USER MANUAL

MPPT CHARGER CONTROLLER

5KW-48V/100A
6KW-48V/120A

VERSION:V01

Table Of Contents

1 ABOUT THIS MANUAL

1.1 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.

1.2 Scope

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

2 SAFETY INSTRUCTIONS

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 charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this charger.
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 DC terminals. Please refer to INSTALLATION section of this manual for the details.
10. One piece of 150A fuse is provided as over-current protection for the battery supply.
11. GROUNDING INSTRUCTIONS -This charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this charger.
12. NEVER cause DC input short circuited.
13. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this charger back to local dealer or service center for maintenance.

3 INTRODUCTION

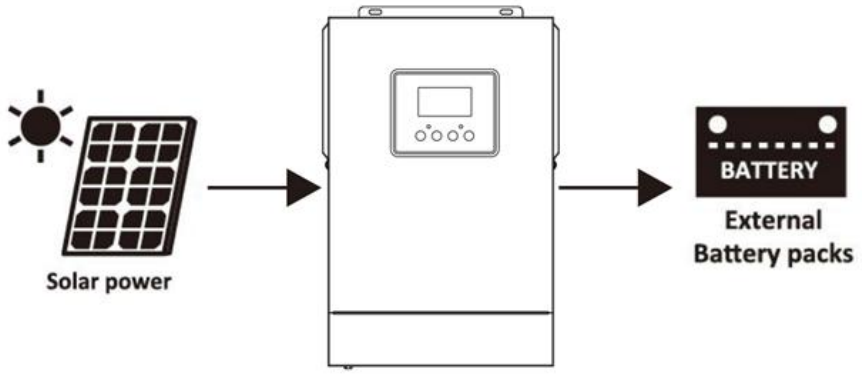
This is a solar charger. Its comprehensive LCD display offers user-configurable and easy-accessible button operation such as battery charging current.

3.1 Features

- Configurable battery charging current based on applications via LCD setting
- Over temperature protection
- Smart battery charger design for optimized battery performance

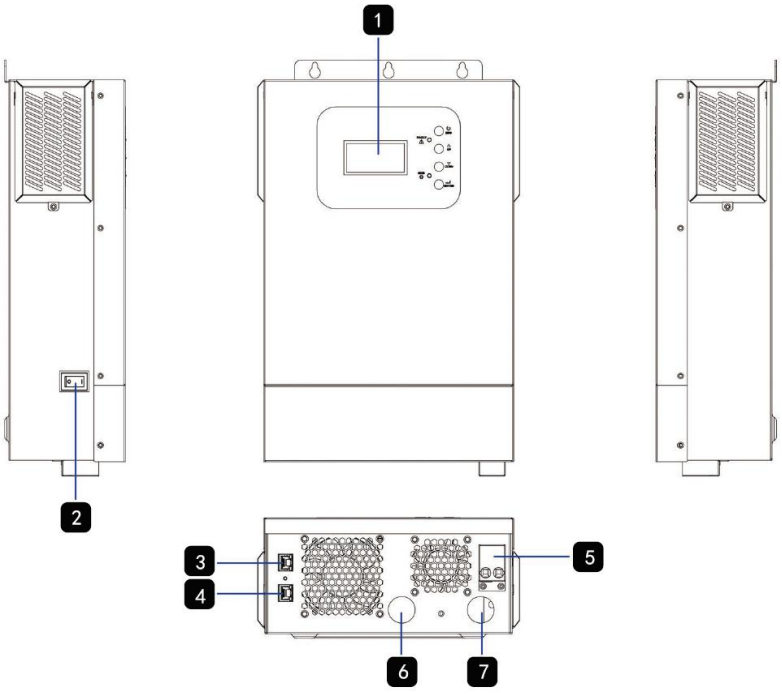
3.2 Basic System Architecture

The following illustration shows basic application for this charger.



