



# SUNPUMP<sup>tm</sup>

## USER'S MANUAL

*SUNPUMP 2.3*

*MULTI-FUNCTION HEAT PUMP*



## BEFORE YOU START

1. After receiving your SunPump please inspect the state of the system to ensure components are not damaged. Any damage related to transport is the responsibility of the purchaser's shipping company and should be promptly addressed.
2. It is essential to read and follow all instructions and warnings, including labels shipped with or attached to the unit before operating your new SunPump.
3. These instructions are intended as a general guide and do not supersede local codes in any way. Consult authorities having jurisdiction before installation. This appliance must only be installed by a qualified installer who is certified to install and operate heat pump/refrigeration systems..
4. The SunPump must be used only in applications for which it was intended. Any misuse of this unit can cause personal injury and/or damage to equipment.
5. Modifications of any electrical connections in the SunPump System may cause the warranty to become void.
6. It is important to keep this manual with the SunPump for reference in the future.



## WARNING


### PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE HAZARD

Failure to follow this warning could result in personal injury, death, or property damage.

Read and follow all instructions and warnings, including labels shipped with or attached to unit before operating your new SunPump system.

Sunpump 2.3 multi-function heat pump is a special appliance. Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency or your distributor for information or assistance. The qualified installer or service agency must use factory-authorized kits or accessories when modifying this product.

Note: SunPump is not responsible for any personal injury or unit damage caused by improper installation or operation.

Any time you see this symbol  in manuals, instructions and on the unit, be aware of the potential for personal injury. There are three levels of precaution:

- **DANGER** identifies the most serious hazards which can result in severe personal injury or death.
- **WARNING** signifies hazards that could result in personal injury or death.
- **CAUTION** is used to identify unsafe practices which would result in minor personal injury or product and property damage.

**NOTE** is used to highlight suggestions which will result in enhanced installation, reliability, or operation.

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## 1 Introduction

This document is designed to be used in conjunction with the installation manuals and/or technical support manuals provided with Sunpump 2.3 Multi-Function Heat Pump. This manual will provide the information on all necessary activities before and during usage of the system.

Sunpump Solar encourages installers of Sunpump products to always keep workmanship, best practices and safety in mind. An organized installation will benefit both installer and end-user.

While reading the manual, please pay close attention to three level of cautions described on page iii of this manual.



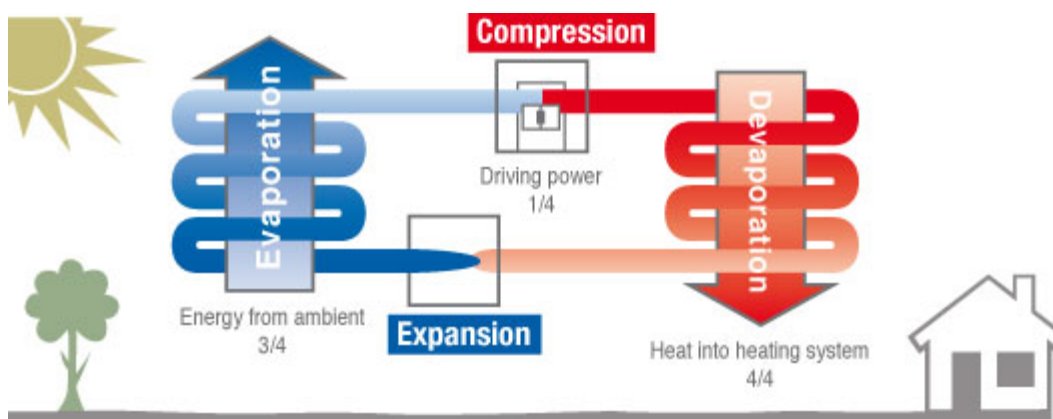
### CAUTION

This device is not suitable for children and must be operated by persons over the age of 18 and who are acquainted with content of the installation and operating instruction manual.

## 2 Principle of heat pumps

A heat pump is a device in which a refrigerant continuously changes phase from gas to liquid, changing temperature at the same time. In the cold liquid state it absorbs energy from the atmosphere as it evaporates to gas. More energy is added at the compressor as the warm gas is compressed to a high pressure hot gas. The combined energy is released into your house when the hot gas condenses back to liquid. The cool liquid is expanded back to a low pressure cold liquid and the process is continuously repeated.

The advantage of a heat pump is that it moves more heat energy through the vapour-compression cycle described above than the electricity it consumes, providing very high effective efficiency. The Coefficient of Performance (COP) of a heat pump is the ratio of the total energy delivered over the amount of energy consumed by the compressor and is typically in the range of 3 to 4.



<http://www.tepelna-cerpadla-mach.cz/en/heat-pump-for-family-houses/heat-pump-principle.php>

### 3 Safety

Do not climb on the unit or try to move it after it has been installed.

Do not allow children to play on or around the unit.

Do not place any items into ventilation openings on the side of the unit. Doing so could damage equipment or result in severe electrical shock.

If you detect any abnormal odour from the unit or the smell of burning turn off the power and switch off power at the breaker.

Do not pull on the power cables or place these under tension.

Do not clean the appliance with water as this can damage the insulation on the hot water tank.

Do not place any objects in front of the air vents on the side of the unit that may block airflow as this can cause internal electronics to over heat.

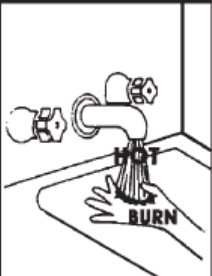
Avoid touching power cables or any electrical connections with wet hands as there is a risk of electric shock.

Only a certified refrigeration technician familiar with the use of R410a refrigerant should make any adjustments in the refrigerant levels in the system.

Failure to turn off all power connections to the unit (system power and electric backup heater) at the disconnect or breaker before installing or servicing the system can result in severe personal injury or death, and can result in damage to the equipment.

Never make any changes to the control parameters unless you are fully aware of how these will affect the operation of the system and know that those changes will not increase the risk of injury to people or cause damage to the unit or any associated heating equipment.

## SAFETY PRECAUTIONS



**⚠ DANGER**

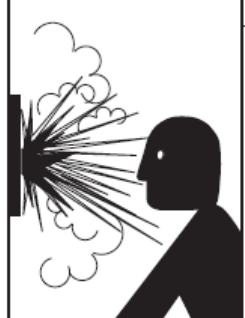
Water temperature over 125°F (52°C) can cause severe burns instantly resulting in severe injury or death.

Children, the elderly, and the physically or mentally disabled are at highest risk for scald injury.

Feel water before bathing or showering.

Temperature limiting valves are available.

Read instruction manual for safe temperature setting.



**⚠ WARNING**

**Explosion Hazard**

- Temperature-pressure relief valve must comply with ANSI Z21.22-CSA 4.4 and ASME code.
- Properly sized temperature-pressure relief valve must be installed in opening provided.
- Can result in overheating and excessive tank pressure.
- Can cause serious injury or death.



**⚠ WARNING**

Read and understand instruction manual and safety messages before installing, operating or servicing this water heater.

Failure to follow instructions and safety messages could result in death or serious injury.

