



CPS Energy Balancer

Installation and Operation Manual

Version: 1.0





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Before You Start...



This manual contains important information regarding installation and safe operation of this unit. Be sure to read this manual carefully before using.

Thanks for choosing CPS Energy Balancer (referred to in this manual as “The Energy Balancer”). CPS Energy Balancer is a highly reliable product due to its innovative design and perfect quality control.

If you encounter any problems during installation or operation of this unit, first check this manual before contacting your local dealer or supplier. Instructions inside this manual will help you solve most installation and operation difficulties.






Please keep this manual on hand for quick reference.

IMPORTANT SAFETY INSTRUCTIONS (SAVE THESE INSTRUCTIONS)

Please read this user manual carefully before undertaking the installation.

CPS reserves the right to refuse warranty claims for equipment damage if the user fails to install the equipment as per the instructions in this manual.

Warnings and symbols in this document

	DANGER: DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	WARNING: WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION: CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	NOTICE: NOTICE indicates a hazardous situation which, if not avoided, could result in equipment working abnormally or property loss.
	INSTRUCTION: INSTRUCTION indicates important supplementary information or provides skills or tips that can be used to help you solve a problem or

	save you time.
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The meaning of mark on the product



EARTH GROUND:

This symbol marks the location of grounding terminal, which must be securely connected to the earth through the PE (protective earthing) cable to ensure operational safety.



DANGER:

Please disconnect the Energy Balancer from DC and AC sides before opening the cover of the device. Make sure hazardous high voltage and energy inside the device has been discharged.

Do not operate or maintain the Energy Balancer until at least 5 minutes after disconnecting all sources from DC and AC sides.



WARNING:

All the installation and cable connections should be performed only by qualified technical personnel. Disconnect the Energy Balancer from both DC and AC sides and make sure it is safely grounded

before maintaining and operating the device.



NOTICE:

CPS Energy Balancer can **NOT** be applied in the energy storage PV system.



NOTICE:

Do not install the Energy Balancer under direct sunlight to avoid conversion efficiency de-rating caused by excessively high temperature.



CAUTION:

Although designed to meet international safety standards, the Energy Balancer can become hot during operation. Do not touch the heat sink or peripheral surfaces during or shortly after operation.

Chapter 1 Overview

1.1 Application of CPS Energy Balancer

The Potential Induced Degradation (PID) phenomenon of crystalline silicon PV modules can directly affect and obviously reduce the output power of PV modules. The Energy Balancer can impose 400V~950V high voltage on the PV modules and protecting earthing (PE) to effectively recover the PID problem.

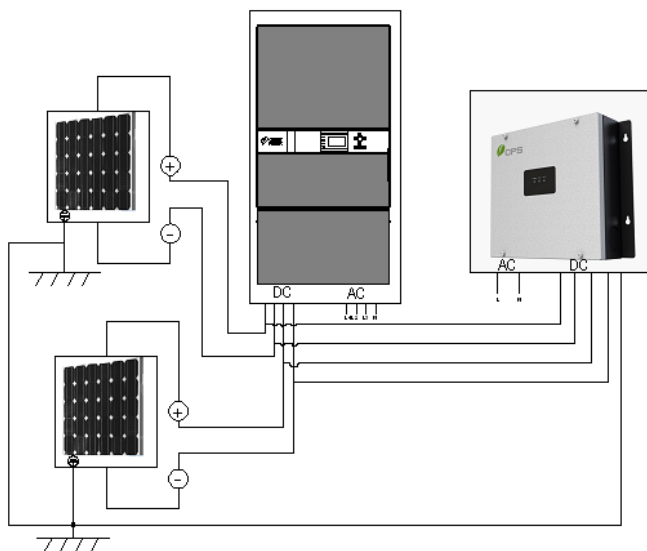


Figure 2-1 Diagram of CPS Energy Balancer connection

1.2 Appearance description of CPS Energy Balancer

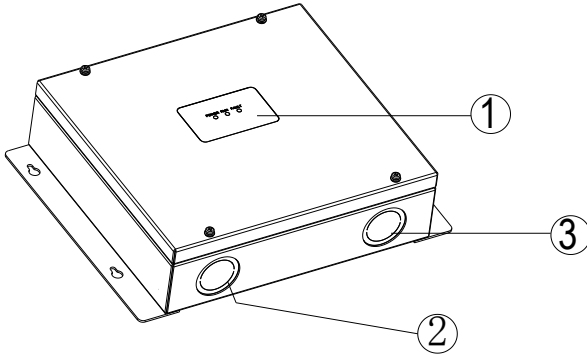


Figure 2-2 Appearance of CPS Energy Balancer

Description of main items of CPS Energy Balancer (see Figure 2-2):

