

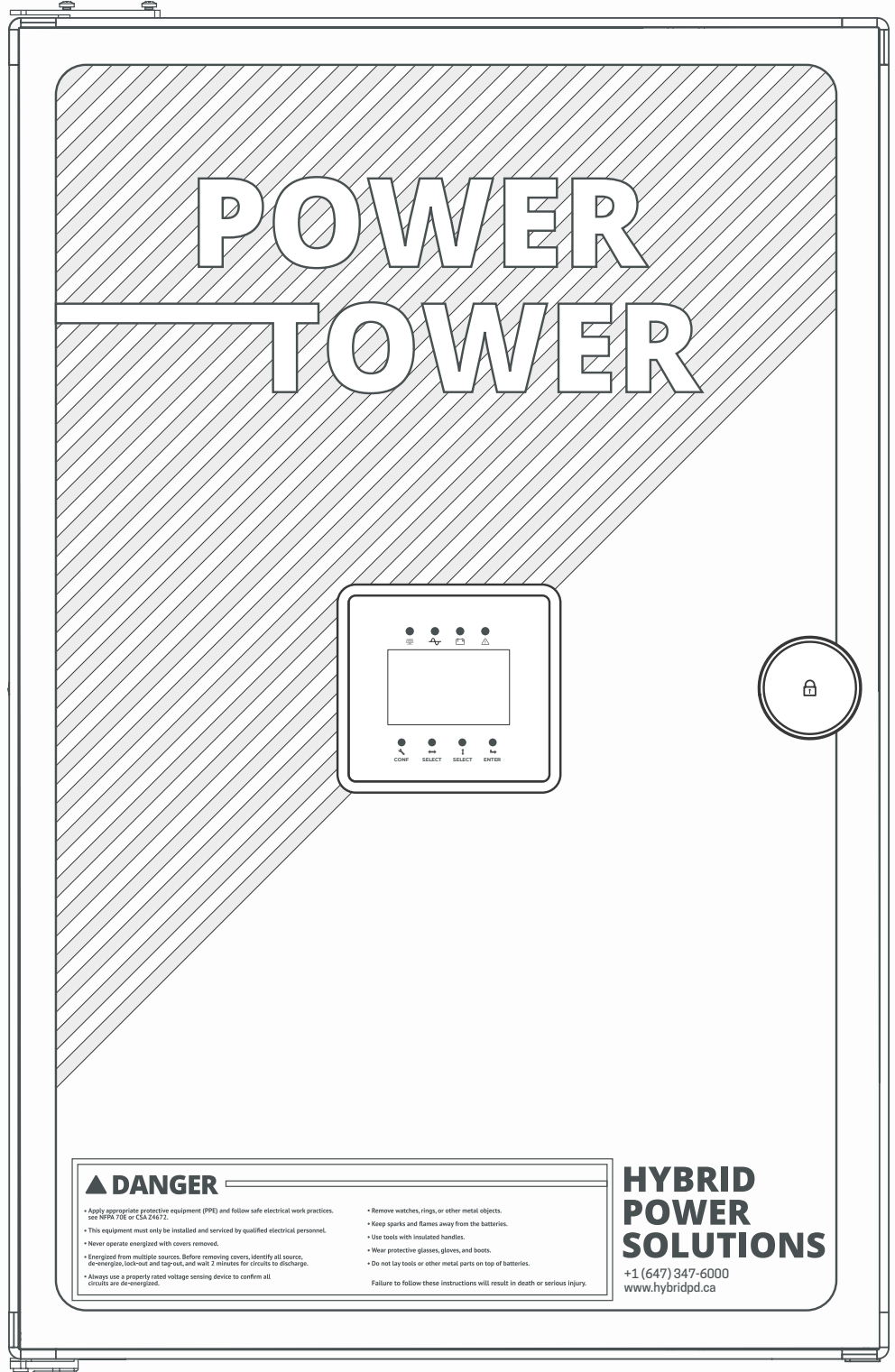
# POWER TOWER

User Manual

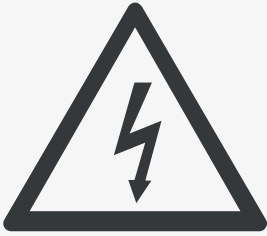
Manufactured by:

## HYBRID POWER SOLUTIONS

288 Judson St #5  
ON M8Z 5T6





**SHOCK HAZARD:**

Possible shock or death if used improperly, when damaged or used by untrained personnel.

**ATTENTION:**

It is the customer's and installer's obligation to check local electrical requirements and certification requirements of all HPS purchased equipment.

**FLAMMABLE HAZARD:**

Lithium ion batteries contain flammable liquid electrolyte that may vent, ignite and produce sparks when subjected to high temperatures (> 150 °C (302 °F)), when damaged or abused (e.g., mechanical damage or electrical overcharge). Burning cells can ignite other batteries in close proximity.

Vapors or mists from a ruptured battery may cause respiratory irritation.

MANUAL

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# OVERVIEW

## SECTION 1

## 1.1. Purpose

The purpose of this manual is to provide explanations and procedures for installing, operating, and troubleshooting for the unit. This manual should be read carefully before installations and operations. Please retain this manual for future reference.

## 1.2. Scope

This document defines the functional requirements of the unit, intended for worldwide use in electronic processing equipment. All manuals are applicable under all operating conditions when installed in the End-Use system, unless otherwise stated.

## 1.3. Contact Details

Hybrid Power Solutions Inc.

Customer Service/ Technical Support  
288 Judson St Unit #5, Toronto, ON M8Z 5T6  
Canada

Phone: +1 (647) 347-6000

E-Mail: [Info@hybridps.ca](mailto:Info@hybridps.ca)

Website: [hybridps.ca](http://hybridps.ca)

# **SAFETY INFORMATION**

## SECTION 2



## 2.1. General Precautions

Before using the unit, read all instructions and cautionary markings on:

1. The Power Tower unit
2. The Power Tower Batteries
3. All appropriate sections of this manual

**CAUTION** - To reduce risk of injury, charge only HPS Power Tower rechargeable batteries. Other types of batteries may rupture, causing personal injury and damage.

**DO NOT** expose the unit to rain, snow or liquids of any type. The unit is designed for indoor use only.

**DO NOT** disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.

To reduce risk of electric shock, disconnect all wiring before attempting any maintenance or cleaning. Simply turning off the unit without disconnecting wiring will not reduce this risk.

**CAUTION** - Batteries and Inverters may only be installed by a qualified professional (e.g. solar installer). If you have any questions, please contact HPS.

**NEVER** charge a frozen battery.

**USE CAUTION** when working with metal tools on or around batteries. The potential exists to drop a tool and short-circuit the batteries or other electrical parts resulting in sparks that could cause an explosion.

**Turn OFF** Power Tower battery switch and disconnect all wiring before installation or while performing repairs or maintenance.

When the PV module or panel is exposed to light, it starts to supply high voltage DC power. Be sure to turn off the DC Breaker switch before commencing maintenance, and make sure the cables from the PV panel are properly sealed after disconnection.

**GROUNDING INSTRUCTIONS** - The Power Tower should be connected to a grounded permanent wiring system. For most installations, the Ground Lug should be bonded to the grounding system at one (and only one point) in the system. All installations should comply with all national and local codes and ordinances.

