solstice®
HEAT PUMPS

IAW2-1023

MODEL SIM INVERTER MONOBLOC AIR-TO-WATER HEAT PUMP INSTALLATION AND OPERATION MANUAL

SPACE PAK®

IN UNITED STATES: 260 NORTH ELM ST. WESTFIELD, MA 01085 800-465-8558
IN CANADA: 7555 TRANMERE DRIVE, MISSISSAUGA, ONTARIO, L5S 1L4 (905) 670-5888

SECTION 1: INTRODUCTION

Read Before Proceeding

Hazard Definitions

The following terms are used throughout this manual to bring attention to the presence of potential hazards or to important information concerning the product.

DANGER Indicates an imminently hazardous situation, which if not avoided, WILL result in death, serious injury or substantial property damage.

WARNING Indicates an imminently hazardous situation, which if not avoided, COULD result in death, serious injury or substantial property damage.

CAUTION Indicates an imminently hazardous situation, which if not avoided, MAY result in minor injury or property damage.

NOTICE Used to notify of special instructions on installation, operation or maintenance, which are important to equipment, but not related to personal injury hazards.

Failure to comply with these recommendations will void the warranty.

CAUTION **ALL** Air-to-Water Heat Pump installations require some level of Propylene Glycol or Ethylene Glycol freeze protection in the hydronic circuit.

Refer to the graphic in Section 3 for the recommended concentration in your region, however in all cases it is the responsibility of the contractor to ensure that sufficient freeze protection has been installed to prevent freezing under all conditions.

Heat Exchanger rupture or other component failure due to freezing is not covered under the manufacturer's warranty.

Benefits and Features

Inverter Compressor

SIM Air-To-Water Heat Pump uses Inverter technology to precisely match the heating or cooling load.

Advanced Controls
Unit function is managed by a parametric microprocessor allowing on site adjustment to match specific operating requirements.

Easy Installation
The monobloc configuration keeps all refrigerant outdoors with no refrigeration connection or handling done on site. Only the water/antifreeze mixture is plumbed indoors.

Quiet Operation
The insulated housing, advanced fan profile, and variable speed fan and compressor all combine to achieve a low noise level of 58dBA @ 3 meters (SIM-060) and 54dBA @ 3 meters (SIM-036).

Efficient Energy Transfer
SIM heat pump is equipped with high efficiency, large surface area energy exchangers for both the air to refrigerant heat transfer and the refrigerant to water energy transfer.

Low Ambient Temperature Cooling Operation
SIM heat pump is capable of operating in cooling mode in ambient temperatures as low as 5°F.

Outdoor Coils
Outdoor coils have been tested in accordance with GB/T 2432.17 salt spray test.

Specification

		Units	SIM-036	SIM-060
Cooling	Capacity Range	BTU/hr (kW)	12,704 - 34,423 (4-10)	17,884 - 59,523 (5-17)
	Efficiency Range	EER	11.26-11.74	10.75-11.26
	Efficiency	IPLV	12.2	12.1
	Water Temperature Setpoint (Return)	°F (°C)	46-68 (8-20)	
	Ambient Temp Range	°F (°C)	5-110 (-15-43)	
Heating	Capacity Range	BTU/hr (kW)	13,191 - 38,755 (4-11)	25,413 - 70,666 (7-21)
	Efficiency Range	COP	4.04-5.01	3.69-4.67
	Water Temperature Setpoint (Return)	°F (°C)	86-130 (30-55)	
	Ambient Temp Range	°F (°C)	5-109 (-15-43)	
CEC Data	Cooling Capacity*	BTU/hr (kW)	34,120 (10)	49,490 (15)
	Cooling Efficiency*	EER	10	8.8
	Heating Capacity**	BTU/hr (kW)	39,240 (12)	56,315 (17)
	Heating Efficiency**	COP	3	
	Heating Capacity***	BTU/hr (kW)	21,236 (6)	48,260 (14)
	Heating Efficiency***	COP	1.9	
Electrical	Power	V/Ph/Hz	230/1/60	
	Fan Motor	A	0.8	0.8 (x2)
	Compressor Motor	A	14	25
	MCA	A	24	35
	MOPD	A	30	50
	SCCR	kA	5	
Refrigerant	Type		R410A	
	Factory Charge	lbs. (kg)	5.29 (2.4)	7.06 (3.2)
Fan	Quantity		1	2
	Power Input	W	200	
	Type		EC	
	Max Speed	RPM	750	
Sound (@3 ft/1m)	Maximum	dBA	54	58
Hydronic	Rated Flow	GPM	7	13
	Max Water Temp	°F (°C)	131 (55)	
	Piping Connections	inch (cm)	1 (2.5)	1.25 (3.2)
	Rated Pressure Drop @ Rated Flow	PSI (ft W.C.)	6 (13.8)	10 (23)
Compressor	Type		Rotary Inverter	
	Speed Range	Hz	30-90	
	Brand		Mitsubishi	
	Quantity		1	
Dimensions	Net Dimensions (W x D x H)	inch (cm)	39 x 18 x 35 (98 x 47 x 90)	39 x 13 x 52 (99 x 33 x 132)
	Shipping Dimensions (W x D x H)	inch (cm)	41 x 19 x 36 (104 x 49 x 92)	42 x 18 x 53 (107 x 46 x 135)
	Net Weight	lbs. (kg)	243 (110)	326 (148)
	Shipping Weight	lbs. (kg)	271 (123)	368 (167)

CEC is California Energy Commission.Data is tested in accordance with AHRI 550/590
*= 44°F LWT 54°F EWT @10 GPM & 95°F DB Ambient
**= 120°F LWT 107°F EWT @10 GPM & 47°F DB Ambient
***= 120°F LWT 110°F EWT @10 GPM & 17°F DB Ambient

Performance

(all data based on pure water)

SIM-036 HEATING

Water temperatures shown in the following tables are controlled by the Heating Target Temperature Set point. This is the temperature of the water returning to the heat pump from the system. The supply water temperature will be higher than the Return Target Temperature. Settings that will result in supply temperature in excess of 131°F are not recommended and cannot be expected to be achieved under all conditions.

Ambient Temp.	Compressor Frequency	Return Water Temperature: 86°F, Supply Water Temperature: 95°F							
		30	40	50	60	70	80	90	
45°F DB, 43°F WB	Heating Capacity	13,191	17,406	21,621	25,833	30,140	34,447	38,755	BTU/hr
	COP	5.01	4.93	4.88	4.84	4.46	4.21	4.04	
36°F DB, 34°F WB	Heating Capacity	11,062	14,836	18,611	22,386	26,086	29,785	33,488	BTU/hr
	COP	4.01	3.87	3.79	3.74	3.64	3.57	3.52	
19°F DB, 18°F WB	Heating Capacity	10,539	12,621	14,700	16,782	19,536	22,294	25,048	BTU/hr
	COP	2.97	2.91	2.88	2.85	2.81	2.78	2.75	
5°F DB, 3°F WB	Heating Capacity	8,256	9,829	11,406	12,980	15,007	17,038	19,065	BTU/hr
	COP	2.18	2.25	2.31	2.35	2.29	2.25	2.22	

Ambient Temp.	Compressor Frequency	Return Water Temperature: 104°F, Supply Water Temperature: 113°F							
		30	40	50	60	70	80	90	
45°F DB, 43°F WB	Heating Capacity	12,116	16,014	20,086	24,154	28,222	32,294	36,366	BTU/hr
	COP	3.70	3.54	3.47	3.43	3.31	3.22	3.16	
36°F DB, 34°F WB	Heating Capacity	9,215	13,065	16,915	20,765	24,427	28,089	31,751	BTU/hr
	COP	3.20	3.06	2.98	2.94	2.88	2.84	2.81	
19°F DB, 18°F WB	Heating Capacity	7,345	10,200	13,300	15,345	18,219	21,089	23,963	BTU/hr
	COP	2.50	2.37	2.29	2.23	2.18	2.15	2.13	
5°F DB, 3°F WB	Heating Capacity	4,150	6,703	9,256	11,809	14,362	16,915	19,468	BTU/hr
	COP	1.78	1.82	1.84	1.85	1.88	1.91	1.93	

Ambient Temp.	Compressor Frequency	Return Water Temperature: 122°F, Supply Water Temperature: 131°F							
		30	40	50	60	70	80	90	
45°F DB, 43°F WB	Heating Capacity	18,150	19,256	20,362	21,471	26,004	30,536	-	BTU/hr
	COP	2.80	2.69	2.60	2.52	2.35	2.24	-	
36°F DB, 34°F WB	Heating Capacity	12,058	14,270	16,485	18,696	22,471	27,007	-	BTU/hr
	COP	2.50	2.33	2.21	2.13	2.14	2.20	-	
19°F DB, 18°F WB	Heating Capacity	8,240	11,320	13,481	14,529	17,444	20,362	-	BTU/hr
	COP	1.45	1.57	1.68	1.79	1.79	1.79	-	
5°F DB, 3°F WB	Heating Capacity	3,413	5,782	8,154	10,522	13,345	16,167	-	BTU/hr
	COP	1.13	1.27	1.34	1.38	1.44	1.48	-	

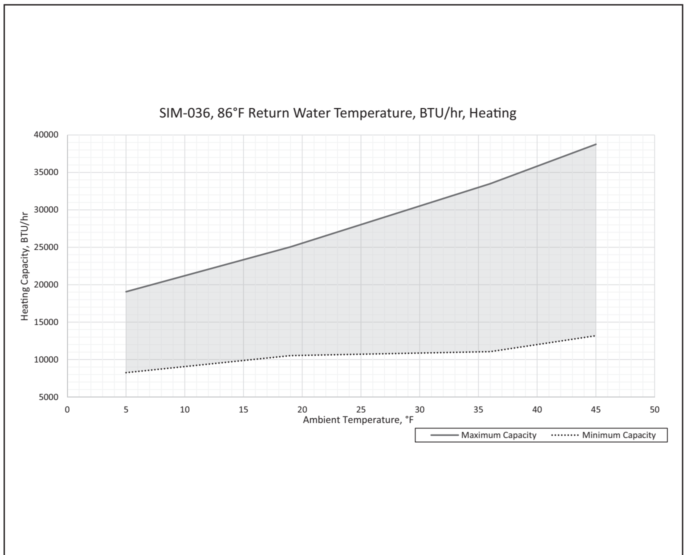
SIM-036 COOLING

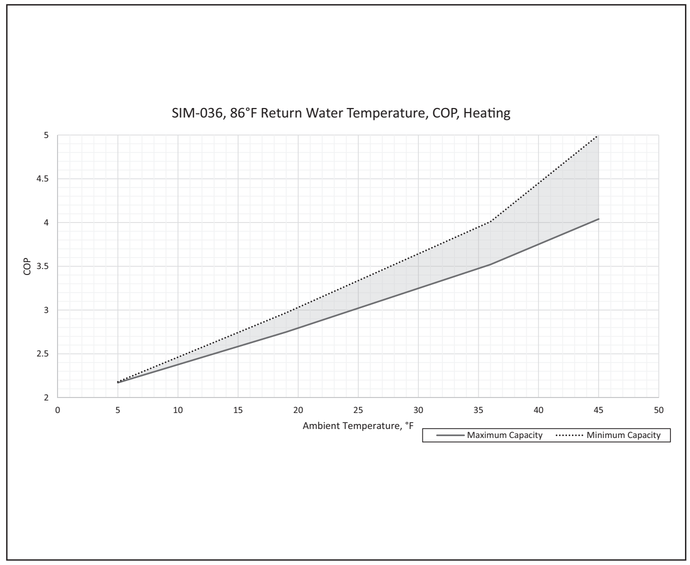
Water temperatures shown in the following table(s) are controlled by the Cooling Target Temperature Set point. This is the temperature of the water returning to the heat pump from the system. ("INLET" temperature on the home screen) The supply water temperature ("OUTLET" temperature on the home screen) will be lower than the Return Target Temperature. Settings that will result in the supply temperature below 37°F are not recommended and cannot be expected to be achieved under all Conditions.

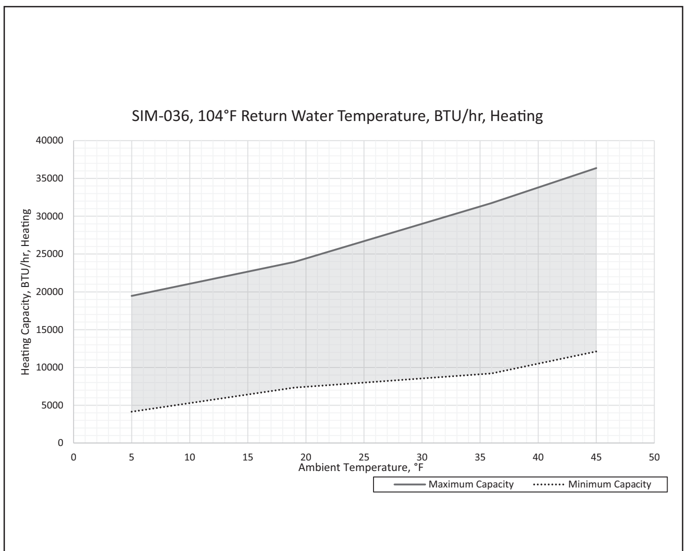
Ambient Temp.	Compressor Frequency	Return Water Temperature: 46°F, Supply Water Temperature: 37°F							
		30	40	50	60	70	80	90	
86°F DB	Cooling Capacity	8,128	10,757	16,904	20,285	23,768	26,603	30,837	BTU/hr
	EER	9.90	10.14	10.24	10.00	9.62	9.42	9.22	
95°F DB	Cooling Capacity	8,025	10,689	16,836	20,217	23,666	27,149	30,735	BTU/hr
	EER	9.42	9.80	10.07	9.73	9.39	9.18	9.04	
104°F DB	Cooling Capacity	7,991	10,655	16,768	20,114	23,564	27,115	30,394	BTU/hr
	EER	9.18	9.52	9.93	9.56	9.28	9.04	8.81	
113°F DB	Cooling Capacity	7,957	10,587	16,665	20,046	23,495	27,047	-	BTU/hr
	EER	8.94	9.28	9.69	9.42	9.18	8.87	-	

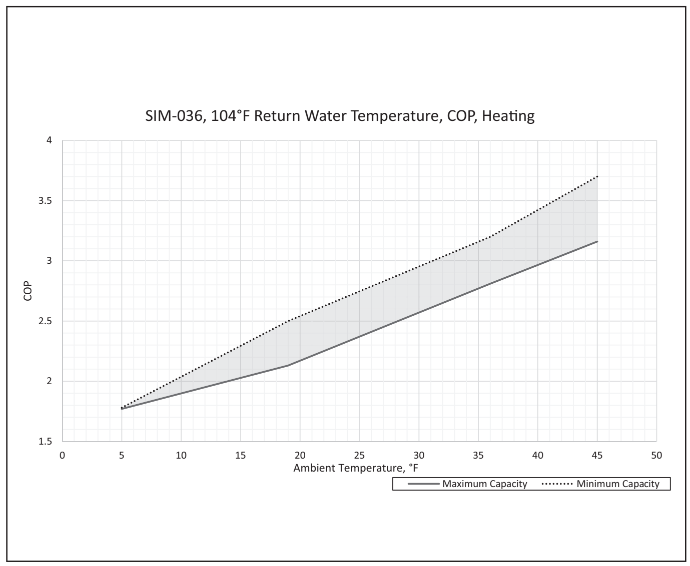
Ambient Temp.	Compressor Frequency	Return Water Temperature: 59°F, Supply Water Temperature: 50°F							
		30	40	50	60	70	80	90	
86°F DB	Cooling Capacity	12,704	16,631	21,002	24,486	28,413	31,350	34,423	BTU/hr
	EER	11.74	12.32	12.97	12.56	11.67	11.40	11.26	
95°F DB	Cooling Capacity	12,465	16,563	20,661	24,281	28,242	31,520	34,594	BTU/hr
	EER	11.23	11.98	12.42	11.84	11.06	10.89	10.65	
104°F DB	Cooling Capacity	12,157	16,085	20,251	23,359	27,935	30,394	34,082	BTU/hr
	EER	10.31	10.72	11.64	10.85	9.83	9.66	9.42	
113°F DB	Cooling Capacity	11,440	15,538	19,636	22,368	25,613	-	-	BTU/hr
	EER	9.39	10.03	10.44	9.80	8.77	-	-	

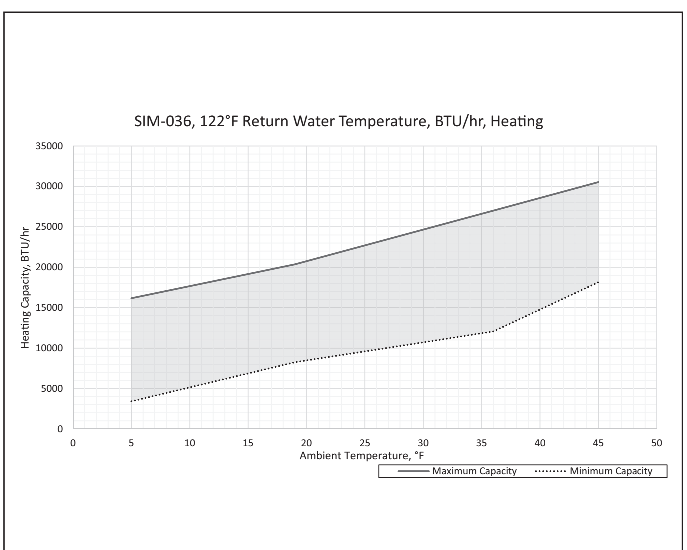
SIM-036 Heating Performance
(all data based on pure water)

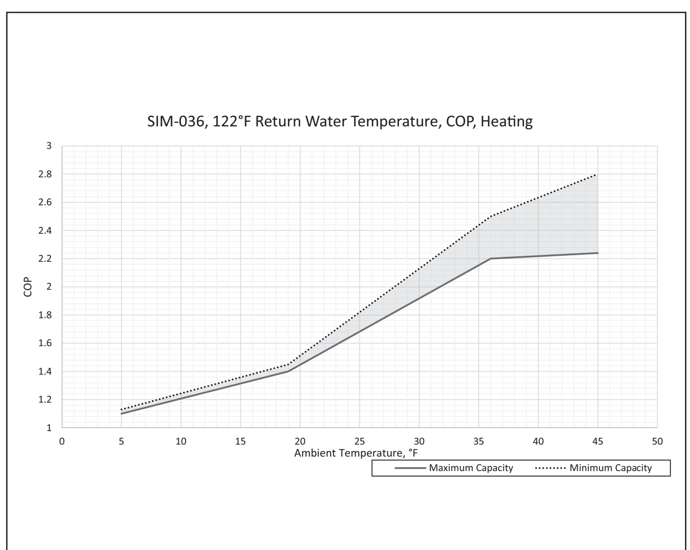




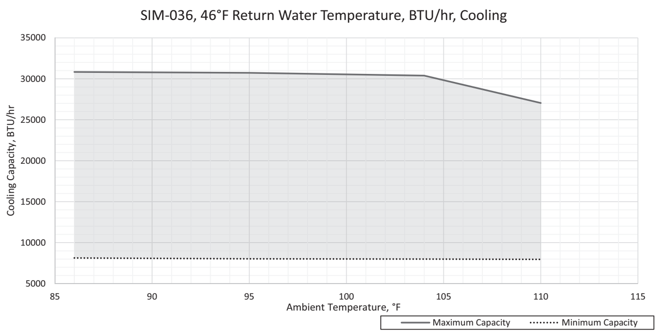


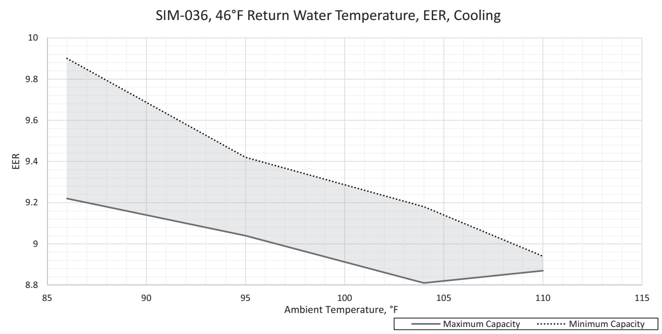


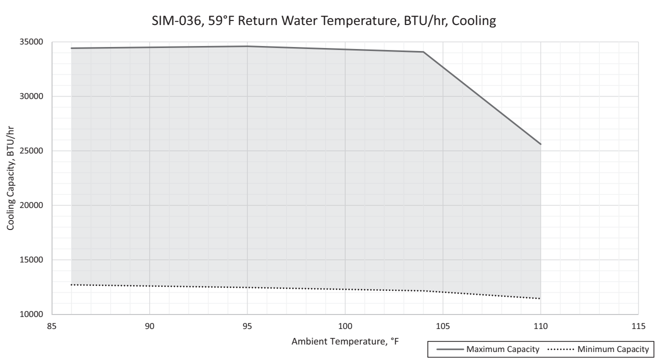


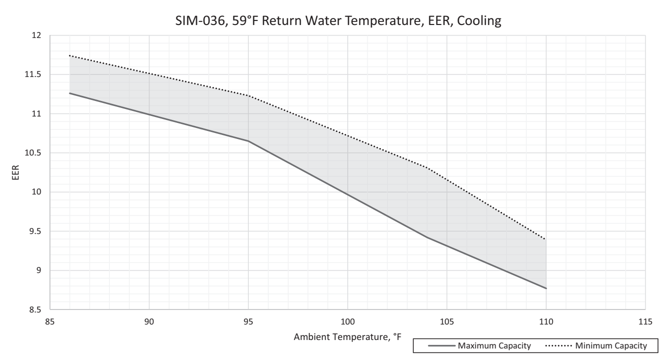


SIM-036 Cooling Performance
(all data based on pure water)









Performance

(all data based on pure water)

SIM-060 HEATING

Water temperatures shown in the following tables are controlled by the Heating Target Temperature Set point. This is the temperature of the water returning to the heat pump from the system. The supply water temperature will be higher than the Return Target Temperature. Settings that will result in supply Temperature in excess of 131°F are not recommended and cannot be expected to be achieved under all conditions.

Ambient Temp.	Compressor Frequency	Return water temperature: 86°F, supply water temperature: 95°F							
		30	40	50	60	70	80	90	
45°F DB,	Heating Capacity	25,413	33,560	41,703	49,847	56,789	63,728	70,666	BTU/hr
43°F WB	COP	4.67	4.58	4.53	4.49	4.12	3.87	3.69	
36°F DB,	Heating Capacity	18,928	26,847	34,765	42,680	47,895	53,110	58,321	BTU/hr
34°F WB	COP	3.95	3.80	3.72	3.67	3.32	3.08	2.91	
19°F DB,	Heating Capacity	15,309	21,275	27,239	32,348	37,912	43,475	49,099	BTU/hr
18°F WB	COP	3.10	2.96	2.87	2.80	2.65	2.55	2.47	
5°F DB,	Heating Capacity	11,690	15,703	19,713	23,727	28,557	33,389	38,219	BTU/hr
3°F WB	COP	2.08	2.08	2.07	2.07	2.05	2.01	1.96	

Ambient Temp.	Compressor Frequency	Return water temperature:104°F, supply water temperature:113°F							
		30	40	50	60	70	80	90	
45°F DB,	Heating Capacity	21,973	30,116	38,263	46,407	52,830	59,250	65,673	BTU/hr
43°F WB	COP	3.65	3.53	3.47	3.43	3.24	3.11	3.01	
36°F DB,	Heating Capacity	17,748	25,666	33,584	41,502	46,898	52,297	57,693	BTU/hr
34°F WB	COP	2.95	3.01	3.05	3.07	2.88	2.74	2.64	
19°F DB,	Heating Capacity	14,891	20,799	26,707	32,144	37,222	44,161	47,376	BTU/hr
18°F WB	COP	2.50	2.40	2.33	2.28	2.18	2.21	2.06	
5°F DB,	Heating Capacity	12,034	15,932	19,830	23,731	26,727	29,724	32,720	BTU/hr
3°F WB	COP	2.00	1.87	1.80	1.75	1.64	1.56	1.50	

Ambient Temp.	Compressor Frequency	Return water temperature, 122°F, supply water temperature 131°F							
		30	40	50	60	70	80	90	
45°F DB,	Heating Capacity	18,150	26,294	34,441	42,584	48,004	53,427	-	BTU/hr
43°F WB	COP	2.80	2.67	2.61	2.57	2.50	2.45	-	
36°F DB,	Heating Capacity	12,058	19,748	27,437	35,130	45,045	50,465	-	BTU/hr
34°F WB	COP	2.50	2.28	2.20	2.15	2.17	2.20	-	
19°F DB,	Heating Capacity	9,782	15,519	21,256	24,389	28,017	31,642	35,270	BTU/hr
18°F WB	COP	1.45	1.47	1.48	1.49	1.55	1.59	1.63	
5°F DB,	Heating Capacity	7,505	11,290	15,075	18,860	22,942	27,021	31,099	BTU/hr
3°F WB	COP	1.13	1.13	1.13	1.13	1.19	1.24	1.28	

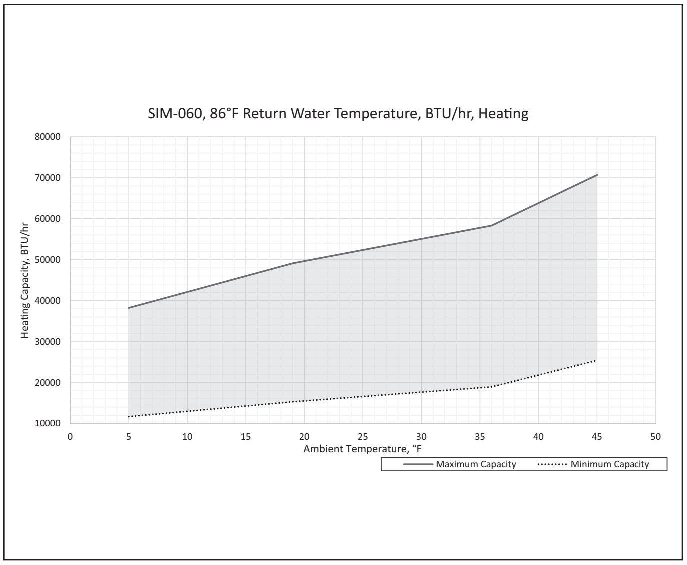
SIM-060 COOLING

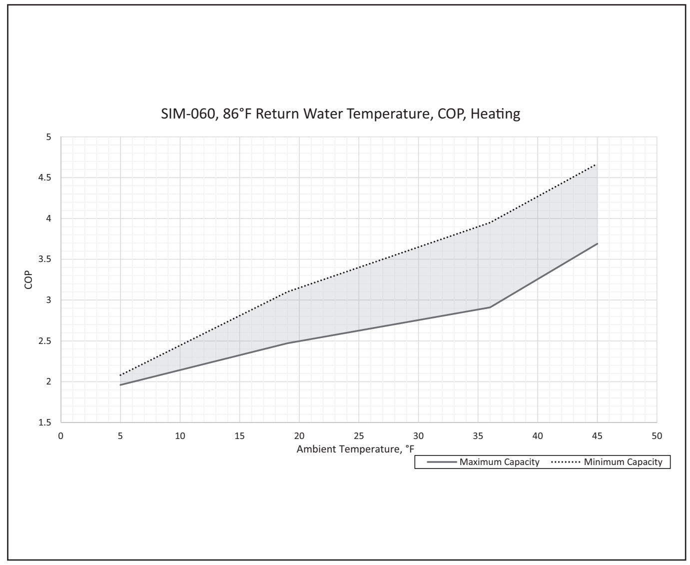
Water temperatures shown in the following table(s) are controlled by the Cooling Target Temperature Set point. This is the temperature of the water returning to the heat pump from the system. ("INLET" temperature on the home screen) The supply water temperature ("OUTLET" temperature on the home screen) will be lower than the Return Target Temperature. Settings that will result in the supply temperature below 37°F are not recommended and cannot be expected to be achieved under all conditions.

