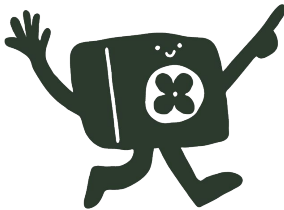


Technical Specification Document

Harvest Classic

Technical Specifications

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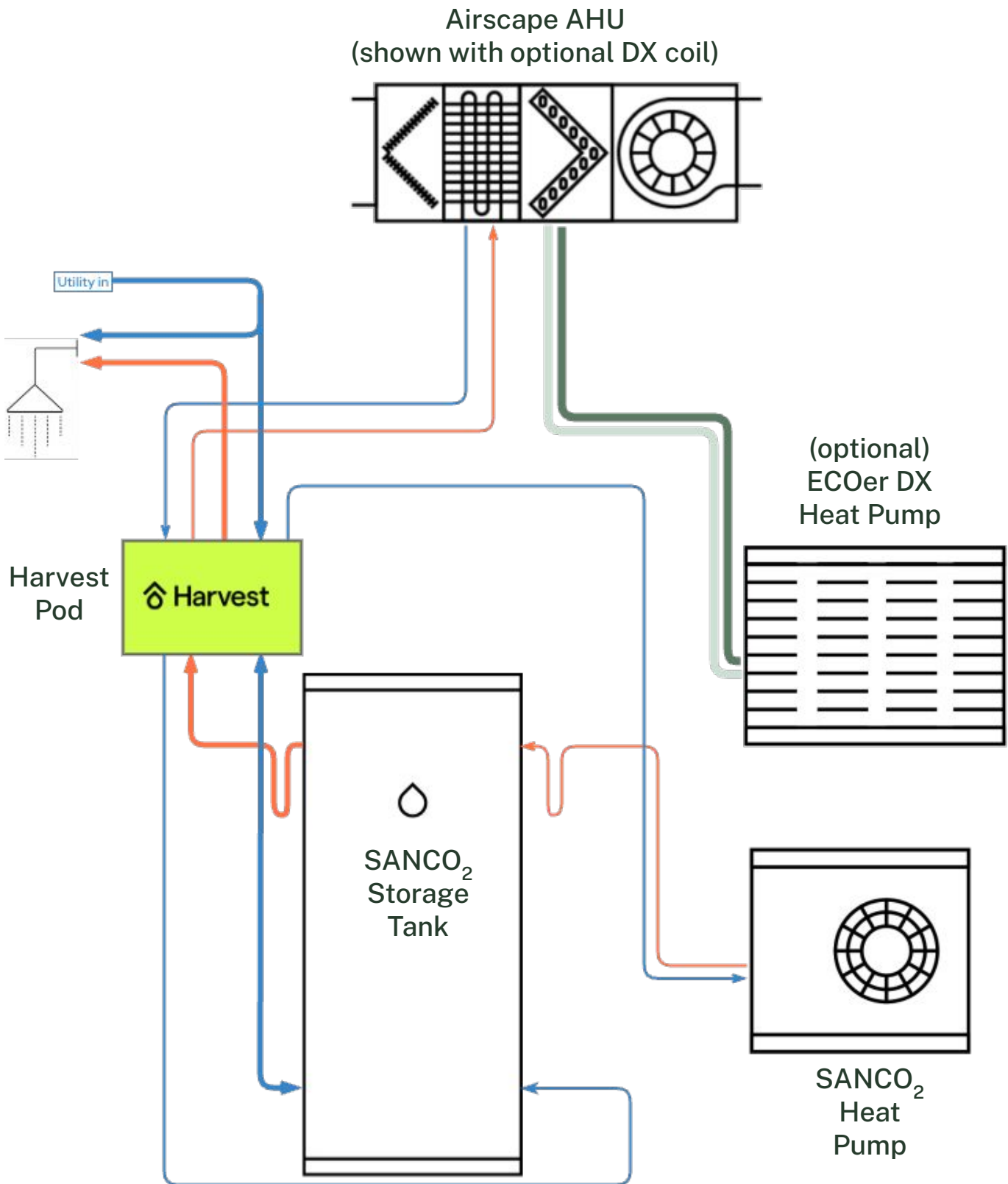


Harvest Classic integrates a Harvest Pod, the SANCO2 heat pump water heater, and a configurable air handler unit from Airscape into a smart thermal battery solution for heating and DHW applications up to 36 kBtu/hr. In addition, it can be configured to provide additional cooling capabilities with an optional ECOer conventional refrigerant heat pump for loads up to 36 kBtu/hr.

Harvest Classic offers modulated heat delivery for premium comfort and efficiency, and can include a built-in A/C economizer & night cooling for summer cooling efficiency. As a smart thermal battery, Harvest Classic will shift heat pump operation from times of high costs and emissions to times of low costs and emissions, while always delivering heating and hot water whenever it is needed.

Harvest offers up to 30% reductions in heating and hot water energy costs and 90% in CO2 emissions compared to gas. It protects your home from rising electrical rates and provides resilient dispatchable heating energy when you need it. In addition, Harvest Classic works well alongside solar photovoltaic and electrochemical battery systems (not required).

1. System Overview



2. System Sizing

The Peak capacity shown in this table is the heating level that can be sustained for 4 hours when the storage tank is full, and can be compared to the design load of the building. The Daily Heating Capacity is the amount of heat that can be provided to the house over a single day, and can be compared most directly with any known prior gas usage from a home. The constant capacity is the Daily Heating Capacity divided by 24hrs.

