

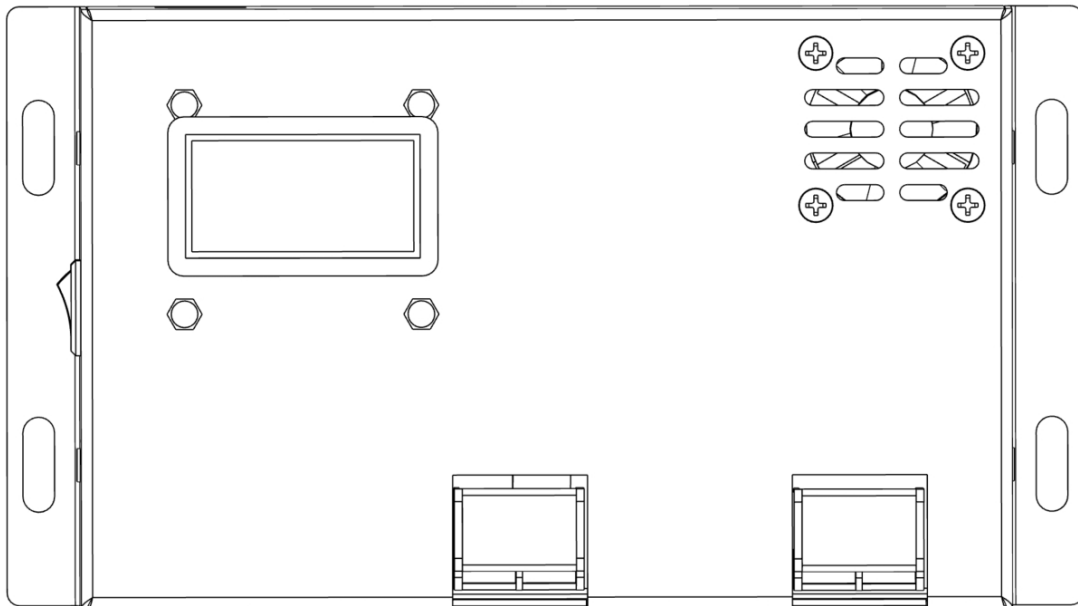
MPPT Solar Charge Controller Manual

Model H20TB (Boost Type)

Supports battery voltage range: 36V~90V, suitable for various photovoltaic charging solutions for electric vehicles on the market

Supports ternary, lead-acid, lithium iron, colloidal, and customized batteries

Supports customized batches










Manual Version: V1.1 Subject to change 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 voltages that exceed safe levels for humans, please read the manual thoroughly and complete safety operation training before operating this controller.
Only then can this controller be operated.
-  2、 The controller has no parts that require maintenance or repair; users should not disassemble or repair the controller themselves.
-  3、 Please install the controller indoors to prevent components from exposure and to avoid water 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 exterior of the controller.
-  6、 Before installing and adjusting the wiring of the controller, be sure to disconnect the photovoltaic array and remove the fuse or circuit breaker near the battery terminals.
-  7、 After installation, check that all wiring connections are secure to avoid the danger of overheating due to loose connections.



Warning: Indicates that this operation is dangerous; ensure safety



reparations are made before proceeding.

Note: Indicates that this operation is destructive.



Tip: Indicates advice and suggestions for the operator.



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1. Product Introduction

1.1 Product Overview

The H20TB controller uses industry-leading MPPT (Maximum Power Point Tracking) technology to achieve maximum energy tracking of solar panels, making it

Under various conditions, quickly and accurately track the maximum power point of the solar cell, and obtain the maximum energy of the solar panel in real time, significantly improving the solar energy performance.

Energy utilization efficiency of solar systems. Widely used in off-grid photovoltaic systems, managing the operation of solar panels, batteries, and loads.

The core control component of the off-grid photovoltaic system. The controller has comprehensive software and hardware fault detection and protection functions, which can maximize the prevention of Damage to product components caused by installation errors and system failures.

