MPPT Solar Charging Controller User Manual

A24PB Model

Applicable to 24V platform batteries (ternary, lithium iron, lead-acid, custom) step-down version

Intelligent dual power switching / AC to DC supplementary power

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

Provides an additional guarantee for your product, worry-free, with intelligent switching

Manual Version: V1.0 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 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 on the outside of the controller.

6. Before installing and adjusting the wiring of the controller, be sure to disconnect 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 that safety preparations are made before proceeding.

Note: This operation is destructive.

Note: Indicates suggestions and tips for the operator.

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1.1 Product Overview

The A24PB 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 solar 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 A24PB 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 is equal to the MPPT charging power itself. 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 A24PB will automatically switch to direct current from the mains to power the battery until it is fully charged, then stop automatically.

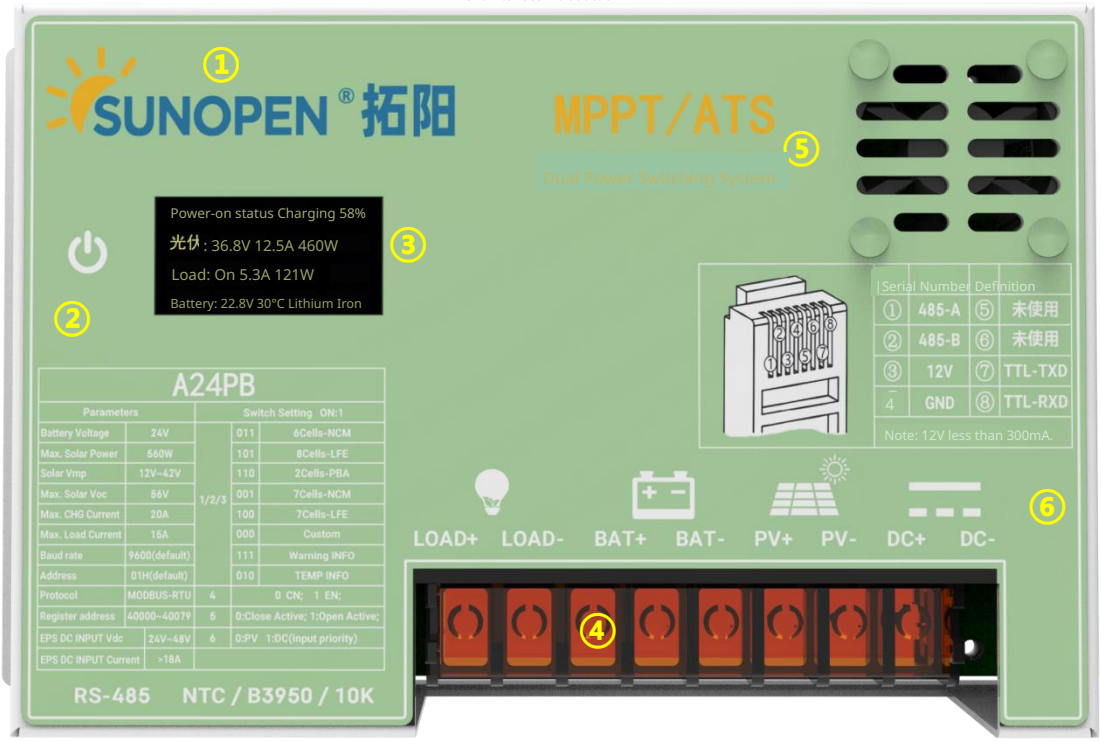
Ensure the system is stable and reliable. The A24PB cleverly reuses the internal DC/DC conversion hardware, saving costs.

1.2 Product Features

- Using MPPT (Maximum Power Point Tracking) technology, the MPPT tracking efficiency can reach 99.9%.
- The industry's first MPPT control integrated ATS system.
- The configurable backup power intervenes to start or stop the ATS system based on the battery voltage.
- The size of the configurable backup power replenishment can be adjusted to make the most reasonable use of solar energy, reducing the reliance on grid electricity for replenishment.
- Supports simultaneous full power charging and discharging.
- Supports various types of batteries including sealed, gel, open, lithium, 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 standard Modbus protocol RS485 communication, with a configurable baud rate (default 9600bps).
- Supports standard Modbus protocol TTL communication, with a configurable baud rate (default 9600bps).
- Supports Bluetooth and Ethernet communication functions (optional).
- Equipped with comprehensive over-voltage, over-current, overload, over-temperature, and short-circuit protection mechanisms for charging and discharging.
- Uses 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 for battery type selection, Chinese-English switch, interface switch toggle, input priority setting	See the toggle switch section for details
②	Start Button	Side Boat-Type Switch
③	Display Screen Interface	
④	Load Interface; Battery Interface; Photovoltaic Input Interface; Backup Power Interface	Interface Fence
⑤	Fan Outlet	Do Not Block
⑥	Mounting hole for earth screw	