3.3 Product Overview

1. LCD display
2. Main switch
3. RJ45 for BMS-RS485
4. RJ45 for WiFi kit-RS232
5. PV input connector
6. BAT+ output hole
7. BAT- output hole



4 INSTALLATION

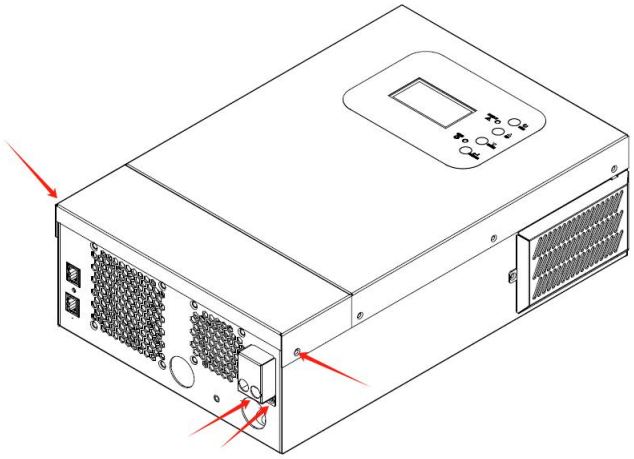
4.1 Unpacking and Inspection

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:

- The unit x 1
- User manual x 1
- Ring terminal x 1
- PV wire cover x 1
- Screws x 2

4.2 Preparation

Before connecting all wirings, please take off bottom cover and PV connector cover by removing 4 screws as shown below.

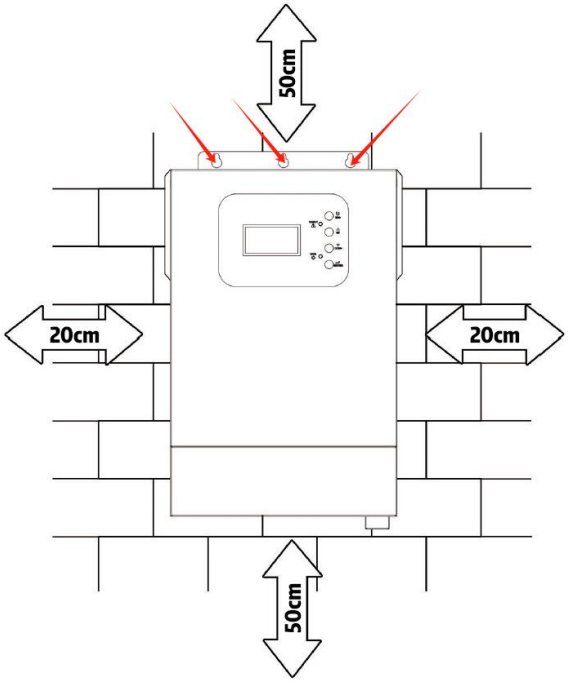


4.3 Mounting the Unit

Consider the following points before selecting where to install:

- Do not mount the charger on flammable construction materials.
- Mount on a solid surface.
- Install this charger at eye level in order to allow the LCD display to be read at all times.
- 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.
- 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 diagram to guarantee sufficient heat dissipation and to have enough space for removing wires.

Install the unit by screwing 3 screws. It's recommended to use M4 or M5 screws.



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

4.4 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.

WARNING! All wiring must be performed by qualified personnel.

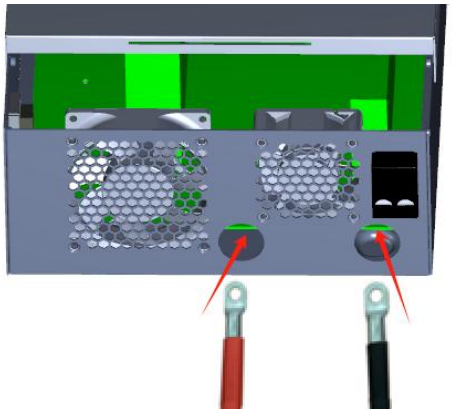
WARNING! It's very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable as below.