1.2 Product Features

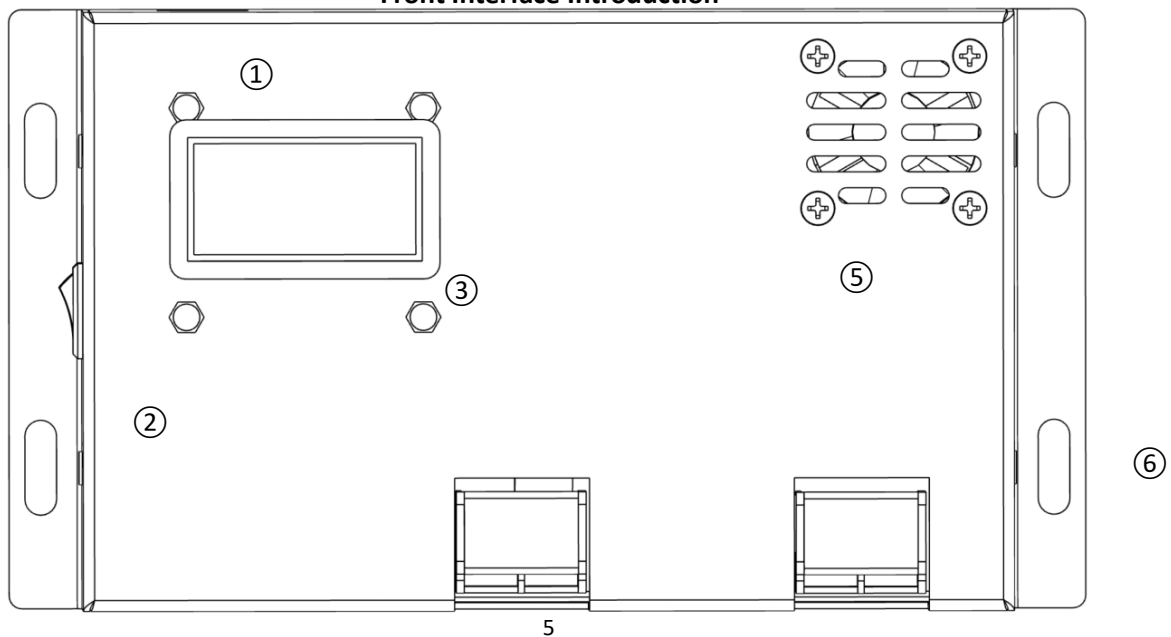
- Utilizing MPPT (Maximum Power Point Tracking) technology, the MPPT tracking efficiency can reach up to 99.9%.
- Supports simultaneous full power charging and discharging.
- Supports various battery types including sealed, gel, open, lithium-ion, and custom types.

- Support for charging current settings.
- Support full settings.
- Support parallel charging.
- Support saving historical data.
- Support RS485 communication with standard Modbus protocol, with a fixed baud rate.
- Support TTL communication with standard Modbus protocol, with a fixed baud rate.
- Support Bluetooth, WIFI, 4G, and Ethernet communication functions (optional).
- Equipped with comprehensive overpressure, overcurrent, overload, overtemperature, short circuit, and other charging and discharging protection mechanisms.
- Utilizes high-quality aluminum heat sinks, air cooling, and high-temperature derating to ensure reliable and efficient operation in various working environments.



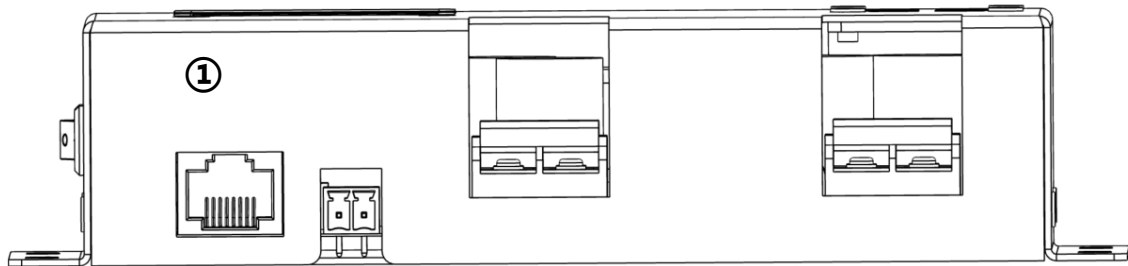
1.3 Appearance and

Front Interface Introduction



Serial Number	Function Description	Remarks
①	Battery type selection, language switch between Chinese and English, interface change toggle switch	See the toggle switch section for details
②	Start button	Side boat-shaped switch
③	Display screen interface	
④	Battery interface; photovoltaic input interface	
⑤	Fan air outlet	Do not block
⑥	Ground Screw Hole Position	

Introduction to Side Interface



Serial Number	Function Description	Remarks
①	RS485 communication interface	The definition of interface pins can be found in other chapters.



