



■ Features :

- Controlled by microprocessor
- 2/3/8 stage charging selectable on output panel (Note 4)
- Universal AC input / Full range
- Built-in active PFC function PF>0.95
- Protection: Reverse Polarity / Short circuit / Over voltage / Over temperature
- Charger for lead-acid batteries
- 3 color LED loading indicator
- Built-in remote ON-OFF control
- 2-Bank charger
- Temperature compensation function
- FAN on/off control (depends on charging current)
- 3 years warranty

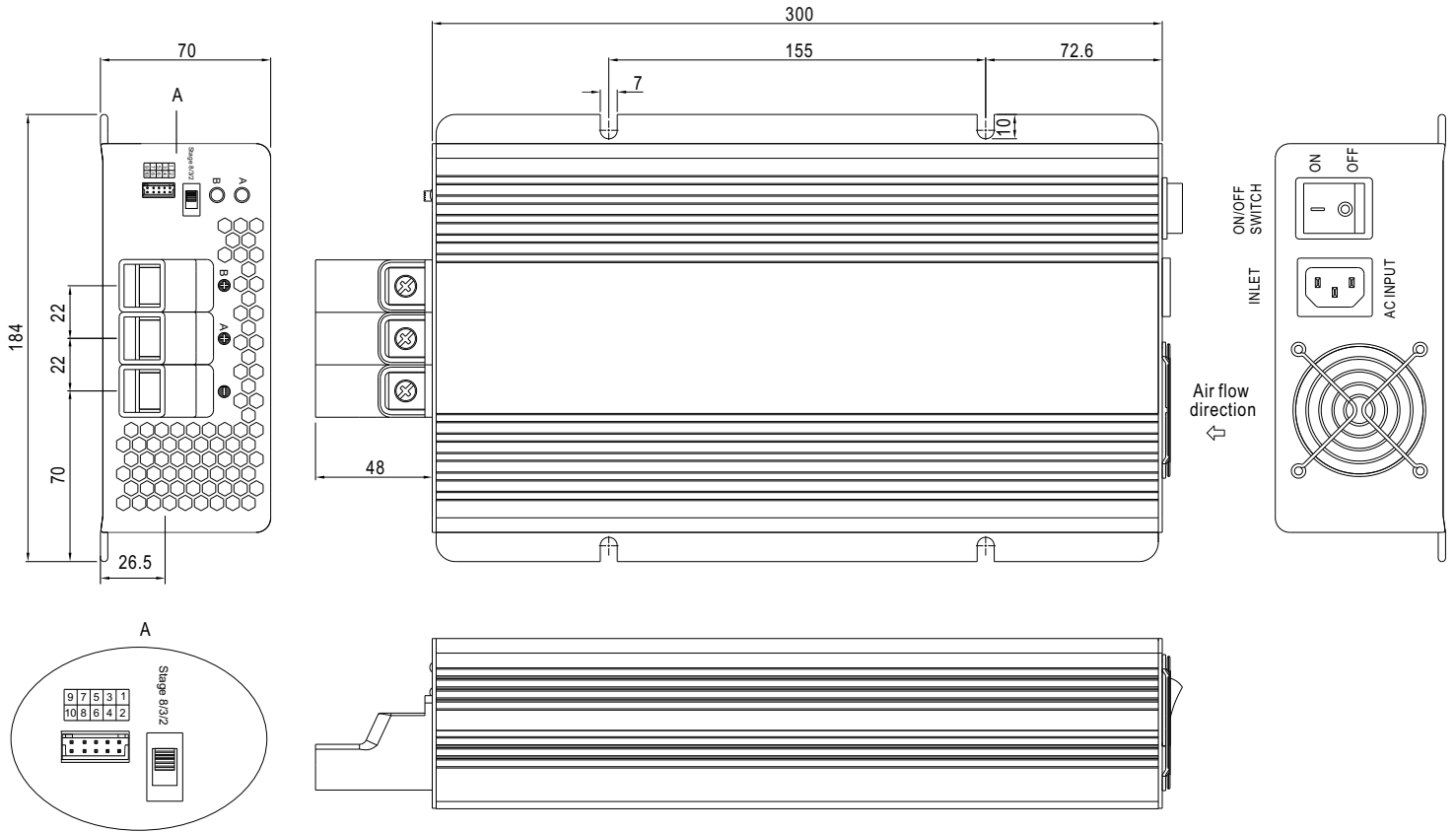


**SPECIFICATION**

MODEL		PB-1000-12	PB-1000-24	PB-1000-48
OUTPUT	BOOST CHARGE VOLTAGE	14.4V	28.8V	57.6V
	FLOAT CHARGE VOLTAGE	13.8V	27.6V	55.2V
	OUTPUT CURRENT	60A	34.7A	17.4A
	RECOMMENDED BATTERY CAPACITY(AMP HOURS)(Note 3)	200 ~ 600Ah	120 ~ 350Ah	60 ~ 175Ah
	BATTERY TYPE	Open & Sealed Lead Acid		
	LEAKAGE CURRENT FROM BATTERY (Typ.)	<1mA		
INPUT	VOLTAGE RANGE	90 ~ 264VAC 127 ~ 370VDC		
	FREQUENCY RANGE	47 ~ 63Hz		
	EFFICIENCY (Typ.)	85%	88%	89%
	POWER FACTOR (Typ.)	0.95/230VAC 0.98/115VAC at full load		
	AC CURRENT (Typ.)	12A/115VAC 5.2A/230VAC		
	INRUSH CURRENT (Typ.)	25A/115VAC 50A/230VAC		
	LEAKAGE CURRENT	<3.5mA / 240VAC		
PROTECTION	OVER VOLTAGE	16 ~ 18V	32 ~ 35V	64.5 ~ 69.5V
		Protection type : Shut down o/p voltage, re-power on to recover		
	OVER TEMPERATURE	80°C ±5°C (12V), 85°C ±5°C (24V,48V) (TSW1: detect on heatsink of power transistor)		
		85°C ±5°C (12V), 75°C ±5°C (24V,48V) (TSW2 : detect on heatsink of o/p diode)		
	Protection type : Shut down o/p voltage, recovers automatically after temperature goes down			
	SHORT CIRCUIT	YES, protected by internal circuit		
	REVERSE POLARITY	YES, protected by internal circuit		
FUNCTION	REMOTE CONTROL	Open: Normal work Short: Stop Charging		
	BATTER BANKS	2 banks (A & B)		
	FAST CHARGE	2 / 3 / 8 stage selectable		
	CHARGER OK	Relay contact rating(max.): 30V/1A resistive ; "Short" when the unit is working properly, "Open" when the unit is failure or the protection function is activating		
	OUTPUT OK	Relay contact rating(max.): 30V/1A resistive ; "Short" when the battery is full, "Open" when the battery is still charging		
	TEMPERATURE COMPENSATION	By NTC, compensate both banks at the same time		
	ENVIRONMENT	WORKING TEMP.	-20 ~ +60°C (Refer to output load derating curve)	
WORKING HUMIDITY		20 ~ 90% RH non-condensing		
STORAGE TEMP., HUMIDITY		-40 ~ +85°C, 10 ~ 95% RH		
TEMP. COEFFICIENT		±0.05%/°C (0 ~ 50°C)		
VIBRATION		10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes		
SAFETY & EMC (Note 2)	SAFETY STANDARDS	UL60950-1, TUV EN60950-1 approved		
	WITHSTAND VOLTAGE	I/P-O/P:3KVAC I/P-FG:1.5KVAC O/P-FG:0.5KVAC		
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:100M Ohms / 500VDC / 25°C / 70% RH		
	EMI CONDUCTION & RADIATION	Compliance to EN55022 (CISPR22)		
	HARMONIC CURRENT	Compliance to EN61000-3-2,-3		
OTHERS	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11; ENV50204, EN55024, light industry level, criteria A		
	MTBF	127.4Khrs min. MIL-HDBK-217F (25°C)		
	DIMENSION	300*184*70mm(L*W*H)		
	PACKING	3.5Kg; 4pcs/15Kg/1.83CUFT		
NOTE	<p>1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25°C of ambient temperature.</p> <p>2. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives.</p> <p>3. This is Mean Well's suggested range. Please consult your battery manufacturer for their suggestions about maximum charging current limitation.</p> <p>4. Please choose the "3 stage" selection when the charger is used to charge the batteries and power the loads in the same time.</p>			

