

SYNERGY3D

Geothermal Heat Pumps with Water Heating for Radiant Floor Applications

- 3 thru 6 Ton

Design Features

Factory Options

Accessories

Dimensional Data

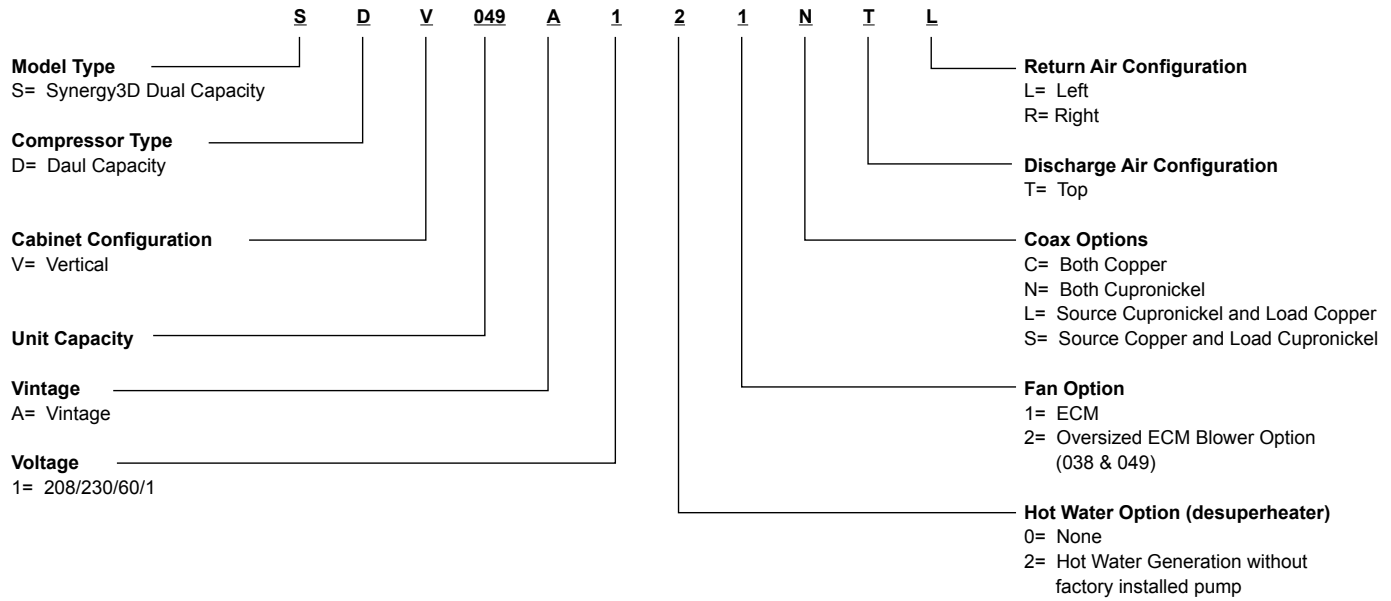
Physical Data

Performance Data

Engineering Guide Specifications



Model Nomenclature



The factory installed Hot Water option (desuperheater) does not include a factory mounted circulating pump or temperature control. Kit DPK5 (ordered separately) includes field installed circulator, hot water tank adaptor, temperature limit and installation instructions.

Table of Contents

General Introduction	2
What's New	3
Design Features	4-5
Unit Components	6
Application Information	7-8
ARI Data & Information	9
ARI/ISO 13256-1 Performance Ratings	10
Dimensional Data	11
Physical Data	12
Unit Electrical Data	13
Auxiliary Heat Ratings	13
Auxiliary Heat Electrical Data	13
Blower Performance Data	14
Reference Calculations	15
Legends and Notes	15
Correction Factor Tables	16
Capacity Data	17-28
Wiring Schematics	29-30
Microprocessor Control	31-34
Operation Logic Data Table	35
Pressure Drop Tables	35
Engineering Guide Specifications	36-37

SYNERGY3D



With the WaterFurnace Synergy3D Series, you'll provide superior comfort, incredible performance and energy savings. Integrating the comfort of a radiant floor heating system with the advantages of geothermal technology, the Synergy3D provides forced air heating and cooling to ducted zones while simultaneously providing hot water to radiant floor zones. The Synergy3D is the geothermal equivalent of a boiler, furnace and air conditioner— a three-in-one unit.

The Synergy3D line is available in four dual capacity sizes (3 to 6 tons) with Copeland Scroll UltraTech™ compressors.

The Synergy3D utilize ozone-safe R-410A refrigerant to meet the most stringent EPA requirements. Coated air coils add durability and longer life. ECM blowers are used to increase comfort and efficiency. A sophisticated microprocessor control sequences all components during operation for optimum performance, and provides easy-to-use troubleshooting features with fault lights and on-board diagnostics. An Emerson Comfort Alert is also included to monitor compressor operation and faults. A hinged door and swing-out control box improves serviceability. Unit configurations include vertical top discharge (left or right return). Heavy-gauge metal cabinets are fully insulated and coated with an attractive and durable metallic silver paint for long lasting protection. The cabinet's rounded front corners, red wave styling element and gold nameplates add a touch of elegance to the unit.

Synergy3D products are performance-certified to ARI ISO 13256-1 standards, are ETL listed, and are ENERGYSTAR® qualified.

As a leader in the industry, WaterFurnace is dedicated to innovation, quality and customer satisfaction. In fact, every unit built is exposed to a wide range of quality control procedures throughout the assembly process and is then subjected to a rigorous battery of computerized run tests to certify that it meets or exceeds performance standards for efficiency and safety, and will perform flawlessly at startup. As further affirmation of our quality standards, each unit carries our exclusive Quality Assurance emblem, signed by the final test technician.

WaterFurnace International's corporate headquarters and 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 Envision products, you can be assured that your customer is investing in the ultimate comfort system and peace of mind for many years to come.

New Features on the Synergy3D

- ① **COMPRESSOR:** Copeland Scroll UltraTech™ (dual capacity) mounted on double isolation plates
- ② **CONTROLS:** Comfort Alert control module detects and displays compressor abnormalities for easier service diagnostics.
- ③ **STATUS LIGHTS:** Mounted higher on the unit
- ④ **HEAT EXCHANGER:** Standard copper (optional cupronickel)
- ⑤ **AIR COIL:** Exclusive FormiShield™ coated for added protection
- ⑥ **FILTER RACK:** Redesigned rack holds 1" or 2" filters (field changeable)
- ⑦ **FILTER:** Pleated MERV 11 Standard
- ⑧ **INSULATION:** Foil lined
- ⑨ **CABINET FINISH:** Silver metallic powder coat

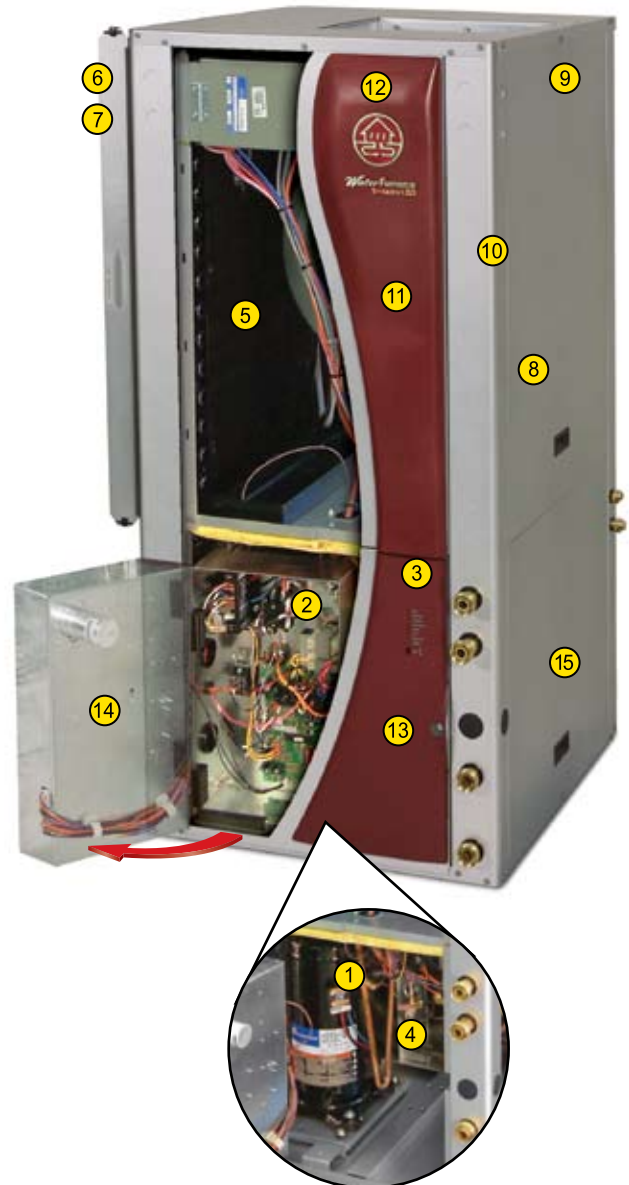
CABINET STYLING ELEMENTS:

- ⑩ Rounded front corner posts
- ⑪ "Wave" trim piece
- ⑫ Gold nameplate

SERVICE ACCESS:

- ⑬ Hinged front bottom access panel
- ⑭ Hinged, removable control box

- ⑮ **REMOVABLE PANELS:** Redesigned for easier removal and replacement



Design Features

What's New?

- Copeland UltraTech™ Compressors in dual capacity units.
 - Modulating, switches from low to high without delay.
 - 67% capacity first stage.
 - Sizes 038, 049, 064, 072.
- Comfort Alert Control Module.
 - Monitors compressor operation for easier service diagnostics.
- Cabinet styling—silver metallic paint, rounded front corner posts, “wave” styling element, gold nameplate.
- Standard 2” filter rack switchable to 1”.
- Foil lined cleanable insulation.
- Double isolation mounted compressors.
- Hinged front compressor access panel & hinged/removable control box.
- Text based thermostats with ComforTalk, communicate with control box
- Improved air coil service access.
- Graduated cabinet heights fits as replacement for 100,000+ installed Premier units.
- FormiShield™ coated air coil.
- Optional desuperheater (without factory installed pump) can generate heated water at considerable savings.

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 air discharge for upflow installations in vertical units.
- True left or right return air locations—units include filter rack/duct collar.
- Variable-speed ECM2 blowers permit various duct applications.
- Narrow cabinet for easy movement through doorways.
- Internally trapped condensate piping for neat, compact installation.
- Optional field-installed auxiliary electric heater.
- Corner-located electrical box for field wiring from two sides.
- Fuse-protected loop pump power block for easy wiring.
- Loop pump slaving feature allows multiple units to share one flow center.
- Field-selectable low source water temperature limit setting for well or closed loop systems.
- Relays to control field-mounted air dampers.

Operating Efficiencies

- ARI/ISO 13256-1 rating for heating COPs, cooling EERs and low water flow requirements.
- High-stability expansion valve delivers optimum refrigerant flow over a wide range of conditions and provides bidirectional operation without troublesome check valves.
- Efficient 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.
- Large, low-RPM blowers with variable-speed motors provide quiet and efficient air movement with high static capability.
- Utilizes the ozone-friendly R-410A refrigerant which produces higher efficiencies and warmer discharge air temperatures.

Service Advantages

- Hinged front access door with hinged/removable control box for added serviceability.
- Removable panels: three for the compressor compartment and two 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.
- 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 with memory for easy diagnostics.
- Detachable thermostat connection strip for wiring convenience.
- Hot water pump shut-off switch for easy startup and service.
- Control box and fan 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.
- Fan and transformer powered from auxiliary heat supply (when installed) to provide emergency heat with open compressor circuit breaker.

Design Features (cont.)

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, desuperheater coil, and all water pipes are fully insulated to reduce condensation problems in low temperature operation.
- FormiShield™ air coils 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-inch 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; low source water limit sensor to safeguard the coaxial heat exchanger; fan start detection; Comfort Alert compressor monitoring; fault lockout enables emergency heat and prevents compressor operation until thermostat or circuit breaker is reset.

Microprocessor Benefits

- Digital auto-changeover thermostat with 3-stage heating/2-stage cooling holds precise temperature and provides varying fan speed control.
- Component sequencing delays for quiet startup, shut-down, and timed staging of auxiliary electric heat.
- ECM2 fan speed control provides higher supply air temperature in heating, better dehumidification in cooling, and quiet operation at reduced airflows in all modes.

Options & Accessories

- Cupronickel heat exchangers for open loop applications
- Optional desuperheater without factory mounted pump.
- Optional oversized ECM fan motor for high static applications on 038 to 049 models.
- Electronic auto-changeover thermostat with 3-stage heating/2-stage cooling and indicator LEDs.
- 24 volt 1-inch electronic air cleaner.
- 90% efficient, cleanable electrostatic filters.
- Closed loop flow center.
- Auxiliary electric heater.
- Hose kits.

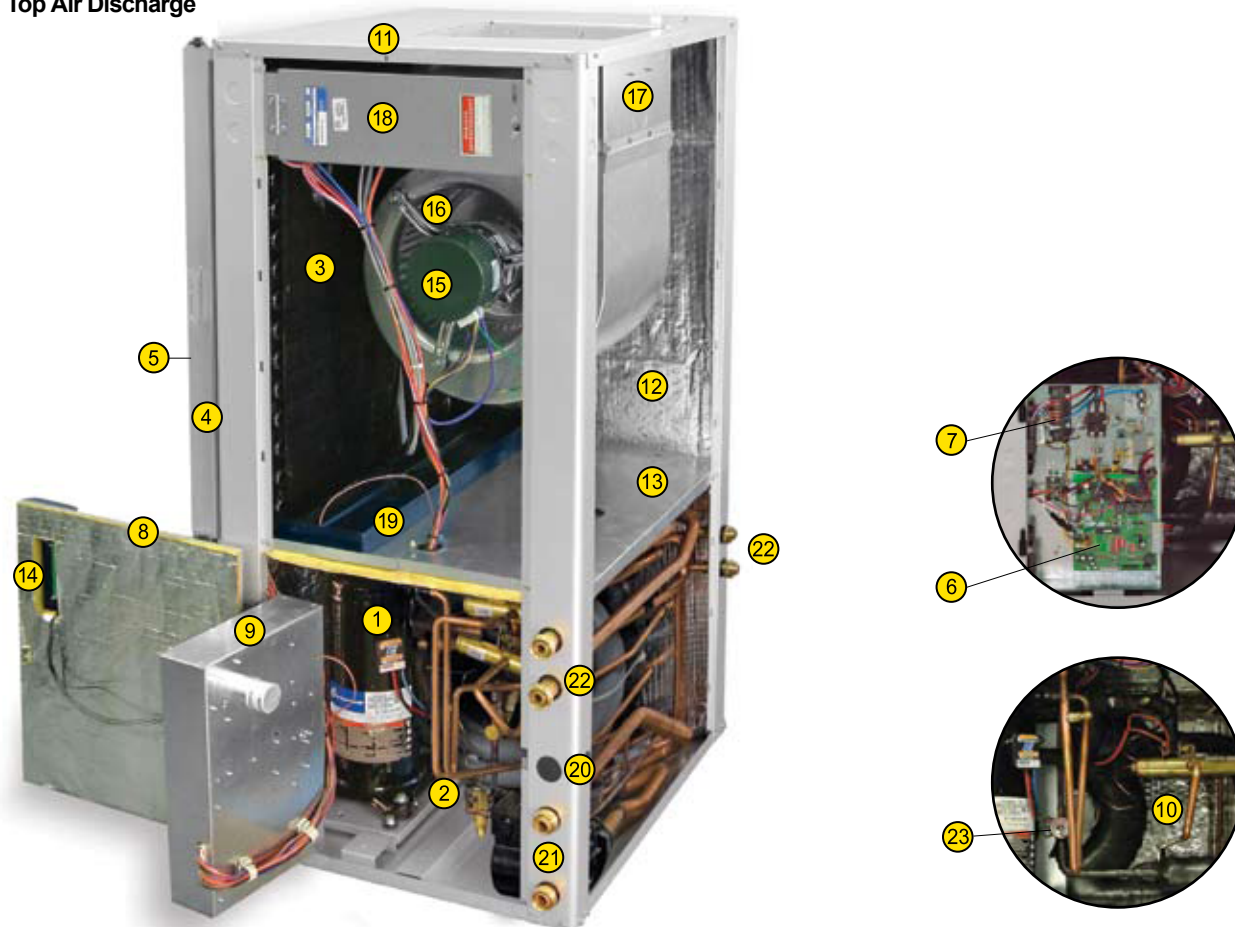
Manufacturing Quality

- All units are computer run-tested, with conditioned source water, in all modes to insure 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 insure an annual leak rate of less than 1/4 ounce.
- All major components bar coded. Eliminating possibility of mis-matched parts built into unit.
- All assembly technicians thoroughly trained in proper quality procedures.
- Focus on geothermal products enables company to dedicate all resources to product.

Unit Components

- ① Copeland UltraTech™ (dual capacity)
- ② Double isolation plate for compressor mounting
- ③ Air coil with FormiShield™ coating
- ④ Factory mounted filter rack
- ⑤ MERV 11 pleated filter standard
- ⑥ Microprocessor control
- ⑦ Comfort Alert compressor monitor
- ⑧ Hinged front access panel
- ⑨ Hinged/removable control box
- ⑩ Copper heat exchanger (optional cupronickel)
- ⑪ Silver metallic powder coat cabinet finish
- ⑫ Fully insulated with foil lined material
- ⑬ Insulated divider panel
- ⑭ Fault and status LEDs
- ⑮ ECM2 blower motor
- ⑯ Oversize blower wheel
- ⑰ Internally mounted auxiliary heater
- ⑱ Internally mounted control for auxiliary heater
- ⑲ Plastic drain pan with overflow protection
- ⑳ Internally trapped condensate
- ㉑ Brass swivel water connections
- ㉒ Optional desuperheater without factory mounted pump
- ㉓ Easy access to expansion valve

Vertical Top Air Discharge



Application Information

Synergy3D units provide ducted heating and cooling, and hot water to radiant floor applications.

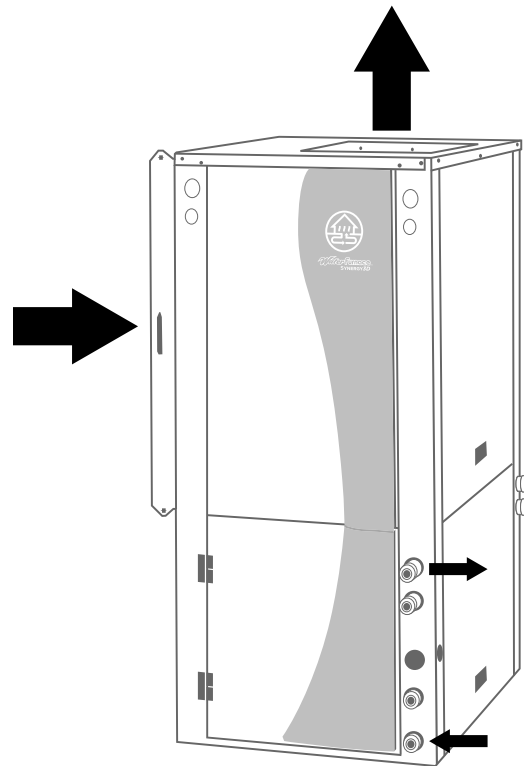
Most Synergy3D applications use multiple thermostats for heating. One or more thermostats may be dedicated to the forced air zone(s) while separate thermostats are used in the radiant floor zones. The microprocessor control in the unit allows for priority selection for either radiant or forced air zones, depending on the size, location and use of each zone.

Although the unit does not heat air and water simultaneously, the comfort “system” should be designed and controlled so that both functions occur simultaneously. This is achieved using a holding tank (buffer tank) for hot water. The buffer tank acts as a storage device for water heated using the Synergy3D unit. Warm water can be drawn from the buffer tank during forced air heating operation. At some point, the unit will need to switch from forced air heating mode to water heating mode when the temperature of the buffer tank drops below the setpoint. This switchover will occur either before or after the ducted zones are satisfied in heating, depending on the prioritization.

Typical water temperatures in radiant floor heating systems are around 100-105° F (38-40° C). Heat pumps using R-410A refrigerant are not designed to produce water above 130° F (54° C). The system efficiency decreases as the temperature difference (TD) between the heat source (generally the earth loop) and the supply water (the distribution system) increases. The heating capacity of the heat pump also decreases as the temperature difference increases.

When designing radiant floor distribution systems, the temperature limits of the geothermal system must be a

Figure 2: Air Flow for Ducted Zones, and Water Flow for Radiant Zones



major consideration. In new construction, the distribution system can easily be designed with the temperature limits in mind. In retrofits, care must be taken to address the operating temperature limits of the existing distribution system.

Figure 1: Radiant Floor Heating



Application Information (cont.)

Radiant Floor Heating

Radiant floor heating has been the system of choice in many parts of Europe for some time. Manufacturers have developed tubing designed for installation in concrete floors and built-up wood floors. Floor heating systems have several benefits in residential, commercial and industrial heating applications. In a building with a radiant floor heating system, the entire floor acts as a heat source for the room.

