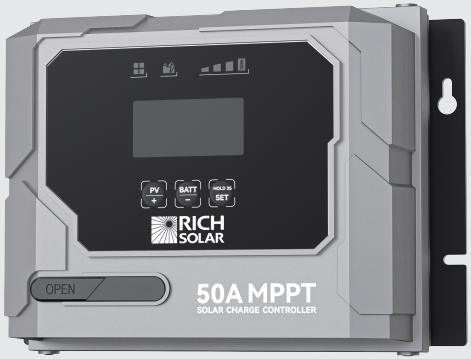
User Manual

50A MPPT

SOLAR CHARGE CONTROLLER



MODEL: RS-MPPT50P

THIS MANUAL CONTAINS IMPORTANT SAFETY AND OPERATING INSTRUCTIONS FOR SOLAR CHARGE CONTROLLER. PLEASE READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.

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Warning: Important, Please Read

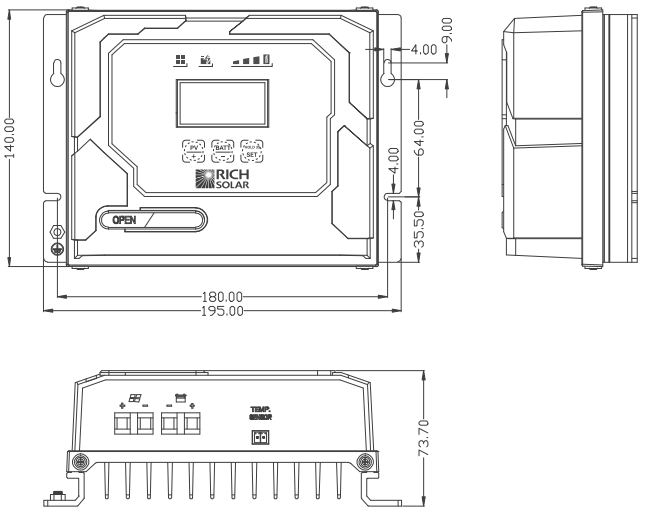
Risk of explosive gases working in vicinity of a lead-acid battery is dangerous. Explosive gases develop during normal battery operation.
It is important that each time before using or connecting your solar controller:

• This charger is designed for indoor use only and should never be exposed to rain.
• Do not disassemble the controller. Take to a qualified person if the unit requires repairing.
• Lead acid, LCO, $LiFePO_4$, LTO batteries can be dangerous. Ensure no sparks or flames are present when working near batteries.
• Eye protection should always be used. Never short circuit the battery.
• Given sufficient light solar panels always generate energy even when they are disconnected.
• Accidental 'shorting' of the terminals or wiring can result in sparks causing personal injury or a fire hazard. We recommend that you cover up the panel(s) with some sort of soft cloth so you can block all incoming light during the installation. This will ensure that no damage is caused to the Solar Panel or Battery if the wires are accidentally short circuited.
• Always install a battery fuse on each circuit including the solar controller.
• Do not reverse connect the wires to the solar panel or battery.

Mounting and Installation

This solar controller is designed to be mounted against a wall, especially for caravan use, out of the way but easily visible, please note, mounted on a vertical surface to optimize cable placement and cooling of the unit, indoor use, protected from the weather.

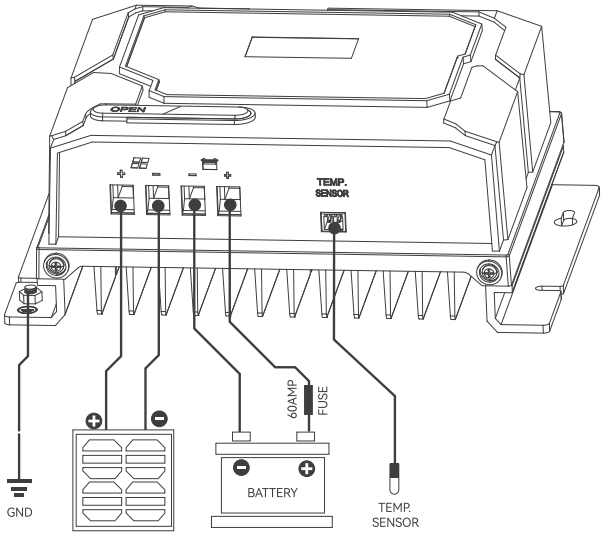
The mounting dimensions



Wiring Connections

To protect the battery and the solar panel, we strongly recommend that you place an inline fuse on the positive wire on both the “solar” and “battery” circuits. 50A fuse for 40A controller; 60A fuse for 50A controller, (As close to the battery /panel as possible).