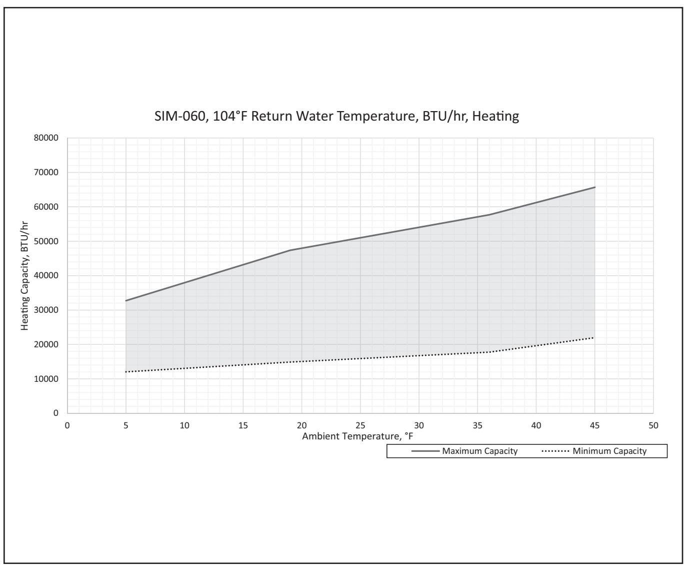
Ambient Temp.	Compressor Frequency	Return water temperature: 46°F, supply water temperature 37°F							
		30	40	50	60	70	80	90	
86°F DB	Cooling Capacity	14,915	26,724	32,389	34,915	41,366	45,973	49,591	BTU/hr
	EER	9.83	9.93	10.07	10.04	9.78	9.39	9.04	
95°F DB	Cooling Capacity	14,847	26,621	32,321	34,813	41,297	45,905	49,489	BTU/hr
	EER	9.28	9.69	9.90	9.94	9.52	8.98	8.84	
104°F DB	Cooling Capacity	14,744	26,485	32,185	34,642	41,161	45,734	49,318	BTU/hr
	EER	9.04	9.49	9.73	9.39	9.04	8.77	8.63	
113°F DB	Cooling Capacity	14,676	26,280	32,082	34,574	40,990	45,598	-	BTU/hr
	EER	8.57	9.15	9.49	8.98	8.84	8.23	-	

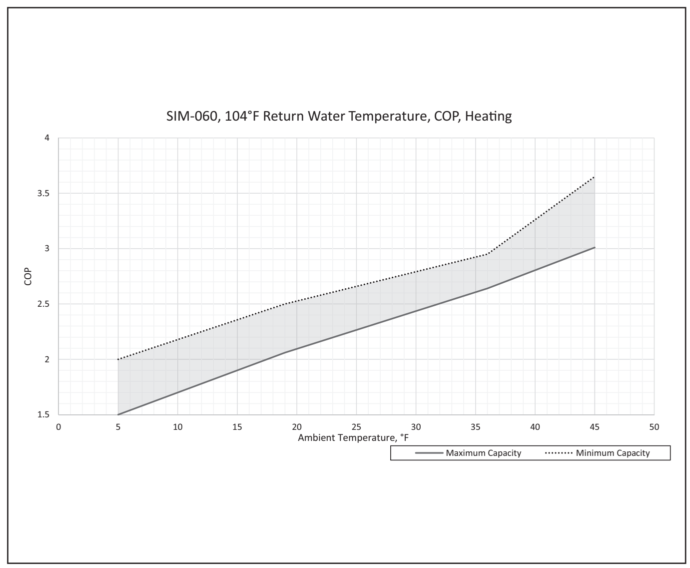
Ambient Temp.	Compressor Frequency	Return water temperature: 59°F, supply water temperature: 50°F							
		30	40	50	60	70	80	90	
86°F DB	Cooling Capacity	17,884	31,741	38,874	41,912	49,625	55,154	59,523	BTU/hr
	EER	11.26	11.54	11.60	11.47	11.33	11.16	10.75	
95°F DB	Cooling Capacity	17,816	31,946	38,772	41,297	49,557	55,086	58,021	BTU/hr
	EER	10.89	11.26	11.30	11.19	10.75	10.34	10.07	
104°F DB	Cooling Capacity	17,679	31,775	38,635	41,570	49,386	54,881	57,338	BTU/hr
	EER	10.00	10.12	10.35	10.30	9.97	9.73	9.52	
113°F DB	Cooling Capacity	17,611	28,123	37,202	41,502	49,181	54,710	-	BTU/hr
	EER	8.91	9.39	9.73	9.39	9.15	8.87	-	

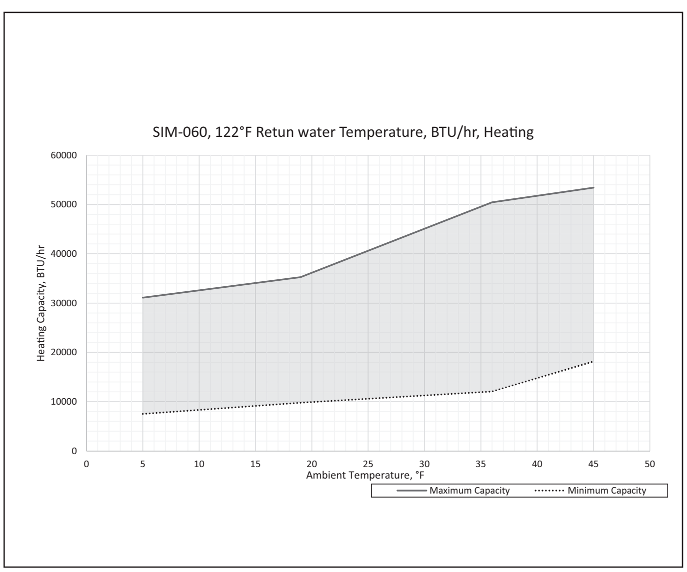
SIM-060 Heating Performance
(all data based on pure water)

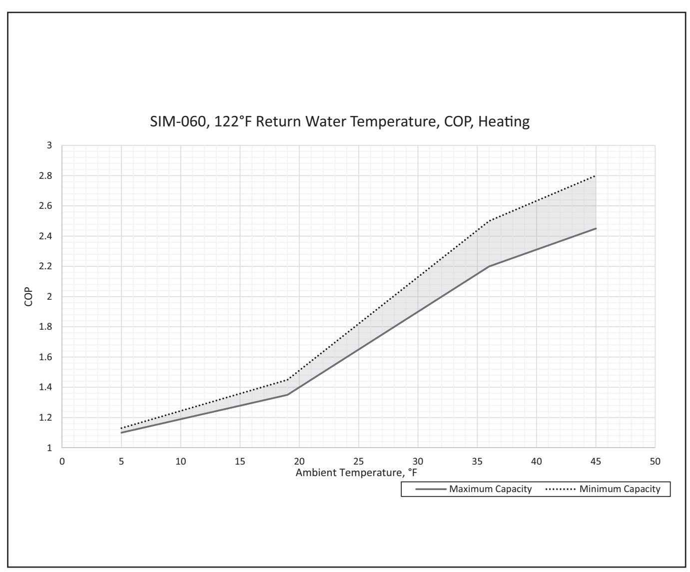




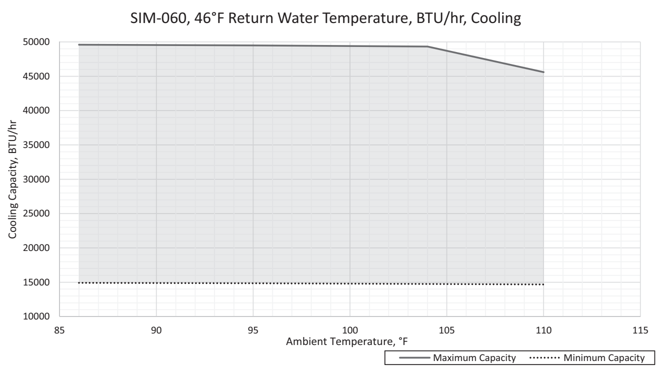


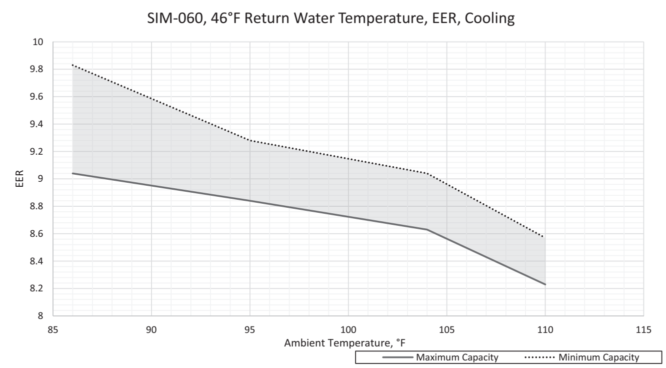


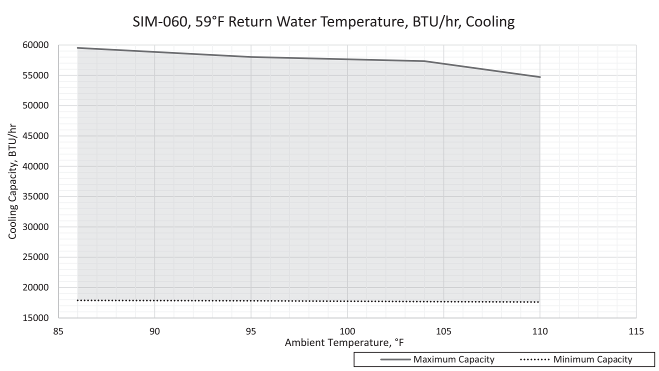


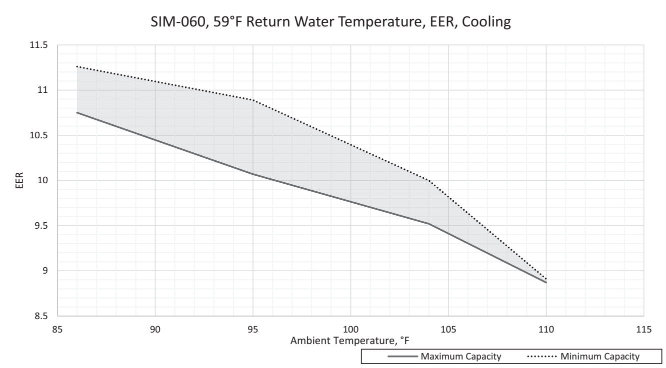


SIM-060 Cooling Performance
(all data based on pure water)

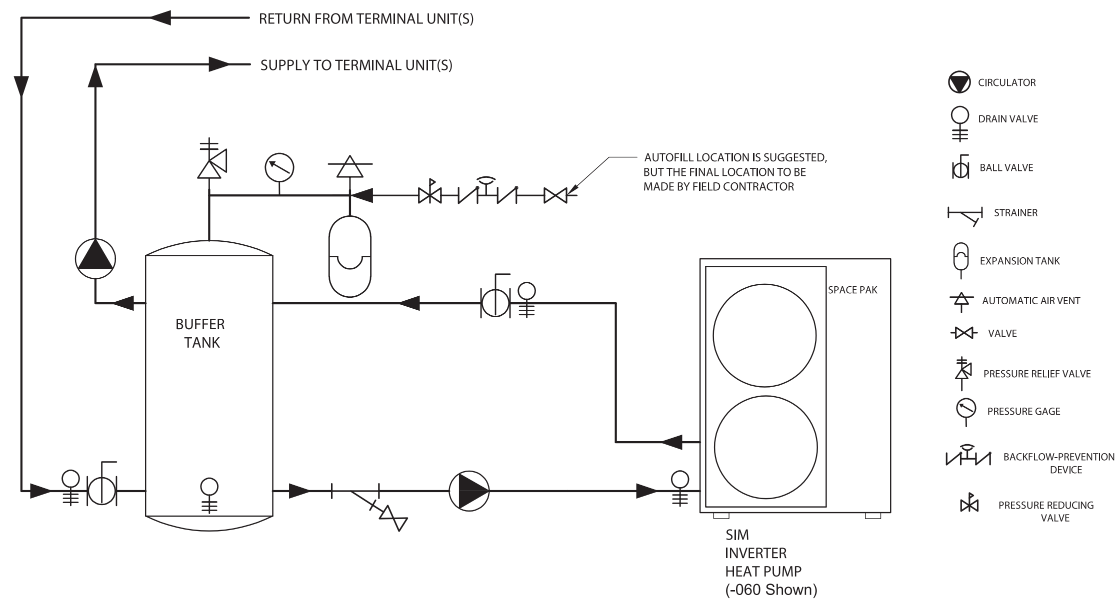


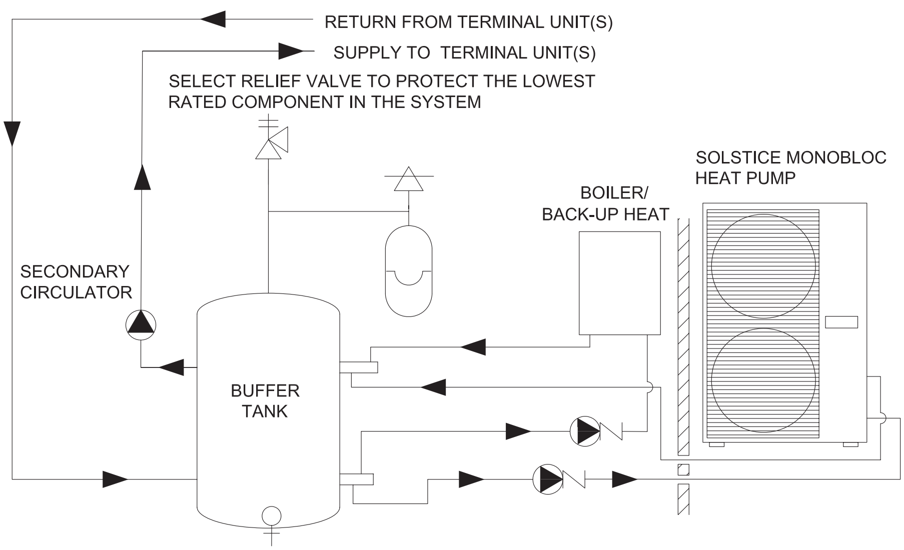




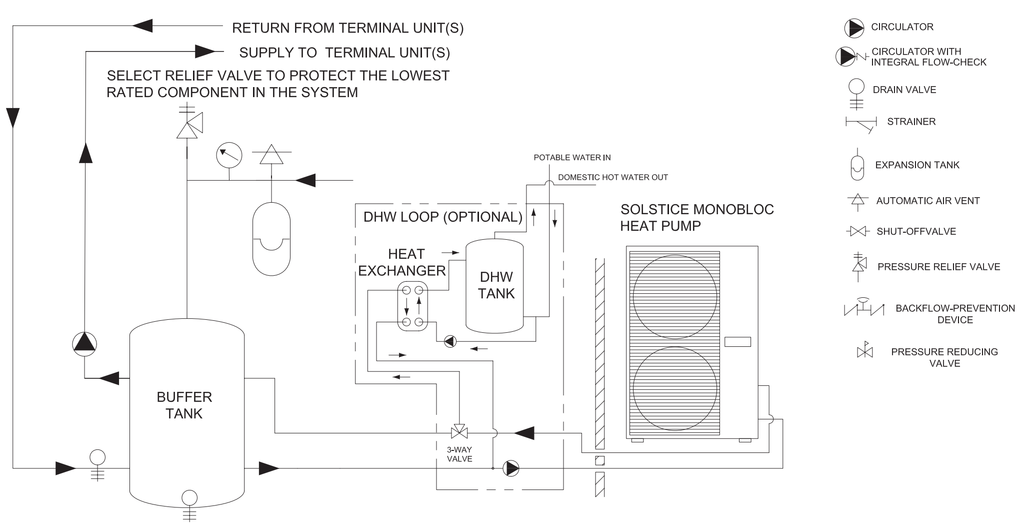


Typical System Diagram





SIM Heating with DHW Offset



Applicable to SIM-036 and SIM-060

SECTION 2: INSTALLATION

Choose the Correct Heat Pump

Perform appropriate load calculation to determine required heating or cooling load for the project. Refer to specifications in this manual to determine proper size heat pump.

Installation Location

- SIM heat pump must be installed outdoors, in a location capable of supporting the full weight, plus any potential snow load. The outdoor unit must be secured to the support with sufficient hardware to withstand any potential wind or seismic conditions without shifting or tipping. Additionally, the outdoor unit should be installed with enough clearance to allow for condensate roll-off during the defrost cycle. This will prevent freezing under the unit during defrost.
- The heat pump should be located away from sources of heat or moisture such as combustion vents, dryer vents, building exhausts, etc.
- Proper clearances shown on following page must be respected.

Water Loop Connection

Please read below for water piping instructions:

- The piping must be clean and free from dirt. Prior to insulating the pipe, it is suggested that a leak test be performed to ensure no water leaks are present.
- The system must be supplied with a pump sized to provide the minimum flow rate specified in the Glycol/Water System Design section of this manual. Pump selection must consider the pressure loss through the plumbing system and its components, plus the pressure loss through the heat pump's internal heat exchanger. The pump must be rated for the full range of heated or chilled water temperatures, as well as any anti-freeze or corrosion inhibitor additives.
- The piping system should have a wye strainer installed, on the inlet side, that is sized properly for the anticipated flow rate and pressure drop for the application. This will help protect internal components of the heat pump against sediments, contaminants and fouling that could damage the unit
- Do Not use the heat pump for DIRECT heating of potable water. The heat exchanger and internal components are not suitable for this application.
- Warning! Never expose the SIM Hydronic circuit to pressures in excess of 30 PSI. Loss of coolant, property damage, or equipment damage may result.
- The total system must be protected with a Pressure Relief Valve or valves sized to protect the system component with the lowest pressure rating. In no instance shall this exceed 30PSI.
- Caution! It is the responsibility of the installing contractor to ensure that sufficient Propylene Glycol concentration is maintained in the hydronic circuit to provide freeze protection in all foreseeable conditions. Failure to do so voids the warranty and damage caused by freezing is not covered.

Electrical Connections

SIM heat pump must be connected to an individual 230V (220V-240V) circuit, sized and protected according to the Minimum Circuit Ampacity and Max Overload Protection ratings specified on the rating label affixed to the exterior of the unit.

The power connection must include a Protective Earth Ground and a properly sized Neutral and two separate conductors in accordance with National Electric Code and all local codes.

When using the SIM as a single standalone heat pump called on by external inputs, (Thermostat, SSIC, Zoning controller etc.) the low voltage wiring should be connected according to the Field Wiring Diagram, to the terminals listed below.

Control Input connections

Important: All of the inputs are for voltage free relay contacts. No voltage should ever be introduced to these inputs. Doing so will immediately destroy the control and such damage will not be covered under warranty.

Remote On/Off is a master unit enable. This must be closed for all unit operation. This connection is located at the power input side access panel.

Heat/Cool On/Off is the input for space conditioning. This must be closed for operation in either Heating or Cooling mode. This connection is located in the electrical compartment under the top cover.

Remote Heat/Cool is the space conditioning mode selection. Open results in Cooling operation, Closed results in Heating operation. This connection is located at the power input side access panel.

DHW On/Off enables the Domestic Hot Water mode. When the contacts are closed, the SIM Control monitors the (potable) Domestic Water temperature and automatically changes over to maintain the DHW temperature according to the parameters selected. This connection is located in the electrical compartment under the top cover.

TT input is from a 10 thermistor sensor monitoring the DHW Tank Temperature. This connection is located in the electrical compartment under the top cover.

Control Output Connections

110V/60 Hz Circulation Pump provides line to neutral power (110-120VAC) of up to five amps to operate the primary circulator between the heat pump and the buffer tank. This is switched by the SIM control according to the selected parameters. This connection is located at the power input side access panel.

Caution: If the circulator is controlled by an external source, it must still respond to a call from the heat pump, in order to allow to operate for the unit's freeze protection. Disabling this will void the unit warranty.

110V/60 Hz 3 Way Valve provides line to neutral power (110-120VAC) of up to five amps to operate a Three way Valve. This is energized when the SIM control changes over to DHW operation. This connection is located in the electrical compartment under the top cover.

110V/60 Hz Hot Water Pump provides line to neutral power (110-120VAC) of up to five amps to operate the circulator on the Secondary (Potable) side of the DHW heat exchanger. This is energized when the DHW operation is active. This connection is located in the electrical compartment under the top cover.

AUX Output is a relay contact capable of switching 24 to 240VAC at a low current to operate a contactor which engages electric, or any supplemental heat source, according the selected parameters. This connection is located at the power input side access panel.

DI07 to GND on the SIM control board must be connected to a Normally Closed over temp safety switch located at the supplemental heat source. The switch must open if the safe maximum temperature is exceeded, and this will immediately open the AUX Output contacts. This feature must be employed when any supplemental heat source is used. This connection is located in the electrical compartment under the top cover.

The **Remote Display** output is a pigtail with a five-conductor female plug located inside the top compartment. The Display has a short connector that can be plugged directly into this pigtail for commissioning, and a 20m (66’) connection cable is provided to mount the display permanently in a suitable interior mechanical space. This cable can be extended up to 600’ by using 24 AWG shielded five-conductor cable and splicing it into the connection cable.

The electrical loads given in the Specification Table, allow for a pump load of no more than 5 amps and 110 VAC (2.5 amps at 230 VAC). If the pump load exceeds this, provide a separate power source to the pump. DO NOT feed power to the pump from the SpacePak air handler panel.

Electric Heat: SIM-036 ONLY

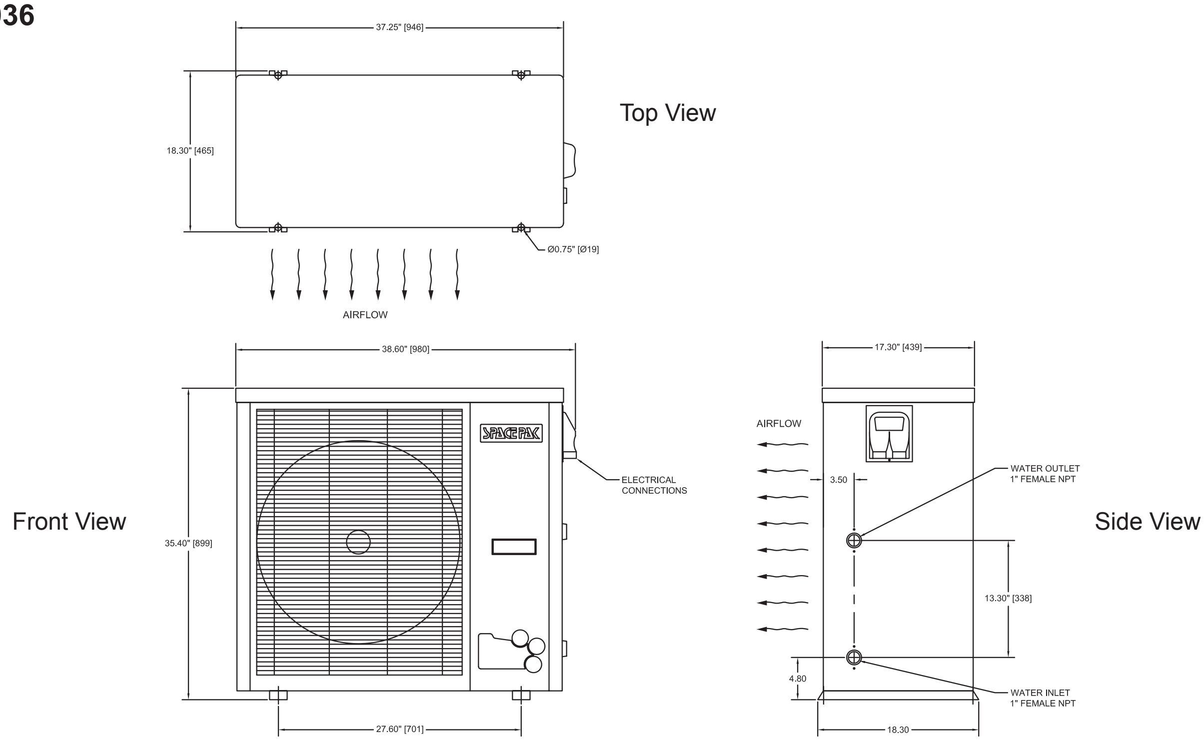
The SIM-036 heat pumps have provisions for 3kW electric heater elements contained within the water circuit. These are powered by a 230VAC input (separate from the heat pump power) and must have individual protections, (minimum 15A). The 3kW heater kit can be purchased from SpacePak as part number 45460-WG1061-02.

The heater function is managed by the unit controller, and it provides three different functions, all of which are adjustable via the Display Keypad.

Dimensions

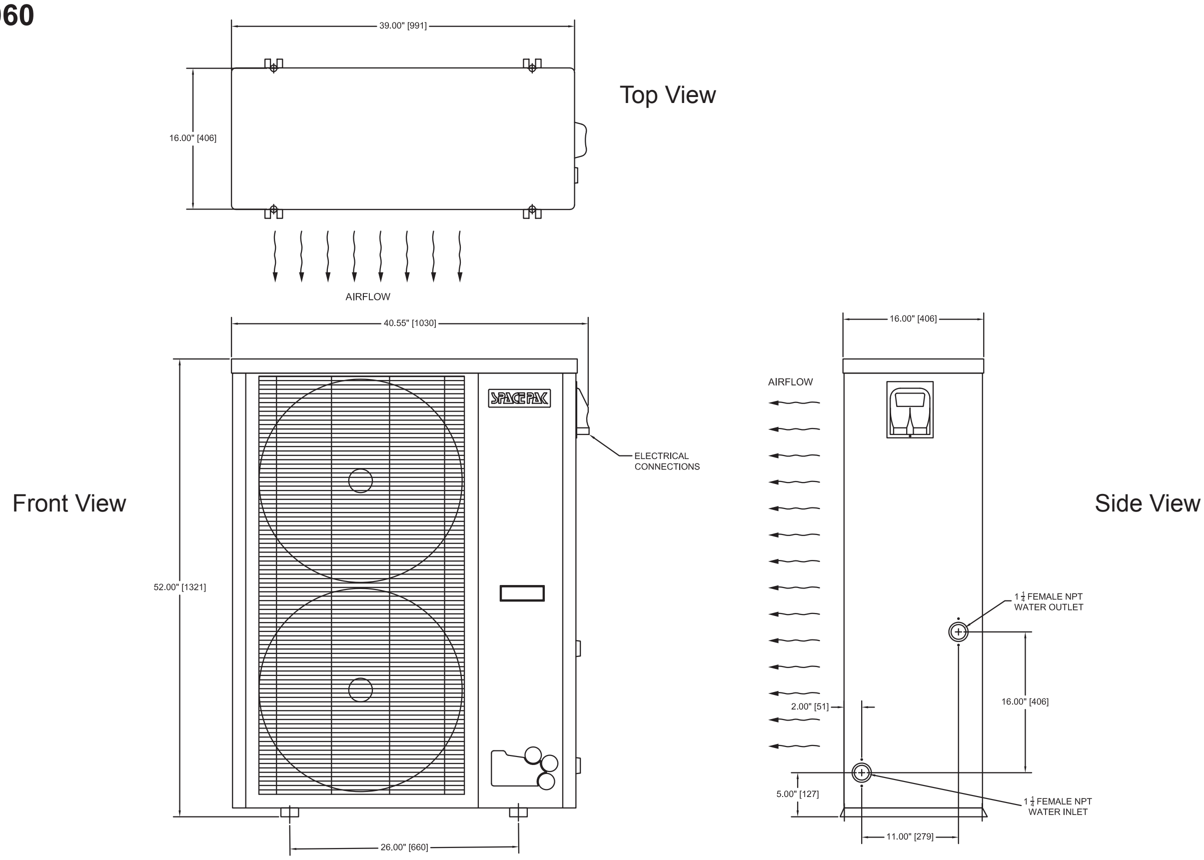
Unit Dimensions (inch (mm))

SIM-036



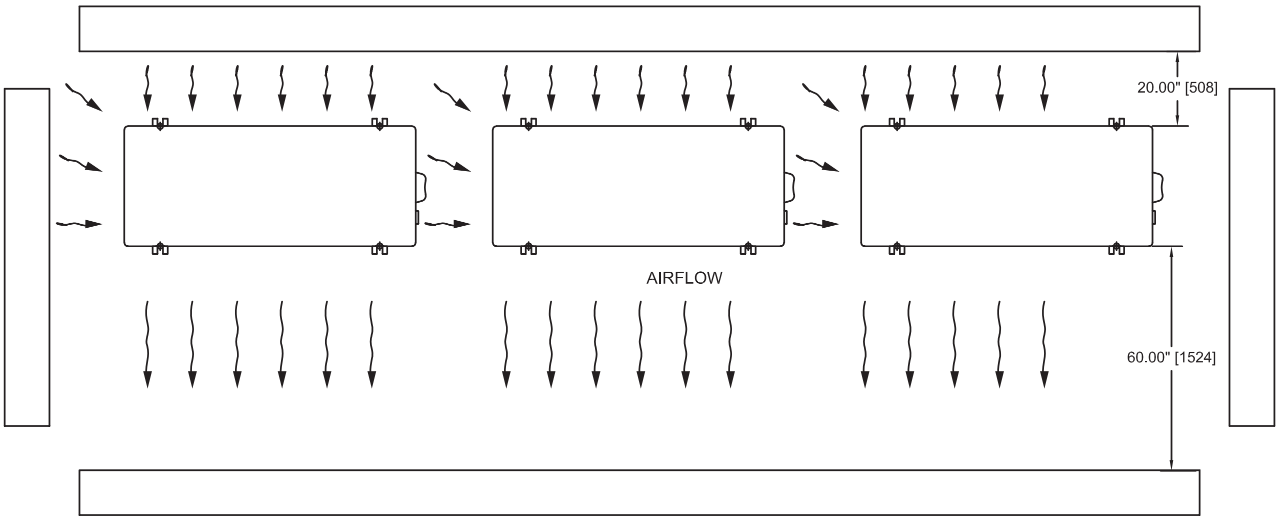
SIM-036

SIM-060

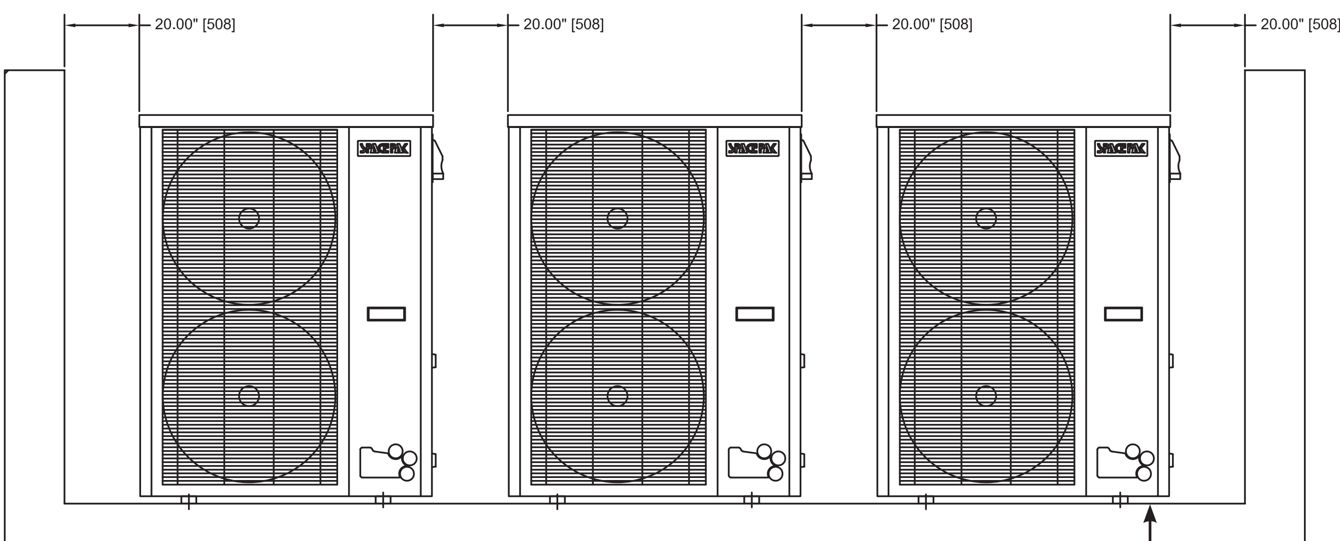


SIM-060

Required Clearances



CLEARANCES SHOWN ARE ASSUMING NO WALL EXTENDS MORE THAN 6" ABOVE THE TOP OF THE HEAT PUMPS, THERE IS NO OVERHEAD ROOF, AND THERE ARE NOT MORE THAN TWO BARRIER WALLS ADJACENT TO THE UNITS