In residential applications, occupants in a space feel comfortable with lower air temperatures if their feet are warm. Typically the space will feel comfortable with air temperatures as low as 65° F (18° C). Since the heat loss of a building is directly related to the temperature difference between the inside and outside, a lower temperature difference means the heat loss is lower. Air temperatures in a room with a forced air heating system tend to be warmer near the ceiling than the floor. The hot air rises and creates a greater pressure imbalance between the inside and outside. The building's infiltration increases, resulting in a higher heat loss. Air temperatures in a room with floor heating tend to be warmer at the floor than the ceiling, helping cut down on infiltration in the building. The energy savings in a building with floor heating can range from 20-40% over traditional forced air systems.

Temperatures in a forced air system tend to be more uneven than in a radiant floor heating system. The air temperatures in a forced air system tend to be much higher than with radiant floor heating, making the temperature difference between inside and outside higher, which results in a higher BTU requirement.

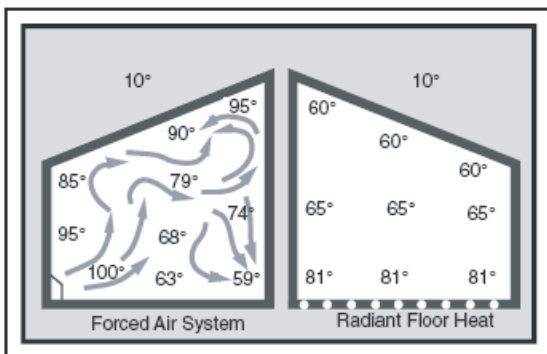
Hydronic/geothermal systems can be used very effectively in new installations, as well as in many retrofit applications. Efficient systems can be built for residential, commercial and industrial applications.

To make a system as efficient as possible, it is important to follow good design criteria. Some of the factors to consider are listed below:

- An accurate heat loss and heat gain calculation must be done to size the system to operate efficiently.
- The system must meet the application requirements. In other words, the design of the system must take into consideration the type of distribution system and the needs of the customer.
- The components of the system must be designed to work together. The loop must be designed to work with the heat pumps, the pumping system must work efficiently with the earth loop and the heat distribution, and the distribution system must be chosen to work efficiently with the water temperatures available from the equipment.
- The system must be controlled to operate as efficiently as possible. It is important to operate the system to take variations in the building loads into account. For example, the heat loss of the building is reduced when the outdoor temperature climbs, and the temperature of the water circulated through the distribution system can be lowered, allowing the heat pumps to operate more efficiently.
- Modulating the various components of a system to meet the varying requirements of a building can significantly improve the efficiency of a system. Variable-speed pumps, for example, can greatly increase the overall efficiency of a system.
- The cost-effectiveness of the system must be considered. Regardless of the application, the design must take into account operating costs, installation costs and future repair/maintenance.

Note: Additional information on hydronic system design and application can be found in WFS272.

Figure 3 - Air Temperature Variations



Performance Standard

ARI/ISO/ASHRAE 13256-1

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

Unit of Measure: The Cooling COP

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

Water Conditions Differences

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

Air Conditions Differences

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

Pump Power Correction Calculation

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

- Pump power correction = $(\text{gpm} \times 0.0631) \times (\text{Press Drop} \times 2990) / 300$

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.

Fan Power Correction Calculation

Fan 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.

- Fan Power Correction = $(\text{cfm} \times 0.472) \times (\text{esp} \times 249) / 300$

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

ISO Capacity and Efficiency Calculations

The following equations illustrate cooling calculations:

- ISO Cooling Capacity = Cooling Capacity (Btuh) + (Fan Power Correction (Watts) x 3.412)

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

The following equations illustrate heating calculations:

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

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

Comparison of Test Conditions

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

Note *: Flow rate is set by 10°F rise in standard cooling test
Part load entering water conditions not shown.

Note **: Flow rate is specified by the manufacturer

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

Conversions:

Airflow (lps) = CFM x 0.472;

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

WaterFlow (lps) = GPM x 0.0631;

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

ARI/ISO 13256-1 Performance Ratings

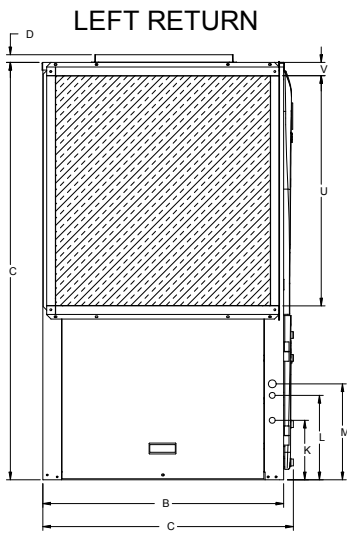
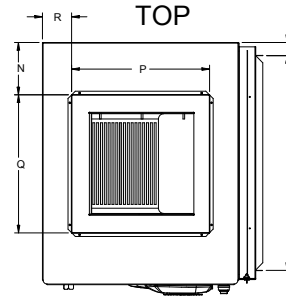
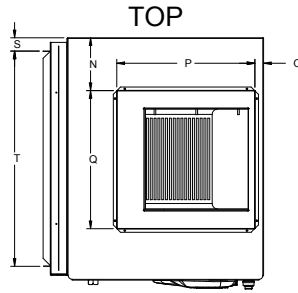
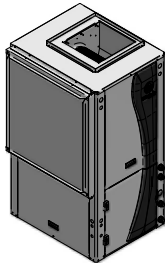
Model	Capacity Modulation	Flow Rate		Ground Water Heat Pump				Ground Loop Heat Pump			
				Cooling EWT 59°F		Heating EWT 50°F		Full Load 77°F Part Load 68°F		Full Load 32°F Part Load 41°F	
		gpm	cfm	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
038	Full	9.0	1200	37,100	19.6	31,100	4.6	35,800	18.5	24,800	4.0
	Part	8.0	1000	27,400	27.8	22,200	5.0	26,500	23.7	20,000	4.5
049	Full	12.0	1500	45,000	22.1	39,300	4.5	44,600	16.6	34,000	3.7
	Part	11.0	1300	37,500	25.3	32,400	4.7	36,100	21.7	28,600	4.2
064	Full	16.0	1800	65,200	18.8	53,800	4.1	60,500	15.4	42,000	3.5
	Part	14.0	1500	48,300	24.3	38,000	4.3	46,100	20.8	33,000	3.9
072	Full	18.0	2000	74,500	17.7	64,600	4.1	70,400	15.0	50,000	3.6
	Part	16.0	1500	56,600	22.6	47,100	4.2	55,400	20.2	41,400	3.9

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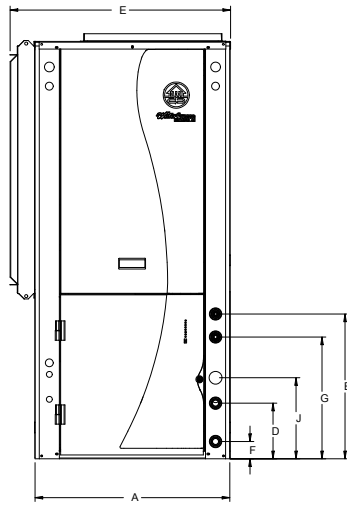
Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature
 Heating capacities based upon 68°F DB, 59°F WB entering air temperature
 All ratings based upon 208V operation



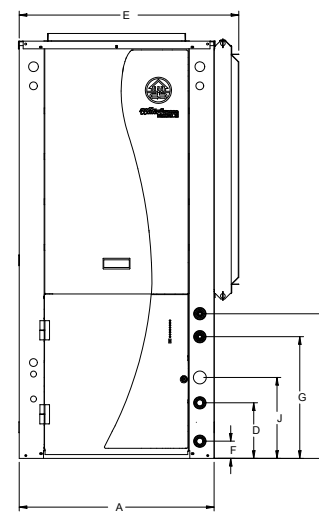
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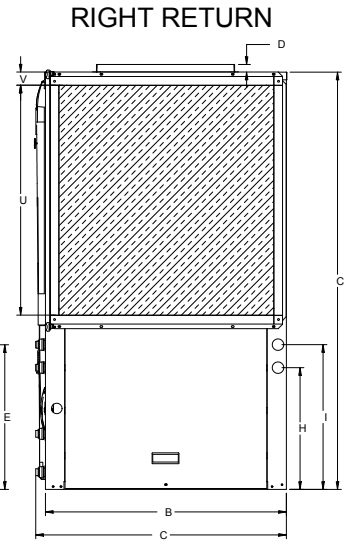
LEFT



FRONT



FRONT



RIGHT

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Vertical Topflow Model	Overall Cabinet			Water Connections										Electrical Connections			Discharge Connection <small>duct flange installed (±0.10 in)</small>					Return Connection <small>using std deluxe filter rack (±0.10 in)</small>				
	A	B	C	D	E	F	G	H	I	J	Loop	Hydronic	HWG	K	L	M	N	O	P	Q	R	S	T	U	V	
	Width	Depth	Height	Loop In	Hydronic Out	Hydronic In	Loop Out	HWG In	HWG Out	Condensate	Water FPT	Water FPT	FPT	1/2" cond Low Voltage	1/2" cond Ext Pump	3/4" cond Power Supply	Supply Width	Supply Depth	Return Depth	Return Height	Return Depth	Return Height	Return Depth	Return Height		
038	in.	25.6	31.6	50.4	2.3	18.9	2.3	7.3	13.6	16.6	10.6	1" Swivel	1" Swivel	1" Swivel	8.0	11.3	12.8	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	48.0	5.8	18.5	34.5	42.2	26.9	1" Swivel	1" Swivel	1" Swivel	20.3	28.7	32.5	17.5	2.8	45.7	45.7	9.7	4.3	71.4	66.0	4.3
049	in.	25.6	31.6	54.4	2.3	18.9	2.3	7.3	15.9	48.9	10.6	1" Swivel	1" Swivel	1" Swivel	8.0	11.3	12.8	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	48.0	5.8	18.5	40.4	124.2	26.9	1" Swivel	1" Swivel	1" Swivel	20.3	28.7	32.5	17.5	2.8	45.7	45.7	9.7	4.3	71.4	76.2	4.3
064	in.	25.6	31.6	58.4	2.3	18.9	2.3	7.3	15.9	18.9	10.6	1" Swivel	1" Swivel	1" Swivel	8.0	11.3	12.8	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	48.0	5.8	18.5	40.4	48.0	26.9	1" Swivel	1" Swivel	1" Swivel	20.3	28.7	32.5	17.5	2.8	45.7	45.7	9.7	4.3	71.4	86.4	4.3
072	in.	25.6	31.6	58.4	2.3	18.9	2.3	7.3	15.9	18.9	10.6	1" Swivel	1" Swivel	1" Swivel	8.0	11.3	12.8	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	48.0	5.8	18.5	40.4	48.0	26.9	1" Swivel	1" Swivel	1" Swivel	20.3	28.7	32.5	17.5	2.8	45.7	45.7	9.7	4.3	71.4	86.4	4.3

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

Physical Data

Model				
	038	049	064	072
Compressor (1 each)	Copeland Scroll			
Factory Charge R410a, oz [kg]	90 [2.55]	111 [3.14]	128 [3.62]	128 [3.62]
ECM Fan Motor & Blower				
Fan Motor Type/Speeds	ECM Variable Speed			
Fan Motor- hp [W]	1/2 [373]	1/2 [373]	1 [746]	1 [746]
Blower Wheel Size (Dia x W), in. [mm]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
Coax and Water Piping				
Loop Water Connections Size - Swivel - in [mm]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]
Hydronic Water Connections Size - Swivel - in [mm]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]
HWG Connection Size - Swivel - in [mm]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]
Coax & Piping Water Volume - gal [l]	1.3 [4.9]	1.6 [6.1]	1.6 [6.1]	1.6 [6.1]
Vertical				
Air Coil Dimensions (H x W), in. [mm]	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 ² [m ²]	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]
Air Coil Number of rows	3	3	4	4
Filter Standard - 2" [51mm] Pleated MERV11 Throwaway, in [mm]	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]	425	530	540	540
Weight - Packaged, lb [kg]	445	550	560	560

6/2/08

Unit Electrical Data

Electrical Data

Model	Rated Voltage	Voltage Min/Max	Compressor			Int Pump FLA	Ext Loop FLA	Fan Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse calc	Max Fuse/HACR
			MCC	RLA	LRA							
SDV038	208-230/60/1	197/254	26.0	16.6	82.0	1.07	5.4	4.0	27.1	31.2	47.8	45
SDV038*	208-230/60/1	197/254	26.0	16.6	82.0	1.07	5.4	7.0	30.1	34.2	50.8	50
SDV049	208-230/60/1	197/254	33.0	21.1	96.0	1.07	5.4	4.0	31.6	36.8	57.9	50
SDV049*	208-230/60/1	197/254	33.0	21.1	96.0	1.07	5.4	7.0	34.6	39.8	60.9	60
SDV064	208-230/60/1	197/254	40.0	25.6	118.0	1.07	5.4	7.0	39.1	45.5	71.2	70
SDV072	208-230/60/1	197/254	42.5	27.2	150.0	1.07	5.4	7.0	40.7	47.5	74.7	70

* With optional 1 HP ECM2 motor

Rated Voltage of 208-230/60/1.

HACR circuit breaker in USA only.

Local electrical codes overrule any wiring recommendations.

Min/Max Voltage of 197/254.

All fuses Class RK-5.

6/17/08

Auxiliary Heat

Auxiliary Heat Electrical Data

Model	Supply Circuit	Heater Amps		Min Circuit Amp		Max Fuse (USA)		Max Fuse (CAN)		Max CKT BRK	
		208 V	240 V	208 V	240 V	208 V	240 V	208 V	240 V	208 V	240 V
EAL(H)10	Single	34.7	40	53.3	60	60	60	60	60	60	60
EAL(H)15	Single	52.0	60	75	85	80	90	80	90	70	100
	L1/L2	34.7	40	53.3	60	60	60	60	60	60	60
	L3/L4	17.3	20	21.7	25	25	25	25	25	20	30
EAL(H)20	Single	69.3	80	96.7	110	100	110	100	110	100	100
	L1/L2	34.7	40	53.3	60	60	60	60	60	60	60
	L3/L4	34.7	40	43.3	50	45	50	45	50	40	50

All heaters rated single phase 60 cycle and include unit fan load

All fuses type "D" time delay (or HACR circuit breaker in USA)

Auxiliary Heat Ratings

Model	KW		Stages	BTU/HR		Min CFM	Model Compatibility			
	208V	230V		208V	230V		038	049	064	072
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			•	•

Notes: High fan tap setting must be above the minimum CFM for the heater selected.

Blower Performance Data

MODEL	MAX ESP	AIR FLOW DIP SWITCH SETTINGS											
		1	2	3	4	5	6	7	8	9	10	11	12
038	0.50	650	750 L	850	1000	1100 M	1200	1300 H	1400	1500			
038 w/1hp*	0.75	800 L	1000	1100 M	1300 H	1500	1600	1800					
049	0.50	650	800 L	900	1050	1150	1250	1350 M	1450	1550 H			
049 w/1hp*	0.75	800 L	900	1000	1200	1400 M	1600 H	1700	1850	2000	2200	2300	2400
064	0.75	800	950 L	1100	1300	1500 M	1750	1950 H	2100	2300			
072	0.75	800	950 L	1100	1300	1500 M	1750	1950 H	2100	2300			

Factory settings are at recommended L-M-H DIP switch locations

CFM is controlled within ±5% up to the maximum ESP

3/18/08

M-H settings MUST be located within boldface CFM range

Max ESP includes allowance for wet coil and standard filter

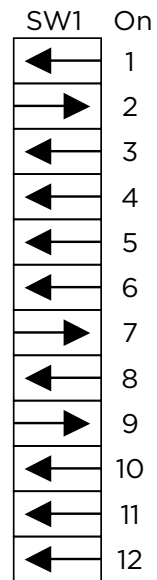
Lowest and Highest DIP switch settings are assumed to be L and H respectively

A 12-position DIP switch package on the Synergy3D control allows the airflow levels to be set for Low, Medium and High speed when using the ECM2 blower motor.

Only three of the DIP switches can be in the “On” position. The first “On” switch (the lowest position number) determines the “Low Speed Fan” setting. The second “On” switch determines the “Medium Speed Fan” setting, and the third “On” switch determines the “High Speed Fan” setting.

The example to the right shows SW1 on the Synergy3D control board configured for the following SDV049 airflow settings:

- Low Speed Fan: 800 CFM
- Medium Speed Fan: 1350 CFM
- High Speed Fan: 1550 CFM



Reference Calculations

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

Operating Limits

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

Legends and Notes

ABBREVIATIONS AND DEFINITIONS

CFM	= airflow, cubic feet/minute	KW	= kilowatts
COP	= coefficient of performance = (btu output/btu input) = $[HC/(kw \times 3.413)]$	LAT	= leaving air temperature °F
EAT	= entering air temperature °F	LC	= latent cooling capacity in MBTUH
EER	= energy efficient ratio = btu output / watt input	LGPM	= load flow in gallons per minute
ELT	= entering load fluid temperature to heat pump	LLT	= leaving load fluid temperature from heat pump
EST	= entering source fluid temperature to heat pump	LST	= leaving source fluid temperature from heat pump
EWT	= entering water temperature (source) to heat pump	LWPD	= load coax water pressure drop
FT HD	= pressure drop in feet of head	LWT	= leaving water temperature °F
GPM	= gallons per minute	PSI	= pressure drop in pounds per square inch
HC	= total heating capacity in MBTUH	S/T	= sensible to total cooling ratio
HE	= heat extracted in MBTUH	SC	= sensible cooling capacity in MBTUH
HR	= heat rejected in MBTUH	SWPD	= source coax water pressure drop
		TC	= total cooling capacity in MBTUH
		TH	= total heating capacity in MBTUH
		WPD	= water pressure drop in PSI, feet of water

Notes:

Minimum/maximum limits are only for start-up conditions, and are meant for bringing the space up to occupancy temperature. Units are not designed to operate at the minimum/maximum conditions on a regular basis. The operating limits are dependant upon three primary factors: 1) Water temperature 2) Return air temperature 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.

Notes to Capacity Data Tables

The following notes apply to all *Capacity Data* tables:

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

Correction Factor Tables

Part Load Air Flow Corrections

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
400	100	1.000	1.000	1.000	1.000	1.000	1.000	1.000
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

Full Load Air Flow Corrections

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
400	100	1.000	1.000	1.000	1.000	1.000	1.000	1.000
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 (Dual Capacity Full & Part Load)

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		
45	0.719	0.891	1.058	1.128	*	*	*	*	*	*	*	0.898	0.741
50	0.719	0.893	0.980	1.106	*	*	*	*	*	*	*	0.898	0.741
55	0.812	0.629	0.844	1.026	1.172	*	*	*	*	*	*	0.922	0.819
60	0.897			0.820	0.995	1.206	1.238	*	*	*	*	0.955	0.895
65	0.960			0.568	0.810	1.004	1.052	1.227	*	*	*	0.982	0.951
66.2	0.984			0.505	0.743	1.002	1.027	1.151	*	*	*	0.993	0.980
67	1.000			0.463	0.699	1.000	1.011	1.101	1.310	*	*	1.000	1.000
70	1.047				0.599	0.865	0.879	1.007	1.225	1.433	*	1.018	1.029
75	1.148					0.567	0.584	0.734	0.956	1.261	1.476	1.056	1.118

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

7/20/06

Heating Capacity Corrections (Dual Capacity Full & Part Load)

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

7/20/06

SDV038 Capacity Data - Low Speed

Performance capacities shown in thousands of Btuh.