Refer to the below drawing, please cover the solar panel before connecting cables.



Correct Wire Size (stranded copper wire)

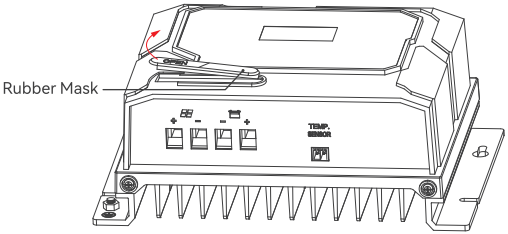
Please refer to the wire size chart below to determine the minimum size wire needed for each connection. This will also ensure you get the best performance out of your solar controller.

Rated current	The cable total length One-way distance	**Solar panel -> Controller -> Battery**		
		< 3M	3-6M	6-9M
Rated current	The cable total length One-way distance	**Solar panel -> Controller -> Battery (meter)**		
		< 3M	3-6M	6-9M
50Amp	The cable size (AWG)	8AWG	6AWG	4AWG

Rated current	The cable total length One-way distance	**Solar panel -> Controller -> Battery**		
		< 10ft	10-20ft	20-30ft
Rated current	The cable total length One-way distance	**Solar panel -> Controller -> Battery (feet)**		
		< 10ft	10-20ft	20-30ft
50Amp	The cable size (AWG)	8AWG	6AWG	4AWG

The solar controller is installed to close to the battery as near as possible. Please do not reverse the connections with the solar panel and battery when installed the cables.

1. Using the terminals supplied, crimp the terminals on your solar array wires and connect to the solar panel.
2. Using the terminals supplied, crimp the terminals on your battery wires and connect to the battery.
3. Take off the rubber mask plate at OPEN end on the top face, you will see the four screws, loosen the screws.
4. Insert the input and output cables and firmly secure the cables to the solar controller via the screws.
5. Reinstall the rubber mask plate back to the solar controller like shown in below.



Please do not reverse the connections with the solar panel and battery when installed the cables.

Once the connections are completed, the solar controller will start working automatically.

Operating – LCD Display

When the controller powers on, the unit will run self-qualify mode and automatically show below items on LCD before going into charging process.

88.88	Self-test starts, digital meter segments test
r0.01	Software version test
12V 50A	System battery voltage and current test
rt5 25℃	External battery temperature sensor test (if connected)

	Absorption voltage test
	Float voltage test
	Self-test completed

System battery voltage setting

Press and hold the **SET UP button** for 3 seconds to go into the system battery voltage setting mode, press **PV / +** or **BATT / - button** to select your desired system battery voltage 12V, 24V or AUTO, press the **SET UP button** again to confirm the battery voltage setting.

The display in sequence,



The controller will automatically memorize your previous battery voltage setting, If AUTO mode selected, the controller will automatically detect 12V or 24V battery connected.

System Battery type setting

Please check your battery manufacturer's specifications to select correct battery type. The unit provides 8+1 battery types for selections: LCO, LTO, LFP, Crystal (Lead crystal), Gel, AGM, WET (Conventional lead acid) and Calcium (Calcium contented) battery plus Custom setting.