1. LED indicator lights: show the status of CPS Energy Balancer
2. Knockout hole for AC input cable entry
3. Knockout hole for DC output cable entry

Chapter 2 Installation

Below is the installation instruction of the Energy Balancer. Please read carefully and install the product step-by-step.

Check and make sure that the following items are included in the package before installation, as shown in Table 3-1.

Table 3-1 Main items

No.	Item	Q'ty	Note
(1)	CPS EB-2	1	
(2)	Installation and Operation manual	1	
(3)	Warranty card	1	
(4)	Expansion screws	4	
(5)	Packing list	1	

2.1 Basic requirements



NOTICE:

Do not install the Energy Balancer under direct sunlight to avoid conversion efficiency de-rating caused by excessively high temperature.

- ✓ Check and make sure that the ambient temperature of the installation location is -86°F to +140°F / -30°C ~ +60°C;
- ✓ Make sure that the power grid voltage is within normal range;
- ✓ Permission of grid connection has been granted by the local electric power authority;
- ✓ Installation personnel must be qualified electricians or people who have received professional training;
- ✓ Sufficient convection space;
- ✓ Away from flammable and explosive substances.

2.2 Mechanical installation

(1) Dimensions

The dimensions of the Energy Balancer are shown in Figure 3-1.

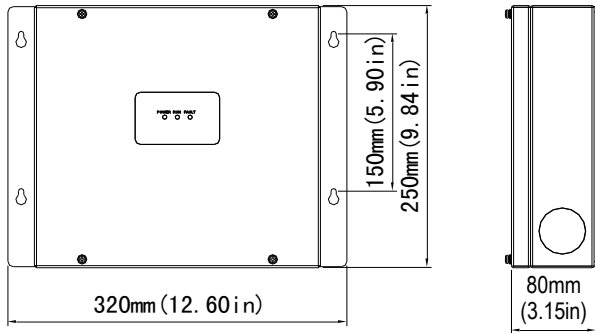


Figure 3-1 Dimensions of CPS SC20KTL-DO/US-480

(2) Check whether the wall to install the Energy Balancer is solid enough:

- (a) The Energy Balancer supports vertical installation for cables coming out from the downside;
- (b) The Energy Balancer supports slanting installation by 15° to 90° ;

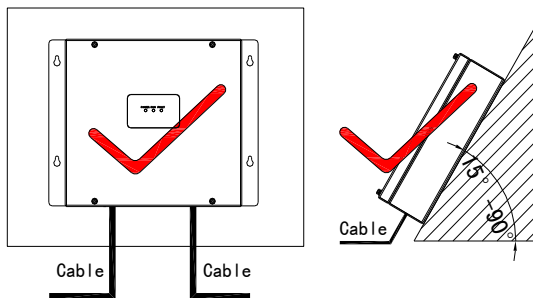


Figure 3-2 Mounting the Energy Balancer properly

(3) Space required for the Energy Balancer mounting on the wall (as shown in Figure 3-3)

The Energy Balancer should be mounted vertically. The distances between the inverter and the surrounding objects should meet the following conditions: two sides from the walls $\geq 100\text{mm}$ (3.94in.); top distance $\geq 100\text{mm}$ (3.94in.); bottom distance $\geq 300\text{mm}$ (11.81in.).