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
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 1050	15.1 15.7	1.60 1.65	9.6 10.1	85.5 83.8	2.75 2.80	2.4 2.2								
30	4.0	0.9	2.0	Operation not recommended							Operation not recommended							
	6.0	1.7	3.9	900 1050	16.8 17.5	1.58 1.62	11.4 12.0	87.3 85.4	3.12 3.17	2.3 2.1	900 1050	25.5 26.2	15.0 16.6	0.59 0.63	0.93 0.94	28.6 29.4	27.5 27.7	- -
	8.0	2.8	6.5	900 1050	17.9 18.6	1.62 1.66	12.3 12.9	88.4 86.4	3.24 3.29	2.4 2.2	900 1050	25.9 26.6	15.4 17.0	0.59 0.64	0.92 0.94	29.0 29.8	28.2 28.4	- -
40	4.0	0.8	1.9	Operation not recommended							Operation not recommended							
	6.0	1.6	3.8	900 1050	20.6 21.4	1.59 1.62	15.2 15.8	91.2 88.8	3.80 3.86	2.5 2.3	900 1050	27.6 28.4	16.5 18.3	0.60 0.65	1.02 1.04	31.1 31.9	27.1 27.3	- -
	8.0	2.7	6.3	900 1050	21.8 22.5	1.63 1.66	16.2 16.8	92.4 89.8	3.91 3.97	2.6 2.4	900 1050	28.0 28.8	17.0 18.8	0.60 0.65	1.01 1.03	31.5 32.3	27.8 28.0	- -
50	4.0	0.8	1.9	900 1050	23.1 23.8	1.60 1.62	17.7 18.3	93.8 91.0	4.24 4.31	2.6 2.4	900 1050	29.9 30.7	17.6 19.5	0.59 0.63	1.17 1.19	33.9 34.8	25.6 25.8	0.9 1.0
	6.0	1.6	3.7	900 1050	23.9 24.7	1.60 1.62	18.5 19.1	94.6 91.7	4.38 4.46	2.7 2.5	900 1050	30.2 31.0	17.7 19.6	0.59 0.63	1.14 1.16	34.0 34.9	26.5 26.7	0.9 1.0
	8.0	2.6	6.1	900 1050	25.1 25.8	1.64 1.66	19.5 20.1	95.8 92.8	4.48 4.56	2.8 2.5	900 1050	30.6 31.5	18.2 20.1	0.59 0.64	1.13 1.15	34.5 35.4	27.2 27.4	0.8 0.9
60	4.0	0.8	1.8	900 1050	26.6 27.3	1.65 1.66	21.0 21.6	97.4 94.1	4.74 4.82	2.9 2.6	900 1050	28.3 29.1	18.5 20.4	0.65 0.70	1.29 1.31	32.7 33.5	21.9 22.1	1.3 1.3
	6.0	1.5	3.6	900 1050	27.7 28.3	1.65 1.65	22.1 22.7	98.5 95.0	4.93 5.02	3.0 2.7	900 1050	28.5 29.3	18.6 20.6	0.65 0.70	1.26 1.28	32.8 33.7	22.7 22.9	1.2 1.3
	8.0	2.5	5.9	900 1050	28.7 29.3	1.68 1.69	22.9 23.5	99.5 95.8	4.99 5.08	3.0 2.8	900 1050	29.0 29.8	19.0 21.1	0.66 0.71	1.24 1.27	33.3 34.1	23.3 23.5	1.1 1.2
70	4.0	0.8	1.8	900 1050	30.3 30.9	1.70 1.70	24.5 25.1	101.2 97.2	5.22 5.32	3.2 2.9	900 1050	27.7 28.5	19.3 21.3	0.70 0.75	1.44 1.47	32.6 33.5	19.2 19.3	1.7 1.8
	6.0	1.5	3.5	900 1050	31.6 32.2	1.69 1.69	25.8 26.4	102.5 98.4	5.47 5.58	3.3 3.0	900 1050	28.0 28.7	19.4 21.5	0.69 0.75	1.41 1.43	32.8 33.6	19.9 20.0	1.6 1.8
	8.0	2.5	5.7	900 1050	32.4 33.0	1.73 1.73	26.5 27.1	103.4 99.1	5.50 5.60	3.4 3.1	900 1050	28.4 29.2	19.9 22.0	0.70 0.75	1.39 1.42	33.2 34.1	20.4 20.5	1.5 1.7
80	4.0	0.7	1.7	900 1050	33.4 33.8	1.73 1.72	27.5 28.0	104.3 99.8	5.66 5.77	3.6 3.3	900 1050	27.3 28.0	19.2 21.2	0.70 0.76	1.62 1.66	32.8 33.7	16.8 16.9	2.4 2.6
	6.0	1.4	3.3	900 1050	35.0 35.4	1.72 1.70	29.1 29.6	106.0 101.2	5.97 6.09	3.7 3.4	900 1050	27.5 28.3	19.3 21.4	0.70 0.76	1.58 1.61	32.9 33.8	17.4 17.5	2.3 2.5
	8.0	2.4	5.5	900 1050	35.5 35.8	1.75 1.74	29.5 29.9	106.5 101.6	5.93 6.05	3.8 3.5	900 1050	28.0 28.7	19.8 21.9	0.71 0.76	1.57 1.60	33.3 34.2	17.8 18.0	2.1 2.3
90	4.0	0.7	1.6	900 1050	36.6 36.9	1.77 1.75	30.5 30.9	107.6 102.5	6.06 6.18	4.0 3.7	900 1050	25.0 25.7	18.8 20.8	0.75 0.81	1.82 1.86	31.3 32.1	13.7 13.9	3.2 3.4
	6.0	1.4	3.2	900 1050	38.5 38.7	1.75 1.73	32.5 32.8	109.6 104.1	6.42 6.56	4.2 3.8	900 1050	25.3 26.0	18.9 21.0	0.75 0.81	1.77 1.81	31.3 32.1	14.2 14.4	3.0 3.3
	8.0	2.3	5.3	900 1050	38.6 38.8	1.79 1.76	32.5 32.8	109.7 104.2	6.33 6.46	4.3 4.0	900 1050	25.7 26.4	19.4 21.5	0.76 0.81	1.76 1.79	31.7 32.5	14.6 14.7	2.8 3.1
100	4.0	0.7	1.6	Operation not recommended							Operation not recommended							
	6.0	1.3	3.1	Operation not recommended							Operation not recommended							
	8.0	2.2	5.1	900 1050	24.5 25.2	18.7 20.7	0.76 0.82	2.00 2.04	31.3 32.1	12.3 12.4	3.9 4.2	900 1050	24.9 25.6	19.2 21.2	0.77 0.83	1.98 2.02	31.7 32.5	12.6 12.7
110	4.0	0.7	1.5	Operation not recommended							Operation not recommended							
	6.0	1.3	3.0	Operation not recommended							Operation not recommended							
	8.0	2.1	4.9	900 1050	22.0 22.6	17.7 19.6	0.80 0.87	2.23 2.28	29.6 30.4	9.9 9.9	5.0 5.4	900 1050	22.4 23.0	18.2 20.1	0.81 0.87	2.22 2.26	29.9 30.7	10.1 10.2
120	4.0	0.6	1.5	Operation not recommended							Operation not recommended							
	6.0	1.2	2.9	Operation not recommended							Operation not recommended							
	8.0	2.0	4.7	900 1050	20.1 20.7	17.0 18.8	0.85 0.91	2.51 2.56	28.7 29.4	8.0 8.1	5.9 6.4	900 1050	20.4 21.0	17.4 19.3	0.85 0.92	2.49 2.54	28.9 29.7	8.2 8.3

SDV038 Capacity Data - High Speed

Performance capacities shown in thousands of Btuh.

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
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 1250	22.1 22.5	2.12 2.07	14.9 15.4	89.5 86.6	3.06 3.18	2.8 2.5	Operation not recommended							
30	5.0	1.2	2.9	Operation not recommended							Operation not recommended							
	7.0	2.2	5.1	1050 1250	25.3 26.1	2.05 2.12	18.3 18.9	92.3 89.3	3.61 3.61	2.9 2.7	1050 1250	37.0 39.1	20.8 23.2	0.56 0.59	1.57 1.66	42.4 44.8	23.6 23.6	- -
	9.0	3.4	7.9	1050 1250	25.8 26.6	2.08 2.14	18.7 19.3	92.7 89.7	3.64 3.64	3.0 2.8	1050 1250	37.3 39.5	22.9 25.5	0.62 0.65	1.52 1.62	42.5 45.0	24.5 24.4	- -
40	5.0	1.2	2.8	Operation not recommended							Operation not recommended							
	7.0	2.1	4.9	1050 1250	29.8 30.7	2.19 2.24	22.4 23.1	96.3 92.8	3.99 4.03	3.4 3.1	1050 1250	39.0 41.1	22.9 25.4	0.59 0.62	1.72 1.81	44.9 47.3	22.6 22.6	- -
	9.0	3.3	7.6	1050 1250	30.4 31.4	2.21 2.26	22.9 23.7	96.8 93.3	4.03 4.07	3.5 3.1	1050 1250	39.3 41.5	24.8 27.6	0.63 0.66	1.68 1.77	45.0 47.6	23.5 23.4	- -
50	5.0	1.2	2.7	1050 1250	32.5 33.4	2.27 2.30	24.7 25.6	98.6 94.8	4.19 4.26	3.6 3.3	1050 1250	40.6 42.7	25.0 27.8	0.62 0.65	2.03 2.14	47.6 50.0	20.0 20.0	1.7 1.8
	7.0	2.1	4.8	1050 1250	33.7 34.7	2.32 2.35	25.7 26.7	99.7 95.7	4.25 4.33	3.7 3.4	1050 1250	41.5 43.6	25.3 28.1	0.61 0.64	1.92 2.01	48.0 50.5	21.6 21.7	1.6 1.8
	9.0	3.2	7.4	1050 1250	34.4 35.5	2.34 2.38	26.4 27.4	100.4 96.3	4.30 4.38	3.8 3.5	1050 1250	41.9 44.1	27.0 30.0	0.64 0.68	1.87 1.96	48.3 50.8	22.4 22.5	1.5 1.7
60	5.0	1.1	2.6	1050 1250	36.3 37.5	2.38 2.40	28.2 29.3	102.0 97.8	4.46 4.58	4.1 3.8	1050 1250	38.5 40.4	24.5 27.3	0.64 0.68	2.16 2.26	45.9 48.1	17.8 17.9	2.1 2.2
	7.0	2.0	4.6	1050 1250	37.9 39.2	2.45 2.47	29.6 30.7	103.5 99.0	4.53 4.65	4.2 3.9	1050 1250	39.4 41.3	24.8 27.5	0.63 0.67	2.06 2.14	46.4 48.6	19.2 19.3	2.0 2.1
	9.0	3.1	7.2	1050 1250	38.9 40.1	2.48 2.49	30.4 31.6	104.3 99.7	4.60 4.73	4.3 4.0	1050 1250	39.8 41.7	26.2 29.0	0.66 0.70	2.01 2.10	46.6 48.9	19.8 19.9	1.8 2.0
70	5.0	1.1	2.5	1050 1250	40.4 41.7	2.52 2.52	31.8 33.2	105.6 100.9	4.70 4.86	4.7 4.3	1050 1250	37.7 39.3	24.8 27.6	0.66 0.70	2.35 2.44	45.7 47.7	16.0 16.1	2.6 2.8
	7.0	1.9	4.5	1050 1250	42.4 43.8	2.60 2.60	33.6 34.9	107.4 102.5	4.79 4.94	4.8 4.4	1050 1250	38.7 40.3	25.1 27.8	0.65 0.69	2.25 2.33	46.3 48.3	17.2 17.3	2.4 2.6
	9.0	3.0	6.9	1050 1250	43.5 45.0	2.63 2.62	34.5 36.1	108.4 103.3	4.85 5.04	5.0 4.6	1050 1250	39.0 40.8	26.1 28.9	0.67 0.71	2.19 2.28	46.5 48.6	17.8 17.9	2.3 2.5
80	5.0	1.1	2.5	1050 1250	43.3 44.8	2.65 2.63	34.2 35.8	108.2 103.2	4.79 4.99	5.2 4.8	1050 1250	36.8 38.3	25.2 28.0	0.68 0.73	2.56 2.64	45.6 47.3	14.4 14.5	3.2 3.4
	7.0	1.9	4.3	1050 1250	45.8 47.3	2.75 2.73	36.4 38.0	110.4 105.1	4.87 5.09	5.3 4.9	1050 1250	37.9 39.4	25.5 28.3	0.67 0.72	2.47 2.55	46.3 48.1	15.3 15.5	3.0 3.3
	9.0	2.9	6.7	1050 1250	47.1 48.7	2.79 2.75	37.6 39.3	111.5 106.1	4.95 5.19	5.5 5.1	1050 1250	38.3 39.8	26.1 29.0	0.68 0.73	2.42 2.49	46.5 48.4	15.8 16.0	2.8 3.1
90	5.0	1.0	2.4	1050 1250	46.5 48.1	2.79 2.75	36.9 38.7	111.0 105.6	4.88 5.13	5.9 5.4	1050 1250	34.1 35.3	24.4 27.1	0.72 0.77	2.79 2.85	43.6 45.0	12.2 12.4	4.0 4.3
	7.0	1.8	4.2	1050 1250	49.4 51.1	2.92 2.87	39.4 41.4	113.6 107.9	4.96 5.23	6.0 5.6	1050 1250	35.1 36.4	24.7 27.4	0.70 0.75	2.71 2.77	44.3 45.9	13.0 13.1	3.7 4.1
	9.0	2.8	6.5	1050 1250	50.9 52.7	2.96 2.89	40.8 42.8	114.9 109.0	5.04 5.35	6.2 5.8	1050 1250	35.5 36.8	24.9 27.6	0.70 0.75	2.66 2.72	44.6 46.1	13.3 13.5	3.5 3.9
100	5.0	1.0	2.3	Operation not recommended							Operation not recommended							
	7.0	1.7	4.0	Operation not recommended							1050 1250	34.3 35.4	24.8 27.6	0.72 0.78	2.98 3.02	44.5 45.7	11.5 11.7	4.6 5.0
	9.0	2.7	6.2	Operation not recommended							1050 1250	34.7 35.8	24.8 27.4	0.71 0.76	2.92 2.97	44.7 45.9	11.9 12.1	4.4 4.8
110	5.0	1.0	2.2	Operation not recommended							Operation not recommended							
	7.0	1.7	3.9	Operation not recommended							1050 1250	31.5 32.4	23.7 26.3	0.75 0.81	3.22 3.24	42.5 43.4	9.8 10.0	5.6 6.1
	9.0	2.6	6.0	Operation not recommended							1050 1250	31.8 32.7	23.4 25.8	0.73 0.79	3.16 3.19	42.6 43.6	10.1 10.2	5.2 5.8
120	5.0	0.9	2.1	Operation not recommended							Operation not recommended							
	7.0	1.6	3.7	Operation not recommended							1050 1250	29.4 30.1	23.1 25.7	0.78 0.85	3.61 3.61	41.8 42.4	8.2 8.4	6.8 7.4
	9.0	2.5	5.8	Operation not recommended							1050 1250	29.7 30.4	22.5 24.8	0.76 0.82	3.55 3.56	41.9 42.6	8.4 8.5	6.3 7.0

Synergy3D 038 Water Heating Data

ELT	EST	LGPM	SOURCE 5.0 GPM							SWPD			HWC kBtuh	SOURCE 7.0 GPM							SWPD			HWC kBtuh	SOURCE 9.0 GPM							SWPD			HWC kBtuh
			LLT	HC	KW	HE	COP	LST	PSI	FT HD	LLT	HC		KW	HE	COP	LST	PSI	FT HD	LLT	HC	KW	HE		COP	LST	PSI	FT HD							
80	30	5.0	90.3	25.8	2.02	19.0	3.8	22.2	1.1	2.5	2.9	90.6	26.5	2.03	19.6	3.8	23.8	2.3	5.2	2.9	90.9	27.2	2.04	20.2	3.9	25.4	3.4	7.9	3.0						
		7.0	88.0	25.8	1.99	19.0	3.8	22.2	1.1	2.5	2.8	88.2	26.5	2.00	19.7	3.9	23.8	2.3	5.2	2.8	88.4	27.1	2.01	20.3	4.0	25.4	3.4	7.9	2.9						
		9.0	85.7	25.8	1.96	19.1	3.9	22.1	1.1	2.5	2.6	85.9	26.4	1.97	19.7	3.9	23.7	2.3	5.2	2.7	86.0	27.1	1.97	20.3	4.0	25.3	3.4	7.9	2.8						
80	40	5.0	92.2	30.4	2.09	23.3	4.3	30.4	1.1	2.5	3.3	92.5	31.3	2.10	24.1	4.4	32.4	2.2	5.1	3.3	92.9	32.2	2.12	25.0	4.5	34.4	3.3	7.7	3.4						
		7.0	89.5	30.5	2.06	23.5	4.3	30.3	1.1	2.5	3.1	89.7	31.4	2.07	24.3	4.4	32.3	2.2	5.1	3.2	90.0	32.2	2.08	25.1	4.5	34.4	3.3	7.7	3.3						
		9.0	86.8	30.6	2.03	23.7	4.4	30.2	1.1	2.5	3.0	87.0	31.4	2.04	24.4	4.5	32.3	2.2	5.1	3.1	87.1	32.2	2.04	25.2	4.6	34.4	3.3	7.7	3.1						
80	50	5.0	94.0	34.9	2.16	27.6	4.7	38.6	1.1	2.4	3.6	94.4	36.1	2.18	28.6	4.8	41.0	2.2	5.0	3.7	94.9	37.3	2.20	29.7	5.0	43.4	3.3	7.5	3.8						
		7.0	92.4	35.2	2.13	27.9	4.8	38.5	1.1	2.4	3.5	91.3	36.2	2.15	28.9	4.9	40.9	2.2	5.0	3.6	91.6	37.3	2.16	29.9	5.1	43.4	3.3	7.5	3.7						
		9.0	87.9	35.5	2.11	28.3	4.9	38.3	1.1	2.4	3.4	88.1	36.4	2.11	29.2	5.1	40.8	2.2	5.0	3.4	88.3	37.2	2.11	30.0	5.2	43.3	3.3	7.5	3.5						
80	60	5.0	95.8	39.5	2.23	31.9	5.2	46.9	1.0	2.4	4.1	96.3	40.9	2.26	33.2	5.3	49.6	2.1	4.9	4.2	96.9	42.3	2.29	34.5	5.4	52.3	3.2	7.3	4.3						
		7.0	92.4	39.9	2.21	32.4	5.3	46.7	1.0	2.4	4.0	92.8	41.1	2.22	33.5	5.4	49.5	2.1	4.9	4.1	93.2	42.3	2.23	34.7	5.6	52.3	3.2	7.3	4.1						
		9.0	89.0	40.4	2.19	32.9	5.4	46.4	1.0	2.4	3.8	89.2	41.3	2.18	33.9	5.5	49.3	2.1	4.9	3.9	89.4	42.3	2.18	34.9	5.7	52.2	3.2	7.3	4.0						
80	70	5.0	97.6	44.0	2.30	36.1	5.6	55.1	1.0	2.3	4.7	98.3	45.7	2.33	37.7	5.7	58.2	2.1	4.7	4.8	98.9	47.3	2.37	39.2	5.9	61.3	3.1	7.2	4.9						
		7.0	93.8	44.6	2.28	36.8	5.7	54.8	1.0	2.3	4.6	94.3	46.0	2.29	38.2	5.9	58.0	2.1	4.7	4.7	94.7	47.4	2.31	39.5	6.0	61.2	3.1	7.2	4.7						
		9.0	90.0	45.2	2.26	37.5	5.9	54.5	1.0	2.3	4.4	90.3	46.3	2.26	38.6	6.0	57.9	2.1	4.7	4.5	90.5	47.4	2.25	39.7	6.2	61.2	3.1	7.2	4.6						
100	30	5.0	110.1	25.2	2.62	16.2	2.8	23.3	1.1	2.5	2.8	110.3	25.7	2.62	16.7	2.9	24.7	2.3	5.2	2.8	110.5	26.2	2.62	17.2	2.9	26.2	3.4	7.9	2.9						
		7.0	107.8	25.1	2.58	16.3	2.9	23.3	1.1	2.5	2.7	108.0	25.6	2.58	16.8	2.9	24.7	2.3	5.2	2.7	108.1	26.1	2.58	17.3	3.0	26.2	3.4	7.9	2.8						
		9.0	105.6	25.0	2.53	16.3	2.9	23.3	1.1	2.5	2.6	105.7	25.5	2.54	16.9	2.9	24.7	2.3	5.2	2.6	105.8	26.1	2.54	17.4	3.0	26.1	3.4	7.9	2.7						
100	40	5.0	111.7	29.3	2.69	20.2	3.2	31.7	1.1	2.5	3.2	112.0	30.0	2.69	20.8	3.3	33.5	2.2	5.1	3.2	112.3	30.7	2.70	21.5	3.3	35.2	3.3	7.7	3.2						
		7.0	109.1	29.4	2.64	20.3	3.3	31.6	1.1	2.5	3.0	109.3	30.0	2.65	21.0	3.3	33.4	2.2	5.1	3.1	109.5	30.7	2.66	21.6	3.4	35.2	3.3	7.7	3.1						
		9.0	106.5	29.4	2.60	20.5	3.3	31.5	1.1	2.5	2.9	106.7	30.0	2.60	21.1	3.4	33.4	2.2	5.1	3.0	106.8	30.7	2.61	21.8	3.4	35.2	3.3	7.7	3.0						
100	50	5.0	113.4	33.5	2.75	24.1	3.6	40.1	1.1	2.4	3.5	113.7	34.4	2.77	24.9	3.6	42.2	2.2	5.0	3.5	114.1	35.2	2.78	25.7	3.7	44.3	3.3	7.5	3.6						
		7.0	110.5	33.6	2.71	24.4	3.6	39.9	1.1	2.4	3.4	110.7	34.4	2.72	25.2	3.7	42.1	2.2	5.0	3.4	111.0	35.2	2.73	25.9	3.8	44.2	3.3	7.5	3.5						
		9.0	107.5	33.8	2.67	24.7	3.7	39.8	1.1	2.4	3.2	107.7	34.5	2.67	25.4	3.8	42.0	2.2	5.0	3.3	107.8	35.2	2.67	26.1	3.9	44.2	3.3	7.5	3.3						
100	60	5.0	115.1	37.7	2.82	28.1	3.9	48.4	1.0	2.4	3.9	115.5	38.7	2.84	29.0	4.0	50.9	2.1	4.9	4.0	115.9	39.7	2.86	30.0	4.1	53.3	3.2	7.3	2.8						
		7.0	111.8	37.9	2.77	28.5	4.0	48.3	1.0	2.4	3.8	112.1	38.9	2.79	29.3	4.1	50.8	2.1	4.9	3.8	112.4	39.8	2.80	30.2	4.2	53.3	3.2	7.3	2.7						
		9.0	108.5	38.2	2.73	28.9	4.1	48.1	1.0	2.4	3.6	108.7	39.0	2.73	29.7	4.2	50.7	2.1	4.9	3.7	108.8	39.8	2.74	30.5	4.3	53.2	3.2	7.3	3.8						
100	70	5.0	116.7	41.8	2.88	32.0	4.3	56.8	1.0	2.3	4.5	117.2	43.1	2.91	33.1	4.3	59.6	2.1	4.7	4.6	117.7	44.3	2.94	34.2	4.4	62.4	3.1	7.2	4.6						
		7.0	113.1	42.2	2.84	32.5	4.4	56.6	1.0	2.3	4.3	113.4	43.3	2.85	33.5	4.4	59.5	2.1	4.7	4.4	113.8	44.3	2.87	34.5	4.5	62.3	3.1	7.2	4.4						
		9.0	109.5	42.6	2.80	33.0	4.5	56.4	1.0	2.3	4.1	109.7	43.5	2.80	33.9	4.6	59.3	2.1	4.7	4.2	109.9	44.4	2.80	34.8	4.6	62.3	3.1	7.2	4.3						
120	30	5.0	129.8	24.5	3.22	13.5	2.2	24.4	1.1	2.5	2.7	129.9	24.8	3.22	13.8	2.3	25.6	2.3	5.2	2.7	130.1	25.2	3.21	14.2	2.3	26.7	3.4	7.9	2.8						
		7.0	127.6	24.3	3.17	13.5	2.3	24.4	1.1	2.5	2.6	127.7	24.7	3.16	13.9	2.3	25.6	2.3	5.2	2.6	127.8	25.1	3.16	14.3	2.3	26.7	3.4	7.9	2.7						
		9.0	125.4	24.2	3.11	13.6	2.3	24.4	1.1	2.5	2.5	125.5	24.6	3.11	14.0	2.3	25.5	2.3	5.2	2.5	125.6	25.1	3.12	14.4	2.4	26.7	3.4	7.9	2.6						
120	40	5.0	131.3	28.3	3.28	17.1	2.5	33.0	1.1	2.5	3.0	131.5	28.7	3.28	17.5	2.6	34.5	2.2	5.1	3.1	131.7	29.2	3.28	18.0	2.6	36.0	3.3	7.7	3.1						
		7.0	128.8	28.2	3.23	17.2	2.6	32.9	1.1	2.5	2.9	128.9	28.7	3.23	17.7	2.6	34.4	2.2	5.1	2.9	129.1	29.2	3.23	18.1	2.6	36.0	3.3	7.7	3.0						
		9.0	126.3	28.1	3.17	17.3	2.6	32.9	1.1	2.5	2.8	126.4	28.6	3.17	17.8	2.6	34.4	2.2	5.1	2.8	126.5	29.2	3.18	18.3	2.7	35.9	3.3	7.7	2.9						
120	50	5.0	132.8	32.1	3.34	20.7	2.8	41.5	1.1	2.4	3.3	133.1	32.6	3.35	21.2	2.9	43.3	2.2	5.0	3.4	133.3	33.2	3.36	21.7	2.9	45.2	3.3	7.5	3.4						
		7.0	130.0	32.1	3.28	20.9	2.9	41.4	1.1	2.4	3.2	130.2	32.6	3.29	21.4	2.9	43.3	2.2	5.0	3.2	130.3	33.2	3.30	22.0	3.0	45.1	3.3	7.5	3.3						
		9.0	127.1	32.1	3.22	21.1	2.9	41.3	1.1	2.4	3.0	127.3	32.7	3.23	21.6	3.0	43.2	2.2	5.0	3.1	127.4	33.2	3.23	22.2	3.0	45.1	3.3	7.5	3.1						
120	60	5.0	134.4	35.9	3.40	24.3	3.1	50.0	1.0	2.4	3.8	134.6	36.5	3.42	24.9	3.1	52.1	2.1	4.9	3.8	134.9	37.2	3.43	25.5	3.2	54.3	3.2	7.3	2.6						
		7.0	131.2	36.0	3.34	24.6	3.2	49.9	1.0	2.4	3.6	131.4	36.6	3.35	25.2	3.2	52.0	2.1	4.9	3.6	131.6	37.3	3.36	25.8	3.2	54.3	3.2	7.3	2.5						
		9.0	128.0	36.0	3.28	24.8	3.2	49.8	1.0	2.4	3.4	128.1	36.7	3.29	25.5	3.3	51.9	2.1	4.9	3.5	128.3	37.3	3.29	26.1	3.3	54.2	3.2	7.							

