

MPPT charge controller

Solar Mate



Version : A1.1

Date: DEC. 2016

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About this Manual

This manual describes our product features and provides procedure of installations. This manual is for anyone intending to install our equipment.

General Instruction

Thanks for choosing our products and this manual were suitable for SP series MPPT.

This chapter contains important safety and operation instructions. Read and keep this User Guide well for later reference.

SP MPPT needs to be installed by professionals and please pay attention to the following points prior to installation:

- 1> Please check the voltage of battery is same to the nominal input voltage of this charger.
- 2> Please connect battery to MPPT charge controller first. Positive terminal "+" of battery to "Bat +" of the MPPT charge controller terminal block. Negative terminal "-" of battery to "Bat -" of the MPPT charge controller terminal block.
- 3> Please use the shortest cable to connect and ensure the secure connection.
- 4> Then connect the MPPT charge controller to PV array. "PV+" terminal on MPPT charge controller terminal block to Positive terminal of PV array. "PV-" terminal on MPPT charge controller terminal block to Negative terminal of PV array.
- 5> While connecting wires, please secure the connection and avoid short cut between positive terminal and negative terminal of battery, which will cause damage of battery.
- 6> MPPT charge controller will have high voltage inside. Only authorized electrician can open the case.

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1.0 General Safety Instruction

1.1 Safety Instruction

As dangerous voltage and high temperature exist within the charge controller, only qualified and authorized maintenance personnel are permitted to open and repair it.

This manual contains information concerning the installation and operation of the charge controller. All relevant parts of the manual should be read prior to commencing the installation. Please follow the local stipulation meantime.

Any operation against safety requirement or against design, manufacture, safety standard, and are out of the manufacturer warranty.

1.2 General Precaution

- 1.2.1 Do not expose to rain, snow or liquids of any type, it is designed for indoor use.
- 1.2.2 To avoid fire and electric shock, make sure all cables selected with right gauge and being connected well. Smaller diameter and broken cable are not allowed to use.
- 1.2.3 Please do not put any inflammable goods near to charge controller.
- 1.2.4 Never place unit directly above batteries, gases from a battery will corrode and damage the charge controller.
- 1.2.5 Do not place battery over charge controller

1.3 Precaution regarding battery operation

- 1.3.1 Use plenty of fresh water to clean in case battery acid contacts skin, clothing, or eyes and consult with doctor as soon as possible.
- 1.3.2 The battery may generate flammable gas during charging. NEVER smoke or allow a spark or flame in vicinity of a battery.
- 1.3.3 Do not put the metal tool on the battery, spark and short circuit might lead to explosion.
- 1.3.4 REMOVE all personal metal items such as rings, bracelets, necklaces, and watches while working with batteries. Batteries can cause short-circuit current high enough to make metal melt, and could cause severe burns.

2.0 Description of main Function

Thanks for choosing SP series MPPT. The product was delivered with following equipment:

- MPPT Charger
- Installation kit
- a BTS (battery temperature sensor)
- a user's manual



Fig2-1 MPPT Charger, Installation kit and BTS

2.1 General Description

SP is a solar charge controller with built in Maximum Power Point Tracking (MPPT) technology, which can optimize the PV's output eliminate the fluctuation due to shading or temperatures variables. It tracked the maximum power point of a PV array to deliver the maximum charging current for battery, enabling PV array to increase the output by as much as 30% compared with PWM design.

SP is a multi-voltage MPPT with built in sophisticated battery charging algorithm for various kinds of lead acid batteries, including AGM, GEL, Semi traction, Traction. Data management with a year of history record was offered as well. Meantime, version for Lead-Carbon battery and lithium ion battery were available upon request.

Thanks to its self cooling design, it is suitable for most rugged environment with dust or bugs. SP can operate at their full rating in ambient temperatures as high as 40°C.

- Peak efficiency 98%
- Built in dynamic Maximum Power Point Tracking
- Continuous operation at full power up to 40°C
- Self cooling design for high reliability
- Built in TBB premium II battery charging algorithm for lead acid battery
- Configurable auxiliary contact
- Data logging
- Extensive networking and communication capabilities
 - Auxiliary contact
 - RS485 : communication among TBB products or with others

2.2 Maximum Power Point Tracking

The output power of PV array was affected by sun irradiation level and environment temperature. The max power point varies a lot under different weather condition.

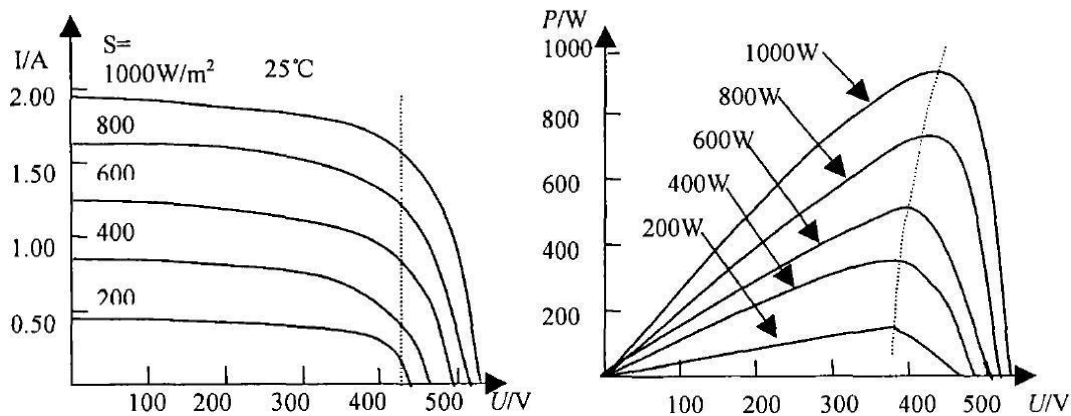


Fig 2-2 : I-V curve of various irradiation under same temp. Fig 2-3 :P-V curve of various irradiation under same temp.

Max Power Point Tracking allows the maximum harvest of energy from PV array and delivered it into battery. The MPPT software will continuously adjusts the operating points in an attempt to find the maximum power point of the array no matter how the weather changes. With MPPT, we can maximize the usage of the PV array, increasing the system efficiency by maximum 30%.

2.3 Battery charging control

With built in TBB premium II charging algorithm, SP automatically regulated the voltage and current according to the DC source available from PV array and SOC of battery connected.

The SP is able to charge a lower nominal voltage battery from a higher nominal voltage array. For example, a 36Vdc PV array to charge a 12Vdc battery. This gives the flexibility to use longer wires without compromising the efficiency of PV system.



The SP was not able to charge a higher voltage battery from a lower voltage array.

2.4 TBB premium II charging algorithm

++ Multistage sophisticated charging algorithm

Fitted with multistage charging algorithm (bulk-absorption-float-recycle), the TBB premium II charging algorithm is designed to charge battery quickly and fully. Microprocessor controlled charging algorithm with variable absorption charging timer guarantee the optimal charging for batteries of different discharged state.

Float charging and Recycle charging program guarantee your battery could get proper maintenance in case of long time connected.

++ Battery temperature compensation

Battery temperature is a key factor in correct charging, the charging formula must be adjusted (automatically and in real time) according to the actual battery temperature to ensure that battery are fully charged but not overcharged or undercharged. All charging voltages recommended by battery manufacture are in fact ONLY applied at 20°C-25°C.

The BTS (Battery Temperature Sensor) supplied with SP measures the temperature of battery and automatically makes adjustments at real time to properly charge your batteries at compensation rate of $-4\text{mv}/^{\circ}\text{C}/\text{cell}$.

In case of BTS was not present, the SP will use 40°C as default setting.



Fig 2-4: Battery Temperature Sensor(BTS)

++ Multi battery chemical available

Commonly encountered lead acid battery chemicals include AGM, GEL, Traction and Semi-traction. The voltage required for a proper charging of different battery varies. SP offer premium charging for above commonly encountered battery categories, of which you can set through the LCD and control button or RS485 communication.

++ Manual Equalization

Over a period of time, the cells in the OPZS, traction or semi-traction battery can develop uneven chemical states. This will result in a weak cell which in turn can reduce the overall capacity of battery. To improve the life and performance of these types of battery, SP includes a manual equalization program that can be used if recommended by battery manufacturer, to equalize the battery. For details, please refer to chapter 6.3

This charging program can ONLY being applied to semi traction and traction lead-acid battery. As a protection, the EQ mode will automatically disable if you select either AGM, GEL, Lead-Carbon or LFP as battery type.