Unit shall be mounted per local codes and high enough off ground to allow for proper condensate drainage

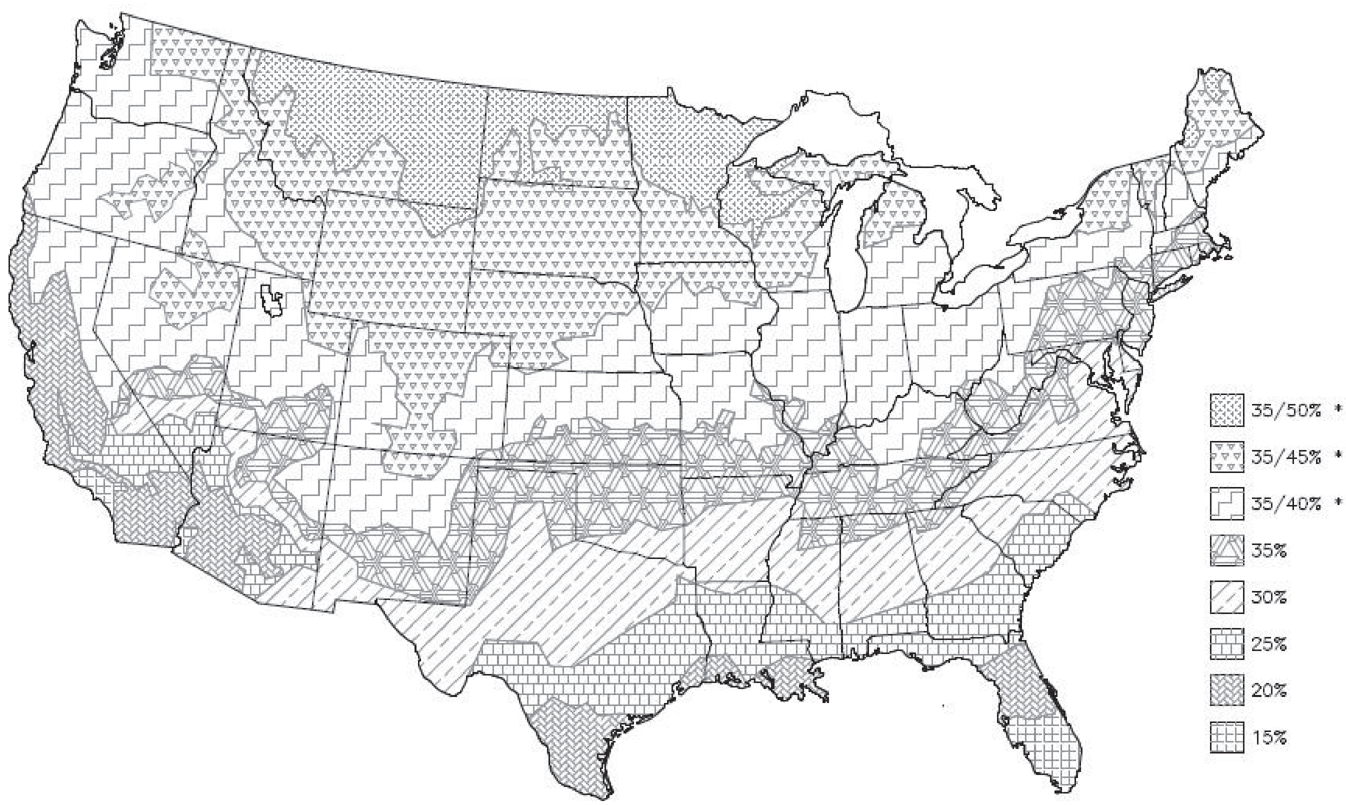
SECTION 3: GLYCOL/WATER SYSTEM

Table 1 SIM Glycol Concentrations (10% Minimum, 50% Maximum)

Ethylene Glycol %	10	20	30	40	50
Min. Ambient Temp for Operation	23°F/-5°C	14°F/-10°C	2°F/-17°C	-13°F/-25°C	-36°F/-38°C
SpacePak Capacity Multiplier	0.98	0.96	0.93	0.91	0.89
Pressure Drop Multiplier (Cooling)	1.06	1.12	1.16	1.25	1.36
Pressure Drop Multiplier (Heating)	1.06	1.12	1.16	1.22	1.28
Minimum Expansion Volume / System Volume					
Heating and Cooling (Gallons)	1 gallon expansion per 15 gallons system volume				
Heating only, HP only (Gallons)	1 gallon expansion per 20 gallons system volume				
Heating Only, with Boiler (Gallons)	1 gallon expansion per 15 gallons system volume				
Propylene Glycol %	10	20	30	40	50
Min. Ambient Temp for Operation	26°F/-3°C	18°F/-8°C	8°F/-13°C	-7°F/-22°C	-29°F/-34°C
SpacePak Capacity Multiplier	0.99	0.98	0.96	0.93	0.88
Pressure Drop Multiplier (Cooling)	1.10	1.20	1.34	1.5	1.65
Pressure Drop Multiplier (Heating)	1.10	1.20	1.34	1.46	1.5
Minimum Expansion Volume / System Volume					
Heating and Cooling	1 gallon expansion per 15 gallons system volume				
Heating only, HP only	1 gallon expansion per 20 gallons system volume				
Heating only, with Boiler	1 gallon expansion per 15 gallons system volume				

Non use of glycol will void warranty.

This information is provided as a general guideline only, and is not intended to cover all possible conditions. It is ultimately the responsibility of the installer to ensure that proper freeze protection is provided.



*** A 35% concentration will prevent solid freezing, and protect from bursting, in all conditions. However, this solution will become a thick sludge at extremely low temperatures, possibly resulting in pump overloading, pump damage, or high pressures. Therefore this concentration should only be used in systems that will remain inactive during the winter. Use the higher value shown for systems that must start and run at the coldest temperatures.**

Glycol/Water System Design

Each SIM heat pump has a recommended flow that should be maintained during all times of operation. For the SIM-060, the recommended flow is 13GPM at which the head loss is 23ft W.C, 10PSI or 69kPa. For the SIM-036 the recommended water flow is 7GPM at which the head loss is 13.8 ft W.C., 6 PSI, or 41.3 kPa. These head loss values are based upon pure water, see Table 1 for multipliers to correct for various concentrations of anti-freeze solution. Head loss values shown are for the heat pump only, the selected circulator must be capable of overcoming the entire system head loss.

Note: these are the recommended flow values. Should the flow drop significantly below this value, the heat pump will shut down. This is not an indication of a fault in the heat pump, but rather points to insufficient pump or plumbing capacity, or air trapped within the system.

Glycol/Water Mixture

⚠CAUTION Automotive glycol is not suitable for use in the SIM system. Over time it may leave deposits which will degrade the performance and damage pumps or other devices in the system. Use only ethylene glycol or propylene glycol mixtures specifically labeled for boiler or HVAC use.

Obtain all components specified in the Typical System Diagram. Make sure all components and piping comply with applicable local codes.

DO NOT use galvanized pipe anywhere in the system. Galvanizing will react with the glycol and can cause glycol degradation and sludge in the system.

- Confirm charge of expansion tank is 12-15 PSIG (with no water or pressure in the system).
- Install the system piping. DO NOT connect the heat pump unit to the system piping until the system has been cleaned as required below.

The SIM must NOT be connected to the system during this process.

1. Connect a hose from a fresh water supply to the system fill hose bib. Note the drain port can be used for this purpose. The hose bib purge/drain valve should be located low in the system and close to the SIM return connection.
2. Open the high point purge valve, (not shown in illustration, as it may be inside the air handler) while slowly filling the system. Close the valve when air is removed from the system and water begins to flow out of the valve.
3. Fill the system with fresh water and run water until the system has been thoroughly flushed clean.

Automatic Fill – When an automatic fill system is installed, the cooling fluid (Glycol/water) must be inspected at least every 3 months, or whenever a leak is detected to ensure the proper glycol concentration is maintained.

System Volume and Expansion Volume

To ensure smooth temperature control and minimize cycling of refrigeration system, all installations must have total circulating volumes equal to or greater than 7.5 gallons per nominal ton of the unit performance at minimum capacity (The greater of either heating or cooling produced). In other words, in the case of a five ton heat pump with 3 to 1 turndown (0.33x rated capacity) the minimum total system volume is 5x0.33x7.5=12.5 gal. Multiple heat pump installations that are operating in a staged configuration follow the same rule, so that only a single heat pump tonnage needs to be considered. Additionally, the system requires an expansion volume (air) to compensate for the change in volume of the glycol mixture as it heats and cools, see Table 1 for expansion volume. A typical multiple heat pump installation may actually have a volume far greater than the minimum required, and it is this entire volume that must be considered when sizing the expansion tank. Note that the nominal expansion tank volume is not the same as the expansion volume. If the actual air volume is not published, consider it to be no more than half the nominal volume. As an example, a five ton nominal heat pump operating down to 33% capacity, used for both heating and cooling, requires a minimum of 12.5 gallons of circulated system volume. A 13 gallon buffer tank is selected for best operation. When the system installation is complete, the total volume including the heat pump, buffer tank, and all plumbing is 18 gallons. (Note: the expansion tank, no matter how large, is not considered circulated volume). According to the chart above, the minimum acceptance volume of the expansion tank must be at least 18/15, or 1.2 gallons. If the acceptance volume is not specified, assume it is no greater than 50% of the total tank volume. Therefore in the case of this example, the system would require a minimum tank size of 2.4 gallons. As it is unlikely to find this specific size. Always be sure to round up, so a tank of 3 gallons total volume, or larger, would be appropriate.

Air Separator

Locate at least one high efficiency air separator as shown in the piping to remove any air from the system.

Pressure Test The System

1. Add water to the system as needed to raise the pressure to 25 PSIG (verify that all system components are suitable for this pressure). Verify that the pressure remains constant for at least one hour. Locate and correct any leaks.
2. After successfully testing, drain the system and remove the fresh water hose.

Insulate The Piping

For systems used in cooling applications, the plumbing should be insulated using a vapor barrier to prevent sweating of the pipes and possible damage of the insulation or structure due to water accumulation.

SECTION 4: WIRING

SIM Control Wiring Connection

The SpacePak SIM requires a dry contact (relay) signal to enable and select between heating and cooling modes. They will not operate on the 24V signals from typical thermostats or air handlers. Connecting 24V to either of these points will result in significant component damage.

- Connect multiple zone system to heat pump using SpacePak SSIC Control Module and instructions included with it. Refer to manual supplied with SSIC Control Module for connection and operational details.
- See wiring diagram for heat pump electrical diagram.

Note: As with all electronic devices, it is important to separate low voltage communication wiring from line voltage power wiring to avoid interference.

When alternating current flows through a conductor, it can induce voltage in another conductor that is placed nearby. This is the same principal that a transformer operates upon.

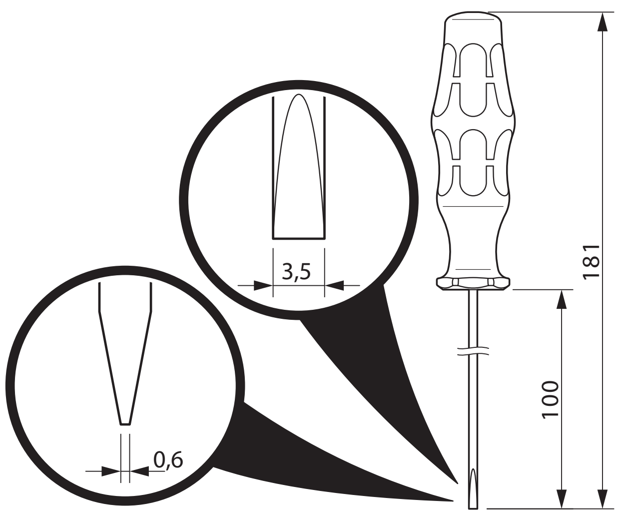
When 230VAC, 120VAC, or sometimes even 24VAC wires are run near any wires connected to the Remote On/Off, Remote Heat/Cool, Heat/Cool On/Off, or ModBus wiring, it can create interference that may cause erratic operation, or prevent normal operation of the heat pump.

Alternating current and communication wiring should always be separated by a minimum of 6" throughout the length of the wires.

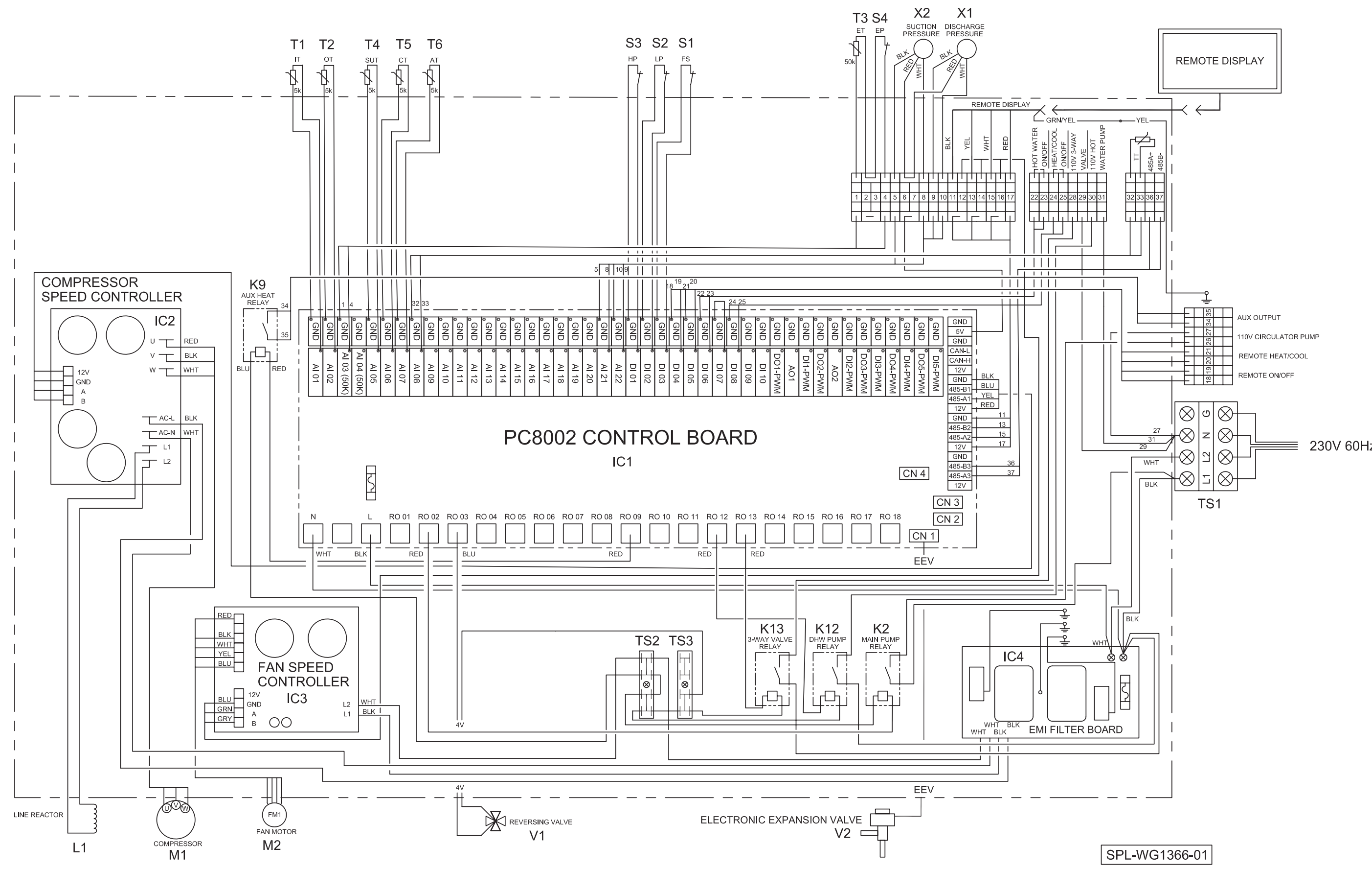
If it is unavoidable to run these wires with the proper separation, the use of shielded multi-conductor cabling for communication may provide sufficient protection to avoid interference. However this should be kept to a minimum length, and the system observed to verify normal operation.

Terminal Block Screwdriver

Prior to the connection of wiring to unit, please ensure to use a properly sized tool to insert wires into terminal blocks. See figure below for dimensions. Failure to do so can result in damage to the terminal blocks or wires. Note: Dimensional drawing is in mm.

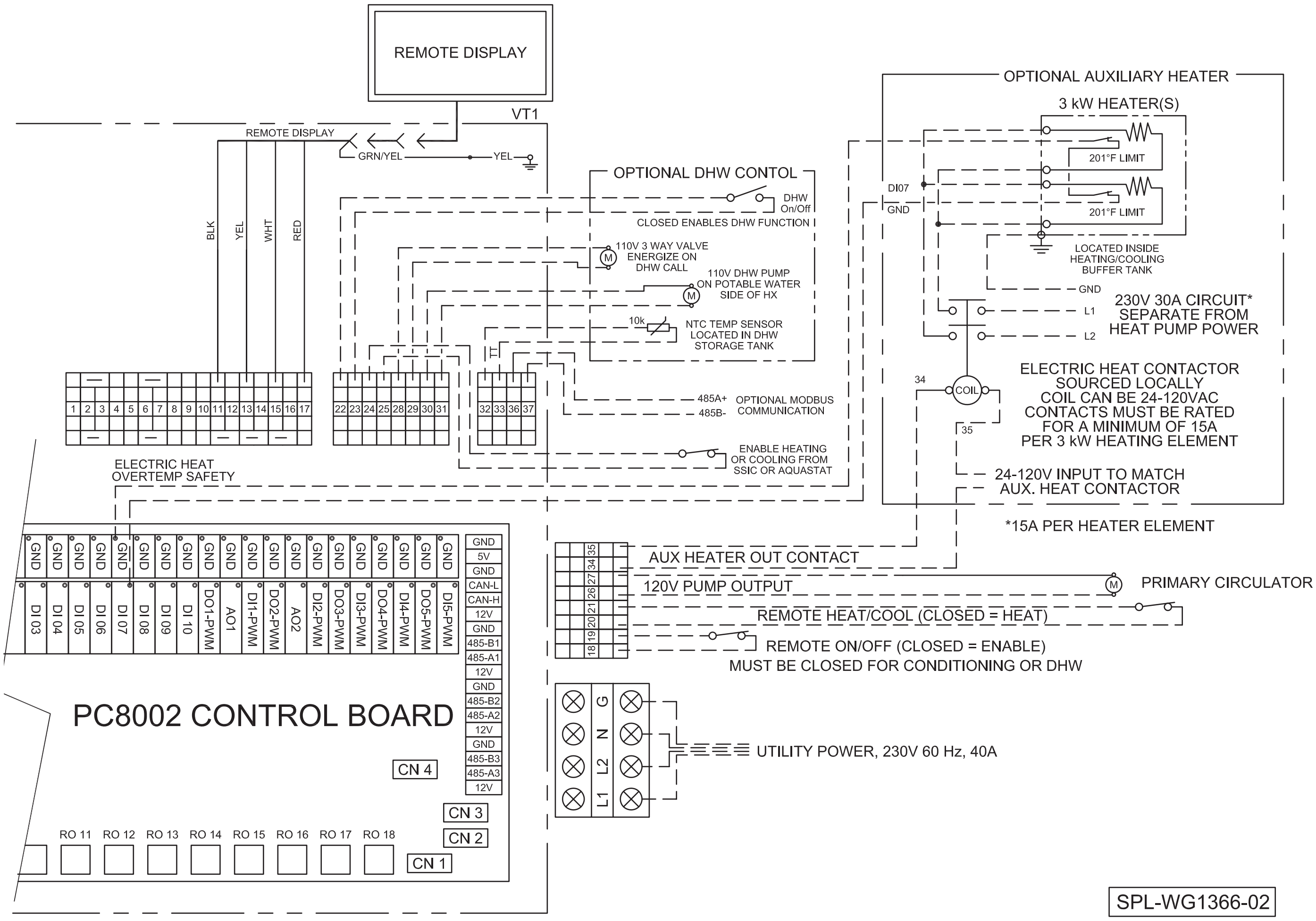


Wiring Diagrams and Definitions: Internal Wiring - SIM-036



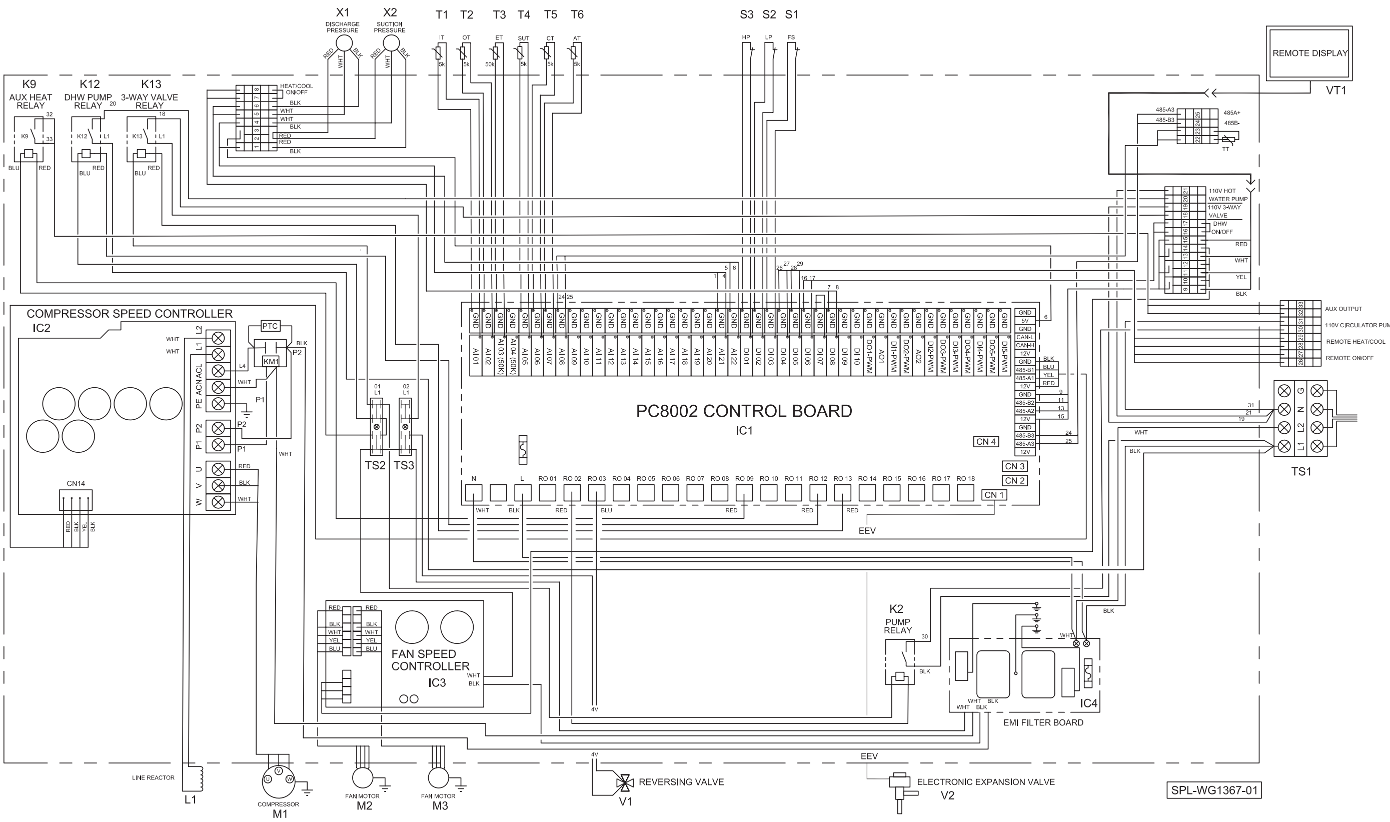
CAUTION: The Remote On/Off, Remote Heat/Cool, Heat/Cool On/Off, and DHW On/OFF inputs are for voltage-free relay contacts only. Any voltage introduced to the controls at these points will immediately destroy the primary unit control.

Wiring Diagrams and Definitions: Field Connections - SIM-036



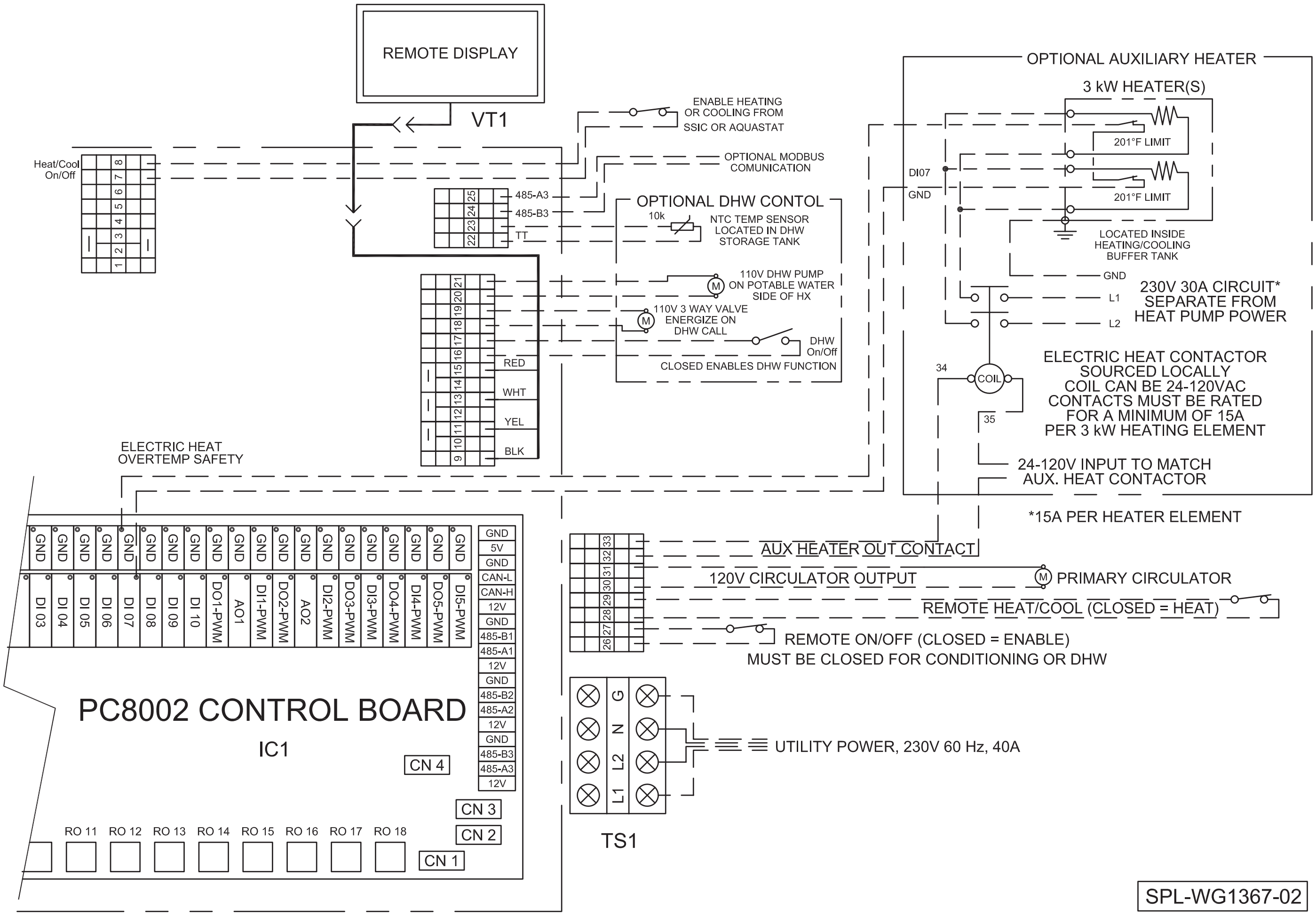
CAUTION: The Remote On/Off, Remote Heat/Cool, Heat/Cool On/Off, and DHW On/OFF inputs are for voltage-free relay contacts only. Any voltage introduced to the controls at these points will immediately destroy the primary unit control.

