CPS SC Series Grid-tied PV Inverter
CPS SC20KTL-DO/US-480

Installation and Operation Manual

Ver 1.2

Table of Contents

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.

Thank you for choosing this CPS Grid-tied PV Inverter. This PV Inverter is a high performance and highly reliable product specifically designed for the North American Solar market.

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.

Chapter 1 IMPORTANT SAFETY INSTRUCTIONS (SAVE THESE INSTRUCTIONS)

Please read this user manual carefully before product installation. CPS reserves the right to refuse warranty claims for equipment damage if the user fails to install the equipment according to 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.

Markings on the product

	**HIGH VOLTAGE:** The product works with high voltages. All work on the product must only be performed as described in this document.
	**HOT SURFACE:** The equipment is designed to meet international safety standards, but surfaces can become hot during operation. Do not touch the heat sink or peripheral surfaces during or shortly after operation.
	**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 inverter from AC grid and PV modules before opening the equipment. When the PV array is exposed to light, it supplies DC voltage to this equipment. Make sure hazardous high voltage and energy inside the equipment has been discharged.

Do not operate or maintain the inverter until at least 10 minutes after disconnecting all sources from DC and AC sides.

WARNING:

All the installation and wiring connections should be performed only by qualified technical personnel. Disconnect the inverter from PV modules and the Power Grid before maintaining and operating the equipment.

CAUTION:

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

CAUTION:

CPS SC20KTL-DO/US-480 inverter is approx **132lbs (63kg).**

Please ensure the mounting is properly installed before hanging the the inverter on the bracket.

NOTICE:

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

INSTRUCTION:

Conduits shall be used as the cable protectors for cable connection.

Chapter 2 Overview

2.1 Inverter for grid-tied PV systems

CPS SC20KTL-DO/US-480 inverter is suitable for use with commercial and large scale PV grid-tied systems. The system is generally made up of PV modules, DC power distribution equipment, PV inverter and AC power distribution equipment (Figure 2-1). The inverter converts the DC from PV modules to AC with the same frequency and phase as the AC grid. All or part of the AC power is supplied to local loads, and the surplus power is supplied to the electricity grid.

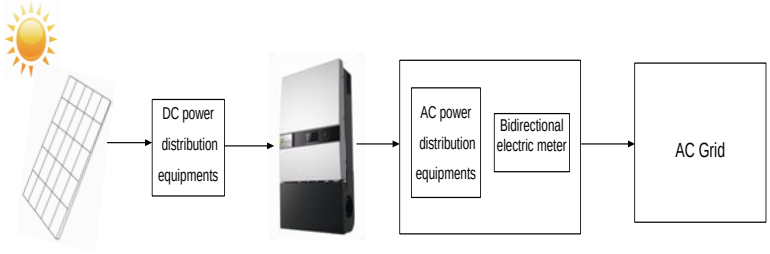


Figure 2-1 Grid-tied PV system

2.2 Product type description

CPS SC20KTL-DO/US-480 is a two-MPPT PV inverter integrated with the DC and AC switches for indoor and outdoor application. The suffix “US” means that this model of inverter passes the UL certification and is specialized for the American market.

2.3 Product features

CPS SC20KTL-DO/US-480 inverter incorporates the advanced 3-level and MOSFET paralleled with IGBT technology to minimize the energy loss.

The two-MPPT design has the benefit of increasing the power generating

efficiency of the whole PV system. The inverter has 2 MPPTs, so a separate array can be controlled by an independent Maximum Power Point Tracking (MPPT) control circuit. This means that the two arrays can be installed in different positions and orientations.

The transformerless design of inverter with the benefit of small size, light weight and high power density, provides the best cost performance for the whole PV system.

The inverter is available for both indoor and outdoor applications due to its NEMA 3R (IP65) protection class enclosure.

The integrated DC and AC switches make the maintenance more flexible and safer. Besides, the inverter has the function to support one or two independent MPPTs input to improve the system efficiency. Meanwhile, the inverter can automatically identify the connection way between PV modules due to its excellent self-adaption ability.

2.4 Circuit structure design

The basic schematic diagram of CPS SC20KTL-DO/US-480 is shown in Figure 2-2. The input DC passes through surge protection circuitry, DC EMI filter, and the boost circuit to achieve maximum power tracking and boost up voltages. The inverter converts the DC energy to 3-phase AC energy. The high frequency components of AC voltage are removed with a line filter. Then the 3-phase AC energy is sent through two-stage relays and EMI filter to produce high quality AC power.

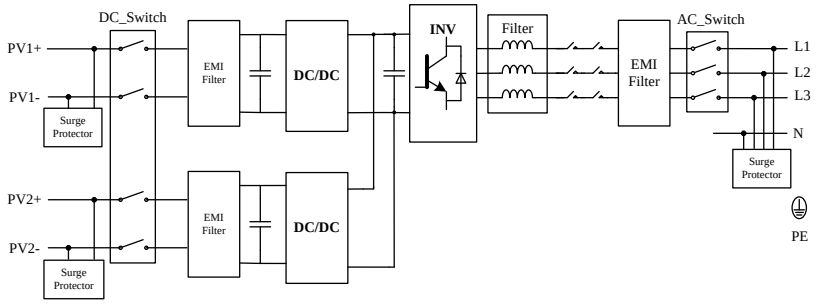


Figure 2-2 Schematic diagram of CPS SC20KTL-DO/US-480

2.5 Appearance description

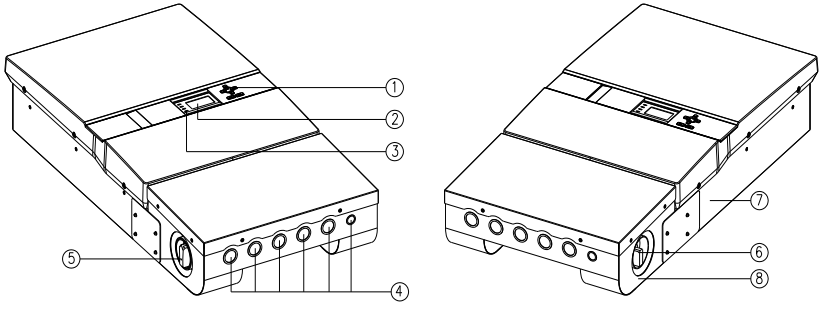


Figure 2-3 Appearance sketch of CPS SC20KTL-DO/US-480

Description of main items of the inverter (shown in Figure 2-3):

1. LCD key buttons: operate the functions and change settings of inverter
2. LCD display: indicates data
3. LED indicator lights: indicate the status of inverter
4. DC input knockouts (4), AC output & ground knockout (1) and signal port (1) from left to right
5. DC switch: control the DC power on and off
6. AC switch: control the AC power on and off
7. Main housing
8. Wiring box

Chapter 3 Installation

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

Before installation, please check that the following items are included in the package:

Table 3-1 Main items

Item	Q'ty	Note
(1) CPS SC20KTL-DO/US-480 Grid-tied PV inverter	1	Grid-tied PV inverter
(2) Mounting bracket	1	upon which Inverter is hung and mounted onto a wall
(3) User manual	1	Installation and operation manual
(4) Warranty card	1	for maintenance and repair
(5) Accessory kit	1	contains all necessary accessories

The (5) Accessory kit contains items listed below:

Table 3-2 Accessories

Item	Q'ty	Purpose
M (8×25L) expansion bolts & nuts	8 pairs	for bracket installation (2 pairs for backup use)
M5 nut	2	for grounding wire (1 nut for backup use)
Ring terminal	1	for grounding wire
Cord end terminals	20	16 for input wires, 3 for

		output wires, 1 for neutral wire (optional)
RJ45 connecters	4	for communication cables
Red wire	1	for inverter with 1 MPPT working alone

3.1 Basic requirements

- ✓ Check that the product environmental specifications (protection degree, operating temperature range, humidity and altitude, etc) meet the requirements of the specific project location;
- ✓ Make sure that the power grid voltage is within normal range;
- ✓ Ensure that the local electricity supply authority has granted permission to connect to the grid;
- ✓ Installation personnel must be qualified electricians or people who have received professional training;
- ✓ Sufficient space is provided to allow the inverter cooling system to operate normally;
- ✓ Install the inverter away from flammable and explosive substances;
- ✓ Avoid installing the inverter in locations that exceed the temperature limits specified in the inverter data sheet to limit undesirable power loss;
- ✓ Do not install the inverter near the electromagnetic source which can compromise the normal operation of electronic equipment;

3.2 Mechanical installation

(1) Dimensions

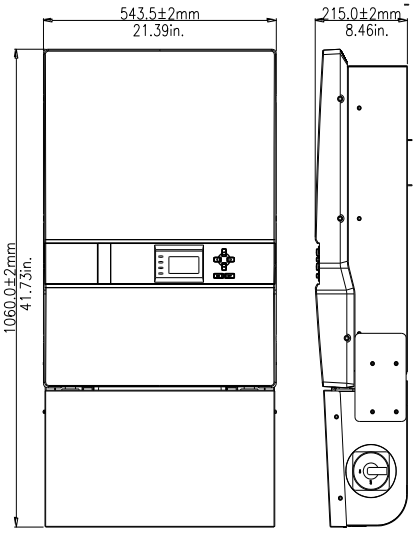


Figure 3-1 Dimensions of CPS SC20KTL-DO/US-480

(2) Installation method (see Figure 3-2):

Make sure that the mounting structure (wall, rack, etc) is suitable to support the inverter weight. Follow the mounting guidelines below:

(a) If the location permits, install the inverter vertically.

