CPS SC Series

Photovoltaic Grid Connection Inverter

CPS SC100KT-O/US-480

Installation and Operation Manual

Shanghai CHINT Power Systems Co., Ltd.

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Chapter 1 IMPORTANT SAFETY INSTRUCTIONS (SAVE THESE INSTRUCTIONS)

Please read this manual carefully before installation. The warranty will be invalid automatically if the user does not follow this manual during installation and operation resulting in damage to the equipment.

ELECTRIC SHOCK HAZARD:

All operations and wiring should be performed by qualified technical personnel.

Disconnect the inverter from PV assemblies and the Grid before the maintenance and operation of the equipment.

At the same time, make sure that equipment is grounded properly. If a ground fault is indicated, the grounding conductors are probably ungrounded and energized.

WARNING:

1. When the connected PV module is exposed to the sunlight, it generates DC voltage and charges the DC bus capacitors of the inverter. Electric charges are still stored in the capacitors even the input of the PV inverter is turned off. Therefore, equipment shall not be maintained or operated

until 15 minutes after all inputs are cut off or the “discharge” command is carried out successfully through LCD button operations.

2. This inverter is specially designed to connect AC power to the public grid. Do not connect the AC output of this equipment directly to private AC power equipments.

3. Please choose the type of inverter based on the way of DC grounding system! Change of PV grounding in the inverter is prohibited without permission. Please contact our after-sale service personnel if the change of grounding in the inverter is necessary.

4. To ensure operational safety, run the initial on-grid testing before operating the CPS SC100KT-O/US-480.

HIGH TEMPERATURE:

Do not touch the metal surfaces of the radiator and inverter during the operation of the inverter.

Chapter 2 Overview

2.1 Grid-tie PV system

CPS SC100KT-O/US-480 grid connection photovoltaic inverter applies to all kinds of commercial rooftop grid connected system or power station system. Normally, the system consists of PV modules, DC power distribution unit, grid connection inverter and AC power distribution unit (Figure 2-1). Solar energy is converted to direct current through PV modules. The direct current is then converted to alternative current with the same frequency and phase as the grid through grid connection inverter. All or part of the alternative current is supplied to the local load. The remaining or all electricity is fed to the grid.

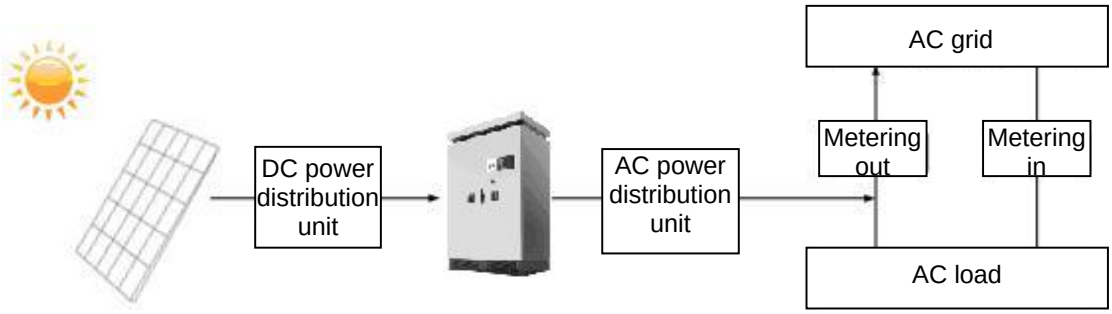


Figure 2-1 Grid connection photovoltaic power generation system

2.2 Inverter circuit structure

The basic schematic diagram of CPS SC100KT-O/US-480 inverter is shown in Figure 2-2. The output of PV modules first passes through DC circuit breaker. The inverter converts DC voltage to 3-phase AC voltage. The 3-phase AC voltage will be removed of high frequency

component by the sine wave filter, then stepped up and isolated by the low frequency transformer and go through AC contactor, AC EMI filter, circuit breaker, at last, be fed to the LV grid.

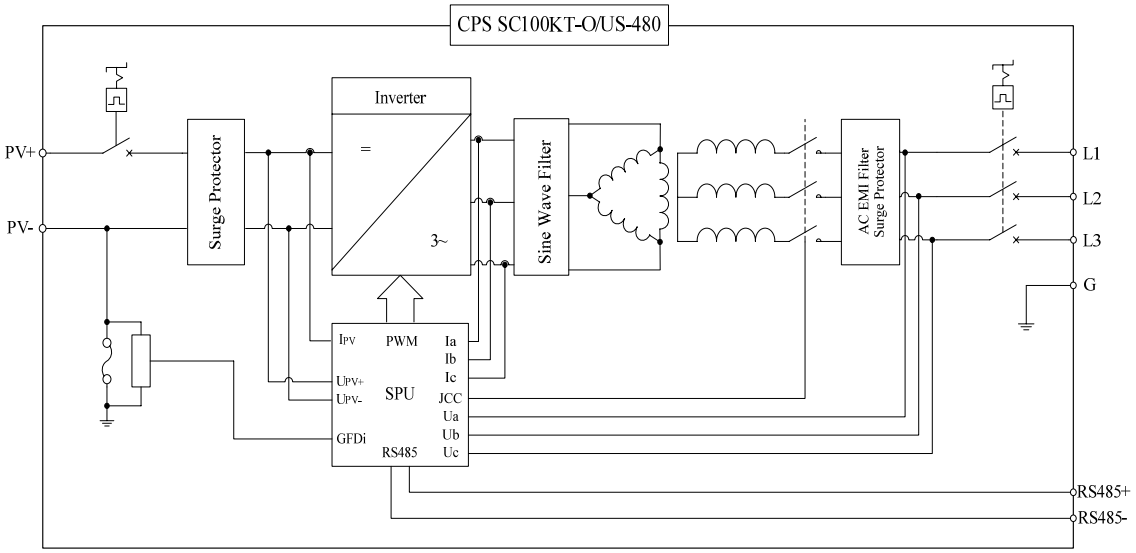


Figure 2-2 Schematic diagram

2.3 Appearance

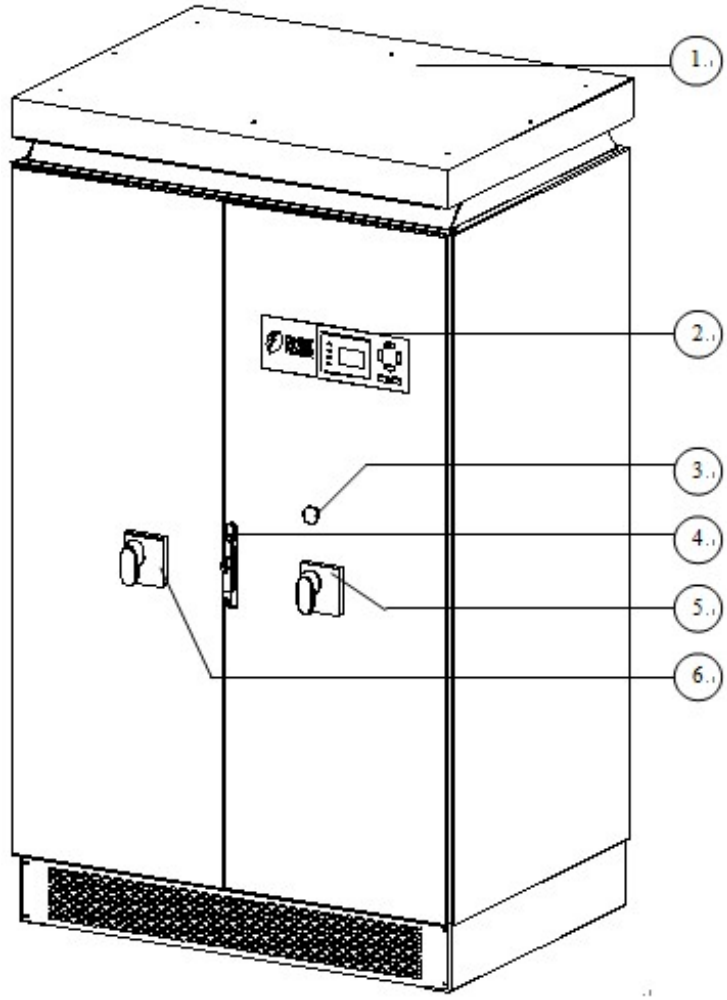


Figure 2-3 Appearance sketch

Description of main components (shown in Figure 2-3):

1、Roof Panel

2、Operation buttons and LCD display panel

3、Emergency stop button

4、Door lock

5、AC circuit breaker

6、DC circuit breaker

Chapter 3 Installation

3.1 Basic requirements

The protection level of CPS SC100KT-O/US-480 photovoltaic inverter is NEMA3R (IP44). Please keep the equipment from direct sunlight exposure if it is installed outdoors.

- ✓ Check and make sure that the ambient temperature of the installation environment is – 25 °C ～ + 60°C;
- ✓ Make sure that the public power grid voltage is 422～528Vac and the grid frequency is 57.0~60.5Hz;
- ✓ 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

3.2 Checklist of installation tools

The checklist of tools for installation of the product:

Table 3-1

No.	Name	Specification	Function
1	Wabbler screwdriver	T25	For screws on the backboard
2	Cross-shaped screwdriver	2#	For M3 and M4 screws
3	Open end wrench	14mm	For M8 screws
4	Open end wrench	17mm	For M10 screws
5	Straight screwdriver	2#	For screws on dry contact
6	Sleeve	7mm	For M4 nuts
7	Torque wrench	/	For M10 screws

3.3 Mechanical installation

(1) Dimensions

Dimensions of CPS SC100KT-O/US-480 grid-tie PV inverter are shown in Figure 3-1.The dimensions of foundation installation are shown in Figure 3-2:

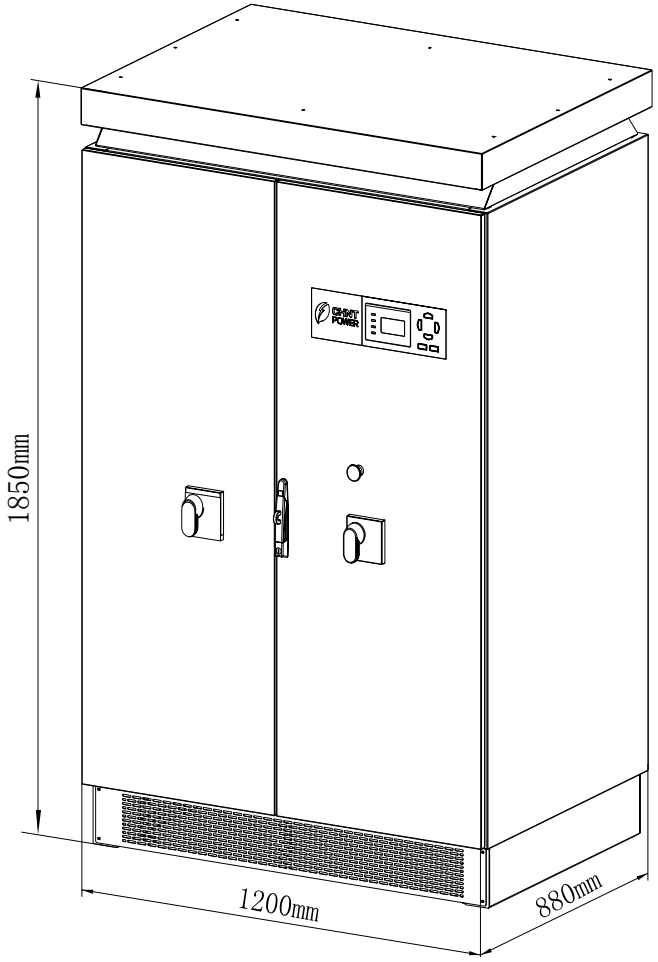


Figure 3-1 Sketch of dimensions

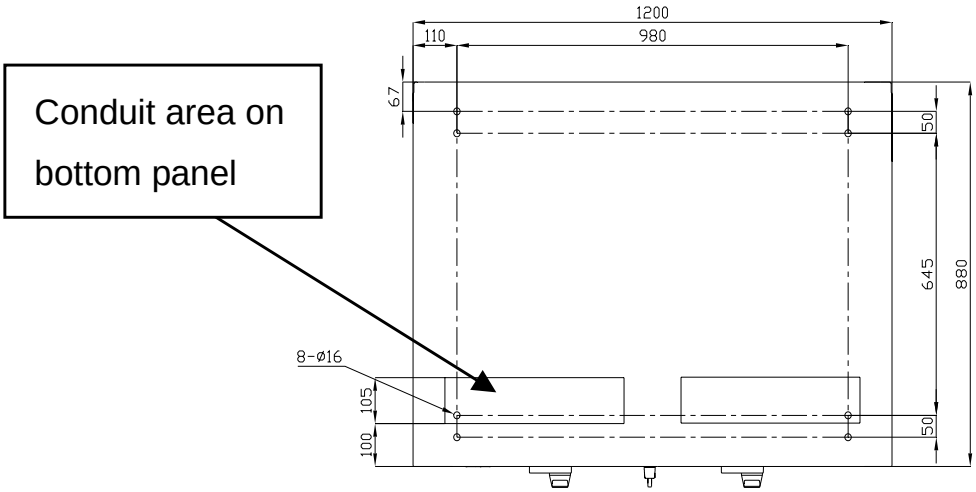


Figure 3-2 Sketch of foundation installation dimensions

(2) Requirements of inverter installation:

According to the installation dimensions shown in Figure 3-2, secure the inverter on the hard ground or channel steel chassis with M12 foundation bolts through the 8 ₵16 holes at the bottom of the equipment.

Front door: A 650mm space should be reserved to ensure that the front door can be opened and closed freely.

Back: A 800mm space should be reserved for maintenance.

The weight of the inverter is approximately 900kg. Make sure that the mounting place can bear the weight. Two approaches are recommended to lift the machine, i.e. lifting with a crane or a forklift:

Lifting with a crane:

Before lifting the machine, place the enclosed EPE buffer material at the position as shown in Figure 3-3. Put 2 strings of sling rope (each no shorter than 7 meters) through

the machine from the left to the right foot bottom. Then lift the machine slowly to the appropriate location for installation with the crane (shown in Figure 3-4).

