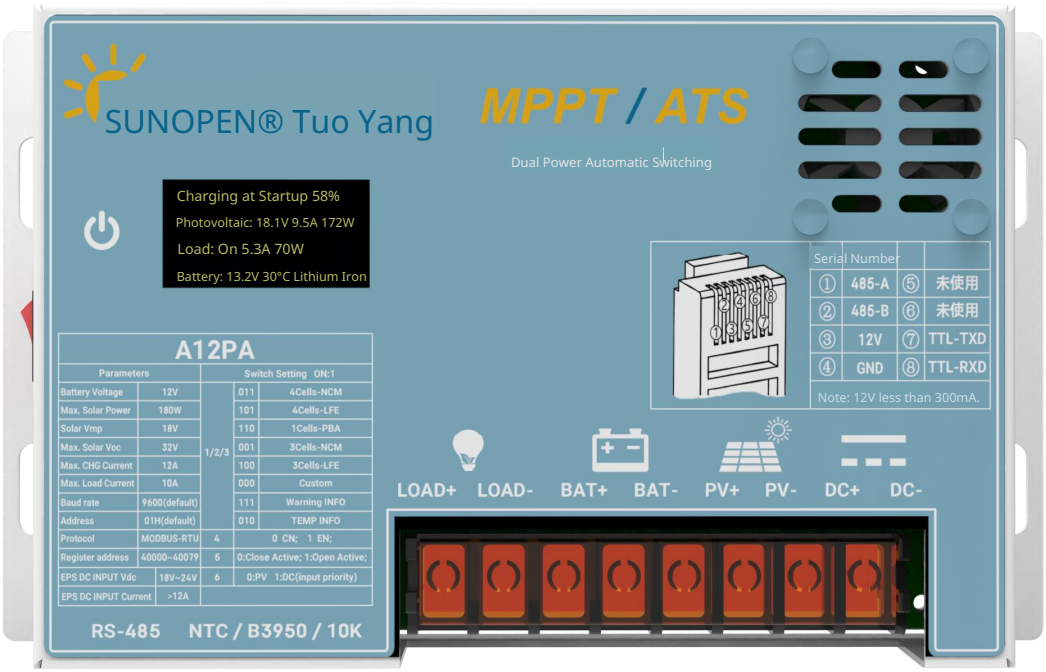
MPPT Solar Charging Controller User Manual

A12PA Model

Applicable to 12V platform batteries (ternary, lithium iron, lead-acid, custom) step-down version

Intelligent dual power switching/grid power DC supplement

Integrated ATS system with ultra-small size, a pioneering innovation in the industry



Providing an extra guarantee for your product, worry-free, intelligent switching

Manual Version: V1.2 Changes may occur without prior notice. Please contact sales for the latest electronic documentation.

Thank you very much for choosing our products!

Safety Instructions

1. Since the operating voltage of this controller exceeds the safe voltage for the human body, please read the manual carefully and ensure that safety operation training is completed before operating this controller.

2. There are no parts inside the controller that require maintenance or repair; users should not disassemble or repair the controller themselves.

3. Please install the controller indoors to avoid exposure of components and prevent water from entering the interior of the controller.

4. Please install the controller in a well-ventilated area, as the temperature of the heat sink can be very high during operation.

5. It is recommended to install a suitable fuse or circuit breaker outside the controller.

6. Before installing and adjusting the wiring of the controller, be sure to disconnect the connection of the photovoltaic array and the fuse or circuit breaker near the battery terminals.

7. After installation, check that all wiring connections are secure to avoid the risk of heat buildup due to loose connections.

Warning: Indicates that this operation is dangerous; ensure safety preparations are made before proceeding.

Note: Indicates that this operation is destructive.

Tip: Indicates suggestions and tips for the operator.

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1. Product Introduction

1.1 Product Overview

The A12PA controller adopts industry-leading MPPT (Maximum Power Point Tracking) technology to achieve maximum energy tracking of solar panels, enabling it to quickly and accurately track the maximum power point of solar cells in various environments. It real-time obtains the maximum energy from solar panels, significantly improving the energy utilization efficiency of solar systems. It is widely used in off-grid photovoltaic systems to manage the operation of solar panels, batteries, and loads, serving as the core control component of off-grid photovoltaic systems. The controller features comprehensive software and hardware fault detection and protection functions, minimizing the risk of damage to product components due to installation errors and system failures.

The highlight is that the A12PA comes with an ATS switching system. Its compact size integrates an automatic dual power switching system and an MPPT system, and the switching power for charging the battery is equal to its own MPPT charging power. The efficiency reaches >96%~99%. If, due to environmental issues during the day, the battery does not have enough power to supply the system throughout the night, the A12PA will automatically switch to direct current from the mains to power the battery until it is fully charged, then automatically stop.

