CHNT POWER

CPS SCE Series Grid-tied PV Inverter

CPS SCE4/5/6/7KTL-O/US

Installation and Operation Manual

Version: 1.1

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Before You Start…

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

Thanks for choosing CPS Grid-tied PV Inverter (referred to in this manual as “PV Inverter”, or simply “Inverter”). This PV Inverter is a highly reliable product due to its innovative design and perfect quality control. Such an Inverter is used in high demand, grid-tied PV systems.

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

Please keep this manual on hand for quick reference.

Important Safety Notification

General

This user manual contains important instructions and notifications that must be followed during installation and maintenance of the CPS grid-tied PV Inverter.

The CPS grid-tied PV Inverter is a well-designed product through strict tests to meet international safety requirements, but as an electrical and electronic equipment, certain precautions must be observed during the installation and operation of the PV Inverter.

In order to avoid personal injury during installation and daily operation of the Inverter, users must read and follow all instructions, cautions and warnings that are described in this manual.

Electrical Code

CPS grid-tied PV Inverters follow the National Electrical Code and other local regulations to meet the requirements of electrical installation in the United States. For the electrical installation in Canada, inverter installation must be completed in accordance with applicable Canadian standards.

Safety Instructions

This manual contains important safety instructions to minimize the hazards to people and equipment. Not following the procedures and practices correctly could result in damage to or destruction of part or all of the CPS grid-tied PV Inverter and/or other equipment connected to the Inverter or personal injury.

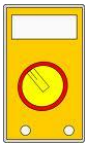
Preventive Regulation of Product

The Inverter should be installed, operated and maintained by qualified personnel who have read and understood the operation instructions. The qualification of the personnel is defined in the National Electrical Code. Moreover, CPS grid-tied PV Inverters are provided with fixed trip limits and shall not be aggregated above 30kW on a single point of common connections.

Safety Symbols

	ELECTRIC SHOCK Electric shock indicates a potential risk of electric shock if not avoided.
	WARNING Warning indicates a potentially hazardous situation that could result in death or serious injury if not avoided.
	CAUTION Caution indicates a hazardous situation that could result in minor injury if not avoided.
	HOT SURFACE Hot surface indicates a hot surface during operation that could result in a burn injury if not avoided.
	IMPORTANT Important indicates important and useful information that the user should know about the system.
	ESD Protection Risk of electric shock can occur when qualified service personnel are dealing with the electrical components within the PV Inverter, such as wiring box. An ESD glove should be worn during the wiring operation, fuse replacement and component installation.

Tool Equipment Symbols

	Multi-Meter Multi-meter symbol indicates that a multi-meter is needed for measuring to ensure the proper operational functionality of components.
	Tools Tools symbol indicates that specific tools are required during installation procedures.

1. Introduction

This manual describes all the information needed to install and operate the following PV Inverter Models:
CPS SCE4KTL-O/US, CPS SCE5KTL-O/US, CPS SCE6KTL-O/US, and CPS SCE7KTL-O/US

	IMPORTANT In order to avoid problems during the installation, it is recommended to read the entire user manual before any installation procedures.

Any improper usage may result in damage to the unit. Therefore, it is important that all installation procedures shall be completed by qualified personnel that have been trained to install and operate PV Inverters. Moreover, this user manual only describes the information that is needed for the CPS grid-tied PV Inverter and does not cover any installation information relating to other equipment installed in the PV system. The following safety instruction should be followed:

	WARNING It is necessary that only qualified personnel conduct the installation and operation of the PV Inverter. Otherwise, risk of damage to or destruction of part or all of the Inverter and/or other equipment connected to the Inverter or personal injury due to improper installation procedures or practices.
	ELECTRIC SHOCK Alternating Current (AC) and Direct Current (DC) sources are directly connected to the terminals in the PV Inverter. In order to prevent risk of electric shock before maintenance or installation, it is necessary to ensure that all AC and DC terminals are disconnected.
	HOT SURFACE Although the inverter is designed to meet international safety standards, the surface of the inverter can become hot during operation. Therefore, do not touch the heat sink or peripheral surfaces during or shortly after operation.

	ELECTRIC SHOCK Risk of electric shock from energy stored in capacitors. Do not remove the cover until three minutes after disconnecting all sources of power supply and the service should be done by qualified personnel.

2. Limited Warranty

The warranty policy of this product is specified in the contract; otherwise, the warranty period is 10 years.

This warranty covers all defects due to design, components and manufacturing. However, the warranty does not cover damages resulting from the following circumstances:

- Seal on the product is broken
- Improper transportation and delivery
- Improper installation and operation
- Insufficient ventilation for the inverter
- The Inverter has been misused, neglected, or abused
- The Inverter has been used or stored in conditions beyond its electrical or environmental specifications
- The Inverter has been used for purposes other than for which it was designed
- The Inverter has been used beyond its stated specifications, operating parameters and application
- Acts of third parties, atmospheric discharges, excess voltage, chemical influences, natural wear and tear and for loss and damage in transit
- Improper testing, operation, maintenance, adjustment, repair, or any modification of any kind not authorized in writing by the inverter supplier
- The Inverter has been connected to other equipment with which it is not compatible
- Application beyond the scope of applicable safety standards or grid codes (VDE, UL, etc.)
- Acts of nature such as lightning, fire, storm, flood and vandalism, etc.

Repairs and/or replacement of parts or the device are made at the manufacturer's discretion. Defective parts or malfunction discovered during installation should be presented in a written report for confirmation before applying for replacement or repair. The damage report must be issued within seven working days after receiving the PV Inverter. Manufacturer is not responsible for damages beyond the scope of this warranty.

3. Features Overview

- Max. energy yield CEC efficiency of 97%
- Transformer-less Design
- Field selectable voltage out: 208/240/277 Vac
- Wide MPPT voltage operating range: 105-500V
- Integrated NEC compliant wire raceway
- Integrated PV system AC / DC disconnect switch
- (4) branch circuit-rated Negative and Positive fused inputs
- Performance Monitoring Package
- LCD display with side pushbutton for nighttime monitoring
- NEMA 3R enclosure
- Meets UL1741 standard

4. Product Overview

4.1 Introduction of Grid-tied PV system

The grid-tied PV system is mainly composed of four parts: PV modules, DC distribution unit, grid-tied PV inverter and AC distribution unit. When the PV modules are exposed to sufficient irradiation, they will generate DC power. First, the DC will be fed to the PV Inverter (via DC distribution unit). Then the Inverter converts the DC to AC and feeds AC to the Public Grid via the AC distribution unit. The AC power can be used directly by the local load, or it can be sold to your energy supplier.