**Mechanical Specification**

Case No. 804B Unit:mm

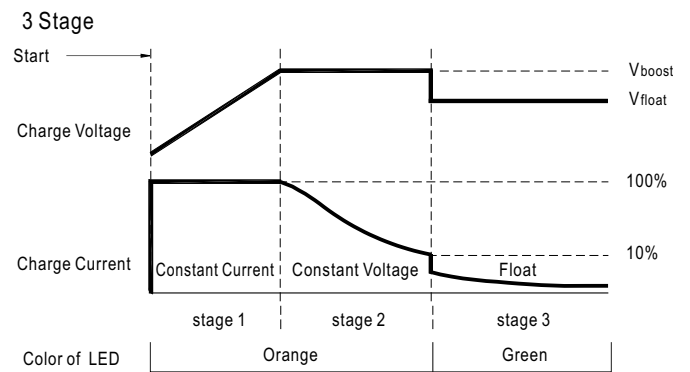
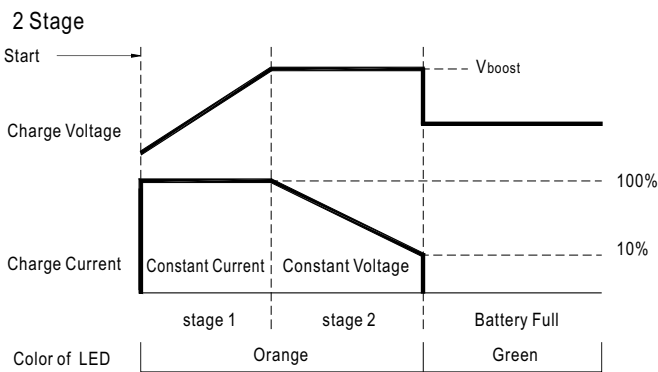


Control Pin No. Assignment(CN100) : HRS DF11-10DP-2DS or equivalent

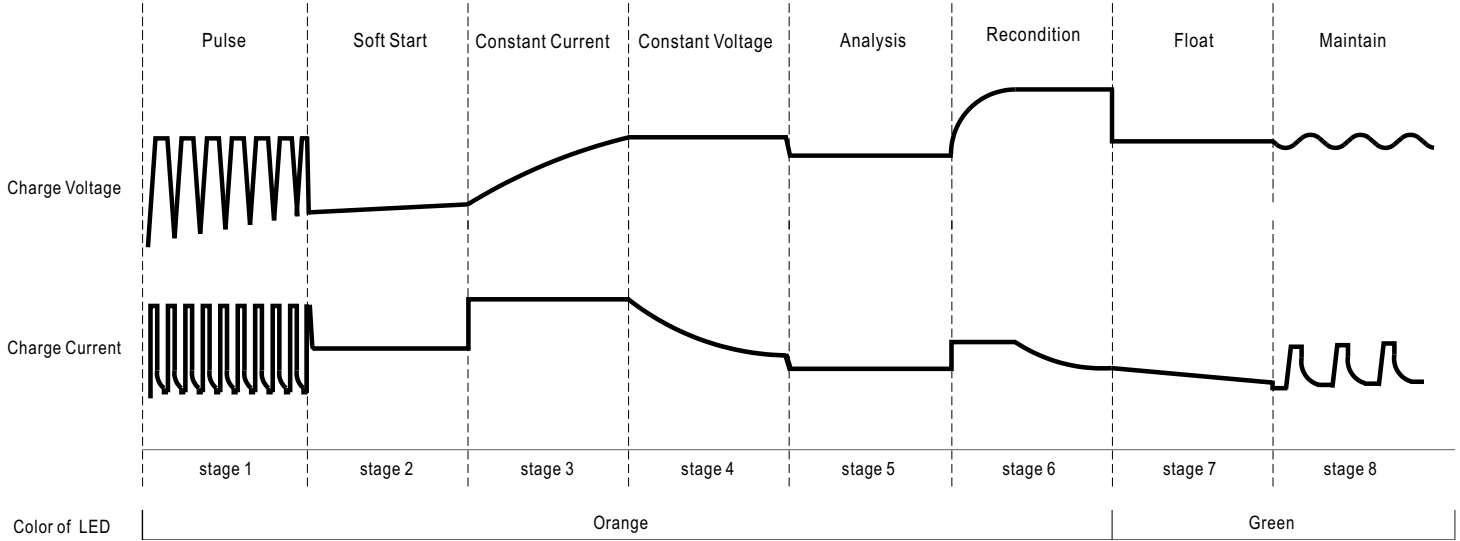
Pin No.	Assignment	Pin No.	Assignment	Mating Housing	Terminal
1,2	RY13	8	NTC(5KΩ)	HRS DF11-10DS or equivalent	HRS DF11-**SC or equivalent
3,4	RY14	9	RC-		
5,6	RY15	10	RC+		
7	GND				

RY13 : Bank A OK      NTC / GND : Temperature sense  
 RY14 : Bank B OK      RC+ / RC-: Remote ON/OFF  
 RY15 : Charger OK