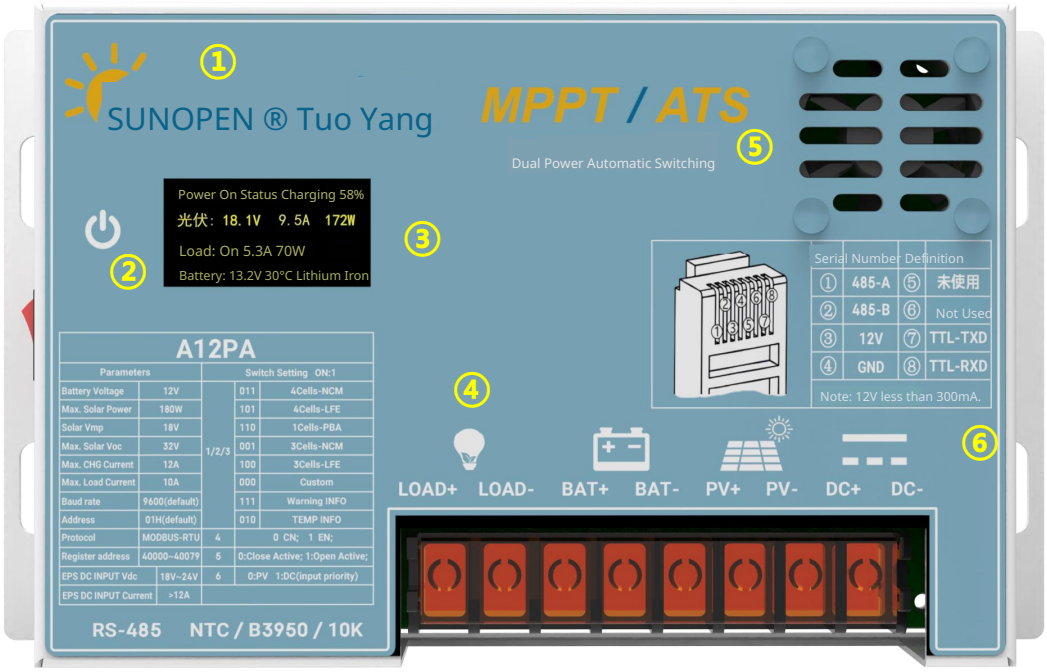
Ensure the system is stable and reliable. The A12PA cleverly reuses the internal DC/DC conversion hardware, saving costs.

1.2 Product Features

- Using MPPT (Maximum Power Point Tracking) technology, the MPPT tracking efficiency can reach 99.9%.
- Supports simultaneous full power charging and discharging.
- Supports various types of batteries including sealed, colloidal, open, lithium batteries, and custom types.
- Supports activation of lithium and lead-acid batteries.
- Supports charging current settings.
- Supports full charge settings.
- Supports temperature compensation function.
- Supports parallel charging.
- Supports multiple load operating modes.
- Supports starting capacitive and inductive loads.
- Supports saving historical data.
- Supports RS485 communication with standard Modbus protocol, with adjustable baud rate (default 9600bps).
- Supports TTL communication with the standard Modbus protocol, with a configurable baud rate (default 9600 bps).
- Supports Bluetooth and Ethernet communication functions (optional).
- Equipped with comprehensive protection mechanisms for over-voltage, over-current, overload, over-temperature, and short-circuit during charging and discharging.
- Utilizes high-quality aluminum heat sinks, air cooling, and high-temperature derating to ensure reliable and efficient operation in various working environments.

1.3 Appearance and Interface Description

Front Interface Introduction



Serial Number	Function Description	Remarks
①	Side toggle switch, battery type selection, Chinese-English switching, interface toggle switch, input priority setting	See the toggle switch section for details
②	Start button	Side boat-shaped switch
③	Display Screen Interface	
④	Load interface; battery interface; photovoltaic input interface; backup power interface	Interface barrier
⑤	Fan outlet	Do not block
⑥	Ground screw hole position	

Side interface introduction

Serial Number	Function Description	Remarks
①	RS485 communication interface	Refer to other chapters for pin definitions.
②	Battery temperature monitoring interface, external NTC B3950 10K thermistor.	No battery temperature monitoring when not connected.

The A12PA series Maximum Power Point Tracking (MPPT) system is an advanced charging technology that adjusts the operating state of the electrical module to enable solar panels to output more electrical energy. Due to the nonlinear characteristics of solar panel arrays, there exists a maximum power point on their curve. Traditional PWM charging technology cannot maintain charging at this point, thus failing to capture the maximum energy from the solar panels. However, solar controllers with MPPT technology can continuously track the maximum power point of the array to obtain the maximum energy for charging the batteries. For example, in a 12V system, the peak voltage (Vpp) of the solar panel is around 18V, while the battery voltage is about 12V. General charging controllers operate at around 12V during charging, which does not fully utilize the maximum power.

MPPT controllers can overcome this issue by real-time adjusting the input voltage and current of the solar panels to achieve maximum input power. Compared to traditional PWM controllers, MPPT controllers can harness the maximum power of solar panels, thus providing a larger charging current. Generally, MPPT can improve energy utilization by 20% to 30% compared to PWM controllers.