The following figure shows the general picture of a grid-tied PV System:

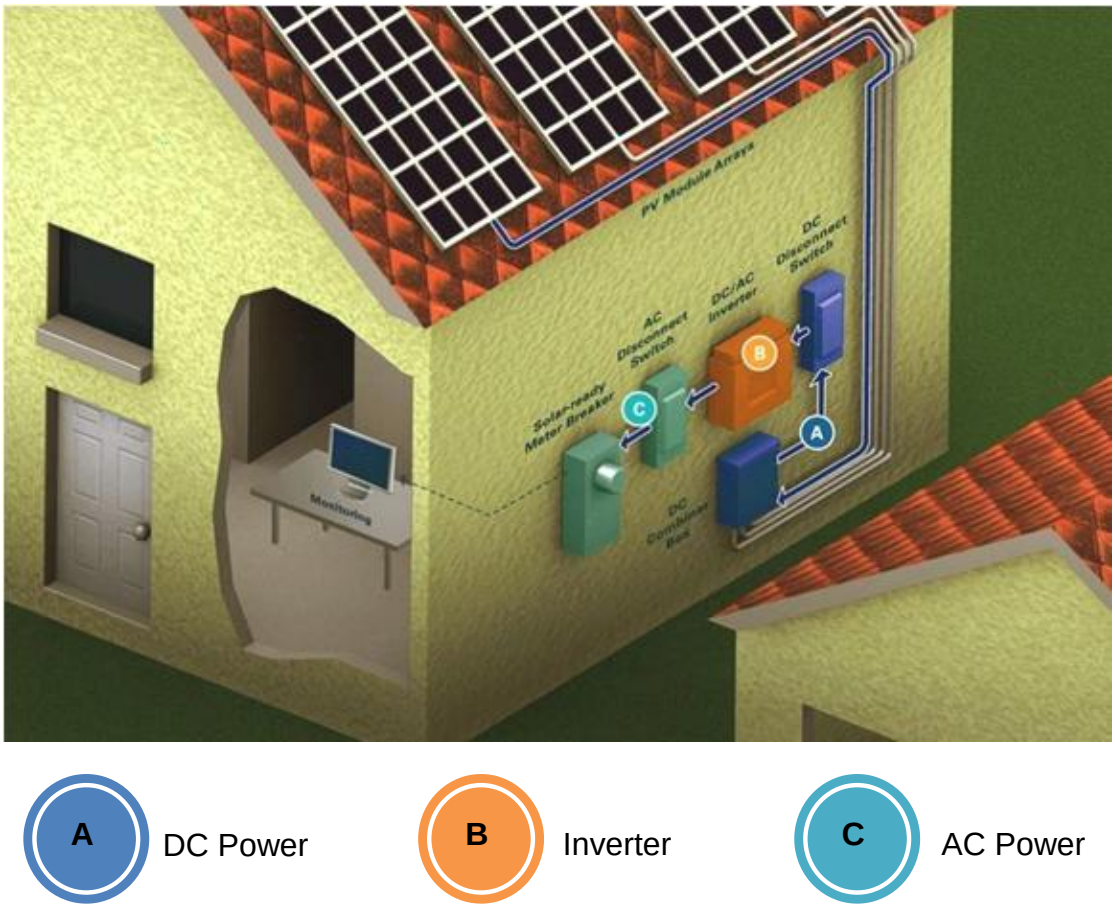


Figure 4.1.1: General picture of grid-tied PV System

4.2 Introduction of CPS Grid-tied PV Inverter

CPS grid-tied PV Inverter converts direct current (DC) power generated by a PV panel into alternating current (AC), which is compatible with the local electric distribution network, also called the public grid.

The CPS grid-tied PV Inverter is designed with a transformer-less topology. Therefore, CPS grid-tied PV Inverters will not be suitable with PV modules that are required to have the negative (–) or positive (+) polarity of PV modules connected to the ground. For such application, please contact the supplier before proceeding.