CA Climate Zone	Design Temp. (F)	SanCO2 HPHW		1	1	1	2	2	1
		Storage Volume (gal)		83	119	166	119	119	119
		AHU Configuration		A	A	A	A	B	C
		Aux Heat Source							ECOer HP
CZ2 (Santa Rosa)	32	Variable Heating Capacity	Peak* (kBtu/hr)	16.2	24.8	31.2	30.0	36.2	35.3
			Constant (kBtu/hr)	12.2	12.2	12.2	25.5	25.5	35.3
		Daily Heating Capacity (kBtu/day)		293	293	293	613	613	836
		Airflow (CFM)		704	919	1,080	1,050	1,204	1,240
CZ3 (Oakland)	40	Variable Heating Capacity	Peak* (kBtu/hr)	14.8	23.4	29.9	30.0	35.5	35.3
			Constant (kBtu/hr)	10.9	10.9	10.9	22.9	22.9	35.3
		Daily Heating Capacity (kBtu/day)		262	262	262	550	550	791
		Airflow (CFM)		671	886	1,047	1,050	1,186	1,240
CZ4 (San Jose)	38	Variable Heating Capacity	Peak* (kBtu/hr)	14.8	23.4	29.8	30.0	35.3	35.3
			Constant (kBtu/hr)	10.8	10.8	10.8	22.8	22.8	35.3
		Daily Heating Capacity (kBtu/day)		260	260	260	547	547	789
		Airflow (CFM)		670	885	1,045	1,050	1,183	1,240
CZ12 (Sacramento)	37	Variable Heating Capacity	Peak* (kBtu/hr)	14.8	23.4	29.8	30.0	35.3	35.3
			Constant (kBtu/hr)	10.8	10.8	10.8	22.8	22.8	35.3
		Daily Heating Capacity (kBtu/day)		260	260	260	547	547	789
		Airflow (CFM)		670	885	1,045	1,050	1,183	1,240

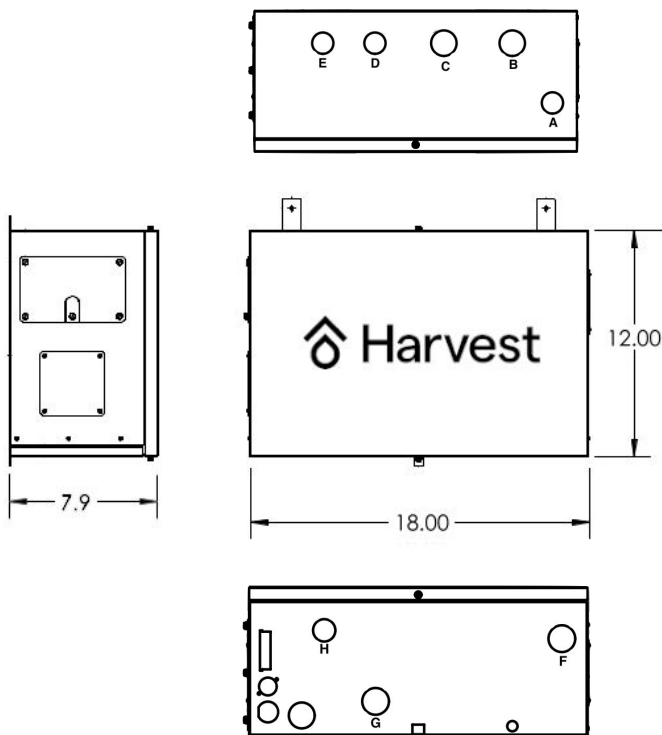
* Maximum heating capacity sustainable for 4 hrs

** The addition of the resistive Tank Booster can increase Daily Heating Capacity, and Constant Heating Capacity for sites on the margin.

3. System Components

3.1 Harvest Pod

The Harvest Pod controls the state of charge of the thermal energy storage, predicts heating and hot water needs based on occupants usage patterns and weather forecast, optimizes when the heat pumps operate so they are most efficient and cost effective, and prioritizes DHW over home heating as needed. It also enables remote monitoring to identify issues such as DHW leaks, HPWH failure to start, circulator failure, and optional ECOer HP failure.



Configuration	Open
Specifications	
Operating Temperature	32°F to 122°F
Operating Humidity	5% to 95% rh
Max Hydronic Flow	1.6 gal/min
Power Supplies	24 VDC, 90W*
Power Consumption: circulator off/on	2W/10 W
Wiring Connections	Screwless push-in terminal blocks & RJ45
Wiring	18 awg solid core & cat-5***
Networking	LAN/cat-5 (preferred) or wifi
Plumbing Connections	
Cold Water - Heat Pump (A)	1/2" NPT Male
Cold Water - Tank (F)	1/2" NPT Male
Hot Water - Tank (G)	3/4" NPT Male
DHW Hot (C)	3/4" NPT Male
Utility In (B)	3/4" NTP Male
Supply - To Coil / Heat Exchanger (D)	1/2" NPT Male
Return - To Coil / Heat Exchanger (E)	1/2" NPT Male
Return - Tank (H)	1/2" NPT Male
Dimensions	
Weight	33 lbs
Max Pipe Length to Coil	65 ft
Max Lift to Coil	35 ft
Max Incoming Water Pressure	75 psig
* Appropriate 24VDC Power Supply Included	
*** Cat-5 Equipment Communication Wire(s) Included	

Certifications:



UL 60730-1



CSA E60730-1

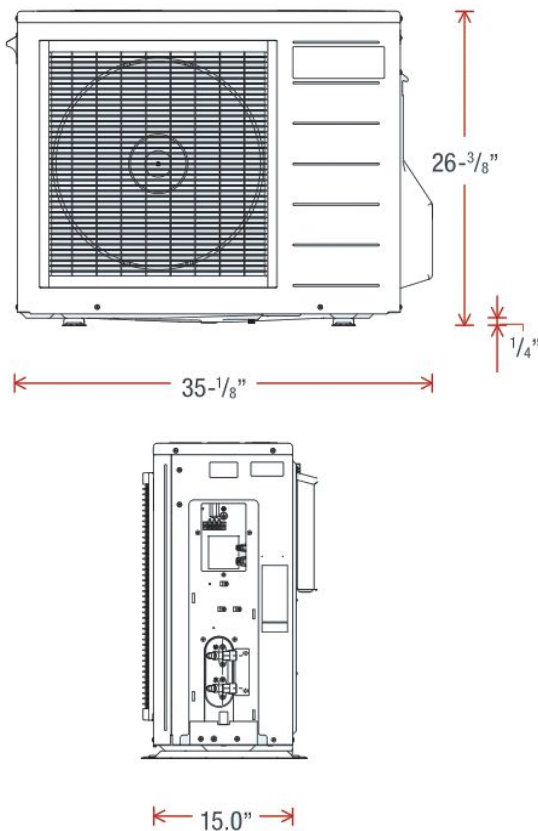


Tier 3


 Title 24
JA13


3.2 SANCO2 Water Heater

The SANCO2 water heater utilizes CO₂ refrigerant to generate up to 15 kBtu/hr of hot water. The water heater can operate at temperatures as low as -25°F, and has a maximum noise level of 37 dBA. It requires 208V/230V, 15A service, and can be ground or wall mounted.



Certifications:

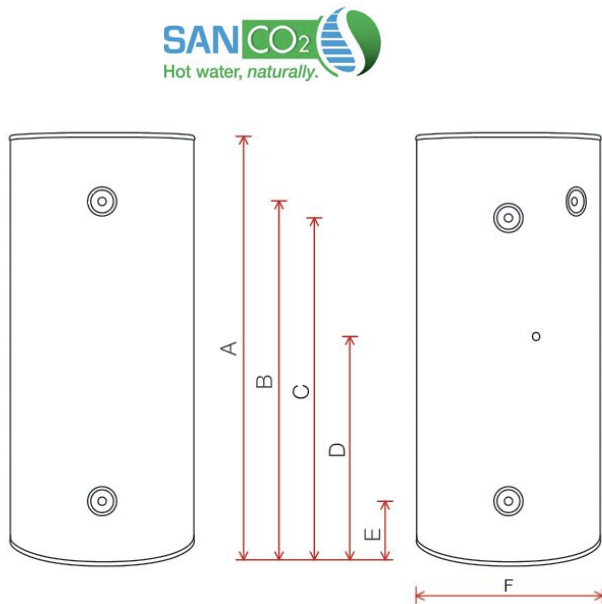


Model Number	GS4-45HPC	GS4-45HPC-D
Description	Standard	W/ drain pan heater for cold climates
Specifications		
Water Temperature Setting	145°F or 150°F	
Ambient Air Operating Range	-25°F to 104°F	-25°F to 114°F
Nominal Heating Capacity	15,400 Btu/hr	
Drain Pan Heating Power Consumption	N/A	132 W
Heating COP @ 80/47/17 F	5.5 / 4.2 / 2.8	5.5 / 4.2 / 2.6
Refrigerant Type (Pre-Charged)	R744 (CO ₂)	
Voltage	240v-1Ph-60Hz	
Breaker Size	15A	
MCA	7.2A	
Compressor Type	Rotary	
Noise Level	37 dBA	
Approved for Potable Water	Yes	
Water Hardness	< 0.1 oz/gallon	
Water Chloride levels	< 0.1 oz/gallon	
Water pH	6.5 < pH < 8.5	
Dimensions		
Weight	108 lbs	
Connections (Supply/Return)	1/2"	
Max Length Including Vertical Steps	66 ft	
Max Vertical Separation	23 ft	
Max Incoming Water Pressure	95 PSI	75 PSI

3.3 Thermal Energy Storage

Harvest’s thermal energy storage utilizes a SANCO₂ tank. The tank is available in 119 gallons and 83 gallons, depending on the application. Both tanks consist of 4 inlet/outlet plumbing connections with built-in diffusers that allow the water to remain thermally stratified.