2.5 Auxiliary output

The SP has a configurable auxiliary output (relay contact, nominal switching capacity is 2A up to 30Vdc), of which can be used for load management, or switch devices such as alarm, or a ventilation fan on/off.

Only one function can be designed at a time. Please refer to chapter 5.3 “Configuring the auxiliary contact”



The auxiliary contact output was designed to energize a low current circuit. Connecting to a high amperage device will possibly damage the equipment and it is out of warranty.

Load management:

The auxiliary contact can be used to switch a relay coil on/off to disconnect or reconnect loads depending on battery voltage (reflecting battery SOC). This function can help optimize the system performance.

Ventilation fan:

If a ventilation fan was installed in the battery compartment, the auxiliary contact can be configured to activate the fan upon gassing voltage reached during charging.

Alarms:

The auxiliary contact can be configured to switch the alarm circuit or indicator light on upon preset condition occurs, such as MPPT failure, battery low voltage, high PV input voltage etc.

2.6 Comprehensive Protection

The equipment is being protected against many failures through hardware and software making it robust and reliable.

++ Battery reverse polarity protection

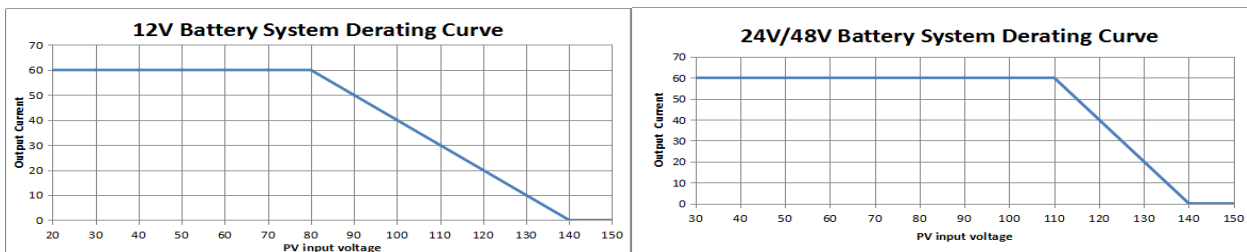
Upon battery reverse polarity detected, SP will not be able to power on and will resume output upon corrected the connection.

++ PV array reverse polarity protection

When PV reverse polarity is detected, SP will shut down, send out alarm and will resume output upon corrected the connection.

++ PV over voltage protection

Upon the PV input voltage exceeding the limit, SP will shut down, send out alarm and will resume output when PV input voltage falls into the normal range.

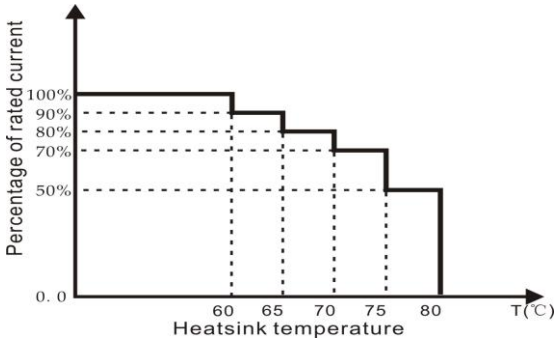


++ Equipment Over temp protection

The SP will shut down upon internal over temp occurs and will auto restart when temperature falls into the normal range.

++ Battery over temp protection

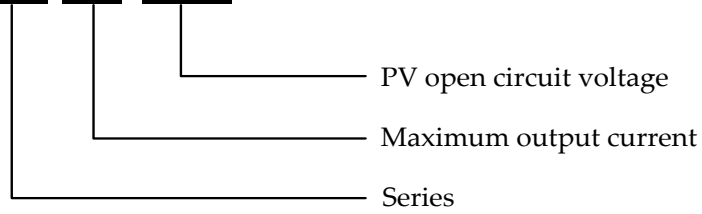
During charging, the SP will keep monitoring battery temperature and will reduce charging rate or even shut down upon too high temperature detected. This will help to prevent thermal runaway of battery.



2.7 Naming rules

SP XX-YYY

SP 60-150



field	character	Description	
SP	SP	SP series mppt solar charge controller	
XX	60	Maximum output current (A)	60A
	45	Maximum output current (A)	45A
YYY	150	PV open circuit voltage:(V)	150V

3.0 Structure

3.1 Front

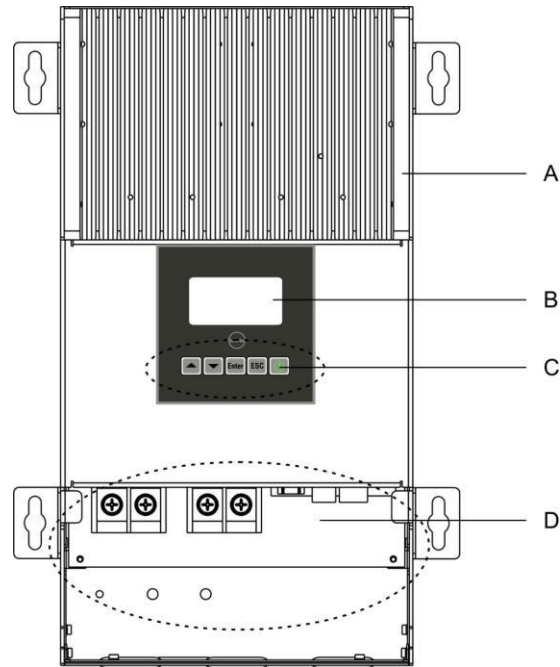


Fig3-1 Charge controller structure in front view

A	Heat sink
B	LCD
C	Control button
D	Connection compartment

3.2 LCD and control panel

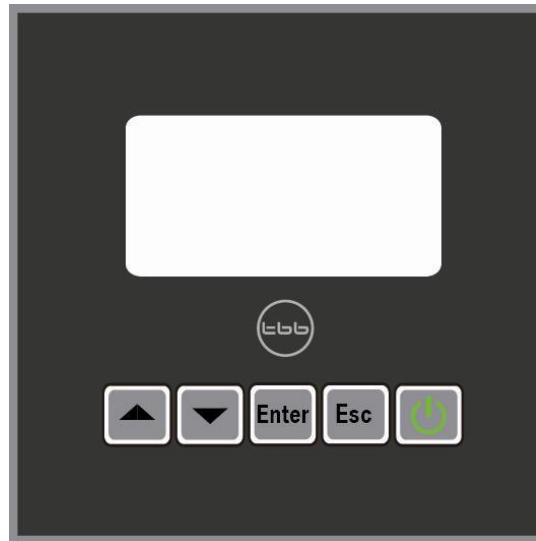



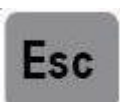



Fig3-2 MPPT Control buttons

Button	Function
	<ul style="list-style-type: none"> ● Display the previous page ● Increase the value of the selected item
	<ul style="list-style-type: none"> ● Display the next page ● Decrease the value of the selected item
	<ul style="list-style-type: none"> ● Enter into this menu, displaying the next level ● Select and confirm the selection of a menu item
	<ul style="list-style-type: none"> ● Cancel the selection ● Display the previous level of menu
	<ul style="list-style-type: none"> ● Power On/Off

Tab3-1 Control Button

3.3 Connection compartment

Open the cover of the connection compartment; you will see terminals as Fig3-3shows.

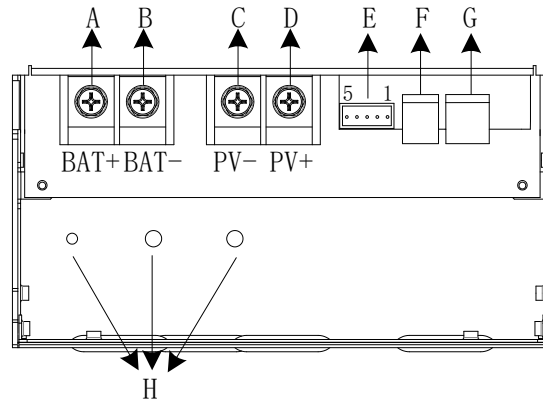


Fig3-3 Connection terminals

A	BAT+	Battery Connection Positive
B	BAT-	Battery Connection Negative
C	PV-	PV array Negative
D	PV+	PV array Positive
E	Connector	HV input, Auxiliary contact
F	BTS	battery temperature sensor
G	Multilock Connector	RS485
H	Ground Bolt	Grounding terminal

Tab3-3 Connection terminal introduction

Tab3-4and Tab3-5 is PIN definition of PCB Connector E and Connector G.

