MPPT Solar Charge Controller User Manual

Model M24PB

For 24V Batteries System(Ternary, Lithium Iron Phosphate, Lead Acid, Custom) Step-Down Version

Manual Version: V1.1 Subject to change without notice. Contact sales for the latest electronic documentation.

Thank you for choosing our product!

Safety Instructions

-  As this controller operates at voltages exceeding safe human contact levels, please thoroughly read the manual and complete safety training before operation.
- before operating this controller.
-  There are no user-serviceable parts inside the controller. Do not disassemble or attempt repairs yourself.
-  Install the controller indoors to avoid exposing components and prevent water ingress into the controller.
-  Install the controller in a well-ventilated area, as the heat sink will become very hot during operation.
-  It is recommended to install an appropriate fuse or circuit breaker externally on the controller.
-  Before connecting or adjusting the controller wiring, disconnect the PV array and open the fuse or circuit breaker near the battery terminals.
-  After installation, inspect all wiring connections to ensure they are secure and prevent potential hazards caused by loose connections leading to heat buildup.

 **Warning: Indicates a hazardous operation. Ensure all safety preparations are completed before proceeding.**

 **Caution: Indicates destructive consequences if performed incorrectly.**

 **Tip: Indicates recommendations and suggestions for the operator.**

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1. Product Overview

1.1 Product Overview

The M24PB controller employs industry-leading MPPT (Maximum Power Point Tracking) technology to achieve maximum energy tracking for solar panels. This enables rapid and precise tracking of the maximum power point of solar cells under all conditions, allowing real-time acquisition of the maximum energy from solar panels and significantly enhancing overall energy output.

rapidly and accurately track the maximum power point of solar cells under various environmental conditions. It captures the maximum energy output from solar panels in real time, significantly enhancing the energy utilization efficiency of solar systems.

energy utilization of solar systems. Widely used in off-grid solar photovoltaic systems, it manages the operation of solar panels, batteries, and loads, serving as the

core control component for off-grid PV systems. The controller incorporates comprehensive software and hardware fault detection and protection functions, minimizing damage to product components caused by

damage to product components caused by installation errors or system failures.

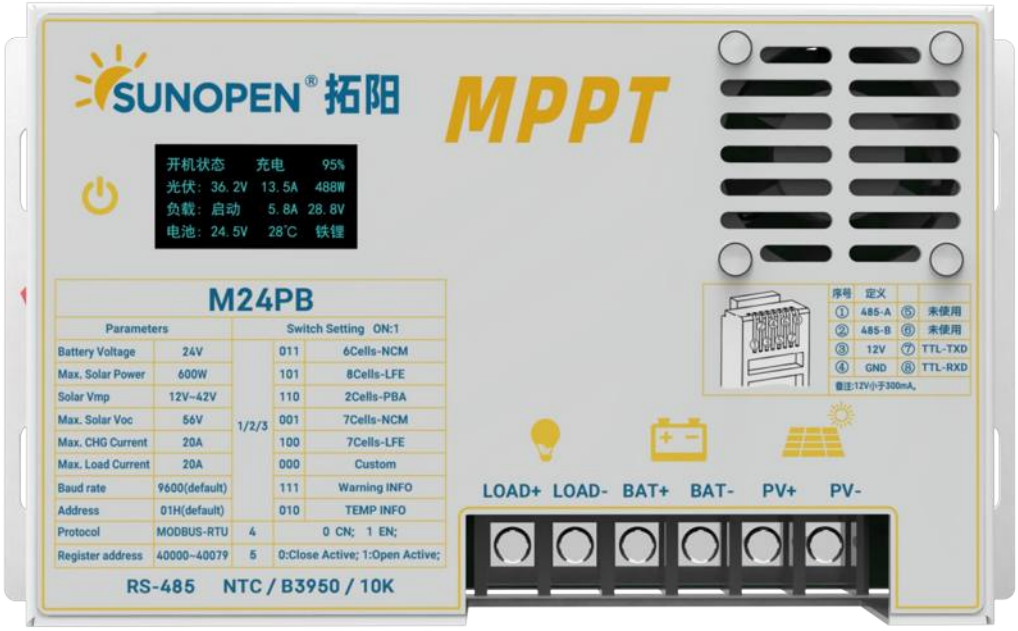
1.2 Product Features

- Utilizes MPPT (Maximum Power Point Tracking) technology with tracking efficiency up to 99.9%.
- Supports simultaneous full-power charging and discharging.
- Supports multiple battery types including sealed, gel, flooded, lithium, and custom configurations.
- Supports lithium battery and lead-acid activation.
- Supports configurable charging current settings.
- Supports full-charge settings.
- Supports temperature compensation.
- Supports parallel charging.
- Supports multiple load operating modes.
- Supports starting capacitive and inductive loads.
- Supports historical data storage.
- Supports RS485 communication with standard Modbus protocol at a fixed baud rate.
- Supports TTL communication with standard Modbus protocol at a fixed baud rate.
- Supports Bluetooth and Ethernet communication functions (optional).