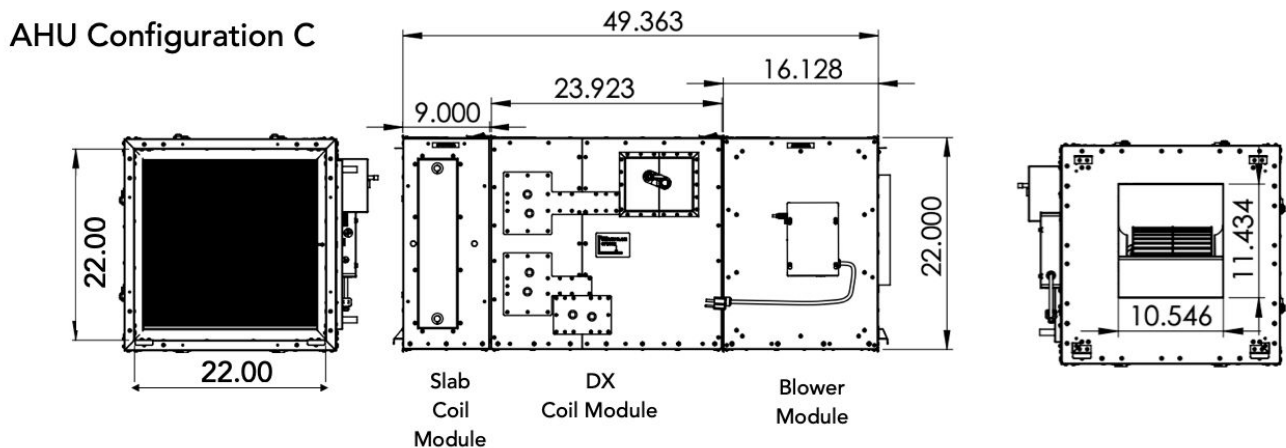
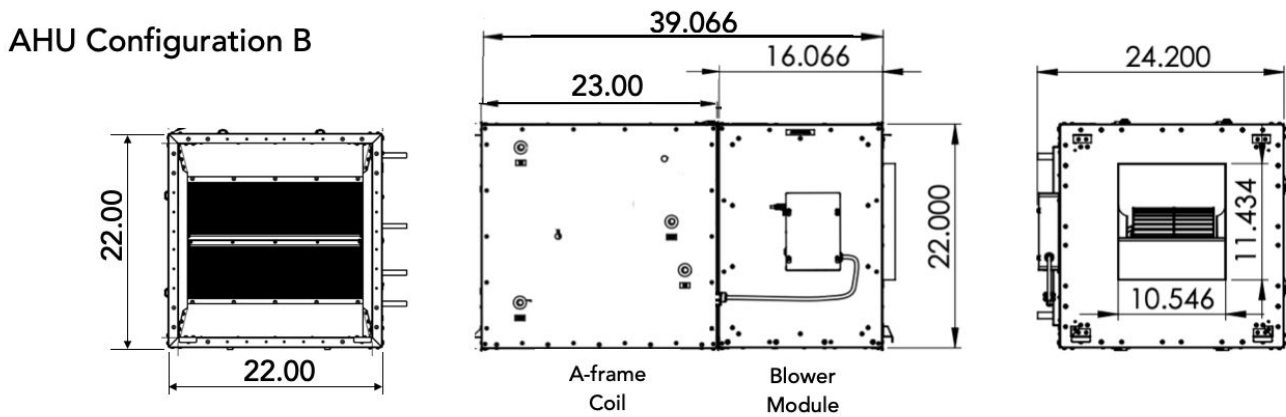
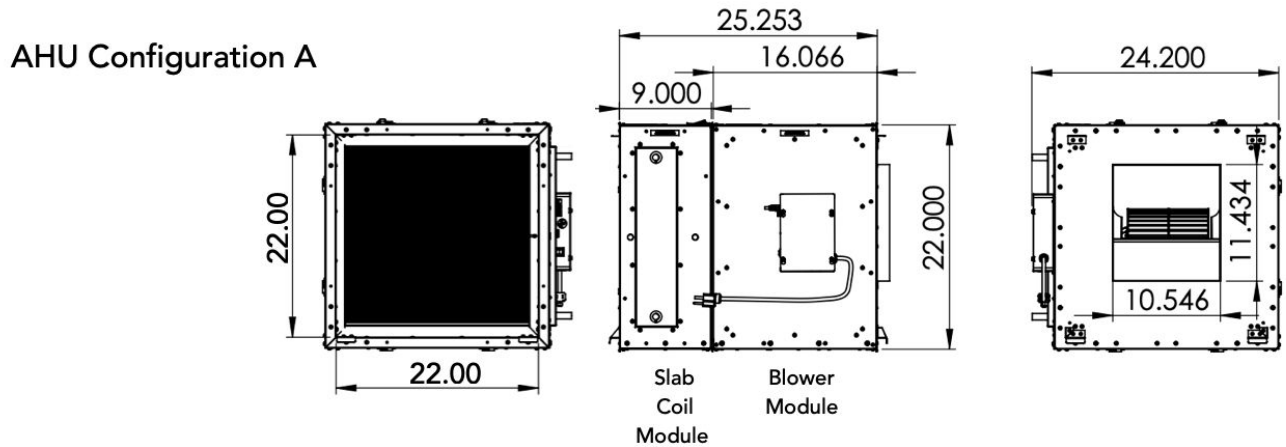
Both tanks also include a pressure relief valve port and built-in temperature sensor port.



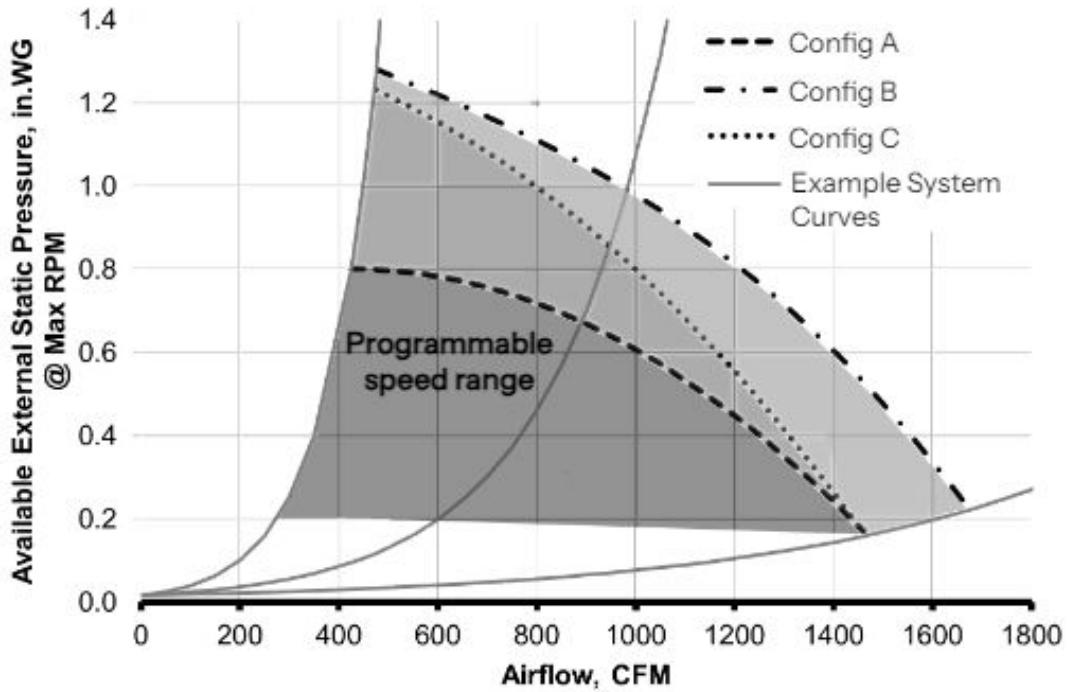
Model Number	SAN-83SSAQA	SAN-119GLBK
Capacity	83 gallons	119 gallons
Dimensions		
A: Height	68-7/8"	63-3/8"
B: Hot Water Outlet and PRV	60-1/4"	56"
C: Heat Pump Return	60-1/4"	60-1/4"
D: Sensor Port	40-5/8"	56"
E: Hydronic Return & Cold Water to HP	8-3/4"	4"
F: Diameter	24-1/2"	28"
Weight	115 lbs	345 lbs
Connections		
Hydronic Return	3/4" NPT	1-1/2" NPT
Hot Water Outlet	3/4" NPT	1-1/2" NPT
Hot Water Return from HP	3/4" NPT	3/4" NPT
Cold Water Inlet/Return to HP	3/4" NPT	3/4" NPT
Misc		
Material*	Stainless Steel	Glass-lined steel tank
Pressure Relief Setting	125 Psig / 210°F	125 Psig / 210°F
Warranty	15 years	10 years
*Both tanks must be insulated to R-8 minimum conductive insulation value. Harvest carries a 3-inch lined fiberglass insulation blanket with R-10 value.		