Side interface introduction

Serial Number	Function Description	Remarks
①	RS485 communication interface	Pin definitions for the interface can be found in other sections
②	Battery temperature monitoring interface, external NTC B3950 10K temperature sensor	No battery temperature monitoring when not connected

The A24PB 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.

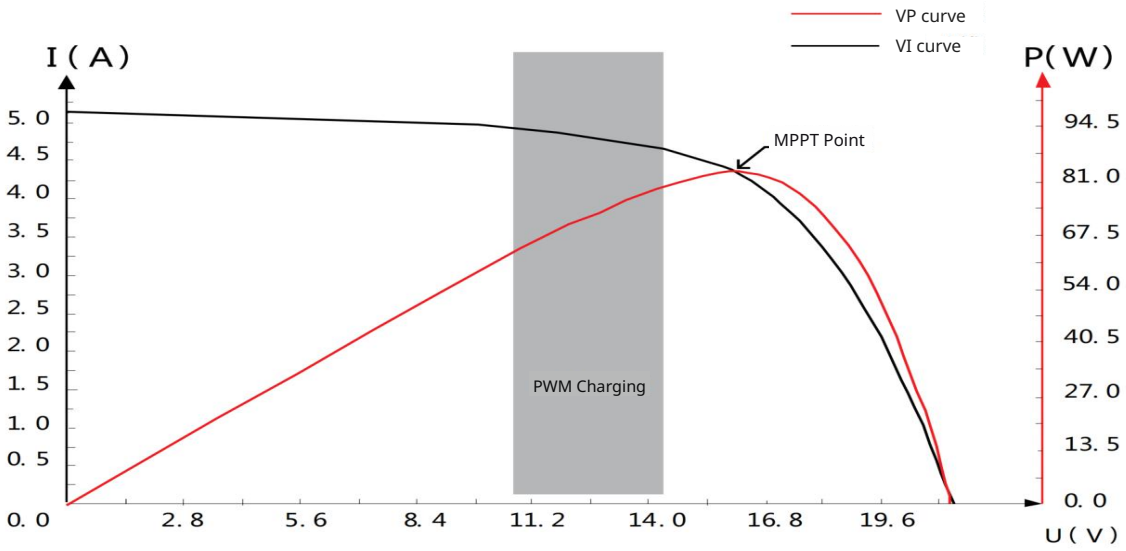


Figure 1-2 Battery panel output characteristic curve

Due to variations in environmental temperature and light conditions, the maximum power point often 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 automated, requiring no adjustments from the user.

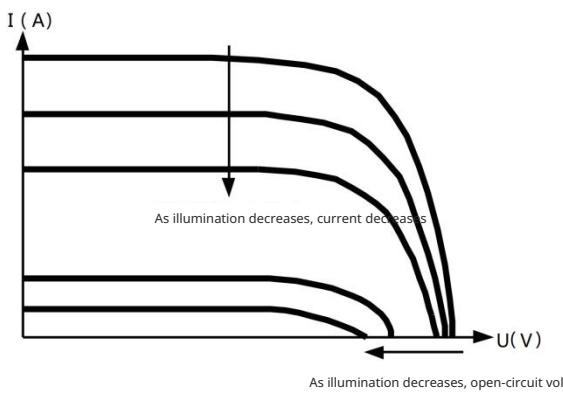


Figure 1-3 Relationship between solar panel output characteristics and light intensity

