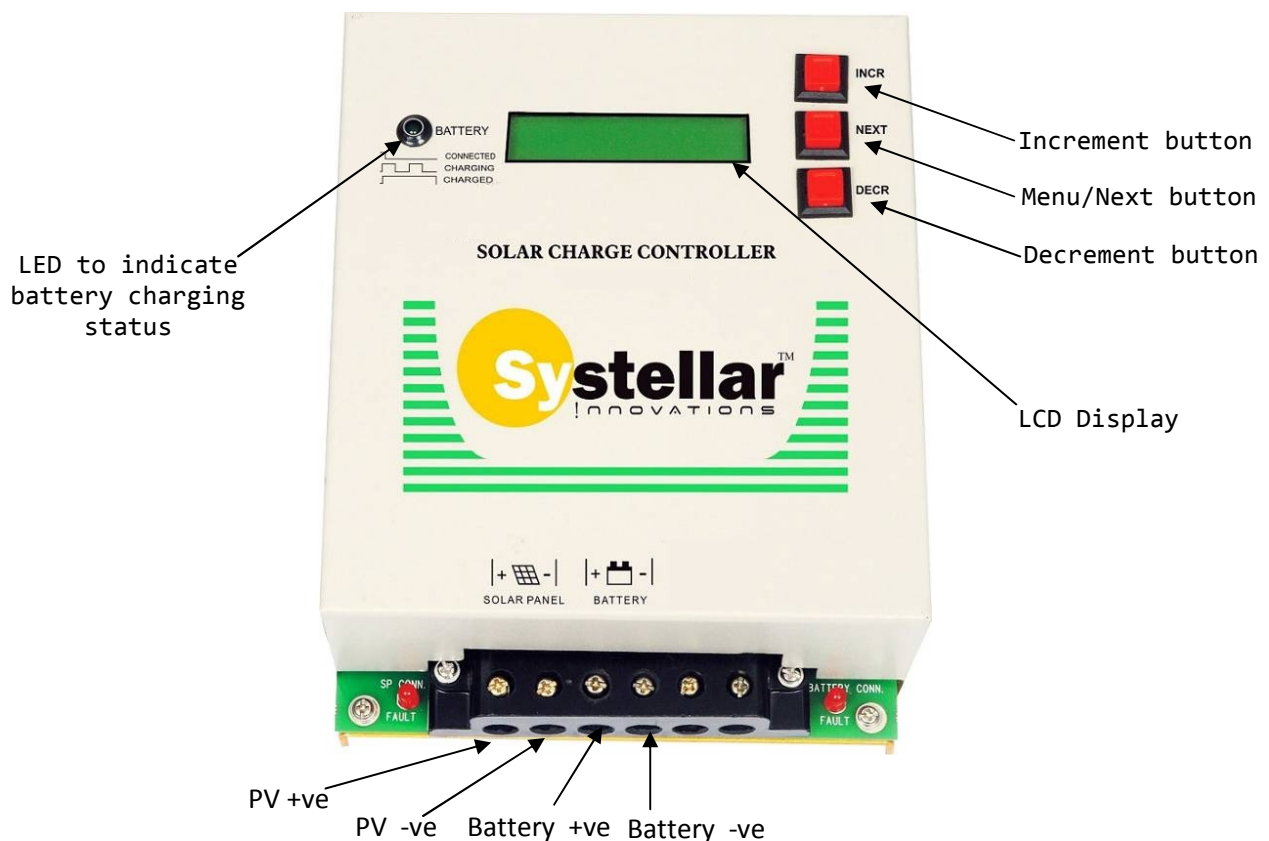# PWM-High Voltage Charge controller
User's Manual

