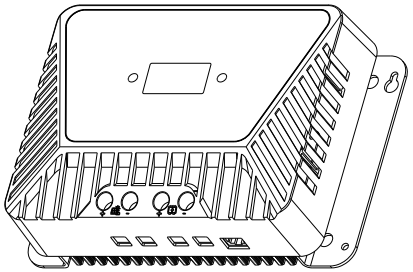
MPPT Charge Controller
Negative Grounded

MD2420/MD2435/MD2460
MD4820/MD4835/MD4860

User Manual



*We may modify these specifications without prior notice.

1. Warnings and Tools Icon Chart

Icons	Name	Description
	High Voltage	High-voltage device. Installation should be performed by a qualified electrician.
	High Temperature	This device generates heat. Mount it away from other objects.
	Environmental Hazard	Electronic Equipment. Do not dispose of in landfills.
	Wire Cutter	A wire cutter is required to cut and strip wires before connection.
	Multi-meter	A multi-meter is required for testing equipment and verifying polarity of cables.
	Anti-static Glove	Anti-static gloves are recommended to prevent damage to the controller from static electricity.
	Electrical Tape	Electrical tape is recommended for safely insulating spliced or exposed wires.
	Screwdriver	A standard screwdriver is required to attach wires to the controller.

2. Safety Tips

· Read this manual thoroughly before attempting installation.

· Be aware of any nearby electrical equipment that may interfere with installing this device.

· Solar panels can generate high voltages and currents, ensure your solar panels are fully covered to block sunlight during installation. It is recommended that installation be performed by a qualified electrician.

· Connecting wires to this device may generate sparks, Wear appropriate insulating gear during installation.

· To prevent damage to the battery or controller, use appropriate fuses in the wiring. Contact a professional for assistance with fuse sizing if needed.

· Always keep children away from this device.

· Ensure the correct wire gauge is used. Refer to the table below for recommended sizes for different current loads.

Solar Input Current	5A	10A	20A	30A	40A	60A
Wire Cross Section Area (mm^2)	1.5	2.5	5	8	10	12
Wire AWG	15	13	10	8	7	6

* We suggest no more than 5A's current for each square millimeter's wire core, e.g., for current of 10A, at least you should use 2mm2's wire.

3. Product Features

Thank you for choosing our products. This MPPT solar charge controller regulates solar charging. This device is mainly used in small and medium sized off-grid solar power systems.

These MPPT charge controllers have features as follows:

· By continuously monitoring changes in solar panel power output, the controller uses a combination of MPPT charging algorithms to improve charging efficiency under varying weather and temperature conditions.

· A built-in buffer, allows up to 25% overload of the rated input power.

· Supports charging modes for most common deep-cycle battery types, including AGM (sealed lead-acid), GEL, Flooded, and Lithium.

· Supports mobile app operation for monitoring and parameter configuration when connected to an external Bluetooth module(optional accessory, not included in the standard package).

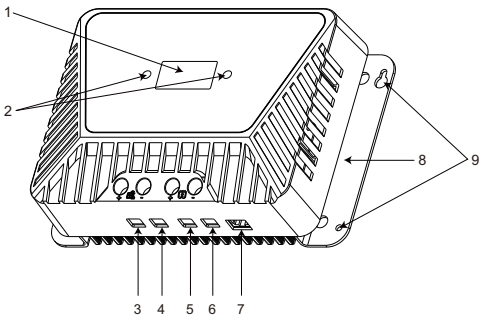
· Models MD2420/MD2435/MD2460 auto recognize 12/24V battery system voltages; Models MD4820/MD4835/MD4860 auto recognizes 12/24/36/48V battery system voltages. This feature does not apply to lithium batteries.

· Supports recording of system operation data, including power generated and power consumed, for up to 300 days. Compatible with the monitoring app on iOS and Android.

· Industrial-grade design with reverse polarity protection for solar panels, batteries.