3.3 Airscape Air Handler Unit

The Airscape air handler units come in three different configurations; A, B, and C. All configurations require an additional MERV 13 filter module, and an A/C economizer/Night Cooling damper can be added to all configurations.



Air Handler Configuration Options			
Air Handler Configuration	A	B	C
Specifications			
Exterior Enclosure Material	Aluminum		
Insulation	Fibreglass 1"; R-4.3		
Directional	No		
Filter Module Model Number *	FB-MA-3-1		
Filter Orientation	v-bank		
Filter Type	Two 14"x20"x2" MERV-13		
Filter Module Weight	19lbs		
Hydronic Coil Model Number	HT-CB-MA-4-1	AH2-AF-HC-MA-0-1	HT-CB-MA-4-1
Type	Slab	A-frame	Slab
Approved for Potable Water	Yes		
Design Temperature Rise	22°-28°F delta-T air temperature rise across the heating coil (400-500 CFM/ton heating).		
Coil Connections	2 x 3/8"	4 x 3/8"	2 x 3/8"
Static Pressure Port Connections	2 x 1/8" Barb	2 x 1/8" Barb	2 x 1/8" Barb
Coil Material	Copper		
Hydronic Coil Weight	29 lbs	63 lbs	29 lbs
Blower Model Number	HT-CF-MA-5-10-P-23100005	HT-CF-MA-5-10-1HP-P-231020004	
Voltage	120 VAC 60 Hz		
HP	1/2	1	
Amps	3 A	6 A	
MOCP	15 A		
Blower module Weight	49 lbs		
DX Coil Model Number	N/A	N/A	201343
AHRI #	n/a	n/a	#203376742
Refrigerant	n/a	n/a	R-410A
Metering device	n/a	n/a	Factory-installed TXV metering
Liquid/Gas Pipe Size	n/a	n/a	3/8" O.D. / 3/4" O.D.
Drain Connection	n/a	n/a	3/4" NPT(F)
Coil Material	n/a	n/a	All-Aluminum
DX Coil Weight	n/a	n/a	46.7 lbs
Economizer/Night cooling Model Number (optional)	201040		
Door Seal	Replaceable EDPM door seals		
Weight	25 lbs		
Actuator	50 in/lbs , 90 deg, multi-directional, 24VDC, 6VA,		
Warranty	5 Year Parts and Labor		



CFM	Config A Power Usage (W)					
	External Static Pressure (in. w.g.)					
	0.2	0.4	0.6	0.8	1.0	1.2
400	25	44	63	82	101	-
600	50	78	106	-	-	-
800	88	126	164	-	-	-
1000	145	192	240	-	-	-
1200	226	282	-	-	-	-
1400	334	-	-	-	-	-
1600	-	-	-	-	-	-

CFM	Config B Power Usage (W)					
	External Static Pressure (in. w.g.)					
	0.2	0.4	0.6	0.8	1.0	1.2
400	23	41	60	-	-	-
600	40	69	97	126	154	183
800	67	104	142	180	218	-
1000	103	151	198	245	293	-
1200	153	210	267	324	-	-
1400	220	286	352	419	-	-
1600	305	-	-	-	-	-

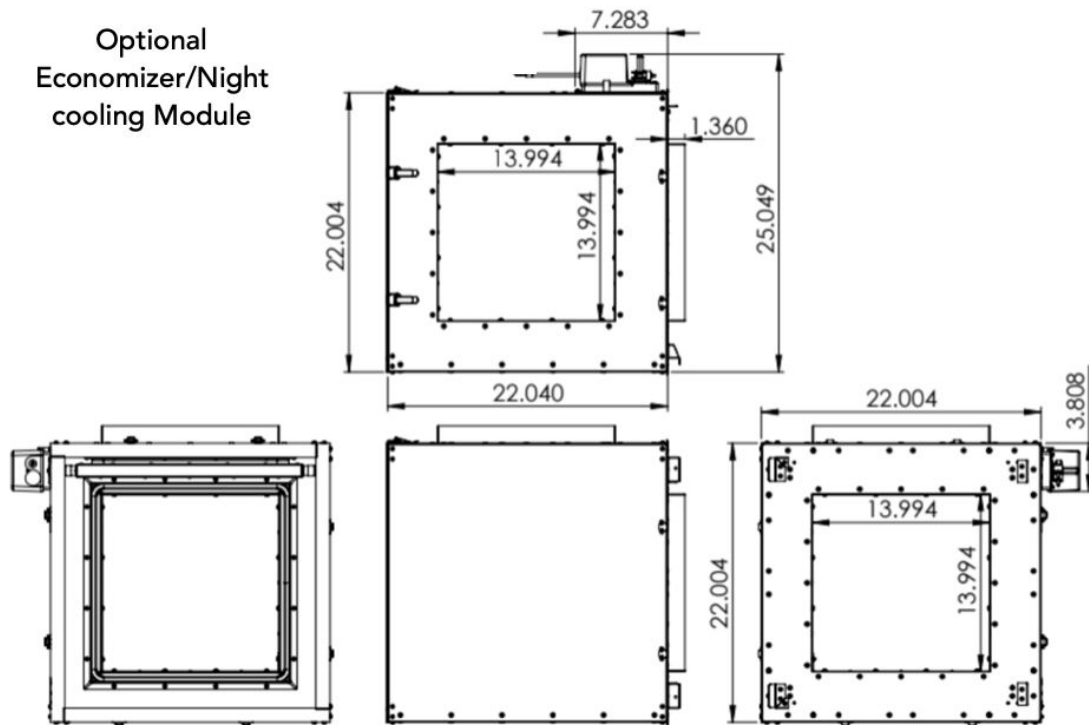
CFM	Config C Config A Power Usage (W)					
	External Static Pressure (in. w.g.)					
	0.2	0.4	0.6	0.8	1.0	1.2
400	29	39	54	-	-	-
600	63	73	96	119	141	164
800	120	126	157	187	217	-
1000	208	204	242	280	-	-
1200	334	313	-	-	-	-
1400	507	-	-	-	-	-



