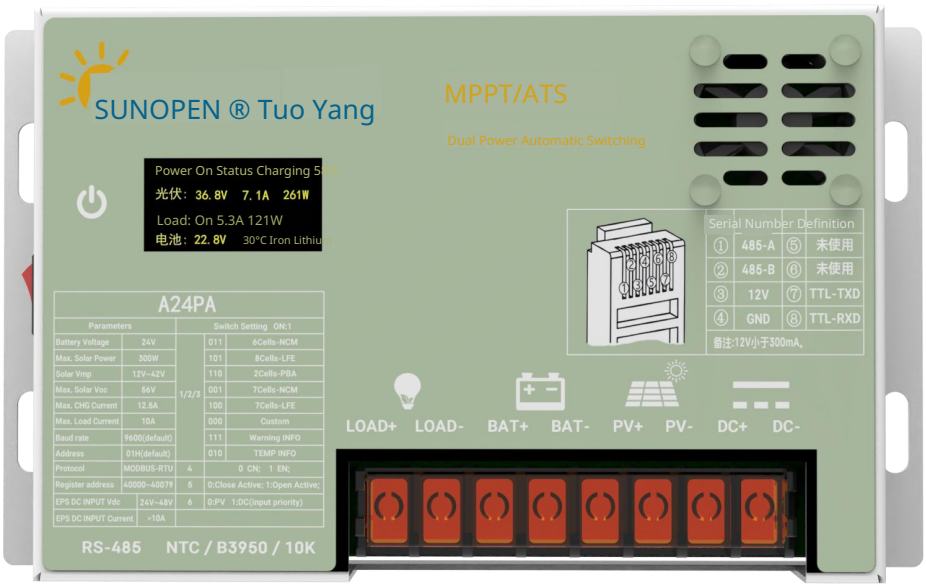
M P P T Solar Charging Controller User Manual

A24PA Model

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

Intelligent dual power switching / AC direct DC supplement

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 this controller operates at a voltage exceeding the safe voltage for the human body, please read the manual carefully and complete safety operation training before operating this controller.

2. There are no components 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.

Please install the controller in a well-ventilated area, as the temperature of the heat sink will 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; safety preparations must be made before proceeding.

Note: Indicates that this operation is destructive.

Tip: Indicates suggestions and tips for the operator.

Table of Contents

1.1 Product Overview

The A24PA 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.

Highlights: The A24PA comes with an ATS (Automatic Transfer Switch) system, integrating an automatic dual power switch system and MPPT system in a compact size. The power charging capacity of the switched power supply is equal to that of its own MPPT charging power. Efficiency reaches >96%~99%. If the battery does not have enough power to supply the system throughout the night due to daytime environmental issues, the A24PA will automatically switch to supply power from the mains DC to the battery until it is fully charged, then stop automatically.

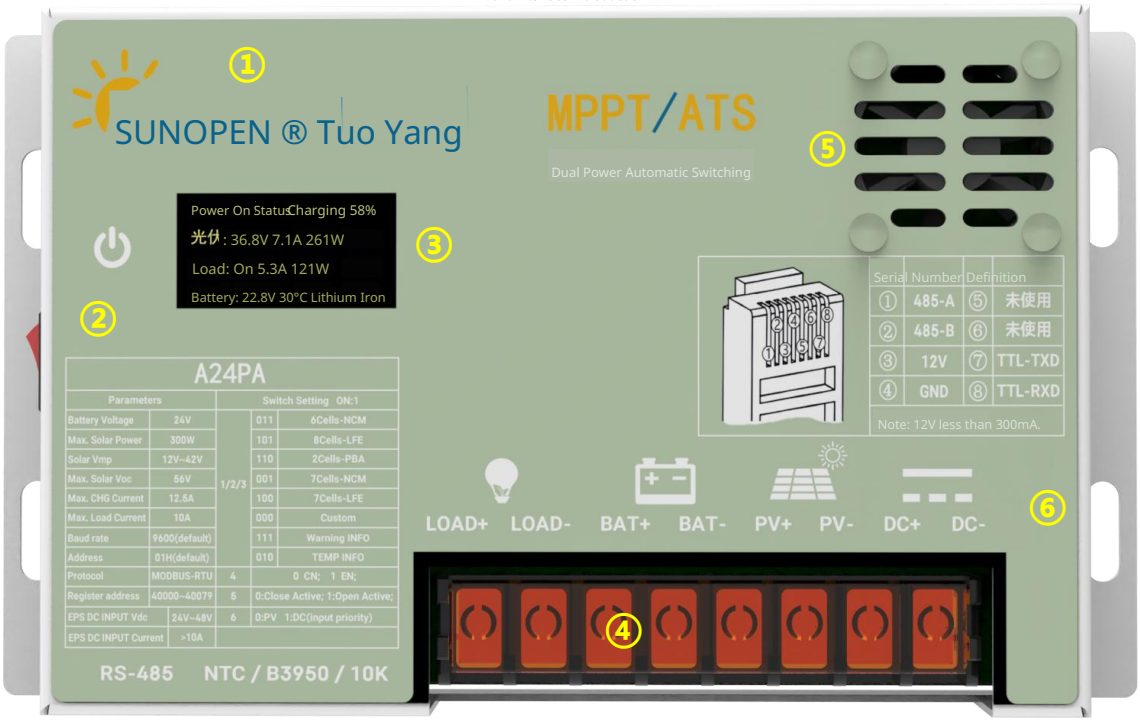
Ensure the system is stable and reliable. The A24PA cleverly reuses the internal DC/DC conversion hardware, saving costs.