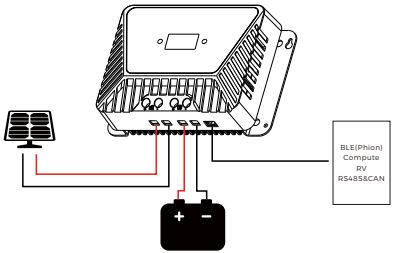
4. Device Diagram

MD2420/MD2435/MD2460
MD4820/MD4835/MD4860



#	Description	#	Description
1	LCD Display Screen	6	Battery Terminal -
2	Function Key ([SET], [Adj])	7	CAN&RS485 Counication Port
3	Solar Terminal +	8	GND
4	Solar Terminal -	9	Installation Mounting Holes
5	Battery Terminal +		

5. Wire Connection Sequences



During installation of your MPPT controller, please follow the order of connection below:

1. First connect the positive battery wire, then the negative battery wire.
2. Ensure solar panels are fully covered to prevent electric shock.
3. First, connect the positive wire of the solar array, then connect the negative wire.

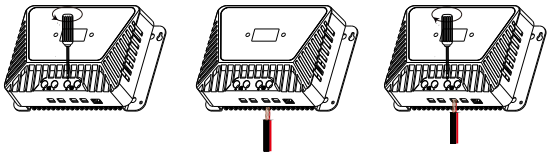
6. Mounting Instruction

6.1 wire preparation

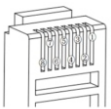
Select the appropriate cable. Expose the conductor at the wire end, ensuring the conductor length is 8-10mm and the wire does not fray.

6.2 Connect the main wire

First, loosen the terminal. Then, connect the wire to the inside of the terminal (ensure the terminal is loose before connection). Next, use a Phillips screwdriver to tighten the screws (note the positive and negative polarities of the wire and ensure no power is applied during wiring).



6.3 Connect the communication or the secondary line

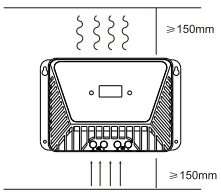


1: CAN_H
2: CAN_L
3-4: GND
5-6: POWER-3.3V
7: RS485 D+/A
8: Rs485 D-/B

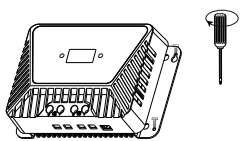
6.4 Fixed

6.4.1 Placement

This device uses vertical heat dissipation and must be mounted horizontally to ensure hot air can disperse smoothly.

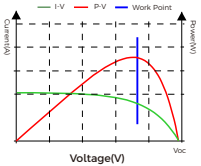


6.4.2 Secure using self-tapping screws or other auxiliary fastening devices.

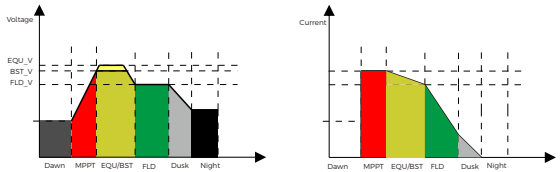


7. MPPT Charging

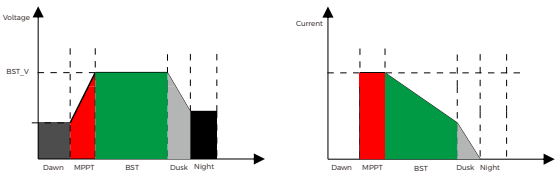
MPPT is the abbreviation of Maximum Power Point tracking. Since the photovoltaic curve has the following characteristics, it is hoped that the following Work Point can be tracked when the photovoltaic energy is used for charging.