- Features comprehensive charging and discharging protection mechanisms against overvoltage, overcurrent, overload, overtemperature, and short circuits.
- 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

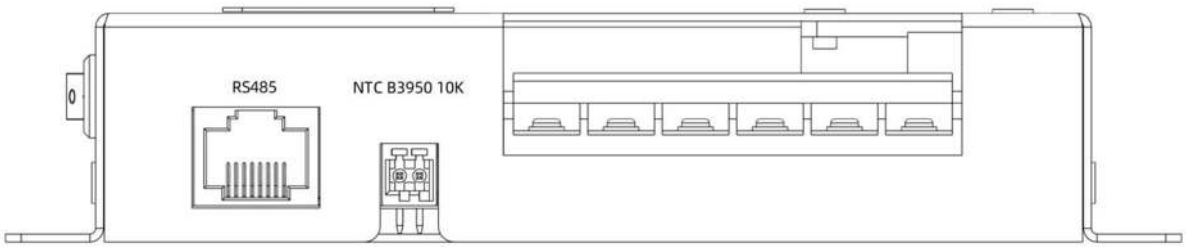
Front Panel Interface Overview



Serial Number	Function Description	Remarks
①	Battery type selection, language switching (Chinese/English), interface switching DIP switch	See DIP Switch section for details
②	Start Button	Side Toggle Switch
③	Display Interface	
④	Load interface; Battery interface; PV input interface	Interface KF2EDGR
⑤	Fan outlet	Do Not Block

⑥	Grounding screw hole positions	

Side Interface Overview



Serial Number	Function Description	Remarks
①	RS485 Communication Interface	See other sections for pin definitions
②	Battery temperature monitoring interface, external NTC B3950 10K temperature-sensing resistor	No battery temperature monitoring when unconnected

1.4 Introduction to Maximum Power Point Tracking Technology

The M24PB series Maximum Power Point Tracking (MPPT) system is an advanced charging technology that

adjusting the operating state of the electrical module to enable solar cells to output more electrical energy. Due to the nonlinear characteristics of solar cell arrays,

The nonlinear characteristics of solar cell arrays result in a maximum power point on their curve. Traditional PWM charging controllers cannot maintain

maintain charging at this point for the battery, thus failing to capture the maximum energy from the panels. However, solar

can continuously track the array's maximum power point to charge the battery with maximum energy. Taking a 12V system as an example,

, the peak voltage (Vpp) of solar cells is approximately 18V, while the battery voltage is around 12V. During charging with a conventional

During charging, the solar cell voltage remains around 12V, failing to fully utilize its maximum power potential.

MPPT controllers overcome this limitation by dynamically adjusting the input voltage and current of the solar panels in real time, maximizing the input power

. Compared to traditional PWM controllers, MPPT controllers maximize solar panel power output, thereby increasing

a higher charging current. Generally, MPPT controllers improve energy utilization by 20% to 30% compared to PWM controllers.

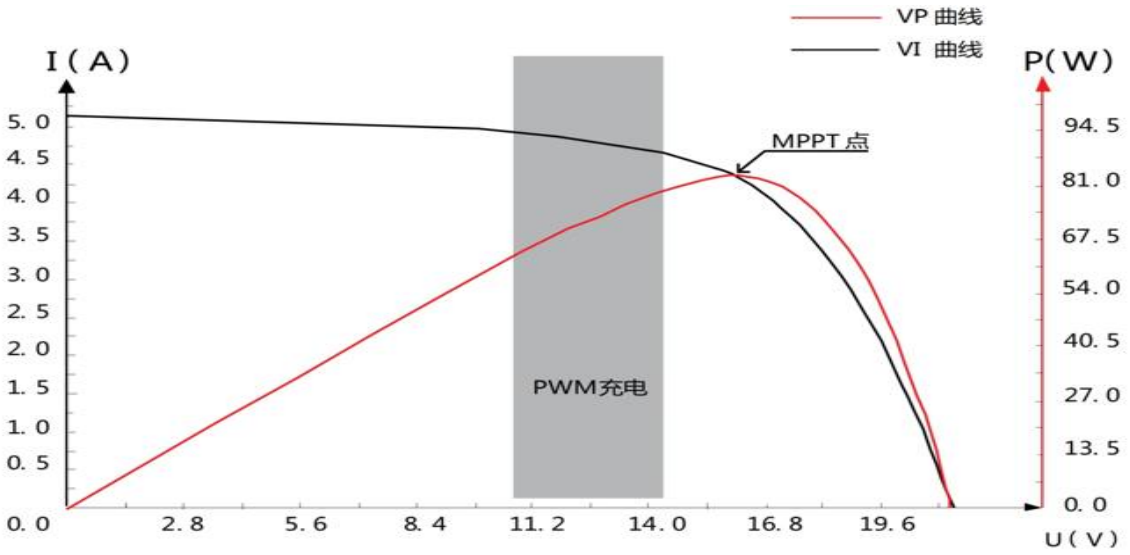


Figure 1-2 Solar Panel Output Characteristics Curve

Due to variations in ambient temperature and illumination conditions, the maximum power point frequently shifts. Our MPPT controller dynamically adjusts parameters based on these conditions to maintain the system near the maximum operating point at all times. This process is fully automated and requires no user intervention.

adjust parameters in real time based on different conditions, ensuring the system remains near the maximum operating point at all times. This process is fully automatic and requires no user intervention.

adjustment.