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 system intervenes based on whether the battery voltage activates the ATS system.
- 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, colloidal, open, lithium batteries, and custom types.
- Supports lithium battery and lead-acid activation.
- Support for charging current settings.
- Support full 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, baud rate adjustable (default 9600bps).
- Supports TTL communication with standard Modbus protocol, baud rate adjustable (default 9600bps).
- 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.
- Uses high-quality aluminum heat sinks, air cooling, and high-temperature derating treatment 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 and English switching, interface toggle switch, input priority setting	For details, see the toggle switch section
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	Pin definitions for the interface are in other sections
②	Battery Temperature Monitoring Interface, external NTC B3950 10K temperature sensor	No battery temperature monitoring when not connected

The A24PA series Maximum Power Point Tracking (MPPT) system is an advanced charging technology that adjusts the operating state of electrical modules 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 equipped with MPPT technology can continuously track the maximum power point of the array to charge the batteries with the maximum energy. 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 output.

MPPT controllers can overcome this issue by dynamically 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.

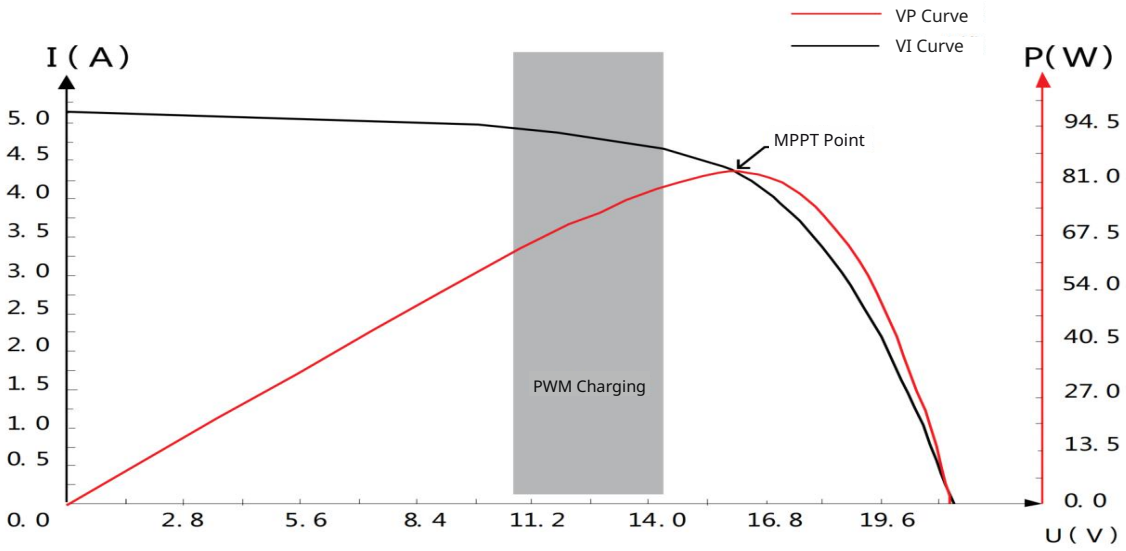


Figure 1-2 Battery panel output characteristic curve

Due to variations in environmental temperature and lighting conditions, the maximum power point frequently changes. Our company's MPPT controller can adjust parameters in real-time based on different conditions to keep the system near the maximum operating point at all times. The entire process is fully automated, requiring no adjustments from the user.