Instruction manual must remain with water heater.



**⚠ WARNING**

- Before removing any access panels or servicing the water heater, make sure the electrical supply to the water heater is turned "OFF".
- Failure to do this could result in death, serious bodily injury, or property damage.

**CAUTION**

**Improper installation and use may result in property damage.**

- Do not operate water heater if flood damaged.
- Inspect and replace the anode as needed.
- Install in location with drainage.
- Fill tank with water before operation.
- Be alert for thermal expansion.

Refer to instruction manual for installation and service.

**⚠ WARNING**


**Excessive Weight Hazard**

Use two or more people to move and install water heater.


Failure to do so can result in back or other injury.

**⚠ WARNING**

**Fire Hazard / Electric Shock Hazard**



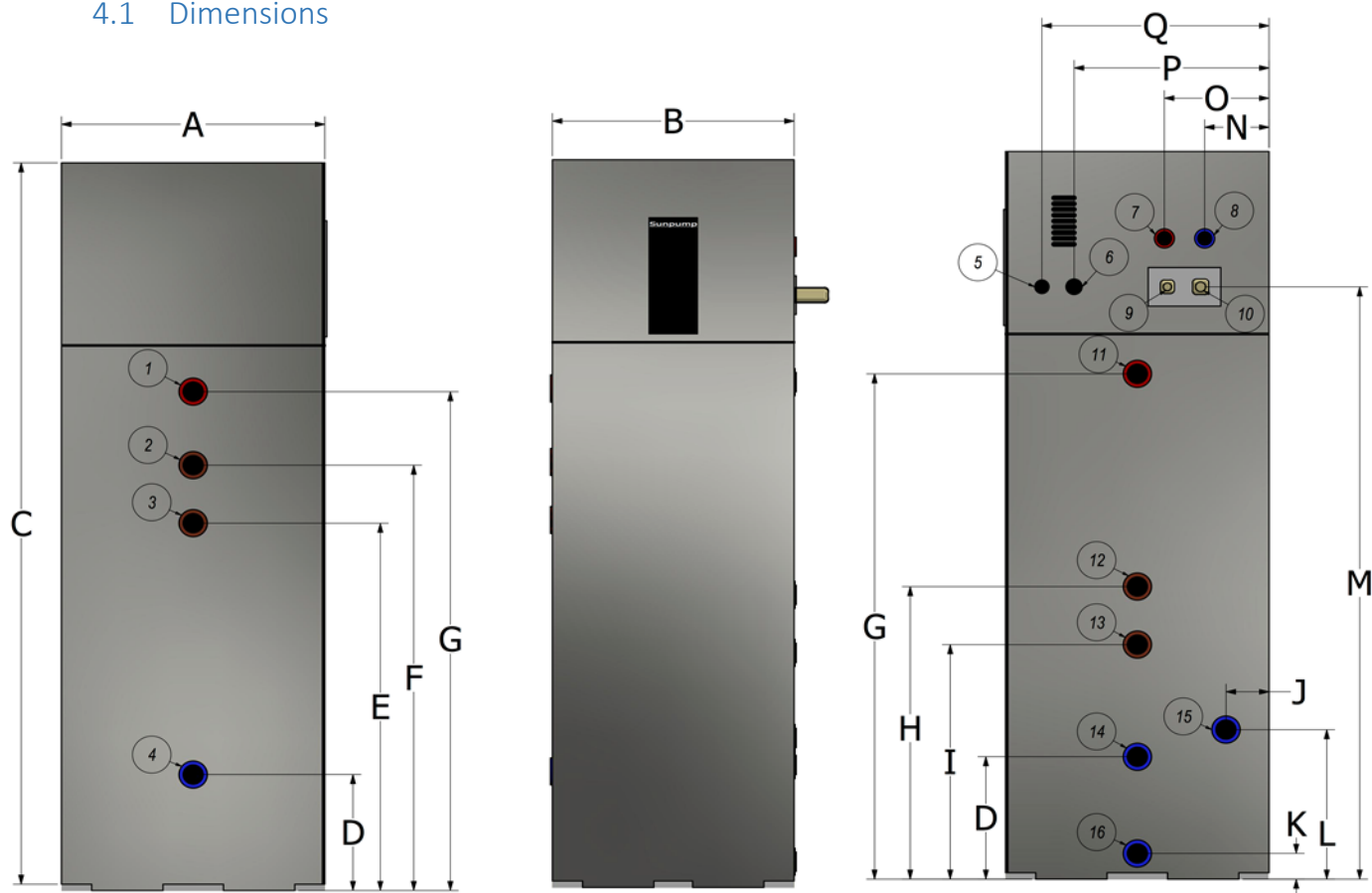
- Do not use this water heater with any voltage other than shown on the model rating plate.
- Failure to use the correct voltage shown on the model rating plate could result in death, serious bodily injury, or property damage.