**AVOID** AC output short-circuit, DC input short-circuit and **DO NOT** connect the mains while DC input short-circuit

**WARNING:** The maintenance information is for authorized technicians only. If the product is used in a manner which is not covered by the scope of warranty, the protection provided by the product may become void. Please contact HPS if you have any questions.

## 2.2. Personal Precautions

**NEVER** smoke or allow a spark or flame in the vicinity of a battery or generator.

**USE CAUTION** when working with metal tools on or around batteries. The potential exists to drop a tool and short-circuit the batteries or other electrical parts resulting in damage, injury or death.

**REMOVE** personal metal items such as rings, bracelets, necklaces, and watches when working with the battery. Battery can produce short-circuit current high enough to weld these items to metal, potentially causing severe burns.

If a remote or automatic generator start system is used, disable the automatic starting circuit and/or disconnect the generator from its starting battery while servicing to prevent accidental starting during servicing.

# INSTALLATION

## SECTION 3

### 3.1. Unpacking and Inspection

Carefully unpack the Power Tower from its shipping carton.

Verify all of the items listed below are present. Please call HPS if any items are missing.

- Qty 1 - Power Tower Unit
- Qty 1 - User Manual
- Qty 1 - Automatic Generator Start connector and pins
- Qty 1 - Set of keys

### 3.2. Basic Configuration

The Power Tower is designed to serve as an off-grid power supply for AC loads. The input power for the Power Tower comes from either a PV system and/or AC grid which not only supplies power to AC loads but also charges the battery bank.

The following illustrations show basic applications for the Power Tower.

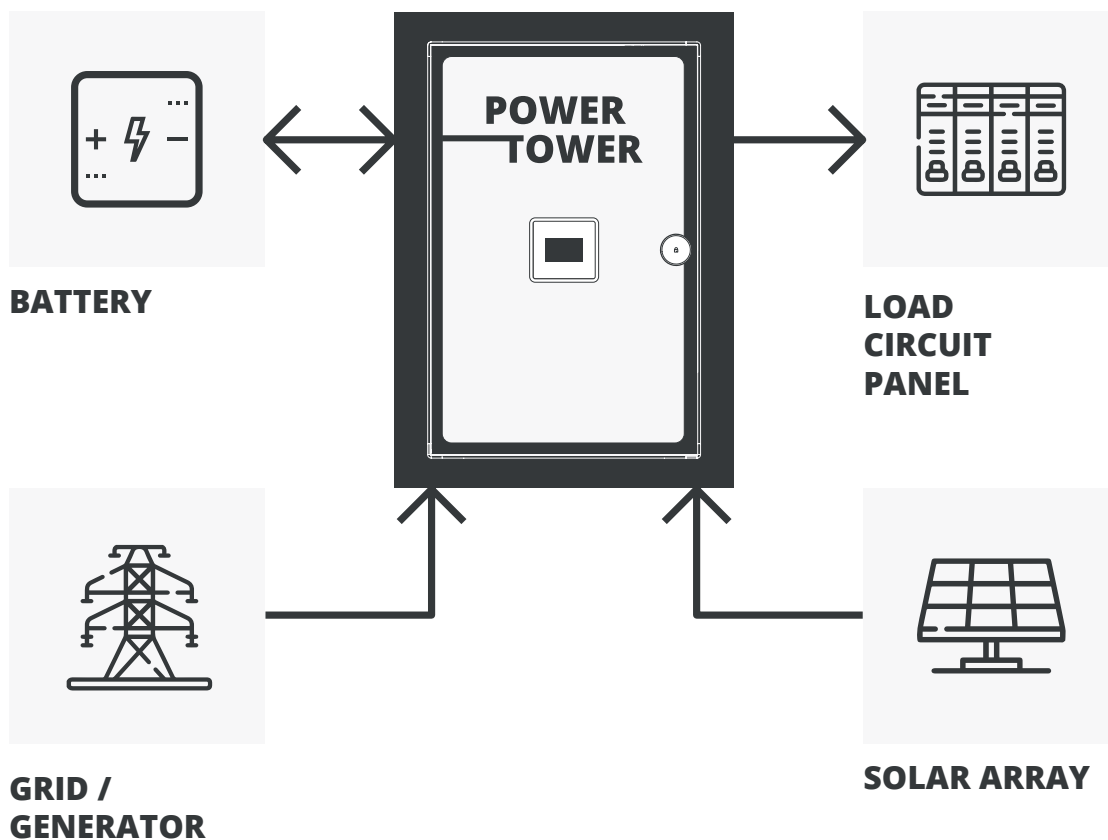


Figure 1. Typical Application of Power Tower

**Note:** Appliances like Air conditioners need at least 3 minutes to restart during a power outage. These systems bounce on and off (time is required to balance the refrigerant gas inside the circuit); so in order to protect your Air conditioner, please consult the Air conditioner manufacturer whether they have already provided a time delay function before installing. Otherwise, the Power Tower may trigger an overload fault and shut off its output to protect your appliance. This protection may not always be sufficient and may cause permanent damage to the Air Conditioner.

### 3.3. Batteries & Cabling

The Power Tower is designed to work exclusively with the Power Tower Batteries (48V version) and should not be used with any other batteries. All cabling provided should not be cut or trimmed as this will create an imbalance in resistance throughout the cabling and cause performance issues.

**Up to 5 batteries:** Five batteries can be connected directly to the Power Tower without any additional cabling. Ensure you follow the commissioning process defined in the Power Tower Battery manual.

**6 - 15 batteries:** When connecting 6 or more batteries, please use jumper leads sold through HPS or construct similar jumper leads that are identical to one another in length. Reuse the end connectors to ensure the leads from the battery bank to the inverter are identical. See schematic below.

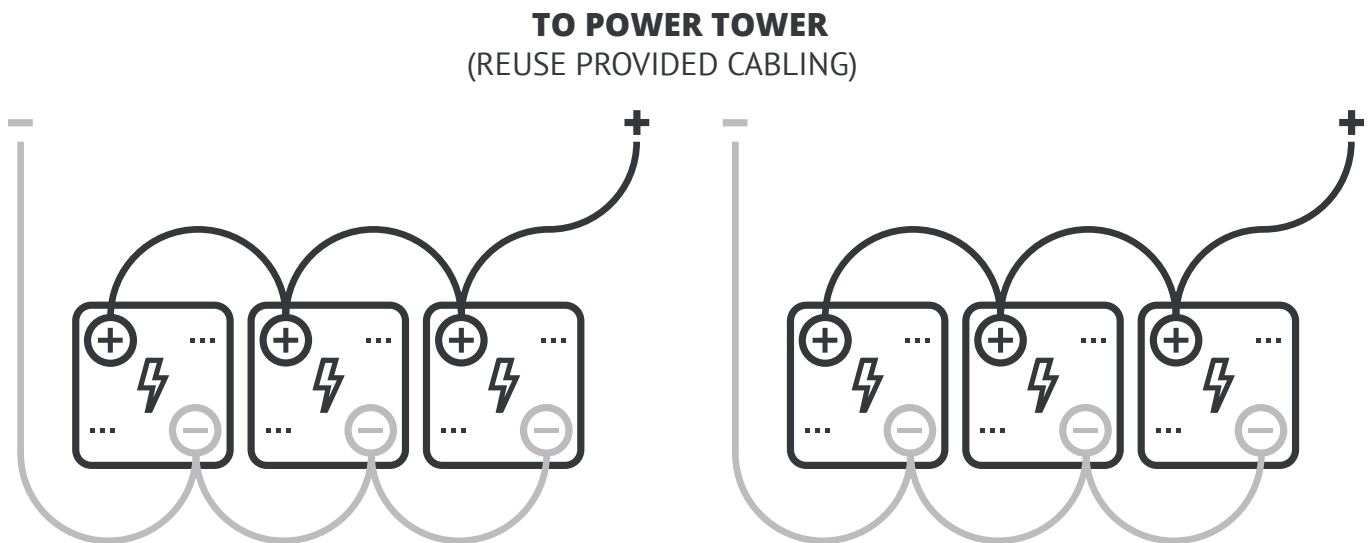


Figure 2: Example of 6 battery parallel setup

### 3.4. AC Connections

Installation should be done by a qualified electrician. Consult local code for the proper wire sizes, connectors, and conduit requirements.