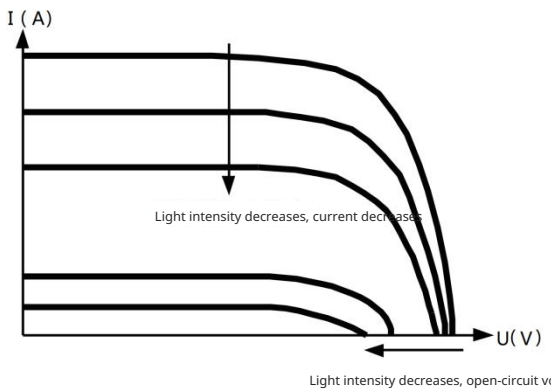


Figure 1-3 Relationship between battery panel output characteristics and illumination

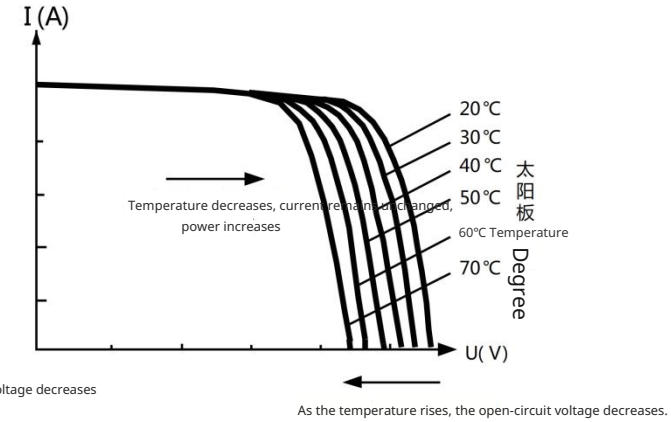
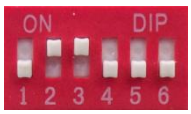
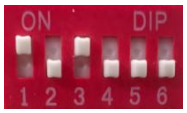
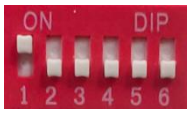
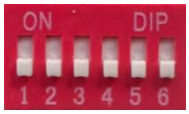
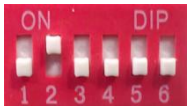
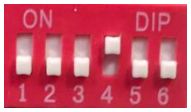
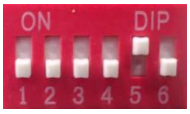


Figure 1-4 Relationship between battery panel output characteristics and temperature

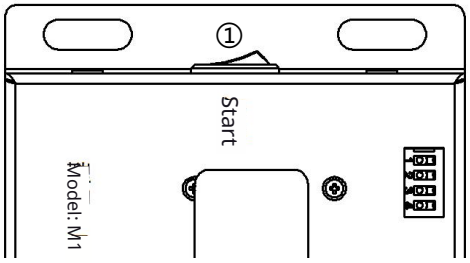
Product Model	**A24PA**
Static Power Consumption	≤30mA
Battery Type	Tri-element/Lithium Iron/Lead Acid/Colloidal/Other Batteries (Users can configure independently based on the upper computer)
Battery Voltage	24V Platform
System Mode	Step-down
Rated Battery Charging Current	12.5A
Maximum PV Input Current	10A
Maximum Solar Panel Power	300W
Max: PV Open Circuit Voltage (Voc)	56V (System withstand voltage 63V)
Recommended PV power point voltage (Vmp)	16V~44V (Recommended)
AUX input voltage	52V
Maximum input current	10A
Maximum input power	300W
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)
System maximum withstand voltage	Overvoltage of 63V (±2%) will damage the system
MPPT tracking efficiency	>99.9%
MPPT tracking rate	<1ms
Charging conversion efficiency	>96%
Rated load current	10A
Load operating mode	Manual mode, automatic mode (users can configure independently via the upper computer)
Charging Work 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 automatic save	√
Supported baud rate types	4800/9600/14400/19200/38400/56000/57600 default 9600 (replacement requires upper computer configuration)
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 (fuse)
Operating temperature range	- 35℃~65℃
Protection level	IP32
Cooling method	Natural convection, air cooling
Dimensions	Length x Width x Height 97x170x32mm
Weight	0.47kg
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 10V~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)