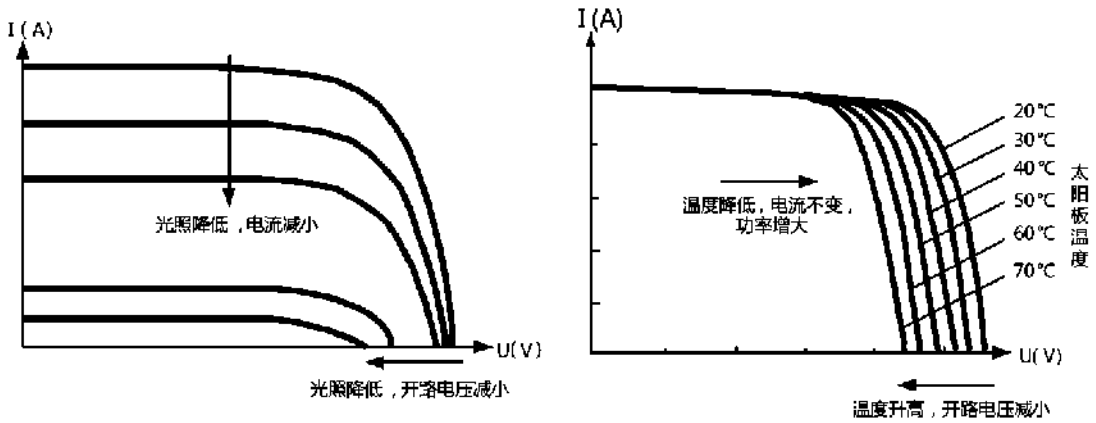


Figure 1-3 Relationship between Panel Output Characteristics and Irradiance

Figure 1-4 Relationship between Panel Output Characteristics and Temperature

2. Technical Specifications

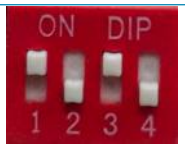
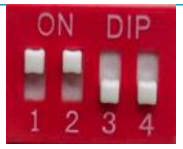
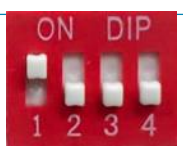
Product Model	**M24PB**
Static Power Consumption	≤30mA

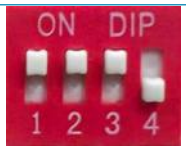
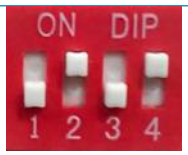
Battery Type	Ternary/Lithium Iron Phosphate/Lead Acid/Gel/Other Batteries (User-configurable via host computer)
Battery Voltage	24V Platform
System Mode	Step-down
Rated Battery Charging Current	20A
Maximum PV Input Current	18A
Maximum Solar Panel Power	600W
Max: PV Open-Circuit Voltage (Voc)	56V
Recommended PV Power Point Voltage (Vmp)	24V~42V (Recommended)
System Maximum Withstand Voltage	63V (±2%) Overvoltage will damage the system
MPPT Tracking Efficiency	>99.9%
MPPT Tracking Speed	<1ms
Charging Conversion Efficiency	>96%
Rated Load Current	20A
Load Operating Mode	Manual mode, automatic mode (users can configure independently via host computer)
Charging Mode	Trickle/Constant Current/Constant Voltage
Battery Charge Temperature Control Configurable	√
Temperature Protection	√
Activate Battery	√
Overload/Short Circuit Protection	√
TTL communication	√
RS485 Communication	√
External 12V Power Supply (<150mA)	√
Display	√
Supports SOC display	√
Charging power adjustable	√
Configurable battery model and cell count	√
Supports Bluetooth (external speaker optional)	√
Supports Ethernet (external expansion, optional)	√
Settings auto-save	√
Supported baud rates	4800/9600/14400/19200/38400/56000/57600/115200 (Default: 9600; requires host computer configuration to change)
Backlight Function	Default backlight always on (backlight duration adjustable; set to 0 for constant backlight)
Protection Functions	PV overvoltage protection, PV reverse connection protection, PV short circuit protection, nighttime reverse charging protection, input power limit protection, overtemperature protection,

	Load Short Circuit Protection, Load Overload Protection, Battery Overvoltage/Over-Discharge Protection, Battery Reverse Connection Protection (**Reverse connection prohibited when startup activation function is enabled**)
Operating Temperature Range	-35°C to 65°C (No derating required up to 45°C with adequate ventilation)
Protection Rating	IP32
Cooling Method	Natural convection cooling, forced air cooling
Dimensions	Dimensions: 94.5 x 170 x 34 mm
Weight	0.55 kg
Lithium Iron Phosphate Battery Support	8 series
Ternary Lithium Battery Support	6 or 7 series
Lead-acid battery support	2-cell
Other Batteries	User-configurable under-voltage and over-voltage thresholds (set via host computer from 12V to 30V)