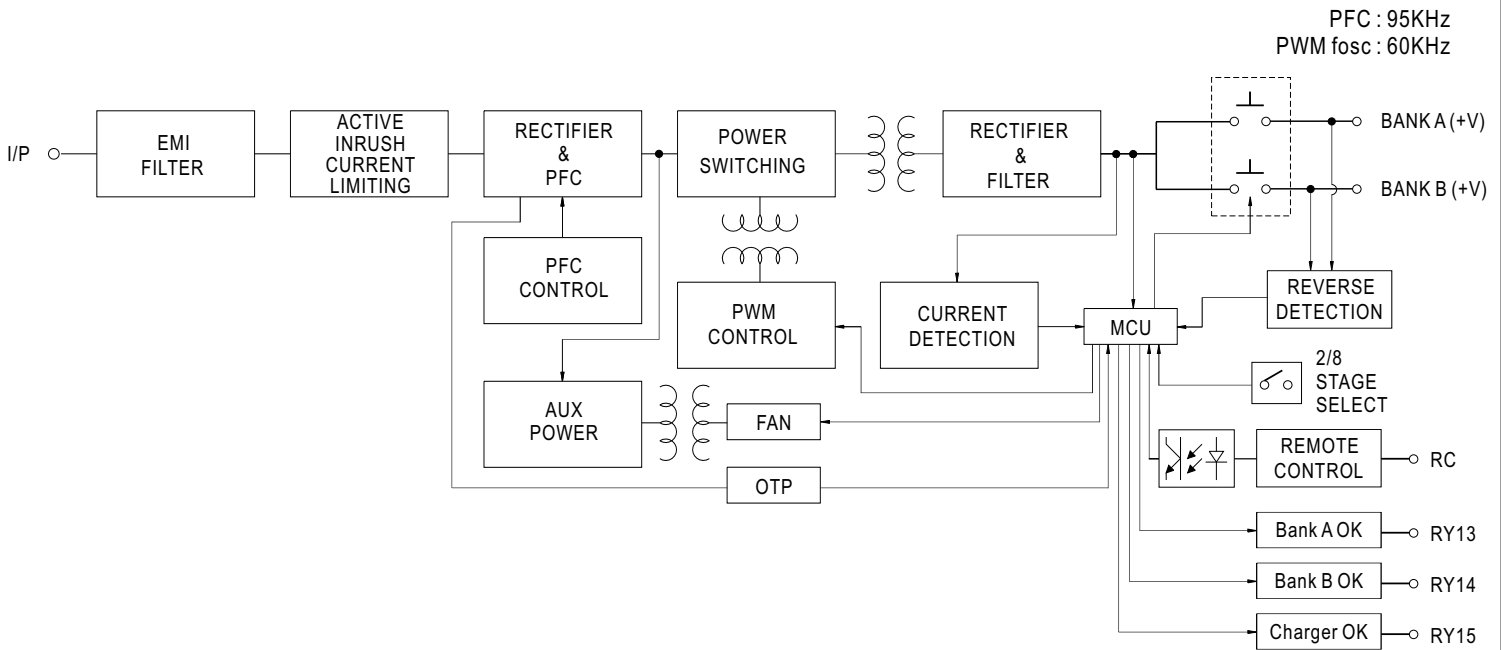
**Charging Curve**



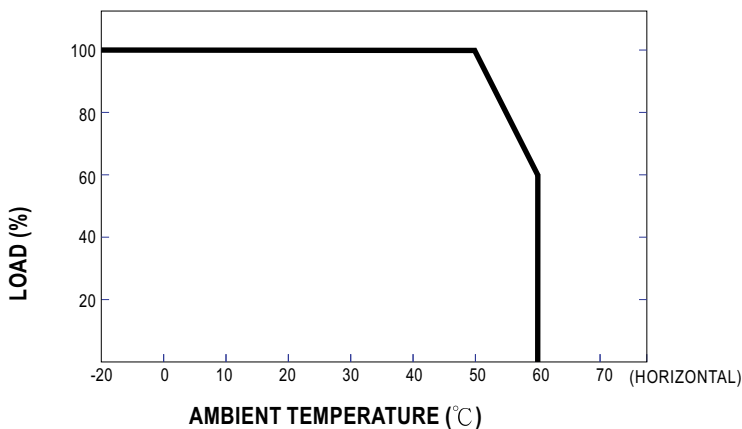
8 Stage



**Block Diagram**



**Derating Curve**



**The Function of LEDs**

Battery	Color of LED
Fail	Red
Charging	Orange
Battery Full	Green

■ Function Description of CN100

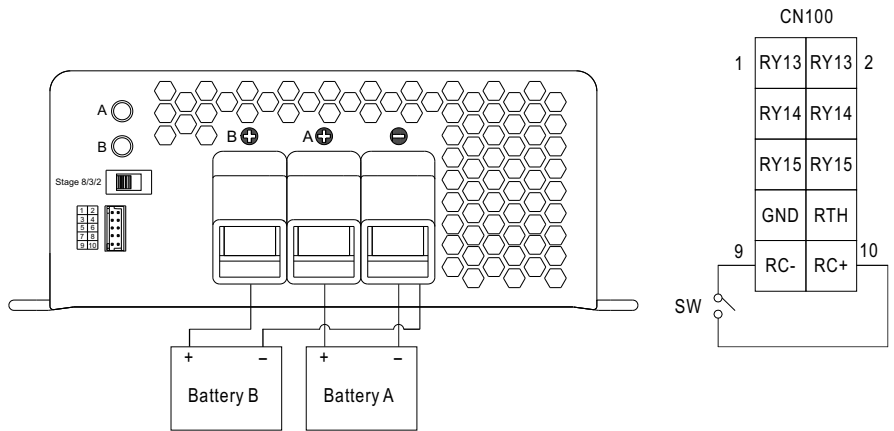
Pin No.	Function	Description
1,2	RY13	Relay contact rating(max.): 30V/1A resistive.; "Short" when the battery A is full, "Open" when the battery A is still charging.
3,4	RY14	Relay contact rating(max.): 30V/1A resistive.; "Short" when the battery B is full, "Open" when the battery B is still charging.
5,6	RY15	Relay contact rating(max.): 30V/1A resistive.; "Short" when the unit is working properly, "Open" when the unit is failure or the protection function is activating.
7,8	GND / RTH	Temperature sensor comes along with the charger can be connected to the unit to allow temperature compensation of the charging voltage. <b>If the temperature sensor is not used, the charger still works normally.</b>
9,10	RC- / RC+	Turn the output on and off by electrical or dry contact between pin 10 (RC+) and pin 9(RC-), "Open" : Normal work , "Short" : Stop charging