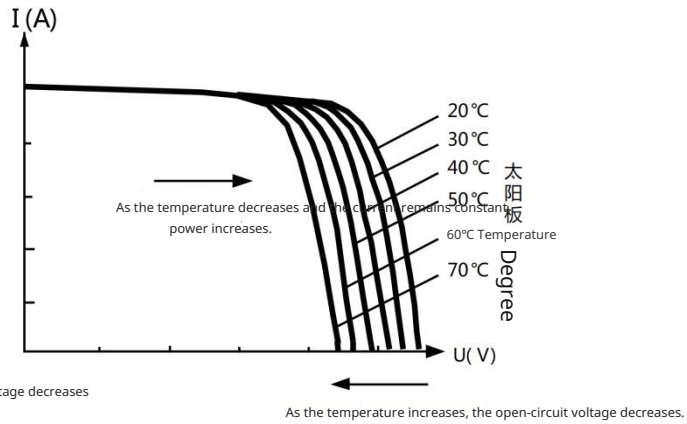


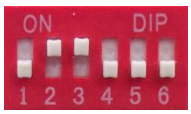
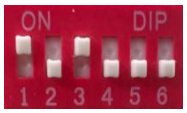
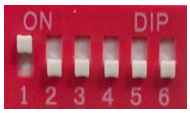
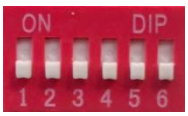
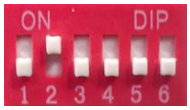
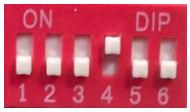
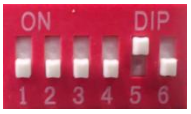
Figure 1-4 Relationship between solar panel output characteristics and temperature

2. Technical Parameters

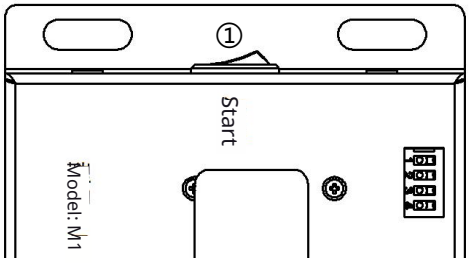
Product Model	**A24PB**
Static Power Consumption	≤30mA
Battery Type	Three-way/Lithium Iron/Lead Acid/Colloidal/Other Batteries (Users can configure independently based on the upper computer)
Battery Voltage	24V Platform
System Mode	Step-down
Rated Battery Charging Current	20A
Maximum PV Input Current	18A
Maximum Solar Panel Power	560W
Max: PV Open Circuit Voltage (Voc)	<56V (System Voltage Rating 63V)
Recommended PV Power Point Voltage (Vmp)	30V~50V (Recommended for 24V system)
AUX Input Voltage	<52V
Maximum Input Current	20A
Maximum Input Power	480W
Battery Voltage to Start ATS System Setting	Battery voltage is 20V~25.2V (e.g., set to 22V upper limit, 24V lower limit; if the battery voltage is less than 22V, ATS will automatically intervene; otherwise, it will not intervene; if greater than 24V, it will automatically stop)
Maximum System Voltage Rating	63V(±2%) overvoltage will damage the system
MPPT Tracking Efficiency	>99.9%
MPPT Tracking Speed	<1ms
Charging Conversion Efficiency	>96%
Rated Load Current	15A
Load Operating Mode	Manual Mode, Automatic Mode (Users can configure independently via the upper computer)
Charging Operating Mode	Activation/Trickle/Constant Current/Constant Voltage
Battery charging temperature control can be set	√
Temperature protection	√
Activate battery	√
Load overload/short circuit protection	√
TTL communication	√
RS485 communication	√
External 12V power supply (<300mA)	√
Display screen	√
Support SOC display	√
Charging power can be set	√
Battery model series can be configured	√
Supports Bluetooth (optional expansion)	√
Supports Ethernet (optional expansion)	√
Set to auto-save	√
Supported baud rate types	4800/9600/14400/19200/38400/56000/57600 default 9600 (replacement requires configuration via host computer)
Backlight adjustment function	A24PA does not support, always on, can be adjusted according to customer needs
Protection function	PV over-voltage protection, PV reverse connection protection, PV short circuit protection, night reverse charge 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
Operating temperature range	- 35℃~65℃
Protection level	IP32
Cooling method	Natural cooling, air cooling
Dimensions	Length x Width x Height 97x170x37mm
Weight	0.55kg
Lithium iron phosphate battery supports	7, 8 series
Nickel-cobalt-manganese lithium battery supports	6, 7 series
Lead-acid/gel battery supports	2 series
Other batteries	Users can set undervoltage and overvoltage points (set via the upper computer 16V~30V)