4.3 Dimensions and Weight

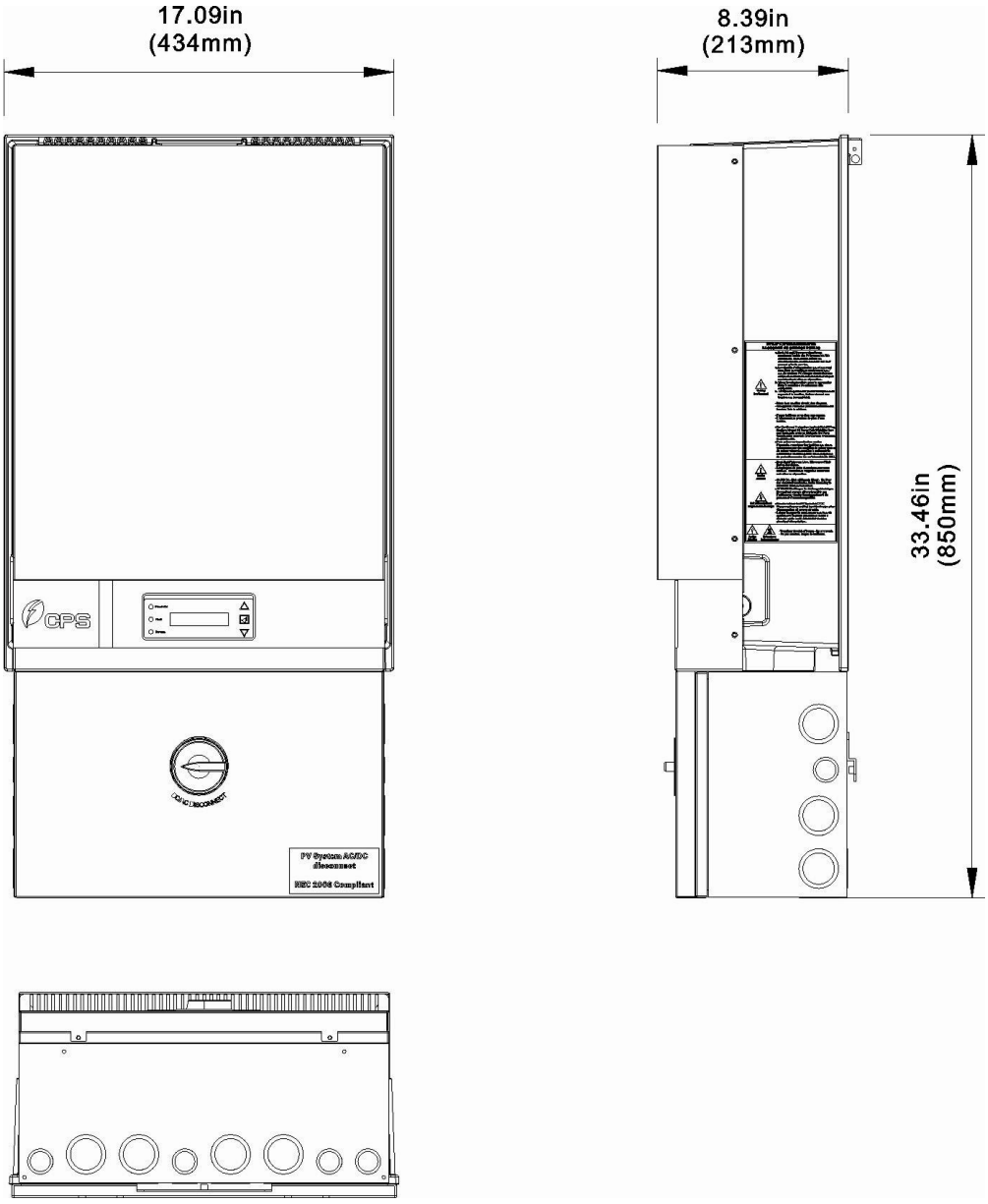


Figure 4.3.1: Dimensions of PV Inverter

Table 4.3.1 Product weight in the package

Inverter Model	CPS SCE4KTL-O/US	CPS SCE5KTL-O/US	CPS SCE6KTL-O/US	CPS SCE7KTL-O/US
Net Weight (lbs)	86	90.4	101.4	101.4

4.4 Control and Display Overview

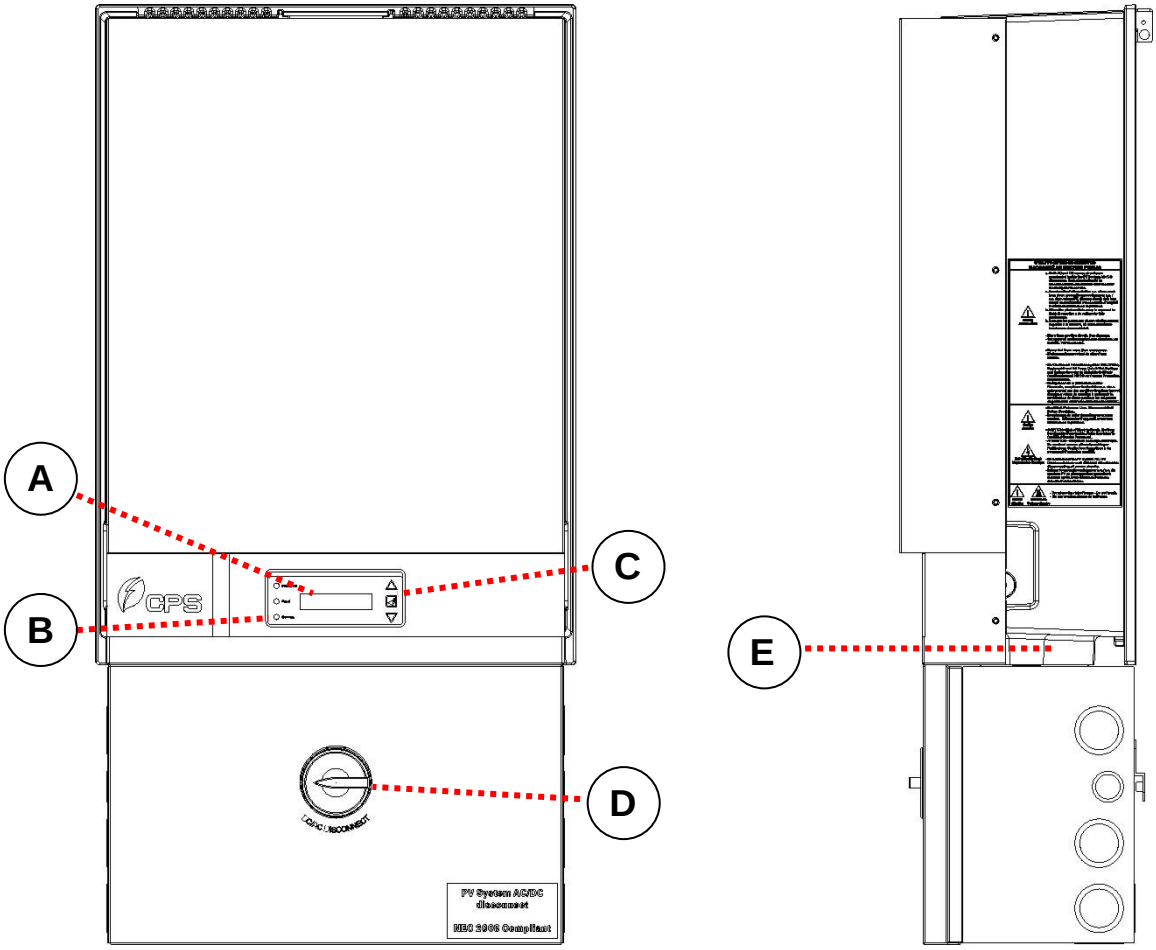


Figure 4.4.1: Overview of CPS PV Inverter

A. LCD Display

LCD screen displays all measured values and parameters.

B. LED Indicators

There are three indicators used to indicate the operating status.

C. Control Buttons

They are three control buttons available to switch between each display menu and configure the settings for the LCD.

D. DC/AC Disconnect Switch

It is a built-in disconnect switch that is used to disconnect both the DC input and AC output power to and from the PV inverter.

E. Hand Grip Area

It is a carrying area that is used to lift up the PV Inverter. For the lifting, two people are required due to the size and weight of the Inverter.

4.5 LED Indicators

CPS grid-tied PV Inverter has three built-in LED indicators which will provide information of the operational status:

Figure 4.5.1: LED Indicators

A) Power-On LED Indicator

It is a green LED indicator which will light up in ***green*** when the feed-in DC voltage from PV array reaches the minimum operating voltage for the PV Inverter.

B) Fault LED Indicator

It is a red LED indicator that lights in ***red*** when the PV Inverter has a fault during startup or operating period.

C) Communication LED Indicator

It is a Green LED indicator that lights and flashes in ***green*** when there is a communication device connected and working with PV inverter via the RS232 or Modbus interface.