1.4 Introduction to

H20TB series Maximum Power Point Tracking (MPPT) system is a type of system that achieves

An advanced charging technology that adjusts the operating status of the electrical module, enabling the solar cells to output more electrical energy. Due to the solar energy

The nonlinear characteristics of the array mean that there exists a maximum power point on its curve, which traditional controller PWM charging technology cannot maintain.

Charging the battery at this point will not allow the maximum energy from the solar panel to be obtained, but the solar system with MPPT control technology will

The controller can continuously track the maximum power point of the array to obtain the maximum energy for charging the battery, using a 12V system.

For example, the peak voltage (V_{pp}) of a solar cell is around 18V, while the battery voltage is approximately 12V, generally.

When charging, the voltage of the solar panel is around 12V, and it does not fully reach its maximum power output.

The MPPT controller can overcome this issue by adjusting the input voltage and current of the solar panels in real-time to maximize the input power.

The purpose of the value. Compared to traditional PWM controllers, MPPT controllers can maximize the power output of solar panels, allowing for improved efficiency.

To provide a larger charging current, generally speaking, MPPT controllers can improve energy utilization by 20% to 30% compared to PWM controllers.

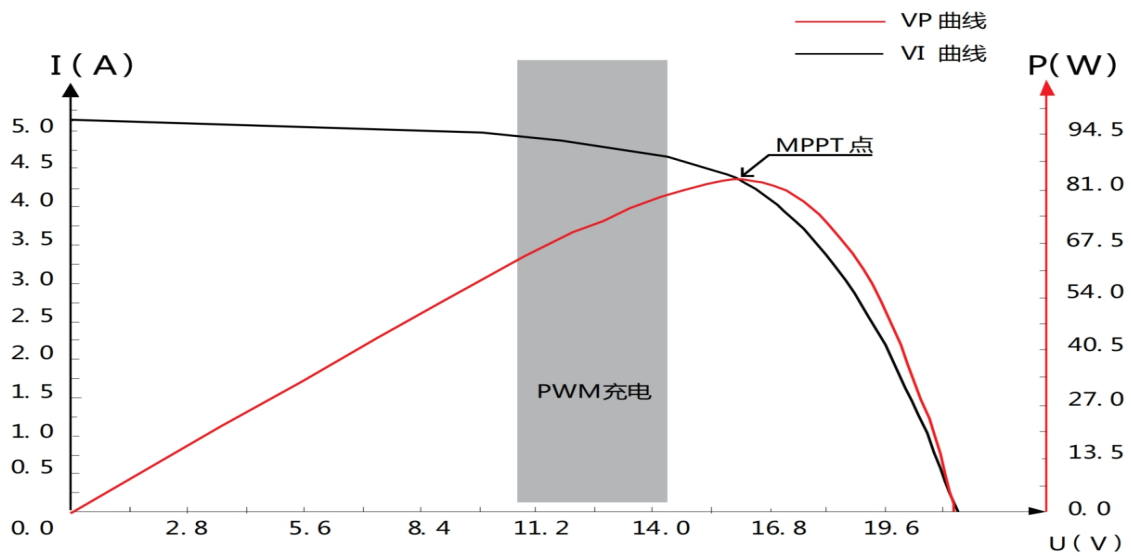


Figure 1-2 Battery Panel Output Characteristic Curve

Due to variations in environmental temperature and light conditions, the maximum power point often changes. Our company's MPPT controller can adjust according to Parameters are adjusted according to different conditions to keep the system close to its maximum operating point at all times. The entire process is fully automated, requiring no user intervention.

What adjustments.