Pin	Definition
Pin1	Auxiliary contact (Common terminal)
Pin2	Auxiliary contact(Normally Open)
Pin3	Auxiliary contact(Normally Closed)
Pin4	HV input, Positive
Pin5	HV input, Negative

Tab3-4 Pin definition of PCB Connector E

Pin	Definition
Pin1,2	VCC_485(12VDC)
Pin3,4	RS485 - B
Pin5,6	RS485 - A
Pin7,8	GND_485

Tab3-5 Pin definition of PCB Connector G

3.4 Dimension

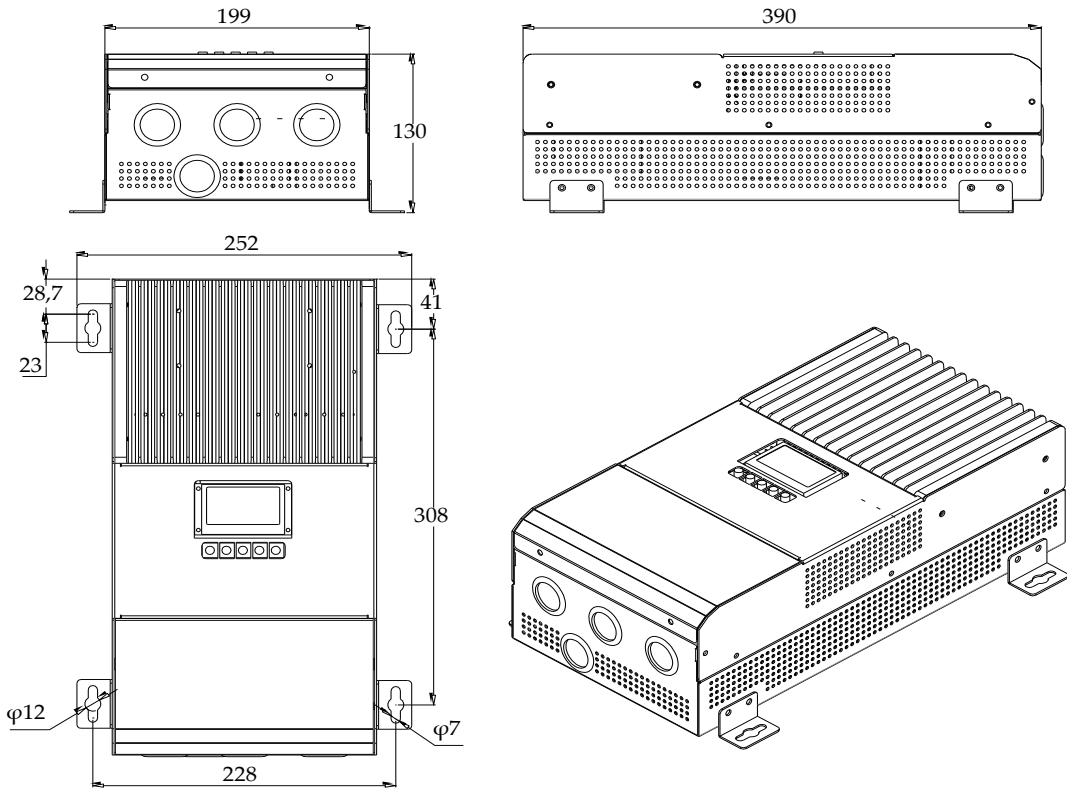


Fig3-4 Dimension of SP60-150 charge controller

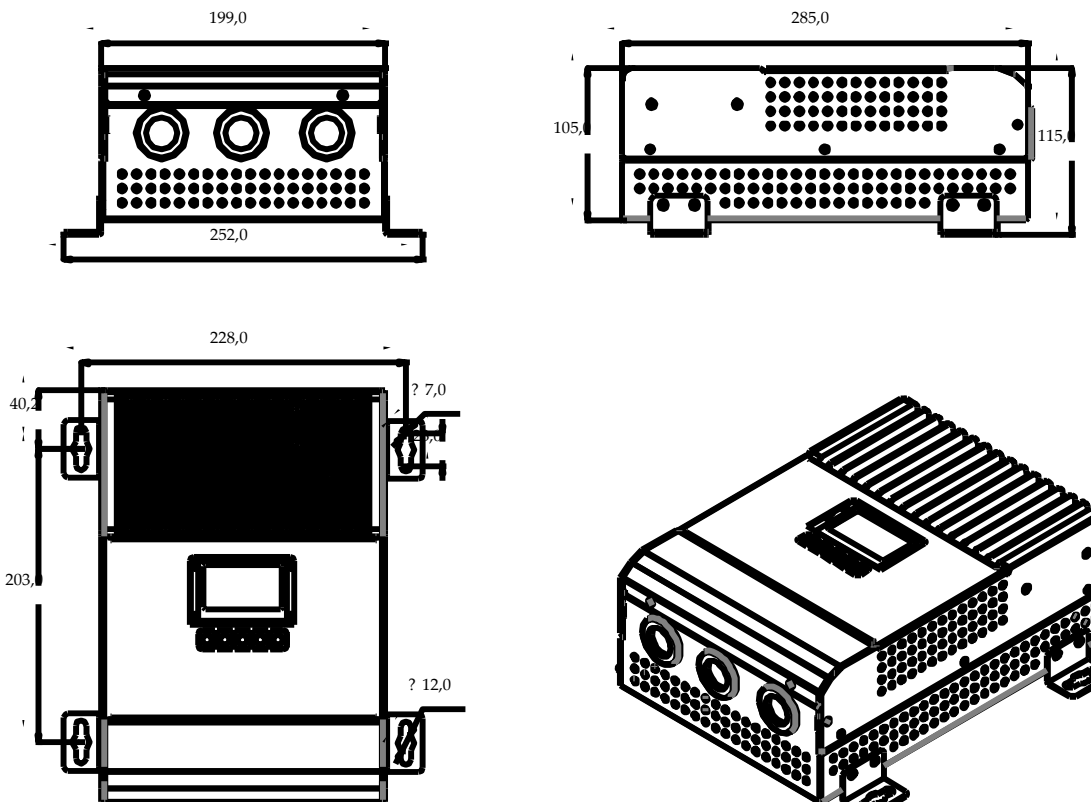


Fig3-5 Dimension of SP45-150 charge controller

4.0 Installation

4.1 PV Array requirement

Each SP must be connected to its own PV array. Please find following maximum PV array can be connected under various DC systems.

	Battery	SP45-150	SP60-150
Recommended PV	12Vdc	650W	860W
	24Vdc	1300W	1720W
	48Vdc	2600W	3440W



The Voc (open circuit voltage) of PV array must never exceed 150Voc. The PV array Isc must not exceed the nominal current of SP at any time (45A/60A).



The Voc or Vmpp of solar panel was rated at 25°C with normal weather condition. Along with temperature reduced, the Voc/Vmpp of solar array will increase. Please consult with PV manufacturer for Voc/Vmpp of the lowest possible environment temperature and making sure it is below 150Vdc.

- PV array with Isc up to 55A was recommended for SP60 to allow for increase of Isc caused by irradiance enhancement under certain condition.
- Please ensure the PV array used in the system operates within the MPPT operational window. Following table shows effects of different PV array voltage.

Battery Voltage	36cells Voc<23V		48cells Voc<31V		54cells Voc<34V		
	MAX	BEST	MAX	BEST	MAX	BEST	
12V	4	2	2	1	2	1	
24V	6	3	4	2	4	2	
48V	6	5	4	3	4	3	
Battery Voltage	60cells Voc<38V		72cells Voc<46V		96cells Voc<62V		Thin-Film Module Voc>80V
	MAX	BEST	MAX	BEST	MAX	BEST	
12V	2	1	2	1	1	1	1
24V	3	2	3	2	2	1	1

48V	3	3	3	2	2	2	1
-----	---	---	---	---	---	---	---

Voltage	Effect	SP mode
$V_{mpp} = V_{batt}$ to 140Vdc	Maximize the harvest of solar energy	Charging
$V_{mpp} > 140Vdc$	SP shut down. Voc is often higher than 150VDC when V_{mpp} is higher than 140V DC. Unit might damage if $V_{oc} > 150V$	Overvoltage fault

Tab4-1 Effects of different PV array voltage

4.2 Location

Please install the equipment in a location of Dry, Clean, Cool with good ventilation.

- Working temperature : -20°C-60°C
- Storage temperature : -40-70°C
- Relative Humidity : 0%-95%, non-condensing
- Cooling : Natural cooling



Do not install SP in a sealed compartment containing batteries.