SDV049 Capacity Data - Low Speed

Performance capacities shown in thousands of Btuh.

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
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 1350	22.0 22.8	2.06 2.09	15.0 15.7	87.7 85.6	3.13 3.20	4.1 3.7								
30	5.0	0.9	2.1	Operation not recommended							Operation not recommended							
	8.0	1.9	4.4	1150 1350	25.2 26.0	2.18 2.19	17.8 18.5	90.3 87.8	3.40 3.48	4.2 3.8	1150 1350	34.8 36.0	20.8 24.5	0.60 0.68	1.25 1.33	39.1 40.6	27.8 27.1	- -
	11.0	3.3	7.6	1150 1350	25.9 26.8	2.19 2.23	18.4 19.2	90.8 88.4	3.46 3.53	4.3 3.9	1150 1350	34.9 35.8	20.7 24.4	0.59 0.68	1.17 1.24	38.9 40.0	29.8 28.8	- -
40	5.0	0.9	2.0	Operation not recommended							Operation not recommended							
	8.0	1.9	4.3	1150 1350	29.6 30.6	2.24 2.24	21.9 23.0	93.8 91.0	3.87 4.01	4.5 4.2	1150 1350	37.2 38.4	23.5 27.6	0.63 0.72	1.39 1.47	41.9 43.4	26.7 26.1	- -
	11.0	3.2	7.4	1150 1350	30.6 31.6	2.25 2.27	22.9 23.9	94.6 91.7	3.97 4.08	4.7 4.2	1150 1350	37.3 38.4	23.4 27.6	0.63 0.72	1.31 1.38	41.8 43.1	28.6 27.8	- -
50	5.0	0.9	2.0	1150 1350	30.8 31.8	2.24 2.24	23.2 24.2	94.8 91.8	4.04 4.17	4.8 4.4	1150 1350	39.3 40.5	26.5 31.3	0.68 0.77	1.80 1.88	45.4 46.9	21.8 21.5	1.6 1.7
	8.0	1.8	4.2	1150 1350	33.2 34.5	2.31 2.29	25.3 26.6	96.7 93.6	4.21 4.40	4.9 4.5	1150 1350	40.1 41.4	26.7 31.4	0.66 0.76	1.56 1.64	45.5 46.9	25.7 25.2	1.5 1.6
	11.0	3.1	7.2	1150 1350	34.5 35.6	2.32 2.32	26.5 27.7	97.8 94.4	4.35 4.49	5.1 4.6	1150 1350	40.4 41.6	26.7 31.4	0.66 0.75	1.47 1.55	45.4 46.9	27.4 26.9	1.4 1.5
60	5.0	0.8	1.9	1150 1350	34.2 35.4	2.34 2.32	26.2 27.5	97.5 94.3	4.29 4.47	5.2 4.8	1150 1350	37.1 38.3	25.4 30.0	0.68 0.78	1.96 2.04	43.8 45.3	19.0 18.7	2.3 2.4
	8.0	1.8	4.0	1150 1350	37.0 38.4	2.40 2.37	28.8 30.3	99.8 96.3	4.52 4.76	5.4 5.0	1150 1350	37.8 38.9	25.6 30.2	0.68 0.77	1.74 1.82	43.7 45.1	21.7 21.4	2.1 2.3
	11.0	3.0	6.9	1150 1350	38.6 39.9	2.42 2.39	30.3 31.8	101.0 97.4	4.67 4.90	5.5 5.1	1150 1350	38.2 39.3	25.7 30.2	0.67 0.77	1.65 1.72	43.8 45.2	23.1 22.8	1.9 2.2
70	5.0	0.8	1.8	1150 1350	37.6 39.1	2.41 2.38	29.4 31.0	100.3 96.8	4.57 4.81	5.8 5.4	1150 1350	36.2 37.3	25.5 30.0	0.71 0.80	2.16 2.26	43.5 45.0	16.7 16.5	3.0 3.1
	8.0	1.7	3.9	1150 1350	40.8 42.4	2.45 2.41	32.5 34.2	102.9 99.1	4.88 5.16	6.0 5.5	1150 1350	36.5 37.7	25.8 30.3	0.70 0.80	1.96 2.04	43.2 44.6	18.7 18.4	2.8 3.0
	11.0	2.9	6.7	1150 1350	42.7 44.3	2.48 2.43	34.2 36.0	104.4 100.4	5.04 5.35	6.1 5.7	1150 1350	37.2 38.3	25.9 30.4	0.70 0.79	1.87 1.94	43.5 44.9	19.9 19.7	2.6 2.8
80	5.0	0.8	1.8	1150 1350	40.0 41.5	2.48 2.44	31.5 33.2	102.2 98.5	4.73 5.00	6.5 6.0	1150 1350	35.6 36.8	25.7 30.2	0.72 0.82	2.35 2.45	43.7 45.1	15.2 15.0	4.2 4.4
	8.0	1.6	3.8	1150 1350	43.4 45.2	2.51 2.44	34.9 36.8	105.0 101.0	5.08 5.42	6.7 6.1	1150 1350	35.8 36.9	26.0 30.6	0.73 0.83	2.18 2.27	43.3 44.7	16.4 16.3	3.9 4.2
	11.0	2.8	6.5	1150 1350	45.6 47.4	2.53 2.46	37.0 39.0	106.7 102.5	5.28 5.64	6.9 6.3	1150 1350	36.6 37.8	26.2 30.8	0.72 0.82	2.09 2.18	43.8 45.2	17.5 17.4	3.6 4.0
90	5.0	0.7	1.7	1150 1350	42.4 44.1	2.53 2.48	33.8 35.6	104.2 100.2	4.91 5.22	7.2 6.7	1150 1350	32.9 34.0	24.2 28.4	0.73 0.84	2.56 2.67	41.7 43.1	12.8 12.7	5.4 5.7
	8.0	1.6	3.6	1150 1350	46.1 48.0	2.55 2.46	37.4 39.6	107.1 102.9	5.31 5.72	7.4 6.9	1150 1350	32.9 33.9	24.5 28.8	0.74 0.85	2.43 2.52	41.2 42.5	13.5 13.4	5.0 5.5
	11.0	2.7	6.2	1150 1350	48.7 50.7	2.57 2.49	39.9 42.2	109.2 104.8	5.54 5.97	7.7 7.1	1150 1350	33.9 34.9	24.7 29.1	0.73 0.83	2.33 2.43	41.8 43.2	14.5 14.4	4.7 5.2
100	5.0	0.7	1.7	Operation not recommended							Operation not recommended							
	8.0	1.5	3.5	1150 1350	31.5 32.5	24.6 29.0	0.78 0.89	2.72 2.83	40.8 42.1	11.6 11.5	6.6 7.2							
	11.0	2.6	6.0	1150 1350	32.7 33.7	24.9 29.3	0.76 0.87	2.63 2.74	41.7 43.0	12.5 12.3	6.2 6.8							
110	5.0	0.7	1.6	Operation not recommended							Operation not recommended							
	8.0	1.5	3.4	Operation not recommended							Operation not recommended							
	11.0	2.5	5.8	Operation not recommended							Operation not recommended							
120	5.0	0.7	1.5	Operation not recommended							Operation not recommended							
	8.0	1.4	3.3	Operation not recommended							Operation not recommended							
	11.0	2.4	5.6	1150 1350	25.5 26.4	22.1 26.0	0.86 0.98	3.36 3.51	37.0 38.4	7.6 7.5	10.2 11.0	1150 1350	27.0 27.7	22.6 26.5	0.84 0.96	3.26 3.42	38.1 39.4	8.3 8.1

SDV049 Capacity Data - High Speed

Performance capacities shown in thousands of Btuh.

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
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 1550	27.5 28.4	2.53 2.61	18.8 19.5	88.9 87.0	3.18 3.18	4.7 4.2	1350 1550	39.9 42.4	26.3 29.3	0.66 0.69	1.75 1.87	45.9 48.7	22.8 22.7	- -
30	6.0	1.2	2.9	Operation not recommended							Operation not recommended							
	9.0	2.4	5.5	1350 1550	31.0 31.9	2.49 2.57	22.5 23.2	91.2 89.1	3.64 3.64	4.9 4.5	1350 1550	40.4 42.7	26.3 29.2	0.65 0.68	1.67 1.78	46.1 48.8	24.2 24.0	- -
	12.0	3.9	8.9	1350 1550	31.5 32.5	2.52 2.60	22.9 23.6	91.6 89.4	3.66 3.67	5.0 4.6	1350 1550	42.9 45.2	29.9 33.2	0.70 0.73	1.84 1.95	49.2 51.9	23.4 23.2	- -
40	6.0	1.2	2.8	Operation not recommended							Operation not recommended							
	9.0	2.3	5.3	1350 1550	36.8 37.9	2.69 2.75	27.6 28.5	95.2 92.6	4.01 4.04	5.6 5.2	1350 1550	42.4 44.9	29.9 33.2	0.70 0.74	1.92 2.03	49.0 51.8	22.1 22.1	- -
	12.0	3.7	8.7	1350 1550	37.5 38.7	2.72 2.77	28.2 29.2	95.7 93.1	4.04 4.09	5.8 5.3	1350 1550	42.9 45.2	29.9 33.2	0.70 0.73	1.84 1.95	49.2 51.9	23.4 23.2	- -
50	6.0	1.2	2.7	1350 1550	39.6 40.8	2.77 2.81	30.1 31.3	97.1 94.4	4.18 4.26	6.1 5.6	1350 1550	44.9 47.3	33.3 37.0	0.74 0.78	2.29 2.41	52.7 55.5	19.6 19.6	2.7 2.9
	9.0	2.2	5.2	1350 1550	41.1 42.3	2.83 2.87	31.5 32.5	98.2 95.3	4.26 4.32	6.3 5.8	1350 1550	45.4 47.9	33.8 37.6	0.74 0.79	2.14 2.25	52.8 55.6	21.2 21.3	2.5 2.7
	12.0	3.6	8.4	1350 1550	41.9 43.3	2.86 2.90	32.2 33.4	98.8 95.9	4.30 4.38	6.5 5.9	1350 1550	45.9 48.3	33.9 37.7	0.74 0.78	2.06 2.17	53.0 55.7	22.3 22.2	2.3 2.6
60	6.0	1.1	2.6	1350 1550	43.7 45.0	2.85 2.86	33.9 35.3	99.9 96.9	4.49 4.61	6.9 6.4	1350 1550	42.9 45.0	32.2 35.7	0.75 0.79	2.39 2.50	51.1 53.5	17.9 18.0	3.2 3.4
	9.0	2.2	5.0	1350 1550	45.6 47.0	2.92 2.94	35.7 37.0	101.3 98.1	4.58 4.69	7.1 6.6	1350 1550	43.6 45.7	32.6 36.2	0.75 0.79	2.26 2.36	51.3 53.8	19.3 19.4	3.0 3.2
	12.0	3.5	8.1	1350 1550	46.7 48.2	2.96 2.97	36.6 38.1	102.0 98.8	4.63 4.76	7.3 6.7	1350 1550	44.1 46.2	32.8 36.4	0.74 0.79	2.19 2.29	51.5 54.0	20.1 20.2	2.7 3.1
70	6.0	1.1	2.5	1350 1550	48.0 49.5	2.96 2.95	37.9 39.4	102.9 99.5	4.75 4.91	7.9 7.3	1350 1550	42.0 43.8	33.1 36.8	0.79 0.84	2.68 2.78	51.1 53.3	15.7 15.8	3.9 4.2
	9.0	2.1	4.9	1350 1550	50.3 51.9	3.05 3.04	39.9 41.5	104.5 101.0	4.84 5.00	8.1 7.5	1350 1550	42.9 44.8	33.5 37.2	0.78 0.83	2.55 2.65	51.6 53.8	16.8 16.9	3.7 4.0
	12.0	3.4	7.9	1350 1550	51.6 53.3	3.09 3.07	41.1 42.8	105.4 101.8	4.90 5.09	8.4 7.7	1350 1550	43.3 45.3	33.7 37.5	0.78 0.83	2.48 2.58	51.8 54.1	17.5 17.6	3.4 3.8
80	6.0	1.1	2.5	1350 1550	50.1 51.7	3.03 3.00	39.7 41.5	104.3 100.9	4.84 5.06	8.7 8.1	1350 1550	41.3 43.0	32.6 36.1	0.79 0.84	2.86 2.94	51.0 53.0	14.5 14.6	5.1 5.4
	9.0	2.0	4.7	1350 1550	52.9 54.6	3.14 3.10	42.1 44.0	106.3 102.6	4.93 5.16	9.0 8.3	1350 1550	42.4 44.1	32.9 36.5	0.78 0.83	2.75 2.83	51.7 53.7	15.4 15.6	4.7 5.1
	12.0	3.3	7.6	1350 1550	54.4 56.2	3.18 3.14	43.5 45.5	107.3 103.6	5.01 5.25	9.3 8.6	1350 1550	42.8 44.5	33.2 36.9	0.78 0.83	2.68 2.76	52.0 54.0	16.0 16.1	4.4 4.9
90	6.0	1.0	2.4	1350 1550	52.3 54.1	3.11 3.05	41.7 43.7	105.9 102.3	4.94 5.21	9.7 9.0	1350 1550	38.5 39.9	29.9 33.1	0.78 0.83	2.99 3.06	48.7 50.3	12.9 13.0	6.3 6.7
	9.0	2.0	4.5	1350 1550	55.6 57.4	3.24 3.17	44.5 46.6	108.1 104.3	5.03 5.31	10.0 9.3	1350 1550	39.6 41.1	30.2 33.4	0.76 0.81	2.91 2.97	49.6 51.3	13.6 13.9	5.9 6.4
	12.0	3.2	7.3	1350 1550	57.3 59.2	3.27 3.21	46.1 48.3	109.3 105.4	5.13 5.41	10.3 9.6	1350 1550	40.1 41.5	30.4 33.8	0.76 0.81	2.85 2.91	49.8 51.4	14.1 14.3	5.5 6.1
100	6.0	1.0	2.3	Operation not recommended							Operation not recommended							
	9.0	1.9	4.4	Operation not recommended							Operation not recommended							
	12.0	3.1	7.1	1350 1550	38.6 39.9	30.9 34.2	0.80 0.86	3.38 3.43	50.2 51.6	11.4 11.7	7.5 8.1	1350 1550	39.1 40.3	31.2 34.6	0.80 0.86	3.32 3.37	50.4 51.8	11.7 12.0
110	6.0	1.0	2.2	Operation not recommended							Operation not recommended							
	9.0	1.8	4.2	Operation not recommended							Operation not recommended							
	12.0	2.9	6.8	1350 1550	35.7 36.7	28.4 31.4	0.80 0.86	3.77 3.80	48.5 49.6	9.5 9.7	9.3 10.1	1350 1550	36.0 37.0	28.8 31.9	0.80 0.86	3.72 3.75	48.7 49.8	9.7 9.9
120	6.0	0.9	2.1	Operation not recommended							Operation not recommended							
	9.0	1.7	4.0	Operation not recommended							Operation not recommended							
	12.0	2.8	6.5	1350 1550	33.0 33.8	27.6 30.4	0.84 0.90	4.19 4.18	47.3 48.1	7.9 8.1	11.3 12.2	1350 1550	33.3 34.1	28.0 31.0	0.84 0.91	4.15 4.14	47.5 48.2	8.0 8.2

