit 3.25 in. and is suitable for duct connection.  
 Discharge flange is field installed and extends 1 in. [25.4mm] from cabinet  
 Decorative molding and/or water connections extend 1.2 in. [30.5mm] beyond front of cabinet.

7/11/12

Units Not Shown Above		L	O
Right Return End Discharge	in	2.8	4.6
	cm	7.1	11.8
Right Return Side Discharge	in	4.9	6.9
	cm	12.4	17.5
Left Return End Discharge	in	4.9	7.6
	cm	12.4	19.4
Left Return Side Discharge	in	2.8	6.9
	cm	7.1	17.5

# Physical Data

## Single Speed

Model		Single Speed								
		012	018	022	030	036	042	048	060	070
Compressor (1 each)		Rotary			Scroll					
Factory Charge R-410A, oz [kg]	Vertical	42 [1.19]	40 [1.13]	62 [1.76]	80 [2.26]	84 [2.38]	92 [2.60]	100 [2.83]	120 [3.40]	150 [4.25]
Factory Charge R-410A, oz [kg]	Horizontal	42 [1.19]	40 [1.13]	60 [1.70]	80 [2.26]	84 [2.38]	92 [2.60]	100 [2.83]	120 [3.40]	122 [3.46]
<b>Blower Motor and Blower</b>										
Blower Motor Type/Speeds	VS ECM	N/A	Variable Speed ECM							
	5-Spd ECM	N/A			5-Speed ECM					
	PSC	PSC - 4 Speeds	PSC - 3 Speeds							
Blower Motor - hp [W]	VS ECM	N/A	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1 [746]	1 [746]
	5-Spd ECM	N/A			1/2 [373]	1/2 [373]	1 [746]	1 [746]	1 [746]	1 [746]
	PSC	1/10 [75]	1/6 [134]	1/5 [149]	1/3 [249]	1/2 [373]	1/2 [373]	1/2 [373]	1 [746]	1 [746]
High Static Blower Motor - hp [W]	VS ECM	N/A				1 [746]	1 [746]	1 [746]	N/A	
	PSC	N/A		1/3 [249]	1/3 [249]	1/2 [373]	3/4 [560]	3/4 [560]	N/A	
Blower Wheel Size (Dia x W), in. [mm]	VS ECM & 5-Spd ECM	N/A	9 x 7 [229 x 178]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
	PSC	6 x 8 [152 x 203]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	10 x 10 [254 x 254]	10 x 10 [254 x 254]	10 x 10 [254 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
High Static Blower Wheel Size (Dia x W), in. [mm]	VS ECM	N/A				11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	N/A	
	PSC	N/A		9 x 7 [229 x 178]	9 x 7 [229 x 178]	10 x 10 [254 x 254]	10 x 10 [254 x 254]	10 x 10 [254 x 254]	N/A	
<b>Coax and Water Piping</b>										
Water Connections Size - Swivel - in. [mm]	1 [25.4]		1 [25.4]	1 [25.4]	1 [25.4]	1 [25.4]	1 [25.4]	1 [25.4]	1 [25.4]	1 [25.4]
Hot Water Generator Connection Size - Female Sweat I.D. - in. [mm]	N/A		1/2 [12.7]	1/2 [12.7]	1/2 [12.7]	1/2 [12.7]	1/2 [12.7]	1/2 [12.7]	1/2 [12.7]	1/2 [12.7]
Coax and Piping Water Volume - gal [L]	0.35 [1.3]		0.40 [1.5]	0.7 [2.6]	1.0 [3.8]	1.3 [4.9]	1.3 [4.9]	1.6 [6.1]	1.6 [6.1]	2.3 [8.7]
<b>Vertical</b>										
Air Coil Dimensions (H x W), in. [mm]	16 x 16 [406 x 406]	19 x 20 [483 x 508]	24 x 20 [610 x 542]	28 x 20 [711 x 542]	28 x 25 [711 x 635]	32 x 25 [813 x 635]	32 x 25 [813 x 635]	36 x 25 [914 x 635]	36 x 25 [914 x 635]	
Air Coil Total Face Area, ft <sup>2</sup> [m <sup>2</sup> ]	1.8 [0.167]	2.6 [0.242]	3.3 [0.310]	3.9 [0.362]	4.9 [0.451]	5.6 [0.570]	5.6 [0.570]	6.3 [0.641]	6.3 [0.641]	
Air Coil Tube Size, in. [mm]	3/8 [9.5]	5/16 [7.9]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	
Air Coil Number of Rows	3	3	3	3	3	3	3	4	4	
Filter Standard - 2 in. [51 mm] Pleated MERV 11 Throwaway, in. [mm]	16 x 20 [406 x 508]	20 x 24 [508 x 610]	28 x 24 [712 x 610]	28 x 24 [712 x 610]	28 x 30 [712 x 762]	32 x 30 [813 x 762]	32 x 30 [813 x 762]	36 x 30 [914 x 762]	36 x 30 [914 x 762]	
Weight - Operating, lb [kg]	165 [75]	200 [91]	293 [133]	308 [140]	353 [160]	368 [167]	408 [185]	443 [201]	468 [212]	
Weight - Packaged, lb [kg]	185 [84]	220 [100]	313 [142]	328 [149]	373 [169]	388 [176]	428 [194]	463 [210]	488 [221]	
<b>Horizontal</b>										
Air Coil Dimensions (H x W), in. [mm]	16 x 16 [406 x 406]	18 x 21 [457 x 533]	18 x 27 [457 x 686]	18 x 30 [457 x 762]	20 x 35 [508 x 889]	20 x 40 [508 x 1016]	20 x 40 [508 x 1016]	20 x 45 [508 x 1143]	20 x 45 [508 x 1143]	
Air Coil Total Face, ft <sup>2</sup> [m <sup>2</sup> ]	1.8 [0.167]	2.6 [0.242]	3.4 [0.316]	3.9 [0.362]	4.9 [0.451]	5.6 [0.570]	5.6 [0.570]	6.3 [0.641]	6.3 [0.641]	
Air Coil Tube Size, in. [mm]	3/8 [9.5]	5/16 [7.9]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	
Air Coil Number of Rows	3	3	3	3	3	3	3	3	3	
Filter Standard - 2 in. [51 mm] Pleated MERV 11 Throwaway, in. [mm]	1-16 x 20 [406 x 508]	1-18 x 24 [457 x 610]	1-18 x 32 [457 x 813]	1-18 x 32 [457 x 813]	1-20 x 37 [686 x 940]	1-20 x 20 [508 x 508] 1-20 x 22 [508 x 559]	1-20 x 20 [508 x 508] 1-20 x 22 [508 x 559]	1-20 x 25 [508 x 635] 1-20 x 22 [508 x 559]	1-20 x 25 [508 x 635] 1-20 x 22 [508 x 559]	
Weight - Operating, lb [kg]	165 [75]	200 [91]	300 [136]	315 [143]	368 [167]	403 [183]	418 [190]	453 [205]	478 [217]	
Weight - Packaged, lb [kg]	185 [84]	220 [100]	320 [145]	335 [152]	388 [176]	423 [192]	438 [199]	473 [215]	498 [226]	

## Physical Data cont.

### Dual Capacity

Model		Dual Capacity				
		026	038	049	064	072
Compressor (1 each)		Copeland UltraTech, Dual Capacity Scroll				
Factory Charge R-410A, oz [kg]	Vertical	60 [1.70]	82 [2.32]	93 [2.63]	128 [3.63]	138 [3.91]
Factory Charge R-410A, oz [kg]	Horizontal	60 [1.70]	82 [2.32]	93 [2.63]	128 [3.63]	138 [3.91]
<b>Blower Motor and Blower</b>						
Blower Motor Type/Speeds	VS ECM	Variable Speed ECM				
	5-Spd ECM	5-Speed ECM				
Blower Motor- hp [W]	VS ECM	1/2 [373]	1/2 [373]	1/2 [373]	1 [746]	1 [746]
	5-Spd ECM	1/2 [373]	1/2 [373]	1 [746]	1 [746]	1 [746]
High Static Blower Motor - hp [W]	VS ECM	N/A	1 [746]	1 [746]	N/A	
Blower Wheel Size (Dia x W), in. [mm]	VS ECM	9 x 7 [229 x 178]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
	5-Spd ECM	9 x 7 [229 x 178]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
High Static Blower Wheel Size - [Dia. x W], in. [mm]	VS ECM	N/A	11 x 10 [279 x 254]	11 x 10 [279 x 254]	N/A	
<b>Coax and Water Piping</b>						
Water Connections Size - Swivel - in. [mm]		1 [25.4]	1 [25.4]	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]	1/2 [12.7]	1/2 [12.7]
Coax and Piping Water Volume - gal [l]		0.7 [2.6]	1.3 [4.9]	1.6 [6.1]	1.6 [6.1]	2.3 [8.7]
<b>Vertical</b>						
Air Coil Dimensions (H x W), in. [mm]		24 x 20 [610 x 542]	28 x 25 [711 x 635]	32 x 25 [813 x 635]	36 x 25 [914 x 635]	36 x 25 [914 x 635]
Air Coil Total Face Area, ft <sup>2</sup> [m <sup>2</sup> ]		3.3 [0.310]	4.9 [0.451]	5.6 [0.570]	6.3 [0.641]	6.3 [0.641]
Air Coil Tube Size, in. [mm]		3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of Rows		3	3	3	4	4
Filter Standard - 2 in. [51 mm] Pleated MERV 11 Throwaway, in. [mm]		28 x 24 [712 x 610]	28 x 30 [712 x 762]	32 x 30 [813 x 762]	36 x 30 [914 x 762]	36 x 30 [914 x 762]
Weight - Operating, lb [kg]		293 [133]	358 [162]	408 [185]	453 [205]	468 [212]
Weight - Packaged, lb [kg]		313 [142]	378 [172]	428 [194]	473 [215]	488 [221]
<b>Horizontal</b>						
Air Coil Dimensions (H x W), in. [mm]		18 x 27 [457 x 686]	20 x 35 [508 x 889]	20 x 40 [508 x 1016]	20 x 45 [508 x 1143]	20 x 45 [508 x 1143]
Air Coil Total Face Area, ft <sup>2</sup> [m <sup>2</sup> ]		3.4 [0.316]	4.9 [0.451]	5.6 [0.570]	6.3 [0.641]	6.3 [0.641]
Air Coil Tube Size, in. [mm]		3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of Rows		3	3	3	4	4
Filter Standard - 2 in. [51 mm] Pleated MERV 11 Throwaway, in [mm]		1 - 18 x 32 [457 x 813]	1 - 20 x 37 [686 x 940]	1 - 20 x 20 [508 x 508] 1 - 20 x 22 [508 x 559]	1 - 20 x 25 [508 x 635] 1 - 20 x 22 [508 x 559]	1 - 20 x 25 [508 x 635] 1 - 20 x 22 [508 x 559]
Weight - Operating, lb [kg]		300 [136]	368 [167]	418 [190]	463 [210]	480 [218]
Weight - Packaged, lb [kg]		320 [145]	388 [176]	438 [199]	483 [219]	500 [227]

2/29/12

## Auxiliary Heat Ratings

Model	kW		Stages	Btu/h		Min cfm	Model Size Compatibility					
	208V	230V		208V	230V		012	018	022	026 - 030	036 - 042	048 - 072
EAS(H)4	2.9	3.8	1	9,700	12,900	250	•					
EAM(H)5	3.6	4.8	1	12,300	16,300	450		•	•	•		
EAM(H)8	5.7	7.6	2	19,400	25,900	550		•	•	•		
EAM(H)10	7.2	9.6	2	24,600	32,700	650				•		
EAL(H)10	7.2	9.6	2	24,600	32,700	1100					•	•
EAL(H)15	10.8	14.4	3	36,900	49,100	1250					•	•
EAL(H)20	14.4	19.2	4	49,200	65,500	1500						•

Order the "H" part number when installed on horizontal and vertical rear discharge units  
Air flow level for auxiliary heat (Aux) must be above the minimum cfm in this table

5/8/12

## Auxiliary Heat Electrical Data

Model	Supply Circuit	Heater Amps		Min Circuit Amp		Fuse (USA)		Fuse (CAN)		CKT BRK	
		208 V	240 V	208 V	240 V	208 V	240 V	208 V	240 V	208 V	240 V
<b>EAS(H)4</b>	Single	13.7	15.8	17.9	20.5	20	20	20	20	20	20
<b>EAM(H)5</b>	Single	17.3	20.0	26.7	30.0	30	30	30	30	30	30
<b>EAM(H)8</b>	Single	27.5	31.7	39.3	44.6	40	45	40	45	40	45
<b>EAM(H)10</b>	Single	34.7	40.0	48.3	55.0	50	60	50	60	50	60
<b>EAL(H)10</b>	Single	34.7	40.0	53.3	60.0	60	60	60	60	60	60
<b>EAL(H)15</b>	Single	52.0	60.0	75.0	85.0	80	90	80	90	70	100
	L1/L2	34.7	40.0	53.3	60.0	60	60	60	60	60	60
	L3/L4	17.3	20.0	21.7	25.0	25	25	25	25	20	30
<b>EAL(H)20</b>	Single	69.3	80.0	96.7	110.0	100	110	100	110	100	100
	L1/L2	34.7	40.0	53.3	60.0	60	60	60	60	60	60
	L3/L4	34.7	40.0	43.3	50.0	45	50	45	50	40	50

All heaters rated single phase 60 cycle and include unit blower load  
All fuses type "D" time delay (or HACR circuit breaker in USA)  
Supply wire size to be determined by local codes

2/11/12

## Electrical Data

### Single Speed Unit with Variable Speed ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/HACR
			MCC	RLA	LRA	LRA**						
018	208-230/60/1	197/253	10.4	6.7	33.5	n/a	0.4	5.4	4.0	16.5	18.1	20
022	208-230/60/1	197/253	14.0	9.0	48.0	17.0	0.4	5.4	4.0	18.8	21.0	30
030	208-230/60/1	197/253	20.0	12.8	58.3	21.0	0.4	5.4	4.0	22.6	25.8	35
036	208-230/60/1	197/253	22.0	14.1	73.0	26.0	0.4	5.4	4.0	23.9	27.4	40
036*	208-230/60/1	197/253	22.0	14.1	73.0	26.0	0.4	5.4	7.0	26.9	30.4	40
042	208-230/60/1	197/253	26.0	16.6	79.0	28.0	0.4	5.4	4.0	26.4	30.6	45
042*	208-230/60/1	197/253	26.0	16.6	79.0	28.0	0.4	5.4	7.0	29.4	33.6	50
048	208-230/60/1	197/253	31.0	19.8	109.0	38.0	0.4	5.4	4.0	29.6	34.6	50
048*	208-230/60/1	197/253	31.0	19.8	109.0	38.0	0.4	5.4	7.0	32.6	37.6	50
060	208-230/60/1	197/253	41.2	26.4	134.0	47.0	0.4	5.4	7.0	39.2	45.8	70
070	208-230/60/1	197/253	44.2	28.3	178.0	63.0	0.4	5.4	7.0	41.1	48.2	70

\* With optional 1 hp ECM motor

\*\* With optional IntelliStart®

Rated voltage of 208/230/60/1

All fuses Class RK-5

HACR circuit breaker in USA only

4/6/12

### Single Speed Unit with 5-Speed ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/HACR
			MCC	RLA	LRA	LRA**						
022	208-230/60/1	197/253	14.0	9.0	48.0	17.0	0.4	5.4	4.1	18.9	21.1	30
030	208-230/60/1	197/253	20.0	12.8	58.3	21.0	0.4	5.4	4.1	22.7	25.9	35
036	208-230/60/1	197/253	22.0	14.1	73.0	26.0	0.4	5.4	4.1	24.0	27.5	40
042	208-230/60/1	197/253	26.0	16.6	79.0	28.0	0.4	5.4	7.6	30.0	34.2	50
048	208-230/60/1	197/253	31.0	19.8	109.0	38.0	0.4	5.4	7.6	33.2	38.2	50
060	208-230/60/1	197/253	41.2	26.4	134.0	47.0	0.4	5.4	7.6	39.8	46.4	70
070	208-230/60/1	197/253	44.2	28.3	178.0	63.0	0.4	5.4	7.6	41.7	48.8	70

\*\* With optional IntelliStart®

Rated voltage of 208/230/60/1

All fuses Class RK-5

HACR circuit breaker in USA only

4/6/12

### Single Speed Unit with PSC Motor

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/HACR
			MCC	RLA	LRA	LRA**						
012	208-230/60/1	197/253	7.7	4.9	25.0	n/a	-	5.4	0.6	10.9	12.2	15
018	208-230/60/1	197/253	10.4	6.7	33.5	n/a	0.4	5.4	1.1	13.6	15.2	20
022	208-230/60/1	197/253	14.0	9.0	48.0	17.0	0.4	5.4	1.2	16.0	18.2	25
022*	208-230/60/1	197/253	14.0	9.0	48.0	17.0	0.4	5.4	1.5	16.3	18.5	25
030	208-230/60/1	197/253	20.0	12.8	58.3	21.0	0.4	5.4	1.5	20.1	23.3	35
030*	208-230/60/1	197/253	20.0	12.8	58.3	21.0	0.4	5.4	2.8	21.4	24.6	35
036	208-230/60/1	197/253	22.0	14.1	73.0	26.0	0.4	5.4	2.8	22.7	26.2	40
036*	208-230/60/1	197/253	22.0	14.1	73.0	26.0	0.4	5.4	3.5	23.4	26.9	40
042	208-230/60/1	197/253	26.0	16.6	79.0	28.0	0.4	5.4	3.5	25.9	30.1	45
042*	208-230/60/1	197/253	26.0	16.6	79.0	28.0	0.4	5.4	4.6	27.0	31.2	45
048	208-230/60/1	197/253	31.0	19.8	109.0	38.0	0.4	5.4	3.5	29.1	34.1	50
048*	208-230/60/1	197/253	31.0	19.8	109.0	38.0	0.4	5.4	4.6	30.2	35.2	50
060	208-230/60/1	197/253	41.2	26.4	134.0	47.0	0.4	5.4	5.9	38.1	44.7	70
070	208-230/60/1	197/253	44.2	28.3	158.0	63.0	0.4	5.4	5.9	41.8	49.3	70

\* With optional high static motor

\*\* With optional IntelliStart®

Rated voltage of 208/230/60/1

All fuses Class RK-5

HACR circuit breaker in USA only

4/6/12

## Electrical Data cont.

### Dual Capacity Unit with Variable Speed ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/HACR
			MCC	RLA	LRA	LRA**						
<b>026</b>	208-230/60/1	197/253	18.2	11.6	58.3	21.0	0.4	5.4	4.0	21.4	24.4	35
<b>038</b>	208-230/60/1	197/253	23.8	15.2	83.0	30.0	0.4	5.4	4.0	25.0	28.8	40
<b>038*</b>	208-230/60/1	197/253	23.8	15.2	83.0	30.0	0.4	5.4	7.0	28.0	31.8	50
<b>049</b>	208-230/60/1	197/253	33.0	21.1	104.0	37.0	0.4	5.4	4.0	30.9	36.2	50
<b>049*</b>	208-230/60/1	197/253	33.0	21.1	104.0	37.0	0.4	5.4	7.0	33.9	39.2	60
<b>064</b>	208-230/60/1	197/253	42.3	27.1	152.9	54.0	0.4	5.4	7.0	39.9	46.6	70
<b>072</b>	208-230/60/1	197/253	46.3	29.6	179.2	63.0	0.4	5.4	7.0	42.4	49.8	70

\* With optional 1 hp ECM motor

4/6/12

\*\* With optional IntelliStart®

Rated voltage of 208/230/60/1

All fuses Class RK-5

HACR circuit breaker in USA only

### Dual Capacity Unit with 5-Speed ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/HACR
			MCC	RLA	LRA	LRA**						
<b>026</b>	208-230/60/1	197/253	18.2	11.6	58.3	21.0	0.4	5.4	4.1	21.5	24.5	35
<b>038</b>	208-230/60/1	197/253	23.8	15.2	83.0	30.0	0.4	5.4	4.1	25.1	28.9	40
<b>049</b>	208-230/60/1	197/253	33.0	21.1	104.0	37.0	0.4	5.4	7.6	34.5	39.8	60
<b>064</b>	208-230/60/1	197/253	42.3	27.1	152.9	54.0	0.4	5.4	7.6	40.5	47.2	70
<b>072</b>	208-230/60/1	197/253	46.3	29.6	179.2	63.0	0.4	5.4	7.6	43.0	50.4	80

\*\* With optional IntelliStart®

4/6/12

Rated voltage of 208/230/60/1

All fuses Class RK-5

HACR circuit breaker in USA only

## Blower Performance Data

### Single Speed Unit with Variable Speed ECM Motor

Model	Max ESP	Airflow Speed Settings											
		1	2	3	4	5	6	7	8	9	10	11	12
018	0.50	300	400 G	<b>500</b>	<b>600</b> L	<b>700</b> H	<b>800</b>	875	950	1025	1125 Aux		
022	0.50		400	500 G	<b>600</b> L	<b>700</b> H	<b>800</b> H	<b>900</b>	1000	1100	1200 Aux		
030	0.50		400	500 G	600	<b>700</b> L	<b>800</b>	<b>900</b> H	<b>1000</b>	<b>1100</b>	1200 Aux		
036	0.50	650	750	850 G	1000	<b>1100</b> L	<b>1200</b>	<b>1300</b> H	<b>1400</b>	<b>1500</b>	1550 Aux		
036 w/1hp*	0.75	800	1000 G	<b>1100</b> L	<b>1300</b> H	<b>1500</b>	<b>1600</b>	1800	1950	2100	2200 Aux		
042	0.50	650	800	900 G	1050	<b>1150</b> L	<b>1250</b>	<b>1350</b>	<b>1450</b> H	<b>1550</b>	1600 Aux		
042 w/1hp*	0.75	800	900 G	1000	<b>1200</b> L	<b>1400</b> H	<b>1600</b>	<b>1700</b>	<b>1850</b>	2000	2200 Aux	2300	2400
048	0.50	650	800	900 G	1050	1150	<b>1250</b>	<b>1350</b> L	<b>1450</b>	<b>1550</b> H	1600 Aux		
048 w/1hp*	0.75	800	900	1000 G	1200	<b>1400</b> L	<b>1600</b> H	<b>1700</b>	<b>1850</b>	2000	2200 Aux	2300	2400
060	0.75	800	950	1100 G	1300	<b>1500</b> L	<b>1750</b>	<b>1950</b> H	<b>2100</b>	<b>2300</b>	2325 Aux		
070	0.75	800	950	1100 G	1300	<b>1500</b>	<b>1750</b>	<b>1950</b>	<b>2100</b> H	<b>2300</b>	2325 Aux		

Factory settings are at recommended G-L-H-Aux speed settings

6/8/12

**L-H settings MUST be located within boldface cfm range**

"Aux" is factory setting for auxiliary heat and must be equal to or above the "H" setting as well as at least the minimum required for the auxiliary heat package

"G" may be located anywhere within the airflow table

Cfm is controlled within  $\pm 5\%$  up to the maximum ESP

Max ESP includes allowance for wet coil and standard filter

### Dual Capacity Unit with Variable Speed ECM Motor

Model	Max ESP	Airflow Switch Settings											
		1	2	3	4	5	6	7	8	9	10	11	12
026	0.50		400	500 G	600	<b>700</b> L	<b>800</b>	<b>900</b> H	<b>1000</b>	1100	1200 Aux		
038	0.50	650	750 G	850	1000	<b>1100</b> L	<b>1200</b>	<b>1300</b> H	<b>1400</b>	<b>1500</b>	1550 Aux		
038 w/1hp*	0.75	800 G	1000	<b>1100</b> L	<b>1300</b> H	<b>1500</b>	<b>1600</b>	1800	1875	1925	2000 Aux		
049	0.50	650	800 G	900	1050	1150	<b>1250</b>	<b>1350</b> L	<b>1450</b>	<b>1550</b> H	1575 Aux		
049 w/1hp*	0.75	800 G	900	1000	1200	<b>1400</b> L	<b>1600</b> H	<b>1700</b>	<b>1850</b>	2000	2200 Aux	2300	2400
064	0.75	800	950 G	1100	1300	<b>1500</b> L	<b>1750</b>	<b>1950</b> H	<b>2100</b>	<b>2300</b>	2325 Aux		
072	0.75	800	950 G	1100	1300	<b>1500</b>	<b>1750</b>	<b>1950</b>	<b>2100</b> H	<b>2300</b>	2325 Aux		

Factory settings are at recommended G-L-H-Aux speed settings

6/8/12

**L-H settings MUST be located within boldface cfm range**

"Aux" is factory setting for auxiliary heat and must be equal to or above the "H" setting as well as at least the minimum required for the auxiliary heat package

"G" may be located anywhere within the airflow table

Cfm is controlled within  $\pm 5\%$  up to the maximum ESP

Max ESP includes allowance for wet coil and standard filter



# Blower Performance Data cont.

## Setting Blower Speed - ECM

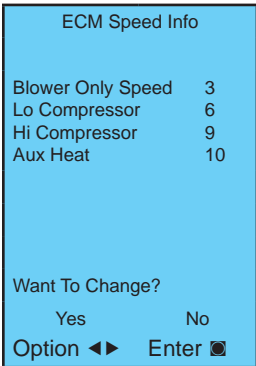
The ABC board's Yellow Config LED will flash the current ECM blower speed selections for "G", low, and high continuously with a short pause in between. The speeds can also be confirmed with the AID Tool under the Setup/ECM Setup screen. The Aux will not be flashed but can be viewed in the AID Tool. The 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), High (Y2), and Aux 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 cannot be set manually without an AID Tool.

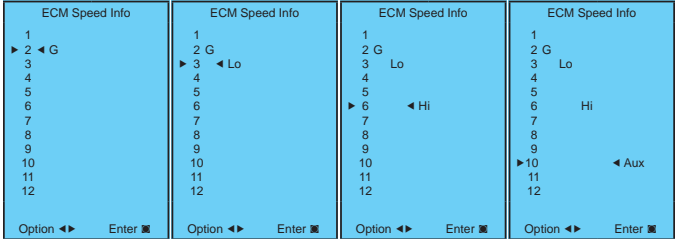
### ECM Setup with an AID Tool

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 Enter button to select the item.



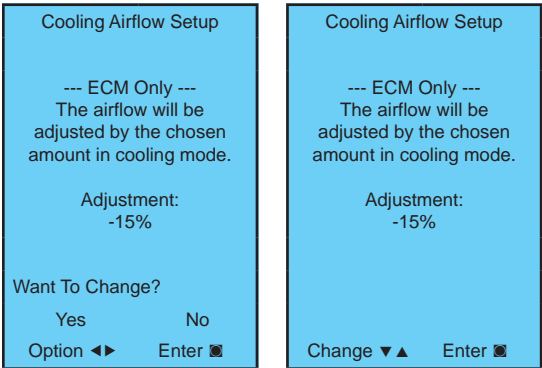
Selecting YES will enter ECM speed setup, while selecting NO will return to the previous screen.

**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 Enter 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 Enter button to save the change.



## Blower Performance Data cont.

### Single Speed Unit with 5-Speed ECM Motor

Model	Motor Speed	Motor Tap	T'stat Cnct.	Blower Size	Motor HP	Airflow (cfm) at External Static Pressure (in. wg)															
						0	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90	1.00
<b>022</b>	<b>High</b>	<b>5</b>	W	9 x 7	1/2	980	960	940	930	920	905	890	875	860	840	820	800	745	-	-	-
	<b>Med High</b>	<b>4</b>	Y1			890	878	865	845	825	813	800	785	770	753	735	710	665	-	-	-
	Med	3				830	815	800	788	775	755	735	723	710	690	670	640	600	-	-	-
	<b>Med Low</b>	<b>2</b>	G			780	760	740	703	665	653	640	620	600	585	570	-	-	-	-	-
	Low	1				625	593	560	535	510	495	480	455	430	410	390	-	-	-	-	-
<b>030</b>	High	5		9 x 7	1/2	1407	1381	1354	1327	1300	1267	1233	1201	1168	1131	1094	1009	-	-	-	-
	<b>Med High</b>	<b>4</b>	W			1146	1134	1122	1111	1099	1085	1071	1062	1052	1042	1031	966	-	-	-	-
	<b>Med</b>	<b>3</b>	Y1			1023	1012	1001	985	969	959	949	937	925	913	901	-	-	-	-	-
	Med Low	2				978	962	946	934	922	907	891	882	872	858	843	-	-	-	-	-
	<b>Low</b>	<b>1</b>	G			795	777	759	748	737	718	698	686	673	650	626	-	-	-	-	-
<b>036</b>	<b>High</b>	<b>5</b>	W	11 x 10	1/2	1530	1503	1476	1453	1429	1413	1397	1376	1355	1342	1329	1276	1231	1173	-	-
	<b>Med High</b>	<b>4</b>	Y1			1413	1388	1363	1342	1321	1303	1285	1263	1240	1226	1212	1173	1016	946	-	-
	Med	3				1355	1325	1294	1276	1258	1235	1212	1188	1164	1144	1123	982	909	883	-	-
	Med Low	2				1336	1299	1261	1242	1222	1202	1181	1157	1132	1111	1090	937	874	830	-	-
	<b>Low</b>	<b>1</b>	G			1243	1182	1121	1061	1000	964	928	856	784	744	703	647	592	-	-	-
<b>042</b>	High	5		11 x 10	1	1934	1910	1886	1871	1855	1827	1799	1780	1760	1747	1734	1700	1659	1617	-	-
	<b>Med High</b>	<b>4</b>	W			1799	1783	1767	1744	1720	1693	1666	1649	1631	1617	1603	1560	1530	1492	-	-
	Med	3				1694	1680	1666	1642	1617	1592	1567	1552	1537	1519	1500	1453	1421	1372	-	-
	<b>Med Low</b>	<b>2</b>	Y1			1575	1560	1540	1520	1502	1487	1471	1448	1424	1409	1393	1351	1308	1266	-	-
	<b>Low</b>	<b>1</b>	G			1454	1406	1358	1333	1308	1285	1261	1239	1217	1198	1179	1072	1002	988	-	-
<b>048</b>	High	5		11 x 10	1	1934	1910	1886	1871	1855	1827	1799	1780	1760	1747	1734	1700	1659	1617	-	-
	<b>Med High</b>	<b>4</b>	W			1799	1783	1767	1744	1720	1693	1666	1649	1631	1617	1603	1560	1530	1492	-	-
	<b>Med</b>	<b>3</b>	Y1			1694	1680	1666	1642	1617	1592	1567	1552	1537	1519	1500	1453	1421	1372	-	-
	Med Low	2				1575	1560	1540	1520	1502	1487	1471	1448	1424	1409	1393	1351	1308	1266	-	-
	<b>Low</b>	<b>1</b>	G			1454	1406	1358	1333	1308	1285	1261	1239	1217	1198	1179	1072	1002	988	-	-
<b>060</b>	<b>High</b>	<b>5</b>	W	11 x 10	1	2245	2230	2214	2194	2173	2155	2136	2120	2103	2087	2070	2032	1998	1957	1910	1825
	Med High	4				2092	2073	2054	2035	2015	1995	1975	1958	1940	1922	1904	1880	1843	1806	1767	1728
	Med	3				1951	1931	1910	1889	1868	1850	1831	1812	1793	1774	1755	1722	1688	1654	1612	1562
	<b>Med Low</b>	<b>2</b>	Y1			1812	1796	1780	1761	1741	1718	1695	1682	1668	1651	1633	1591	1555	1518	1480	1433
	<b>Low</b>	<b>1</b>	G			1682	1661	1640	1616	1591	1573	1555	1533	1510	1495	1480	1441	1400	1351	1316	1263
<b>070</b>	<b>High</b>	<b>5</b>	W	11 x 10	1	2472	2454	2435	2414	2393	2371	2349	2328	2306	2289	2271	2230	2189	2121	2033	1936
	<b>Med High</b>	<b>4</b>	Y1			2271	2248	2225	2205	2184	2166	2147	2129	2110	2094	2078	2039	2011	1977	1930	1846
	Med	3				2133	2115	2096	2072	2047	2030	2013	1996	1979	1965	1950	1909	1873	1837	1793	1748
	Med Low	2				2008	1985	1962	1939	1915	1898	1880	1862	1843	1828	1812	1774	1742	1703	1669	1635
	<b>Low</b>	<b>1</b>	G			1806	1784	1761	1742	1722	1696	1669	1656	1642	1625	1607	1564	1527	1490	1443	1404

Factory speed settings are in Bold

6/14/12

Air flow values are with dry coil and standard filter

For wet coil performance first calculate the face velocity of the air coil (Face Velocity [fpm] = Airflow [cfm] / Face Area [sq ft]).

Then for velocities of 200 fpm reduce the static capability by 0.03 in. wg, 300 fpm by 0.08 in. wg, 400 fpm by 0.12in. wg., and 500 fpm by 0.16 in. wg.

Highest setting is for auxiliary heat (W) and lowest setting is for constant blower (G). The "Y1" and "Y2" settings must be between the "G" and "W" settings.

The gray wire is not factory wired to the motor and is tied to the wire harness. This wire can be field connected and can be used with 3ht/2cl thermostats or IntelliZone2 to deliver the required air flow for the Y2 signal.