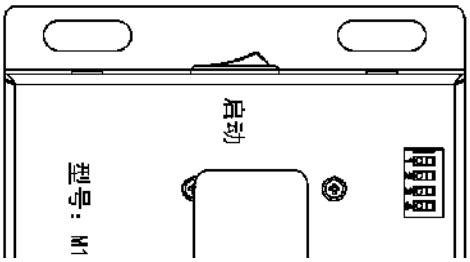
3. DIP Switch and Power Operation Instructions

3.1 DIP Switch Usage Instructions (Ensure battery type is selected beforehand)

	The first three DIP switches [1 2 3] "011" indicate: Selecting 6-series ternary batteries Overvoltage protection point: 25.2V Undervoltage protection point: 18.0V (automatically generated by the system), load recovery: 19.2V Full-charge cut-off voltage: 24.6V
	First three DIP switches [1 2 3] "101" indicates: Selecting 8-series $LiFePO_4$ batteries Overvoltage protection point: 28.8V Undervoltage protection point: 22.4V (system auto-generated), Load recovery: 24.8V Full Charge Cut-off Voltage: 27.2V
	First three DIP switches [1 2 3] "110" indicates: Select 24V lead-acid Overvoltage protection point: 28.8V Undervoltage protection point: 20.0V (system auto-generated), Load recovery: 23.0V Full Charge Cut-off Voltage: 26.4V
	First three DIP switches [1 2 3] "001" indicates: Select 7-series ternary battery Overvoltage protection point: 29.4V Undervoltage protection point: 21V (system auto-generated), Load recovery: 22.4V Full Charge Cut-off Voltage: 28.7V
	First three DIP switches [1 2 3] "100" indicates: Select 7-series lithium iron phosphate battery Overvoltage protection point: 25.2V Undervoltage protection point: 19.6V (system auto-generated), load recovery: 21.7V Full Charge Cut-off Voltage: 23.8V

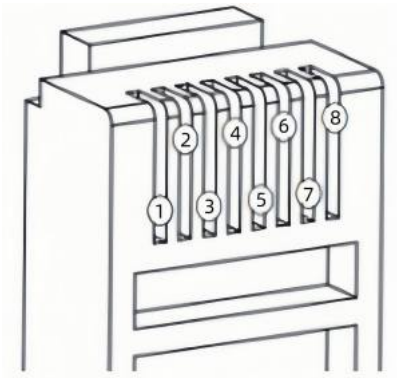
	First three DIP switches [1 2 3] "000" indicates: Custom battery configuration. Overvoltage/undervoltage thresholds require customer setup via host computer. Load recovery voltage is customizable, default 1.2V Default full-charge cut-off voltage difference: 1.0V
	First three DIP switches [1 2 3] "111" indicates: All alarm information can be viewed (using this function will automatically stop charging)
	First three DIP switches [1 2 3] "010" indicates: System temperature and battery temperature information can be viewed (using this function will automatically stop charging). Users need to configure the protection values via the host computer.
	4th DIP Switch "1": English interface, "0": Chinese interface

3.2 Device Power Switch Usage Instructions



① To power on the device, slide the switch left to off

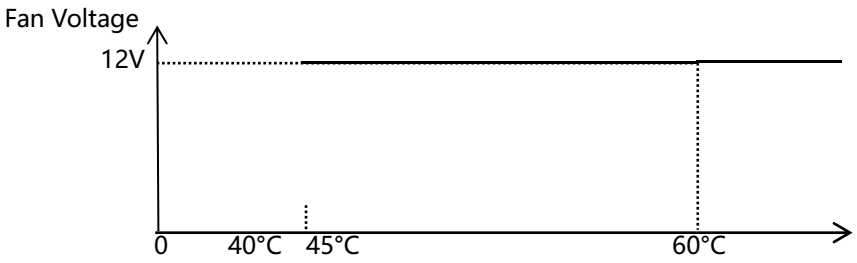
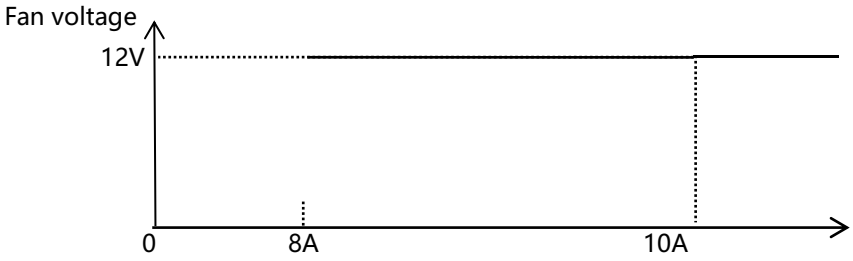
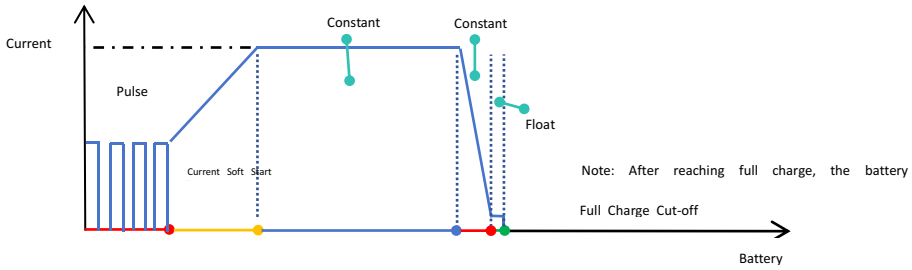
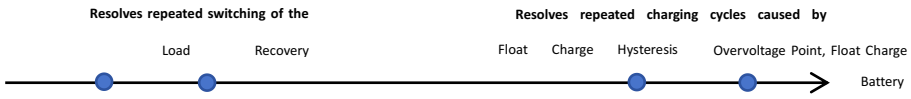
4. Pin Definitions for TTL Communication, RS485 Communication, and External



