



User's Manual

Systellar MPPT Solar Charge Controller CC-MPPT-Compact

Systellar Innovations

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Introduction

Congratulations! You are the proud owner of one of the best MPPT charge controllers available in the market. Please read this manual carefully before installing and operating the charge controller.

Systellar Innovations offers high performance and cost effective CC-MPPT-Compact series solar charge controllers in the following models:

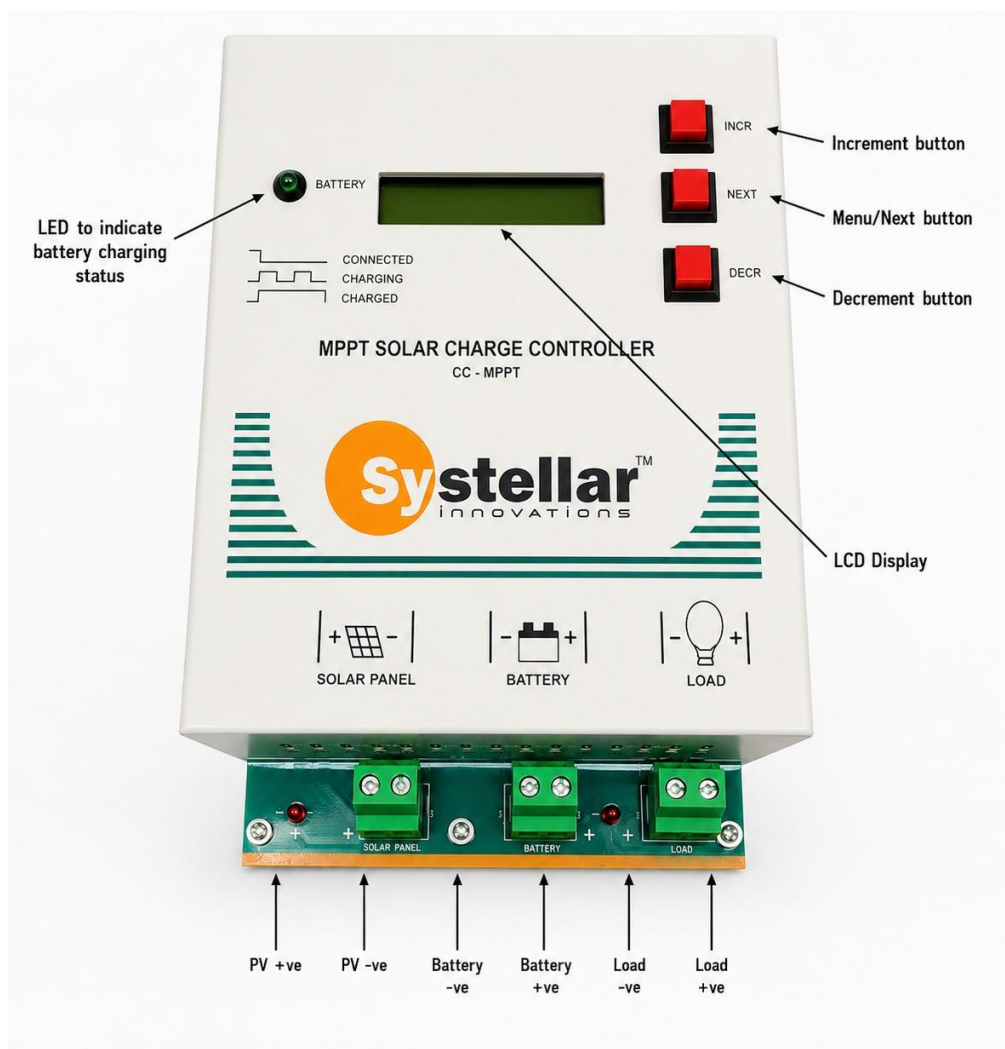
Model	Nominal Battery Voltage	Max Charging Current	Max Solar Panel Voc
CC-MPPT-Compact-100-12/24V-25A	12 / 24 volts	25 amps	85 volts
CC-MPPT-Compact-100-12/24V-50A	12 / 24 volts	50 amps	85 volts
CC-MPPT-Compact-200-24/36/48V-25A	24 / 36 / 48 volts	25 amps	175 volts
CC-MPPT-Compact-200-24/36/48V-50A	24 / 36 / 48 volts	50 amps	175 volts

These charge controllers are available for: Lead acid / Li-ion / LiFePO4 cell chemistries. However, the same is factory set and needs to be specified at the time of placing the order.