At the bottom of the Power Tower enclosure is a 3m (10') AC output cable which should be wired to your breaker panel. The National Electrical Code requires an external breaker switch.

## AC Output Wiring Instructions:

**Step 1:** Disconnect the unit from the battery by removing the battery cables. Turn the Power Tower OFF before disconnecting the batteries. Disconnect any inputs if present. Turn off main output breaker on the inside of the cabinet.

**Step 2 (120V Version):** Connect the GND (green/yellow), Line (black), and neutral (white) wires from the AC output to the proper circuit breaker panel with the panel OFF.

**Step 2 (120V/240V Version):** Connect the GND (green/yellow), Line 1 (black), Line 2 (typically red) and neutral (white) wires from the AC output to the proper circuit breaker panel with the panel OFF.

## Maximum Power When using split phase configuration:

- L1 to N = Max 3000W (120V)
- L2 to N = Max 3000W (120V)

or

- L1 to L2 to N = Max 6000W (240V)

or

- L1 To L2 = Max 3000W (240V)
- L1 to N = Max 1500W (120V)

## AC Generator/Grid Input Wiring Instructions:

For easy installation and compatibility, the Power Tower has been outfitted with two (2) L14-30 receptacles. These receptacles match the most common generator plug type (120/240V) plugs. A simple extension cord between both will enable quick installation. Ensure all local electrical codes are met when wiring the input. **ALWAYS ENSURE THAT BOTH INPUT PLUGS ARE FED BY THE SAME SOURCE.** The inputs must use the same wave form and sinusoidal timing, therefore a single source must be used. For example, a single generator must be used **NEVER two (2) different generators** unless they have synchronization capability. When powering from the grid, two separate circuits can be used as both wave forms should be identical but both inputs should use the same L-N. Do not split a 240V output into two (2) 120V lines and input into two (2) separate plugs.

A 120V Power Tower will not accept an incoming 240V input as it draws from a single hot lead of the L14-30 receptacle. The 120V/240V version will accept only 240V input as it will pull power from both hot leads.

## AC Input Wiring Instructions:

**Step 1:** Ensure generator or input grid power is off.

**Step 2:** Connect input source to Power Tower using one (1) or both input plugs. A L14-30P can be purchased from a local electrical supplier or a complete compatible extension cord can be used.

**Step 3:** Wire the L14-30P based on the following:

**120V Model:**

- Connect L1 to X
- Connect N to W
- Connect Ground to G

Always ensure the voltage measured between X and W is 120V.

**120V/240V Model:**

- Connect L1 to X
- Connect L2 to Y
- Connect N to W
- Connect Ground to G

Always ensure the voltage measured between X and Y is 240V.

**Step 4:** Turn on generator or grid power.

## **BOTH PLUGS MUST BE FED BY SAME SOURCE AND PHASE**

Each plug has a 30A breaker to ensure no more than 30A is drawn per plug. Ensure that the phases are matching.

### **Single 120V 30A Input:**

When charging the Power Tower system using only a single 120V 30A input, ensure that the charging rate and power drawn from the load (home) is less than 30A.

## 3.5 Automatic Generator Start (AGS)

The two-wire connection that is provided with the Power Tower allows for automation of a backup generator when solar power is insufficient. The two-wire system closes a relay when a low voltage scenario is detected and opens when the batteries have reached a higher voltage.

**AGS relay ON:** 51Vdc

**AGS relay OFF:** 54.6Vdc

# **GROUNDING & SOLAR WIRING**

## SECTION 4



Grounding of the Power Tower should reflect local electrical codes and installation location and application requirements. The following should be used as a general rule but should be confirmed by local electrical codes.

## 4.1. Grounding

### 4.1.1. When Earth Ground is Available

When a proper ground to earth is available, the Power Tower grounding point should be tied to earth. In this installation, the neutral (white) should be separate from the ground (green) wire.

### 4.1.2. When No Earth Ground is Available

Ground and neutral wire should be bound and should be connected to the negative battery bus. To do so, connect the grounding point on the Power Tower to the negative terminal of the battery. Connect the output neutral AC wire to the grounding point or the negative terminal. The resulting circuit should be equivalent to the following. A separate GFCI will need to be installed on the output in the circuit breaker panel.

## 4.2. Solar Wiring

The Power Tower is configured for use with a plug-and-play solar panel.

**Maximum input Amperage:** 30A per input, 60A total

**Maximum Open Solar Panel Voltage:** 150Vdc

**Maximum Solar Power:** 3500W

**Solar Connectors:** MC4

### 4.2.1. Rapid Shutdown



Figure 3: Rapid Shutdown  
(sold separately)



Figure 4: Emergency Off Switch  
(sold separately)

#### **4.2.1. Adding Additional Solar or Wind Power**

If the provided solar power is insufficient, additional solar charging or wind charging capability may be added directly to the batteries. Chargers may be connected directly to the battery terminals or preferably, through an available DC input port below the Power Tower. When doing so, respect all parameters listed in the Power Tower Battery manual and all solar or wind charger installation requirements. Ensure that the total charging amperage does not exceed the maximum allowable charging amperage for the battery. For example, a system with three (3) Power Tower Batteries has a recommended charge amperage of 20A and maximum charge of 75A per battery for a total of 60A recommended and 225A maximum. The Power Tower charging off of the grid and/or maximum solar will output 60A therefore additional charging from an external source is possible but not recommended for maximum battery cycle life. Systems with more batteries are well suited for additional solar chargers or wind turbines.

# SYSTEM CONFIGURATION SECTIONS

## 5.1. AC Charge Rate (setting 4 + 5)

The default programming is set to 20A AC charging which will prolong the life of the battery but may not be appropriate for all users. If more than one battery is connected, then a higher charging amperage is acceptable and desired as each battery will split the available amperage. For example, two (2) batteries connected with the Power Tower set a 20A charge rate will receive 10A each. It is also possible to increase the charging amperage to favor fast charging over a long life.

## 5.2. Off Grid vs Hybrid Mode: Power Priority (setting 6 + 7)

The default programming for the Power Tower is best set for an off grid situation and is set to AC Priority Mode. This setting uses AC input power if available at all times instead of depleting batteries. This ensures that when the automatic generator starter turns on the generator, power from the generator will be used to power both the output (your home) as well as charge the battery. Please ensure that the generator has the necessary power for both house loads and battery charging.