■ Function Manual

1.Remote Control

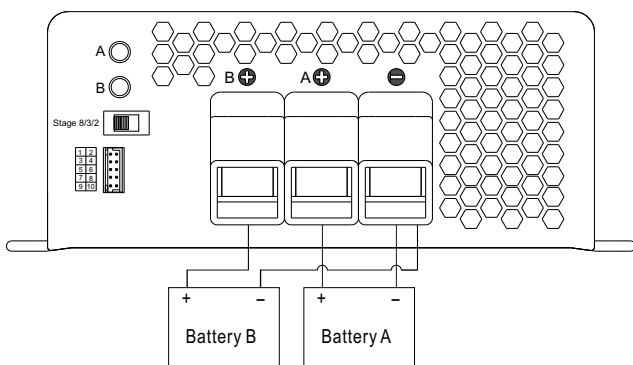
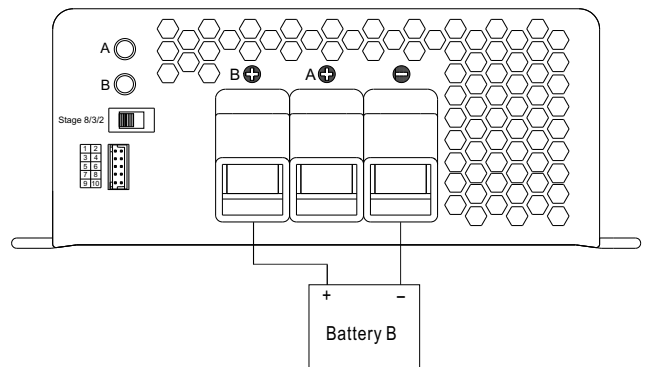
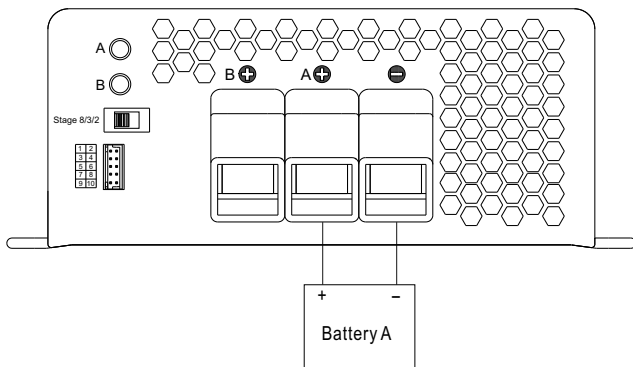
The charger can be turned ON/OFF by using the "Remote Control" function.

Between RC+(pin10) and RC-(pin9)	Charger
SW Open	ON
SW Short	OFF



2.Two Battery Banks

The charger may be hooked up two battery banks (A and/or B). Connect the battery bank(s) as below. If you are connecting 2 battery banks in the same time, keep in mind that they must share a common ground.

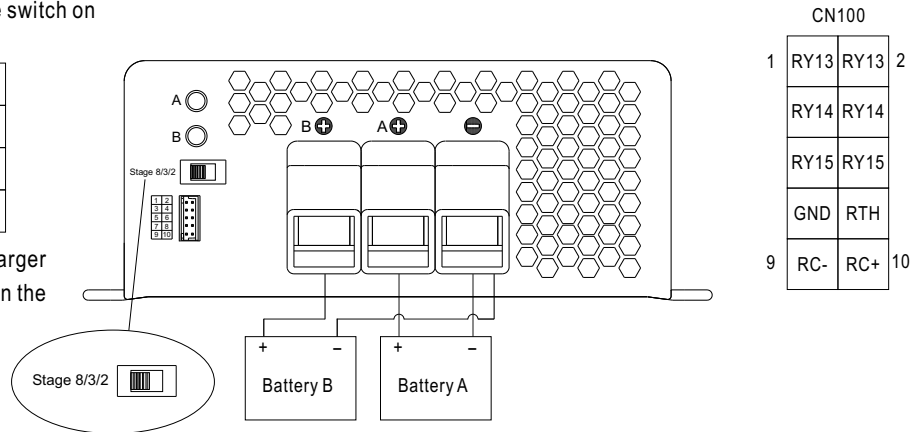


### 3. 2,3, or 8 stage Charging Select

(1)The charger features user selectable 2,3, or 8 stage charging.  
The charging profile is selected by moving the slide switch on the back panel.

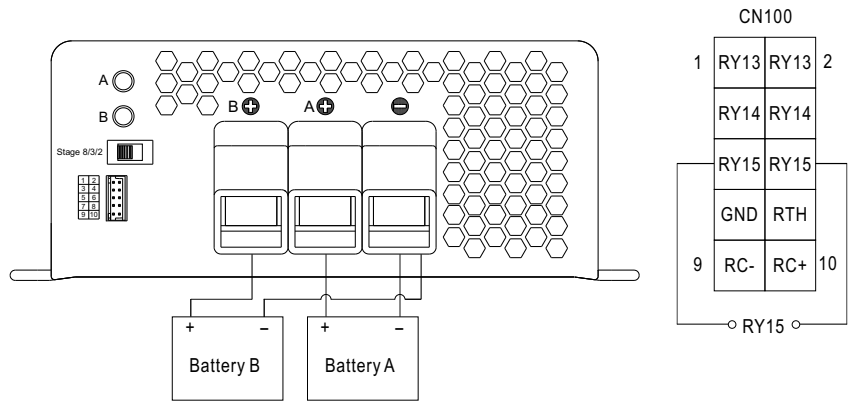
Switch	Charging mode
Right	2 stage charging
Middle	3 stage charging
Left	8 stage charging

(2)Please choose the "3 stage" selection when the charger is used to charge the batteries and power the loads in the same time.



### 4.Charger OK Relay(RY15)

Charger	Between pin5 and pin6(RY15)
Normal work	ON (Short)
Failure or the protection function is activating	OFF (Open)



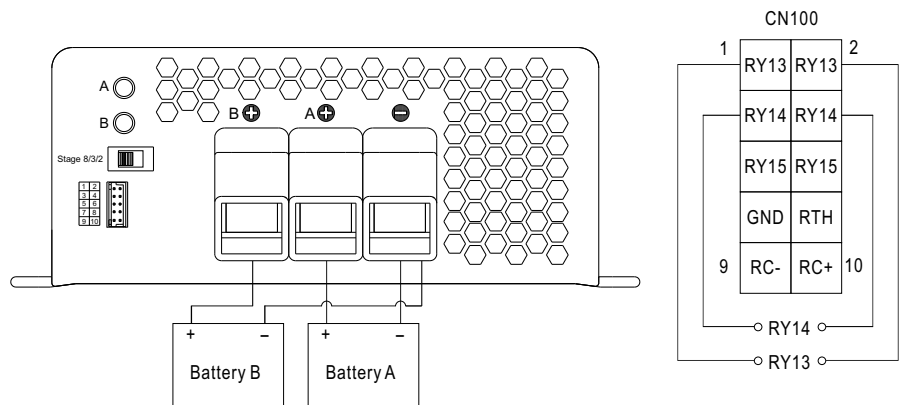
### 5.Output OK Relay(RY13 & RY14)

#### 1.Bank A OK (RY13)

Bank A	Between pin1 and pin2(RY13)	Color of LED A
Battery A Full	ON (Short)	Green
Charging	OFF (Open)	Orange