Synergy3D 049 Water Heating Data

ELT	EST	LGPM	SOURCE 6.0 GPM							SWPD		HWC kBtu/h	SOURCE 9.0 GPM							SWPD		HWC kBtu/h	SOURCE 12.0 GPM							SWPD		HWC kBtu/h
			LLT	HC	KW	HE	COP	LST	PSI	FT HD	LLT		HC	KW	HE	COP	LST	PSI	FT HD	LLT	HC		KW	HE	COP	LST	PSI	FT HD				
80	30	6.0	90.7	32.2	2.59	23.4	3.6	22.0	1.2	2.8	4.7	91.0	33.1	2.61	24.2	3.7	23.8	2.7	6.2	4.8	91.4	34.1	2.63	25.1	3.8	25.7	4.2	9.7	4.9			
		9.0	88.0	32.1	2.54	23.5	3.7	21.9	1.2	2.8	4.6	88.3	33.1	2.56	24.4	3.8	23.8	2.7	6.2	4.7	88.5	34.0	2.57	25.2	3.9	25.7	4.2	9.7	4.8			
		12.0	85.3	32.1	2.49	23.6	3.8	21.9	1.2	2.8	4.4	85.5	33.0	2.50	24.5	3.9	23.8	2.7	6.2	4.5	85.7	33.9	2.51	25.4	4.0	25.6	4.2	9.7	4.6			
80	40	6.0	92.4	37.1	2.63	28.1	4.1	30.4	1.2	2.7	5.5	92.8	38.3	2.66	29.2	4.2	32.6	2.6	6.1	5.6	93.2	39.5	2.68	30.3	4.3	34.9	4.1	9.4	5.7			
		9.0	89.3	37.0	2.58	28.2	4.2	30.3	1.2	2.7	5.3	89.6	38.2	2.59	29.4	4.3	32.6	2.6	6.1	5.4	89.9	39.4	2.60	30.5	4.4	34.9	4.1	9.4	5.5			
		12.0	86.2	37.0	2.52	28.4	4.3	30.2	1.2	2.7	5.1	86.4	38.2	2.52	29.6	4.4	32.5	2.6	6.1	5.2	86.6	39.4	2.53	30.7	4.6	34.9	4.1	9.4	5.3			
80	50	6.0	94.0	41.9	2.68	32.8	4.6	38.7	1.2	2.7	6.1	94.5	43.4	2.70	34.2	4.7	41.4	2.6	5.9	6.3	94.9	44.8	2.72	35.6	4.8	44.1	4.0	9.1	6.4			
		9.0	90.5	41.9	2.61	33.0	4.7	38.7	1.2	2.7	5.9	90.8	43.4	2.62	34.4	4.8	41.3	2.6	5.9	6.0	91.2	44.8	2.64	35.8	5.0	44.0	4.0	9.1	6.2			
		12.0	87.0	41.9	2.54	33.2	4.8	38.6	1.2	2.7	5.7	87.2	43.3	2.55	34.6	5.0	41.3	2.6	5.9	5.8	87.5	44.8	2.56	36.1	5.1	44.0	4.0	9.1	5.9			
80	60	6.0	95.6	46.8	2.72	37.5	5.0	47.1	1.1	2.6	7.0	96.2	48.5	2.74	39.2	5.2	50.2	2.5	5.7	7.1	96.7	50.2	2.76	40.8	5.3	53.2	3.8	8.8	7.3			
		9.0	91.7	46.8	2.64	37.8	5.2	47.0	1.1	2.6	6.7	92.1	48.5	2.66	39.4	5.3	50.1	2.5	5.7	6.9	92.6	50.2	2.67	41.1	5.5	53.1	3.8	8.8	7.0			
		12.0	87.8	46.8	2.56	38.0	5.3	46.9	1.1	2.6	6.5	88.1	48.5	2.57	39.7	5.5	50.0	2.5	5.7	6.6	88.4	50.2	2.58	41.4	5.7	53.1	3.8	8.8	6.7			
80	70	6.0	97.2	51.7	2.76	42.2	5.5	55.5	1.1	2.5	8.0	97.9	53.6	2.79	44.1	5.6	58.9	2.4	5.5	8.2	98.5	55.6	2.81	46.0	5.8	62.3	3.7	8.5	8.3			
		9.0	92.9	51.7	2.68	42.5	5.7	55.4	1.1	2.5	7.7	93.4	53.6	2.69	44.5	5.8	58.8	2.4	5.5	7.9	93.9	55.6	2.70	46.4	6.0	62.3	3.7	8.5	8.0			
		12.0	88.6	51.7	2.59	42.8	5.8	55.3	1.1	2.5	7.4	88.9	53.7	2.59	44.8	6.1	58.7	2.4	5.5	7.6	89.3	55.7	2.60	46.8	6.3	62.2	3.7	8.5	7.7			
100	30	6.0	110.3	31.0	3.31	19.7	2.7	23.2	1.2	2.8	4.6	110.9	32.6	3.41	21.0	2.8	24.8	2.7	6.2	4.8	111.4	34.2	3.50	22.3	2.9	26.3	4.2	9.7	5.0			
		9.0	107.8	31.1	3.25	20.0	2.8	23.1	1.2	2.8	4.4	108.1	32.3	3.30	21.0	2.9	24.7	2.7	6.2	4.5	108.4	33.4	3.36	22.0	2.9	26.3	4.2	9.7	4.7			
		12.0	105.2	31.2	3.20	20.2	2.9	23.0	1.2	2.8	4.3	105.3	31.9	3.20	21.0	2.9	24.7	2.7	6.2	4.3	105.4	32.7	3.21	21.7	3.0	26.4	4.2	9.7	4.4			
100	40	6.0	111.8	35.5	3.35	24.1	3.1	31.7	1.2	2.7	5.2	112.4	37.2	3.43	25.5	3.2	33.6	2.6	6.1	5.4	112.9	38.8	3.51	26.9	3.2	35.5	4.1	9.4	5.6			
		9.0	108.9	35.6	3.28	24.4	3.2	31.6	1.2	2.7	5.1	109.3	36.9	3.32	25.6	3.3	33.6	2.6	6.1	5.2	109.6	38.3	3.37	26.8	3.3	35.5	4.1	9.4	5.3			
		12.0	105.9	35.7	3.21	24.7	3.3	31.5	1.2	2.7	4.9	106.1	36.7	3.22	25.7	3.3	33.5	2.6	6.1	5.0	106.3	37.7	3.23	26.7	3.4	35.6	4.1	9.4	5.0			
100	50	6.0	113.4	40.1	3.39	28.5	3.5	40.2	1.2	2.7	5.9	113.9	41.7	3.45	30.0	3.5	42.5	2.6	5.9	6.0	114.5	43.4	3.51	31.4	3.6	44.8	4.0	9.1	6.2			
		9.0	110.0	40.1	3.31	28.9	3.6	40.1	1.2	2.7	5.7	110.4	41.6	3.34	30.2	3.6	42.4	2.6	5.9	5.8	110.8	43.1	3.38	31.5	3.7	44.7	4.0	9.1	5.9			
		12.0	106.7	40.2	3.23	29.2	3.6	40.0	1.2	2.7	5.5	106.9	41.5	3.24	30.4	3.8	42.3	2.6	5.9	5.5	107.1	42.7	3.25	31.6	3.9	44.7	4.0	9.1	5.6			
100	60	6.0	114.9	44.6	3.42	32.9	3.8	48.7	1.1	2.6	6.7	115.4	46.3	3.47	34.5	3.9	51.3	2.5	5.7	6.8	116.0	48.0	3.52	36.0	4.0	54.0	3.8	8.8	7.0			
		9.0	111.2	44.7	3.34	33.3	3.9	48.6	1.1	2.6	6.4	111.6	46.3	3.36	34.8	4.0	51.3	2.5	5.7	6.6	112.0	47.9	3.39	36.3	4.1	53.9	3.8	8.8	6.7			
		12.0	107.5	44.8	3.25	33.7	4.0	48.4	1.1	2.6	6.2	107.7	46.3	3.26	35.1	4.2	51.2	2.5	5.7	6.3	108.0	47.7	3.26	36.6	4.3	53.9	3.8	8.8	6.4			
100	70	6.0	116.4	49.1	3.46	37.3	4.2	57.2	1.1	2.5	7.6	117.0	50.9	3.49	38.9	4.3	60.2	2.4	5.5	7.7	117.5	52.6	3.53	40.6	4.4	63.2	3.7	8.5	7.9			
		9.0	112.3	49.2	3.36	37.7	4.3	57.0	1.1	2.5	7.3	112.7	50.9	3.38	39.4	4.4	60.1	2.4	5.5	7.5	113.2	52.7	3.40	41.1	4.5	63.2	3.7	8.5	7.6			
		12.0	108.2	49.3	3.27	38.2	4.4	56.9	1.1	2.5	7.1	108.5	51.0	3.27	39.9	4.6	60.0	2.4	5.5	7.2	108.8	52.8	3.28	41.6	4.7	63.1	3.7	8.5	7.3			
120	30	6.0	129.9	29.8	4.02	16.1	2.2	24.5	1.2	2.8	4.4	130.7	32.1	4.20	17.8	2.2	25.6	2.7	6.2	4.7	131.5	34.4	4.37	19.4	2.3	26.7	4.2	9.7	5.0			
		9.0	127.5	30.0	3.96	16.5	2.2	24.3	1.2	2.8	4.3	127.9	31.5	4.05	17.6	2.3	25.6	2.7	6.2	4.4	128.3	32.9	4.14	18.7	2.3	26.8	4.2	9.7	4.6			
		12.0	125.0	30.2	3.90	16.9	2.3	24.2	1.2	2.8	4.1	125.1	30.8	3.91	17.5	2.3	25.5	2.7	6.2	4.2	125.2	31.4	3.91	18.0	2.3	26.9	4.2	9.7	4.2			
120	40	6.0	131.3	34.0	4.06	20.2	2.5	33.1	1.2	2.7	5.0	132.0	36.1	4.20	21.8	2.5	34.6	2.6	6.1	5.3	132.7	38.2	4.34	23.4	2.6	36.1	4.1	9.4	5.5			
		9.0	128.5	34.2	3.99	20.6	2.5	32.9	1.2	2.7	4.9	128.9	35.7	4.06	21.8	2.6	34.5	2.6	6.1	5.0	129.4	37.1	4.13	23.0	2.6	36.2	4.1	9.4	5.2			
		12.0	125.7	34.4	3.91	21.1	2.6	32.8	1.2	2.7	4.7	125.9	35.2	3.92	21.8	2.6	34.5	2.6	6.1	4.8	126.0	36.0	3.92	22.6	2.7	36.2	4.1	9.4	4.8			
120	50	6.0	132.7	38.2	4.09	24.2	2.7	41.7	1.2	2.7	5.6	133.4	40.1	4.20	25.8	2.8	43.6	2.6	5.9	5.8	134.0	42.0	4.31	27.3	2.9	45.4	4.0	9.1	6.0			
		9.0	129.6	38.4	4.01	24.7	2.8	41.5	1.2	2.7	5.4	130.0	39.8	4.06	26.0	2.9	43.5	2.6	5.9	5.5	130.4	41.3	4.12	27.2	2.9	45.5	4.0	9.1	5.7			
		12.0	126.4	38.6	3.92	25.2	2.9	41.3	1.2	2.7	5.2	126.6	39.6	3.93	26.2	3.0	43.4	2.6	5.9	5.3	126.8	40.6	3.94	27.2	3.0	45.5	4.0	9.1	5.4			
120	60	6.0	134.1	42.4	4.13	28.3	3.0	50.3	1.1	2.6	6.3	134.7	44.1	4.20	29.8	3.1	52.5	2.5	5.7	6.5	135.3	45.8	4.28	31.2	3.1	54.8	3.8	8.8	6.6			
		9.0	130.6	42.6	4.03	28.8	3.1	50.1	1.1	2.6	6.1	131.0	44.0	4.07	30.2	3.2	52.4	2.5	5.7	6.2	131.4	45.5	4.11	31.5	3.2	54.7	3.8	8.8	6.3			
		12.0	127.1	42.8	3.93	29.4	3.2	49.9	1.1	2.6	5.9	127.3	44.0	3.94	30.6	3.3	52.3	2.5	5.7	6.0	127.5	45.2	3.95	31.8	3.4	54.7						

SDV064 Capacity Data - Low Speed

Performance capacities shown in thousands of Btuh.

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
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 1500	24.6 25.4	2.71 2.75	15.3 16.0	88.2 85.7	2.65 2.71	4.6 4.2	1250 1500	46.5 47.9	29.6 33.8	0.64 0.70	1.55 1.62	51.8 53.4	29.9 29.5	- -
30	6.0	1.0	2.3	Operation not recommended							Operation not recommended							
	10.0	2.6	6.0	1250 1500	28.1 29.1	2.77 2.81	18.6 19.5	90.8 88.0	2.97 3.04	4.6 4.2	1250 1500	46.6 47.9	29.5 33.7	0.63 0.70	1.52 1.60	51.8 53.3	30.8 29.9	- -
	14.0	5.0	11.5	1250 1500	29.1 30.1	2.77 2.81	19.6 20.5	91.6 88.6	3.08 3.14	4.7 4.3	1250 1500	46.6 47.8	29.5 33.7	0.63 0.70	1.52 1.60	51.8 53.3	30.8 29.9	- -
40	6.0	1.0	2.3	Operation not recommended							Operation not recommended							
	10.0	2.5	5.9	1250 1500	34.3 35.2	2.89 2.90	24.4 25.4	95.4 91.8	3.48 3.57	5.1 4.6	1250 1500	48.9 50.3	31.5 35.8	0.64 0.71	1.74 1.82	54.8 56.5	28.0 27.6	- -
	14.0	4.8	11.1	1250 1500	35.4 36.4	2.90 2.90	25.5 26.4	96.2 92.4	3.58 3.67	5.2 4.8	1250 1500	49.0 50.3	31.4 35.7	0.64 0.71	1.70 1.79	54.8 56.4	28.7 28.1	- -
50	6.0	0.9	2.2	1250 1500	38.7 39.8	2.92 2.92	28.7 29.8	98.7 94.5	3.88 3.98	5.3 4.9	1250 1500	51.5 53.0	33.4 37.9	0.65 0.72	2.06 2.17	58.5 60.4	25.0 24.4	1.9 2.0
	10.0	2.5	5.7	1250 1500	39.3 40.2	2.98 2.96	29.1 30.1	99.1 94.8	3.87 3.98	5.5 5.1	1250 1500	51.7 53.2	33.7 38.2	0.65 0.72	1.98 2.08	58.4 60.2	26.1 25.6	1.8 1.9
	14.0	4.7	10.8	1250 1500	40.5 41.4	3.00 2.98	30.3 31.2	100.0 95.6	3.96 4.07	5.7 5.2	1250 1500	51.8 53.3	33.7 38.2	0.65 0.72	1.94 2.04	58.4 60.3	26.6 26.2	1.6 1.8
60	6.0	0.9	2.1	1250 1500	43.8 44.7	3.02 2.99	33.5 34.5	102.4 97.6	4.25 4.38	6.0 5.5	1250 1500	48.8 50.3	32.4 36.5	0.66 0.73	2.26 2.37	56.6 58.4	21.6 21.2	2.6 2.8
	10.0	2.4	5.5	1250 1500	45.1 45.9	3.07 3.03	34.7 35.5	103.4 98.3	4.31 4.44	6.1 5.7	1250 1500	49.0 50.5	32.7 36.9	0.67 0.73	2.19 2.29	56.5 58.3	22.4 22.1	2.5 2.7
	14.0	4.5	10.4	1250 1500	46.2 46.9	3.10 3.06	35.6 36.5	104.2 99.0	4.37 4.50	6.3 5.8	1250 1500	49.3 50.7	32.7 37.0	0.66 0.73	2.15 2.25	56.6 58.4	22.9 22.6	2.3 2.5
70	6.0	0.9	2.0	1250 1500	49.1 49.9	3.12 3.07	38.4 39.4	106.4 100.8	4.61 4.77	6.7 6.2	1250 1500	47.3 48.8	32.2 36.1	0.68 0.74	2.54 2.65	56.0 57.8	18.6 18.4	3.7 3.9
	10.0	2.3	5.3	1250 1500	51.2 51.7	3.17 3.10	40.3 41.1	107.9 101.9	4.73 4.89	7.0 6.4	1250 1500	47.6 49.1	32.5 36.5	0.68 0.74	2.47 2.58	56.1 57.9	19.3 19.1	3.4 3.7
	14.0	4.4	10.1	1250 1500	52.1 52.7	3.21 3.14	41.2 42.0	108.6 102.5	4.76 4.92	7.2 6.6	1250 1500	47.9 49.4	32.6 36.7	0.68 0.74	2.42 2.52	56.2 58.0	19.8 19.6	3.2 3.5
80	6.0	0.9	2.0	1250 1500	52.8 53.3	3.19 3.12	41.9 42.6	109.1 102.9	4.85 5.00	7.4 6.9	1250 1500	46.0 47.4	32.1 35.8	0.70 0.76	2.85 2.95	55.7 57.4	16.1 16.1	5.1 5.4
	10.0	2.2	5.1	1250 1500	55.7 56.0	3.24 3.15	44.7 45.3	111.3 104.6	5.04 5.22	7.7 7.1	1250 1500	46.4 47.8	32.4 36.2	0.70 0.76	2.78 2.89	55.8 57.6	16.7 16.5	4.8 5.2
	14.0	4.2	9.8	1250 1500	56.4 56.6	3.28 3.19	45.2 45.7	111.8 105.0	5.04 5.20	7.9 7.3	1250 1500	46.7 48.1	32.6 36.4	0.70 0.76	2.73 2.83	56.0 57.8	17.1 17.0	4.4 4.9
90	6.0	0.8	1.9	1250 1500	56.7 56.9	3.26 3.17	45.6 46.0	112.0 105.1	5.10 5.25	8.3 7.7	1250 1500	42.3 43.6	30.5 33.8	0.72 0.78	3.17 3.26	53.1 54.7	13.3 13.4	6.8 7.2
	10.0	2.1	5.0	1250 1500	60.5 60.5	3.31 3.19	49.2 49.7	114.8 107.4	5.36 5.56	8.6 7.9	1250 1500	42.8 44.0	30.8 34.3	0.72 0.78	3.10 3.21	53.3 55.0	13.8 13.7	6.4 6.9
	14.0	4.1	9.4	1250 1500	60.9 60.8	3.36 3.24	49.5 49.7	115.1 107.5	5.31 5.50	8.8 8.2	1250 1500	43.1 44.5	31.1 34.6	0.72 0.78	3.06 3.15	53.5 55.3	14.1 14.1	5.9 6.6
100	6.0	0.8	1.8	Operation not recommended							Operation not recommended							
	10.0	2.1	4.8	Operation not recommended							Operation not recommended							
	14.0	3.9	9.1	1250 1500	40.9 42.1	30.5 33.8	0.75 0.80	3.52 3.61	52.9 54.4	11.6 11.7	8.3 8.9	1250 1500	41.3 42.6	30.9 34.2	0.75 0.80	3.47 3.56	53.1 54.7	11.9 12.0
110	6.0	0.8	1.8	Operation not recommended							Operation not recommended							
	10.0	2.0	4.6	Operation not recommended							Operation not recommended							
	14.0	3.8	8.7	1250 1500	36.7 37.8	28.9 31.7	0.79 0.84	3.94 4.02	50.1 51.5	9.3 9.4	10.4 11.3	1250 1500	37.1 38.3	29.4 32.2	0.79 0.84	3.88 3.96	50.4 51.8	9.6 9.7
120	6.0	0.7	1.7	Operation not recommended							Operation not recommended							
	10.0	1.9	4.4	Operation not recommended							Operation not recommended							
	14.0	3.6	8.4	1250 1500	33.3 34.4	27.6 30.1	0.83 0.88	4.43 4.48	48.5 49.7	7.5 7.7	12.6 13.6	1250 1500	33.9 34.9	28.2 30.6	0.83 0.88	4.38 4.43	48.8 50.0	7.7 7.9

IMPORTANT NOTE: Refer to page 20 (Notes to Capacity Tables) for additional information.

SDV064 Capacity Data - High Speed

Performance capacities shown in thousands of Btuh.