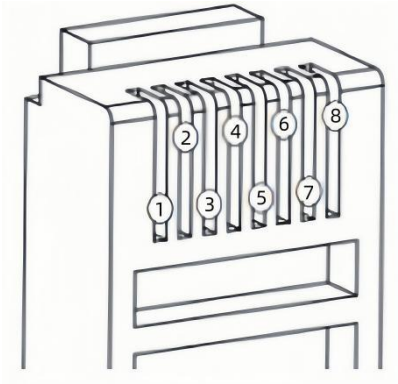
	The first three dip switches [1 2 3] “011” represent: selecting 6 series lithium batteries Over-voltage protection point: 25.2V Under-voltage protection point: 17.4V (automatically generated by the system)
	The first three dip switches [1 2 3] “101” represent: selecting 8 series lithium iron phosphate batteries 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: selecting 24V lead-acid or 24V gel batteries 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: selecting 7 series lithium batteries 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: selecting 7 series lithium iron phosphate batteries 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 customer 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”: prohibit activation;
	The 6th switch "1": Priority charging from backup power input; "0" priority charging from photovoltaic input (default)

3.2 Device Startup Switch Instructions



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

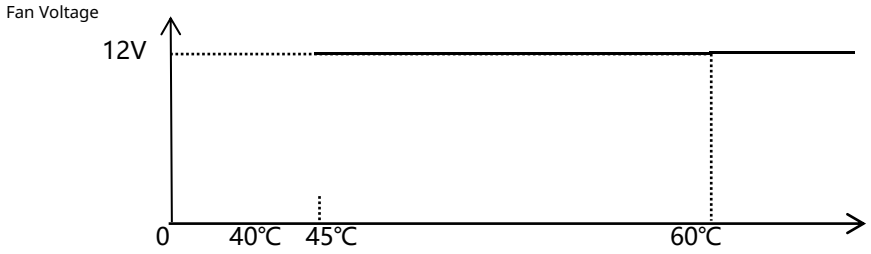
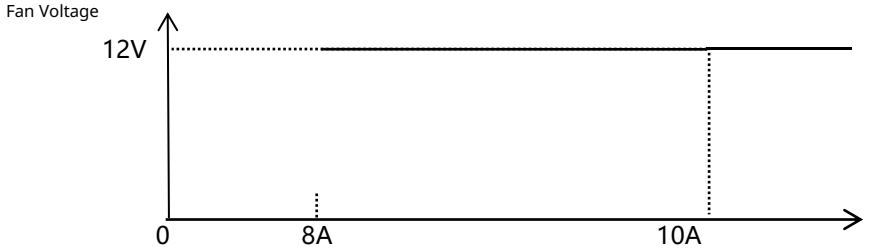
4. TTL Communication, RS485 Communication, External 12V Output Interface Pin Definitions



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

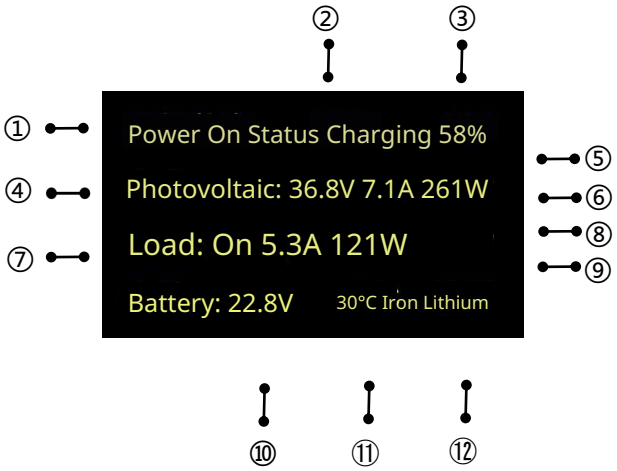
Serial Number	Fan Startup Logic Diagram
During PV charging	
PV starts with discharge load current when not charged	

6. Common Problems and Solutions

Phenomenon	Treatment method
Indicator light, LCD screen not lit	Check if the connections of the battery and solar panel are correct
Solar panel has voltage, no voltage output at the battery terminal	Disconnect the battery to check if there is 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.
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 anomalies	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 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. Is the silent mode set?