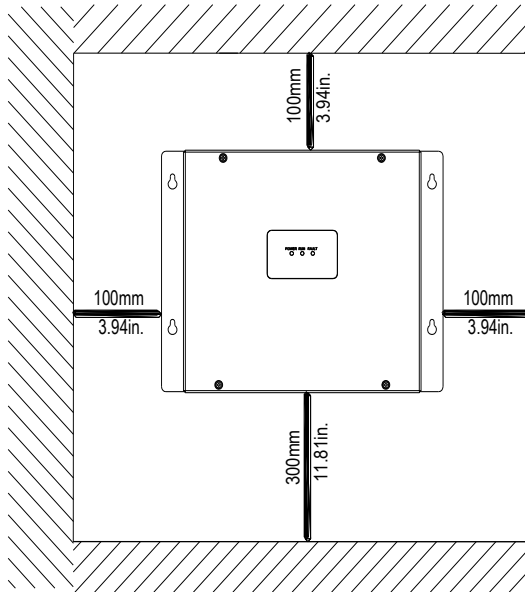


Figure 3-3 Inverter mounting dimensions

(4) Install the Energy Balancer:

(a) Mark the 4 expansion screw holes for mounting the device;



DANGER:

The natural gas pipe or electric cable may be located behind the mounting wall. The pipe or cable can be damaged when drilling the holes. Please check and make sure the installation place is secure without pipe or cable to avoid the risk of electric shock or explosion.

(b) Drill the holes on the mounting wall;

Table 3-2 Specifications of drilling holes

Diameter	6mm (0.24in.)
Length	30mm (1.18in.)

(c) Fix the Energy Balancer on the wall with expansion screws;

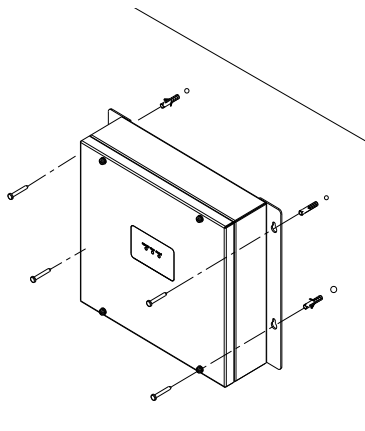


Figure 3-4 Install the Energy Balancer on the wall

2.3 Electrical installation

The cable connection terminals of the Energy Balancer are shown in

Figure 3-5:

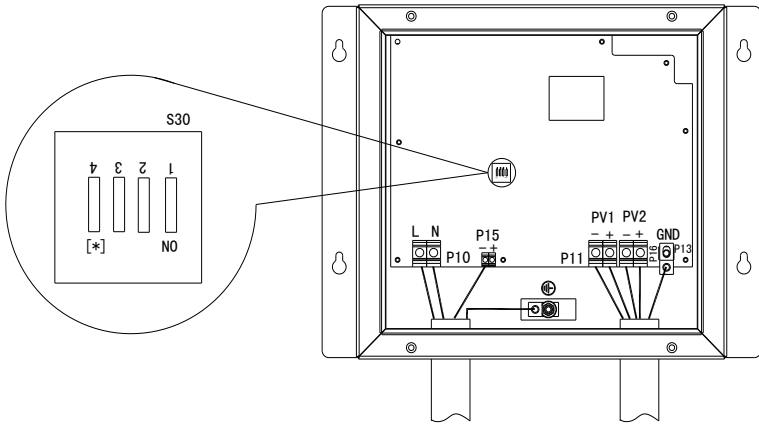


Figure 3-5 The cable connection terminals of the Energy Balancer

Position	Description	Recommend cable	Tool	Torque (N.m)
P10	Connector for AC input	#18~10AWG	4mm flat screwdriver	1.2
P11	Connector for PV1 voltage detection	#18~10AWG	4mm flat screwdriver	1.2
P13	Terminal for PV output	#18~10AWG	#2 cross	2

	grounding		screwdriver	
P15	Connector for Output dry contact	#22~18AWG	3mm flat screwdriver	0.5
P16	Connector PV2 voltage detection	#18~10AWG	4mm flat screwdriver	1.2
	Terminal for Protection grounding	#18~10AWG	#2 cross screwdriver	2

2.3.1 Set the output voltage

The output voltage of the Energy Balancer can be configured by the DIP switch (S30). Each DIP switch in Figure 3-6 corresponds with the output voltage as below:

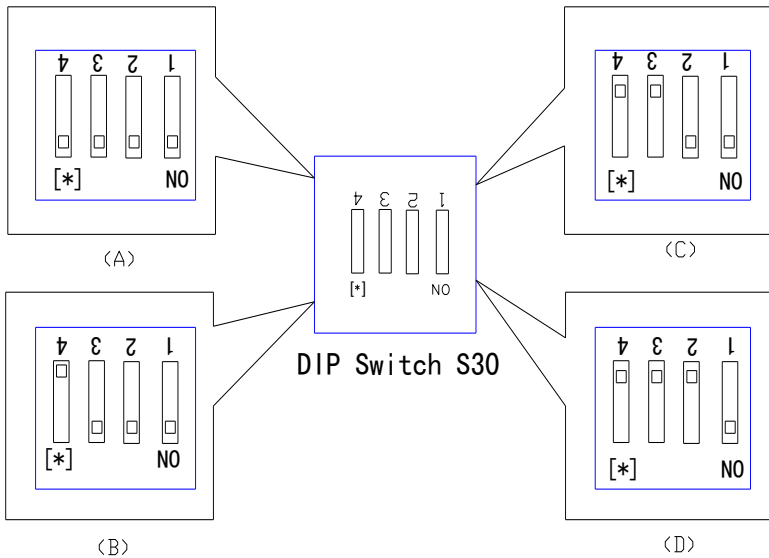


Figure 3-6 Configuration of the output voltage

A	400V output voltage	✓
B	600V output voltage	
C	800V output voltage	
D	950V output voltage	

Note: The default output voltage of the Energy Balancer is set to 400V.

Please follow the guidelines when setting the output voltage:

- (a) It is forbidden to configure the dip switch when the Energy Balancer is energized. Disconnect the device from all electrical connections to avoid the risk of high voltage hazard.
- (b) Check and make sure the output voltage of the Energy Balancer is lower than the withstand voltage of the Y capacitor on the DC side of the inverter to avoid damaging the inverter.

2.3.2 DC connection

(1) Please follow the guidelines to achieve the optimized effect of the Energy Balancer:

- (a) Make sure the Voc of the PV strings is lower than 1000Vdc under any conditions;
- (b) One Energy Balancer can only work with one inverter, and the equivalent capacity load of PV strings should be $\leq 1.2\mu\text{F}$.
- (c) Connect the PV1 cables from the PV strings to the P11 socket of the Energy Balancer and the PV2 cables to the P16 socket. Make sure the polarities of PV cable match the positive and negative marks on the sockets.

(b) When connecting the inverter that works with two MPPTs, please connect the cables, as shown below:

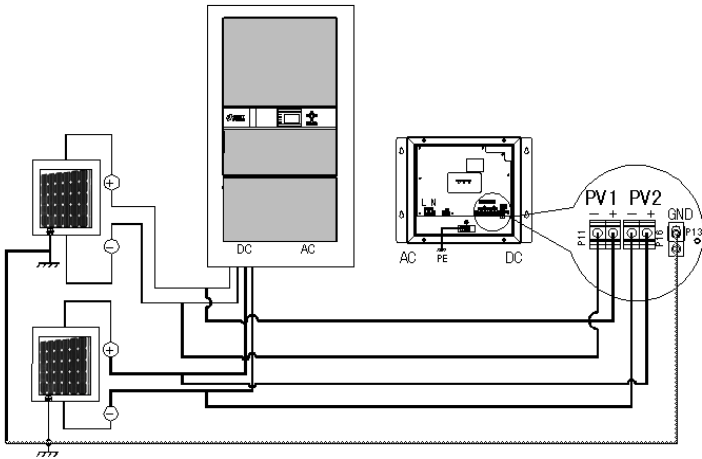


Figure 3-7 The cable connection with the inverter working with 2 MPPTs

2.3.3 AC and ground connection

Connect the L and N cables to the P10 socket, and connect the ground cable to the grounding terminal of the Energy Balancer.

2.3.4 Installation of conduit

Please select the EMT or ENT as the conduit for cable connection. The size of conduit should be 1inch or 1.25inch. If conduits are not used for installation, please make sure the same protection level as follows:

(a) The Energy Balancer meets the waterproof and dustproof level.

(b) The cables are free from tension.

2.3.5 Output dry contact connection

The Energy Balancer has an output dry contact port through which the fault can be reported to the inverter. It is recommended to connect a 5K Ω resistance to the positive terminal of the P15 socket to raise the voltage to 15V, and connect a 15V Gnd cable to the negative terminal of the P15 socket.