### 5-Speed ECM Constant Torque Motors

The 5-Speed ECM is a 'Constant Torque' ECM motor and delivers air flow similar to a PSC but operates as efficiently as an ECM Motor. Because it's an ECM Motor, the 5-Speed ECM can ramp slowly up or down like the ECM motor. There are 5 possible speed taps available on the 5-Speed ECM motor with #1 being the lowest airflow and #5 being the highest airflow. These speed selections are preset at the time of manufacture and are easily changed in the field if necessary.

If more than one tap are energized at the same time, built in logic gives precedence to the highest tap number and allows air flow to change with G, Y1, Y2 and W signals or with Fan, CC, CC2, and E1 output signals. Each of those 5 speeds has a specific 'Torque' value programmed into the motor for each speed selection. As static pressure

increases, airflow decreases resulting in less torque on the rotor. The motor responds only to changes in torque and adjusts its speed accordingly.

The 5-Speed ECM motor is powered by line voltage but the motor speed is energized by 24 VAC.

#### 5-Speed ECM Benefits:

- High efficiency
- Soft start
- 5 speeds with up to 4 speeds on-line
- Built in logic allows air flow to change with G, Y1, Y2 and W signals
- Super efficient low airflow continuous blower setting (G)

# Blower Performance Data cont.

## Dual Capacity Unit with 5-Speed ECM

Model	Motor Speed	Motor Tap	T'stat Cnct.	Blower Size	Motor HP	Airflow (cfm) at External Static Pressure (in. wg)															
						0	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90	1.00
<b>026</b>	<b>High</b>	<b>5</b>	W	9 x 7	1/2	1120	1109	1097	1082	1066	1055	1044	1028	1011	1001	991	932	839	-	-	-
	<b>Med High</b>	<b>4</b>	Y2			1020	1006	991	980	968	950	932	922	911	894	876	849	812	-	-	-
	Med	3				917	906	895	884	872	854	836	824	812	792	772	754	719	-	-	-
	<b>Med Low</b>	<b>2</b>	Y1			836	824	812	794	776	765	754	735	715	703	691	653	631	-	-	-
	<b>Low</b>	<b>1</b>	G			735	721	707	687	666	653	640	622	603	589	574	533	-	-	-	-
<b>038</b>	<b>High</b>	<b>5</b>	W	11 x 10	1/2	1530	1503	1476	1453	1429	1413	1397	1376	1355	1342	1329	1276	1231	1173	-	-
	<b>Med High</b>	<b>4</b>	Y2			1413	1388	1363	1342	1321	1303	1285	1263	1240	1226	1212	1173	1016	946	-	-
	Med	3	Y1			1355	1325	1294	1276	1258	1235	1212	1188	1164	1144	1123	982	909	883	-	-
	Med Low	2				1336	1299	1261	1242	1222	1202	1181	1157	1132	1111	1090	937	874	830	-	-
	<b>Low</b>	<b>1</b>	G			1243	1182	1121	1061	1000	964	928	856	784	744	703	647	592	-	-	-
<b>049</b>	<b>High</b>	<b>5</b>	W	11 x 10	1	1934	1910	1886	1871	1855	1827	1799	1780	1760	1747	1734	1700	1659	1617	-	-
	Med High	4				1799	1783	1767	1744	1720	1693	1666	1649	1631	1617	1603	1560	1530	1492	-	-
	<b>Med Low</b>	<b>3</b>	Y2			1694	1680	1666	1642	1617	1592	1567	1552	1537	1519	1500	1453	1421	1372	-	-
	Med Low	2	Y1			1575	1560	1540	1520	1502	1487	1471	1448	1424	1409	1393	1351	1308	1266	-	-
	<b>Low</b>	<b>1</b>	G			1454	1406	1358	1333	1308	1285	1261	1239	1217	1198	1179	1072	1002	988	-	-
<b>064</b>	<b>High</b>	<b>5</b>	W	11 x 10	1	2245	2230	2214	2194	2173	2155	2136	2120	2103	2087	2070	2032	1998	1957	1910	1825
	<b>Med High</b>	<b>4</b>	Y2			2092	2073	2054	2035	2015	1995	1975	1958	1940	1922	1904	1880	1843	1806	1767	1728
	Med	3				1951	1931	1910	1889	1868	1850	1831	1812	1793	1774	1755	1722	1688	1654	1612	1562
	<b>Med Low</b>	<b>2</b>	Y1			1812	1796	1780	1761	1741	1718	1695	1682	1668	1651	1633	1591	1555	1518	1480	1433
	<b>Low</b>	<b>1</b>	G			1682	1661	1640	1616	1591	1573	1555	1533	1510	1495	1480	1441	1400	1351	1316	1263
<b>072</b>	<b>High</b>	<b>5</b>	W	11 x 10	1	2472	2454	2435	2414	2393	2371	2349	2328	2306	2289	2271	2230	2189	2121	2033	1936
	<b>Med High</b>	<b>4</b>	Y2			2271	2248	2225	2205	2184	2166	2147	2129	2110	2094	2078	2039	2011	1977	1930	1846
	Med	3				2133	2115	2096	2072	2047	2030	2013	1996	1979	1965	1950	1909	1873	1837	1793	1748
	<b>Med Low</b>	<b>2</b>	Y1			2008	1985	1962	1939	1915	1898	1880	1862	1843	1828	1812	1774	1742	1703	1669	1635
	<b>Low</b>	<b>1</b>	G			1806	1784	1761	1742	1722	1696	1669	1656	1642	1625	1607	1564	1527	1490	1443	1404

6/14/12

Factory speed settings are in **Bold**

Air flow values are with dry coil and standard filter


For wet coil performance first calculate the face velocity of the air coil (Face Velocity [fpm] = Airflow [cfm] / Face Area [sq ft]).

Then for velocities of 200 fpm reduce the static capability by 0.03 in. wg, 300 fpm by 0.08 in. wg, 400 fpm by 0.12 in. wg., and 500 fpm by 0.16 in. wg.

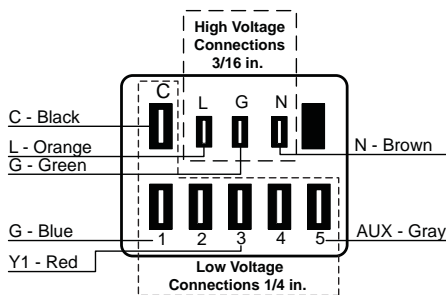
Highest setting is for auxiliary heat (W) and lowest setting is for constant blower (G). The "Y1" and "Y2" settings must be between the "G" and "W" settings.

## Setting Blower Speed - 5-Speed ECM

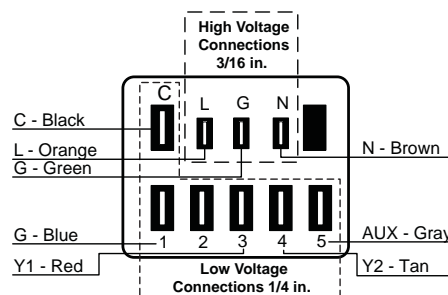
5-Speed ECM blower motors have five (5) speeds of which three (3) are selectable on single speed and four (4) are selectable on dual capacity.

 **CAUTION: Disconnect all power before performing this operation.**

### 5-Speed ECM Motor Connections - Single Speed



### 5-Speed ECM Motor Connections - Dual Capacity



# Blower Performance Data cont.

## Unit with Standard PSC Motor

Model	Motor Spd	Blower Size	Motor HP	Airflow (cfm) at External Static Pressure (in. wg)															
				0	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90	1.00
<b>012</b>	H	6 x 8	1/10	480	450	440	420	410	380	360	340	330	310	300	-	-	-	-	-
	MH*			440	410	400	380	370	350	330	310	300	280	270	-	-	-	-	-
	ML			395	370	360	340	330	310	290	280	270	250	240	-	-	-	-	-
	L			325	310	300	280	270	250	240	230	220	210	200	-	-	-	-	-
<b>018</b>	H	9 x 7	1/6	845	835	825	815	800	790	775	755	735	710	680	565	-	-	-	-
	M			735	730	725	715	705	700	690	675	660	630	600	485	-	-	-	-
	L			620	615	610	605	600	590	580	565	550	520	490	-	-	-	-	-
<b>022</b>	H	9 x 7	1/5	1110	1095	1080	1065	1045	1020	995	970	945	915	880	810	-	-	-	-
	M			850	845	835	825	815	805	795	775	755	735	715	-	-	-	-	-
	L			750	745	740	735	725	715	700	685	670	650	630	-	-	-	-	-
<b>030</b>	H	9 x 7	1/3	1290	1270	1245	1220	1190	1160	1125	1090	1055	1020	985	880	760	-	-	-
	M			1100	1090	1075	1060	1045	1020	995	970	940	910	875	785	625	-	-	-
	L			910	905	900	895	885	875	865	850	835	810	780	710	560	-	-	-
<b>036</b>	H	10 x 10	1/2	1665	1640	1610	1580	1550	1515	1480	1450	1415	1315	1215	1090	980	-	-	-
	M			1465	1445	1425	1400	1375	1350	1325	1260	1190	1140	1090	990	890	-	-	-
	L			1130	1115	1100	1090	1075	1035	995	965	930	895	860	795	730	-	-	-
<b>042</b>	H	10 x 10	1/2	2010	1975	1940	1905	1870	1825	1780	1735	1690	1640	1590	1470	1210	-	-	-
	M			1670	1650	1630	1610	1590	1560	1530	1495	1460	1425	1390	1190	1080	-	-	-
	L			1220	1215	1210	1295	1200	1180	1160	1130	1100	1060	1020	930	-	-	-	-
<b>048</b>	H	10 x 10	1/2	2010	1975	1940	1905	1870	1825	1780	1735	1690	1640	1590	1470	1210	-	-	-
	M			1670	1650	1630	1610	1590	1560	1530	1495	1460	1425	1390	1190	1080	-	-	-
	L			1220	1215	1210	1295	1200	1180	1160	1130	1100	1060	1020	930	-	-	-	-
<b>060</b>	H	11 x 10	1	2430	2400	2365	2330	2290	2255	2215	2180	2140	2095	2045	1945	1835	1715	1510	1330
	M			2265	2235	2205	2175	2145	2110	2070	2035	2000	1960	1915	1825	1730	1605	1440	1260
	L			2075	2050	2020	1995	1965	1940	1915	1885	1850	1820	1785	1720	1610	1505	1335	1175
<b>070</b>	H	11 x 10	1	2430	2400	2365	2330	2290	2255	2215	2180	2140	2095	2045	1945	1835	1715	1510	1330
	M			2265	2235	2205	2175	2145	2110	2070	2035	2000	1960	1915	1825	1730	1605	1440	1260
	L			2075	2050	2020	1995	1965	1940	1915	1885	1850	1820	1785	1720	1610	1505	1335	1175

2/7/12

## Unit with Optional High Static PSC Motor

Model	Motor Spd	Blower Size	Motor HP	Airflow (cfm) at External Static Pressure (in. wg)															
				0	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90	1.00
<b>022</b>	H	9 x 7	1/3	1290	1270	1245	1220	1190	1160	1125	1090	1055	1020	985	880	760	-	-	-
	M			1100	1090	1075	1060	1045	1020	995	970	940	910	875	785	625	-	-	-
	L			910	905	900	895	885	875	865	850	835	810	780	710	560	-	-	-
<b>030</b>	H	9 x 7	1/2	1365	1340	1325	1305	1280	1250	1215	1180	1140	1100	1055	960	850	-	-	-
	M			1040	1040	1035	1030	1020	1005	990	970	945	915	885	810	735	-	-	-
	L			880	880	880	880	875	870	860	840	820	800	775	730	480	-	-	-
<b>036</b>	H	10 x 10	1/2	1930	1905	1875	1840	1805	1765	1725	1680	1635	1530	1425	1270	1150	1025	-	-
	M			1635	1620	1600	1580	1555	1530	1505	1465	1425	1335	1240	1135	1035	775	-	-
	L			1230	1230	1225	1215	1200	1165	1130	1095	1060	1035	1005	935	795	675	-	-
<b>042</b>	H	10 x 10	3/4	2115	2075	2035	1980	1920	1900	1880	1840	1795	1730	1660	1390	1225	1070	-	-
	M			2005	1980	1950	1910	1865	1815	1765	1725	1685	1585	1485	1315	1140	1025	-	-
	L			1860	1835	1805	1780	1750	1715	1675	1635	1590	1540	1490	1260	1115	980	-	-
<b>048</b>	H	10 x 10	3/4	2115	2075	2035	1980	1920	1900	1880	1840	1795	1730	1660	1390	1225	1070	-	-
	M			2005	1980	1950	1910	1865	1815	1765	1725	1685	1585	1485	1315	1140	1025	-	-
	L			1860	1835	1805	1780	1750	1715	1675	1635	1590	1540	1490	1260	1115	980	-	-

Factory settings are in Bold

1/25/12

High-Static option not available for 012, 018, 060, and 070

Air flow values are with dry coil and standard filter

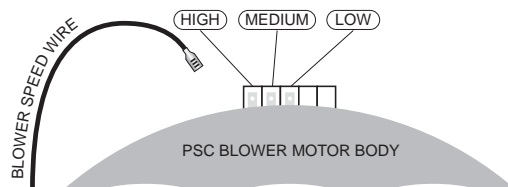
For wet coil performance first calculate the face velocity of the air coil (Face Velocity [fpm] = Airflow [cfm] / Face Area [sq ft]).

Then for velocities of 200 fpm reduce the static capability by 0.03 in. wg, 300 fpm by 0.08 in. wg, 400 fpm by 0.12in. wg, and 500 fpm by 0.16 in. wg.

## Setting Blower Speed - PSC



**CAUTION: Disconnect all power before performing this operation.**



## Reference Calculations

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

## Legend and Notes

### Abbreviations and Definitions

cfm = airflow, cubic feet/minute	HWC = hot water generator capacity, MBtu/h
EWT = entering water temperature, Fahrenheit	EER = Energy Efficient Ratio
gpm = water flow in gallons/minute	= Btu output/Watt input
WPD = water pressure drop, psi and feet of water	COP = Coefficient of Performance
EAT = entering air temperature, Fahrenheit (dry bulb/wet bulb)	= Btu output/Btu input
HC = air heating capacity, MBtu/h	LWT = leaving water temperature, °F
TC = total cooling capacity, MBtu/h	LAT = leaving air temperature, °F
SC = sensible cooling capacity, MBtu/h	TH = total heating capacity, MBtu/h
kW = total power unit input, kilowatts	LC = latent cooling capacity, MBtu/h
HR = total heat of rejection, MBtu/h	S/T = sensible to total cooling ratio
HE = total heat of extraction, MBtu/h	

### 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

Operating Limits	Cooling		Heating	
	(°F)	(°C)	(°F)	(°C)
<b>Air Limits</b>				
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
<b>Water Limits</b>				
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.

## Antifreeze Corrections

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

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



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

### Antifreeze Correction Example

Antifreeze solution is Propylene Glycol 20% by weight. Determine the corrected heating and cooling performance at 30°F and 90°F respectively as well as pressure drop at 30°F for a 5 Series NS\*022-ECM.

The corrected cooling capacity at 90°F would be: 22,400 MBtu/h x 0.969 = 21,706 MBtu/h

The corrected heating capacity at 30°F would be: 14,500 MBtu/h x 0.913 = 13,239 MBtu/h

The corrected pressure drop at 30°F and 6 gpm would be: 6.6 feet of head x 1.270 = 8.38 feet of head

# Correction Factor Tables

## Air Flow Corrections (Dual Capacity Part Load)

Airflow		Cooling				Heating		
cfm Per Ton of Clg	% of Nominal	Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
240	60	0.922	0.778	0.956	0.924	0.943	1.239	0.879
275	69	0.944	0.830	0.962	0.944	0.958	1.161	0.914
300	75	0.957	0.866	0.968	0.958	0.968	1.115	0.937
325	81	0.970	0.900	0.974	0.970	0.977	1.075	0.956
350	88	0.982	0.933	0.981	0.980	0.985	1.042	0.972
375	94	0.991	0.968	0.991	0.991	0.993	1.018	0.988
<b>400</b>	<b>100</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>
425	106	1.007	1.033	1.011	1.008	1.007	0.990	1.010
450	113	1.013	1.065	1.023	1.015	1.012	0.987	1.018
475	119	1.017	1.099	1.037	1.022	1.018	0.984	1.025
500	125	1.020	1.132	1.052	1.027	1.022	0.982	1.031
520	130	1.022	1.159	1.064	1.030	1.025	0.979	1.034

5/30/06

## Air Flow Corrections (Dual Capacity Full Load and Single Speed)

Airflow		Cooling				Heating		
cfm Per Ton of Clg	% of Nominal	Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
240	60	0.922	0.786	0.910	0.920	0.943	1.150	0.893
275	69	0.944	0.827	0.924	0.940	0.958	1.105	0.922
300	75	0.959	0.860	0.937	0.955	0.968	1.078	0.942
325	81	0.971	0.894	0.950	0.967	0.977	1.053	0.959
350	88	0.982	0.929	0.964	0.978	0.985	1.031	0.973
375	94	0.992	0.965	0.982	0.990	0.993	1.014	0.988
<b>400</b>	<b>100</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>
425	106	1.007	1.034	1.020	1.010	1.007	0.990	1.011
450	113	1.012	1.065	1.042	1.018	1.013	0.983	1.020
475	119	1.017	1.093	1.066	1.026	1.018	0.980	1.028
500	125	1.019	1.117	1.092	1.033	1.023	0.978	1.034
520	130	1.020	1.132	1.113	1.038	1.026	0.975	1.038

5/30/06

## Cooling Capacity Corrections

Entering Air WB °F	Total Clg Cap	Sensible Cooling Capacity Multipliers - Entering DB °F										Power Input	Heat of Rejection
		60	65	70	75	80	80.6	85	90	95	100		
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
<b>67</b>	<b>1.000</b>			0.616	0.806	<b>1.000</b>	1.023	1.193	1.330	1.480	*	<b>1.000</b>	<b>1.000</b>
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.

3/28/12

## Heating Capacity Corrections

Ent Air DB °F	Heating Corrections		
	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
<b>70</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>
75	0.987	1.048	0.970
80	0.975	1.099	0.930

11/10/09

# Pressure Drop

## Single Speed

Model	gpm	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F
012	1.5	0.3	0.3	0.3	0.3	0.3
	2.5	1.0	1.0	1.0	1.0	1.0
	3.5	1.7	1.7	1.7	1.6	1.6
	4.5	2.5	2.4	2.4	2.4	2.3
018	3.0	1.6	1.6	1.5	1.5	1.4
	4.0	2.9	2.9	2.8	2.8	2.7
	5.0	4.2	4.2	4.1	4.0	3.9
	6.0	6.0	5.8	5.7	5.6	5.5
022	3	0.9	0.9	0.8	0.7	0.7
	4.5	1.7	1.6	1.5	1.4	1.3
	6	2.8	2.7	2.5	2.3	2.2
	8	4.7	4.4	4.1	3.9	3.6
030	4	1.3	1.2	1.2	1.1	1.0
	6	2.7	2.5	2.4	2.2	2.2
	8	4.5	4.2	3.9	3.7	3.4
	10	6.8	6.3	5.4	5.4	5.0
036	5	1.0	1.0	0.9	0.8	0.8
	7	2.1	1.9	1.8	1.7	1.6
	9	3.6	3.3	3.0	2.8	2.6
	12	6.3	5.9	5.5	5.1	4.8
042	5	0.8	0.7	0.7	0.7	0.6
	8	2.1	2.1	1.9	1.8	1.7
	11	4.2	4.1	3.8	3.5	3.3
	14	7.6	6.7	6.3	5.8	5.4
048	6	1.1	1.0	1.0	0.9	0.8
	9	2.3	2.1	2.0	1.9	1.7
	12	3.9	3.7	3.4	3.2	3.0
	16	6.7	6.3	5.9	5.5	5.1
060	9	2.4	2.2	2.1	2.0	1.8
	12	3.9	3.6	3.4	3.2	2.9
	15	5.7	5.3	5.0	4.7	4.3
	20	9.5	8.9	8.3	7.8	7.2
070	12	3.0	2.8	2.6	2.4	2.2
	15	4.4	4.0	3.8	3.5	3.3
	18	6.0	5.5	5.1	4.8	4.4
	24	9.7	9.1	8.5	7.9	7.3

2/7/12

## Dual Capacity

Model	gpm	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F
026 full load	4	1.4	1.3	1.2	1.1	1.0
	6	2.8	2.6	2.4	2.3	2.1
	8	4.7	4.4	4.1	3.8	3.5
	10	7.0	6.6	6.2	5.8	5.3
026 part load	3	0.8	0.7	0.7	0.7	0.6
	5	2.0	1.8	1.7	1.6	1.5
	7	3.6	3.4	3.2	3.0	2.8
	9	5.8	5.5	5.1	4.8	4.4
038 full load	5	1.2	1.2	1.1	1.0	1.0
	7	2.2	2.1	1.9	1.8	1.7
	9	3.4	3.2	3.0	2.8	2.6
	11	4.9	4.6	4.3	4	3.7
038 part load	4	0.9	0.8	0.8	0.7	0.7
	6	1.7	1.6	1.5	1.4	1.3
	8	2.8	2.6	2.5	2.3	2.1
	10	4.2	3.9	3.7	3.4	3.2
049 full load	6	1.2	1.2	1.1	1.0	1.0
	9	2.4	2.2	2.1	2.0	1.8
	12	3.9	3.6	3.4	3.2	2.9
	15	5.7	5.3	5	4.7	4.3
049 part load	5	0.9	0.9	0.8	0.8	0.7
	8	2.0	1.8	1.7	1.6	1.5
	11	3.4	3.1	2.9	2.8	2.5
	14	5.0	4.7	4.4	4.1	3.8
064 full load	8	1.8	1.7	1.6	1.4	1.3
	12	3.8	3.5	3.3	3.0	2.8
	16	6.5	6.0	5.6	5.2	4.8
	20	9.7	9.1	8.5	8.0	7.4
064 part load	6	1.0	0.9	0.9	0.8	0.8
	10	2.6	2.5	2.3	2.1	2.0
	14	5.0	4.7	4.4	4.1	3.8
	18	8.1	7.6	7.1	6.6	6.1
072 full load	12	3.2	3.0	2.8	2.6	2.4
	15	4.5	4.2	4.0	3.7	3.4
	18	6.0	5.7	5.3	4.9	4.6
	21	7.8	7.3	6.8	6.4	5.9
072 part load	10	2.3	2.1	2.0	1.9	1.7
	13	3.6	3.3	3.0	2.8	2.6
	16	5.0	4.6	4.3	4.0	3.7
	19	6.5	6.2	5.8	5.4	5.0

1/26/12



# Performance Data

## NS012 - Single Speed PSC (400 cfm)

EWT °F	Flow Rate GPM	WPD		Heating - EAT 70 °F					Cooling - EAT 80/67 °F					
		psi	ft/hd	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	TC MBtu/h	SC MBtu/h	S/T Ratio	Power kW	HR MBtu/h	EER
20	1.5	0.3	0.7	Operation not recommended					Operation not recommended					
	2.5	1.0	2.3	Operation not recommended					Operation not recommended					
	3.5	1.7	3.9	7.5	0.78	4.8	85.3	2.80	Operation not recommended					
30	1.5	0.3	0.7	Operation not recommended					Operation not recommended					
	2.5	1.0	2.3	9.0	0.80	6.3	88.8	3.29	16.3	10.3	0.63	0.43	17.8	37.7
	3.5	1.7	3.9	9.1	0.81	6.3	89.1	3.29	16.5	10.3	0.62	0.41	18.0	40.2
40	1.5	0.3	0.7	Operation not recommended					Operation not recommended					
	2.5	1.0	2.3	10.0	0.82	7.2	91.1	3.57	15.8	10.1	0.64	0.49	17.4	31.9
	3.5	1.7	3.9	10.3	0.83	7.4	91.7	3.64	16.0	10.1	0.63	0.46	17.6	34.9
50	1.5	0.3	0.7	10.6	0.83	7.8	92.5	3.75	15.0	10.0	0.66	0.61	17.1	24.6
	2.5	1.0	2.3	11.0	0.83	8.2	93.5	3.86	15.2	9.9	0.65	0.56	17.1	27.3
	3.5	1.7	3.8	11.4	0.84	8.5	94.4	3.97	15.5	9.9	0.64	0.51	17.2	30.6
60	1.5	0.3	0.7	11.8	0.85	8.9	95.2	4.08	14.5	9.7	0.67	0.69	16.9	21.1
	2.5	1.0	2.3	12.2	0.85	9.3	96.3	4.21	14.7	9.7	0.66	0.64	16.9	23.1
	3.5	1.7	3.8	12.7	0.86	9.8	97.4	4.33	14.9	9.7	0.65	0.59	16.9	25.3
70	1.5	0.3	0.7	12.9	0.86	10.0	98.0	4.40	14.1	9.4	0.67	0.77	16.7	18.3
	2.5	1.0	2.3	13.5	0.87	10.5	99.2	4.54	14.2	9.5	0.67	0.72	16.7	19.8
	3.5	1.7	3.8	14.0	0.88	11.0	100.4	4.67	14.4	9.6	0.67	0.67	16.7	21.4
80	1.5	0.3	0.7	14.3	0.88	11.3	101.2	4.76	13.6	9.2	0.68	0.87	16.6	15.7
	2.5	1.0	2.2	14.9	0.89	11.9	102.6	4.92	13.8	9.3	0.68	0.82	16.6	16.8
	3.5	1.6	3.8	15.3	0.90	12.2	103.4	5.00	13.9	9.4	0.68	0.76	16.5	18.2
90	1.5	0.3	0.7	15.8	0.90	12.8	104.7	5.15	13.2	9.0	0.68	0.97	16.5	13.6
	2.5	1.0	2.2	16.5	0.91	13.4	106.3	5.34	13.3	9.2	0.69	0.93	16.5	14.2
	3.5	1.6	3.8	16.6	0.92	13.5	106.4	5.32	13.4	9.2	0.69	0.85	16.3	15.7
100	1.5	0.3	0.7	Operation not recommended					Operation not recommended					
	2.5	1.0	2.2	Operation not recommended					12.9	9.0	0.70	1.06	16.5	12.1
	3.5	1.6	3.7	Operation not recommended					13.0	9.1	0.70	0.95	16.2	13.7
110	1.5	0.3	0.7	Operation not recommended					Operation not recommended					
	2.5	1.0	2.2	Operation not recommended					12.4	8.8	0.71	1.21	16.5	10.3
	3.5	1.6	3.6	Operation not recommended					12.6	8.9	0.71	1.05	16.2	12.0
120	1.5	0.3	0.7	Operation not recommended					Operation not recommended					
	2.5	1.0	2.2	Operation not recommended					12.0	8.6	0.72	1.37	16.7	8.8
	3.5	1.5	3.5	Operation not recommended					12.1	8.7	0.72	1.16	16.0	10.5

10/1/10

## Performance Data cont.

### NS018 - Single Speed PSC (600 cfm)

EWT °F	Flow Rate GPM	WPD		Heating - EAT 70 °F						Cooling - EAT 80/67 °F						
		psi	ft/hd	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC MBtu/h	TC MBtu/h	SC MBtu/h	S/T Ratio	Power kW	HR MBtu/h	EER	HWC MBtu/h
20	3.0	1.6	3.8	Operation not recommended						Operation not recommended						
	4.0	2.9	6.8	Operation not recommended						Operation not recommended						
	5.0	4.3	9.9	12.7	1.18	8.7	87.6	3.16	1.4	Operation not recommended						
30	3.0	1.6	3.7	Operation not recommended						Operation not recommended						
	4.0	2.9	6.7	14.4	1.25	10.1	90.2	3.36	1.5	19.5	12.9	0.66	0.76	22.1	25.8	--
	5.0	4.2	9.7	14.6	1.26	10.3	90.5	3.40	1.5	18.8	12.4	0.66	0.74	21.4	25.4	--
40	3.0	1.6	3.6	Operation not recommended						Operation not recommended						
	4.0	2.9	6.6	15.9	1.31	11.4	92.5	3.55	1.6	19.9	13.0	0.65	0.81	22.7	24.7	--
	5.0	4.2	9.6	16.3	1.32	11.8	93.1	3.61	1.6	19.8	12.7	0.64	0.75	22.3	26.2	--
50	3.0	1.6	3.6	17.1	1.36	12.4	94.3	3.69	1.7	20.1	13.2	0.65	0.95	23.3	21.3	0.9
	4.0	2.9	6.6	17.5	1.37	12.8	95.0	3.75	1.7	20.4	13.1	0.64	0.86	23.3	23.8	0.9
	5.0	4.2	9.6	17.9	1.38	13.2	95.7	3.81	1.8	20.7	13.1	0.63	0.77	23.3	27.0	0.9
60	3.0	1.5	3.5	19.0	1.42	14.2	97.4	3.94	1.9	19.2	12.6	0.66	1.00	22.6	19.2	1.1
	4.0	2.8	6.5	19.4	1.43	14.5	98.0	3.98	1.9	19.4	12.6	0.65	0.94	22.6	20.6	1.1
	5.0	4.1	9.5	19.8	1.45	14.9	98.6	4.02	2.0	19.6	12.6	0.64	0.88	22.6	22.3	1.0
70	3.0	1.5	3.5	21.0	1.48	16.0	100.4	4.17	2.1	18.3	12.1	0.66	1.05	21.9	17.4	1.3
	4.0	2.8	6.5	21.4	1.50	16.3	101.0	4.18	2.1	18.4	12.1	0.66	1.02	21.9	18.0	1.3
	5.0	4.1	9.5	21.7	1.52	16.6	101.6	4.20	2.2	18.5	12.1	0.66	0.99	21.9	18.6	1.2
80	3.0	1.5	3.4	23.3	1.54	18.1	104.0	4.44	2.4	17.5	11.6	0.66	1.11	21.3	15.8	1.7
	4.0	2.8	6.4	23.7	1.57	18.3	104.5	4.43	2.4	17.5	11.6	0.67	1.12	21.3	15.6	1.6
	5.0	4.1	9.4	24.0	1.58	18.6	105.1	4.45	2.5	17.7	11.8	0.67	1.12	21.5	15.8	1.5
90	3.0	1.5	3.4	25.9	1.61	20.4	108.0	4.72	2.8	16.7	11.1	0.66	1.17	20.7	14.3	2.2
	4.0	2.8	6.4	26.1	1.64	20.5	108.3	4.68	2.8	16.6	11.2	0.67	1.22	20.8	13.6	2.0
	5.0	4.0	9.2	26.3	1.65	20.7	108.6	4.67	2.8	16.8	11.4	0.68	1.24	21.1	13.6	1.9
100	3.0	1.4	3.3	Operation not recommended						Operation not recommended						
	4.0	2.7	6.3	Operation not recommended						15.8	10.7	0.68	1.34	20.4	11.8	2.5
	5.0	4.0	9.1	Operation not recommended						15.8	11.0	0.70	1.37	20.4	11.5	2.3
110	3.0	1.4	3.2	Operation not recommended						Operation not recommended						
	4.0	2.7	6.2	Operation not recommended						15.0	10.3	0.69	1.46	20.0	10.3	3.2
	5.0	3.9	9.0	Operation not recommended						14.7	10.7	0.73	1.50	19.8	9.8	3.0
120	3.0	1.4	3.2	Operation not recommended						Operation not recommended						
	4.0	2.7	6.2	Operation not recommended						14.3	9.9	0.70	1.60	19.7	8.9	4.0
	5.0	3.9	8.9	Operation not recommended						13.7	10.2	0.75	1.66	19.4	8.3	3.6