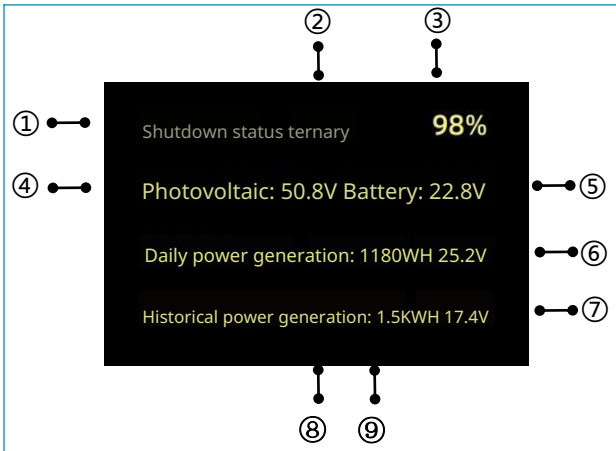
7. Display Interface Introduction

7 . 1Start System Display Interface



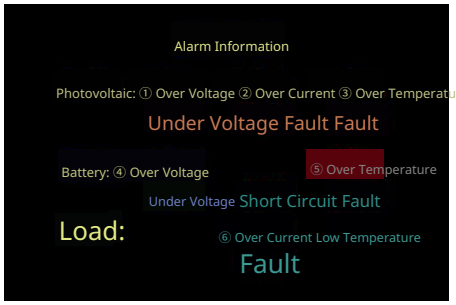
① Power-on status display
② The system is in charging state (charging, discharging, protection)
③ Battery SOC display
④ Display photovoltaic voltage value, backup power supply voltage value, alternately
⑤ Display photovoltaic charging current size
⑥ Display photovoltaic charging power size
⑦ Load startup status display
⑧ Display load output current size
⑨ Display load output power size
⑩ Display battery voltage size
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



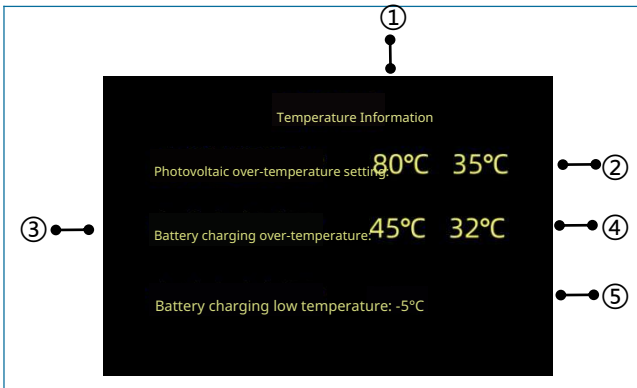
① Represents the current state is off
② Represents the current battery selection is ternary type
③ Displays battery state of charge (SOC)
④ Alternately displays photovoltaic/backup power voltage values
⑤ Displays battery voltage values
⑥ Current battery over-voltage protection setting point/ATS startup voltage
⑦ Current battery under-voltage protection setting point/ATS shutdown voltage
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" prompt
Load "short circuit," "overcurrent," "fault" prompt

7 . 5System Temperature Interface



① Current photovoltaic over-temperature protection point (modifiable via upper computer)
② Current photovoltaic operating 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; 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 excessive 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 terminal on the controller can be connected to either a single battery or a group of batteries. The subsequent instructions in the manual are for use with a single battery, but are also applicable 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, do not reverse the battery connections, as this can cause irreversible damage.

8.2 Installation Steps

Wiring and installation methods must comply with national and local electrical code requirements. Wiring specifications should be selected based on 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.

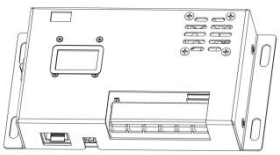
Mark the installation position according to the controller's installation dimensions, drill two appropriately sized mounting holes at the marked points, and secure the screws in the two mounting holes.

Step 3: Secure the controller.

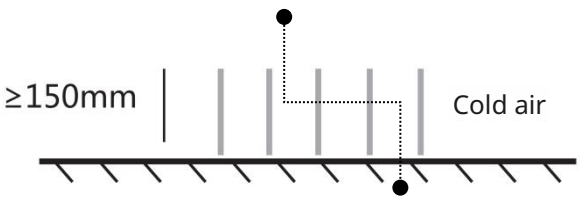
Align the controller's mounting holes with the two pre-secured screws, hang it up, and then secure the two screws at the bottom.

