

CC-PPL User's Manual

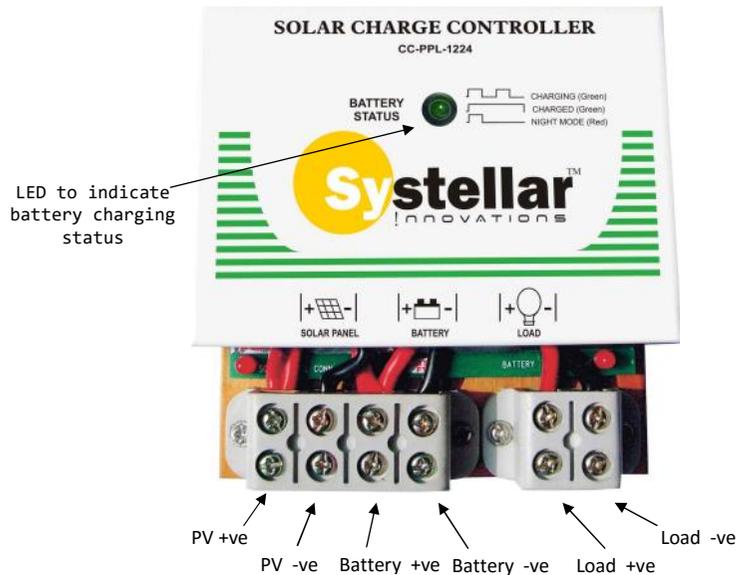
Introduction

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.

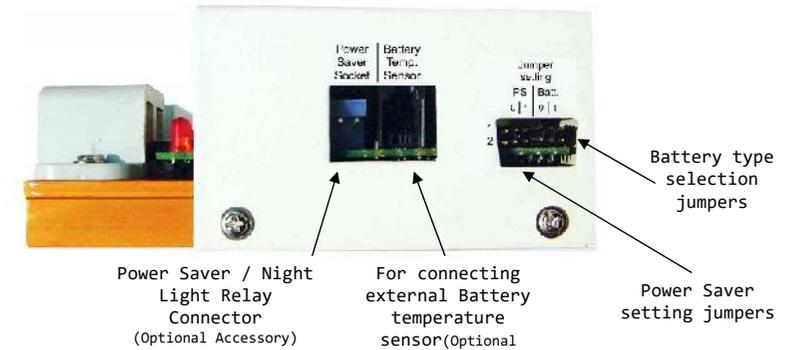
PWM-PPL series comes in the following models:

Model	Battery bank voltage	Max. Charging current
CC-PWM-PPL-1224-20	12V / 24V (auto-select)	20A
CC-PWM-PPL-1224-40	12V / 24V (auto-select)	40A
CC-PWM-PPL-36-20	36 V	20A
CC-PWM-PPL-36-40	36V	40A
CC-PWM-PPL-48-20	48V	20A

Product description



Side View



The following battery types can be selected using jumper settings:

1. **SMF (Sealed Maintenance Free)**
2. **Flooded – Flat plate**
3. **Flooded – Tubular**

A three stage battery charging algorithm **Booster Bulk, Absorption, Trickle** or **Floatis** is implemented in this charge controller, which can charge battery with precise current and voltage levels to achieve fast charging yet ensuring long battery life. For all battery types, Boost or Bulk charge voltage is 14.4V (for 12V battery bank) / 28.8V (for 24V battery bank) / 43.2 (For 36V battery bank) / 57.6V (for 48V battery bank). Trickle charge voltage is 13.5V (for 12V battery bank) / 27V (for 24V battery bank) / 40.5 (For 36V battery bank) / 54V (for 48V battery bank). However, for each battery type the absorption time (The time battery voltage is maintained at end of charging voltage) is different. For SMF battery it is 5 minutes (so that the electrolyte does not get dried up). For flooded Flat plate battery the absorption time is 30 minutes. For flooded Tubular battery it is 120 minutes (so that the proper acid gravity can be ensured).