Please always guarantee the enough clearance around SP upon installation. Please refer to following fig 4-1 for minimum clearance.

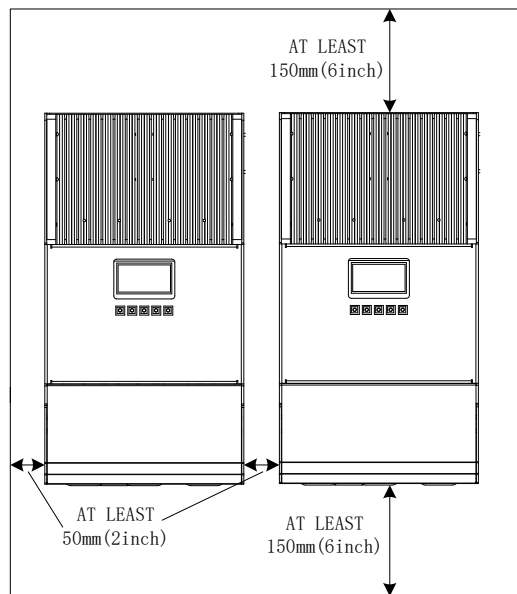


Fig 4-1 Requirement of minimum clearance

4.3 Cable recommendation

Cable with minimum 90°C (194F) insulation rating was recommended to be used for SP installation. Please find the following minimum wire size.

Model	Recommended DC wiring							
	2 meters		3 meters		5 meters		7 meters	
10A	12AWG	4mm ²	12AWG	4mm ²	8AWG	10mm ²	8AWG	10mm ²
20A	10AWG	6mm ²	8AWG	10mm ²	6AWG	16mm ²	4AWG	25mm ²
30A	10AWG	6mm ²	6AWG	16mm ²	4AWG	25mm ²	3AWG	25mm ²
40A	8AWG	10mm ²	6AWG	16mm ²	3AWG	25mm ²	2AWG	35mm ²
50A	6AWG	16mm ²	4AWG	25mm ²	2AWG	35mm ²		
60A	6AWG	16mm ²	4AWG	25mm ²	2AWG	35mm ²		
80A	4AWG	25mm ²	2AWG	35mm ²				

Tab4-2 Recommended DC wiring

4.4 Installation



The SP must be compliant with all local electrical guidelines. Installation of this equipment should be performed by a qualified electrician.



Upon installation, please make sure SP was switched off and all circuit breaker was

at OFF and fuse was open.

4.4.1 Preparation

- Please find in chapter 3.4 of the size of the SP charge controller
- Please choose a flat surface and with 4xM6 supplied to install
- Before mounting, please loose the screws on front panel to access the connection compartment.
- Please install four feet supplied in the accessory pack on side of the charge controller.

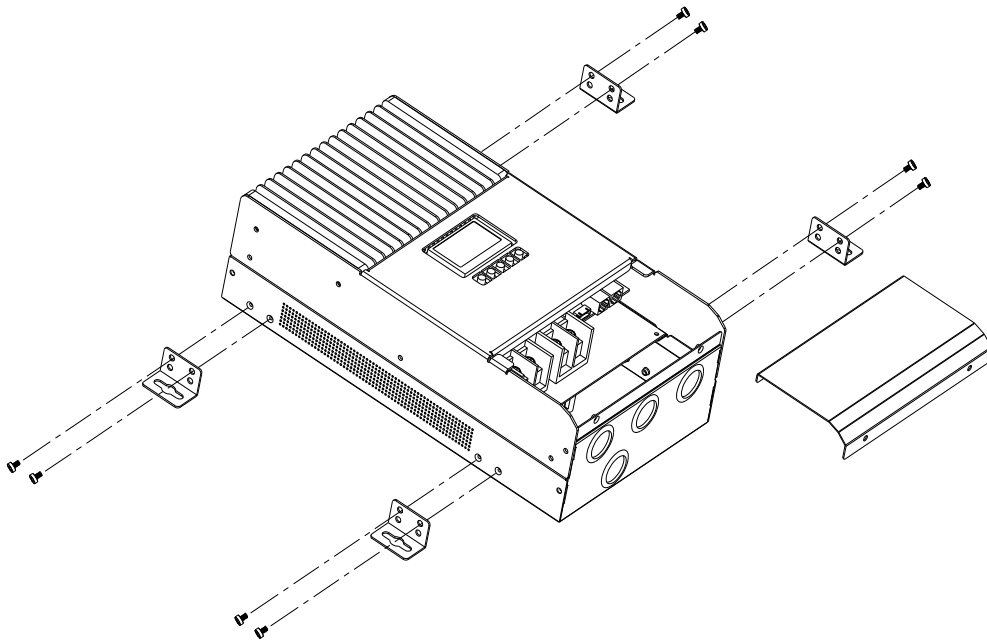


Fig4-2 Illustration of installation

4.4.2 Mounting the SP charge controller

- The SP need to be installed vertically
- Please place the SP on your preference location and mark the location of four feet.
- Screw the four screw on the wall, leaving about 6mm (1/4").
- Hanging the SP on the four screws and screw tight the four screws afterwards.



Please double check the SP was securely mounted on the wall.

4.4.3 Wiring Diagram

Please refer to following overall wiring diagram of SP60-150

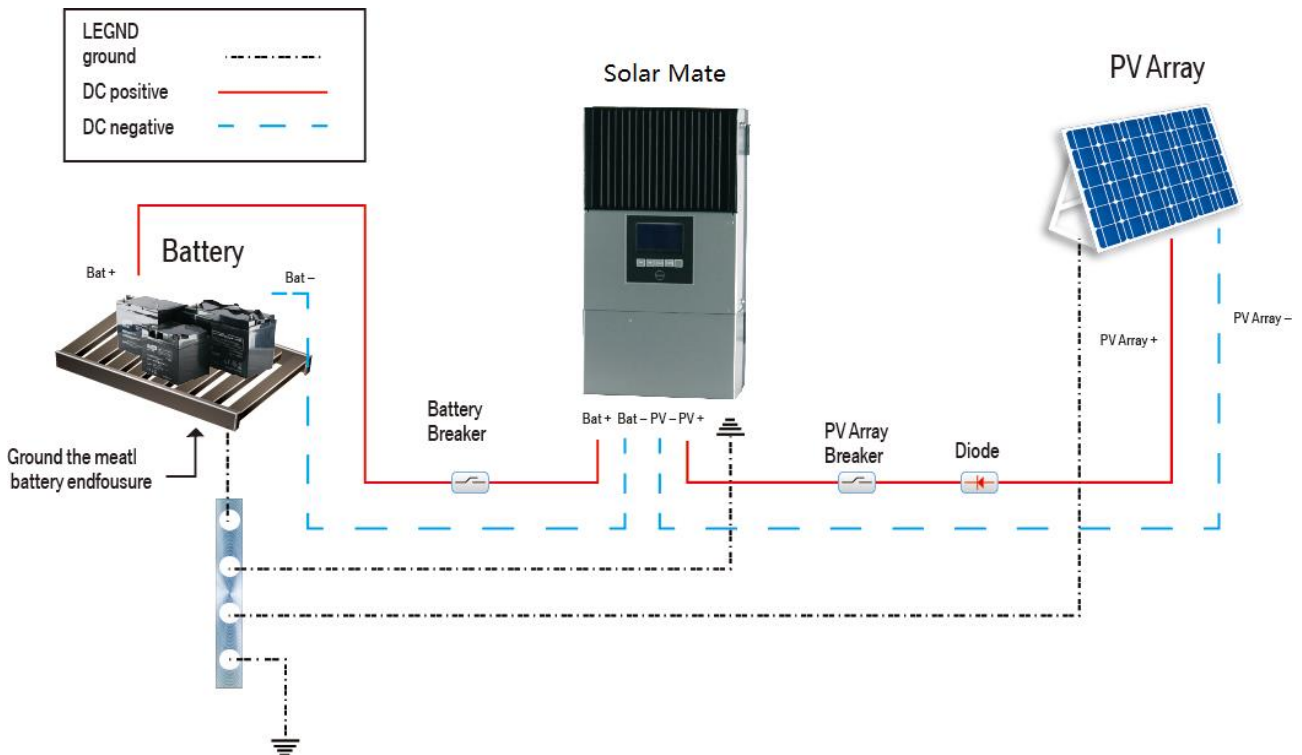


Fig4-3Wiring diagram of Solar Mate

4.4.4 Battery connection



Please always wiring the battery first before wiring to PV array



Please ensure the circuit breaker was switched OFF or fuse was open

- Install the SP as close to the batteries as possible reducing the voltage drop on cable for the better performance of the equipment.



