# **User Manual**



# **Solar Hybrid Inverter**

SP6000 Handy Ultra 120V SP8000 Handy Ultra 230V

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### **ABOUT THIS MANUAL**

## **Purpose**

This manual describes the assembly, installation, operation and troubleshooting of this unit. Please read this manual carefully before installations and operations. Keep this manual for future reference.

## Scope

This manual provides safety and installation guidelines as well as information on tools and wiring.

### **SAFETY INSTRUCTIONS**

 $\triangle$  WARNING: This chapter contains important safety and operating instructions. Read and keep this manual for future reference.

- 1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.
- 2. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
- 3. 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.
- 4. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
- 5. **CAUTION** Only qualified personnel can install this device with battery.
- 6. **NEVER** charge a frozen battery.
- 7. For optimum operation of this inverter, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter.
- 8. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
- 9. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
- 10. Fuses are provided as over-current protection for the battery supply.
- 11. GROUNDING INSTRUCTIONS -This inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
- 12. NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
- 13. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this inverter back to local dealer or service center for maintenance.
- 14. **WARNING:** Because this inverter is non-isolated, only three types of PV modules are acceptable: single crystalline, poly crystalline with class A-rated and CIGS modules. To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter. When using CIGS modules, please be sure NO grounding.
- 15. **CAUTION:** It's required to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

#### INTRODUCTION

This is a multi-function inverter, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support in a single package. The comprehensive LCD display offers user-configurable and easy-accessible button operations such as battery charging current, AC or solar charging priority, and acceptable input voltage based on different applications.

#### **Features**

- Pure sine wave inverter
- Configurable color with the built-in RGB LED bar
- Built-in Wi-Fi for mobile monitoring (APP is required)
- Supports USB On-the-Go function
- Built-in anti-dusk kit
- Detachable LCD control module with multiple communication ports for BMS (RS485, CAN-BUS, RS232)
- Configurable input voltage ranges for home appliances and personal computers via LCD control panel
- Configurable AC/PV output usage timer and prioritization
- Configurable AC/Solar charger priority via LCD control panel
- Configurable battery charging current based on applications via LCD control panel
- Compatible to utility mains or generator power
- · Auto restart while AC is recovering
- Overload / Over temperature / short circuit protection
- Smart battery charger design for optimized battery performance
- Cold start function

## **Basic System Architecture**

The following illustration shows basic application for this unit. It also required the following devices to have a complete running system:

- · Generator or Utility mains.
- PV modules

Consult with your system integrator for other possible system architectures depending on your requirements.

This inverter can power various appliances in home or office environment, including motor-type appliances such as tube light, fan, refrigerator and air conditioners.

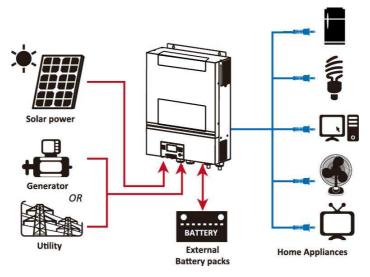
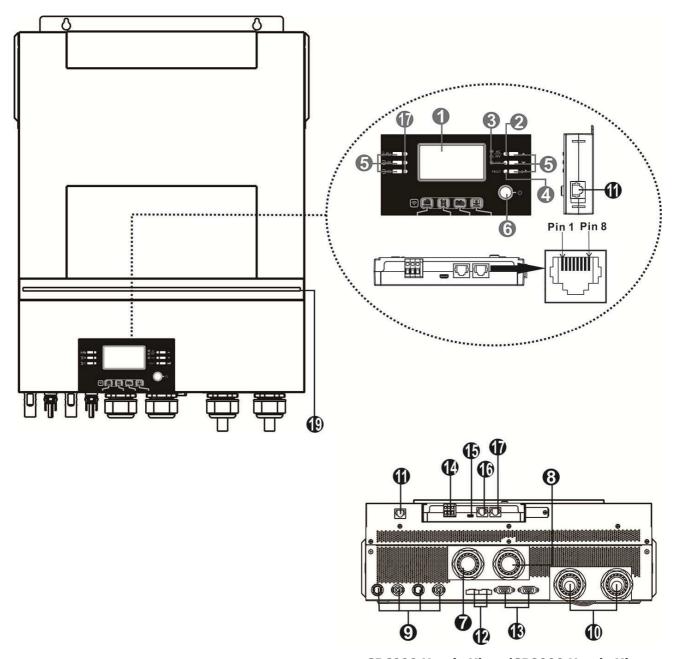


Figure 1 Basic hybrid PV System Overview

### **Product Overview**



SP6000 Handy Ultra /SP8000 Handy Ultra

**NOTE:** SP6000 Handy Ultra and SP8000 Handy Ultra are parallel models. For parallel installation and operation, please check *Appendix I*.

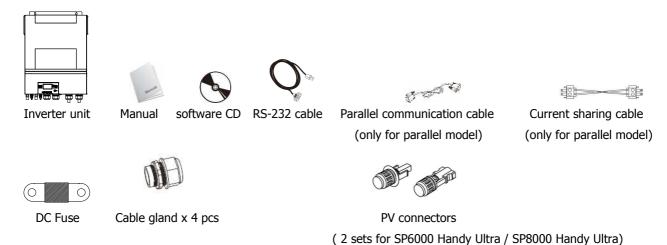
- 1. LCD display
- 2. Status indicator
- 3. Charging indicator
- 4. Fault indicator
- 5. Function buttons
- 6. Power on/off switch
- 7. AC input connectors
- 8. AC output connectors (Load connection)
- 9. PV connectors
- 10. Battery connectors
- 11. Remote LCD module communication Port

- 12. Current sharing port
- 13. Parallel communication port
- 14. Dry contact
- 15. USB port as USB communication port and USB function port
- 16. BMS communication port: CAN, RS-485 or RS-232
- 17. Output source indicators (refer to OPERATION/Operation and Display Panel section for details) and USB function setting reminder (refer to OPERATION/Function Setting for the details)
- 18. RS-232 communication port
- 19. RGB LED bar (refer to LCD Setting section for the details)

#### **INSTALLATION**

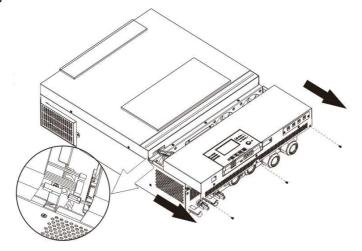
## **Unpacking and Inspection**

Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items inside of package:



## **Preparation**

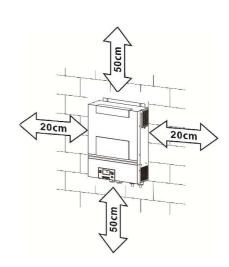
Before connecting all wirings, please take off bottom cover by removing five screws. When removing the bottom cover, be carefully to remove three cables as shown below.



## **Mounting the Unit**

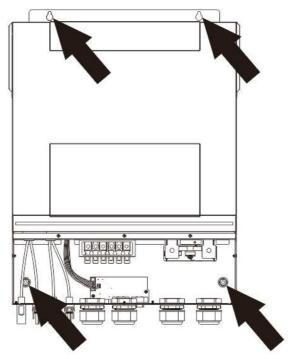
Consider the following points before selecting where to install:

- Do not mount the inverter on flammable construction materials.
- Mount on a solid surface
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- The ambient temperature should be between 0°C and 55°C to ensure optimal operation.
- The recommended installation position is to be adhered to the wall vertically.
- Be sure to keep other objects and surfaces as shown in the right diagram to guarantee sufficient heat dissipation and to have enough space for removing wires.



**↑** SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.

Install the unit by screwing four screws. It's recommended to use M4 or M5 screws.

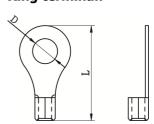


## **Battery Connection**

**CAUTION:** For safety operation and regulation compliance, it's requested to install a separate DC over-current protector or disconnect device between battery and inverter. It may not be requested to have a disconnect device in some applications, however, it's still requested to have over-current protection installed. Please refer to typical amperage in below table as required fuse or breaker size. **Ring terminal:** 

**WARNING!** All wiring must be performed by a qualified personnel.

**WARNING!** It's very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable and terminal size as below.

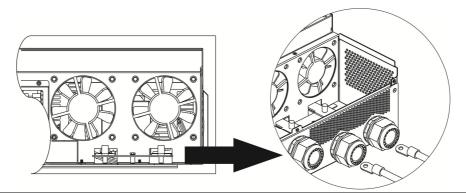


#### Recommended battery cable and terminal size:

Model	Typical	Battery	Wire Size	Cable	Ring Te Dimen		Torque
	Amperage	capacity		mm <sup>2</sup>	D (mm)	L (mm)	value
SP6000	153A		1*2/0AWG	67	8.4		
Handy Ultra	133A	250AH	1 · Z/UAWG	07	0.4	47	5 Nm
SP8000	192.24	183.2A		67.4	8.4	51	3 14111
Handy Ultra	103.2A		1*2/0AWG	07.4	0.4	31	

Please follow below steps to implement battery connection:

- 1. Assemble battery ring terminal based on recommended battery cable and terminal size.
- 2. Fix two cable glands into positive and negative terminals.
- 3. Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the nuts are tightened with torque of 5 Nm. Make sure polarity at both the battery and the inverter/charge is correctly connected and ring terminals are tightly screwed to the battery terminals.





#### **WARNING: Shock Hazard**

Installation must be performed with care due to high battery voltage in series.



**CAUTION!!** Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur.

**CAUTION!!** Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.

**CAUTION!!** Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

## **AC Input/Output Connection**

**CAUTION!!** Before connecting to AC input power source, please install a **separate** AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input.

**CAUTION!!** There are two terminal blocks with "IN" and "OUT" markings. Please do NOT mis-connect input and output connectors.

**WARNING!** All wiring must be performed by a qualified personnel.

**WARNING!** It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

#### Suggested cable requirement for AC wires

Model	Gauge	Torque Value
SP6000 Handy Ultra	4 AWG	1.4~ 1.6Nm
SP8000 Handy Ultra	8 AWG	1.4~ 1.6Nm

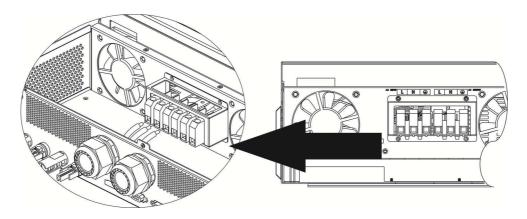
Please follow below steps to implement AC input/output connection:

- 1. Before making AC input/output connection, be sure to open DC protector or disconnector first.
- 2. Remove insulation sleeve 10mm for six conductors. And shorten phase L and neutral conductor N 3 mm.
- 3. Fix two cable glands into input and output sides.
- 4. Insert AC input wires according to polarities indicated on terminal block and tighten the terminal screws. Be sure to connect PE protective conductor ( ) first.

**Ground (yellow-green)** 

L→LINE (brown or black)

N→Neutral (blue)



<u>^!\</u>

#### **WARNING:**

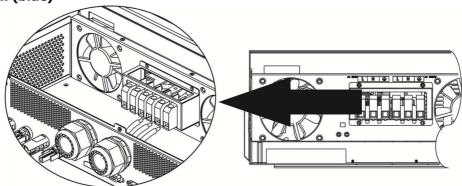
Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

5. Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws. Be sure to connect PE protective conductor ( ) first.

**Ground** (yellow-green)

L→LINE (brown or black)

N→Neutral (blue)



6. Make sure the wires are securely connected.

#### **CAUTION: Important**

Be sure to connect AC wires with correct polarity. If L and N wires are connected reversely, it may cause utility short-circuited when these inverters are worked in parallel operation.

**CAUTION:** Appliances such as air conditioner requires at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check manufacturer of air conditioner if it's equipped with time-delay function before installation. Otherwise, this inverter will be trigger overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

### **PV Connection**

**CAUTION:** Before connecting to PV modules, please install **separately** DC circuit breakers between inverter and PV modules.

**NOTE1:** Please use 600VDC/30A circuit breaker. **NOTE2:** The overvoltage category of the PV input is II.

Please follow the steps below to implement PV module connection:

**WARNING:** Because this inverter is non-isolated, only three types of PV modules are acceptable: single crystalline and poly crystalline with class A-rated and CIGS modules.

To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter. When using CIGS modules, please be sure NO grounding.

**CAUTION:** It's required to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

**Step 1**: Check the input voltage of PV array modules. This system is applied with two strings of PV array. Please make sure that the maximum current load of each PV input connector is 18A.

**CAUTION:** Exceeding the maximum input voltage can destroy the unit!! Check the system before wire connection.

**Step 2:** Disconnect the circuit breaker and switch off the DC switch.

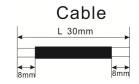
Step 3: Assemble provided PV connectors with PV modules by the following steps.

**Components for PV connectors and Tools:** 

Components for PV Comit	<u>zetora ana room.</u>
Female connector housing	
Female terminal	
Male connector housing	
Male terminal	
Crimping tool and spanner	

### Prepare the cable and follow the connector assembly process:

Strip one cable 8 mm on both end sides and be careful NOT to nick conductors.