If a power source such as grid or generator is always available but solar and battery should be prioritized over this generator/grid power source, the inverter should be set to Intelligent mode. This mode will deplete the battery first then engage the AC input mode when voltage falls below 49.6Vdc. This voltage switch over can be changed by changing setting number 7 (DC Voltage Point). The voltage transition point selected (2.9, 3.0 or 3.1Vdc) dictates the transition point by multiplying this value by 16. For example, the default 3.1Vdc mode is  $3.1 \times 16 = 49.6\text{Vdc}$ .

## 5.3. Front Panel and Settings

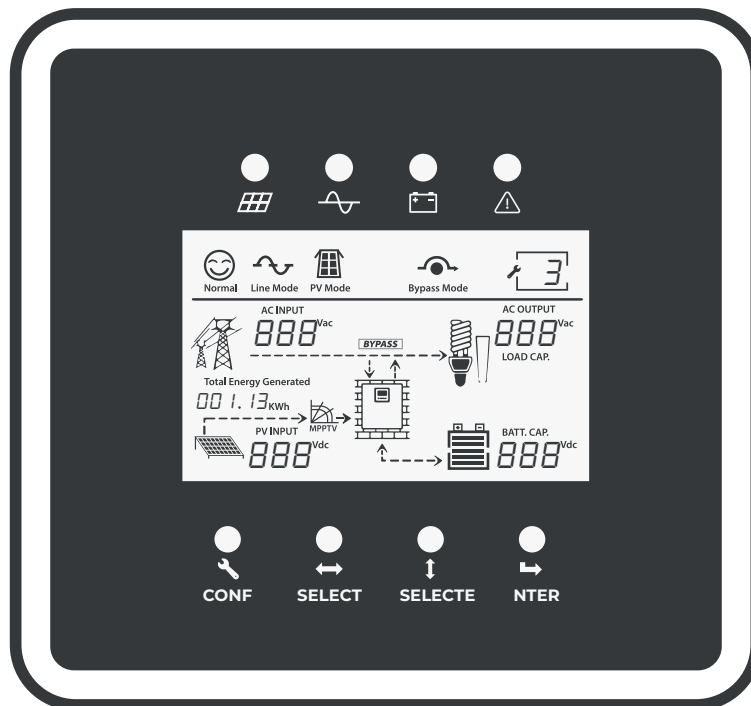

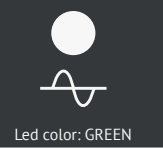
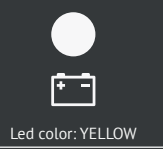
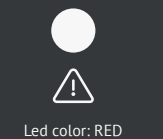


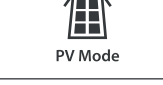







Figure 5: Power Tower  
Front panel

### 5.3.1. Icon & Lighting Glossary

LED INDICATOR	
 <p>Led color: GREEN</p>	GREEN LED lighting = PV (Solar) normal
 <p>Led color: GREEN</p>	GREEN LED lighting = AC Line Mode On
 <p>Led color: YELLOW</p>	YELLOW LED lighting = Battery Inverter Mode On
 <p>Led color: RED</p>	RED LED lighting = Alarm / Error. Please contact HPS.

ICON DEFINITION	
 <p>Normal</p>	Power Tower Operating Normally
 <p>Line Mode</p>	Line Mode is enabled
 <p>PV Mode</p>	PV input is connected
 <p>Batt. Mode</p>	Backup Mode is enabled
 <p>Bypass Mode</p>	Bypass Mode is enabled
 <p>Fault Mode</p>	This icon is shown when there is a fault event. The indicated number is the specific fault code which represents the error. (Please refer to Section 5.3.4. Fault Codes).
	AC Icon
	Bypass Icon

→  
Continuation

## ICON DEFINITION



AC Voltage and Frequency display



The load icon and level bar indicates the loading level (0-100%) Loading display



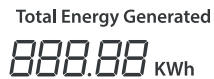
Level of remaining battery capacity  
Battery voltage



PV (Solar system)



PV (Solar system) input voltage  
and Amperage



PV (Solar system) power generation display



MPPT solar charger working normally



Inverter

### 5.3.2. Changing System Settings

#### **CHANGE SETTING AT YOUR OWN RISK. CONTACT HPS FOR ASSISTANCE.**

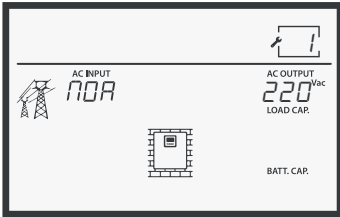
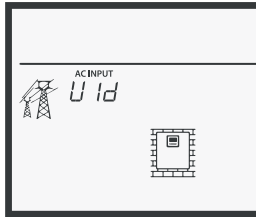
Any settings change may result in product damage, fire, shock, injury and/or death. The below instructions should only be used if advised to do so by HPS or must be changed based on recommendations in this manual.

1. Long press (1 sec) CONF button.
2. Use the Left/Right SELECT button to cycle through available menu settings.
3. Use the Up/Down SELECT button to change parameters in each menu.
4. Confirm your selection by pressing the ENTER button.

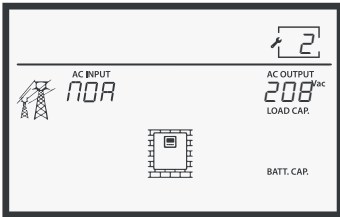
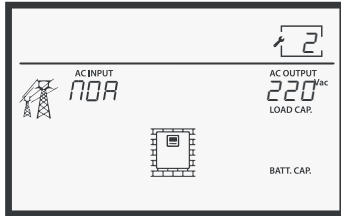
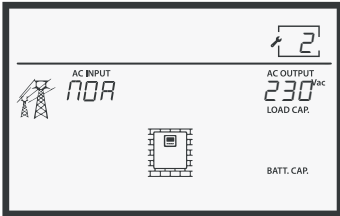
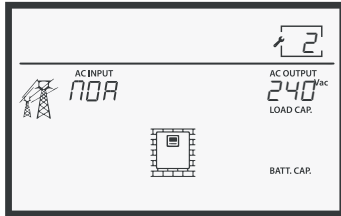


Please, go to next page to see settings table

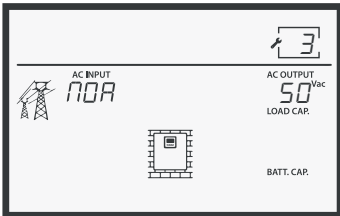
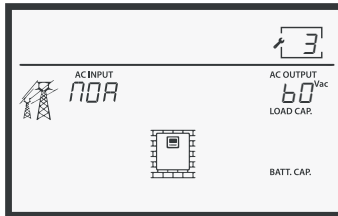
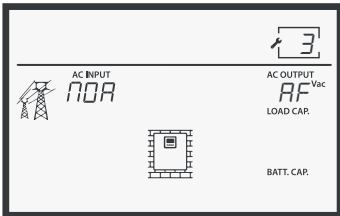
SETTING #	DESCRIPTION	OPTIONS
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1	Input Voltage Settings	Narrow Range Mode (95V - 131Vac)*	Wide Range Mode (85V - 135Vac):
			