#### 2.Bank B OK (RY14)

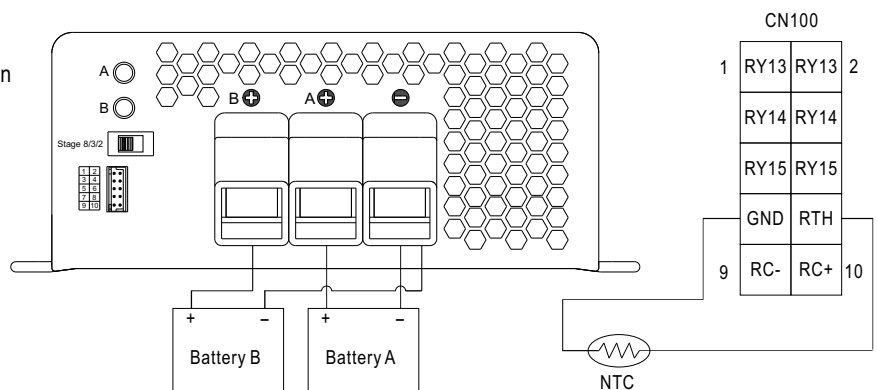
Bank B	Between pin3 and pin4(RY14)	Color of LED B
Battery B Full	ON (Short)	Green
Charging	OFF (Open)	Orange



### 6.Temperature Compensation

Temperature sensor comes along with the charger can be connected to the unit to allow temperature compensation of the charging voltage.

**If the temperature sensor is not used, the charger still works normally.**



The temperature sensor can either be attached to the battery or placed in its surrounding environment.



# **PB-1000**

## **Instruction Manual**



# PB-1000 Instruction Manual

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## 0. Product description

PB-1000 is MW's next generation smart charger. It has many of the protective features that consumers would like to have in a charger including battery misconnection (wrong voltage), reverse polarity, battery disconnection or not connected, and battery failure analysis. The latest high efficiency switching topology plus microcontroller power management are utilized in its design. Three types of charging curves are offered for lead acid battery charging, 2 stages for quick charging, 3 stages (quick + float), and 8 stages for optimized charging. Charging stage selection can be easily made by the user through the selection switch on the front panel.

Depending on battery brand and type (lead acid, gel, lithium iron, and lithium manganese); the battery may require special charging curves and adjustment to the protective functions which differs from the standard settings. The charging curves and protective functions can be customized by reprogramming its firmware. Basically, you can change the voltage/current settings of each individual stage plus adjust or cancel the protective functions. Please note, the factory charging curve is for charging lead-acid battery. Please contact MW regarding other types of battery charging requirements.

## 1. Notes on operation:

- ⦿ Designed for charging lead acid battery.
- ⦿ Must be installed in a dry and well ventilated area. It should not be exposed to rain or snow.
- ⦿ The cables between charger and battery should be kept as short as possible to prevent excessive voltage drop. Too much voltage drop will lead to longer charging period.
- ⦿ Please make sure charging voltage and current meets battery specification.
- ⦿ Refrain from connecting new and old batteries in series.
- ⦿ Charger should be in the OFF mode before making battery connection or disconnection.
- ⦿ Three years warranty is provided under normal operating conditions. Failure resulting from improper operation will result in cancellation of warranty.

## 2. Front and back panel

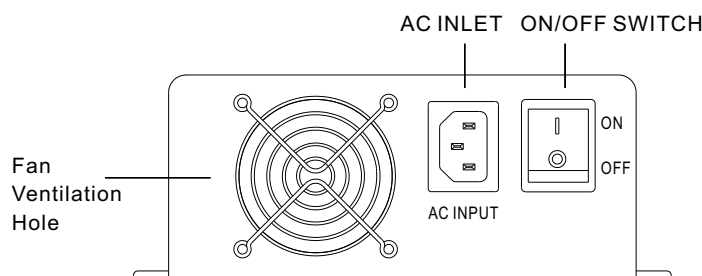


Figure 2.1 Front Panel



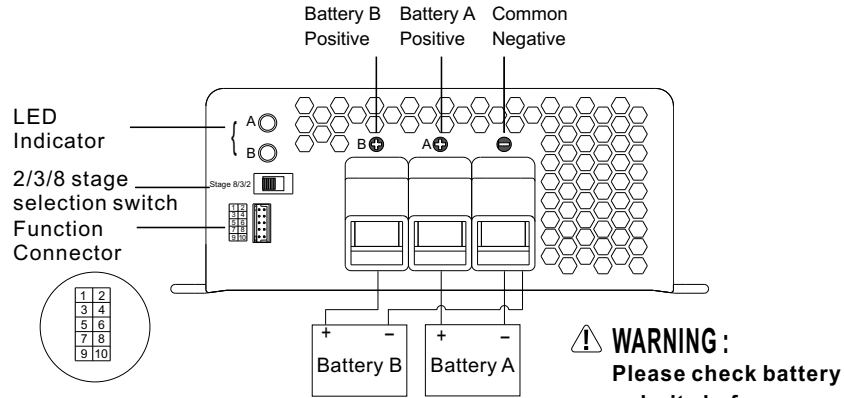


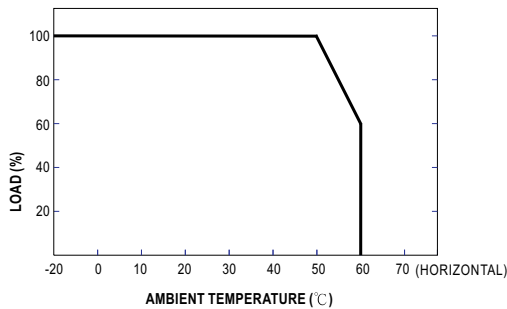
Figure 2.2 Back Panel

**Assembly guidelines:**

1. The charger should be turned OFF prior to battery connection. Suitable wire gauge should be chosen based on rated charging current of the charger unit. Double-check battery polarity before making the battery connection. Positive terminal of the charger must be connected to + of the battery and negative terminal to of the battery. Also, make sure the positive and negative terminals of the charger are not accidentally shorted together.
2. After plugging in the AC power cable, flick the ON/OFF (0/-) switch to the ON(-) position. The LED indicator on the switch will light up.

**3. Derating curve**

**3.1 Charging current VS temperature**



**4. Function description for CN100**

Pin No.	Function	Description
1,2	RY13	Relay contact rating (max.): 30V/1A. "Short" when bank A is full. "Open" when bank A is still charging.

Pin No.	Function	Description
3,4	RY14	Relay contact rating (max.): 30V/1A. "Short" when bank B is full. "Open" when bank B is still charging.
5,6	RY15	Relay contact rating (max.): 30V/1A. "Short" when the unit is working properly. "Open" when the unit has failed or protection has activated.
7,8	GND/RTH	Temperature sensor which comes with the charger can be connected to the unit to allow temperature compensation of the charging voltage. <b>If the temperature sensor is not used, the charger can still work normally.</b>
9,10	RC-/RC+	Turn the output ON and OFF by electrical or dry contact between pin10 (RC+) and pin9 (RC-). Open: start charging. Short: stop charging.