Insert striped cable into female terminal and crimp female terminal as shown below.



Insert assembled cable into female connector housing as shown below.



Insert striped cable into male terminal and crimp male terminal as shown below.



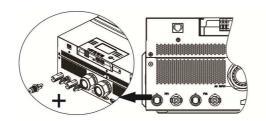
Insert assembled cable into male connector housing as shown below.

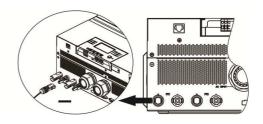


Then, use spanner to screw pressure dome <u>tightly to female connector</u> and male connector as shown below.



**Step 4**: Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable to negative pole (-) of PV input connector.





**WARNING!** For safety and efficiency, it's very important to use appropriate cables for PV module connection. To reduce risk of injury, please use the proper cable size as recommended below.

 - · · · · · · · · · · · · · · · · · · ·	To proper and the recommendate and the
Conductor cross-section (mm <sup>2</sup> )	AWG no.
4~6	10~12

**CAUTION:** Never directly touch the terminals of inverter. It might cause lethal electric shock.

#### **Recommended Panel Configuration**

When selecting proper PV modules, please be sure to consider the following parameters:

1. Open circuit Voltage (Voc) of PV modules not to exceed maximum PV array open circuit voltage of the inverter.

2. Open circuit Voltage (Voc) of PV modules should be higher than the start-up voltage.

INVERTER MODEL	SP6000 Handy Ultra	SP8000 Handy Ultra
Max. PV Array Power	8000W	8000W
Max. PV Array Open Circuit Voltage	250Vdc	500Vdc
PV Array MPPT Voltage Range	90Vdc~230Vdc	90Vdc~450Vdc
Start-up Voltage (Voc)	80Vdc	80Vdc

Recommended solar panel configuration for SP6000 Handy Ultra model:

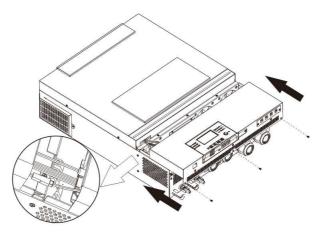
			I		
Solar Panel Spec.	SOLAR INPUT 1	SOLAR INPUT 2			
(reference)	Min in series: 3pcs, p		Q'ty of panels	Total Input Power	
- 330Wp	Max. in series:6pcs,	per input			
- Vmp: 33.7Vdc	3pcs in series	X	3pcs	990W	
- Imp: 9.79A	Х	3pcs in series	3pcs	990W	
- Voc: 39.61Vdc	6pcs in series	Х	6pcs	1980W	
- Isc: 10.4A	Х	6pcs in series	6pcs	1980W	
- Cells: 60	6pcs in series	6pcs in series	12pcs	3960W	
	6pcs in series, 2 strings	Х	12pcs	3960W	
	Х	6pcs in series, 2 strings	12pcs	3960W	
	6pcs in series, 2 strings	6pcs in series, 2 strings	24pcs	7920W	

Recommended solar panel configuration for SP8000 Handy Ultra model:

Solar Panel Spec.	SOLAR INPUT 1	SOLAR INPUT 2		
(reference)	Min in series: 4pcs, per input		Q'ty of panels	<b>Total Input Power</b>
- 250Wp	Max. in series: 12pcs	, per input		
- Vmp: 30.7Vdc	4pcs in series	Х	4pcs	1000W
- Imp: 8.3A	х	4pcs in series	4pcs	1000W
- Voc: 37.7Vdc	12pcs in series	Х	12pcs	3000W
- Isc: 8.4A	х	12pcs in series	12pcs	3000W
- Cells: 60	6pcs in series	6pcs in series	12pcs	3000W
	6pcs in series, 2 strings	Х	12pcs	3000W
	х	6pcs in series, 2 strings	12pcs	3000W
	8pcs in series, 2 strings	Х	16pcs	4000W
	х	8pcs in series, 2 strings	16pcs	4000W
	9pcs in series, 1 string	9pcs in series, 1 string	18pcs	4500W
	10pcs in series, 1 string	10pcs in series, 1 string	20pcs	5000W
	12pcs in series, 1 string	12pcs in series, 1 string	24pcs	6000W
	6pcs in series, 2 strings	6pcs in series, 2 strings	24pcs	6000W
	7pcs in series, 2 strings	7pcs in series, 2 strings	28pcs	7000W
	8pcs in series, 2 strings	8pcs in series, 2 strings	32pcs	8000W

## **Final Assembly**

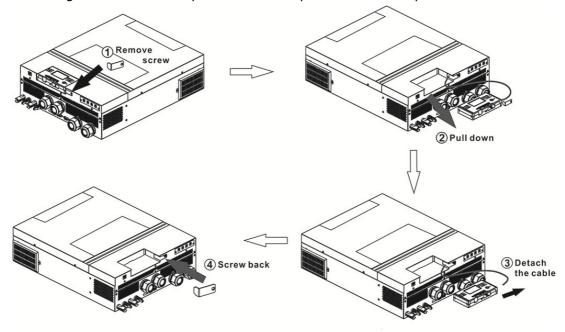
After connecting all wirings, re-connect three cables and then put bottom cover back by screwing five screws as shown below.



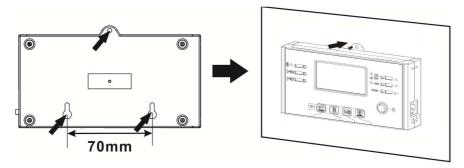
## **Remote Display Panel Installation**

The LCD module can be removable and installed in a remote location with an optional communication cable. Please take the follow steps to implement this remote panel installation.

**Step 1.** Remove the screw on the bottom of LCD module and pull down the module from the case. Detach the cable from the original communication port. Be sure to replace the retention plate back to the inverter.



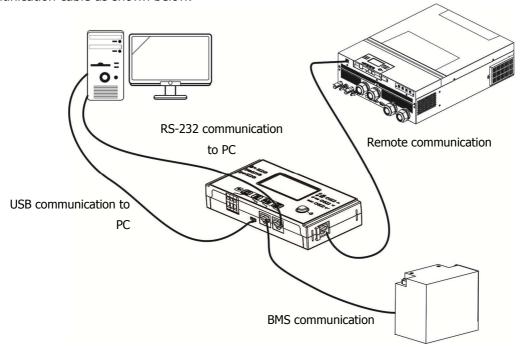
**Step 2.** Prepare your mounting holes in the marked locations as shown in the illustration below. The LCD module then can be securely mounted to your desired location.



**Note:** Wall installation should be implemented with the proper screws to the right.



**Step 3.** After LCD module is installed, connect LCD module to the inverter with an optional RJ45 communication cable as shown below.



## **Communication Connection**

#### **Serial Connection**

Please use the supplied serial cable to connect between the inverter and your PC. Install the monitoring software from the bundled CD and follow the on-screen instructions to complete your installation. For detailed software operation, refer to the software user manual on the bundled CD.

#### **Wi-Fi Connection**

This unit is equipped with a Wi-Fi transmitter. Wi-Fi transmitter can enable wireless communication between off-grid inverters and monitoring platform. Users can access and control the monitored inverter with downloaded APP. You may find "WatchPower" app from the Apple® Store or "WatchPower Wi-Fi" in Google® Play Store. All data loggers and parameters are saved in iCloud. For quick installation and operation, please check Appendix III.



## **Dry Contact Signal**

There is one dry contact (3A/250VAC) available on the rear panel. It could be used to deliver signal to external device when battery voltage reaches warning level.

Unit Status		Condi	tion	Dry contact	port: NC C NO
				NC & C	NO & C
Power Off	Unit is off and	no output is pow	vered.	Close	Open
	Output is powered	Program 01 set as USB	Battery voltage < Low DC warning voltage	Open	Close
Power On	from Battery power or Solar energy.	(utility first) or SUB (solar first)	Battery voltage > Setting value in Program 13 or battery charging reaches floating stage	Close	Open
Power Off		Program 01 is set as SBU	Battery voltage < Setting value in Program 12	Open	Close
		(SBU priority)	Battery voltage > Setting value in Program 13 or battery charging reaches floating stage	Close	Open

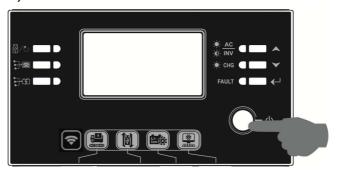
## **BMS Communication**

It is recommended to purchase a special communication cable if you are connecting to Lithium-Ion battery banks. Please refer to *Appendix II- BMS Communication Installation* for details.

#### **OPERATION**

## **Power ON/OFF**

Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch (located on the display panel) to turn on the unit.



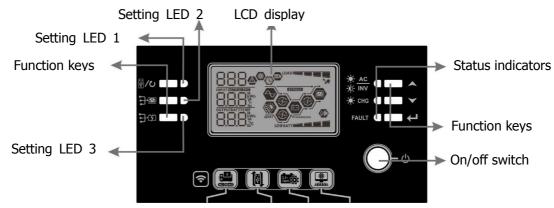
#### **Inverter Turn-on**

After this inverter is turned on, WELCOME light show will be started with RGB LED BAR. It will slowly cycle through entire spectrum of nine colors (Green, Sky blue, Royal blue, Violet, Pink, Red, Honey, Yellow, Lime yellow) about 10-15 seconds. After initialization, it will light up with default color.

RGB LED BAR can light up in different color and light effects based on the setting of energy priority to display the operation mode, energy source, battery capacity and load level. These parameters such as color, effects, brightness, speed and so on can be configured through the LCD panel. Please refer to LCD settings for the details.

## **Operation and Display Panel**

The operation and the LCD module, shown in the chart below, includes six indicators, six function keys, on/off switch and a LCD display to indicate the operating status and input/output power information.



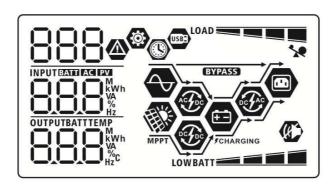
#### **Indicators**

LED Ind	icator	Color	Solid/Flashing	Messages
Setting	LED 1	Green	Solid On	Output powered by utility
Setting	LED 2	Green	Solid On	Output powered by PV
Setting	LED 3	Green	Solid On	Output powered by battery
	₩ AC		Solid On	Output is available in line mode
			Flashing	Output is powered by battery in battery mode
Status	× 0110	Croon	Solid On	Battery is fully charged
indicators	-\(\hat{\tau}\)- CHG Green	Flashing	Battery is charging.	
		Dod	Solid On	Fault mode
	FAULT	Red	Flashing	Warning mode

## **Function Keys**

Function	Key	Description
∰/ <b>ʻ</b> U	ESC	Exit the setting
(P)	USB function setting	Select USB OTG functions
<del>]</del>	Timer setting for the Output source priority	Setup the timer for prioritizing the output source
<del>]</del> *\$	Timer setting for the Charger source priority	Setup the timer for prioritizing the charger source
+	<del>]</del> \$	Press these two keys at the time to switch RGB LED bar for output source priority and battery discharge/charge status
<b>^</b>	Up	To last selection
~	Down	To next selection
<b>←</b>	Enter	To confirm/enter the selection in setting mode

# **LCD Display Icons**



Icon	Function description
Input Source Information	
AC	Indicates the AC input.
PV	Indicates the PV input
INPUT BATIFAGEZA	Indicate input voltage, input frequency, PV voltage, charger current,
	charger power, battery voltage.
<b>Configuration Program and F</b>	ault Information
<b>(4)</b>	
888	Indicates the setting programs.
	Indicates the warning and fault codes.
1888 <b>&amp;</b>	Warning:flashing with warning code.
000-	Fault: Gighting with fault code
<b>Output Information</b>	
OUTPUTBATTTEMP MWh	Indicate output voltage, output frequency, load percent, load in VA,
	load in Watt and discharging current.
<b>Battery Information</b>	
BATT	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.

, , ,	harging, it will	present battery ch			
Status	-		LCD Display		
_	<2V/cell		4 bars will fla	ash in turns. will be on and the other three bars	
Constant	2 ~ 2.083V/cell		will flash in t		
Current mode / Constant	2.083 ~ 2.16	7V/cell	Bottom two bars will flas	bars will be on and the other two h in turns.	
Voltage mode	> 2.167 V/ce	ill	Bottom three flash.	e bars will be on and the top bar will	
Floating mode. I	Batteries are fu	illy charged.	4 bars will be	e on.	
in battery mode,	it will present	battery capacity.			
Load Percentage	9	Battery Voltage		LCD Display	
		< 1.85V/cell		LOWBATT	
Load >50%		1.85V/cell ~ 1.93	33V/cell	BATT	
Load >30 70		1.933V/cell ~ 2.	017V/cell	BATT TO THE STATE OF THE STATE	
		> 2.017V/cell		BATT	
		< 1.892V/cell		LOWBATT	
Load < 50%		1.892V/cell ~ 1.975V/cell		BATT ====	
L0au < 50%		1.975V/cell ~ 2.058V/cell		BATT <b>EXAMPLE</b>	
		> 2.058V/cell		BATT <b>SATE</b>	
Load Information					
	Indicates overload.		ad.		
.0AD ======		Indicates the load level by 0-24%, 25-49%, 50-74% and 75-100%.			
		0%~24%		25%~49%	
	_	LOAD		LOAD	
	<u></u>	50%~74%		75%~100%	
2		LOAD		LOAD	
Mode Operation	n Information	1			
$\bigcirc$		Indicates unit co	onnects to the	e mains.	
MBBT		Indicates unit co	onnects to the	e PV panel.	
BYPASS		Indicates load is	s supplied by ι	supplied by utility power.	
AGD:		Indicates the ut	ility charger ci	ger circuit is working.	
		Indicates the so	lar charger cir	rcuit is working.	
Do. JAC		Indicates the DO	C/AC inverter	circuit is working.	
<b>(4)</b>		Indicates unit alarm is disabled.			
		Indicates USB disk is connected.			
USB <b>=</b>		Indicates USB d	isk is connecte	ed.	