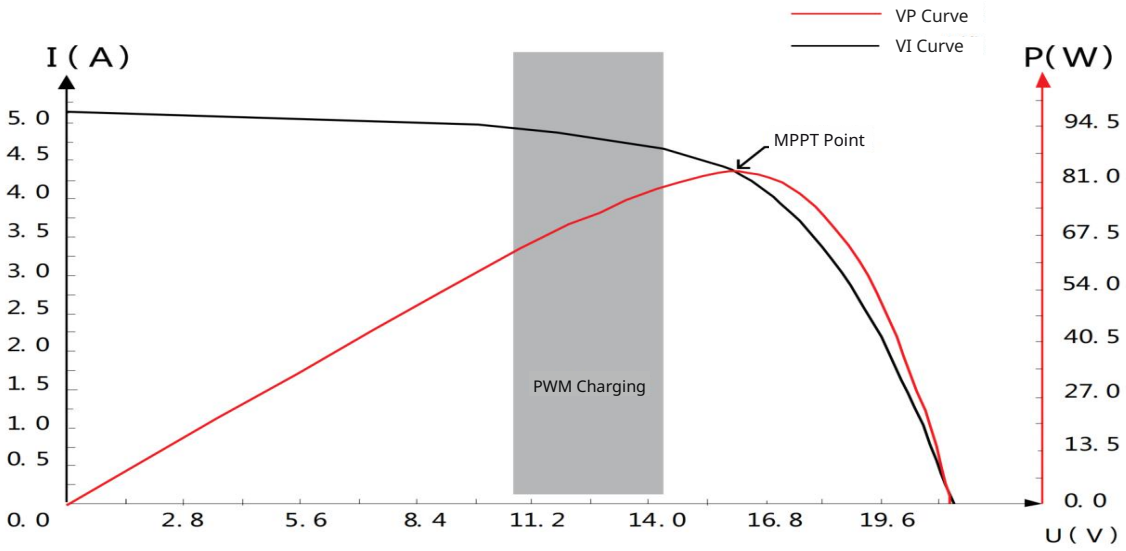


Figure 1-2 Battery Panel Output Characteristic Curve

Due to varying environmental temperatures and lighting conditions, the maximum power point frequently changes. Our company's MPPT controller can adjust parameters in real-time according to different conditions, ensuring that the system remains close to the maximum operating point at all times. The entire process is fully automatic, requiring no adjustments from the user.

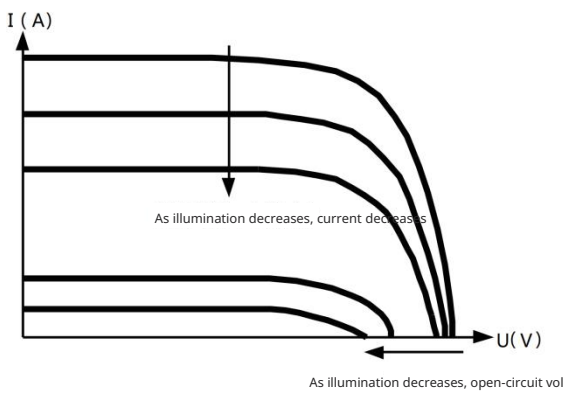


Figure 1-3 Relationship Between Battery Panel Output Characteristics and Illumination

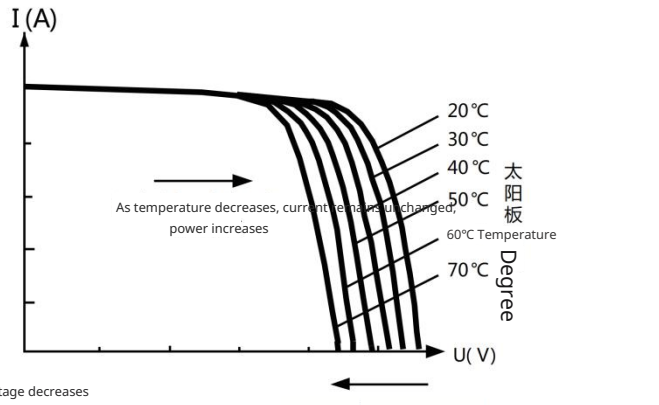
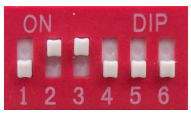
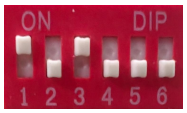
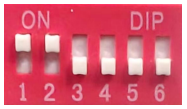
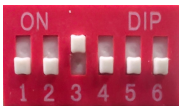
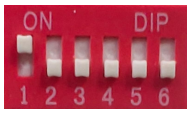
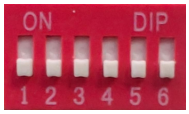
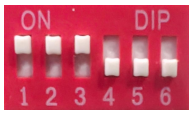
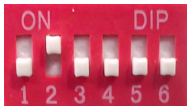
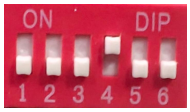
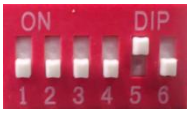
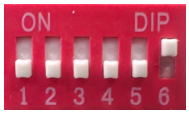


Figure 1-4 Relationship Between Battery Panel Output Characteristics and Temperature