(b) If the inverter cannot be mounted vertically, it is allowed to be tilted backward by Max. 15°.

(c) Do NOT mount the inverter forwards.

(d) Do NOT mount the inverter in a horizontal position.

(e) Do NOT mount the inverter upside down.

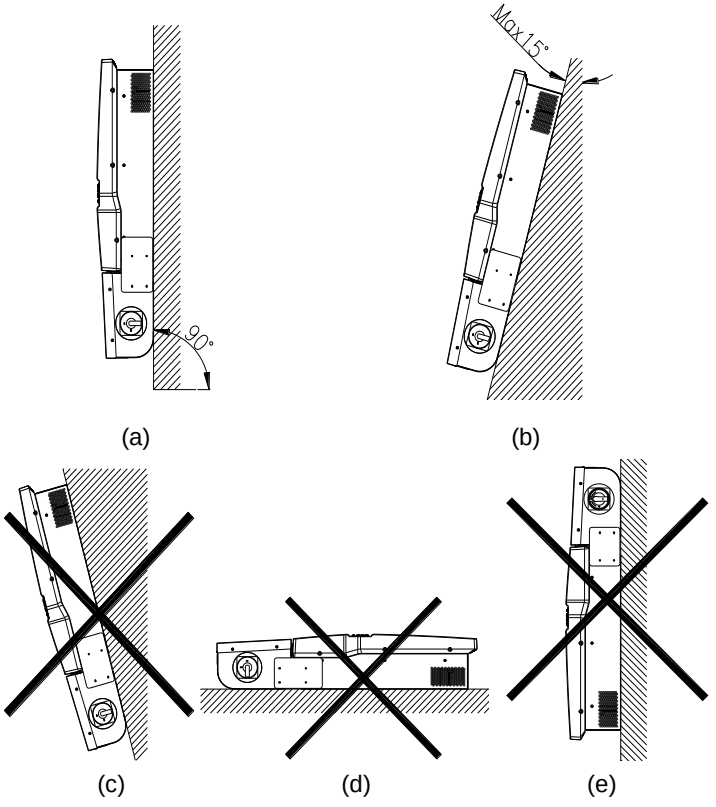


Figure 3-2 Mounting the inverter properly

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

The distances between the inverter and the surrounding objects should meet the following conditions: two sides from the walls ≥11.81 inches; top distance ≥11.81 inches; bottom distance ≥23.62 inches; the minimum spacing between two adjacently mounted inverters ≥23.62 inches.

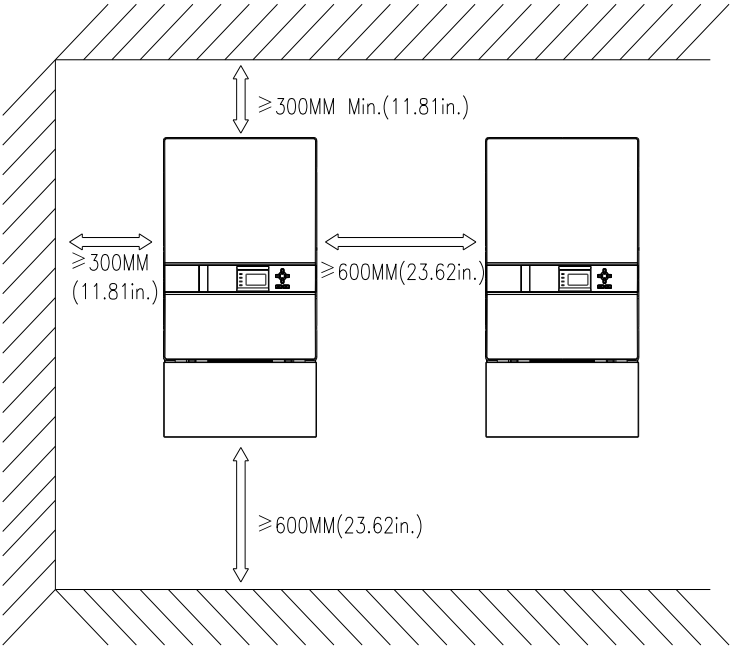


Figure 3-3 Inverter mounting dimensions

(3) Secure the bracket with bolts through the mounting holes and install the inverter:

(a) Mark the 6 bolt holes for mounting the bracket as shown in Figure 3-4;

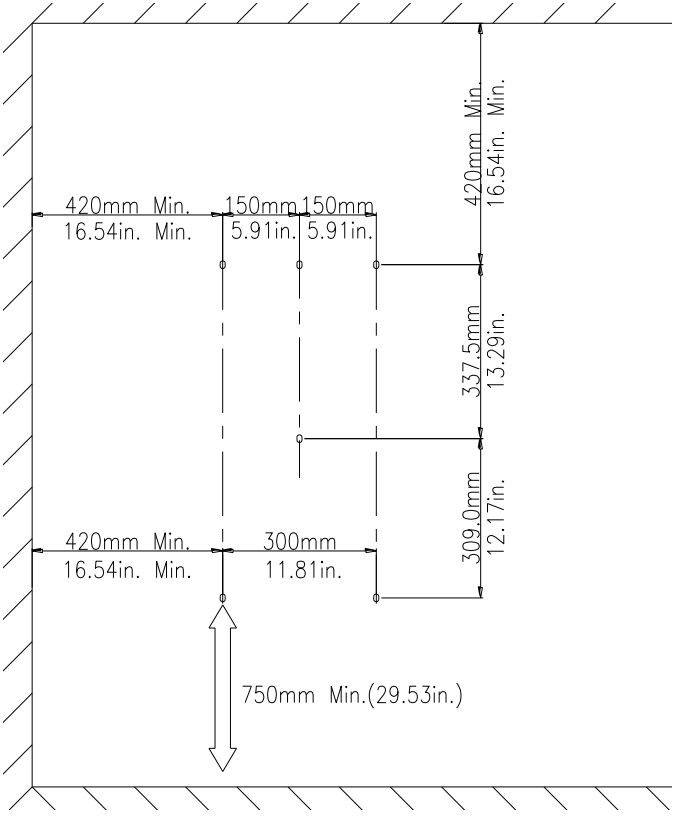


Figure 3-4 Bracket mounting dimensions

(b) Drill holes at the marked positions with a diameter of 0.4 inch drill and put the 6 M8*25 expansion bolts into the holes;

(c) Take the mounting bracket out of the package and secure the bracket on the wall with the 6 nuts in pair as shown in Figure 3-5;

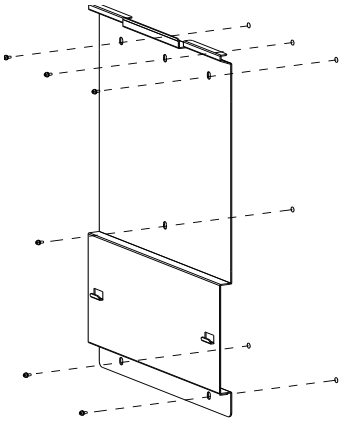


Figure 3-5 Positions of bolt holes on the bracket

(d) Screw off the bolts and remove the two panels on both sides of the inverter as shown in Figure 3-6;

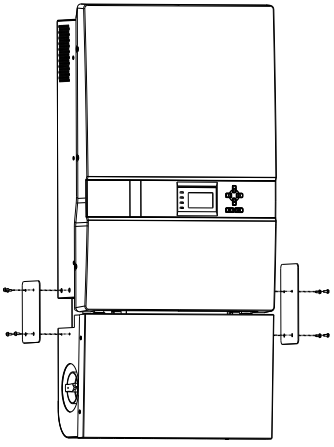


Figure 3-6 Removal of panels before mounting inverter

(e) Two people grab at the position on each side, lift up the inverter and then hang it on the bracket (Figure 3-7a~e). Make sure the inverter is securely mounted on the bracket;