Do not install SP in a sealed compartment containing batteries.

- Choose the right cable size (refer to Tab4-2) and follow polarity guide marked on the panel
- An over current protection devices DC fuse or circuit breaker needs to be installed on positive cable, of which rated for 125% of the nominal rating.
 - SP45-150: 60A
 - SP60-150: 75A
- Wiring need to be protected against any potential physical damage
- Pull through the DC cables through the holes at front panel, clamping the cable terminal on cable.
- Secure the battery cable on BAT+ and BAT- terminals respectively making sure it is tightly screwed



Please double confirm the polarity of battery input. SP will not be able to switch on with reverse polarity connection.

4.4.5 Installing the Battery Temperature Sensor (BTS)

- Pull through the BTS cable through gland and connect it on socket marked BTS

- Please glue the temperature sensor, which was plugged into BTS socket, on the SIDE of battery and secure the attachment.

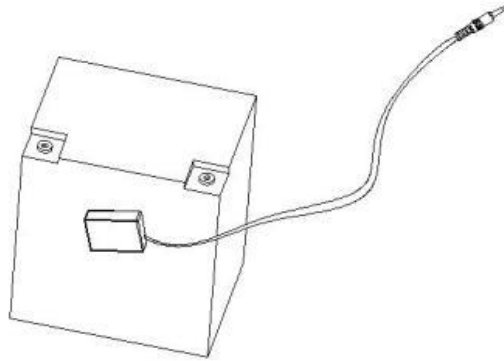


Fig4-4 Glue the temperature sensor



Please notice the cable supplied is around 300cm. Do not pull cable too hard avoid loose contact loose.

4.4.6 PV array connection



A diode was requested to be added between PV array and SP charge controller preventing current from battery damage the PV array at night.



The Voc (open circuit voltage) of PV array must never exceed 150Voc. The PV array Isc must not exceed the nominal current of SP at any time (60A). Please also consider the local temperature condition which might result in the increase of PV array Voc/Isc. Refer to chapter 4.1



Whenever a PV array is exposed to light, a shock hazard exists at the output of wires or terminals. To reduce the risk, cover the array with a dark material before making the connection.

- Choose the right cable size (refer to 4.3) and follow polarity guide marked on the panel
- Adding diode between PV array and MPPT preventing reverse current at night to PV.
- An over current protection devices DC fuse or circuit breaker needs to be installed on positive cable, of which rated for 100% of the nominal rating.
 - SP45-150: 45A
 - SP60-150: 60A
- Wiring need to be protected against any potential physical damage.
- Pull through the DC cables through the holes at front panel, clamping the cable terminal on cable.
- Secure the PV cable on PV+ and PV- terminals respectively making sure it is tightly screwed.



Please double confirm the polarity of PV connection. SP will show fault with reverse polarity connection.

4.4.7 Grounding connection

- Total three grounding terminal was offered within the SP charge controller, one was used for PCB. The other two can both be used for SP grounding.

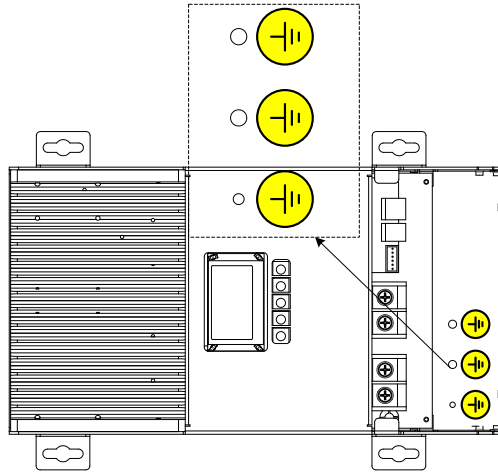


Fig4-5 Grounding terminals

- Using proper gauges of wires for grounding, recommending 6mm².
- Please connect the SP grounding terminal to the system grounding bar, refer to Fig 4-3 of chapter 4.4.3
- Please connect the frame of PV to the system grounding bar, refer to Fig 4-3 of chapter 4.4.3
- Please connect the battery frame to the system grounding bar, refer to Fig 4-3 of chapter 4.4.3



Do not connect either the PV negative or the Battery negative to ground. They must be connected to corresponding terminal marked at connection compartment. Negative ground might cause equipment damage which is out of warranty.



Do not connect the PV negative and battery negative terminal together at any place of the system. They must be connected to corresponding terminal marked at connection compartment. Wrong connection might cause equipment damage which is out of warranty.

4.4.8 Connecting the multiple units

- In a multiple unit installation, each SP charge controller need to be connected to a separate PV array.



Please make sure each SP charge controller was connected with its own PV array. The mixing connection will cause damage which is out of warranty.

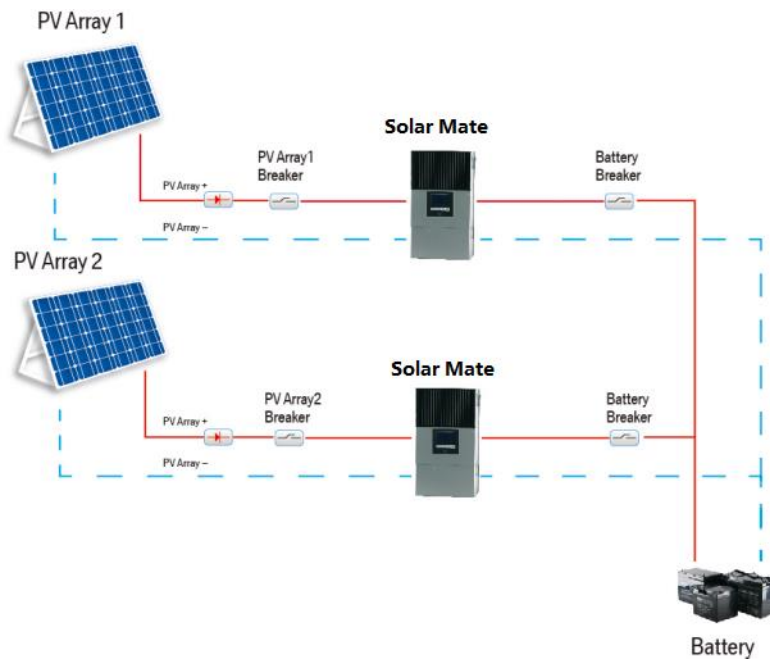


Fig4-6 Connecting the multiple units

4.4.9 Auxiliary output connection

- The nominal switching capacity of auxiliary contact within SP is 30Vdc 2A /resistive load. Please double check if the rating satisfies your system design.



The auxiliary contact output was designed to switch a low current circuit on/off. Connecting to a high amperage device will possibly damage the equipment and it is out of warranty.

- Please connect the wire between the auxiliary communication port and the load you want to control (normally a relay)
- Please refer to chapter 5.3 for configuration.

4.4.10 Communication port connection

- RS485 bus was offered
- Please refer to chapter 3.2 for port definition



Do not route the communication wire in the same conduit as the DC input/output cable.

4.5 Disconnecting the SP charge controller



Ensure both PV array and the battery was disconnected before you disconnect the SP charge controller.



High voltage might exist within the SP. Only qualified professional are permitted to open the case. Recommend wait for a few minutes before opening the case.

- Switched off the SP charge controller
- Disconnecting the PV array.
- Disconnecting the battery
- You can remove the SP charge controller for necessary maintenance

5.0 LCD Menu and Configuration

Some of the configurations were protected by password. The default password was 0000. You can reset during first installation.