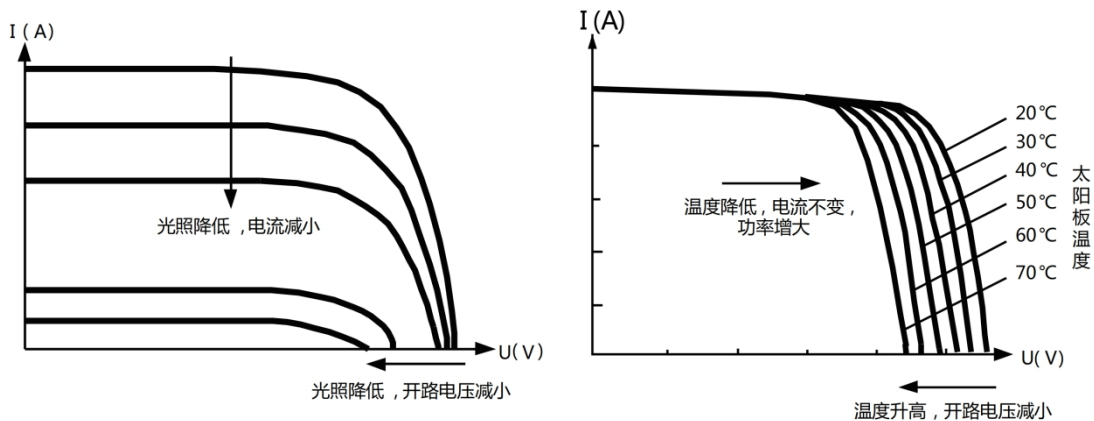


Figure 1-3 The Relationship Between Solar Panel Output Characteristics and

Illumination

Figure 1-4 The Relationship Between Solar Panel Output Characteristics and



2. Technical Parameters

Product Model	H20TB
Static Power Consumption	≤30mA
Battery Type	Li-NCM/LiFePO4/Lead Acid/Colloid/Other batteries (users can configure independently based on the upper computer)
Battery Voltage	(LiFePO4, Lead Acid, Li-NCM, Other)
System Mode	Boost
Rated battery charging current	15A
Maximum PV Input Current	20A
Maximum Solar Panel Power	800W
Max: PV Open Circuit Voltage (Voc)	16V~60V
Recommended PV Power Point Voltage (Vmp)	16V~52V (recommended)
System Maximum Voltage Rating	Overvoltage of 100V (±2%) will damage the system
MPPT tracking efficiency	>99.9%
MPPT tracking rate	<1ms
Charging conversion efficiency	94%~99%
Charging working mode	Trickle/Constant current/Constant voltage/Floating/full automatic cut-off/Backflow automatic recharge (fully automatic management)
Temperature protection	√
Short Circuit Protection	√
TTL Communication	√
RS485 Communication	√
External 12V Power Supply (<150mA)	√
Display Screen	√
Supports SOC Display	√
Configurable Charging Power	√
Configurable Battery Model Series	√
Supports Bluetooth (Optional Expansion)	√
Supports Ethernet (Optional Expansion)	√
Set Auto Save	√
Supported Baud Rate Types	4800/9600/14400/19200/38400/56000/57600 Default 9600 (change requires upper computer configuration)
Backlight Function	Default backlight always on (backlight time adjustable; set to 0 for always on)
Protection Function	PV Over-voltage Protection, PV Reverse Polarity 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 Polarity Protection
Working Environment Temperature	-35°C~65°C (within 45°C under good ventilation, no derating)

Range	
Protection Level	IP32
Cooling Method	Natural Cooling, Air Cooling
Dimensions	Length × Width × Height 95x175x37mm
Weight	0.37kg
Lithium Iron Phosphate Battery Support	36V~90V
Tri-Element Lithium Battery Support	36V~90V
Lead-acid/gel battery support	36V~90V
Other batteries	User-defined undervoltage and overvoltage points (set via the upper computer from 36V to 90V)



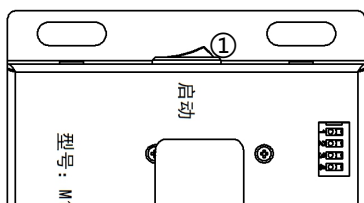
3. Dip switch and power on/off instructions

3.1 Dip switch usage instructions (Please make sure to select the battery type correctly; dip switch up for 1, dip switch down for 0)