## 4 SunPump 2.3 Multi-function Heat Pump

### 4.1 Dimensions



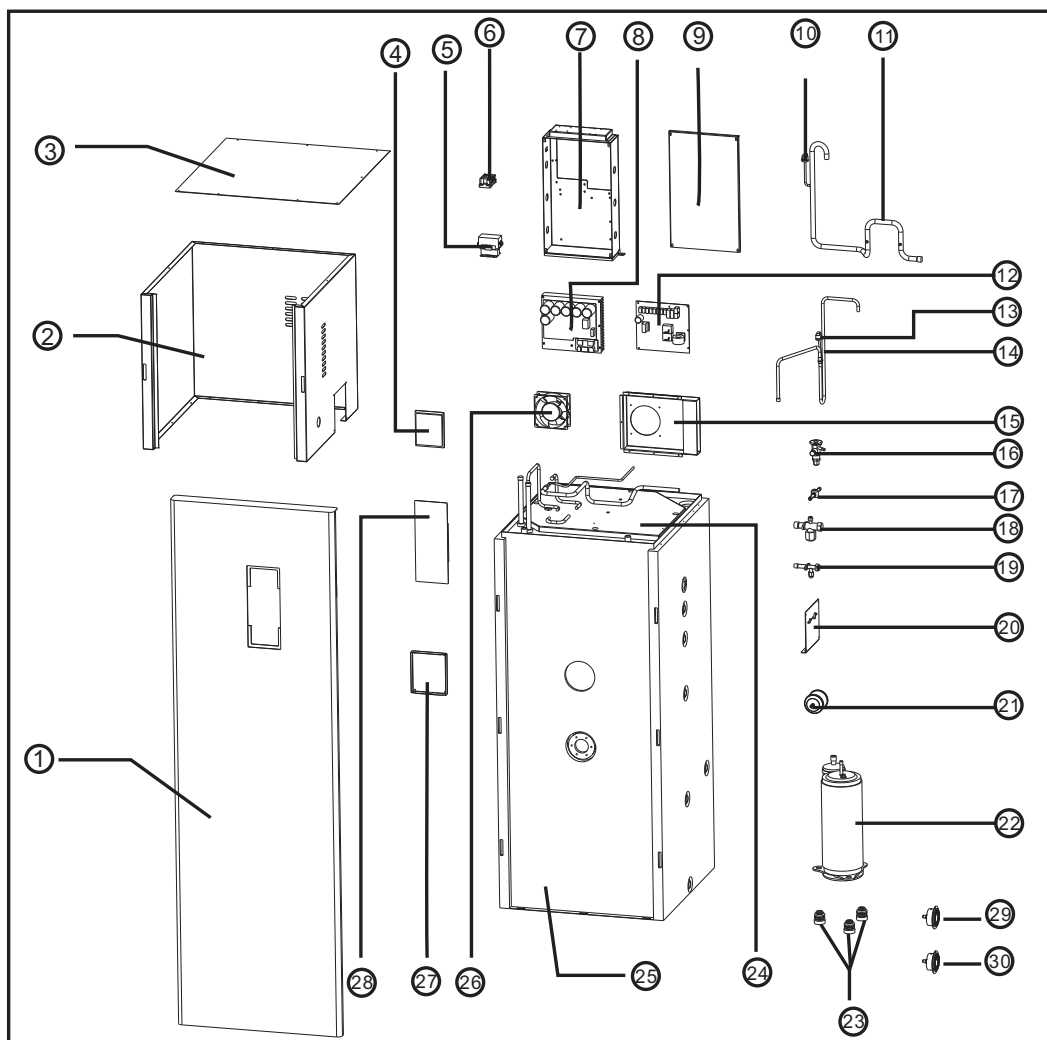
#### System Components

1	Hot water outlet	9	Liquid service valve
2	Space heating outlet	10	Gas service valve
3	Space heating inlet	11	Hot water outlet
4	Cold water inlet	12	Space heating outlet
5	Power cable access	13	Space heating inlet
6	Power cable access	14	Cold water inlet
7	Low pressure gauge	15	Drain outlet
8	High pressure gauge	16	Drain outlet

#### System Dimensions (in.)

Model #	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
18-36DC80GT	25.7	23.6	72.0	13.8	32.3	38.2	44.7	31.1	25.2	2.8	1.3	15.4	57.6	7.0	9.6	19.2	22.0
48DC80GT	25.7	23.6	76.7	13.8	32.3	38.2	44.7	31.1	25.2	2.8	1.3	15.4	57.6	7.0	9.6	19.2	22.0

## 4.2 Parts List

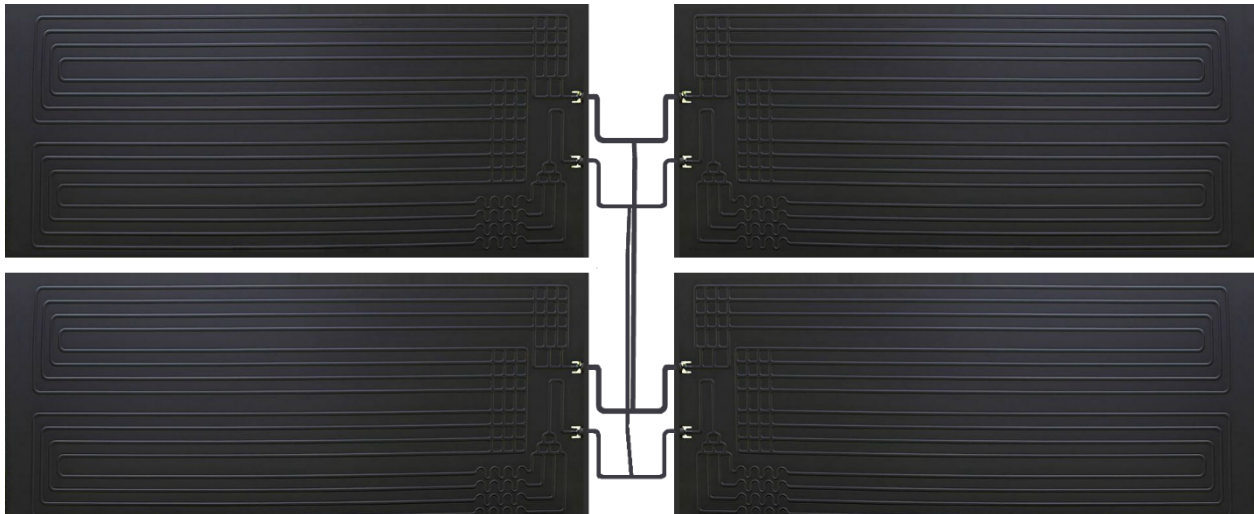


1	Front Panel	16	Thermal Expansion Valve
2	Side Panel	17	Sight Glass
3	Top Panel	18	Liquid Valve
4	Operator Display	19	Gas Valve
5	AC Contactor	20	Valve Mounting Plate
6	Terminal Block	21	Dry Filter
7	PCB Box	22	Compressor
8	Inverter Board	23	Vibration Mounts
9	PCB Box Cover	24	Mounting Plate
10	Low Pressure Switch	25	Water Tank
11	Suction Tube	26	Fan
12	PCB	27	Operator Display Box
13	High Pressure Switch	28	Operator Display Panel
14	Pressure Tube	29	High Pressure Gauge
15	Fan Mounting Plate	30	Low Pressure Gauge

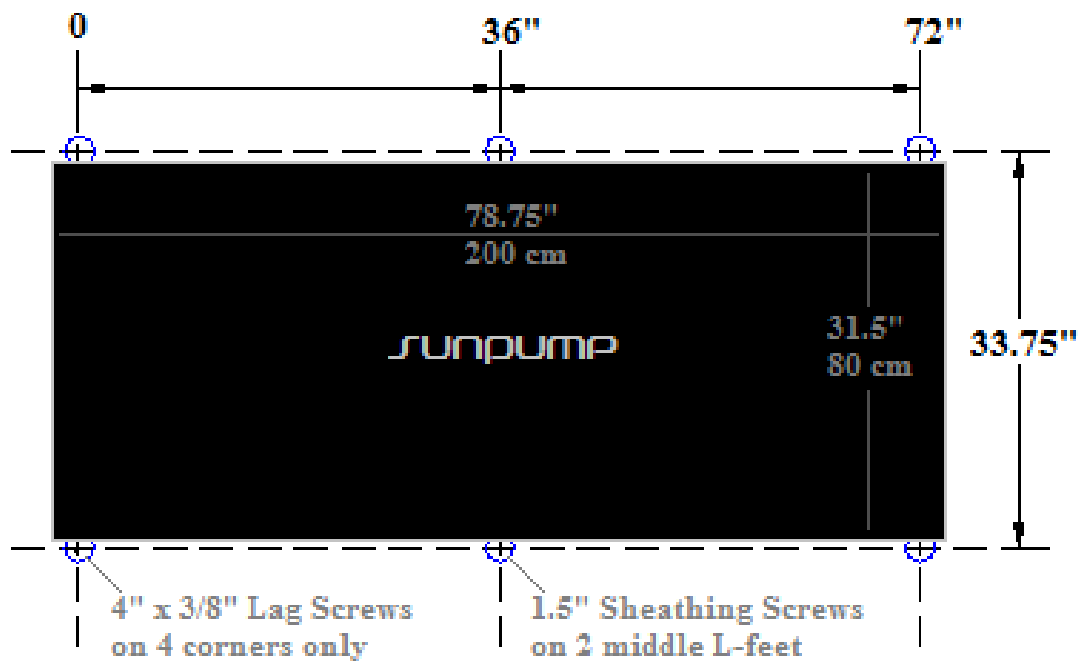
### 4.3 SunPump Solar Evaporators

#### DANGER

All person working on roofs should have successfully completed a fall safety course and should be properly equipped with appropriate safety equipment.