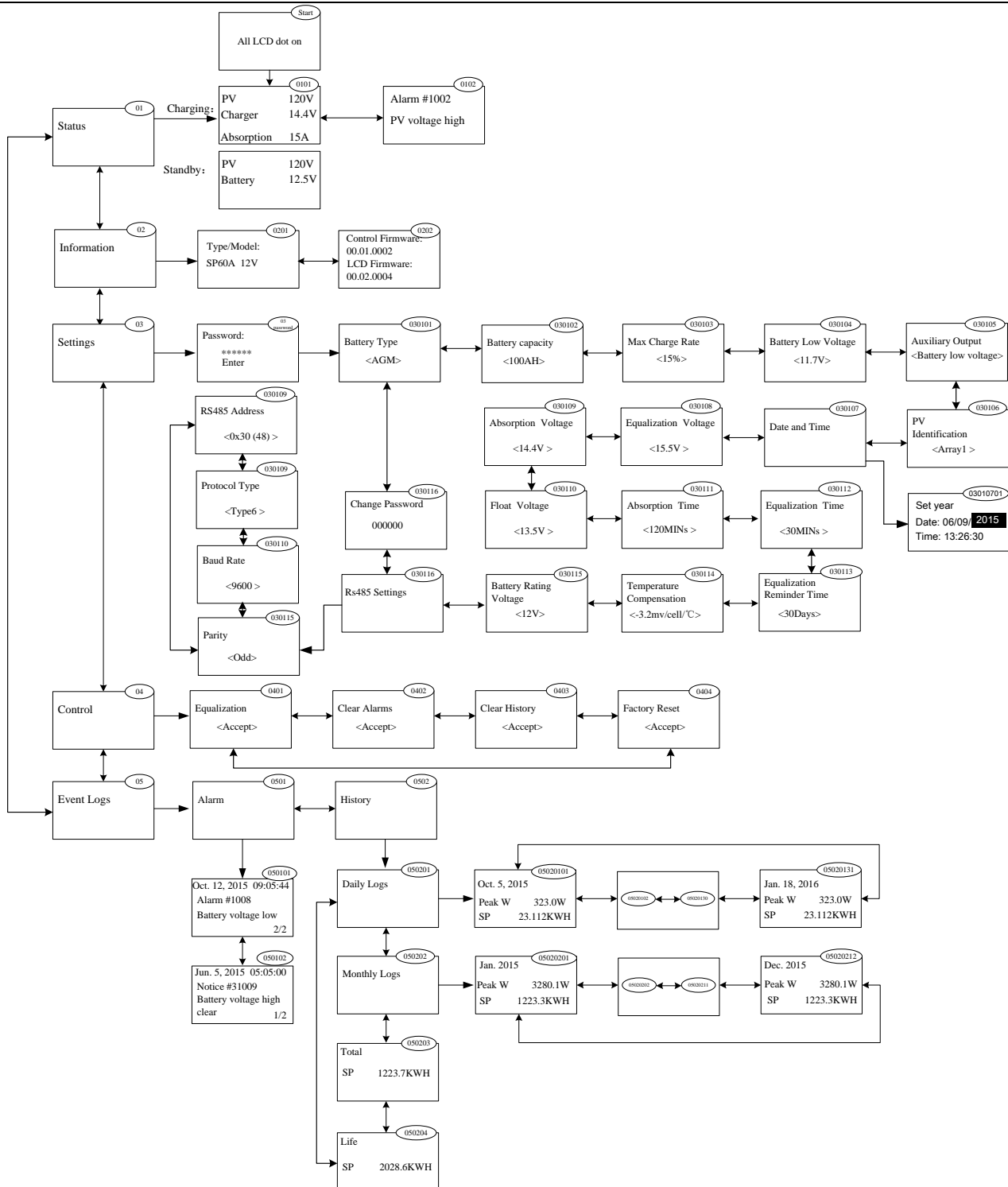


Fig 5-1 Complete Menu Map

5.1 Status Page

The front page will be the status menu, on which you can see the input and output info. Press



entering into next page.

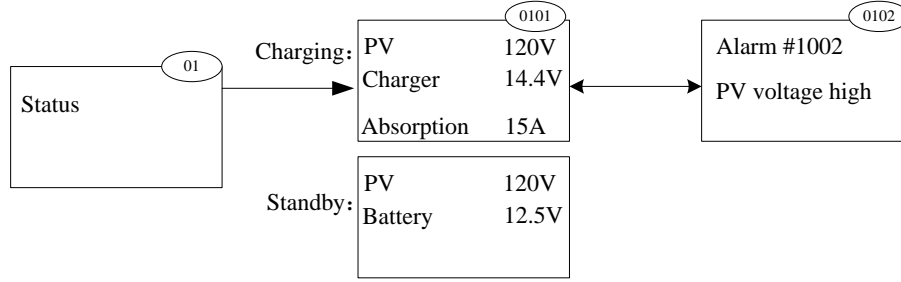



Fig 5-2 Status page

5.2 Information Page

This page contain basic information of this equipment. Press  entering into next page.

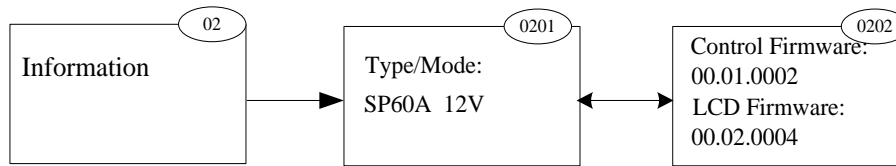


Fig5-3 Information page

5.3 Setting Page and Configuration

This page contains the necessary configuration involved with this equipment. Pressing “UP” or “DOWN” button, you can choose your setting page and pressing “ENTER” button to enter into this page.

The configuration involved with:

Basic system configurations:

Language, Change Password, Date and Time

Battery Capacity, Battery Type, Battery Low Voltage Level, Max Charger Rate

Battery Equalization Charging reminder

PV array voltage, PV array power, PV&SP identification

Auxiliary output

Advanced system configurations:

Charger constant voltage (absorption stage)

Constant voltage timer

Charger floating voltage

Temperature compensation rate

Charger Equalization voltage

Charger Equalization timer



It is important to finish the basic configurations listed below to assure the right performance and display of this equipment. Some setting such as battery type is compulsory to finish.

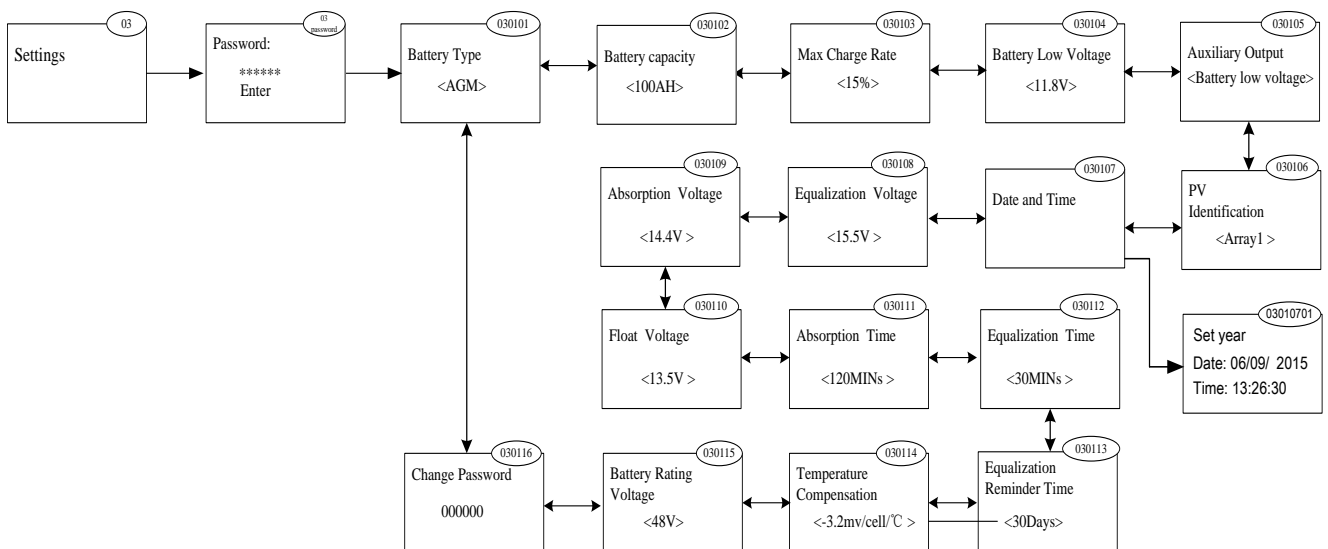


Fig5-4 Setting page

5.3.1 Entering into Setting

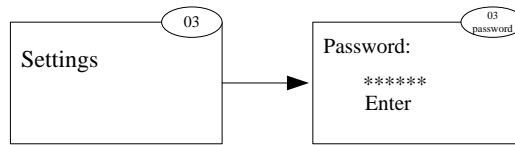


Fig5-5 Enter into the Setting page

- When you enter into the Setting Page, the password was requested. Only with this password, you can enter into the setting. (page 0312-0318)
- The default password is 666666

5.3.2 Basic Configuration

System Setting

Setting Page	Value	Default	Description
Language	English,Chinese	English	
Change Password	Six digit	<666666>	using up/down arrow button and enter button to compose your own password
Date and Time		GMT+8	Please set your time zone

Tab5-1 Content of Basic System Setting



It was highly recommended changing password and keep in privacy. Only professional can enter into advanced setting.