## **LCD Setting**

## **General Setting**

After pressing and holding "←" button for 3 seconds, the unit will enter the Setup Mode. Press "♠" or "▼" button to select setting programs. Press "←" button to confirm you selection or "Û" button to exit.

**Setting Programs:** 

Program	Description	Selectable option	
00	Exit setting mode	Escape   Control of the control of t	
		Utility first (default)	Utility will provide power to the loads as first priority. Solar and battery energy will provide power to the loads only when utility power is not available.
01	Output source priority: To configure load power source priority	Solar first	Solar energy provides power to the loads as first priority.  If solar energy is not sufficient to power all connected loads, Utility energy will supply power to the loads at the same time.
		SBU priority	Solar energy provides power to the loads as first priority.  If solar energy is not sufficient to power all connected loads, battery energy will supply power to the loads at the same time.  Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or
02	Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	60A (default)	the setting point in program 12.  Setting range is from 10A to 120A for SP6000 Handy Ultra/SP8000 Handy Ultra models.

		Appliances (default)	If selected, acceptable AC input voltage range will be within 90-280VAC.
03	AC input voltage range	APL .	
	The imput voltage range	UPS	If selected, acceptable AC input voltage range will be within 170-280VAC.
		UPS	
		AGM (default)	Flooded
		86-	FLd
	Battery type	User-Defined	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
		USE	
05		Pylontech battery	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		PYL	
		WECO battery	If selected, programs of 02, 12, 26, 27 and 29 will be auto-configured per battery supplier recommended. No need
		υEC	for further adjustment.
		Soltaro battery	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		SOL	

	LIb-protocol compatible battery	Select "LIb" if using Lithium battery compatible to Lib protocol. If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
Battery type	UЬ	
	3 <sup>rd</sup> party Lithium battery	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting. Please contact the battery supplier
	LI C	for installation procedure.
Auto restart when overload occurs	Restart disable (default)	Restart enable
	L-4	LHE
Auto restart when over temperature occurs	Restart disable (default)	Restart enable
	ヒト리	<b>Ł</b> +E
Output frequency	50Hz (default for SP8000 Handy Ultra)	60Hz (default for SP6000 Handy Ultra)
	50 <sub>Hz</sub>	50 <sub>Hz</sub>
	Available options for SP8000 220V	Handy Ultra 230V (default)
Output voltage	240V	230,
	Auto restart when overload occurs  Auto restart when over temperature occurs  Output frequency	Battery type  LIL  3rd party Lithium battery  Solution  Auto restart when overload occurs  Restart disable (default)  LIL  Restart disable (default)  Solution  Auto restart when over temperature occurs  Boltz (default for SP8000 Handy Ultra)  Solution  Available options for SP8000  220V  Output voltage  Output voltage

		Available entions for CDC000	Handy I Iltra
		Available options for SP6000 110V	1
		1100	120V (default)
10	Output voltage		150,
		157	
	Maximum utility charging current	30A (default)	
	Current		Setting range is 2A, then from 10A
	Note: If setting value in	1 1 2	to 120A for SP6000 Handy
11	program 02 is smaller than that in program in 11, the	\ <u>\</u> \_\	Ultra/SP8000 Handy Ultra model.
	inverter will apply charging		Increment of each click is 10A.
	current from program 02 for utility charger.	30^	
		·	Handy Ultra/SP8000 Handy Ultra
		models:	
	Setting voltage point back	46V (default)	Setting range is from 44V to 51V.
12	to utility source when selecting "SBU" (SBU priority) in program 01.		Increment of each click is 1V.
		HE V	

		Available options for SP6000	Handy Ultra:
		Battery fully charged	54V (default)
		Dattery rully charged	I S
			10 0
		BATT	BATT
	Setting voltage point back	FIII v	<b>5</b> 4
	to battery mode when	Setting range is from 48V to 0	62V. Increment of each click is 1V.
13	selecting "SBU" (SBU	Available options for SP8000	
	priority) in program 01.	Battery fully charged	54V (default)
		! □ <b>③</b>	!⊐ ⊚
		'-'	1.0
		BATT	ВАТТ
		<b> -  _  _</b>	<b>'</b> _''
		Setting range is from 48V to !	58V. Increment of each click is 1V.
		=	ine, Standby or Fault mode, charger
		source can be programmed as below:	
	Charger source priority: To configure charger source priority	Solar first	Solar energy will charge battery as
			first priority.
			Utility will charge battery only
			when solar energy is not available.
		550	
		Solar and Utility (default)	Color operay and utility will share
		Solar and Othicy (default)	Solar energy and utility will charge battery at the same time.
		io 🗳	battery at the same time.
16			
		SNU	
		Only Solar	Solar energy will be the only
		!⊑ <b>®</b>	charger source no matter utility is
		10	available or not.
		oco	
		050	
		-	Sattery mode, only solar energy can
			vill charge battery if it's available and
		sufficient.	
		Alarm on (default)	Alarm off
		! <b>!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!</b>	!□ 🚳
18	Alarm control	'U	''
10	AIGITH COHUO		
		<b>6</b> 80	6UF

19	Auto return to default display screen	Return to default display screen (default)	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.  If selected, the display screen will stay at latest screen user finally switches.
		F6P	
20	Backlight control	Backlight on (default)	Backlight off
		LON	LOF
22	Beeps while primary source is interrupted	Alarm on (default)	Alarm off
		800	ACF
23	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery	Bypass disable (default)	Bypass enable
	mode.	<b>649</b>	<b>646</b>
25	Record Fault code	Record enable (default)	Record disable
		FEN	FdS

		SP6000 Handy Ultra/SP8000	Handy Ultra models default: 56.4V
26	Bulk charging voltage (C.V voltage)		program 5, this program can be set DV to 62.0V for SP6000 Handy crement of each click is 0.1V.
27	Floating charging voltage	SP6000 Handy Ultra/SP8000 I	Handy Ultra models default: 54.0V  brogram 5, this program can be set  OV to 62.0V for SP6000 Handy  dels. Increment of each click is 0.1V.
28	AC output mode (only for SP6000 Handy Ultra/SP8000 Handy Ultra model) *This setting is only available when the inverter is in standby mode (Switch off).	inverter to be operated in special phase:  28   3P   L3 phase: 28   3P	L2 phase:  28

		L1 for split phase:	L2 for split phase:	
			(120° phase difference)	
			28 <b>®</b>	
			170	
		28 :	150	
			2P2	
		L2 for split phase:		
		(180° phase difference)		
		2 <b>0 0</b>		
		.00		
		180		
		292		
	Low DC cut-off voltage:		Handy Ultra models default: 44.0V	
	If battery power is only	JQ @	•	
	power source available, inverter will shut down.	CD W		
	If PV energy and battery	լնո		
	power are available, inverter will charge	BATT		
29	battery without AC	'-{'-{ <u>`</u> .' <sub>'</sub> '		
	<ul><li>output.</li><li>If PV energy, battery</li></ul>	If self-defined is selected in p	rogram 5, this program can be set	
	power and utility are all available, inverter will transfer to line mode and provide output	up. Setting range is from 42.0V to 48.0V for SP6000 Handy		
		Ultra/SP8000 Handy Ultra. Increment of each click is 0.1V. Low DC		
		cut-off voltage will be fixed to setting value no matter what		
	power to loads.	percentage of load is connect  Battery equalization	ea. Battery equalization disable	
		battery equalization	(default)	
			ì⊇ń ☻	
			50	
30	Battery equalization			
		EEN	888	
			" is selected in program 05, this	
		program can be set up.		
		SP6000 Handy Ultra/SP8000 I	Handy Ultra models default: 58.4V	
		3   🚳		
		CII		
31	Battery equalization voltage	BATT		
		58 <u>.</u> 4 <sup>,</sup>		
		Setting range is from 48.0V to 62.0V for SP6000 Handy		
		Ultra/SP8000 Handy Ultra mo	dels. Increment of each click is 0.1V.	
		60min (default)	Setting range is from 5min to	
		33 🚳	900min. Increment of each click is	
33	Battery equalized time		5min.	
		60		
-	•	·		

		120min (default)	Setting range is from 5min to 900
24	Debter a cuelinad bireacut	∃4 ❷	min. Increment of each click is 5 min.
34	Battery equalized timeout		
		120	
		30days (default)	Setting range is from 0 to 90 days.  Increment of each click is 1 day
35	Equalization interval	77 7	The efficience of each effect is 1 day
		56.	
		<u> </u>	B: 11 (1 ( 1)
		Enable	Disable (default)
		JU -	JU -
		oco	0.10
36	Equalization activated immediately	If equalization function is anal	bled in program 30, this program can
		be set up. If "Enable" is selec	ted in this program, it's to activate tely and LCD main page will show
			I, it will cancel equalization function
		untii next activated equalization	on time arrives based on program 35
		setting. At this time, " \( \sim \) Not reset(Default)	vill not be shown in LCD main page.
	Reset all stored data for PV	37 🐵	<b>⊣</b>
37	generated power and		
	output load energy	NFF	LCL
		Disable (Default)	If selected, battery discharge
		Lļ ļ 🐵	protection is disabled.
		<b>'</b> '	
41	Maximum discharging current	ddS	
41	(only for SP8000 Handy Ultra model)	30A	The setting range is from 30 A to 150 A. Increment of each click is
		4   🕸	10A. If discharging current is higher
			than setting value, battery will stop discharging. At this time, if the
		30	utility is available, the inverter will operate in bypass mode. If no
			utility is available, the inverter will

		150A	shut down output for 5 minutes.
		4   🐵	
		ıco	
		ISO	
		Enabled (default)	Disable
F.1	On/Off control for RGB LED *It's necessary to enable	5   🐵	5   🚳
51	this setting to activate RGB		
	LED lighting function.	LEN	LdS
		Low	Normal (default)
		52 🚳	52 @
	Brightness of RGB LED	LO	NO-
52		High	1101
		S2 @	
		JC	
		111	
		H i	
		Low	Normal (default)
		53 🚳	53 🔮
		LO	NOH
53	Lighting speed of RGB LED	High	
		53 🚳	
		HI	
		Scrolling	Breathing
		<u> </u>	GU ®
54	RGB LED effects	_· ·	
		SCH	

		Solid on (Default)	
		54 <b>®</b>	
		ירכ -	
		SOL	
55	Color combination of RGB LED to show energy source and battery charge/discharge status:  Grid-PV-Battery Battery charge/discharge status	C01: (Default)  Violet-White-Sky blue  Pink-Honey	C02:  White-Yellow-Green Royal blue-Lime yellow
		Not reset (Default)	Reset
93	Erase all data log	93 👁	93 👁
		UF <mark>F</mark>	FSE .
		3 minutes	5 minutes
		3	5
94	Data log recorded interval *The maximum data log number is 1440. If it's over	10 minutes (default)	20 minutes
	1440, it will re-write the first log.	10	20
		30 minutes	60 minutes
		30	60
		For minute setting, the range	is from 0 to 59.
95	Time setting – Minute	∩l N 0	

		For hour setting, the range is from 0 to 23.
96	Time setting – Hour	
		0
		For day setting, the range is from 1 to 31.
97	Time setting- Day	48Y
		For month setting, the range is from 1 to 12.
98	Time setting– Month	
90		
	Time setting – Year	For year setting, the range is from 17 to 99.
99		33 <b>4</b> 0
		YER
		19

## **Function Setting**

There are three function keys on the display panel to implement special functions such as USB OTG, Timer setting for output source priority and timer setting for charger source priority.

## 1. USB Function Setting

Insert an OTG USB disk into the USB port ( ). Press and hold " button for 3 seconds to enter USB Setup Mode. These functions including inverter firmware upgrade, data log export and internal parameters re-write from the USB disk.