2.3.6 Recommended fuses

Please disconnect the AC and DC sources before replacing the fuses:

Table 3-5 Recommended fuses for Energy Balancer

	Specification	Type	Brand
AC fuse	500Vac @3.15A	04773.15MXP	Littelfuse
DC fuse	1000Vdc @3A	3A10F	Bussmann

Chapter 3 Operation

3.1 Start-up

Automatic start-up: When the output voltage of PV strings is lower than 50V, the AC grid is normal, and the environmental temperature is within operating range, the Energy Balancer will start up automatically.

3.2 Shut-down

Automatic shut-down: The Energy Balancer will shut down automatically when any one of the following conditions happens:

1. The output voltage of PV strings exceeds 75V;
2. Reverse connection of polarities of PV cables;
3. Over-load or short circuit of DC output;
4. Fault of AC grid;
5. Environmental temperature exceeds normal range;
6. Disconnection of PV voltage sampling cables

3.3 Status of indicator lights

The Energy Balancer has 3 working modes. Each mode has a corresponding indicator status, as shown below :

Table 5-1 LED Indication

LED Sign	Description	State	Meaning
POWER	Work power supply indicator light	Light up	Energized by AC power
		Light off	No working power supply
RUN	Grid connection operation indicator light	Light up	In charging and resetting state
		Light off	Standby or no working power supply
FAULT	Fault state indicator light	Light up	Fault occurs
		Light off	No fault or no working power supply

(1) Standby mode, the POWER indicator lights up.

In this mode, the Energy Balancer stands by to check whether the start-up conditions are met to start up working normally.

(2) Normal operation mode : the POWER and RUN indicators light up.

In this mode, the Energy Balancer is in normal operation.

(3) Fault mode : the POWER and FAULT indicators light up.

In this mode, the Energy Balancer will disconnect the output and enter the fault mode.



WARNING:

All the installation and wiring connections should be performed only by qualified technical personnel. Disconnect the Energy Balancer from PV strings and the AC grid before maintaining and operating the equipment.

3.4 Troubleshooting

The LED indication and fault of the ENERGY BALANCER :

LED state	Fault	Description
RUN lights off FAULT lights up	Reverse connection of the polarities of PV1 and PV2	The voltage of reverse connection is higher than 70V. Fault shutdown ; FAULT keeps lighting up.

	Over temperature	When the environmental temperature is higher than 60°C ; FAULT keeps lighting up ; When the environmental temperature is lower than 50°C ; the power will recover.
RUN lights off FAULT blinks once	Over-load or Short circuit of DC output	Fault shutdown ; If the over-load or short circuit persists, the FAULT will blink once every 90s.
	Over voltage of DC output	Fault shutdown ; If the overvoltage persists, the FAULT will blink once every 90s.
	Open circuit of PV1 and PV2 voltage sampling circuit	Fault shutdown ; If the open circuit persists, the FAULT will blink once every 90s.

Chapter 4 Technical Data

Model Name	CPS EB-2
Input	
Nominal Input Power	10W
Max. Input Power	<15W
Max. Input Current	<300mA
Norminal Grid Voltage	208-277Vac Single phase
Allowable Grid Voltage	166-318Vac
Rated Grid Frequency	50-60Hz
Output	
Max. Output Voltage	1000Vdc
Output Voltage Range	400-950Vdc
Max. Output Current ¹	2x3mA
Max. Output Number	2
System	
Protection Degree	NEMA 4 (IP65)
Operating Temperature Range	-22°F to +140°F / - 30°C to +60°C
Cooling	Natural cooling
Operating Altitude	13123ft / 4000m
Operating Humidity	0-95%, non-condensing
Stand-by / Night Consumption	<3.5W
Display	
Display	LED
Mechanical Data	
Dimensions (WxHxD)	12.6x9.9x3.2 in / 320x250x80 mm

¹ CPS Energy Balancer has two channels of PV output. The Max. Output Current is 6mA in total. The two channels may not share the same current because of the difference of PV strings.

Weight	4lbs / 1.8kg
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Chapter 5 Limited Warranty

The warranty policy of this product is specified in the contract; otherwise, the warranty period is 5 years.

For service, Chint Power Systems America will provide local support. For Warranty terms, please refer to the CPS America standard warranty policy in place at time of purchase.