10/1/10

# Performance Data cont.

## NS022 - Single Speed PSC (700 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F						COOLING - EAT 80/67 °F						
		PSI	FT	HC Mbtu/h	Power kW	HE Mbtu/h	LAT °F	COP	HWC Mbtu/h	TC Mbtu/h	SC MBtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC MBtu/h
20	3.0	0.9	2.2	Operation not recommended						Operation not recommended						
	4.5	1.8	4.2	Operation not recommended						Operation not recommended						
	6.0	2.9	6.8	12.6	1.30	8.1	86.6	2.84	1.5	Operation not recommended						
30	3.0	0.9	2.1	Operation not recommended						Operation not recommended						
	4.5	1.7	4.0	14.8	1.31	10.3	89.5	3.31	1.6	24.1	18.0	0.75	0.81	26.6	29.7	---
	6.0	2.8	6.6	15.0	1.32	10.5	89.8	3.33	1.6	24.4	17.1	0.70	0.79	26.8	30.9	---
40	3.0	0.9	2.0	Operation not recommended						Operation not recommended						
	4.5	1.7	3.9	17.3	1.33	12.8	92.9	3.82	1.8	24.9	17.1	0.68	0.87	27.3	28.6	---
	6.0	2.8	6.4	17.6	1.34	13.0	93.3	3.85	1.8	25.2	17.1	0.68	0.85	27.5	29.8	---
50	3.0	0.9	2.0	18.8	1.33	14.2	94.8	4.14	2.0	25.4	16.8	0.66	0.99	27.7	25.7	1.2
	4.5	1.6	3.8	19.7	1.36	15.0	96.0	4.25	2.0	25.7	16.9	0.66	0.95	28.0	27.1	1.1
	6.0	2.7	6.2	20.0	1.36	15.4	96.5	4.30	2.1	26.0	16.9	0.65	0.93	28.2	28.1	1.1
60	3.0	0.8	1.9	21.2	1.36	16.5	98.0	4.55	2.2	24.6	16.6	0.68	1.09	26.9	22.5	1.4
	4.5	1.6	3.7	22.2	1.39	17.5	99.4	4.67	2.3	24.9	16.8	0.68	1.04	27.2	23.8	1.3
	6.0	2.6	6.0	22.6	1.40	17.8	99.8	4.72	2.3	25.1	16.8	0.67	1.02	27.4	24.7	1.3
70	3.0	0.8	1.8	23.6	1.40	18.8	101.2	4.94	2.5	24.3	16.4	0.68	1.22	26.6	19.9	1.7
	4.5	1.5	3.6	24.8	1.43	19.9	102.8	5.06	2.5	24.6	16.6	0.68	1.16	26.9	21.1	1.7
	6.0	2.5	5.8	25.1	1.44	20.2	103.2	5.11	2.6	24.7	16.6	0.67	1.13	27.0	21.9	1.6
80	3.0	0.8	1.8	25.8	1.45	20.8	104.1	5.22	2.8	23.2	16.1	0.69	1.36	25.6	17.1	2.2
	4.5	1.5	3.4	27.0	1.48	21.9	105.7	5.36	2.8	23.5	16.2	0.69	1.30	25.8	18.1	2.1
	6.0	2.4	5.6	27.4	1.49	22.3	106.3	5.40	2.9	23.7	16.2	0.69	1.26	26.0	18.8	2.0
90	3.0	0.7	1.7	28.0	1.50	22.9	107.0	5.47	3.1	21.5	15.6	0.73	1.52	24.0	14.1	2.7
	4.5	1.4	3.3	29.2	1.52	24.0	108.6	5.62	3.2	21.7	15.8	0.73	1.45	24.2	15.0	2.6
	6.0	2.3	5.4	29.7	1.54	24.5	109.3	5.66	3.3	21.9	15.8	0.72	1.41	24.4	15.5	2.4
100	3.0	0.7	1.7	Operation not recommended						Operation not recommended						
	4.5	1.4	3.2	Operation not recommended						20.8	15.4	0.74	1.62	23.3	12.8	3.2
	6.0	2.2	5.2	Operation not recommended						21.0	15.4	0.74	1.58	23.5	13.2	3.0
110	3.0	0.7	1.6	Operation not recommended						Operation not recommended						
	4.5	1.3	3.1	Operation not recommended						18.6	14.9	0.80	1.81	21.3	10.2	3.9
	6.0	2.2	5.0	Operation not recommended						18.7	14.9	0.79	1.77	21.5	10.6	3.7
120	3.0	0.7	1.5	Operation not recommended						Operation not recommended						
	4.5	1.3	2.9	Operation not recommended						17.2	14.4	0.84	2.04	20.0	8.4	4.7
	6.0	2.1	4.8	Operation not recommended						17.4	14.4	0.83	1.99	20.2	8.8	4.4

# Performance Data cont.

## NS030 - Single Speed PSC (900 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F						COOLING - EAT 80/67 °F						
		PSI	FT	HC Mbtu/h	Power kW	HE Mbtu/h	LAT °F	COP	HWC Mbtu/h	TC Mbtu/h	SC MBtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC MBtu/h
20	4.0	1.4	3.5	Operation not recommended						Operation not recommended						
	6.0	2.8	7.2	Operation not recommended						Operation not recommended						
	8.0	4.6	12.1	17.6	1.67	11.9	88.1	3.09	2.0	Operation not recommended						
30	4.0	1.4	3.4	Operation not recommended						Operation not recommended						
	6.0	2.7	7.0	20.2	1.66	14.6	90.8	3.57	2.2	26.4	18.9	0.71	1.06	30.0	24.9	---
	8.0	4.4	11.8	20.7	1.68	14.9	91.2	3.61	2.2	26.9	18.8	0.70	1.03	30.4	26.1	---
40	4.0	1.3	3.3	Operation not recommended						Operation not recommended						
	6.0	2.6	6.8	23.7	1.70	17.9	94.4	4.07	2.4	28.7	20.4	0.71	1.14	32.6	25.1	---
	8.0	4.3	11.4	24.2	1.72	18.3	94.9	4.12	2.5	29.1	20.3	0.70	1.11	32.9	26.1	---
50	4.0	1.3	3.2	25.9	1.74	20.0	96.6	4.36	2.6	30.7	21.8	0.71	1.29	35.1	23.8	1.5
	6.0	2.5	6.6	26.8	1.75	20.8	97.6	4.49	2.7	30.8	21.9	0.71	1.25	35.0	24.7	1.4
	8.0	4.2	11.1	27.4	1.76	21.3	98.1	4.55	2.8	31.2	21.9	0.70	1.22	35.3	25.5	1.4
60	4.0	1.2	3.1	29.1	1.80	23.0	99.9	4.75	3.0	30.0	21.4	0.72	1.40	34.7	21.4	1.8
	6.0	2.4	6.4	30.1	1.81	23.9	101.0	4.89	3.0	30.0	21.5	0.71	1.35	34.7	22.2	1.7
	8.0	3.9	10.7	30.7	1.82	24.5	101.6	4.93	3.1	30.4	21.5	0.71	1.32	34.9	22.9	1.6
70	4.0	1.2	3.0	32.4	1.87	26.0	103.3	5.08	3.3	30.1	21.7	0.72	1.54	35.4	19.5	2.2
	6.0	2.4	6.2	33.5	1.88	27.1	104.5	5.22	3.4	30.2	21.7	0.72	1.49	35.3	20.3	2.1
	8.0	3.9	10.4	34.1	1.90	27.6	105.1	5.24	3.5	30.6	21.8	0.71	1.46	35.5	20.9	2.0
80	4.0	1.2	2.9	35.1	1.93	28.5	106.1	5.32	3.7	28.9	21.4	0.74	1.70	34.7	17.0	2.8
	6.0	2.3	5.9	36.4	1.95	29.7	107.4	5.46	3.8	29.0	21.4	0.74	1.64	34.6	17.7	2.7
	8.0	3.8	10.0	36.9	1.98	30.2	108.0	5.48	3.9	29.3	21.5	0.73	1.61	34.8	18.2	2.5
90	4.0	1.1	2.8	37.9	2.01	31.0	108.9	5.51	4.2	26.7	20.2	0.76	1.87	33.1	14.3	3.5
	6.0	2.2	5.7	39.3	2.04	32.3	110.4	5.64	4.3	26.9	20.2	0.75	1.80	33.0	14.9	3.3
	8.0	3.6	9.6	39.9	2.06	32.8	111.0	5.66	4.4	27.1	20.3	0.75	1.77	33.2	15.3	3.2
100	4.0	11.1	2.7	Operation not recommended						Operation not recommended						
	6.0	2.1	5.5	Operation not recommended						25.6	20.2	0.79	2.01	32.5	12.8	4.1
	8.0	3.5	9.3	Operation not recommended						25.9	20.3	0.78	1.97	32.6	13.1	3.9
110	4.0	1.0	2.6	Operation not recommended						Operation not recommended						
	6.0	2.0	5.3	Operation not recommended						21.7	18.9	0.87	2.22	29.3	9.8	5.0
	8.0	3.4	8.9	Operation not recommended						22.0	19.0	0.87	2.17	29.4	10.1	4.7
120	4.0	1.0	2.5	Operation not recommended						Operation not recommended						
	6.0	2.0	5.1	Operation not recommended						21.0	18.3	0.87	2.47	29.5	8.5	6.0
	8.0	3.2	8.6	Operation not recommended						21.3	18.3	0.86	2.42	29.5	8.8	5.7

2/10/12

# Performance Data cont.

## NS036 - Single Speed PSC (1250 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F						COOLING - EAT 80/67 °F						
		PSI	FT	HC Mbtu/h	Power kW	HE Mbtu/h	LAT °F	COP	HWC Mbtu/h	TC Mbtu/h	SC MBtu/h	S/T Ratio	Power kW	HR kBtuh	EER	HWC MBtu/h
20	5.0	1.0	2.4	Operation not recommended						Operation not recommended						
	7.0	2.1	4.9	Operation not recommended						Operation not recommended						
	9.0	3.6	8.2	21.8	1.99	15.0	86.1	3.21	2.4	Operation not recommended						
30	5.0	1.0	2.3	Operation not recommended						Operation not recommended						
	7.0	2.1	4.7	24.5	1.99	17.7	88.1	3.60	2.6	30.6	22.0	0.72	1.26	33.1	24.4	---
	9.0	3.5	8.0	25.0	2.01	18.1	88.5	3.64	2.7	31.1	21.4	0.69	1.22	33.5	25.6	---
40	5.0	1.0	2.3	Operation not recommended						Operation not recommended						
	7.0	2.0	4.6	28.4	2.04	21.5	91.1	4.09	3.0	33.6	23.9	0.71	1.36	36.0	24.8	---
	9.0	3.4	7.8	29.0	2.06	22.0	91.5	4.14	3.0	34.1	23.9	0.70	1.32	36.5	25.8	---
50	5.0	1.0	2.2	30.9	2.07	23.8	92.9	4.37	3.2	36.3	25.9	0.71	1.53	38.7	23.7	1.7
	7.0	1.9	4.5	32.0	2.08	24.9	93.7	4.51	3.3	36.4	26.0	0.72	1.48	38.8	24.6	1.6
	9.0	3.3	7.5	32.6	2.10	25.5	94.2	4.56	3.4	36.8	26.0	0.71	1.45	39.2	25.5	1.6
60	5.0	0.9	2.1	34.7	2.11	27.5	95.7	4.81	3.6	36.0	26.5	0.74	1.65	38.5	21.8	2.1
	7.0	1.9	4.3	35.9	2.12	28.6	96.6	4.95	3.7	36.1	26.6	0.74	1.60	38.6	22.6	2.0
	9.0	3.1	7.3	36.6	2.15	29.2	97.1	4.99	3.8	36.5	26.6	0.73	1.56	39.0	23.4	1.9
70	5.0	0.9	2.1	38.6	2.16	31.3	98.6	5.24	4.1	36.5	27.5	0.75	1.81	39.1	20.1	2.6
	7.0	1.8	4.2	40.0	2.18	32.6	99.6	5.38	4.2	36.6	27.5	0.75	1.75	39.2	20.9	2.5
	9.0	3.0	7.0	40.7	2.20	33.2	100.1	5.41	4.3	37.0	27.6	0.75	1.72	39.6	21.6	2.4
80	5.0	0.9	2.0	41.8	2.20	34.3	101.0	5.57	4.6	35.6	27.4	0.77	1.99	38.3	17.9	3.3
	7.0	1.7	4.0	43.4	2.23	35.8	102.1	5.71	4.7	35.8	27.4	0.76	1.91	38.4	18.7	3.1
	9.0	2.9	6.8	44.1	2.25	36.4	102.6	5.73	4.8	36.2	27.5	0.76	1.88	38.8	19.2	3.0
90	5.0	0.8	1.9	45.3	2.25	37.6	103.5	5.89	5.1	33.4	26.6	0.80	2.17	36.1	15.4	4.1
	7.0	1.7	3.9	47.0	2.28	39.2	104.8	6.03	5.3	33.6	26.6	0.79	2.09	36.3	16.1	3.9
	9.0	2.8	6.6	47.7	2.31	39.8	105.3	6.05	5.4	33.9	26.7	0.79	2.05	36.6	16.5	3.7
100	5.0	0.8	1.8	Operation not recommended						Operation not recommended						
	7.0	1.6	3.8	Operation not recommended						32.7	26.3	0.81	2.31	35.4	14.1	4.8
	9.0	2.7	6.3	Operation not recommended						33.0	26.5	0.80	2.27	35.7	14.5	4.6
110	5.0	0.8	1.8	Operation not recommended						Operation not recommended						
	7.0	1.6	3.6	Operation not recommended						29.4	24.5	0.83	2.54	32.2	11.6	5.9
	9.0	2.6	6.1	Operation not recommended						29.7	24.6	0.83	2.49	32.5	11.9	5.6
120	5.0	0.7	1.7	Operation not recommended						Operation not recommended						
	7.0	1.5	3.5	Operation not recommended						27.5	24.1	0.88	2.81	30.5	9.8	7.1
	9.0	2.5	5.8	Operation not recommended						27.8	24.2	0.87	2.75	30.8	10.1	6.7

2/10/12

## Performance Data cont.

### NS042 - Single Speed PSC (1350 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F						COOLING - EAT 80/67 °F						
		PSI	FT	HC Mbtu/h	Power kW	HE Mbtu/h	LAT °F	COP	HWC Mbtu/h	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR kBtuh	EER	HWC Mbtu/h
20	5.0	0.8	1.9	Operation not recommended						Operation not recommended						
	8.0	2.3	5.3	Operation not recommended						Operation not recommended						
	11.0	4.4	10.3	25.4	2.41	17.1	87.4	3.09	3.7	Operation not recommended						
30	5.0	0.8	1.8	Operation not recommended						Operation not recommended						
	8.0	2.2	5.1	29.3	2.45	21.0	90.1	3.51	3.9	41.0	28.4	0.69	1.73	43.4	23.8	---
	11.0	4.3	10.0	29.7	2.45	21.4	90.4	3.56	4.0	41.4	27.8	0.67	1.69	43.7	24.6	---
40	5.0	0.8	1.8	Operation not recommended						Operation not recommended						
	8.0	2.1	4.9	33.3	2.52	24.7	92.9	3.88	4.3	42.7	29.7	0.70	1.81	45.1	23.5	---
	11.0	4.2	9.7	33.9	2.52	25.3	93.3	3.94	4.4	43.1	29.7	0.69	1.77	45.5	24.4	---
50	5.0	0.7	1.7	35.8	2.52	27.2	94.6	4.16	4.7	43.3	30.7	0.71	2.01	45.7	21.6	2.6
	8.0	2.1	4.8	37.3	2.57	28.5	95.6	4.26	4.8	43.8	31.0	0.71	1.93	46.2	22.7	2.5
	11.0	4.1	9.4	38.0	2.58	29.3	96.1	4.33	5.0	44.2	31.0	0.70	1.88	46.6	23.5	2.4
60	5.0	0.7	1.7	39.3	2.57	30.5	97.0	4.48	5.3	43.1	31.4	0.73	2.17	45.6	19.8	3.2
	8.0	2.0	4.6	41.1	2.63	32.1	98.2	4.58	5.4	43.6	31.7	0.73	2.08	46.1	20.9	3.0
	11.0	3.9	9.1	42.0	2.65	33.0	98.8	4.66	5.6	44.1	31.7	0.72	2.03	46.5	21.7	2.9
70	5.0	0.7	1.6	42.7	2.63	33.7	99.3	4.76	6.0	43.1	32.4	0.75	2.37	45.7	18.2	4.0
	8.0	1.9	4.5	44.8	2.70	35.5	100.7	4.86	6.1	43.8	32.8	0.75	2.26	46.4	19.4	3.8
	11.0	3.8	8.8	45.9	2.73	36.6	101.5	4.94	6.3	44.3	32.8	0.74	2.21	46.8	20.1	3.6
80	5.0	0.7	1.6	45.9	2.65	36.9	101.5	5.09	6.7	41.4	31.7	0.77	2.59	44.0	15.9	5.1
	8.0	1.9	4.3	48.4	2.73	39.0	103.2	5.18	6.9	42.1	32.0	0.76	2.47	44.7	17.0	4.8
	11.0	3.7	8.5	49.8	2.77	40.3	104.1	5.28	7.1	42.6	32.0	0.75	2.41	45.1	17.7	4.6
90	5.0	0.7	1.5	49.1	2.68	40.0	103.7	5.37	7.5	39.0	30.8	0.79	2.86	41.7	13.7	6.4
	8.0	1.8	4.2	51.8	2.78	42.4	105.6	5.47	7.8	39.8	31.1	0.78	2.72	42.5	14.7	6.1
	11.0	3.5	8.2	53.5	2.82	43.9	106.7	5.57	8.0	40.2	31.1	0.77	2.64	42.9	15.2	5.8
100	5.0	0.6	1.5	Operation not recommended						Operation not recommended						
	8.0	1.7	4.0	Operation not recommended						38.2	30.5	0.80	2.98	40.9	12.8	7.5
	11.0	3.4	7.9	Operation not recommended						38.6	30.5	0.79	2.91	41.3	13.3	7.2
110	5.0	0.6	1.4	Operation not recommended						Operation not recommended						
	8.0	1.7	3.9	Operation not recommended						34.6	28.2	0.82	3.29	37.4	10.5	9.2
	11.0	3.3	7.6	Operation not recommended						35.0	28.2	0.81	3.20	37.7	10.9	8.8
120	5.0	0.6	1.3	Operation not recommended						Operation not recommended						
	8.0	1.6	3.7	Operation not recommended						32.5	27.9	0.86	3.61	35.4	9.0	11.1
	11.0	3.2	7.3	Operation not recommended						32.8	27.9	0.85	3.52	35.7	9.3	10.6

2/10/12

# Performance Data cont.

## NS048 - Single Speed PSC (1500 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F						COOLING - EAT 80/67 °F						
		PSI	FT	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC MBtu/h	TC MBtu/h	SC MBtu/h	S/T Ratio	Power kW	HR kBtu/h	EER	HWC MBtu/h
20	6.0	1.1	2.6	Operation not recommended						Operation not recommended						
	9.0	2.3	5.4	Operation not recommended						Operation not recommended						
	12.0	4.0	9.2	32.8	3.05	22.4	90.2	3.15	4.8	Operation not recommended						
30	6.0	1.1	2.5	Operation not recommended						Operation not recommended						
	9.0	2.3	5.3	37.5	3.13	26.8	93.1	3.51	5.2	49.7	34.1	0.69	1.90	52.0	26.1	---
	12.0	3.9	9.0	38.0	3.13	27.3	93.5	3.56	5.3	50.2	33.5	0.67	1.85	52.5	27.1	---
40	6.0	1.1	2.5	Operation not recommended						Operation not recommended						
	9.0	2.2	5.1	43.0	3.23	32.0	96.6	3.90	5.7	51.5	35.3	0.69	2.06	53.9	25.0	---
	12.0	3.8	8.7	43.8	3.24	32.7	97.0	3.96	5.8	52.1	35.3	0.68	2.01	54.4	25.9	---
50	6.0	1.0	2.4	46.2	3.26	35.1	98.5	4.16	6.2	52.5	36.7	0.70	2.35	54.9	22.3	3.1
	9.0	2.1	4.9	48.1	3.32	36.7	99.7	4.25	6.4	53.1	37.1	0.70	2.26	55.5	23.5	2.9
	12.0	3.7	8.4	49.0	3.33	37.7	100.3	4.31	6.5	53.6	37.1	0.69	2.20	56.0	24.4	2.8
60	6.0	1.0	2.3	50.8	3.33	39.5	101.4	4.48	7.0	51.1	36.3	0.71	2.58	53.5	19.8	3.7
	9.0	2.1	4.8	53.1	3.41	41.5	102.8	4.57	7.2	51.8	36.6	0.71	2.47	54.2	21.0	3.6
	12.0	3.5	8.2	54.4	3.43	42.7	103.6	4.64	7.4	52.3	36.6	0.70	2.40	54.7	21.8	3.4
70	6.0	1.0	2.2	55.5	3.41	43.9	104.3	4.78	7.9	50.8	36.7	0.72	2.86	53.2	17.8	4.7
	9.0	2.0	4.6	58.2	3.51	46.3	105.9	4.87	8.1	51.5	37.1	0.72	2.72	54.0	18.9	4.5
	12.0	3.4	7.9	59.7	3.54	47.7	106.9	4.95	8.3	52.1	37.1	0.71	2.65	54.5	19.6	4.2
80	6.0	0.9	2.1	59.4	3.46	47.5	106.6	5.03	8.8	48.5	35.9	0.74	3.17	51.0	15.3	5.9
	9.0	1.9	4.5	62.5	3.58	50.3	108.6	5.11	9.1	49.4	36.2	0.73	3.01	51.9	16.4	5.6
	12.0	3.3	7.6	64.3	3.62	51.9	109.7	5.20	9.4	49.9	36.2	0.73	2.93	52.4	17.0	5.4
90	6.0	0.9	2.1	63.2	3.52	51.2	109.0	5.26	9.9	45.1	34.2	0.76	3.50	47.7	12.9	7.4
	9.0	1.9	4.3	66.8	3.66	54.3	111.2	5.35	10.2	46.0	34.6	0.75	3.32	48.6	13.9	7.1
	12.0	3.2	7.4	68.9	3.71	56.2	112.5	5.44	10.6	46.5	34.6	0.74	3.23	49.0	14.4	6.7
100	6.0	0.9	2.0	Operation not recommended						Operation not recommended						
	9.0	1.8	4.2	Operation not recommended						44.3	34.1	0.77	3.69	46.9	12.0	8.8
	12.0	3.1	7.1	Operation not recommended						44.8	34.1	0.76	3.58	47.4	12.5	8.4
110	6.0	0.8	1.9	Operation not recommended						Operation not recommended						
	9.0	1.7	4.0	Operation not recommended						39.9	31.7	0.79	4.07	42.6	9.8	10.8
	12.0	3.0	6.8	Operation not recommended						40.3	31.7	0.79	3.96	43.0	10.2	10.2
120	6.0	0.8	1.8	Operation not recommended						Operation not recommended						
	9.0	1.7	3.8	Operation not recommended						37.6	31.1	0.83	4.50	40.4	8.4	13.0
	12.0	2.8	6.6	Operation not recommended						38.0	31.1	0.82	4.38	40.8	8.7	12.4

# Performance Data cont.

## NS060 - Single Speed PSC (2000 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F						COOLING - EAT 80/67 °F						
		PSI	FT	HC Mbtu/h	Power kW	HE Mbtu/h	LAT °F	COP	HWC Mbtu/h	TC Mbtu/h	SC MBtu/h	S/T Ratio	Power kW	HR kBtuh	EER	HWC MBtu/h
20	9.0	2.5	5.7	Operation not recommended						Operation not recommended						
	12.0	4.0	9.2	Operation not recommended						Operation not recommended						
	15.0	5.9	13.5	40.4	4.06	26.5	88.7	2.92	5.8	Operation not recommended						
30	9.0	2.4	5.5	Operation not recommended						Operation not recommended						
	12.0	3.9	8.9	45.4	4.06	31.5	91.0	3.28	6.2	68.8	47.6	0.69	2.91	71.2	23.7	---
	15.0	5.7	13.1	46.8	4.16	32.6	91.7	3.30	6.4	70.0	48.1	0.69	2.74	72.3	25.6	---
40	9.0	2.3	5.3	Operation not recommended						Operation not recommended						
	12.0	3.7	8.7	53.6	4.23	39.1	94.8	3.71	6.9	70.3	49.8	0.71	3.10	72.7	22.7	---
	15.0	5.5	12.7	54.8	4.30	40.1	95.4	3.73	7.1	71.1	49.6	0.70	2.95	73.5	24.1	---
50	9.0	2.2	5.2	58.9	4.35	44.1	97.3	3.97	7.5	71.4	50.5	0.71	3.44	73.8	20.8	4.1
	12.0	3.6	8.4	60.4	4.39	45.5	98.0	4.04	7.7	71.4	51.0	0.71	3.38	73.9	21.1	3.9
	15.0	5.3	12.3	61.5	4.43	46.4	98.5	4.07	7.9	72.2	51.0	0.71	3.23	74.6	22.3	3.7
60	9.0	2.2	5.0	65.4	4.47	50.1	100.3	4.29	8.4	69.1	49.4	0.71	3.63	71.5	19.0	5.0
	12.0	3.5	8.1	66.8	4.51	51.4	100.9	4.34	8.7	69.4	49.6	0.71	3.53	71.9	19.7	4.8
	15.0	5.2	11.9	68.7	4.58	53.1	101.8	4.40	8.9	69.8	49.9	0.71	3.41	72.2	20.5	4.6
70	9.0	2.1	4.9	72.0	4.60	56.3	103.4	4.59	9.5	67.8	49.4	0.73	3.97	70.3	17.1	6.3
	12.0	3.4	7.9	73.4	4.65	57.5	104.0	4.63	9.8	68.5	49.4	0.72	3.83	71.0	17.9	6.0
	15.0	5.0	11.6	76.1	4.74	59.9	105.2	4.71	10.0	68.5	49.9	0.73	3.73	71.0	18.4	5.7
80	9.0	2.0	4.7	76.7	4.71	60.7	105.5	4.78	10.7	64.8	48.0	0.74	4.35	67.3	14.9	8.0
	12.0	3.3	7.6	79.4	4.73	63.2	106.7	4.92	11.0	65.4	48.0	0.73	4.16	67.9	15.7	7.6
	15.0	4.8	11.2	81.5	4.87	64.9	107.7	4.91	11.3	65.8	48.5	0.74	4.05	68.3	16.2	7.2
90	9.0	2.0	4.5	81.6	4.83	65.2	107.8	4.96	12.0	60.3	45.8	0.76	4.74	62.9	12.7	10.0
	12.0	3.2	7.3	85.5	4.83	69.1	109.6	5.19	12.4	61.0	45.8	0.75	4.49	63.5	13.6	9.5
	15.0	4.7	10.8	87.2	5.02	70.1	110.4	5.09	12.8	61.6	46.3	0.75	4.37	64.1	14.1	9.1
100	9.0	1.9	4.4	Operation not recommended						Operation not recommended						
	12.0	3.1	7.1	Operation not recommended						58.5	45.0	0.77	4.99	61.1	11.7	11.8
	15.0	4.5	10.4	Operation not recommended						59.1	45.5	0.77	4.87	61.7	12.1	11.2
110	9.0	1.8	4.2	Operation not recommended						Operation not recommended						
	12.0	2.9	6.8	Operation not recommended						53.4	41.8	0.78	5.43	56.1	9.8	14.5
	15.0	4.3	10.0	Operation not recommended						54.0	42.3	0.78	5.30	56.6	10.2	13.8
120	9.0	1.7	4.0	Operation not recommended						Operation not recommended						
	12.0	2.8	6.5	Operation not recommended						49.8	41.5	0.83	6.09	52.6	8.2	17.5
	15.0	4.2	9.6	Operation not recommended						50.7	41.9	0.83	5.92	53.5	8.6	16.7



# Performance Data cont.

## NS070 - Single Speed PSC (2200 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F						COOLING - EAT 80/67 °F						
		PSI	FT	HC Mbtu/h	Power kW	HE Mbtu/h	LAT °F	COP	HWC Mbtu/h	TC Mbtu/h	SC MBtu/h	S/T Ratio	Power kW	HR kBtu/h	EER	HWC MBtu/h
20	12.0	3.0	7.0	Operation not recommended						Operation not recommended						
	15.0	4.4	10.2													
	18.0	6.0	13.9	46.9	4.62	31.2	89.8	2.98	6.9							
30	12.0	3.0	6.8	Operation not recommended						Operation not recommended						
	15.0	4.3	9.9	54.1	4.73	37.9	92.8	3.35	7.4	72.1	48.7	0.68	2.87	74.4	25.1	---
	18.0	5.8	13.5	54.3	4.75	38.1	92.8	3.35	7.6	72.5	49.1	0.68	2.86	74.8	25.3	---
40	12.0	2.9	6.6	Operation not recommended						Operation not recommended						
	15.0	4.1	9.6	63.1	4.89	46.4	96.5	3.78	8.2	75.8	52.8	0.70	3.11	78.2	24.4	---
	18.0	5.7	13.1	63.5	4.91	46.7	96.7	3.79	8.4	76.4	52.6	0.69	3.09	78.7	24.7	---
50	12.0	2.8	6.4	69.5	5.00	52.4	99.3	4.07	8.9	79.1	55.5	0.70	3.51	81.5	22.5	4.5
	15.0	4.0	9.3	70.9	5.04	53.7	99.9	4.13	9.2	79.5	55.7	0.70	3.41	81.9	23.3	4.3
	18.0	5.5	12.7	71.6	5.06	54.3	100.1	4.14	9.4	80.3	56.0	0.70	3.38	82.7	23.8	4.1
60	12.0	2.7	6.2	77.1	5.15	59.5	102.4	4.39	10.0	75.8	53.7	0.71	3.81	78.2	19.9	5.5
	15.0	3.9	9.0	79.3	5.21	61.6	103.4	4.47	10.3	76.1	53.9	0.71	3.70	78.6	20.6	5.2
	18.0	5.3	12.3	80.3	5.24	62.4	103.8	4.49	10.6	77.1	54.6	0.71	3.65	79.5	21.1	5.0
70	12.0	2.6	6.0	85.1	5.31	66.9	105.8	4.69	11.3	75.2	54.5	0.72	4.19	77.7	17.9	6.9
	15.0	3.8	8.7	88.2	5.39	69.8	107.1	4.79	11.6	75.5	54.6	0.72	4.08	78.0	18.5	6.6
	18.0	5.1	11.9	89.4	5.43	70.9	107.6	4.83	11.9	76.7	55.8	0.73	4.01	79.1	19.1	6.3
80	12.0	2.5	5.8	91.0	5.46	72.3	108.3	4.89	12.7	71.9	52.2	0.73	4.61	74.3	15.6	8.7
	15.0	3.6	8.4	95.1	5.56	76.2	110.0	5.01	13.1	72.1	52.2	0.72	4.49	74.6	16.1	8.3
	18.0	5.0	11.5	96.8	5.60	77.6	110.7	5.06	13.5	73.3	53.8	0.73	4.40	75.8	16.7	7.9
90	12.0	2.4	5.6	97.3	5.62	78.1	110.9	5.07	14.3	65.7	48.5	0.74	5.06	68.2	13.0	10.9
	15.0	3.5	8.1	102.5	5.75	82.9	113.1	5.23	14.7	65.9	48.4	0.73	4.93	68.4	13.4	10.4
	18.0	4.8	11.1	104.5	5.80	84.7	114.0	5.28	15.2	67.2	50.3	0.75	4.81	69.7	14.0	9.9
100	12.0	2.3	5.4	Operation not recommended						Operation not recommended						
	15.0	3.4	7.8							63.7	47.8	0.75	5.47	66.3	11.6	13.0
	18.0	4.6	10.7							65.1	50.2	0.77	5.33	67.7	12.2	12.3
110	12.0	2.2	5.2	Operation not recommended						Operation not recommended						
	15.0	3.3	7.5							56.2	42.5	0.76	6.03	58.8	9.3	15.9
	18.0	4.4	10.2							57.6	45.0	0.78	5.85	60.3	9.9	15.1
120	12.0	2.2	5.0	Operation not recommended						Operation not recommended						
	15.0	3.1	7.2							53.2	43.1	0.81	6.69	55.9	7.9	19.2
	18.0	4.3	9.8							54.6	46.0	0.84	6.47	57.5	8.4	18.2