7.1 Lead-acid 3-phases charging

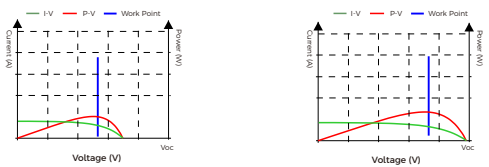


7.2 LI Battery Charging

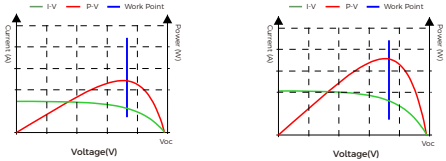


7.3 Photovoltaic Characteristics

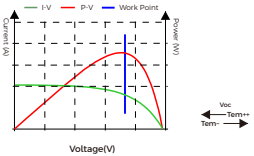
7.3.1 PV from dark to normal light. (low light on the left, light enhancement on the right)



7.3.2 The change of light intensity to photovoltaic curve. (Weak light on the left and strong light on the right)

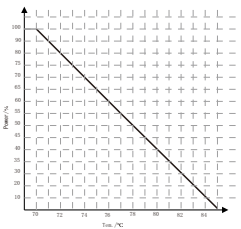


7.3.3 The effect of temperature on light. (The higher the temperature. The lower the open circuit voltage, but the overall power is almost the same)

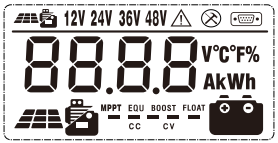


7.4 Controller Over-Temperature Charging Derating Ratio

When the controller temperature exceeds the set threshold (70℃), the device reduces charging power to maintain stability. This allows the controller temperature to reach thermal equilibrium. The charging power follows the operation curve shown in the figure below.



8. LCD Display Interface Overview



9. LCD Display Interface

Display Section	Display Layout
Charge Status and Charge Mode	MPPT EQU BOOST FLOAT CC CV
Parameter	V°C°F% AkWh
Active Functions	12V 24V 36V 48V

10. Status Information

Status Icon	Indication	Status	Description
	Solar Charge Indication	Flowing	Solar Power Charging Battery
		Off	Solar Power Not Charging Battery
MPPT	Charge Mode	Steady On	MPPT Charge Mode
EQU			Equ Charge Mode
BOOST			Boost Charge Mode
FLOAT			Float Charge Mode
		Off	Not Charging

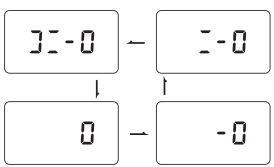
	Solar Icon	Steady On	Daylight Detected
		Off	No Daylight Detected
		Fast Flash	Solar System Over Voltage or Reverse connection
	Battery Icon	Steady On	Battery Connected and Functional
		Off	No Battery Connection
		Fast Flash	Battery Over-Discharged Over voltage or Reverse Connection

11. Key Functionality Chart

Function Key	System Mode	Input	Input Function
	View Mode	Long Press	Enter SET mode
	View Mode	Short Press	View Next Page
	Set Mode	Long Press	Save Data & Exit SET Mode
		Short Press	Next Setting
	Set Mode	Short Press	Adjustment Parameter Value

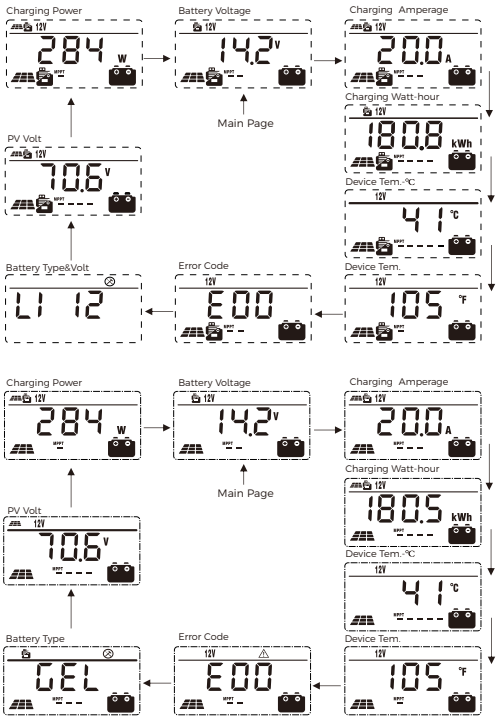
12. LCD Display Rules & Cycles

Pre start-up display cycle: when the MPPT controller turns on, it usually lasts several seconds while the controller detects the operating environment.