Models available: 72V to 240V in 20A or 40A

Introduction

Congratulations! You are the proud owner of one of the best PWM charge controllers available in India. Please read this manual carefully before installing and operating the charge controller.
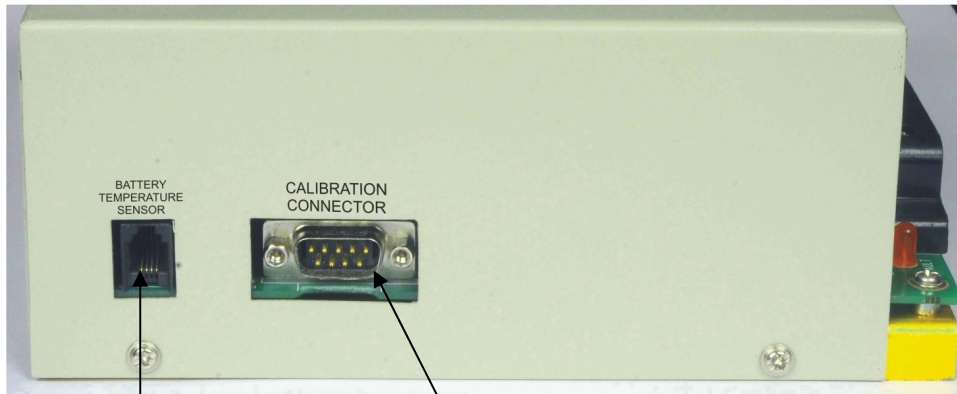
PWM charge controller model HV is advanced charge controllers and provide maximum current up to 20 Amps or 40Amps (depending on model). This charge controller can work with Solar Photo Voltaic Panels with wide power and voltage range. A four stage battery charging algorithm is implemented which can charge battery with precise current and voltage to achieve fast battery charging yet ensuring long battery life.
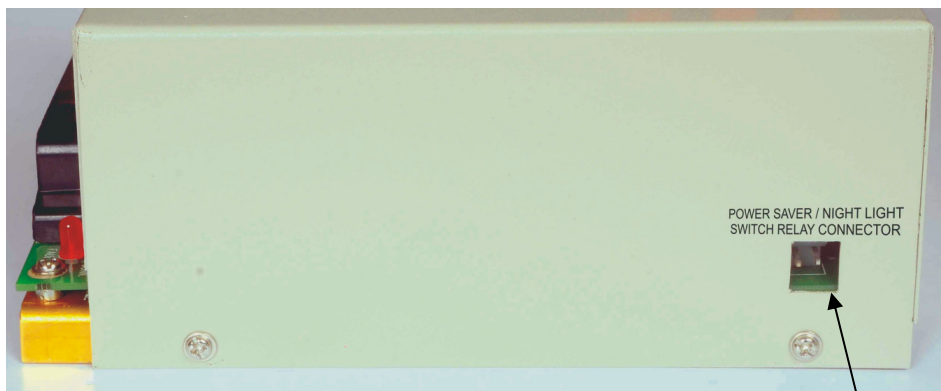
Product description

Front View

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

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Left Side View

BATTERY
TEMPERATURE
SENSOR

CALIBRATION
CONNECTOR

For connecting
external Battery
temperature
sensor(Optional
accessory)

For system
calibration only. Do
not connect anything
here

Right Side View

POWER SAVER / NIGHT LIGHT
SWITCH RELAY CONNECTOR

Power Saver / Night
Light Relay
Connector
(Optional Accessory)

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

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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 display and make any changes in the settings.

2. Connect the battery using minimum 4 mm sq cables for 20A model and 8 mm sq cables for 40A model. Keep cable length small to minimize losses in the cable. Observe correct polarity while connecting wires from battery and Solar panels. If the wrong polarity is connected, the Batt. connection fault LED / Solar Panel (SP) connection fault LED will start glowing. Correct the polarity before proceeding further.

3. As soon as the battery cables are connected, the Charge Controller will start working and its display will start showing various messages. The green LED beside LCD display will also blink slowly

4. Connect solar panel to the charge controller in correct polarity. **Take care not to touch solar panel cable ends with bare hand.** It is very dangerous and will give electric shock. Once connections are made, if it is day time, the battery charging will start after about 30 seconds.

LCD Display Messages: Messages in the table below are as per 96V model. The displayed battery voltage will change according to your particular model.