3. Dip switch and power on/off instructions

3.1 Dip Switch Usage Instructions (Please ensure to select the correct battery type in advance)

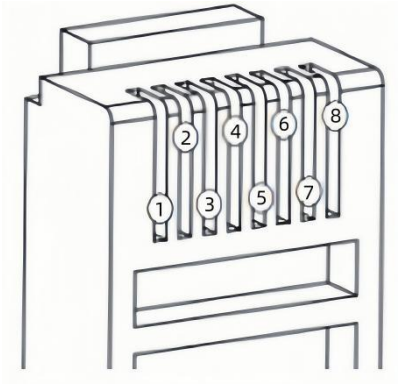
	The first three dial codes [1 2 3] “011” represent: selecting 6 series of ternary batteries Over-voltage protection point: 25.2V Under-voltage protection point: 17.4V (automatically generated by the system)
	The first three dip switches [1 2 3] “101” represent: Select 8 series lithium iron phosphate battery Over-voltage protection point: 28.8V Under-voltage protection point: 22.4V (automatically generated by the system)
	The first three dip switches [1 2 3] “110” represent: Select 24V lead-acid or 24V gel battery Over-voltage protection point: 28.8V Under-voltage protection point: 21.0V (automatically generated by the system)
	The first three dip switches [1 2 3] “001” represent: Select 7 series ternary battery Over-voltage protection point: 29.4V Under-voltage protection point: 20.3V (automatically generated by the system)
	The first three dip switches [1 2 3] “100” represent: Select 7 series lithium iron phosphate battery Over-voltage protection point: 25.2V Under-voltage protection point: 19.6V (automatically generated by the system)
	The first three dip switches [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 switches [1 2 3] “111” represent: All alarm information can be viewed (using this function will automatically stop charging the system)
	The first three dip switches [1 2 3] “010” represent: System temperature information and battery temperature information can be viewed (using this function will automatically stop charging the system), users need to configure the protection values through the upper computer
	The 4th dip switch “1”: English interface, “0”: Chinese interface
	The 5th dip switch “1”: Start activation; “0”: Disable activation;
	The 6th dip switch “1”: Priority charging from backup power input; “0”: Priority charging from photovoltaic input (default)

3.2 Device Startup Switch Usage Instructions



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

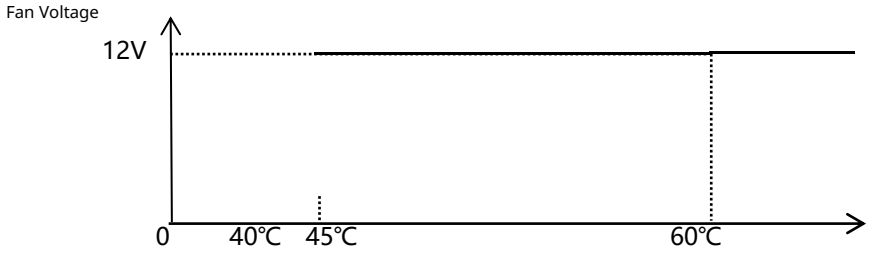
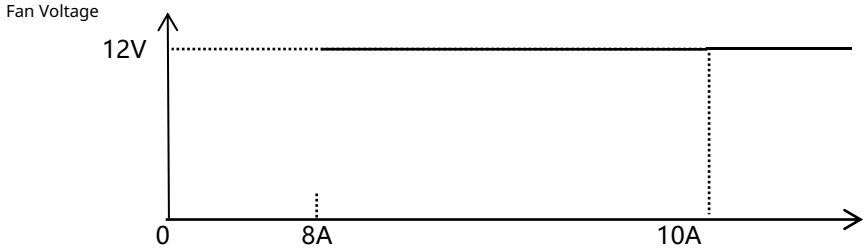
4. TTL Communication, RS485 Communication, External 12V Output Interface Pin Definitions



Serial Number	Definition
①	485-A
②	485-B
③	12V
④	GND
⑤	Unused
⑥	Unused
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

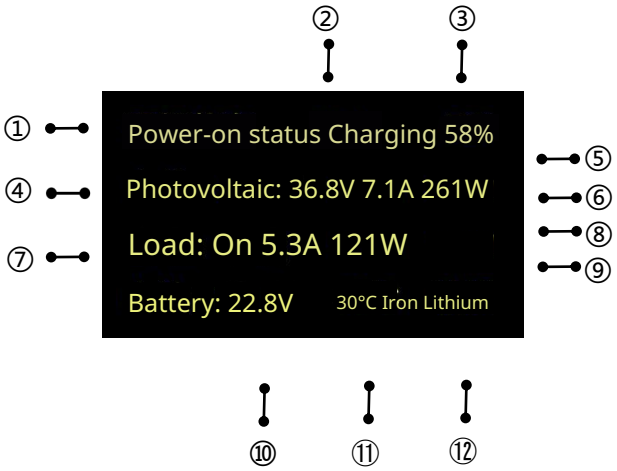
Serial Number	Fan Start Logic Diagram
When PV Charging	
When the PV is not charged, it starts with the discharge load current.	