Wiring Diagrams and Definitions: Internal Wiring - SIM-060

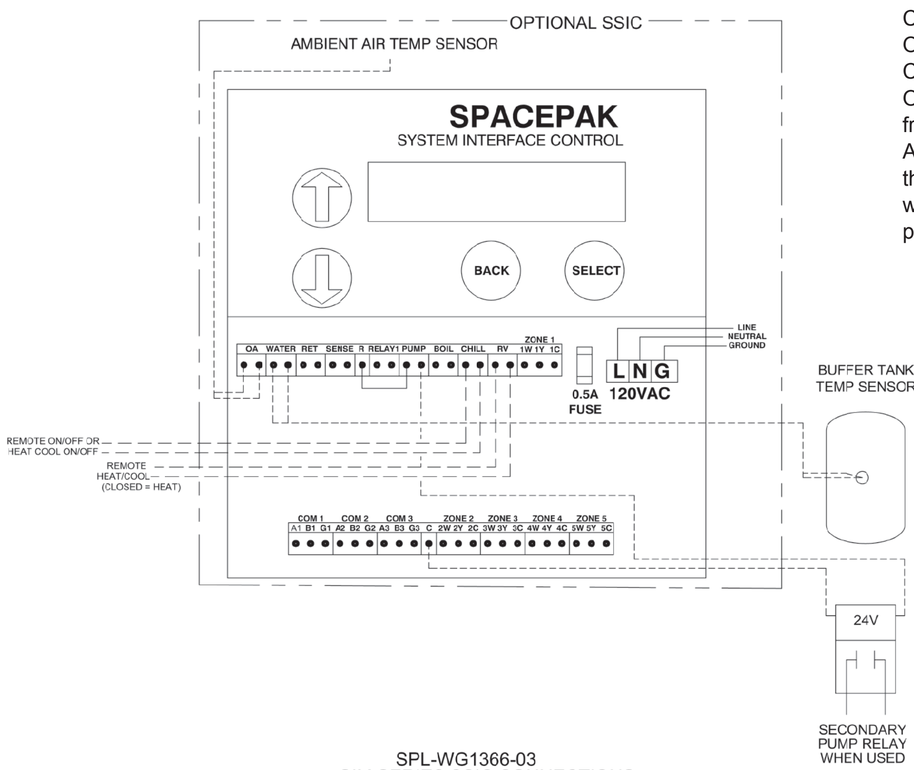


CAUTION: The Remote On/Off, Remote Heat/Cool, Heat/Cool On/Off, and DHW On/OFF inputs are for voltage-free relay contacts only. Any voltage introduced to the controls at these points will immediately destroy the primary unit control.

Wiring Diagrams and Definitions: Field Connections - SIM-060



CAUTION: The Remote On/Off, Remote Heat/Cool, Heat/Cool On/Off, and DHW On/OFF inputs are for voltage-free relay contacts only. Any voltage introduced to the controls at these points will immediately destroy the primary unit control.



SPL-WG1366-03
SIM SERIES SSIC CONNECTIONS

SECTION 5: REMOTE TOUCHSCREEN DISPLAY

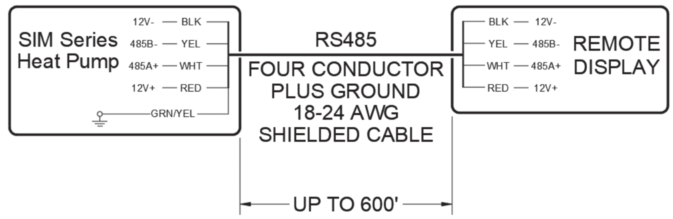
Overview of the Remote Touchscreen Display

The remote touchscreen display is the Operation and Service interface to the SIM control.

The full-color screen displays current water inlet and outlet temperatures, outdoor ambient temperature, and DHW tank temperature (if this feature is enabled).

It also allows the user to query the operating status of multiple system characteristics, as well as providing the ability to view and adjust operating parameters through various menu screens.

Remote Display Connection Diagram



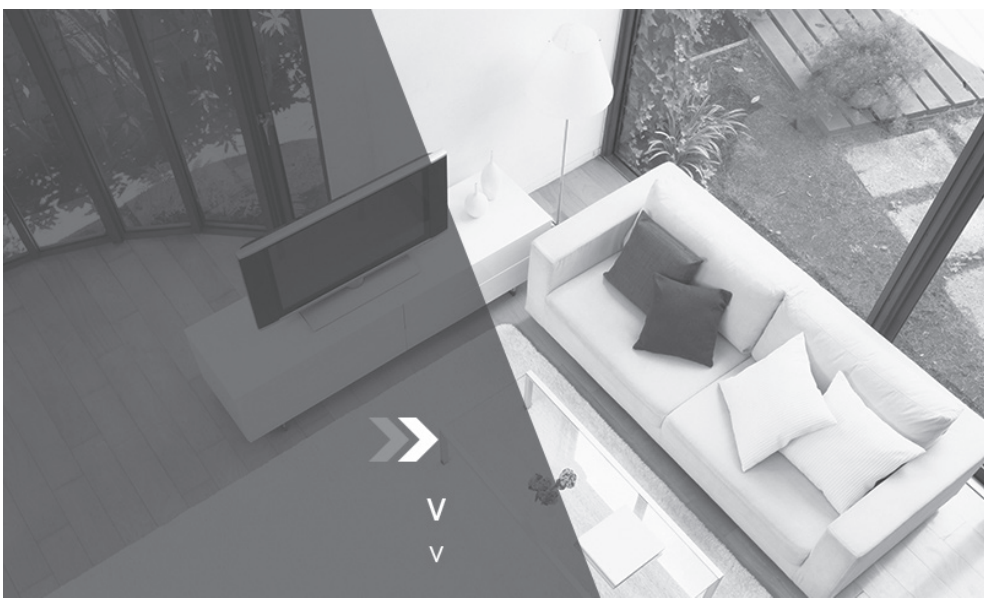
Function of the Ports

Port No.	Name	Terminals No.	Function
CN2	Signal port	485A/485B	Communicate with PC8002
	Power input	+12V/GND	Power supply of wire controller, 12V DC

Display Windows and Functions

If the display screen is not touched in 30s the screen will dim. The screen will go to sleep after 2 minutes of no operation. Touching the screen will "wake" up the controller again. If the units selected is deg F, the date and time will be displayed as MM/DD/YY, Hr/Min/Wk. If the units selected is deg C, the display date and time will be displayed as DD/MM/YYY and Hr/Min/Wk.

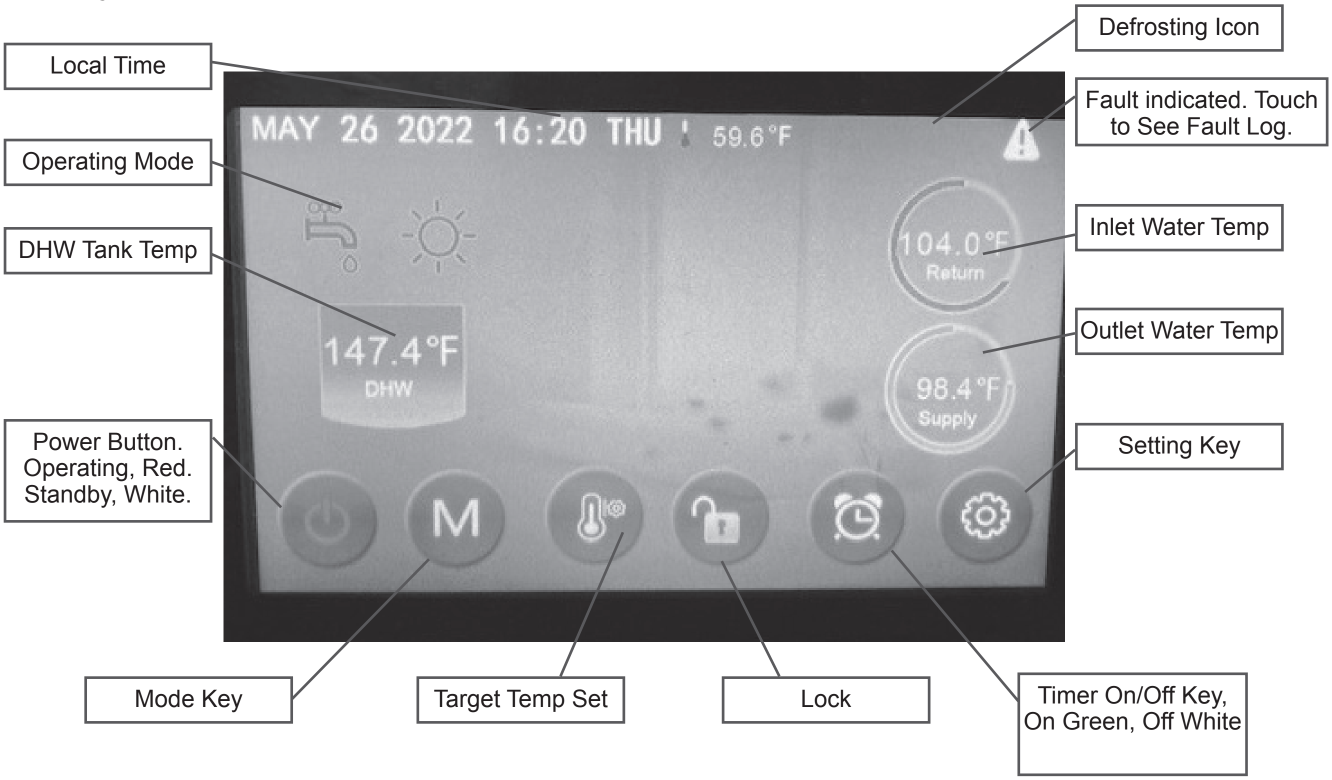
Power on Display Window



The display will show controller and display versions after several seconds at start up. The top number, after the upper-case V, is the Control Software version, the bottom number, after the lower-case v, is the Display Software version. These will be displayed for about four seconds, then show the Home Screen.

If communication fails, the version numbers won’t be displayed and the Home Screen will appear after 15 seconds. In this case, the home screen will show all zeros, or inaccurate default values.

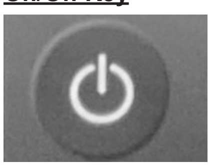
Main Display Window



Contents and Buttons on Main Display Window

On the startup interface, contents and buttons on main display are illustrated above.

On/Off Key

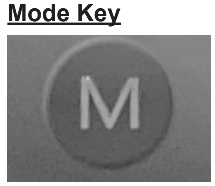


The "on/off" key or power button allows a use to turn the unit on or off regardless of the status of the unit. This will shut down the entire unit, but the unit will still have power going to it. The main display will then turn grey.

Return Key

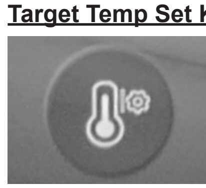
In each sub-menu (not the main interface) the user can use the "return key" to return to the previous screen. This is located in the upper left-hand corner of each menu and submenu.

Mode Key



By pressing the "Mode" key the user can now choose which mode they would like the heat pump to run in. Once the mode has been selected, the screen will automatically return to the main screen and the appropriate mode symbol will be displayed on the main screen. Heating = sun, cooling = snowflake etc…

Target Temp Set Key

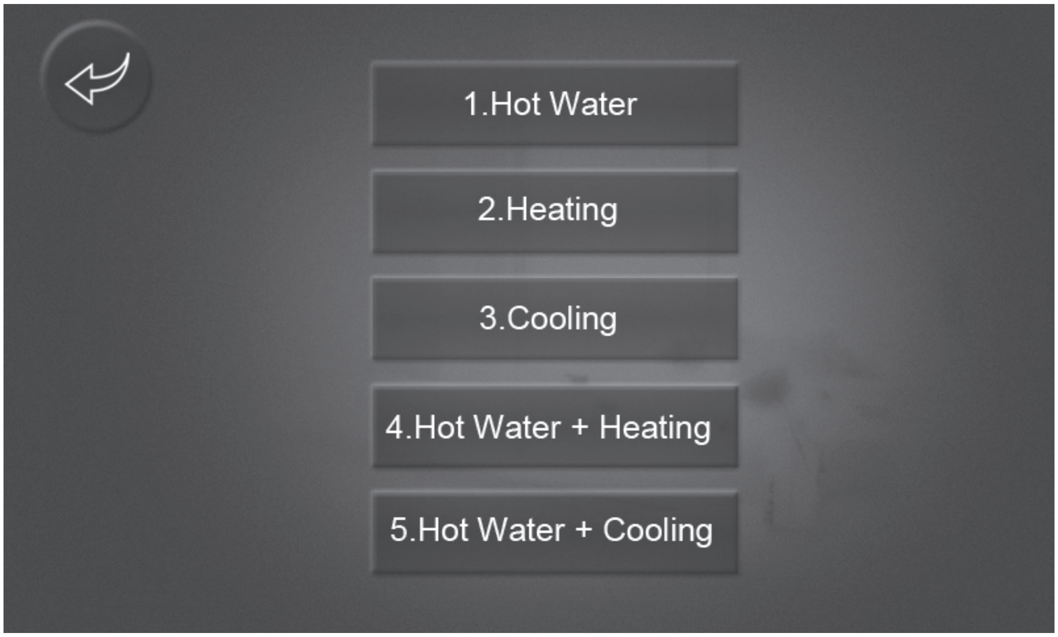


This key is used to set the target set point the heat pump will work to achieve.

Animation on Main Display Window

1. When the unit is in defrosting mode, the defrosting icon will show until the defrosting is completed.
2. When the unit is shutdown, the main display will turn grey.
3. When the unit is shutdown, if the timing switch function is activated, the color of the button for 'timer on/off key' will be green, if not, the button will be white.

Mode Selection and Target Temperature Setting



Mode Selection

On main display window, press ‘M’ button, it will show five modes. After having chosen one mode, It will return to main display automatically.

1. When choosing Hot Water mode, the display will show 'hot water' 
2. When choosing Heating mode, the display will show ‘heating’ 
3. When choosing Cooling mode, the display will show ‘cooling’ 
4. When choosing Hot Water + Heating mode, the display will show 'hot water' and 'heating'.  
5. When choosing Hot Water + Cooling mode, the display will show 'hot water' and 'cooling'.  

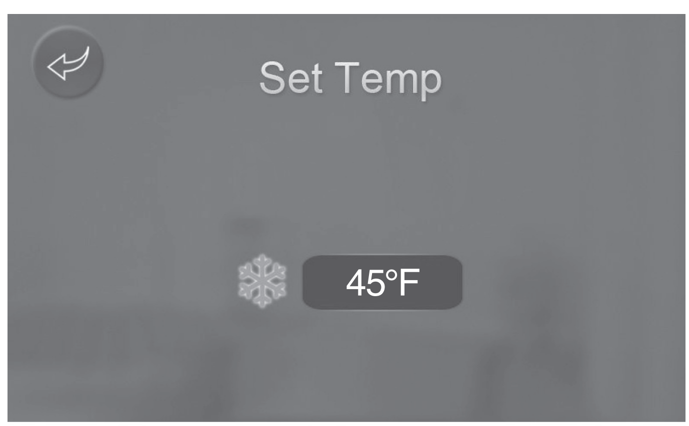
Other Selections

Mode Selection Under Slave Mode

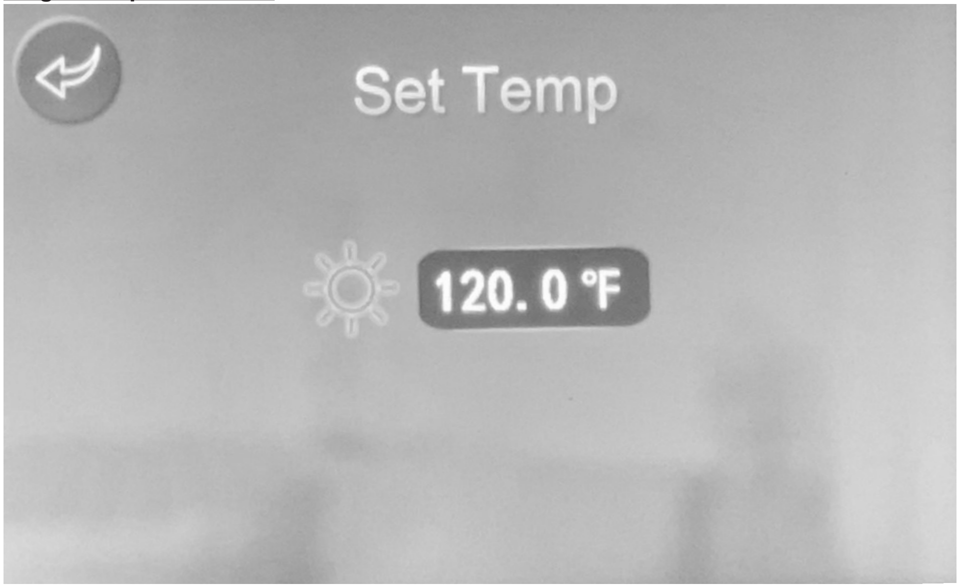
When choosing slave mode H02=1, the color of the buttons on the display will turn grey and are not clickable.

Target Temperature Setting Under Current Mode

The different modes have different target temperature settings interface. For example, when choosing Cooling mode, The target temperature setting interface will show cooling set point.



Target Temp Set Screen

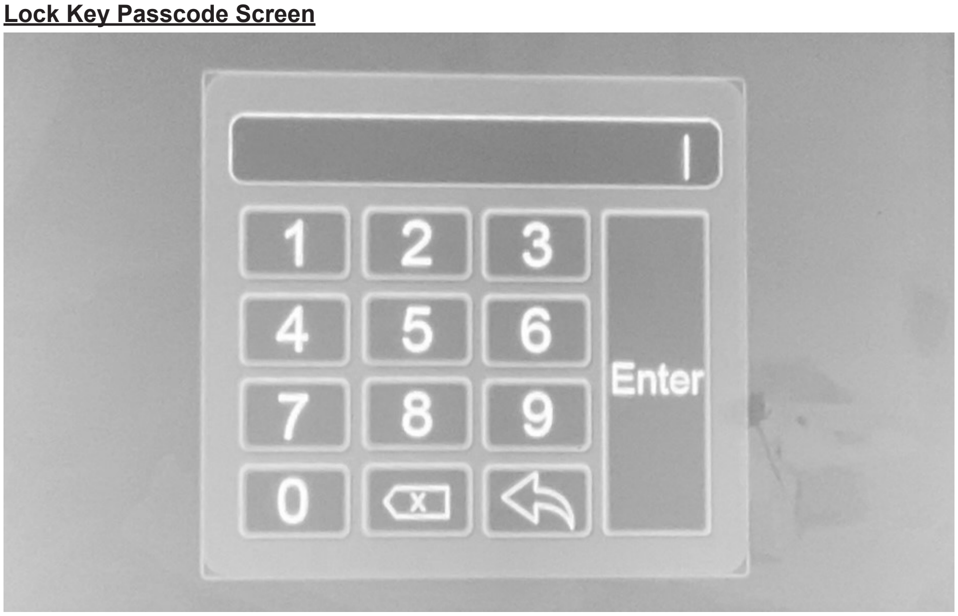


This can be adjusted by pressing the temp (on the screen) which opens a new screen and then entering in a numeric value within specified parameters in the control (see parameter chart for min and max settings). Once a target is set, the user will need to press “enter” to save the set point. This should return the user to the target set screen where they will see the new setpoint has been saved. Press the return key to return to the main interface.

Lock Key

The lock key button will allow a user to lock the screen and prevent un-wanted or accidental touches on the screen.

Lock Key Passcode Screen

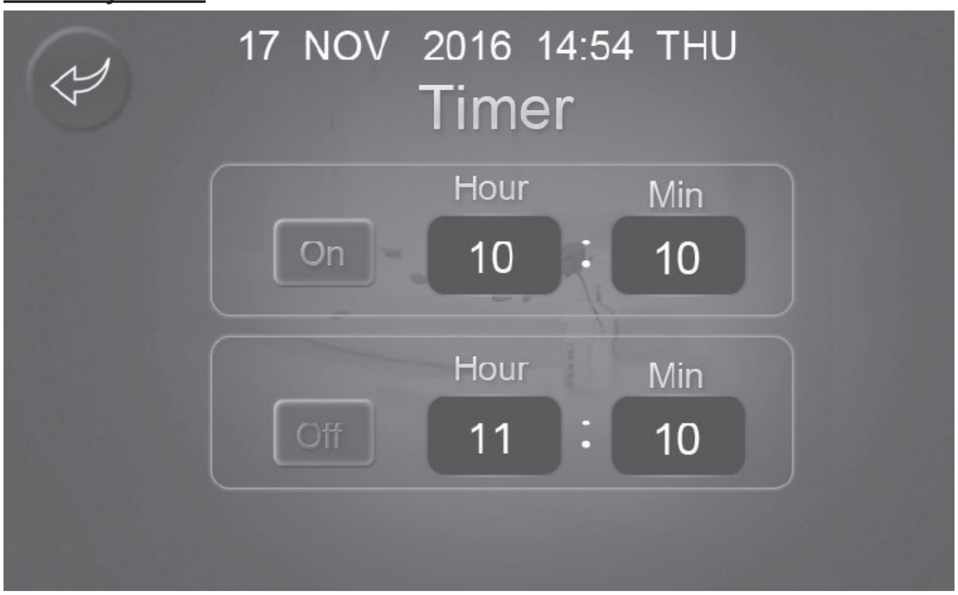


To unlock, simply press the lock key again and enter the code “22” when prompted. Press enter and the screen will be unlocked again.

Timer Key

The timer key allows the user to set a schedule to not allow the unit to operate through timers regardless of set points.

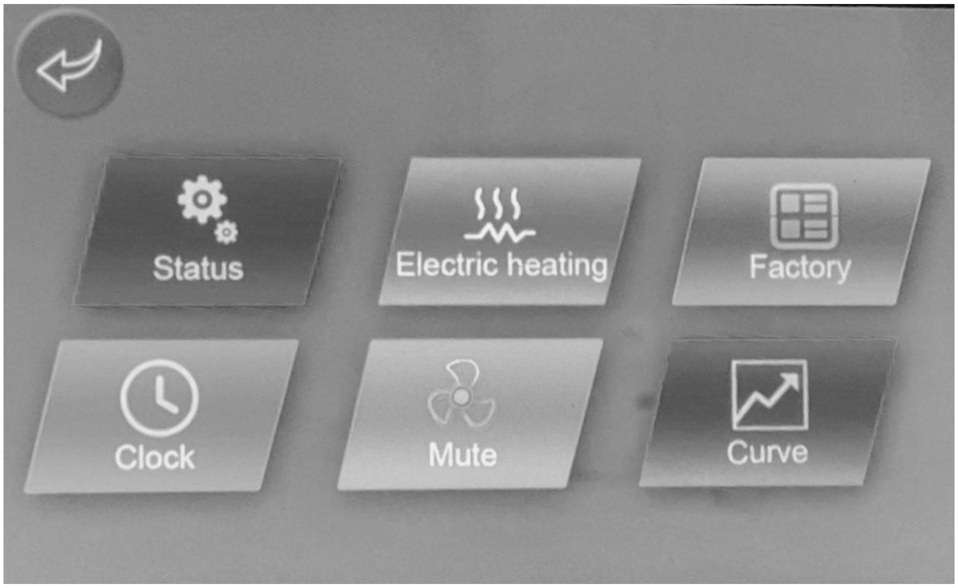
Timer Key Screen



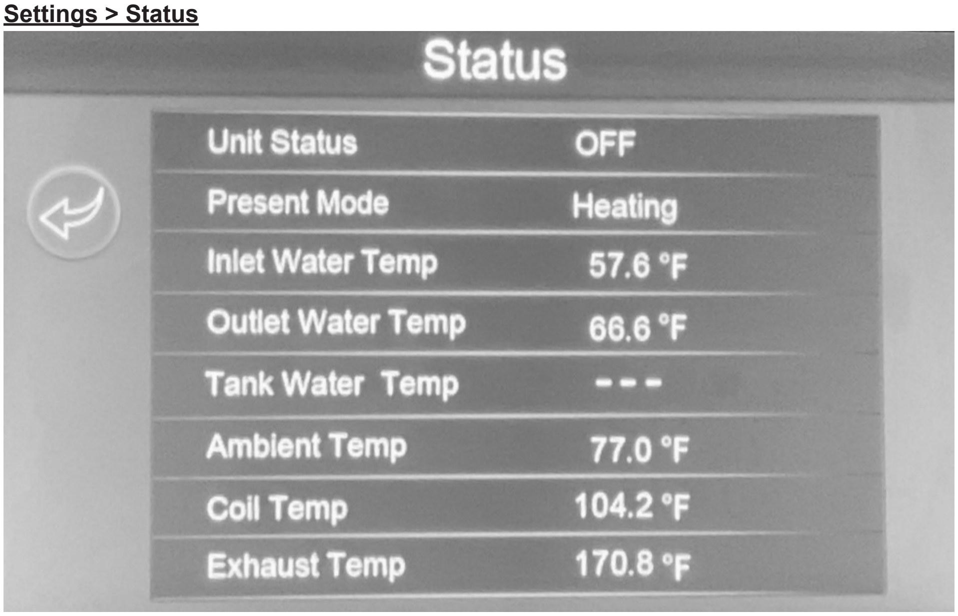
The user can use the day schedule on the bottom row to select the day they want to set the unit to be off. Once the day is selected, the user will need to select the appropriate times (AM or PM) that the unit will not need to be run. For example: If a user does not want the unit to run on Monday from 11 AM – 2PM. Select “Mon” at the bottom (red arrow should be under the day). Select “AM” and press the clock on the 11-12 block and the 1-2 block. This should highlight the blocks in green. Once the schedule has been set, the user will need to ensure the “on/off” toggle is set to “on” by pressing it if it set to “off”. Once confirmed, press the “return” key which will bring you back to the main interface. During normal operation, the unit will run normally. During the scheduled “off” time the main interface will now be grey and the “timer key” will be illuminated in green.

Settings Key

Settings Screen



Settings > Status

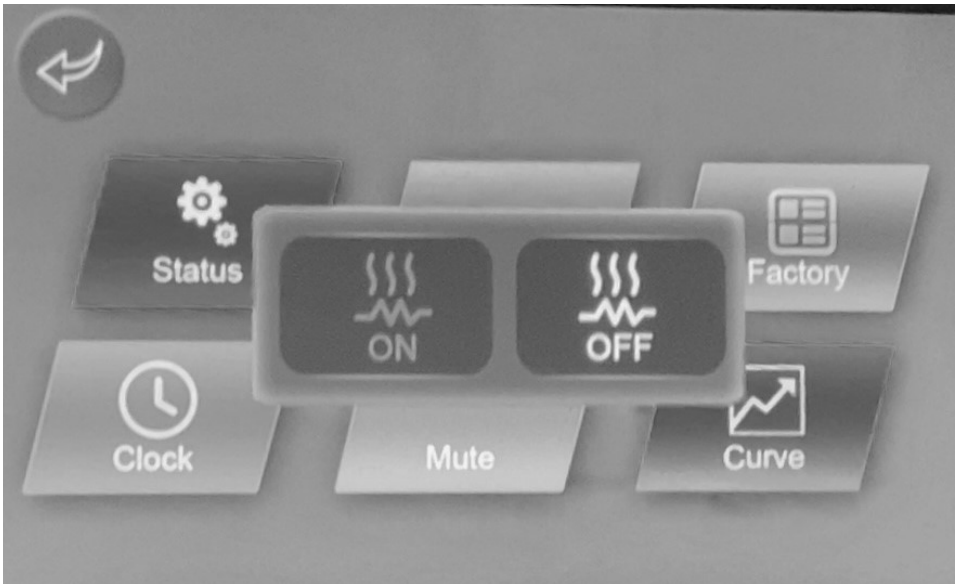


Under the status menu, the user can view the following status' of the unit during real time operation

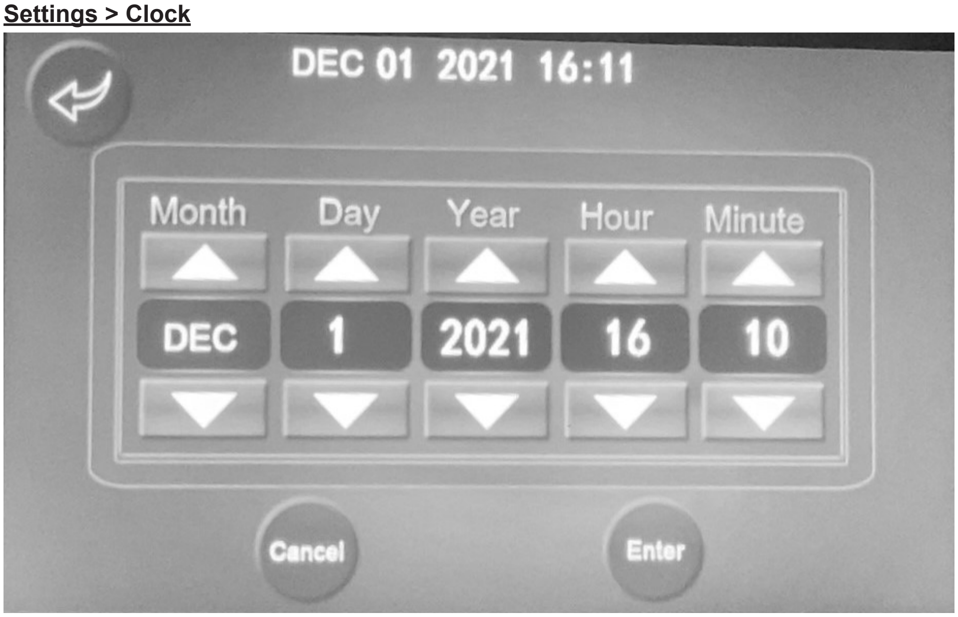
1. Unit Status (on/off). Whether the unit is operating or not
2. Present Mode: Displays the mode that the unit is running in (heating, cooling etc..)
3. Inlet Water Temp: Displays the current inlet water temperature being measured
4. Outlet Water Temp: Displays the current outlet water temperature being measured
5. Tank Water Temp: Displays the domestic hot water tank temperature, if used. If installed (see wiring diagram: field connections for wiring locations of tank water temperature). If not installed or not reading the display will show "- - -"
6. Ambient Temp: Will display the current ambient temperature being measured
7. Coil Temp: Will display the current coil temperature being measure on the surface of the finned coil.
8. Exhaust temp: Will display the current discharge refrigerant temperature.