Procedure	LCD Screen
Step 1: Press and hold " button for 3 seconds to enter USB function setting mode.	
Step 2: Press " or " button to enter the selectable setting programs (detail descriptions in Step 3)	UPC ● ● SEL LOG

**Step 3:** Please select setting program by following the procedure.

Program#	Operation Procedure LCD S		
⊕/℧։	This function is to upgrade inverter firmware. If firmware upgrade is needed, please check with		
Upgrade	your dealer or installer for detail instructions.		
firmware			

<del>]</del> ••:	This function is to over-write all parameter settings (TEXT file) with settings in the On-The-Go USB disk from a previous setup or to duplicate inverter settings. Please check with your dealer			
Re-write	or installer for detail instructions.			
internal				
parameters				
	By pressing " button to export data log from the inverter to USB disk. If			
	the selected function is ready, LCD will display "LJ". Press " button to			
	confirm the selection again.	F84		
<b>学</b> : Export data log	Press "     button to select "Yes", LED 1 will flash once every second			
	during the process. It will only display LOG and all LEDs will be on after	YES		
	this action is complete. Then, press "砂/ひ" button to return to main screen.	ΠΟ		
	Or press "📆" button to select "No" to return to main screen.			

If no button is pressed for 1 minute, it will automatically return to main screen.

## **Error message for USB On-the-Go functions:**

<b>Error Code</b>	Messages
	No USB disk is detected.
U02	USB disk is protected from copy.
U03	Document inside the USB disk with wrong format.

If any error occurs, error code will only show 3 seconds. After three seconds, it will automatically return to display screen.

## 2. Timer Setting for Output Source Priority

This timer setting is to set up the output source priority per day.

Procedure	LCD Screen
<b>Step 1:</b> Press and hold "button for 3 seconds to enter Timer Setup Mode for output source priority.	
Step 2: Press " or " button to enter the selectable programs (detail	506   560
descriptions in Step 3).	200

**Step 3:** Please select setting program by following each procedure.

Program#	Operation Procedure	LCD Screen
∰/₺	Press " button to set up Utility First Timer. Press button to select staring time. Press " button to adjust values and press " to confirm. Press button to select end time. Press " or " button to adjust values, press " button to confirm. The setting values are from 00 to 23, with 1-hour increment.	US6 © 00 23

<del>]</del> <b>1</b>	Press "Ja" button to set up Solar First Timer. Press "Ja" button to select staring time. Press "A" or "Y" button to adjust values and press "A" to confirm. Press "Ja" button to select end time. Press "A" or "Y" button to adjust values, press "A" button to confirm. The setting values are from 00 to 23, with 1-hour increment.	SUb ®
<del>] (</del> )	Press "Ju" button to set up SBU Priority Timer. Press "Ju" button to select staring time. Press "A" or "V" button to adjust values and press "I" to confirm. Press "Ju" button to select end time. Press "A" or "V" button to adjust values, press "I" button to confirm. The setting values are from 00 to 23, with 1-hour increment.	S6U ® 00 23

Press " button to exit the Setup Mode.

## 3. Timer Setting for the Charger Source Priority

This timer setting is to set up the charger source priority per day.

Procedure	LCD Screen
Step 1: Press and hold "button for 3 seconds to enter Timer Setup Mode for charging source priority.	[50 <b>©</b> 500
Step 2: Press "学/ひ", "ラコ" or "ラダ" button to enter the selectable programs (detail	050
descriptions in Step 3).	

**Step 3:** Please select setting program by following each procedure.

Program#	Operation Procedure	LCD Screen
∰/₺	Press " button to set up Solar First Timer. Press " button to select staring time. Press " vibutton to adjust values and press " vibutton to confirm. Press " button to select end time. Press " vibutton to adjust values, press " vibutton to confirm. The setting values are from 00 to 23, with 1-hour increment.	CSO ♥ 00 23
<del>]</del> 9	Press "Dur button to set up Solar & Utility Timer. Press "Dur button to select staring time. Press "A" or "V" button to adjust values and press "L" to confirm. Press "Dutton to select end time. Press "A" or "V" button to adjust values, press "L" button to confirm. The setting values are from 00 to 23, with 1-hour increment.	SNU <b>◎</b> 00 23
<del>}</del> \$	Press "" button to set up Solar Only Timer. Press " button to select staring time. Press " vi button to adjust values and press " to confirm. Press " button to select end time. Press " vi button to adjust values, press " vi button to confirm. The setting values are from 00 to 23, with 1-hour increment.	050 <b>©</b> 00 23

Press " button to exit the Setup Mode.

## **LCD Display**

The LCD display information will be switched in turn by pressing the "UP" or "DOWN" button. The selectable information is switched as the following table in order.

LCD display
Input Voltage=230V, output voltage=230V
LOAD
OUTPUT OUTPUT V MPPT CONTRACTOR STATE OF SCHARGING
Input frequency=50Hz
OUTPUT  V  EXPASS  OUTPUT  V  BATT
PV voltage=260V
LOAD
OUTPUT OUTPUT OF SATE SATE SATE SATE SATE SATE SATE SATE
PV1 voltage=260V (dual input model)  LOAD  INPUT  OUTPUT  OUTPUT  V  MPPT  OUTPUT  V  MPPT  OUTPUT  OU
BATT BATT
PV2 voltage=260V (dual input model)  LOAD  INPUT  INPUT  V  INPUT  V  INPUT  IN
OUTPUT  MPPT  BATT
PV current = 2.5A
OUTPUT  OUTPUT  WPPT  OUTPUT  BYPASS  OUTPUT  MPPT  OUTPUT  BATT

	PV1 current = 2.5A (dual input model)
	INPUT A BYPASS
	PV2 current = 2.5A (dual input model)
	LOAD LOAD
	OUTPUT  OUTPUT  WPPT  OCHARGING
	BATT
	PV power = 500W
	OUTPUT  W  MPPT  BATT
	PV1 power = 500W (dual input model)
	LOAD
PV power	OUTPUT  W  W  OUTPUT  W  W  W  W  W  FCHARGING  BATT
	PV2 power = 500W (dual input model)
	[DI]
	INPUT EXW SYPASS
	V MPPT CHARGING

	AC and PV charging current=50A
Charging current	LOAD
	OUTPUT  OUTPUT  PV charging current=50A
	LOAD
	OUTPUT  MPPT  BYPASS  BYPASS  CD  YCHARGING
	BATT
	AC charging current=50A
	LOAD
	OUTPUT  OUTPUT  JCHARGING  BATT
	AC and PV charging power=500W
	LOAD
Charging power	OUTPUT  W  OUTPUT  W  PPT  SCHARGING  BATT  BATT
	OUTPUT  W  OUTPUT  WARPPT  WARRING  BATT
	OUTPUT CHARGING BATT
	Battery voltage=48, output voltage=230V
Battery voltage and output voltage	OUTPUT WPPT OF SCHARGING
	BATT

	Output frequency=50Hz
Output frequency	Dutput frequency = 50112
	OUTPUT MPPT FCHARGING
Load percentage	Load percent=70%
	OUTPUT OF SCHARGING
Load in VA	When connected load is lower than 1kVA, load in VA will present xxxVA like below chart.
	OUTPUT  VA  When load is larger than 1kVA (≥1KVA), load in VA will present x.xkVA like below chart.
	OUTPUT V MPPT CHARGING
Load in Watt	When load is lower than 1kW, load in W will present xxxW like below chart.
	When load is larger than 1kW (≥1KW), load in W will present x.xkW like below chart.
	Battery voltage=48V, discharging current=1A
Battery voltage/DC discharging current	BATT BATT BATT

	This PV Today energy = 3.88kWh, Load Today energy= 9.88kWh.
PV energy generated today and Load output energy today	LOAD BYPASSS BYPASSS
	OUTPUT KWh MPPT SCHARGING BATT
	This PV month energy = 388kWh, Load month energy= 988kWh.
PV energy generated this month and Load output energy	LOAD
this month.	OUTPUT OUTPUT
	BATT BATT
	This PV year energy = 3.88MWh, Load year energy = 9.88MWh.
PV energy generated this year and Load output energy	LOAD
this year.	
	Myh MPPT PCHARGING
	PV Total energy = 38.8MWh, Load Output Total energy = 98.8MWh.
PV energy generated totally and Load output total	LOAD
energy.	DYPASS DYPASS
	OUTPUT Wh MPPT FCHARGING
	Real date Nov 28, 2020.
Deel dete	C'LJ © GYPASS
Real date.	
	MPPT CHARGING BATT
	Real time 13:20.
Real time.	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □
	MPPT GOOD FCHARGING
	BATT

Main CPU version checking.	Main CPU version 00014.04.  LOAD  BYPASS  MPPT  SCHARGING  BATI
Secondary CPU version checking.	Secondary CPU version 00012.03.  LOAD  SYPASS  MAPPT  SYPASS  BATT  BATT
Secondary Wi-Fi version checking.	Secondary Wi-Fi version 00000.24.  LOAD  SPYPASS  MPPT  MPPT

# **Operating Mode Description**

Operation mode	Description	LCD display
		Charging by utility and PV energy.  MPPT  Charging by utility.
Standby mode  Note:  *Standby mode: The inverter is not turned on yet but at this time, the inverter can	No output is supplied by the unit but it still can charge batteries.	FCHARGING FCHARGING
charge battery without AC output.		Charging by PV energy.  MPPT  CHARGING
		No charging.

Operation mode	Description	LCD display
Fault mode Note: *Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.	PV energy and utility can charge batteries.	Charging by utility.  Charging by utility.  Charging by PV energy.  MPPT  SCHARGING  Charging by PV energy.  No charging.
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Charging by utility and PV energy.  BYPASS  Charging by utility.  BYPASS  Charging by utility.  BYPASS  Charging by utility.  BYPASS  CHARGING  If "SUB" (solar first) is selected as output source priority and solar energy is not sufficient to provide the load, solar energy and the utility will provide the loads and charge the battery at the same time.  BYPASS  BYPASS  CHARGING

Operation mode	Description	LCD display
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	If either "SUB" (solar first) or "SBU" is selected as output source priority and battery is not connected, solar energy and the utility will provide the loads.  BYPASS  Power from utility.
Battery Mode	The unit will provide output power from battery and/or PV power.	PV energy will supply power to the loads and charge battery at the same time. No utility is available.  Power from battery only.  Power from PV energy only.

## **Faults Reference Code**

Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off.	F::
02	Over temperature	F82
03	Battery voltage is too high	F83
04	Battery voltage is too low	F84
05	Output short circuited.	F8S
06	Output voltage is too high.	F08
07	Overload time out	F [] ]
08	Bus voltage is too high	F88
09	Bus soft start failed	F88
10	PV over current	
11	PV over voltage	F } }
12	DCDC over current	T 10
13	Battery discharge over current	7
51	Over current	7. 
52	Bus voltage is too low	FS2
53	Inverter soft start failed	F <u>53</u>
55	Over DC voltage in AC output	855
57	Current sensor failed	FS7
58	Output voltage is too low	F58

# **Warning Indicator**

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on.	Beep three times every second	
02	Over temperature	None	02@
03	Battery is over-charged	Beep once every second	□ 3
04	Low battery	Beep once every second	
07	Overload	Beep once every 0.5 second	LOAD
10	Output power derating	Beep twice every 3 seconds	
15	PV energy is low.	Beep twice every 3 seconds	5 <u>&amp;</u>
16	High AC input (>280VAC) during BUS soft start	None	154
32	Communication failure between inverter and remote display panel	None	32@
E9	Battery equalization	None	[= <b>]</b>
68	Battery is not connected	None	<b>60</b>

## **BATTERY EQUALIZATION**

Equalization function is added into charge controller. It reverses the buildup of negative chemical effects like stratification, a condition where acid concentration is greater at the bottom of the battery than at the top. Equalization also helps to remove sulfate crystals that might have built up on the plates. If left unchecked, this condition, called sulfation, will reduce the overall capacity of the battery. Therefore, it's recommended to equalize battery periodically.

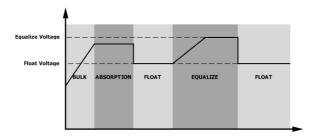
#### How to Apply Equalization Function

You must enable battery equalization function in monitoring LCD setting program 33 first. Then, you may apply this function in device by either one of following methods:

- 1. Setting equalization interval in program 37.
- 2. Active equalization immediately in program 39.

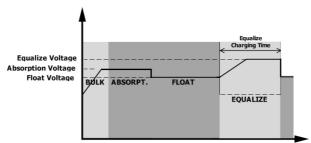
#### When to Equalize

In float stage, when the setting equalization interval (battery equalization cycle) is arrived, or equalization is active immediately, the controller will start to enter Equalize stage.

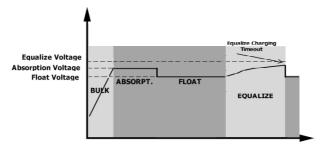


#### • Equalize charging time and timeout

In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until setting battery equalized time is arrived.



However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.