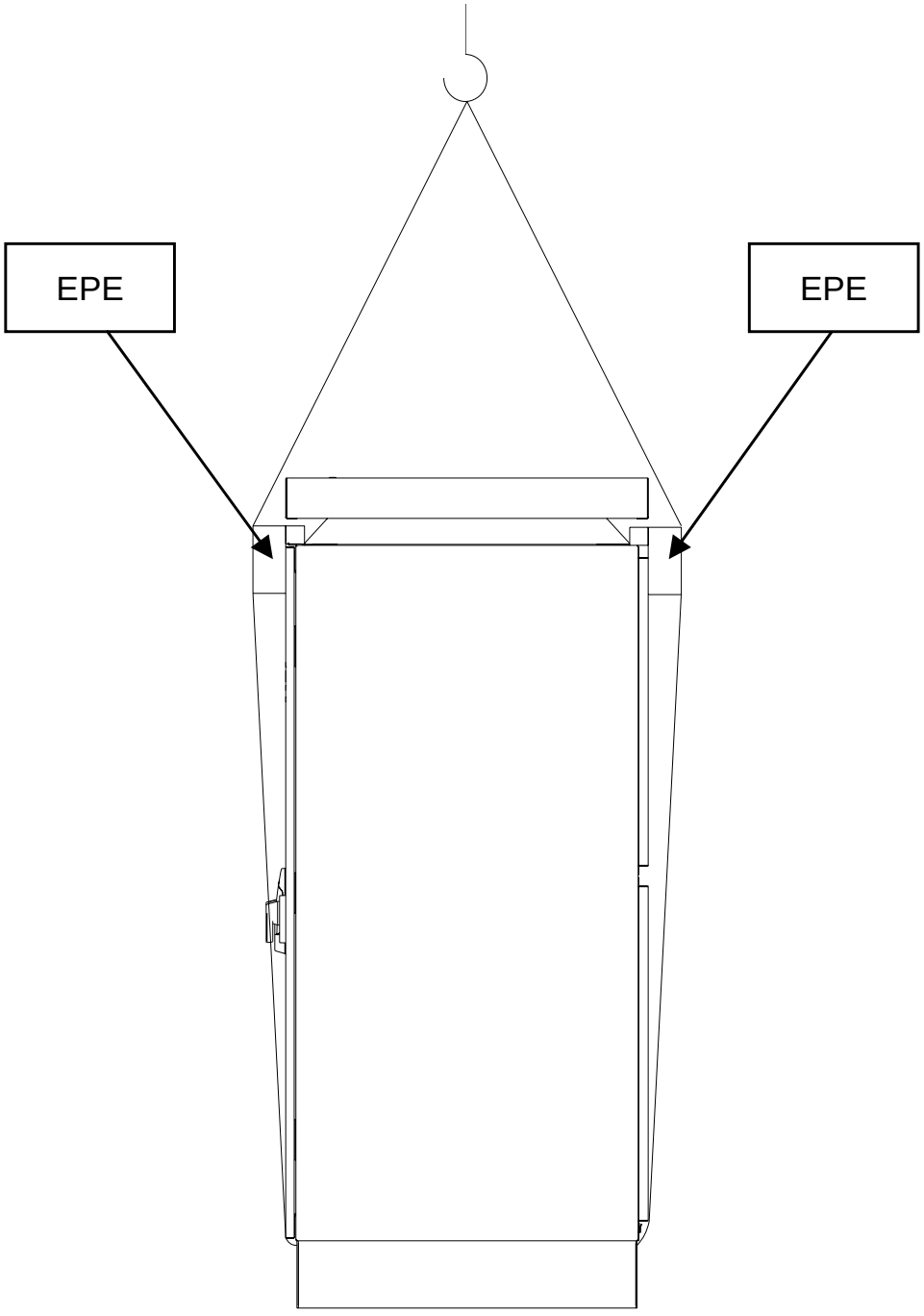


Figure 3-3 Diagram of EPE placement

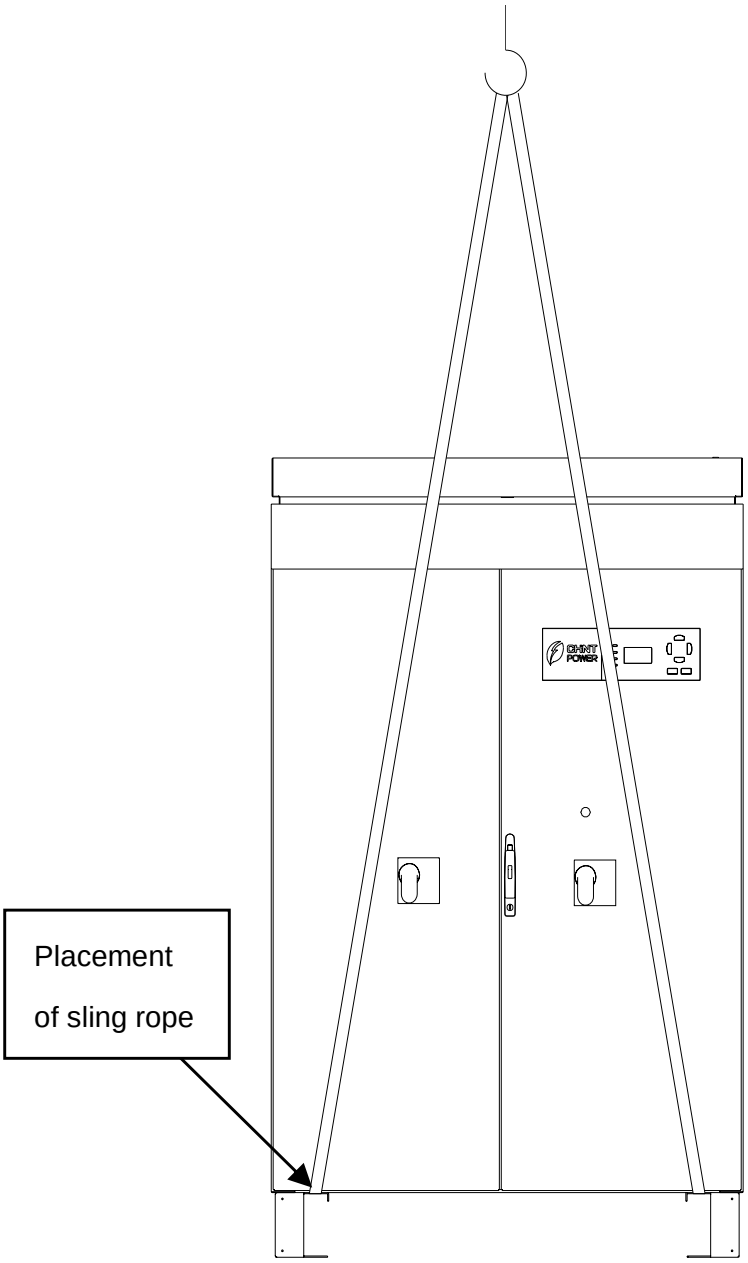


Figure 3-4 Diagram of lifting with a crane

Lifting with a forklift:

Adjust the width of the forklift arm within 850mm and insert the fork into the bottom of the machine from the back and lift it to the appropriate location for installation as shown in Figure 3-5.

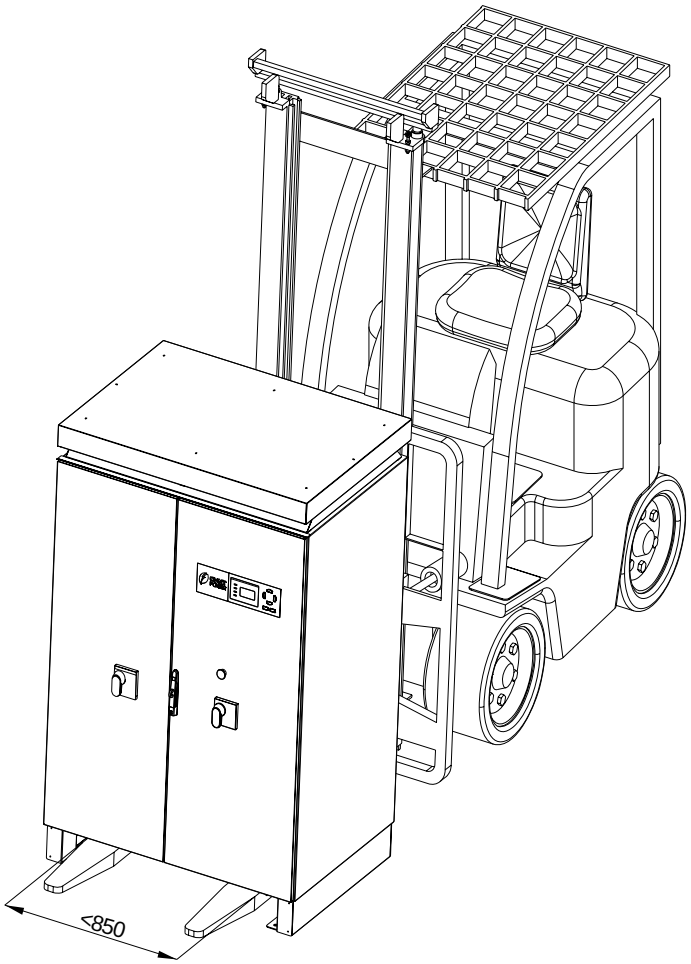


Figure 3-5 Diagram of lifting with a forklift

3.4 Electrical installation

Open the front door of the machine. Proceed as shown in Figure 3-6.

1、Turn the handle bar of DC circuit breaker anti-clockwise to horizontal position.

2、Turn the handle bar of AC circuit breaker anti-clockwise to horizontal position.

3、Unlock the door with the key. Pull the door knob 45 degree outward to open the front door.

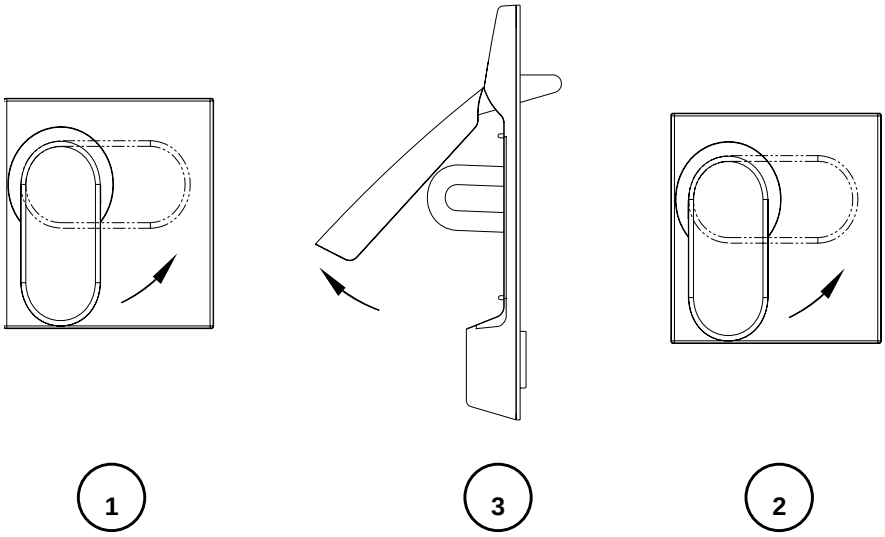
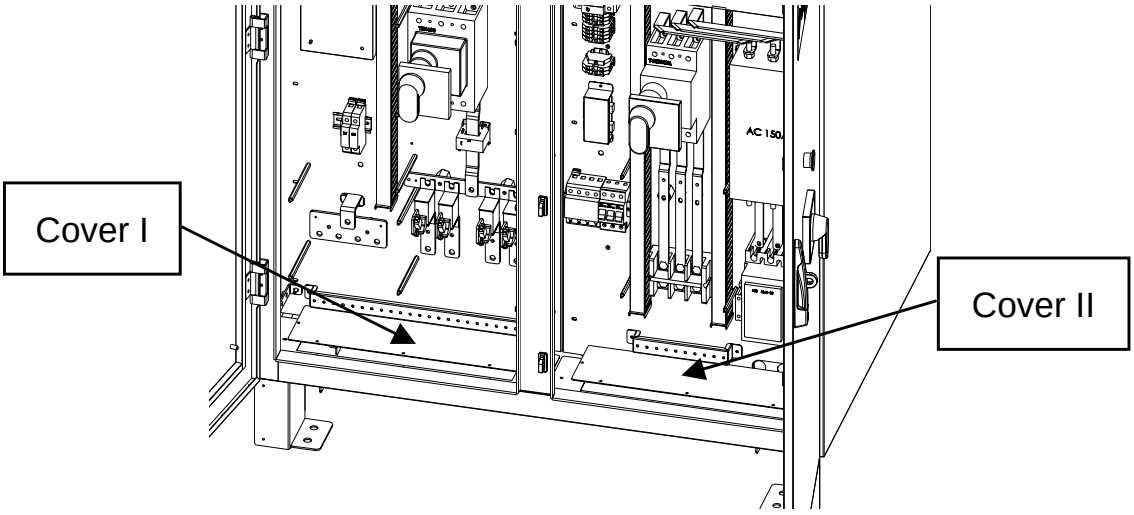
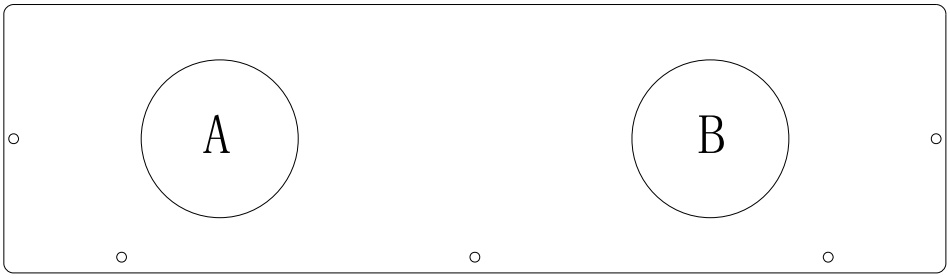


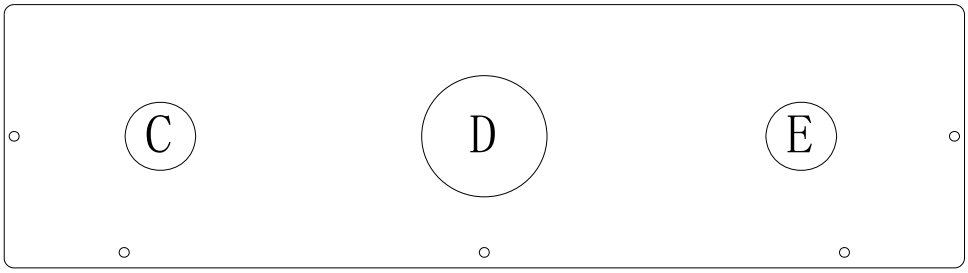
Figure3-6 Diagram of opening front door

4、After opening the front door, remove the transparent Plexiglas cover at the bottom of the machine and connect the external cables to the inverter, as shown in Figure 3-7. The incoming and outgoing cables are routed from the bottom. It is recommended that all the cables are routed along the cable trenches for the convenience of installation and maintenance.