Battery Type	Dip switch 1	Dip switch 2	Dip switch 3	Dip switch 4	Dip switch 5	Description	Full Charge Replenishment
Iron Lithium	1	0	0	0	x	Iron Lithium 48V, over-voltage protection point: 54.0V, under-voltage protection point: 42.0V, 15 series	51.0V
	1	0	1	0	x	Iron Lithium 60V, over-voltage protection point: 72.0V, under-voltage protection point: 56.0V, 20 series	68.0V
	1	0	0	1	x	Iron Lithium 72V, over-voltage protection point: 82.8V, under-voltage protection point: 64.4V, 23 series	78.2V
Trinary	0	1	0	0	x	Trinary 48V, over-voltage protection point: 54.6V, under-voltage protection point: 39.0V, 13 series	53.3V
	0	1	1	0	x	Tri-cell 60V, over-voltage protection point: 71.4V, under-voltage protection point: 51.0V, 17 series	69.7V
	0	1	0	1	x	Tri-cell 72V, over-voltage protection point: 84.0V, under-voltage protection point: 60.0V, 20 series	82.0V
Lead-acid	1	1	0	0	x	Lead-acid 48V, over-voltage protection point: 57.6V, under-voltage protection point: 40.0V, 04 series	53.6V
	1	1	1	0	x	Lead-acid 60V, over-voltage protection point: 72.0V, under-voltage protection point: 50.0V, 05 series	66.0V
	1	1	0	1	x	Lead-acid 72V, over-voltage protection point: 86.4V, under-voltage protection point: 60.0V, 06 series	79.2V
Colloid	0	0	0	0	x	Colloid 48V, overvoltage protection point: 55.2V, undervoltage protection point: 40.0V, 04 series	52.0V
	0	0	1	0	x	Colloid 60V, overvoltage protection point: 69.0V, undervoltage protection point: 50.0V, 05 series	65.0V

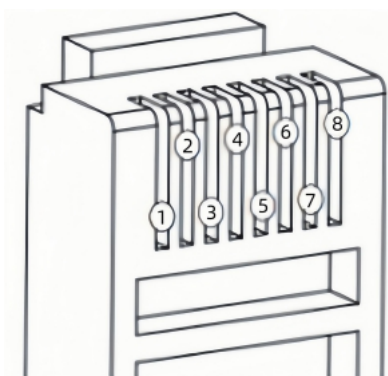
	0	0	0	1	x	Colloid 72V, overvoltage protection point: 82.8V, undervoltage protection point: 60.0V, 06 series	78.0V
Custom	0	0	1	1	x	Custom mode, overvoltage point, undervoltage point, recharge point, executed according to customer settings	Custom
Chinese and English	x	x	x	x	0	Represents Chinese display	
	x	x	x	x	1	Represents English display	

3.2 Equipment Startup Switch Usage Instructions



① To start the device, switch left to enable charging,

4. TTL Communication, RS485 Communication, and External 12V Output Interface



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

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



5. Fan Temperature Control

Serial Number	Fan Startup Logic Diagram
During PV Charging	

6. Common Problems and Solutions

Phenomenon	Processing Method
Indicator light and LCD screen do not light up	Check if the connections of the battery and solar panel are correct
There is voltage from the solar panel, but no voltage output from the battery terminal	Disconnect the battery to check if it has voltage
Battery type and series cannot be modified while MPPT is in operation	Changing battery type will alter the over-voltage and under-voltage protection points!
Charging power does not meet the rated value	The system adopts 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.
Photovoltaic voltage flickering; battery voltage flickering	Under-voltage or high voltage
Other issues or difficult-to-solve anomalies	Go to the settings interface to initiate a factory reset. After setting the factory settings, reconfigure the related parameters according to the system configuration. Proceed with caution!
No response from battery connection	Check if the battery's positive and negative terminals are reversed
No response from photovoltaic connection	Check if the photovoltaic's positive and negative terminals are reversed
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 the foreign objects, please contact customer service for fan replacement. 3、 Is the system itself in a low-temperature state?