Four Options:  
105Vac / 110Vac /115Vac / 120Vac \*

2	Output Voltage Setting		
			

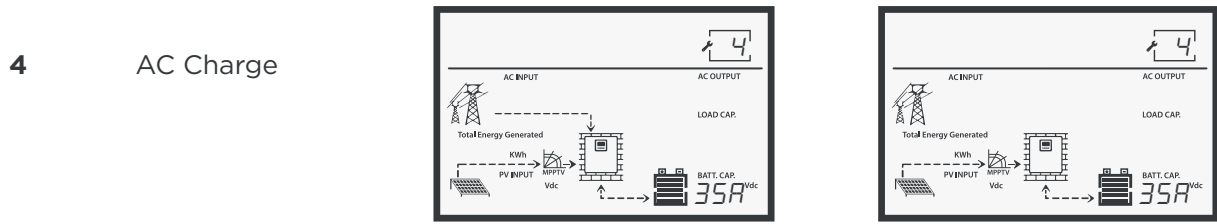
50Hz/60Hz/Automatic

3	Output frequency setting		
			<p>50/60Hz frequency output can be adjusted, as well as the adaptive AC input frequency.</p>

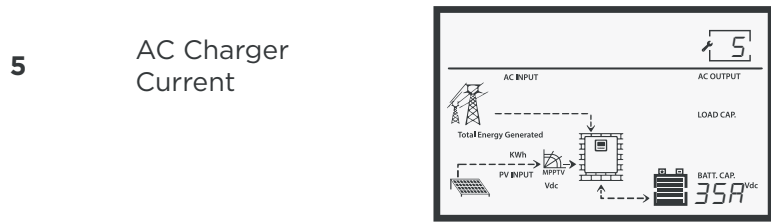


SETTING #	DESCRIPTION	OPTIONS
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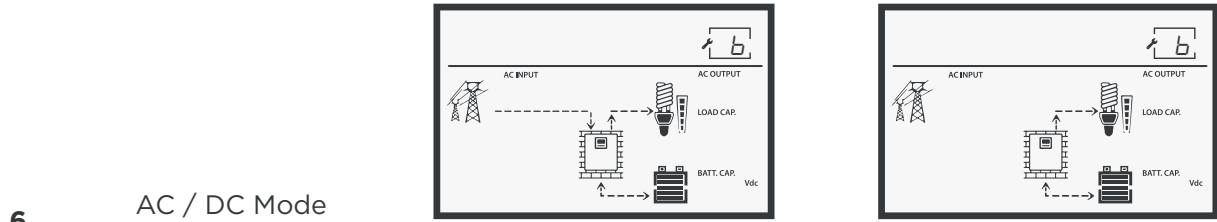
4 AC Charge      AC Charge ON      AC Charge OFF



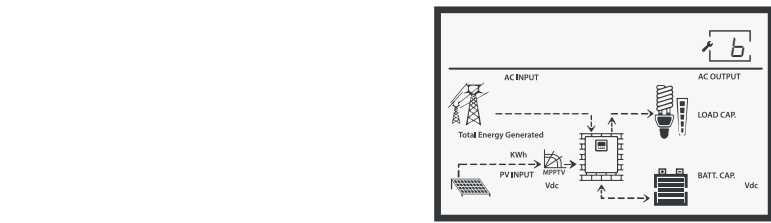
5 AC Charger Current      20A / 35A / 50A



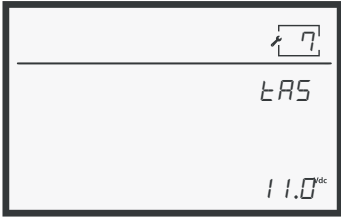
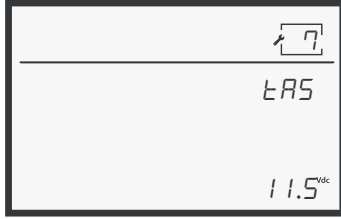
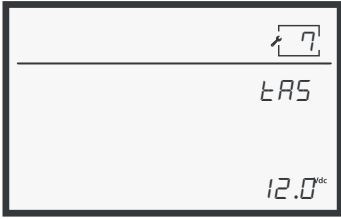
6 AC / DC Mode Selection      AC Priority      DC Priority



Intelligent Mode

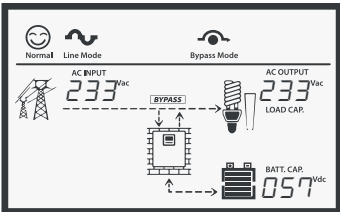
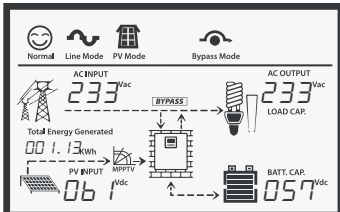
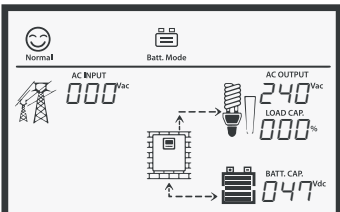
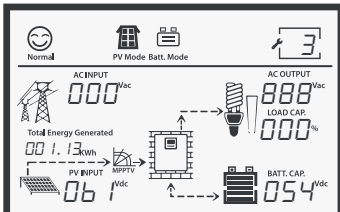




SETTING #	DESCRIPTION	OPTIONS
		2.9Vdc / 3Vdc / 3.1Vdc
7	DC Conversion Voltage Point	  

\*double values for 120V/240V output model

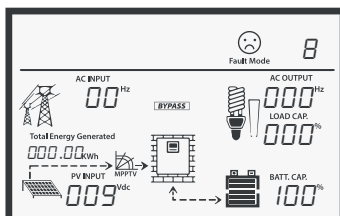
### 5.3.3. Operating Indicators

AC MODE	AC + PV MODE
<p>Voltage and Frequency change display every 5 seconds.</p> 	<p>Voltage and Frequency change display every 5 seconds.</p> 
DC MODE	PV MODE
<p>Voltage and Frequency change display every 5 seconds.</p> 	<p>Voltage and Frequency change display every 5 seconds.</p> 



## FAULT MODE

The upper left corner of the LCD shows the fault code and buzzer ringing.



### 5.3.4. Fault Code Troubleshooting

CODE	FAULT	REASON AND SOLUTION
1	Over temperature, fan fault  (alarm light on)	Inverter operating environment is inadequate, insufficient ventilation and indoor temperature is very high. Close the inverter and wait for 10 minutes, after the inverter cools, start again, if there is a fan fault, please replace it with a new fan.
2	Overload  (alarm light on)	Connecting load power is more than inverter's rated power, if the load equipment quantity, inverter will work again.
3	Output short circuit  (alarm light on)	Close the inverter and disconnect all load equipment, inspect load equipment if any of them had fault or internal short circuit, then start the inverter again. If still at fault, please consult HPS.
4	Over temperature  (alarm light on)	Inverter operating environment is not adequate, insufficient ventilation and indoor temperature is very high. Turn off the inverter and wait for 10 minutes, after the inverter cools, turn the unit back on.
5	Low battery voltage  (alarm light on)	Battery is reaching critical levels, system and battery should be shut off unless adequate charge can be provided. Output can be turned off if solar is available for charging to decrease likelihood of damage and reduce load on system
6	Reverse input  (alarm light on)	Connect input and output again in the correct configuration..



<b>CODE</b>	<b>FAULT</b>	<b>REASON AND SOLUTION</b>
<b>7</b>	Semi-wave short circuit (unusual load)	The connecting load power is more than the inverter's rated power, after reducing load equipment quantity, the inverter will operate normally.
<b>8</b>	Over charge (alarm light on)	Battery type selection incorrect; Charger damaged, please consult HPS for help.
<b>9</b>	Battery over voltage (alarm light on)	Check if battery bank DC voltage is corresponding to this inverter requested DC voltage.