Recommended battery cable size:

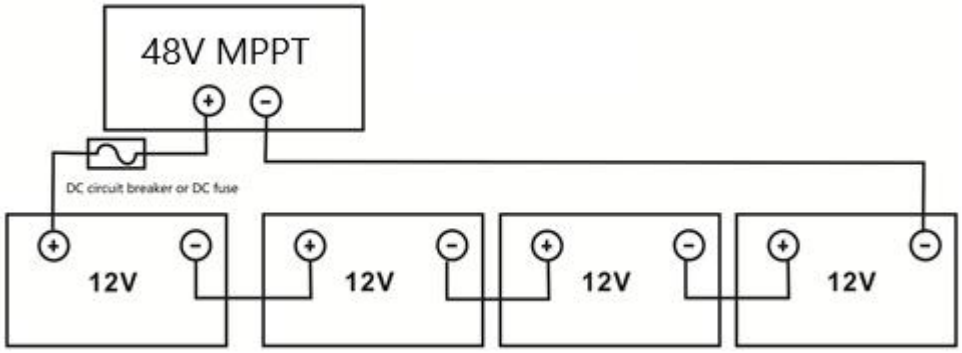
Model	Wire Size	Cable (mm^2)	Torque value (max)
5KW-48V 6KW-48V	1 x 2AWG	25	2 Nm

Please follow below steps to implement battery connection:

1. Use a 150A copper terminal to crimp a suitable cable for battery.
2. Connect the battery cable to the correct battery terminal.
3. Tighten the cable with the screws.



4. Connect all battery packs as below chart.



⚠	**WARNING: Shock Hazard** Installation must be performed with care due to high battery voltage in series.

⚠	**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 (-).

4.5 PV Connection

CAUTION: Before connecting to PV modules, please install separately a DC circuit breaker between charger and PV modules.

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

Model	Wire Size	Cable (mm^2)	Torque value (max)
5KW-48V 6KW-48V	1 x 12AWG	4	1.2 Nm

PV Module Selection:

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

Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of charger.

CHARGER MODEL	
Max. PV Array Open Circuit Voltage	500Vdc
PV Array MPPT Voltage Range	60Vdc~450Vdc

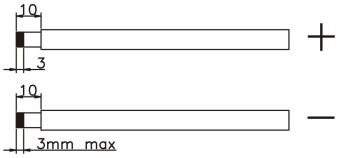
Take 300Wp PV module as an example. After considering above two parameters, the recommended module configurations are listed as below table.

Solar Panel Spec.	SOLAR INPUT	Q'ty of panels	Total input	Total Voc

(reference) - 300Wp - Vmp: 34Vdc - Imp: 8.3A - Voc: 42Vdc - Isc: 8.7A	(Min in serial: 6 pcs, max. in serial: 11 pcs)		power	
	6 pcs in serial	6 pcs	1800W	252 Vdc
	7 pcs in serial	7 pcs	2100W	294 Vdc
	8 pcs in serial	8 pcs	2400W	336 Vdc
	9 pcs in serial	9 pcs	2700W	378 Vdc
	10 pcs in serial	10 pcs	3000W	420 Vdc
	11 pcs in serial	11 pcs	3300W	462 Vdc
	6 pcs in serial and 2 sets in parallel	12 pcs	3600W	252 Vdc
	7 pcs in serial and 2 sets in parallel	14 pcs	4200W	294 Vdc
	8 pcs in serial and 2 sets in parallel	16 pcs	4800W	336 Vdc
	9 pcs in serial and 2 sets in parallel	18 pcs	5400W	378 Vdc
	10 pcs in serial and 2 sets in parallel	20 pcs	6000W	420 Vdc
	11 pcs in serial and 2 sets in parallel	22 pcs	6600W	462 Vdc

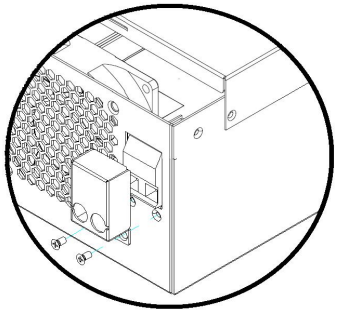
Note: The total solar Voltage = Voc* (in serial number) must be ≤ 495Vdc.

PV Module Wire Connection

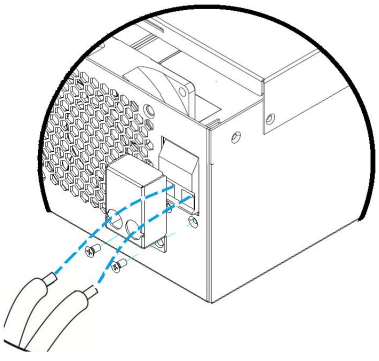


Please follow below steps to implement PV module connection:

1. Remove insulation sleeve 10 mm for positive and negative conductors.
2. Suggest to put bootlace ferrules on the end of positive and negative wires with a proper crimping tool.
3. Fix PV wire cover to the charger with supplied screws as shown in below chart.