### 5.LED Indication

Color of LED	Orange	Green	Red
Battery status	Charging	Battery full	Fail

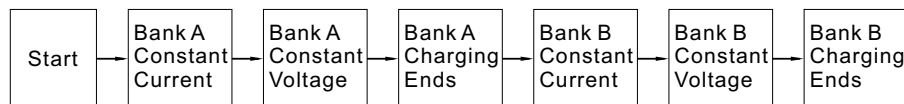
Types of failure: ① Battery disconnected ② Damaged battery ③ Reverse polarity  
 ④ Incorrect battery voltage (e.g. PB-1000-12 connected to 24V battery)  
 ⑤ Activation of protection function (e.g. OTP, OVP, and Short)

### 6.Explanation of operation logic (charging stages):

PB-1000 has a total of 3 charging modes to choose from, 2 stages, 3 stages, and 8 stages. 8 stages charging differ from 2 stages with the addition of pulse, soft start, analysis, recondition, float, and maintain stages. 2 stages provide simple and quick charging. 3 stages is similar to 2 stages with the exception of not shutting OFF after the battery is fully charged. Lastly, 8 stages will allow charging to maximum capacity. User can select between 2,3 or 8 stages depending on their requirement.

#### 6.1 2 stage charging (flick switch to "2" stage)

PB-1000 has channels A & B which can perform 2 stages charging individually. Channel A will be the first to commence charging. During initial charge (stage 1), charger will provide maximum current to the battery. The built-in fan will also turn ON. As the battery starts to get full, charging current will gradually decrease (stage 2). When charging current decrease to less than 10% of max. LED indicator will turn Green to show a full charge. Channel A will turn OFF while charging commence at Channel B. After the battery at channel B is fully charged, PB-1000 will turn OFF its outputs.



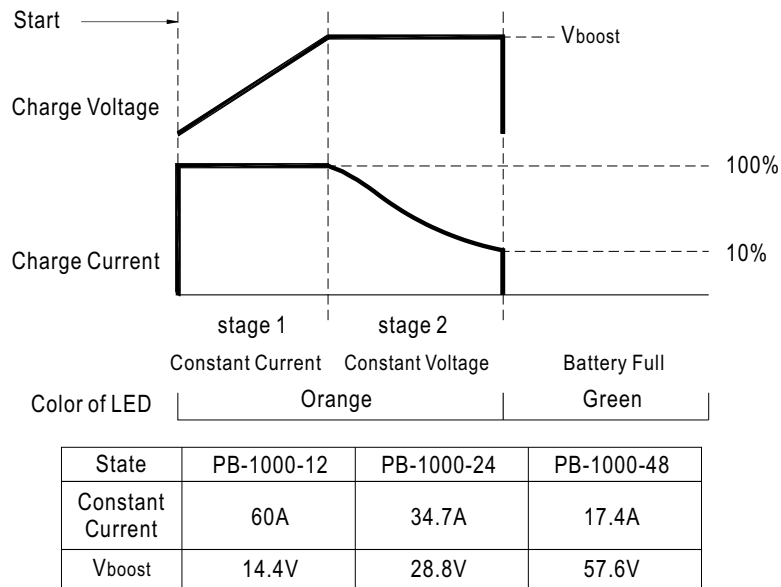


Figure 6.1 2 stage charging curve

**Explanation for 2 stages charging curve**

(0)Initial stage (battery analysis):

Check battery voltage level to see if it is within the normal range, whether or not a battery is connected, or if the battery is already full and further charging is not required.

(1)Stage 1 (constant current):

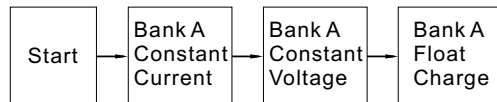
A constant current is provided so the battery can be quickly charged to 2.4V per cell.

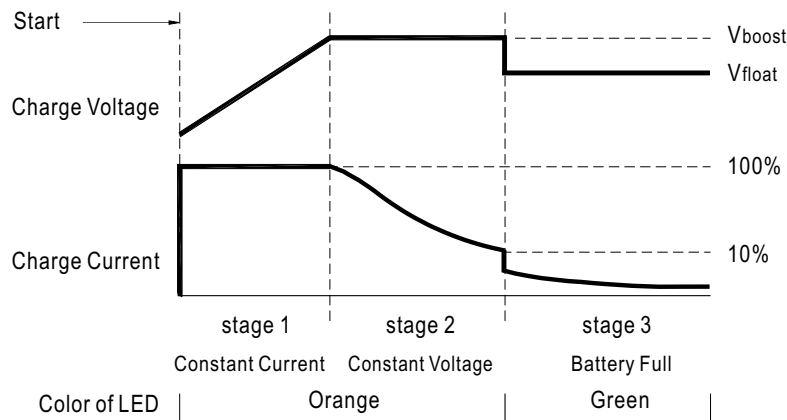
(2)Stage 2 (constant voltage):

A constant voltage of 2.4V per cell is provided until the charging current naturally tapers down to 10% then stop charging.

**6.2 3 stage charging (flick switch to "3" stage)**

PB-1000 can only perform 3 stages charging to Channel A. During initial charge (stage 1), charger will provide maximum current to the battery. The built-in fan will also turn ON. As the battery starts to get full, charging current will gradually decrease (stage 2: programmed to last no longer than 24hrs). When charging current decrease to less than 10% of max. LED indicator will turn Green to show a full charge. The charger will now maintain a float charge voltage (stage 3).





State	PB-1000-12	PB-1000-24	PB-1000-48
Constant Current	60A	34.7A	17.4A
Vboost	14.4V	28.8V	57.6V
Vfloat	13.8V	27.6V	55.2V

Figure 6.2 3 stage charging curve

**Explanation for 3 stages charging curve**

(0)Initial stage (battery analysis):

Check battery voltage level to see if it is within the normal range, whether or not a battery is connected, or if the battery is already full and further charging is not required.

(1)Stage 1 (constant current):

A constant current is provided so the battery can be quickly charged to 2.4V per cell.

(2)Stage 2 (constant voltage):

A constant voltage of 2.4V per cell is provided until the charging current naturally tapers down to 10% then move on to stage 3.

(3)Stage 3 (Float voltage):

A float voltage of 2.3V per cell is provided so that the battery can maintain full charge.

\*For applications that utilize the charger (PB-1000) to charge batteries and supply System power simultaneously(e.g. UPS system), please select "3 stage" charging for the best use of the charger.