4.6 Control Buttons and LCD Displays

CPS grid-tied PV Inverters are equipped with three control buttons which could be used to switch between display menus.

Figure 4.6.1: Control buttons and LCD displays

A) Up Control Button

The up control button is used to advance the display menu or move the cursor up

B) Enter Control Button

The enter control button is used to configure the settings such as parameters or is used to activate the lock function of display menu. To pause the display menu, the user can hold the enter control button for more than two seconds until LCD displays a ***"Lock"*** text. To release, the user can presses the same control button for another two seconds again in order to release menu from the "lock" mode.

C) Down Control Button

The down control button is used to advance the display menu in the opposite direction to the up control button.

D) Liquid Crystal Display (LCD)

A green color LCD screen is used to display the text messages of the operating status, monitoring parameters, PV inverter failures and inverter faults. Moreover, the LCD screen will be automatically turn off after ten seconds if LCD is not manually operated using the above control buttons or nighttime button.

5. Installation of PV Inverter

5.1 Open the package

The product package contains the following items (Table 5.1.1):

Item	Q'ty	Note
(1) PV-Inverter	1	Photovoltaic Inverter
(2) Mounting Bracket	1	Upon which Inverter be hang and mounted onto a wall
(3) Accessory Box	1	Contains all necessary accessories (Table 5.1.2)
Note: Please keep the package box in case of need for sending the product for repair service.		

▲ Table 5.1.1 Items in the package

The (3) Accessory Box contains items listed below.

Items	Q'ty	Purpose	Figure
User's Manual	1	Installation and Operation Manual	
Mounting Anchor	6	For bracket installation.	
Screw (M4)	6		
Security Screw.(M4)	2	For security locking to Inverter	
Terminal Connector	See*	For AC / DC Wires	

▲ Table 5.1.2 Items in the accessory box

Terminal Connectors of AC/DC wires are provided for Each Inverter Model:

*Table 5.1.3 Number of terminal connector

Inverter model / Wire diameter	CPS SCE4KTL-O /US	CPS SCE5KTL-O /US	CPS SCE6KTL-O /US	CPS SCE7KTL-O /US	Unit
6AWG	0	0	0	3+1	PCS
8AWG	1+1	1+1	4+1	1+1	PCS
10AWG	12+3	12+3	9+2	9+2	PCS

The number of spare parts is listed behind "+" in the above table.

5.2 Visually check the PV Inverter

It is important to check the PV Inverter for any visible damage, including the LCD screen. If there are visible damages can be found, please contact the dealer or supplier immediately.

	WARNING Due to the weight of the inverter, it is recommended at least 2 people lift the PV Inverter from the packing and also for the mounting the PV Inverter on the wall.
	CAUTION It is important to use the correct lifting point to lift the PV Inverter from the packing, as any improper carrying and moving could result in serious injury or damage the unit.
	Warning Any modification of the PV Inverter is not permitted. Risk of damage can be caused by any improper modification.

5.3 Identify the PV Inverter

The structure of the CPS grid-tied PV Inverter can be divided into two parts, main housing and wiring box shown in figure 5.3.1. The main housing contains the electrical components that are used for power conversion and the wiring box contains the electrical components that are used as the connection points for DC input voltage and AC output voltage as required by the NEC.

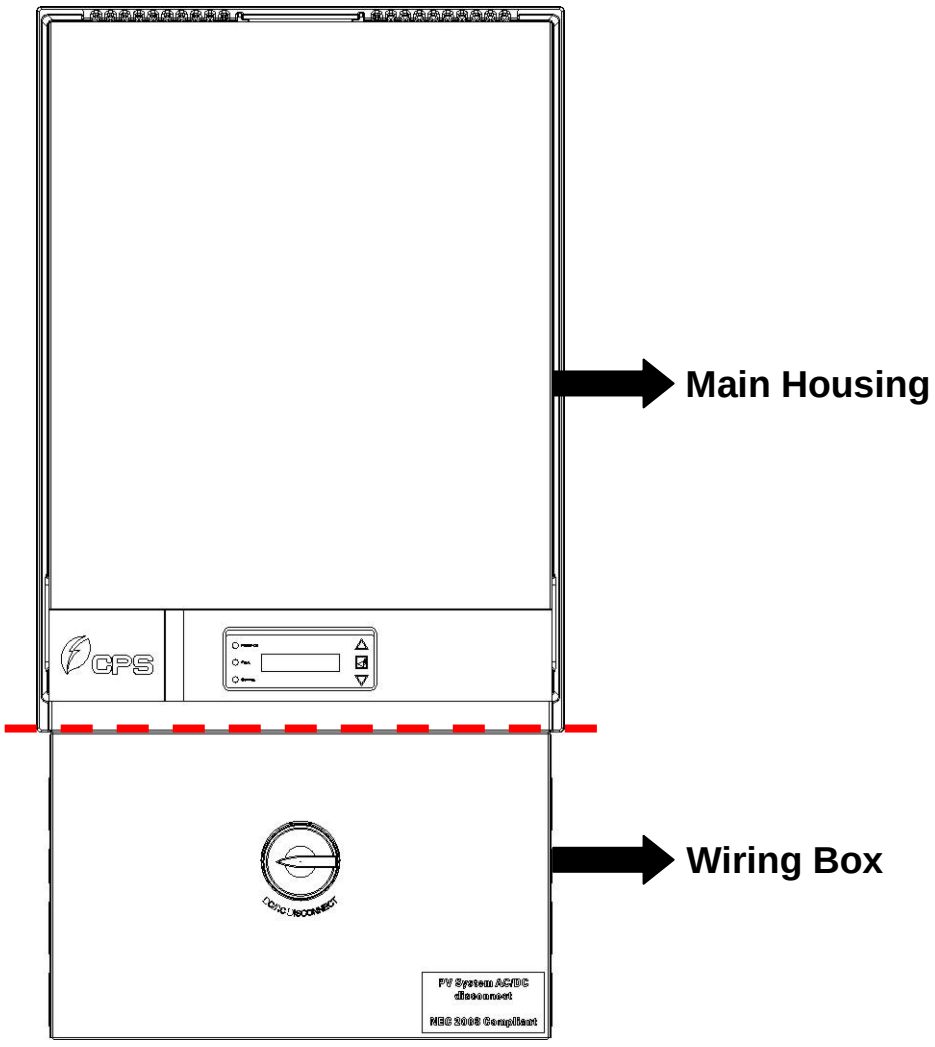


Figure 5.3.1: PV Inverters Structure

CPS grid-tied PV Inverter can be identified by the name plate. The name plate indicates general electrical information of the product as shown in Figure 5.3.2:

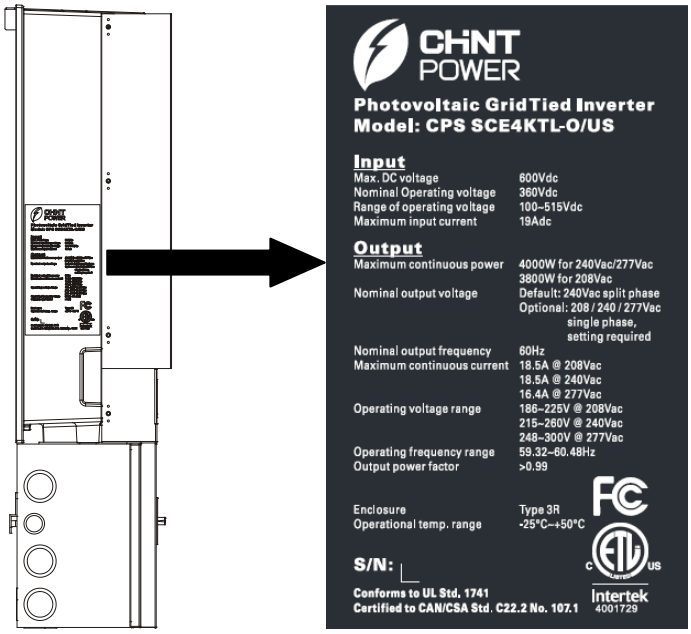


Figure 5.3.2: Main Housing Name Plate

A warning label plate is located in the left-hand side of PV Inverter as indicated in figure 5.3.4. This warning label is used to indicate all important notices that shall be known. When you are dealing with the general utility system and DC generator, read and follow all notifications from the warning label as a reminder in order to prevent any electric shock that can happen during the configuration period.