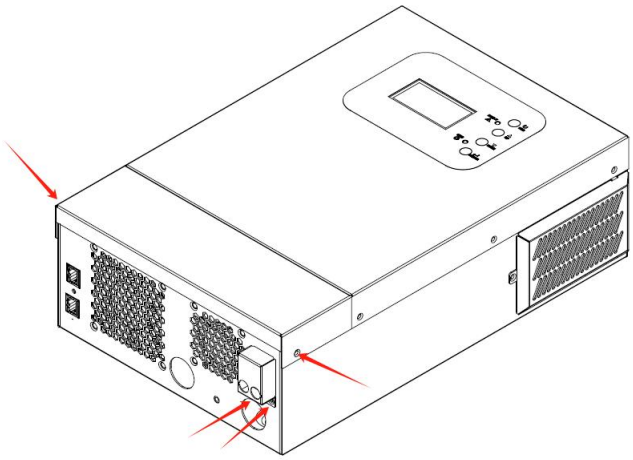


4. Check correct polarity of wire connection from PV modules and PV input connectors. Then, connect positive pole (+) of connection wire to positive pole (+) of PV input connector. Connect negative pole (-) of connection wire to negative pole (-) of PV input connector. Screw two wires tightly in clockwise direction. Recommended tool: 4mm blade screwdriver



4.6 Final Assembly

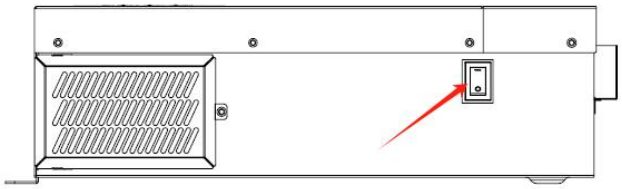
After connecting all wirings, please put bottom cover and PV connector cover back by screwing two screws as shown below.



5 OPERATION

5.1 Power ON/OFF

Side view of unit



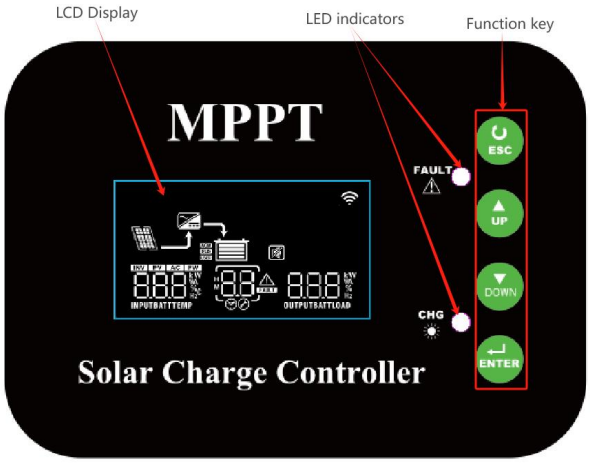
If the PV energy is sufficient, the MPPT controller will be automatically awakened. If the PV energy is weak, the MPPT controller will automatically shut down and will no longer consume battery power.

Switch on the switch, and the PV starts charging the batteries.

Switch off the switch, PV stops charging the batteries.

5.2 Operation and Display Panel

The operation and display panel, shown in below chart, is on the front panel of the charger. It includes three indicators, four function keys and a LCD display, indicating the operating status and input/output power information.



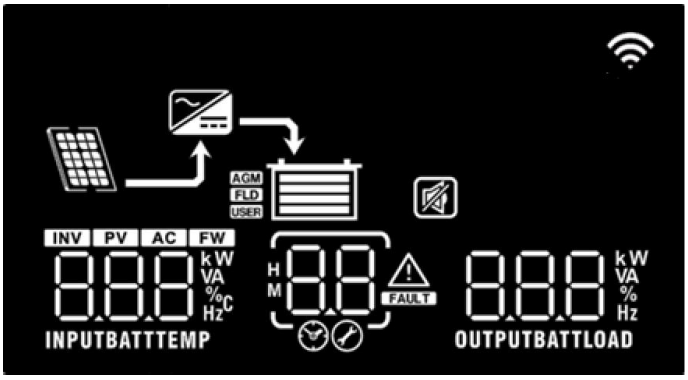
LED Indicator

LED Indicator			Messages
☀ CHG	Green	Solid On	Battery is fully charged.
		Flashing	Battery is charging.
⚠ FAULT	Red	Solid On	Fault occurs in the charger.
		Flashing	Warning condition occurs in the charger.