Cover I



Cover II

Figure 3-7 Sketch of external wiring

Two ways of routing are available as follows:

(1) Routing from square conduit areas at the bottom: Detach the screws from the bottom covers with a cross-shaped screwdriver, remove the two covers and connect cables through the square conduit areas.

(2) Routing from round holes on the bottom cover:

(a) Remove the cover screws, put the screws aside, and then take off the two covers.

(b) Mark all the holes on cover I and II as shown in Figure 3-7 for the conduits. Two conduits for DC cables, one for the communication cables and one

for the AC cables and grounding cable.

A，B：Conduit for DC cables

C: Conduit for communication cables

D: Conduit for AC cables

E: Conduit for the grounding cable

(c) Punch holes on the bottom cover for the conduits;

(d) Check the seal of the cover;

(e) Restore the cover to the equipment，attach the screws;

(f) Insert the conduits into the openings;

(g) Attach the conduits with the appropriate hubs.

3.4.1 DC connection

(1) The following rules should be abided by to ensure the highest efficiency of the PV inverter:

(a) First, make sure that the maximum open circuit voltage of the PV modules is lower than 600Vdc under any conditions;

(b) Ensure that the polarity of DC input is correct, i.e. the positive pole of PV module is connected to the positive pole of the inverter's DC input, and the negative pole of PV module is connected to the negative pole of the inverter's DC input;

(c) The Max. DC input current of the inverter is 350A, so 35～95mm^2 copper core cables with an insulation rating of 90℃ are recommended for inverter's DC input, as shown in Table 3-2：

Table 3-2

	4 strings	3 strings	2 strings
Positive	2AWG（35mm²）	1/0AWG (50 mm²)	3/0AWG (95 mm²)
Negative	2AWG（35mm²）	1/0AWG (50 mm²)	3/0AWG (95 mm²)
Bolts	M10 bolts (torque value：10N-M or 88.5Lb-In.)		

(2) Confirm that the input PV modules are of the same specifications and types before connection of DC input;

(3) Connect the DC cables to the inverter's copper bar terminals of DC side according to the Table 3-3, as shown in Figure 3-8 and 3-9. In Table 3-3, CPS SC100KT-O/US-480, this type of inverter means that the negative pole of DC input needs to be connected to the earth grounding wire and CPS SC100KT-OPG/US-480, this type of inverter means that the positive pole of DC input needs to be connected to the earth grounding wire.

Table 3-3

Type of Inverter	Default way of grounding	PV -	PV+
CPS SC100KT-O/US-480	Negative grounding	Connect to ground bar	Hot
CPS SC100KT-OPG/US-480	Positive grounding	Hot	Connect to ground bar

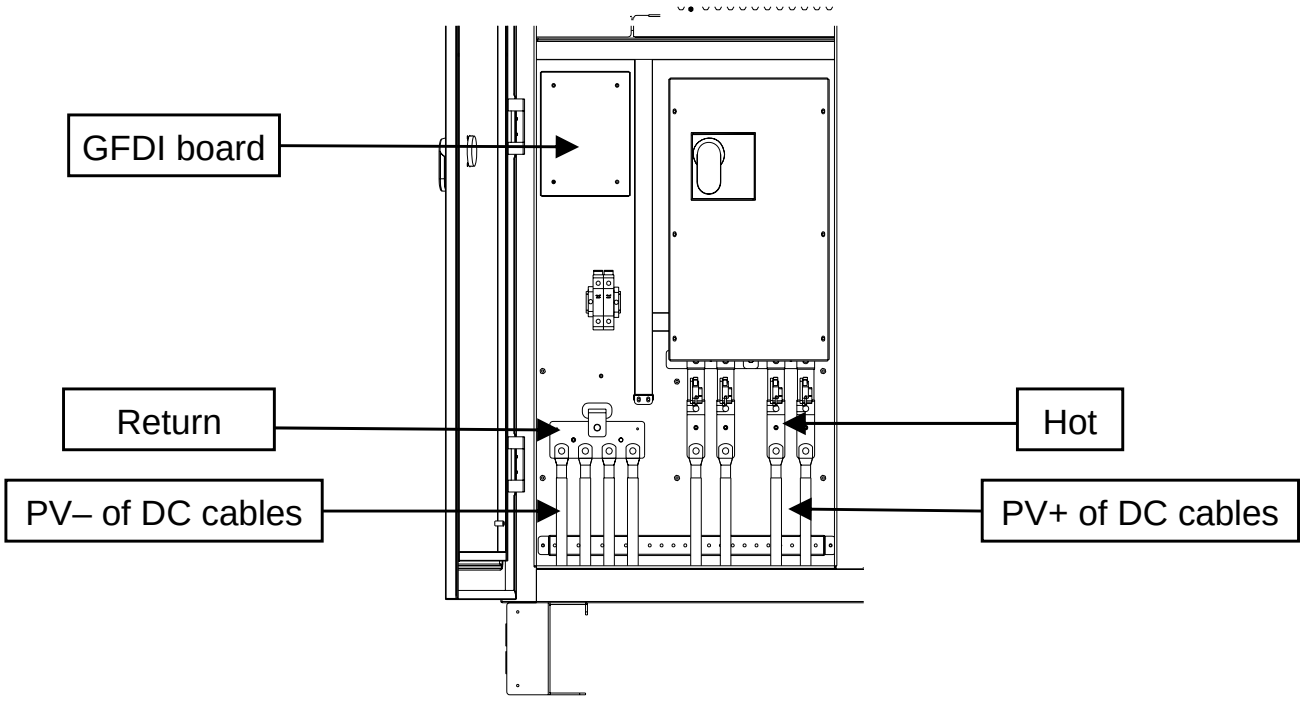


Figure 3-8 DC connection of CPS SC100KT-O/US-480

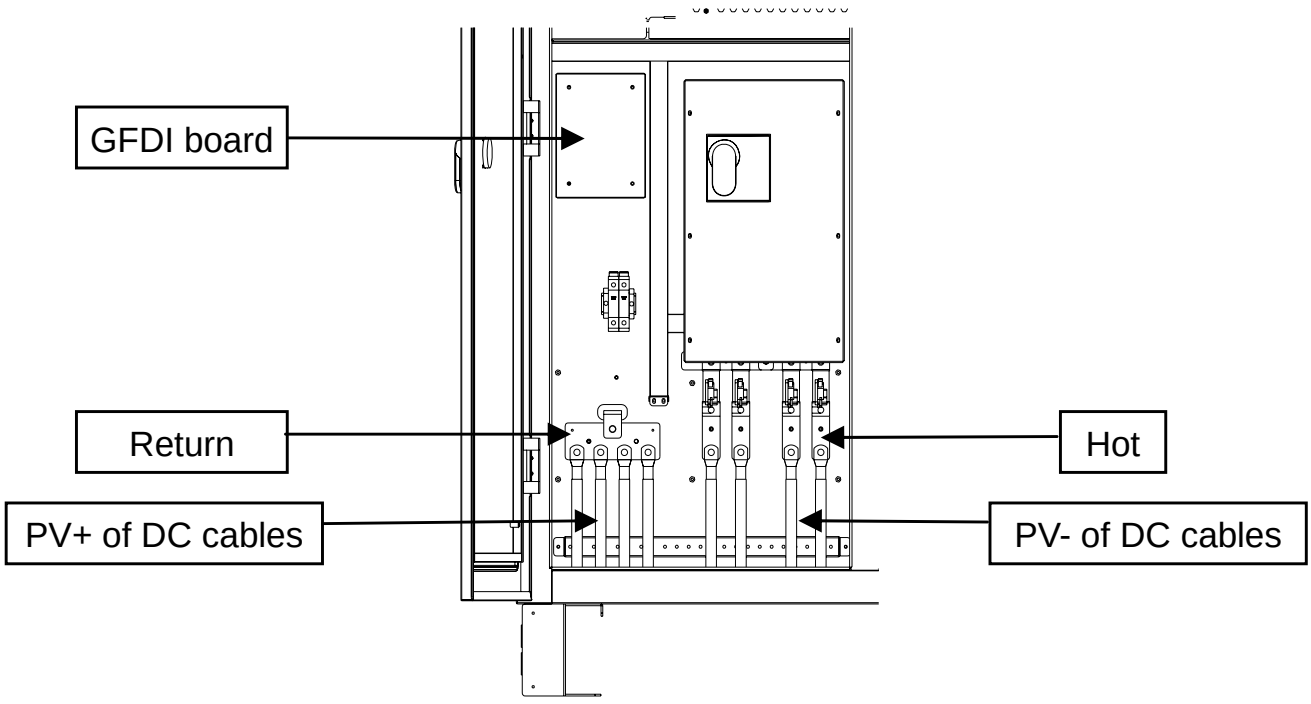


Figure 3-9 DC connection of CPS SC100KT-OPG/US-480

The schematic diagram of wire connection is shown in Figure 3-10.

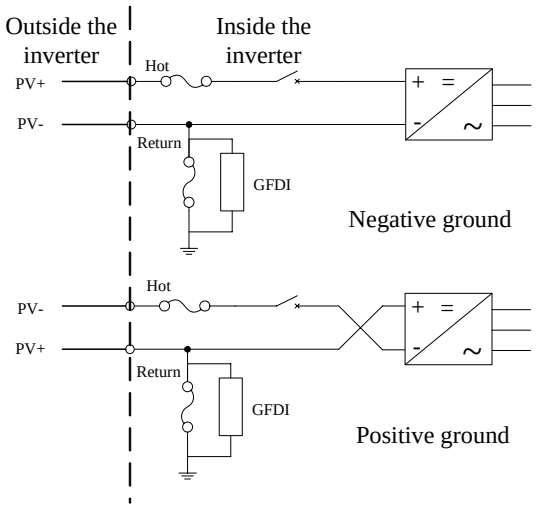


Figure 3-10 Schematic diagram of DC side

The type of fuse is shown in Table 3-4. If a large stream of electric current passes through, the fuse will be disconnected and the GFDI circuit will detect the fault. Solution of the problem may refer to “5.3 Troubleshooting”.

Table 3-4

Type of fuse	Rated current	Rated voltage	Safety breaking current on rated voltage
Bussmann KLM-2	2A	600VAC	100kA@600VAC

Warning:

Please choose the type of inverter based on the way of DC grounding system! Change of PV grounding in the inverter is prohibited without permission. Please contact our after-sale service personnel if the change of grounding in the inverter is necessary.

3.4.2 AC and ground connection

Connect the AC output of PV inverter to the AC cabinet or the power grid through AC output and grounding cables:

(1) Use the recommended copper cored cables with an insulation rating of 90℃, as shown in Table 3-5:

Table 3-5

Connection terminals	L1	L2	L3	Gnd
Wire diameter	2/0AWG(70mm^2)	2/0AWG(70mm^2)	2/0AWG(70mm^2)	2AWG(35mm^2)
Bolts	M10 bolts (torque value：10N-M or 88.5Lb-In.)			M8

(2) Connect the power grid A, B, C cables to L1, L 2, L3 terminals of the inverter, as shown in Figure 3-11:

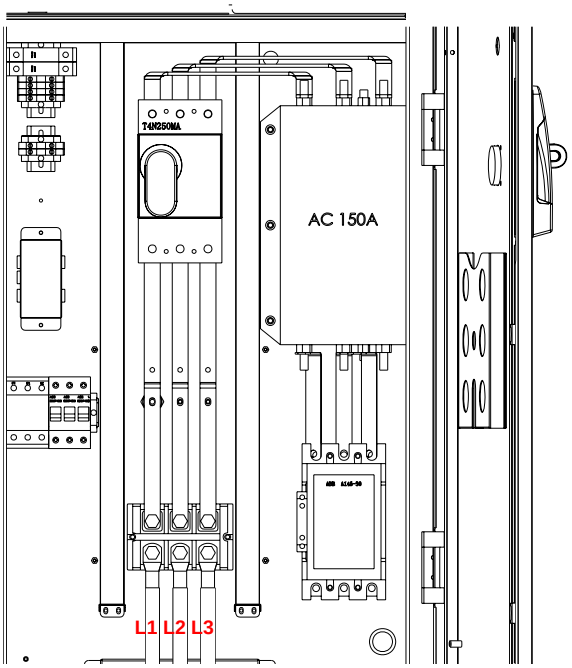


Figure 3-11 AC output connection

(3) Connect the PE cable to terminal G on either side

of the ground bar.

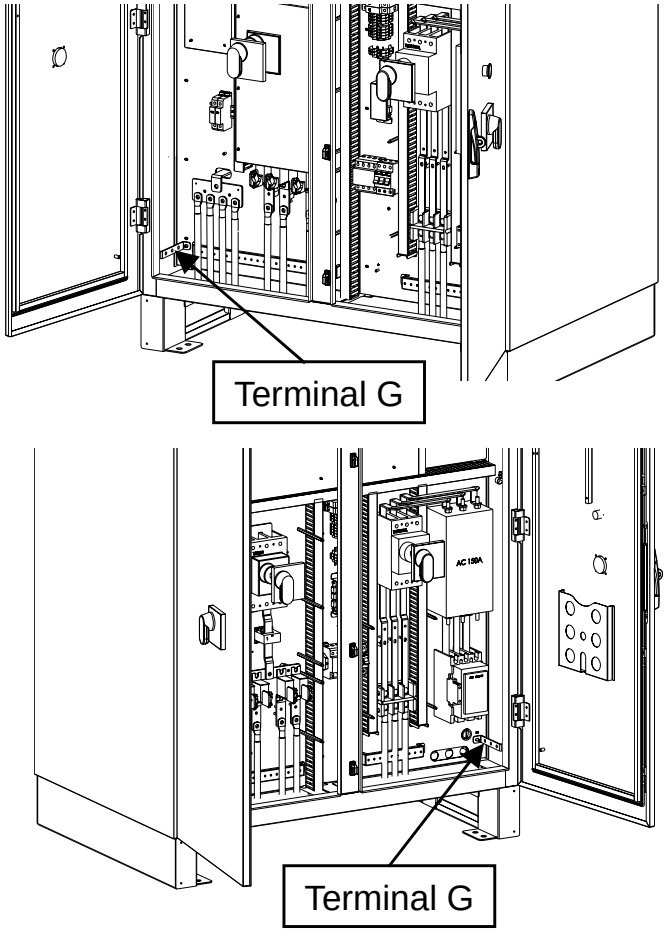


Figure 3-12 Ground connection

(4) Make sure that all cables are tightened on L1, L2, L3 and G terminals properly.