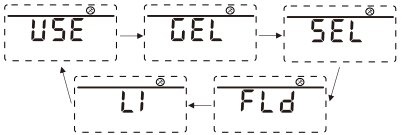
LCD Screen Display Cycle

The battery voltage view is displayed by default. Use the ▲ and ▼ keys to cycle through the available views. After 30 seconds of inactivity, the display will return to the battery voltage view. When an error is detected, the error code view will be shown. The screen backlight turns on for 20 seconds with any button operation.



Setting Battery Mode

Enter SET mode by pressing the Setting key from any view page except Load Mode. Use the ▲ and ▼ keys to select the battery mode, then press and hold the Setting key to save.

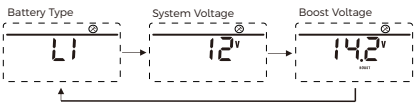


Abbreviations	Battery Types	Description
FLD	Flooded Battery	Auto-recognition with default parameters set for each type of batteries.
SEL	Sealed/AGM Battery	
GEL	Gel Battery	
LI	Lithium Battery	Some parameters can be customized.
USE	Advanced User Mode	Most parameters can be customized.

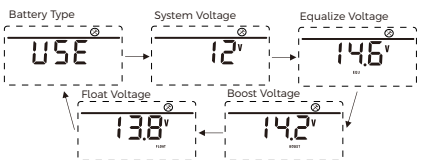
Advanced Battery Settings

In Lithium or User mode, short press the Setting key again to cycle through each parameter view. Use the up and down arrow key to adjust parameter value, then long press Setting key to save.

For Battery Type: LI



For Battery Type: USE



13. Error Code Chart

Code	Error	Description & Quick Troubleshoot
E00	No Error	No action needed.
E01	Battery Over-discharged	Battery voltage is too low. DC load will be turned off until battery recharges to the recovery voltage.
E02	Battery Over voltage	The voltage exceeds the systems's set maximum value.
E06	Overheating	The controller has exceeded its operating temperature limit. Ensure it is placed in a well-ventilated, cool, and dry location.
E08	Solar (Overcurrent)	Input current from solar array exceeds controller limit. Lower panel output or upgrade to a higher-rated controller.
E10	Solar Over-voltage	The solar array voltage exceeds the controller's rated input voltage. Reduce the voltage of the solar panels connected to the controller.
E13	Solar Reverse Polarity	The solar array input wires are connected with reverse polarity. Disconnect and reconnect the wires with the correct polarity.
E14	Battery Reverse Polarity	The battery connection wires are connected with reverse polarity. Disconnect and reconnect the wires with the correct polarity.

* Please contact professionals for technical support with additional troubleshooting.

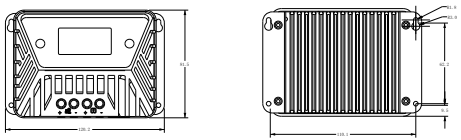
14. Technical Parameters

The variable "n" is used as a multiplying factor when calculating parameter voltages. The rule for "n" is as follows: 12V battery system → n = 1; 24V → n = 2; 36V → n = 3; 48V → n = 4. For example, the equalize charge voltage for a 12V FLD (Flooded) battery bank is 14.8V × 1 = 14.8V. For a 24V FLD battery bank, the equalize charge voltage is 14.8V × 2 = 29.6V.