Function Keys

Function Key	Description
ESC	To exit setting mode
UP	To go to previous selection
DOWN	To go to next selection
ENTER	To confirm the selection in setting mode or enter setting mode

LCD Display Icons



Icon	Function description
Input Source Information	
PV	Indicates the PV input
BATT	Indicates Battery information
	Indicate PV voltage, PV input current, charger current, charger power.
	Indicate Battery voltage.
Configuration Program and Fault Information	
	Indicates the setting programs.

	Indicates the warning and fault codes. Warning:  flashing with warning code. Fault:  lighting with fault code
Battery Information	
	1. Indicates battery type. 2. Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.
Mode Operation Information	
	Indicates unit connects to the PV panel.
Mute Operation	
	Indicates unit alarm is disabled.

5.3 LCD Setting

After pressing and holding ENTER button for 3 seconds, the unit will enter setting mode. Press “UP” or “DOWN” button to select setting programs. And then, press “ENTER” button to confirm the selection or ESC button to exit.

Setting Programs:

Program	Description	Selectable option	
00	Exit setting mode	Escape 	
02	Maximum charging current	10A 	20A 
		30A 	40A 
		50A 	60A (default) 

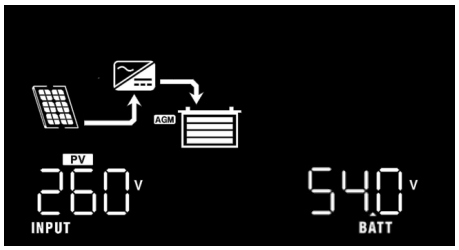
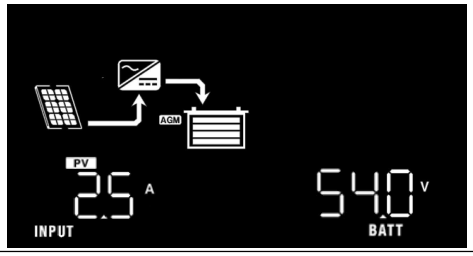
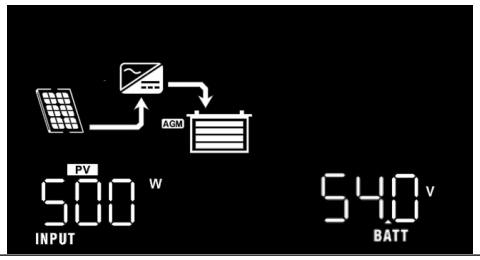
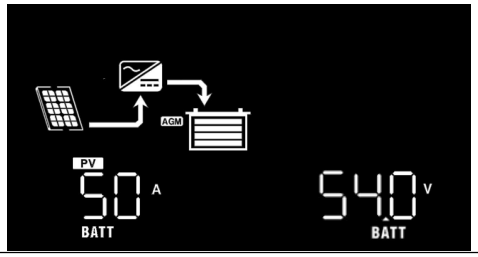
		70A 	80A 
		90A 	100A 
		110A 	120A 
05	Battery type	AGM (default) 	Flooded 
		User-Defined 	If “User-Defined” is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
07	Auto restart when over temperature occurs	Restart disable (default) 	Restart enable 
18	Alarm control	Alarm on (default) 	Alarm off 
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.
		Stay at latest screen 	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on (default) 	Backlight off 