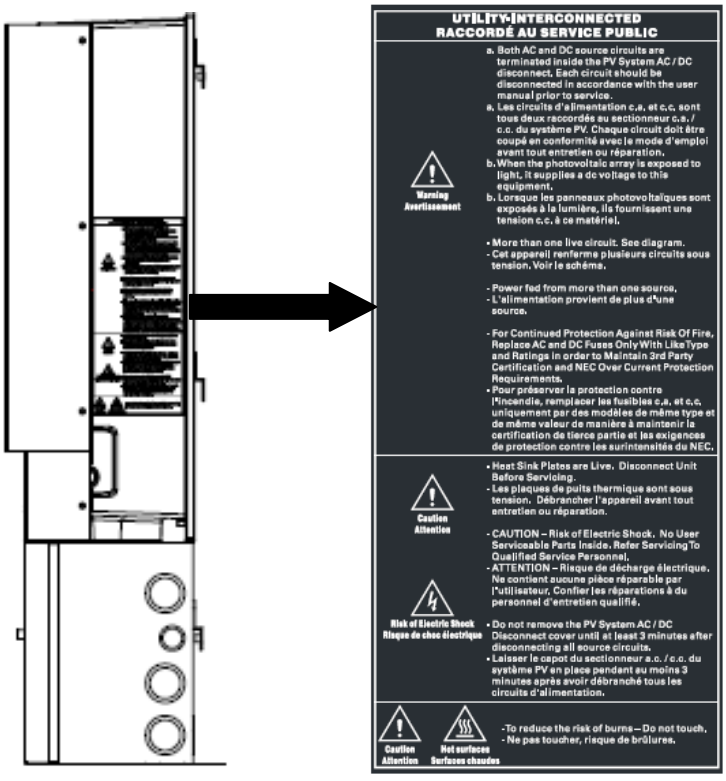


Figure 5.3.4: Warning Label Plate

5.4 Mount the PV Inverter

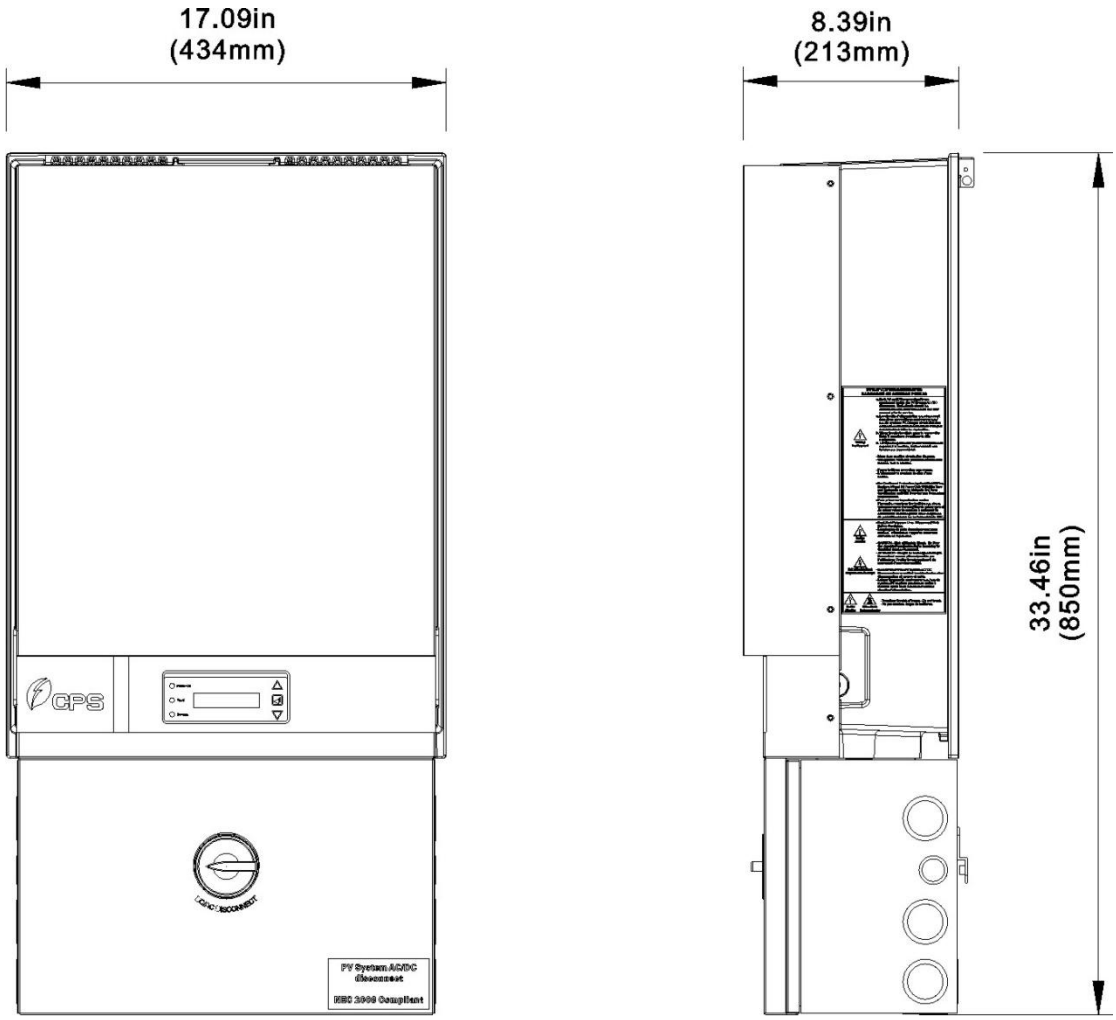


Figure 5.4.1: Required Dimension

A) Select a dry location, out of direct sunlight with ambient temperature between -20 and 45°C.

	IMPORTANT It is important not to install the CPS grid-tied PV Inverter under direct sunlight, because the exposure of direct sunlight may cause an internal heating and also a reduction of output power, which is known as derating protection.

B) Select a wall or solid vertical surface which is strong enough to support the inverter.

	WARNING PV Inverter's surface and housing can become hot during operation. Ensure not to install PV Inverters in a location that contains any flammable material.
	CAUTION Ensure selected location has a sufficient space for air flow.

C) The PV Inverter requires an adequate cooling space for heat dispersal. Therefore, the PV Inverter must have sufficient clearance for the air flow as illustrated below:

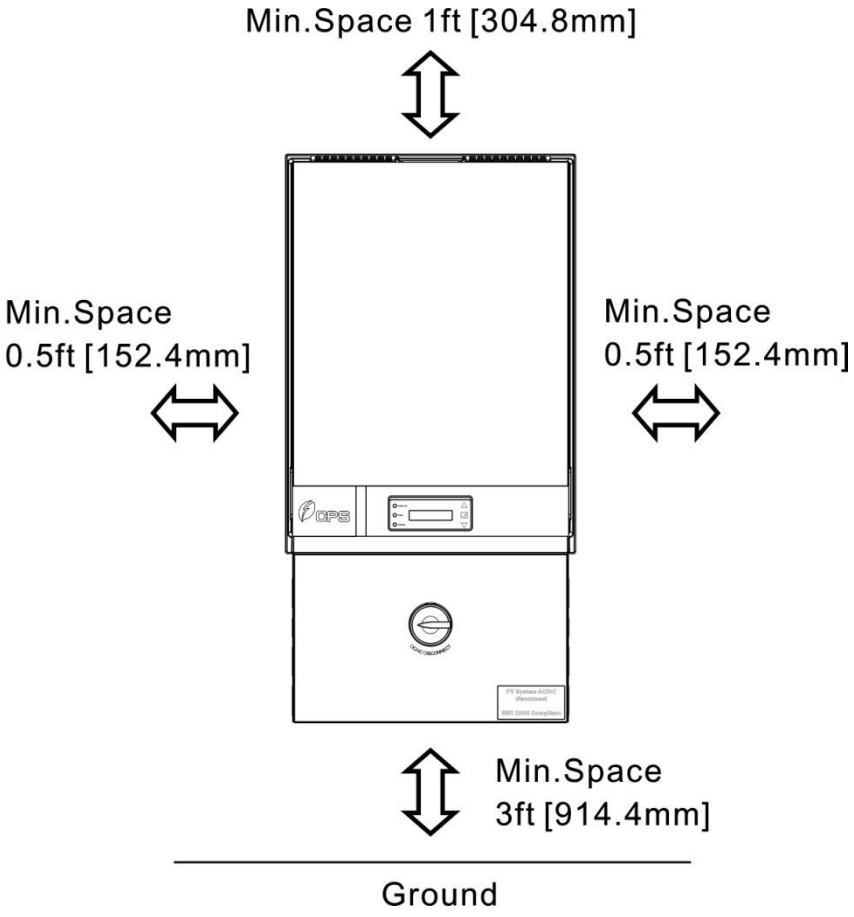


Figure 5.4.2: Required Clearance Space

	IMPORTANT The NEC requires that the DC disconnect should be mounted between 3 ft ~ 6.5 ft from the ground if the PV Inverter will be used as the standard disconnect.

D) Install Orientation

Selecting a proper orientation for the PV Inverter is very important. The PV Inverter should be installed in a vertical position. In order to avoid heat dissipating issues, ensure there are no any obstacles located or installed near by the PV Inverter.