This product also provides the following advanced features:

1. **Power Saver relay drive:** This software feature along with optional Power saver accessory provides a means to cut off mains supply to the inverter during the day when the battery is fully charged. This helps in saving electricity coming from the electricity board. The mains supply is reconnected 2 hours before sunset or when battery voltage becomes less than user programmed voltage in the range of 11.2 to 11.8 Volts. This voltage can be set using two jumpers. (Given later in Setting programmable parameters using jumpers section)
2. **D.C. Load output:** There is a D.C. output (same voltages as the battery bank voltage) which is capable of driving a 20 Amp load. Normally this output is always ON. It is turned off if the battery voltage drops below 10.5 Volts (per battery) to prevent battery deep discharge.

- Battery Temperature sensor input:** This feature along with an optional battery temperature sensor probe adjusts battery charging voltages based on the temperature of the battery. This ensures optimum battery charging and longer battery life.

Installing the Charge Controller

- Install the Charge Controller indoors near the battery bank at chest height. This will make it easy to make wire connections and jumper settings.
- For 20A model, connect the battery bank using 4 mm sq. copper cable. Battery cable length should be around 1.5 metres. Voltage drop in the cable has been adjusted in the software with these cable dimensions. Observe correct polarity while connecting wires from battery and Solar panel. If the wrong polarity is connected, the Batt. connection fault LED (red) will start glowing. Correct the polarity before proceeding further. For 40A model, use 10 mm sq. copper cable of length 1.5 m
- As soon as the battery cables are connected, the Charge Controller will start working and its **Battery Status** LED indicator will start glowing / blinking.
- Check open circuit voltage of the solar panels. For optimum results, open circuit voltage of solar panels should be matched with the battery bank voltage. For 12V battery bank, use 30 or 36 cell solar panels ($V_{oc} = 19V$ or $21V$). For 24V battery bank, use 60 or 72 cell solar panels ($V_{oc} = 37V$ or $43V$).

Maximum solar panel open circuit voltages are as under:

Model	Maximum allowed Solar Panel V_{oc}
1224-20 & 1224-40	50V DC
36-20, 36-40, 48-20	85V DC

For CC-PPL Model 1224-20 and 1224-40, maximum solar panel voltage should be less than 50 volts. This means that maximum two 12V solar panels ($V_{oc} 19 - 21V$) can be connected in series. Any number of such series strings may be connected in parallel to increase the current from solar panels (upto rated capacity of solar charge controller). If 24V solar panels of $V_{oc} 37 - 43V$ are used, then these panels should only be connected in parallel and not in series.

CAUTION: Connecting Solar panel voltage above specified max. values can permanently damage the charge controller.

- Connect solar panel to the charge controller in correct polarity. Once connections are made, if it is day time, the battery charging will start after about 15 seconds and GREEN led will blink. At night time, RED led will blink

LED indications

CC-PPL has a dual-colour LED (Red / GREEN) which gives a variety of indications about the functioning of CC-PPL:

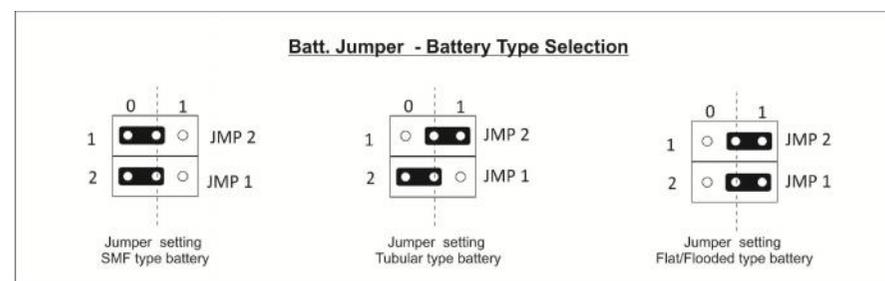
Condition	Indication
1. System un-calibrated (system fault)	Red: 30 blink 100 msec On & 100 msec Off
2. Battery discharged	Red: Three 50 msec blink at 2 seconds interval
3. Load shutdown due to Low Battery voltage or Load current exceeding 20 Amp	Red: Two 50 msec blink at 2 seconds interval
4. Battery voltage too high (system fault)	Red: Solid On (Unlikely fault)
5. Dusk / dawn verification	Green: Two 50 msec blink at 2 seconds interval
6. During NIGHT	Red: One 50 msec blink at 2 seconds interval
7. Battery fully charged	Green: Solid On
7. During DAY, Charging current < 1 Amp	Green: One 50 msec blink at 2 seconds interval
8. During DAY, Charging current 1-2 Amp	Green: 500 msec On, 500 msec Off

Note that the above is prioritized list of indications i.e. when a higher priority indication is there, any lower priority indication will not be given during that period.