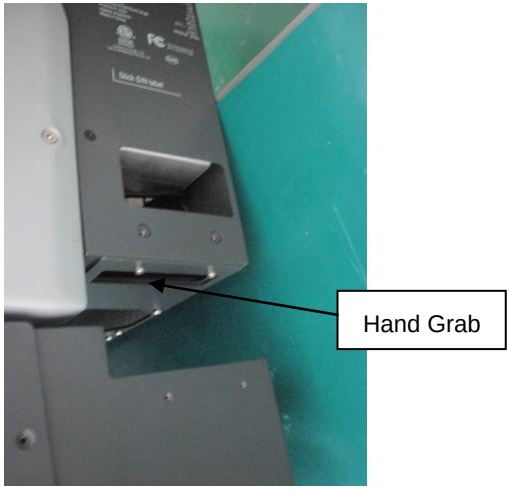


Figure 3-7a Mounting inverter on the bracket

Figure 3-7b Mounting inverter on the bracket

Figure 3-7c Mounting inverter on the bracket

Figure 3-7d Mounting inverter on the bracket

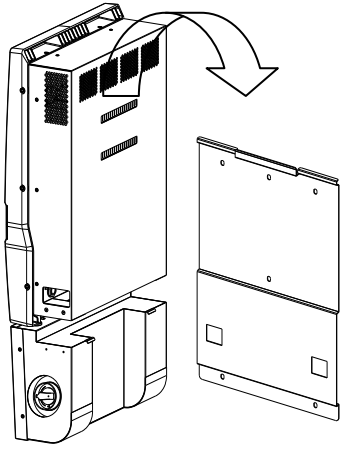


Figure 3-7e Mounting inverter on the bracket

(f) Put the two removed panels back and secure them with 4 M4*12 bolts on each side, as shown in Figure 3-8.

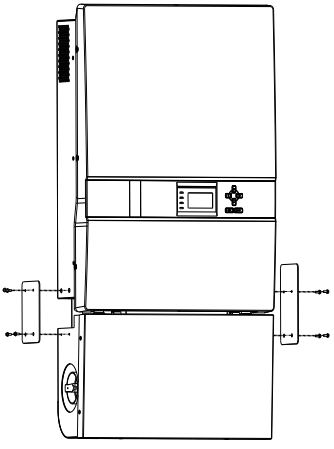


Figure 3-8 Securing panels on both sides

3.3 Electrical installation

INSTRUCTION:

Conduits shall be used as the cable protectors for cable connection.

The knockouts for cable entry of CPS SC20KTL-DO/US-480 are shown in Figure 3-9:

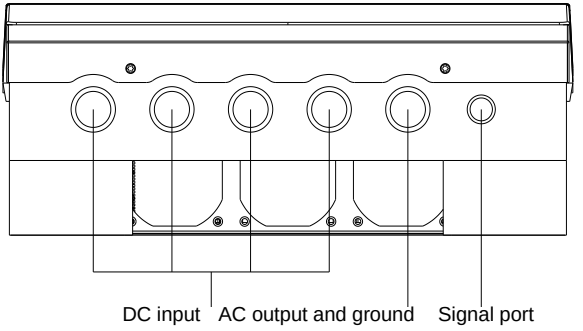


Figure 3-9 Knockouts for cable entry

The 5 ports on the left are for DC input, AC output and ground connections, matching the 1¼ & 1½ inch diagram of conduits; The last port on the right is for communication, matching the ½ & ¾ inch diagram of conduits.

3.3.1 DC connection

(1) To ensure the optimal performance of the inverter, please read the following guidelines before DC connection:

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

(b) The inverter has 2 MPPTs. Ensure that the Max. DC input current of each MPPT does NOT exceed 35A.

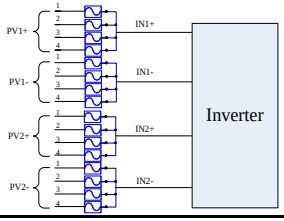
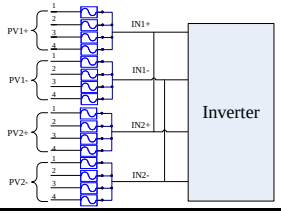
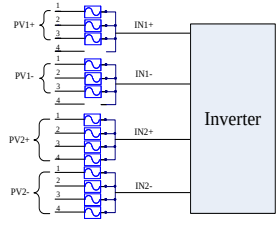
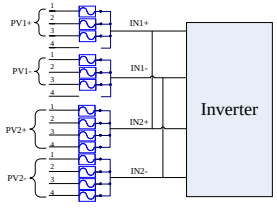
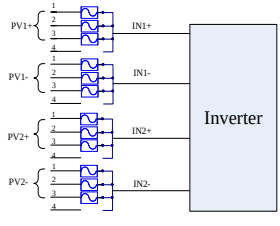
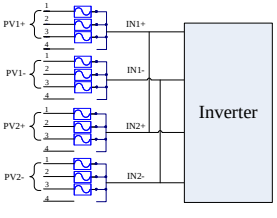
(c) Confirm that the PV modules for each MPPT of the inverter are of the same types and specifications before connection. The number,

orientation, and tilt of PV modules may differ for different application.

(2) Wire connection for DC input

(a) Wire connection between PV modules and inverter:

Table 3-3 Common configurations

DC input	2 MPPTs working independently	1 MPPT working alone
8 strings		
7 strings		
6 strings		

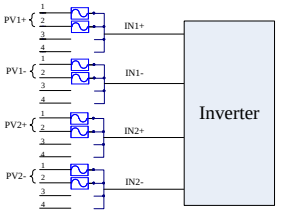
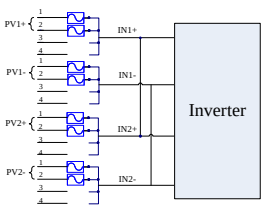
4 strings		

Table 3-4 Wiring requirement

	4 strings	6 strings	7 strings	8 strings
Positive	14~10AWG	16~10AWG	16~10AWG	18~10AWG
Negative	14~10AWG	16~10AWG	16~10AWG	18~10AWG
Bolts	M5			
Torque value	1.19N-M (10.5Lb-In.)			

- Note 1: The DC fuse protectors of different fusing capacity should be chosen according to the short circuit current of PV modules. The 600VDC Littelfuse KLKD fuse series are recommended. The detailed information is available for customers to find and download from http://www.littelfuse.com/.

The recommended fuse types are listed in the following table:

Table 3-5 Recommended fuse types

DC input	2 strings/MPPT	3 strings/MPPT	4 strings/MPPT
Fuse	KLKD 30	KLKD 15	KLKD 15

- Note 2: Concerning the current share of fuse for each DC input string, 1 or 2 DC input strings are NOT recommended. If it has to be, we suggest that the DC input wire be connected to the inverter without DC fuses as follows:

Table 3-6 Configurations for rare occasions

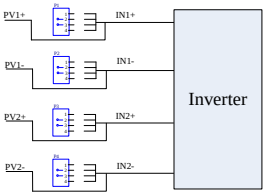
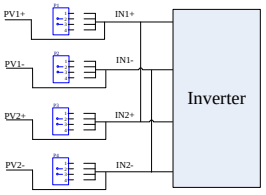
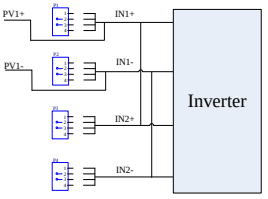
DC input	2 MPPTs working independently	1 MPPT working alone
2 strings		
1 string		

Table 3-7 Wiring requirement

	2 strings	1 string
Positive	8AWG	4AWG
Negative	8AWG	4AWG
Bolts	M5	
Torque value	1.19N-M (10.5Lb-In.)	