Battery related setting

Setting Page	Value	Default	Description
Battery capacity	50-2000AH	100AH	set the AH of your battery
Battery Type	AGM, GEL, Semi traction, Traction, Lead-Carbon, LFP	GEL	Please refer to following chart of the charging voltage.
Battery low voltage	11Vdc-12Vdc	11.7Vdc	This set the battery low voltage protection level. Please refer to your battery supplier for recommendation
Max Charger Rate	AGM, GEL, Semi traction, Traction:10%-20%	15%	will deliver the charge current at the percentage you set of your battery AH installed.
	Lead-Carbon: 10%-60%	30%	
	LFP :10%-100%	30%	
Battery Equalization Reminder	0-90days	0days	Set the reminder that notify you the battery need to be equalized

Tab5-2 Content of Battery Related Setting

Default battery type and charging voltage

Battery type	Absorption			Float			EQ		
	12vdc	24vdc	48vdc	12vdc	24vdc	48vdc	12vdc	24vdc	48vdc
AGM, GEL Exide A-200	14.4	28.8	57.6	13.5	27	54	NA		
GEL Exide A600 (OPzV)	14.1	28.2	56.4	13.7	27.4	54.8	NA		
Semi traction	14.7	29.4	58.8	13.5	27	54	15.5	31	62
Traction (OPzS)	15.2	30.4	60.8	13.5	27	54	16.2	32.4	64.8
Lead-Carbon	13.62	27.24	54.48	13.62	27.24	54.48	NA		
LFP	14.4	28.8	57.6	14.4	28.8	57.6	NA		

Tab5-3 Default Battery Type



Please double check if the above charging voltage matching your battery manufacturer's recommendation. If not, you can adjust the voltage in advanced configuration page after you make the choice.

PV array related setting

Setting Page	Value	Default	Description
PV identification	Array 1-12	Array 1	set the name of this PV array if you have multiple installed.

Tab5-4 PV array related setting

RS485 communication settings

Setting Page	Value	Default	Description
Parity	No check/Odd/ Even	No check	
Baud Rate	1200/2400/4800/ 9600/19200/ 38400bps	9600bps	
Protocol type	Type 6	Type 6	
Rs485 Address	0x01 (1) ~ 0xF6(246)	0x30(48)	

Auxiliary output setting

- The default is no trigger source. Please scroll down to “Set the Auxiliary output” page and press ENTER button starting the auxiliary output setting

Setting Page	Value	Default	Description
Auxiliary output	Battery Voltage Low	+0.1-+0.4Vdc	: +0.2Vdc of Battery low voltage you set it will send signal once the battery voltage reach the level you set. It can be used for load management.
	Battery Temp High	45°C - 50°C	50°C It can be used to trigger on a ventilation fan. Do not use this function if the Temperature sensor was not installed.
	Equalization	N/A	Will send signal once EQ charging was triggered
	Optocoupler input high	N/A	it will send signal once the dry in being close
	Inverter Interactivity	N/A	It can be used to match with inverter,e.g. CD-H.

Tab5-5 Auxiliary output setting

5.3.3 Configuration



Please consult with your battery manufacturer before you enter into this setting. Wrong setting can permanently damage the battery.



It is critical to install the temperature sensor to perform right charging and protection. If not installed, the equipment will assume 40°C.

Setting Page	Value	Default	Description
Charger constant voltage	14-15.2Vdc	default	
Constant voltage timer	1-4hrs	2hrs	
Charger floating voltage	13-13.8Vdc	default	
Temperature Compensation rate	0-6mV	4mV	set the temperature compensation rate. The value is for per Cell/°C
Charger Equalization voltage	15.0-16.5Vdc	default	
Charger Equalization timer	30mins-2hrs	30mins	Changing the max time of Equalization charging stage

Tab5-6 Battery Configuration

Notice

- For above default setting, please refer to chapter 5.3.2 Default battery types and charging voltage.

5.4 Control Page

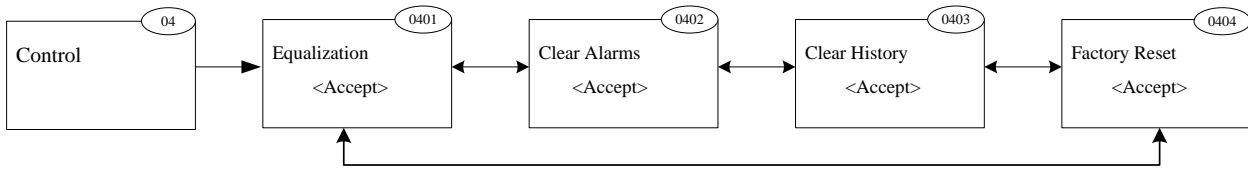


Fig5-6 Control Page

After enter into this page, press “ENTER” button, you can approach following three page. After you make the choice, you can enter into this page by pressing “ENTER” button.

- To start the equalization of the battery
- To clear the alarm
- To clear the history
- To restore default factory setting value

Equalization Charging

- Please refer to chapter 6.3 for detail instruction.

Clear the Alarm

- After enter into this page, through pressing “ENTER” button, you can clear the all the alarm records.
- Max capacity of alarm is 400 records

Clear the History

After each installation, you might want to clear the history record to start a new record of the new installation.

- After enter into this page, through pressing “ENTER” button, you can clear the history records.
- Daily logs, Monthly logs, Life and Total record can be cleared.

Restore default factory setting values

- After enter into this page, through pressing “ENTER” button, you can reset the default factory setting values.

5.5 Event log

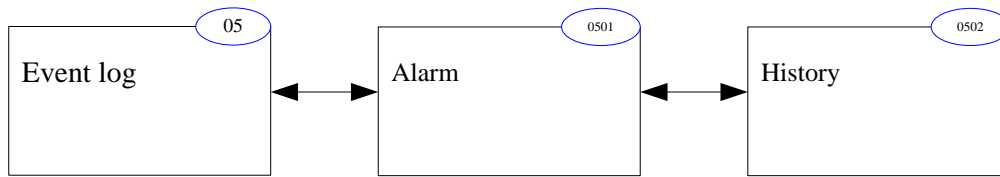


Fig5-7 Event log Page

Within this page, through pressing “UP” and “DOWN” button, you can approach Alarm page and History page.

- Read the alarm record
- Read the history record of this equipment

5.5.1 Alarm

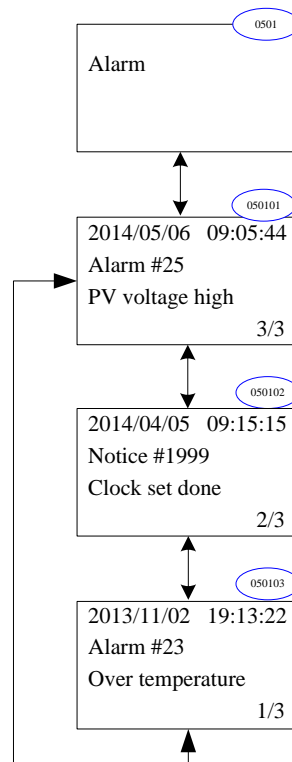


Fig5-8 Alarm Page

After enter into this page, press “ENTER” button, you can read all alarm info by pressing “UP” and “DOWN” button.