		LCD line 1	LCD line 2
Initial display messages:	Message 1: Company name. In case the system is uncalibrated, line 2 displays "Sys Uncalib"	Systellar	Innovations
	Message 2: Line 1 displays the CC Model and line 2 the software version	CC-PWM-HV	Sw ver. 1.02
DAY time messages when battery is being charged	Message 1: Line 1 displays Battery voltage and charging current. Line 2 displays the charging mode. In case Equalizing mode has been set, line 2 displays 'E' in the last column.	Batt:98.4V 10.2A	Boost Chg
	Message 2: Line 1 displays 'Day' and the energy collected from solar panels today in KWHr units. Line 2 displays relay status. If Relay is set to be used as Power Saver it displays "PSaver is On/Off". In case Relay is set to be used as Night Light Switch, it displays "Night Light:On/Off	DAY 02.30Hr	P.Saver:Off

	Message 3: Line 1 displays temperature. In case optional battery temperature sensor is installed, it displays battery temperature else it displays ambient temperature. Line 2 displays the energy collected from the solar panels today in KWHr units	Temp: 33 deg C	Total:0.230KWHr
	Message 4: Line 1 displays Solar panel power. Line 2 displays 'Day' and the energy collected from the solar panels today in KWHr units	Power 1200W	Day:0.230KWHr
Night time messages	Message 1: Line 1 displays present Battery voltage. Line 2 displays "Nite" (Night) and the energy collected by the solar panels during the day which has just ended.	Batt: 99.4V	Nite: 1.526KWHr
	Message 2: Line 1 displays "Nite" (Night) and the time in hr. Line 2 displays relay status. If Relay is set to be used as Power Saver it displays "PSaver is Off". In case Relay is set to be used as Night Light Switch, it displays "Night Light: On/Off"	Nite: 5:46 hrs	Night Switch: On

PROGRAMMING MODE: By pressing **NEXT** button for 2 sec, you can enter the programming mode to change various parameters. Changes to current values can be made using **INCR** and **DECR** buttons and stored in program memory by pressing **NEXT button**. To exit programming mode wait for 20 sec without pressing any button. After making any change, kindly again go in programming mode and verify that the value has been successfully changed.

Note: The voltages in setting mode are displayed as per 12V battery. However, the product will convert and use this for appropriate battery bank size depending upon product model

Adjust Parameters messages	End of Charging Voltage: (Default: 14.2V, Range: 13.6 – 14.5V)	End of Charging	Voltage: 14.2V
	Trickle Charging voltage: (Default: 13.6V, Range: 13.2V – 14.0V)	Trickle Charging	Voltage: 13.6V
	Equalizing Charge voltage: (Default:14.6V, Range: 14.0V – 14.8V)	Equalizing Chg	Voltage: 14.6V
	Max. Charging current: (In 20A models Default: 20A, Range: 5A – 20A, step 2.5A) (In 40A models Default: 40A, Range: 5A – 40A, step 2.5A)	Max. Charging	Current: 20A
	Absorption Time: Default: 30 minutes, Range 5 – 150 minutes. 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 for this parameter are: Flat plate battery: 60 minutes Tubular battery: 150 minutes SMF (Sealed Maintenance Free) Battery: 5 minutes	Float Hold Time:	Min. 5-150:030

	Load Control code: Always On: 0, Dusk to dawn On: 1 2 – 14 Number of hours On after dusk	Load Ctrl Code:	A On:0, 1-14:0
	Relay Usage: (Power Saver: 0, Night Switch: 1)	Relay Usage:	0 Psvr,1 NitSw:1
	In case Relay usage is set as Power saver, it displays: Power Saver Off Voltage: Power saver relay turns off when battery has been discharged to this voltage. Also Power saver relay turns off approx. 2 hours before sunset. Note: Power saver relay turns on at sunrise when solar panel voltage is more than 15V per PV panel. The second condition for power saver relay turning on is that battery should be in trickle charge mode or battery voltage should be equal to or greater than 13.5V. (Default:11.5V, Range: 11.2 – 11.8V)	Power Saver Off	Voltage: 11.5V
	In case Relay usage is set as Night Light Switch, it displays messages as shown here. Code 1 is for Dusk to Dawn operation of the night switch and 2 – 14 Number of hours On after dusk (Default: 4)	Night Light Sw:	1D-D 2-14 Hrs:04

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Setting Equalizing charging mode:

When several batteries are connected in series (like 96v battery bank), it is useful to "overcharge" the battery bank for a limited period of time once every month. 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 homogenised by agitation during gassing at the time of "overcharge". In Systellar PWM HV charge controller, equalizing charge can be set by pressing the NEXT key twice in quick succession. To confirm that equalization charging mode has been set, check the day time display message 2. If equalizing mode is set, 'E' is displayed in the last column. In case NEXT key is pressed twice in quick succession, when equalizing mode is already set, the equalization mode is reset.