3.4 Optional Airscape Economizer/Night Cooling Module

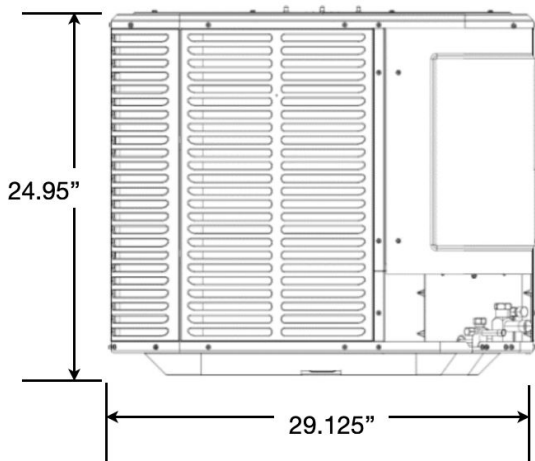
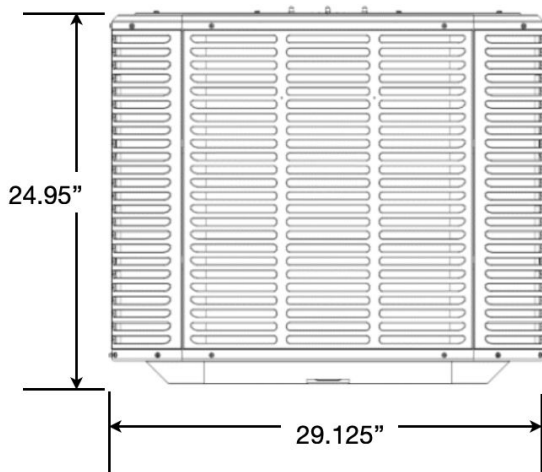
The optional Economizer/Night Cooling Module is added to the return side of the air handler unit. It provides capabilities for an Economizer function if the ECOer Heat Pump is being used, or it can function as a Night Cooling ventilator with a heat only system.

When paired with an Ecobee thermostat the thermostat can automatically switch between cooling from the ECOer Heat Pump and using the Economizer to bring in cooler outdoor air. Ecobee calls this “Free Cooling”. When used with a heat-only setup, the Ecobee thermostat can automatically control the ventilator to improve air quality, or cool the home if outdoor air is cooler than indoor air.



3.5 (Optional) ECOer DX Heat Pump

The ECOer ESi series heat pump is an innovative non-communicating inverter technology that integrates tightly into the Harvest Classic system. It is up to 16 SEER and 9.5 HSPF, and has a maximum noise level of 56 to 66 dBA.