**6.3 8 stage charging (flick switch to "8" stage)**

8 stage charging provides optimized charge to lead acid battery. It also prolongs battery life and increase storage capacity. Some of the main advantages are as below:

- ⊙Advantage of pulse stage: Use pulse current to revive aged battery.
- ⊙Advantage of recondition stage: Allow full charge of battery.

© Advantage of float and maintain stage: After LED turns green, maintenance charge is provided so the battery is always in a full state. User will have access to a full battery whenever it is disconnected from the charger.

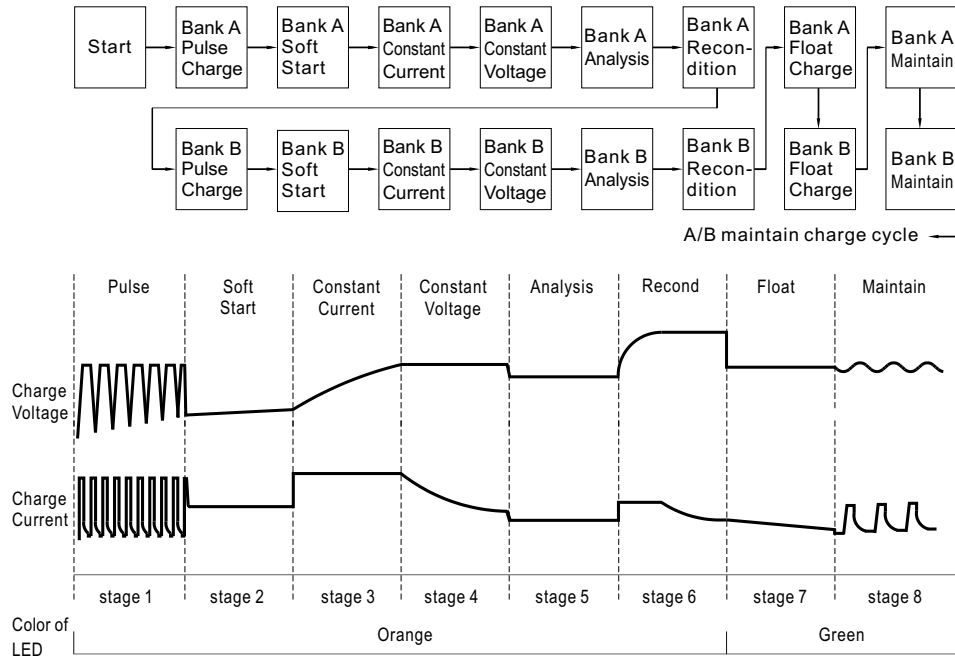


Figure 6.3 8 stage charging curve

### Explanation for 8 stages charging curve

(0) Initial stage (battery analysis):

Check battery voltage level to see if it is within the normal range, whether or not a battery is connected, or if the battery is already full and further charging is not required.

(1) Stage 1 (pulse charging):

Pulse charging is used to revive tired lead acid battery which is either improperly charged/discharged or allowed to self-discharge as occurs during non-use. Basically, help to restore its normal chemical properties.

(2) Stage 2 (soft start):

Use low charge voltage and current to prepare the battery to accept upcoming bulk charging, so a better charge can be applied.

(3) Stage 3 (constant current):

A high constant current is provided so the battery can be quickly charged to 2.4V per cell.

(4) Stage 4 (constant voltage):

A constant voltage of 2.4V per cell is provided until the charging current naturally tapers down to a low level.

(5)Stage 5 (analysis):

The charger will stop charging for 2 minutes to determine battery status. If the battery voltage is higher than 2.1V per cell, the battery is determined as OK and will move on to stage 6. If the battery voltage is lower than 2.1V per cell, the battery fail indication will come ON and the charger will stop charging.

(6)Stage 6 (recondition boost charge):

Boost voltage is provided to recharge the battery storage capacity to its original state.

(7)Stage 7 (float charge):

A float voltage of 2.3V per cell is provided for extended period of time so that the battery can maintain full charge.

(8)Stage 8 (maintain):

Maintenance charge is provided to compensate for battery self-discharge and extend battery life.

7.Function description

7.1 Input voltage

- ⊙Input voltage range is 90~264Vac or 127~370Vdc.
- ⊙The provided input voltage must fall within the specified range otherwise the unit may be non-functional also the active PFC circuit may fail or get damaged.

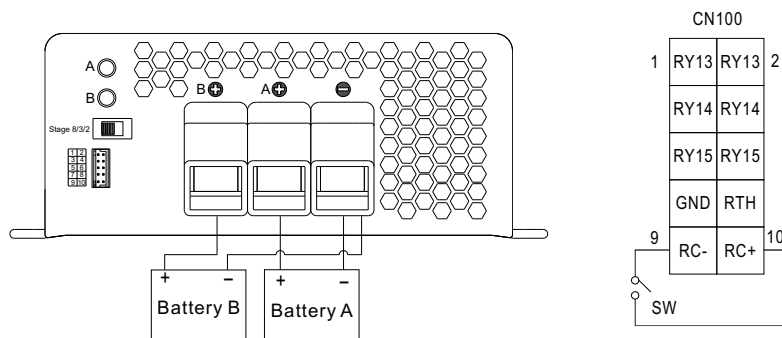
7.2 PFC

- ⊙Built-in active PFC circuit: PF>0.95 when input voltage is between 90~230Vac with full load at the output. On the other hand, if the input voltage is >230V or output is not at full load, the PF will drop below 0.95.

7.3 Remote control

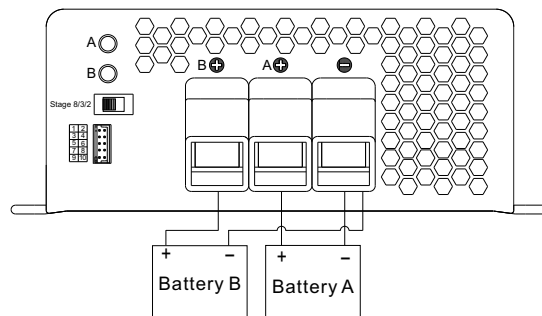
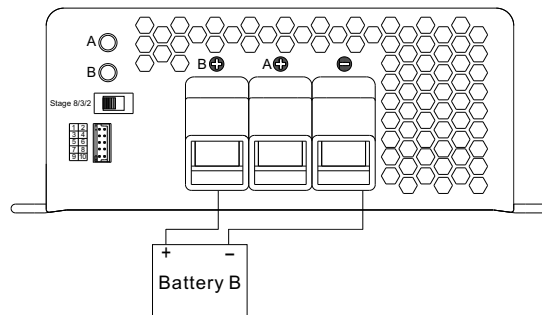
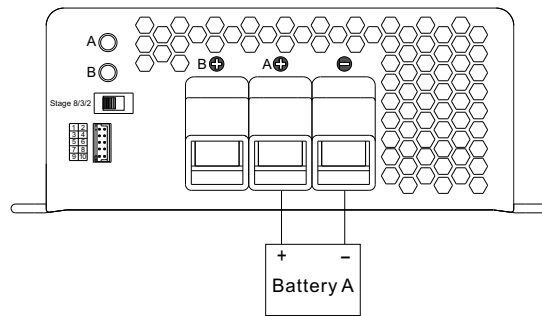
The charger can be turned ON/OFF by using the "remote control" function.