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 end	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.
Load unable to 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 turn	1. Check if there are any foreign objects blocking the fan and clean the air duct regularly. 2. If the fan still does not turn after cleaning, contact customer service for fan replacement. 3. Check if the silent mode is enabled.

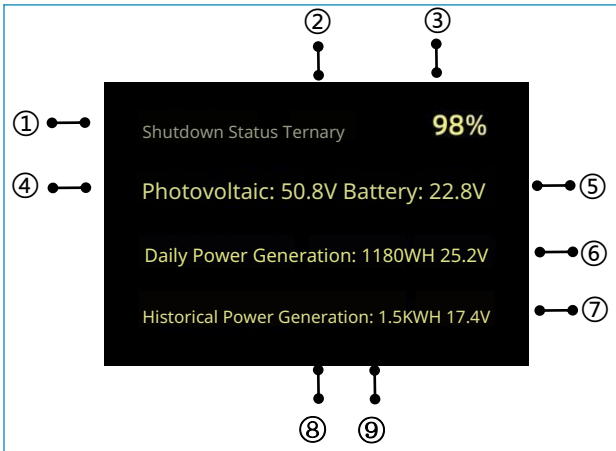
7. Display Interface Introduction

7 . 1Start System Display Interface



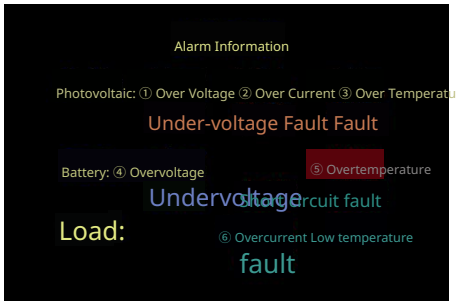
① Power On Status Display
② The system is in charging state (charging, discharging, protection)
③ State of Charge (SOC) display
④ Display photovoltaic voltage value, backup power supply voltage value, alternating
⑤ Display photovoltaic charging current magnitude
⑥ Display photovoltaic charging power magnitude
⑦ Load startup status display
⑧ Display load output current magnitude
⑨ Display load output power magnitude
⑩ Display battery voltage magnitude
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



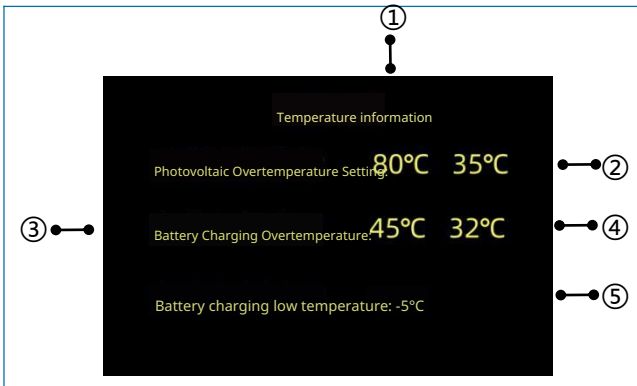
① Indicates the current state is off
② Indicates the current battery selection is ternary type
③ Displays battery state of charge (SOC)
④ Displays photovoltaic/backup power voltage values alternately
⑤ Displays battery voltage values
⑥ Current battery overvoltage protection setting point/ATS startup voltage
⑦ Current battery undervoltage protection setting point/ATS shutdown voltage
Display the power generation for the day
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" prompt
⑥ Load "Short Circuit", "Over Current", "Fault" prompt

7 . 9System temperature interface



① Current photovoltaic over temperature protection point (can be modified via the upper computer)
② Current photovoltaic working real-time temperature
③ Current battery set charging over-temperature value (modifiable via upper computer)
④ Current battery real-time temperature
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, so ensure the surrounding environment is well-ventilated.
- The battery may produce flammable gases; keep away from sparks.
- When installing outdoors, avoid direct sunlight and rainwater infiltration.
- Loose connections and corroded wires can cause significant heat, melting the wire insulation, burning surrounding materials, and even causing fires. 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 safe levels for the human body. When operating, be sure to use insulated tools and keep your hands dry.
- The battery terminals on the controller can connect to either a single battery or a group of batteries. The subsequent instructions in the manual are for single battery use but are also applicable to a system 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

The wiring and installation methods must comply with national and local electrical code requirements. The wiring specifications must be selected according to the rated current, generally at 5A/mm^2.