3.4.3 Communication connection

(1) RS485 communication connection (Standard configuration):

The signal pinboard on the inverter has 3 RJ45 communication connectors, which are RS485-1, RS485-2 and Ethernet terminals, as shown in Figure 3-13. Customers can connect the communication cables by themselves.

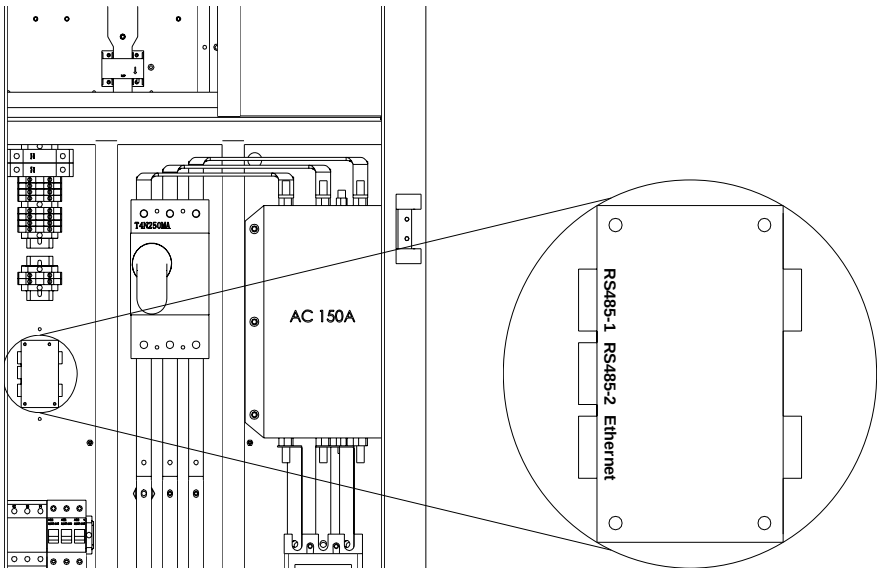


Figure 3-13 Signal cable terminals for communication

(2) The communication of one single local inverter can be connected from the RS485-1 or RS485-2 port on the inverter to 485 bus bar directly.

(3) For remote monitoring of more inverters, connect the RS485-1 port of one inverter to the RS485-2 port of another inverter and then connect to the data logger (Interlink) through the 485 bus bar to send data to the background monitoring system. For more information, please refer to the User Manual of Interlink.

[1] Data collector (Interlink) integrates the PV system data processing and detection functions. It connects CPS SC series grid-tie PV inverter and monitoring background Interview through local or remote communication and realizes real-time monitoring of the various PV systems and improves the reliability of the PV system. Please contact your local dealers if you need the User Manual of Interlink.

(4) Requirement of communication cables:

Shielded cables should be used for communication cables with maximum length of 1000 meters. The wiring requirements of RS485-1/2 connector are shown in Table 3-6 and the way of connection is shown in Figure 3-14. Cables 1~8 are shown from left to right.

Table 3-6

No.	Color	Function
1	White orange	485+
2	Orange	N.C.
3	White green	485-
4	Blue	N.C.
5	White blue	N.C.
6	Green	N.C.
7	White brown	GND
8	Brown	N.C.

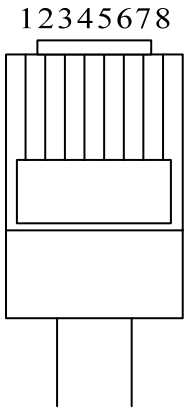


Figure 3-14 Diagram of RS485-1/2 crystal head wiring

(5) Ethernet communication connection (optional)：

The Ethernet interface on the inverter is for data

transmission running on TCP/IP protocol, as shown in Figure 3-13. Shielded twisted pair (STP) is recommended for the communication cables. Both terminals of a communication line should conform to the 568B standard.

3.4.4 Connection of dry contact

The connection of dry contact is shown in Figure 3-15. The two terminals are potential-free contacts for fault alarming of the inverter. The wiring requirement is shown in Table 3-7.

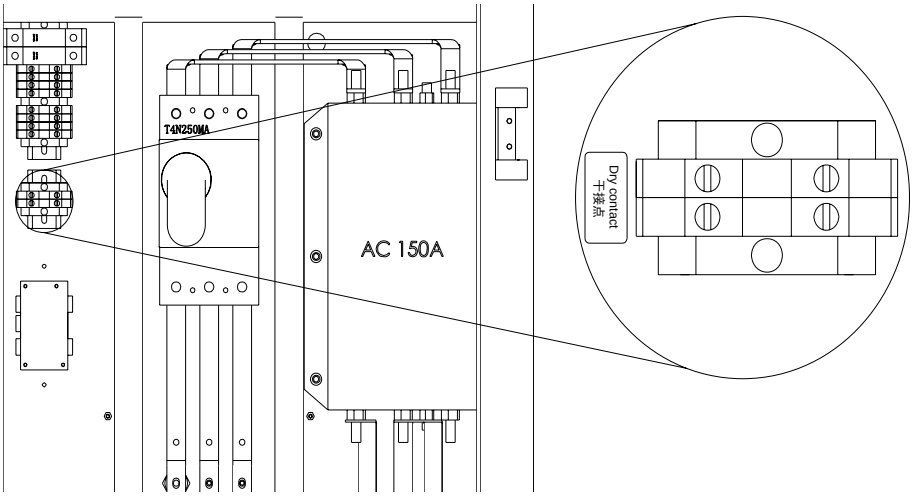


Figure 3-15 Diagram of Dry contact connection

Table 3-7

Function	Wire diameter	Signal type
Inverter fault alarm	18AWG (0.810mm^2)	Dry contact (MAX 240VAC 2A)

3.4.5 Installation of baffles

Use four M4 screws to install the front and back baffles at the bottom of the inverter after all wire connection is completed, as shown in Figure 3-16.

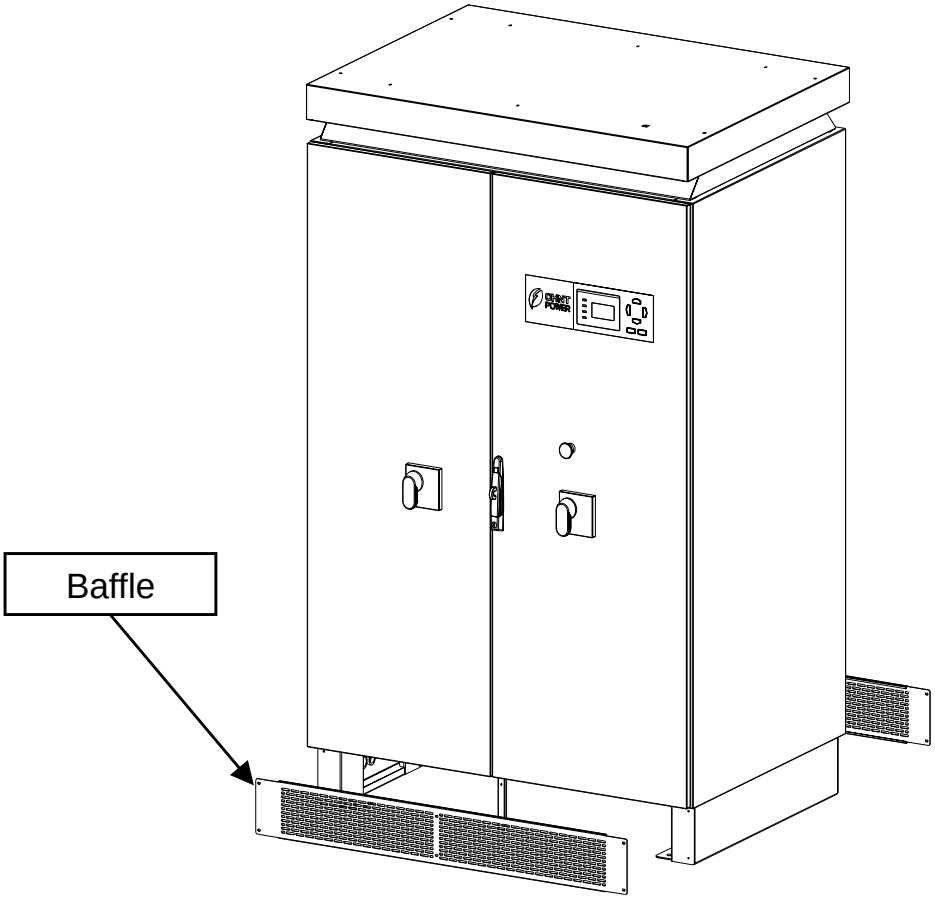


Figure 3-16 Diagram of baffle installation

Chapter 4 Initial On-grid Testing

To ensure operational safety, initial on-grid testing is required as per the instructions in this chapter before connecting PV array and grid power after the installation of CPS SC100KT-O/US-480.

4.1 Testing steps

Conduct the initial on-grid test of CPS SC100KT-O/US-480 according to the following steps:

(1) Check the appearance of inverter
(2) Check the AC connection
(3) Check the DC connection
(4) Connect to the grid
(5) System self-check and time setup
(6) Set up the operational parameters of AC part
(7) Set up the operational parameters of DC part
(8) Set up the operational parameters of MPPT
(9) Connect to PV
(10) Self-check of power train
(11) Start up the inverter

Note: Please refer to “5.3 Troubleshooting” or contact our after-sale service personnel if any problem is found during the testing.

4.2 Testing procedure statement

4.2.1 Appearance of inverter checking

(1) Check whether the inverter has obvious abnormality.

Make sure that the DC circuit breaker and AC circuit breaker are turned off. Open the front door of the inverter and ensure the electrical components and connections are normal.

(2) Check and make sure that all the cables are well connected and there is no wire looseness, short circuit or insulation loss, etc.

(3) Correct any problems identified.

4.2.2 AC connection checking

(1) Check whether the power grid A, B, C, PE cables are tightened on L1, L2, L3 and G terminals correspondingly and properly.

(2) When the AC side of the inverter is connected to the power grid, measure the voltage between two terminals of AC cables. The voltage of L1-L2, L2-L3 and L3-L1 should all be around 480Vac.

(3) If abnormal power grid voltage or no voltage is detected, reconfirm the power transmission from the power grid to the inverter. If there is nothing wrong with the power transmission, check whether the cable connection is correct.

(4) Correct any problems identified.

4.2.3 DC connection checking

(1) Check whether the PV cables are correctly connected to the inverter’s copper bar terminals of DC side.

(2) Connect PV and energize the DC side of the inverter. Measure the voltage between Hot and Return bars, which should range from 300~600Vdc. If no voltage is detected,

check whether the cable connection from DC source to the inverter is correct.

(3) Confirm whether the polarity of DC connection is correct.

(4) Correct any problems identified.

4.2.4 Power supply from grid to inverter

(1) Close the front door of the inverter.

(2) Turn on the AC circuit breaker. The auxiliary power supply of the inverter is energized and the control circuit is started up.

(3) Check carefully whether there is abnormality, including noise or smell.

(4) Turn off the AC circuit breaker immediately if there is any abnormality. Reconfirm whether the previous testing steps are correct. Stop testing if no abnormality exists.

4.2.5 System self-check and time set-up

(1) “Sys. Checking” will be indicated on the LCD when the AC circuit breaker is turned on.

(2) The inverter will stand by after the self-check of system is completed. Meanwhile, fault indication interface will be shown on the LCD if any malfunction occurs. The specific fault indication and solution are available to be found in “5.3 Troubleshooting”.

(3) Enter the “4 SysTime” menu and set up the present date and time according to “6.3.6 System setup”.

4.2.6 Setup of AC Operational parameters

Enter “1 SysPara” menu according to “6.3.7 System protection parameter setup”.

(1) Check the AC voltage, frequency protection value and time of protection actions.

(2) Change the parameters if necessary.

4.2.7 Setup of DC Operational parameters

(1) Check the PV start voltage and time of the inverter.

(2) Change the parameters if necessary.

4.2.8 Setup of operational parameters of MPPT

(1) Check the active derating and reactive compensation of the inverter;

(2) Make changes if necessary.

(3) Set the active power derating to 10%.

4.2.9 Power supply from PV to inverter

(1) Turn off the AC circuit breaker.

(2) Turn on the DC circuit breaker to provide the PV power supply to the DC side of the inverter.

(3) Check carefully whether there is abnormality, including noise and smell.

(4) Turn off the DC circuit breaker if there is any abnormality. Reconfirm whether the previous testing steps are correct. Stop testing if no abnormality exists.

4.2.10 Self-check of power train

(1) Confirm that the front door of the inverter is closed

and locked up. Then turn on the AC and DC circuit breaker.

(2) Wait for the inverter to stand by, the status of which will be indicated on the LCD.

(3) Select “2 PowerTrain” on the LCD and press “ENT” according to “6.3.6 System setup”. Then self-check interface will be indicated on the LCD. (Figure 4-1) After pressing “ENT”, the system begins self-checking of power train. (Figure 4-2)

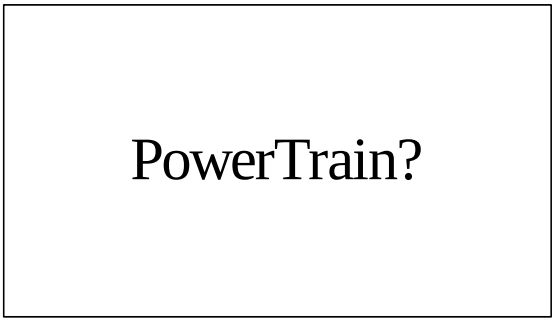


Figure 4-1 Self check confirmation interface

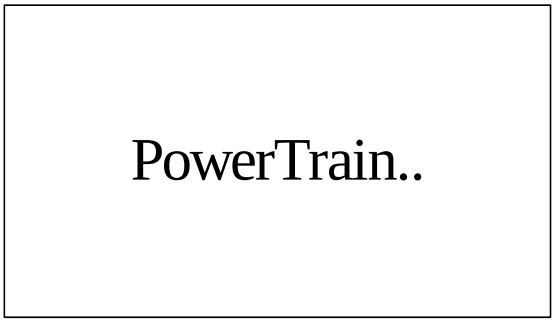


Figure 4-2 Power train self check

(4) If “Low PV Volt” is indicated on the LCD, as shown in Figure 4-3, check whether the PV connection is correct and whether the DC voltage is over 300V.