## Performance Data cont.

### NS018 - Single Speed with Variable Speed ECM (600 cfm)

EWT °F	Flow Rate GPM	WPD		Heating - EAT 70°F							Cooling - EAT 80/67 °F							
		psi	ft/hd	Airflow cfm	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC MBtu/h	Airflow cfm	TC MBtu/h	SC MBtu/h	S/T Ratio	Power kW	HR MBtu/h	EER	HWC MBtu/h
20	3.0	1.8	4.1	Operation not recommended							Operation not recommended							
	4.0	3.0	6.9	Operation not recommended							Operation not recommended							
	5.0	4.3	9.9	500	12.3	1.09	8.6	90.8	3.30	1.6	Operation not recommended							
				600	12.7	1.12	8.9	87.6	3.34	1.5	Operation not recommended							
30	3.0	1.7	3.9	Operation not recommended							Operation not recommended							
	4.0	3.0	6.8	500	13.9	1.16	10.0	93.8	3.51	1.6	500	19.0	11.6	0.61	0.65	21.2	29.4	--
				600	14.4	1.19	10.3	90.2	3.55	1.6	600	19.5	12.9	0.66	0.70	21.9	28.1	--
	5.0	4.2	9.7	500	14.2	1.17	10.2	94.2	3.54	1.7	500	18.3	11.2	0.61	0.63	20.4	29.1	--
600				14.6	1.20	10.5	90.5	3.58	1.6	600	18.8	12.4	0.66	0.68	21.1	27.9	--	
40	3.0	1.7	3.8	Operation not recommended							Operation not recommended							
	4.0	2.9	6.7	500	15.4	1.22	11.2	96.5	3.70	1.8	500	19.4	11.7	0.60	0.69	21.8	28.0	--
				600	15.9	1.24	11.6	92.5	3.74	1.6	600	20.0	13.0	0.65	0.75	22.5	26.8	--
	5.0	4.2	9.6	500	15.8	1.23	11.6	97.2	3.76	1.8	500	19.2	11.5	0.60	0.64	21.4	29.9	--
600				16.3	1.26	12.0	93.1	3.79	1.7	600	19.8	12.8	0.65	0.69	22.1	28.6	--	
50	3.0	1.6	3.7	500	16.6	1.27	12.3	98.7	3.83	1.9	500	19.6	11.9	0.61	0.82	22.4	23.8	0.9
				600	17.1	1.30	12.7	94.4	3.87	1.7	600	20.1	13.2	0.66	0.89	23.1	22.7	1.0
	4.0	2.9	6.6	500	17.0	1.28	12.6	99.4	3.89	1.9	500	19.8	11.8	0.60	0.74	22.4	26.8	0.8
				600	17.5	1.31	13.0	95.0	3.93	1.8	600	20.4	13.2	0.64	0.80	23.1	25.7	0.9
5.0	4.2	9.6	500	17.4	1.29	13.0	100.2	3.95	1.9	500	20.1	11.8	0.59	0.66	22.4	30.7	0.8	
			600	17.9	1.32	13.4	95.6	3.99	1.9	600	20.7	13.1	0.63	0.71	23.1	29.4	0.9	
60	3.0	1.6	3.6	500	18.5	1.33	13.9	102.2	4.08	2.1	500	18.7	11.4	0.61	0.87	21.6	21.5	1.0
				600	19.1	1.36	14.4	97.4	4.12	2.0	600	19.2	12.7	0.66	0.94	22.4	20.5	1.1
	4.0	2.8	6.6	500	18.8	1.34	14.3	102.9	4.11	2.1	500	18.9	11.4	0.60	0.81	21.7	23.2	1.0
				600	19.4	1.37	14.8	98.0	4.16	2.0	600	19.4	12.6	0.65	0.88	22.4	22.2	1.1
5.0	4.1	9.5	500	19.2	1.36	14.6	103.6	4.15	2.2	500	19.1	11.3	0.59	0.76	21.7	25.2	0.9	
			600	19.8	1.39	15.1	98.6	4.19	2.0	600	19.6	12.6	0.64	0.82	22.4	24.0	1.0	
70	3.0	1.5	3.5	500	20.4	1.39	15.6	105.7	4.31	2.4	500	17.8	10.9	0.61	0.92	20.9	19.4	1.2
				600	21.0	1.42	16.2	100.4	4.35	2.2	600	18.3	12.1	0.66	0.99	21.7	18.6	1.3
	4.0	2.8	6.5	500	20.7	1.41	15.9	106.4	4.32	2.4	500	17.9	10.9	0.61	0.89	20.9	20.2	1.1
				600	21.4	1.44	16.5	100.9	4.36	2.2	600	18.4	12.1	0.66	0.96	21.7	19.3	1.3
5.0	4.1	9.5	500	21.0	1.43	16.2	107.0	4.33	2.4	500	18.0	10.9	0.60	0.86	20.9	20.9	1.1	
			600	21.7	1.46	16.7	101.5	4.37	2.2	600	18.5	12.1	0.65	0.93	21.7	20.0	1.2	
80	3.0	1.5	3.4	500	22.6	1.45	17.7	109.9	4.57	2.7	500	17.0	10.4	0.61	0.97	20.3	17.6	1.6
				600	23.3	1.48	18.3	104.0	4.62	2.5	600	17.5	11.6	0.66	1.04	21.0	16.8	1.7
	4.0	2.8	6.4	500	22.9	1.48	17.9	110.4	4.55	2.7	500	17.0	10.4	0.61	0.97	20.3	17.5	1.5
				600	23.6	1.51	18.5	104.5	4.60	2.4	600	17.5	11.6	0.66	1.05	21.1	16.7	1.6
5.0	4.1	9.4	500	23.3	1.49	18.2	111.1	4.58	2.7	500	17.2	10.6	0.62	0.95	20.4	18.1	1.4	
			600	24.0	1.52	18.8	105.0	4.63	2.5	600	17.7	11.8	0.67	1.02	21.1	17.3	1.5	
90	3.0	1.4	3.2	500	25.1	1.52	19.9	114.4	4.85	3.0	500	16.2	10.0	0.62	1.02	19.7	15.9	1.9
				600	25.8	1.55	20.6	107.9	4.90	2.8	600	16.7	11.1	0.67	1.10	20.4	15.2	2.1
	4.0	2.7	6.3	500	25.3	1.55	20.0	114.9	4.79	3.0	500	16.2	10.0	0.62	1.07	19.8	15.1	1.8
				600	26.1	1.58	20.7	108.3	4.84	2.8	600	16.6	11.1	0.67	1.15	20.5	14.5	2.0
5.0	4.0	9.2	500	25.5	1.55	20.2	115.2	4.81	3.1	500	16.3	10.3	0.63	1.04	19.9	15.7	1.7	
			600	26.3	1.59	20.9	108.6	4.86	2.9	600	16.8	11.4	0.68	1.12	20.6	15.0	1.9	
100	3.0	1.4	3.1	Operation not recommended							Operation not recommended							
	4.0	2.7	6.2	Operation not recommended							500	15.3	9.6	0.63	1.17	19.3	13.1	2.2
				600	15.8	10.7	0.68	1.26	20.1	12.5	2.4							
	5.0	4.0	9.1	Operation not recommended							500	15.3	9.9	0.65	1.19	19.4	12.9	2.0
600				15.8	11.1	0.70	1.28	20.1	12.3	2.3								
110	3.0	1.3	3.0	Operation not recommended							Operation not recommended							
	4.0	2.7	6.1	Operation not recommended							500	14.6	9.2	0.63	1.28	19.0	11.4	2.9
				600	15.0	10.2	0.68	1.38	19.7	10.9	3.2							
	5.0	3.9	9.0	Operation not recommended							500	14.3	9.6	0.67	1.33	18.9	10.7	2.6
600				14.7	10.7	0.73	1.44	19.6	10.2	3.0								
120	3.0	1.3	2.9	Operation not recommended							Operation not recommended							
	4.0	2.6	6.1	Operation not recommended							500	13.8	8.8	0.64	1.41	18.6	9.8	3.5
				600	14.2	9.8	0.69	1.51	19.4	9.4	4.0							
	5.0	3.9	8.9	Operation not recommended							500	13.3	9.2	0.69	1.48	18.4	9.0	3.1
600				13.7	10.2	0.74	1.60	19.1	8.6	3.5								

## Performance Data cont.

### NS022 - Single Speed with Variable Speed or 5-Speed ECM (700 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	3.0	0.9	2.2	Operation not recommended							Operation not recommended							
	4.5	1.8	4.2	Operation not recommended							Operation not recommended							
	6.0	2.9	6.8	600	12.0	1.16	8.0	88.4	3.03	1.6	Operation not recommended							
				700	12.1	1.17	8.1	86.0	3.04	1.5	Operation not recommended							
30	3.0	0.9	2.1	Operation not recommended							Operation not recommended							
	4.5	1.7	4.0	600	14.0	1.17	10.0	91.6	3.53	1.7	600	23.4	15.8	0.68	0.66	25.7	35.6	---
				700	14.3	1.18	10.3	88.9	3.57	1.6	700	23.8	17.3	0.73	0.69	26.2	34.4	---
	6.0	2.8	6.6	600	14.3	1.18	10.3	92.1	3.57	1.8	600	23.6	15.8	0.67	0.64	25.7	36.9	---
				700	14.5	1.19	10.5	89.2	3.59	1.6	700	24.1	17.3	0.72	0.67	26.4	36.0	---
	40	3.0	0.9	2.0	Operation not recommended							Operation not recommended						
4.5		1.7	3.9	600	16.5	1.19	12.5	95.5	4.06	1.9	600	24.9	16.3	0.65	0.71	27.3	35.3	---
				700	16.9	1.20	12.8	92.3	4.12	1.8	700	25.4	17.8	0.70	0.74	27.9	34.3	---
6.0		2.8	6.4	600	16.8	1.21	12.7	96.0	4.08	2.0	600	25.1	16.3	0.65	0.68	27.5	36.7	---
				700	17.1	1.21	13.0	92.7	4.16	1.8	700	25.7	17.8	0.69	0.72	28.1	35.9	---
50		3.0	0.9	2.0	600	18.0	1.20	13.9	97.7	4.39	2.1	600	25.4	16.0	0.63	0.83	28.2	30.7
	700				18.3	1.20	14.2	94.2	4.48	2.0	700	25.9	17.5	0.67	0.86	28.8	30.1	1.2
	4.5	1.6	3.8	600	18.9	1.23	14.7	99.1	4.51	2.2	600	25.6	16.2	0.63	0.79	28.3	32.6	1.0
				700	19.2	1.23	15.0	95.4	4.60	2.0	700	26.2	17.7	0.67	0.82	29.0	31.9	1.1
	6.0	2.7	6.2	600	19.1	1.24	14.9	99.5	4.51	2.2	600	25.9	16.2	0.63	0.76	28.5	34.0	1.0
				700	19.6	1.23	15.4	95.9	4.65	2.1	700	26.4	17.7	0.67	0.79	29.2	33.3	1.1
60	3.0	0.8	1.9	600	20.3	1.25	16.0	101.3	4.77	2.4	600	24.6	15.9	0.65	0.93	27.7	26.5	1.3
				700	20.7	1.23	16.5	97.4	4.93	2.2	700	25.1	17.3	0.69	0.96	28.4	26.0	1.4
	4.5	1.6	3.7	600	21.2	1.27	16.9	102.7	4.89	2.4	600	24.8	16.1	0.65	0.88	27.8	28.3	1.2
				700	21.8	1.26	17.5	98.8	5.05	2.3	700	25.3	17.5	0.69	0.91	28.5	27.7	1.3
	6.0	2.6	6.0	600	21.6	1.29	17.2	103.3	4.91	2.5	600	25.1	16.1	0.64	0.85	28.0	29.4	1.1
				700	22.1	1.27	17.8	99.3	5.10	2.3	700	25.6	17.5	0.68	0.89	28.6	28.9	1.3
70	3.0	0.8	1.8	600	22.6	1.30	18.2	104.9	5.11	2.7	600	24.3	15.8	0.65	1.05	27.8	23.1	1.6
				700	23.2	1.27	18.8	100.6	5.34	2.5	700	24.7	17.1	0.69	1.09	28.5	22.7	1.7
	4.5	1.5	3.6	600	23.6	1.32	19.1	106.4	5.23	2.7	600	24.5	15.9	0.65	0.99	27.8	24.6	1.5
				700	24.3	1.30	19.9	102.2	5.46	2.5	700	25.0	17.3	0.69	1.03	28.6	24.2	1.7
	6.0	2.5	5.8	600	24.1	1.34	19.5	107.1	5.27	2.8	600	24.7	15.9	0.64	0.97	28.0	25.6	1.4
				700	24.7	1.31	20.2	102.7	5.51	2.6	700	25.2	17.3	0.69	1.00	28.6	25.2	1.6
80	3.0	0.8	1.8	600	24.6	1.35	20.0	108.0	5.34	3.0	600	23.2	15.4	0.66	1.19	27.3	19.5	2.0
				700	25.3	1.32	20.8	103.5	5.64	2.8	700	23.7	16.7	0.71	1.23	27.9	19.2	2.2
	4.5	1.5	3.4	600	25.7	1.38	21.0	109.6	5.45	3.1	600	23.4	15.6	0.66	1.13	27.3	20.8	1.9
				700	26.5	1.35	21.9	105.1	5.78	2.8	700	24.0	16.9	0.71	1.16	27.9	20.6	2.1
	6.0	2.4	5.6	600	26.1	1.40	21.4	110.3	5.48	3.2	600	23.7	15.6	0.66	1.09	27.4	21.7	1.8
				700	27.0	1.36	22.3	105.7	5.82	2.9	700	24.2	16.9	0.70	1.13	28.0	21.4	2.0
90	3.0	0.7	1.7	600	26.6	1.41	21.8	111.1	5.53	3.3	600	21.5	15.0	0.70	1.35	26.1	15.9	2.5
				700	27.5	1.37	22.9	106.4	5.90	3.1	700	22.0	16.3	0.74	1.39	26.8	15.8	2.7
	4.5	1.4	3.3	600	27.8	1.44	22.9	112.9	5.64	3.4	600	21.7	15.2	0.70	1.28	26.1	17.0	2.4
				700	28.8	1.39	24.0	108.0	6.05	3.2	700	22.2	16.5	0.74	1.32	26.7	16.9	2.6
	6.0	2.3	5.4	600	28.2	1.46	23.2	113.6	5.66	3.5	600	22.0	15.2	0.69	1.24	26.2	17.8	2.2
				700	29.3	1.41	24.5	108.7	6.09	3.3	700	22.4	16.5	0.74	1.28	26.8	17.5	2.4
100	3.0	0.7	1.7	Operation not recommended							Operation not recommended							
	4.5	1.4	3.2	Operation not recommended							600	20.8	14.8	0.71	1.45	25.7	14.3	2.9
				700	21.2	16.1	0.76	1.49	26.3	14.2	3.2							
	6.0	2.2	5.2	Operation not recommended							600	21.0	14.8	0.70	1.41	25.8	15.0	2.7
700				21.4	16.1	0.75	1.45	26.4	14.8	3.0								
110	3.0	0.7	1.6	Operation not recommended							Operation not recommended							
	4.5	1.3	3.1	Operation not recommended							600	18.6	14.3	0.76	1.63	24.2	11.4	3.6
				700	19.0	15.5	0.81	1.68	24.8	11.3	3.9							
	6.0	2.2	5.0	Operation not recommended							600	18.8	14.3	0.76	1.59	24.2	11.9	3.3
700				19.2	15.5	0.81	1.63	24.8	11.8	3.7								
120	3.0	0.7	1.5	Operation not recommended							Operation not recommended							
	4.5	1.3	2.9	Operation not recommended							600	17.3	13.8	0.79	1.86	23.7	9.3	4.3
				700	17.6	14.9	0.85	1.91	24.2	9.3	4.7							
	6.0	2.1	4.8	Operation not recommended							600	17.5	13.8	0.79	1.80	23.6	9.7	4.0
700				17.9	14.9	0.84	1.86	24.2	9.6	4.4								

# Performance Data cont.

## NS030 - Single Speed with Variable Speed or 5-Speed ECM (900 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	4.0	1.4	3.5	Operation not recommended							Operation not recommended							
	6.0	2.8	7.2	Operation not recommended							Operation not recommended							
	8.0	4.6	12.1	700	16.9	1.52	11.7	92.4	3.26	2.2	Operation not recommended							
				900	17.2	1.55	11.9	87.7	3.25	2.0	Operation not recommended							
30	4.0	1.4	3.4	Operation not recommended							Operation not recommended							
	6.0	2.7	7.0	700	19.4	1.51	14.2	95.7	3.77	2.4	700	26.1	16.7	0.64	0.87	29.1	30.0	---
				900	19.8	1.54	14.6	90.4	3.77	2.2	900	26.8	18.7	0.70	0.94	30.0	28.5	---
	8.0	4.4	11.8	700	19.9	1.53	14.7	96.3	3.82	2.4	700	26.3	16.7	0.63	0.85	29.2	30.8	---
				900	20.2	1.56	14.9	90.8	3.81	2.2	900	27.3	18.7	0.68	0.91	30.4	30.0	---
40	4.0	1.3	3.3	Operation not recommended							Operation not recommended							
	6.0	2.6	6.8	700	22.7	1.56	17.4	100.1	4.27	2.6	700	28.3	18.0	0.64	0.95	31.5	29.7	---
				900	23.3	1.58	17.9	93.9	4.31	2.4	900	29.1	20.2	0.70	1.02	32.6	28.4	---
	8.0	4.3	11.4	700	23.3	1.58	17.9	100.8	4.32	2.7	700	28.5	18.0	0.63	0.93	31.7	30.5	---
				900	23.8	1.60	18.3	94.5	4.36	2.5	900	29.5	20.2	0.68	0.99	32.9	29.7	---
50	4.0	1.3	3.2	700	24.9	1.60	19.4	102.9	4.55	2.8	700	30.2	19.3	0.64	1.10	34.0	27.5	1.4
				900	25.5	1.62	20.0	96.2	4.61	2.6	900	31.1	21.7	0.70	1.17	35.1	26.6	1.5
	6.0	2.5	6.6	700	25.7	1.61	20.2	104.0	4.68	2.9	700	30.3	19.5	0.64	1.06	33.9	28.6	1.3
				900	26.4	1.63	20.8	97.1	4.75	2.7	900	31.2	21.8	0.70	1.13	35.0	27.7	1.4
	8.0	4.2	11.1	700	26.3	1.63	20.7	104.8	4.72	3.0	700	30.6	19.5	0.64	1.04	34.1	29.5	1.2
900				26.9	1.64	21.3	97.7	4.81	2.8	900	31.6	21.8	0.69	1.10	35.3	28.7	1.4	
60	4.0	1.2	3.1	700	27.9	1.67	22.2	107.0	4.90	3.2	700	29.5	18.9	0.64	1.21	33.6	24.4	1.7
				900	28.7	1.67	23.0	99.5	5.02	3.0	900	30.4	21.3	0.70	1.28	34.7	23.7	1.8
	6.0	2.4	6.4	700	28.9	1.69	23.1	108.2	5.01	3.3	700	29.6	19.1	0.65	1.16	33.5	25.4	1.6
				900	29.7	1.69	23.9	100.6	5.16	3.0	900	30.5	21.3	0.70	1.23	34.7	24.7	1.7
	8.0	4.0	10.7	700	29.5	1.71	23.6	109.0	5.05	3.4	700	29.9	19.1	0.64	1.14	33.8	26.2	1.5
900				30.3	1.70	24.5	101.1	5.21	3.1	900	30.8	21.4	0.69	1.20	34.9	25.6	1.6	
70	4.0	1.2	3.0	700	31.1	1.76	25.1	111.1	5.19	3.6	700	29.7	19.2	0.65	1.35	34.3	22.0	2.1
				900	32.0	1.75	26.0	102.9	5.36	3.3	900	30.6	21.6	0.71	1.42	35.4	21.5	2.2
	6.0	2.4	6.2	700	32.1	1.78	26.0	112.5	5.28	3.7	700	29.7	19.3	0.65	1.30	34.2	22.9	2.0
				900	33.1	1.76	27.1	104.1	5.50	3.4	900	30.6	21.6	0.70	1.37	35.3	22.4	2.1
	8.0	3.9	10.4	700	32.7	1.81	26.5	113.2	5.31	3.8	700	30.1	19.3	0.64	1.27	34.4	23.6	1.8
900				33.7	1.78	27.6	104.6	5.53	3.5	900	31.0	21.7	0.70	1.34	35.5	23.1	2.0	
80	4.0	1.2	2.9	700	33.6	1.84	27.3	114.4	5.36	4.0	700	28.4	19.0	0.67	1.51	33.6	18.9	2.6
				900	34.7	1.81	28.5	105.7	5.61	3.7	900	29.3	21.3	0.73	1.58	34.7	18.5	2.8
	6.0	2.3	5.9	700	34.8	1.87	28.4	116.0	5.46	4.1	700	28.6	19.1	0.67	1.45	33.5	19.7	2.5
				900	36.0	1.83	29.7	107.0	5.75	3.8	900	29.4	21.3	0.72	1.52	34.6	19.4	2.7
	8.0	3.8	10.0	700	35.3	1.89	28.9	116.7	5.47	4.3	700	28.8	19.1	0.66	1.42	33.7	20.3	2.3
900				36.5	1.85	30.2	107.6	5.77	3.9	900	29.7	21.4	0.72	1.49	34.8	19.9	2.5	
90	4.0	1.1	2.8	700	36.2	1.94	29.6	117.8	5.47	4.5	700	26.3	18.0	0.68	1.68	32.0	15.6	3.3
				900	37.4	1.89	31.0	108.5	5.80	4.2	900	27.1	20.1	0.74	1.75	33.1	15.5	3.5
	6.0	2.2	5.7	700	37.5	1.97	30.8	119.6	5.59	4.6	700	26.5	18.0	0.68	1.62	32.0	16.4	3.1
				900	38.9	1.92	32.3	110.0	5.93	4.3	900	27.3	20.1	0.74	1.68	33.0	16.2	3.3
	8.0	3.6	9.6	700	38.0	2.00	31.2	120.3	5.58	4.8	700	26.7	18.1	0.68	1.58	32.1	16.9	2.8
900				39.5	1.94	32.8	110.6	5.95	4.4	900	27.6	20.2	0.73	1.65	33.2	16.7	3.2	
100	4.0	1.1	2.7	Operation not recommended							Operation not recommended							
	6.0	2.1	5.5	700	25.3	18.0	0.71	1.83	31.5	13.8	3.8	Operation not recommended						
				900	26.0	20.1	0.77	1.89	32.5	13.8	4.1	Operation not recommended						
	8.0	3.5	9.3	700	25.5	18.1	0.71	1.79	31.6	14.3	3.5	Operation not recommended						
900				26.3	20.2	0.77	1.85	32.6	14.2	3.9	Operation not recommended							
110	4.0	1.0	2.6	Operation not recommended							Operation not recommended							
	6.0	2.0	5.3	700	21.5	16.9	0.79	2.04	28.5	10.6	4.6	Operation not recommended						
				900	22.2	18.8	0.85	2.10	29.3	10.6	5.0	Operation not recommended						
	8.0	3.4	8.9	700	21.7	17.0	0.78	1.99	28.5	10.9	4.3	Operation not recommended						
900				22.4	18.9	0.84	2.05	29.4	10.9	4.7	Operation not recommended							
120	4.0	1.0	2.5	Operation not recommended							Operation not recommended							
	6.0	2.0	5.1	700	20.8	16.3	0.78	2.30	28.7	9.1	5.5	Operation not recommended						
				900	21.4	18.1	0.85	2.35	29.5	9.1	6.0	Operation not recommended						
	8.0	3.2	8.6	700	20.9	16.4	0.78	2.25	28.6	9.3	5.1	Operation not recommended						
900				21.7	18.2	0.84	2.30	29.5	9.4	5.7	Operation not recommended							

# Performance Data cont.

## NS036 - Single Speed with Variable Speed or 5-Speed ECM (1250 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	5.0	1.0	2.4	Operation not recommended							Operation not recommended							
	7.0	2.1	4.9	Operation not recommended							Operation not recommended							
	9.0	3.6	8.2	1050	21.0	1.83	14.8	88.5	3.36	2.7	Operation not recommended							
				1250	21.4	1.87	15.0	85.8	3.35	2.4	Operation not recommended							
30	5.0	1.0	2.3	Operation not recommended							Operation not recommended							
	7.0	2.1	4.7	1050	23.6	1.84	17.3	90.8	3.76	2.9	1050	30.2	19.5	0.65	1.05	33.8	28.6	---
				1250	24.1	1.88	17.7	87.8	3.76	2.6	1250	31.0	21.9	0.70	1.14	34.9	27.2	---
	9.0	3.5	8.0	1050	24.2	1.86	17.9	91.3	3.82	3.0	1050	30.4	19.4	0.64	1.04	34.0	29.4	---
				1250	24.6	1.89	18.1	88.2	3.81	2.7	1250	31.5	21.8	0.69	1.10	35.3	28.7	---
	40	5.0	1.0	2.3	Operation not recommended							Operation not recommended						
7.0		2.0	4.6	1050	27.4	1.89	20.9	94.2	4.24	3.2	1050	33.1	21.7	0.66	1.15	37.0	28.7	---
				1250	28.0	1.92	21.5	90.8	4.28	3.0	1250	34.0	24.3	0.71	1.24	38.3	27.5	---
9.0		3.4	7.8	1050	28.0	1.92	21.5	94.7	4.29	3.3	1050	33.4	21.6	0.65	1.13	37.2	29.5	---
				1250	28.6	1.94	22.0	91.2	4.33	3.0	1250	34.5	24.3	0.70	1.20	38.6	28.7	---
50		5.0	1.0	2.2	1050	29.8	1.94	23.2	96.3	4.52	3.5	1050	35.6	23.4	0.66	1.33	40.2	26.8
	1250				30.5	1.95	23.8	92.6	4.58	3.2	1250	36.7	26.3	0.72	1.41	41.5	26.0	1.8
	7.0	1.9	4.5	1050	30.8	1.94	24.2	97.1	4.64	3.6	1050	35.7	23.6	0.66	1.28	40.1	27.9	1.6
				1250	31.6	1.96	24.9	93.4	4.72	3.3	1250	36.8	26.4	0.72	1.36	41.4	27.0	1.7
	9.0	3.3	7.5	1050	31.5	1.97	24.7	97.7	4.68	3.7	1050	36.1	23.6	0.65	1.25	40.4	28.8	1.4
				1250	32.2	1.98	25.5	93.9	4.78	3.4	1250	37.2	26.4	0.71	1.33	41.8	28.0	1.6
60	5.0	0.9	2.1	1050	33.4	1.99	26.6	99.4	4.92	3.9	1050	35.4	24.0	0.68	1.45	40.3	24.4	2.0
				1250	34.3	1.99	27.5	95.4	5.04	3.6	1250	36.4	26.9	0.74	1.54	41.7	23.7	2.1
	7.0	1.9	4.3	1050	34.5	2.01	27.6	100.4	5.03	4.0	1050	35.4	24.1	0.68	1.40	40.2	25.4	1.9
				1250	35.5	2.01	28.6	96.3	5.18	3.7	1250	36.5	27.0	0.74	1.48	41.6	24.7	2.0
	9.0	3.1	7.3	1050	35.2	2.04	28.2	101.0	5.06	4.2	1050	35.8	24.1	0.67	1.37	40.5	26.2	1.7
				1250	36.2	2.03	29.2	96.8	5.23	3.8	1250	36.9	27.0	0.73	1.45	41.9	25.6	1.9
70	5.0	0.9	2.1	1050	37.1	2.05	30.1	102.8	5.31	4.4	1050	35.9	24.9	0.69	1.61	41.3	22.3	2.5
				1250	38.2	2.04	31.3	98.3	5.48	4.1	1250	36.9	28.0	0.76	1.70	42.7	21.8	2.6
	7.0	1.8	4.2	1050	38.4	2.09	31.3	103.9	5.40	4.5	1050	36.0	25.0	0.70	1.55	41.2	23.2	2.3
				1250	39.6	2.06	32.6	99.3	5.63	4.2	1250	37.0	28.0	0.76	1.63	42.6	22.7	2.5
	9.0	3.0	7.0	1050	39.1	2.11	31.9	104.5	5.43	4.7	1050	36.3	25.0	0.69	1.52	41.5	24.0	2.2
				1250	40.3	2.09	33.2	99.8	5.66	4.3	1250	37.4	28.1	0.75	1.60	42.9	23.4	2.4
80	5.0	0.9	2.0	1050	40.1	2.11	32.9	105.4	5.57	4.9	1050	35.0	24.8	0.71	1.78	41.0	19.6	3.1
				1250	41.4	2.08	34.3	100.7	5.83	4.6	1250	36.0	27.8	0.77	1.87	42.4	19.3	3.3
	7.0	1.7	4.0	1050	41.6	2.15	34.3	106.7	5.68	5.1	1050	35.1	24.9	0.71	1.72	41.0	20.4	2.9
				1250	43.0	2.11	35.8	101.8	5.97	4.7	1250	36.2	27.8	0.77	1.80	42.3	20.2	3.1
	9.0	2.9	6.8	1050	42.2	2.18	34.8	107.2	5.69	5.2	1050	35.5	24.9	0.70	1.68	41.2	21.1	2.7
				1250	43.7	2.13	36.4	102.3	6.00	4.8	1250	36.6	27.9	0.76	1.76	42.6	20.7	3.0
90	5.0	0.8	1.9	1050	43.3	2.18	35.9	108.2	5.82	5.5	1050	32.8	24.2	0.74	1.97	39.5	16.6	3.9
				1250	44.9	2.13	37.6	103.2	6.16	5.1	1250	33.8	27.0	0.80	2.05	40.8	16.5	4.1
	7.0	1.7	3.9	1050	45.0	2.22	37.4	109.6	5.95	5.7	1050	33.0	24.2	0.73	1.90	39.5	17.4	3.6
				1250	46.6	2.17	39.2	104.5	6.31	5.3	1250	34.0	27.0	0.79	1.97	40.7	17.3	3.9
	9.0	2.8	6.6	1050	45.5	2.25	37.9	110.2	5.93	5.9	1050	33.3	24.3	0.73	1.85	39.6	17.9	3.4
				1250	47.3	2.19	39.8	105.0	6.32	5.4	1250	34.3	27.1	0.79	1.94	40.9	17.7	3.7
100	5.0	0.8	1.8	Operation not recommended							Operation not recommended							
	7.0	1.6	3.8	Operation not recommended							1050	32.1	24.0	0.75	2.12	39.3	15.1	4.5
				1250	33.1	26.8	0.81	2.20	40.6	15.0	4.8							
	9.0	2.7	6.3	Operation not recommended							1050	32.4	24.1	0.75	2.08	39.4	15.6	4.1
1250				33.4	26.9	0.81	2.15	40.7	15.5	4.6								
110	5.0	0.8	1.8	Operation not recommended							Operation not recommended							
	7.0	1.6	3.6	Operation not recommended							1050	28.9	22.3	0.77	2.35	36.9	12.3	5.4
				1250	29.8	24.9	0.84	2.42	38.0	12.3	5.9							
	9.0	2.6	6.1	Operation not recommended							1050	29.1	22.4	0.77	2.30	37.0	12.7	5.0
1250				30.1	25.0	0.83	2.37	38.2	12.7	5.6								
120	5.0	0.7	1.7	Operation not recommended							Operation not recommended							
	7.0	1.5	3.5	Operation not recommended							1050	27.1	22.0	0.81	2.63	36.1	10.3	6.5
				1250	27.9	24.5	0.88	2.70	37.1	10.4	7.1							
	9.0	2.5	5.8	Operation not recommended							1050	27.3	22.2	0.81	2.57	36.1	10.6	6.1
1250				28.2	24.6	0.87	2.63	37.2	10.7	6.7								

# Performance Data cont.

## NS042 - Single Speed with Variable Speed or 5-Speed ECM (1350 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F										
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h			
20	5.0	0.8	1.9	Operation not recommended							Operation not recommended										
	8.0	2.3	5.3	Operation not recommended							Operation not recommended										
	11.0	4.4	10.3	1150	24.0	2.12	16.8	89.3	3.32	4.1	1350	24.3	2.10	17.1	86.7	3.39	3.7				
30	5.0	0.8	1.8	Operation not recommended							Operation not recommended										
	8.0	2.2	5.1	1150	27.9	2.16	20.6	92.5	3.80	4.3	1150	40.2	24.5	0.61	1.34	44.8	29.9	---			
				1350	28.3	2.14	21.0	89.4	3.87	3.9	1350	42.1	27.5	0.65	1.42	46.9	29.6	---			
	11.0	4.3	10.0	1150	28.3	2.16	21.0	92.8	3.85	4.4	1150	40.6	24.5	0.60	1.31	45.0	31.1	---			
1350				28.7	2.14	21.4	89.7	3.93	4.0	1350	42.5	27.5	0.65	1.38	47.2	30.8	---				
40	5.0	0.8	1.8	Operation not recommended							Operation not recommended										
	8.0	2.1	4.9	1150	31.8	2.24	24.1	95.6	4.15	4.7	1150	41.9	26.2	0.62	1.43	46.8	29.3	---			
				1350	32.3	2.21	24.7	92.1	4.28	4.3	1350	43.8	29.4	0.67	1.51	48.9	29.0	---			
	11.0	4.2	9.7	1150	32.4	2.25	24.7	96.1	4.21	4.9	1150	42.3	26.2	0.62	1.39	47.1	30.5	---			
1350				32.9	2.21	25.3	92.5	4.35	4.4	1350	44.2	29.4	0.66	1.47	49.2	30.1	---				
50	5.0	0.7	1.7	1150	34.2	2.26	26.5	97.5	4.44	5.1	1150	42.6	27.0	0.63	1.62	48.1	26.3	2.5			
				1350	34.8	2.21	27.2	93.8	4.61	4.7	1350	44.4	30.4	0.68	1.71	50.2	26.0	2.6			
	8.0	2.1	4.8	1150	35.6	2.31	27.7	98.7	4.52	5.3	1150	43.1	27.3	0.63	1.55	48.3	27.9	2.3			
				1350	36.2	2.26	28.5	94.8	4.71	4.8	1350	44.8	30.7	0.68	1.63	50.4	27.6	2.5			
11.0	4.1	9.4	1150	36.3	2.32	28.4	99.3	4.58	5.4	1150	43.5	27.3	0.63	1.50	48.6	29.0	2.1				
			1350	37.0	2.27	29.3	95.4	4.78	5.0	1350	45.3	30.7	0.68	1.58	50.7	28.7	2.4				
60	5.0	0.7	1.7	1150	37.5	2.32	29.6	100.2	4.73	5.7	1150	42.5	27.7	0.65	1.78	48.5	23.8	3.0			
				1350	38.3	2.26	30.5	96.2	4.96	5.3	1350	44.1	31.1	0.71	1.87	50.5	23.6	3.2			
	8.0	2.0	4.6	1150	39.2	2.39	31.0	101.6	4.80	5.9	1150	43.0	28.0	0.65	1.70	48.8	25.4	2.8			
				1350	40.0	2.32	32.1	97.4	5.06	5.4	1350	44.7	31.4	0.70	1.78	50.8	25.1	3.0			
	11.0	3.9	9.1	1150	40.1	2.41	31.9	102.3	4.87	6.1	1150	43.4	28.0	0.64	1.65	49.1	26.4	2.6			
1350				41.0	2.34	33.0	98.1	5.14	5.6	1350	45.1	31.4	0.70	1.73	51.0	26.1	2.9				
70	5.0	0.7	1.6	1150	40.7	2.40	32.5	102.8	4.97	6.4	1150	42.6	28.6	0.67	1.97	49.4	21.6	3.8			
				1350	41.6	2.32	33.7	98.6	5.26	6.0	1350	44.2	32.1	0.73	2.06	51.2	21.4	4.0			
	8.0	1.9	4.5	1150	42.7	2.48	34.2	104.4	5.04	6.6	1150	43.3	28.9	0.67	1.87	49.7	23.1	3.5			
				1350	43.7	2.39	35.5	100.0	5.36	6.1	1350	44.9	32.5	0.72	1.96	51.5	22.9	3.8			
11.0	3.8	8.8	1150	43.8	2.51	35.2	105.2	5.11	6.8	1150	43.7	28.9	0.66	1.82	49.9	24.1	3.3				
			1350	44.9	2.42	36.6	100.8	5.45	6.3	1350	45.3	32.5	0.72	1.90	51.8	23.8	3.6				
80	5.0	0.7	1.6	1150	43.7	2.44	35.4	105.2	5.26	7.2	1150	41.0	27.9	0.68	2.19	48.5	18.7	4.8			
				1350	44.9	2.34	36.9	100.8	5.63	6.7	1350	42.4	31.4	0.74	2.29	50.2	18.5	5.1			
	8.0	1.9	4.3	1150	46.0	2.54	37.4	107.0	5.32	7.5	1150	41.8	28.2	0.68	2.08	48.9	20.1	4.5			
				1350	47.3	2.42	39.0	102.4	5.72	6.9	1350	43.2	31.7	0.73	2.17	50.6	19.9	4.8			
	11.0	3.7	8.5	1150	47.3	2.57	38.6	108.1	5.39	7.7	1150	42.2	28.2	0.67	2.02	49.1	20.9	4.1			
1350				48.7	2.46	40.3	103.4	5.82	7.1	1350	43.6	31.7	0.73	2.11	50.8	20.7	4.6				
90	5.0	0.7	1.5	1150	46.7	2.48	38.2	107.6	5.51	8.1	1150	38.9	27.1	0.70	2.45	47.2	15.9	6.0			
				1350	48.0	2.37	40.0	102.9	5.95	7.5	1350	40.1	30.5	0.76	2.55	48.8	15.7	6.4			
	8.0	1.8	4.2	1150	49.2	2.60	40.4	109.6	5.55	8.4	1150	39.7	27.4	0.69	2.31	47.6	17.1	5.6			
				1350	50.8	2.47	42.4	104.8	6.03	7.8	1350	40.9	30.8	0.75	2.41	49.1	17.0	6.1			
11.0	3.5	8.2	1150	50.8	2.64	41.8	110.9	5.63	8.6	1150	40.1	27.4	0.68	2.25	47.7	17.8	5.2				
			1350	52.4	2.51	43.9	106.0	6.14	8.0	1350	41.3	30.8	0.75	2.34	49.3	17.6	5.8				
100	5.0	0.6	1.5	Operation not recommended							Operation not recommended										
	8.0	1.7	4.0	1150	38.2	26.9	0.70	2.58	47.0	14.8	6.9	1350	39.2	30.2	0.77	2.68	48.4	14.6	7.5		
				1150	38.5	26.9	0.70	2.50	47.1	15.4	6.4	1350	39.6	30.2	0.76	2.60	48.5	15.2	7.2		
	110	5.0	0.6	1.4	Operation not recommended							Operation not recommended									
8.0		1.7	3.9	1150	34.8	24.9	0.71	2.88	44.6	12.1	8.5	1350	35.7	27.9	0.78	2.98	45.9	12.0	9.2		
				1150	35.1	24.9	0.71	2.79	44.7	12.6	7.9	1350	36.0	27.9	0.77	2.89	45.9	12.5	8.8		
11.0		3.3	7.6	Operation not recommended							Operation not recommended										
	Operation not recommended							Operation not recommended													
120	5.0	0.6	1.3	Operation not recommended							Operation not recommended										
	8.0	1.6	3.7	1150	32.8	24.6	0.75	3.20	43.7	10.2	10.3	1350	33.5	27.6	0.82	3.31	44.8	10.1	11.1		
				1150	33.1	24.6	0.74	3.11	43.7	10.7	9.5	1350	33.9	27.6	0.81	3.21	44.8	10.6	10.6		
	11.0	3.2	7.3	Operation not recommended							Operation not recommended										
Operation not recommended							Operation not recommended														