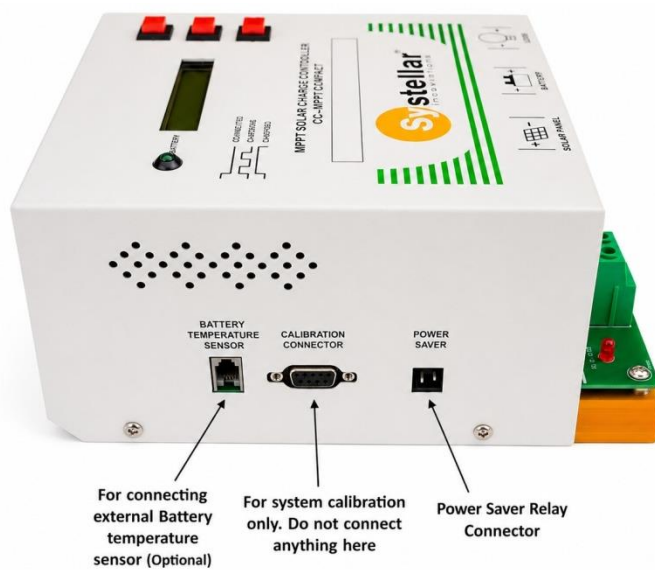
These charge controllers can work with solar photovoltaic panels with wide power and voltage range. They track the maximum power point dynamically to extract the maximum possible power from the solar panels. A four stage battery charging algorithm (Bulk, Absorption, Trickle, and Equalization (only for Lead Acid batteries)) is implemented which can charge the battery with precise current and voltage to achieve fast battery charging while ensuring long battery life.

Product Description

Front View



Left Side View



Installing the Charge Controller

1. Install the Charge Controller indoors near the battery bank at eye level. This will make it easy to read the LCD and make any changes in the settings.
2. Connect the battery using a minimum of 6 mm sq. cables for 25 amp models and 10 mm sq. for 50 amp models. It is better to use even thicker battery cables to reduce power loss in the cable. Keep cable length small to minimize losses.
3. First connect the battery cable. Observe the correct polarity of the wires. This should turn on the display. If cables are connected in the wrong polarity, the battery connection fault LED will glow and the display will not turn on. Correct the polarity before proceeding further.
4. Check the open circuit voltage of the solar panels: For model CC-MPPT-Compact-100-12/24V-25/50A, the maximum solar panel voltage should be less than 85 volts. For model CC-MPPT-Compact-200-24/36/48V-25/50A, the maximum solar panel voltage should be less than 175 volts. ***Note 1:** WARNING: HIGH SOLAR PANEL VOLTAGE MAY DAMAGE THE SYSTEM AND WILL VOID WARRANTY.* ***Note 2:** In case the solar panel voltage exceeds the maximum solar panel voltage specified for the model, the system will not start charging the battery. Instead message "Fault: V SP too high" will be displayed on the LCD. Once solar panel voltage goes below 85V / 175V respectively, the system will automatically resume normal operation.*
5. Then connect the solar panel cable to the charge controller in the correct polarity. If connected in the wrong polarity, the SP connection fault LED will start glowing. Correct the polarity before proceeding further.
CAUTION: If the solar panel voltage is above 60 volts, take care not to touch the solar panel cable ends with a bare hand. It may give an electric shock. Once connections are made, if it is daytime, the battery charging will start after about 5 seconds.