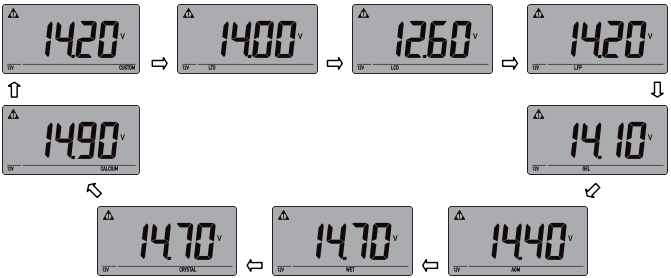
Follow up the Battery voltage setting, Press the **SET UP button** to go into your battery type setting mode, the battery type you select will be flashed on the LCD meter, the default setting is AGM Battery; the controller will automatically memorize your battery type setting.

Remarks: LCO battery type setting is only recommended working with **3-SERIES** Lithium Cobalt Oxide $LiCoO_2$ battery

LFP battery shown in LCD indicates Lithium Iron Phosphate battery, $LiFePO_4$ battery.
LTO battery shown in LCD indicates Lithium titanate oxidized, $Li_4Ti_5O_{12}$ battery.

Caution: Incorrect battery type setting may damage your battery.

Press **PV /** + or **BATT / - button** to navigate your desired battery type as below:

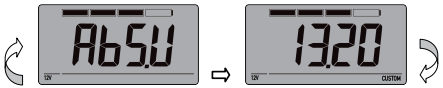


Press the **SET UP button** again, the selected battery type will be solid On and confirmed.

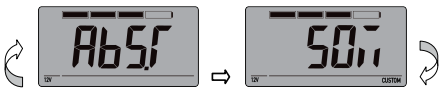
Custom setting

This solar controller provides a CUSTOM mode to meet your special battery charging demand, the users can preset the Absorption voltage level and duration, Equalization voltage level, duration and periodical cycle, Float voltage level and Reset voltage level for your targeted battery charging parameters.

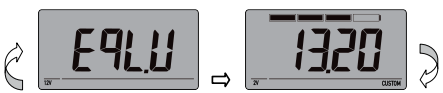
Alternatively display Absorption Voltage character **AbS.U** and voltage data when going into CUSTOM mode



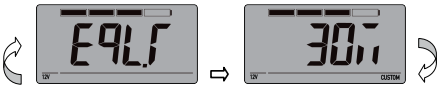
Absorption voltage setting range from 13.20V ~ 15.50V, press **PV / +** or **BATT / - button** for once +/- 0.05V variation, press the **SET UP button** again to confirm the absorption voltage level you preset, then move to next Absorption duration setting.



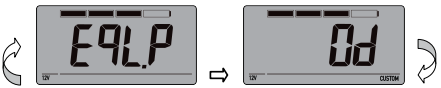
Alternatively display Absorption Time character **AbS.T** and duration data; Absorption duration setting lasted from 5 – 500 minutes, press **PV / +** or **BATT / - button** for once +/- 5 minutes variation, press the **SET UP button** again to confirm the absorption duration setting, then move to next Equalization voltage setting.



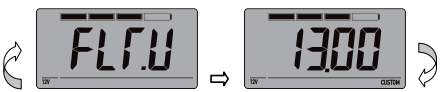
Alternatively display Equalization voltage character **EqL.U** and voltage data; Equalization voltage setting range from 13.20V ~ 16.2V, press **PV / +** or **BATT / - button** for once +/- 0.05V variation, press the **SET UP button** again to confirm the Equalization voltage and then move to next Equalization duration setting.



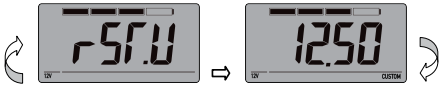
Alternatively display Equalization Time character **EqL.T** and duration data; Equalization duration setting lasted from 5 – 500 minutes, press **PV / +** or **BATT / - button** for once +/- 5 minutes variation, press the **SET UP button** again to confirm the Equalization duration setting and then move to next Equalization periodical cycle setting.



Alternatively display Equalization periodical cycle character **EqL.P** and cycle day; Equalization periodical cycle day setting from 0 – 100 days, press **PV / +** or **BATT / - button** for once +/- 1 day variation, 0 indicates no Equalization setting; press the **SET UP button** again to confirm the Equalization periodical cycle setting and move to next Float voltage setting.