## Performance Data cont.

### NS048 - Single Speed with Variable Speed or 5-Speed ECM (1500 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	6.0	1.1	2.6	Operation not recommended							Operation not recommended							
	9.0	2.3	5.4	Operation not recommended							Operation not recommended							
	12.0	4.0	9.2	1300	31.6	2.84	21.9	92.5	3.26	5.3	Operation not recommended							
				1500	32.0	2.82	22.4	89.7	3.33	4.8	Operation not recommended							
30	6.0	1.1	2.5	Operation not recommended							Operation not recommended							
	9.0	2.3	5.3	1300	36.3	2.92	26.3	95.8	3.64	5.6	1300	48.2	29.6	0.61	1.58	53.6	30.5	---
				1500	36.7	2.90	26.8	92.6	3.71	5.2	1500	50.5	33.3	0.66	1.67	56.2	30.2	---
	12.0	3.9	9.0	1300	36.8	2.93	26.8	96.2	3.68	5.8	1300	48.7	29.6	0.61	1.53	53.9	31.8	---
1500				37.2	2.90	27.3	93.0	3.76	5.3	1500	51.0	33.3	0.65	1.62	56.5	31.4	---	
40	6.0	1.1	2.5	Operation not recommended							Operation not recommended							
	9.0	2.2	5.1	1300	41.7	3.05	31.3	99.7	4.00	6.2	1300	50.1	31.2	0.62	1.74	56.0	28.9	---
				1500	42.2	3.00	32.0	96.1	4.13	5.7	1500	52.3	35.1	0.67	1.83	58.6	28.6	---
	12.0	3.8	8.7	1300	42.4	3.06	31.9	100.2	4.06	6.4	1300	50.6	31.2	0.62	1.68	56.4	30.0	---
1500				43.0	3.01	32.7	96.5	4.19	5.8	1500	52.9	35.1	0.66	1.78	58.9	29.7	---	
50	6.0	1.0	2.4	1300	44.7	3.09	34.1	101.8	4.24	6.7	1300	51.2	32.5	0.63	2.02	58.1	25.3	2.9
				1500	45.4	3.02	35.1	98.0	4.40	6.2	1500	53.3	36.5	0.68	2.13	60.6	25.1	3.1
	9.0	2.1	4.9	1300	46.5	3.16	35.7	103.1	4.32	6.9	1300	51.7	32.8	0.63	1.93	58.3	26.8	2.7
				1500	47.3	3.08	36.7	99.2	4.49	6.4	1500	53.9	36.8	0.68	2.03	60.8	26.6	2.9
12.0	3.7	8.4	1300	47.4	3.18	36.6	103.8	4.37	7.2	1300	52.2	32.8	0.63	1.87	58.6	27.9	2.5	
			1500	48.2	3.10	37.7	99.8	4.56	6.5	1500	54.4	36.8	0.68	1.97	61.1	27.6	2.8	
60	6.0	1.0	2.3	1300	49.1	3.18	38.2	105.0	4.52	7.6	1300	50.0	32.1	0.64	2.24	57.6	22.3	3.5
				1500	50.0	3.10	39.5	100.9	4.74	7.0	1500	51.9	36.0	0.69	2.35	59.9	22.1	3.7
	9.0	2.1	4.8	1300	51.3	3.28	40.1	106.5	4.59	7.8	1300	50.6	32.4	0.64	2.13	57.9	23.7	3.3
				1500	52.3	3.18	41.5	102.3	4.83	7.2	1500	52.6	36.4	0.69	2.24	60.2	23.5	3.6
12.0	3.5	8.2	1300	52.5	3.31	41.2	107.4	4.65	8.0	1300	51.1	32.4	0.63	2.07	58.2	24.7	3.0	
			1500	53.6	3.20	42.7	103.1	4.91	7.4	1500	53.1	36.4	0.69	2.17	60.5	24.4	3.4	
70	6.0	1.0	2.2	1300	53.6	3.29	42.4	108.2	4.78	8.5	1300	49.7	32.4	0.65	2.51	58.3	19.8	4.4
				1500	54.7	3.17	43.9	103.8	5.05	7.9	1500	51.5	36.5	0.71	2.63	60.5	19.6	4.7
	9.0	2.0	4.6	1300	56.1	3.40	44.5	110.0	4.84	8.8	1300	50.5	32.8	0.65	2.38	58.6	21.2	4.1
				1500	57.4	3.27	46.3	105.5	5.14	8.1	1500	52.3	36.8	0.70	2.50	60.9	21.0	4.5
12.0	3.4	7.9	1300	57.6	3.44	45.8	111.0	4.91	9.0	1300	51.0	32.8	0.64	2.31	58.9	22.0	3.8	
			1500	59.0	3.31	47.7	106.4	5.22	8.3	1500	52.9	36.8	0.70	2.42	61.1	21.8	4.2	
80	6.0	0.9	2.1	1300	57.1	3.37	45.6	110.7	4.97	9.6	1300	47.7	31.7	0.67	2.81	57.3	17.0	5.6
				1500	58.6	3.23	47.5	106.2	5.32	8.8	1500	49.3	35.6	0.72	2.94	59.3	16.8	5.9
	9.0	1.9	4.5	1300	60.1	3.50	48.1	112.8	5.03	9.8	1300	48.5	32.0	0.66	2.66	57.6	18.2	5.2
				1500	61.7	3.35	50.3	108.1	5.40	9.1	1500	50.2	36.0	0.72	2.78	59.7	18.0	5.6
12.0	3.3	7.6	1300	61.8	3.55	49.7	114.0	5.10	10.1	1300	49.0	32.0	0.65	2.59	57.8	19.0	4.8	
			1500	63.5	3.39	51.9	109.2	5.49	9.4	1500	50.7	36.0	0.71	2.70	59.9	18.8	5.4	
90	6.0	0.9	2.1	1300	60.7	3.45	48.9	113.2	5.16	10.7	1300	44.5	30.3	0.68	3.14	55.2	14.2	7.0
				1500	62.4	3.29	51.2	108.5	5.56	9.9	1500	45.9	34.0	0.74	3.27	57.0	14.0	7.4
	9.0	1.9	4.3	1300	64.1	3.61	51.7	115.6	5.20	11.1	1300	45.4	30.6	0.67	2.97	55.5	15.3	6.5
				1500	66.0	3.43	54.3	110.7	5.64	10.2	1500	46.8	34.3	0.73	3.09	57.4	15.1	7.1
12.0	3.2	7.4	1300	66.1	3.67	53.5	117.0	5.27	11.4	1300	45.9	30.6	0.67	2.88	55.7	15.9	6.1	
			1500	68.1	3.48	56.2	112.0	5.74	10.6	1500	47.3	34.3	0.73	3.00	57.5	15.7	6.7	
100	6.0	0.9	2.0	Operation not recommended							Operation not recommended							
	9.0	1.8	4.2	Operation not recommended							1300	43.9	30.1	0.69	3.33	55.2	13.2	8.1
				1500	45.1	33.9	0.75	3.46	56.9	13.0	8.8							
	12.0	3.1	7.1	Operation not recommended							1300	44.3	30.1	0.68	3.23	55.3	13.7	7.5
1500				45.6	33.9	0.74	3.36	57.0	13.6	8.4								
110	6.0	0.8	1.9	Operation not recommended							Operation not recommended							
	9.0	1.7	4.0	Operation not recommended							1300	39.7	28.0	0.71	3.71	52.3	10.7	9.9
				1500	40.7	31.4	0.77	3.84	53.8	10.6	10.8							
	12.0	3.0	6.8	Operation not recommended							1300	40.1	28.0	0.70	3.60	52.3	11.1	9.2
1500				41.1	31.4	0.77	3.73	53.8	11.0	10.2								
120	6.0	0.8	1.8	Operation not recommended							Operation not recommended							
	9.0	1.7	3.8	Operation not recommended							1300	37.6	27.4	0.73	4.13	51.7	9.1	12.0
				1500	38.4	30.8	0.80	4.27	53.0	9.0	13.0							
	12.0	2.8	6.6	Operation not recommended							1300	37.9	27.4	0.72	4.01	51.6	9.5	11.1
1500				38.8	30.8	0.79	4.15	53.0	9.4	12.4								





# Performance Data cont.

## NS070 - Single Speed with Variable Speed or 5-Speed ECM (2200 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	12.0	3.0	7.0	Operation not recommended							Operation not recommended							
	15.0	4.4	10.2	Operation not recommended							Operation not recommended							
	18.0	6.0	13.9	1700	45.6	4.45	30.4	94.8	3.00	7.7	Operation not recommended							
				2200	46.6	4.54	31.2	89.6	3.01	6.9	Operation not recommended							
30	12.0	3.0	6.8	Operation not recommended							Operation not recommended							
	15.0	4.3	9.9	1700	52.5	4.55	37.0	98.6	3.38	8.1	1700	69.3	43.4	0.63	2.39	77.5	29.0	---
				2200	53.8	4.65	37.9	92.6	3.39	7.4	2200	73.9	49.6	0.67	2.79	83.4	26.5	---
	18.0	5.8	13.5	1700	52.7	4.57	37.1	98.7	3.38	8.4	1700	69.7	42.9	0.62	2.38	77.8	29.3	---
				2200	54.0	4.66	38.1	92.7	3.39	7.6	2200	74.3	49.0	0.66	2.78	83.8	26.7	---
	40	12.0	2.9	6.6	Operation not recommended							Operation not recommended						
15.0		4.1	9.6	1700	61.3	4.75	45.1	103.4	3.78	8.9	1700	71.7	46.1	0.64	2.63	80.6	27.3	---
				2200	62.8	4.80	46.4	96.4	3.83	8.2	2200	76.1	52.7	0.69	3.03	86.4	25.1	---
18.0		5.7	13.1	1700	61.7	4.77	45.4	103.6	3.79	9.2	1700	72.2	45.9	0.64	2.61	81.1	27.7	---
				2200	63.2	4.82	46.7	96.6	3.84	8.4	2200	76.6	52.5	0.68	3.01	86.9	25.5	---
50		12.0	2.8	6.4	1700	67.6	4.89	50.9	106.8	4.05	9.7	1700	75.1	48.4	0.64	3.01	85.4	24.9
	2200				69.2	4.91	52.4	99.1	4.13	8.9	2200	79.4	55.4	0.70	3.43	91.1	23.2	4.5
	15.0	4.0	9.3	1700	68.9	4.94	52.1	107.5	4.09	10.0	1700	75.5	48.7	0.64	2.92	85.5	25.8	4.0
				2200	70.6	4.95	53.7	99.7	4.18	9.2	2200	79.8	55.7	0.70	3.33	91.2	24.0	4.3
	18.0	5.5	12.7	1700	69.5	4.97	52.6	107.9	4.10	10.3	1700	76.3	48.9	0.64	2.89	86.1	26.4	3.7
				2200	71.3	4.98	54.3	100.0	4.20	9.4	2200	80.6	55.9	0.69	3.29	91.9	24.5	4.1
60	12.0	2.7	6.2	1700	74.9	5.09	57.5	110.8	4.31	10.8	1700	72.3	46.9	0.65	3.31	83.5	21.8	5.2
				2200	76.8	5.06	59.5	102.3	4.45	10.0	2200	76.1	53.6	0.70	3.72	88.8	20.4	5.5
	15.0	3.9	9.0	1700	77.1	5.16	59.5	112.0	4.38	11.2	1700	72.6	47.0	0.65	3.22	83.5	22.6	4.8
				2200	79.1	5.12	61.6	103.3	4.53	10.3	2200	76.4	53.8	0.70	3.62	88.8	21.1	5.2
	18.0	5.3	12.3	1700	78.0	5.20	60.2	112.5	4.39	11.5	1700	73.5	47.6	0.65	3.17	84.3	23.2	4.5
				2200	80.0	5.15	62.4	103.7	4.55	10.6	2200	77.4	54.5	0.70	3.57	89.5	21.7	5.0
70	12.0	2.6	6.0	1700	82.6	5.30	64.5	115.0	4.57	12.2	1700	72.0	47.5	0.66	3.69	84.6	19.5	6.5
				2200	84.8	5.22	66.9	105.7	4.76	11.3	2200	75.5	54.4	0.72	4.11	89.5	18.4	6.9
	15.0	3.8	8.7	1700	85.6	5.40	67.2	116.6	4.65	12.6	1700	72.3	47.6	0.66	3.59	84.5	20.2	6.1
				2200	87.9	5.30	69.8	107.0	4.86	11.6	2200	75.8	54.5	0.72	3.99	89.4	19.0	6.6
	18.0	5.1	11.9	1700	86.8	5.44	68.2	117.3	4.67	13.0	1700	73.4	48.7	0.66	3.53	85.4	20.8	5.6
				2200	89.1	5.34	70.9	107.5	4.89	11.9	2200	76.9	55.7	0.72	3.93	90.3	19.6	6.3
80	12.0	2.5	5.8	1700	88.2	5.50	69.4	118.0	4.70	13.7	1700	69.1	45.5	0.66	4.12	83.1	16.8	8.2
				2200	90.7	5.37	72.3	108.2	4.95	12.7	2200	72.1	52.1	0.72	4.53	87.6	15.9	8.7
	15.0	3.6	8.4	1700	92.2	5.62	73.0	120.2	4.81	14.1	1700	69.3	45.5	0.66	4.00	82.9	17.3	7.7
				2200	94.8	5.47	76.2	109.9	5.08	13.1	2200	72.4	52.1	0.72	4.40	87.4	16.4	8.3
	18.0	5.0	11.5	1700	93.6	5.68	74.3	121.0	4.83	14.6	1700	70.5	46.9	0.67	3.92	83.9	18.0	7.1
				2200	96.5	5.52	77.6	110.6	5.12	13.5	2200	73.6	53.7	0.73	4.31	88.3	17.1	7.9
90	12.0	2.4	5.6	1700	94.2	5.72	74.7	121.3	4.83	15.4	1700	63.4	42.2	0.67	4.57	79.0	13.9	10.3
				2200	97.0	5.53	78.1	110.8	5.14	14.3	2200	66.0	48.4	0.73	4.98	83.0	13.3	10.9
	15.0	3.5	8.1	1700	99.2	5.87	79.2	124.1	4.96	15.9	1700	63.6	42.1	0.66	4.45	78.8	14.3	9.6
				2200	102.2	5.66	82.9	113.0	5.29	14.7	2200	66.2	48.3	0.73	4.84	82.7	13.7	10.4
	18.0	4.8	11.1	1700	100.9	5.93	80.7	125.0	4.99	16.4	1700	64.9	43.8	0.68	4.35	79.7	14.9	8.9
				2200	104.2	5.71	84.8	113.9	5.35	15.2	2200	67.5	50.3	0.74	4.73	83.6	14.3	9.9
100	12.0	2.3	5.4	Operation not recommended							Operation not recommended							
	15.0	3.4	7.8	1700	61.7	41.6	0.67	5.01	78.9	12.3	12.0	Operation not recommended						
				2200	64.0	47.7	0.75	5.39	82.4	11.9	13.0	Operation not recommended						
	18.0	4.6	10.7	1700	63.1	43.7	0.69	4.88	79.8	12.9	11.1	Operation not recommended						
2200				65.4	50.1	0.77	5.24	83.3	12.5	12.3	Operation not recommended							
110	12.0	2.2	5.2	Operation not recommended							Operation not recommended							
	15.0	3.3	7.5	1700	54.8	37.0	0.67	5.58	73.8	9.8	14.6	Operation not recommended						
				2200	56.5	42.4	0.75	5.94	76.8	9.5	15.9	Operation not recommended						
	18.0	4.4	10.2	1700	56.1	39.1	0.70	5.41	74.6	10.4	13.6	Operation not recommended						
2200				57.9	44.9	0.78	5.76	77.6	10.0	15.1	Operation not recommended							
120	12.0	2.2	5.0	Operation not recommended							Operation not recommended							
	15.0	3.1	7.2	1700	52.0	37.4	0.72	6.27	73.4	8.3	17.7	Operation not recommended						
				2200	53.4	43.0	0.80	6.60	76.0	8.1	19.2	Operation not recommended						
	18.0	4.3	9.8	1700	53.4	40.0	0.75	6.06	74.1	8.8	16.4	Operation not recommended						
2200				54.9	45.9	0.84	6.38	76.7	8.6	18.2	Operation not recommended							

# Performance Data cont.

## ND026 - Dual Capacity with Variable Speed or 5-Speed ECM Low Speed (700 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	3.0	0.8	1.9	Operation not recommended							Operation not recommended							
	5.0	2.0	4.7	Operation not recommended							Operation not recommended							
	7.0	3.7	8.7	500	11.8	1.05	8.2	91.8	3.30	1.8	Operation not recommended							
				700	11.9	1.05	8.3	85.8	3.32	1.6	Operation not recommended							
30	3.0	0.8	1.8	Operation not recommended							Operation not recommended							
	5.0	2.0	4.5	500	13.5	1.06	9.9	95.1	3.75	1.8	500	22.5	14.1	0.63	0.52	24.3	43.2	---
				700	13.8	1.07	10.2	88.3	3.80	1.6	700	22.8	15.4	0.67	0.55	24.7	41.6	---
	7.0	3.6	8.4	500	13.8	1.07	10.2	95.6	3.80	1.8	500	22.6	14.1	0.62	0.51	24.3	44.7	---
				700	14.0	1.08	10.3	88.5	3.81	1.6	700	23.2	15.4	0.67	0.53	25.0	43.6	---
	40	3.0	0.8	1.8	Operation not recommended							Operation not recommended						
5.0		1.9	4.4	500	16.0	1.068	12.3	99.6	4.38	1.8	500	23.3	14.7	0.63	0.57	25.3	40.8	---
				700	16.3	1.07	12.6	91.5	4.45	1.7	700	23.8	16.0	0.67	0.60	25.8	39.6	---
7.0		3.5	8.2	500	16.2	1.08	12.6	100.1	4.40	1.9	500	23.5	14.7	0.63	0.56	25.4	42.3	---
				700	16.6	1.08	12.9	91.9	4.49	1.7	700	24.0	16.0	0.67	0.58	26.0	41.4	---
50		3.0	0.7	1.7	500	17.3	1.06	13.6	102.0	4.75	1.9	500	23.8	15.1	0.63	0.68	26.1	35.2
	700				17.6	1.06	14.0	93.3	4.85	1.7	700	24.3	16.4	0.68	0.70	26.7	34.5	0.8
	5.0	1.8	4.3	500	18.1	1.09	14.4	103.6	4.89	1.9	500	24.0	15.2	0.63	0.64	26.2	37.4	0.7
				700	18.5	1.09	14.8	94.5	4.98	1.8	700	24.5	16.6	0.68	0.67	26.8	36.6	0.7
	7.0	3.4	7.9	500	18.4	1.10	14.6	104.1	4.89	2.0	500	24.3	15.2	0.63	0.62	26.4	39.0	0.6
				700	18.8	1.10	15.1	94.9	5.04	1.8	700	24.8	16.6	0.67	0.65	27.0	38.1	0.7
60	3.0	0.7	1.7	500	19.5	1.08	15.8	106.2	5.29	2.1	500	23.0	14.8	0.64	0.76	25.6	30.1	1.0
				700	20.0	1.07	16.3	96.4	5.46	1.9	700	23.5	16.1	0.69	0.79	26.2	29.6	1.0
	5.0	1.8	4.1	500	20.4	1.10	16.7	107.9	5.42	2.1	500	23.2	14.9	0.64	0.72	25.7	32.1	0.9
				700	21.0	1.10	17.2	97.7	5.60	2.0	700	23.7	16.3	0.69	0.75	26.3	31.5	1.0
	7.0	3.3	7.6	500	20.8	1.12	17.0	108.5	5.44	2.2	500	23.5	14.9	0.64	0.70	25.9	33.4	0.8
				700	21.3	1.10	17.5	98.2	5.65	2.0	700	23.9	16.3	0.68	0.73	26.4	32.8	0.9
70	3.0	0.7	1.6	500	21.9	1.10	18.2	110.6	5.86	2.3	500	23.0	15.0	0.65	0.87	26.0	26.4	1.3
				700	22.4	1.07	18.8	99.7	6.12	2.1	700	23.5	16.3	0.69	0.91	26.6	25.9	1.4
	5.0	1.7	4.0	500	22.9	1.12	19.0	112.3	6.00	2.4	500	23.2	15.1	0.65	0.82	26.0	28.2	1.3
				700	23.6	1.10	19.8	101.2	6.26	2.2	700	23.7	16.5	0.69	0.86	26.7	27.7	1.4
	7.0	3.2	7.4	500	23.3	1.13	19.4	113.1	6.03	2.4	500	23.5	15.1	0.64	0.80	26.2	29.2	1.2
				700	23.9	1.11	20.1	101.6	6.31	2.2	700	23.9	16.5	0.69	0.83	26.7	28.8	1.3
80	3.0	0.7	1.6	500	23.8	1.13	19.9	114.0	6.19	2.6	500	21.7	14.5	0.67	1.00	25.1	21.8	1.8
				700	24.5	1.10	20.7	102.4	6.54	2.4	700	22.2	15.7	0.71	1.03	25.7	21.5	1.9
	5.0	1.7	3.9	500	24.8	1.15	20.9	116.0	6.32	2.6	500	21.9	14.6	0.67	0.94	25.1	23.2	1.7
				700	25.6	1.12	21.8	103.9	6.70	2.4	700	22.4	15.9	0.71	0.98	25.7	22.9	1.9
	7.0	3.1	7.1	500	25.3	1.16	21.3	116.8	6.36	2.7	500	22.2	14.6	0.66	0.92	25.3	24.2	1.6
				700	26.1	1.13	22.2	104.5	6.75	2.5	700	22.6	15.9	0.70	0.95	25.8	23.8	1.8
90	3.0	0.7	1.5	500	25.8	1.15	21.9	117.8	6.56	2.9	500	19.8	13.6	0.69	1.14	23.7	17.4	2.4
				700	26.6	1.12	22.8	105.2	6.99	2.7	700	20.3	14.8	0.73	1.17	24.3	17.3	2.6
	5.0	1.6	3.7	500	26.9	1.18	22.9	119.8	6.69	3.0	500	20.0	13.8	0.69	1.08	23.7	18.5	2.3
				700	27.8	1.14	24.0	106.8	7.17	2.8	700	20.5	15.0	0.73	1.11	24.2	18.5	2.5
	7.0	3.0	6.9	500	27.3	1.19	23.3	120.6	6.71	3.1	500	20.3	13.8	0.68	1.04	23.8	19.4	2.1
				700	28.4	1.15	24.4	107.5	7.22	2.8	700	20.6	15.0	0.73	1.08	24.3	19.1	2.4
100	3.0	0.6	1.5	Operation not recommended							Operation not recommended							
	5.0	1.6	3.6	Operation not recommended							500	19.3	13.7	0.71	1.23	23.5	15.7	3.0
				700	19.7	14.8	0.75	1.27	24.1	15.6	3.2							
	7.0	2.9	6.6	Operation not recommended							500	19.5	13.7	0.70	1.19	23.6	16.4	2.8
700				19.9	14.8	0.75	1.23	24.1	16.1	3.1								
110	3.0	0.6	1.4	Operation not recommended							Operation not recommended							
	5.0	1.5	3.4	Operation not recommended							500	16.9	12.6	0.74	1.40	21.7	12.1	3.8
				700	17.3	13.7	0.79	1.44	22.2	12.0	4.1							
	7.0	2.8	6.4	Operation not recommended							500	17.1	12.6	0.74	1.36	21.8	12.6	3.5
700				17.5	13.7	0.78	1.40	22.2	12.5	3.9								
120	3.0	0.6	1.3	Operation not recommended							Operation not recommended							
	5.0	1.4	3.3	Operation not recommended							500	16.2	12.5	0.77	1.59	21.6	10.2	4.7
				700	16.5	13.5	0.82	1.63	22.1	10.1	5.1							
	7.0	2.7	6.1	Operation not recommended							500	16.3	12.5	0.76	1.54	21.6	10.6	4.3
700				16.7	13.5	0.81	1.59	22.1	10.5	4.8								

# Performance Data cont.

## ND026 - Dual Capacity with Variable Speed or 5-Speed ECM High Speed (900 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	4.0	1.4	3.2	Operation not recommended							Operation not recommended							
	6.0	2.9	6.6	Operation not recommended							Operation not recommended							
	8.0	4.8	11.1	700	16.2	1.40	11.4	91.5	3.40	2.1	Operation not recommended							
				900	16.4	1.41	11.6	86.9	3.41	1.9	Operation not recommended							
30	4.0	1.4	3.2	Operation not recommended							Operation not recommended							
	6.0	2.8	6.4	700	18.6	1.44	13.7	94.6	3.79	2.3	700	29.8	18.6	0.62	0.93	33.0	32.1	---
				900	19.0	1.45	14.0	89.5	3.83	2.1	900	30.3	20.3	0.67	0.98	33.6	31.0	---
	8.0	4.7	10.8	700	19.0	1.45	14.0	95.1	3.83	2.3	700	30.0	18.6	0.62	0.90	33.0	33.3	---
				900	19.2	1.46	14.3	89.8	3.85	2.1	900	30.7	20.3	0.66	0.95	33.9	32.5	---
	40	4.0	1.3	3.1	Operation not recommended							Operation not recommended						
6.0		2.7	6.2	700	21.6	1.50	16.5	98.6	4.24	2.5	700	30.2	19.1	0.63	1.01	33.7	29.9	---
				900	22.1	1.50	16.9	92.7	4.30	2.3	900	30.8	20.8	0.68	1.06	34.4	29.1	---
8.0		4.5	10.4	700	22.0	1.51	16.8	99.1	4.26	2.6	700	30.5	19.1	0.63	0.98	33.8	31.1	---
				900	22.4	1.51	17.3	93.1	4.34	2.4	900	31.2	20.8	0.67	1.02	34.7	30.4	---
50		4.0	1.3	3.0	700	23.4	1.53	18.1	100.9	4.46	2.7	700	30.0	19.3	0.64	1.18	34.0	25.5
	900				23.8	1.53	18.6	94.5	4.55	2.5	900	30.7	21.0	0.69	1.22	34.8	25.1	1.4
	6.0	2.6	6.0	700	24.5	1.57	19.2	102.5	4.59	2.8	700	30.3	19.5	0.64	1.12	34.2	27.1	1.3
				900	25.0	1.57	19.7	95.7	4.67	2.6	900	31.0	21.3	0.69	1.16	34.9	26.6	1.4
	8.0	4.4	10.1	700	24.9	1.59	19.5	102.9	4.59	2.9	700	30.7	19.5	0.64	1.08	34.4	28.3	1.2
				900	25.5	1.58	20.1	96.2	4.73	2.7	900	31.3	21.3	0.68	1.13	35.1	27.7	1.3
60	4.0	1.2	2.9	700	26.3	1.62	20.8	104.8	4.77	3.1	700	29.7	19.2	0.65	1.28	34.0	23.2	1.6
				900	26.9	1.60	21.4	97.6	4.93	2.9	900	30.3	20.9	0.69	1.33	34.8	22.8	1.7
	6.0	2.5	5.8	700	27.5	1.65	21.9	106.4	4.89	3.2	700	30.0	19.4	0.65	1.21	34.1	24.7	1.5
				900	28.2	1.64	22.6	99.0	5.05	2.9	900	30.6	21.1	0.69	1.26	34.9	24.3	1.6
	8.0	4.2	9.8	700	28.0	1.67	22.3	107.0	4.91	3.3	700	30.3	19.4	0.64	1.18	34.3	25.7	1.4
				900	28.7	1.65	23.1	99.5	5.10	3.0	900	30.9	21.1	0.68	1.22	35.1	25.3	1.6
70	4.0	1.2	2.8	700	29.3	1.70	23.5	108.8	5.05	3.5	700	29.3	19.1	0.65	1.42	34.2	20.6	2.0
				900	30.0	1.67	24.3	100.9	5.28	3.2	900	29.9	20.8	0.69	1.48	34.9	20.2	2.1
	6.0	2.4	5.6	700	30.6	1.73	24.7	110.5	5.17	3.6	700	29.6	19.3	0.65	1.34	34.1	22.0	1.9
				900	31.5	1.71	25.7	102.5	5.40	3.3	900	30.2	21.0	0.69	1.40	35.0	21.6	2.0
	8.0	4.1	9.5	700	31.2	1.76	25.2	111.3	5.20	3.7	700	29.9	19.3	0.64	1.31	34.4	22.8	1.7
				900	32.0	1.72	26.1	102.9	5.44	3.4	900	30.5	21.0	0.69	1.35	35.1	22.5	1.9
80	4.0	1.2	2.7	700	32.0	1.80	25.8	112.3	5.20	3.9	700	28.2	18.8	0.67	1.57	33.5	17.9	2.5
				900	32.9	1.76	26.9	103.9	5.48	3.6	900	28.7	20.4	0.71	1.63	34.3	17.6	2.7
	6.0	2.4	5.4	700	33.4	1.84	27.1	114.2	5.31	4.0	700	28.4	18.9	0.67	1.49	33.5	19.0	2.3
				900	34.5	1.80	28.4	105.5	5.62	3.7	900	29.0	20.6	0.71	1.54	34.3	18.9	2.5
	8.0	4.0	9.2	700	34.0	1.87	27.6	114.9	5.33	4.1	700	28.7	18.9	0.66	1.45	33.7	19.9	2.2
				900	35.1	1.82	28.9	106.1	5.66	3.8	900	29.3	20.6	0.70	1.50	34.4	19.6	2.4
90	4.0	1.1	2.6	700	34.8	1.91	28.2	116.0	5.33	4.3	700	26.7	18.1	0.68	1.74	32.6	15.3	3.1
				900	35.9	1.86	29.6	107.0	5.67	4.0	900	27.3	19.7	0.72	1.79	33.4	15.2	3.3
	6.0	2.3	5.2	700	36.3	1.96	29.6	118.0	5.43	4.5	700	26.9	18.4	0.68	1.65	32.5	16.3	2.9
				900	37.6	1.89	31.1	108.6	5.82	4.1	900	27.5	19.9	0.72	1.69	33.3	16.3	3.2
	8.0	3.8	8.8	700	36.9	1.98	30.1	118.8	5.45	4.6	700	27.3	18.4	0.67	1.59	32.7	17.1	2.7
				900	38.3	1.91	31.7	109.4	5.86	4.3	900	27.8	19.9	0.72	1.65	33.4	16.8	3.0
100	4.0	1.1	2.5	Operation not recommended							Operation not recommended							
	6.0	2.2	5.1	700	25.6	1.78	0.70	1.85	31.9	13.8	3.6	Operation not recommended						
				900	26.1	1.93	0.74	1.90	32.6	13.8	3.9	Operation not recommended						
	8.0	3.7	8.5	700	25.9	1.78	0.69	1.79	32.0	14.5	3.3	Operation not recommended						
900				26.4	1.93	0.73	1.85	32.7	14.3	3.7	Operation not recommended							
110	4.0	1.0	2.4	Operation not recommended							Operation not recommended							
	6.0	2.1	4.9	700	23.4	1.68	0.72	2.04	30.4	11.5	4.4	Operation not recommended						
				900	23.9	1.82	0.76	2.10	31.1	11.4	4.7	Operation not recommended						
	8.0	3.5	8.2	700	23.7	1.68	0.71	1.98	30.4	12.0	4.1	Operation not recommended						
900				24.2	1.82	0.76	2.04	31.1	11.8	4.5	Operation not recommended							
120	4.0	1.0	2.3	Operation not recommended							Operation not recommended							
	6.0	2.0	4.7	700	21.7	1.61	0.74	2.29	29.5	9.5	5.3	Operation not recommended						
				900	22.1	1.75	0.79	2.35	30.1	9.4	5.7	Operation not recommended						
	8.0	3.4	7.9	700	21.9	1.61	0.74	2.21	29.4	9.9	4.9	Operation not recommended						
900				22.3	1.75	0.78	2.28	30.1	9.8	5.4	Operation not recommended							