LCD Display Messages

Section	Message	LCD line 1	LCD line 2
Initial display messages	Message 1: Company name	Systellar	Innovations
	Message 2: CC-MPPT Model name	CC-MPPT - Compact -	100-12/24V-25A or 200-24/36/48V-50
	Message 3: FW version and Cell type	SW version: 4.00	Cell: Lead Acid
	Message 4: System Calibration status	System	Calibrated
Day time messages (battery being charged)	Message 1: Line 1 displays the PV panel voltage and current. Line 2 displays PV power in Watts.	PV: 029.5V 04.6A	PV Pwr: 135W
	Message 2: Line 1 displays battery voltage and charging current. Line 2 displays the charging mode. In case the Equalizing mode has been set, line 2 displays 'E' in the last column.	Batt:12.9V 10.2A	Bulk Chg
	Message 3: Line 1 displays the load current. In case the load current is less than 1 Amp then it displays "Load: On" and in case the load is Off, it displays "Load: Off". Line 2 displays the power saver relay status.	Load curr: 12.5A	Power Saver: On
	Message 4: Line 1 displays the battery	Batt: 33 deg C	Day: 123.456KWhr

	temperature and HS temperature one by one. In case an optional battery temperature sensor is installed, it displays the battery temperature, else it displays about 26 deg C. Line 2 displays 'Day: ' and the energy harvested from the solar panels today in KWHr units.		
Night time messages	Message 1: Line 1 displays “Night” and battery voltage. Line 2 displays the energy collected by the solar panels during the day which has just ended.	Night Batt:12.7V	Day: 1234.56KWHr
	Message 2: Line 1 displays the load current (as in daytime Message 3). Line 2 displays the power saver relay status.	Load curr: 12.5A	Power Saver: On

Adjust Parameters messages

Section	Parameter	LCD line 1	LCD line 2
Adjust Parameters messages*	Max. Charging current: (In 25A model — Default: 25A, Range: 5A – 25A, Step 5A) (In 50A model — Default: 50A, Range: 5A – 50A, Step 5A)	Max chg curr:	25A
	End of Charge Voltage: For LA battery (Default: 14.4V, Range: 13.98 – 14.7V). For Li-ion battery (Default: 12.6V, Range: 12.54 – 12.66V). For LiFePO4 battery (Default: 14.6V, Range: 14.52 – 14.68V).	V batt EOC:	14.60V
	Absorption time: For LA battery (Default: 60, Range: 5 – 120). For Li-ion battery (Default: 15, Range: 5 – 30). For LiFePO4 battery (Default: 0, Range: 0 – 0). This is the time for which the battery voltage is held at its end of charge voltage while charging before it is reduced to the trickle charge voltage. Recommended values: Flat plate battery 60 minutes; Tubular battery 150 minutes; SMF (Sealed Maintenance Free) battery 5 minutes.	Absorption time:	(05-120): 60Min
	Trickle Charging voltage: For LA battery (Default: 13.8V, Range: 13.20 – 14.1V). For Li-ion battery (Default: 12.54V, Range: 12.45 – 12.60V). For LiFePO4 battery (Default: 13.6V, Range: 13.2 – 13.8V).	V batt Trkl chg:	13.60V
	Low cut enter voltage: For LA battery (Default: 10.8V, Range: 10.32 – 11.4V). For Li-ion battery (Default: 9.45V, Range: 9.00 – 9.9V). For LiFePO4 battery (Default: 11.48V, Range: 10 – 12.4V).	V batt lowcut:	10.80V
	Equalize charge voltage: For LA battery (Default: 14.58V, Range: 14.34 – 14.82V). Equalize charging mode is only applicable for LA batteries.	V batt Eq chg:	14.80V

	Load Control code: 0: Always On. 1: Dusk to dawn On. 2 – 14: Number of hours On after dusk.	Load ctrl code:	(0-14): 01
	Power saver off voltage: For LA battery (Default: 12.36V, Range: 11.40 – 12.6V). For Li-ion battery (Default: 10.5V, Range: 10.2 – 10.62V). For LiFePO4 battery (Default: 12.88V, Range: 12.48 – 13.04V).	V PSaver off:	12.80V
	Psaver type: 0: Power saver normal. 1: Power saver extended.	Psaver type:	(0-1): 01

* Note: The voltage shown in the table is for the whole battery bank.

Charging Stages & Operation

Re-bulk voltage:

Once the battery has been charged up to End of Charge voltage, it goes into Absorption charge stage. After remaining in Absorption charge stage for Absorption time, it goes to Trickle charge stage. If the battery voltage goes below Re-bulk voltage (average of nominal battery voltage and end of charge voltage) due to shortage of solar power or large load on the battery, the battery goes to Bulk charge stage again.