Alternatively display Float voltage character **FLT.U** and voltage data; Float voltage setting range from 13.00V ~ 14.00V, press **PV / +** or **BATT / - button** for once +/- 0.05V variation, press the **SET UP button** again to confirm the Float voltage and then move to next Reset/Restart setting.

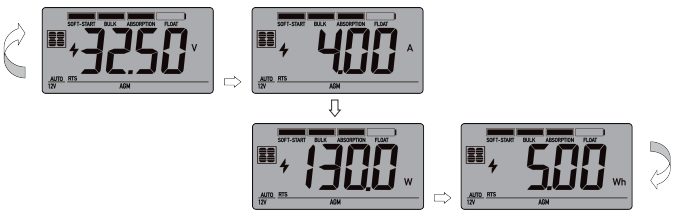


Alternatively display Reset/ Restart voltage character **rST.U** and voltage data; Reset voltage setting range from 12.50V ~ 13.50V, press **PV / +** or **BATT / - button** for once +/- 0.05V variation, press the SET UP button again to confirm the Reset / Restart voltage and all settings will be automatically stored.

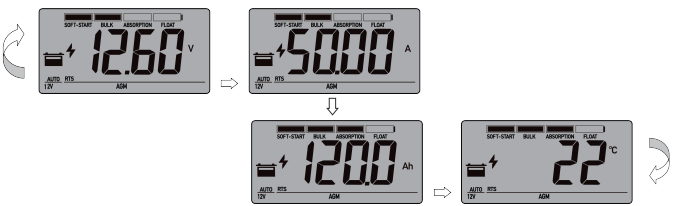
Solar input parameter display

Once the settings are completed, the solar controller will automatically go into charging process, the LCD displays the parameters of solar input as below:

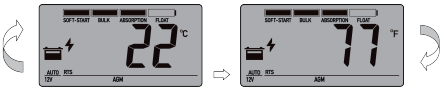
Press **PV / + button** in sequence, the LCD will display in turn with solar input voltage, current, power and kWh.



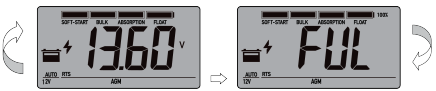
Press **BATT / - button** in sequence, the LCD will display in turn with battery voltage, charging current, charged capacity (Amp-hour) and battery temperature (if external temperature sensor connected)



The users also can read the battery voltage as degree centigrade or Fahrenheit degree by pressing **SET UP button** for converting.



Alternatively display voltage and FUL when battery is fully charged.



You also can visually monitor your battery charging condition for each battery; there is an LCD bar to show the percentage of charge, you can easily see the battery is charged to 25%, 50%, 75% or 100%, and also roughly match each charging stage of Soft-start, Bulk, Absorption and Float.



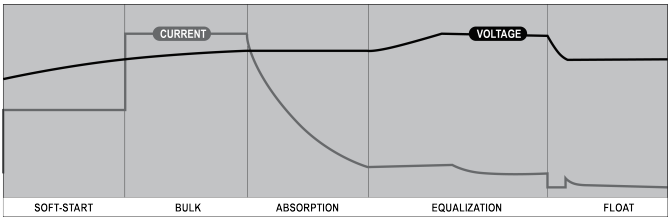
The LCD also can be treated as an independent voltage meter or thermometer at night.

Charging Stages

This solar controller provides multiple charging stages with smart charging algorithm.

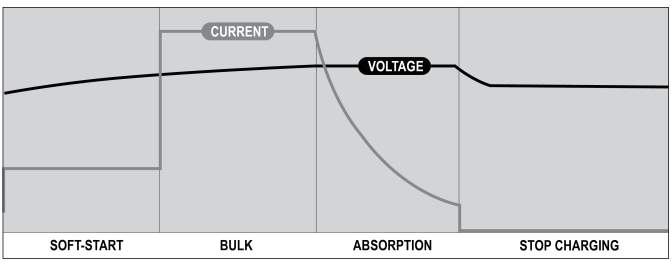
For Lead acid battery (Crystal, Gel, AGM, WET and Calcium battery):

Soft Charge – Bulk Charge - Absorption charge - Equalizing Charge* - Float charge



For Lithium battery (LCO, LFP, LTO battery)

Soft Charge – Bulk Charge - Absorption charge – Stop and Restart charge*



Soft start -

When batteries suffer an over-discharge, the controller will softly ramp the battery voltage up to 10V.