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: Maximum 300mA current at 12V. Exceeding this may damage the interface with some probability.

5. Fan Temperature Control

Serial No.	Fan Start Logic Diagram
During PV charging	
When PV is not charging, starts with discharge load current	
Six-stage current charging	
Custom Settings	 Users can reasonably set these parameters based on their battery characteristics to better protect the battery and enhance system reliability

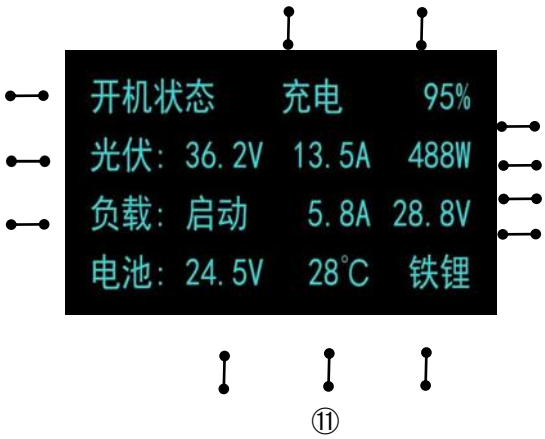
6. Common Issues and Solutions

Symptom	Solution
Indicator lights and LCD screen do not illuminate	Check if the battery and solar panel connections are correct
Solar panel shows voltage, but no voltage output at battery terminals	Disconnect the battery and check for voltage. If no voltage is present, initiate battery activation in the system settings. (Note: When the battery is in activation mode, the system does not support reverse polarity protection.)
Battery type and cell count cannot be modified while MPPT is active	Changing battery type will alter overvoltage and undervoltage protection thresholds!

Charging power fails to reach rated value	The system employs current limiting and constant-temperature control. Check if the system has reset the charging power; Is the voltage difference between the PV model and battery model excessive?
Some loads cannot be started	Adjust the short-circuit load time via the host computer to accommodate different external loads
Other issues or difficult-to-resolve anomalies	Access the settings interface to perform a factory reset. After restoring factory settings, reconfigure relevant parameters according to system specifications. Proceed with caution!
Battery connection shows no response	1、 Check if the fuse is damaged. Replace the fuse or contact the manufacturer for repair.
Fan not spinning	1、 Check for foreign objects blocking the fan. Clean the air duct regularly to remove debris. 2、 If the fan still does not operate after clearing debris, contact after-sales service for fan replacement. 3、 Is silent mode enabled?

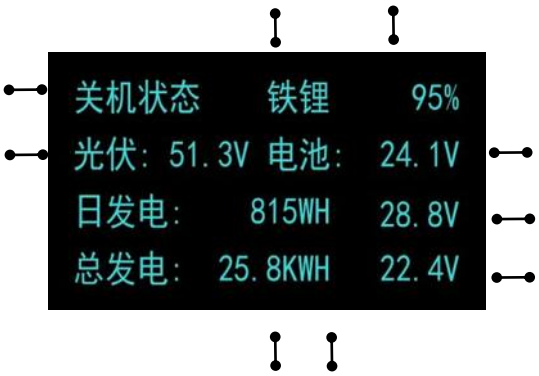
7. Display Interface Overview

7.1 System Startup Display Interface



① Power-on status display
② System charging status (charging, discharging, protection)
③ State of Charge (SOC) Display
④ Display PV voltage value
⑤ Display PV charging current magnitude
⑥ Display PV charging power
⑦ Load startup status display
⑧ Load Output Current Display
⑨ Display load output power
⑩ Display battery voltage
⑪ Battery temperature display (not displayed if NTC not connected)
⑫ Battery Type Selection Display (Ternary, Lithium Iron Phosphate, Lead Acid, Other)