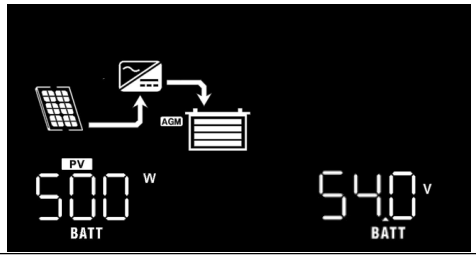
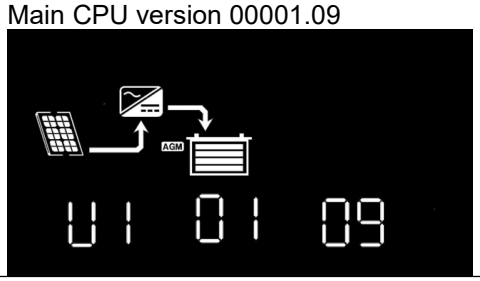
22	Beeps while primary source is interrupted	Alarm on (default) 	Alarm off 
25	Record Fault code	Record enable (default) 	Record disable 
26	Bulk charging voltage (C.V voltage)	48V default setting: 56.4V 	
		If self-defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 59.0V for 48V model. Increment of each click is 0.1V.	
27	Floating charging voltage	48V default setting: 54.0V 	
		If self-defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 59.0V for 48V model. Increment of each click is 0.1V.	
30	Battery equalization	Battery equalization 	Battery equalization disable (default) 
		If “Flooded” or “User-Defined” is selected in program 05, this program can be set up.	
31	Battery equalization voltage	48V default setting: 58.4V 	
		Setting range is from 48.0V to 59.0V for 48V model. Increment of each click is 0.1V.	
33	Battery equalized time	60min (default) 	Setting range is from 5min to 900min. Increment of each click is 5min.
34	Battery equalized timeout	120min (default) 	Setting range is from 5min to 900 min. Increment of each click is 5 min.
35	Equalization interval	30days (default) 	Setting range is from 0 to 90 days. Increment of each click is 1 day
36	Equalization activated immediately	Enable 	Disable (default) 

		If equalization function is enabled in program 30, this program can be set up. If “Enable” is selected in this program, it’s to activate battery equalization immediately and LCD main page will shows “E9”. If “Disable” is selected, it will cancel equalization function until next activated equalization time arrives based on program 35 setting. At this time, “E9” will not be shown in LCD main page.

5.4 Display Setting

The LCD display information will be switched in turns by pressing “UP” or “DOWN” key. The selectable information is switched as below order: input voltage, input frequency, PV voltage, charging current, charging power, battery voltage, output voltage, output frequency, load percentage, load in Watt, load in VA, load in Watt, DC discharging current, main CPU Version.

Selectable information	LCD display
PV voltage & Battery voltage	PV voltage=260V，Battery voltage=54.0V 
PV current & Battery voltage	PV current = 2.5A 
PV power & Battery voltage	PV power = 500W 
Charging current & Battery voltage	PV charging current=50A 

Charging power & Battery voltage	PV charging power=500W 
Main CPU version checking	Main CPU version 00001.09 

5.5 Battery Equalization Description

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.

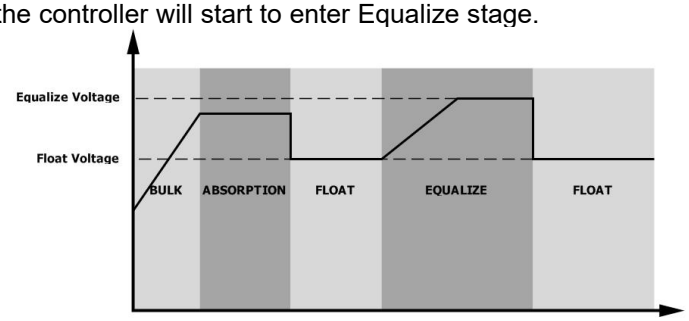
- **How to Apply Equalization Function**

You must enable battery equalization function in monitoring LCD setting program 30 first. Then, you may apply this function in device by either one of following methods:

1. Setting equalization interval in program 35.
2. Active equalization immediately in program 36.

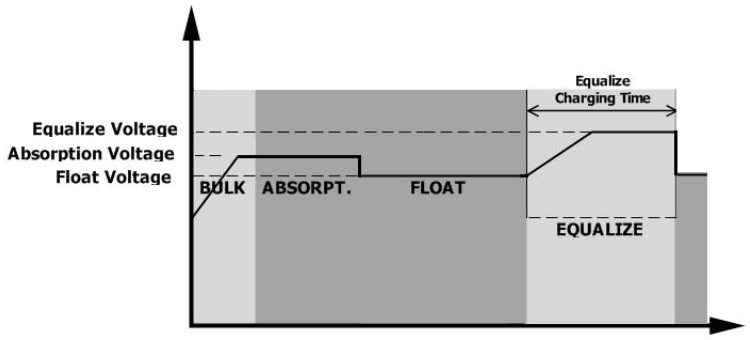
- **When to Equalize**

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.