## **SPECIFICATIONS**

Table 1 Line Mode Specifications

MODEL	SP8000 Handy Ultra	SP6000 Handy Ultra
Input Voltage Waveform	Sinusoidal (utility or generator)	
Nominal Input Voltage	230Vac	120Vac
Low Loss Voltage	170Vac±7V (UPS) 90Vac±7V (Appliances)	90Vac±7V (UPS) 80Vac±7V (Appliances)
Low Loss Return Voltage	180Vac±7V (UPS); 100Vac±7V (Appliances	100Vac±7V (UPS); ) 90Vac±7V (Appliances)
High Loss Voltage	280Vac±7V	140Vac±7V
High Loss Return Voltage	270Vac±7V	135Vac±7V
Max AC Input Voltage	300Vac	150Vac
Max AC Input Current	60A	60A
Nominal Input Frequency	50Hz / 60Hz (Auto detection)	
Low Loss Frequency	40±1Hz	
Low Loss Return Frequency	42±1Hz	
High Loss Frequency	65±1Hz	
High Loss Return Frequency	63±1Hz	
Output Short Circuit Protection	Line mode: Circuit Breaker Battery mode: Electronic Circuits	
Efficiency (Line Mode)	>95% ( Rated R load, battery full charged )	
Transfer Time	10ms typical (UPS); 20ms typical (Appliances)	
Output power de-rating: For SP8000 Handy Ultra models, when AC input voltage under 170V the output power will be de-rated. For SP6000 Handy Ultra model, when AC	Output Power  Rated Power  50% Power	
input voltage under 105V the output power will be de-rated.		170V 280V 3.6K/7.2K models 105V 140V 6.5K models

Table 2 Inverter Mode Specifications

MODEL	SP8000 Handy Ultra	SP6000 Handy Ultra
Rated Output Power	8000W	6500W
Output Voltage Waveform	Pure Sin	e Wave
Output Voltage Regulation	230Vac±5%	120Vac±5%
Output Frequency	60Hz o	r 50Hz
Peak Efficiency	93%	91%
<b>Overload Protection</b>	100ms@≥205% load;5s@≥1509	% load; 10s@110%~150% load
Surge Capacity	2* rated power	for 5 seconds
Nominal DC Input Voltage	48\	/dc
Cold Start Voltage	46.0\	/dc
Low DC Warning Voltage		
@ load < 20%	46.0\	′dc
@ 20% ≤ load < 50%	42.8Vdc	
@ load ≥ 50%	40.4Vdc	
Low DC Warning Return Voltage		
@ load < 20%	48.0Vdc	
@ 20% ≤ load < 50%	44.8Vdc	
@ load ≥ 50%	42.4Vdc	
Low DC Cut-off Voltage		
@ load < 20%	44.0\	/dc
@ 20% ≤ load < 50%	40.8Vdc	
@ load ≥ 50%	38.4Vdc	
High DC Recovery Voltage	64Vdc	
High DC Cut-off Voltage	66Vdc	
DC Voltage Accuracy	+/-0.3V@ no load	
THDV	<5% for linear load,<10% for non-linear load @ nominal voltage	
DC Offset	≦100mV	

Table 3 Charge Mode Specifications

Utility Charging N	Mode		
MODEL		SP8000 Handy Ultra SP6000 Handy Ultra	
<b>Charging Current</b>	(UPS)	120A	
@ Nominal Input Vo	oltage	1200	
	Flooded	58.4Vdc	
Bulk Charging	Battery		
Voltage	AGM / Gel	56.4Vdc	
	Battery		
Floating Charging			4Vdc
Overcharge Prote			6Vdc
Charging Algorith	ım	3-	-Step
Charging Curve  Solar Input		Battery Voltage, per cell  Charging Current, %  Voltage  100%  To T1 = minimum 10mins, maximum 8hrs  Current  Bulk (Constant Current)  Response to the constant Voltage (Floating)  Time	
MODEL		SP8000 Handy Ultra	SP6000 Handy Ultra
Rated Power		8000W	8000W
Max. PV Array Op	en Circuit		
Voltage		500Vdc 250Vdc	
PV Array MPPT V	oltage Range	90Vdc~450Vdc 90Vdc~230Vdc	
Max. Input Curre	nt	18A x 2	
Start-up Voltage		80V +/- 5Vdc	
Power Limitation		PV Current  18A  9A  75° 85° MPPT temperature	

Table 4 General Specifications

MODEL	SP8000 Handy Ultra	SP6000 Handy Ultra
Safety Certification	CE	UL
Operating Temperature Range	-10°C to 50°C	-10°C to 40°C
Storage temperature	-15°C~ 60°C	
Humidity	5% to 95% Relative Humidity (Non-condensing)	
Dimension (D*W*H), mm	147.4x 432.5 x 553.6	
Net Weight, kg	18.4	

Table 5 Parallel Specifications (Parallel model only)

issue or an amor oppositionation of the amore than a more or and property of the amore than a more or a mo		
Max parallel numbers	6	
Circulation Current under No Load Condition	Max 2A	
Power Unbalance Ratio	<5% @ 100% Load	
Parallel communication	CAN	
Transfer time in parallel mode	Max 50ms	
Parallel Kit	YES	

Note: Parallel feature will be disabled when only PV power is available

## **TROUBLE SHOOTING**

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do	
Unit shuts down automatically during startup process.	LCD/LEDs and buzzer will be active for 3 seconds and then complete off.	The battery voltage is too low (<1.91V/Cell)	Re-charge battery.     Replace battery.	
No response after power on.	No indication.	<ol> <li>The battery voltage is far too low. (&lt;1.4V/Cell)</li> <li>Battery polarity is connected reversed.</li> </ol>	<ol> <li>Check if batteries and the wiring are connected well.</li> <li>Re-charge battery.</li> <li>Replace battery.</li> </ol>	
	Input voltage is displayed as 0 on the LCD and green LED is flashing.	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.	
Mains exist but the unit works in battery mode.	Green LED is flashing.	Insufficient quality of AC power. (Shore or Generator)	<ol> <li>Check if AC wires are too thin and/or too long.</li> <li>Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance)</li> </ol>	
	Green LED is flashing.	Set "Solar First" as the priority of output source.	Change output source priority to Utility first.	
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display and LEDs are flashing	Battery is disconnected.	Check if battery wires are connected well.	
	Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.	
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.	
		Temperature of internal converter component is over 120°C.	Check whether the air flow o the unit is blocked or whethe	
	Fault code 02	Internal temperature of inverter component is over 100°C.	the ambient temperature is too high.	
		Battery is over-charged.	Return to repair center.	
Buzzer beeps continuously and	Fault code 03	The battery voltage is too high.	Check if spec and quantity of batteries are meet requirements.	
red LED is on.	Fault code 01	Fan fault	Replace the fan.	
	Fault code 06/58	Output abnormal (Inverter voltage below than 190Vac or is higher than 260Vac)	Reduce the connected load.     Return to repair center	
	Fault code 08/09/53/57	Internal components failed.	Return to repair center.	
	Fault code 51	Over current or surge.	Restart the unit, if the error	
	Fault code 52	Bus voltage is too low.	happens again, please return	
	Fault code 55	Output voltage is unbalanced.	to repair center.	
	Fault code 56	Battery is not connected well or fuse is burnt.	If the battery is connected well, please return to repair center.	

## **Appendix I: Parallel function**

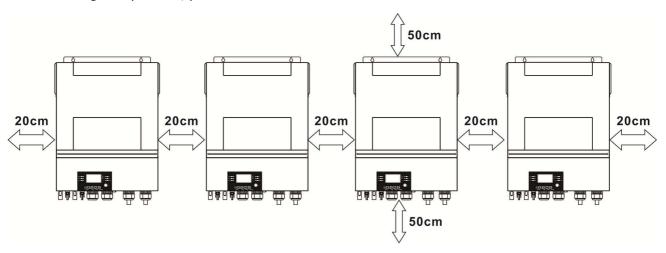
#### 1. Introduction

This inverter can be used in parallel with three different operation modes.

- 1. Parallel operation in single phase is with up to 6 units. The supported maximum output power for SP8000 Handy Ultra model is 48KW/48KVA. The supported maximum output power for SP6000 Handy Ultra model is 39KW/39KVA.
- 2. Maximum six units work together to support three-phase equipment. Maximum four units support one phase.
- 3. Maximum six units work together to support split-phase equipment only available for SP6000 Handy Ultra model. 5 units support one phase maximum. The supported maximum output power is 39KW/39KVA and one phase can be up to 32.5KW/32.5KVA.

## 2. Mounting the Unit

When installing multiple units, please follow below chart.



**NOTE:** For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

## 3. Wiring Connection

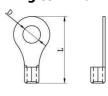
**WARNING:** It's REQUIRED to connect battery for parallel operation.

The cable size of each inverter is shown as below:

#### Recommended battery cable and terminal size for each inverter:

Model	Wire Size	Cable mm <sup>2</sup>	Ring Terminal Dimensions		Torque value
11000	77.11.0 51.20	Cubic iiiii	D (mm)	L (mm)	Torque varae
SP6000	1*2/0AWG	67	8.4	47	5 Nm
Handy Ultra	1"2/UAWG	67	0.4	4/	5 MIII
SP8000	1*2/04/4/	67.4	8.4	47	E Nm
Handy Ultra	1*2/0AWG	67.4	0.4	4/	5 Nm





**WARNING:** Be sure the length of all battery cables is the same. Otherwise, there will be voltage difference between inverter and battery to cause parallel inverters not working.

#### Recommended AC input and output cable size for each inverter:

Model	AWG no.	Torque
SP6000 Handy Ultra	4 AWG	1.4~ 1.6 Nm
SP8000 Handy Ultra	8 AWG	1.4~ 1.6 Nm

You need to connect the cables of each inverter together. Take the battery cables for example: You need to use a connector or bus-bar as a joint to connect the battery cables together, and then connect to the battery

terminal. The cable size used from joint to battery should be X times cable size in the tables above. "X" indicates the number of inverters connected in parallel.

Regarding AC input and output, please also follow the same principle.

**CAUTION!!** Please install the breaker at the battery and AC input side. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of battery or AC input.

#### Recommended breaker specification of battery for each inverter:

Model	1 unit*
SP6000 Handy Ultra	250A/70VDC
SP8000 Handy Ultra	250A/70VDC

<sup>\*</sup>If you want to use only one breaker at the battery side for the whole system, the rating of the breaker should be X times current of 1 unit. "X" indicates the number of inverters connected in parallel.

#### Recommended breaker specification of AC input with single phase:

Model	2 units	3 units	4 units	5 units	6 units
SP6000 Handy Ultra	120A/230VAC	180A/230VAC	240A/230VAC	300A/230VAC	360A/230VAC
SP8000 Handy Ultra	120A/230VAC	180A/230VAC	240A/230VAC	300A/230VAC	360A/230VAC

**Note 1:** Also, you can use 60A breaker for SP8000 Handy Ultra and SP6000 Handy Ultra models with only 1 unit and install one breaker at its AC input in each inverter.

**Note 2:** Regarding three-phase system, you can use 4-pole breaker directly and the rating of the breaker should be compatible with the phase current limitation from the phase with maximum units

#### **Recommended battery capacity**

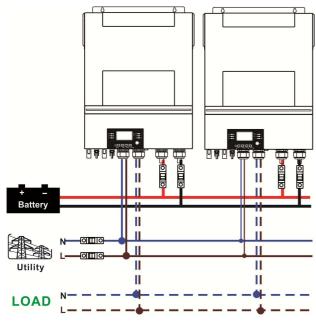
Inverter parallel numbers	2	3	4	5	6
Battery Capacity	200AH	400AH	400AH	600AH	600AH

**WARNING!** Be sure that all inverters will share the same battery bank. Otherwise, the inverters will transfer to fault mode.