(b) Insert the cables through steel conduits and strip the skin 0.4 inch off the cables as shown in Figure 3-10:

Figure 3-10 Wire stripping of DC input

(c) Crimp the terminal as shown in Figure 3-11:

Figure 3-11 Terminal crimping of DC input

(d) The order of wire connection from left to right is PV1-, PV1+, PV2-, PV2+. Connect the PV1- and PV2- to the corresponding fuse socket of the negative pole and connect the PV1+ and PV2+ to the corresponding fuse socket of the positive pole with M5×12 bolts (4 PCS in total) as shown in Figure 3-12:

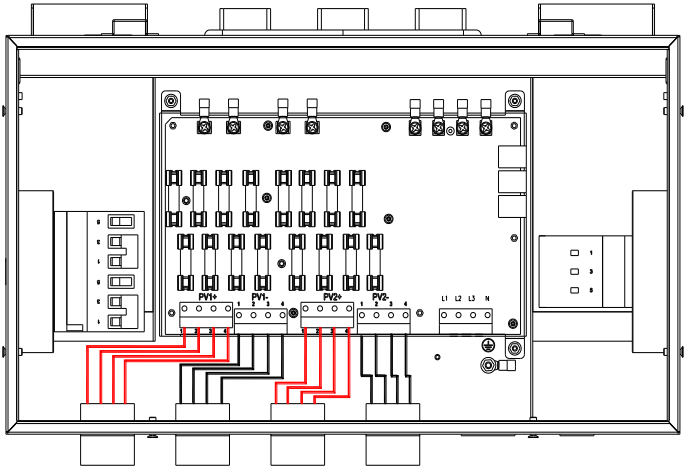


Figure 3-12 Wire connection of DC input

(e) For the inverter with 1 MPPT working alone, connect J1 (IN1+) with J3

(IN2+) wire socket (in the Wiring box) through the red wire in the accessory kit; Connect J2 (IN1-) with J4 (IN2-) wire socket through the black wire in the accessory kit, as shown in Figure 3-13:

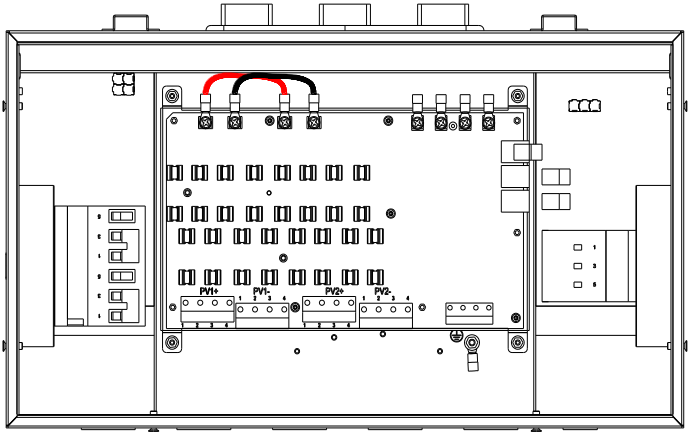


Figure 3-13 Wire connection in the Wiring box (1 MPPT working alone)

3.3.2 AC and ground connection

The following describes how to connect the AC output and grounding cables between the inverter and the public power grid:

(1) Use the recommended cables:

L1 (Line 1), L2 (Line 2), L3 (Line 3), Neutral and Gnd (Equipment grounding conductor): 8~10AWG copper cored soft cables

Table 3-8 Wiring requirement

	L1	L2	L3	Neutral	Gnd
Wire diameter	8~10AWG				
Bolts	M4 screw				M5 nut

Torque value	1.19N-M (10.5Lb-In.)

(2) Wire connection for AC output:

(a) Insert the cables through steel conduits and strip the skin 0.4 inch off the cables as shown in Figure 3-14:

Figure 3-14 Diagram for wire stripping of AC output

(c) Crimp the terminal as shown in Figure 3-15:

Figure 3-15 Diagram for terminal crimping of AC output

(d) Connect the L1, L2, L3 and Neutral (red, black, blue, grey) AC output wires to the corresponding terminals on the PCB board.

(3) Wire connection for grounding:

(a) The Gnd wire (Equipment grounding conductor) is recommended to be green or green with continuous yellow stripes, per National Electrical Code. Insert the cable through the steel conduit and strip the skin 0.4 inch off the cables as shown in Figure 3-16:

Figure 3-16 Diagram for wire stripping of grounding conductor

(b) Crimp the terminal with the ring terminal in the accessory kit as

shown in Figure 3-17:

Figure 3-17 Diagram for terminal crimping of grounding conductor

(c) Connect the Gnd wire with a M5 nut at the marked place on the lower right side of the Wiring box, as shown in Figure 3-18:

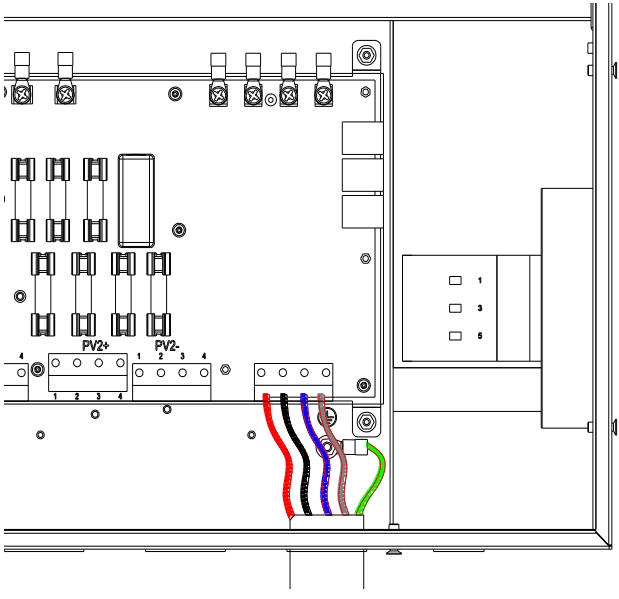


Figure 3-18 Diagram for wire connection of AC output and Grounding

3.3.3 Communication connection

There are two RS485 signal ports on the inverter. Shielded cables should be used for communication cables with the maximum length of 3280 feet.

(1) The communication of one single local inverter is to connect the RS485 communication bus cable through the RS485-1 or RS485-2 port of the inverter directly. Wiring requirement of RS485-1/2 is shown in Table 3-9:

Table 3-9 RS485-1/2 wiring requirement

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	COM
8	Brown	N.C.

(2) The wires are labeled 1~8 from left to right, as shown in Figure 3-19:

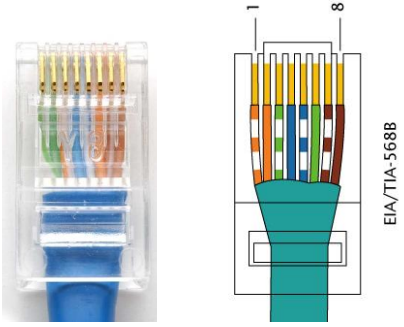


Figure 3-19 Diagram of RS485-1/2 wiring

(3) RS485 network connection:

When the inverters are monitored via the RS485 communication, the unique RS485 address for each inverter can be set through the LCD interface. Up to 31 inverters can be connected together in the RS485 communication network. The Daisy-chain topology is recommended for the RS485 network connection, as shown in Figure 3-20. Other communication topologies, such as the star networks, are not recommended.

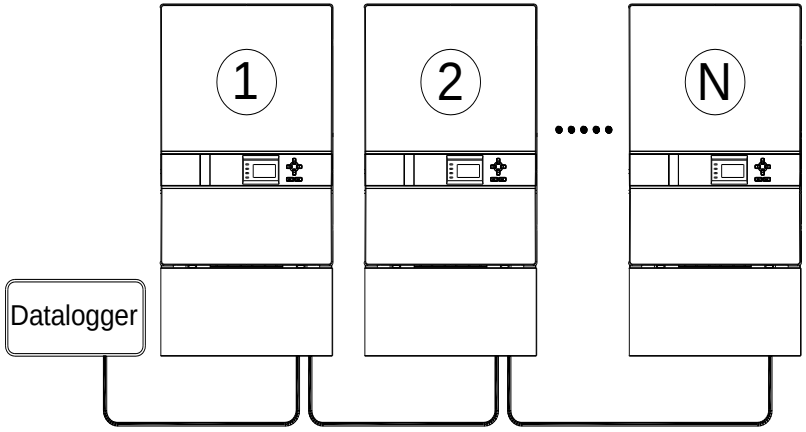


Figure 3-20 R485 network connection

(4) A terminal resistance of 120 ohms connected between Pin 1 and Pin 3 of RS485-1/2 of the first inverter in the multiple inverters string and data logger as shown in Figure 3-20 is recommended.

(5) The communication connection inside the Wiring box of the inverter is shown in Figure 3-21:

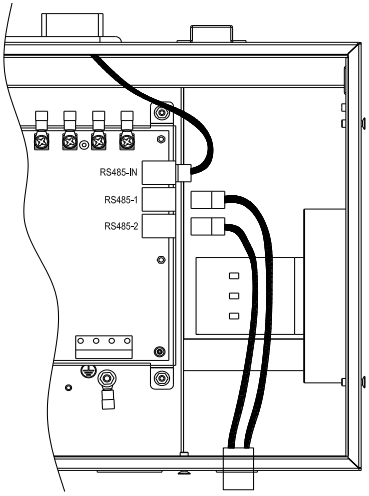


Figure 3-21 Diagram of communication wiring

Chapter 4 User Interface

4.1 Description of LCD panel

The CPS SC20KTL-DO/US-480 LCD panel mainly consists of LCD screen, LED indicator lights, buzzer and 6 keys, as shown in Figure 4-1.