7. Display Interface Introduction

7.1 Start System Display Interface

<p>The screenshot shows a black display with yellow text. At the top, it says '开机 充电 98%'. Below that, '光伏: 18.5V 15.0A 277W' and '电池: 52.2V 5.3A 277W'. At the bottom, '日发电: 50.8KWH 铁锂'. Numbered callouts 1-11 point to specific elements on the screen.</p>	① Power-on status display
	② System is in charging state (charging, discharging, protection)
	③ Battery SOC Display
	④ Display photovoltaic voltage value
	⑤ Display photovoltaic charging current size
	⑥ Display photovoltaic charging power size
	⑦ Battery voltage value
	⑧ Battery charging current value
	⑨ Battery charging power value
	⑩ Power generation statistics
	⑪ Display battery selection type (ternary, lithium iron, lead-acid, others)

7.2 Close system display interface

<p>The screenshot shows a black display with yellow text. At the top, it says '关机 铁锂/48V 98%'. Below that, '光伏: 25.2V 电池: 48.5V' and '日发电: 1580WH 54.7V'. At the bottom, '总发电: 50.8KWH 39.0V'. Numbered callouts 1-9 point to specific elements on the screen.</p>	① Represents the current shutdown status
	② Represents that the current battery selection is of the ternary type
	③ Displays the battery charge state (SOC)
	④ Displays the value of photovoltaic voltage
	⑤ Displays the value of battery voltage
	⑥ Current battery over-voltage protection set point
	⑦ Current battery under-voltage protection set point
	⑧ Displays the power generation for the day
	⑨ Displays historical power generation

8. Product Installation

8.1 Installation

- When installing batteries, extreme caution is required. Protective goggles should be worn when installing vented lead-acid batteries. If contact is made with the battery acid, rinse it off immediately with clean water.
- Avoid placing metal objects near the battery to prevent short circuits.
- When charging the battery, acidic gases may be released; ensure that the surrounding environment is well-ventilated.
- The battery may release flammable gases; please stay away from sparks.
- When installing outdoors, avoid direct sunlight and rainwater intrusion.
- Loose connections and corroded wires can cause significant heat, melting the insulation of the wires, burning surrounding materials, and even causing fires. Therefore, ensure that all connections are tight and the wires are secured with zip ties to prevent movement and loosening of connections during use.
- When connecting the system, the voltage at the component output terminals may exceed safe human levels; when operating, be sure to use insulated tools and ensure that your hands are dry.
- The battery terminals on the controller can connect to a single battery or a set of batteries. The later instructions in the manual apply to the use of a single battery, but are also applicable to a system with a set of batteries.
- Please follow the safety recommendations from the battery manufacturer.
- Ground the controller's grounding terminal
- During installation, reverse connection of the battery is prohibited, as it can cause irreversible damage.

8.2 Installation Steps

Wiring and installation methods must comply with national and local electrical code requirements. Wiring specifications must be selected according to the rated current, generally using $5A/mm^2$ as a reference.