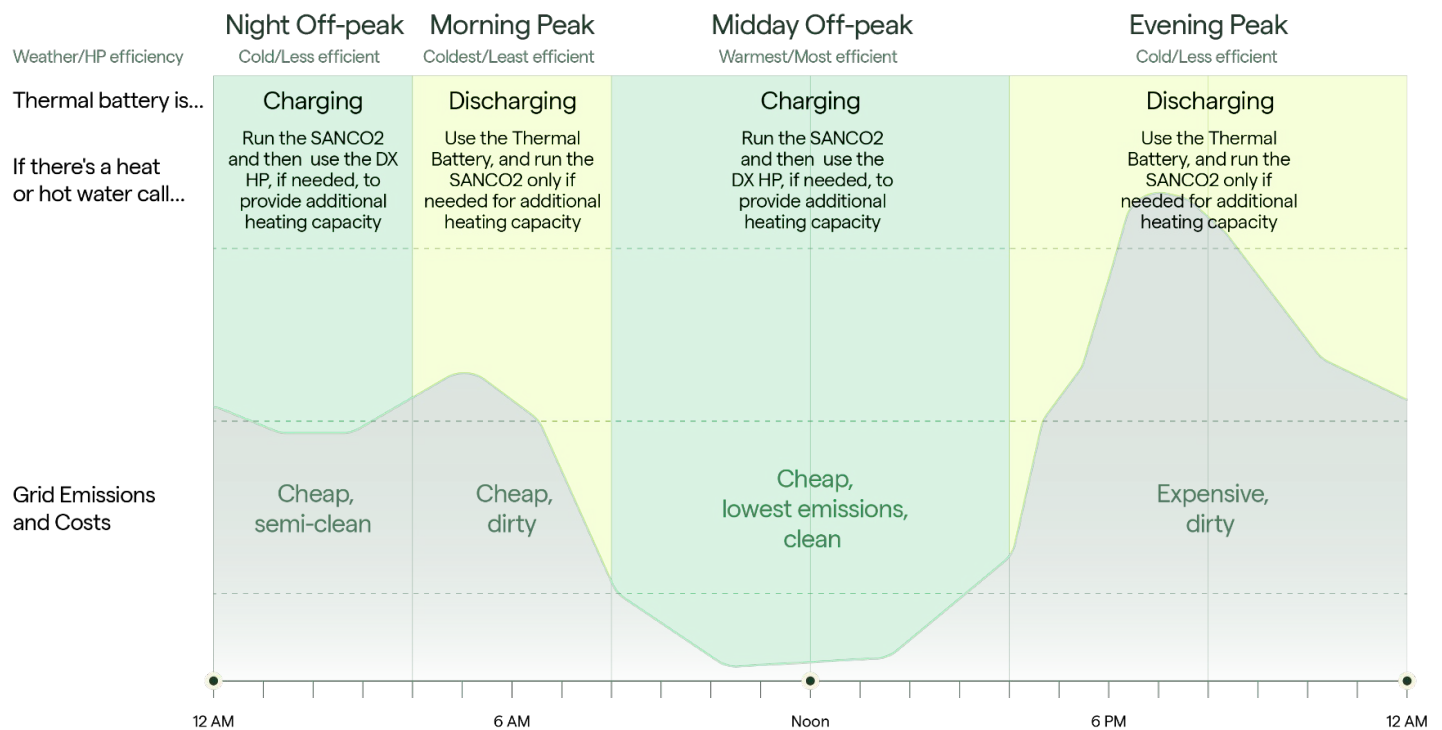
Model Number	EODA18H-2436B
Specifications	
Voltage	208/230 VAC, 60 Hz
Minimum Circuit Ampacity	24.4 A
Max. Over-current Protection	40 A
Compressor	Variable Rotary - Inverter
Crankcase heater	Internal Heating
RLA	17.5 A
LRA	27.9 A
Compressor HP	1/3
CFM @ 0 in. W.G 3250	3250
Coil Type	Copper tube with hydrophilic aluminum fins
Liquid/Gas Pipe Size	3/8" O.D. / 3/4" O.D.
Max. Line Length	100 ft
Max. Elevation Difference	50 ft
Heating Metering Device	EEV
Cooling Metering Device	TXV (inside coil)
Sound level	
Standard (2T/3T)	63 / 66 dB
Silent (2T/3T)	59 / 64 dB
Supersilent (2T/3T)	56 / 60 dB
Weight	150 lbs

4. Operation & Performance

4.1 Operation

The Harvest Pod serves four primary purposes:

- manage the thermal battery system’s state of charge,
- monitor and predict heating and hot water demand based on the weather forecast and occupant usage patterns,
- optimize the heat pump operating schedule to shift electricity usage from time of high price and emissions to times of low price and emissions, while always delivering heating and hot water whenever needed, and
- modulates heating delivery for control of the water return temperature which optimizes heat pump capacity and efficiency.



4.2 Domestic Hot Water Performance

The SANCO₂ HP, controlled to run at the cheapest and cleanest times of day by the Harvest Pod, provides remarkable domestic hot water performance, capacity, and recovery as part of the Harvest Open application.

Domestic Hot Water Performance*			
Tank Capacity	83 G	119 G	166 G
Coefficient of Performance	up to 5.5	up to 5.5	up to 5.5
Nominal Heating Capacity	15.4 kBtu/hr	15.4 kBtu/hr	15.4 kBtu/hr

* SANCO₂ performance data

4.3 System Seasonal Coefficient of Performance (S-SCOP)

An S-SCOP of 3.0 has been measured at five field sites ranging from 1,400 sqft to 3,200 sqft over 12 months in CZ3 and CZ12. S-SCOP includes the heat pump, air handler, circulator, and controller, as well as thermal losses while providing combined heating and DHW.

4.4 Thermal Battery System Dispatchable Energy

Dispatchable energy is the quantity of energy from the thermal battery system that is used for heating and hot water during each discharge cycle. It represents how much energy can be shifted from peak times to off-peak times.


- In winter, the thermal battery system is typically cycled twice per day: once in the morning to serve heating and DHW needs, and once in the evening for heating and DHW needs. Dispatched energy can be limited by thermal battery system capacity or SANCO₂ capacity, depending on the home energy needs.
- In summer, the thermal battery system is typically only charged once per day and only as much as needed to serve occupant needs until the next day. Dispatchable energy in summer is limited by energy demand rather than by thermal battery capacity.

Thermal Battery Dispatchable Energy Per Cycle			
	Storage Capacity		
	83 G	119 G	166 G
Heating Thermal Energy* (kBtu)	19	46	71
DHW Thermal Energy* ** (kBtu)	15	15	15
Combined DHW+Heating Thermal Energy* (kBtu)	34	61	86
Combined DHW+Heating Equivalent Electrical Load ***(kWh)	3.5	6.4	9.1