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F																							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh																
20	8.0	1.8	4.2	Operation not recommended							Operation not recommended																							
	12.0	3.8	8.8	Operation not recommended							Operation not recommended																							
	16.0	6.5	15.1	1500	36.5	3.46	24.7	92.5	3.10	5.7	1800	37.4	3.62	25.1	89.2	3.03	5.2																	
30	8.0	1.8	4.1	Operation not recommended							Operation not recommended																							
	12.0	3.7	8.6	1500	42.6	3.56	30.4	96.3	3.50	6.1	1800	43.7	3.79	30.8	92.5	3.38	5.6	1500	63.2	40.7	0.64	2.69	72.4	23.5	-	1800	63.8	44.4	0.70	2.85	73.5	22.4	-	
	16.0	6.4	14.7	1500	43.2	3.65	30.7	96.6	3.46	6.3	1800	44.2	3.82	31.2	92.7	3.39	5.7	1500	63.9	41.1	0.64	2.64	72.9	24.2	-	1800	64.3	44.7	0.70	2.81	73.9	22.9	-	
40	8.0	1.7	4.0	Operation not recommended							Operation not recommended																							
	12.0	3.6	8.3	1500	50.1	3.82	37.1	100.9	3.85	6.9	1800	51.3	3.98	37.7	96.4	3.77	6.3	1500	66.0	42.4	0.64	2.93	76.0	22.5	-	1800	67.0	46.2	0.69	3.11	77.6	21.5	-	
	16.0	6.2	14.2	1500	50.9	3.89	37.6	101.4	3.84	7.1	1800	52.0	4.02	38.3	96.8	3.79	6.5	1500	66.7	42.9	0.64	2.88	76.6	23.1	-	1800	67.6	46.6	0.69	3.06	78.1	22.1	-	
50	8.0	1.7	3.8	1500	53.3	3.97	39.8	102.9	3.93	7.4	1800	54.5	4.10	40.5	98.0	3.90	6.9	1500	68.1	43.7	0.64	3.31	79.4	20.6	3.8	1800	69.5	47.5	0.68	3.52	81.5	19.8	4.0	
	12.0	3.5	8.1	1500	56.4	4.05	42.6	104.8	4.08	7.7	1800	57.6	4.15	43.4	99.6	4.07	7.1	1500	68.8	44.1	0.64	3.24	79.9	21.2	3.6	1800	70.2	48.0	0.68	3.44	81.9	20.4	3.9	
	16.0	6.0	13.8	1500	57.4	4.10	43.4	105.4	4.11	7.9	1800	58.6	4.20	44.3	100.1	4.09	7.2	1500	69.5	44.6	0.64	3.18	80.4	21.8	3.3	1800	70.9	48.4	0.68	3.38	82.4	21.0	3.7	
60	8.0	1.6	3.7	1500	60.0	4.25	45.5	107.0	4.14	8.3	1800	61.3	4.32	46.5	101.5	4.16	7.7	1500	65.9	43.0	0.65	3.51	77.9	18.8	4.6	1800	67.6	46.7	0.69	3.73	80.4	18.1	4.9	
	12.0	3.4	7.8	1500	62.7	4.32	48.0	108.7	4.26	8.6	1800	64.1	4.37	49.1	103.0	4.29	7.9	1500	66.6	43.4	0.65	3.44	78.3	19.4	4.3	1800	68.3	47.1	0.69	3.65	80.8	18.7	4.7	
	16.0	5.8	13.4	1500	64.1	4.37	49.2	109.5	4.30	8.9	1800	65.5	4.42	50.4	103.7	4.35	8.1	1500	67.3	43.8	0.65	3.38	78.8	19.9	4.0	1800	69.0	47.6	0.69	3.59	81.2	19.2	4.4	
70	8.0	1.6	3.6	1500	66.5	4.52	51.1	111.1	4.32	9.4	1800	68.0	4.54	52.5	105.0	4.39	8.7	1500	64.8	42.9	0.66	3.82	77.9	17.0	5.6	1800	66.8	46.6	0.70	4.07	80.7	16.4	6.0	
	12.0	3.3	7.5	1500	69.0	4.58	53.4	112.6	4.41	9.7	1800	70.5	4.59	54.9	106.3	4.50	8.9	1500	65.4	43.3	0.66	3.75	78.2	17.5	5.3	1800	67.6	47.0	0.70	3.98	81.2	17.0	5.7	
	16.0	5.6	12.9	1500	70.7	4.64	54.9	113.7	4.47	10.0	1800	72.4	4.64	56.6	107.2	4.58	9.2	1500	66.1	43.7	0.66	3.68	78.7	17.9	4.9	1800	68.2	47.5	0.70	3.92	81.6	17.4	5.4	
80	8.0	1.5	3.5	1500	71.6	4.74	55.4	114.2	4.42	10.3	1800	73.2	4.72	57.1	107.7	4.55	9.6	1500	62.7	42.1	0.67	4.15	76.8	15.1	7.3	1800	65.0	45.7	0.70	4.42	80.1	14.7	7.7	
	12.0	3.2	7.3	1500	73.3	4.80	56.9	115.2	4.47	10.7	1800	75.0	4.75	58.8	108.6	4.63	9.9	1500	63.3	42.4	0.67	4.07	77.2	15.6	6.8	1800	65.6	46.1	0.70	4.33	80.4	15.2	7.4	
	16.0	5.4	12.5	1500	75.5	4.86	58.9	116.6	4.55	11.0	1800	77.4	4.80	61.0	109.8	4.72	10.1	1500	63.9	42.9	0.67	4.00	77.6	16.0	6.3	1800	66.3	46.6	0.70	4.26	80.8	15.6	7.0	
90	8.0	1.4	3.3	1500	76.6	4.98	59.6	117.3	4.51	11.4	1800	78.4	4.91	61.7	110.4	4.69	10.5	1500	58.3	40.2	0.69	4.47	73.5	13.0	9.3	1800	60.9	43.7	0.72	4.76	77.1	12.8	9.8	
	12.0	3.0	7.0	1500	77.6	5.03	60.4	117.9	4.52	11.7	1800	79.6	4.93	62.7	110.9	4.73	10.9	1500	59.0	40.5	0.69	4.38	73.9	13.5	8.6	1800	61.4	44.1	0.72	4.66	77.3	13.2	9.4	
	16.0	5.2	12.0	1500	80.3	5.10	62.9	119.6	4.62	12.1	1800	82.4	4.98	65.4	112.4	4.85	11.2	1500	59.5	41.0	0.69	4.31	74.2	13.8	8.0	1800	62.1	44.5	0.72	4.59	77.8	13.5	8.9	
100	8.0	1.4	3.2	Operation not recommended							Operation not recommended																							
	12.0	2.9	6.8	Operation not recommended							Operation not recommended																							
	16.0	5.0	11.6	1500	56.3	39.7	0.70	4.82	72.8	11.7	10.5	1800	59.0	43.1	0.73	5.14	76.5	11.5	11.4	1500	56.9	40.1	0.71	4.74	73.0	12.0	9.8	1800	59.6	43.6	0.73	5.05	76.8	11.8
110	8.0	1.3	3.1	Operation not recommended							Operation not recommended																							
	12.0	2.8	6.5	Operation not recommended							Operation not recommended																							
	16.0	4.8	11.2	1500	50.8	37.3	0.74	5.21	68.6	9.8	13.6	1800	53.5	40.5	0.76	5.55	72.5	9.6	14.8	1500	51.3	37.7	0.74	5.11	68.7	10.0	12.7	1800	54.0	41.0	0.76	5.46	72.6	9.9
120	8.0	1.3	3.0	Operation not recommended							Operation not recommended																							
	12.0	2.7	6.3	Operation not recommended							Operation not recommended																							
	16.0	4.6	10.7	1500	46.7	35.6	0.76	5.75	66.3	8.1	16.5	1800	49.5	38.7	0.78	6.14	70.4	8.1	17.9	1500	47.2	36.0	0.76	5.64	66.4	8.4	15.3	1800	49.9	39.1	0.78	6.03	70.5	8.3

SDV072 Capacity Data - Low Speed

Performance capacities shown in thousands of Btuh.

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F															
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh								
20	10.0	2.3	5.4	Operation not recommended							Operation not recommended															
	13.0	3.6	8.2	Operation not recommended							Operation not recommended															
	16.0	5.0	11.6	1400	32.4	3.36	21.0	91.4	2.83	5.9	1700	33.2	3.50	21.3	88.1	2.78	5.3									
30	10.0	2.3	5.3	Operation not recommended							Operation not recommended															
	13.0	3.5	8.0	1400	36.2	3.38	24.7	93.9	3.14	5.5	1700	38.0	3.42	26.3	90.7	3.25	5.0	1400	55.1	33.7	0.61	1.82	61.3	30.3	-	
	16.0	4.9	11.3	1400	37.8	3.38	26.2	95.0	3.28	5.7	1700	36.0	3.54	23.9	89.6	2.98	5.1	1400	55.2	33.6	0.61	1.75	61.2	31.6	-	
1700	55.4	36.9	0.67	2.34	63.3	23.7	-																			
40	10.0	2.2	5.1	Operation not recommended							Operation not recommended															
	13.0	3.4	7.8	1400	42.6	3.48	30.7	98.1	3.58	6.5	1700	44.4	3.49	32.5	94.2	3.73	5.9	1400	57.7	35.7	0.62	2.00	64.5	28.9	-	
	16.0	4.7	11.0	1400	44.1	3.49	32.1	99.1	3.70	6.7	1700	46.0	3.50	34.1	95.1	3.85	6.1	1400	57.8	35.6	0.62	1.93	64.4	29.9	-	
1700	59.5	40.7	0.68	2.06	66.5	28.9	-																			
50	10.0	2.1	4.9	1400	47.6	3.52	35.6	101.5	3.96	6.8	1700	49.7	3.48	37.8	97.1	4.18	6.3	1400	59.7	37.3	0.62	2.30	67.6	25.9	2.3	
	13.0	3.3	7.5	1400	48.3	3.56	36.1	101.9	3.98	7.0	1700	50.2	3.54	38.2	97.4	4.16	6.4	1400	61.6	42.2	0.69	2.42	69.8	25.4	2.4	
	16.0	4.6	10.6	1400	49.7	3.58	37.5	102.9	4.07	7.2	1700	52.6	3.80	39.6	98.6	4.05	6.6	1400	59.9	37.6	0.63	2.22	67.5	26.9	2.1	
1700	61.7	42.7	0.69	2.34	69.7	26.4	2.3	1400	60.0	37.6	0.63	2.16	67.4	27.7	2.0	1700	61.8	41.7	0.68	2.80	71.3	22.0	2.2			
60	10.0	2.1	4.8	1400	52.9	3.63	40.5	105.0	4.27	7.5	1700	55.1	3.56	43.0	100.0	4.54	6.9	1400	58.0	36.8	0.63	2.53	66.6	22.9	3.2	
	13.0	3.2	7.3	1400	54.4	3.67	41.9	106.0	4.34	7.7	1700	56.5	3.61	44.2	100.8	4.60	7.1	1400	59.7	41.5	0.70	2.64	68.7	22.6	3.4	
	16.0	4.4	10.3	1400	55.6	3.71	43.0	106.8	4.40	7.9	1700	57.9	3.64	45.4	101.5	4.66	7.3	1400	58.2	37.1	0.64	2.45	66.6	23.8	3.0	
1700	60.3	42.1	0.70	2.50	68.7	23.4	3.2																			
70	10.0	2.0	4.6	1400	58.4	3.76	45.5	108.6	4.54	8.3	1700	60.7	3.65	48.3	103.1	4.87	7.7	1400	57.6	37.3	0.65	2.83	67.2	20.4	4.4	
	13.0	3.0	7.0	1400	60.6	3.80	47.6	110.1	4.67	8.5	1700	62.9	3.69	50.3	104.3	5.00	7.9	1400	59.2	42.0	0.71	2.94	69.3	20.2	4.6	
	16.0	4.3	9.9	1400	61.7	3.86	48.5	110.8	4.69	8.8	1700	66.5	4.04	52.7	106.2	4.83	8.1	1400	57.9	37.8	0.65	2.74	67.3	21.2	4.1	
1700	59.6	42.5	0.71	2.85	69.3	20.9	4.4	1400	58.2	38.0	0.65	2.70	67.5	21.6	3.8	1700	58.3	41.5	0.71	3.34	69.7	17.5	4.2			
80	10.0	1.9	4.5	1400	62.9	3.86	49.7	111.6	4.77	9.2	1700	65.2	3.72	52.5	105.5	5.13	8.5	1400	57.6	37.3	0.65	2.83	67.2	20.4	4.4	
	13.0	2.9	6.8	1400	66.2	3.91	52.8	113.8	4.97	9.5	1700	68.5	3.75	55.8	107.3	5.36	8.8	1400	59.2	42.0	0.71	2.94	69.3	20.2	4.6	
	16.0	4.2	9.6	1400	66.9	3.96	53.4	114.3	4.95	9.8	1700	69.2	3.81	56.2	107.7	5.32	9.1	1400	59.7	37.8	0.65	2.74	67.3	21.2	4.1	
1700	57.5	41.5	0.72	3.11	68.1	18.5	5.4	1400	58.2	38.0	0.65	2.70	67.5	21.6	3.8	1700	58.3	41.5	0.71	3.34	69.7	17.5	4.2			
90	10.0	1.9	4.3	1400	67.5	3.97	53.9	114.6	4.98	10.3	1700	69.7	3.81	56.7	108.0	5.37	9.5	1400	57.6	37.3	0.65	2.83	67.2	20.4	4.4	
	13.0	2.8	6.6	1400	71.9	4.03	58.1	117.5	5.23	10.6	1700	74.3	3.83	61.2	110.4	5.69	9.8	1400	59.2	42.0	0.71	2.94	69.3	20.2	4.6	
	16.0	4.0	9.3	1400	72.3	4.08	58.4	117.8	5.19	11.0	1700	76.3	4.26	61.8	111.6	5.25	10.2	1400	57.9	37.8	0.65	2.74	67.3	21.2	4.1	
1700	51.7	39.3	0.76	4.03	65.5	12.8	7.7	1400	58.2	38.0	0.65	2.70	67.5	21.6	3.8	1700	58.3	41.5	0.71	3.34	69.7	17.5	4.2			
100	10.0	1.8	4.2	Operation not recommended							Operation not recommended															
	13.0	2.7	6.3	Operation not recommended							Operation not recommended															
	16.0	3.9	8.9	1400	49.1	34.9	0.71	3.87	62.4	12.7	10.0	1700	50.7	38.7	0.76	3.92	64.1	12.9	10.9	1400	49.8	35.3	0.71	3.82	62.8	13.0
1700	51.3	39.1	0.76	3.86	64.5	13.3	10.4																			
110	10.0	1.7	4.0	Operation not recommended							Operation not recommended															
	13.0	2.6	6.1	Operation not recommended							Operation not recommended															
	16.0	3.7	8.6	1400	43.7	32.7	0.75	4.33	58.4	10.1	12.7	1700	45.2	36.1	0.80	4.35	60.0	10.4	13.8	1400	44.4	33.2	0.75	4.27	59.0	10.4
1700	45.6	36.6	0.80	4.94	62.5	9.2	13.1																			
120	10.0	1.7	3.8	Operation not recommended							Operation not recommended															
	13.0	2.5	5.8	Operation not recommended							Operation not recommended															
	16.0	3.6	8.2	1400	40.8	31.9	0.78	4.88	57.5	8.4	15.8	1700	42.3	34.9	0.83	4.86	58.9	8.7	17.1	1400	41.7	32.5	0.78	4.80	58.0	8.7
1700	42.3	35.3	0.83	5.45	60.9	7.8	16.3																			

SDV072 Capacity Data - High Speed

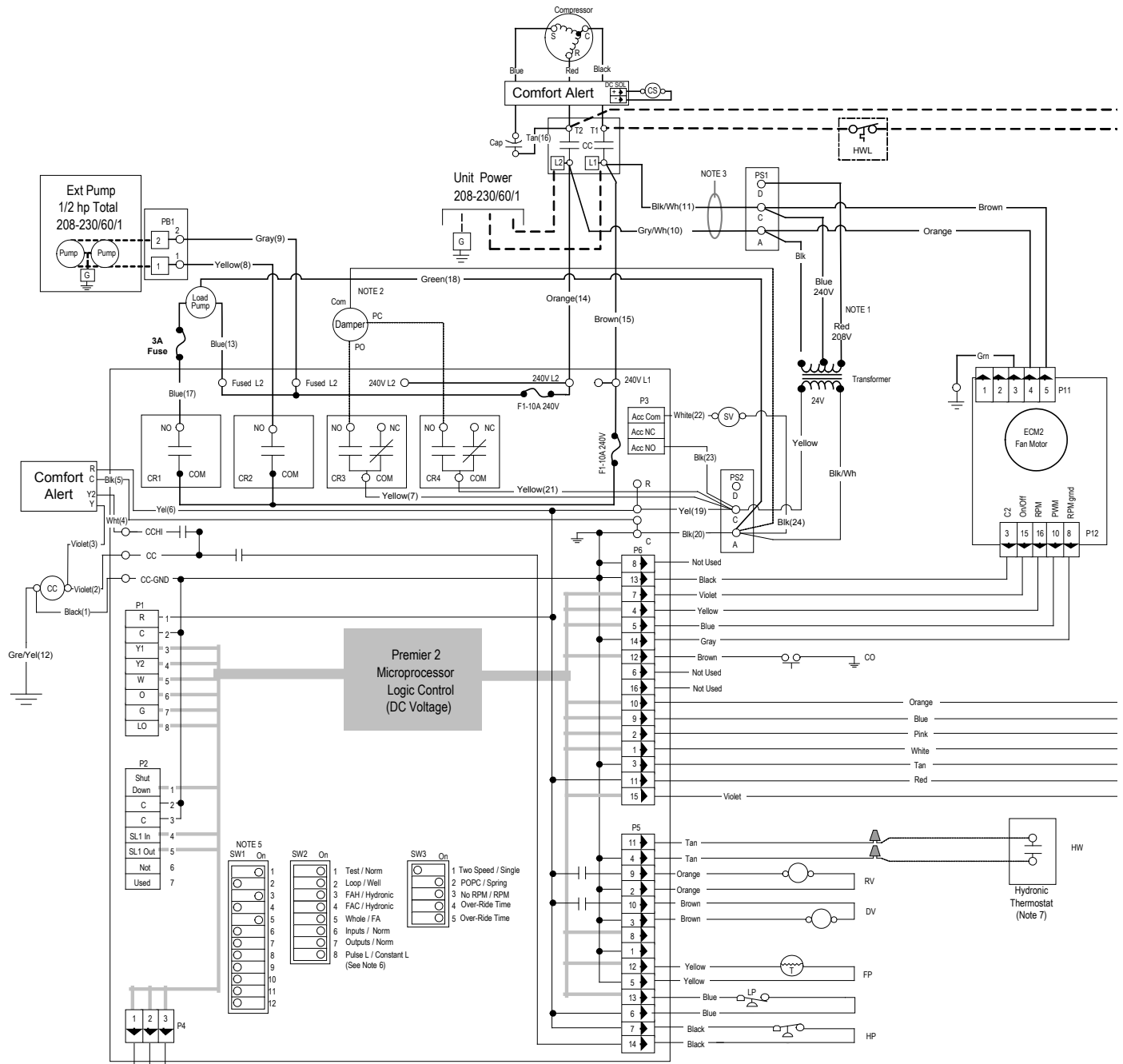
Performance capacities shown in thousands of Btuh.