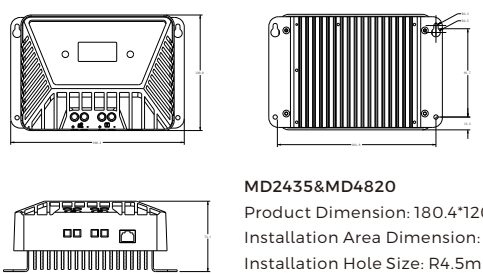
Parameter	Value					
Model No.	MD2420	MD2435	MD2460	MD4820	MD4835	MD4860
System Wiring Grounded	Negative Grounded					
Battery System Voltage	12V/24V Auto (FLD/GEL/SEL) Manual (Li/Use)			12V/24V/36V/48V Auto (FLD/GEL/SEL) Manual (Li/Use)		
No-load Loss	12mA (12V), 10mA (24V)			12mA (12V), 10mA (24V) 8mA (36V), 6mA (48V)		
Max Solar Input Voltage	<100Voc				<140Voc	
Max DC Input Voltage	80V				115V	
Rated Solar Charge Current	20A	35A	60A	20A	35A	60A
Max Solar Input Power	300W/12V 600W/24V	520W/12V 1050W/24V	900W/12V 1800W/24V	300W/12V 600W/24V 900W/36V 1200W/48V	520W/12V 1050W/24V 1570W/36V 2100W/48V	900W/12V 1800W/24V 2700W/36V 3600W/48V
Light Control Voltage	5V*n					
Light Control Delay Time	10s					
Protection	PV Over Voltage, PV Reverse Polarity, Battery Over Voltage, Battery Over Discharge, Battery Reverse Polarity, Controller Overheating					
Display	LCD					
Over-Temperature Action	70℃: Derating / 85℃: Stopping Charging / Below 85℃: Charging Resumes					
Operating Temperature	-35℃ ~ +45℃					
Max. Storage Temperature	85℃					
IP Protection	IP32					
Net Weight	430g	760g	1850g	760g	1850g	2100g
Communication Port	CAN & RS485 (RJ45)					
Operating Altitude	≤ 3000 Meters					
Controller Dimension	120.2*81.5 *60.5mm	180.4*120.0 *73.1 mm	248.0*165.0 *90.0 mm	180.4*120.0 *73.1 mm	248.0*165.0 *90.0 mm	248.0*165.0 *90.0 mm
Optional Function	Built-in Bluetooth / External Display / External Bluetooth Module					

Parameter	Battery Parameters				
Battery Types	FLD	SEL	GEL(default)	USE(adjustable)	LI (adjustable)
Equalize Charge Voltage	14.8V*n	14.6V*n	--	Default	--
Boost Charge Voltage	14.6V*n	14.4V*n	14.2V*n	Default: GEL	Default: 14.2V*n
Float Charge Voltage	13.8V*n			Default: GEL	--
Boost Charge Recovery Voltage	13.2V*n			Default: GEL	--
Over-discharge Recovery Voltage	12.6V*n			Default: GEL	--
Over-discharge Voltage	11.1V*n			Default: GEL	Default: 11.1V*n

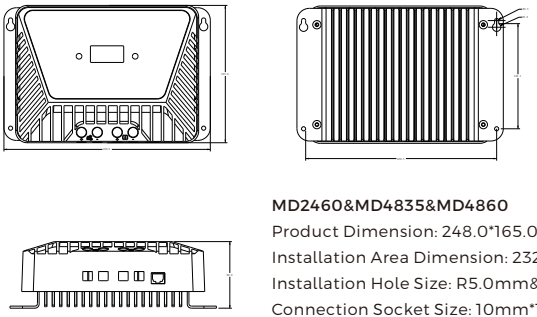
15. Product Dimension



MD2420
Product Dimension: 120.2*81.5*60.5mm
Installation Area Dimension: 111.4*58.6mm
Installation Hole Size: R3.0mm&R1.8mm
Connection Socket Size: 5mm*5mm



MD2435&MD4820
Product Dimension: 180.4*120.0*73.1mm
Installation Area Dimension: 167.0*87.8mm
Installation Hole Size: R4.5mm&R2.3mm
Connection Socket Size: 7.5mm*10mm



MD2460&MD4835&MD4860
Product Dimension: 248.0*165.0*90.0mm
Installation Area Dimension: 232.0*122.0mm
Installation Hole Size: R5.0mm&R2.5mm
Connection Socket Size: 10mm*10mm