Absorption charge time:

Absorption charge time can be set by the user from 5 to 120 minutes. Once the absorption time is over, the battery goes into Trickle charge mode and the battery terminal voltage is reduced to 13.6 volts. During the night, there will be no power from the solar panel and the battery may be partially discharged.

Setting Equalizing charging mode:

It is useful to "overcharge" the lead acid battery bank for a limited period once every 15 days or a month. This is especially helpful when several batteries are connected in series (like 24V, 36V, or 48V battery bank). It helps in equalizing the charge in all the cells of the battery bank by bringing them to full charge. The electrolyte in the batteries is also homogenized by agitation during gassing at the time of "overcharge". In the Systellar MPPT charge controller, the equalizing charge can be set by pressing the NEXT key twice in quick succession. To confirm that the equalization charging mode has been set, check the daytime display message 2. If the equalizing mode is set, 'E' is displayed in the last column. In case the NEXT key is pressed twice in quick succession, when the equalizing mode is already set, the equalization mode is reset.

***Note:** When equalization mode is set, it does not go to equalization charging mode immediately. Equalization charging is the last leg of battery charging. In equalizing charging mode, instead of stopping the battery voltage at the "end of charge" voltage, the system will allow the battery to go up to "Equalizing Charge voltage" and it will maintain it there for a total period of 60 minutes. Once this period is over, the battery will go into "Trickle charging mode" and equalizing mode will be automatically reset.*

Reading of energy collected in last 3 days:

You can see the energy harvested by CC-MPPT in the last 3 days by pressing the INCR key for 2 seconds. The display will show the total energy in the first row and the energy collected in the last 3 days in the second row (in KWHr units).

Setting programmable parameters

To enter "Adjust Parameter" mode, keep the NEXT key pressed for 2 seconds. It will turn on the backlight of the LCD and display the first parameter with its present value. To increase the value, press the INCR key. To decrease the value, press the DECR key.

***Note:** The value of the parameter will not go beyond its preset maximum and minimum limits. When NEXT is pressed, the displayed value of the parameter is written in the MEMORY and the display goes to the next parameter. Press the NEXT key for 2 seconds to come out of 'Adjust parameter mode'. If no key is pressed for 20 seconds, it automatically comes out of Adjust parameter mode. In this case, the value of the last parameter is not written in MEMORY.*

Power Saver Modes and Power Saver On/Off Voltage Settings

Power Saver is an optional accessory available from Systellar Innovations. When the battery is near full charge, the Power Saver relay is turned on. This cuts off the mains supply to the inverter and thus saves on electricity bill expenses.

There are 2 settings for the usage of the power saver relay: **0: Power Saver Normal** • **1: Power Saver Extended**

In both these modes, the power saver relay turns on during the day when the battery voltage becomes more than the "Power Saver On Voltage" (average of Re-bulk voltage and the End of Charge voltage).

In **Power Saver Normal** mode, the relay turns off approx. 2 hours before sunset or when the battery has been discharged to user programmable "Power Saver Off Voltage". If you want to use maximum solar energy set this voltage nearer to 11.2V. However, if you want to minimize the possibility of the battery getting discharged (in case of grid supply failure) then set it nearer to 11.8V.

In **Power Saver Extended** mode, the relay turns off only when the battery has been discharged to "Power Saver Off Voltage" i.e. the power saver will remain on even at night if the battery voltage remains above "Power Saver Off Voltage". This mode is useful for minimizing electricity bills if solar energy is normally sufficient to run the load during the day as well as at night.