This is a 4 panel array sample configuration which may vary depending on installation parameters.



#### 4.4 System Specification

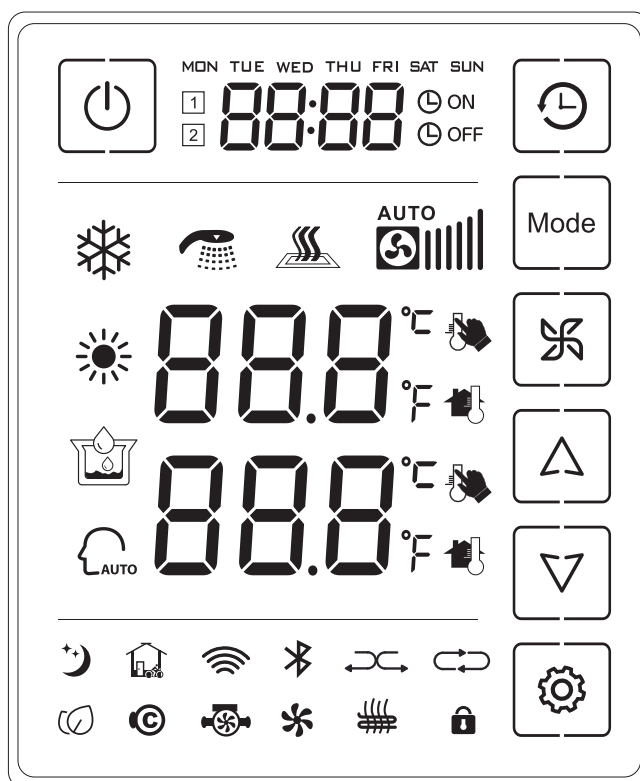
The following table shows the specifications of SunPump 2.3 Multi-function Heat pump:

Model Number	VRHA-18DC80GT	VRHA-24DC80GT	VRHA-36DC80GT	VRHA-48DC80GT
<b>Capacity</b>				
Heating (BTU/hr)	17,000	24,000	34,000	48,000
Heating (kW)	5	7	10	14
<b>Performance</b>				
Max. water temp.	60°C	60°C	60°C	60°C
Heating input power	1.57 kW	2.12 kW	3.03 kW	4.24 kW
COP <sup>1</sup>	3.2	3.3	3.3	3.3
Noise level	44 dB(A)	48 dB(A)	52 dB(A)	54 dB(A)
<b>Mechanical</b>	<i>Refer to local plumbing and building codes for system and installation</i>			
Dimensions (in.)	23.6*25.7*72.0	23.6*25.7*72.0	23.6*25.7*72.0	23.6*25.7*76.7
Shipping weight	175 lbs	181 lbs	185 lbs	189 lbs
Number of panels	3	4	6	8
Refrigerant	R410a			
Max. pressure	610 psi high side / 305 psi low side			
Max. line length	75 ft (consult Dealer if longer length required)			
Refrigerant charge	49.5 oz	63.6 oz	81 oz	102 oz
Line set length	10 ft	10 ft	10 ft	10 ft
Add per additional foot	0.33 oz	0.33 oz	0.33 oz	0.33 oz
Liquid line OD	1/4 in	3/8 in	3/8 in	1/2 in
Gas line OD	1/2 in	5/8 in	5/8 in	3/4 in
Tank capacity	80 gal	80 gal	80 gal	80 gal
Water fittings	3/4" NPT	3/4" NPT	3/4" NPT	3/4" NPT
Suggested exp. tank	3 gal	3 gal	3 gal	3 gal
Heater coil dimension	3/4 in OD x 33 ft long			
Suggested water flow	3 feet/sec (~4,000 Reynolds number)			
<b>Electrical</b>	<i>Refer to local electrical and building codes for wiring and installation requirements</i>			
Compressor	DC Inverter			
Voltage	208/230 single phase			
Rated current	6.8 A	9.2 A	13.2 A	18.4 A
Max. current	11 A	15 A	19 A	26 A
Elec. Backup Heater	6 kW	6 kW	6 kW	6 kW
Voltage	208/230 single phase			
Max. current	30 A	30 A	30 A	30 A

1. COP Measured at ambient 7C and water temperature 45C.

## 5 Operation

### 5.1 Operator Display



The SunPump 2.3 Multi Function Heat Pump uses the following indicators to display system status.


	Heating Mode. The SunPump 2.3 does not include a cooling option and only operates in heating mode.
	Indicates when the compressor is running during normal heating.
	Indicates system is operational.
	Indicates that the controller cooling fan is running.
	Indicates when the electric backup heater is running.
	Indicates that the screen is locked. Press and hold power button  for 5 seconds to lock or unlock the screen.
<div>MON TUE WED THU FRI SAT SUN</div> <div>1 88:88 ON</div> <div>2 88:88 OFF</div>	Displays current time. Also used to set system timer (see below).
<div>88.8 °C</div> <div>88.8 °F</div>	Indicates set point temperature (lower display) and actual water temperature (top display).

**CAUTION**



Before applying power to the SunPump ensure that all plumbing connections have been hooked up, that the tank is full of water, and that the refrigeration lines have been properly installed and tested.

## 5.2 Start up

When power is first applied to the SunPump the display will come on showing the current water temperature and the time display (to set the correct time see below).





To turn the SunPump on press and release the On/Off button . The display will now show both the current water temperature and the set point temperature (default is 45°C). At this point the system will be operational and, assuming the water temperature is at least 5°C below the set point, will start the compressor to begin heating the water.

When the heating cycle begins, the controller fan will start first to cool the internal electronics. This will be indicated by the fan symbol on the display panel. The compressor will start shortly after, indicated by the compressor symbol on the display panel.

The arrow buttons   can be used to adjust the set point temperature up or down as desired. The recommended temperature is between 45°C and 50°C.





## 5.3 System Setup

### 5.3.1 Setting Correct Time

- Press and hold clock button  for 5 seconds until day starts to blink.
- Use arrow buttons   to select current day.
- Press clock button to switch to hour digits and use arrow keys to set correct hour (Note, SunPump uses a 24 hour format for time).
- Press clock button again to switch to minute digits and use arrow keys to set correct minute.
- Press On/Off button  to confirm time and exit setup.

### 5.3.2 Setting Temperature Display Units

SunPump 2.3 can display temperatures in either Celsius or Fahrenheit. You can change between units using the function setup option using the following procedure.



- To enter the function setup press and hold the settings button  and the mode button **M** at the same time for 5 seconds.
- Press the settings button twice more to select F03 and use arrow buttons   to select either C or F to display Celsius or Fahrenheit respectively.
- Press the On/Off button  to confirm the selection and exit function setup.