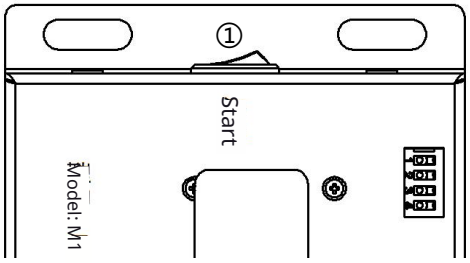
Product Model	**A12PA**
Static Power Consumption	≤30mA
Battery Type	Li-ion/LiFePO4/Lead Acid/Colloidal/Other Batteries (User can configure independently based on the upper computer)
Battery Voltage	12V Platform
System Mode	Step-down
Rated battery charging current	12.5A
Maximum PV input current	10A
Maximum solar panel power	180W
Max: PV open circuit voltage (Voc)	<30V
Recommended PV power point voltage (Vmp)	16V~24V (recommended)
AUX input voltage	14V~28V
Maximum input current	12.5A
Maximum Input Power	180W
Maximum System Voltage	36V(±2%) overvoltage will damage the system
MPPT Tracking Efficiency	>99.9%
MPPT Tracking Speed	<1ms
Charging Conversion Efficiency	>96%
Rated Load Current	10A
Load Working Mode	Manual Mode, Automatic Mode (Users can configure independently based on the host computer)
Charging Working Mode	Activation/Trickle/Constant Current/Constant Voltage
Battery Charging Temperature Control Adjustable	√
Temperature Protection	√
Activate Battery	√
Load Overload/Short Circuit Protection	√
TTL Communication	√
RS485 Communication	√
External 12V power supply (<300mA)	√
Display	√
Supports SOC display	√
Charging power can be set	√
Battery model series can be configured	√
Supports Bluetooth (optional expansion)	√
Supports Ethernet (optional expansion)	√
Set automatic save	√
Supported baud rate types	4800/9600/14400/19200/38400/56000/57600 default 9600 (replacement requires upper computer configuration)
Backlight adjustment function	M12PAE does not support, always on, adjustable according to customer needs
Protection function	PV over-voltage protection, PV reverse connection protection, PV short-circuit protection, night reverse charging protection, input power limit protection, over-temperature protection, load short-circuit protection, load overload protection, battery over-voltage/over-discharge protection, battery reverse connection protection (fuse)
Operating environment temperature range	- 35℃~65℃
Protection level	IP32
Cooling method	Natural cooling, air cooling
Size	Dimensions 97x170x32mm
Weight	0.36kg
Lithium iron phosphate battery support	4 Series
Ternary lithium battery support	3, 4 Series
Lead-acid/gel battery support	1 Series
Sodium battery support	3, 4 Series
Other batteries	The user sets the undervoltage and overvoltage points (set via the upper computer at 8.4V~16.8V)

3. DIP switch and power on/off instructions

3.1 DIP Switch Usage Instructions (Please select the battery type carefully from the front)

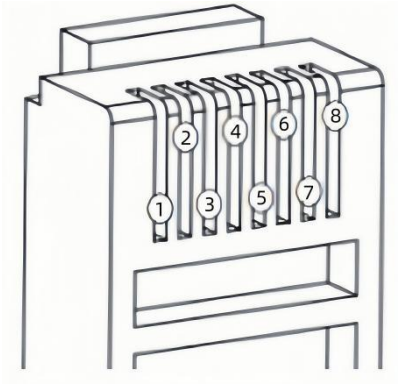
	The first three DIP switch positions [1 2 3] “011” represent: Select 4 series lithium batteries Over-voltage protection point: 16.8V Under-voltage protection point: 11.6V (automatically generated by the system)
	The first three DIP switch positions [1 2 3] “101” represent: Select 4 series lithium iron phosphate batteries Over-voltage protection point: 14.4V Under-voltage protection point: 11.2V (automatically generated by the system)
	The first three DIP switch positions [1 2 3] “110” represent: Select 12V lead-acid or 12V gel batteries Over-voltage protection point: 14.4V Under-voltage protection point: 10.5V (automatically generated by the system)
	The first three DIP switch positions [1 2 3] “001” represent: Select 3 series lithium batteries Over-voltage protection point: 12.6V Under-voltage protection point: 8.7V (automatically generated by the system)
	The first three DIP switch positions [1 2 3] “100” represent: Select 3 series lithium iron phosphate batteries Over-voltage protection point: 10.8V Under-voltage protection point: 8.4V (automatically generated by the system)
	The first three DIP switch positions [1 2 3] “000” represent: Custom battery, over-voltage and under-voltage settings need to be configured by the user through the upper computer
	The first three DIP switch positions [1 2 3] “111” represent: All alarm information can be viewed (using this function will automatically stop charging)
	The first three DIP switch positions [1 2 3] “010” represent: System temperature information and battery temperature information can be viewed (using this function will automatically stop charging), users need to configure the protection values through the upper computer
	Switch 4: "1" for English interface, "0" for Chinese interface
	Switch 5: "1" to enable activation; "0" to disable activation;
	Switch 6: "1" for priority charging from backup power input; "0" for priority charging from photovoltaic input (default)

3.2 Device Startup Switch Usage Instructions



① To start the device, switch left to turn off, right to turn on

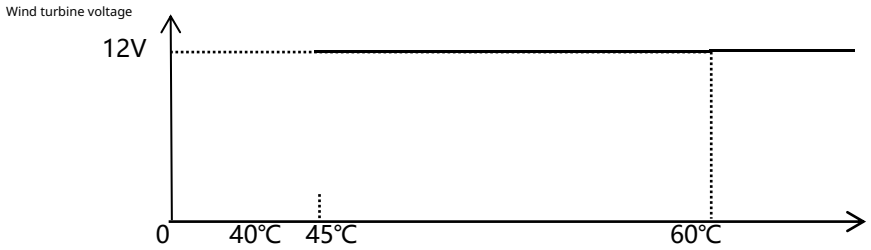
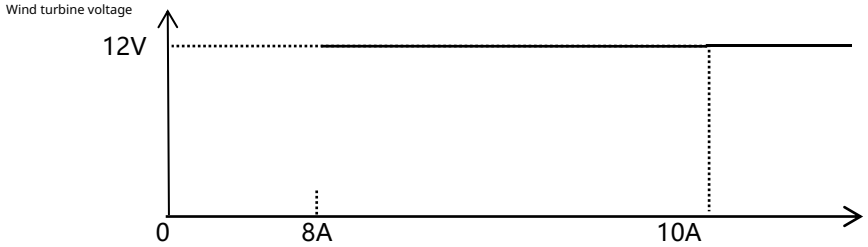
4. TTL Communication, RS485 Communication, External 12V Output Interface Pin Definitions



Serial Number	Definition
①	485-A
②	485-B
③	12V
④	GND
⑤	Not Used
⑥	Not Used
⑦	TTL-TXD
⑧	TTL-RXD

Note: 12V can provide a maximum current of 300mA; exceeding this may damage the interface.