# **SPECIFICATIONS**

## SECTION 6

## 6.1. Line Mode Specifications

MODEL	POWER TOWER 120V	POWER TOWER 120V/240V
<b>RATED POWER</b>	6000W	6000W
<b>INPUT VOLTAGE WAVEFORM</b>	Sine wave(Utility or Generator)	Sine wave(Utility or Generator)
<b>NOMINAL INPUT VOLTAGE</b>	120Vac	120V/240V
<b>LOW LINE DISCONNECT</b>	85Vac±4%(NOR)	184Vac±4%(NOR)
	80Vac±4%(WID)	135Vac±4%(WID)
<b>LOW LINE RECONNECT</b>	95Vac±4%(NOR)	194Vac±4%(NOR)
	85Vac±4%(WID)	145Vac±4%(WID)
<b>HIGH LINE DISCONNECT</b>	136Vac±4%(NOR)	270Vac±4%(NOR)
	140Vac±4%(WID)	270Vac±4%(WID)
<b>HIGH LINE RECONNECT</b>	131Vac±4%(NOR)	260Vac±4%(NOR)
	135Vac±4%(WID)	260Vac±4%(WID)
<b>MAX AC INPUT VOLTAGE</b>	150Vac	280Vac
<b>NOMINAL INPUT FREQUENCY</b>	50Hz / 60Hz (Auto detection)	50Hz / 60Hz (Auto detection)
<b>LOW LINE FREQUENCY DISCONNECT</b>	40+0.3Hz for 50Hz, 50+0.3Hz for 60Hz	40+0.3Hz for 50Hz, 50+0.3Hz for 60Hz
<b>LOW LINE FREQUENCY RE-CONNECT</b>	41+0.3Hz for 50Hz, 51+0.3Hz for 60Hz	41+0.3Hz for 50Hz, 51+0.3Hz for 60Hz
<b>HIGH LINE FREQUENCY DISCONNECT</b>	55+0.3Hz for 50Hz, 65+0.3Hz for 60Hz	55+0.3Hz for 50Hz, 65+0.3Hz for 60Hz
<b>HIGH LINE FREQUENCY RE-CONNECT</b>	54+0.3Hz for 50Hz, 64+0.3Hz for 60Hz	54+0.3Hz for 50Hz, 64+0.3Hz for 60Hz
<b>OUTPUT VOLTAGE WAVEFORM</b>	Same as Input Waveform	Same as Input Waveform
<b>OUTPUT SHORT CIRCUIT PROTECTION</b>	Circuit Breaker	Circuit Breaker
<b>EFFICIENCY (LINE MODE)</b>	>97%	>97%
<b>TRANSFER TIME</b>	15ms (typical) 20ms max(WID)	15ms (typical) 20ms max(WID)
<b>BYPASS CHARGER ENABLE IN OFF MODE</b>	Yes	Yes

Note: NOR – Normal range; WID-Wide range

## 6.2. Inverter Mode Specifications (Battery as Source)

MODEL	POWER TOWER 120V	POWER TOWER 120V/240V
<b>OUTPUT VOLTAGE WAVEFORM</b>	Pure Sine Wave	Power Tower 120V/240V
<b>RATED OUTPUT POWER</b>	6KW/18KW surge	Pure Sine Wave
<b>POWER FACTOR</b>	0.9 - 1.0	0.9 - 1.0
<b>NOMINAL OUTPUT VOLTAGE</b>	120Vac	HOT1-N: 120V HOT2-N: 120V HOT1-HOT2: 240V
<b>MINIMUM PEAK OUTPUT VOLTAGE AT RATED POWER</b>	>100V	>200V
<b>OUTPUT FREQUENCY(HZ)</b>	50Hz / 60Hz $\pm$ 0.3Hz	50Hz / 60Hz $\pm$ 0.3Hz
<b>OUTPUT VOLTAGE REGULATION</b>	$\pm$ 10%	$\pm$ 10%
<b>NOMINAL EFFICIENCY</b>	>87% (@Normal DC Input; >60% R load)	>87% (@Normal DC Input; >60% R load)
<b>OVERLOAD PROTECTION</b>	105% <load<150%, beeps 0.5s every 1s, and Fault after 60s. Load>150%, beeps 0.5s every 1s, and Fault after 20s.	105% <load<150%, beeps 0.5s every 1s, and Fault after 60s. Load>150%, beeps 0.5s every 1s, and Fault after 20s.
<b>CAPABLE OF STARTING ELECTRIC MOTOR</b>	YES	YES
<b>OUTPUT SHORT CIRCUIT PROTECTION</b>	Current limit (Fault after 10s), Circuit Breaker	Current limit (Fault after 10s), Circuit Breaker
<b>POWER SAVER</b>	Load $\leq$ 25 $\pm$ 5W (Enabled Via Internal Switch)	Load $\leq$ 25 $\pm$ 5W (Enabled Via Internal Switch)
<b>NOMINAL DC INPUT VOLTAGE</b>	48 Vdc	48 Vdc

### 6.3. AC Charger Mode Specifications

<b>NOMINAL INPUT VOLTAGE</b>	120V	120V/240V
<b>INPUT VOLTAGE RANGE</b>	95V - 131Vac(NOR) 85V - 135Vac(WID)	180V - 270Vac(NOR) 140V - 270Vac(WID)
<b>HIGH VOLTAGE DISCONNECT</b>	131Vac±4%(NOR) 135Vac±4%(WID)	270Vac±4%(NOR) 270Vac±4%(WID)
<b>HIGH LINE RECONNECT</b>	128Vac±4%(NOR) 132Vac±4%(WID)	260Vac±4%(NOR) 260Vac±4%(WID)
<b>LOW VOLTAGE DISCONNECT</b>	95Vac±4%(NOR) 85Vac±4%(WID)	95Vac±4%(NOR) 85Vac±4%(WID)
<b>LOW LINE RECONNECT</b>	98Vac±4%(NOR) 88Vac±4%(WID)	190Vac±4%(NOR) 150Vac±4%(WID)
<b>NOMINAL CHARGE CURRENT</b>	10/20/30/40/50A	10/20/30/40/50A
<b>CHARGE CURRENT TOLERANCE</b>	±5A	±5A
<b>OVER CHARGE PROTECTION</b>	Bat. V ≥ 59.2Vdc, Fault, Buzzer alarm for 48Vdc  (Beeps 0.5s every 1s & fault after 60s)	Bat. V ≥ 59.2Vdc, Fault, Buzzer alarm for 48Vdc  (Beeps 0.5s every 1s & fault after 60s)

Note: NOR – Normal range; WID-Wide range

### 6.4. Solar Charger Mode Specifications

<b>RATED BATTERY VOLTAGE</b>	48Vdc
<b>RATED CHARGE CURRENT</b>	60A (2x30A inputs)
<b>INPUT VOLTAGE RANGE</b>	55-150Vdc
<b>MAX. PV OPEN CIRCUIT ARRAY VOLTAGE</b>	150Vdc
<b>MAX. RECOMMENDED INPUT POWER (W)</b>	3500W

## 6.5. General Specifications

<b>INDICATORS</b>	LED+LCD Display
<b>PROTECTIONS</b>	Low battery, over charge, overload , over temp.
<b>OPERATING TEMPERATURE RANGE</b>	0°C ~ 40°C
<b>STORAGE TEMPERATURE</b>	-15°C ~ 60°C
<b>OPERATION HUMIDITY</b>	5% ~ 95% (non-condensing)
<b>EARTHING(ABYC STANDARD)</b>	Follow customer requirement: Inverter mode: the neutral and the earth joined ; Line mode: the neutral and the earth separated. Use a Relay to realize the function.
<b>AUDIBLE NOISE</b>	60dB max, no noise at low load/low heat
<b>COOLING</b>	Forced air, variable speed fan
<b>SIZE (L*W*H MM)</b>	860 x 564 x 240 mm (34" x 22" x 9.5") less bottom cabling
<b>NET WEIGHT (KG)</b>	67kg (148lbs)
<b>CERTIFICATIONS</b>	UL1741, CSA 22.2 NO.107.1, ISO 9001 certified facility (inverter only), ISO 14001 certified facility (inverter only)

Product specifications are subject to change without further notice.