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 Suspension Screws

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

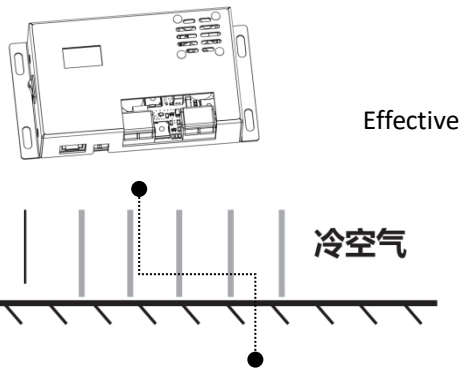
Step 3: Secure the Controller

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

Step 4: Fix the Ground Line

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





9. Protection Functions

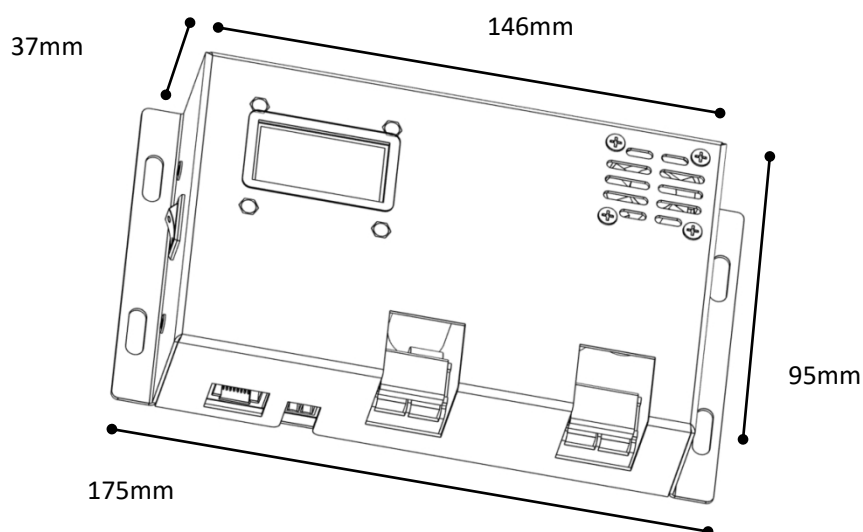
- **Overtemperature Protection of the Device**
When the internal temperature of the controller exceeds the set value, it will automatically reduce the charging power or even shut down while charging, thereby further slowing down the rise in internal temperature of the controller.
- **Overtemperature Protection of the Battery**
The battery overtemperature protection requires an external temperature sampling sensor for the storage battery. 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 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.
The device enters current-limiting charging.
- **The voltage at the photovoltaic input terminal is too high.**
If the voltage at the photovoltaic array input terminal is too high, the controller will automatically disconnect the photovoltaic input.
- **Photovoltaic input reverse connection protection.**
When the photovoltaic array is connected with reversed polarity, the controller will not be damaged and will continue to operate normally after correcting the wiring error.
- **Nighttime reverse charge protection.**
Prevents 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.
- If abnormal faults or error messages are detected, corrective measures should be taken promptly.
 - Check if the terminal connections have corrosion, insulation damage, signs of high temperature or burning/discoloration, deformation of the casing, etc., and carry out repairs or replacements in a timely manner.
 - Wires that are exposed, damaged, or have deteriorating insulation should be repaired or replaced in a timely manner.
 - If there is dirt, nesting insects, or signs of corrosion, they should be cleaned promptly.

Warning: Risk of electric shock! Ensure that all power supplies to the controller are disconnected before performing the above checks or operations! Non-professionals, please do not operate without permission.

11. Product Size Diagram



12. Communication Protocol

12.1

Basic

Transmission Mode	RTU	Protocol Standard / Function Code	0x02 Read one or more input statuses	Bitwise Read	
Baud Rate	Default is 9600 bps		0x03 Read Holding Register	Read in 16-bit words	
Parity Bit	No Parity		0x04 Read a Register	Read in 16-bit words	
Data Bit	8bit		0x05 Write a Coil Status	Bit Write	
Stop Bit	1bit		0x06 Write a Holding Register	Written in 16-bit words	
Frame interval	Not less than 3.5 byte times		0x10 Write multiple hold registers	Written in 16-bit words	
Frame length	200 bytes		When the communication module detects errors other than CRC errors, it must send information back to the host, with the highest bit of the function code set to 1; 01 illegal function code, 02 illegal data address 03 illegal data value 04 service failure		
12.2 Information address					
Minimum value of host polling interval	400 bytes time				

This communication protocol is based on <Standard MODBUS Protocol>, where the master continuously requests data from the slave, and the slave receives the request instruction and responds with data.

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

Address (Decimal)	Meaning	Byte	Read/W rite	Example	Explanation
----------------------	---------	------	----------------	---------	-------------