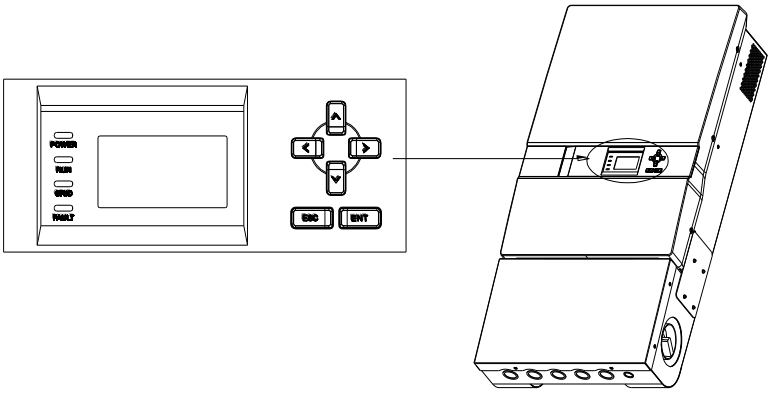


Figure 4-1 LCD panel

Interpretation for the indicator lights is shown in Table 4-1 and function of the keys is shown in Table 4-2.

Table 4-1 LED Indication

LED light	Name	Status	Indication
POWER	Working power light	Light on	Energized (control panel starts to work)
		Light off	Power supply not working
RUN	Grid-tied operation indication light	Light on	In grid-tied power generation state
		Flash	Derated running status (light up 0.5s, light off 1.6s)

		Light off	In other operation status or power supply not working
GRID	Grid status indication light	Light on	Grid is normal
		Flash	Grid fault (light up 0.5s, light off 1.6s)
		Light off	Power supply not working
FAULT	Fault status indication light	Light on	Indicates a Fault
		Slow flash	Indicates Alarm (light up 0.5s, light off 2s)
		Fast flash	Protective action (light up 0.5s, light off 0.5s)
		Light off	No fault or power supply not working

Table 4-2 Definitions of the keys

Key	Description	Definition of function
	Escape	Back/end/mute
	Enter	Confirm entering the menu/confirm set point
	Up	Page up in selection menu
	Down	Page down in selection menu
	Left	-1 when setting parameters

	Right	+1 when setting parameters

4.2 Operation state

Table 4-1 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 into the grid. "RUN" will blink if the grid is in derated running state during the period of feeding power into 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 out until the fault is eliminated. The light will blink slowly when an alarm occurs. "FAULT" keeps being lighted up when an internal fault occurs.

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

4.3 Interface and menu functions

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

4.3.1 Interface types

(1) The LCD interface starts with the company logo once the system is energized, as shown in Figure 4-2.

Figure 4-2 LOGO interface

(2) Indication of inverter operation mode:

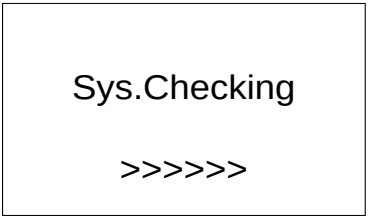


Figure 4-3 Inverter system check ongoing

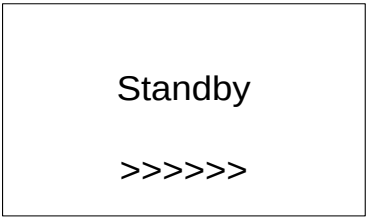
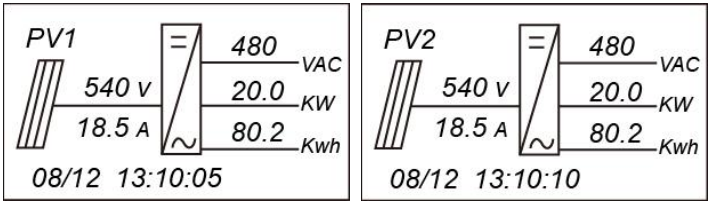


Figure 4-4 Inverter system in standby mode



(a) (b)

Figure 4-5 Default display interface for normal operation

Figure 4-6 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 4-3), stand-by mode (as shown in Figure 4-4), normal operation mode (as shown in Figure 4-5, the switching time between (a) and (b) is 5 seconds), and fault mode (as shown in Figure 4-6).

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

The fault information of the most recent / current fault will be indicated on the LCD screen when the inverter is in fault mode.

4.3.2 Menu functions

LCD screen displays “default indication interface” when the inverter is in operation mode. Press **ESC** in this interface to escape the default interface and enter the main operation interface. The main operation interface is shown in Figure 4-7.

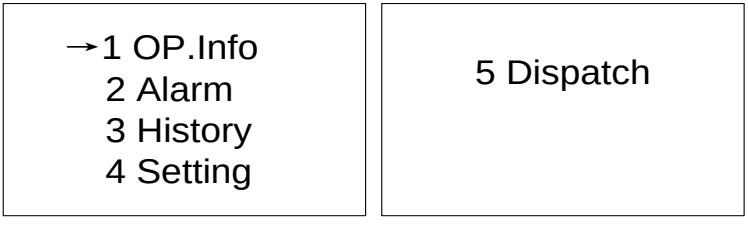


Figure 4-7 Main menus on the LCD screen

The main operation interface of LCD screen has 5 menus, i.e. “1 OP. Info”, “2 Alarm”, “3 History”, “4 Setting” and ”5 Dispatch”. The users may select options with **PAGEUP** and **PAGEDOWN**, and then press **ENT** to confirm selection. The users can return to the default indication interface by pressing **ESC**.

4.3.3 Operation information

When the cursor moves to “1 OP. Info” in the main interface, you should press **ENT** to select the operation information as shown in Figure 4-8. Check the information by pressing **PAGEUP** and **PAGEDOWN**. Return to the previous menu by pressing **ESC**.

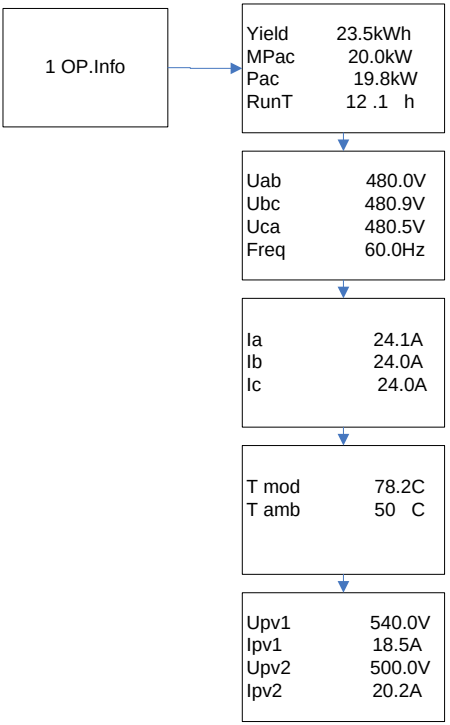


Figure 4-8 Operation information indication

4.3.4 Alarm

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 **ENT** to check out the specific fault information, as shown in Figure 4-9.

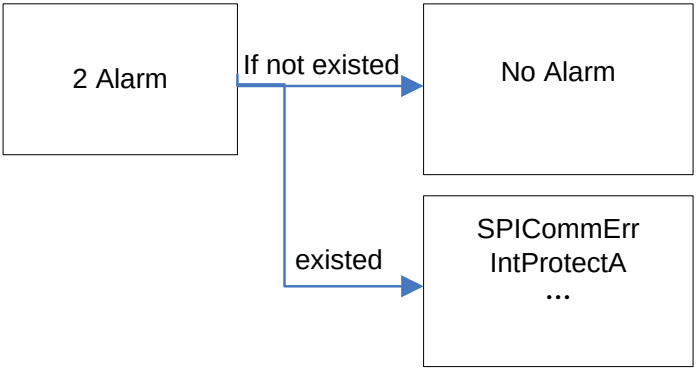


Figure 4-9 Alarm / failure information

4.3.5 History

Move the cursor to “3 History” in the main interface. Press **ENT** to check the history information, as shown in Figure 4-10. There are 4 submenus in “3 History” : “1 ErrRecd”, “2 OP. Recd”, “3 Version” and “4 TotalTag”.

(1) UP to 100 pieces of latest fault messages can be recorded and found in “1 ErrRecd” 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) Cumulative generated power since the first day the inverter began working is available to be found in “4 TotalTag” menu.