5. Fan Temperature Control

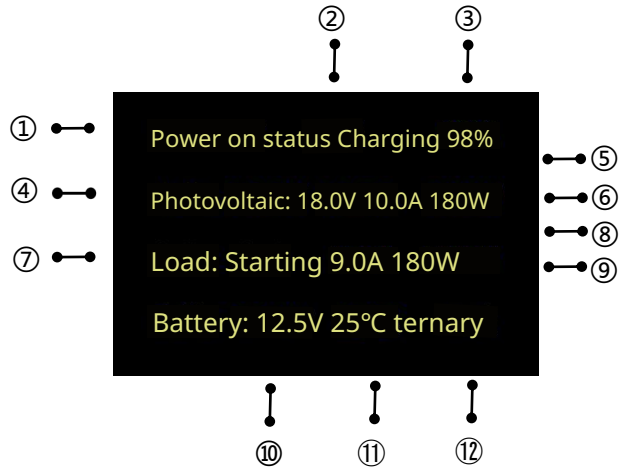
Serial Number	Fan Startup Logic Diagram
When PV charging	
When PV is not charging, starts with discharge load current	

6. Common problems and solutions

Phenomenon	Processing Method
Indicator light and LCD screen not lit	Check if the connections of the battery and solar panel are correct
Solar panel has voltage, but no voltage output at the battery terminal	Disconnect the battery to check if it has voltage. If there is no voltage, activate the battery in the system settings. (The battery is in an activated state, and the system does not support reverse connection protection for the battery)
Battery type and series cannot be modified while MPPT is in operation	Changing the battery type will alter the over-voltage and under-voltage protection points!
Charging power does not reach the rated value	The system uses current limiting and constant temperature control; Check if the system has reset the charging power; Whether the voltage difference between the PV model and the battery model is too large.
The load cannot start some loads.	You can set the short circuit load time through the upper computer to accommodate different external loads.
Other issues or difficult-to-solve exceptions.	Go to the settings interface to initiate a factory reset. After setting the factory settings, reconfigure the relevant parameters according to the system configuration. Please be cautious!
No response when the battery is connected.	1. Check if the last reverse connection caused the fuse to blow; if so, replace the fuse or contact the manufacturer for repair.
The fan does not rotate.	1. Check if there are any foreign objects blocking the fan and clean the air duct regularly. 2. If the fan still does not rotate after cleaning, contact customer service for fan replacement. 3. Check if the silent mode has been activated.

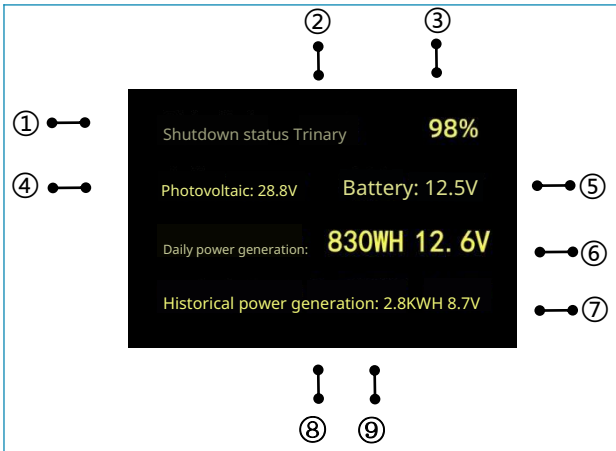
7. Display interface introduction

7 . 1System startup display interface



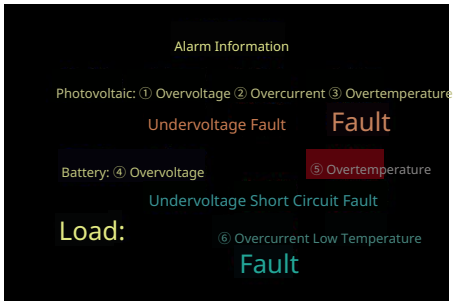
① Power on status display
The system is in charging mode (charging, discharging, protection)
③ State of Charge (SOC) display
④ Display photovoltaic voltage value, backup power supply voltage value, alternating
⑤ Display photovoltaic charging current size
⑥ Display photovoltaic charging power size
⑦ Load startup status display
⑧ Display load output current size
⑨ Display load output power size
⑩ Display battery voltage size
⑪ Battery temperature display (NTC not connected, not displayed)
⑫ Display battery selection type (ternary, lithium iron, lead-acid, other)