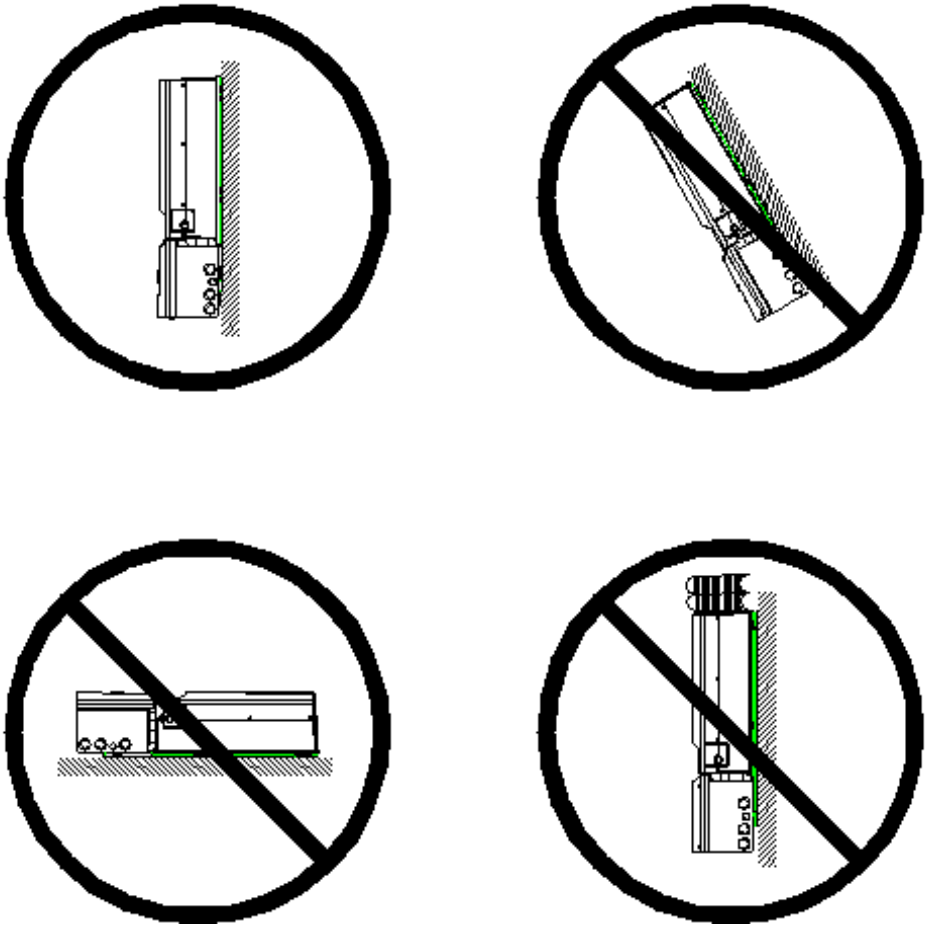


Figure 5.4.3: Installing Position and Location

	CAUTION Do not to install PV Inverter horizontally and tilt-forward direction as illustrated above. The PV Inverter is designed only for the vertical installation position. ***Do not place any objects on the top of PV Inverter.*** **Moreover, PV Inverter may make noise during operation. As a consideration, install the PV Inverter away from living or working areas where noise could be a concern.**

E) Fix the bracket by using outer mounting holes

i) A rectangular-shaped mounting bracket that shipped with the PV Inverter is able to be used with all types of walls such as stone wall, brick wall or wooden wall, but it is more important to ensure the wall that is selected will be able handle with the weight of PV Inverter, specifically the installations that are wooden walls. Figure 5.4.3 described the required dimension of drilling locations:

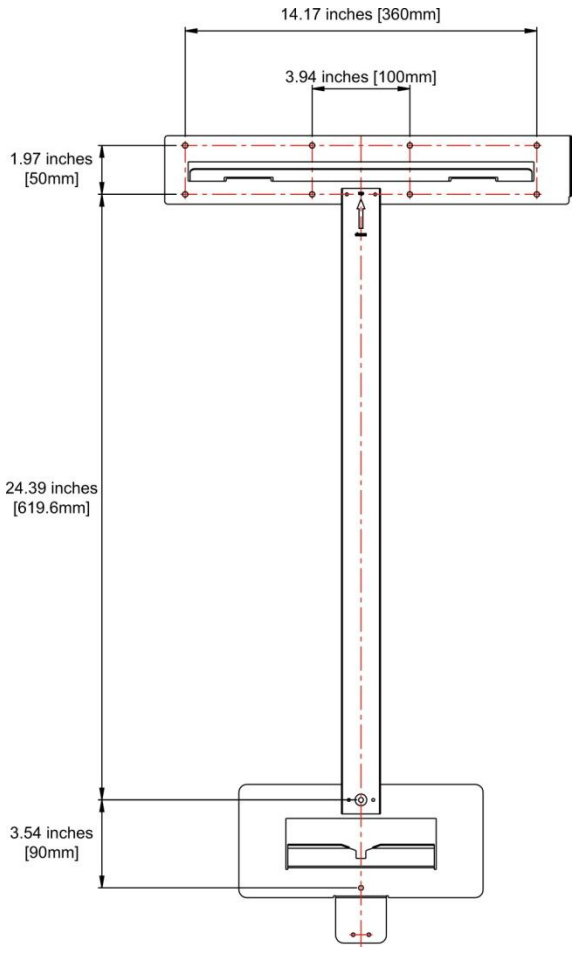


Figure 5.4.4: Dimension of Drilling Point for the Wall

ii) There are 2 types of handling modes to install the mounting bracket on a wall. The user can use the different screwing points as appropriate. The corner screwing points or the central screwing point as illustrated in the figures, below. To secure the mounting bracket, mark 6 outer holes on the wall, drive in the 6 mounting anchors, then screw in the 6 M4 screws to each screwing point as illustrated below:

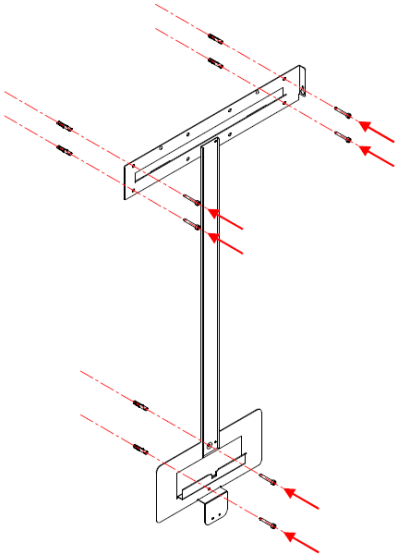


Figure 5.4.5: Corner screwing fixing mode

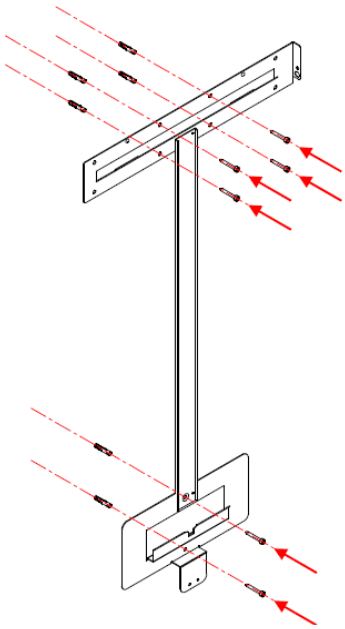


Figure 5.4.6: Central Point Fixing Mode

	WARNING It is important to ensure the drilling location is not located on any electric wiring within the wall.