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 mounting screws

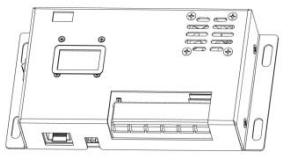
Mark the installation position according to the controller's installation dimensions, drill two appropriately sized mounting holes at the marked points, and secure the screws in the two mounting holes.

Step 3: Secure the controller

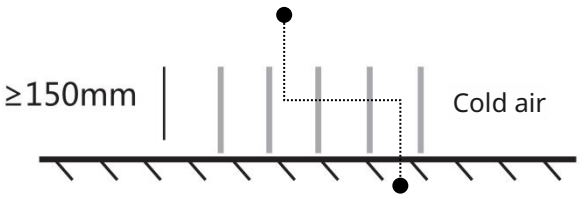
Align the controller's mounting holes with the two pre-secured screws and hang it up, then secure the two screws at the bottom.

Step 4: Secure the grounding wire

Lock one wire to the side screw of the controller, and connect the other end effectively to the ground (it can be tied to a metal block for burial) to direct leakage, static electricity, and lightning currents into the ground.



Effective grounding of the equipment



9. Protection Functions

- Device Overtemperature Protection

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

- Battery Overtemperature Protection

  The battery over-temperature 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 lower than the set value and remains 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.

- Photovoltaic Input Reverse Polarity Protection

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

- Nighttime Reverse Charge Protection

  Prevents the battery from discharging through the solar panel at night. Special Note: There is no reverse polarity protection function for the battery.

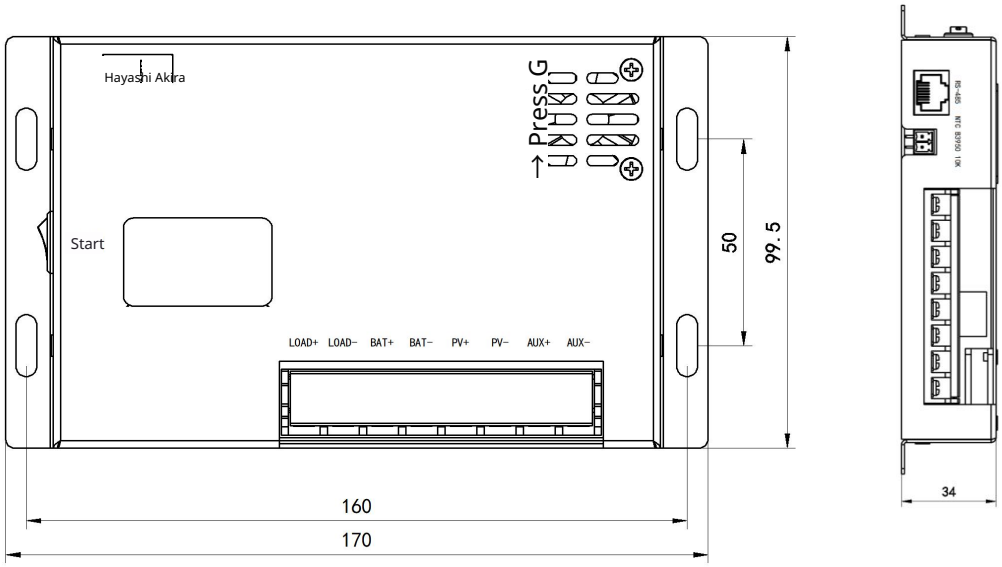
10. System Maintenance

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 whether the terminal blocks have signs of corrosion, insulation damage, high temperature, burning/discoloration, deformation of the casing, etc. Repair or replace them in a timely manner.
- If any exposed, damaged, or deteriorating insulation wires are found during inspection, they should be repaired or replaced promptly.
- If there is dirt, nesting insects, or corrosion found during inspection, it should be cleaned up in a timely manner.