7 . 2Turn off system display interface



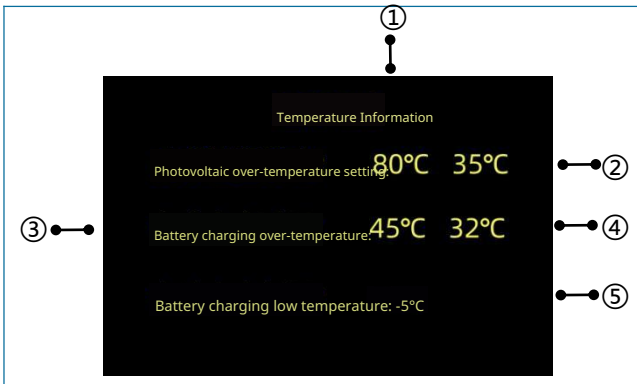
① Represents the current state is off
② Represents the current battery selection is ternary type
③ Displays battery charge level SOC
④ The voltage values of the photovoltaic/backup power supply are displayed alternately.
⑤ Display battery voltage value
⑥ Current battery over-voltage protection set point
⑦ Current battery under-voltage protection set point
⑧ Display today's power generation
⑨ Display historical power generation

7 . 3System alarm interface "Fault": Sensor fault(Users can take corresponding measures based on the alarm information)



① Photovoltaic "over-voltage", "under-voltage" prompt
② Photovoltaic "over-current", "fault" prompt
③ Photovoltaic "over-temperature", "fault" prompt
④ Battery "over-voltage", "under-voltage" prompt
⑤ Battery "Over Temperature," "Low Temperature," "Fault" Alerts
⑥ Load "Short Circuit," "Over Current," "Fault" Alerts

7 . 5System Temperature Interface



① Current Photovoltaic Over Temperature Protection Point (modifiable via upper computer)
② Current Real-Time Temperature of Photovoltaic Operation
③ Current Battery Set Charging Over Temperature Value (modifiable via upper computer)
④ Current Real-Time Temperature of Battery
⑤ Current Battery Set Charging Low Temperature Value (modifiable via upper computer)

8. Product Installation

8.1 Installation Precautions

- Be very careful when installing batteries. When installing open lead-acid batteries, wear protective goggles. If battery acid comes into contact with skin, rinse immediately with clean water.
- Avoid placing metal objects near the battery to prevent short circuits.
- Charging the battery may produce acidic gases; ensure the surrounding environment is well-ventilated.
- The battery may produce flammable gases; keep away from sparks.
- When installing outdoors, avoid direct sunlight and rain infiltration.
- Loose connections and corroded wires can cause excessive heat, melting the wire insulation, burning surrounding materials, and even starting a fire. Therefore, ensure all connections are tight, and it is best to secure the wires with zip ties to prevent movement that could loosen the connections.
- When connecting the system, the output voltage of the components may exceed the safe voltage for the human body. When operating, be sure to use insulated tools and keep your hands dry.
- The battery terminal on the controller can be connected to a single battery or a group of batteries. The subsequent instructions in the manual are for use with a single battery, but they also apply to a system with a group of batteries.
- Please follow the safety recommendations of the battery manufacturer.
- Ground the controller's grounding terminal.
- During installation, reverse connection of the battery is prohibited, as it can cause irreversible damage.

8.2 Installation Steps

Wiring and installation methods must comply with national and local electrical code requirements. Wiring specifications must be selected according to the rated current, generally at 5A/mm².

Step 1: Choose the installation location.

Avoid installing the controller in direct sunlight, high temperatures, or areas prone to water ingress, and ensure good ventilation around the controller.

Step 2: Secure the hanging screws.

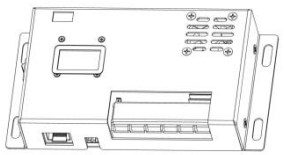
Mark the installation position according to the controller's installation dimensions, drill two appropriately sized mounting holes at the two marks, and secure the screws in the two mounting holes.

Step 3: Fix the Controller

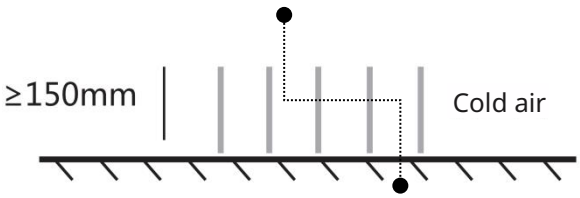
Align the controller's mounting holes with the two pre-fixed screws, then hang it up, and secure the two screws at the bottom.

Step 4: Secure the grounding wire

Lock one wire to the side screws of the controller, and connect the other end effectively to the ground (you can bind a metal block for burial) to allow leakage, static electricity, and lightning currents to be directed into the ground.



Effective grounding of the equipment



9. Protection Functions

- Overtemperature Protection for Equipment

  When the internal temperature of the controller exceeds the set value, it will automatically reduce the charging power or even shut down during charging, thereby further slowing the rise in internal temperature.

- Overtemperature Protection for Batteries

  The battery overtemperature protection requires an external battery temperature sampling sensor. When the battery temperature is detected to be too high, charging will stop. When the battery temperature drops to 5 degrees below the set value and remains there for 2 seconds, charging will automatically resume.

- Input Overpower Protection

  When the power of the solar panel exceeds the rated power, the controller will limit the charging power within the rated power range to prevent excessive current from damaging the controller, and the controller will enter current-limiting charging.

- Excessive Voltage at Photovoltaic Input

  If the input voltage of the photovoltaic array is too high, the controller will automatically disconnect the photovoltaic input.

- Reverse Polarity Protection for Photovoltaic Input

  When the photovoltaic array is connected with reversed polarity, the controller will not be damaged and will continue to operate normally after correcting the wiring error.

- Nighttime anti-reverse charge protection

  Prevents the battery from discharging through the solar cells at night. Special note: There is no reverse connection protection function for the battery.