# Performance Data cont.

## ND038 - Dual Capacity with Variable Speed or 5-Speed ECM Low Speed (1050 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	4.0	0.9	2.1	Operation not recommended							Operation not recommended							
	6.0	1.7	4.0	Operation not recommended							Operation not recommended							
	8.0	2.9	6.7	900	15.1	1.40	10.3	85.5	3.17	2.5	Operation not recommended							
				1050	15.7	1.43	10.8	83.9	3.22	2.3	Operation not recommended							
30	4.0	0.9	2.0	Operation not recommended							Operation not recommended							
	6.0	1.7	3.9	900	16.8	1.38	12.1	87.3	3.56	2.4	900	29.1	18.4	0.63	0.74	31.6	39.3	---
				1050	17.5	1.42	12.6	85.4	3.61	2.2	1050	29.9	20.4	0.68	0.75	32.5	39.6	---
	8.0	2.8	6.5	900	17.9	1.42	13.0	88.4	3.69	2.5	900	29.6	18.9	0.64	0.73	32.1	40.3	---
				1050	18.6	1.45	13.6	86.4	3.75	2.3	1050	30.4	20.9	0.69	0.75	33.0	40.6	---
	40	4.0	0.8	1.9	Operation not recommended							Operation not recommended						
6.0		1.6	3.8	900	19.8	1.41	15.0	90.4	4.13	2.5	900	30.3	19.7	0.65	0.80	33.0	37.8	---
				1050	20.5	1.44	15.6	88.1	4.19	2.3	1050	31.1	21.8	0.70	0.82	33.9	38.1	---
8.0		2.7	6.3	900	20.9	1.44	16.0	91.5	4.24	2.6	900	30.8	20.2	0.66	0.79	33.5	38.8	---
				1050	21.6	1.47	16.6	89.1	4.31	2.4	1050	31.7	22.4	0.71	0.81	34.4	39.1	---
50		4.0	0.8	1.9	900	21.8	1.43	16.9	92.5	4.46	2.6	900	31.3	21.1	0.67	0.91	34.4	34.3
	1050				22.5	1.45	17.6	89.8	4.54	2.4	1050	32.2	23.4	0.73	0.93	35.3	34.6	1.1
	6.0	1.6	3.7	900	22.6	1.43	17.7	93.2	4.62	2.7	900	31.6	21.2	0.67	0.89	34.6	35.5	0.9
				1050	23.3	1.45	18.3	90.5	4.70	2.5	1050	32.5	23.5	0.72	0.91	35.6	35.8	1.0
	8.0	2.6	6.1	900	23.7	1.47	18.6	94.3	4.72	2.8	900	32.1	21.8	0.68	0.88	35.1	36.4	0.9
				1050	24.4	1.49	19.3	91.5	4.81	2.5	1050	33.0	24.1	0.73	0.90	36.1	36.7	1.0
60	4.0	0.8	1.8	900	24.6	1.46	19.6	95.3	4.94	2.9	900	30.1	20.3	0.68	1.02	33.5	29.5	1.3
				1050	25.2	1.47	20.2	92.2	5.02	2.6	1050	30.9	22.5	0.73	1.04	34.4	29.7	1.4
	6.0	1.5	3.6	900	25.6	1.46	20.6	96.3	5.15	3.0	900	30.3	20.5	0.67	0.99	33.7	30.5	1.3
				1050	26.2	1.47	21.2	93.1	5.24	2.7	1050	31.2	22.6	0.73	1.01	34.6	30.8	1.4
	8.0	2.5	5.9	900	26.5	1.49	21.4	97.3	5.21	3.0	900	30.8	21.0	0.68	0.98	34.2	31.3	1.2
				1050	27.1	1.50	22.0	93.9	5.30	2.8	1050	31.7	23.2	0.73	1.00	35.1	31.6	1.3
70	4.0	0.8	1.8	900	27.3	1.49	22.3	98.1	5.39	3.2	900	29.7	20.6	0.69	1.16	33.6	25.7	1.9
				1050	27.9	1.49	22.8	94.6	5.49	2.9	1050	30.5	22.8	0.75	1.18	34.5	25.9	2.0
	6.0	1.5	3.5	900	28.5	1.48	23.5	99.4	5.65	3.3	900	29.9	20.7	0.69	1.13	33.8	26.6	1.7
				1050	29.1	1.48	24.0	95.6	5.76	3.0	1050	30.8	23.0	0.75	1.15	34.7	26.8	1.9
	8.0	2.5	5.7	900	29.3	1.51	24.1	100.1	5.67	3.4	900	30.4	21.3	0.70	1.12	34.2	27.3	1.6
				1050	29.8	1.51	24.6	96.3	5.78	3.1	1050	31.3	23.5	0.75	1.14	35.2	27.5	1.8
80	4.0	0.7	1.7	900	29.9	1.51	24.8	100.8	5.79	3.6	900	28.6	20.2	0.71	1.32	33.1	21.7	2.5
				1050	30.3	1.51	25.2	96.7	5.91	3.3	1050	29.4	22.4	0.76	1.34	33.9	21.9	2.7
	6.0	1.4	3.3	900	31.4	1.50	26.2	102.3	6.11	3.7	900	28.8	20.3	0.71	1.28	33.2	22.5	2.4
				1050	31.7	1.49	26.6	98.0	6.23	3.4	1050	29.6	22.5	0.76	1.31	34.1	22.7	2.6
	8.0	2.4	5.5	900	31.8	1.54	26.6	102.7	6.07	3.8	900	29.3	20.8	0.71	1.27	33.6	23.0	2.2
				1050	32.1	1.52	26.9	98.3	6.19	3.5	1050	30.1	23.1	0.77	1.30	34.5	23.2	2.5
90	4.0	0.7	1.6	900	32.5	1.54	27.2	103.4	6.18	4.0	900	26.5	18.9	0.71	1.50	31.6	17.6	3.4
				1050	32.7	1.52	27.5	98.9	6.31	3.7	1050	27.2	20.9	0.77	1.53	32.4	17.8	3.6
	6.0	1.4	3.2	900	34.1	1.53	28.9	105.1	6.56	4.2	900	26.7	19.0	0.71	1.46	31.7	18.3	3.2
				1050	34.3	1.50	29.2	100.3	6.69	3.8	1050	27.4	21.0	0.77	1.49	32.5	18.4	3.4
	8.0	2.3	5.3	900	34.3	1.56	29.0	105.3	6.45	4.3	900	27.1	19.5	0.72	1.45	32.1	18.7	2.9
				1050	34.4	1.53	29.2	100.4	6.59	4.0	1050	27.9	21.6	0.77	1.48	32.9	18.9	3.3
100	4.0	0.7	1.6	Operation not recommended							Operation not recommended							
	6.0	1.3	3.1	900	25.8	1.93	0.75	1.67	31.5	15.4	4.1	Operation not recommended						
				1050	26.5	2.14	0.81	1.70	32.3	15.6	4.5	Operation not recommended						
	8.0	2.2	5.1	900	26.2	1.98	0.76	1.65	31.8	15.8	3.8	Operation not recommended						
1050				26.9	2.19	0.81	1.69	32.7	16.0	4.2	Operation not recommended							
110	4.0	0.7	1.5	Operation not recommended							Operation not recommended							
	6.0	1.3	3.0	900	23.1	1.81	0.79	1.90	29.6	12.2	5.2	Operation not recommended						
				1050	23.7	2.01	0.85	1.93	30.3	12.3	5.7	Operation not recommended						
	8.0	2.1	4.9	900	23.5	1.86	0.79	1.88	29.9	12.5	4.8	Operation not recommended						
1050				24.1	2.06	0.85	1.92	30.7	12.6	5.4	Operation not recommended							
120	4.0	0.6	1.5	Operation not recommended							Operation not recommended							
	6.0	1.2	2.9	900	21.9	1.80	0.82	2.15	29.2	10.2	6.5	Operation not recommended						
				1050	22.5	1.99	0.88	2.20	30.0	10.2	7.0	Operation not recommended						
	8.0	2.0	4.7	900	22.2	1.84	0.83	2.13	29.5	10.4	6.0	Operation not recommended						
1050				22.9	2.04	0.89	2.18	30.3	10.5	6.7	Operation not recommended							

# Performance Data cont.

## ND038 - Dual Capacity with Variable Speed or 5-Speed ECM High Speed (1250 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	5.0	1.3	3.0	Operation not recommended							Operation not recommended							
	7.0	2.3	5.2	Operation not recommended							Operation not recommended							
	9.0	3.5	8.1	1050	21.6	1.90	15.1	89.0	3.34	2.9	Operation not recommended							
30	5.0	1.2	2.9	Operation not recommended							Operation not recommended							
				1050	24.9	1.93	18.3	91.9	3.77	3.1	1050	37.9	22.5	0.59	1.41	42.8	27.0	---
	7.0	2.2	5.1	1250	25.6	1.99	18.8	88.9	3.77	2.8	1250	40.1	25.1	0.63	1.49	45.2	26.9	---
				1050	25.3	1.95	18.6	92.3	3.80	3.2	1050	38.2	24.8	0.65	1.37	42.9	28.0	---
	9.0	3.4	7.9	1250	26.1	2.01	19.2	89.3	3.80	2.9	1250	40.5	27.5	0.68	1.46	45.5	27.8	---
40	5.0	1.2	2.8	Operation not recommended							Operation not recommended							
				1050	29.0	2.05	22.0	95.6	4.16	3.4	1050	39.4	24.1	0.61	1.55	44.7	25.4	---
	7.0	2.1	4.9	1250	29.9	2.09	22.8	92.2	4.19	3.1	1250	41.5	26.8	0.65	1.64	47.1	25.4	---
				1050	29.6	2.07	22.5	96.1	4.20	3.5	1050	39.7	26.1	0.66	1.51	44.9	26.3	---
	9.0	3.3	7.6	1250	30.5	2.11	23.3	92.6	4.24	3.2	1250	42.0	29.0	0.69	1.60	47.4	26.2	---
50	5.0	1.2	2.7	1050	31.4	2.10	24.3	97.7	4.39	3.7	1050	39.6	25.1	0.63	1.84	45.9	21.5	1.9
				1250	32.4	2.13	25.1	94.0	4.46	3.4	1250	41.7	27.9	0.67	1.94	48.3	21.5	2.0
	7.0	2.1	4.8	1050	32.6	2.15	25.3	98.7	4.45	3.8	1050	40.5	25.4	0.63	1.74	46.4	23.3	1.8
				1250	33.6	2.17	26.2	94.9	4.53	3.5	1250	42.6	28.2	0.66	1.82	48.8	23.4	1.9
	9.0	3.2	7.4	1050	33.3	2.17	25.9	99.4	4.51	3.9	1050	40.9	27.1	0.66	1.69	46.7	24.1	1.7
60	5.0	1.1	2.6	1050	34.7	2.20	27.2	100.6	4.62	4.2	1050	39.2	25.7	0.66	1.96	45.9	20.0	2.3
				1250	35.8	2.22	28.2	96.5	4.73	3.8	1250	41.1	28.6	0.70	2.05	48.1	20.1	2.4
	7.0	2.0	4.6	1050	36.2	2.26	28.5	102.0	4.69	4.3	1050	40.2	26.0	0.65	1.87	46.5	21.5	2.2
				1250	37.4	2.28	29.6	97.7	4.81	4.0	1250	42.1	28.9	0.69	1.94	48.7	21.6	2.3
	9.0	3.1	7.2	1050	37.1	2.29	29.3	102.7	4.76	4.4	1050	40.5	27.4	0.68	1.82	46.8	22.3	2.0
70	5.0	1.1	2.5	1050	38.0	2.32	30.1	103.5	4.80	4.7	1050	39.2	26.6	0.68	2.15	46.5	18.2	2.9
				1250	39.3	2.32	31.4	99.1	4.96	4.3	1250	40.9	29.6	0.72	2.24	48.5	18.3	3.0
	7.0	1.9	4.5	1050	39.9	2.40	31.8	105.2	4.88	4.8	1050	40.2	26.9	0.67	2.06	47.2	19.5	2.7
				1250	41.2	2.40	33.1	100.6	5.04	4.4	1250	41.9	29.8	0.71	2.13	49.2	19.6	2.9
	9.0	3.0	6.9	1050	41.0	2.43	32.7	106.1	4.95	5.0	1050	40.6	28.0	0.69	2.01	47.5	20.2	2.5
80	5.0	1.1	2.5	1050	40.4	2.41	32.2	105.6	4.90	5.2	1050	37.8	26.2	0.69	2.34	45.8	16.1	3.6
				1250	41.8	2.40	33.7	101.0	5.12	4.8	1250	39.3	29.2	0.74	2.42	47.5	16.3	3.8
	7.0	1.9	4.3	1050	42.7	2.51	34.2	107.7	4.99	5.4	1050	38.8	26.6	0.68	2.26	46.6	17.2	3.3
				1250	44.2	2.49	35.7	102.7	5.21	5.0	1250	40.4	29.4	0.73	2.33	48.3	17.4	3.6
	9.0	2.9	6.7	1050	44.0	2.54	35.3	108.8	5.07	5.6	1050	39.3	27.2	0.69	2.21	46.8	17.7	3.1
90	5.0	1.0	2.4	1050	42.9	2.52	34.3	107.8	4.98	5.9	1050	35.7	25.5	0.71	2.53	44.3	14.1	4.4
				1250	44.4	2.49	35.9	102.9	5.24	5.4	1250	37.0	28.4	0.77	2.59	45.8	14.3	4.7
	7.0	1.8	4.2	1050	45.6	2.64	36.6	110.2	5.06	6.0	1050	36.8	25.9	0.70	2.46	45.1	15.0	4.1
				1250	47.2	2.59	38.4	105.0	5.34	5.6	1250	38.1	28.7	0.75	2.52	46.7	15.1	4.5
	9.0	2.8	6.5	1050	47.0	2.68	37.9	111.5	5.15	6.2	1050	37.2	26.1	0.70	2.42	45.4	15.4	3.9
100	5.0	1.0	2.3	Operation not recommended							Operation not recommended							
				1050	35.4	25.6	0.72	2.74	44.8	12.9	5.1	Operation not recommended						
	7.0	1.7	4.0	1250	36.6	28.4	0.78	2.78	46.1	13.1	5.5	Operation not recommended						
				1050	35.8	25.6	0.71	2.69	45.0	13.3	4.8	Operation not recommended						
9.0	2.7	6.2	1250	37.0	28.3	0.76	2.74	46.3	13.5	5.3	Operation not recommended							
110	5.0	1.0	2.2	Operation not recommended							Operation not recommended							
				1050	32.4	24.1	0.74	2.99	42.6	10.8	6.2	Operation not recommended						
	7.0	1.7	3.9	1250	33.3	26.7	0.80	3.01	43.6	11.0	6.8	Operation not recommended						
				1050	32.7	23.7	0.73	2.94	42.8	11.1	5.8	Operation not recommended						
9.0	2.6	6.0	1250	33.6	26.2	0.78	2.97	43.8	11.3	6.4	Operation not recommended							
120	5.0	0.9	2.1	Operation not recommended							Operation not recommended							
				1050	30.5	23.6	0.77	3.34	41.9	9.1	7.5	Operation not recommended						
	7.0	1.6	3.7	1250	31.2	26.2	0.84	3.34	42.6	9.3	8.1	Operation not recommended						
				1050	30.8	23.0	0.75	3.29	42.0	9.4	7.0	Operation not recommended						
9.0	2.5	5.8	1250	31.5	25.3	0.81	3.30	42.7	9.5	7.7	Operation not recommended							

# Performance Data cont.

## ND049 - Dual Capacity with Variable Speed or 5-Speed ECM Low Speed (1350 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	5.0	0.9	2.2	Operation not recommended							Operation not recommended							
	8.0	2.0	4.6	Operation not recommended							Operation not recommended							
	11.0	3.4	7.8	1150	22.1	2.23	14.4	87.8	2.90	4.2	Operation not recommended							
				1350	22.9	2.26	15.1	85.7	2.96	3.8	Operation not recommended							
30	5.0	0.9	2.1	Operation not recommended							Operation not recommended							
	8.0	1.9	4.4	1150	25.4	2.28	17.7	90.5	3.27	4.3	1150	37.5	20.0	0.53	1.13	41.4	33.3	---
				1350	26.2	2.29	18.4	88.0	3.35	3.9	1350	38.8	23.6	0.61	1.20	42.9	32.4	---
	11.0	3.3	7.6	1150	26.1	2.29	18.2	91.0	3.33	4.4	1150	37.6	19.9	0.53	1.05	41.2	35.7	---
1350				27.0	2.32	19.1	88.5	3.40	4.0	1350	38.6	23.5	0.61	1.12	42.4	34.5	---	
40	5.0	0.9	2.0	Operation not recommended							Operation not recommended							
	8.0	1.9	4.3	1150	29.2	2.36	21.1	93.5	3.63	4.5	1150	39.6	21.8	0.55	1.24	43.9	31.9	---
				1350	30.2	2.36	22.2	90.7	3.76	4.2	1350	40.9	25.7	0.63	1.31	45.4	31.3	---
	11.0	3.2	7.4	1150	30.1	2.37	22.0	94.3	3.72	4.7	1150	39.8	21.8	0.55	1.17	43.8	34.1	---
1350				31.2	2.39	23.0	91.4	3.82	4.2	1350	40.9	25.7	0.63	1.23	45.1	33.3	---	
50	5.0	0.9	2.0	1150	30.2	2.35	22.2	94.3	3.77	4.8	1150	40.4	23.3	0.58	1.60	45.9	25.2	1.6
				1350	31.2	2.35	23.2	91.4	3.89	4.4	1350	41.7	27.5	0.66	1.67	47.4	24.9	1.7
	8.0	1.8	4.2	1150	32.6	2.43	24.3	96.2	3.93	4.9	1150	41.3	23.4	0.57	1.39	46.0	29.8	1.5
				1350	33.8	2.41	25.6	93.2	4.11	4.5	1350	42.5	27.6	0.65	1.45	47.5	29.2	1.6
11.0	3.1	7.2	1150	33.8	2.44	25.5	97.2	4.06	5.1	1150	41.5	23.4	0.56	1.31	46.0	31.8	1.4	
			1350	34.9	2.44	26.6	94.0	4.19	4.6	1350	42.8	27.6	0.65	1.37	47.5	31.1	1.5	
60	5.0	0.8	1.9	1150	33.0	2.44	24.7	96.6	3.97	5.2	1150	40.2	23.3	0.58	1.73	46.1	23.3	2.3
				1350	34.2	2.43	25.9	93.5	4.14	4.8	1350	41.5	27.4	0.66	1.80	47.6	23.0	2.4
	8.0	1.8	4.0	1150	35.7	2.50	27.2	98.8	4.19	5.4	1150	40.9	23.5	0.57	1.53	46.1	26.7	2.1
				1350	37.1	2.47	28.7	95.5	4.40	5.0	1350	42.1	27.6	0.66	1.60	47.6	26.3	2.3
11.0	3.0	6.9	1150	37.3	2.52	28.7	100.0	4.33	5.5	1150	41.3	23.5	0.57	1.46	46.3	28.4	1.9	
			1350	38.6	2.49	30.1	96.5	4.54	5.1	1350	42.6	27.7	0.65	1.52	47.8	28.0	2.2	
70	5.0	0.8	1.8	1150	35.7	2.53	27.1	98.8	4.14	5.8	1150	40.4	24.5	0.61	1.90	46.9	21.3	3.2
				1350	37.1	2.50	28.6	95.5	4.36	5.4	1350	41.7	28.8	0.69	1.99	48.5	20.9	3.4
	8.0	1.7	3.9	1150	38.8	2.57	30.0	101.2	4.42	6.0	1150	40.8	24.7	0.61	1.72	46.7	23.7	3.0
				1350	40.3	2.53	31.7	97.6	4.67	5.5	1350	42.1	29.1	0.69	1.80	48.3	23.4	3.2
11.0	2.9	6.7	1150	40.5	2.60	31.7	102.6	4.57	6.1	1150	41.6	24.8	0.60	1.65	47.2	25.2	2.8	
			1350	42.1	2.54	33.4	98.8	4.85	5.7	1350	42.8	29.2	0.68	1.71	48.7	25.0	3.1	
80	5.0	0.8	1.8	1150	37.9	2.59	29.1	100.5	4.30	6.5	1150	39.2	23.4	0.60	2.07	46.2	18.9	4.4
				1350	39.4	2.54	30.7	97.0	4.54	6.0	1350	40.4	27.5	0.68	2.16	47.8	18.7	4.6
	8.0	1.6	3.8	1150	41.2	2.62	32.3	103.2	4.61	6.7	1150	39.4	23.7	0.60	1.93	45.9	20.4	4.1
				1350	42.9	2.55	34.2	99.4	4.92	6.1	1350	40.5	27.9	0.69	2.00	47.4	20.2	4.4
11.0	2.8	6.5	1150	43.3	2.65	34.3	104.9	4.80	6.9	1150	40.2	23.9	0.59	1.84	46.5	21.8	3.8	
			1350	45.0	2.57	36.2	100.9	5.13	6.3	1350	41.5	28.1	0.68	1.92	48.0	21.6	4.2	
90	5.0	0.7	1.7	1150	40.0	2.64	31.0	102.2	4.43	7.2	1150	36.9	21.6	0.58	2.27	44.7	16.3	5.9
				1350	41.6	2.59	32.7	98.5	4.71	6.7	1350	38.1	25.4	0.67	2.36	46.2	16.1	6.2
	8.0	1.6	3.6	1150	43.5	2.66	34.4	105.0	4.79	7.4	1150	36.9	21.8	0.59	2.15	44.3	17.2	5.5
				1350	45.3	2.57	36.5	101.1	5.16	6.9	1350	38.0	25.7	0.68	2.23	45.6	17.0	5.9
11.0	2.7	6.2	1150	45.9	2.69	36.7	107.0	5.00	7.7	1150	38.0	22.1	0.58	2.06	45.0	18.4	5.1	
			1350	47.8	2.60	38.9	102.8	5.39	7.1	1350	39.1	26.0	0.66	2.15	46.5	18.2	5.6	
100	5.0	0.7	1.7	Operation not recommended							Operation not recommended							
	8.0	1.5	3.5	1150	35.2	22.5	0.64	2.42	43.5	14.6	7.1	Operation not recommended						
				1350	36.3	26.5	0.73	2.51	44.9	14.4	7.7	Operation not recommended						
	11.0	2.6	6.0	1150	36.5	22.8	0.63	2.33	44.5	15.7	6.6	Operation not recommended						
1350				37.6	26.8	0.71	2.43	45.9	15.5	7.3	Operation not recommended							
110	5.0	0.7	1.6	Operation not recommended							Operation not recommended							
	8.0	1.5	3.4	1150	31.6	21.2	0.67	2.69	40.8	11.7	9.0	Operation not recommended						
				1350	32.6	24.9	0.76	2.80	42.2	11.6	9.8	Operation not recommended						
	11.0	2.5	5.8	1150	33.1	21.6	0.65	2.61	42.0	12.7	8.4	Operation not recommended						
1350				34.0	25.3	0.74	2.72	43.3	12.5	9.3	Operation not recommended							
120	5.0	0.7	1.5	Operation not recommended							Operation not recommended							
	8.0	1.4	3.3	1150	29.1	20.6	0.71	3.01	39.4	9.7	11.2	Operation not recommended						
				1350	30.1	24.2	0.80	3.14	40.8	9.6	12.1	Operation not recommended						
	11.0	2.4	5.6	1150	30.8	21.0	0.68	2.92	40.8	10.6	10.4	Operation not recommended						
1350				31.6	24.7	0.78	3.06	42.0	10.3	11.5	Operation not recommended							

# Performance Data cont.

## ND049 - Dual Capacity with Variable Speed or 5-Speed ECM High Speed (1550 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	6.0	1.3	3.0	Operation not recommended							Operation not recommended							
	9.0	2.5	5.7	Operation not recommended							Operation not recommended							
	12.0	4.0	9.2	1350	30.7	2.72	21.4	91.1	3.31	5.3	Operation not recommended							
				1550	31.7	2.80	22.2	89.0	3.32	4.8	Operation not recommended							
30	6.0	1.2	2.9	Operation not recommended							Operation not recommended							
	9.0	2.4	5.5	1350	35.1	2.84	25.3	94.0	3.61	5.6	1350	49.6	27.8	0.56	1.79	55.7	27.6	---
				1550	36.1	2.94	26.1	91.6	3.61	5.2	1550	52.6	30.9	0.59	1.91	59.1	27.5	---
	12.0	3.9	8.9	1350	35.6	2.88	25.8	94.4	3.63	5.8	1350	50.1	27.8	0.55	1.71	56.0	29.4	---
1550				36.8	2.97	26.7	92.0	3.63	5.3	1550	53.0	30.8	0.58	1.83	59.3	29.1	---	
40	6.0	1.2	2.8	Operation not recommended							Operation not recommended							
	9.0	2.3	5.3	1350	40.0	2.97	29.8	97.4	3.94	6.2	1350	51.5	29.4	0.57	1.98	58.2	25.9	---
				1550	41.1	3.04	30.8	94.6	3.97	5.7	1550	54.4	32.7	0.60	2.10	61.6	25.9	---
	12.0	3.7	8.7	1350	40.7	3.01	30.4	97.9	3.97	6.4	1350	52.0	29.4	0.57	1.90	58.5	27.4	---
1550				42.0	3.07	31.5	95.1	4.01	5.8	1550	54.9	32.7	0.60	2.01	61.8	27.2	---	
50	6.0	1.2	2.7	1350	42.8	3.08	32.3	99.3	4.07	6.7	1350	52.1	30.2	0.58	2.37	60.2	22.0	3.0
				1550	44.1	3.12	33.5	96.4	4.15	6.2	1550	54.8	33.5	0.61	2.50	63.4	22.0	3.2
	9.0	2.2	5.2	1350	44.4	3.14	33.7	100.5	4.15	6.9	1350	52.7	30.6	0.58	2.22	60.3	23.8	2.8
				1550	45.7	3.18	34.8	97.3	4.21	6.4	1550	55.5	34.0	0.61	2.33	63.5	23.8	3.0
12.0	3.6	8.4	1350	45.3	3.18	34.5	101.1	4.18	7.2	1350	53.3	30.7	0.58	2.13	60.6	25.0	2.6	
			1550	46.8	3.21	35.8	98.0	4.27	6.5	1550	56.0	34.1	0.61	2.25	63.7	24.9	2.9	
60	6.0	1.1	2.6	1350	46.7	3.20	35.7	102.0	4.27	7.6	1350	51.5	30.5	0.59	2.51	60.1	20.5	3.7
				1550	48.1	3.22	37.2	98.8	4.38	7.0	1550	54.0	33.8	0.63	2.63	63.0	20.6	3.9
	9.0	2.2	5.0	1350	48.8	3.28	37.6	103.4	4.35	7.8	1350	52.3	30.9	0.59	2.38	60.4	22.0	3.4
				1550	50.2	3.30	39.0	100.0	4.46	7.2	1550	54.9	34.3	0.62	2.48	63.4	22.2	3.7
12.0	3.5	8.1	1350	49.9	3.33	38.6	104.2	4.40	8.0	1350	52.9	31.0	0.59	2.30	60.7	23.0	3.2	
			1550	51.5	3.34	40.1	100.8	4.53	7.4	1550	55.5	34.5	0.62	2.40	63.6	23.1	3.5	
70	6.0	1.1	2.5	1350	50.5	3.32	39.2	104.6	4.46	8.5	1350	51.2	31.0	0.61	2.75	60.6	18.6	4.6
				1550	52.1	3.31	40.8	101.1	4.61	7.9	1550	53.5	34.5	0.64	2.85	63.2	18.8	4.9
	9.0	2.1	4.9	1350	53.0	3.42	41.3	106.3	4.54	8.8	1350	52.3	31.4	0.60	2.62	61.2	20.0	4.3
				1550	54.6	3.41	43.0	102.6	4.70	8.1	1550	54.6	34.8	0.64	2.72	63.9	20.1	4.6
12.0	3.4	7.9	1350	54.4	3.46	42.6	107.3	4.60	9.0	1350	52.8	31.6	0.60	2.54	61.5	20.8	4.0	
			1550	56.1	3.45	44.4	103.5	4.77	8.3	1550	55.2	35.1	0.64	2.64	64.3	20.9	4.4	
80	6.0	1.1	2.5	1350	53.6	3.49	41.7	106.7	4.50	9.6	1350	49.0	30.3	0.62	2.98	59.2	16.5	5.8
				1550	55.3	3.45	43.5	103.0	4.70	8.8	1550	51.1	33.7	0.66	3.06	61.5	16.7	6.2
	9.0	2.0	4.7	1350	56.6	3.62	44.2	108.8	4.58	9.8	1350	50.3	30.7	0.61	2.87	60.1	17.6	5.4
				1550	58.4	3.57	46.2	104.9	4.79	9.1	1550	52.4	34.0	0.65	2.95	62.4	17.8	5.9
12.0	3.3	7.6	1350	58.2	3.66	45.7	109.9	4.66	10.1	1350	50.8	30.9	0.61	2.80	60.4	18.2	5.0	
			1550	60.1	3.62	47.8	105.9	4.87	9.4	1550	52.9	34.3	0.65	2.88	62.7	18.4	5.6	
90	6.0	1.0	2.4	1350	56.5	3.66	44.1	108.8	4.53	10.7	1350	46.1	29.1	0.63	3.20	57.0	14.4	7.3
				1550	58.5	3.58	46.2	104.9	4.78	9.9	1550	47.8	32.3	0.68	3.27	59.0	14.6	7.7
	9.0	2.0	4.5	1350	60.0	3.81	47.0	111.2	4.62	11.1	1350	47.5	29.4	0.62	3.11	58.1	15.3	6.8
				1550	62.0	3.73	49.3	107.1	4.88	10.2	1550	49.3	32.6	0.66	3.17	60.1	15.5	7.4
12.0	3.2	7.3	1350	61.9	3.85	48.8	112.4	4.72	11.4	1350	48.0	29.7	0.62	3.05	58.4	15.8	6.3	
			1550	64.0	3.77	51.1	108.2	4.97	10.6	1550	49.7	33.0	0.66	3.11	60.3	16.0	7.0	
100	6.0	1.0	2.3	Operation not recommended							Operation not recommended							
	9.0	1.9	4.4	1350	45.3	28.8	0.64	3.45	57.1	13.1	8.4	Operation not recommended						
				1550	46.8	31.9	0.68	3.50	58.8	13.4	9.2	Operation not recommended						
	12.0	3.1	7.1	1350	45.8	29.1	0.64	3.40	57.4	13.5	7.8	Operation not recommended						
1550				47.3	32.3	0.68	3.45	59.0	13.7	8.7	Operation not recommended							
110	6.0	1.0	2.2	Operation not recommended							Operation not recommended							
	9.0	1.8	4.2	1350	41.0	26.8	0.66	3.75	53.8	10.9	10.3	Operation not recommended						
				1550	42.1	29.7	0.70	3.78	55.0	11.1	11.2	Operation not recommended						
	12.0	2.9	6.8	1350	41.4	27.2	0.66	3.71	54.0	11.2	9.6	Operation not recommended						
1550				42.5	30.1	0.71	3.74	55.3	11.4	10.7	Operation not recommended							
120	6.0	0.9	2.1	Operation not recommended							Operation not recommended							
	9.0	1.7	4.0	1350	38.0	25.7	0.68	4.18	52.3	9.1	12.5	Operation not recommended						
				1550	38.9	28.4	0.73	4.18	53.2	9.3	13.5	Operation not recommended						
	12.0	2.8	6.5	1350	38.4	26.1	0.68	4.14	52.5	9.3	11.6	Operation not recommended						
1550				39.3	28.9	0.74	4.14	53.4	9.5	12.9	Operation not recommended							