## 4-1. Parallel Operation in Single phase

Two inverters in parallel:

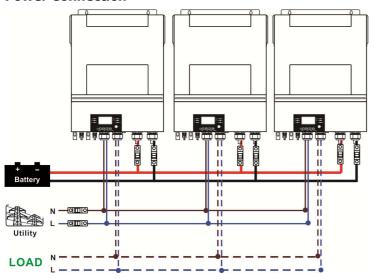
#### **Power Connection**





## Three inverters in parallel:

#### **Power Connection**

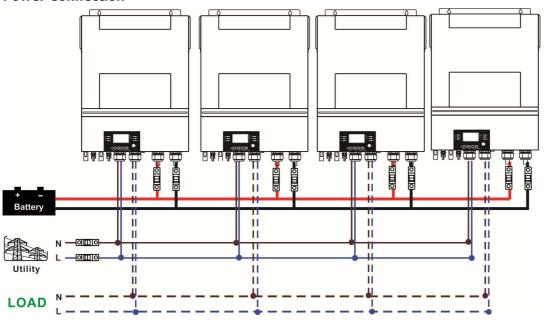


## **Communication Connection**



## Four inverters in parallel:

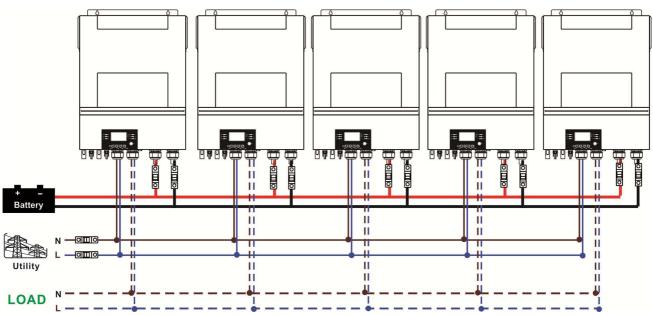
#### **Power Connection**



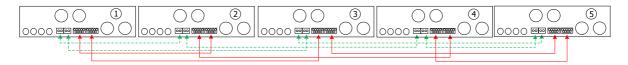


## Five inverters in parallel:

#### **Power Connection**

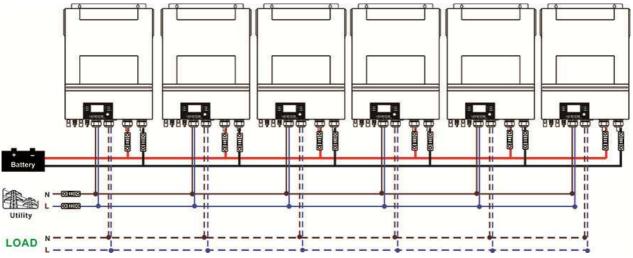


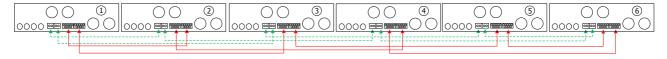
#### **Communication Connection**



#### Six inverters in parallel:

#### **Power Connection**

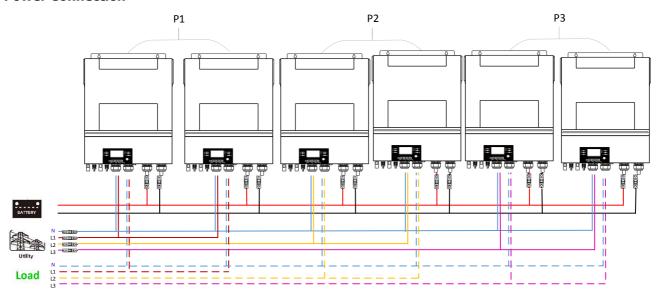




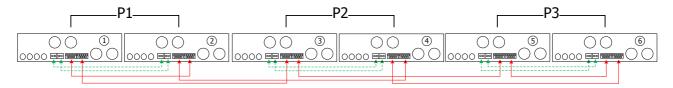
## 4-2. Support 3-phase equipment

## Two inverters in each phase:

#### **Power Connection**

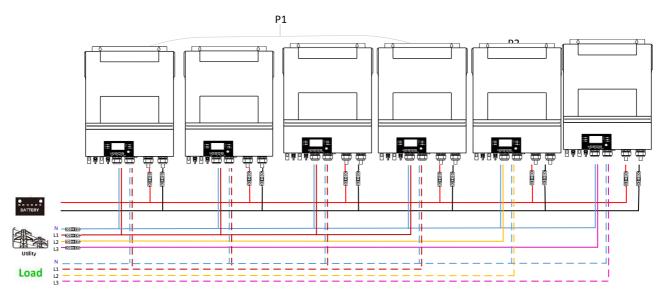


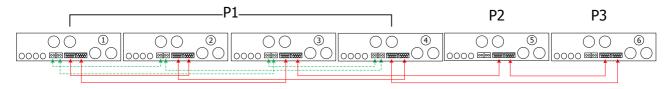
#### **Communication Connection**



## Four inverters in one phase and one inverter for the other two phases:

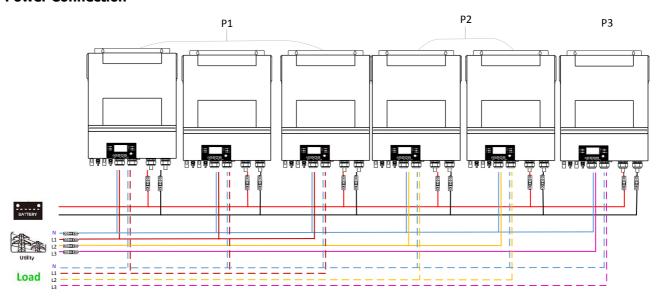
#### **Power Connection**



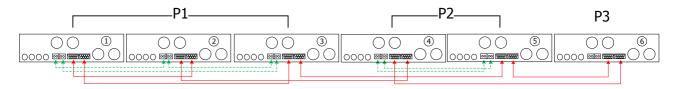


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

#### **Power Connection**

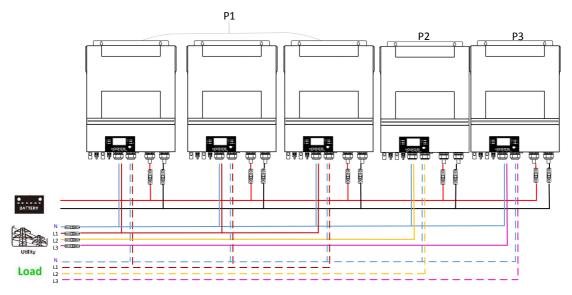


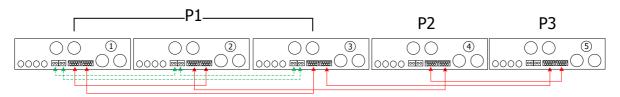
#### **Communication Connection**



Three inverters in one phase and only one inverter for the remaining two phases:

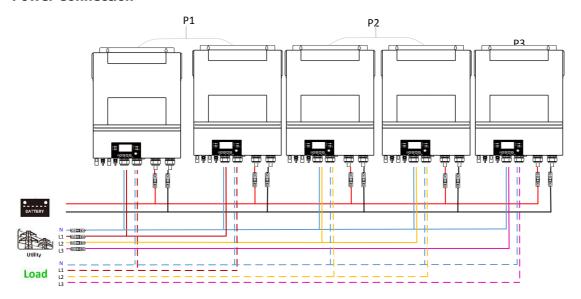
#### **Power Connection**



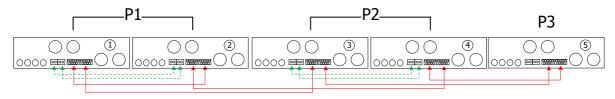


## Two inverters in two phases and only one inverter for the remaining phase:

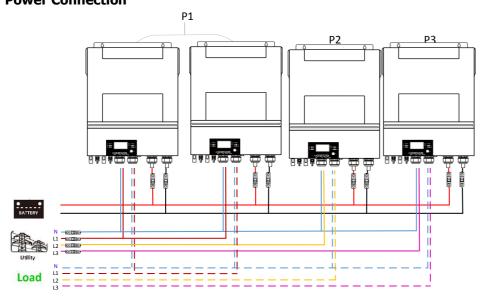
#### **Power Connection**

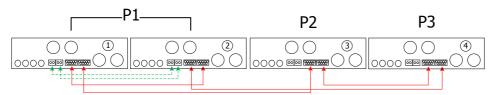


## **Communication Connection**



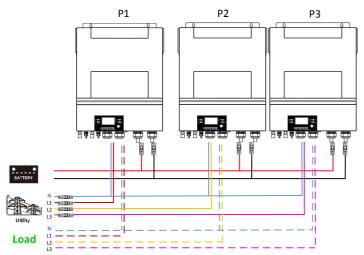
# Two inverters in one phase and only one inverter for the remaining phases: **Power Connection**



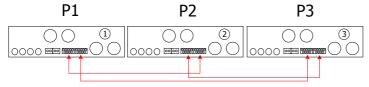


## One inverter in each phase:

#### **Power Connection**



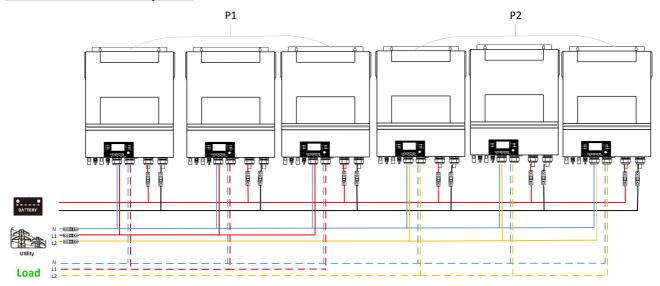
#### **Communication Connection**

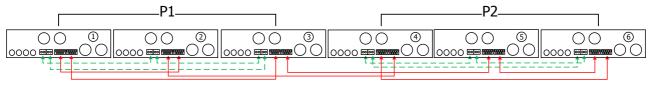


**WARNING:** Do not connect the current sharing cable between the inverters which are in different phases. Otherwise, it may damage the inverters.

## 4-3. Support split-phase equipment (only for SP6000 Handy Ultra model)

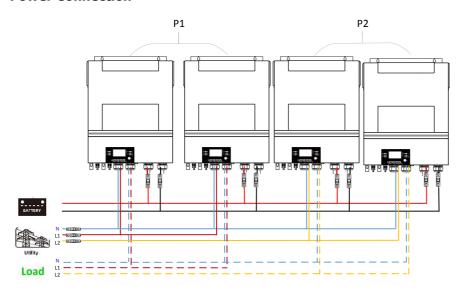
Three inverters in each phase:



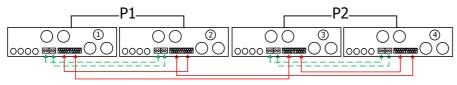


## Two inverters in each phase:

#### **Power Connection**

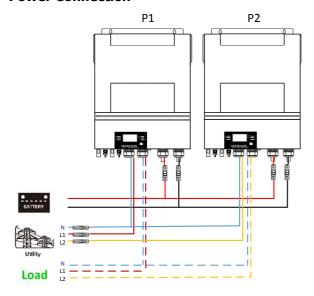


#### **Communication Connection**

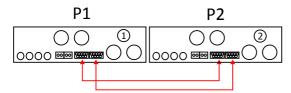


## One inverter in each phase:

#### **Power Connection**



## **Communication Connection**



## 5. PV Connection

Please refer to user manual of single unit for PV Connection.

CAUTION: Each inverter should connect to PV modules separately.

# 6. LCD Setting and Display

**Setting Program:** 

Program	Description	Selectable option	
		Single	When the unit is operated alone, please select "SIG" in program 28.
		SI G	
		Parallel 🐵	When the units are used in parallel for single phase application, please select "PAL" in program 28. Please refer to 5-1
		PAL	for detailed information.
		L1 phase:	When the units are operated in 3-phase application, please choose "3PX" to define each inverter. It is required to have at least 3 inverters or
		38 :	maximum 6 inverters to support three-phase equipment. It's required to have at least one inverter in each phase or
	AC output mode *This setting is able to set up only when the inverter is in standby mode. Be sure that on/off switch is in "OFF" status.	L2 phase:	it's up to four inverters in one phase.  Please refers to 5-2 for detailed information.  Please select "3P1" in program 28 for the
		3P2 L3 phase:	inverters connected to L1 phase, "3P2" in program 28 for the inverters connected to L2 phase and "3P3" in program 28 for the inverters connected to L3 phase.
28		28 <b>®</b>   323	Be sure to connect share current cable to units which are on the same phase. Do NOT connect share current cable between units on different phases.
		L1 for split phase:	When the units are operated in split phase
		2P :	application, please choose "2PX" to define each inverter. It is required to have at least 2 inverters or maximum 6 inverters to support
		L2 for split phase: (120° phase difference)	split-phase equipment. It's required to have at least one inverter in each phase or it's up to three inverters in one phase. Please refers to 5-2 for detailed
		120 293	information.  Please select "2P1" in program 28 for the inverters connected to L1 phase, "2P2" in program 28 for the inverters connected to L2 phase. And it can choose 120° or 180° o
		L2 for split phase: (180° phase difference)	L2 phase. And it can choose 120°or 180° phase difference for "2P2".  Be sure to connect share current cable to units which are on the same phase.
		180	Do NOT connect share current cable between units on different phases.
		285	

#### Fault code display:

Fault Code	Fault Event	Icon on
60	Power feedback protection	F68
71	Firmware version inconsistent	
72	Current sharing fault	T)
80	CAN fault	18 C3
81	Host loss	30 
82	Synchronization loss	-80 -0
83	Battery voltage detected different	83
84	AC input voltage and frequency detected different	70 70
85	AC output current unbalance	F85
86	AC output mode setting is different	F86

#### **Code Reference:**

Code	Description	Icon on
NE	Unidentified unit master or slave	
HS	Master unit	
SL	Slave unit	

## 7. Commissioning

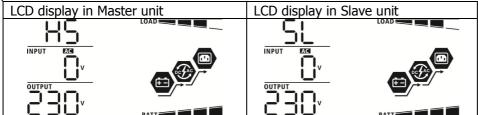
#### Parallel in single phase

Step 1: Check the following requirements before commissioning:

- Correct wire connection
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

Step 2: Turn on each unit and set "PAL" in LCD setting program 28 of each unit. And then shut down all units. **NOET:** It's necessary to turn off switch when setting LCD program. Otherwise, the setting cannot be programmed.

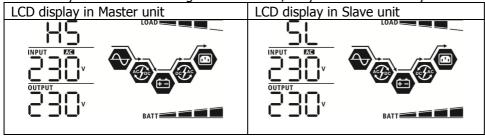
Step 3: Turn on each unit.