Between RC+ (pin10) and RC- (pin9)	Charger
SW open	ON
SW closed	OFF



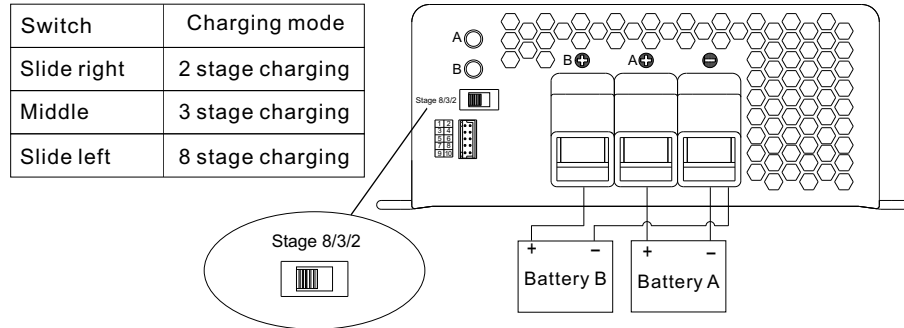
## 7.4 Two battery banks

The charger can be hooked up to two battery banks (A and/or B). Connect the battery bank(s) as below. If you are connecting 2 battery banks at the same time, keep in mind that it must share a common ground.



## 7.5 2, 3, or 8 stage charging mode selection

The charger features user selectable 2, 3, or 8 stage charging. The charging profile is selected by moving the slide switch on the back panel.



### 7.6 Reverse polarity protection

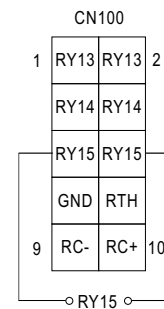
With built-in battery reverse polarity detection circuit. When the battery is connected in reverse at the output terminal of the charger, the output relay circuit will remain open.

### 7.7 Fan speed control

With built-in fan speed control circuit, the fan will automatically change speed depending on load condition.

### 7.8 Charger OK relay (RY15)

Charger	Between pin5 and pin6
Working normally	ON (short)
Failure or protection function has activated	OFF (open)



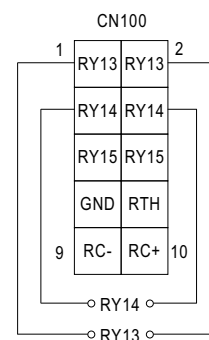
### 7.9 Output OK relay (RY13 & RY14)

#### 1. Bank A OK (RY13)

Bank A	Between pin1 and pin2	Color of LED A
Bank A full	ON (short)	Green
Charging	OFF (open)	Orange

#### 2. Bank B OK (RY14)

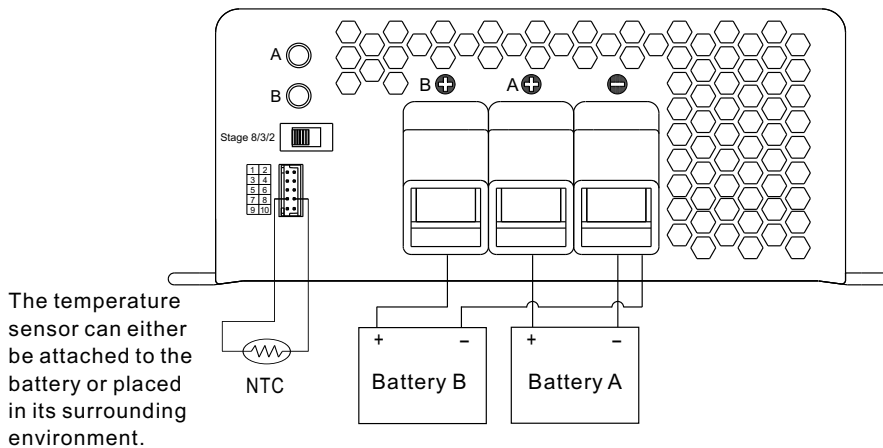
Bank B	Between pin3 and pin4	Color of LED B
Bank B full	ON (short)	Green
Charging	OFF (open)	Orange





### 7.10 Temperature compensation

Temperature sensor which comes with the charger can be connected to the unit to allow temperature compensation of the charging voltage. **If the temperature sensor is not used, the charger can still work normally.**



### 8. Wiring for battery

Select suitable wire gauge based on rated charging current. Refer to the following table for minimum wire gauge. We highly recommend using RED wire for + connection and BLACK wire for - connection:

AWG	CROSS SECTION(mm <sup>2</sup> )	Max. Current(A) UL1015(600V 105°C)
14	2.1	12
12	3.3	22
10	5.3	35
7	10	46
6	16	60
4	25	80

### 9. Suggested battery capacity

Model	Battery capacity
PB-1000-12	200-600AH
PB-1000-24	120-350AH
PB-1000-48	60-175AH

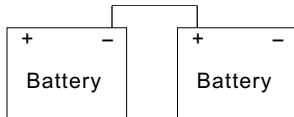
Note: 1. Using battery capacity larger than the suggested value will not lead to damage of the battery. The main drawback is it may take longer to fully charge the battery.

2. If you're unsure about max allowable charging current of your battery, please refer to the battery's technical specification or consult its manufacturer.

## 10. Series and parallel connection of batteries

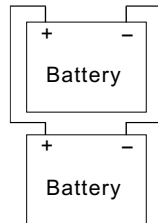
### 1. Batteries in series

Voltage can be doubled when 2 batteries are connected in series. However, the capacity (Ah) will remain the same. For example, 2 x 12V 100Ah batteries connected in series = 24V 100Ah.



### 2. Batteries in parallel

When 2 batteries are connected in parallel, voltage remains the same and the capacity (Ah) doubles. For example, 2 x 12V 100Ah batteries connected in parallel = 12V 200Ah.



## 11. Failure correction notes

Status	Possible reasons	Solutions
Unable to charge the battery	ON/OFF switch in the OFF position	Switch to the ON position
	Battery reverse polarity	Reconnect using the right polarity
	Battery with higher voltage is connected	Use battery with the correct voltage
	Input AC voltage is too low	Make sure input source is between 90~264VAC
LED indicator does not turn Green after a long charging period	Battery exceeded lifespan or damaged	Replace with a new battery
	Output cables are too thin	Replace with suitable wire gauge

**If you are not able to clear the failure condition, please contact Mean Well or any of our distributors for repair service.**

**WARNING :** This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

明緯企業股份有限公司

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