Setting programmable parameters using jumpers

There are two sets of 2 jumpers each on the right side of the CC-PPL. Their settings are as under:

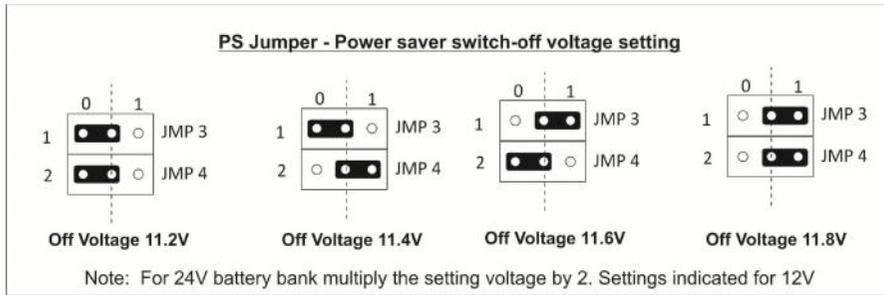
1. Battery type selection (Jmp1 and Jmp2)



If no jumper is attached then the default battery type is Flat/Flooded battery.

After making changes in battery type selection, the battery wires should be dis-connected from charge controller and reconnected for battery type to be sensed correctly.

2. Power saver turn off voltage setting (Jmp3 and Jmp4)



If no jumper is connected then default Power Saver off voltage is 11.8V

Optional Accessories

1. Battery Temperature sensor



External Battery Temperature Sensor

Battery temperature sensor is supplied as an optional accessory. Paste the temperature sensor on the battery side using adhesive tape. Insert the 4 pin RJ11 connector at the end of the temperature sensor cable in the socket provided on the right side of the charge controller.

Note that if temperature sensor is not inserted in the connector in CC_PPL, the battery charging voltages suitable at 25 deg C are used automatically. With increase in battery temperature the charging voltage values will reduce.

2. Power Saver accessory:



Power Saver Accessory



Inverter Mains Input Plug needs to be inserted into Power Saver Box

Power Saver Connection Diagram

Connect the plug of PowerSaver accessory in Mains power socket. Connect inverter mains cord to the socket provided on the Power saver box. Connect the 2 pin PV connector to the Power saver socket on the right side of the charge controller.

Now when it is day and the battery voltage is more than 13.5 V (each 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 charged using solar energy.

Other Features

1. When load is ON, battery is connected to load output. Load output is designed for maximum 20A DC current. In case this current is exceeded, the load is Shut down. To restart load, reduce the load (So that load current does not exceed 20 Amp) and change the position of JMP3 or JMP4 temporarily to reset Load Overload shutoff condition.
2. In case battery voltage drops below 10.5 / 21.0 V the load is shut off. It will automatically reset when battery voltage rises above 12 V / 24 V or if JMP3 or JMP4 position is changed.
3. All **SYSTELLAR** brand charge controllers have **excess PV panel protection**. The charge controller delivers only the rated maximum charging current to the battery even if excess panels are connected (Solar panel V_{oc} – PV Open circuit voltage cannot be exceeded from max. specified value). However, you should not install excess solar panel capacity for extended period of time (more than 1 day).

Technical specifications

MODEL	CC-PPL-1224-20	CC-PPL-1224-40	
	CC-PPL-36-20	CC-PPL-36-40	CC-PPL-48-20
Maximum charging current	20 Amp	40 Amp	
PWM duty cycle range	0 – 100%		
Technology	Zero voltage drop Pulse Width Modulation		
MODEL	1224	36	48
Nominal Battery bank voltage	12V / 24V auto-select	36V	48V
Maximum solar panel voltage (V_{oc})	50V	85V	85V
Load shut-down voltage for battery deep discharge protection	10.8 / 21.6V	32.4V	43.2V
Load shut-down recovery voltage	12.4V / 24.8V	37.2V	49.6V
Max. Load current	20A	20A	20A

* For continuous product improvement, product specifications can change without notice

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