Settings > Electric Heating

All SIM units have a feature that allows the unit to turn on a dry contract “AUX” relay (see wiring section) for an external electric heater. The heater can be controlled by selecting and adjusting the appropriate parameters (see parameter chart) to provide supplemental heat when desired. To turn the feature on, press the electric heating key and choose “on”. To turn off, choose “off”. Once selected, the screen will automatically return to the “settings” screen.

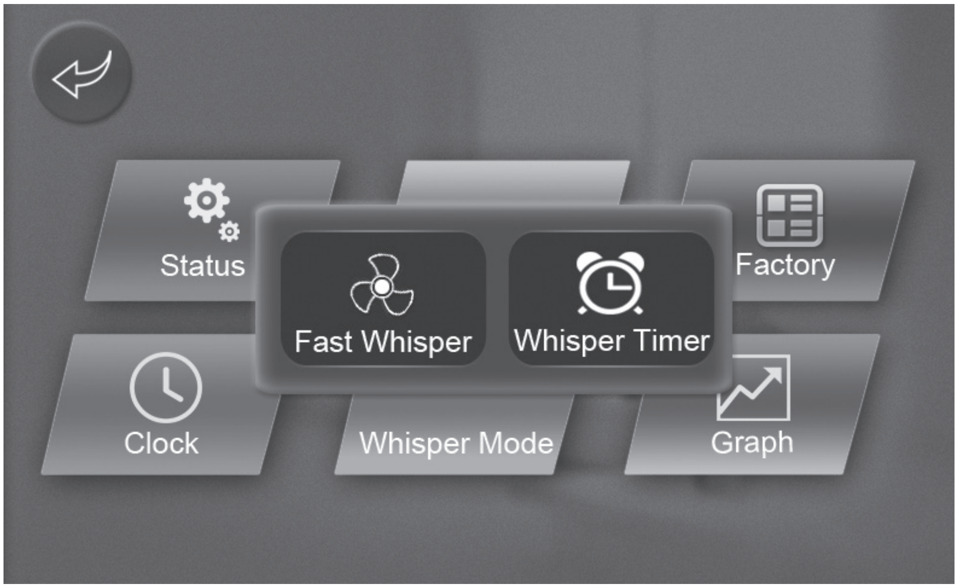


Settings > Clock



By pressing the clock menu, the user can set the correct time and date by using the up and down arrows keys. To save the user must press the enter key.

Settings > Whisper Mode

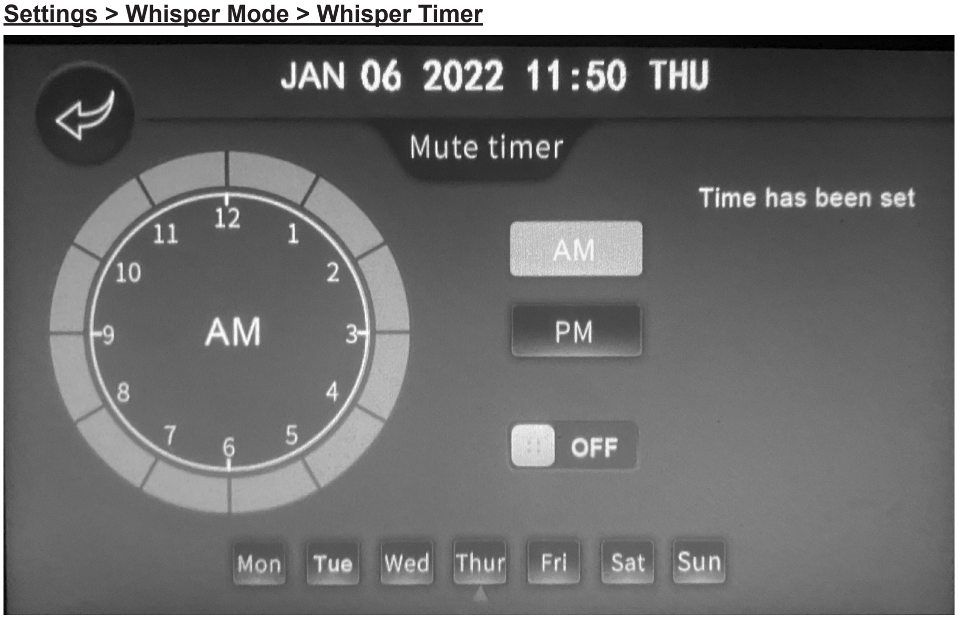


The purpose of the Whisper Key is to silence the fans and unit for a quieter operation. When pressing the Whisper key, the user has two options. “Fast Whisper” or “Whisper Timer”.

Fast Whisper- To enable the "Fast Whisper" function, press the "Fast Whisper" button, this will slow the fans down to provide a quieter operation. However, the fast whisper will also decrease capacity. Use only when quiet operation is required. To turn off, press "Fast Whisper" again.

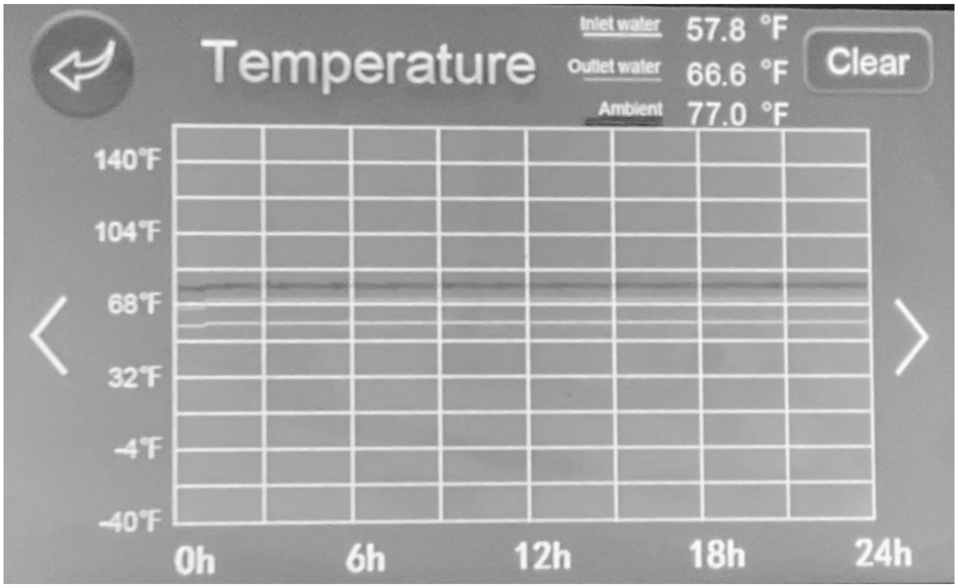
"Fast Whisper" may also be referred to as "Fast Mute" however the functionality will be the same.

Settings > Whisper Mode > Whisper Timer



Allows the user to schedule times to quiet the unit. This will slow the fans down to provide a quieter operation during the scheduled times. However, the Whisper timer will also decrease capacity. Use only when quiet operation is required

Settings > Curve



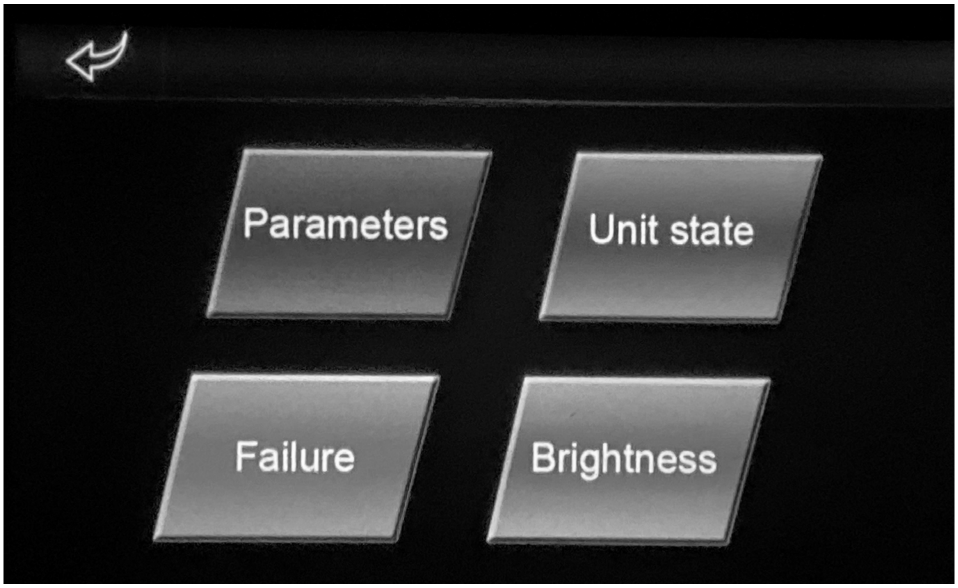
The curve key allows a user to visually see (in real time and historical) the operational curves of the inlet water, outlet water and ambient on graph of temperature versus time period.

Settings > Factory

The factory key allows the user to enter in a password that will provide certain information based on the password entered. Please see below charts for each menu based on password selection.

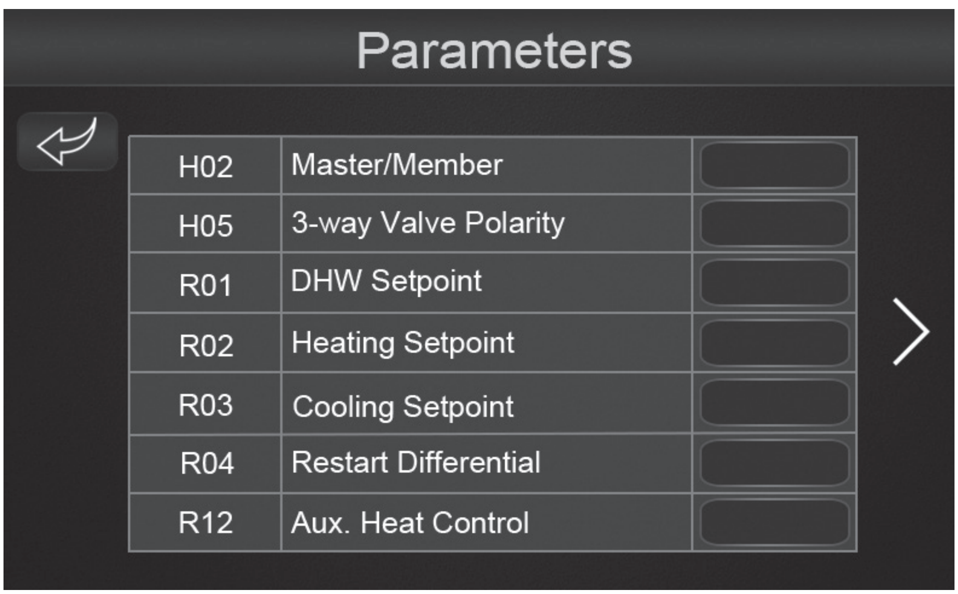
Settings > Factory > Passcode ‘’22”

Password = “22” the following menus appear:



Settings > Factory > Passcode ‘’22” > Parameters

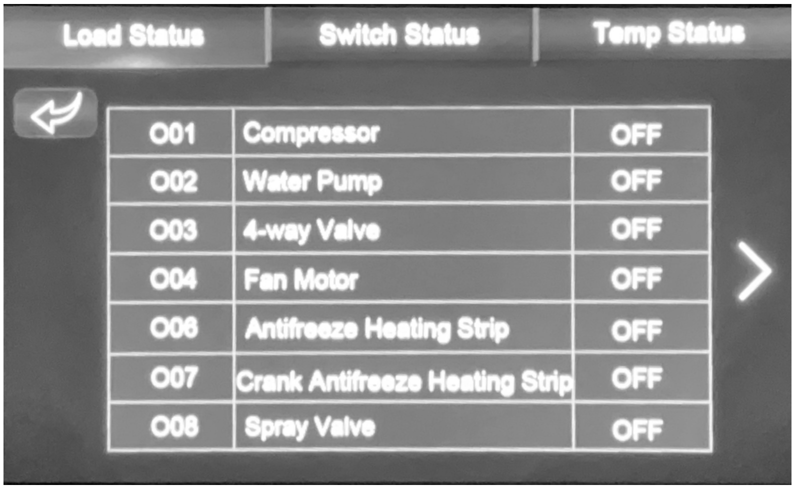
Parameters Submenu



Press this key to access certain parameters only meant to be changed by a user. Use the parameter chart from this manual to determine what parameters are accessible with the proper password.

<u>Settings > Factory > Passcode ‘’22” > Unit State</u>

Unit State Submenu

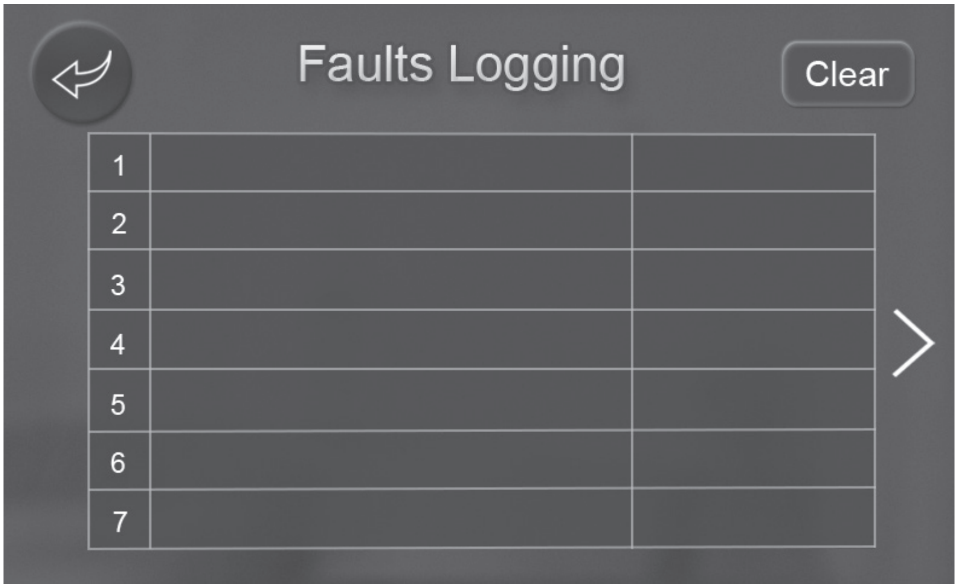


Allows the user to see the current state of certain items. By selecting the appropriate top menu, the user can see how the unit is currently operating. See below chart for each item a user can monitor.

Unit State Menu				
Top Menu	**Number**	**Name**	**Possible Options**	**Description**
Load Status	O01	Compressor	On/Off	Status of the Compressor
	O02	Water Pump	On/Off	Status of the Primary Circulator
	O03	4-Way Valve	On/Off	Status of the Reversing Valve. ON is Heating, OFF is Cooling
	O04	Fan motor	On/off	Status of Fan motor(s)
	O06	Antifreeze heat strip	On/Off	Status of the Condensate Pan heater
	O07	Crank Antifreeze Heat Strip	On/Off	Status of the Compressor Crankcase Heater
	O08	Spray valve	On/Off	Not available for this unit
	O09	Auxillary Electric Heater	On/Off	Status of the Auxiliary Electric Heater output
	O11	Alarm	On/Off	Status of the Alarm output
	O12	Hot Water Pump	On/Off	Status of the DHW pump circulator
	O13	3-way Valve	On/Off	Status of DHW diverter valve. ON is DHW, OFF is space conditioning circulation
	O14	Eev Steps	0-480	Electronic Expansion Valve steps of capacity, out of 480
Switch Status	S01	High Pressure	Open/Closed	High Pressure protection switch. Closed indicates normal operation. Open indicates the switch is tripped on High Pressure, 638 PSIG, 4.4 MPa.
	S02	Low Pressure	Open/Closed	Low Pressure protection switch. Closed indicates normal operation. Open indicates the switch is tripped on Low Suction Pressure, 2.1 PSIG, 0.15 MPa
	S03	Flow Switch	Open/Closed	Water flow switch. Closes when minimum flow is achieved, Approximately 4.5 GPM for the SIM-036, 7.0 GPM for SIM-060. Opens when flow is lost or falls below this value
	S04	Remote Switch	Open/Closed	Remote On/Off, open is Standby, Closed is Unit Enabled
	S05	Mode Switch	Open/Closed	Remote Heat/Cool selection, Open is Cooling, Closed is Heating
	S06	DHW On/Off	Open/Closed	Indicates DHW enabled by an external switch
	S07	Electric Heater Overload	Open/Closed	Auxiliary Electric Heater Safety Switch. Closed allows normal heater operation, Open indicates the safety tripped on water overtemp and Aux Heat output is prevented.
	S08	Heat/Cool On Off	Open/Closed	Indicates Space Conditioning modes, Heating or Cooling, are enabled. Whether or not the compressor is active
Temp Status	T01	Inlet Water Temp	°F / °C	Return water temp
	T02	Outlet Water Temp	°F / °C	Supply water temp
	T03	Exhaust Temp	°F / °C	Compressor discharge temp
	T04	Water Tank Temp	°F / °C	DHW Tank temperature
	T05	Suction Temp	°F / °C	Compressor Suction Temperature
	T06	Coil Temp	°F / °C	Outside Coil surface temperature
	T07	Ambient Temp	°F / °C	Outside Air temperature
	T08	Suction Pressure	PSI	Compressor Suction Pressure
	T09	Exhaust Pressure	PSI	Compressor Discharge Pressure
	T10	Actual Frequency	Hz	Running frequency of compressor
	T11	Set Frequency	Hz	Target frequency compressor/control is attempting to achieve
	T12	Speed of fan1 motor	RPM's	Operating speed of Fan Motor 1
	T13	Speed of fan2 motor	RPM's	Operating speed of Fan Motor 2 (if applicable)
	T14	Suction Overheat	°F / °C	Calculated Suction Superheat
	T15	Exhaust Overheat	°F / °C	Calculated Discharge Superheat
	T16	Module Temp Protect Value	°F / °C	Overtemp protection Setpoint of the Inverter Board chip. Set by Inveter Board. Actual Measured Value is T21
	T17	AC Input Voltage	V	Measured input voltage to unit
	T18	AC Input Current	A	Measured current that unit is using
	T19	Compressor phase current valid value	A	Three phase current provided to the Compressor motor from the Inverter Board
	T20	Bus Voltage Value	V	Three phase voltage provided to the Compressor motor from the Inverter Board
	T21	IPM/PIM module Actual Temp	°F / °C	Inverter board chip temperature. Shuts the compressor off if temperature is excessive.
	T22	Target Speed of Fan Motor	RPM's	Target operating speed of Fan Motor(s)
	T23	Target Temp after AT compensation	°F / °C	Target temperature that the unit is driving to under current condtions according to the Outdoor Reset (ODR) Settings

<u>Settings > Factory > Passcode ‘’22” > Failure</u>

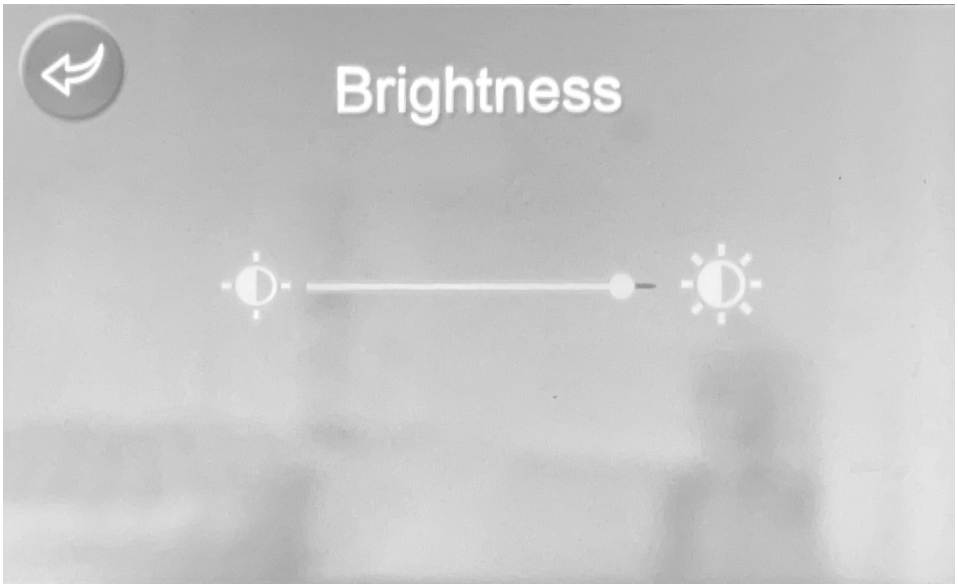
Failure Log Submenu



Press this key to find the log of the most recent faults the unit has encountered. The fault, the time of the fault and the date of the fault will all be recorded and displayed. The log is capable of holding the most recent 35 faults. The fault log can be cleared by pressing the “Clear” button in the upper right hand corner and then entering in the correct password. The password changes everyday with the day of the month (see instructions how to set up time and date). Example: if the date is 1/5/21 the password will be “5”. Press Yes to continue/verify to clear the log.

Settings > Factory > Passcode ‘’22” > Brightness

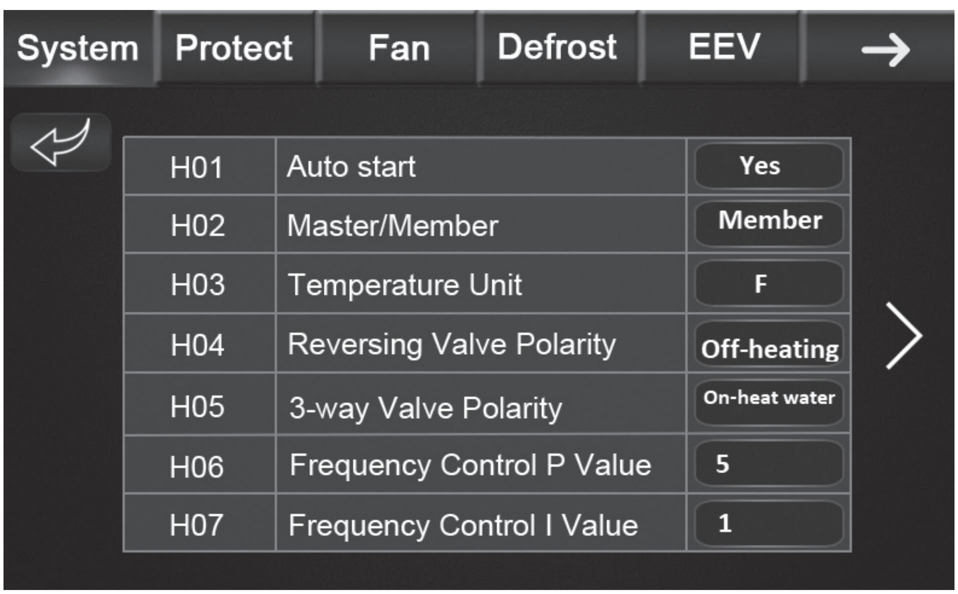
Brightness Submenu



The brightness key allows the user to adjust the screen brightness. Press the brightness bar to the right to make the display brighter and the left on the brightness bar to make the display less bright.

Settings > Factory > Passcode ‘’66”

Password = “66” the following menus appear: Use the Parameter table in this manual to define and determine which parameter are accessible through the "66" pass code.



SECTION 6: PARAMETERS

Top Menu	Code	Description	Units	Range	Passcode	-036	-060	Notes
Protect	A01	Freeze Protection Temperature	Deg F	14 to 50	66	41	41	Pump will start when water temperature is below this value
	A02	Freeze Protection Pressure	PSI	0 to 145	66	0	0	Compressor will stop if suction pressure is below this value
	A03	Freeze Protection Differential	Deg F	0 to 18	66	3.6	3.6	Freeze protection stops when water temperature reaches A01 + A03
	A04	Minimum Ambient Temperature	Deg F	-22 to 50	66	-4	-4	Unit will not operate below this ambient temperature
	A05	Discharge Temperature Protection	Deg F	176 to 266	66	230	230	Compressor will stop if discharge temperature is above this value
Defrost	D01	Exit defrosting Temperature	Deg F	35 to 104	66	55	55	Defrost cycle ends when coil temperature reaches this value
	D02	Exit defrosting Pressure	PSI	14.5 to 362.5	66	362.5	362.5	Defrost cycle ends when suction pressure reaches this value
	D03	Min time between two Defrost Cycles	Min.	1 to 90	66	45	45	Defrost will not repeat before this interval regardless of conditions
	D04	Max. duration of a Defrost Cycle	Min.	1 to 20	66	8	8	Defrost cycle will not run longer than this regardless of conditions
	D05	Sliding Defrost, Max Pressure	PSI	14.5 to 290	66	76.9	76.9	Suction Pressure to start defrost at Max Ambient
	D06	Sliding Defrost, Min Pressure	PSI	14.5 to 290	66	40.6	40.6	Suction Pressure to start defrost at Min Ambient
	D07	Sliding Defrost, Max Ambient Temp	Deg F	14 to 50	66	35.6	35.6	Max Ambient of Defrost Pressure Curve
	D08	Sliding Defrost, Min Ambient Temp	Deg F	-22 to 50	66	5	5	Min Ambient of Defrost Pressure Curve
	D09	Enable Sliding Defrost	-	0 ~ 1	66	1	1	If 0, defrost operates on fixed values, if 1, operates on a sliding scale
	D10	Electric Heat During Defrost	-	0 ~ 1	66	0	0	If 0, no action. If 1, aux heat is energizes during Defrost
	D11	Compressor Speed during Defrost	Hz	30 to 90	66	70	70	Fixed compressor speed during Defrost only
EEV	E01	EEV Mode	-	Auto~Manual	66	Auto	Auto	Manufacturer setting, do not alter
	E02	Superheat in Heating operation	Deg F	-18 to 18	66	7.2	9	Manufacturer setting, do not alter
	E03	Superheat Compensation1 (Heating)	Deg F	-18 to 18	66	0.9	0.9	Manufacturer setting, do not alter
	E04	Superheat Compensation2 (Heating)	Deg F	-18 to 18	66	0.9	0.9	Manufacturer setting, do not alter
	E05	EEV initial opening at startup in Heating	Steps	0 to 480	66	300	350	Manufacturer setting, do not alter
	E06	EEV initial opening Compensation1	Steps	0 to 480	66	0	0	Manufacturer setting, do not alter
	E07	EEV initial opening Compensation2	Steps	0 to 480	66	0	0	Manufacturer setting, do not alter
	E08	EEV initial opening Compensation3	Steps	0 to 480	66	0	0	Manufacturer setting, do not alter
	E09	Min Initial Steps	Steps	0 to 200	66	100	100	Manufacturer setting, do not alter
	E10	Defrost Steps	Steps	0 to 480	66	480	480	Manufacturer setting, do not alter
	E11	Superheat in Cooling	Deg F	-18 to 18	66	7.2	7.2	Manufacturer setting, do not alter
	E12	Initial Steps in Cooling	Steps	0 to 480	66	480	350	Manufacturer setting, do not alter
	E13	Exhaust Assist Open Time	Min.	0 to 100	66	60	10	Manufacturer setting, do not alter
	E14	Suction Superheat Open Time	Min.	0 to 100	66	24	4	Manufacturer setting, do not alter
	E15	EEV Control P Value	-	0 to 100	66	5	5	Manufacturer setting, do not alter
	E16	EEV Control I Value	-	0 to 100	66	3	3	Manufacturer setting, do not alter
	E17	EEV Control D Value	-	0 to 100	66	0	0	Manufacturer setting, do not alter
	E18	Manual Steps	Steps	0 to 550	66	0	0	Manufacturer setting, do not alter
	E19	Superheat Compensation1 (Cooling)	Deg F	-18 to 18	66	2	0	Manufacturer setting, do not alter
	E20	Superheat Compensation2 (Cooling)	Deg F	-18 to 18	66	4	1	Manufacturer setting, do not alter

Top Menu	Code	Description	Units	Range	Passcode	-036	-060	Notes
Fan	F01	Max Fan Speed in Heating	RPM	0 to 2000	66	850	850	Max value at minimum suction pressure. Do not exceed
	F02	Min Fan Speed in Heating	RPM	0 to 2000	66	300	300	Main value at maximum ambient temperature. Do not set lower
	F03	LP of Suction for Heating	PSI	0 to 290	66	58	58	Minimum Suction Pressure for Max Fan Speed
	F04	HP of Suction for Heating	PSI	0 to 290	66	160	160	Maximum Suction Pressure for Min Fan Speed
	F05	Max Fan Speed in Cooling	RPM	0 to 2000	66	850	850	Max value at maximum suction pressure. Do not exceed
	F06	Min Fan Speed in Cooling	Deg F	0 to 2000	66	300	300	Main value at minimum ambient temperature. Do not set lower
	F07	HP of Exhaust in Cooling	PSI	0 to 725	66	377	377	Maximum Discharge Pressure for Max Fan Speed
	F08	LP of Exhaust in Cooling	PSI	0 to 725	66	290	290	Minimum Discharge Pressure for Min Fan Speed
	F09	Manual Fan Speed	RPM	0 to 1000	22	0	0	Manual override at fixed speed. If value is 0, fan speed is automatic
	F10	Timer Mute	-	0 ~ 1	66	0	0	Silent mode enabled if value is 1, not enabled if value is 0
	F11	Mute Timer Start Hour	Hr	0 to 23	66	0	0	Time of day (whole hour, 24 hr clock) to start Silent Mode
	F12	Mute Timer End Hour	Hr	1 to 23	66	0	0	Time of day (whole hour, 24 hr clock) to end Silent Mode
	F13	Mute Mode Speed	RPM	300 to 1300	66	600	600	Max allowed fan speed during Silent Mode
	F14	DC/EC Fan Rated Speed	RPM	0 to 1300	66	600	600	Manufacturer setting, do not alter
	F15	Fan Motor Type	-	0 to 2	66	1	2	Quantity of Fans
System	H01	Auto Start	-	0~1	66	1	1	If value is one, unit will retain On/ Off status after power reset.* *Significant only in "Master mode"
	H02	Master/Member Unit	-	0/1	22	0	0	0 = Touchscreen operation, 1 = Wired operation
	H03	Temperature Units	-	0~1	66	1	1	0 = Temps displayed in °C, press.in Bar, 1= Temps in °F, press. in PSI
	H04	4-way valve polarity	-	0~1	66	0	0	0= Reversing Valve de-energized in heating, 1=RV energized in Heating
	H05	3-way valve polarity	-	0~1	22	1	1	0=3-way valve de-energized in DHW, 1=3-way valve energized in DHW
	H06	EEV Control P Value	-	1 to 100	66	5	5	Manufacturer setting, do not alter
	H07	EEV Control I Value	-	1 to 100	66	3	3	Manufacturer setting, do not alter
	H08	EEV Control D Value	-	0 to 100	66	0	0	Manufacturer setting, do not alter
	H09	Min Frequency	Hz	20 to 60	66	30	30	Minimum compressor drive frequency limit at low load
	H10	Max Frequency	Hz	30 to 120	66	90	90	Maximum compressor drive frequency limit at high load
	H11	Model Selection	-	0 TO 50	66	17	17	Set specific to Compressor Type, do not alter
	H12	Hand Drive Frequency	Hz	0 to 90	66	0	0	Manual compressor frequency override. 0=Automatic modulation
	H13	PFC Function Enabled	-	0~1	66	1	1	1=Power Factor Correction feature is enabled. 0=Disabled
	H15	Unit Address	-	1 to 99	66	1	1	Unique network address if units are connected together via RS485
	H16	Heating/Cooling and Hot Water Function	-	0~1	66	0	0	0=DHW Mode Disabled, 1=DHW Mode Enabled
	H17	Cooling Mode	-	0~1	66	1	1	0=Cooling Mode disabled, 1=Cooling Mode available
Pump	P01	Pump Operation	-	0 to 2	22	0	0	P01=0-CONSTANT, pump runs whenever the unit is active in heating or cooling operation 1-ON CALL, pump runs when the unit is active and the compressor is running 2-INTERVAL, pump runs for short pulses to sample system water temperature.
	P02	Interval Pump Off duration	Min.	1 to 120	22	10	10	P02= RUNNING INTERVAL TIME between starts during Interval operation
	P03	Interval Pump On duration	Min.	1 to 30	22	3	3	P03= RUNNING DURATION during interval operation.
	P04	Advanced Start Time	Min.	0 to 30	22	1	1	P04= ADVANCE START TIME, in minutes, between Pump Start and Compressor Start
	P05	Manual Control	-	0~1	22	0	0	P05= NO, MANUAL CONTROL Feature is not available in this model. Do not change.