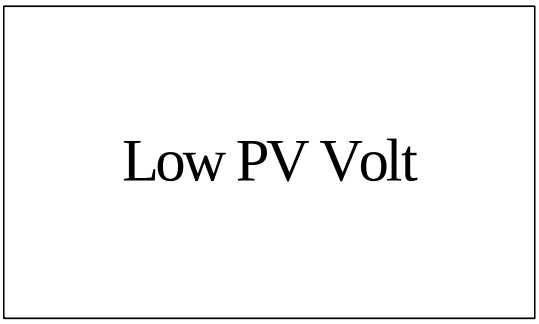


Figure 4-3 Low Volt

(5) If “PowerTrainFualt” is indicated on the LCD, as shown in Figure 4-4, check whether the DC circuit breaker is turned on. Then check whether the inverter is in “ON State” according to “6.3.6 System setup”. If the fault still occurs when the DC circuit breaker is turned on and the inverter is “ON State”, please contact our after-sale service personnel.

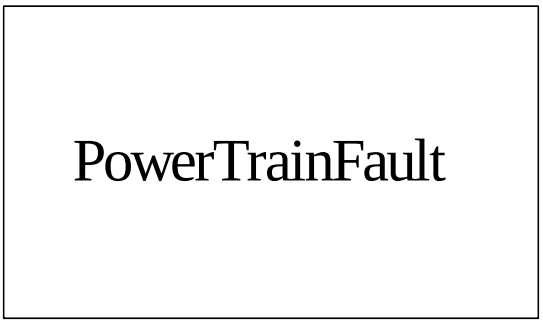


Figure 4-4 Self check fails

(6) Restart the self-check of power train when the fault is fixed. If the self-check is successful, “PowerTrain OK” will prompt up on the LCD, as shown in Figure 4-5. Press “ESC” to return to the main menu.

Figure 4-5 Self check OK

(7) Turn off the AC and DC circuit breakers if anything abnormal happens.

4.2.11 Inverter start-up

(1) If the PV voltage exceeds the starting voltage (adjusted automatically with the grid voltage and 330V is the default minimum voltage.) and the grid voltage meets the requirement of grid connection, the contactor inside the inverter will be picked up to energize the inverter to start up after several minutes under stand-by mode. The largest output power is 10% of the rated power.

（2）If no abnormality happens, the active derating can be gradually increased or be set up to 100% directly.

（3）Check all the operation information on the LCD.

（4）Turn off the AC and DC circuit breaker if anything abnormal happens.

Chapter 5 Operation

Warning:

To ensure operational safety, conduct the initial on-grid testing before operating on the CPS SC100KT-O/US-480.

5.1 Start-up and shut-down

5.1.1 Start-up

Turn on the DC and AC circuit breakers.

Manual start-up: Manual start-up is required after initial installation or manual (fault) shut-down.

Move the cursor from the main operation interface to“4 Setting” according to “6.3.6 System setup”. Press ENTER and go to submenu “1 ON/OFF”. Then move the cursor to “ON” and press ENTER to start the inverter. Then the inverter will start up and operate normally if the start-up condition is met. Otherwise, the inverter stands by.

Automatic start-up: Confirm that the inverter is “ON State” at first. The inverter will start up automatically when the output voltage (Default value is 330V, which can be set up according to “6.3.6 System setup”.) of PV panel meet the set point, AC power grid is normal, and the ambient temperature is within allowable operating range.

5.1.2 Shutdown

Manual shut-down : Normally, manual shutdown is not

necessary. It can be shut down manually if repair or maintenance is required.

(1) Move the cursor from the main operation interface to “4 Setting” according to “6.3.6 System setup”. Press ENTER and go to submenu “1 ON/OFF”. The inverter will be shut down and enter “OFF State” after moving the cursor to “OFF” and press ENTER.

(2) Press the “emergency stop button” on the panel to shut down the inverter in case of emergencies. The inverter is still in “ON State” after it is shut down by emergency button. After the fault alarm is eliminated and the “emergency stop button” restored, the inverter will automatically try to reconnect to the power grid, during which inverter’s status is still “ON State”.

Automatic shut-down: The inverter will be shut down automatically and enter standby mode when the output voltage of PV panel is lower than the set point (300Vdc minimum), or AC power grid fails; or the ambient temperature exceeds the normal range.

The inverter will start up again automatically when the appropriate grid-connection condition is detected.

Manual Shut-down for maintenance: If service personnel needs to maintain or repair the inverter, the manual shut-down operation steps should be conducted first and then execute the “De-energy” program.

The “De-energy” steps are as follows:

(1) Turn off the DC circuit breaker and ensure that the

AC circuit breaker is turned on.

(2) Referring to “6.3.6 System setup”, move the cursor from the main operation interface to“4 Setting”, press ENTER and go to submenu “6 OtherCmd”. Then move the cursor to “1 De-energy” and press ENTER, as shown in Figure 5-1. After pressing ENTER to confirm, the DC bus capacitor begins to discharge, as shown in Figure 5-2.

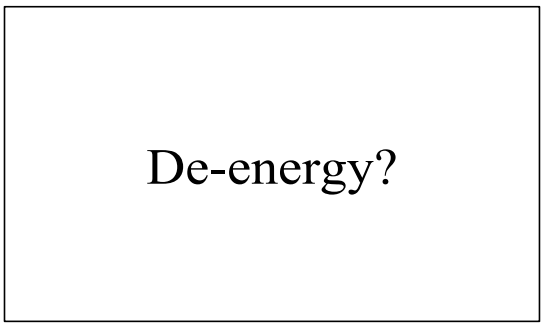


Figure 5-1 Inverter de-energy interface

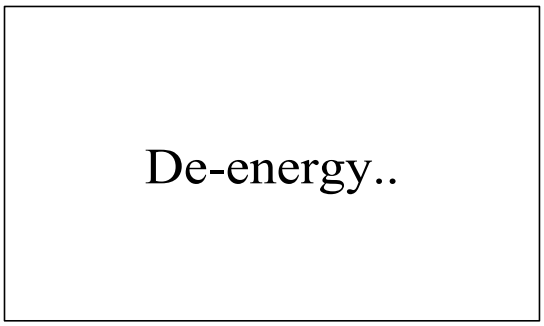


Figure 5-2 De-energy ongoing

(3) When “De-energy” is successfully completed (Figure 5-3), press “ESC” to return to the main menu. Check the PV voltage on the LCD according to “6.3.3 Operation information” or check the voltage of DC bus capacitor with a voltmeter. Don’t turn off the AC circuit breaker and maintain the inverter until the DC bus capacitor is discharged to safe voltage, as shown in Figure 5-3.

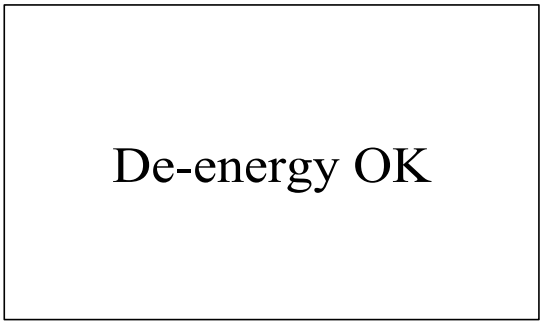


Figure 5-3 De-energy OK interface

(4) If “De-energy” fails, as shown on the LCD in Figure 5-4. It takes at least 15 minutes for the inverter to discharge automatically after turning off the AC circuit breaker. The inverter should not be maintained until the voltmeter shows that there is no electric charge left in the DC bus capacitor.

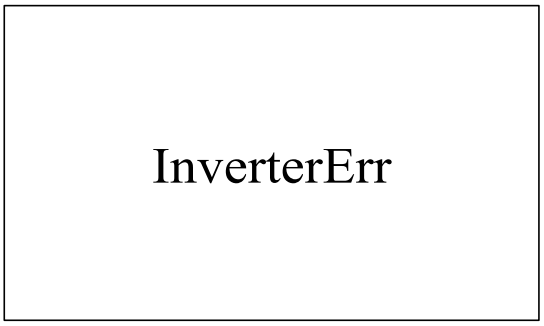


Figure 5-4 De-energy error interface

(5) If the DC circuit breaker is not turned off, LCD will remind of “TurnOff DC Break”, as shown in Figure 5-5. Please turn off the DC circuit breaker and press “ENT” to continue discharging.

Figure 5-5 Turnoff DC circuit breaker

5.2 Operation mode

There are 4 operation modes. The following are corresponding indications for each mode.

(1) System check mode is shown in Figure 5-6:

System is in self check status when inverter is energized. The program will complete initialization in this status.

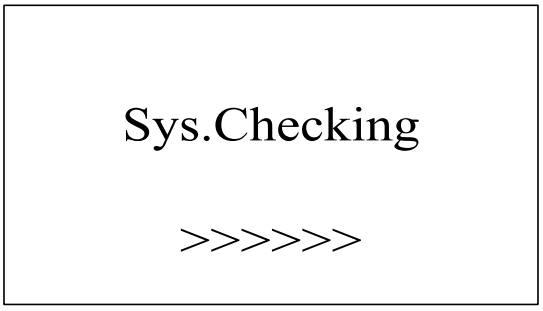


Figure 5-6 System self check ongoing

(2) Standby mode, as shown in Figure 5-7:

After self check is completed, the inverter will turn into standby mode if the output voltage of PV panel or grid power does not meet the startup conditions. The inverter will check automatically whether it meets the startup conditions in this mode until it turns back to normal.

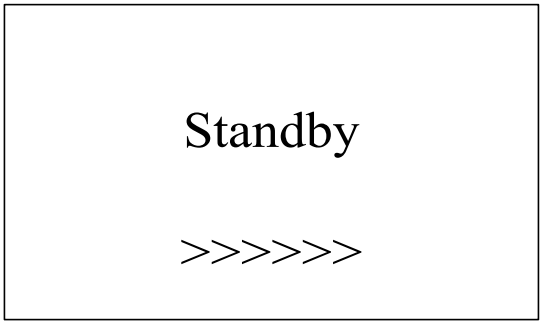


Figure 5-7 Inverter system in standby

(3) Normal operation mode, as shown in Figure 5-8:

The inverter will turn from standby into normal operation mode when the output voltages of PV panel and power grid meet the startup conditions as long as the inverter is “ON State”. In this mode, the inverter converts the power generated by PV modules to AC continuously and feeds to the power grid. During the grid connection and power generation, the inverter will maximize the output energy of PV panel in the manner of MPPT (Maximum Power Point Tracking). Meanwhile, the inverter will check the power grid and PV voltage constantly. Once any abnormality happens, the inverter will stop running and take self-protection.

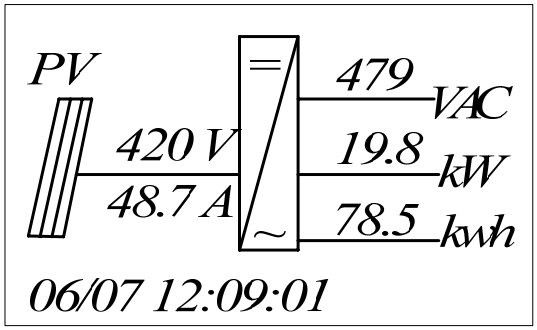


Figure 5-8 Grid connection and power generation default interface

(4) Fault mode, as shown in Figure 5-9:

The inverter will disconnect from the power grid and turn

into fault mode when the PV power generation system fails. Check the fault information on the LCD, which may be referred to “6.3.4 Present fault” and “6.3.5 History”. Specific cause can also be found in “5.3 Troubleshooting” and corresponding instructions are available to eliminate the faults.

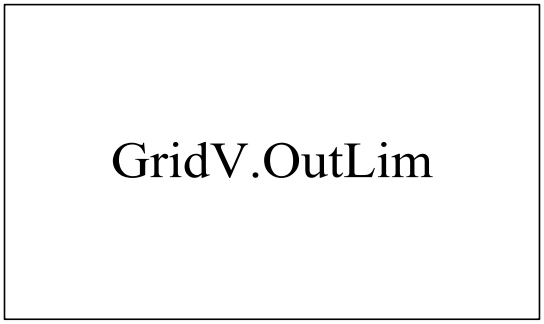


Figure 5-9 Fault indication interface

5.3 Troubleshooting

There are mainly three fault alert statuses: Warn, Protect and Fault. When there is a “Warn”, the system only reminds customers of the problem while it doesn’t change the operation mode. When there is a “Protect”, the system will turn into fault mode and come back to normal when the “Protect” disappears. When there is a “Fault”, the system will stop working and remain standby until resetting the system or repair the inverter to eliminate the fault.

Two ways of system reset are listed as follows:

1. Turn off the AC circuit breaker, wait for 5 seconds and turn on the AC circuit breaker again to recharge the system control unit. If the system check is passed, the inverter will turn into normal operation mode.

2. Run the “2 Restart” command to reboot the system according to “6.3.7 System protection parameter setup”.

The causes of fault can be identified based on the faults listed in Table 5-1. Please contact our after-sales service if the fault persists.