7.2 System Display Interface Shutdown

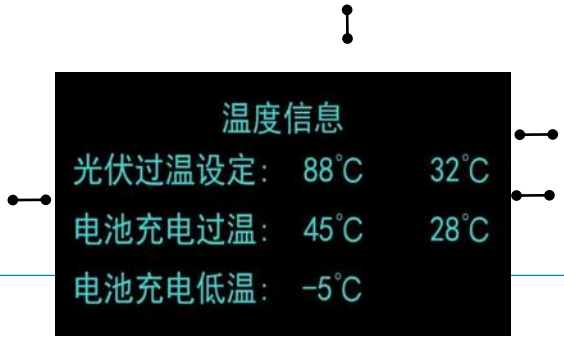


① Indicates the device is currently powered off
② Indicates the current battery selection is ternary type
③ Displays battery state of charge (SOC)
④ Displays the photovoltaic voltage value
⑤ Displays the battery voltage value
⑥ Current battery overvoltage protection setpoint
⑦ Current battery undervoltage protection setpoint
⑧ Display daily power generation
⑨ Display historical power generation

7.3 System Alarm Interface **"Fault": Sensor malfunction (Users may take appropriate actions based on alarm information)**

① PV "Overvoltage" and "Undervoltage" alerts
② PV "Overcurrent" and "Fault" alerts
③ PV "Over-temperature" and "Fault" alerts
④ Battery "Overvoltage," "Undervoltage" Alerts
⑤ Battery "Over-temperature," "Low-temperature," "Fault" alerts
⑥ Load "Short Circuit," "Overcurrent," "Fault" Alerts

7.4 System Temperature Interface



① Current PV over-temperature protection point (modifiable via host computer)
② Current real-time operating temperature of the photovoltaic system
③ Current battery charging over-temperature threshold (adjustable via

	host computer)
	④ Current real-time battery temperature
	⑤ Current battery low-temperature charging threshold (adjustable via host computer)

8. Product Installation

8.1 Installation

- Exercise extreme caution when installing batteries. Wear safety goggles when handling open-top lead-acid batteries. If battery acid comes into contact with skin, immediately rinse thoroughly with clean water.
- Avoid placing metal objects near the battery to prevent short circuits.
- Charging batteries may produce acidic gases; ensure the surrounding environment is well-ventilated.
- Batteries may produce flammable gases; keep away from sparks.
- When installing outdoors, avoid direct sunlight and rain penetration.
- Loose connections and corroded wires can cause excessive heat, melting wire insulation, igniting surrounding materials, and potentially starting fires. Ensure all terminals are securely tightened and wires

  Secure wires with cable ties to prevent movement during operation, which could loosen connections.
- When connecting the system, the output voltage of the components may exceed safe human voltage levels. When handling, use insulated tools and ensure hands are dry.
- The battery terminals on the controller can connect to either a single battery or a group of batteries. Subsequent instructions in this manual apply to single-battery use, but

  they also apply to systems using a battery bank.
- Follow the battery manufacturer's safety recommendations.
- Ground the controller's ground terminal.
- Reverse connection of the battery during installation is strictly prohibited, as it will cause irreversible damage.

8.2 Installation

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

Step 1: Select Installation Location

Avoid installing the controller in areas exposed to direct sunlight, high temperatures, or potential water ingress. Ensure adequate ventilation around the controller.

Step 2: Secure Mounting Screws

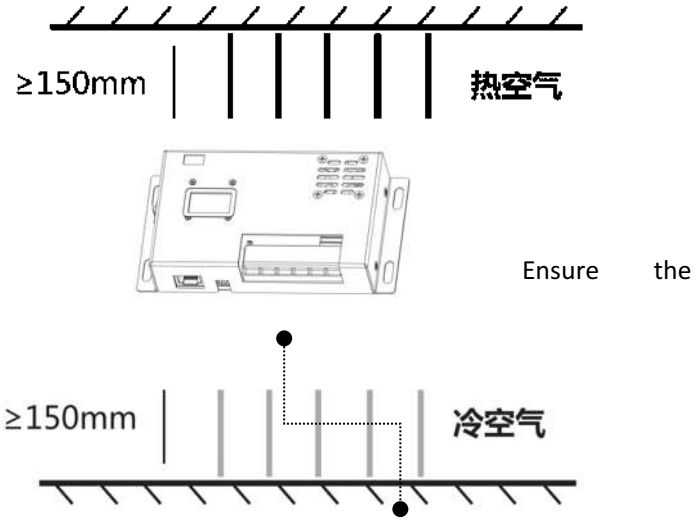
Mark the installation location according to the controller's dimensions. Drill two appropriately sized mounting holes at the marked positions and secure screws into both holes.

Step 3: Secure the Controller

Align the controller's mounting holes with the two pre-installed screws, hang the controller in place, and secure it with the two lower screws.

Step 4: Secure the Grounding Wire

Secure one wire to the controller's side screw. Connect the other end of the wire to a reliable ground point (e.g., bury a metal block with the wire attached) to divert leakage currents, static electricity, and lightning strikes into the ground.



Ensure the

9. Protective Functions

- Over-Temperature Protection

When the internal temperature of the controller exceeds the preset value, charging power will automatically decrease or even shut off during charging, thereby further slowing the rise in internal temperature.