* available for both a morning and an evening peak period

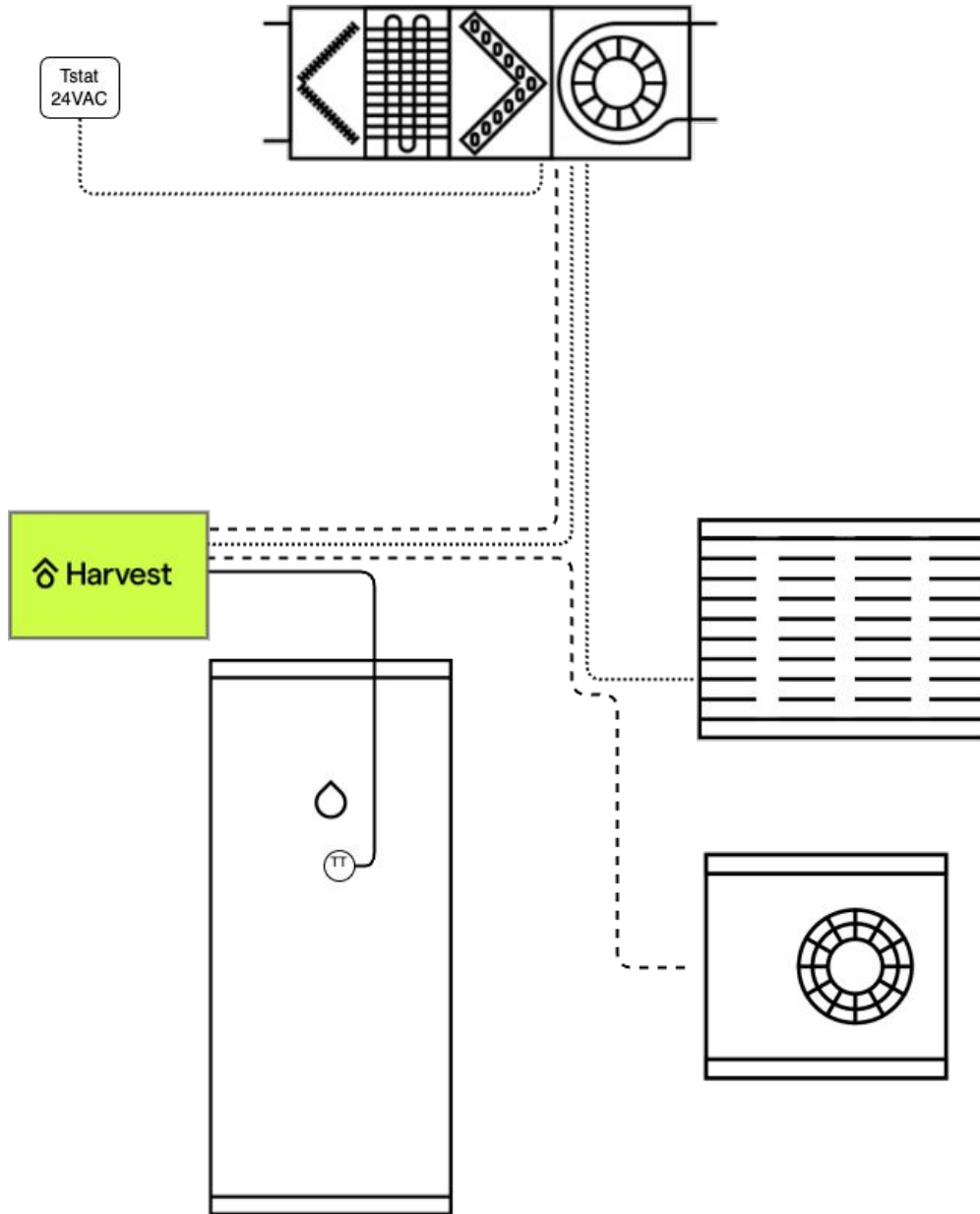
** 30 gal of peak-coincident DHW usage ***Assuming an average COP of 2.8

5.1 Field Supplied Plumbing Schedule

Symbol	Description	Qty	119 G Tank	83 G Tank	Notes
	½" and/or ¾" general plumbing	TBD	X	X	Configuration is location dependent
	plumbing insulation	TBD	X	X	1" closed cell insulation on all plumbing runs, including the cold lines
A	½" isolation valves	5	X	X	
B	¾" isolation valves	4	X	X	
ET	Expansion tank	1	X		Total volume >5 gal Acceptance Volume > 1.5 gal
		1		X	Total volume >3.5 gal Acceptance Volume > 1 gal
HB	½" hose bib drains	2	X	X	For purging and hydronic coil descaling
R&D	Reducers and dielectric connections for tank	2	X		Hex bushing reducer - 1 ½" x ¾" MPT x FPT, galvanized
		2	X		¾" dielectric union or 6" of red brass (if using Copper plumbing) *
		2	X		Hex bushing reducer - ¾" x ½" MPT x FPT, galvanized
		2	X		½" dielectric union or 6" of red brass (if using Copper plumbing) *
		2		X	Hex bushing reducer - ¾" x ½" MPT x FPT, brass
		2		X	Hex bushing coupler - ¾" MPT x FPT, brass
	Plumbing reducer at hydronic coil	2 or 4	X	X	Fitting Reducer, FTG X C, 1/2" X 3/8" (2 for Slab coil, 4 for A-frame coil)
PRV	Pressure Regulating Valve	1	X	X	REQUIRED IF NOT ALREADY PRESENT. Must comply with AS1357.
LNS	Refrigerant lineset	1	X	X	Follow manufacturer's recommendations

* CA Plumbing Code, Section 315.3: All connections between ferrous and nonferrous pipe shall be made with a six-inch red brass nipple or a dielectric union.

6. Low Voltage Wiring



Icon	Description	Qty	Notes
.....	Thermostat wire	TBD	18-8, 18-6, and 18-2
- - -	Cat5 communications cable	50'	Supplied with Harvest Pod
—	Tank thermistor cable	20'	Supplied with SANCO ₂ Tank

7. Commissioning

Commissioning the system consists of:

1. Connecting the system to WiFi if applicable
2. Setting the software parameters to match the hardware configuration
3. Verifying that wiring connections from the Harvest pod to the thermostat, SANCO₂ heat pump, SANCO₂ tank, and air handler are working properly
4. Configuring the hydronic heat output based on the home heating load
5. Configuring basic mode heat output
6. Selecting the appropriate time-of-use rate where applicable.

Commissioning is supported by the *Harvest Tech* app which works on phones, tablets and laptops. See the Installation Manual for more information on how to use the app.

8. Support

Online documentation at docs.harvest-thermal.com:

- Owner documents
- Installation manuals
- Technical documents
- Quick Guides and Videos

24/7 remote monitoring and diagnostics are provided by Harvest as long as the Harvest Pod is internet connected.

Harvest Support: support@harvest-thermal.com, 510-962-6898, 9 AM-5 PM
Monday-Friday

9. Service

See the Harvest Service Manual under docs.harvest-thermal.com / Technical Documents.