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	12.0	3.3	7.6	Operation not recommended							Operation not recommended							
	15.0	4.6	10.7	Operation not recommended							Operation not recommended							
	18.0	6.2	14.3	1850 2200	45.2 46.9	4.40 4.68	30.2 30.9	92.6 89.7	3.01 2.93	7.9 7.1	1850 2200	68.5 69.8	44.3 48.3	0.65 0.69	3.82 4.05	81.5 83.6	18.0 17.2	- -
30	12.0	3.2	7.4	Operation not recommended							Operation not recommended							
	15.0	4.5	10.4	1850 2200	52.3 54.1	4.56 4.85	36.7 37.6	96.2 92.8	3.36 3.27	8.3 7.6	1850 2200	68.5 69.8	44.3 48.3	0.65 0.69	3.82 4.05	81.5 83.6	18.0 17.2	- -
	18.0	6.0	13.9	1850 2200	52.7 54.7	4.60 4.90	37.0 37.9	96.4 93.0	3.36 3.27	8.5 7.7	1850 2200	69.2 70.5	45.1 48.6	0.65 0.69	3.75 3.99	82.0 84.1	18.5 17.7	- -
40	12.0	3.1	7.1	Operation not recommended							Operation not recommended							
	15.0	4.4	10.1	1850 2200	61.2 63.3	4.88 5.11	44.5 45.8	100.6 96.6	3.68 3.63	9.2 8.4	1850 2200	72.5 73.9	46.7 50.7	0.64 0.69	4.09 4.34	86.5 88.8	17.7 17.0	- -
	18.0	5.8	13.5	1850 2200	62.0 64.2	4.93 5.16	45.2 46.6	101.0 97.0	3.69 3.65	9.5 8.6	1850 2200	73.3 74.7	47.5 51.1	0.65 0.68	4.02 4.28	87.0 89.3	18.2 17.5	- -
50	12.0	3.0	6.9	1850 2200	64.8 67.0	5.07 5.25	47.5 49.1	102.4 98.2	3.75 3.74	9.9 9.2	1850 2200	75.4 77.0	48.2 52.3	0.64 0.68	4.51 4.79	90.8 93.3	16.7 16.1	4.3 4.5
	15.0	4.2	9.8	1850 2200	68.4 70.7	5.16 5.33	50.8 52.5	104.2 99.7	3.88 3.89	10.2 9.4	1850 2200	76.2 77.7	48.7 52.9	0.64 0.68	4.41 4.69	91.3 93.7	17.3 16.6	4.0 4.3
	18.0	5.7	13.1	1850 2200	69.6 71.9	5.22 5.38	51.8 53.6	104.9 100.3	3.91 3.92	10.5 9.6	1850 2200	77.0 78.5	49.6 53.4	0.64 0.68	4.34 4.62	91.8 94.3	17.7 17.0	3.7 4.1
60	12.0	2.9	6.7	1850 2200	72.9 75.2	5.42 5.53	54.4 56.4	106.5 101.7	3.94 3.99	11.1 10.3	1850 2200	74.0 75.5	48.2 52.1	0.65 0.69	4.75 5.05	90.2 92.7	15.6 14.9	5.2 5.5
	15.0	4.1	9.5	1850 2200	76.1 78.6	5.51 5.60	57.3 59.5	108.1 103.1	4.05 4.11	11.5 10.6	1850 2200	74.7 76.2	48.7 52.7	0.65 0.69	4.65 4.95	90.6 93.1	16.1 15.4	4.9 5.3
	18.0	5.5	12.7	1850 2200	77.8 80.4	5.58 5.66	58.8 61.1	108.9 103.8	4.09 4.16	11.8 10.9	1850 2200	75.5 77.0	49.5 53.2	0.66 0.69	4.57 4.87	91.1 93.6	16.5 15.8	4.5 5.0
70	12.0	2.8	6.5	1850 2200	81.1 83.6	5.78 5.82	61.3 63.8	110.6 105.2	4.11 4.21	12.5 11.6	1850 2200	74.1 75.7	49.0 52.7	0.66 0.70	5.13 5.46	91.7 94.3	14.4 13.9	6.6 6.9
	15.0	4.0	9.1	1850 2200	83.9 86.6	5.87 5.89	63.9 66.5	112.0 106.4	4.19 4.31	12.9 11.9	1850 2200	74.9 76.4	49.5 53.2	0.66 0.70	5.03 5.34	92.0 94.6	14.9 14.3	6.1 6.6
	18.0	5.3	12.2	1850 2200	86.1 88.9	5.95 5.95	65.8 68.6	113.1 107.4	4.24 4.38	13.3 12.3	1850 2200	75.7 77.2	50.1 53.9	0.66 0.70	4.94 5.26	92.5 95.2	15.3 14.7	5.7 6.3
80	12.0	2.7	6.3	1850 2200	87.0 89.8	6.10 6.06	66.2 69.1	113.5 107.8	4.18 4.34	13.9 12.8	1850 2200	71.6 73.1	47.9 51.8	0.67 0.71	5.45 5.80	90.2 92.9	13.1 12.6	8.4 8.9
	15.0	3.8	8.8	1850 2200	89.1 91.9	6.19 6.10	67.9 71.1	114.6 108.7	4.22 4.41	14.3 13.2	1850 2200	72.3 73.8	48.4 52.2	0.67 0.71	5.34 5.68	90.5 93.2	13.6 13.0	7.8 8.4
	18.0	5.1	11.8	1850 2200	91.8 94.8	6.27 6.17	70.4 73.8	115.9 109.9	4.29 4.50	14.7 13.6	1850 2200	73.1 74.6	49.1 52.8	0.67 0.71	5.25 5.59	91.0 93.7	13.9 13.4	7.2 8.0
90	12.0	2.6	6.0	1850 2200	93.1 96.2	6.45 6.32	71.1 74.6	116.6 110.5	4.23 4.46	15.4 14.3	1850 2200	66.7 68.1	45.7 49.6	0.68 0.73	5.76 6.13	86.4 89.0	11.6 11.1	10.5 11.1
	15.0	3.7	8.5	1850 2200	94.4 97.5	6.52 6.35	72.2 75.8	117.3 111.0	4.25 4.50	15.9 14.7	1850 2200	67.4 68.8	46.1 50.1	0.68 0.73	5.64 6.00	86.6 89.2	12.0 11.4	9.8 10.6
	18.0	4.9	11.4	1850 2200	97.7 100.9	6.61 6.42	75.1 79.0	118.9 112.5	4.33 4.61	16.4 15.2	1850 2200	68.1 69.5	47.0 50.6	0.69 0.73	5.55 5.90	87.0 89.6	12.3 11.8	9.1 10.1
100	12.0	2.5	5.8	Operation not recommended							Operation not recommended							
	15.0	3.6	8.2	Operation not recommended							Operation not recommended							
	18.0	4.8	11.0	1850 2200	65.4 66.7	45.7 49.5	0.70 0.74	6.14 6.54	86.3 89.0	10.6 10.2	12.2 13.2	1850 2200	66.1 67.5	46.4 49.9	0.70 0.74	6.04 6.43	86.7 89.4	10.9 10.5
110	12.0	2.4	5.6	Operation not recommended							Operation not recommended							
	15.0	3.4	7.9	Operation not recommended							Operation not recommended							
	18.0	4.6	10.6	1850 2200	59.3 60.5	43.4 46.7	0.73 0.77	6.57 6.99	81.7 84.4	9.0 8.7	14.9 16.1	1850 2200	60.0 61.2	43.8 47.1	0.73 0.77	6.45 6.86	82.0 84.6	9.3 8.9
120	12.0	2.3	5.4	Operation not recommended							Operation not recommended							
	15.0	3.3	7.6	Operation not recommended							Operation not recommended							
	18.0	4.4	10.2	1850 2200	55.2 56.4	41.6 44.9	0.75 0.80	7.12 7.58	79.5 82.2	7.8 7.4	18.0 19.5	1850 2200	55.9 57.0	42.1 45.3	0.75 0.79	7.01 7.44	79.8 82.4	8.0 7.7

Synergy3D 072 Water Heating Data

ELT	EST	LGPM	SOURCE 12.0 GPM						SWPD		HWC kBtuh	SOURCE 15.0 GPM						SWPD		HWC kBtuh	SOURCE 18.0 GPM						SWPD		HWC kBtuh
			LLT	HC	KW	HE	COP	LST	PSI	FT HD		LLT	HC	KW	HE	COP	LST	PSI	FT HD		LLT	HC	KW	HE	COP	LST	PSI	FT HD	
80	30	12.0	88.8	52.9	4.11	38.8	3.8	23.3	4.0	9.2	8.0	89.0	53.8	4.13	39.7	3.8	24.3	6.2	14.2	8.2	89.1	54.7	4.14	40.6	3.9	25.4	8.3	19.2	8.4
		15.0	87.3	52.9	4.07	39.0	3.8	23.3	4.0	9.2	7.7	87.5	53.8	4.08	39.9	3.9	24.3	6.2	14.2	7.9	87.6	54.7	4.10	40.7	3.9	25.3	8.3	19.2	8.1
		18.0	85.9	52.9	4.03	39.1	3.8	23.3	4.0	9.2	7.4	86.0	53.8	4.04	40.0	3.9	24.3	6.2	14.2	7.6	86.1	54.7	4.05	40.9	4.0	25.3	8.3	19.2	7.7
80	40	12.0	90.3	61.8	4.25	47.3	4.3	31.9	3.9	9.0	8.9	90.5	63.0	4.27	48.4	4.3	33.2	6.0	13.8	9.1	90.7	64.2	4.29	49.6	4.4	34.5	8.1	18.6	9.3
		15.0	88.6	61.8	4.20	47.4	4.3	31.9	3.9	9.0	8.6	88.7	63.0	4.22	48.6	4.4	33.1	6.0	13.8	8.8	88.9	64.2	4.24	49.7	4.4	34.5	8.1	18.6	9.0
		18.0	86.9	61.8	4.16	47.6	4.4	31.8	3.9	9.0	8.3	87.0	63.0	4.17	48.7	4.4	33.1	6.0	13.8	8.5	87.1	64.2	4.19	49.9	4.5	34.5	8.1	18.6	8.6
80	50	12.0	91.8	70.7	4.38	55.7	4.7	40.4	3.8	8.7	10.0	92.0	72.2	4.41	57.1	4.8	42.0	5.8	13.3	10.2	92.3	73.7	4.44	58.6	4.9	43.5	7.8	18.0	10.4
		15.0	89.8	70.6	4.33	55.9	4.8	40.4	3.8	8.7	9.6	90.0	72.2	4.36	57.3	4.9	41.9	5.8	13.3	9.8	90.2	73.7	4.39	58.7	4.9	43.5	7.8	18.0	10.0
		18.0	87.8	70.6	4.28	56.0	4.8	40.4	3.8	8.7	9.2	88.0	72.2	4.31	57.5	4.9	41.9	5.8	13.3	9.4	88.2	73.7	4.33	58.9	5.0	43.5	7.8	18.0	9.6
80	60	12.0	93.3	79.5	4.52	64.1	5.2	49.0	3.6	8.4	11.3	93.6	81.4	4.55	65.8	5.2	50.7	5.6	12.9	11.5	93.9	83.2	4.59	67.6	5.3	52.5	7.6	17.4	11.7
		15.0	91.0	79.5	4.46	64.3	5.2	49.0	3.6	8.4	10.8	91.3	81.3	4.49	66.0	5.3	50.7	5.6	12.9	11.1	91.6	83.2	4.53	67.7	5.4	52.5	7.6	17.4	11.3
		18.0	88.8	79.5	4.40	64.5	5.3	48.9	3.6	8.4	10.4	89.0	81.3	4.44	66.2	5.4	50.7	5.6	12.9	10.6	89.2	83.1	4.47	67.9	5.4	52.5	7.6	17.4	10.9
80	70	12.0	94.7	88.4	4.65	72.6	5.6	57.5	3.5	8.1	12.7	95.1	90.6	4.69	74.6	5.7	59.5	5.4	12.5	13.0	95.5	92.7	4.73	76.5	5.7	61.5	7.3	16.9	13.2
		15.0	92.3	88.4	4.59	72.7	5.6	57.5	3.5	8.1	12.2	92.6	90.5	4.63	74.7	5.7	59.5	5.4	12.5	12.5	92.9	92.7	4.67	76.7	5.8	61.5	7.3	16.9	12.7
		18.0	89.8	88.4	4.53	72.9	5.7	57.5	3.5	8.1	11.8	90.1	90.5	4.57	74.9	5.8	59.5	5.4	12.5	12.0	90.3	92.6	4.61	76.9	5.9	61.5	7.3	16.9	12.3
100	30	12.0	108.5	51.1	5.17	33.5	2.9	24.2	4.0	9.2	7.8	108.6	51.9	5.18	34.2	2.9	25.2	6.2	14.2	7.9	108.8	52.6	5.18	34.9	3.0	26.1	8.3	19.2	8.0
		15.0	107.1	51.1	5.13	33.6	2.9	24.2	4.0	9.2	7.5	107.2	51.8	5.13	34.3	3.0	25.2	6.2	14.2	7.6	107.3	52.6	5.13	35.0	3.0	26.1	8.3	19.2	7.7
		18.0	105.7	51.1	5.08	33.7	2.9	24.2	4.0	9.2	7.2	105.8	51.8	5.08	34.4	3.0	25.1	6.2	14.2	7.3	105.8	52.5	5.09	35.2	3.0	26.1	8.3	19.2	7.4
100	40	12.0	109.9	59.3	5.29	41.2	3.3	32.9	3.9	9.0	8.6	110.0	60.2	5.30	42.1	3.3	34.1	6.0	13.8	8.7	110.2	61.2	5.31	43.0	3.4	35.2	8.1	18.6	8.9
		15.0	108.2	59.2	5.24	41.4	3.3	32.9	3.9	9.0	8.3	108.4	60.2	5.25	42.3	3.4	34.0	6.0	13.8	8.4	108.5	61.2	5.26	43.2	3.4	35.2	8.1	18.6	8.5
		18.0	106.6	59.2	5.18	41.5	3.3	32.9	3.9	9.0	7.9	106.7	60.2	5.19	42.5	3.4	34.0	6.0	13.8	8.1	106.8	61.2	5.21	43.4	3.4	35.2	8.1	18.6	8.2
100	50	12.0	111.2	67.4	5.41	48.9	3.6	41.6	3.8	8.7	9.5	111.4	68.6	5.43	50.0	3.7	43.0	5.8	13.3	9.7	111.6	69.8	5.45	51.2	3.8	44.3	7.8	18.0	9.8
		15.0	109.4	67.4	5.35	49.1	3.7	41.6	3.8	8.7	9.2	109.5	68.6	5.37	50.3	3.7	42.9	5.8	13.3	9.3	109.7	69.8	5.39	51.4	3.8	44.3	7.8	18.0	9.5
		18.0	107.5	67.4	5.29	49.3	3.7	41.5	3.8	8.7	8.8	107.6	68.6	5.30	50.5	3.8	42.9	5.8	13.3	9.0	107.8	69.8	5.32	51.7	3.8	44.3	7.8	18.0	9.1
100	60	12.0	112.6	75.5	5.53	56.6	4.0	50.3	3.6	8.4	10.7	112.8	77.0	5.56	58.0	4.1	51.8	5.6	12.9	10.9	113.1	78.4	5.59	59.3	4.1	53.4	7.6	17.4	11.0
		15.0	110.5	75.5	5.46	56.9	4.1	50.2	3.6	8.4	10.3	110.7	77.0	5.49	58.2	4.1	51.8	5.6	12.9	10.5	110.9	78.4	5.51	59.6	4.2	53.4	7.6	17.4	10.6
		18.0	108.4	75.5	5.39	57.1	4.1	50.2	3.6	8.4	9.9	108.6	77.0	5.42	58.5	4.2	51.8	5.6	12.9	10.1	108.7	78.5	5.44	59.9	4.2	53.3	7.6	17.4	10.2
100	70	12.0	113.9	83.7	5.65	64.4	4.3	58.9	3.5	8.1	12.0	114.2	85.3	5.69	65.9	4.4	60.7	5.4	12.5	12.2	114.5	87.0	5.72	67.5	4.5	62.5	7.3	16.9	12.4
		15.0	111.6	83.7	5.57	64.6	4.4	58.9	3.5	8.1	11.6	111.9	85.4	5.61	66.2	4.5	60.7	5.4	12.5	11.8	112.1	87.1	5.64	67.8	4.5	62.5	7.3	16.9	12.0
		18.0	109.3	83.7	5.50	64.9	4.5	58.8	3.5	8.1	11.1	109.5	85.4	5.53	66.5	4.5	60.6	5.4	12.5	11.3	109.7	87.1	5.56	68.2	4.6	62.4	7.3	16.9	11.5
120	30	12.0	128.2	49.4	6.24	28.1	2.3	25.2	4.0	9.2	7.5	128.3	49.9	6.23	28.7	2.3	25.9	6.2	14.2	7.6	128.4	50.5	6.22	29.2	2.4	26.7	8.3	19.2	7.7
		15.0	126.9	49.3	6.18	28.2	2.3	25.2	4.0	9.2	7.2	126.9	49.8	6.18	28.8	2.4	25.9	6.2	14.2	7.3	127.0	50.4	6.17	29.3	2.4	26.6	8.3	19.2	7.4
		18.0	125.5	49.2	6.12	28.3	2.4	25.1	4.0	9.2	6.9	125.5	49.8	6.12	28.9	2.4	25.9	6.2	14.2	7.0	125.6	50.3	6.13	29.4	2.4	26.6	8.3	19.2	7.1
120	40	12.0	129.5	56.8	6.34	35.1	2.6	34.0	3.9	9.0	8.2	129.6	57.5	6.34	35.8	2.7	34.9	6.0	13.8	8.3	129.7	58.2	6.34	36.5	2.7	35.9	8.1	18.6	8.4
		15.0	127.9	56.7	6.27	35.3	2.6	33.9	3.9	9.0	7.9	128.0	57.4	6.28	36.0	2.7	34.9	6.0	13.8	8.0	128.1	58.2	6.28	36.7	2.7	35.9	8.1	18.6	8.1
		18.0	126.3	56.6	6.21	35.5	2.7	33.9	3.9	9.0	7.6	126.4	57.4	6.21	36.2	2.7	34.9	6.0	13.8	7.7	126.5	58.2	6.22	36.9	2.7	35.9	8.1	18.6	7.8
120	50	12.0	130.7	64.1	6.44	42.1	2.9	42.8	3.8	8.7	9.1	130.8	65.0	6.45	43.0	3.0	43.9	5.8	13.3	9.2	131.0	65.9	6.46	43.8	3.0	45.1	7.8	18.0	9.3
		15.0	128.9	64.1	6.37	42.4	2.9	42.7	3.8	8.7	8.7	129.0	65.0	6.38	43.3	3.0	43.9	5.8	13.3	8.8	129.2	65.9	6.39	44.1	3.0	45.1	7.8	18.0	8.9
		18.0	127.1	64.1	6.29	42.6	3.0	42.7	3.8	8.7	8.4	127.2	65.0	6.30	43.5	3.0	43.9	5.8	13.3	8.5	127.3	66.0	6.31	44.4	3.1	45.1	7.8	18.0	8.6
120	60	12.0	131.9	71.5	6.55	49.1	3.2	51.6	3.6	8.4	10.1	132.1	72.5	6.57	50.1	3.2	52.9	5.6	12.9	10.2	132.3	73.6	6.58	51.1	3.3	54.3	7.6	17.4	10.4
		15.0	129.9	71.5	6.46	49.5	3.2	51.5	3.6	8.4	9.7	130.1	72.6	6.48	50.5	3.3	52.8	5.6	12.9	9.9	130.2	73.7	6.50	51.5	3.3	54.3	7.6	17.4	10.0
		18.0	127.9	71.5	6.38	49.8	3.3	51.5	3.6	8.4																			

Wiring Schematic

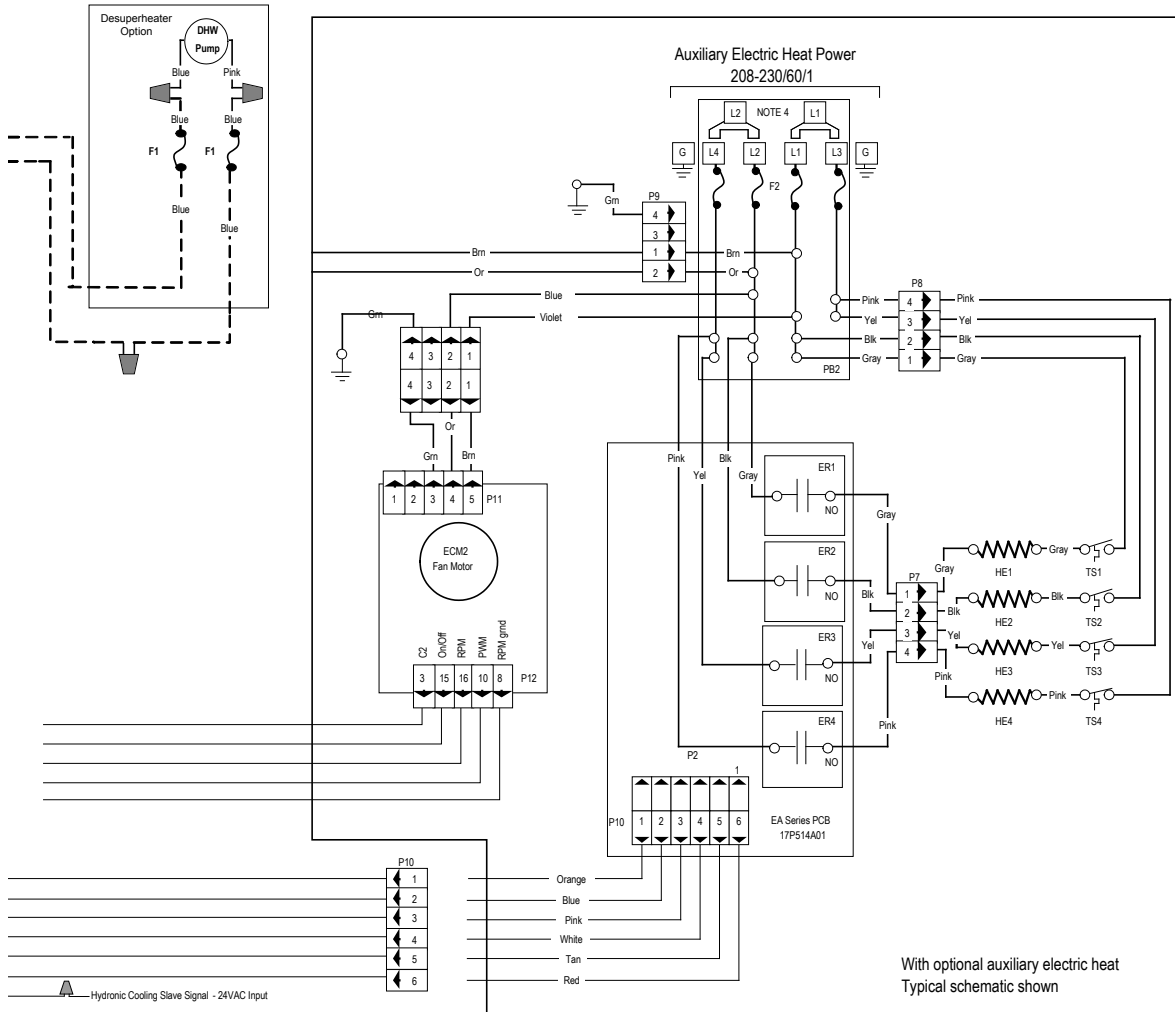


LED	Normal Display Mode	Diagnostic Modes			
		Current Fault Status	Inputs	Outputs	Outputs2
	Field Selection Dips - #1 On, #6 On, #7 On	#1 Off, #6 On, #7 On	#6 Off, #7 On	#6 On, #7 Off	#6 Off, #7 Off
Drain	Drain pan overflow lockout	Drain pan overflow	Y1	Compressor	Blower low
Water Flow	FP thermostat (loop<15°F, well>30°F) Lockout	FP thermostat (loop<15°F, well>30°F)	Y2	Not used	Blower med.
High Press	High pressure lockout	High pressure	O	RV	Blower hi
Low Press	Low pressure lockout	Low pressure	G	FAN	Aux heat #1
Air Flow	ECM2 RPM < 100 rpm lockout	ECM2 RPM < 100 rpm	W	HW pump	Aux heat #2
Status	Microprocessor malfunction	Not used	SL1	Loop pump	Aux heat #3
HW Limit	Not used	Not used	HW	DV	Aux heat #4
HW off	Hot-water disable	HW off	HW off	HW off	HW off