Optional Accessories

1. Battery Temperature sensor



External Battery Temperature Sensor

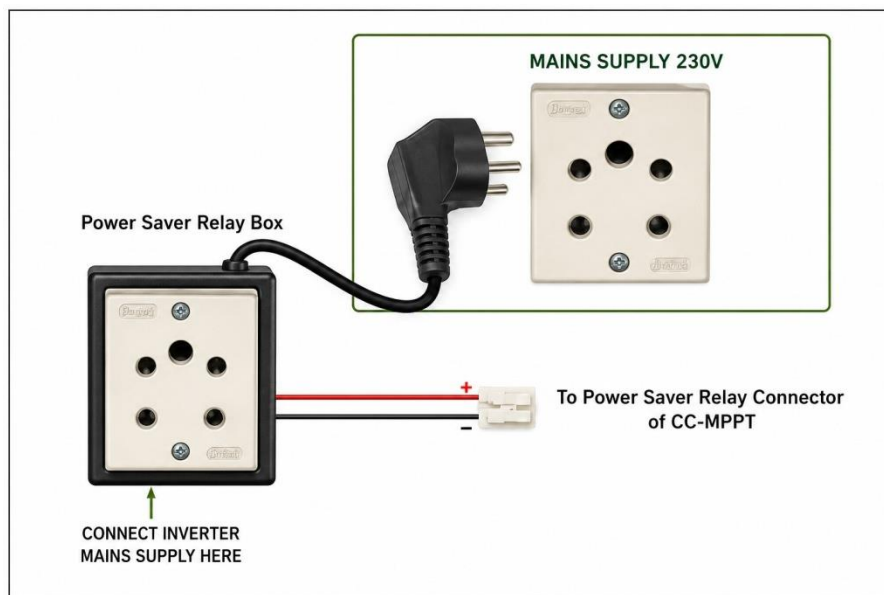
The battery temperature sensor is supplied as an optional accessory. Paste the temperature sensor on the battery side using double-sided tape. Insert the 4-pin RJ11 connector at the end of the temperature sensor cable in the socket provided on the left side of the charge controller.

2. Power Saver Relay box



Power Saver Relay Box

For use as a power saver:



Power Saver Connection Diagram

Inside the relay box, the tag going to the output socket should come from the N/C contact of the relay. This will cause the mains supply to the inverter to be cut when the relay is On.

Connect the power plug of the relay box to a power socket. Connect the inverter mains cord to the socket provided on the Relay box. Connect the 2-pin PV connector to the relay drive output connector on the right side of the charge controller.

Now when the battery charge voltage is more than 13.5 V / 27 V / 40.5 V / 54 V, the relay will turn on. This will cut off the mains supply to the inverter and thus save electricity. Note that in this condition, the load connected from the inverter will be driven by the battery while the battery is being charged by the solar panels.

Technical Specifications

Parameter	CC-MPPT-Compact-100-12/24V-25/50A	CC-MPPT-Compact-200-24/36/48V-25/50A
Technology	Dual Channel Interleaved Synchronous Buck Converter	Dual Channel Interleaved Synchronous Buck Converter
Battery bank voltage	12 / 24 Volts	24 / 36 / 48 Volts
Maximum charging current	25 / 50 Amp	25 / 50 Amp
Maximum solar panel voltage	85 Volts	175 Volts
Maximum power point voltage range	Battery voltage to 85V	Battery voltage to 175V
Idle current from battery (typical)	21 mA	21 mA

Other Features

1. When the load is On, the battery is connected to the load output. Load output is designed for a maximum of 20A DC current. In case this current is exceeded, the load is Shut Off. In this case "Overload Shutoff" message is displayed. Reduce load connected to the DC load output. Charge controller attempts to turn on the load by itself 1 minute after it is turned off. To turn it On expeditiously, press the NEXT key for 2 seconds.
2. In case the battery voltage drops below the user programmable Load cut off voltage (default 10.8V) again the load is shut off. It will automatically be turned on when the battery voltage rises above Low cut exit voltage (average of battery nominal and re-bulk voltage). User can press the NEXT key to attempt to turn on the load manually.
3. To reset all programmable parameters to their factory default values and to reset the total energy harvested KWHr value, remove the solar panel and battery connections. Then keep the INCR and DECR keys pressed while connecting the battery connections. After a few seconds "User parm reset" message will be displayed and all parameters will be reset.

Note: For product enhancement, product parameters can be changed without notice.

Ordering Information

Product model code:

CC – MPPT – Compact – 200V – 24/36/48V – 50A

(Basic model name)

- Abs. Max. PV voltage → 200V
- Battery nominal voltage → 24/36/48V
- Maximum charging current → 50A

Standard models are:

1. CC – MPPT - Compact - 100V - 12/24V - 25A
2. CC – MPPT - Compact - 100V - 12/24V - 50A
3. CC – MPPT - Compact - 200V - 24/36/48V - 25A
4. CC – MPPT - Compact - 200V - 24/36/48V - 50A
5. Other models (with Modbus interface or some special features) may be supplied on order.

*Company Contact details:***Systellar Innovations**

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