- Battery Over-Temperature Protection

Battery over-temperature protection requires an external battery temperature sensor. When excessive battery temperature is detected, charging stops. Once the battery temperature drops to

5 degrees below the set value for 2 seconds, charging will automatically resume.

- Input Overpower Protection

When the solar panel power exceeds the rated power, the controller limits the charging power within the rated power range to prevent excessive current from damaging the controller. The controller

the controller enters current-limited charging mode.

- Excessive PV Input Voltage

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

- Photovoltaic Input Reverse Polarity Protection

If the PV array polarity is reversed, the controller will not be damaged. After correcting the wiring error, it will resume normal operation.

- Nighttime Reverse Charging Protection

Prevents the battery from discharging through the solar panels at night. Special Note: No reverse connection protection for the battery.

10. System Maintenance

To ensure the controller maintains optimal performance over time, it is recommended to periodically perform the following inspections.

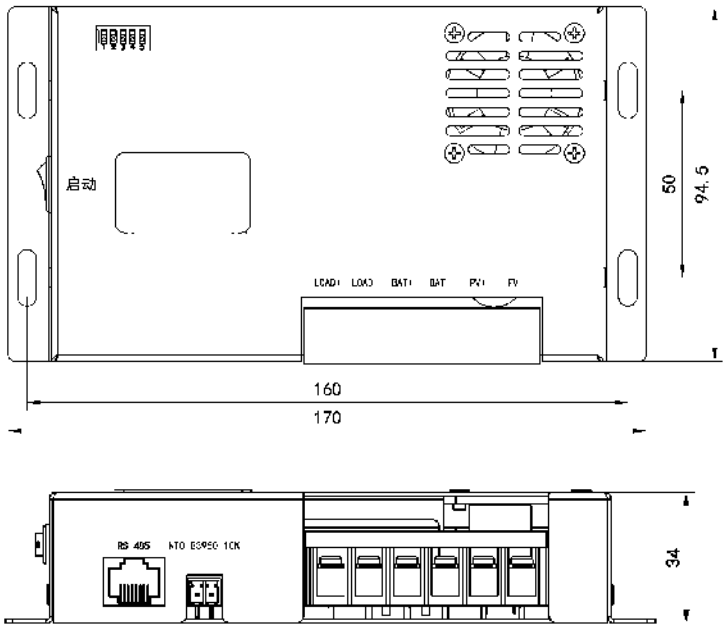
- When abnormal faults or error prompts are detected, corrective measures should be taken promptly.
- Inspect terminals for corrosion, insulation damage, signs of overheating or burning/discoloration, and housing deformation. Repair

or replace as needed.

- Inspect wires for exposure, damage, or degraded insulation; repair or replace them promptly.
- Clean any dirt, nesting insects, or corrosion promptly.

WARNING: Risk of electric shock! Ensure all power sources to the controller are disconnected before performing any inspections or operations! Unauthorized personnel must not operate the equipment.

11. Product Dimension Diagram



12. Communication Protocol

12.1 Basic

Transmission Mode	RTU	Protocol Standard/Function Code	0x02 Read one or more input states	Bitwise Read
Baud Rate	Default: 9600 bps	This communication protocol is based on the <Standard MODBUS Protocol>. The master device periodically requests data from the slave device, which receives the request command and responds with the data.	0x03 Read Holding Register	Read as 16-bit word
Parity bit	No parity		0x04 Read a Single Register	Read as a 16-bit word
Data bits	8 bits		0x05 Write a coil status	Write bitwise
Stop bit	1 bit		0x06 Write a hold register	Write as a 16-bit word
Frame interval	Not less than 3.5 bytes Time		0x10 Write multiple hold registers	Write in 16-bit words
Frame length	200 bytes		When the communication module detects an error other than a CRC error, it must send a response to the host. The most significant bit of the function code is 1; 01 indicates an invalid function code, 02 indicates an invalid data address 03 Invalid data value 04 Service failure	
Maximum slave response time	350 bytes			
Minimum host polling interval	400 bytes time			

12.2 Message Address

Register Address Table: Read corresponding function code 0x03, set corresponding function code 0x06. The addresses in the table below match those in the actual message frame and require no further offsetting or conversion.