Bulk Charge -

Maximum current charging until batteries rise to Absorption level.

For Lead crystal battery type, the charge controller will deliver two step level of Bulk charge, when the first level rises the battery voltage up to 14.4V, then switch into the second level of the 10% of the first bulk charge rate, until the Lead crystal battery voltage up to 14.7V.

Absorption -

Constant voltage charging and battery is over 85% for lead acid battery; the Lithium battery (LCO, LFP and LTO battery) will close fully charged after absorption stage.

Equalization* -

Only for WET or Calcium battery type, when the battery is deeply drained below 10V or every 28 days cycle, it will automatically run this stage to bring the internal cells as an equal state and fully complement the loss of capacity. (Lead crystal, Gel, AGM battery or Lithium batteries do not run Equalization charge)

Float Charge or Re-Start charge* -

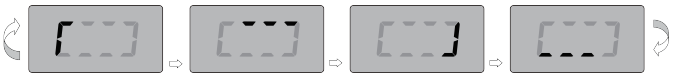
Battery is fully charged and maintained at a safe level.

A fully charged Lead acid battery (Crystal, GEL, AGM, WET or Calcium battery) has a voltage of more than 13.6 Volts; if the lead acid battery voltage drops to 12.7V at float mode, it will return to Bulk charge, Lithium battery will stop charge after Absorption stage, it will restart to bulk charge if the voltage discharge less than 12.0V for LCO battery, 13.0V for LTO battery.

Remarks:

The solar controller checks the lithium battery initial voltage to determine whether it should go to Soft-start or Bulk charge; if the Lithium battery is protected by BMS due to over-discharged, the solar controller will automatically send a signal periodically to the battery terminals to activate the BMS against protection. In case the battery is hooked a loading and

BMS is not able to be successfully activated, the solar controller is also provided a BMS activation method by manual: Press **BATT / - button** for 3 seconds to wake it up. During the period of the BMS activation by manual, the LED bar will rotate to move in LCD display.



LED Indications

Normal charge

LED indications						
LED Color	GREEN	BLUE	WHITE	WHITE	WHITE	WHITE
Soft-Start	ON	FLASH	FLASH	OFF	OFF	OFF
Bulk charge	ON	ON	ON	FLASH	OFF	OFF
Absorption / Equalization	ON	ON	ON	ON	ON	FLASH
Float charge	ON	OFF	ON	ON	ON	ON

Abnormal charge

Solar panel abnormal mode	**LCD display**	**LED indication**	**LCD backlight**
Solar panel weak <15V	/	Flash ON	ON
Solar panel reverse connection		Flash Flash	Flash
Solar panel over voltage (> 95V)		Flash Flash	Flash

Battery abnormal mode	LCD display	LED indication	LCD backlight
Solar panel is connected, battery disconnected		Flash	Flash
Battery reverse connection		Flash	Flash
Battery over voltage than > 17V		Flash Flash Flash Flash	Flash
Battery temperature over 65℃		Flash Flash Flash Flash	Flash
The controller over temperature protection		ON	Flash

Safety Protections

--Reverse polarity solar and battery connection.
--Against reverse current from battery to solar panel at night.
--Over temperature protection with charging current de-rate.
--Transient overvoltage protection, a variety or transient voltage suppressor (TVS) at the solar input and battery output against surge voltage.

Maintenance

Occasionally, clean the case using a damp cloth and mild cleaning agent. Check with terminals without loose, rusty; If connecting cable is damaged, replace the cable by qualified person.