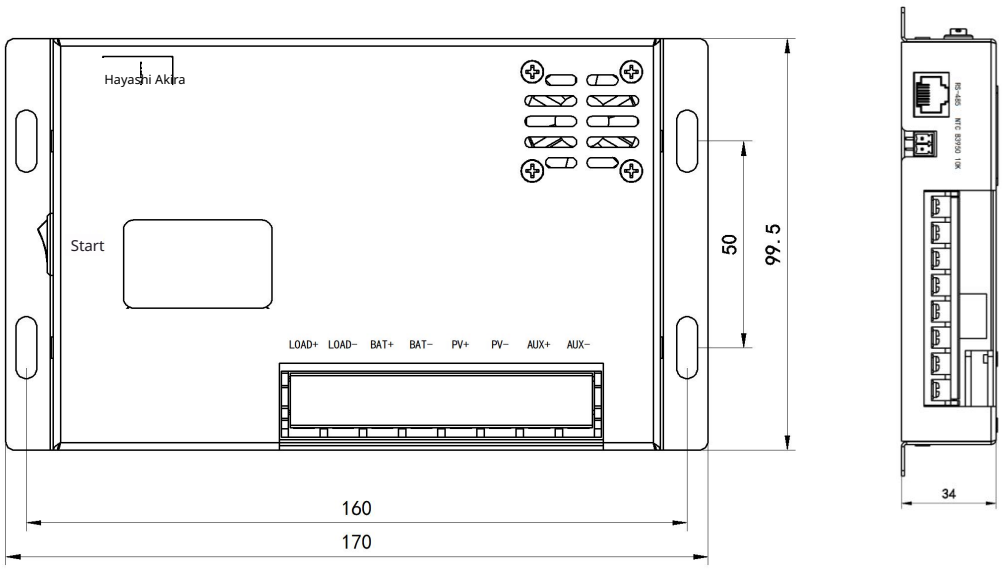
10. System Maintenance

To ensure the controller maintains optimal performance over time, it is recommended to regularly check the following items.

- If any abnormal faults or error messages are found, corrective measures should be taken promptly.
- Check for corrosion, insulation damage, high temperature, or signs of burning/discoloration at the terminal connections, as well as any deformation of the casing, and repair or replace as necessary.
- If any exposed, damaged, or deteriorating insulation wires are found, they should be repaired or replaced promptly.
- If dirt, nesting insects, or corrosion are found, they should be cleaned up promptly.

Warning: Risk of electric shock! Ensure that all power sources to the controller are disconnected before performing the above operations, and then proceed with the corresponding checks or operations! Non-professionals should not oper

11. Product Dimension Diagram



12.1 Basic Communication Configuration

Transmission Mode	RTU	Protocol Standard/Function Code	0x02 Read one or more input states	Bitwise read
Baud rate	Default is 9600bps	This communication protocol is based on <standard MODBUS protocol>, the master cyclically requests data from the slave, the slave receives the request command and responds with data.	0x03 Read holding registers	Read by 16-bit words
Checksum	No checksum		0x04 Read one register	Read by 16-bit words
Data Bit	8bit		0x05 Write a Coil Status	Bitwise Write
Stop Bit	1bit		0x06 Write a Holding Register	Write by 16-bit Word
Frame Interval	Not less than 3.5 Byte Times		0x10 Write multiple hold registers	Write by 16-bit Word
Frame Length	200 Bytes		When the communication module detects errors other than CRC code errors, it must send a message back to the host, with the highest bit of the function code set to 1; 01 illegal function code, 02 illegal data	
Maximum slave response time	350 Bytes time			
Minimum host polling interval	400 Bytes time		03 Illegal data value 04 service fault	

12.2 Information Address

Register address table, read corresponding function code 0x03, set corresponding function code 0x06. The addresses in the table below are the same as those in the actual information frame, and no offset or other conversion is needed.

Address (Decimal)	Meaning	Byte	Read/ Write	Example	Explanation
40000	Device model	2	R	11221	A12PA
40001	Software Version	2	R	10	V1.0
40002	Hardware Version	2	R	10	V1.0
40003	Maximum Power Support	2	R	180	180W
40004	Input and output maximum current	2	R	1012	PV:10A, BAT:12A
40005	Photovoltaic step-down heat sink temperature	2	R	25	Current system temperature 25 degrees Celsius
40006	P V N T Status	2	R	0	0~7
40007	B A T N T Status	2	R	0	0~7
40008	Reserved	2	R	Not Used	Reserved
40009	Reserved	2	R	Not Used	Reserved
40010	Charging Stage	2	R	3	1: Activation, 2: Trickle, 3: Constant Current, 4: Constant Voltage
40011	Charging Status	2	R	1	0: Not charged, 1: Charging
40012	Fully Charged Status	2	R	1	0: Not Fully Charged, 1: Fully Charged
40013	Current Load Status	2	R	1	1: Starting, 0: Shutting Down
40014	B U C Heatsink Temperature	2	R	50	50℃ (Accuracy 1℃)
40015	Reserved	2	R	Not Used	Reserved
40016	Reserved	2	R	Not Used	Reserved
40017	Reserved	2	R	Not Used	Reserved
40018	Reserved	2	R	Not Used	Reserved
40019	DC input voltage	2	R	2024	24.24V (accuracy 0.01V)
40020	Photovoltaic input voltage	2	R	2498	24.98V (accuracy 0.01V)
40021	DC or photovoltaic input current	2	R	275	2.75A (accuracy 0.01A)
40022	DC or photovoltaic input power	2	R	100	100W (accuracy 1W)
40023	DC or photovoltaic heatsink temperature	2	R	20	20 (Accuracy 1℃)
40024	Photovoltaic Fault Code	2	R	0	See Fault Table 1
40025	Battery Output Voltage	2	R	1156	11.56V (Accuracy 0.01V)