Address (Decimal)	Meaning	Byte	Read/Write	Example	Explanation
40000	Device Model	2	R	52422	M24PB Model
40001	Software Version	2	R	10	V1.2
40002	Hardware Version	2	R	10	V1.0
40003	Maximum Power Support	2	R	600	600W
40004	Maximum Input/Output Current	2	R	2020	PV: 20A, BAT: 20A
40005	Photovoltaic Step-Down Heat Sink Temperature	2	R	25	Current System Temperature 25° C
40006	PV NTC Status	2	R	0	0~7
40007	BAT NTC Status	2	R	0	0~7
40008	Reserved	2	R	Unused	Reserved
40009	Reserved	2	R	Unused	Reserved
40010	Charging Phase	2	R	3	1: Activation, 2: Trickle Charge, 3: Constant Current, 4: Constant Voltage
40011	Charging Status	2	R	1	0: Not Charging, 1: Charging
40012	Fully charged	2	R	1	0: Not fully charged, 1: Fully charged
40013	Current load status	2	R	1	1 Starting, 0 Shutting down
40014	BUCK Heatsink Temperature	2	R	50	50° C
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	Reserved	2	R	Unused	Reserved
40020	Photovoltaic Input Voltage	2	R	4550	45.5V (Accuracy 0.01V)
40021	Photovoltaic Input Current	2	R	111	1.11A (Accuracy 0.01A)
40022	Photovoltaic Input Power	2	R	256	256W (Accuracy 1W)
40023	Photovoltaic heat sink temperature	2	R	20	20° C (Accuracy 1° C)
40024	Photovoltaic Fault Code	2	R	0	Refer to Fault Table 1
40025	Battery Output Voltage	2	R	2412	24.12V (Accuracy 0.01V)
40026	Battery Output Current	2	R	0	None (see load current)
40027	Battery Output Power	2	R	0	None (See Load Power)
40028	Battery Radiator Temperature	2	R	25	25° C (Accuracy 1° C)
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 Start Status	2	R	0	0: Off 1: On
40033	Historical system charging watt-hours high	2	R	H+L (Unit: Wh)	Historical Total Generation (Wh)

40034	Historical System Charge WH Count Low	2	R		
40035	Current SOC Value	2	R	982	98.2%
40036	Reserved	2	R	Unused	Reserved
40037	Today's Power Generation	2	R	855	855WH
40038	MPPT Operating Mode	2	R	0	See Table 2
40039	Remote Load Switch	2	R/W	0	1: Load enabled; 0: Load disabled
40040	Maximum Voltage Setting for PV Connection	2	R	560	56.0V
40041	Minimum Voltage Setting for PV Grid Connection	2	R	20	20.0V
40042	User-defined maximum charging power	2	R/W	200	200W (Limits maximum PV power)
40043	Reserved	2	R/W	Unused	Reserved
40044	Photovoltaic shutdown temperature setting	2	R/W	70	70° C
40045	Current PV Start Fan Temperature	2	R	40	40° C Fan Start
40046	Equipment Address	2	R/W	01	Communication Address: 01H
40047	Maximum Battery Charging Voltage Setting	2	R	2520	25.2V
40048	Battery Discharge Minimum Voltage Setting	2	R	1740	17.4V
40049	Reserved	2	R/W	Not Used	Reserved
40050	Current Battery Discharge High Temperature Setting	2	R/W	60	>60° C Load Output Halt
40051	Current Battery Discharge Low Temperature Setting	2	R/W	-10	<-10° C Load Output Halt
40052	Current Battery Charging High Temperature Setting	2	R/W	45	>45° C 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 String Count	2	R	7	7-series ternary lithium
40057	Power On	2	R	1	0: Disable power generation, 1: Start power generation
40058	Battery activation setting	2	R	0	0: Disable Activation (Default), 1: Enable Activation
40059	Baud Rate	2	R/W	0	1:9600 (default) 0~8
40060	Backlight Duration	2	R/W	60	60S (Default) (Not supported on some M24PB models)
40061	Lock Screen	2	R/W	0	0: Unlock, 1: Lock (Not supported on some M24PB models)
40062	Reserved	2	R/W	Not used	Reserved
40063	User-defined battery overvoltage threshold	2	R/W	2520	25.2V
40064	User-defined battery under-voltage threshold	2	R/W	1740	17.4V
40065	User-set load short-circuit time	2	R/W	500	500*20(μs)
40066	Reserved	2	R/W	Unused	Reserved
40067	Reserved	2	R/W	Unused	Reserved
40068	Load Disconnect	2	R/W	1000	1000mV (Hysteresis trigger voltage setting

	Hysteresis Voltage Setting				after load shutdown)
40069	Full-charge re-charge voltage difference setting	2	R/W	1000	1000mV (Voltage drop setting for recharging after float charge voltage recovery)
40070	Reserved	2	R/W	Unused	Reserved

13. Detailed List of Attachments

13.1 Feature List

Function Table 1 (Decimal)		
NMC Battery	Ternary Lithium Battery	0
LFP Battery	Lithium Iron Phosphate Battery	1
PAB Battery	Lead-Acid Battery	2

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

13.2 Fault List

Fault Table 1 (Decimal)					
OV	Solar Panel Overvoltage	1	SC	Solar Panel Short Circuit	128
UV	Solar Panel Undervoltage	2			
OT	System Over-Temperature	4			
TF	Temperature	8			

Fault Table 2 (Decimal)					
OV	Battery Overvoltage	1	SF	Battery Current Sensor Fault	128
UV	Battery Undervoltage	2	SC	Battery Short Circuit	256
OT	Battery Over-Temperature	4	LOC1	Load Level 1 Overcurrent	512
UT	Battery Low Temperature	8	LOC2	Load Level 2 Overcurrent	1024
TF	Temperature Sensor Failure	16	LSC	Load Short Circuit	2048
OC	Battery Overcurrent	32	LSF	Load Current Sensor Failure	5096

14. Application Wiring Diagram