**WARRANTY**

SECTION 7

## 7.1. Manufacturer's Warranty Coverage

All Power Tower units supplied by Hybrid Power Solutions are tested for reliability and performance before delivery for correct function and condition.

We grant no warranty or liability for defects and losses that occur during the use by the customer or the shipment of the unit.

Please refer to this user manual to ensure proper user operation and operating conditions, which will ultimately prolong the life of the Power Tower unit. The warranty does not cover negligence to this manual's directions.

Hybrid Power Solutions (HPS) warrants its products against defects in material and workmanship. Under normal use and service, every hardware portion of the product will be free from physical defects in material and workmanship during the warranty period, or the product will be repaired or replaced as determined solely by HPS. HPS provides a limited warranty for its products only to the person or entity that originally purchased the product from HPS or its authorized distributor or retailer.

**WARRANTY PERIOD: 3 YEARS.** HPS warrants that its product be free against defects as stated above for a period of 3 years. This warranty does not scale back or lower its value over the period of time. **If it's our fault, we will repair or replace it. Simple as that.**

## 7.2. Owner's Warranty Responsibility

If the product does not operate as warranted above during the applicable warranty period, HPS shall, at its option and expense (except for shipping cost), repair the defective product or part, deliver to the customer an equivalent product or part to replace the defective item. All products that are replaced will become the property of HPS. Replacement products may be new or reconditioned as determined by state of the original unit.

For this warranty to remain valid, all wiring instruction must be strictly adhered to and installation must be made according to all directions and guidelines made in this manual or provided with the battery. All inverter and charger settings must be modified to accommodate this battery or else the warranty is void.

**This limited warranty gives you specific legal rights. You may have further legal rights and remedies under local laws in your country. The terms of this limited warranty will apply to the extent permitted by applicable law. Some countries do not allow disclaimers of implied warranties or limitations on how long an implied warranty lasts, meaning the disclaimers and limitations set forth in this limited warranty may not apply to you. Some countries require specific disclosures to be inserted in an implied warranty. Please see the specific disclosures set forth in the appendix to this warranty; specific disclosures may relate to your country. For a full description of your legal rights you should refer to the laws applicable in your country.**

**This limited warranty and any dispute or claim arising out of or in connection with it (including non-contractual disputes or claims) is governed by and construed in accordance with the laws of the country or (if applicable) state or province where the warranted product is first installed. If any provision of this limited warranty is held by a court of competent jurisdiction to be unenforceable because it is invalid or in conflict with any law of any relevant jurisdiction, the validity of the remaining provisions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the unenforceable provisions were replaced by valid, legal and enforceable provisions that come closest to the intent underlying the invalid or unenforceable provision. The United Nations Conventions on Contracts for the International Sale of Goods (1980) shall not apply to this limited warranty or any aspect of any dispute relating to this limited warranty.**

## 7.3. Exclusions

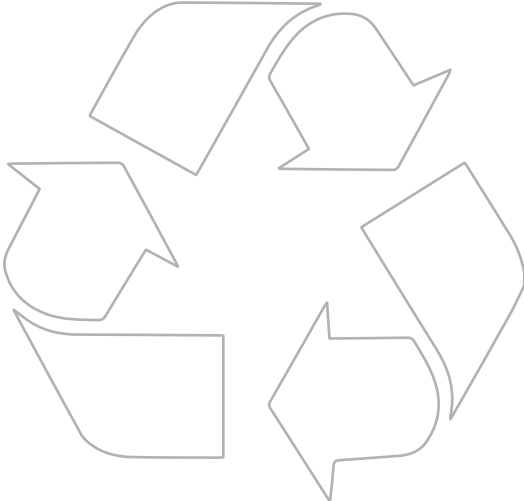
Warranty does not apply, if:

- The warranty period is expired.
- The warranty label is broken or removed.
- The serial number label is missing or unrecognizable.
- The product has been modified, opened or repaired by any unauthorized service center or personnel.
- The defect was subject to abuse, improper use not conforming to product manual instructions, or environment conditions more severe than those specified in the manual operating condition and user operation.
- Used with an improper charger, inverter or load.

**DISPOSAL**

SECTION 8

Please return the product to, or contact HPS for safe recycling. Disposal of the product at the end of its service life shall be done in accordance with applicable disposal regulations for electronic waste.



The product must not be disposed of with the household waste.

# APPENDIX

## SECTION 9

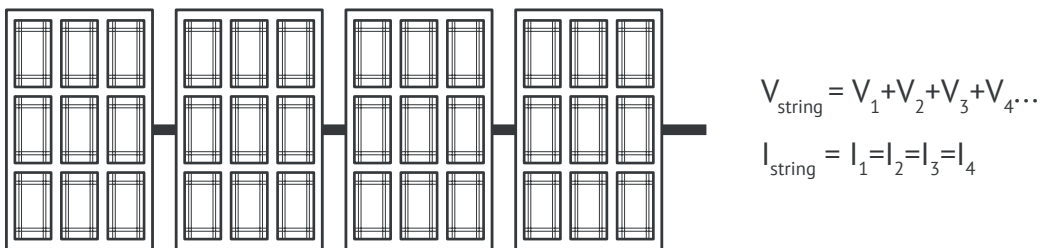
## 9.1. How to Select and Configure PV Panels

The following parameters can be found in each PV panel's specification:

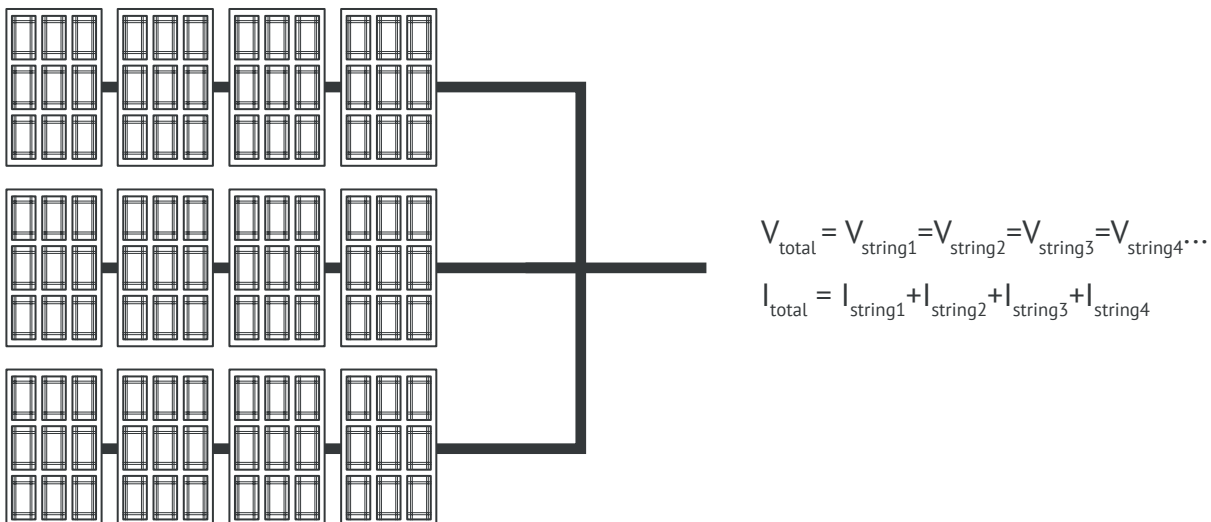
- $P_{max}$ : Max output power (W)
- $V_{oc}$ : open-circuit voltage (V)
- $I_{sc}$ : short-circuit current (A)
- $V_{mp}$ : max power voltage (V)
- $I_{mp}$ : max power current (A)

PV panels can be connected in series or parallel in order to obtain the desired output voltage and current which meets the inverter's allowed range.

When connecting PV panels in **series**, the max voltage and current of the string is:



When connecting the above PV string in **parallel**, the max voltage and current of the total string is:



In either case, the total output power is  $P_{total} = P_{panel} \times \# \text{ of PV panels}$

The guideline to select and configure PV string is:

- $P_{total}$  shall be equal or slightly larger than the max. capacity of solar battery charger. Surplus capacity of PV string does not help the solar charger's capacity and only results in higher installation cost.
- Total  $V_{mp}$  of the string shall be within the operating voltage range of solar battery charger.
- Total  $I_{mp}$  of the string shall be less than the max. input charging current of the solar battery charger (2x 30A).

### Example with 260W panels – 2340W Solar Installed

$$P_{max}: 260W$$

$$V_{oc}: 37.7V$$

$$I_{sc}: 8.89A$$

$$V_{mp}: 30.9V$$

$$I_{mp}: 8.42A$$

- 1.The max. PV input power for the Power Tower is 3500W,  $3500W / 260W = 13.46$  min. 10 PV panels shall be connected 13.
- 2.Best Operating Voltage Range is 60~150V,  $150V/37.7V = 3.97$  max. number of PV panel in series is 3.
- 3.Max. input charging current is 30A or 60A (dual input), Assuming single input usage:  $30A/8.42A = 3.56$  max. number of PV panel in parallel is 3.
- 4.Taking (1)~(3) into consideration, the optimized configuration is 3 PV panels in series as a string, and 3 strings in parallel (as shown in figure 9).
- 5.Check again the  $V_{oc}$  and  $I_{sc}$  of PV string,

$$V_{oc} \text{ of string is } 3 \times 37.7V = 113.1V < 150V \text{ (Max. PV Input Voltage)} = \mathbf{OK}$$

$$I_{sc} \text{ of string is } 3 \times 8.89A = 26.67A < 30A \text{ (Max. PV Input Current)} = \mathbf{OK}$$



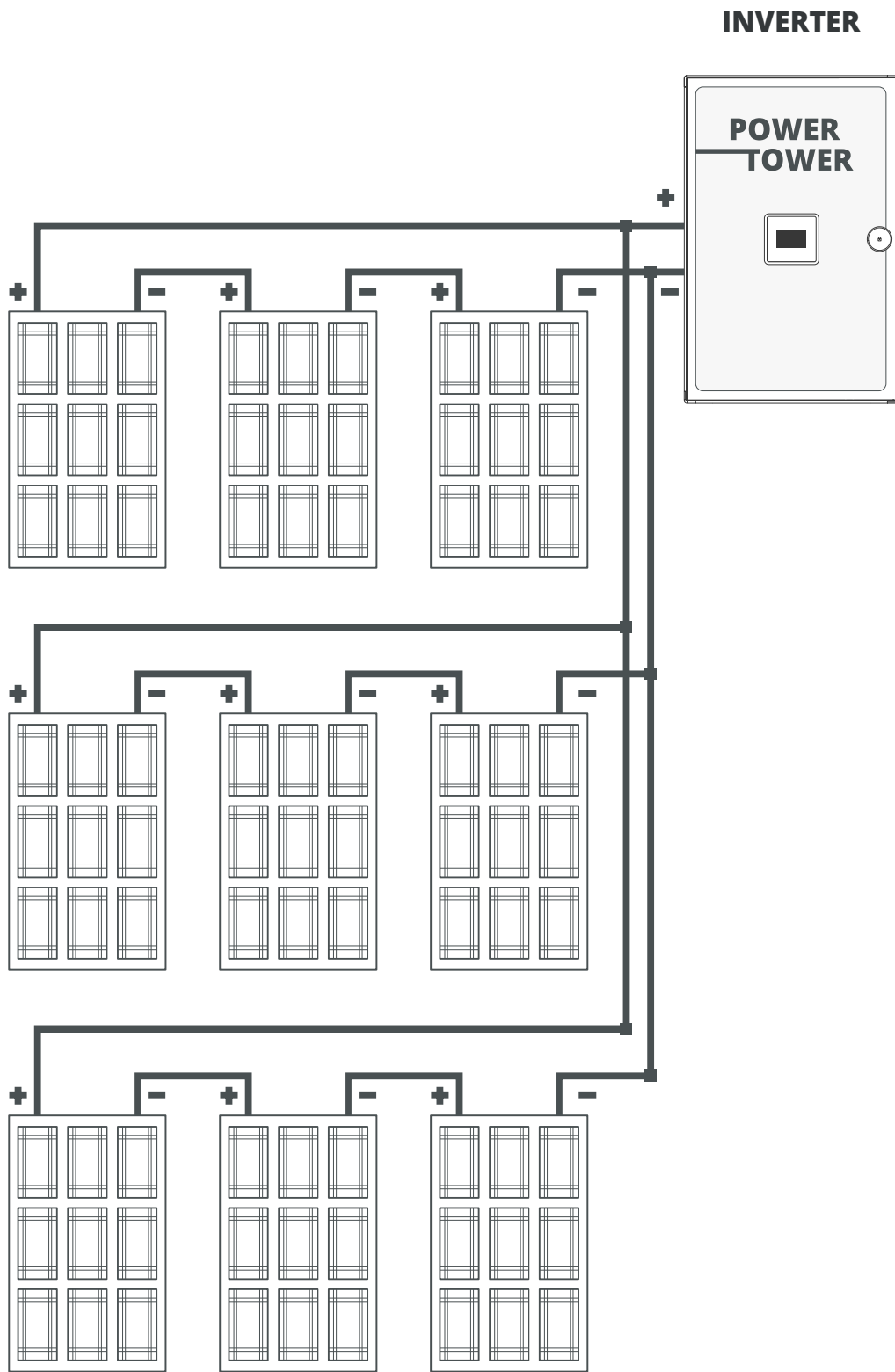


Figure 8

# POWER TOWER



POWER TOWER



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