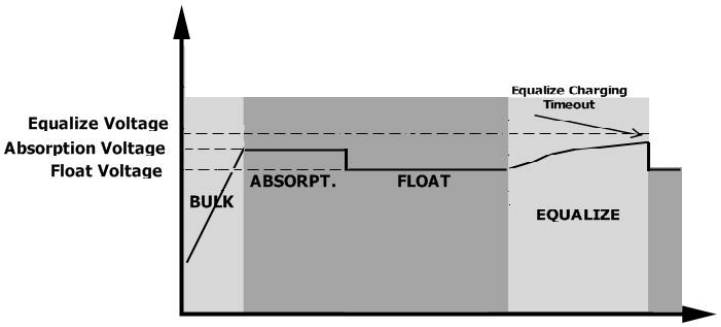


- **Equalize charging time and timeout**

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.



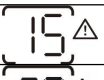
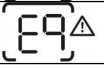
However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery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



5.6 Fault Reference Code

Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off.	
02	Over temperature	
03	Battery voltage is too high	
04	Battery voltage is too low	
08	Bus voltage is too high	
09	Bus soft start failed	
52	Bus voltage is too low	
59	PV voltage is over limitation	

5.7 Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when charger is on.	Beep three times every second	
03	Battery is over-charged	Beep once every second	
04	Low battery	Beep once every second	
15	PV energy is low.	Beep twice every 3 seconds	
EQ	Battery equalization	None	

6 CLEARANCE AND MAINTENANCE FOR ANTI-DUST KIT

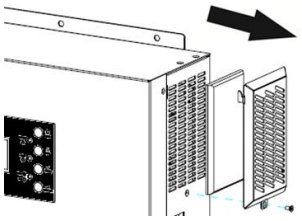
6.1 Overview

Every charge is already installed with anti-dusk kit from factory. Charge will automatically detect this kit and activate internal thermal sensor to adjust internal temperature. This kit also keeps dusk from your charge and increases product reliability in harsh environment.

6.2 Clearance and Maintenance

Step 1: Please release the screws on the side of the charge counterclockwise.

Step 2: Then, dust proof case can be removed and take out air filter foam as shown in below chart.



Step 3: Clean air filter foam and dust proof case. After clearance, re-assemble the dust-kit back to the charger.

NOTICE: The anti-dust kit should be cleaned from dust every one month.

7 CHARGE MODE SPECIFICATIONS

Charger Specifications

MPPT Solar Charging		
CHARGER MODEL	**48V/100A**	**48V/120A**
Max. PV Array Power	5000W	6000W
PV start up voltage	75Vdc	75Vdc
V Array MPPT Voltage Range	60~450Vdc	60~450Vdc
Max. PV Array Open Circuit Voltage	500Vdc	500Vdc
Max Charging Current	100Amp	120Amp

Communication	
BMS Communication Protocol	PACE Protocol RS485
WiFi/APP	RJ45 PORT for connection, optional
Protection	
Over Temperature	Yes
Over Voltage	Yes
Other information	
Isolation Design	Yes
Heat Dissipation	Fan cooling
Operating Temperature Range	-10°C~ 50°C
Storage temperature	-15°C~ 60°C
Humidity	5% to 95% Relative Humidity (Non-condensing)
Dimension (D*W*H), mm	118*236*365
Net Weight, kg	6.7

8 TROUBLE SHOOTING

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
Buzzer beeps continuously and red LED is on.	Fault code 02	Temperature of internal converter component is over 120°C.	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Fault code 03	Battery is over-charged. The battery voltage is too high.	Check if spec and quantity of batteries are meet requirements.
	Fault code 01	Fan fault	Replace the fans.
	Fault code 09	Fan fault	The PV energy is too weak to start. The controller will restart after waiting for 5 minutes
	Fault code 52	Bus voltage is too low.	