**NOTE:** Master and slave units are randomly defined.

Step 4: Switch on all AC breakers of Line wires in AC input. It's better to have all inverters connect to utility at the same time. If not, it will display fault 82 in following-order inverters. However, these inverters will

automatically restart. If detecting AC connection, they will work normally.



Step 5: If there is no more fault alarm, the parallel system is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

#### **Support three-phase equipment**

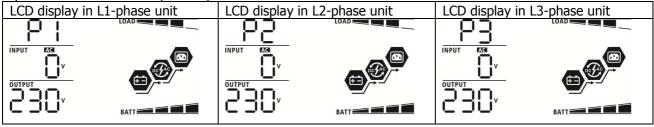
Step 1: Check the following requirements before commissioning:

- Correct wire connection
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

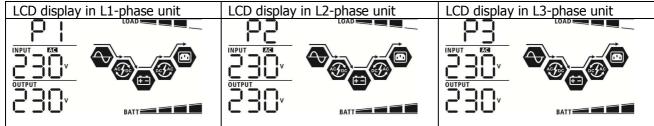
Step 2: Turn on all units and configure LCD program 28 as P1, P2 and P3 sequentially. And then shut down all units.

**NOET:** It's necessary to turn off switch when setting LCD program. Otherwise, the setting cannot be programmed.

Step 3: Turn on all units sequentially.



Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and three phases are matched with unit setting, they will work normally. Otherwise, the AC icon will flash and they will not work in line mode.



Step 5: If there is no more fault alarm, the system to support 3-phase equipment is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

Note 1: To avoid overload occurring, before turning on breakers in load side, it's better to have whole system in operation first.

Note 2: Transfer time for this operation exists. Power interruption may happen to critical devices, which cannot bear transfer time.

#### Support split-phase equipment

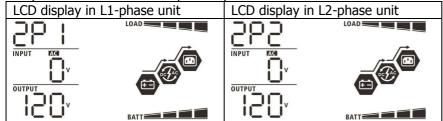
Step 1: Check the following requirements before commissioning:

- Correct wire connection
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

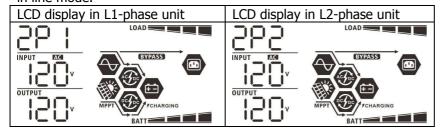
Step 2: Turn on all units and configure LCD program 28 as 2P1 and 2P2 sequentially. And then shut down all units.

**NOET:** It's necessary to turn off switch when setting LCD program. Otherwise, the setting cannot be programmed.

Step 3: Turn on all units sequentially.



Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and split-phases are matched with unit setting, they will work normally. Otherwise, the AC icon will flash and they will not work in line mode.



- Step 5: If there is no more fault alarm, the system to split-phase equipment is completely installed.
- Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.
- Note 1: To avoid overload occurring, before turning on breakers in load side, it's better to have whole system in operation first.
- Note 2: Transfer time for this operation exists. Power interruption may happen to critical devices, which cannot bear transfer time.

8. Trouble shooting

	Situation	
Fault Code	Fault Event Description	Solution
60	Current feedback into the inverter is detected.	<ol> <li>Restart the inverter.</li> <li>Check if L/N cables are not connected reversely in all inverters.</li> <li>For parallel system in single phase, make sure the sharing are connected in all inverters.</li> <li>For supporting three-phase system, make sure the sharing cables are connected in the inverters in the same phase, and disconnected in the inverters in different phases.</li> <li>If the problem remains, please contact your installer.</li> </ol>
71	The firmware version of each inverter is not the same.	<ol> <li>Update all inverter firmware to the same version.</li> <li>Check the version of each inverter via LCD setting and make sure the CPU versions are same. If not, please contact your instraller to provide the firmware to update.</li> <li>After updating, if the problem still remains, please contact your installer.</li> </ol>
72	The output current of each inverter is different.	<ol> <li>Check if sharing cables are connected well and restart the inverter.</li> <li>If the problem remains, please contact your installer.</li> </ol>
80	CAN data loss	Check if communication cables are connected well and restart the
81	Host data loss	<ol> <li>Check if communication cables are connected well and restart the inverter.</li> </ol>
82	Synchronization data loss	<ol> <li>If the problem remains, please contact your installer.</li> </ol>
83	The battery voltage of each inverter is not the same.	<ol> <li>Make sure all inverters share same groups of batteries together.</li> <li>Remove all loads and disconnect AC input and PV input. Then, check battery voltage of all inverters. If the values from all inverters are close, please check if all battery cables are the same length and same material type. Otherwise, please contact your installer to provide SOP to calibrate battery voltage of each inverter.</li> <li>If the problem still remains, please contact your installer.</li> </ol>
84	AC input voltage and frequency are detected different.	<ol> <li>Check the utility wiring connection and restart the inverter.</li> <li>Make sure utility starts up at same time. If there are breakers installed between utility and inverters, please be sure all breakers can be turned on AC input at same time.</li> <li>If the problem remains, please contact your installer.</li> </ol>
85	AC output current unbalance	<ol> <li>Restart the inverter.</li> <li>Remove some excessive loads and re-check load information from LCD of inverters. If the values are different, please check if AC input and output cables are in the same length and material type.</li> <li>If the problem remains, please contact your installer.</li> </ol>
86	AC output mode setting is different.	<ol> <li>Switch off the inverter and check LCD setting #28.</li> <li>For parallel system in single phase, make sure no 3P1, 3P2 or 3P3 is set on #28.</li> <li>For upporting three-phase system, make sure no "PAL" is set on #28.</li> <li>If the problem remains, please contact your installer.</li> </ol>

## **Appendix II: BMS Communication Installation**

#### 1. Introduction

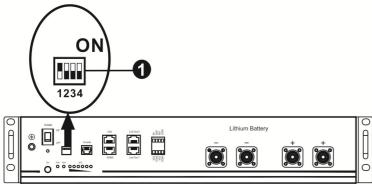
If connecting to lithium battery, it is recommended to purchase a custom-made RJ45 communication cable. Please check with your dealer or integrator for details.

This custom-made RJ45 communication cable delivers information and signal between lithium battery and the inverter. These information are listed below:

- Re-configure charging voltage, charging current and battery discharge cut-off voltage according to the lithium battery parameters.
- Have the inverter start or stop charging according to the status of lithium battery.

## 2. Lithium Battery Communication Configuration

## **PYLONTECH**



①Dip Switch: There are 4 Dip Switches that sets different baud rate and battery group address. If switch position is turned to the "OFF" position, it means "0". If switch position is turned to the "ON" position, it means "1".

Dip 1 is "ON" to represent the baud rate 9600.

Dip 2, 3 and 4 are reserved for battery group address.

Dip switch 2, 3 and 4 on master battery (first battery) are to set up or change the group address.

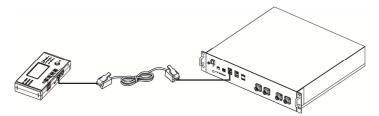
**NOTE:** "1" is upper position and "0" is bottom position.

Dip 1	Dip 2	Dip 3	Dip 4	Group address
	0	0	0	Single group only. It's required to set up master battery with this
		Ŭ		setting and slave batteries are unrestricted.
	1	0	0	Multiple group condition. It's required to set up master battery on the
1: RS485	1	O .	0	first group with this setting and slave batteries are unrestricted.
baud	_		_	Multiple group condition. It's required to set up master battery on the
rate=9600	$\begin{vmatrix} 0 & 1 \end{vmatrix}$		0	second group with this setting and slave batteries are unrestricted.
	1 1 0		0	Multiple group condition. It's required to set up master battery on the
Restart to	1	1	U	third group with this setting and slave batteries are unrestricted.
take effect	0	0 1		Multiple group condition. It's required to set up master battery on the
0	0	$\begin{bmatrix} 0 & 1 \end{bmatrix}$	fourth group with this setting and slave batteries are unrestricted.	
	1 0 1	0 1	Multiple group condition. It's required to set up master battery on the	
		1	fifth group with this setting and slave batteries are unrestricted.	

**NOTE:** The maximum groups of lithium battery is 5 and for maximum number for each group, please check with battery manufacturer.

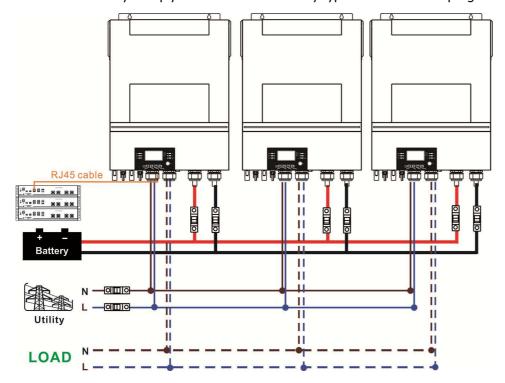
#### 3. Installation and Operation

After configuration, please install LCD panel with inverter and Lithium battery with the following steps. Step 1. Use custom-made RJ45 cable to connect inverter and Lithium battery.

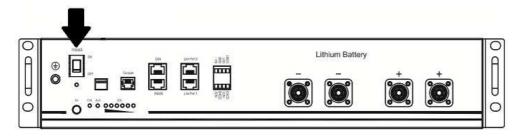


#### Note for parallel system:

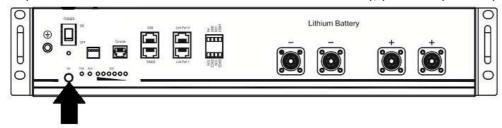
- 1. Only support common battery installation.
- 2. Use custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set this inverter battery type to "PYL" in LCD program 5. Others should be "USE".



Step 2. Switch on Lithium battery.



Step 3. Press more than three seconds to start Lithium battery, power output ready.



Step 4. Turn on the inverter.



Step 5. Be sure to select battery type as "PYL" in LCD program 5.



# PYL

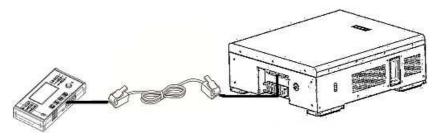
If communication between the inverter and battery is successful, the battery icon on LCD display will flash. Generally speaking, it will take longer than 1 minute to establish communication.

#### **Active Function**

This function is to activate lithium battery automatically while commissioning. After battery wiring and commissioning is successfully, if battery is not detected, the inverter will automatically activate battery if the inverter is powered on.

#### **WECO**

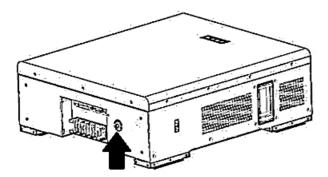
Step 1. Use a custom-made RJ45 cable to connect inverter and Lithium battery.



#### Please take notice for parallel system:

- 1. Only support common battery installation.
- 2. Use one custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set battery type of this inverter to "WEC" in LCD program 5. The remaining inverters are set as "USE".

Step 2. Switch on Lithium battery.



Step 3. Turn on the inverter.



Step 4. Be sure to select battery type as "WEC" in LCD program 5.

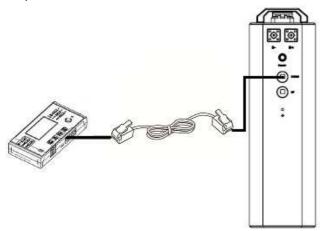




If communication between the inverter and battery is successful, the battery icon on LCD display will "flash". Generally speaking, it will take longer than 1 minute to establish communication.

#### **SOLTARO**

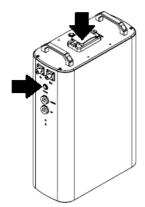
Step 1. Use a custom-made RJ45 cable to connect inverter and Lithium battery.



## Please take notice for parallel system:

- 1. Only support common battery installation.
- 2. Use one custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set battery type of this inverter to "SOL" in LCD program 5. The remaining inverters are set as "USE".

Step 2. Open DC isolator and switch on Lithium battery.



Step 3. Turn on the inverter.



Step 4. Be sure to select battery type as "SOL" in LCD program 5.



# SOL

If communication between the inverter and battery is successful, the battery icon on LCD display wil "flash". Generally speaking, it will take longer than 1 minute to establish communication.

## 4. LCD Display Information

Press "\rightar" or "\rightar" button to switch LCD display information. It will show battery pack and battery group number before "Main CPU version checking" as shown below.

Selectable information	LCD display
Battery pack numbers & Battery	Battery pack numbers = 3, battery group numbers = 1
group numbers	DAD LOAD BATT BATT

## **5. Code Reference**

Related information code will be displayed on LCD screen. Please check inverter LCD screen for the operation.