40026	Battery Output Current	2	R	12	None
40027	Battery Output Power	2	R	100	None
40028	Battery Radiator Temperature	2	R	25	25℃ (accuracy 1℃)
40029	Battery fault code	2	R	See fault table 2	See fault table 2
40030	Load output current	2	R	18	1.8A
40031	Load output power	2	R	125	125W
40032	Fan Startup Status	2	R	0	0: Off 1: On
40033	Historical System ChargingW High Value	2	R	H+L (Unit: WH)	Historical Total Power Generation WH
40034	Historical System ChargingW Low Value	2	R		
40035	CurrentS O V Value	2	R	982	98.2%
40036	Reserved	2	R	Not Used	Reserved
40037	Today's Power Generation	2	R	855	855WH
40038	M P P WTorking Mode	2	R	0	See Function Table 2
40039	Remote Load Switch	2	R/W	0	1: Load On; 0: Load Off
40040	Maximum Voltage for Photovoltaic Access	2	R	300	30.0V
40041	Minimum Voltage for Photovoltaic Access	2	R	130	13.0V
40042	User-defined maximum charging power	2	R/W	100	100W (Limit for maximum photovoltaic charging power setting)
40043	Reserved	2	R/W	Not Used	Reserved
40044	Photovoltaic stop working temperature setting	2	R/W	70	70℃
40045	Current photovoltaic fan start temperature	2	R	40	40℃ fan start
40046	Device communication address	2	R/W	01	Communication address: 01H (01~255)
40047	Battery charging maximum voltage setting	2	R	1440	14.4V (The system automatically allocates based on the dial)
40048	Battery discharge minimum voltage setting	2	R	1120	11.2V (The system automatically allocates based on the dial)
40049	Reserved	2	R/W	Not Used	Reserved
40050	Current battery discharge high temperature setting	2	R/W	60	>60℃ stop load output
40051	Current battery discharge low temperature setting	2	R/W	-10	<-10℃ stop load output
40052	Current battery charging high temperature setting	2	R/W	45	>45℃ stop charging the battery
40053	Current battery charging low temperature setting	2	R/W	0	Stop charging the battery
40054	Reserved	2	R/W	Not Used	Reserved
40055	Set battery type	2	R	0	0: Ternary lithium, see Function Table 1
40056	Set battery series	2	R	3	Ternary lithium 3 series
40057	Power on	2	R/W	1	0: Disable power generation, 1: Start power generation (default)
40058	Battery Activation Setting	2	R	0	0: Activation (M12PA model default)
40059	Baud rate	2	R/W	0	1: 9600 (default) 0~7 (4800~115200)
40060	Backlight Time	2	R/W	60	60S (default) (some models do not support M12PA)
40061	Lock Screen	2	R/W	0	0: Unlocked, 1: Locked (Some models, such as M12PA, do not support this)
40062	Set the size of the DC charging power	2	R/W	100	100W (unit 1W)
40063	User set battery overvoltage value	2	R/W	160	16.0V(100~170)
40064	User set battery undervoltage value	2	R/W	100	10.0V(75~140)
40065	User-defined load short-circuit time	2	R/W	100	100*20(us) (Customer adjusts based on external load)
40066	Reserved	2	R/W	Not Used	Reserved
40067	Reserved	2	R/W	Not Used	Reserved
40068	Reserved	2	R/W	Not Used	Reserved
40069	Reserved	2	R/W	Not Used	Reserved
40070	Reserved	2	R/W	Not Used	Reserved

13. Detailed attachment table

Function Table

Function Table 1 (Decimal)		
NMC Battery	Tri-Element Lithium Battery	0
LFP Battery	Lithium Iron Phosphate Battery	1
PAB Battery	Lead-Acid Battery	2
OTH Battery	Other Batteries	5
ERR	Error Configuration	8

Function Table II (Decimal)		
MPPT->BAT	Solar Panel Charging Battery	0

Fault Table

Fault Table 1 (Decimal)					
OV	Solar Panel Over Voltage	1	SC	Solar Panel Short Circuit	128
UV	Solar Panel Under Voltage	2			
OT	System Over Temperature	4			
TF	Temperature Sensor Failure	8			
OC	Solar Panel Overcurrent	16			
OP	Solar Panel Overpower	32			
SF	Current Sensor Failure	64			

Fault Table II (Decimal)					
OV	Battery Overvoltage	1	SF	Battery Current Sensor Fault	128
UV	Battery Undervoltage	2	SC	Battery Short Circuit	256
OT	Battery Overtemperature	4	LOC1	Load Level 1 Overcurrent	512
UT	Battery Low Temperature	8	LOC2	Load Secondary Overcurrent	1024
TF	Temperature Sensor Failure	16	LSC	Load Short Circuit	2048
OC	Battery Overcurrent	32	LSF	Load Current Sensor Fault	5096
OP	Battery Overload	64	PF	Battery Configuration Abnormality	10192
DPF	Charging Dial Fault Code	20384			

14. Application wiring diagram