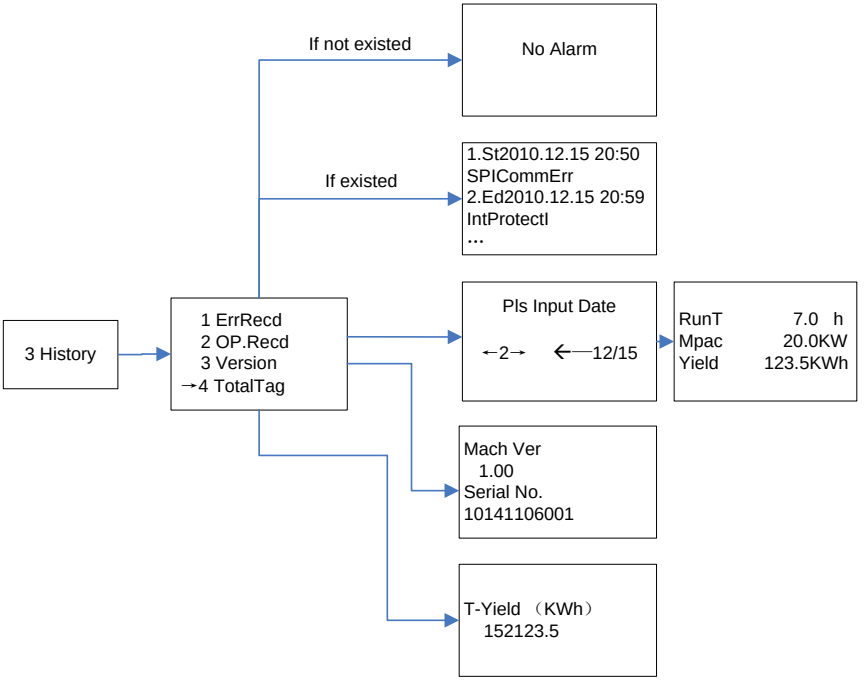


Figure 4-10 History menu and submenu

4.3.6 System setup

Move the cursor to “4 Setting” in the main interface. Press **ENT** to set the current system parameters, as shown in Figure 4-11. There are 5 submenus in “4 Setting” : “1 ON/OFF”, “2 Language”, “3 Buzzer”, “4 SysTime” and “5 Commun.”.

(1) The inverter can be started and shut down with “1 ON/OFF” menu. Move the cursor to “ON” and press **ENT**, “ON State” will then be indicated at

the bottom of LCD screen ; move the cursor to “OFF” and press **ENT**, 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 Alarm beep can be set mute/unmute in “3 Buzzer” menu. “Key beep” and “Alarm beep” can be chosen by pressing **PAGEUP** and **PAGEDOWN**. Shift between “Enable” and “Disable” by pressing **PAGEUP** and **PAGEDOWN** if the cursor is on the “Key beep”. Complete the setup by pressing **ENT**. Similarly, the Alarm beep can be set up in the same way.

(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 with “5 Commun” menu.

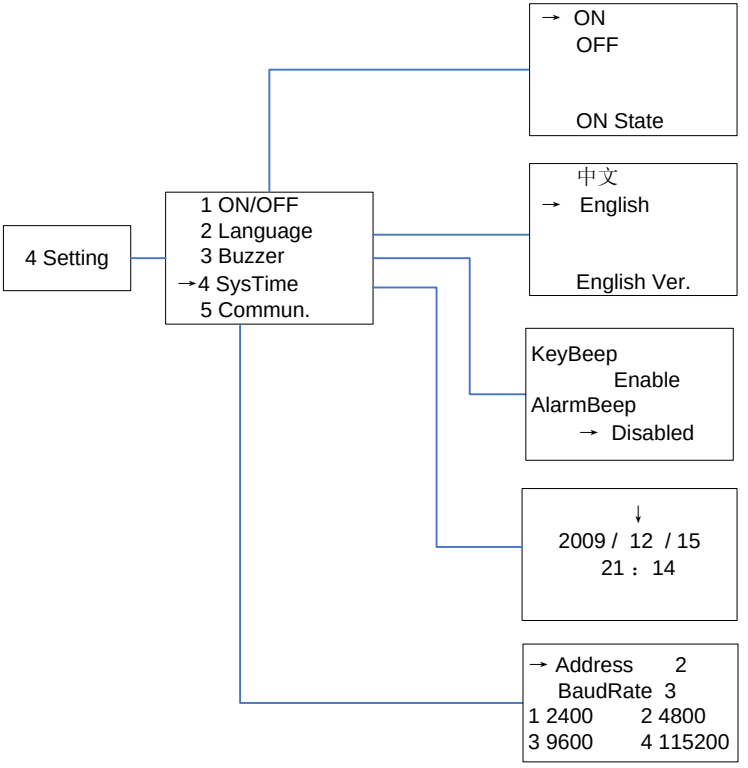


Figure 4-11 System setup menu and submenu

4.3.7 Power Dispatch

"ActivePower" and "PowerFactor" parameters can be set up through LCD operations as well as remote control by software.

Local dispatch order: Service personnel can adjust the "ActivePower" and "PowerFactor" parameters through LCD operations. For detailed setup steps, please refer to "4.3.8 System protection parameters setup".

The current parameters of "ActivePower" and "PowerFactor" can be checked by the following steps.

Move the cursor to "5 Dispatch" in the main interface, as shown in Figure

4-12:

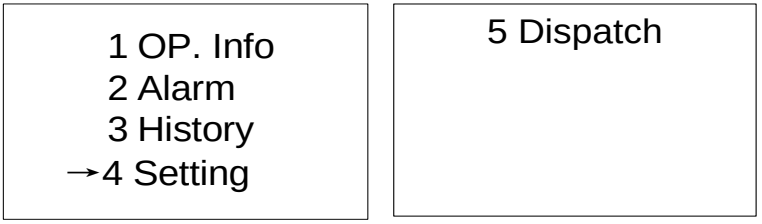


Figure 4-12 Contents indicated on the main operation interface

Press **ENT** to the interface shown in Figure 4-13.

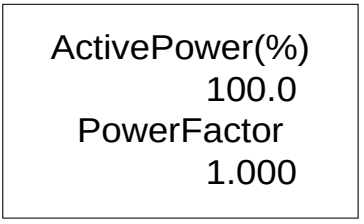


Figure 4-13 Parameters of power dispatch

Remote dispatch method: The “ActivePower” and “PowerFactor” parameters can be adjusted through remote monitoring software. For detailed information, please refer to the manual of our monitoring system products.

4.3.8 System protection parameters setup

In Standby mode, press **PAGEDOWN** and **ENT** at the same time in the main interface and enter the password (**PAGEUP** -> **PAGEDOWN** -> **RIGHT** -> **LEFT**), the system parameter setup menu is accessed. This menu includes 4 submenus: “1 SysPara”, “2 Restart”, “3 Recover” and “4 ClrErrRecd”, as shown in Figure 4-14.

(1) Set up the system protection parameters in “1 SysPara” menu. The specification of protection parameters is shown in Table 4-3.

Table 4-3 Protection Parameters Table

No.	LCD indication	Description	Setup range (lower limit, default & upper limit)
1.	GridV.Max(V)	Grid voltage upper limit	（200, 528, 533V）
2.	GridVmaxTripT(S)	Trip time under Max. Grid V.	(0.05, 1.80, 2.00S)
3.	GridV.Min(V)	Grid voltage lower limit	（0, 422, 480V）
4.	GridVminTripT(S)	Trip time under Min. Grid V.	（0.05，1.80，2.00S）
5.	GridF.Max(Hz)	Grid frequency upper limit	(50.00，60.50，65.00Hz)
6.	GridF.Min(Hz)	Grid frequency lower limit	(45.00，59.30，60.00Hz)
7.	GridFTripT(S)	Trip time under Min. Grid F.	（0.05，0.08，300.00S）
8.	IsoResis(KOhm)	Insulation impedance lower limit	(200，600，1200KΩ)
9.	ActivePower(%)	Active power derating	（80.0%，100.0%，100.0%）
10.	PowerFactor	Reactive power compensation	（-0.900，1.000，0.900）

INSTRUCTION:

The function of **active power derating** and **reactive power compensation** is optional. For detailed information, you may call our after-sales service center.

(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.

INSTRUCTION:

The “Restart” function is effective only when the fault “IntFaultA~O” in the troubleshooting table 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 be indicated.

(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.