### 5.3.3 Setting Timer Option

SunPump 2.3 can be set to operate only during certain times on any day if desired. You are able to set up to two time periods per day that the heating system will operate, or you can turn the timer off to operate any time if preferred.

#### 5.3.3.1 Turn Timer Option On or Off

Use the following procedure to toggle the timer option between On and Off.

- Press and hold the clock button  and the On/Off button  at the same time for 5 seconds.
- When the time display changes to show only the days of the week release the buttons and wait a few seconds for the screen to refresh.
- When the timer option is Off the screen will appear similar to the image below:



- When the timer option is On the screen will appear similar to the image below, with the number of the corresponding period for the day shown (1 or 2), and whether the current time is within an operating period or not (ON or OFF).







#### 5.3.3.2 Setting Operating Times

The default settings for the timer option are as follows.

Day of Week	1 <sup>st</sup> Operating Period		2 <sup>nd</sup> Operation Period	
	Start Time	End Time	Start Time	End Time
Monday	8:00	11:30	13:30	17:30
Tuesday	8:00	11:30	13:30	17:30
Wednesday	8:00	11:30	13:30	17:30
Thursday	8:00	11:30	13:30	17:30
Friday	8:00	11:30	13:30	17:30
Saturday	8:00	11:30	13:30	17:30
Sunday	8:00	11:30	13:30	17:30

When the timer option is turned On the SunPump will only run heating during the times indicated by these settings. For example, in the default settings above, the SunPump would not operate before 8:00 on any morning, between 11:30 and 13:30, or after 17:30 in the evening, regardless of the water temperature in the tank.

To change the timer settings use the following procedure.

- Press and release the clock button  which will cause the time display to change to the first start time for Monday, with the day blinking.
- Use arrow buttons   to select the day you want to adjust.
- Press clock button to switch to hour digits for the 1<sup>st</sup> starting time on that day and use arrow keys to set hour you want the system to start.
- Pressing the clock button cycles through all the times which can be adjusted as needed (1<sup>st</sup> stop, 2<sup>nd</sup> start, 2<sup>nd</sup> stop, 1<sup>st</sup> start next day....).
- Once you have the times set correctly press the On/Off button  to confirm and exit.





#### 5.4 Adjusting Parameters

The table on the following page lists the parameters that can be adjusted on the SunPump as well as the default values for each. The adjust parameters use the following procedure.



### CAUTION

These parameters affect the operation and performance of the SunPump system and should only be adjusted by a qualified technician who fully understands their function.

- Press and hold the setting button  for 5 seconds until P01 displays in place of the upper temperature display and the value for P01 displays in place of the lower temperature display.
- Use the arrow buttons   to adjust the value of P01 up or down.
- Press and release the settings button to cycle through all of the parameters, adjusting any of these using the arrow buttons if desired.
- Press and release the On/Off button  to confirm changes and exit.

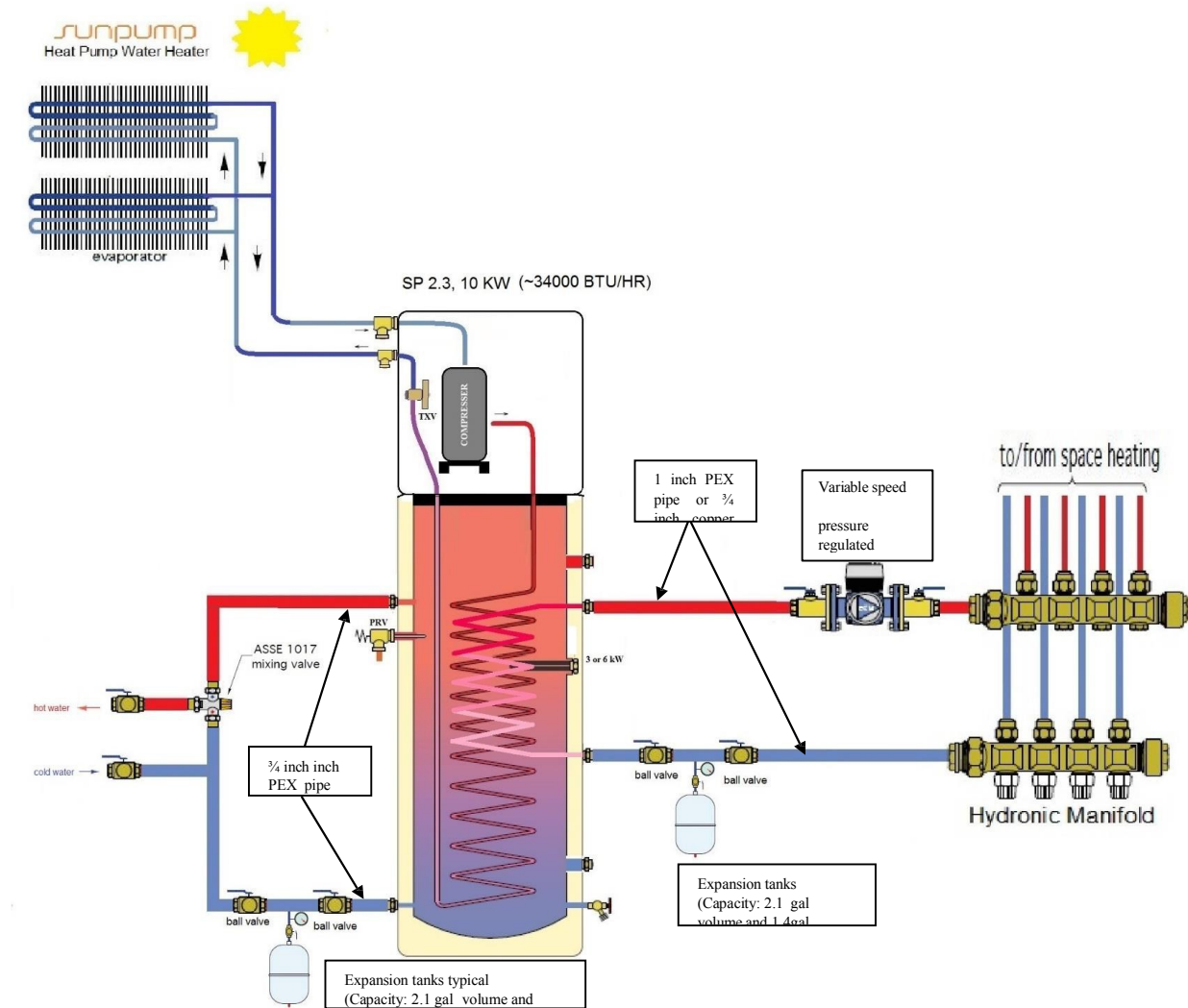


## Parameter Settings

Code	Setting	Setting Data Range
P01	Water tank temperature set point	20 to 60°C, Default: 45°C
P02	Temperature below set point when heating is initiated with system in ON/OFF Mode.  NOTE: When using Fahrenheit the actual temperature difference will be the value set minus 32 degrees. (for example for a temperature difference of 9°F this parameter should be set to 41°F)	3 to 15°C, Default: 5°C
P03	ON/OFF Mode or Constant Water Temperature(CWT) Mode	0: ON/OFF; 1:CWT; Default: 0
P04	Temperature below set point when heating is initiated with system in CWT Mode.  NOTE: When using Fahrenheit the actual temperature difference will be the value set minus 32 degrees. (for example for a temperature difference of 9°F this parameter should be set to 41°F)	0 to 8°C, Default: 3°C
P05	Delay time before Auxiliary Electric Heating Element starts operating (from start of heating cycle)	3 to 180 min, Default: 90 min
P06	Auxiliary Electric Heating Element starting temperature	20 to 50°C, Default: 50°C
P07	Minimum Outdoor Ambient temperature for heat pump operation	-30 to -1°C, Default: -30°C
P08	Reserved parameter	
P09	Reserved parameter	
P10	Reserved parameter	
P11	Reserved parameter	
P12	Reserved parameter	