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

11. Product Dimension Diagram



12. Communication Protocol

12.1 Basic communication configuration

Transmission Mode	RTU	Protocol Standard/Function Code	0x02 Read one or more input statuses	Bitwise Read
Baud rate	Default is 9600bps	This communication protocol is based on <Standard MODBUS protocol>, where the master cyclically requests data from the slave, and the slave receives the request command and responds with data.	0x03 Read Holding Registers	Read as 16-bit words
Checksum	No checksum		0x04 Read a Register	Read as 16-bit words
Data bits	8bit		0x05 Write a Coil Status	Bit-wise write
Stop bit	1bit		0x06 Write a holding register	Write in 16-bit words
Frame interval	Not less than 3.5 byte times		0x10 Write multiple holding registers	Write in 16-bit words
Frame length	200 Byte	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 response time of the slave	350 Byte time			
Minimum polling interval of the host	400 Byte 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	12422	A24PA
40001	Software Version	2	R	10	V1.0
40002	Hardware Version	2	R	10	V1.0
40003	Maximum Power Support	2	R	580	580W
40004	Maximum Input and Output Current	2	R	1820	PV:10A, BAT:12A
40005	Photovoltaic Voltage Reduction Heat Sink Temperature	2	R	25	Current System Temperature 25 Degrees Celsius
40006	P V N T C Status	2	R	0	0~7
40007	B A T N T C Status	2	R	0	0~7
40008	Reserved	2	R	Unused	Reserved
40009	Reserved	2	R	Unused	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	Unused	Reserved
40016	Reserved	2	R	Unused	Reserved
40017	Reserved	2	R	Unused	Reserved
40018	Reserved	2	R	Unused	Reserved
40019	DC input voltage	2	R	3624	36.24V (accuracy 0.01V)
40020	Photovoltaic input voltage	2	R	5098	50.98V (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 radiator temperature	2	R	20	20 (accuracy 1℃)
40024	Photovoltaic fault code	2	R	0	See Fault Table 1
40025	Battery Output Voltage	2	R	2256	22.56V (Accuracy 0.01V)

40026	Battery output current	2	R	12	1.2A
40027	Battery output power	2	R	100	100W
40028	Battery heatsink 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 Value	2	R	982	98.2%
40036	Reserved	2	R	Unused	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	560	56.0V
40041	Minimum Voltage for Photovoltaic Access	2	R	140	14.0V
40042	User set maximum charging power	2	R/W	100	100W (Limit maximum charging power setting for photovoltaic)
40043	Reserved	2	R/W	Unused	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	25.2V (System automatically allocates based on the dip switch)
40048	Battery discharge minimum voltage setting	2	R	1120	17.6V (system automatically allocates based on the switch)
40049	Reserved	2	R/W	Unused	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	<0 stop charging the battery
40054	Reserved	2	R/W	Unused	Reserved
40055	Set battery type	2	R	0	0: Ternary lithium, see Function Table 1
40056	Set battery series	2	R	6	Ternary lithium 6 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 (A24PA 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 A24PA do not support)
40061	Lock screen	2	R/W	0	0: Unlock, 1: Lock (some models A24PA do not support)
40062	SetA T Scharging power level	2	R/W	100	100W (unit 1W) (default)
40063	User-defined battery overvoltage value	2	R/W	260	26.0V(100~170)
40064	User-defined battery undervoltage value	2	R/W	200	20.0V(75~140)
40065	User-defined load short-circuit time	2	R/W	100	100*20(us)(Customer adjusts based on external load)
40066	A T Ssystem startup voltage	2	R/W	220	Battery voltage less than 22.0V starts the ATS system
40067	A T Ssystem shutdown voltage	2	R/W	240	Battery voltage greater than 24.0V starts the ATS system
40068	Set load start hysteresis value	2	R/W	1000	1000mV
40069	Reserved	2	R/W	Unused	Reserved
40070	Reserved	2	R/W	Unused	Reserved

13. Detailed Attachment Table

13.1 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 One (Decimal)					
OV	Solar Panel Over Voltage	1	SC	Solar Panel Short Circuit	128
UV	Solar Panel Under Voltage	2			
OT	System Overheating	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 Over Voltage	1	SF	Battery Current Sensor Fault	128
UV	Battery Under Voltage	2	SC	Battery Short Circuit	256
OT	Battery Over Temperature	4	LOC1	Load Level 1 Over Current	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