Table 5-1 Troubleshooting Table

	Warn/Protect/ Fault	Definition	Possible causes	Recommended solutions
Warn	1、SPICommErr	Communication inside inverter fails	1、Communication circuits inside inverter are loose; 2、Serious EMI around inverter	1、Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2、Turn off 3-phase working power supply and then reboot the system; 3、Contact after-sales service personnel
	2、Warn0010	Fan (invisible from outside) inside inverter is working abnormally	1、Fan is blocked; 2、Power supply circuit of the fan has problem; 3、Fan state test circuit is loose; 4、Fan service life expires	1、Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2、Switch off 3-phase working power supply and then reboot the system; 3、Contact after-sales service personnel
	3、Warn0030	Eeprom error	Internal storage error	1、Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2、Contact after-sales service personnel
	4、Warn0040	DC breaker error	1、PV positive pole and negative pole are connected reversely;	1、Observe for 5 minutes and see whether the alarm will be eliminated automatically;

	Warn/Protect/ Fault	Definition	Possible causes	Recommended solutions
			2、PV over-current; 3、DC breaker is damaged; 4、Circuit inside DC breaker is loose	2、Check DC breaker; 3、Check PV cable connection; 4、Check whether the sunlight is too strong or the configuration of PV panel is reasonable; 5、Contact after-sales service personnel
	5、Warn0050	Temperature sensor error	1、Temperature inside inverter exceeds normal range; 2、Temperature sensor has problem	1、Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2、Check whether the operation temperature is －25℃~60℃; 3、Contact after-sales service personnel
	6、Warn0020~0150	Inside warning	Inverter has inside problem	1、Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2、Contact after-sales service personnel
Protect	1、TempOver	Ambient temperature or temperature inside inverter is too high	1、Ambient temperature outside the inverter is too high; 2、Radiation air inlet is blocked; Too much dust is on the filter net; 3、Radiation fan is blocked without rotation	1、Confirm that external ambient temperature is within the specified range of operating temperature; 2、Check whether radiation air inlet is blocked and filter net has too much dust; 3、Whether radiation fan is blocked; 4、Observe for 30 minutes and see whether the alarm will be eliminated automatically; 5、Contact after-sales service personnel

	Warn/Protect/ Fault	Definition	Possible causes	Recommended solutions
	2、GridV.OutLim	Grid voltage exceeds the specified range, or grid is not detected	1、Grid voltage is abnormal; 2、Power grid outage 3、Cable connection between the inverter and the grid is disconnected	1、Observe for 10 minutes and see whether the alarm will be eliminated automatically; 2、Check whether the grid voltage is within the specified range; 3、Check whether the cable connection to the grid is disconnected or has abnormalities; 4、Contact after-sales service personnel
	3、GridF.OutLim	Grid voltage frequency is abnormal, or grid is not detected	1、Grid frequency has abnormalities; 2、Power outage of the grid; 3、Cable connection between the inverter and the grid is disconnected	1、Observe for 10 minutes and see whether the alarm will be eliminated automatically; 2、Check whether the grid frequency is within the specified range; 3、Check whether the cable connection to the grid is disconnected or has abnormalities; 4、Contact after-sales service personnel
	4、PV.VoltOver	PV voltage exceeds the specified value	PV over-voltage	1、Observe for 30 minutes and see whether the alarm will be eliminated automatically; 2、Check whether PV voltage exceeds the specified range; 3、Turn off the PV input switch, wait for 5 minutes, turn on the switch again;

	Warn/Protect/ Fault	Definition	Possible causes	Recommended solutions
				4、Contact after-sale service personnel
	5、PV.Reverse	PV panel is connected reversely	1、PV positive pole and negative pole are connected reversely;	1、Check whether positive pole and negative pole are connected reversely; 2、Contact after-sales service personnel
	6、AC.ContErr	AC contactor has abnormality	1、AC contactor is damaged; 2、Power supply circuit of the contactor has problem	Contact after-sale service personnel
	7、EmergencyStp	Inverter is in the status of emergent stop	Emergency stop button is pressed	1、Check whether emergency stop button is pressed. If so, restore the button; 2、Contact after-sale service personnel if the problem still exists
	8、GFCI.Err	PV grounding fault	1、Excessive current passes through return circuit in the result of disconnecting internal PV grounding	1、Check whether the system has ground connection or grounding fault; 2、Check whether the LED on GFDI is lighted on. If so, replace with a new fuse; 3、Contact after-sales service personnel

	Warn/Protect/ Fault	Definition	Possible causes	Recommended solutions
	9、Protect0010~0620	Internal protection of inverter	Internal protection of inverter	1、 Observe for 10 minutes and see whether the alarm will be eliminated automatically; 2、Contact after-sales service personnel
Fault	Fault0010~0160	Fault inside inverter	Serious fault occurs inside inverter	1、The inverter can be forced restarted once if it is required by operation and if it is confirmed that there is no other problem according to “6.3.7 System protection parameters setup”; 2、Contact after-sales service personnel

The instructions of “5.1.2 Shutdown” should be followed before opening the inverter for maintenance.

Electric shock hazard:
All operations and wiring should be performed by qualified technical personnel.
Disconnect the inverter from PV assemblies and the power Grid before the maintenance and operation of the equipment.

5.4 Filter net cleaning and replacement

Note: When the inverter operates for a period of time (one year for general, may be shorter according to the circumstances), the filter net needs to be cleaned or

replaced.

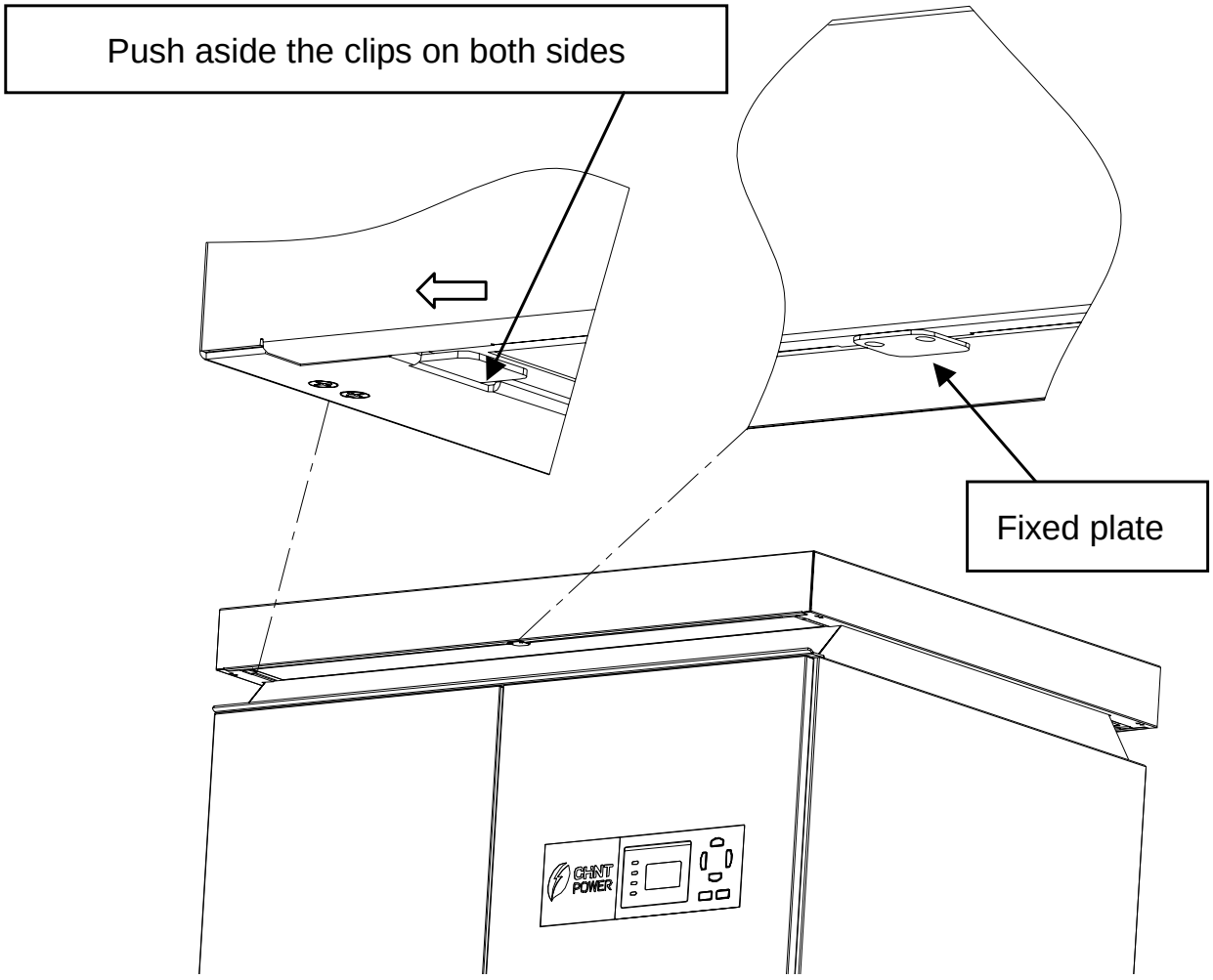
5.4.1 Replacement of filter net on the top

Steps of replacement are shown in Figure 5-10:

(1) Screw off the M3 bolts in the middle of the filter net with 2# cross-shaped screwdriver and take off the fixed plate.

(2) Push aside the two clips on both sides and disassemble the filter net.

(3) Clean the filter net and put it back or replace with a new one.



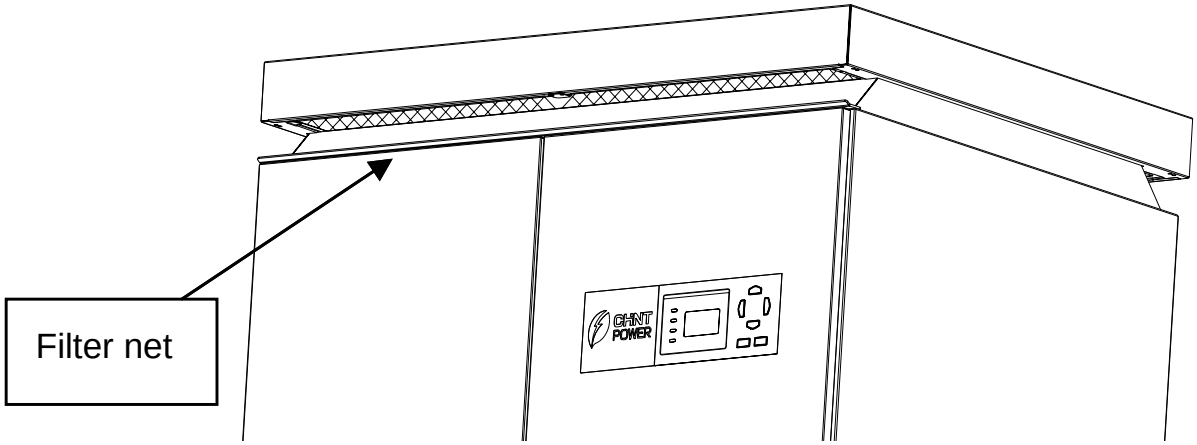


Figure 5-10 Diagram of filter net disassembly (top)

5.4.2 Replacement of internal filter net

The instructions of "5.1.2 Shutdown" should be followed before opening the inverter for maintenance.

Electric shock hazard:
All operations and wiring should be performed by qualified technical personnel.
Disconnect the inverter from PV assemblies and the power Grid before the maintenance and operation of the equipment.

Steps of replacement (Figure 5-10):

(1) Screw off 7 M4 bolts on the backboard of the inverter with a T25 wabbler screwdriver.

(2) Rotate the backboard downward and pull it out when it turns to about 45°. Screw off the grounding cable from the backboard and take away the backboard, as shown in Figure 5-11.

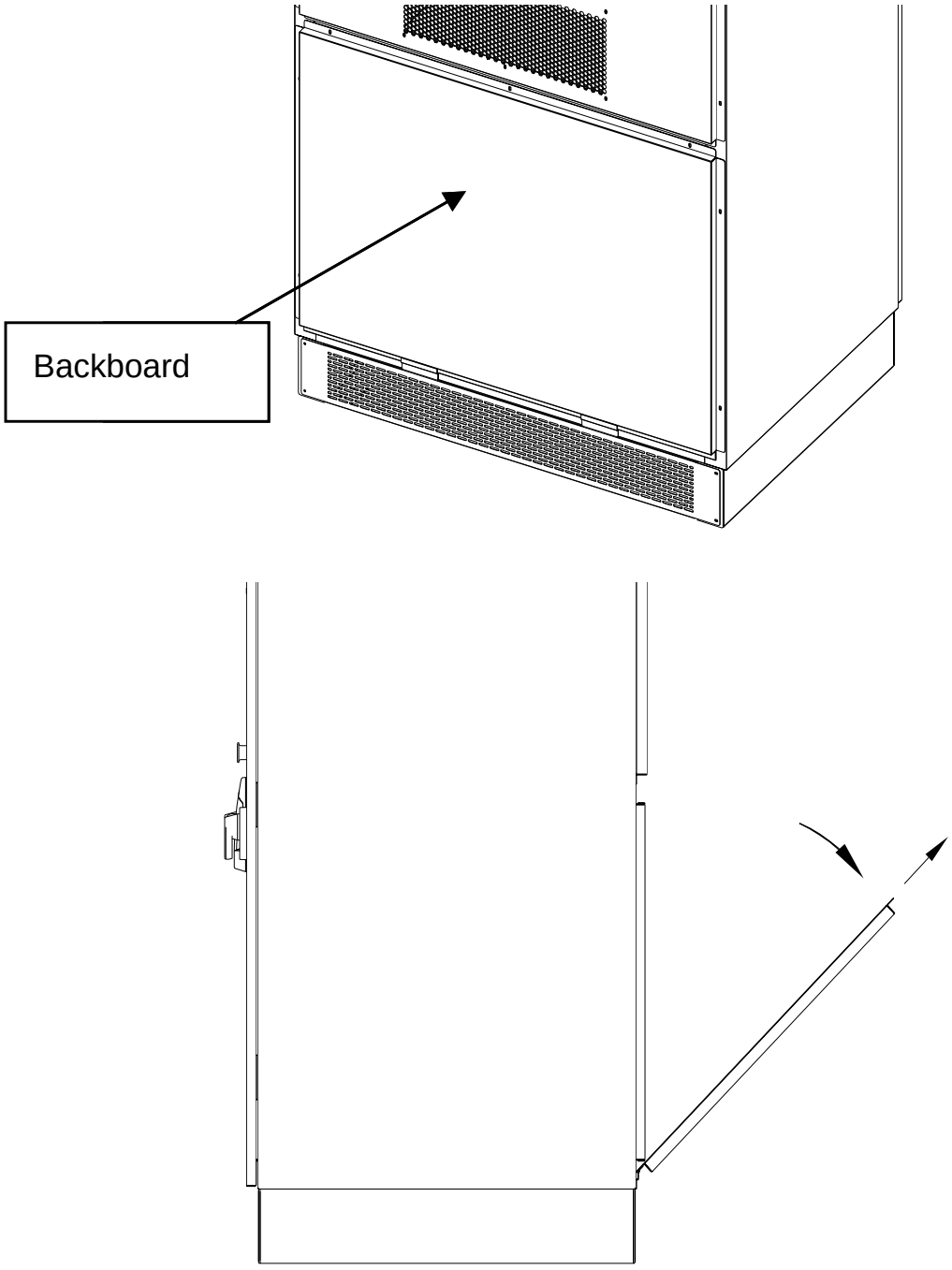


Figure 5-11 Disassembling of backboard

(3) Screw off the fixed bracket of filter net and take out the filter net at the bottom of the transformer, as shown in Figure 5-12.