- Equipment will record all alarm info with its date and time
- Max 400 records can be available from

5.5.2 History

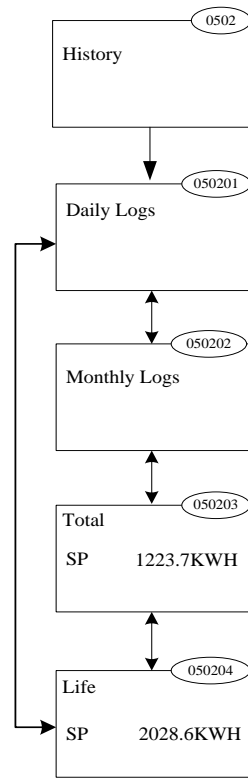


Fig5-9 History Page

Within this page, through pressing “UP” and “DOWN” button, you can approach various history records

- Daily logs
- Monthly logs
- Total: record of total output of this installation
- Life : record of total output of life performance

Daily Logs

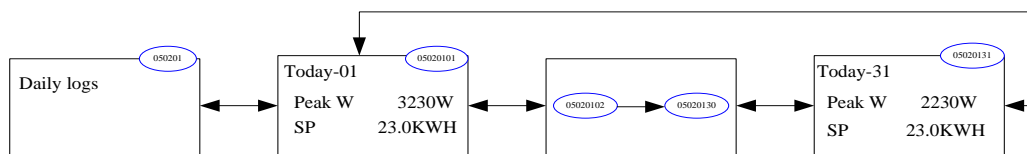


Fig5-10 Daily Logs Page

- It will record the output of each day of this month
- After each month, the figures will be accumulated into Monthly log

Monthly Logs

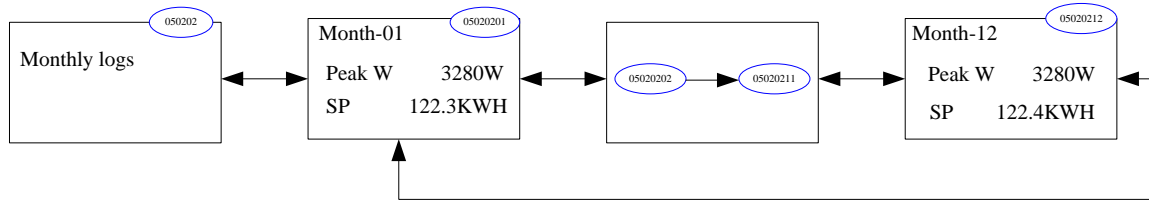


Fig5-11 Monthly logs Page

- Total 36monthes of record can be available from this page.
- After each year, this figures will be accumulated into Total log

Total Log

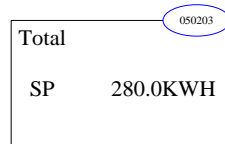


Fig5-12 Total log Page

- It will show the accumulated KWH of this installation.
- It can be reset to zero if you want to start the log again.

Life Log

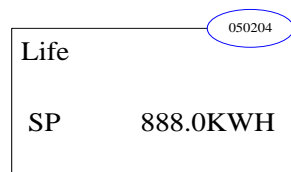


Fig5-13 Life Log Page

- It will show the accumulated KWH of this installation.
- It can be reset to zero if you reset the sp solar charge controller.


6.0 Operation

After you finished the installation and configuration, you can start switch the equipment to start charging the battery from PV array installed. Before power on, please

- Double check the V_{oc} (Voltage of open circuit)of PV array is less than 150VDC
- Double check the PV array wires are connected securely in right polarity

Following switch need to be switched on one by one:

- Switch of the battery
- Switch of the PV array

Then, you can press the “”Power On/Off button on front panel to switch on the MPPT charger controller. If system self-testing is OK, after one minute,the MPPT will start deliver charging to battery connected and LCD will display system status page.

6.1 Viewing system status

You will see first page which shows the system status.

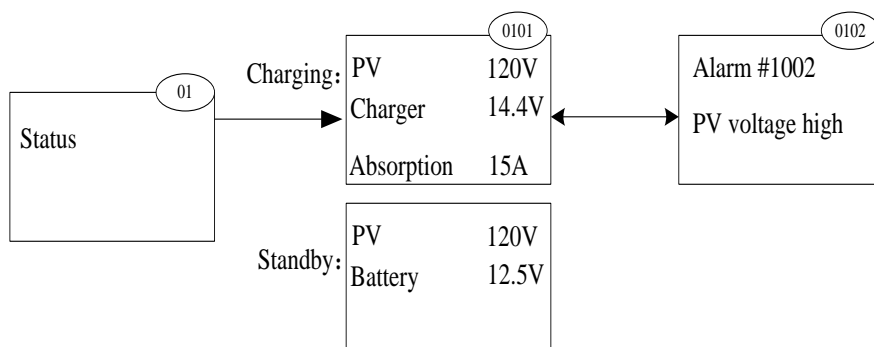


Fig6-1System status page

6.2 Viewing Log Data

Please refer to chapter 5.5.2 of entering different Log page viewing history record.

Page	Description
Daily log	Press "Enter" to view the daily logs. Press "UP" and "Down" button reviewing each day of present month. Daily log contains today's accumulated KWH and Peak Watt recorded.
Monthly log	Press "Enter" to view the monthly logs. Press "UP" and "Down" button reviewing different month of this year. Monthly log contained accumulated KWH and Peak Watt recorded this month.
Total	Press "Enter" to view the TOTAL logs. Total log contained accumulated KWH recorded of this installation.
Life	Press "Enter" to view the LIFE logs. Total log contained accumulated KWH recorded of this unit since this power on.

Tab6-1 Viewing Log Data

6.3 Equalization Charging (EQ charging)



It is strongly recommended to read this section carefully before you start the EQ charging and DO NOT leave battery unattended while performing de-sulphation.



Always check if your battery supplier recommended EQ charging. Only start when it is suitable.



If battery type was set at AGM, GEL, Lead-Carbon or LFP, this charging can't be triggered on.

Over a period of time, the cells in a semi traction or traction battery can develop uneven chemical states. This will result in a weak cell which in turn can reduce the overall capacity of battery. To improve the life and performance of these non sealed battery, SP include a manual equalization program that can be used, if recommended by battery manufacturer.

Through this PAGE, you can initiate the desulphation program manually. After entering this page, please press "ENTER" button to trigger on the EQ charging.

- After 30mins, it will quit and stop charging.
- Check electrolyte level and refill battery with distilled water if necessary.
- If you want to come to normal charging, you need stop equalization charging and switch off the unit.
- Switch on the unit again, then you will have your equipment back to normal charging.



During equalization, the battery generates potentially flammable gases. Follow all the battery safety precautions listed in this guide. Ventilate the area around the battery thoroughly and ensure that there are no sources of flame or sparks in the vicinity



Turn off or disconnect all loads on the battery during equalization. The voltage applied to the battery during equalization may be above the safe levels for some loads.

Frequency: Maximum once a month, for heavily used battery, you may wish to equalize your battery. For battery with light service only need to be equalized every 2-3months.

Important: Equalization can damage your batteries if it is not performed properly. Always check battery fluid before and after equalization. Fill batteries only with distilled water.

Always check the equalization switch is set back to OFF after each time's equalization.

Battery manufactures' recommendations on equalization vary. Always follow the battery manufacturer's instructions so batteries are properly equalized. As a guide, a heavily used battery may require equalization once a month while a battery in light duty service, only needs equalizing once every 2 to 4 months.

Battery type As a protection, equalization charging can be performed if and ONLY if you set the battery to be semi traction or traction lead-acid/OPZS batteries. If you choose AGM, GEL, Lead-Carbon or LFP, EQ charging can't be performed.

7.0 Specification

		SP60-150	SP45-150
Electrical			
Nominal battery voltage		12Vdc/24Vdc or 48Vdc	
PV open circuit voltage (Voc)		150Vdc	
Maximum output current (40°C)		60A	45A
Recommended PV	12Vdc	860W	650W
	24Vdc	1720W	1300W
	48Vdc	3440W	2600W
Max efficiency (full load)		98%@48Vdc system	
Standby power consumption		<2W	
Charging algorithm		TBB II multiple stages	
Temperature compensation		Automatic, -4mV/C/cell	
Equalization charging		By manual	
Others			
Communication port		RS485	
Auxiliary contact		1 programmable	
Data logging		365days of history record - peak watts for every day along with total accumulated kWh of production	
Operating temperature		-40°C ~ 60°C (power derated above 40°C)	
Dimension (LxWxH) - mm		390x199x130	285x199x115
Weight (kgs)		7	5
Max wire sizes		35mm ²	
Protection		IP20	
Cooling		Natural cooling	
Standard		EN55022, EN60950	

Tab 7-1 Specification

8.0 Trouble Shooting

Problem	Possible Cause	Solution
Press Power On button, MPPT did not work	Battery breaker is on OFF state.	Check battery breaker's state.
	Battery wires are connected in reverse polarity.	Verify that battery wires are connected in appropriate way.
LCD shows PV error and beep alarms.	PV breaker is on OFF state.	Check PV breaker's state.
	PV wires are connected in reverse polarity.	Verify that PV wires are connected in appropriate way.
	Short-circuit fault occurs in PV input circuit, input voltage is zero voltage.	Check PV array.
LCD shows SP charge over temperature	Overheat protection of the SP unit	SP charger can resume charging automatically after the temperature fall into range.
LCD shows SP shows battery detect error	Battery voltage is out of SP unit automatic detecting voltage range	Manual set battery rating voltage according to the actual battery rating voltage

Fig8-1 Trouble Shooting

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