Top Menu	Code	Description	Units	Range	Passcode	-036	-060	Notes
Temp	R01	Hot Water Setpoint	Deg F	R06 to R07	22	140	140	DHW Setpoint. Cannot be less than R06 or greater than R07
	R02	Heating Setpoint	Deg F	R08 to R09	22	120	120	Return temperature setpoint in heating. Must fall between R10 & R11
	R03	Cooling Setpoint	Deg F	R10 to R11	22	46.4	46.4	Return temperature setpoint in Cooling. Must fall between R08 & R10
	R04	Power-on return Difference	Deg F	0.9 to 18	22	3.6	3.6	Differential from setpoint to start compressor operation
	R05	Standby Temp Difference	Deg F	0 to 18	66	3.6	3.6	Differential from setpoint to end compressor operation
	R06	Min Hot Water Setpoint	Deg F	32 to R07	66	104	104	Minimum value allowed for DHW setpoint
	R07	Max Hot Water Setpoint	Deg F	R06 to 149	66	140	140	Maximum value allowed for DHW setpoint
	R08	Min Heating Setpoint	Deg F	68 to 86	66	86	86	Minimum value allowed for Heating setpoint
	R09	Max Heating Setpoint	Deg F	86 to 140	66	120	120	Maximum value allowed for Heating setpoint
	R10	Min Cooling Setpoint	Deg F	46.4 to 68	66	46.4	46.4	Minimum value allowed for Cooling setpoint
	R11	Max Cooling Setpoint	Deg F	68 to 86	66	68	68	Maximum value allowed for Cooling setpoint
	R12	Electric Heating	-	0 to 2	22	0	0	0=No Elect. heater, 1=Heater in HP Circuit, 2=Heater in DHW tank
	R13	Electric Heat Start Difference	Deg F	0 to 18	66	9	9	Electric Heat is active when the water temp is below R02-R13
	R14	Electric Heat Start AT	Deg F	14 to 86	66	41	41	Electric Heat is active after delay when the Amb Temp is below R14
	R15	Delay of Electric heater	Min.	0 to 60	66	5	5	Delay of electric heat start when Amb Temp is between R14 and R16 All these must be true, and compressor must be at >80Hz, for Electric heat to energize
	R16	Electric Heat start at once AT	Deg F	-22 to 68	66	25	25	Electric Heat is active immediately when Ambient Temp is below R16
	R17	Compensatation ON, Low AT	Deg F	R18 to 32	66	17	17	Low Ambient T Heating Temp rollback ends on fall at this Ambient T
	R18	Compensatation OFF, Low AT	Deg F	-22 to R17	66	10	10	Low Ambient T Heating Temp rollback ends on fall at this Ambient T
	R19	Low AT Maximum Compensation	Deg F	68 to 140	66	110	110	Resulting Water Temp rollback at R18 Ambient T
	R20	Compensation ON High AT	Deg F	23 to 50	22	23	23	OD reset begins to lower Water Temp as Ambient rises to this point
	R21	Compensation OFF High AT	Deg F	23 to 140	22	50	50	OD reset completes lowering Water Temp as Ambient rises to this point
	R22	High AT Max Compensation	Deg F	68 to 140	66	110	110	Resulting Water Temp rollback at R21 Ambient T See graphic
High Temp Disinfection	G01	Setpoint	Deg F	140 to 158	22	158	158	Target temperature of Sterilize mode.
	G02	Time of Duration	Min.	0 to 60	22	0	0	Time that Sterilize Temp is held during cycle. If 0, feature is disabled
	G03	Time	Hr	1 to 23	22	0	0	Time of day (whole hour, 24 hr clock) to start Sterilize
	G04	Sterilize Cycle	Day	1 to 30	22	7	7	Interval, in days, between Serilize Cycles Requires electric heat if G01 is greater than R01

Meaning of Each Parameter

Parameter A (Protection Parameter)

Anti-Freeze Protection

Detect Malfunction

Cooling mode: After the compressor starts, it will detect water outlet temperature (T02). If T02≤A01 or the suction pressure is lower than A02 for 10s, the unit will enter anti-freezing protection.

Note: After the compressor has run for 5min, the unit starts to detect its suction pressure.

Heating / Hot water mode: After the compressor starts, it will detect water outlet temperature (T02).

If T02≤T01-2 and T02≤A01 at the same time, the unit will enter anti-freezing protection.

Malfunction Performance

The unit will stop running and the 4-way valve won't change its place. The pump will keep running.

Recovery

1. When the unit detects its water outlet temperature T02≥ parameter A01+A03 or the suction pressure≥parameter A02, the unit will restart to run automatically.
2. If the protection happens over 3 times within 30min, the unit won't be restarted automatically (Recovery only by manual).

A04——Shutdown Ambient Temp

When the ambient temperature (T07) is lower than A04, the unit won't start to run. But there is still a primary winter protection function. (Electric heating is not affected. If electric heating is turned on, the pump needs to be turned on). When the Ambient Temp>parameter A04+2°C, the unit will restart to run.

A05——Discharge Temp Protect Setup

Five mins after compressor starts, when the exhaust temperature is higher than A05, the unit will stop running and enter high exhaust temp protection.

When the unit detects its exhaust temperature T03<parameter A05-25°C, the unit will restart to run automatically.

A06——Spray Valve Open Temp

In cooling mode, when the ambient temperature (T07) reaches the value A06, the unit will open spray valve to cool the condenser. If the T07≤A06-2°C, the spray valve will shutdown.

Parameter D (Defrost Parameter)

1. Requirements to enter defrosting

   ① Check the suction pressure for 1 min. after the compressor starts, and when suction pressure is ≤D05, defrosting timing shall be started.

   ② If the suction pressure sensor failure, the unit will start timing defrost, and the defrost cycle is D03, defrost time is D04.

2. Requirements to stop defrosting

   ① After starting defrosting, when T09≥D02,and T06≥D01, the unit stops defrosting;

   ② If the defrosting time reaches the maximum D04, the heat pump stops defrosting. D01——Exit Defrosting Setpoint.

3. Defrosting action

   ① The following operations shall be conducted if it complies with enter defrosting requirements:

   a. The compressor start to down the frequency at the target frequency of 30Hz.(timings start).
   b. When the cumulative time is 55S, the fan stops working and the four-way valve turns its direction.
   c. Continue to accumulate 5s, and then start to up the frequency, and the target frequency is the max.value of D11.

   ② The following operations shall be conducted if it complies with stop defrosting requirements:

   a. The compressor start to down the frequency at the target frequency of 30Hz (timings start).
   b. The fan stops working, when the cumulative time is 55S, the four-way valve turns its direction.
   c. Continue to accumulate 5s, and then start to up the frequency;
   d. Raise the frequency to the start frequency setting and maintain it for 3 minutes before automatically determining the inlet temperature.

Abnormal end of defrosting

① If the system turns off at the period of defrosting, it will keep on defrosting until defrosting ends.

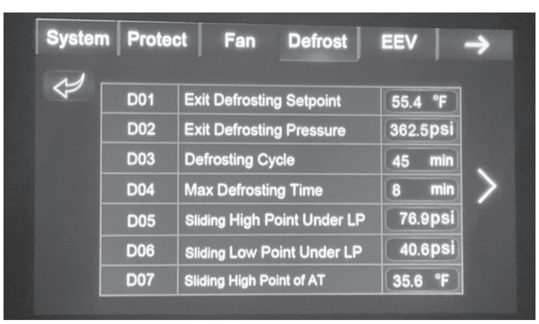
② When detecting the HP switch is disconnected in the course of defrosting, the heat pump will stop defrosting.

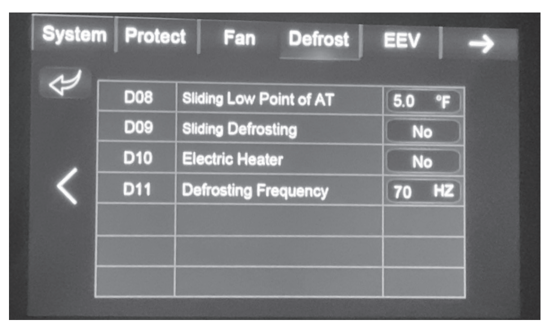
③ When detecting the water flow switch is disconnected in the course of defrosting, the heat pump will stop for protection.

④ When detecting the LP switch is disconnected in the course of defrosting, the heat pump shield this fault and keep defrosting.

⑤ When detecting the exhaust temperature is overheated in the course of defrosting, the heat pump will stop for protection.

⑥ When detecting anti-freezing protection in the course of defrosting, the heat pump will stop for protection.





Parameter F (Fan Parameter)

Normally, in heating mode or cooling mode, fan will start up 10s ahead of compressor and 30s later to shut off.

1. Fast mute function

   When the fast mute function is turned on, the fan will run according to the parameter F13 if it needs to be turned on, and exit the mute function after 8 hours. The manual operation of fast mute during the timing mute will result in the time mute failure.

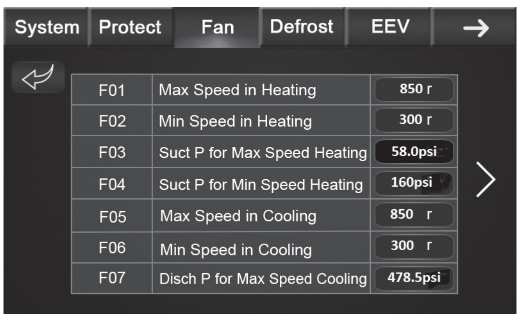
2. When F10=1, enable the timing mute function.

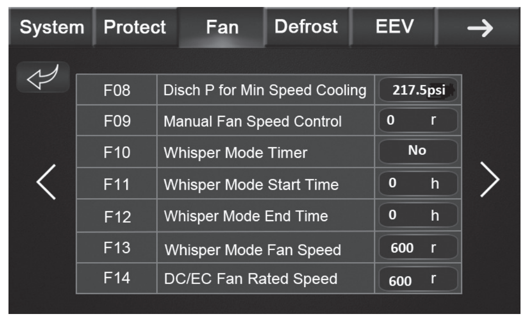
   During the time of F11-F12 (including F11, excluding F12), if the fan needs to be turned on, it will run according to the parameter F13. If the fan needs to be turned on at other times, the speed will be controlled according to the suction pressure and exhaust pressure.

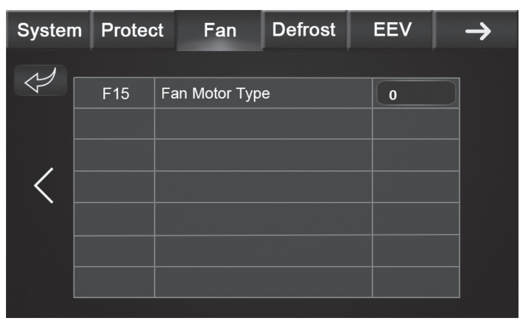
3. During the period that the mute function is performed, if high /low voltage protection occurs in any system:

   ① Automatic exit fast mute function;

   ② Permanently exit the timer mute function, and will be restored until the power is reenergized.







Parameter H (System Parameter)

Parameter P (Pump Parameter)

Remote ON/OFF terminals must be closed for any unit operation.

P01=0-CONSTANT Pump is on when the unit is Started from the Touchscreen (In Master Mode) or when Heat/Cool On/Off terminals are closed (In Member Mode).

P01=1-On Call Pump is on when the unit is Started from the Touchscreen (In Master Mode) or when Heat/Cool On/Off terminals are closed (In Member Mode), ***and*** the Return Water Temperature is outside of the satisfied range calling for the Compressor to run. Pump will run for two additional minutes after the compressor stops.

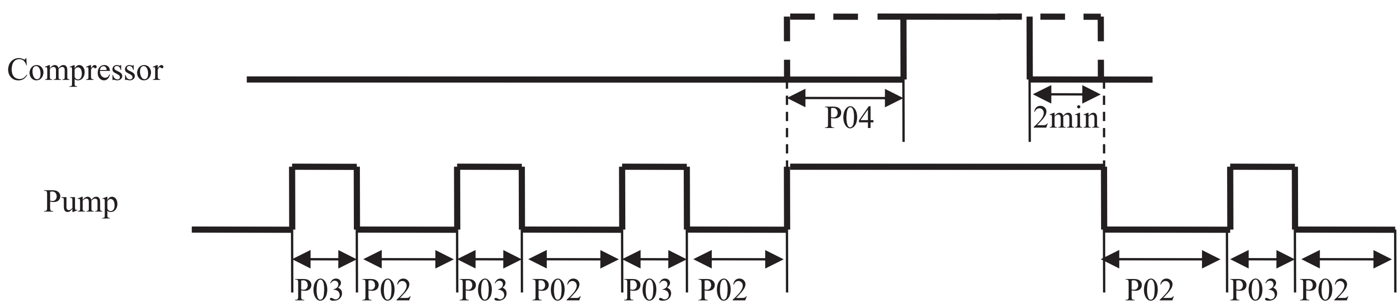
P01=2-Interval When temperature is within the satisfied range and the compressor is not running, the pump will start every **(P02)** minutes, and run for the duration of **(P03)** minutes in order to circulate wate from the system through the Heat Pump so that it can sample the water temperature. If the temperature leaves the satisfied range, and the compressor starts, the pump will run along with the compressor, and remain on for two minutes after the compressor stops.

P02, if **P01=2-INTERVAL,** the value of **P02** is the elapsed in minutes between starts of the pump, when the temperature is within the satisfied range.

P03, if **P01=2-INTERVAL,** the value of **P03** is the duration of the run time while the pump is circulating.

P04, ADVANCE START TIME, this is the minimum time, in minutes, that the pump runs before the compressor can start.

P05= NO, MANUAL CONTROL This feature is not available on the SIM Series heat pumps. The value must remain **NO**.



Auxiliary Electric Heater Operation

When parameter **R12** is set to **1** (Heater placed in space heating circuit) or **2** (heater placed in DHW circuit), the electric heater function is enabled.

The heater will energize when ***all (5)*** of the below conditions are met.

1. The flow switch has been closed for a minimum of 1 minute.
2. The heater overtemp switch is closed.
3. The compressor is running at 80 Hz or above.
4. The supply water temperature is less than **R02** minus **R13**
5. The ambient temperature is below **R14** and all above conditions have been met for **R15** minutes. ***Or*** the ambient temperature is below **R16**.

The heater will de-energize when ***any*** of the below conditions are met.

1. Parameter **R12** is set to **0**
2. The return water is greater than **R02** minus **R13**
3. The compressor speed falls below 50 Hz
4. The ambient temperature rises above **R14** plus 4°F
5. The flow switch opens
6. The heater overtempt switch opens

The heater will operate energize in Defrost operation when ***all (3)*** of the following conditions are met.

1. Parameter **D10** is set to **1**
2. The heater overtempt switch is closed
3. The flow switch is closed.

Compressor Short Cycle Protection

In order to protect the compressor from short cycling, and ensure proper oil circulation and return, the compressor will remain running at startup for a minimum of three minutes, and remain off for minimum of three minutes at shut-off, regardless of whether the temperature setpoint has been satisfied.

The compressor can be restarted after 3min when switch OFF. It is applicable to all conditions.

ModBus BMS Controls

Every SIM unit has the ability to communicate with Building Automation Systems (BMS) through ModBus. The “RS485” terminals on the main control board will be utilized for this feature. The table below lists all addresses available. It is important to note that some are read only while others can be changed and are writable functions.

Prior to connecting to BMS the following steps need to be taken

1. Ensure the transmission format is set in the BMS when trying to connect. This includes baud rate, start bit, byte width, parity, and stop bits. These can be found in the table below labeled “Transmission Format”
2. Connect the - wire (from the BMS) to the terminal labeled “RS485 -” in the SIM electrical cabinet and + wire (from the BMS) to the terminal labeled “RS485 +” in the SIM electrical cabinet. Locate a GND (if required) and wire from BMS to a ground terminal in the SIM electrical cabinet.
3. Ensure that the SIM unit is in the "Master" mode set at the local controller through parameter H02. (to access H02 press the setting key, passcode= 66, system tab, change parameter H02 accordingly)
4. Ensure parameter H15 is set to the address of the unit being controlled (if it's the first unit H15 = 1, 2nd unit H15 = 2 etc...). To access parameter H15 press the settings key, passcode= 66, system tab, change parameter H15 accordingly).
5. Place a jumper on the "Remote ON/OFF" terminals located at the main board connections.

Important Note: All temperatures values in the MODBUS registers are stored as tenths of a degree Celsius, regardless of whether the unit is set to display Fahrenheit or Celsius.

Therefore, a temperature value such as register 1192 = Heating Target Temperature may be stored as 500. Divide this value by 10 and you get 50.0°C. To determine the equivalent value in Fahrenheit, multiply this value by 9/5, to get 90, then add 32. The Fahrenheit temperature is 122°F.

If you wish to change the target temperature to 115°F, first subtract 32 to get 83, then multiply by 5/9. The Celsius temperature is 46.1°C, multiply this by 10 and enter the value 461.

When a value represents a difference between two temperatures, such as register 1194, Start temperature differential, the conversion from Celsius to Fahrenheit is simply, multiply by 9/5, and from Fahrenheit to Celsius is multiply by 5/9.

For example, if the default value is 36, divide this by 10 and it represents 3.6°C difference, multiply by 9/5 to get 6.5°F difference. Conversely, if you want to set this value to 5°F differential, multiply by 5/9 to get 2.8°C differential. Divide this by 10, and set the register value to 28.

SIM Ambient Temperature Compensation (Outdoor Reset)

The SIM Air-to-Water Heat Pumps provide Outdoor Reset control to match delivered water temperature in Heating Mode to the actual load of the system.

Refer to the following graph to better understand the function of the referenced parameters.

The control adjusts the Target Temperature set point in response to the outdoor air temperature. The primary setpoint, parameter **R02**, is set to meet the required capacity of the system at the Design Point, that is the lowest ambient temperature, and therefore greatest heating load, at which the Air-to-Water Heat Pump is expected to operate.

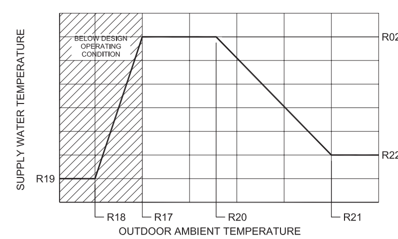
As the ambient temperature rises to a certain pre-selected point, defined by parameter **R20**, the system load is expected to diminish, and can be satisfied with lower delivered water temperature. The control will then begin lowering the setpoint on a sliding scale, until reaches its lowest point, defined by parameter **R22**, at an ambient temperature of **R21**.

The unit power consumption is closely linked to the supply water temperature, so delivering lower temperature water at lower load conditions can greatly improve overall system efficiency.

An additional feature of the SIM Outdoor Reset control occurs at the lower end of the ambient temperature range. As the temperature falls below the *Design Point,* the heating capacity of the unit falls rapidly, to the point where it is unlikely to meet the system load, and therefore reach the Target temperature setpoint, and should not be expected to do so. To protect the unit from operating continuously without ever satisfying, the control will lower the Target temperature setpoint. As the ambient temperature falls below the value of **R17**, the Target setpoint will begin falling on a sliding scale, until it reaches the lowest setpoint of **R19**, when the Ambient temperature reaches **R18**. This action will approximately match the diminishing unit capacity as the temperature falls, so it is not actually limiting unit performance in any real manner.

The setpoint of **R17** should be at, or slightly below the *Design Point,* so operation below this should be considered for *emergency purpose only.* This operation should only occur under exceptional conditions, such as the failure of the backup heating source, or extraordinarily rare cold weather conditions. The unit should not be expected to maintain desired indoor temperatures, but will remain online to provide sufficient heat to prevent damage to the system and structure.

SIM SERIES OUTDOOR RESET OPERATION, HEATING



Throughout the entire operating range, it is possible to see the “real time” Outdoor Reset Target Temperature by reading the value of **T23** in the Unit Status menu. This will display the actual Target based upon the current outdoor ambient temperature and the values of parameters **R17** through **R22**.

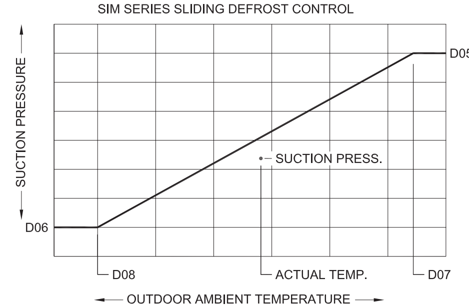
Note: If Domestic Water Heating is employed, the same Outdoor Reset applies. Therefore, if you desire full DHW capacity during mild to warm weather, set R22 equal to R01 to effectively disable the Reset feature.

SIM Defrost Control

The SIM Air-to-Water Heat Pumps offer two modes of outside coil defrosting logic, Fixed Point operation, and Sliding Defrost Function.

- When the value of parameter D09 = 0, the control will default to Fixed Point defrost. During this operation, the control logic will monitor the outside coil pressure (suction pressure in heating). If the compressor has been operating for longer than the value of D03, in minutes, and the suction pressure is below the value of D05*, then the control logic will initiate a defrost cycle.
- During this cycle, the compressor stops, the system will remain idle for one minute to allow refrigerant pressures to equalize, the reversing valve will shift to the Cooling position, and the heat pump will begin operating in cooling mode and send heat to the outside coil in order to melt accumulated ice from the coil tubes and fins.
- This will continue until the outside of the coil reaches the temperature defined by parameter D01*, and the coil pressure reaches the value of D02*.
- The system will then stop, wait one minute, shift the reversing valve to Heating, and resume normal operation. Parameter D04 sets a maximum defrost duration, in minutes.
- If the cycle fails to satisfy both D01 and D02 within that time, the defrost cycle will stop and the unit will return to heating operation.
- When the value of parameter D09 = 1, the control will operate in in Sliding defrost logic.
- During this operation, the control logic will monitor the outside coil pressure and also the outdoor ambient air temperature.
- The control will plot the Suction pressure and Ambient temperature as shown in the graph below.
- If the compressor has been running for longer than D03 minutes, and the Suction pressure falls below the heavy line at the current actual ambient temperature, then the system will begin the defrost cycle as described above.

SIM SERIES SLIDING DEFROST CONTROL



The system will exit defrost according to parameters D01 and D02 and D04 as described above.

*If the heat pump is configured to display in Imperial units, (default) the values of D01, D07 and D08 will be shown in degrees Fahrenheit and D02, D05 and D06 will be shown in PSI.

If it is configured for SI units, (H03 = 1) the D01, D07 and D08 will be shown in degrees Celsius, and D02, D05 and D06 will be shown in Bar.

Modbus RTU Protocol

From: To:

Vesion 1.7 update: 2020.1.1

1. Transmission Format

Baud Rate	9600bps
Start bit	1
Byte width	8
Parity	N
Stop bits	1
Network address	H15

2. Packet Format

Address	Function	Data	CRC checksum
16bits	16bits 03:Function of reading multi registers 16:Function of presenting multi registers 06:Function of presenting single	N*16bits	16bits

3. Important Note:

All temperatures values in the MODBUS registers are stored as tenths of a degree Celsius, regardless of whether the unit is set to display Fahrenheit or Celsius.

Therefore, a temperature value such as register 1192 = Heating Target Temperature may be stored as 500. Divide this value by 10 and you get 50.0°C. To determine the equivalent value in Fahrenheit, multiply this value by 9/5, to get 90, then add 32. The Fahrenheit temperature is 122°F.

If you wish to change the target temperature to 115°F, first subtract 32 to get 83, then multiply by 5/9. The Celsius temperature is 46.1°C, multiply this by 10 and enter the value 461.

When a value represents a difference between two temperatures, such as register 1194, Start temperature differential, the conversion from Celsius to Fahrenheit is simply, multiply by 9/5, and from Fahrenheit to Celsius is multiply by 5/9.

For example, if the default value is 36, divide this by 10 and it represents 3.6°C, multiply by 9/5 to get 6.5°F difference. Conversely, if you want to set this value to 5°F differential, multiply by 5/9 to get 2.8°C differential. Divide this by 10, and set the register value to 28.