# Performance Data cont.

## ND064 - Dual Capacity with Variable Speed or 5-Speed ECM Low Speed (1500 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	6.0	1.0	2.4	Operation not recommended							Operation not recommended							
	10.0	2.7	6.2	Operation not recommended							Operation not recommended							
	14.0	5.1	11.8	1250	26.5	2.53	17.8	89.6	3.07	4.9	Operation not recommended							
				1500	27.4	2.56	18.6	86.9	3.13	4.5	Operation not recommended							
30	6.0	1.0	2.3	Operation not recommended							Operation not recommended							
	10.0	2.6	6.0	1250	30.7	2.60	21.8	92.8	3.46	5.0	1250	50.1	28.9	0.58	1.36	54.8	36.8	---
				1500	31.8	2.64	22.8	89.6	3.53	4.6	1500	51.6	32.9	0.64	1.42	56.5	36.2	---
	14.0	5.0	11.5	1250	31.8	2.60	22.9	93.6	3.58	5.1	1250	50.2	28.8	0.57	1.33	54.8	37.8	---
1500				32.9	2.64	23.9	90.3	3.66	4.7	1500	51.5	32.8	0.64	1.40	56.3	36.7	---	
40	6.0	1.0	2.3	Operation not recommended							Operation not recommended							
	10.0	2.5	5.9	1250	36.3	2.70	27.1	96.9	3.94	5.3	1250	51.6	29.6	0.57	1.50	56.7	34.5	---
				1500	37.3	2.70	28.0	93.0	4.04	4.9	1500	53.1	33.7	0.63	1.57	58.5	33.9	---
	14.0	4.8	11.1	1250	37.4	2.70	28.2	97.7	4.06	5.5	1250	51.7	29.5	0.57	1.46	56.7	35.4	---
1500				38.4	2.71	29.2	93.7	4.15	5.0	1500	53.1	33.6	0.63	1.54	58.4	34.5	---	
50	6.0	0.9	2.2	1250	40.8	2.74	31.5	100.2	4.37	5.6	1250	52.8	30.0	0.57	1.73	58.7	30.5	2.0
				1500	41.9	2.74	32.6	95.9	4.49	5.2	1500	54.4	34.1	0.63	1.83	60.6	29.7	2.1
	10.0	2.5	5.7	1250	41.4	2.79	31.9	100.7	4.36	5.7	1250	53.0	30.3	0.57	1.67	58.7	31.7	1.9
				1500	42.4	2.77	32.9	96.2	4.48	5.3	1500	54.5	34.3	0.63	1.75	60.5	31.1	2.0
14.0	4.7	10.8	1250	42.7	2.80	33.1	101.6	4.46	5.9	1250	53.1	30.3	0.57	1.64	58.7	32.4	1.7	
			1500	43.6	2.79	34.1	96.9	4.59	5.4	1500	54.6	34.3	0.63	1.72	60.5	31.8	1.9	
60	6.0	0.9	2.1	1250	45.4	2.83	35.8	103.6	4.71	6.1	1250	50.9	29.4	0.58	1.94	57.5	26.3	2.8
				1500	46.4	2.80	36.8	98.6	4.85	5.7	1500	52.5	33.1	0.63	2.03	59.4	25.9	3.0
	10.0	2.4	5.5	1250	46.8	2.88	37.0	104.7	4.77	6.3	1250	51.1	29.6	0.58	1.87	57.5	27.3	2.6
				1500	47.6	2.84	37.9	99.4	4.92	5.8	1500	52.7	33.5	0.64	1.96	59.4	26.9	2.9
14.0	4.5	10.4	1250	47.9	2.90	38.0	105.5	4.84	6.5	1250	51.4	29.7	0.58	1.84	57.6	28.0	2.5	
			1500	48.7	2.86	38.9	100.1	4.99	6.0	1500	52.9	33.5	0.63	1.92	59.4	27.5	2.7	
70	6.0	0.9	2.0	1250	49.9	2.92	39.9	107.0	5.01	6.8	1250	50.0	29.7	0.59	2.19	57.5	22.9	4.0
				1500	50.7	2.87	41.0	101.3	5.19	6.3	1500	51.6	33.3	0.65	2.28	59.4	22.6	4.2
	10.0	2.3	5.3	1250	52.0	2.97	41.9	108.5	5.14	7.0	1250	50.4	30.0	0.59	2.13	57.6	23.7	3.7
				1500	52.6	2.90	42.7	102.5	5.31	6.5	1500	51.9	33.7	0.65	2.22	59.5	23.4	4.0
14.0	4.4	10.1	1250	53.0	3.00	42.8	109.3	5.18	7.2	1250	50.7	30.1	0.59	2.08	57.8	24.4	3.5	
			1500	53.6	2.93	43.6	103.1	5.35	6.6	1500	52.2	33.8	0.65	2.17	59.6	24.0	3.9	
80	6.0	0.9	2.0	1250	54.1	3.01	43.9	110.1	5.27	7.6	1250	47.9	28.7	0.60	2.47	56.3	19.4	5.5
				1500	54.6	2.94	44.6	103.7	5.44	7.0	1500	49.3	32.0	0.65	2.56	58.0	19.3	5.9
	10.0	2.2	5.1	1250	57.2	3.06	46.7	112.3	5.48	7.8	1250	48.3	28.9	0.60	2.41	56.5	20.0	5.2
				1500	57.4	2.97	47.3	105.5	5.68	7.2	1500	49.7	32.4	0.65	2.50	58.3	19.9	5.6
14.0	4.2	9.8	1250	57.8	3.10	47.3	112.9	5.47	8.0	1250	48.6	29.1	0.60	2.37	56.7	20.5	4.8	
			1500	58.1	3.01	47.8	105.8	5.66	7.4	1500	50.1	32.6	0.65	2.46	58.5	20.4	5.3	
90	6.0	0.8	1.9	1250	58.2	3.10	47.6	113.1	5.51	8.5	1250	44.3	27.2	0.61	2.79	53.9	15.9	7.4
				1500	58.3	3.01	48.0	106.0	5.67	7.8	1500	45.7	30.2	0.66	2.87	55.5	15.9	7.8
	10.0	2.1	5.0	1250	62.1	3.14	51.4	116.0	5.79	8.7	1250	44.8	27.5	0.61	2.73	54.1	16.4	6.9
				1500	62.1	3.03	51.8	108.3	6.01	8.1	1500	46.1	30.6	0.66	2.82	55.8	16.3	7.5
14.0	4.1	9.4	1250	62.5	3.19	51.6	116.3	5.74	9.0	1250	45.2	27.7	0.61	2.70	54.4	16.7	6.4	
			1500	62.4	3.08	51.9	108.5	5.94	8.3	1500	46.6	30.9	0.66	2.78	56.1	16.8	7.1	
100	6.0	0.8	1.8	Operation not recommended							Operation not recommended							
	10.0	2.1	4.8	1250	43.0	2.75	0.64	3.12	53.6	13.8	9.0	Operation not recommended						
				1500	44.3	30.5	0.69	3.20	55.2	13.8	9.7	Operation not recommended						
	14.0	3.9	9.1	1250	43.4	27.9	0.64	3.07	53.9	14.1	8.3	Operation not recommended						
1500				44.8	30.8	0.69	3.15	55.5	14.2	9.2	Operation not recommended							
110	6.0	0.8	1.8	Operation not recommended							Operation not recommended							
	10.0	2.0	4.6	1250	38.7	26.0	0.67	3.53	50.7	10.9	11.3	Operation not recommended						
				1500	39.9	28.6	0.72	3.60	52.2	11.1	12.3	Operation not recommended						
	14.0	3.8	8.7	1250	39.2	26.4	0.67	3.48	51.1	11.3	10.5	Operation not recommended						
1500				40.4	29.0	0.72	3.55	52.5	11.4	11.7	Operation not recommended							
120	6.0	0.7	1.7	Operation not recommended							Operation not recommended							
	10.0	1.9	4.4	1250	36.2	26.1	0.72	4.01	49.8	9.0	14.0	Operation not recommended						
				1500	37.3	28.5	0.76	4.05	51.1	9.2	15.2	Operation not recommended						
	14.0	3.6	8.4	1250	36.7	26.6	0.72	3.96	50.2	9.3	13.0	Operation not recommended						
1500				37.8	29.0	0.77	4.00	51.5	9.5	14.5	Operation not recommended							



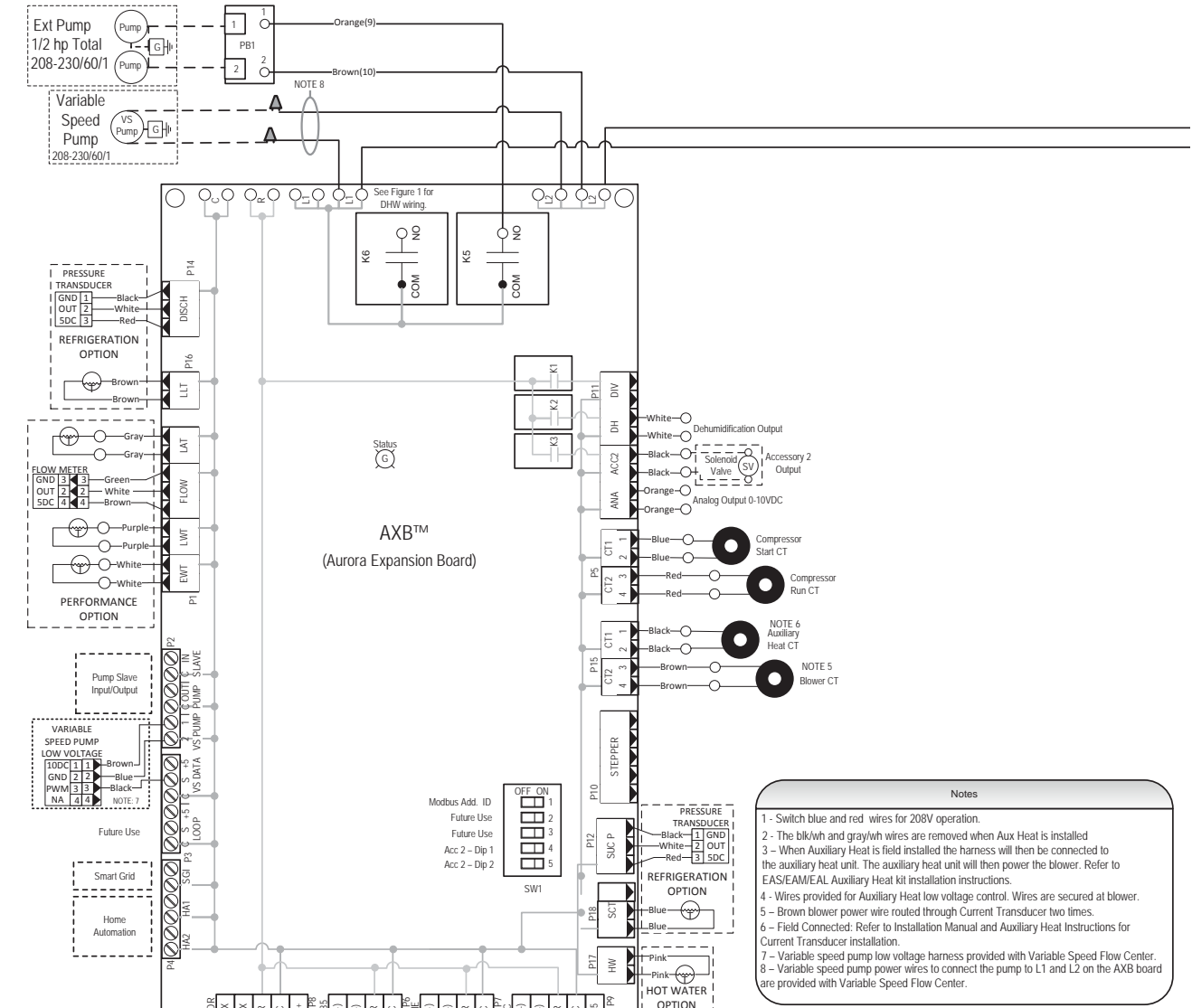






# Wiring Schematics

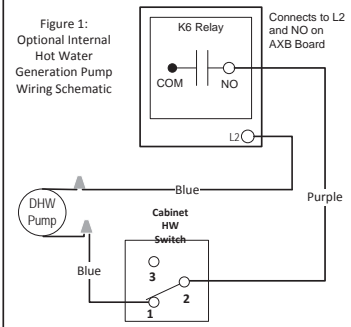
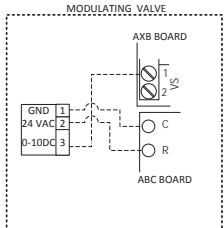
## Aurora Advanced with ECM and IntelliStart



- Notes**
- 1 - Switch blue and red wires for 208V operation.
  - 2 - The blk/wh and gray/wh wires are removed when Aux Heat is installed
  - 3 - When Auxiliary Heat is field installed the harness will then be connected to the auxiliary heat unit. The auxiliary heat unit will then power the blower. Refer to EAS/EAM/EAL Auxiliary Heat kit installation instructions.
  - 4 - Wires provided for Auxiliary Heat low voltage control. Wires are secured at blower.
  - 5 - Brown blower power wire routed through Current Transducer two times.
  - 6 - Field Connected: Refer to Installation Manual and Auxiliary Heat Instructions for Current Transducer installation.
  - 7 - Variable speed pump low voltage harness provided with Variable Speed Flow Center.
  - 8 - Variable speed pump power wires to connect the pump to L1 and L2 on the AXB board are provided with Variable Speed Flow Center.

**AXB Accessory 2 DIP Settings**

SW1-4	SW1-5	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 DH from ABC board



**Legend**

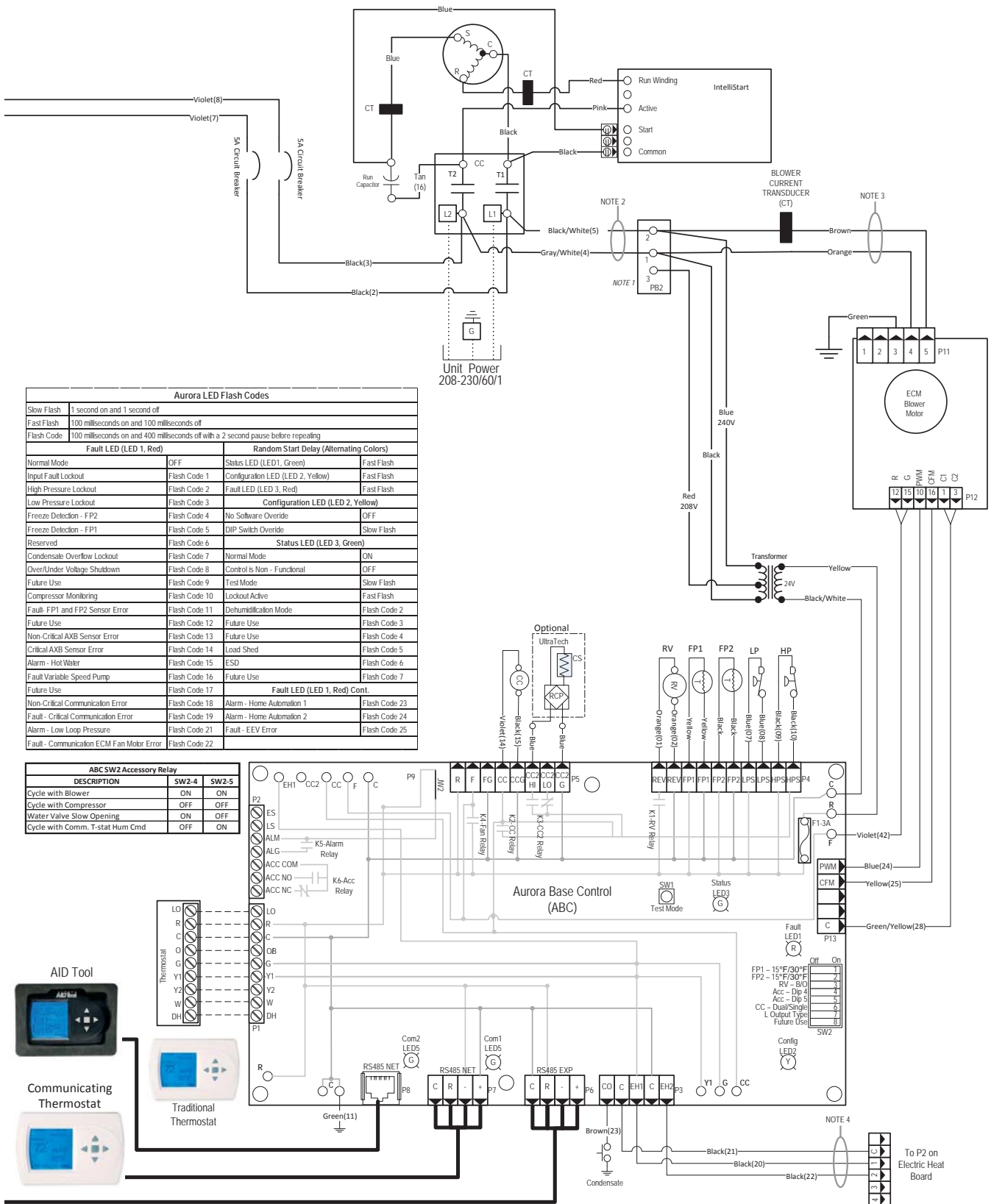
	Factory Low voltage wiring		Thermistor
	Factory Line voltage wiring		Light emitting diode - Green
	Field low voltage wiring		Relay coil
	Field line voltage wiring		Capacitor w/ bleed resistor
	Optional block		Switch - Condensate overflow
	DC Voltage PCB traces Junction		Switch - High pressure
	Quick connect terminal		Switch - Low pressure
	Wire nut		Polarized connector
	Field wire lug		Current Transducer (CT)
	Ground		
	Relay Contacts- N.O., N.C.		
	Fuse		
	Breaker		

CC - Compressor Contactor	PB1, PB2 - Power blocks
CO - Condensate overflow sensor	PS - Power strip
K5 - DHW pump relay	RV - Reversing Valve coil
K6 - Loop pump relay	SW1 - DIP package 5 position AXB
CR3 - PSC Fan Speed Relay	SW1 - TEST MODE ABC Board
CR4 - PSC Fan Power Relay	SW2 - DIP package 8 position ABC Board
CS - Compressor Solenoid	
F1 and F2 - Fuses	TS - Thermal limit switch
HE - Heater element	HWL - Hot water limit sensor
HP - High pressure switch	SC - Start Contactor
ER1 to ER4 - Aux heat stage relays	SR - Start Relay
LP - Low pressure switch	WCL - Water Coil Limit Sensor

# Wiring Schematics cont.

## Aurora Advanced with ECM and IntelliStart cont.



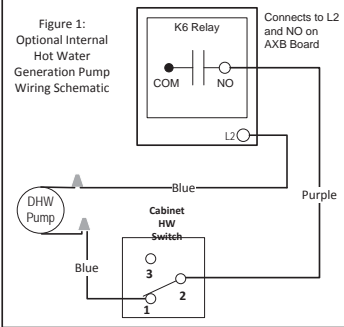
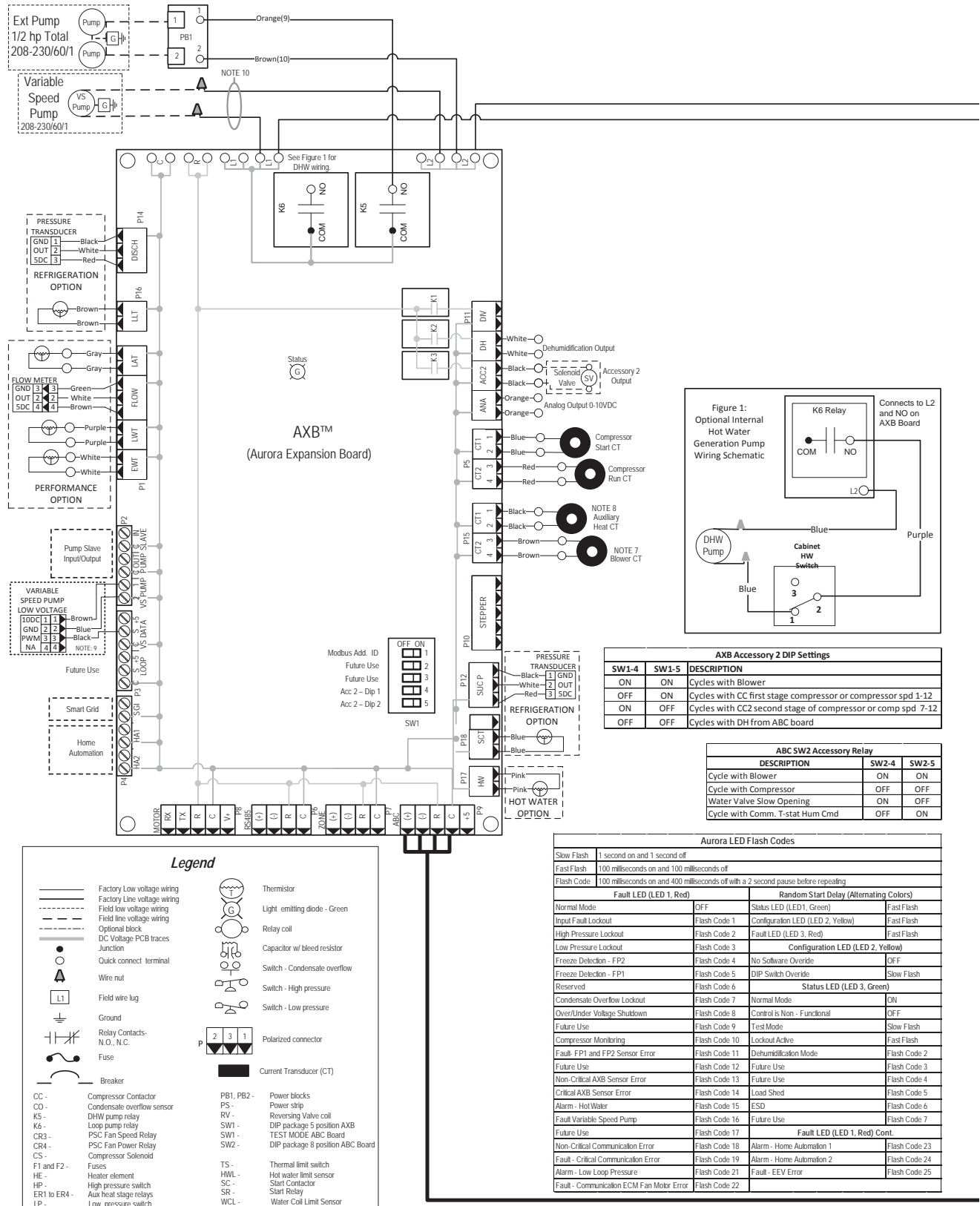
Aurora LED Flash Codes			
Slow Flash	1 second on and 1 second off		
Fast Flash	100 milliseconds on and 100 milliseconds off		
Flash Code	100 milliseconds on and 400 milliseconds off with a 2 second pause before repeating		
Fault LED (LED 1, Red)		Random Start Delay (Alternating Colors)	
Normal Mode	OFF	Status LED (LED1, Green)	Fast Flash
Input Fault Lockout	Flash Code 1	Configuration LED (LED 2, Yellow)	Fast Flash
High Pressure Lockout	Flash Code 2	Fault LED (LED 3, Red)	Fast Flash
Low Pressure Lockout	Flash Code 3	Configuration LED (LED 2, Yellow)	
Freeze Detection - FP2	Flash Code 4	No Software Override	OFF
Freeze Detection - FP1	Flash Code 5	DIP Switch Override	Slow Flash
Reserved	Flash Code 6	Status LED (LED 3, Green)	
Condensate Overflow Lockout	Flash Code 7	Normal Mode	ON
Over/Under Voltage Shutdown	Flash Code 8	Control Is Non - Functional	OFF
Future Use	Flash Code 9	Test Mode	Slow Flash
Compressor Monitoring	Flash Code 10	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-Critical AXB Sensor Error	Flash Code 13	Future Use	Flash Code 4
Critical AXB Sensor Error	Flash Code 14	Load Shed	Flash Code 5
Alarm - Hot Water	Flash Code 15	ESD	Flash Code 6
Fault Variable Speed Pump	Flash Code 16	Future Use	Flash Code 7
Future Use	Flash Code 17	Fault LED (LED 1, Red) Cont.	
Non-Critical Communication Error	Flash Code 18	Alarm - Home Automation 1	Flash Code 23
Fault - Critical Communication Error	Flash Code 19	Alarm - Home Automation 2	Flash Code 24
Alarm - Low Loop Pressure	Flash Code 21	Fault - EEV Error	Flash Code 25
Fault - Communication ECM Fan Motor Error	Flash Code 22		

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



# Wiring Schematics cont.

## Aurora Advanced with 5-Speed ECM



AXB Accessory 2 DIP Settings		
SW1-4	SW1-5	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 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

Aurora LED Flash Codes		
Slow Flash	1 second on and 1 second off	
Fast Flash	100 milliseconds on and 100 milliseconds off	
Flash Code	100 milliseconds on and 400 milliseconds off with a 2 second pause before repeating	
Fault LED (LED 1, Red)		
Normal Mode	OFF	Status LED (LED1, Green)
Input Fault Lockout	Flash Code 1	Configuration LED (LED 2, Yellow)
High Pressure Lockout	Flash Code 2	Fault LED (LED 3, Red)
Low Pressure Lockout	Flash Code 3	Configuration LED (LED 2, Yellow)
Freeze Detection - FP2	Flash Code 4	No Software Override
Freeze Detection - FP1	Flash Code 5	DIP Switch Override
Reserved	Flash Code 6	Status LED (LED 3, Green)
Condensate Overflow Lockout	Flash Code 7	Normal Mode
Over/Under Voltage Shutdown	Flash Code 8	Control Is Non - Functional
Future Use	Flash Code 9	Test Mode
Compressor Monitoring	Flash Code 10	Lockout Active
Fault- FP1 and FP2 Sensor Error	Flash Code 11	Dehumidification Mode
Future Use	Flash Code 12	Future Use
Non-Critical AXB Sensor Error	Flash Code 13	Future Use
Critical AXB Sensor Error	Flash Code 14	Load Shed
Alarm - Hot Water	Flash Code 15	ESD
Fault Variable Speed Pump	Flash Code 16	Future Use
Future Use	Flash Code 17	Fault LED (LED 1, Red) Cont.
Non-Critical Communication Error	Flash Code 18	Alarm - Home Automation 1
Fault - Critical Communication Error	Flash Code 19	Alarm - Home Automation 2
Alarm - Low Loop Pressure	Flash Code 21	Fault - EEV Error
Fault - Communication ECM Fan Motor Error	Flash Code 22	

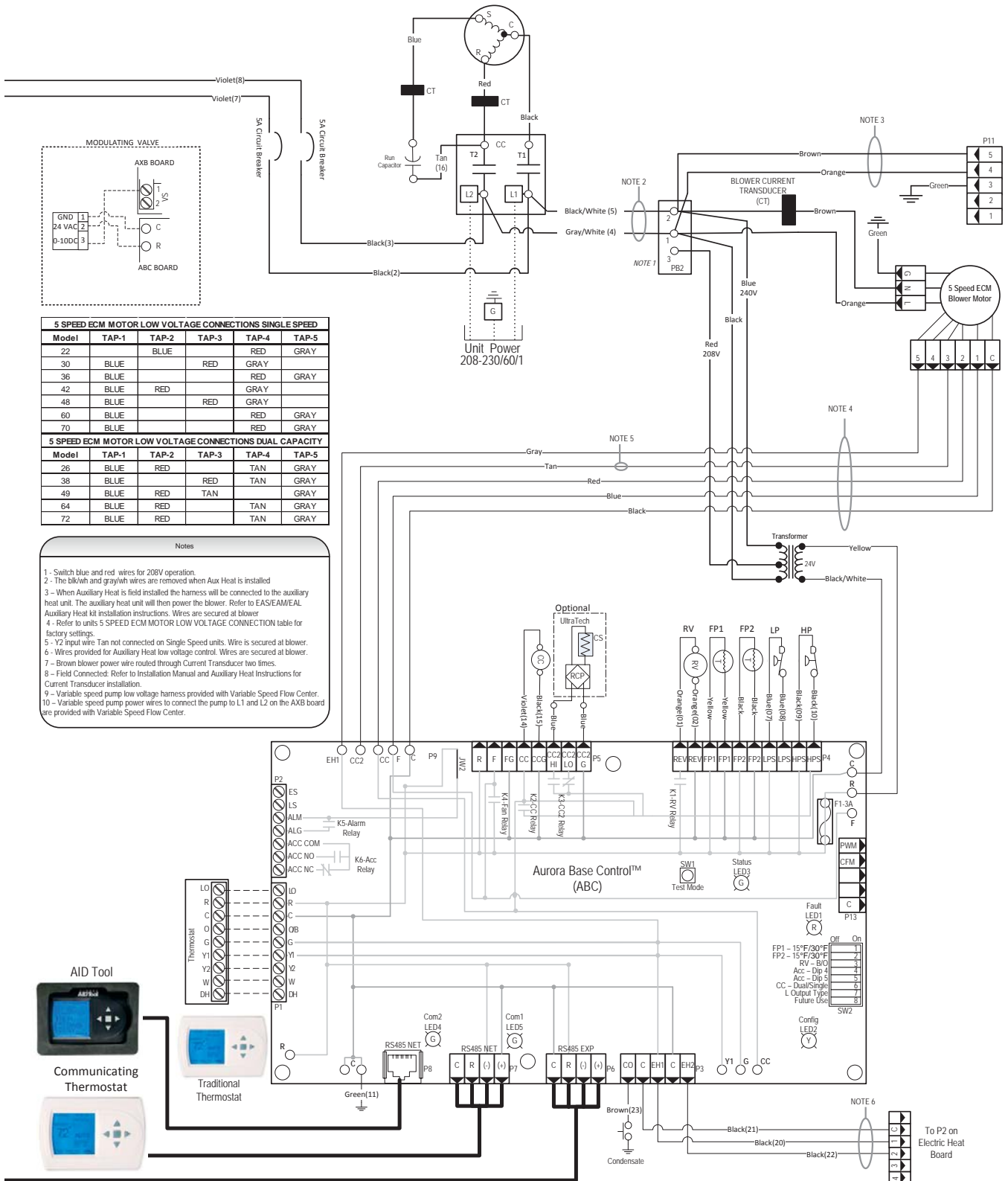
**Legend**

<ul style="list-style-type: none"> <li>Factory Low voltage wiring</li> <li>Factory Line voltage wiring</li> <li>Field low voltage wiring</li> <li>Field line voltage wiring</li> <li>Optional block</li> <li>DC Voltage PCB traces</li> <li>Junction</li> <li>Quick connect terminal</li> <li>Wire nut</li> <li>Field wire lug</li> <li>Ground</li> <li>Relay Contacts - N.O., N.C.</li> <li>Fuse</li> <li>Breaker</li> </ul>	<ul style="list-style-type: none"> <li>Thermistor</li> <li>Light emitting diode - Green</li> <li>Relay coil</li> <li>Capacitor w/ bleed resistor</li> <li>Switch - Condensate overflow</li> <li>Switch - High pressure</li> <li>Switch - Low pressure</li> <li>Polarized connector</li> <li>Current Transducer (CT)</li> </ul>
---	--

**CC -** Compressor Contactor  
**CO -** Condensate overflow sensor  
**K5 -** DHW pump relay  
**K6 -** Loop pump relay  
**CR3 -** PSC Fan Speed Relay  
**CR4 -** PSC Fan Power Relay  
**CS -** Compressor Solenoid  
**F1 and F2 -** Fuses  
**HE -** Heater element  
**HP -** High pressure switch  
**ER1 to ER4 -** Aux heat stage relays  
**LP -** Low pressure switch  
**PB1, PB2 -** Power blocks  
**PS -** Power strip  
**RV -** Reversing Valve coil  
**SW1 -** DIP package 5 position AXB TEST MODE ABC Board  
**SW2 -** DIP package 8 position ABC Board  
**TS -** Thermal limit switch  
**HWL -** Hot water limit sensor  
**SC -** Start Contactor  
**SR -** Start Relay  
**WCL -** Water Coil Limit Sensor

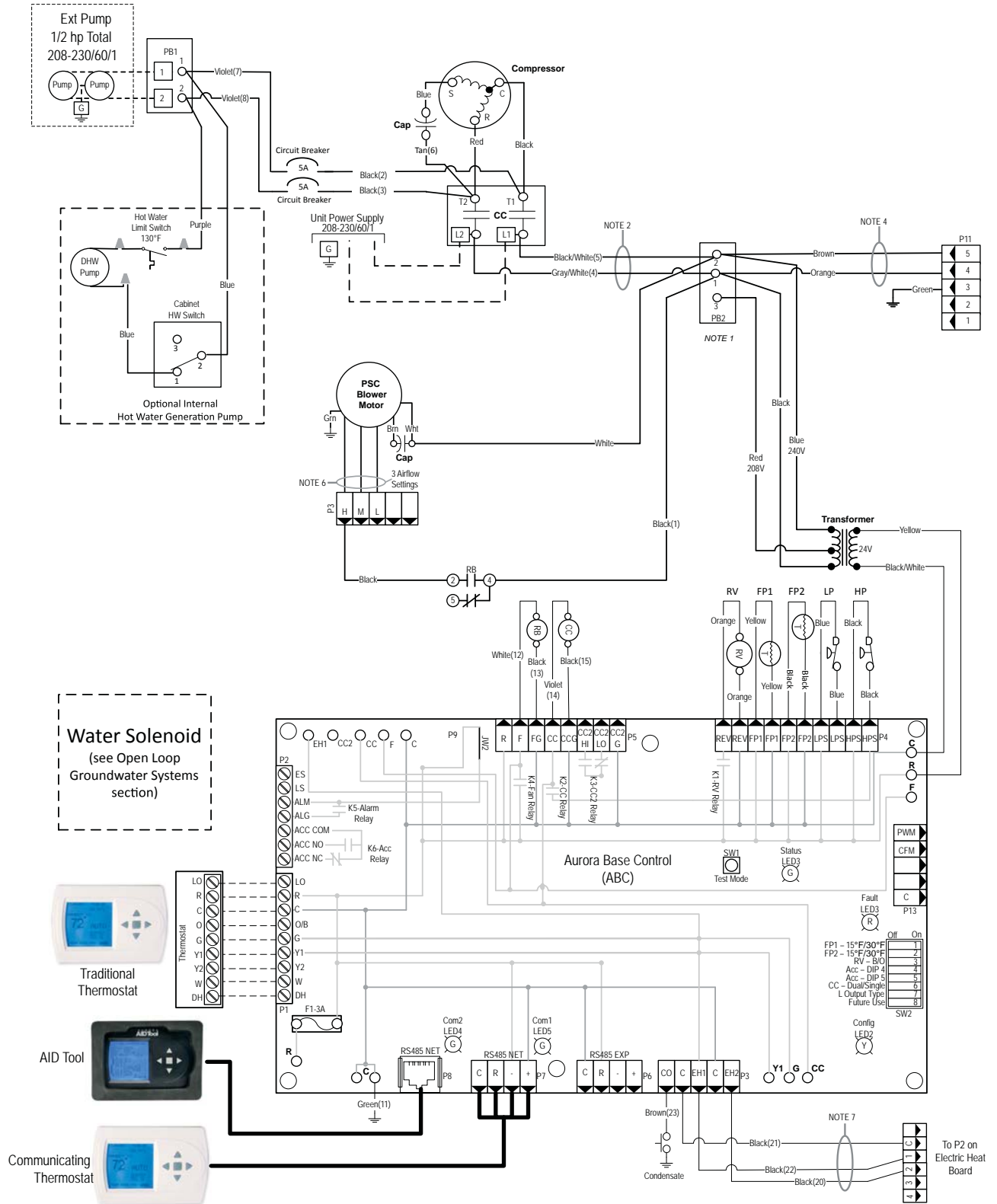
# Wiring Schematics cont.