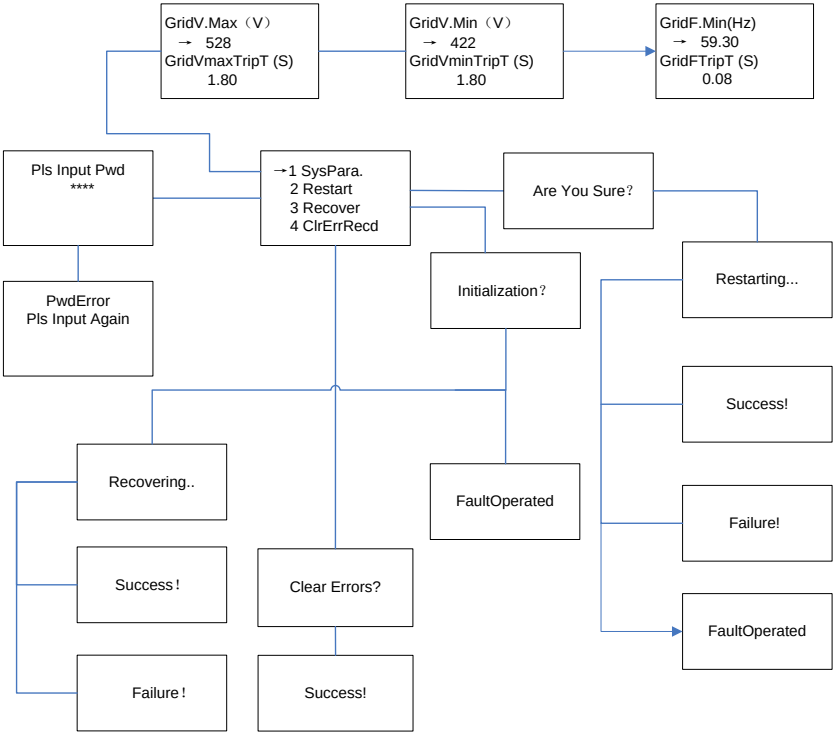


Figure 4-14 System parameter setup

Chapter 5 Operation

5.1 Start-up

Manual start-up: Manual start-up is required after regulation setting or manual (fault) shut-down. Move the cursor from the main operation interface to “4 Setting”. Press **ENT** and go to submenu “1 ON/OFF”. Then move the cursor to “ON” and press **ENT** to start the inverter. Then the inverter will start up and operate normally if the start-up condition is met. Otherwise, the inverter will go to stand-by mode.

Automatic start-up: The inverter will start up automatically when the output voltage and power of PV arrays meet the set value, AC power grid is normal, and the ambient temperature is within allowable operating range.

5.2 Shut-down

Manual shutdown : Normally, manual shutdown is not required. It can be shut down manually if repair or maintenance is required. Move the cursor from the main operation interface to “4 Setting”. Press **ENT** and go to submenu “1 ON/OFF”. Move the cursor to “OFF” and press **ENT**, and then the inverter will be shut down.

Automatic shutdown: The inverter will shut down automatically when the output voltage and power of PV modules are lower than the set point, or AC power grid fails; or the ambient temperature exceeds the normal range.

5.3 Operation mode

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

(1) System check mode for start up, as shown in Figure 5-1:

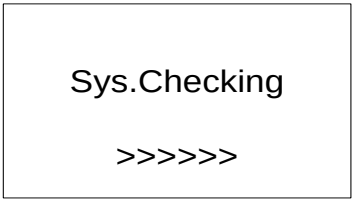
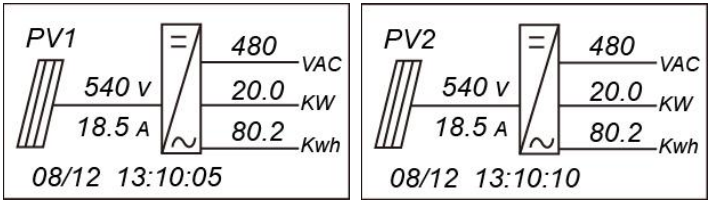


Figure 5-1 System self check ongoing

This mode indicates that the inverter is checking whether it is ready for normal operation after the manual start-up of the inverter.

(2) Normal operation mode: Default indication interface for normal operation of CPS SC20KTL-DO/US-480 is shown in Figure 5-2 (a) and 5-2 (b). The switching time between (a) and (b) is 5 seconds.



(a) (b)

Figure 5-2 Default indication interface for normal operation

In this mode, the inverter converts the power generated by PV modules to AC continuously and feeds into the power grid.

(3) Standby mode, as shown in Figure 5-3:

The inverter will turn into standby mode when the output voltage and power of PV modules do not meet the startup conditions or PV voltage and input power are lower than the set point. The inverter will check automatically whether it meets the startup conditions in this mode until it turns back to normal mode. The inverter will switch from standby mode to fault mode if malfunction occurs.

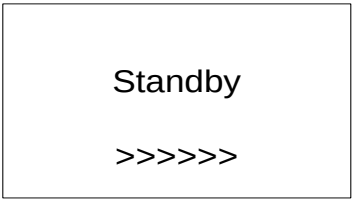


Figure 5-3 Inverter system in standby mode

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

The inverter will disconnect from the power grid and turn into fault mode when the inverter or power grid fails. Check the specific cause through “Troubleshooting table” (Table 5-1) in terms of the fault message displayed on the LCD and eliminate the fault according to the instructions.

Figure 5-4 Fault indication interface

WARNING:

All the installation and wiring connections should be performed only by qualified technical personnel. Disconnect the inverter from PV modules and the Power Grid before maintaining and operating the equipment.

5.4 Grid connection and power generation

CPS SC20KTL-DO/US-480 inverter has an automatic grid-tied power generation process. It will check constantly whether AC power grid meets the conditions for grid-tied power generation, and also test whether the PV array

has adequate energy. After all conditions are met, the inverter will enter grid-tied power generation mode. While in grid-tied power generation, the inverter can detect the power grid at all times, and also keep the photovoltaic array output in maximum power point tracking (MPPT) mode. In case of any abnormity, the inverter will enter the protection program immediately. In low light conditions when power generation is not enough to keep the inverter in operation, the inverter will enter standby mode. When the voltage of PV array changes and becomes stable and higher than the required set value, the inverter will attempt to start grid-tied power generation again.

5.5 Fault shutdown

The inverter will be shut down automatically when the PV power generation system fails, such as output short circuit, grid overvoltage / undervoltage, grid overfrequency / underfrequency, high ambient temperature or internal malfunction of the machine.

The causes of fault can be identified based on the faults listed in Table 5-1. Proper treatment is recommended before contacting after-sales service. There are mainly 3 types of faults: alarm, protection and hardware fault.

Table 5-1 Troubleshooting Table

Alarm	1. TempSensorErr	Definition: Prompt detection of abnormal temperature
		Possible causes: 1. Temperature Sensor socket connecter has poor contact; 2. Temperature Sensor is damaged;
		Recommended solutions: 1. Observe temperature display; 2. Switch off 3-phase working power supply and then reboot the system; 3. Contact after-sales service personnel
	2. SPICommErr	Definition: Communication inside inverter fails
		Possible causes: 1. Communication circuits inside inverter are loose; 2. LCD software problem; 3. Inverter software problem;
		Recommended solutions: 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 our after-sales service center.

	3. IntFanErr	Definition: Fan (invisible from outside) inside inverter is working abnormally
		Possible causes: 1. Fan service life has expired; 2. Fan socket connecter has poor contact.
		Recommended solutions: 1. Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2. Switch off 3-phase work power supply and then reboot the system; 3. Contact after-sales service personnel
	4. ExtFanErr	Definition: The visible fan from outside view is working abnormally
		Possible causes: 1. Fan is blocked; 2. Fan service life has expired; 3. Fan socket connecter has poor contact.
		Recommended solutions: 1. Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2. Check for foreign matters on fan blades; 3. Switch off 3-phase work power supply and then reboot the system; 4. Contact after-sales service personnel
	5. EepromErr	Definition: Internal alarm

		Possible causes: Internal memory has a certain problem
		Recommended solutions: 1. Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2. Contact after-sales service personnel
Protect	1. TempOver	Definition: Ambient temperature or temperature inside inverter is too high
		Possible causes: 1. Ambient temperature outside the inverter is too high; 2. Fan is blocked; 3. Cooling is affected because of incorrect installation.
		Recommended solutions: 1. Confirm that external ambient temperature is within the specified range of operating temperature; 2. Check whether radiation air inlet is blocked; 3. Whether radiation fan is blocked; 4. Check whether the location of installation is appropriate or not; 5. Observe for 30 minutes and see whether the alarm will be eliminated automatically; 6. Contact after-sales service personnel
	2. GridV.OutLim	Definition: Grid voltage exceeds the specified range,

		Possible causes: 1. Grid voltage is abnormal; Power grid breaks down 2. Cable connection between the inverter and the grid is poor;
		Recommended solutions: 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 between the inverter and power grid is disconnected or has abnormalities; 4. Contact after-sales service personnel
	3. GridF.OutLim	Definition: Grid voltage frequency is abnormal, or power grid is not detected
		Possible causes: 1. Grid frequency has abnormalities; 2. Cable connection between the inverter and the grid is poor;
		Recommended solutions: 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 between the inverter and power grid is disconnected or has

		abnormalities; 4. Contact after-sales service personnel
	4. PV1(2) VoltOver*	Definition: PV voltage exceeds the specified value
		Possible causes: PV over-voltage
		Recommended solutions: 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, and then turn on the switch again; 4. Contact after-sales service personnel
	5. PV1(2) Reverse*	Definition: PV module is connected inversely
		Possible causes: PV positive pole and negative pole are connected inversely;
		Recommended solutions: 1. Check whether positive pole and negative pole are connected inversely; 2. Contact after-sales service personnel
	6. GFCI.Err	Definition: System leakage current is too high
		Possible causes: 1. Excessive parasitic capacitance on PV module due to environmental factor;