Specifications

Electrical parameters	
Maximum PV open circuit voltage at -20℃	100 VDC
Maximum normal input PV voltage at 25℃	92 VDC
Maximum PV input current	50 AMP
Maximum PV short circuit current	62.5 AMP
Maximum rated charging current	50 AMP
Maximum conversion efficiency	98 %
Minimum tracking efficiency	99.5 %
Maximum Recommended PV Input Power	700 Watt (12V) / 1400 Watt (24V)
Self-consumption from battery when PV is disconnected	10±0.5 mA
Maximum output open circuit voltage when battery is disconnected	0.5 VDC
Maximum MPP voltage range	$V_{battery}$ +3V to 72VDC
Charging characteristics	
Minimum battery start charging voltage	5 VDC
Soft start charging voltage	5-10±0.2 VDC
Soft start charging current	25 AMP
Maximum bulk charge	50 AMP
Absorption charging voltage at 25℃	
--LCO battery	12.6±0.2 VDC
--LTO battery	14.0±0.2 VDC
--LFP battery	14.2±0.2 VDC
--Gel type battery	14.1±0.2 VDC
--AGM type battery (default setting)	14.4±0.2 VDC
--WET type battery	14.7±0.2 VDC
--Lead Crystal battery	14.7±0.2 VDC
--Calcium battery	14.9±0.2 VDC
--Custom setting range	13.2-15.5±0.2 VDC

Absorption transits to Equalizing or Float /Stop condition	
--Charging current drops to	2.5±0.1 AMP
-- or Absorption charging timer timed out for Lead acid battery	4 Hour
-- or Absorption charging timer timed out for Lithium battery	0.5 Hour
Equalization charging activation	
--Only for WET or Calcium battery	
--Battery voltage discharged less than	10±0.2 VDC
--Automatic equalizing charging periodical	28 Day
Equalization charging voltage at 25℃	15.5±0.2 VDC
Equalization charging timer timed out	2 Hour
Equalization charging voltage for CUSTOM setting	13.2~16.2±0.2 VDC
Float voltage (for Crystal, GEL, WET, AGM and Calcium battery) at 25℃	13.6±0.2 VDC
Restart voltage	
-- for Crystal, GEL, WET, AGM and Calcium battery)	12.7±0.2 VDC
-- for LCO battery	12.0±0.2 VDC
-- LTO battery	13.0±0.2 VDC
-- LFP battery	13.3±0.2 VDC
-- for CUSTOM setting range	12.5~13.5±0.2 VDC
Voltage control accuracy	± 1%
Battery temperature compensation coefficient	-24 mV/℃
Temperature compensation range	-20~+50 ℃
Electrical parts	
Input output terminal	Rated 50A connector
Physical parameters	
Controller material	Plastic, PC
Mounting	Surface mounting

IP grade	IP43
Net weight	1.40kg / 3.09lb
Environmental characteristics	
Operating temperature	-25 ~ 50℃ / -13 ~ 122 ℉
Storage temperature	-40 ~ 85℃ / -40 ~ 185 ℉
Operating Humidity range	0-85% RH

Remarks: Battery Voltage settings for 12V mode, x2 for 24V mode.

Features and Advantages

- PV open circuit voltage up to 100V.
- The latest Maximum Power Point Tracking (MPPT) algorithm.
- Unique multiple peaks detected technology for maximum power point tracking.
- MPPT tracking efficiency above 99.5%.
- Wider MPP operating voltage range.
- Common negative grounding connection.
- Suit for most rechargeable batteries, up to 8 battery types preset plus custom setting.
- Extensive internal electronics in-circuit protection.
- Reliable operating safety protection: overcharging or under charging protection, short circuit protection, reverse polarity protection, thermal protection.
- Automatically detect 12V or 24V DC system voltages.
- Unique and concise LED bar to indicate the solar statues and battery charging condition.
- Large and informative display interface to show Solar parameter, battery charging parameter, battery type, battery temperature, custom presetting and faulty codes, etc.
- Provides external battery temperature sensor (Optional).
- Splash proof IP43.
- Rubber mask for connecting terminals protection.
- Conformal coating for internal boards.

1-800-831-9889
support@richsolar.com
www.richsolar.com
1900 Mountain Ave, Norco, CA 92860