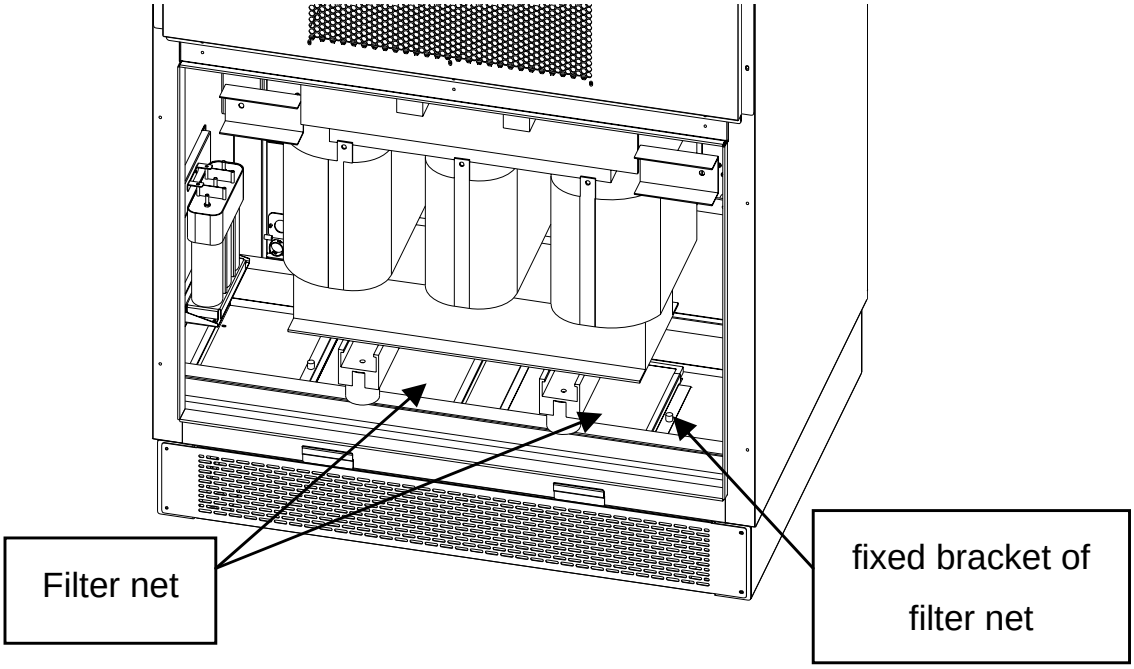


Figure 5-12 Diagram of filter net disassembly (internal)

(4) Clean the filter net, put it back or replace with a new one and then reinstall the backboard.

Chapter 6 Human Machine Interface

6.1 Description of LCD display

CPS SC100KT display mainly consists of LCD screen, LED indicator lights, buzzer and 6 keys. Meanings of indicator lights are shown in Table 6-1 and functions of the keys are shown in Table 6-2.

Table 6-1 LED Indication

LED Sign	Description	State	Meaning
POWER	Work power supply indicator light	Light up	Energized(control panel starts to work)
		Light off	No working power supply
RUN	Grid connection operation indicator light	Light up	In grid connection and power generation state
		Blink	Rundown state (light up 0.5s, Light off 1.6s)
		Light off	In other operation state or no working power supply
GRID	Grid state indicator light	Light up	Grid is normal
		Blink	Grid abnormal (light up 0.5s, Light off 1.6s)
		Light off	No working power supply
FAULT	Fault state indicator light	Light up	Fault occurs
		Slow blink	Alarm occurs (light up 0.5s, Light off 2s)
		Quick blink	Protective action (light up 0.5s, Light off 0.5s)
		Light off	No fault or no working power supply

Table 6-2 Definitions of the keys

Key	Description	Definition of function
ESC(←)	Escape key	Back/end/mute
ENTER（↵）	Enter key	Confirm entering the menu/confirm set point
PAGEUP（▲）	Up	Page up in selection menu
PAGEDOWN（▼）	Down	Page down in selection menu
ADD（◄）	Left	+1 when setting parameters
DEC（►）	Right	-1 when setting parameters

6.2 Operation state

Table 6-1 indicates the definitions of LED, i.e. indicates the information of the inverter's operation state. It indicates that the system is energized and under DSP control when "POWER" lights up.

"RUN" will light up when the inverter detects that the grid connection conditions meet the requirements and power is fed to the grid. "RUN" will blink if the grid is in derated running state during the period of feeding power to the grid.

"GRID" will light up when the grid is normal during the operation of the inverter. Otherwise, "GRID" will blink until the grid restores to normal.

"FAULT" will blink quickly as a fault (except grid abnormality) occurs. "FAULT" will not light off until the fault is eliminated. The light will blink slowly when an alarm occurs. "FAULT" keeps lighting up when an internal fault occurs.

“FAULT” will not light up if both the inverter and grid are normal.

The buzzer will give alarms if a fault (involving power grid abnormality) occurs.

6.3 Interface and menu functions

Users can perform the corresponding operations with the 6 function keys according to the indications of the LCD display.

6.3.1 Interface types

(1) The LCD interface starts with the company logo once the system is energized as shown in Figure 6-1. Six seconds later, the LCD shows the inverter is running system check as shown in Figure 6-2.

Figure 6-1 LOGO interface

(2) Indication of inverter operation mode

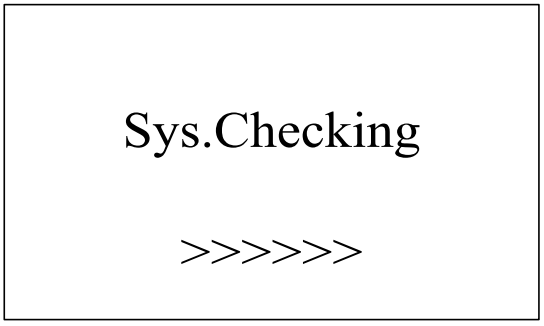


Figure 6-2 Inverter system check ongoing

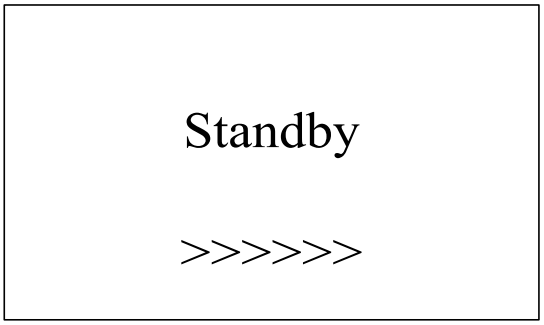


Figure 6-3 Inverter system in standby mode

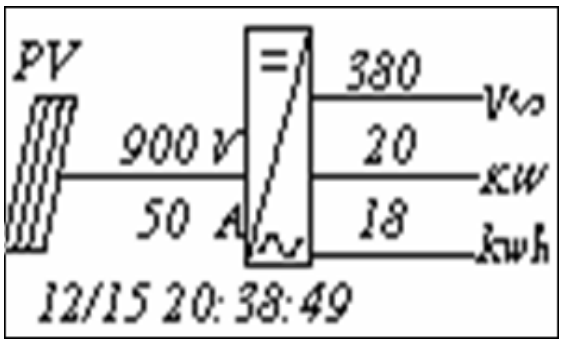


Figure 6-4 Default display interface for normal operation

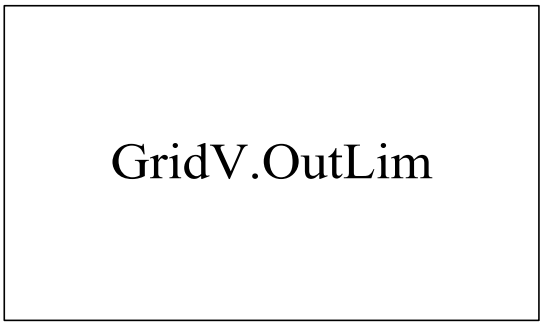


Figure 6-5 Fault indication interface

LCD screen will display different mode interfaces based on the operation modes of the inverter. There are four operation modes: startup system check mode (as shown in Figure 6-2), stand-by mode (as shown in Figure 6-3), normal operation mode (as shown in Figure 6-4) and fault mode (as shown in Figure 6-5).

The default indication interface mainly indicates PV voltage, PV current, grid voltage, generation power, instant generated power and time information under normal operation.

LCD screen changes into fault indication interface and display the present fault information automatically when the inverter is in fault mode.

6.3.2 Main operation interface

LCD screen displays “default indication interface” when the inverter is in operation mode. Press the ESC key in this interface to escape the default interface and enter the main operation interface. The main operation interface is shown in Figure 6-6.

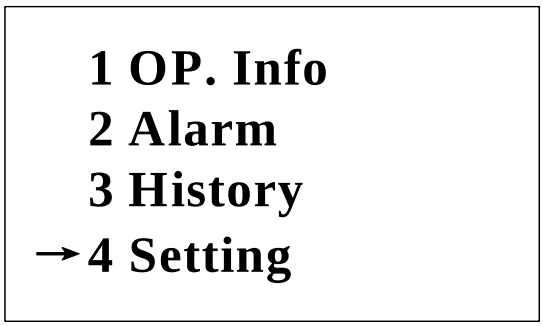


Figure 6-6 Contents indicated on the main operation interface

The main operation interface of LCD screen has 4 level-1 menus, i.e. “1 OP. Info”, “2 Alarm”, “3 History” and “4 Setting”. The users may select options with PAGEUP and PAGEDOWN, and then press ENTER to confirm selection. The users can return to the default indication interface by pressing the ESC key.

6.3.3 Operation information

When the cursor moves to “1 OP. Info” in the main interface, press ENTER to select the operation information as shown in Figure 5-7. Check the information by pressing PAGEUP and PAGEDOWN. Return to the previous menu and enter the main operation interface by pressing ESC.

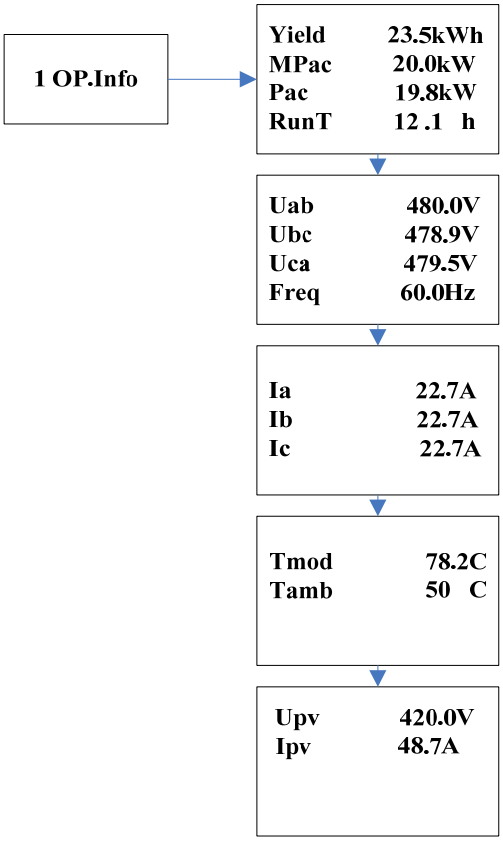


Figure 6-7 Operation information indication

6.3.4 Present fault

As described before, when faults occur during the normal operation of the inverter, corresponding fault message will be indicated in “2 Alarm” menu besides the sound and light alarms. Move the cursor to “2 Alarm” and press ENTER to check out the specific fault information (50 pieces of fault information can be indicated at the same time), as shown in Figure 6-8.

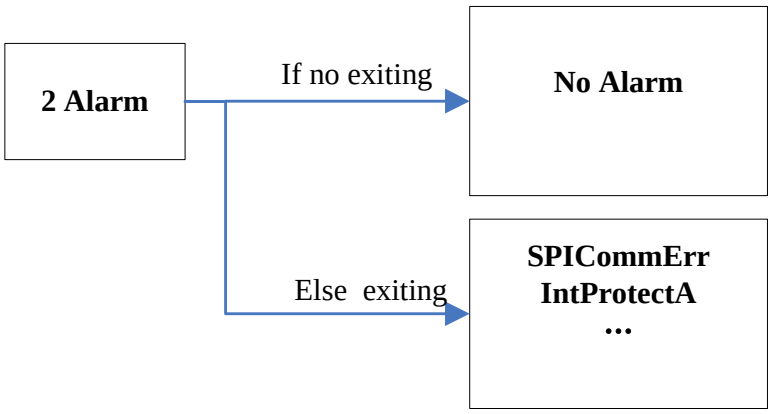


Figure 6-8 Present fault information

6.3.5 History

Move the cursor to “3 History” in the main interface. Press ENTER to check the history information, as shown in Figure 5-9. There are 4 submenus in “3 History” : “1 HistErr”, “2 OP. Recd”, “3 Version” and “4 TotalTag”.

(1) UP to 100 pieces of latest fault messages can be recorded and found in “1 HistErr” menu.

(2) The latest 21 days’ operation history data is available to be found in “2 OP. Recd” menu. All variable names in the data comply with the content in “1 OP. Info” menu of the main

interface. The users can select the “2 OP. Recd” menu and input the retraceable days (For example, the input number is 21. If the current date is December 15th, the LCD will indicate the operation information of 21 days before that date which is November 24th).

(3) Software version, hardware version and serial number of the product are listed in “3 Version” menu.

(4) Accumulative generated electric power since the first day the inverter began working is available to be found in “4 TotalTag” menu.