4. Mailing Address

Address	Function	HEX	Number	Content	Description	Remark
1011	03/16/06	3F3		ON/OFF	0-off/1-on	DIGI1
1012	03/16/06	3F4		Mode	0-hot water/1-heating/2-cooling/3-hot water+heating/4-hot water+cooling	DIGI1
1013	03/16/06	3F5		Timer mute	0-start 1-exit	DIGI1
1014	03/16/06	3F6		Reserved		
1015	03/16/06	3F7		Reserved		
1016	03/16/06	3F8		Reserved		
1017	03/16/06	3F9		Reserved		
1018	03/16/06	3FA	H01	Whether with power-down memory	0-without memory/1-with memory	DIGI1
1019	03/16/06	3FB	H02	Master and member parameters	0-master/1-member	DIGI1
1020	03/16/06	3FC	H03	Unit conversion	0-°C/1-°F	DIGI1
1021	03/16/06	3FD	H04	Four way valve	0-heating lost electricity/1-heating got electricity	DIGI1
1022	03/16/06	3FE	H05	Three-way valve polarity control	0-heating water lost electricity/1-heating water got electricity	DIGI1
1023	03/16/06	3FF	H06	Compressor frequency control P value	1~100	DIGI1
1024	03/16/06	400	H07	Compressor frequency control I value	1~100	DIGI1
1025	03/16/06	401	H08	Compressor frequency control D value	0~100	DIGI1
1026	03/16/06	402	H09	Compressor minimum frequency	20~60Hz	DIGI1
1027	03/16/06	403	H10	Compressor maximum frequency	30~120Hz	DIGI1
1028	03/16/06	404	H11	Compressor model selection	0~99	DIGI1
1029	03/16/06	405	H12	Manual compressor frequency	0~90Hz	DIGI1
1030	03/16/06	406	H13	PFC enable	0~1	DIGI1
1031	03/16/06	407		One-button electric heating	0-off/1-on	DIGI1
1032	03/16/06	408	H15	Unit Address	1~99	DIGI1
1033	03/16/06	409	H16	Hot water function	0-disable 1-enable	DIGI1
1034	03/16/06	40A	H17	Cooling mode	0-disable 2-enable	DIGI1
1035	03/16/06	40B		Reserved		
1036	03/16/06	40C		Reserved		
1037	03/16/06	40D		Reserved		
1038	03/16/06	40E		Reserved		
1039	03/16/06	40F		Reserved		
1040	03/16/06	410	A01	Outlet water antifreeze temperature point	-10~10°C	TEMP1
1041	03/16/06	411	A02	Antifreeze low value	0~10bar	TEMP1
1042	03/16/06	412	A03	Anti-freeze protection return difference	0~10°C	TEMP1
1043	03/16/06	413	A04	Ambient temperature at which the heat pump stops working	-30~10°C	TEMP1
1044	03/16/06	414	A05	Exhaust temperature too high protection set value	80~130°C	TEMP1
1045	03/16/06	415	A06	Spray valve opening temperature	10~50°C	TEMP1
1046	03/16/06	416		Reserved		
1047	03/16/06	417		Reserved		
1048	03/16/06	418		Reserved		

Address	Function	HEX	Number	Content	Description	Remark
1049	03/16/06	419		Reserved		
1050	03/16/06	41A		Reserved		
1051	03/16/06	41B		Reserved		
1052	03/16/06	41C		Reserved		
1053	03/16/06	41D		Reserved		
1054	03/16/06	41E		Reserved		
1055	03/16/06	41F		Reserved		
1056	03/16/06	420		Reserved		
1057	03/16/06	421		Reserved		
1058	03/16/06	422		Reserved		
1059	03/16/06	423	F01	Maximum fan speed setting during heating	0-2000r	DIGI1
1060	03/16/06	424	F02	Fan minimum speed set value during heating	0-2000r	DIGI1
1061	03/16/06	425	F03	Maximum fan speed during heating corresponding to low return air pressure	0-20bar	TEMP1
1062	03/16/06	426	F04	Minimum fan speed during heating corresponds to the high return air pressure	0-20bar	TEMP1
1063	03/16/06	427	F05	Maximum fan speed setting during cooling	0-2000r	DIGI1
1064	03/16/06	428	F06	Fan minimum speed set value during cooling	0-2000r	DIGI1
1065	03/16/06	429	F07	Maximum fan speed during cooling corresponding to low return air pressure	0-50bar	TEMP1
1066	03/16/06	42A	F08	Minimum fan speed during cooling corresponds to the high return air pressure	0-50bar	TEMP1
1067	03/16/06	42B	F09	Manual fan speed	0~2000r	DIGI1
1068	03/16/06	42C	F10	Whether enable the timer mute function	(0-no/1-yes)	DIGI1
1069	03/16/06	42D	F11	Timed mute start time	0~23h	DIGI1
1070	03/16/06	42E	F12	Timed mute end time	0~23h	DIGI1
1071	03/16/06	42F	F13	Mute speed	300~1300r	DIGI1
1072	03/16/06	430	F14	DC fan rated speed	600r	DIGI1
1073	03/16/06	431	F15	Fan type	0~2 (0-Single speed fan, 1-DC single fan, 2-DC double fan)	DIGI1
1074	03/16/06	432		One-click mute	0-off/1-on	DIGI1
1075	03/16/06	433		Reserved		
1076	03/16/06	434		Reserved		
1077	03/16/06	435		Reserved		
1078	03/16/06	436		Reserved		
1079	03/16/06	437		Reserved		
1080	03/16/06	438		Reserved		
1081	03/16/06	439		Reserved		
1082	03/16/06	43A		Reserved		
1083	03/16/06	43B		Reserved		
1084	03/16/06	43C		Reserved		
1085	03/16/06	43D		Reserved		
1086	03/16/06	43E		Reserved		
1087	03/16/06	43F		Reserved		
1088	03/16/06	440		Reserved		
1089	03/16/06	441		Reserved		
1090	03/16/06	442		Reserved		
1101	03/16/06	44D	D01	Coil temperature for heating exit defrost	1~40°C	TEMP1
1102	03/16/06	44E	D02	Corresponding pressure value for heating exit defrost	1~25bar	TEMP1
1103	03/16/06	44F	D03	Heating defrost cycle	1~90Min	DIGI1
1104	03/16/06	450	D04	Heating defrost longest time	1~20Min	DIGI1
1105	03/16/06	451	D05	Slip into low pressure high point	1~20bar	TEMP1
1106	03/16/06	452	D06	Slip into low pressure low point	1~20bar	TEMP1
1107	03/16/06	453	D07	Slip into ambient temperature high point	-10~10°C	TEMP1
1108	03/16/06	454	D08	Slip into ambient temperature low point	-30~10°C	TEMP1
1109	03/16/06	455	D09	Whether enable sliding defrost	(0-no/1-yes)	DIGI1
1110	03/16/06	456	D10	Whether enable auxiliary electric heating during defrosting	0~1	DIGI1
1111	03/16/06	457	D11	Defrost frequency	0-90Hz	DIGI1
1112	03/16/06	458		Reserved		
1113	03/16/06	459		Reserved		
1114	03/16/06	45A		Reserved		
1115	03/16/06	45B		Reserved		
1116	03/16/06	45C		Reserved		
1117	03/16/06	45D		Reserved		
1118	03/16/06	45E		Reserved		
1119	03/16/06	45F		Reserved		
1120	03/16/06	460		Reserved		
1121	03/16/06	461		Reserved		
1122	03/16/06	462		Reserved		
1123	03/16/06	463		Reserved		
1124	03/16/06	464		Reserved		
1125	03/16/06	465		Reserved		
1126	03/16/06	466		Reserved		
1127	03/16/06	467	E01	EEV adjustment	0~1 (0-manual/1-auto)	DIGI1
1128	03/16/06	468	E02	EEV heating target overheat	-10~10°C	TEMP1

Address	Function	HEX	Number	Content	Description	Remark
1129	03/16/06	469	E03	Heating target overheat compensation 1	-10~10°C	TEMP1
1130	03/16/06	46A	E04	Heating target overheat compensation 2	-10~10°C	TEMP1
1131	03/16/06	46B	E05	EEV heating steps	0~480N	DIGI1
1132	03/16/06	46C	E06	Steps compensation 1	0~200N	DIGI1
1133	03/16/06	46D	E07	Steps compensation 2	0~200N	DIGI1
1134	03/16/06	46E	E08	Steps compensation 3	0~200N	DIGI1
1135	03/16/06	46F	E09	EEV minimum steps	0~200N	DIGI1
1136	03/16/06	470	E10	Defrosting steps	0~480N	DIGI1
1137	03/16/06	471	E11	EEV cooling target overheat	-10~10°C	TEMP1
1138	03/16/06	472	E12	EEV cooling steps	0~480N	DIGI1
1139	03/16/06	473	E13	Exhaust assist control start time	0~100min	TEMP2
1140	03/16/06	474	E14	Suction overheat control start time	0~100min	TEMP2
1141	03/16/06	475	E15	EEV conrol P value	0~100	DIGI1
1142	03/16/06	476	E16	EEV conrol I value	0~100	DIGI1
1143	03/16/06	477	E17	EEV conrol D value	0~100	DIGI1
1144	03/16/06	478	E18	Manual steps	0~550N	DIGI1
1145	03/16/06	479	E19	Cooling target overheat compensation 1	-10~10°C	TEMP1
1146	03/16/06	47A	E20	Cooling target overheat compensation 2	-10~10°C	TEMP1
1147	03/16/06	47B		Reserved		
1148	03/16/06	47C		Reserved		
1149	03/16/06	47D		Reserved		
1150	03/16/06	47E		Reserved		
1151	03/16/06	47F		Reserved		
1152	03/16/06	480		Reserved		
1153	03/16/06	481		Reserved		
1154	03/16/06	482		Reserved		
1155	03/16/06	483		Reserved		
1156	03/16/06	484		Reserved		
1157	03/16/06	485		Reserved		
1158	03/16/06	486		Reserved		
1159	03/16/06	487		Reserved		
1160	03/16/06	488	G01	Target temperature for pasteurization	60°C-70°C	TEMP1
1161	03/16/06	489	G02	Pasteurization duration	0-60min	DIGI1
1162	03/16/06	48A	G03	Start time of pasteurization	0-23h	DIGI1
1163	03/16/06	48B	G04	Pasteurization cycle	1-30days	DIGI1
1164	03/16/06	48C		Reserved		
1165	03/16/06	48D		Reserved		
1166	03/16/06	48E		Reserved		
1167	03/16/06	48F	P01	Working mode of circulating water pump	0-normal/1-special/2-intermittent	DIGI1
1168	03/16/06	490	P02	Circulating water pump running time interval	0~120min	DIGI1
1169	03/16/06	491	P03	Circulating water pump running duration	0~30min	DIGI1
1170	03/16/06	492	P04	Circulating water pump advance compressor running time	0~30min	DIGI1
1171	03/16/06	493	P05	Manual startup the pump	0~1	DIGI1
1172	03/16/06	494		Reserved		
1173	03/16/06	495		Reserved		
1174	03/16/06	496		Reserved		
1175	03/16/06	497		Reserved		
1176	03/16/06	498		Reserved		
1177	03/16/06	499		Reserved		
1178	03/16/06	49A		Reserved		
1179	03/16/06	49B		Reserved		
1180	03/16/06	49C		Reserved		
1191	03/16/06	4A7	R01	Hot water target temperature	R06~R07°C	TEMP1
1192	03/16/06	4A8	R02	Heating target temperature	R08~R09°C	TEMP1
1193	03/16/06	4A9	R03	Cooling target temperature	R10~R11°C	TEMP1
1194	03/16/06	4AA	R04	Constant temperature start-up return difference	0.5~10°C	TEMP1
1195	03/16/06	4AB	R05	Constant temperature shutdown temperature difference	0~10°C	TEMP1
1196	03/16/06	4AC	R06	Min hot water setpoint	0~R07	TEMP1
1197	03/16/06	4AD	R07	Max hot water setpoint	R07~60°C	TEMP1
1198	03/16/06	4AE	R08	Min Heating Setpoint	20~30°C	TEMP1
1199	03/16/06	4AF	R09	Max Heating Setpoint	30~60°C	TEMP1
1200	03/16/06	4B0	R10	Min Cooling Setpoint	8~20°C	TEMP1
1201	03/16/06	4B1	R11	Max Cooling Setpoint	20~30°C	TEMP1
1202	03/16/06	4B2	R12	Whether enable electrical heating	0-off electrical heating/1-on tap water electrical heating/2-water tank electrical heating	DIGI1
1203	03/16/06	4B3	R13	Electric heating start temperature difference	0.5~10°C	TEMP1
1204	03/16/06	4B4	R14	Electric heating start ambient temperature	-10~30°C	TEMP1
1205	03/16/06	4B5	R15	Electric heating start delay	0~60min	DIGI1
1206	03/16/06	4B6	R16	Electric heating zero delay start ambient temperature	-30~20°C	TEMP1
1207	03/16/06	4B7	R17	Low ambient temperature at which heating starts to compensate	R18~0°C	TEMP1
1208	03/16/06	4B8	R18	Low ambient temperature compensated by heating shutdown	-30~R17°C	TEMP1

Address	Function	HEX	Number	Content	Description	Remark
1209	03/16/06	4B9	R19	Heating low ambient temperature compensation maximum target temperature	20~60°C	TEMP1
1210	03/16/06	4BA	R20	High ambient temperature compensated for heating start	10~R21°C	TEMP1
1211	03/16/06	4BB	R21	High ambient temperature compensated by heating shutdown	R20~60°C	TEMP1
1212	03/16/06	4BC	R22	High target temperature compensation for heating high ambient temperature	20~60°C	TEMP1
1213	03/16/06	4BD		Reserved		
1214	03/16/06	4BE		Reserved		
1215	03/16/06	4BF		Reserved		
1216	03/16/06	4C0		Reserved		
1217	03/16/06	4C1		Reserved		
1218	03/16/06	4C2		Reserved		
1219	03/16/06	4C3		Reserved		
1220	03/16/06	4C4		Reserved		
1221	03/16/06	4C5		Reserved		
1222	03/16/06	4C6		Reserved		
1223	03/16/06	4C7		Reserved		
1224	03/16/06	4C8		Reserved		
1225	03/16/06	4C9		Reserved		
1226	03/16/06	4CA		Reserved		
1227	03/16/06	4CB		Reserved		
1228	03/16/06	4CC		Reserved		
1229	03/16/06	4CD		Reserved		
1230	03/16/06	4CE		Reserved		
1231	03/16/06	4CF		Reserved		
1232	03/16/06	4D0		Reserved		
1233	03/16/06	4D1		Reserved		
1234	03/16/06	4D2		Reserved		
1235	03/16/06	4D3		Reserved		
1236	03/16/06	4D4		Reserved		
1237	03/16/06	4D5		Reserved		
1238	03/16/06	4D6		Reserved		
1239	03/16/06	4D7		Reserved		
1240	03/16/06	4D8		Reserved		
1241	03/16/06	4D9		Reserved		
1242	03/16/06	4DA		Reserved		
1243	03/16/06	4DB		Reserved		
1244	03/16/06	4DC		Reserved		
1245	03/16/06	4DD		Reserved		
1246	03/16/06	4DE		Reserved		
1247	03/16/06	4DF		Reserved		
1248	03/16/06	4E0		Reserved		
1249	03/16/06	4E1		Reserved		
1250	03/16/06	4E2		Reserved		
1251	03/16/06	4E3		Reserved		
1252	03/16/06	4E4		Reserved		
1253	03/16/06	4E5		Reserved		
1254	03/16/06	4E6		Reserved		
2011	03	7DB		Power on / off status	0-on/1-off	
2012	03	7DC		Running mode	0-cooling/1-heating/2-defrosting/3-pasteurization	
2013	03	7DD		Reserved		
2014	03	7DE		Reserved		
2015	03	7DF		Reserved		
2016	03	7E0		Reserved		
2017	03	7E1		Reserved		
2018	03	7E2		Reserved		
2019	03	7E3	O01~013	Load output	bit0: O01 Compressor output 0-off/1-on bit1: O02 Circulating water pump output (0-off/1-on) bit2: O03 Four way valve output (0-off/1-on) bit3: O04 Fan output (0-off/1-on) bit4: Reserved bit5: O06 Antifreeze heating belt output (0-off/1-on) bit6: O07 Crankshaft heating belt output (0-off/1-on) bit7: O08 Sprinkler valve output (0-off/1-on) bit8: O09 Auxiliary electric heating output (0-off/1-on) bit9: Reserved bit10: O11 Warning output (0-off/1-on) bit11: O12 Hot water circulation pump output (0-off/1-on) bit12: O13 Solenoid three-way valve output (0-off/1-o	
2020	03	7E4	O14	EEV steps	0~500N	
2021	03	7E5		Reserved		
2022	03	7E6		Reserved		
2023	03	7E7		Reserved		
2024	03	7E8		Reserved		

Address	Function	HEX	Number	Content	Description	Remark
2025	03	7E9		Reserved		
2026	03	7EA		Reserved		
2027	03	7EB		Reserved		
2028	03	7EC		Reserved		
2029	03	7ED		Reserved		
2030	03	7EE		Reserved		
2031	03	7EF		Reserved		
2032	03	7F0		Reserved		
2033	03	7F1		Reserved		
2034	03	7F2	S01~S08	Switch status	bit0: S01 high pressure switch (0-close/1-open) bit1: S02 Low pressure switch (0-close/1-open) bit2: S03 Water flow switch (0-close/1-open) bit3: S04 Emergency input (0-close/1-open) bit4: S05 Mode switch (0-close/1-open) bit5: Reserved bit6: S07 Electric heating overload switch (0-close/1-open)	
2035	03	7F3		Reserved		
2036	03	7F4		Reserved		
2037	03	7F5		Reserved		
2038	03	7F6		Reserved		
2039	03	7F7		Reserved		
2040	03	7F8		Reserved		
2041	03	7F9		Reserved		
2042	03	7FA		Reserved		
2043	03	7FB		Reserved		
2044	03	7FC		Reserved		
2045	03	7FD	T01	Inlet water temperature		TEMP1
2046	03	7FE	T02	Outlet water temperature		TEMP1
2047	03	7FF	T03	Exhaust temperature		TEMP1
2048	03	800	T04	Tank temperature		TEMP1
2049	03	801	T05	Suction temperature		TEMP1
2050	03	802	T06	Coil temperature		TEMP1
2051	03	803	T07	Ambient temperature		TEMP1
2052	03	804	T08	Suction pressure		TEMP1
2053	03	805	T09	Exhaust pressure		TEMP1
2054	03	806	T10	Actual frequency		DIGI1
2055	03	807	T11	Set frequency		DIGI1
2056	03	808	T12	DC fan 1 speed		DIGI1
2057	03	809	T13	DC fan 2 speed		DIGI1
2058	03	80A	T14	Suction overheat		TEMP1
2059	03	80B	T15	Exhaust overheat		TEMP1
2060	03	80C	T16	Module temperature protection value		TEMP1
2061	03	80D	T17	AC input voltage value		DIGI1
2062	03	80E	T18	AC input current value		TEMP1
2063	03	80F	T19	Effective value of phase current of compressor		TEMP1
2064	03	810	T20	Main wire voltage value		DIGI1
2065	03	811	T21	IPM/PIM module actual temperature		TEMP1
2066	03	812		Mute display icon position	Fan status sign bit8, Permanent exit timed mute sign bit9	
2067	03	813	T22	DC fan target speed		DIGI1
2068	03	814	T23	Target temperature after compensation		TEMP1
2069	03	815		Reserved		
2070	03	816		Reserved		
2071	03	817		Reserved		
2072	03	818		Reserved		
2073	03	819		Reserved		
2074	03	81A		Reserved		
2075	03	81B		Reserved		
2076	03	81C		Reserved		
2077	03	81D		Reserved		
2078	03	81E		Reserved		
2079	03	81F		Reserved		
2080	03	820		Reserved		
2081	03	821		Reserved		
2082	03	822		Reserved		
2083	03	823		Reserved		
2084	03	824		Reserved		

Address	Function	HEX	Number	Content	Description	Remark
2085	03	825		Failure	bit0: High pressure protection (0-no/1-yes) bit1: Low pressure protection (0-no/1-yes) bit2: Water flow switch protection (0-no/1-yes) bit3: Electric heating overheating protection (0-no/1-yes) bit4: First level antifreeze protection in winter (0-no/1-yes) bit5: Second level antifreeze protection in winter (0-no/1-yes) bit6: Antifreezing protection (0-no/1-yes)) bit7: Exhaust overheating protection (0-no/1-yes) bit8: High pressure protection 3times or more (0-no/1-yes) bit9: Low pressure protection 3times or more (0-no/1-yes) bit10: Electric heating overheating protection 3times or more (0-no/1-yes) bit11: Antifreezing protection 3times or more (0-no/1-yes) bit12: Exhaust overheating protection 3times or more (0-no/1-yes) bit13: Water flow switch protection 3times or more (0-no/1-yes)bit14:Reserved bit15:Reserved	
2086	03	826		Failure	bit0: inlet water temperature sendor failure (0-no/1-yes) bit1: outlet water temperature failure (0-no/1-yes) bit2: Exhaust temperature sensor failure (0-no/1-yes) bit3: Water tank temperature sensor failure (0-no/1-yes) bit4: Suction temperature sensor failure (0-no/1-yes) bit5: Coil temperature sensor failure (0-no/1-yes) bit6: Ambient temperature sensor failure (0-no/1-yes) bit7: Suction pressure sensor failure (0-no/1-yes) bit8: Exhaust pressure sensor failure (0-no/1-yes) bit9: Reserved bit10: Low ambient temperature protection bit11: DC fan 1 failure bit12: DC fan 2 failure bit13: DC fan connection failure bit14:Reserved	
2087	03	827			bit0: Reserved bit1: Reserved bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: Reserved bit8: Reserved bit9: Reserved bit10: Reserved bit11: Reserved bit12: Reserved bit13: Reserved bit14: Reserved bit15: Reserved	
2088	03	828		Failure	bit0: IPM overcurrent shutdown failure bit1: Compreesor start failure bit2: Compressor overcurrent shutdown failure bit3: Input voltage phase loss failure bit4: IPM Current sampling failure bit5: IGBT power device over temperature shutdown failure bit6: PFC failure bit7: DC main wire overvoltage bit8: DC main wire voltage loss bit9: AC input voltage loss bit10: Ac input overcurrent bit11: Input voltage sampling failure bit12: DSP and PFC connection failure bit13: module/heat sink temperature Sensor failure bit14: DSP and communication board connection failure bit15: mainborad connection failure	

Address	Function	HEX	Number	Content	Description	Remark
2089	03	829		Failure	bit0: Compressor overcurrent warning bit1: Compressor field weakening warning bit2: IGBT power component overheating warning bit3: AC input overcurrent warning bit4: EEPROM failure warning bit5: The EEPROM has been programmed to prohibit startup failure bit6: IPM over temperature shutdown bit7: Low voltage 15V voltage loss failure bit8: Reserved bit9: Reserved bit10: Reserved bit11: Reserved bit12: Reserved bit13: Reserved bit14: Reserved	
2090	03	82A		Failure	bit0: Reserved bit1: Reserved bit2: Reserved bit3: Reserved bit4: Reserved bit5: Reserved bit6: Reserved bit7: Reserved bit8: Reserved bit9: Reserved bit10: Reserved bit11: Reserved bit12: Reserved bit13: Reserved	
2101	03	835		Reserved		
2102	03	836		Reserved		
2103	03	837		Reserved		
2104	03	838		Main program version number	Data transfer is 11, means the version number isV1.1	
2105	03	839		Software code	When the data is 1234, the software code is 35005-311234; when the data is 12, the software code is 35005-310012	
2106	03	83A		Reserved		
2107	03	83B		Reserved		
2108	03	83C		Reserved		
2109	03	83D		Reserved		
2110	03	83E		Reserved		
2111	03	83F		Reserved		
2112	03	840		Reserved		
2113	03	841		Reserved		
2114	03	842		Reserved		
2115-2180	03	884		Reserved		

SIM Error Codes

Error Code	Description	Cause	Solution
---	Heat pump will not start when called upon for Heating, Cooling or DHW	Temperature target point may be satisfied. Note if Outdoor Reset is enabled, (in heating) the Target Point may be different from the value entered in the parameter menu.	Refer to Section 5 to navigate to Status Menu. Check temperature reading T24 for the actual target temperature at the current outdoor ambient temperature.
		Various errors will not immediately appear on Home Screen until multiple re-start attempts have been exhausted.	Refer to Section 5 to navigate to Fault Log. Check for faults and identify below.
E032	Flow error	Undersized pump, excessive plumbing restriction, air trapped in the hydronic circuit, pump not receiving signal	Ensure pump is adequate to maintain specified flow at actual head loss, ensure all air has been removed, check wiring to confirm voltage is supplied to pump when called for by the heat pump.
E04	Aux Heat Overtemp Protection	Heater element exposed above water level. Water is not flowing through the system.	"Ensure hydronic system is completely filled. Confirm logic will not energize heater elements unless water is flowing. Replace thermal fuse."
E051	Compressor overcurrent	Excessive refrigerant discharge pressue or undervoltage.	Address high pressure as in E11 above. Ensure a minimum of 220V is supplied to heat pump during operation.
E07	Antifreeze Protection	Insufficient water flow in Cooling	Verify Pump as flow error E032 above
E08	Communication fault with Compressor Inveter Board	Check internal RS485 wiring between control board and Inverter Board	Correct wiring or check fault codes indicating faulty Inverter Board
E11	High Discharge Pressure	Excessive refrigerant discharge pressue. If in Heating, high water temperature or insufficient water flow. If in Cooling, restricted airlow, dirty coil or high ambient temperature.	Correct water or air flow, clean coil or lower water temperature. Note ambient temperatures greater than 110°F are beyond design conditions and may cause this fault.
E12	Low Suction Pressure	Low suction pressure. If in Cooling, insufficient water flow. If in Heatinging, restricted airlow or dirty coil. Low refrigerant charge	Correct water or air flow, clean coil or lower water temperature. Check refrigerant charge by weight posted on the Data Plate.
E19	Primary Freeze Protection	Inlet Water Temperature between 32° and 36°F and Ambient T is below 32°F	Check water temperature. If it is over 36°F, check or replace 5k sensors T1 or T2
E21	Power supply undervoltage	Input power falls below 220V under load	Ensure power supply is adequate to supply 220-240V under maximum load.
E22	Input overcurrent	High amp draw due to high compressor load or low voltage	Address discharge pressure per PP2 above, or check input voltage.
E29	Secondary Freeze Protection	Inlet Water Temperature below 32° and Ambient T is below 32°F	Check water temperature. If it is over 36°F, check or replace 5k sensors T6 or T7
	Compressor or Fan Inverter board specific faults	Component faults on the inverter board are not field serviceable.	Contact SpacePak Technical Support for further instruction. Replace the Compressor Board IC2, or Fan Board IC3
E081	Fan controller loss of communication	Wiring fault between main controller and fan control board.	Check internal wiring between main control board IC1 and fan control IC3. Check fuse on board IC3
E171	Freeze protection Pump and or electric heaters engaged	Normal operation to protect from freezing.	No action necessary if all sensors are reading correctly.
E181	Refrigerant discharge temperature exceeds 239°F	Excessive suction superheat due to refrigerant undercharge.	Determine loss of refrigerant, evacuate and recharge system by weight on Data Label
E182	Refrigerant discharge temperature exceeds 239°F, resets and repeats 3 times in an hour, unit shuts down.	Excessive suction superheat due to refrigerant undercharge.	Determine loss of refrigerant, evacuate and recharge system by weight on Data Label
F00	Inverter internal overcurrrent	Excessive current draw or fault in the inverter board circuit	Confirm incoming power. If correct, replace the compressor inverter board IC2
F01	Compressor motor failure	Electrical failure of the compressor motor or connecting cables	Inspect wiring connections and cables to the compressor, M1. If no faults are found, contact SpacePak Technical Support for further troubleshooting steps
F21	Overload Alarm	excessive current draw of the fan control board.	Ensure fan(s) turn freely
F24-F28 F30-F41	Compressor or Fan Inverter board specific faults	Component faults on the inverter board are not field serviceable.	Contact SpacePak Technical Support for further instruction. Replace the Compressor Board IC2, or Fan Board IC3
F031	Fan #1 Failure	Electrical failure of the fan motor or connecting cables	Inspect wiring connections and cables to the fan. If no faults are found, replace fan motor. M2
F032	Fan #2 Failure (SIM-060 only)	Electrical failure of the fan motor or connecting cables	Inspect wiring connections and cables to the fan. If no faults are found, replace fan motor. M3
F06	Compressor inveter board failure	Electrical failure of the inverter board or connecting cables	Inspect wiring connections and cables to the fan. If no faults are found, replace the compressor. IC2
F12	Compressor inverter board loss of communication	Wiring fault between main controller and compressor inverter board.	Check internal wiring between main control board IC1 and compressor inverter board IC2. Check fuse on board IC2
P01	Inlet Water Temp Sensor	Sensor failed open or shorted. Wiring fault	Correct wiring or replace 5k sensor T1
P02	Outlet Water Temp Sensor	Sensor failed open or shorted. Wiring fault	Correct wiring or replace 5k sensor T2
P03	DHW Tank Temp Sensor	Sensor failed open or shorted. Wiring fault	Correct wiring or replace the field installed 10k sensor TT
P04	Ambient Air Temp Sensor	Sensor failed open or shorted. Wiring fault	Correct wiring or replace 5k sensor T6
P07	Suction Line Temp Sensor	Sensor failed open or shorted. Wiring fault	Correct wiring or replace 5k sensor T4
P08	Discharge Line Temp Sensor	Sensor failed open or shorted. Wiring fault	Correct wiring or replace 50k sensor T3
P151	Coil Temp Sensor	Sensor failed open or shorted. Wiring fault	Correct wiring or replace 5k sensor T5
PP1	Suction Pressure Sensor Fault	Sensor failed open or shorted. Wiring fault	Correct wiring or replace pressure sensor X2
PP2	Discharge Pressure Sensor Fault	Sensor failed open or shorted. Wiring fault	Correct wiring or replace pressure sensor X1

SECTION 7: TROUBLESHOOTING

Failure	Possible Causes for the Failure	Possible Solutions
Heat pump cannot be started	1 Wrong power supply 2 power supply cable loose 3 circuit breaker open	1 shut off the power and check power supply; 2 check power cable and make right connection 3 check for the cause and replace the fuse or circuit breaker
Heat pump capacity is low, compressor do not stop	1 lack of refrigerant; 2 bad insulation on water pipe; 3 low heat exchange rate on air side exchanger; 4 lack of water flow	1 check for the gas leakage and recharge the refrigerant; 2 make good insulation on water pipe; 3 clean the air side heat exchanger; 4 clean the water filter
High compressor exhaust	1 too much refrigerant 2 low heat exchange rate on air side exchanger	1 discharge the redundant gas 2 clean the air side heat exchanger
Low pressure problem of the system	1 lack of gas 2 block on filter or capillary 3 lack of water flow	1 check the gas leakage and recharge freon; 2 replace filter or capillary; 3 clean the water filter and discharge the air in water loop.
Compressor do not run	1 power supply failure 2 compressor contactor broken 3 power cable loose 4 protection on compressor 5 wrong setting on return water temp. 6 lack of water flow	1 check off the power supply; 2 replace compressor contactor; 3 tighten the power cable; 4 check the compressor exhaust temp.; 5 reset the return water temp.; 6 clean the water filter and discharge the air in water loop.
High noise of compressor	1 liquid refrigerant goes into compressor 2 compressor failure	1 bad evaporation, check the cause for bad evaporation and get rid of this; 2 use new compressor;
Fan do not run	1 failure on fan relay 2 fan motor broken	1 replace the fan relay; 2 replace fan motor.
The compressor runs but heat pump has not heating or cooling capacity	1 no gas in the heat pump; 2 heat exchanger broken; 3 compressor failure.	1 check system leakage and recharge refrigerant; 2 find out the cause and replace the heat exchanger; 3 replace compressor.
Low outlet water temperature	1 low water flow rate; 2 low setting for the desired water temp.;	1 clean the water filter and discharge the air in water loop. 2 reset the desired water temperature.
Low water flow protection	1 lack of water in the system; 2 failure on flow switch	1 clean the water filter and discharge the air in water loop. 2 replace the flow switch.