## 6 Installation

### 6.1 Typical Mechanical Room Layout



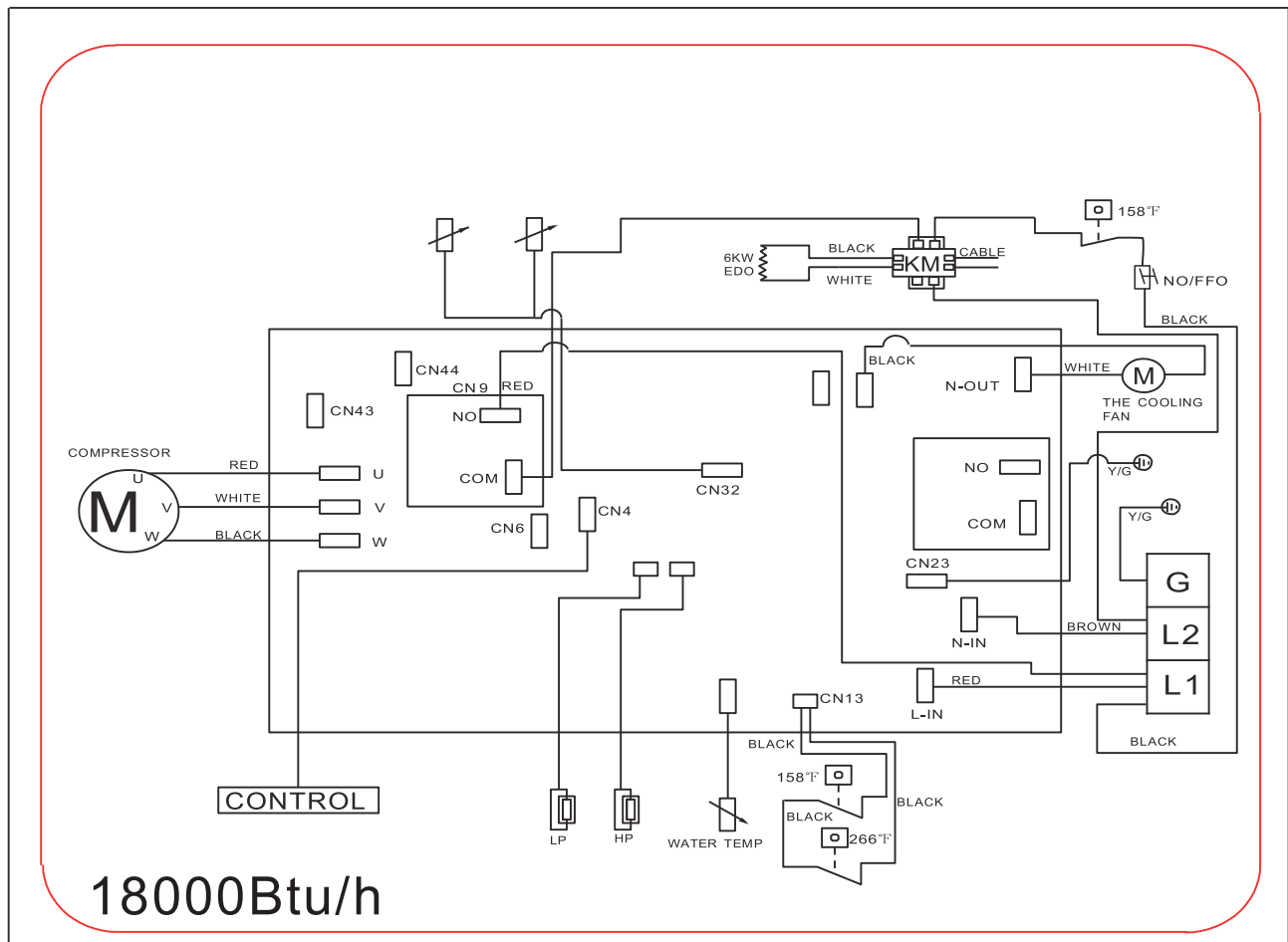
\*This sample mechanical room layout is for reference use only\*