		2. Grounding is abnormal; 3. Fault inside the inverter
		Recommended solutions: 1. Observe for 10 minutes and see whether the alarm will be eliminated automatically; 2.. Detect whether the electrical connection is abnormal 3. Contact after-sales service personnel
	7. IsolationErr	Definition: Insulation impedance of PV positive to ground or PV negative to ground exceeds the specified range
		Possible causes: Air humidity is high
		Recommended solutions: 1. Observe for 10 minutes and see whether the alarm will be eliminated automatically; 2. Check insulation of PV system; 3. Contact after-sales service personnel
	8. IntProtectA~Z	Definition: Internal protection of the inverter
		Possible causes: Protection procedure occurs inside the inverter
		Recommended solutions: 1. Observe for 10 minutes and see whether the alarm will be eliminated automatically; 2. Contact after-sales service personnel
Fault	IntFaultA~O	Definition:

		Internal fault of the inverter
		Possible causes: Fault occurs inside the inverter
		Recommended solutions: 1. The inverter can be forced to restart once if it is required by operation and if it is confirmed that there is no other problem; 2. Contact after-sales service personnel

Chapter 6 Service and Maintenance

The CPS SC20KTL-DO/US-480 inverter is usually maintenance-free.

CAUTION:

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

The following regular maintenance steps must nevertheless be carried out at regular intervals to ensure the inverter's operation with optimal performance.

6.1 Disassembling of fan tray assembly

(1) Screw off the bolts and remove the two panels on both sides of the inverter as shown in Figure 6-1; (Tool: PH2 cross screwdriver)

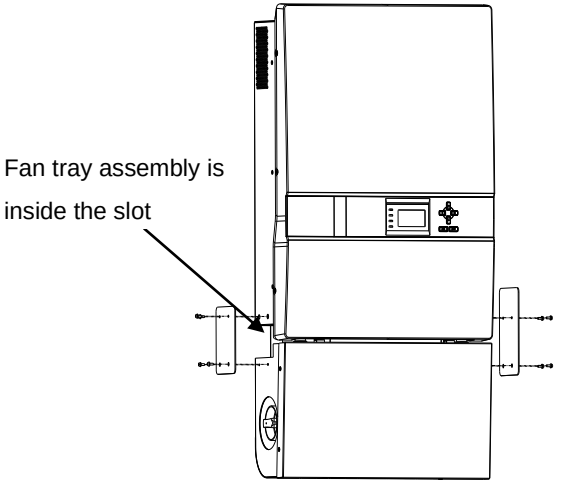


Figure 6-1 Removal of panels on both sides

(2) Disconnect the fan tray assembly from the inverter by unplugging the

wire connectors as shown in Figure 6-2;

Figure 6-2 Unplugging the wire connectors

(3) Remove the 4PCS screws off the fan bracket as shown in Figure 6-3 and 6-4; (Tool: 0.12 inch Hexagon socket screw key)

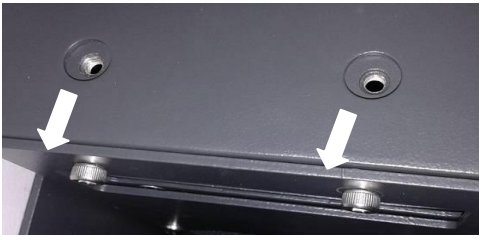


Figure 6-3 Unscrew the fan bracket on the left side

Figure 6-4 Unscrew the fan bracket on the right side

(4) Pull out the fan tray assembly from the left side of inverter as shown in Figure 6-5;

Figure 6-5 Pulling out the fan tray assembly

(5) Use a dry cloth to clean the fan tray assembly to prevent dirt accumulating on it. Do not use abrasive cleaning agents to avoid the damage of fans.

6.2 Restoring of fan tray assembly

(1) Insert the fan tray assembly from the left side of the inverter as shown in Figure 6-6;

Figure 6-6 Inserting the fan tray assembly

(2) Hook the fan tray assembly inside the Main housing at the right end as shown in Figure 6-7;

Figure 6-7 Hooking the fan tray assembly

(3) Make sure the wire connectors reveal from the right hole and the

bracket is well connected, as shown in Figure 6-8 and 6-9;

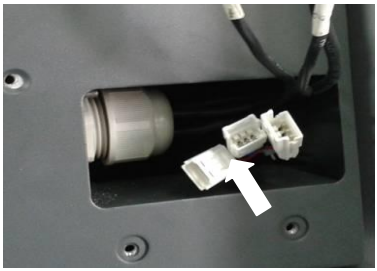


Figure 6-8 Revealing the wire connectors

Figure 6-9 Fan tray assembly well connected

(4) Connect the fan tray assembly with the inverter by plugging the wire connectors as shown in Figure 6-10;

Figure 6-10 Plugging the wire connectors

(5) Fix the left side of fan bracket on the Main housing with 2PCS screws

as shown in Figure 6-11; (Tool: 0.12 inch Hexagon socket screw key)

Figure 6-11 Fixing the fan bracket on the left side

(6) Fix the right side of fan bracket on the Main housing with 2PCS screws as shown in Figure 6-12; (Tool: 0.12 inch Hexagon socket screw key)

Figure 6-12 Fixing the fan bracket on the right side

(7) Put the two removed panels back and secure the M4 screws on both sides with a torque value of 1.76N-M (15.6Lb-In.), as shown in Figure 6-13. (Tool: PH2 cross screwdriver)

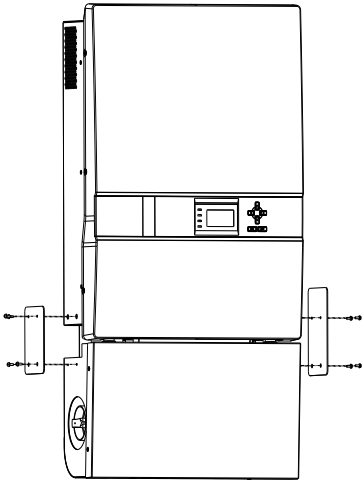


Figure 6-13 Securing panels on both sides

Chapter 7 Technical Data

Model Name	CPS SC20KTL-O/US-480
DC Input	
Max. PV Power	27kW
Nominal DC Input Power	21kW
Max. DC Input Voltage[1]	600Vdc
Operating DC Input Voltage Range	260-580Vdc
Start-up DC Input Voltage / Power	300V / 200W
Nominal DC Input Voltage	500Vdc
Number of MPP Trackers	2
MPPT Voltage Range	300-550Vdc
Max. Input Current	35Ax2
Number of DC Inputs and Fuses	4 conductors with fuses per each of two MPPT inputs
DC Disconnection Type	Switch
AC Output	
Rated AC Output Power	20kW
Max. AC Output Power	20kW
Rated Output Voltage	480Vac
Output Voltage Range	422-528Vac
Grid Connection Type	3ϕ / N / PE
Max AC Output Current	27.3A
Rated Output Frequency	60Hz

[1] Exceeding the rated voltage shown in “Max. DC Input Voltage” may cause permanent damage to the equipment.

Output Frequency Range	59.3-60.5Hz
Power Factor	>0.99
Current THD	<3%
AC Disconnection Type	Switch
System	
Topology	Transformerless
Max. Efficiency	97.3%
CEC Efficiency	96.5%
Stand-by / Night Consumption	<20W / <2W
Environment	
Protection Degree	NEMA 3R
Cooling	Variable speed cooling fans
Operating Temperature Range	-13°F to +140°F / - 25°C to +60°C (derating from +50°C / +122°F)
Operating Humidity	0-95%, non-condensing
Operating Altitude	6562ft / 2000m (derating from 4921ft / 1500m)
Display and Communication	
Display	LCD + LED
Communication	RS485
Mechanical	
Dimensions (WxHxD)	21.4x41.7x8.5in / 544x1060x215mm
Weight	132lbs / 63kg
Safety	
Safety and EMC Standard	UL1741:2010, CSA-C22.2 NO.107.1-01, FCC PART15
Grid Standard	IEEE1547: 2003, IEEE1547.1: 2005

Chapter 8 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.

CHINT POWER SYSTEMS AMERICA CO., LTD.

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