Maintenance for Air-to-Water Heat Pumps

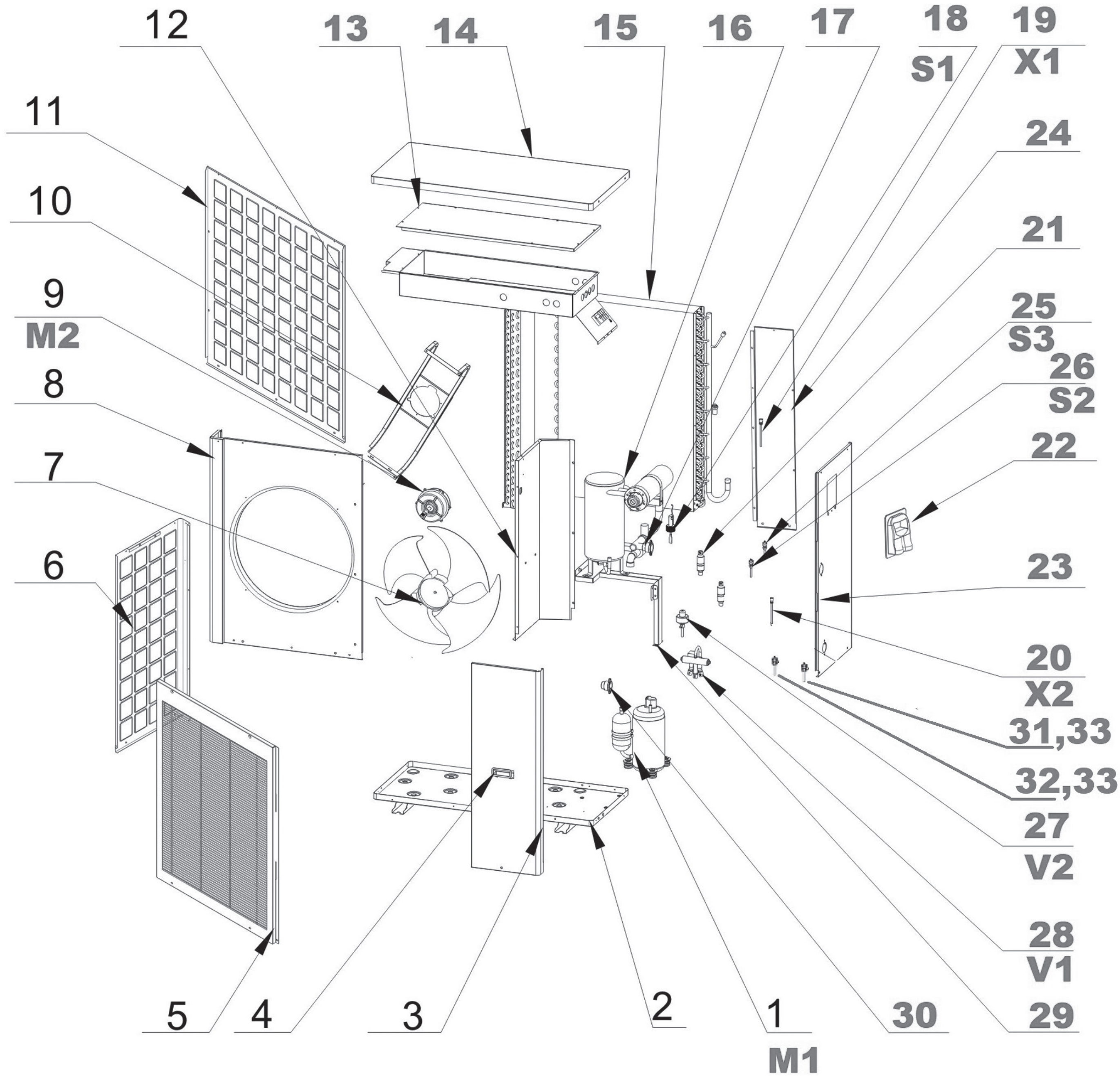
Like all mechanical equipment, air-to-water heat pumps require maintenance to maintain peak performance and reliability. Refer to the following table for maintenance and inspection schedules.

Time Period	Task	Description
Annually	Maintain Glycol %	Over time the % of glycol will degrade leaving the fluid in the system vulnerable to freezing and contaminants. Once a year the fluid should tested using approved test strips for glycol %. If glycol % is below the minimum required for your system design (see install manual for specific % required) the appropriate amount (based on volume) of proper glycol should be added to bring the system back to the minimum. If necessary, the system should be flushed completely, and fresh glycol/water mix should fill the system. If an autofill system is installed, it must be filled with the appropriate concentration.
Seasonally*	Clean coil	Once a season the exposed coil at the outdoor unit should be cleaned using appropriate and approved HVAC coil cleaning solvents ONLY. Use of non-approved solvents can severely damage the system and can impact warranty eligibility.
	Check for loose wires	Verify all wires are still intact and are not making loose connections. Repair as needed
	Clear condensate	Under the outdoor coil there are drain holes for condensate run off. Ensure the path is clear of obstructions that could cause a backup of condensate and potential freezing in freezing conditions.
As Needed	Clear debris	The heat pump should be clear of all debris around the unit to ensure proper air flow
	Rodent damage	Inspect all wiring cabinets, compressor cabinets and panels for any rodent damage. Repair/replace as needed and make provisions to keep rodents out of heat pump cabinets.

*Seasonally is defined at the end of the equipment's operating season. If the unit is used for cooling only, then inspections should be done prior to startup of next season. If unit is used for heating and cooling applications, then inspections/tasks should be completed during the in between time when unit is ready to change from cooling to heating and heating to cooling.

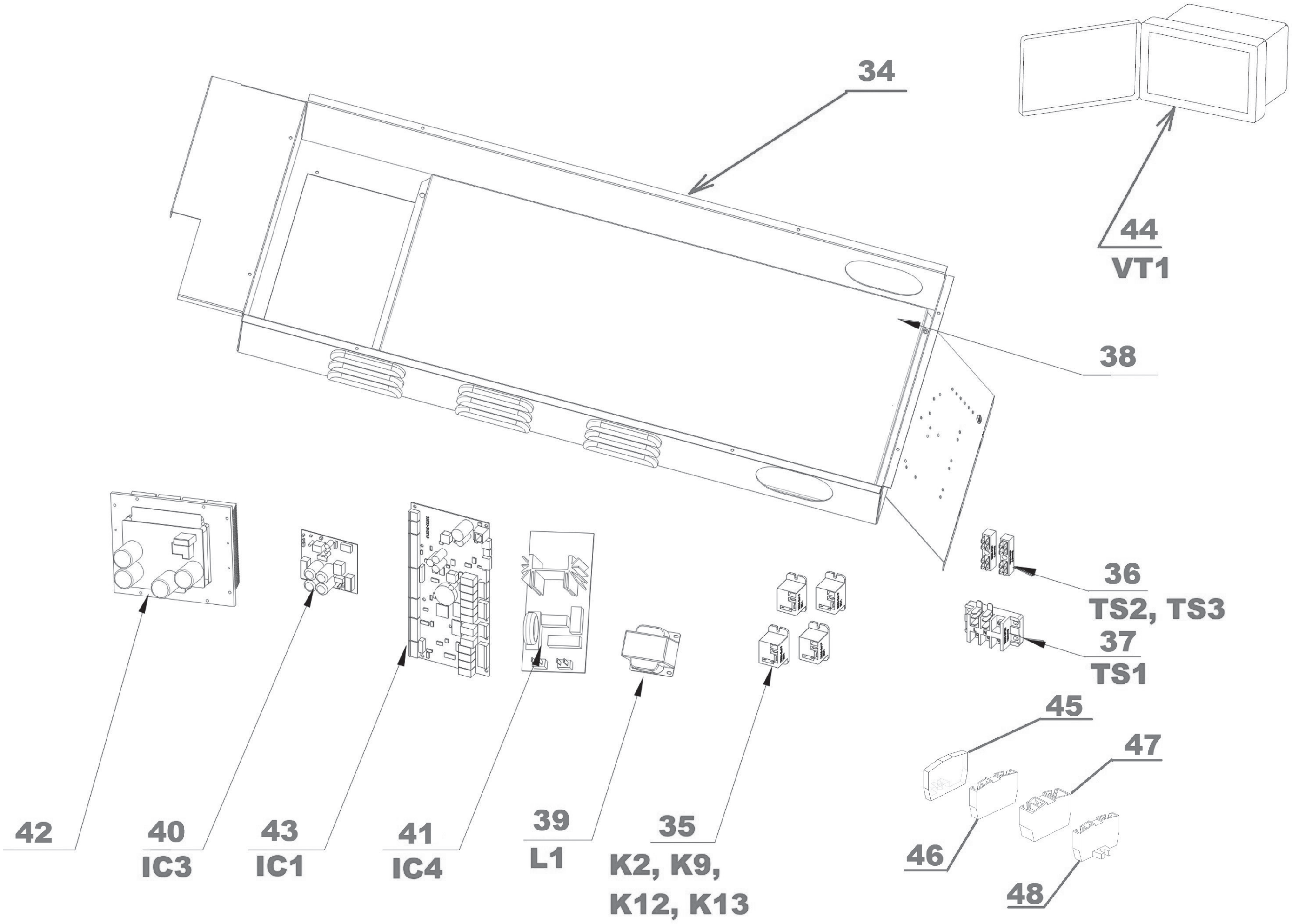
SECTION 8: REPLACEMENT PARTS

SIM036



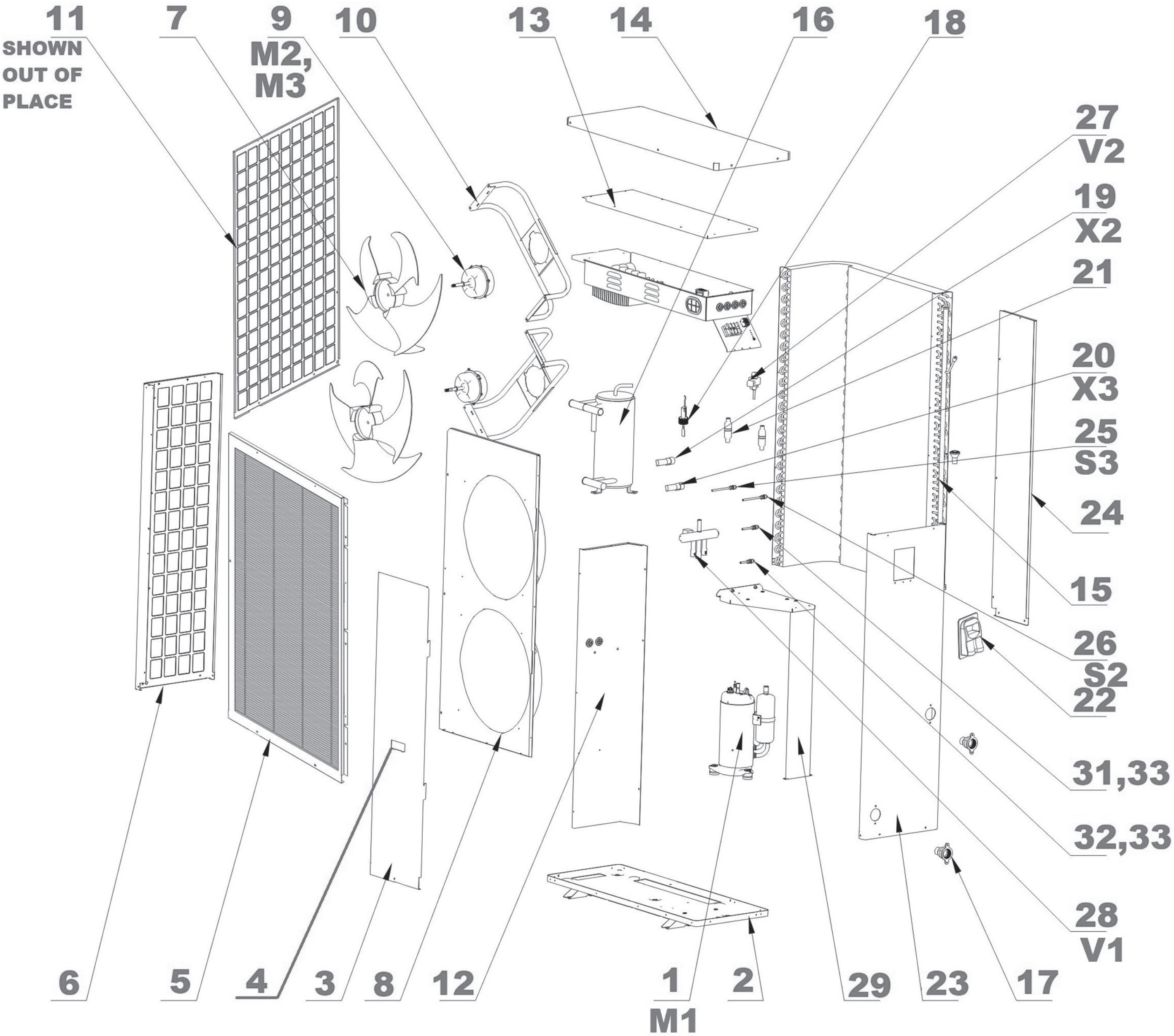
Replacement Parts

SIM036



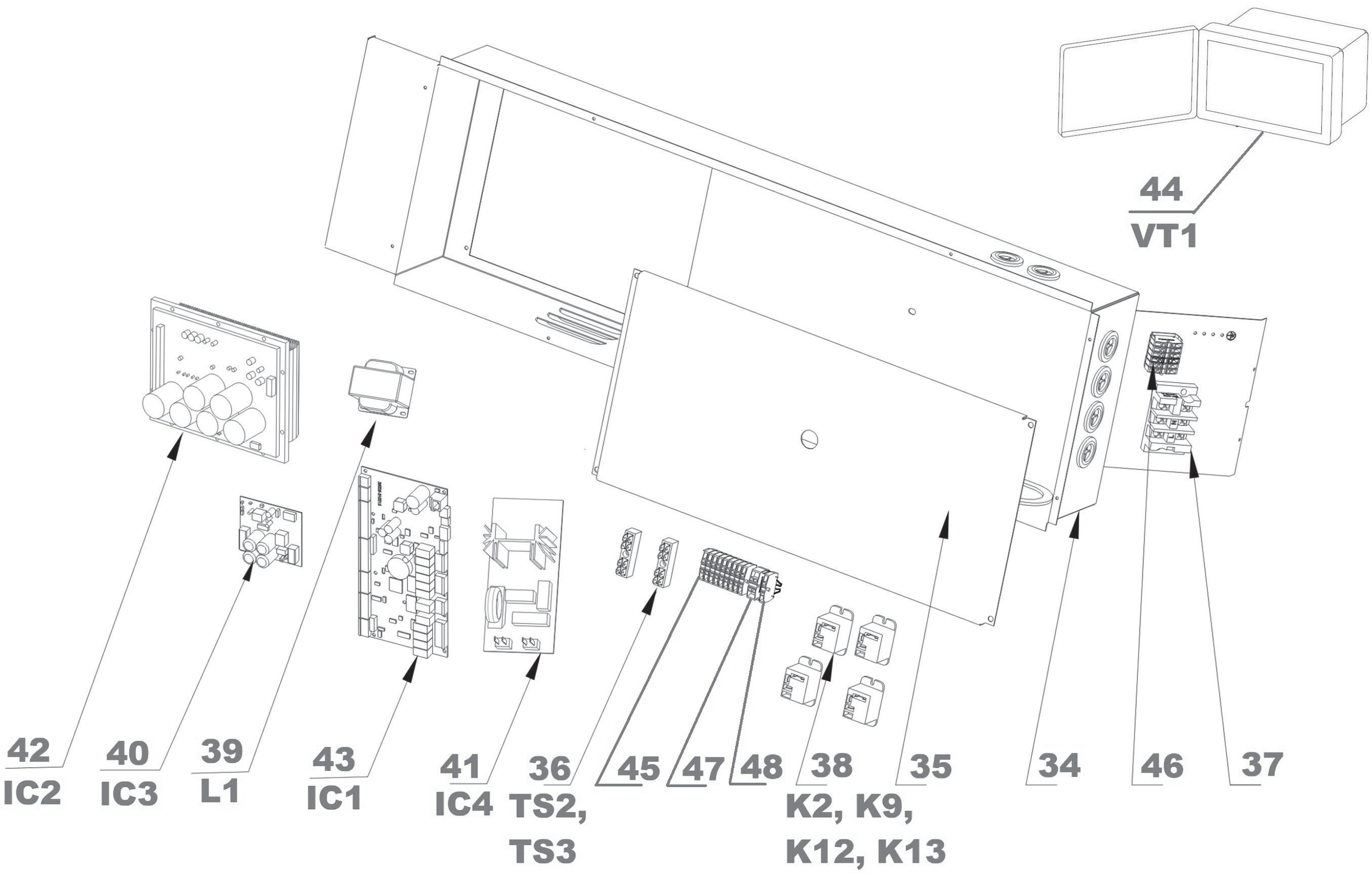
Replacement Parts

SIM060



Replacement Parts

SIM060



Replacement Parts

NO	Part Number	Description	Wiring Diagram Callout	SIM -036	SIM -060
1	45W33-WG1194-01	Compressor	M1	X	
	45W33-WG1259-01				X
2	45W41-WG1195-01	Chassis base plate		X	
	45W41-WG1195-02				X
3	45W41-WG1196-01	Front access panel		X	
	45W41-WG1196-02				X
4	45W19-WG1197-01	Handle, access panel		X	X
5	45W43-WG1198-01	Fan guard		X	
	45W43-WG1198-02				X
6	45W41-WG1199-01	Left coil guard		X	
	45W41-WG1199-02				X
7	45W34-WG1200-01	Fan Blade		X	X
8	45W41-WG1201-01	Fan Panel		X	
	45W41-WG1201-02				X
9	45W31-WG1202-01	Fan Motor	M2	X	
			M2, M3		X
10	45W41-WG1203-01	Fan Support		X	
	45W41-WG1203-02				X
11	45W41-WG1204-01	Rear coil guard		X	
	45W41-WG1204-02				X
12	45W41-WG1205-01	Intermediate plate		X	
	45W41-WG1205-02				X
13	45W41-WG1206-01	Cover, Electrical Box		X	
	45W41-WG1206-02				X
14	45W41-WG1207-01	Cover, top		X	
	45W41-WG1207-02				X
15	45W50-WG1208-01	Coil, finned tube		X	
	45W09-WG1261-01				X
16	45W50-WG1209-01	Heat exchanger, refrigerant to water		X	
	45W50-WG1262-01				X
17	45W40-WG1210-01	Manifold, Water outlet		X	
	45W40-WG1210-03				X
18	45W11-WG1211-01	Flow switch		X	X
19	45W11-WG1212-01	Pressure sensor(0~45bar 0-652 PSI)	X1	X	
			X2		X
20	45W11-WG1212-02	Pressure sensor(0~20bar 0-290 PSI)	X2	X	
			X3		X
21	45W27-WG1214-01	Filter, refrigerant		X	X
22	45W05-WG1216-01	Cover, power inlet		X	X
23	45W41-WG1217-01	Panel, plumbing inlet		X	
	45W41-WG1217-02				X
24	45W41-WG1213-01	Panel, rear		X	
	45W41-WG1213-02				X
25	45W11-WG1218-02	Pressure Switch, Low Limit	S3	X	X
26	45W11-WG1218-01	Pressure Switch, High Limit	S2	X	X
27	45W28-WG1219-01	EEV	V2	X	
	45W28-WG1219-02				X
28	45W28-WG1220-01	Reversing Valve	V1	X	
	45W28-WG1220-02				X
29	45W41-WG1221-01	Support, inside heat exchanger		X	
	45W41-WG1221-02				X
30	45W40-WG1210-02	Connector, 1" NPT		X	
31	45W40-WG1215-01	ACCESS VALVE, SAE 1/4", SIM-036 TO -060		X	X
32	45W40-WG1215-02	ACCESS VALVE, SAE 5/16", SIM-036 TO -060		X	X
33	45W40-WG1215-03	CAP ACCESS VALVE, SAE 5/16", SIM-036 TO -060		X	X
34	45W41-WG1222-01	Control box		X	
	45W41-WG1222-02				X
36	45W09-WG1224-01	2-pole terminal	TS, TS3	X	X
37	45W09-WG1225-01	4-pole terminal (power supply)	TS1	X	X

Replacement Parts (continued)

NO	Part Number	Description	Wiring Diagram Callout	SIM -036	SIM -060
38	45W10-WG1227-01	Relay	K2, K9, K12, K13	X	X
39	45W09-WG1228-01	EMI Reactor	L1	X	
	45W09-WG1228-02				X
40	45W09-WG1229-01	Fan speed module	IC3	X	X
41	45W09-WG1230-01	EMI Filter	IC4	X	
	45W09-WG1230-02				X
42	45W09-WG1231-01	Inverter, Compressor drive	IC2	X	
	45W09-WG1231-02				X
43	45W09-WG1232-01	Control Board	IC1	X	X
44	45W09-WG1233-01	Remote touchscreen display	VT1	X	X
45	45W09-WG1409-01	Cap, terminal End		X	X
46	45W09-WG1358-01	Terminal, Feed Through, 1pole		X	X
47	45W09-WG1408-01	Terminal, Feed Through, 2pole		X	X
48	45W09-WG1359-01	Terminal, Feed Through, 1 pole, flanged		X	X
N/A	45R2000-3242	Temperature Sensor, 5k NTC	T1, T2, T4, T5, T6	X	X
N/A	45R2000-3223	Temperature Sensor, 50K NTC	T3	X	X
N/A	45460-WG1061-02	Electric Heater Kit (SIM-036 Only)		X	
N/A	45Y11-WG1417-01	Cable, Remote Display		X	X
N/A	45W09-WG1415-01	PTC Thermistor, compressor start	PTC		X
N/A	45W09-WG1543-01	Temperature sensor, DHW Tank, 10k NTC	TT*	X	X
N/A	45W09-WG1544-01	Contactor, Compressor Start	KM1		X

*Package loose, installed onsite

Limited Warranty Statement

SpacePak "Solstice Inverter"* Series Air-to-Water Heat Pumps

Subject to the terms and conditions of this Limited Warranty Statement (the "Limited Warranty"), SpacePak warrants to the original purchaser of the "Solstice Inverter" Series that:

1) The parts are warranted for a period of two (2) years to the original owner of the System (as such term is defined in part (4) below). If any parts should prove defective due to improper workmanship and/or material for a period of two (2) years from the date of installation, SpacePak will replace any defective part without charge for that part. Replacement parts are warranted for the remainder of the original 2-year warranty period. Parts used as replacement may be of like kind and quality and may be new or remanufactured. Defective parts must be available for SpacePak in exchange for the replacement parts and become the property of SpacePak.
2) The compressor is warranted for a period of five (5) years to the original owner of the System. If the compressor should prove defective due to improper workmanship and/or material for a period of five (5) years from the date of installation, SpacePak will replace the defective compressor without charge for the compressor. Replacement compressors are warranted for the remainder of the original 5-year warranty period. Compressors used for replacement may be of like kind and quality and may be new or remanufactured. Defective compressors must be made available to SpacePak in exchange for the replacement compressor and become the property of SpacePak.
3) **Notwithstanding the foregoing, if the System is installed in a residential single-family home by a SPACEPAK CERTIFIED CONTRACTOR the parts will be warranted for five (5) years and compressor will be warranted for a period of ten (10) years, to the original owner, so long as the original owner resides in the home.** Specifically, if any parts and/or the compressor should prove defective due to improper workmanship and/or material for the period listed above from the date of installation, SpacePak will replace any defective parts or compressor without charge for the part or compressor. The replacement parts and/or compressor are warranted for the remainder of the original warranty period. Parts and/or compressors used for replacement may be of like kind and quality and may be new or remanufactured. Defective parts and/or compressors must be made available to SpacePak in exchange for the replacement parts and become the property of SpacePak.
4) For purposes of this Solstice Inverter" Series Limited Warranty, as used herein, the term "System" shall mean the Solstice Inverter outdoor and indoor components connected via refrigerant piping and electrical wiring purchased on or after February 1, 2021, (i) sold from a licensed HVAC representative of SpacePak (and not an unauthorized third party) to the original owner, (ii) installed by such contractor in accordance to local and National regulations in the continental U.S., Alaska, Hawaii, and Canada; and (iii) registered on SpacePak's website located at www.SpacePak.com/warranty)

*For any Solstice equipment that is non-inverter, please refer to warranty located in the equipment original installation manual.

SpacePak Small Duct High Velocity Air Handlers and Hydronic Fan Coils

Subject to the terms and conditions of this Limited Warranty Statement (the "Limited Warranty"), SpacePak warrants to the original purchaser of the Small Duct High Velocity Air Handlers and hydronic fan coils that:

1) The parts are warranted for a period of one (1) year to the original owner of the System (as such term is defined in part (3) below). If any parts should prove defective due to improper workmanship and/or material for a period of one (1) year from the date of installation, SpacePak will replace any defective part without charge for that part. Replacement parts are warranted for the remainder of the original 1-year warranty period. Parts used as replacement may be of like kind and quality and may be new or remanufactured. Defective parts must be available for SpacePak in exchange for the replacement parts and become the property of SpacePak.
2) Notwithstanding the foregoing, if the System is installed in a residential single-family home by a SPACEPAK CERTIFIED CONTRACTOR the parts will be warranted for five (5) years, to the original owner, so long as the original owner resides in the home. Specifically, if any parts should prove defective due to improper workmanship and/or material for the period listed above from the date of installation, SpacePak will replace any defective parts or compressor without charge for the part or compressor. The replacement parts are warranted for the remainder of the original warranty period. Parts used for replacement may be of like kind and quality and may be new or remanufactured. Defective parts must be made available to SpacePak in exchange for the replacement parts and become the property of SpacePak.
3) For purposes of this Small Duct High Velocity Air Handlers and hydronic fan coils limited warranty, as used herein, the term "System" shall mean the "SpacePak Small Duct High Velocity Air Handlers, hydronic fan coils purchased on or after February 1, 2021, (i) sold from a licensed HVAC representative of SpacePak (and not an unauthorized third party) to the original owner, (ii) installed by such contractor in accordance to local and National regulations in the continental U.S., Alaska, Hawaii, and Canada; and (iii) registered on SpacePak's website located at www.SpacePak.com/warranty)

SpacePak Buffer Tanks

The “Manufacturer” warrants to the original owner at the original installation site that the Hydronic Buffer Tanks (the “Product”) will be free from defects in material or workmanship for a period not to exceed ten (10) years from the startup, provided the product is installed in accordance with the manufacturers installation instructions. If upon examination by the Manufacturer the Product is shown to have a defect in material or workmanship during the warranty period, the Manufacturer will repair or replace, at its option, that part of the Product which is shown to be defective.

The following items apply to each Limited Warranty offered by SpacePak.

4) **NO LABOR.** Each Limited Warranty offered by SpacePak does NOT include labor or any other costs incurred for service, maintenance, repair, removing, replacing, installing, complying with local building and electric codes, shipping or handling, or replacement of the System/Products, compressors or any other parts. For items that are designed to be maintained or replaced by the original owner, the original owner is solely responsible for all labor and other costs of maintaining, installing, replacing, disconnecting or dismantling the System/ Products and parts in connection with owner-required maintenance. Please consult the applicable technical documentation for regularly suggested maintenance procedures.
5) **PROPER INSTALLATION.** This Limited Warranty applies only to Systems/Products that are sold by SpacePak HVAC representatives, installed by contractors who are licensed for HVAC installation under applicable local and state law, and who install the Systems/Products in accordance with (i) all applicable building codes and permits: (ii) SpacePak’s installation and operation instructions: and (iii) good trade practices.
6) **BEFORE REQUESTING SERVICE,** please review the applicable technical documentation to insure proper installation and correct customer control adjustment for the System/Products. If the problem persists, please arrange for warranty service.
   a. **TO OBTAIN WARRANTY SERVICE:**
      i. Contact the licensed contractor who installed the System/Products or the nearest licensed contractor, dealer, or distributor (whose name and address may be obtained on our website at www.SpacePak.com of any defect within the applicable warranty time period.
      ii. Proof of the installation date by a licensed contractor is required when requesting warranty service. Present the sales receipt, building permit or other document which establishes proof and date of installation. In the absence of acceptable proof, this Limited Warranty shall be deemed to begin one hundred twenty (120) days after the date of manufacture stamped on the System/Products.
      iii. This Limited Warranty applies only to System/Products purchased on or after February 1, 2021 only while the System/Products remains at the site of the original installation, and only to locations within the continental United States, Alaska, Hawaii and Canada.
      iv. Shipment, to the Manufacturer, of that part of the Product thought to be defective. Goods can only be returned with prior written approval from the Manufacturer. All returns must be freight prepaid. Determination, in the reasonable opinion of the Manufacturer, that there exists a defect in material or workmanship.
   b. **THIS LIMITED WARRANTY DOES NOT COVER:** property damages, malfunction or failure of the System/ Products, or personal injury caused by or resulting from: (a) accident, abuse, negligence or misuse; (b) operating the System/Products in a corrosive or wet environment, including those containing chlorine, fluorine or any other hazardous or harmful chemicals or environmental factors, including sea- or salt-water; (c) installation, alteration, repair or service by anyone other than a licensed contractor or other than pursuant to the manufacturer’s instructions; (d) improper matching of System/Products components; (e) improper sizing of the System/Products; (f) improper or deferred maintenance contrary to the manufacturer’s instructions; (g) physical abuse to or misuse of the System/Products (including failure to perform any maintenance as described in the Operation manual, or any System/ Products damaged by excessive physical or electrical stress; (h) System/Productss that have had a serial number or any part thereof altered, defaced or removed; (i) System/Products used in any manner contrary to the Operation Manual; (j) freight damage; or (k) events of force majeure or damage caused by other external factors such as lightning, power surges, fluctuations in or interruptions of electrical power, rodents, vermin, insects, or other animal- or pest-related issues.
   c. **THIS LIMITED WARRANTY ALSO EXCLUDES:** (a) SERVICE CALLS WHERE NO DEFECT IN THE SYSTEM/PRODUCTS COVERED UNDER THIS WARRANTY IS FOUND: (b) System/Products installation or set-ups; (c) Adjustments of user controls; (d) System/Products purchased or installed outside the continental United States, Alaska, Hawaii and Canada; or (e) System/Products purchased or installed prior to **February 1, 2021**. Consult the operating instructions for information regarding user controls.

SPACE PAK®

IN UNITED STATES: 260 NORTH ELM ST. WESTFIELD, MA 01085 800-465-8558
IN CANADA: 7555 TRANMERE DRIVE, MISSISSAUGA, ONTARIO, L5S 1L4 (905) 670-5888