## 7 Wiring Diagrams

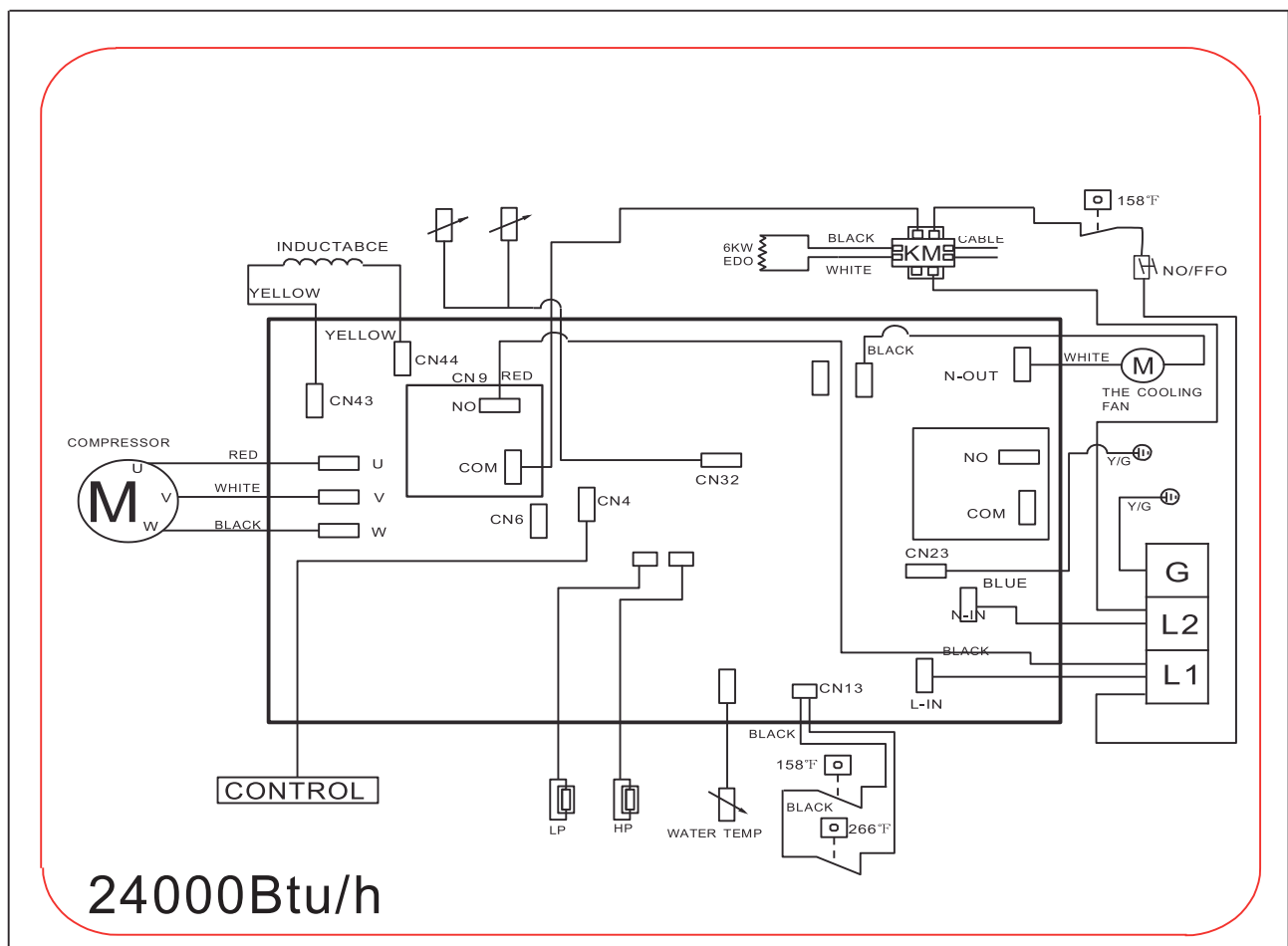


The SunPump is a high voltage appliance and should only be installed and serviced by a qualified electrician who is aware of local guidelines and codes. Improper installation can result in serious injury, damage to equipment, and /or fire.

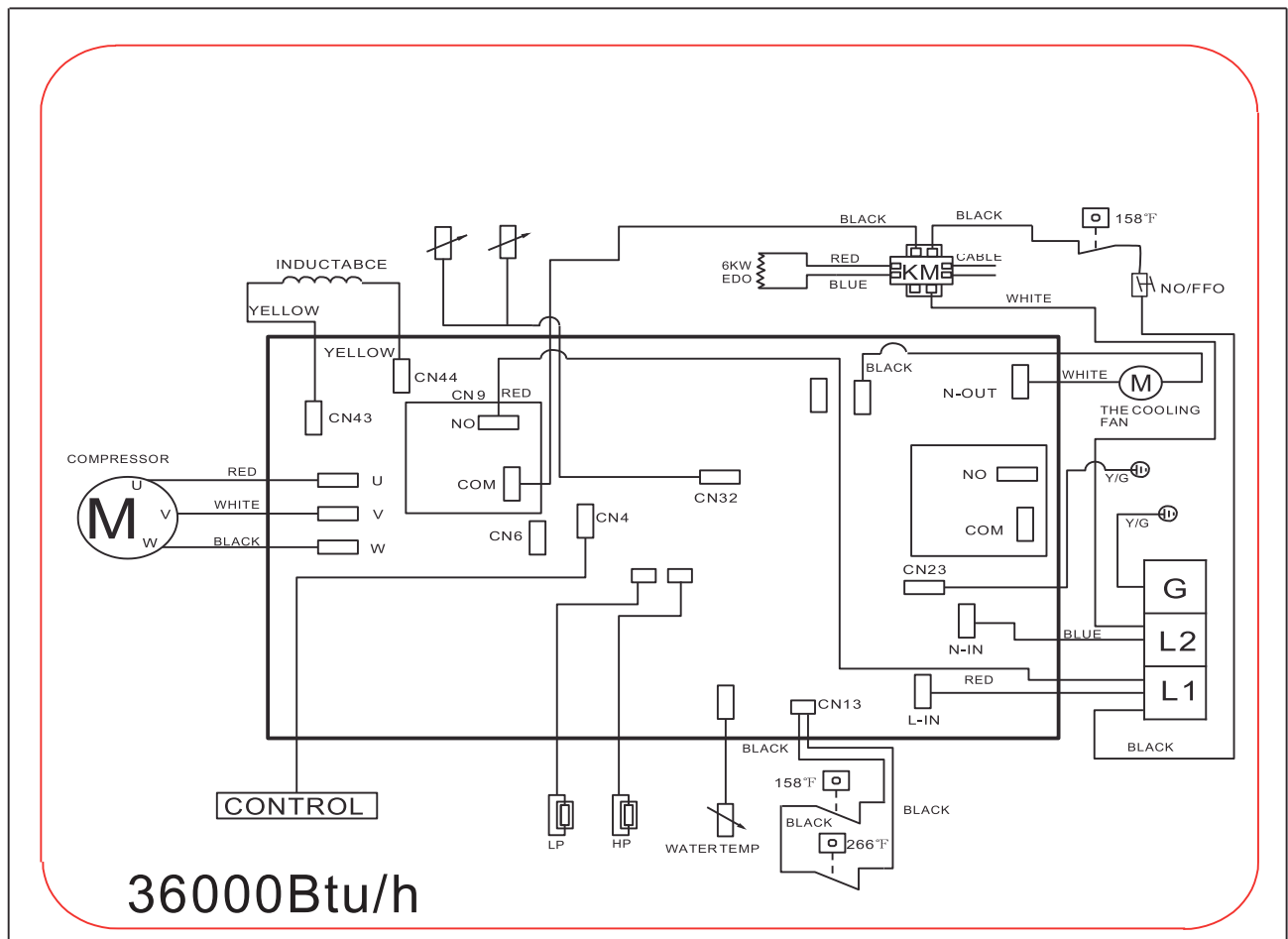
## 5kW or 18000Btu/h Electrical Wiring Diagram