## Aurora Advanced with 5-Speed ECM cont.



# Wiring Schematics cont.

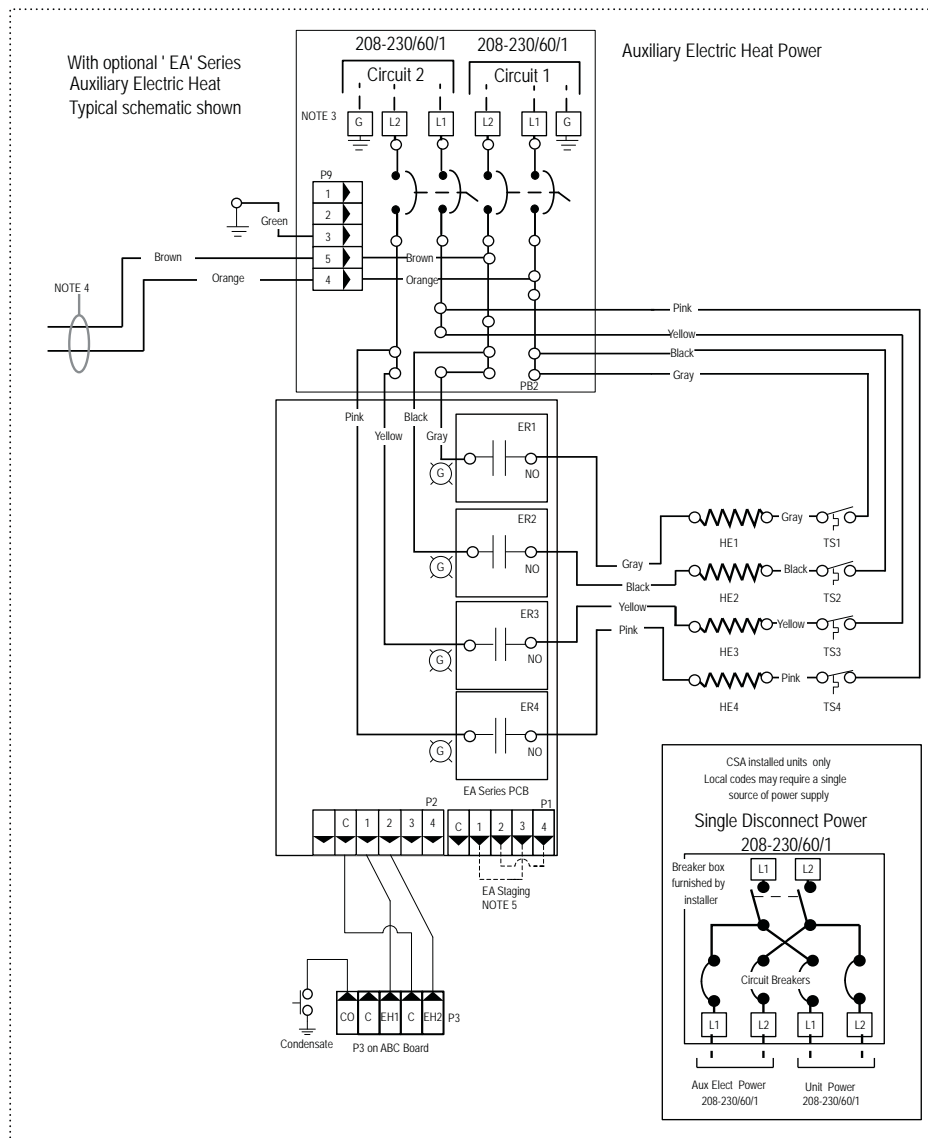
## Aurora Base with PSC





# Wiring Schematics cont.

## Aurora Base with PSC cont.



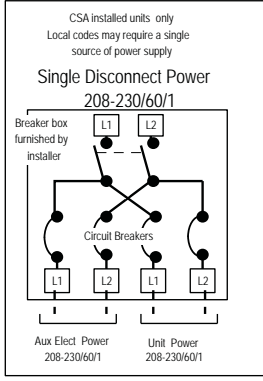
- ### Notes
- 1 - Switch blue and red wires for 208V operation.
  - 2 - The blk/wht and gray/wht wires are removed when Aux Heat is installed.
  - 3 - Use manufacturer's part number 19P592-01 (jumper bar assembly) when single source power is required.
  - 4 - When connected the Auxiliary Heat powers blower and controls. Wires are secured at blower.
  - 5 - For additional Auxiliary Heat staging place jumpers as shown.
  - 6 - Refer to FAN SPEED table for factory settings.
  - 7 - Wires provided for Auxiliary Heat low voltage control. Wires are secured at blower.

### Legend

	Factory Low voltage wiring		Thermistor
	Factory Line voltage wiring		Light emitting diode - Green
	Field low voltage wiring		Relay coil
	Field line voltage wiring		Capacitor w/ bleed resistor
	Optional block		Switch - Condensate overflow
	DC Voltage PCB traces		Switch - High pressure
	Junction		Switch - Low pressure
	Quick connect terminal		Polarized connector
	Wire nut		Current Transducer (CT)
	Field wire lug		
	Ground		
	Relay Contacts- N.O., N.C.		
	Fuse		
	Breaker		

CC - Compressor Contactor  
 CO - Condensate overflow sensor  
 K5 - DHW pump relay  
 K6 - Loop pump relay  
 CR3 - PSC Fan Speed Relay  
 CR4 - PSC Fan Power Relay  
 CS - Compressor Solenoid  
 F1 and F2 - Fuses  
 HE - Heater element  
 HP - High pressure switch  
 ER1 to ER4 - Low pressure switch  
 LP -

PB1, PB2 - Power blocks  
 PS - Power strip  
 RV - Reversing Valve coil  
 SW1 - DIP package 5 position AXB  
 SW2 - TEST MODE ABC Board  
 SW3 - DIP package 8 position ABC Board  
 TS - Thermal limit switch  
 HWL - Hot water limit sensor  
 SC - Start Contactor  
 SR - Start Relay  
 WCL - Water Coil Limit Sensor



Aurora LED Flash Codes			
Slow Flash	1 second on and 1 second off		
Fast Flash	100 milliseconds on and 100 milliseconds off		
Flash Code	100 milliseconds on and 400 milliseconds off with a 2 second pause before repeating		
Random Start Delay (Alternating Colors)		Configuration LED (LED2, Yellow)	
Status LED (LED1, Green)	Fast Flash	No Software Override	OFF
Configuration LED (LED2, Yellow)	Fast Flash	DIP Switch Override	Slow Flash
Fault LED (LED3, Red)	Fast Flash		
Fault LED (LED1, Red)		Status LED (LED3, Green)	
Normal Mode	OFF	Normal Mode	ON
Input Fault Lockout	Flash Code 1	Control is Non-Functional	OFF
High Pressure Lockout	Flash Code 2	Test Mode	Slow Flash
Low Pressure Lockout	Flash Code 3	Lockout Active	Fast Flash
Future Use	Flash Code 4	Dehumidification Mode	Flash Code 2
Freeze Detection - FP1	Flash Code 5	Future Use	Flash Code 3
Reserved	Flash Code 6	Future Use	Flash Code 4
Condensate Overflow Lockout	Flash Code 7	Load Shed	Flash Code 5
Over/Under Voltage Shutdown	Flash Code 8	ESD	Flash Code 6
Future Use	Flash Code 9	Future Use	Flash Code 7
Future Use	Flash Code 10		
FP1 and FP2 Sensor Error	Flash Code 11		

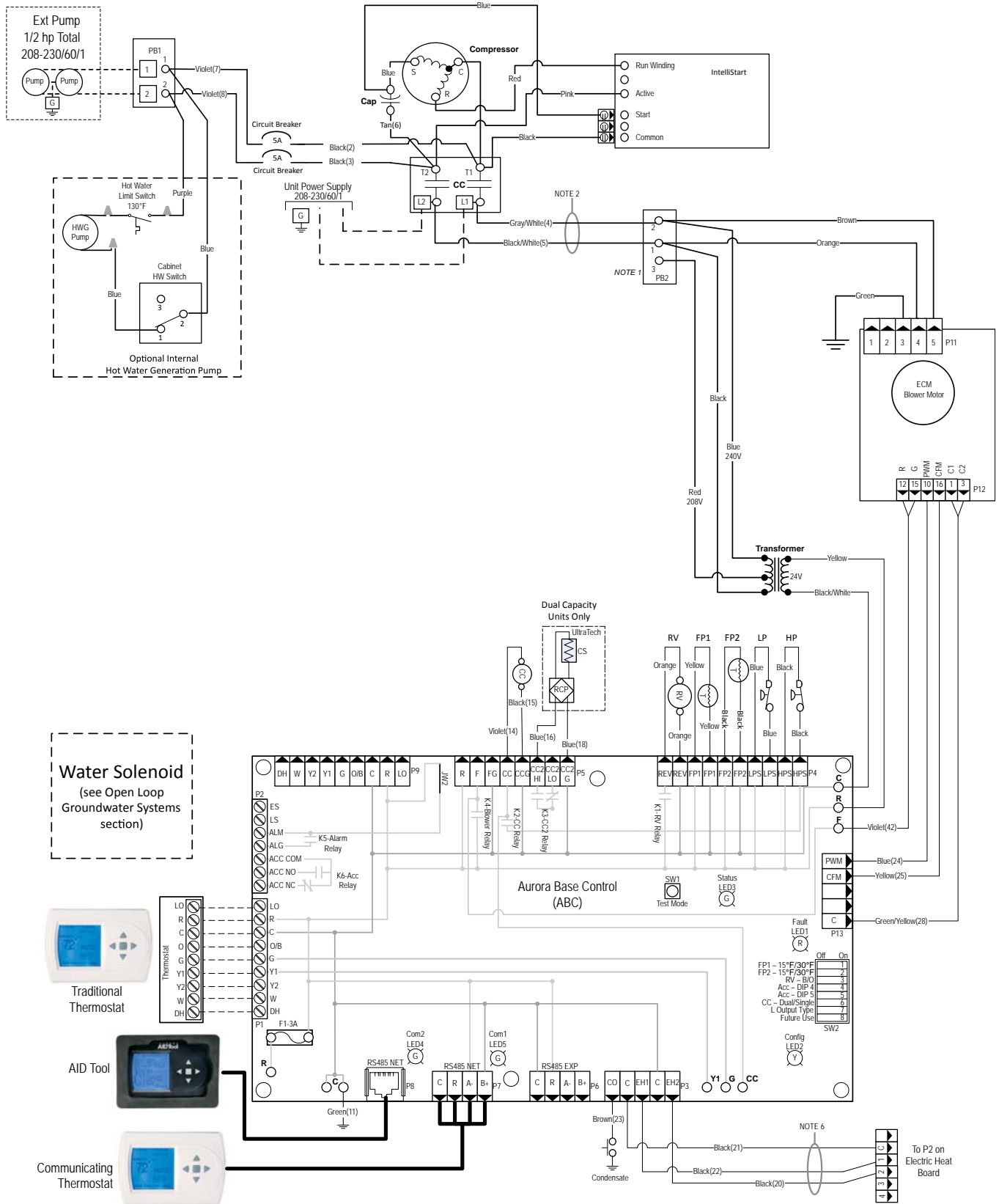
Aurora Timing Events			
Event	Normal Mode	Test Mode	
Random Start Delay	5 to 80 seconds	1 second	
Compressor On Delay	5 seconds	< 1 second	
Compressor Minimum On Time	2 minutes	5 seconds	
Compressor Short Cycle Delay	4 minutes	15 seconds	
Blower Off Delay	30 seconds	2 seconds	
Fault Recognition Delay - High Pressure	Less than 1 second	Less than 1 second	
Start-Up Bypass - Low Pressure	2 minutes	30 seconds	
Fault Recognition Delay - Low Pressure	30 seconds	30 seconds	
Start-Up Bypass - Low Water Coil Limit	2 minutes	30 seconds	
Fault Recognition Delay - Low Water Coil Limit	30 seconds	30 seconds	
Fault Recognition Delay - Condensate Overflow	30 seconds	30 seconds	
Thermostat Call Recognition Time	2 seconds	2 seconds	
Comfort Alert Recognition Time	90 seconds	90 seconds	
Auxiliary Heat Staging Delay	5 minutes	20 seconds	
Emergency Heat Staging Delay	2 minutes	7.5 seconds	
Water Valve Slow Open Delay	90 seconds	90 seconds	

Factory Set Blower Speed	
Model	Standard PSC
12	H
18	M
22	M
30	M
36	M
42	M
48	M
60	M
70	H
Model	High Static PSC
22	M
30	M
36	M
42	M
48	M

Accessory Relay	
Operation	SW2-4 SW2-5
Cycle with Blower	On On
Cycle with Compressor	Off Off
Water Valve Slow Open	On Off
Cycle with Comm Tstat w/ Hum Command	Off On

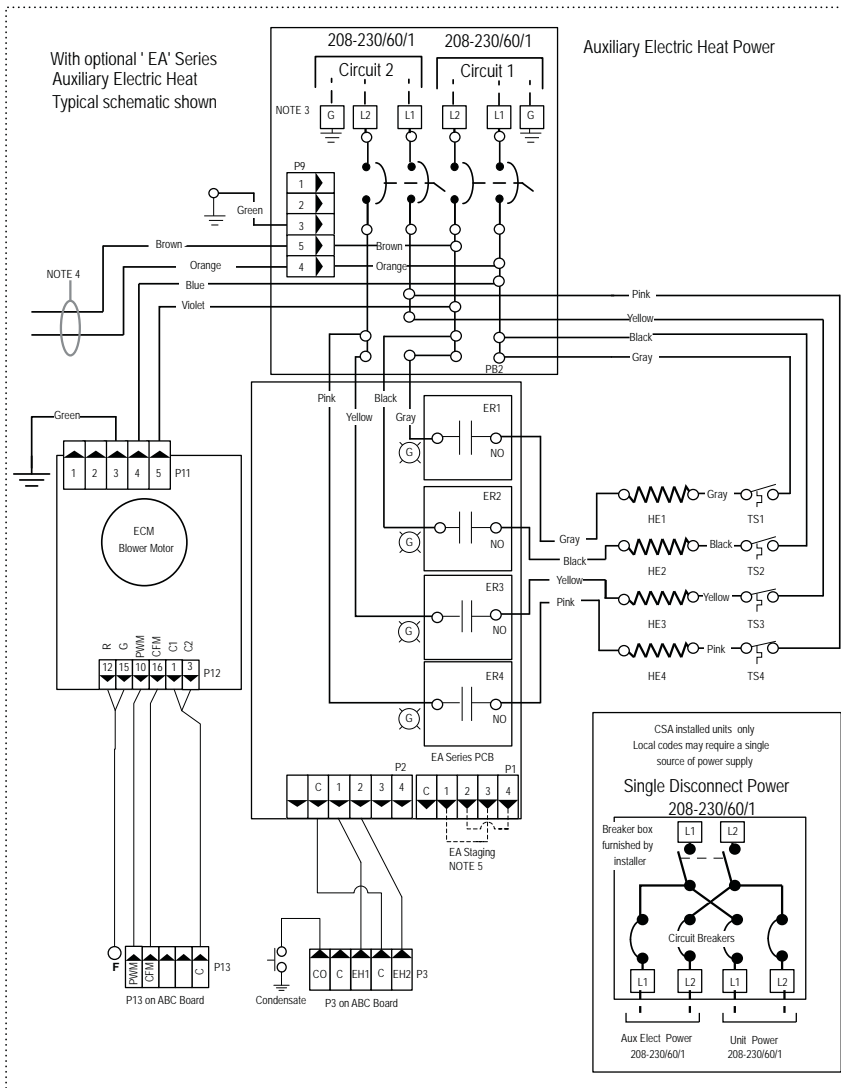
# Wiring Schematics cont.

## Aurora Base with ECM and IntelliStart



# Wiring Schematics cont.

## Aurora Base with ECM and IntelliStart cont.



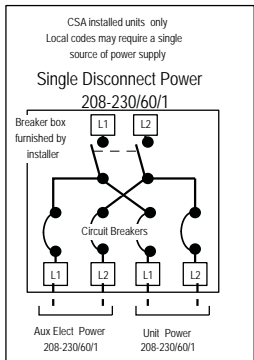
- Notes**
- 1 - Switch blue and red wires for 208V operation.
  - 2 - The blk/wh and gray/wh wires are removed when Aux Heat is installed
  - 3 - Use manufacturer's part number 19P592-01 (jumper bar assembly) when single source power is required.
  - 4 - When installed, the Auxiliary Heat powers blower and controls.
  - 5 - For additional Auxiliary Heat staging place jumpers as shown.
  - 6 - Wires provided for Auxiliary Heat low voltage control. Wires are secured at blower.

**Legend**

	Factory Low voltage wiring		Thermistor
	Factory Line voltage wiring		Light emitting diode - Green
	Field low voltage wiring		Relay coil
	Field line voltage wiring		Capacitor w/ bleed resistor
	Optional block		Switch - Condensate overflow
	DC Voltage PCB traces		Switch - High pressure
	Junction		Switch - Low pressure
	Quick connect terminal		Relay Contacts- N.O., N.C.
	Wire nut		Fuse
	Field wire lug		Breaker
	Ground		Polarized connector
	Relay Contacts- N.O., N.C.		Current Transducer (CT)

CC - Compressor Contactor  
 CO - Condensate overflow sensor  
 K5 - DHW pump relay  
 K6 - Loop pump relay  
 CR3 - PSC Fan Speed Relay  
 CR4 - PSC Fan Power Relay  
 CS - Compressor Solenoid  
 F1 and F2 - Fuses  
 HE - Heater element  
 HP - High pressure switch  
 ER1 to ER4 - Aux heat stage relays  
 LP - Low pressure switch

PB1, PB2 - Power blocks  
 PS - Power strip  
 RV - Reversing Valve coil  
 SW1 - DIP package 5 position AXB  
 SW2 - TEST MODE ABC Board  
 SW2 - DIP package 8 position ABC Board  
 TS - Thermal limit switch  
 HWL - Hot water limit sensor  
 SC - Start Contactor  
 SR - Start Relay  
 WCL - Water Coil Limit Sensor



**Aurora LED Flash Codes**

<b>Slow Flash</b>	1 second ON and 1 second OFF	
<b>Fast Flash</b>	250 milliseconds ON and 250 milliseconds OFF	
<b>Flash Code</b>	250 milliseconds ON and 250 milliseconds OFF with a 10 second pause before repeating	
<b>Random Start Delay (Alternating Colors)</b>		
Status LED (LED1, Green)	Fast Flash	No Software Override
Configuration LED (LED2, Yellow)	Fast Flash	DIP Switch Override
Fault LED (LED3, Red)	Fast Flash	
<b>Fault LED (LED1, Red)</b>		
Normal Mode	OFF	Normal Mode
Input Fault Lockout	Flash Code 1	Control is Non-functional
High Pressure Lockout	Flash Code 2	Test Mode
Low Pressure Lockout	Flash Code 3	Lockout Active
Future Use	Flash Code 4	Dehumidification Mode
Freeze Detection - FP1	Flash Code 5	Future Use
Reserved	Flash Code 6	Future Use
Condensate Overflow Lockout	Flash Code 7	Load Shed
Over/Under Voltage Shutdown	Flash Code 8	ESD
Future Use	Flash Code 9	Future Use
Future Use	Flash Code 10	Future Use
FP1 and FP2 Sensor Error	Flash Code 11	

**Aurora Timing Events**

Event	Normal Mode	Test Mode
Random Start Delay	5 to 80 seconds	1 second
Compressor On Delay	5 seconds	< 1 second
Compressor Minimum On Time	2 minutes	5 seconds
Compressor Short Cycle Delay	4 minutes	15 seconds
Blower Off Delay	30 seconds	2 seconds
Fault Recognition Delay - High Pressure	Less than 1 second	Less than 1 second
Startup Bypass - Low Pressure	2 minutes	30 seconds
Fault Recognition Delay - Low Pressure	30 seconds	30 seconds
Startup Bypass - Low Water Coil Limit	2 minutes	30 seconds
Fault Recognition Delay - Low Water Coil Limit	30 seconds	30 seconds
Fault Recognition Delay - Condensate Overflow	30 seconds	30 seconds
Thermostat Call Recognition Time	2 seconds	2 seconds
Auxiliary Heat Staging Delay	5 minutes	20 seconds
Emergency Heat Staging Delay	2 minutes	7.5 seconds
Water Valve Slow Opening	90 seconds	90 seconds

## 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, downflow, or rear air discharge. Units shall be AHRI/ISO 13256-1 certified and listed by a nationally recognized safety-testing laboratory or agency, such as ETL Testing Laboratory. Each unit shall be computer run-tested at the factory with conditioned water and operation verified to catalog data. Each unit shall be mounted on a pallet and shipped in a corrugated box or stretch-wrapped. The units shall be designed to operate with entering liquid temperature between 20°F and 120°F [-6.7°C and 48.9°C].

### 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.

One (horizontal) to two (vertical) blower and three compressor compartment access panels shall be 'lift-out' removable with supply and return ductwork in place. 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.

A duct collar shall be provided on the supply air opening. Standard size 2 in. [5.1 cm] MERV 11 pleated filters shall be provided with each unit. Vertical units shall have a return air filter rack/duct collar; the horizontal units shall have a filter bracket each field convertible from 2 in. [5.1 cm] to 1 in. [2.5 cm]. The upflow vertical (O22-O72) units shall have a removable insulated divider panel between the air handling section and the compressor section to minimize the transmission of compressor noise and to permit operational service testing without air bypass. Vertical units shall be supplied with left or right horizontal air inlet and top, bottom (O22-O72), or rear vertical (O42-O72) air discharge. Horizontal units shall be supplied with left or right air inlet and side or end air discharge.

The compressor shall be double isolation mounted using selected durometer grommets to provide vibration free compressor mounting.

The drain pan shall be of plastic construction to inhibit corrosion and bacterial growth. Drain outlet shall be located on pan as to allow complete and unobstructed drainage of condensate. The unit as standard will be supplied with solid-state electronic condensate overflow protection. Mechanical float switches WILL NOT be accepted. Vertical units shall be furnished with a PVC slip condensate drain connection and an internal factory installed condensate trap.

### Refrigerant Circuit

All units shall contain a sealed refrigerant circuit including a hermetic motor-compressor, discharge line muffler (O22-O72), bidirectional thermostatic expansion valve, finned tube air-to-refrigerant heat exchanger, reversing valve, coaxial tube water-to-refrigerant heat exchanger, optional hot water generator coil (O18-O72), and service ports.

Compressors shall be high-efficiency single speed rotary or scroll, or dual capacity scroll type designed for heat pump duty and mounted on vibration isolators. Compressor motors shall be single-phase PSC with overload protection. The FormiShield Plus electro-coated coil shall be sized for low-face velocity and constructed of patented 11 element lanced aluminum fins bonded to rifled copper tubes in a staggered pattern not less than three rows deep for enhanced performance. Models O22-O72 shall include discharge mufflers to help quiet compressor discharge gas pulsations. Refrigerant to air heat exchangers shall utilize rifled copper tube construction rated to withstand 600 psig (4135 kPa) refrigerant working pressure.

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

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

### Blower Motor and Assembly

The blower shall be a direct drive centrifugal type with a dynamically balanced wheel. The housing and wheel shall be designed for quiet low outlet velocity operation. The blower housing shall be removable from the unit without

## Engineering Guide Specifications cont.

disconnecting the supply air ductwork for servicing of the blower motor. The blower motor shall be a 3-speed PSC, 5-speed ECM, or variable-speed ECM type. The ECM blower motor shall be soft starting, shall maintain constant cfm over its operating static range, and shall provide 12 cfm settings. An optional 5-speed ECM is available on model sizes 022-072. An optional 3-speed PSC blower motor is available on all single speed models. The blower motor shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated and have thermostatic overload protection. ECM and 5-speed ECM motors shall be long-life ball bearing type.

### Electrical

A control box shall be located within the unit compressor compartment and shall contain a 75VA transformer, 24 volt activated, 2 pole compressor contactor, circuit breakers for protecting loop pumps, terminal block for thermostat wiring, 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 24 volt and provide heating or cooling as required by the remote thermostat/sensor. An Aurora, a microprocessor-based controller, interfaces with a multi-stage electronic thermostat to monitor and control unit operation shall be provided. The control shall provide operational sequencing, blower speed 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, and accessory output. The Lockout signal output shall have a pulsed option so that DDC systems can read specific lockout conditions from the control.

The optional Aurora Advanced Control shall also feature an Energy Monitoring Package that will provide real time total power consumption, compressor monitoring, On Peak input signal for utility controlled demand programs, intelligent hot water generation with user adjustable temperature limit, loop pump slaving 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/CO<sub>2</sub> or dirty air filter sensors. Optional Refrigerant and Performance Monitoring kits to provide real time data including refrigerant superheat and subcooling, as well as heat of extraction/rejection capacity data. The capability for communicating to advanced IntelliZone2 zoning packages with up to 6 zones (Variable Speed), 4 zones (Dual Capacity), or 2 zones (Single Speed) 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.

An optional 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, fault description and history, manual operation capability, sensor readings, timings, and other diagnostic tools.

**Optional IntelliStart® (compressor Soft Starter)** shall be factory installed for use in applications that require low starting amps, reduced compressor start-up noise, off-grid, and improved start-up behavior. IntelliStart shall reduce normal starting current by 60% on 208/60/1 units.

### 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 water piping shall be insulated to prevent condensation at low liquid temperatures, on the vertical units, the condensate connection shall be a 3/4 in. [19.1 mm] PVC socket with internally-trapped hose that can be routed to front or side locations.

### Hanger Kit

#### (field-installed horizontal units only)

The hanger kit shall consist of galvanized steel brackets, bolts, lock washers, and isolators and shall be designed to fasten to the unit bottom panel for suspension from 3/8-inch threaded rods. Unit sizes 012-030 shall include four brackets. Unit sizes 036-072 shall include six brackets.

### 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.

#### 5-Speed ECM Blower Motor

An optional 5-speed ECM blower motor is available on model sizes 022-072.

#### PSC Blower Motor

An optional 3-speed PSC blower motor is available on all single speed models.

## Engineering Guide Specifications cont.

### Thermostat (field-installed)

A multi-stage auto-changeover electronic digital thermostat shall be provided. The thermostat shall offer three heating and two cooling stages with precise temperature control. An OFF-HEAT-AUTO-COOL-EMERG system switch, OFF-AUTO blower switch, and indicating LEDs shall be provided. The thermostat shall display in °F or °C. The thermostat shall be either a communicating type or a traditional 24 VAC type.

### Communicating 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 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.

### Communicating 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 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.

### Electronic Air Cleaner (field-installed)

A 1 in. [25 mm] electronic air cleaner, cleanable 97% efficiency at 0.3 microns and larger, shall be provided in lieu of the standard throwaway filter. The initial pressure drop across the filter shall not exceed 0.2 in. w.g. at 300 fpm force velocity.

### Electrostatic Air Cleaner (field-installed)

A 1 in. [25 mm] electrostatic air cleaner, cleanable 90% efficiency, shall be provided in lieu of the standard throwaway filter. The initial pressure drop across the filter shall not exceed 0.15 in. w.g. at 300 fpm force velocity.

### AlpinePure 411-Rack 4 in. Pleated Filter Accessory

A 4 in. [102 mm] thick MERV 11 filter and filter rack shall be provided in lieu of the standard filter and rack.

### AlpinePure MERV 13 Filter

A 2 in. [50 mm] thick MERV 13 filter shall be provided in lieu of the standard filter and fits the factory filter rack. The filter maintains MERV 13 rating in full ASHRAE 52.2 independent testing as required for LEED® certification. Helps fulfill a full credit under the LEED rating system.

### AlpinePure HRV/ERV (field installed)

A self-contained unit shall provide removal of stale air while replenishing the structure with an equal amount of fresh, clean air. The incoming and exhaust air streams shall be completely separate through the exchanger. The Heat Recovery Ventilator (HRV) shall transfer sensible heat from the stale exhaust air to the fresh incoming air with a Sensible Efficiency up to 79%. The HRV shall be equipped with a Defrost Mode. The Energy Recovery Ventilator (ERV) shall transfer sensible heat as well as latent heat with a Total Efficiency of 50%. The ERV shall be designed for use in warm humid areas with heavy air conditioning use. The ERV shall not be recommended for use in areas where the temperature drops below 25°F (-4°C) for more than five days. The ERV shall not be equipped with a Defrost Mode.

### AlpinePure HEPA Filter

For the ultimate in air filtration, the AlpinePure Series HEPA filter captures 99.97% of all particles down to 0.30 microns in size.

### AlpinePure Drain Pan Treatment

Provides dependable, sustained time-release protection from slime build-up and foul smelling odors in the drain pan. Also adds a light, pleasant scent to the air.

### 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 slaving control so that two units may share one flow center.

### Auxiliary Heater (field-installed)

An electric resistance heater shall provide supplemental and/or emergency heating capability. Vertical units shall have the control panel and resistance heater coil assembly mounted internally. For horizontal units, the control panel shall be mounted internally while the resistance heater coil assembly shall be mounted externally. A low voltage plug shall be provided in each unit for quick auxiliary heat connection. The heater shall operate in sequenced stages as controlled by the unit's microprocessor. The heater shall feed line voltage power to the unit blower and transformer to provide emergency heat capability in the event of an open compressor circuit breaker.

# Revision Guide

---

<b>Pages:</b>	<b>Description:</b>	<b>Date:</b>	<b>By:</b>
23-25	Updated Dimensional Drawings	22 Feb 2013	DS
68-71	Updated Wiring Diagrams	22 Feb 2013	DS
All	Revision Table Added, Minor Formatting Corrections	22 Feb 2013	DS



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