40000	Device Model	2	R	32022	H20TB
40001	Software Version	2	R	10	V1.0
40002	Hardware Version	2	R	10	V1.0
40003	Maximum Power Support	2	R	450	800W
40004	Maximum Input and Output Current	2	R	1210	PV:20A, BAT:15A
40005	Photovoltaic Radiator Temperature	2	R	25	Current System Temperature 25 Degrees Celsius
40006	PV NTC Status	2	R	0	0~7
40007	Reserved	2	R	Not used	Reserved
40008	Reserved	2	R	Not used	Reserved
40009	Reserved	2	R	Not used	Reserved
40010	Charging Stage	2	R	3	1: Trickle 2: Constant Current 3: Constant Voltage
40011	Charging Status	2	R	1	0: Not Charging, 1: Charging
40012	Full Charge Status	2	R	1	0: Not Fully Charged, 1: Fully Charged
40013	Current Load Status	2	R	1	1: Starting, 0: Shutting Down
40014	BOOST Heat Sink Temperature	2	R	50	50°C(accuracy 1°C)
40015	Reserved	2	R	Not used	Reserved
40016	Reserved	2	R	Not used	Reserved
40017	Reserved	2	R	Not used	Reserved
40018	Reserved	2	R	Not used	Reserved
40019	Reserved	2	R	Not used	Reserved
40020	Photovoltaic input voltage	2	R	2498	24.98V(accuracy 0.01V)
40021	Photovoltaic input current	2	R	275	2.75A(accuracy 0.01A)
40022	Photovoltaic input power	2	R	100	100W(accuracy 1W)
40023	Photovoltaic Radiator Temperature	2	R	20	20(accuracy 1°C)
40024	Photovoltaic fault code	2	R	0	See fault table 1
40025	Battery output voltage	2	R	5556	55.56V (accuracy 0.01V)
	Battery output current	2	R	12	None
	Battery output power	2	R	100	None
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	Reserved	2	R	Not used	Reserved
40031	Reserved	2	R	Not used	Reserved
40032	Fan startup status	2	R	0	0: Off 1: On
40033	Historical system charging WH count high	2	R	H+L (unit WH)	Total historical generation WH
40034	Historical system charging WH count low	2	R		
40035	Current SOC value	2	R	982	98.2%
40036	Reserved	2	R	Not used	Reserved
40037	Today's generation	2	R	855	855 WH
40038	MPPT working mode	2	R	0	0 (mppt mode)
40039	Reserved	2	R/W	Not used	Reserved
40040	Maximum voltage for photovoltaic connection	2	R	300	60.0V
40041	Minimum voltage for photovoltaic connection	2	R	130	16.0V



40042	User-defined maximum charging power	2	R/W	100	100W (limit the maximum charging power setting for photovoltaic)
40043	Reserved	2	R/W	Not used	Reserved
40044	Photovoltaic stop working temperature setting	2	R/W	70	70°C
40045	Current temperature to start photovoltaic fan	2	R	40	40°C fan start
40046	Device communication address	2	R/W	01	Communication address: 01H (01~255)
40047	Maximum charging voltage setting for battery	2	R	5400	54V (system automatically allocates based on DIP switch)
40048	Minimum discharge voltage setting for battery	2	R	4200	42V (system automatically allocates based on DIP switch)
40049	Reserved	2	R/W	Not used	Reserved
40050	Reserved	2	R/W	Not used	Reserved
40051	Reserved	2	R/W	Not used	Reserved
40052	Reserved	2	R/W	Not used	Reserved
40053	Reserved	2	R/W	Not used	Reserved
40054	Reserved	2	R/W	Not used	Reserved
40055	Set battery type	2	R	0	0: Ternary lithium, see function table 1
40056	Set number of battery strings	2	R	13	Ternary lithium 13 strings
40057	Power on	2	R/W	1	0: Prohibit electricity generation, 1: Start electricity generation (default)
40058	Reserved	2	R	0	Reserved
40059	Baud Rate	2	R/W	0	1: 9600 (default) 0~7 (4800~115200)
40060	Backlight duration	2	R/W	60	200S (not supported for now)
40061	Reserved	2	R/W	Not used	Reserved
40062	Reserved	2	R/W	Not used	Reserved
40063	User-defined battery overvoltage value	2	R/W	800	80.0V
40064	User-defined battery undervoltage value	2	R/W	450	45.0V
40065	Reserved	2	R/W	100	Reserved
40066	Reserved	2	R/W	Not used	Reserved
40067	Reserved	2	R/W	Not used	Reserved
40068	Reserved	2	R/W	Not used	Reserved
40069	Reserved	2	R/W	Not used	Reserved
40070	Reserved	2	R/W	Not used	Reserved



13. Detailed attachment table

Function Table

NMC	Trivalent Lithium Battery	0
LFP	Lithium Iron Phosphate Battery	1
PAB	Lead-Acid	2

Fault Table

Solar Panel Overvoltage	1	Solar Panel Short Circuit	128
Solar Panel Undervoltage	2	PV Voltage Too High Compared to Battery Voltage	256
System Over Temperature	4		
Temperature Sensor Fault	8		

Fault Table 1			
Battery overvoltage	1	Charging abnormal configuration switch	128
Battery undervoltage	2		
Battery overcurrent	4		
Battery overload	8		

14. Application Wiring Diagram