Over-Ride Selection

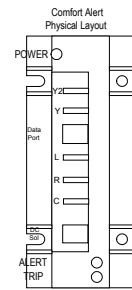
Over-ride time	SW3-4	SW3-5
5 minutes	On	On
15 minutes	Off	On
30 minutes	On	Off
60 minutes	Off	Off

Wiring Schematic



Operation Logic Data

Operation	Heating				Cooling		Hot Water Mode
	STG1	STG2	STG3	EMERG	STG1	STG2	
Compressor	On	On	On	Off	On	On	Stg 2 On
Reversing Valve	Off	Off	Off	Off	On	On	Off
Loop Pump	On	On	On	Off	On	On	On
Load Pump	Off	Off	Off	Off	Off	Off	On
Aux Heater	Off	Off	Staged	Staged	Off	Off	Off
Acc Relay	On	On	On	Off	On	On	Off
Diverting Valve	Off	Off	Off	Off	Off	Off	On
ECM Speed	On	On	On	On	On	On	Off
T-Stat Signal	Y1	Y1, Y2	Y1, Y2, W	W	Y1, O	Y1, Y2, O	HW
Damper	Off	Off	Off	On	Off	Off	Off
Auxiliary 1 - Out	On	On	On	Off	On	On	On



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
	Internal junction		Switch - Low pressure
	Quick connect terminal		Switch - Hot Water On/Off
	Wire nut		Polarized connector
	Field wire lug		
	Ground		
	Relay Contacts - N.O., N.C.		
	Fuse		
	24 vac coil		

CS - Compressor Solenoid
 CC - Compressor Contactor
 CO - Condensate overflow sensor
 CR1 - HW pump relay
 CR2 - Loop pump relay
 CR3 - Damper relay
 CR4 - Damper relay
 DV - Diverting Valve
 F1 and F2 - Fuses
 FP - Freeze protection sensor
 HP - High pressure switch
 LP - Low pressure switch
 PB1 - Power block
 PS1, PS2 - Power strips
 RV - Reversing Valve coil
 SW1 - DIP package 12 position
 SW2 - DIP package 8 position
 SW3 - DIP package 5 position
 SW4 - Hot water enable switch
 HWL - Hot Water Temperature Limit

Notes

- 1 - Switch blue and red wires for 208V operation.
- 2 - Typical hook-up shown for power open - power closed damper shown.
- 3 - The black and gray/wh wires are removed when Aux Heat is installed
- 4 - Bus lugs L1 and L2 can be removed and dual power wire sets connected directly to bus lugs L1, L2, and L3, L4.
- 5 - Air Flow Configuration Example: SW1 configured for dp1 as low, dp3 as medium, and dp 5 as high speed ECM2 fan.
- 6 - SW2-8 must be in the OFF position for pulsed 'L' lockout signal and in the ON position for 'constant L' lockout signal
- 7 - A hydronic input will generate a Y2 compressor call so that compressor only operates in high capacity

Comfort Alert Status

LED	Flash Code	Description
Green	Solid	Module Has Power
Red	Solid	Y1 Present But Compressor Not Running
Yellow	Code 1	Long Run Time
	Code 2	System Pressure Trip
	Code 3	Short Cycling
	Code 4	Locked Rotor
	Code 5	Open Circuit
	Code 6	Open Start Circuit
	Code 7	Open Run Circuit
	Code 8	Welded Contactor
	Code 9	Low Voltage

Microprocessor Control Features

The Synergy3D control system is a microprocessor-based printed circuit board conveniently located in the unit control box for accessibility. The microprocessor control is specifically designed for the Synergy3D series heat pumps which integrate the ECM2 blower motor. All ECM2 airflow selections are conveniently configured on the control via DIP switches. The microprocessor provides control of the entire unit as well as outputs for status modes, faults, and diagnostics. LEDs are located on the front of the unit for quick inspection without removing any access panels.

Startup

The unit will not operate until all the inputs and safety controls are checked for normal conditions. At first power-up, a four-minute delay is employed before the compressor is energized.

Component Sequencing Delays

Components are sequenced and delayed for optimum space conditioning performance.

Accessory Relay

The accessory relay will be used to control a refrigerant solenoid valve. The accessory relay will turn on when the control is operating in forced air heating, forced air cooling and when there is no active thermostat input. The relay will be off when operating in hot water mode.

Short Cycle Protection

The control employs a minimum “off” time of four minutes and a minimum “on” time of two minutes to provide for short cycle protection of the compressor.

Loop Pump Slaving Signals

A signal between multiple Synergy3D control boards at the inputs and outputs (SL1-In and Out) will provide for remote control of the loop pump on any unit.

Condensate Overflow Protection

The Synergy3D control board incorporates an impedance sensing liquid sensor at the top of the drain pan. Upon a continuous 30-second sensing of the condensate, compressor operation is suspended (see Fault Retry), the condensate overflow lockout LED begins flashing, and an output signal (LO) is made available for connection to a “fault” LED at the thermostat.

Shutdown Input

A simple grounded signal to the “shutdown” input on the control board puts the unit into shutdown mode. Compressor, hot water pump and fan operation are suspended.

Safety Controls

The Synergy3D control receives separate signals for a high pressure switch for safety, a low pressure switch to prevent loss of charge damage, and a low suction temperature thermistor for freeze sensing. Upon a continuous 30-second measurement of the fault (immediate for high pressure), compressor operation is suspended (see Fault Retry), the appropriate lockout LED begins flashing, and an output signal (LO) is made available for connection to a “fault” LED at the thermostat.

Testing

The Synergy3D control allows service personnel to shorten most timing delays for faster diagnostics.

Fault Retry

All faults (except for low RPM fault with the ECM2 fan motor) are retried twice before finally locking the unit out. The “Fault Retry” feature is designed to prevent nuisance service calls.

Diagnostics

The Synergy3D control board allows all inputs and outputs to be displayed on the LEDs for fast and simple control board diagnosis.

Resistance Heat Control

The electric heat control module contains the appropriate high-voltage control relays. Control signals energize the relays in the proper sequence, and the LED display board indicates which stages are energized.

Hot Water Disable Switch

The switch on the LED status display will be used by the control to disable the “HW” input and to open the damper connected to CR3 and/or CR4.

ECM2 Airflow Selection DIP Switches (SW1)

A 12-position DIP switch package on the Synergy3D control allows the airflow levels to be set for low, medium and high speed when using the ECM2 blower motor (see Synergy3D *Blower Performance* table).

Only three of the DIP switches can be in the “On” position. The first “On” switch (the lowest position number) determines the “Low Speed Fan” setting. The second “On” switch determines the “Medium Speed Fan” setting, and the third “On” switch determines the “High Speed Fan” setting.

Microprocessor Control

Heating Operation

Heat, 1st Stage (Y1)

The fan motor is started on low speed immediately (PSC ON), the loop pump is energized 5 seconds after the “Y1” input is received, and the compressor is energized on low capacity 10 seconds after the “Y1” input. The fan is switched to medium speed 15 seconds after “Y1” input (ECM only).

Heat, 2nd Stage (Y1,Y2) Dual Capacity Units

The second stage compressor will be activated 5 seconds after receiving a “Y2” input as long as the minimum first stage compressor run time of 1 minute has expired. The ECM blower changes from medium to high speed 15 seconds after the “Y2” input.

The Comfort Alert will delay the second stage compressor until 5 seconds after it receives a “Y2” from the board.

Heat, 3rd Stage (Y1,Y2,W) Dual Capacity Units

The 1st stage of resistance heat is energized 10 seconds after “W” input, and with continuous 3rd stage demand, the second stage of resistance heat engages after 5 minutes.

Emergency Heat (W only)

The fan is started on high speed, and the first stage of resistance heat is energized 10 seconds after the “W” input. Continuing demand will engage the additional stages of resistance heat sequentially every 2 minutes.

Cool, 1st Stage (Y1,O)

The blower motor is started immediately, the loop pump(s) is energized 5 seconds after the “Y1” input is received. The compressor will be energized (on low capacity for Dual Capacity units) 10 seconds after the “Y1” input. The ECM blower will shift from low to medium speed 15 seconds after the “Y1” input.

Cool, 2nd Stage (Y1, Y2, O) Dual Capacity Units

The second stage compressor will be activated 5 seconds after receiving a “Y2” input as long as the minimum first stage compressor run time of 1 minute has expired. The ECM blower changes to high speed 15 seconds after the “Y2” input. The Comfort Alert will delay the second stage compressor until 5 seconds after it receives a “Y2” from the board.

Hydronic Cooling Slave Signal (24 vac input on P6-pin 15 violet wire)

The Synergy3D control board must be operating in cooling mode (Y1 and O inputs) or the cooling slave signal is ignored. When “Y1”, and “O” inputs have been received and a cooling slave input from heating/cooling thermostat located in a hydronic heated/force air cooled zone are received the control will activate CR3 relay to open damper(s) which will allow for cooling to occur in zone. When cooling slave input (24VAC) signal is removed the control will turn off the CR3 relay output, if spring damper operation is selected, or active, the CR4 output if POPC damper operation is selected. This will close field installed damper(s) located in ductwork.

Hot Water Operation

After a hot water input is received, the diverting valve, loop pump and hot water pump are turned on. Five seconds after hot water input is received 2nd stage compressor is activated (Hot water operation only allows 2nd stage compressor).

Fan (G only)

The fan starts on low speed (PSC ON). Regardless of fan input “G” from thermostat, the fan will remain on low speed for 30 seconds at the end of each heating, cooling or emergency heat cycle.

Note: Fan speed can change automatically only with an ECM Motor.

ECM2 Airflow Selection DIP Switches (SW1)

A 12-position DIP switch package on the Envision control allows the airflow levels to be set for low, medium and high speed. (Refer to the ECM Blower Table on page 14.)

Only three of the DIP switches can be in the “on” position. The first “on” switch (the lowest position number) determines the “low speed fan” setting. The second “on” switch determines the “medium speed fan” setting, and the third “on” switch determines the “high speed fan” setting, (see page 14).

Lockout Conditions

During lockout mode, the appropriate unit and thermostat lockout LEDs will illuminate. The compressor, loop pump, hot water pump, and accessory outputs are de-energized. Unless the lockout is caused by an ECM2 low RPM fault, the fan will continue to run on low speed. If the thermostat calls for heating, emergency heat operation will occur.

Comfort Alert faults cannot be reset at the thermostat. All other lockout modes can be reset at the thermostat after turning the unit off, then on, which restores normal operation but keeps the unit lockout LED illuminated. Interruption of power to the unit will reset a lockout without a waiting period and clear all lockout LEDs and Comfort Alert faults.

High Pressure

This lockout mode occurs when the normally closed safety switch is opened momentarily (set at 600 PSI).

Low Pressure

This lockout mode occurs when the normally closed low pressure switch is opened for 30 continuous seconds (set at 40 PSI). A low pressure fault may also be indicated when a Comfort Alert lockout has occurred.

Low Source Water Temperature Limit (Water Flow)

This lockout mode occurs when the low source water thermostat temperature is at or below the selected sensing point (well 30°F or loop 15°F) for 30 continuous seconds.

Condensate Overflow

This lockout mode occurs when the condensate overflow level has been reached for 30 continuous seconds.

Microprocessor Control (cont.)

Fan RPM

The control board monitors fan RPM to sense operation. This lockout mode occurs if the fan RPM falls below the low RPM limit (100 RPM) for 30 continuous seconds (ECM only).

Compressor Monitoring/Comfort Alert

The Comfort Alert displays abnormal compressor conditions through a unique flash code displayed on the module. All fault codes are passive. All compressor alerts are displayed on the module by flashing the yellow Alert LED a specific number of times consecutively followed by a pause, and then repeated. The number of consecutive flashes or "Flash Code" correlates to a

specific abnormal condition. The red "TRIP" LED means there is a thermostat demand signal "Y" present but the compressor is not running. The green "POWER" LED means the module has power. Comfort Alert will not be displayed at the thermostat or on the unit LED status board (only displayed on the Comfort Alert module).

Green "POWER" LED - module has power

Red "TRIP" LED - Thermostat "Y" demand signal is present, but the compressor is not running.

Comfort Alert Flash Codes		
Yellow "ALERT" LED	LED Description	Cause
Flash Code 1	Long Run Time	Eighteen consecutive hours of compressor run time
Flash Code 2	System Pressure Trip	Not applicable
Flash Code 3	Short Cycling	Compressor run time of less than 3 minutes on 4 consecutive cycles
Flash Code 4	Locked Rotor	Four consecutive compressor protector trips indicating compressor won't start
Flash Code 5	Open Circuit	"Y" thermostat demand signal with no compressor current
Flash Code 6	Open Start Circuit	"Y" thermostat demand signal with no current in the start circuit
Flash Code 7	Open Run Circuit	"Y" thermostat demand signal with no current in the run circuit
Flash Code 8	Welded Contactor	Current detected with no "Y" thermostat demand signal present
Flash Code 9	Low Voltage	Less than 17 VAC detected in control circuit

* Flash code number corresponds to a number of LED flashes, followed by a pause and then repeated.

* TRIP and ALERT LEDs flashing at the same time indicates control circuit voltage is too low for operation.

* Reset ALERT flash code by removing 24 VAC power from module.

* Last ALERT flash code is displayed for 1 minute after module is powered on.

Resetting Comfort Alert Codes

Alert codes can be reset manually by cycling power off and on to the Comfort Alert module. Alert codes will reset automatically if conditions return to normal.

Flash Code Number	LED Description	Automatic Reset of Alert Codes
Flash Code 1	Long Run Time	Thirty "alert free" on and off cycles to reset automatically
Flash Code 2	System Pressure Trip	Not applicable
Flash Code 3	Short Cycling	Four "alert free" on and off cycles to reset automatically
Flash Code 4	Locked Rotor	Four "alert free" on and off cycles to reset automatically
Flash Code 5	Open Circuit	One "alert free" on and off cycles to reset automatically
Flash Code 6	Open Start Circuit	One "alert free" on and off cycles to reset automatically
Flash Code 7	Open Run Circuit	One "alert free" on and off cycles to reset automatically
Flash Code 8	Welded Contactor	One "alert free" on and off cycles to reset automatically
Flash Code 9	Low Voltage	Resets when voltage rises above 19 VAC

* Reset ALERT flash code by removing 24 VAC power from module.

Microprocessor Control (cont.)

ComforTalk and FaultFlash Thermostats

When the heat pump micro processor control is configured for ComforTalk or FaultFlash (SW2-8 'off') thermostats the thermostats will flash or display alert codes when a lockout condition is present. SW2-8 in the 'on' position configures the control to operate with typical thermostats (continuous lockout signal).

Tables 1 and 2 show the codes that will be displayed on the different ComforTalk and FaultFlash thermostats. Comfort Alert faults will not be displayed on the thermostat.

Table 1

FaultFlash Thermostats

TA32W01 and TP32W02 Thermostats	
Thermostat Display Lockout Code	Lockout Description
2 Flashes	High Pressure Fault
3 Flashes	Low Pressure Fault
4 Flashes	Freeze Protection Fault
5 Flashes	Water Flow Fault
6 Flashes	Hot Water Fault
7 Flashes	Condensate Fault
8 Flashes	Voltage our of Range
9 Flashes	RPM Fault

Comfort Alert fault codes can not be displayed on the thermostat module. See the Comfort Alert module to determine the specific flash code for compressor abnormalities.

Table 2

ComforTalk Thermostats

TP32U03, TP32U04 and TP32U05 Thermostats	
Thermostat Display Lockout Code	Lockout Description
"High Pressure" or "E2"	High Pressure Fault
"Low Pressure" or "E3"	Low Pressure Fault
"Water Flow" or "E4"	Freeze Protection Fault
"Freeze Protection" or "E5"	Water Flow Fault
"Hot Water" or "E6"	Hot Water Fault
"Condensate" or "E7"	Condensate Fault
"Voltage Range" or "E8"	Voltage our of Range
"RPM" or "E9"	RPM Fault

These thermostats can be configured to display the lockout condition "text" or error number.

* A slow flash of 1 second on and off means the heat pump microprocessor SW2-1 is configured for "Test Mode".

Comfort Alert fault codes can not be displayed on the thermostat module. See the Comfort Alert module to determine the specific flash code for compressor abnormalities.

Operation Logic

	Heating				Cooling		Hot Water Mode
	STG1	STG2	STG3	EMERG	STG1	STG2	
Compressor	On	On	On	Off	On	On	Stg 2 On
Reversing Valve	Off	Off	Off	Off	On	On	Off
Loop Pump	On	On	On	Off	On	On	On
Load Pump	Off	Off	Off	Off	Off	Off	On
Aux Heater	Off	Off	Staged	Staged	Off	Off	Off
Acc Relay	On	On	On	Off	On	On	Off
Diverting Valve	Off	Off	Off	Off	Off	Off	On
ECM Speed	On	On	On	On	On	On	Off
T-Stat Signal	Y1	Y1, Y2	Y1, Y2, W	W	Y1, O	Y1, Y2, O	HW
Damper	Off	Off	Off	On	Off	Off	Off
Auxiliary 1 - Out	On	On	On	Off	On	On	On

Pressure Drop

Model	GPM	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F
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	4.0	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	5.0	4.7	4.3
049 part load	5	1.1	1.1	1.0	0.9	0.9
	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	2.0	1.8	1.7	1.6	1.5
	12	3.9	3.6	3.4	3.2	2.9
	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	1.2	1.2	1.1	1.0	1.0
	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	3.9	3.6	3.4	3.2	2.9
	15	5.7	5.3	5.0	4.7	4.3
	18	8.1	7.6	7.1	6.6	6.1
	21	10.8	10.1	9.5	8.9	8.2
072 part load	10	2.6	2.5	2.3	2.1	2.0
	13	3.4	3.3	3.0	2.7	2.6
	16	6.5	6.1	5.8	5.4	5.0
	19	8.9	8.4	7.9	7.4	6.9

4/9/08

Engineering Guide Specifications

General

Synergy3D units shall be floor mounted type with horizontal air inlet and vertical up flow air discharge. Reverse cycle operation shall provide heating or cooling in the forced air mode. The unit shall also be capable of heating water for hydronic applications when the unit is not in the forced air mode. Units shall be ARI/ISO Standard 13256-1 performance 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. Each unit shall be mounted on a pallet for shipping.

The geothermal units shall be designed to operate with entering liquid temperature between 20°F and 120°F [-6.7°C - 48.9°C].

Refrigerant Circuit

All units shall contain a sealed refrigerant circuit including: a hermetic motor-compressor, bidirectional thermal expansion valve, finned tube air-to-refrigerant heat exchanger, solenoid valve, diverting valve, check valve, reversing valve, source coaxial tube water-to-refrigerant heat exchanger, load coaxial tube refrigerant-to-water heat exchanger, optional desuperheater coil, and service ports.

Compressors shall be high efficiency 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™ electro-coated finned tube coil shall be sized for low-face velocity and constructed of lanced aluminum fins bonded to rifled copper tubes in a staggered pattern not less than three rows deep.

Casing & 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.

Two 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 hinged 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 upflow vertical 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 vertical air discharge.

The compressor shall be double isolation mounted using selected durometer grommets to provide vibration free compressor mounting. The compressor mounting bracket shall be acoustically deadened galvanized steel to prevent vibration transmission to the cabinet.

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.

Fan Motor & Assembly

The fan 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. Tight fan housing geometry shall not be permitted. The fan housing shall be removable from the unit without disconnecting the supply air ductwork for servicing of the fan motor. The fan motor shall be a variable-speed ECM2 type. The ECM2 fan motor shall be soft starting, shall maintain constant CFM over its operating static range, and shall provide 12 CFM settings. The fan motor shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated and have thermal overload protection. ECM2 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, terminal block for thermostat wiring and solid-state controller for complete unit operation. Electro-mechanical 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. The controller shall also be

Engineering Guide Specifications (cont.)

capable of operating the unit in a hydronic heating mode with input from an external thermostat. A microprocessor-based controller that interfaces with a multi-stage electronic thermostat to monitor and control unit operation shall be provided. The control shall provide operational sequencing, fan speed control, fan failure high and low pressure switch monitoring, low source water temperature limit, 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. An integrally mounted ComfortAlert compressor sensing module shall provide monitoring for open start, open run, locked rotor, welded contactor and short cycle conditions.

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 fan motor and control box shall be harness plug wired for easy removal.

Piping

Source and load supply and return water connections (and optional desuperheater 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. All water piping shall be insulated to prevent condensation at low liquid temperatures, on the vertical upflow units, the condensate connection shall be a ¾ in. [19.1 mm] PVC socket with internally-trapped hose that can be routed to front or side locations.

Options & Accessories

Cupronickel Heat Exchanger

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

Desuperheater

An optional heat reclaiming desuperheater coil of vented double-wall copper construction suitable for potable water shall be provided. The coil shall be factory mounted inside the unit. An internal pump is not included. Order DPK5 for field installed pump and temperature limit.

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 fan switch, and indicating LEDs shall

be provided. The thermostat shall display in °F or °C.

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" Pleated Filter Accessory

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

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 box and resistance heater coil assembly mounted internally. 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 fan and transformer to provide emergency heat capability in the event of an open compressor circuit breaker.



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

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Size: 3 thru 6 Ton
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