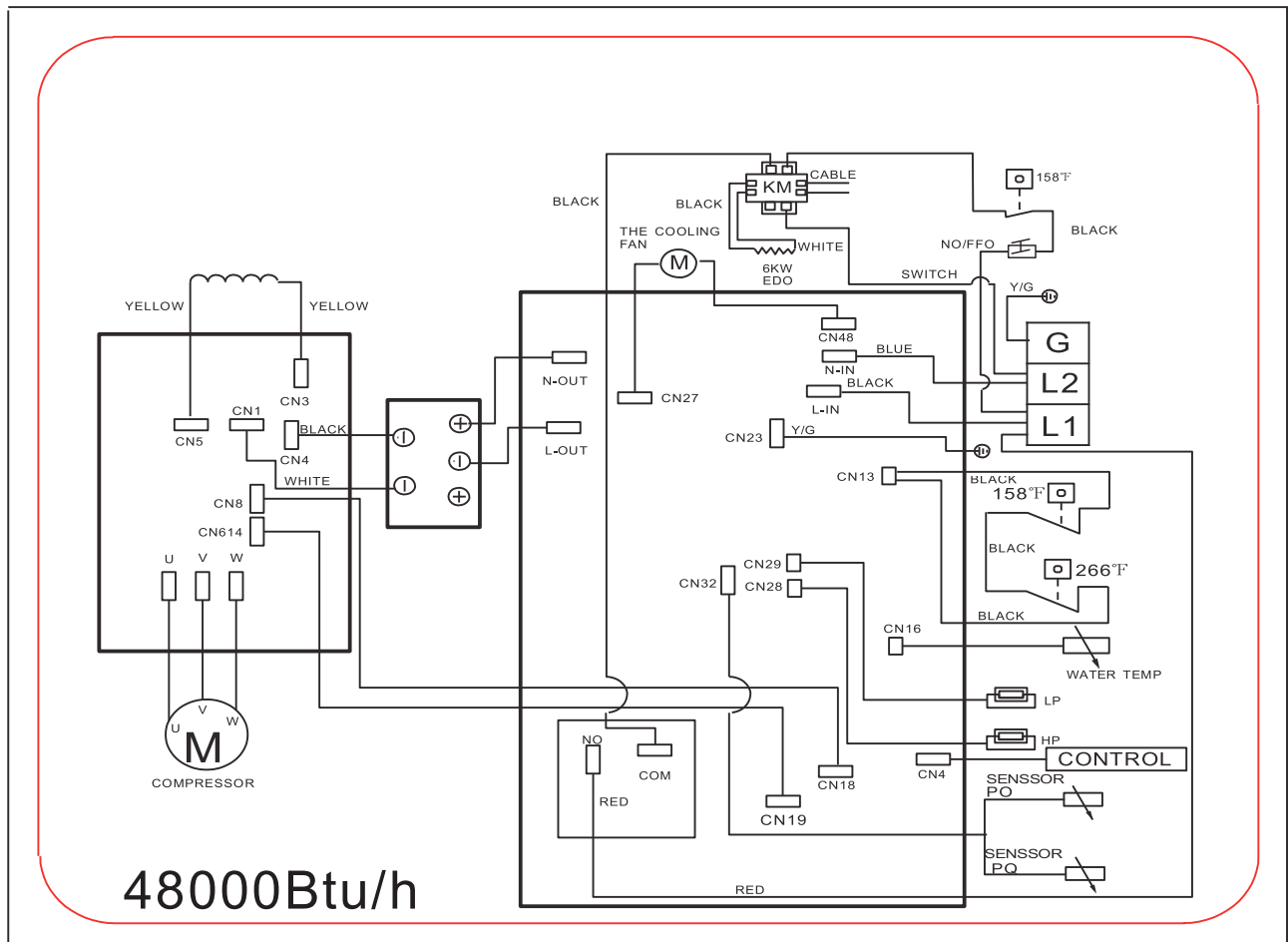
## 7kW or 24000Btu/h Electrical Wiring Diagram



## 10kW or 36000Btu/h Electrical Wiring Diagram



## 14kW or 48000Btu/h Electrical Wiring Diagram





## 8 Trouble Shooting

### 8.1 System Data Codes

Certain sensor outputs can be accessed from the display to help evaluate performance issues and support trouble shooting.

To access this data press and hold the mode button **M** until the temperature display changes to **d01** to show the first display code.

To cycle through display codes press the settings button  .

To exit press the On/Off button  .

The following table lists the data codes that are available on SunPump 2.3

Error code	Meaning
d01	Operating frequency of DC Inverter compressor (Hz)
d02	Operating current of compressor (amp)
d03	Water temperature (same as shown on normal display)
d04	Ambient air temperature
d05	Electronic expansion valve opening
d06	Not used on SunPump 2.3 (will always read 25)
d07	Compressor gas discharge temperature
d08	Not used on SunPump 2.3 (will always read -15)
d09	Not used on SunPump 2.3 (will always read -15)

## 8.2 Error Codes

The following table lists the error codes that you may see on your SunPump system.

Error code	Meaning
E 01	EEPROM error (IDU PCB/Wire Controller)
E 02	Water tank temperature sensor failure
E 06	Ambient temperature sensor failure
E 07	Gas discharge temperature sensor failure
E 08	Signal communication between controller and PCB failure
E 09	Signal communication between main PCB and inverter modular board failure
E 10	Boot failure (compressor protection disconnect; temperature protection)
E 12	Inverter modular board failure
E 13	Discharge gas temperature or compressor temperature overheat protection
E 15	Over current or low current protection
E 16	Water tank temperature low
E 19	Return gas temperature failure
E 20	Expansion valve outlet temperature sensor failure



### 8.3 Trouble Shooting Guide

Malfunction	Reason	Solution
Unit does not turn on	<ol style="list-style-type: none"> <li>1. Power failure.</li> <li>2. Loose power wire connection.</li> <li>3. Fuse burned-out.</li> </ol>	<ol style="list-style-type: none"> <li>1. Turn off power and inspect power supply.</li> <li>2. Identify the cause and rectify.</li> <li>3. Identify the cause and replace with new fuse.</li> </ol>
Unit heating capacity is low or compressor working too long	<ol style="list-style-type: none"> <li>1. Shortage of refrigerant or leakage</li> <li>2. Poor thermal insulation of water system</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the system for leakage, fix leak and re gas</li> <li>2. Improve thermal insulation of the system</li> </ol>
Compressor discharge pressure too high	<ol style="list-style-type: none"> <li>1. Tank water level is too low</li> <li>2. Excessive refrigerant (from repair / re-gas)</li> </ol>	<ol style="list-style-type: none"> <li>1. Check / fix water supply to tank</li> <li>2. Call refrigeration mechanic to reduce refrigerant</li> </ol>
Compressor suction pressure too low	<ol style="list-style-type: none"> <li>1. Shortage of refrigerant or leakage</li> <li>2. Filter or capillary blocked</li> </ol>	<ol style="list-style-type: none"> <li>1. Call refrigeration mechanic to check the system for leakage, fix the leak and re-gas the heat pump</li> <li>2. Replace capillary tube or filter</li> </ol>
Compressor will not turn on	<ol style="list-style-type: none"> <li>1. Power failure</li> <li>2. Compressor contactor malfunction</li> <li>3. Loose connection</li> <li>4. Overload protection of compressor activates</li> <li>5. Compressor capacitor malfunctions</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the power supply and restore</li> <li>2. Replace the contactor</li> <li>3. Check for loose wires and re-connect</li> <li>4. Check that the current / Amp draw of compressor is within specification, may require replacement of the compressor</li> <li>5. Replace the capacitor</li> </ol>
Loud compressor noise	<ol style="list-style-type: none"> <li>1. Liquid refrigerant getting into the compressor</li> <li>2. Compressor not working</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the cause for flooding of the compressor and solve the problem</li> <li>2. Replace the compressor</li> </ol>
The compressor is in operation but the unit does not heat	<ol style="list-style-type: none"> <li>1. Refrigerant has leaked out</li> <li>2. Compressor not working</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the system for refrigerant leakage.</li> <li>2. Repair leak and re-gas</li> <li>3. Replace the compressor</li> </ol>