Note that when equalization mode is set, it does not go to equalization mode immediately. Equalization charging is the last leg of battery charging. In equalizing charging mode, instead of stopping the battery voltage at "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 time period is over, the battery will go into "Trickle charging mode" and equalizing mode will be automatically reset.

Setting programmable parameters

To enter "Adjust Parameter" mode, keep the NEXT key pressed for 2 seconds. It will turn on the back light of the LCD and display the first parameter with its present value. To increase the value, press INCR key. To decrease the value, press DECR key. Note that the value of the parameter will not go beyond its preset 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 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. Note that in this case, the value of the last parameter is not written in MEMORY.

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

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Optional Accessories

1. Battery Temperature sensor

TO EXTERNAL BATTERY TEMPERATURE
SENSOR CONNECTOR OF CC_MPPT

STICK THIS SENSOR
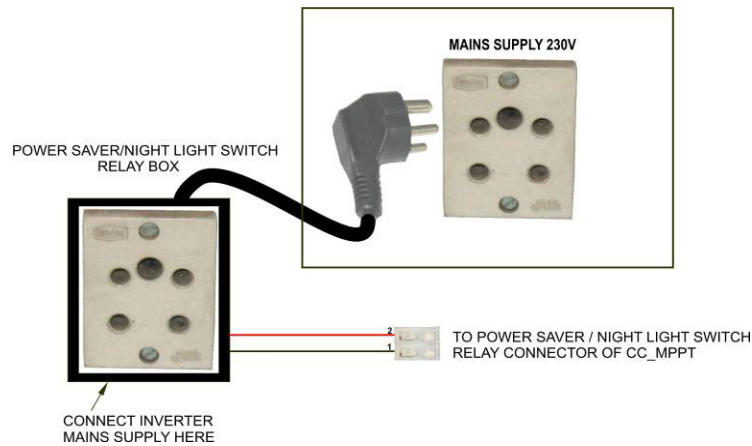TO BATTERY

External Battery Temperature Sensor

Battery temperature sensor is supplied as an 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 / Night Light Switch Relay box:

Power Saver/Night Light Switch Relay Box

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

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For use as power saver:


Power Saver Connection Diagram

Program the parameter 'Relay usage' to 0 (Power Saver). Set appropriate 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 battery getting discharged (in case of grid supply failure) then set it nearer to 11.8V

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 relay is On.

Connect the power plug of the relay box in a power socket. Connect 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 13.5V per battery, 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.

For use as Night Light Switch:
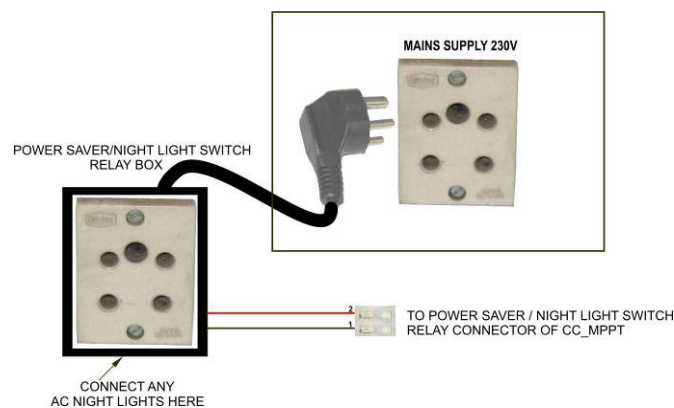
Night Light Switch Connection diagram

Program the parameter 'Relay usage' to 1 (Night Light switch). Set Night Light switch parameter to 1 for dusk to dawn operation or 2 – 14 hours of operation after dusk.

Inside the relay box the tag going to the output socket should come from the N/O contact of the relay.

Now the relay will be turned on at dusk and remain on till dawn or for number of hours as set in the parameters. When the relay is on, the night light connected on the socket of the relay box will be supplied power through the relay.

Technical specifications

Technology	PULSE WIDTH MODULATION
Battery bank voltage	72V / 96V / 120V / 144V / 180V / 192V / 240V
Maximum charging current:	20 Ampere / 40 Ampere
Appropriate solar panel voltage:	Should match battery bank voltage
Idle current from battery (typical)	Upto 11 mA
Deep discharge protection system shut off voltage	10.5V per battery in battery bank

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