Code	Description	Action
50 <b>∞</b>	If battery status is not allowed to charge and	recion
	discharge after the communication between	
	the inverter and battery is successful, it will	
	show code 60 to stop charging and discharging	
	battery.	
	Communication lost (only available when the	
	battery type is setting as "Pylontech Battery",	
	"WECO Battery" or "Soltaro Battery".)	
5 <b>l</b> ⊗	After battery is connected, communication	
	signal is not detected for 3 minutes,	
	buzzer will beep. After 10 minutes,	
	inverter will stop charging and discharging	
	to lithium battery.	
	Communication lost occurs after the	
	inverter and battery is connected	
	successfully, buzzer beeps immediately.	
	Battery number is changed. It probably is	Press "UP" or "DOWN" key to switch LCD
	because of communication lost between	display until below screen shows. It will
	battery packs.	have battery number re-checked and 62
$\Box \neg \neg$		warning code will be clear.
		BATT
5 <b>9</b>	If battery status is not allowed to charge after	BATT
	the communication between the inverter and	
	battery is successful, it will show code 69 to	
	stop charging battery.	
	If battery status must to be charged after the	
	communication between the inverter and	
	battery is successful, it will show code 70 to	
	charge battery.	
7 10	If battery status is not allowed to discharge	
	after the communication between the inverter	
		1
i i	and battery is successful, it will show code 71	

## **Appendix III: The Wi-Fi Operation Guide in Remote Panel**

#### 1. Introduction

Wi-Fi module can enable wireless communication between off-grid inverters and monitoring platform. Users have complete and remote monitoring and controlling experience for inverters when combining Wi-Fi module with WatchPower APP, available for both iOS and Android based device. All data loggers and parameters are saved in iCloud.

The major functions of this APP:

- Delivers device status during normal operation.
- Allows to configure device setting after installation.
- Notifies users when a warning or alarm occurs.
- Allows users to query inverter history data.



#### 2. WatchPower App

#### 2-1. Download and install APP

#### Operating system requirement for your smart phone:

- iOS system supports iOS 9.0 and above
- Android system supports Android 5.0 and above

Please scan the following QR code with your smart phone and download WatchPower App.





Android system

iOS system

Or you may find "WatchPower" app from the Apple® Store or "WatchPower Wi-Fi" in Google® Play Store.



#### 2-2. Initial Setup

Step 1: Registration at first time

After the installation, please tap the shortcut icon to access this APP on your mobile screen. In the screen, tap "Register" to access "User Registration" page. Fill in all required information and scan the remote box PN by tapping icon. Or you can simply enter PN directly. Then, tap "Register" button.

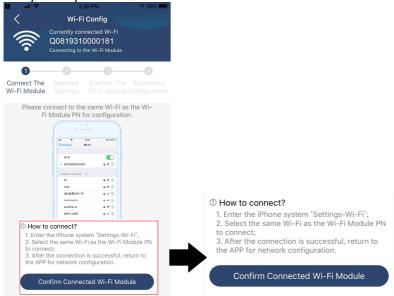


Then, a "Registration success" window will pop up. Tap "Go now" to continue setting local Wi-Fi network connection.

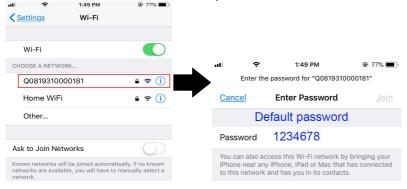


Step 2: Local Wi-Fi Module Configuration

Now, you are in "Wi-Fi Config" page. There are detailed setup procedure listed in "How to connect?" section and you may follow it to connect Wi-Fi.



Enter the "Settings→Wi-Fi" and select connected Wi-Fi name. The connected Wi-Fi name is the same to your Wi-Fi PN number and enter default password "12345678".



Then, return to WatchPower APP and tap "Confirm Connected Wi-Fi Module when Wi-Fi module is connected successfully." button when Wi-Fi module is connected wi-Fi Module when Wi-Fi module is connected successfully.

#### Step 3: Wi-Fi Network settings

ap icon to select your local Wi-Fi router name (to access the internet) and enter password.



Step 4: Tap "Confirm" to complete the Wi-Fi configuration between the Wi-Fi module and the Internet.

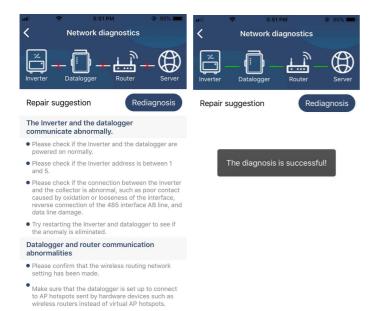


If the connection fails, please repeat Step 2 and 3.



#### Diagnose Function

If the module is not monitoring properly, please tap "Diagnosis" on the top right corner of the screen for further details. It will show repair suggestion. Please follow it to fix the problem. Then, repeat the steps in the chapter 4.2 to re-set network setting. After all setting, tap "Rediagnosis" to re-connect again.



#### 2-3. Login and APP Main Function

After finishing the registration and local Wi-Fi configuration, enter registered name and password to login. Note: Tick "Remember Me" for your login convenience afterwards.



#### Overview

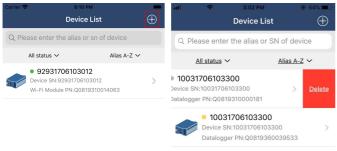
After login is successfully, you can access "Overview" page to have overview of your monitoring devices, including overall operation situation and Energy information for Current power and Today power as below diagram.



#### Devices

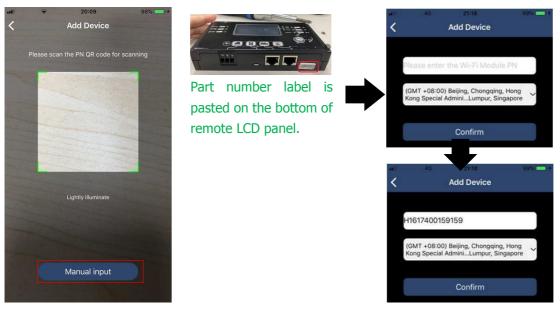
Tap the icon (located on the bottom) to enter Device List page. You can review all devices here by adding or deleting Wi-Fi Module in this page.

# Add device Delete device





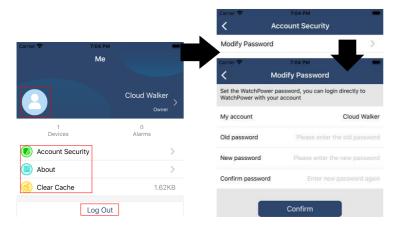
Tap icon on the top right corner and manually enter part number to add device. This part number label is pasted on the bottom of remote LCD panel. After entering part number, tap "Confirm" to add this device in the Device list.



For more information about Device List, please refer to the section 2.4.

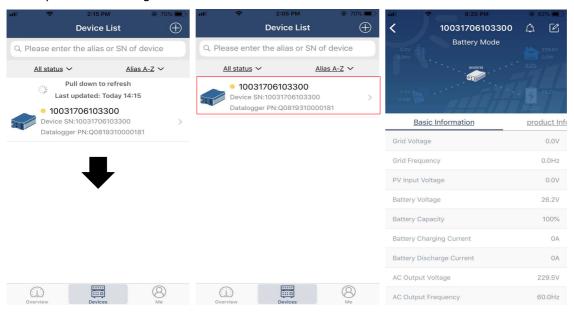
#### ME

In ME page, users can modify "My information", including [User's Photo], [Account security], [Modify password], [Clear cache], and [Log-out], shown as below diagrams.



#### 2-4. Device List

In Device List page, you can pull down to refresh the device information and then tap any device you want to check up for its real-time status and related information as well as to change parameter settings. Please refer to the parameter setting list.



### Device Mode

On the top of screen, there is a dynamic power flow chart to show live operation. It contains five icons to present PV power, inverter, load, utility and battery. Based on your inverter model status, there will be <code>[Standby Mode]</code>, <code>[Line Mode]</code>, <code>[Battery Mode]</code>.

**[Standby Mode]** Inverter will not power the load until "ON" switch is pressed. Qualified utility or PV source can charge battery in standby mode.



**[Line Mode]** Inverter will power the load from the utility with or without PV charging. Qualified utility or PV source can charge battery.

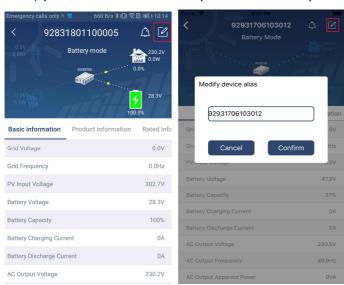


**[Battery Mode]** Inverter will power the load from the batter with or without PV charging. Only PV source can charge battery.



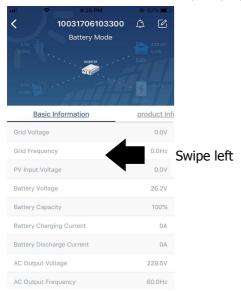
## Device Alarm and Name Modification

In this page, tap the icon on the top right corner to enter the device alarm page. Then, you can review alarm history and detailed information. Tap the icon on the top right corner, a blank input box will pop out. Then, you can edit the name for your device and tap "Confirm" to complete name modification.



### **Device Information Data**

Users can check up [Basic Information], [Product Information], [Rated information], [History], and [Wi-Fi Module Information] by swiping left.



**[Basic Information]** displays basic information of the inverter, including AC voltage, AC frequency, PV input voltage, Battery voltage, Battery capacity, Charging current, Output voltage, Output frequency, Output apparent power, Output active power and Load percent. Please slide up to see more basic information.

**[Production Information]** displays Model type (Inverter type), Main CPU version, Bluetooth CPU version and secondary CPU version.

**[Rated Information]** displays information of Nominal AC voltage, Nominal AC current, Rated battery voltage, Nominal output voltage, Nominal output frequency, Nominal output current, Nominal output apparent power and Nominal output active power. Please slide up to see more rated information.

**[History]** displays the record of unit information and setting timely.

**[Wi-Fi Module Information]** displays of Wi-Fi Module PN, status and firmware version.

## Parameter Setting

This page is to activate some features and set up parameters for inverters. Please be noted that the listing in "Parameter Setting" page in below diagram may differ from the models of monitored inverter. Here will briefly highlight some of it, [Output Setting], [Battery Parameter Setting], [Enable/ Disable items], [Restore to the defaults] to illustrate.



There are three ways to modify setting and they vary according to each parameter.

- a) Listing options to change values by tapping one of it.
- b) Activate/Shut down functions by clicking "Enable" or "Disable" button.
- c) Changing values by clicking arrows or entering the numbers directly in the column. Each function setting is saved by clicking "Set" button.

Please refer to below parameter setting list for an overall description and be noted that the available parameters may vary depending on different models. Please always see the original product manual for detailed setting instructions.

#### **Parameter setting list:**

raidilletei setting list.			
Item		Description	
Output setting	Output source	To configure load power source priority.	
	priority		
	AC input range	When selecting "UPS", it's allowed to connect personal computer.	
		Please check product manual for details.	
		When selecting "Appliance", it's allowed to connect home appliances.	
	Output voltage	To set output voltage.	
	Output frequency	To set output frequency.	
Battery	Battery type:	To set connected battery type.	
parameter	Battery cut-off	To set the battery stop discharging voltage.	
setting	voltage	Please see product manual for the recommended voltage range based	
		on connected battery type.	
	Back to grid	When "SBU" or "SOL" is set as output source priority and battery	
	voltage	voltage is lower than this setting voltage, unit will transfer to line mode	
		and the grid will provide power to load.	
	Back to discharge	When "SBU" or "SOL" is set as output source priority and battery	
	voltage	voltage is higher than this setting voltage, battery will be allowed to	

		discharge.	
	Charger source	To configure charger source priority.	
	priority:		
	Max. charging		
	current		
	Max. AC charging	It's to set up battery charging parameters. The selectable values in	
	current:	different inverter model may vary. Please see product manual for the details.	
	Float charging		
	voltage		
	Bulk charging	It's to set up battery charging parameters. The selectable values in	
	voltage	different inverter model may vary. Please see product manual for the details.	
	Battery	Enable or disable battery equalization function.	
	equalization	Zhabie di disable battely equalization fanetion	
	Real-time	It's real-time action to activate battery equalization.	
	Activate Battery		
	Equalization		
	Equalized Time	To set up the duration time for battery equalization.	
	Out	, ,	
	Equalized Time	To set up the extended time to continue battery equalization.	
	Equalization	To set up the frequency for battery equalization.	
	Period		
	Equalization	To set up the battery equalization voltage.	
	Voltage		
Enable/Disable	LCD Auto-return	If enable, LCD screen will return to its main screen after one minute	
Functions	to Main screen	automatically.	
	Fault Code	If enabled, fault code will be recorded in the inverter when any fault	
	Record	happens.	
	Backlight	If disabled, LCD backlight will be off when panel button is not operated	
		for 1 minute.	
	Bypass Function	If enabled, unit will transfer to line mode when overload happened in	
		battery mode.	
	Beeps while	If enabled, buzzer will alarm when primary source is abnormal.	
	primary source		
RGB LED Setting	interrupt		
	Over	If disabled, the unit won't be restarted after over-temperature fault is	
	Temperature	solved.	
	Auto Restart		
	Overload Auto	If disabled, the unit won't be restarted after overload occurs.	
	Restart		
	Buzzer	If disabled, buzzer won't be on when alarm/fault occurred.	
	Enable/disable	Turn on or off RGB LEDs	
	Brightness	Adjust the lighting brightness	
	Speed	Adjust the lighting speed	
	Effects	Change the light effects	
	Color selection Adjust color combination to show energy source an battery status		
Restore to the	This function is to restore all settings back to default settings.		
default			