Step 4: Fix 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 buried with a metal block) to allow leakage, static electricity, and lightning current 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 mode.

- Excessive Voltage at Photovoltaic Input

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

- Reverse Polarity Protection for Photovoltaic Input

  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 Anti-Reverse Charge Protection

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

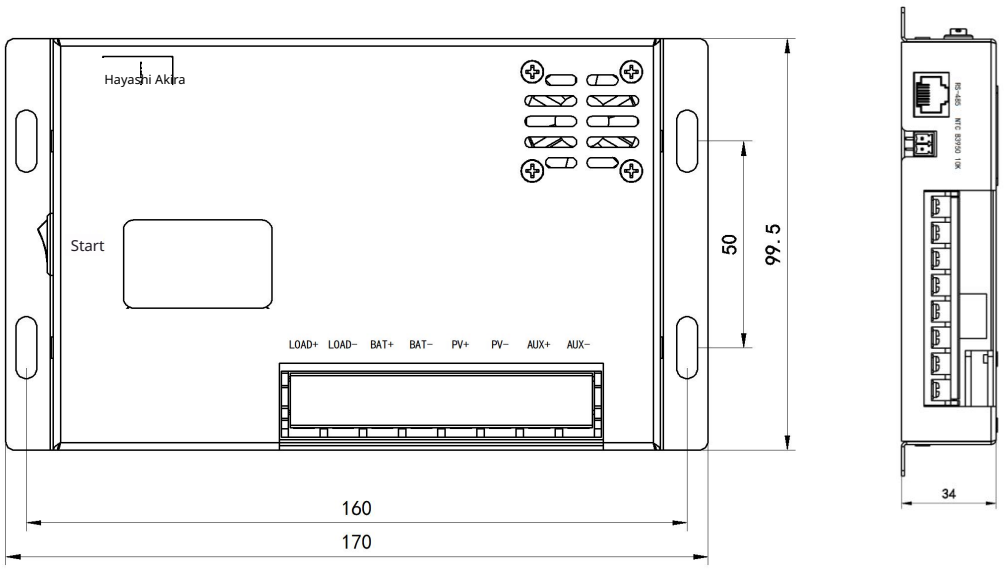
10. System Maintenance

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

- When abnormal faults or error messages are detected, 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 exposed, damaged, or poorly insulated wires are found, they should be repaired or replaced promptly.
- If dirt, nesting insects, or corrosion are present, 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 or checks! Non-professionals should not operate without authorization.

11. Product Dimension Diagram



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>, 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
Parity Bit	No Parity		0x04 Read One Register	Read by 16-bit words
Data Bits	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 holding registers	Write by 16-bit word
Frame length	200 1 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 1 byte time			
Minimum polling interval of the host	400 1 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	11221	A24PA
40001	Software Version	2	R	10	V1.0
40002	Hardware Version	2	R	10	V1.0
40003	Maximum Power Support	2	R	180	300W
40004	Maximum Input and Output 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	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 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	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 Heat Sink 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 working mode	2	R	0	See 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-defined maximum charging power	2	R/W	100	100W (Limit for maximum photovoltaic charging power setting)
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 (The system automatically allocates based on the dial)
40048	Battery discharge minimum voltage setting	2	R	1120	17.6V (The system automatically allocates based on the dial)
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 number	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 Settings	2	R	0	0: Activate (Default for A24PA model)
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 A24PA)
40061	Lock Screen	2	R/W	0	0: Unlock, 1: Lock (Some models do not support A24PA)
40062	SetA T Scharging power size	2	R/W	100	100W (unit 1W) (default)
40063	User set battery over-voltage value	2	R/W	260	26.0V(100~170)
40064	User set battery under-voltage 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 System startup voltage	2	R/W	220	Battery voltage less than 22.0V starts the ATS system
40067	A T System shutdown voltage	2	R/W	240	Battery voltage greater than 24.0V starts the ATS system
40068	Reserved	2	R/W	Unused	Reserved
40069	Reserved	2	R/W	Unused	Reserved
40070	Reserved	2	R/W	Unused	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 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