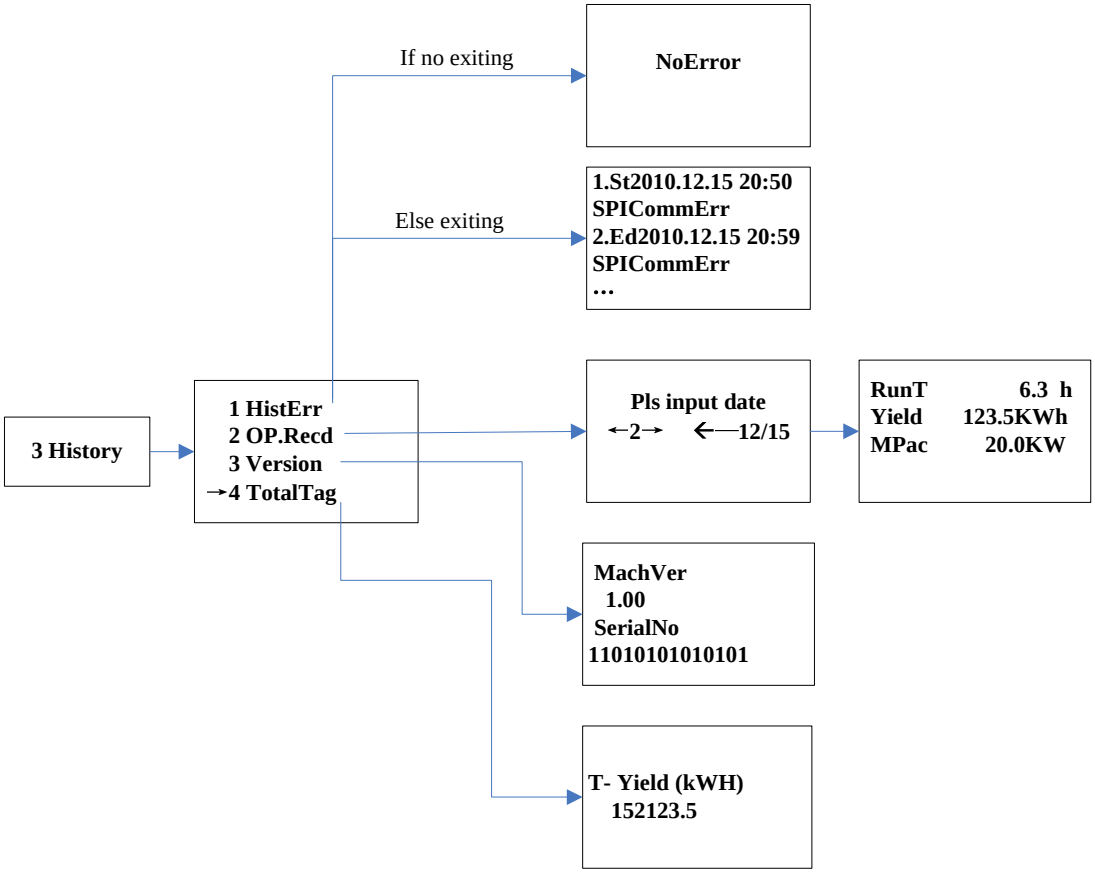


Figure 6-9 History menu and submenu

6.3.6 System setup

Move the cursor to “4 Setting” in the main interface. Press ENTER to set the current system parameters, as shown in Figure 6-10. There are 6 submenus in “4 Setting” : “1 ON/OFF”, “2 Language”, “3 Buzzer”, “4 SysTime”, “5 Commun” and “6 OtherCmd”.

(1) The inverter can be started and shut down with “1 ON/OFF” menu. Move the cursor to “ON” and press ENTER, “ON State” will then be indicated at the bottom of LCD screen ; move the cursor to “OFF” and press ENTER, then “OFF State” will be indicated as well. The inverter will stand by instead of working normally if the startup conditions are not satisfied even “ON” is selected. The inverter will be shut down immediately if “OFF” is selected in any cases.

(2) Two languages, i.e. English and Chinese are available in “2 Language” menu.

(3) Key beep and fault beep can be set mute/unmute in “3 Buzzer” menu. “Key beep” and “Alarm beep” can be shifted by pressing PAGEUP and PAGEDOWN. Shift between “Enable” and “Disable” by pressing Left and Right if the cursor is on the “Key beep”. Complete the setup by pressing ENTER. Similarly, the fault beep can be set up as well.

(4) Set up the system date and time with “4 SysTime” menu. (These parameters are of critical importance and will be used in history information). Select year, month, day, hour and minute by pressing Page Up/Page Down, and set up the

specific date and time by pressing Left and Right.

(5) Set the 485 communication parameters (including the address and baud rate of inverter) with “5 Commun.” menu.

(6) In “6 OtherCmd” menu, run “1 De-energy” to discharge the electric charges of DC capacitor quickly; run “2 PowerTrain” to check the status of main system circuit for the initial on-grid testing.

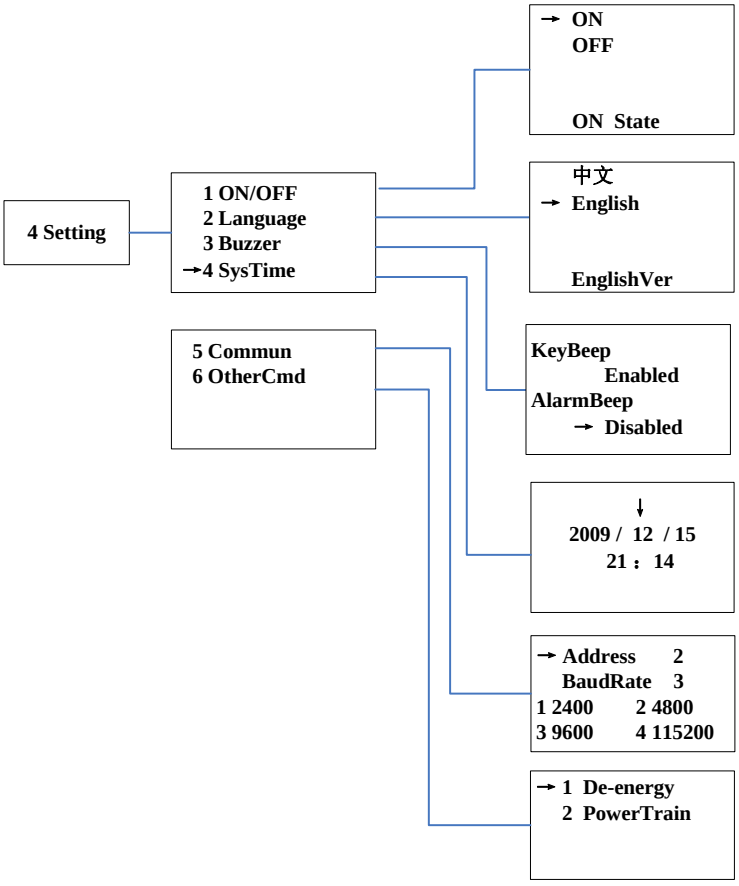


Figure 6-10 System setup menu and submenu

6.3.7 System protection parameter setup

By pressing PAGEDOWN and ENTER at the same

time in the main interface and entering the password (PAGEUP->PAGEDOWN->RIGHT->LEFT), the system parameter setup menu is entered. This menu includes 4 submenus: “1 SysPara”, “2 Restart”, “3 Recover” and “4 ClrErrRecd”.

(1) Set up the system protection parameters in “1 SysPara” menu. The types of protection parameters are shown in Table 6-3.

(2) “2 Restart” menu. If an internal fault shutdown happens, a severe fault has occurred inside the inverter. The user may perform a force restart once in this menu if the user needs to restart the inverter. Note that this function is effective only when a fault shutdown occurs. The inverter may restore to normal operation automatically if alarm or protection faults occur. This function will not respond when the inverter is in operation mode and a “FaultOperated” alarm interface will pop up.

(3) “3 Recover” menu, the manufacturer’s parameter default value can be restored when the inverter is not in operation mode. Otherwise, a “FaultOperated” will be prompted.

(4) In “4 ClrErrRecd” menu, history information of the faults can be cleared. A confirmation is required to clear the records.

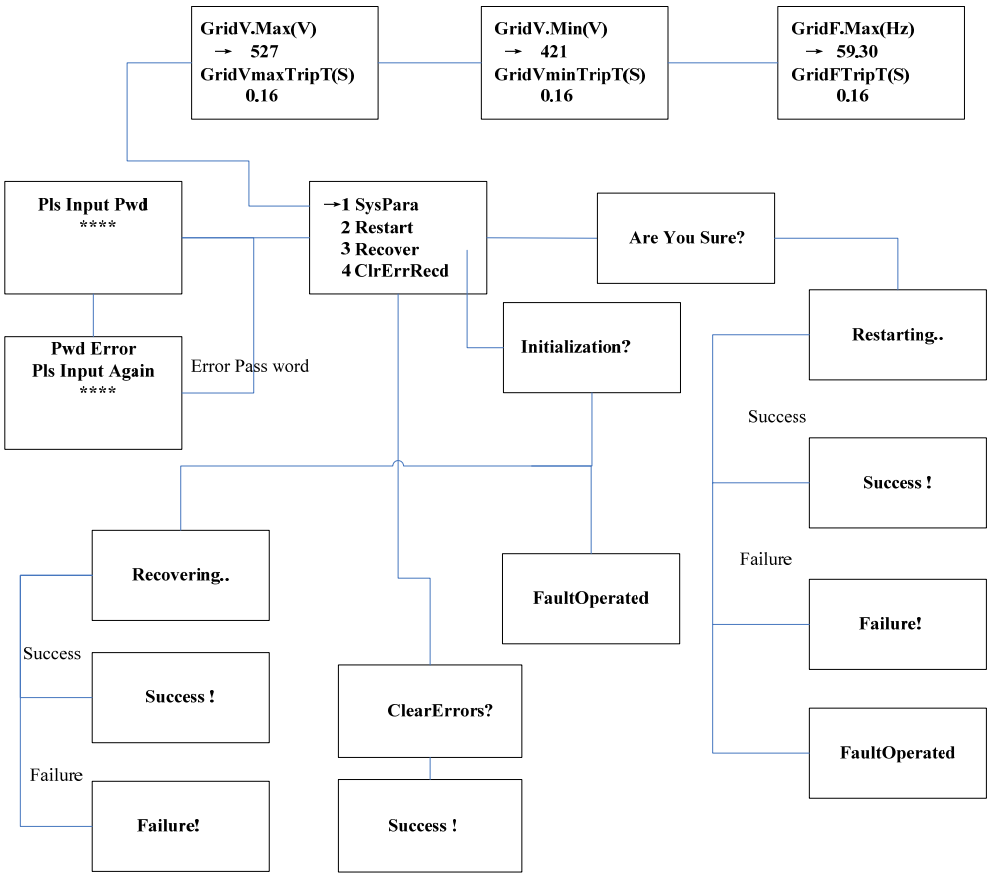


Figure 6-11 System parameter setup

Table 6-3 Protection Parameters Table

No.	Description of parameter	LCD indication	Setup range (lower limit, default & upper limit)
1	Grid voltage upper limit (V)	GridV.Max(V)	（527, 527, 575）
2	Trip time under Max. voltage (S)	GridVmaxTripT(S)	（0.16, 1.00, 1.00）
3	Grid votage lower limit (V)	GridV.Min(V)	（240, 422, 422）

No.	Description of parameter	LCD indication	Setup range (lower limit, default & upper limit)
4	Trip time under Max. voltage (S)	GridVminTripT(S)	（0.16, 2.00, 2.00）
5	Grid frequency lower limit (Hz)	GridF.Min(Hz)	（57.00, 59.30, 59.80）
6	Frequency trip time (S)	GridFTripT(S)	（0.16, 0.16, 300.00）
7	Active power derating (%)	PowerDerating (%)	（10%, 100%, 100%）
8	Reactive Compensation	ReactiveComp	（-0.900, 1.000, 0.900）
9	PV start voltage (V)	PVStartVol(V)	（300, 330, 600）
10	Time delay (Min)	Tdelay(Min)	（0.1, 5.0, 5.0）

Chapter 7 Technical Data

CPS SC100KT-O/US-480, CPS SC100KT-OPG/US-480	
DC Input	
Nominal DC Voltage	400Vdc
Max. DC Voltage*	600Vdc
MPPT Voltage Range	300~550Vdc
Operating Voltage Range	300~600Vdc
Max. DC Power	110KW
Max. Input Current	350A
Max. DC Short Circuit Current	410A
Number of MPP Tracker	1
AC Output	
Output Power	100KW
Nominal Grid Voltage	480Vac 3phase
Allowable Grid Voltage**	422~528Vac
Nominal Grid Frequency**	60Hz
Current THD	<3%
Power Factor	~1
System	
Max. Efficiency	96.8% (with transformer)
CEC Efficiency	96.5% (with transformer)
Protection Degree	NEMA3R（IP44）
Allowable Temperature Range***	-25°C ~ +60°C
Altitude	2000 meters
Humidity	0~95%, no condensation
Cooling	Forced air cooling/RPM adjustable fan
Noise Level	< 75dB (Distance: 2 meters)

Power consumption overnight	<50W
Certification	
General Standard	UL1741 Rev 2010, IEEE1547,
Radiated Emission	FCC PART15, Class A
Display and communication	
Standard Communication	RS485
Optional Communication	Ethernet
Fault Alarm	Dry contact (MAX 240VAC, 2A)
Display	LCD Display
Mechanical parameters	
WxDxH(mm)	1200×1850×880
Weight (kg)	900kg

*Note 1: Exceeding the rated voltage shown in “Maximum DC voltage” may cause permanent damage to the equipment.

**Note 2: “Allowable Grid Voltage” and “Nominal grid frequency” depend on the specific national grid standard.

***Note 3: When the ambient temperature exceeds 50℃, the maximum output power will derate as 3% per ℃. When the ambient temperature reaches 60℃, the maximum output power will be 70% of the rated output power. The inverter will stop running under self-protection when the ambient temperature is over 65℃.

Chapter 8 Quality Assurance

8.1 Warranty

The warranty policy of this product is specified in the contract; otherwise the warranty period is 24 months since the date of installation.

8.2 Disclaimer

1、Damages caused during transportation;

2、Operating in an environment that doesn't conform to the specifications of the manual;

3、Products are not used correctly or properly (including installation and use);

4、Products or software is changed without authorization;

5、Negligence of safety warning, relevant mandatory safety specifications of the product and its related documents;

6、Unexpected disaster or force majeure

8.3 Quality clause (Warranty clause)

1、CPS will repair or replace with new products for products with malfunctions for free during the warranty period.

2、The replaced non-conformance products should be returned to CPS.

3、Reasonable time should be provided to CPS for

repair work.

Please do not hesitate to contact us if you have any questions about CPS SC100KT-O/US-480 PV grid connection inverter. We will be glad to provide the best service for you at any time.

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CPS SC100KT-O/US-480 Installation and Operation Manual (PN: 9.0020.0041A0) is printed for the first time.