F. Mount the PV Inverter into the mounting bracket as illustrated below.

i) Hook up the PV Inverter by aligning the opening of rear-side enclosure and place the PV Inverter into each targeted wedge points of the mounting bracket as illustrated below:

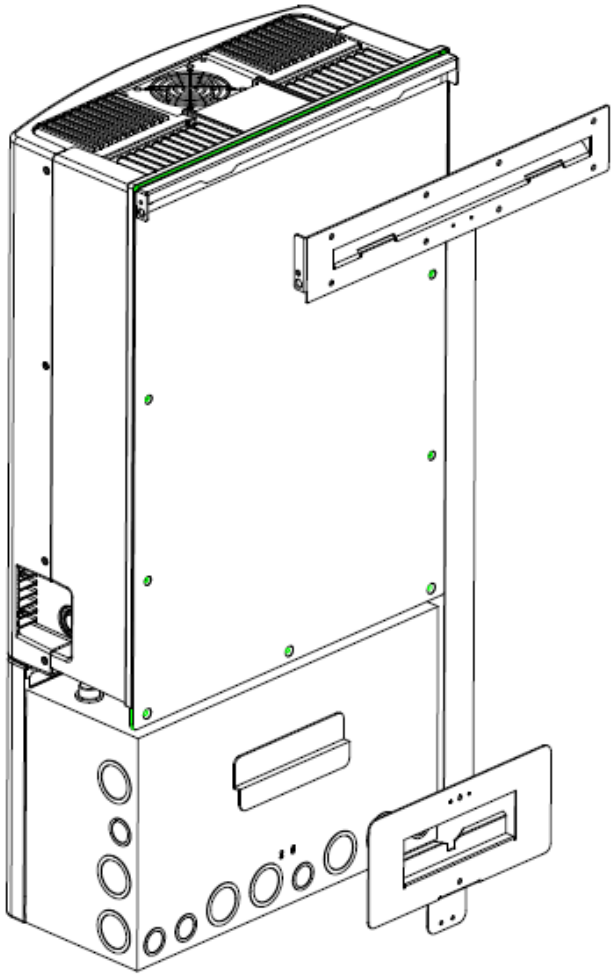


Figure 5.4.7: Install PV Inverter into mounting bracket

	IMPORTANT Check the mounting bracket again before the PV Inverter is hung on the bracket. It is recommended to have least 2 service personnel for this procedure due to the weight of unit.

ii) Secure the edge point of mounting bracket

In order to avoid the wiring box swaying due to weather, the security screws for the wiring box must be tightening. There will be two pieces of the M4 size screws found within accessories box. The tightening location of mounting bracket was indicated in figure 5.4.8. Follow the below instructions in order to complete the tightening procedures:

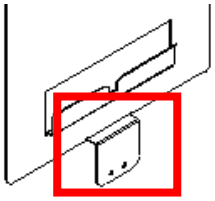


Figure 5.4.8: The edge point of mounting bracket

	WARNING The wiring box shall not be opened under dusty or moist weather. Working with the exposed electrical components under in moist weather is very dangerous, which might cause an electric shock easily. In dusty weather, electrical components of the wiring box might be damaged if there is heavy dust floating within air during serving period. Please be aware and avoid.
	CAUTION It is necessary to disconnect the DC generator and AC Utility if the wiring box is already wired with any DC or AC connection. It is necessary to wait 5 minutes in order to ensure all the electrical components are discharged.
	ESD Protection An ESD glove should be worn during the cable wiring, replacing the fuses and installing the components.

iii) Turn off DC/AC disconnect switch from the wiring box as illustrated below:

Figure 5.4.9: Turn off DC/AC disconnect switch

iv) Unfasten 2 pieces M4 and 4 pieces M5 screws from the top cover of wiring box as illustrated below:

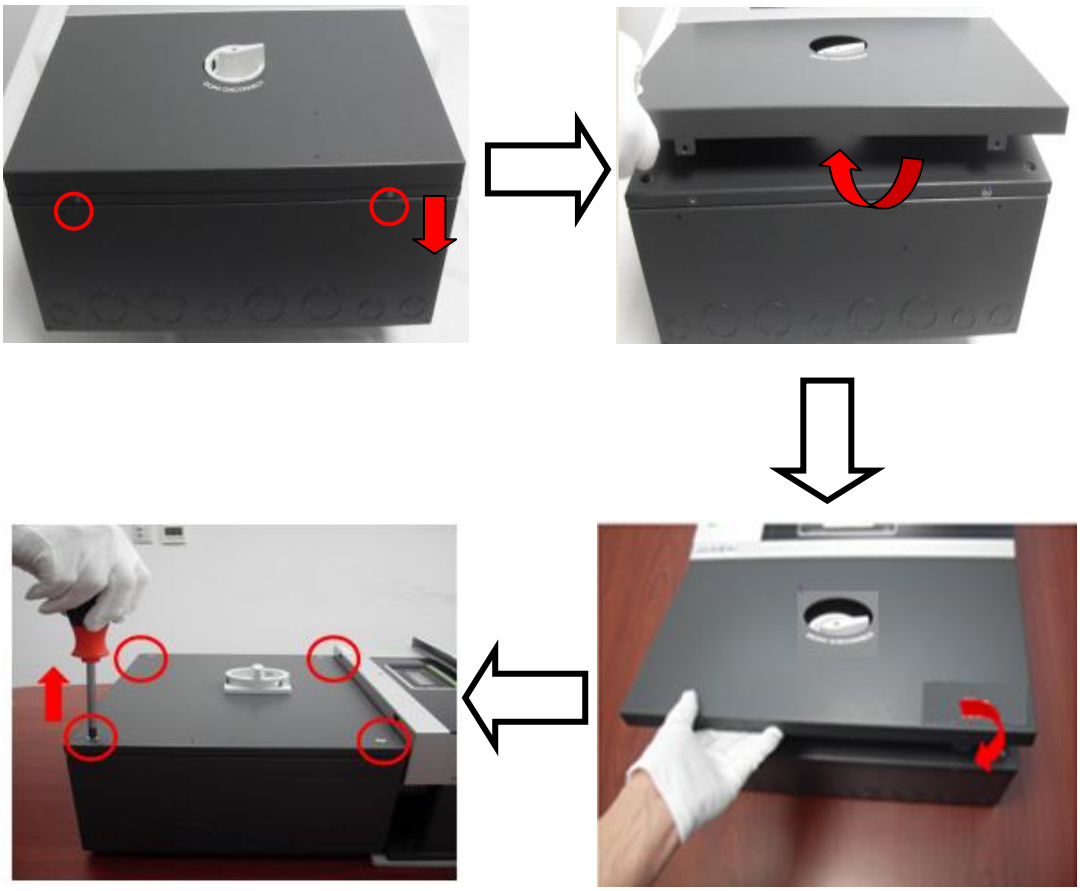


Figure 5.4.10: Remove the screws of DC/AC Wiring Box

	Screwdriver A ***M5 hexagon head screwdriver*** is required for the procedure.

v) Remove the top cover of disconnect box and then find the highlighted location from the below figure and then insert 2 M4 size screws:

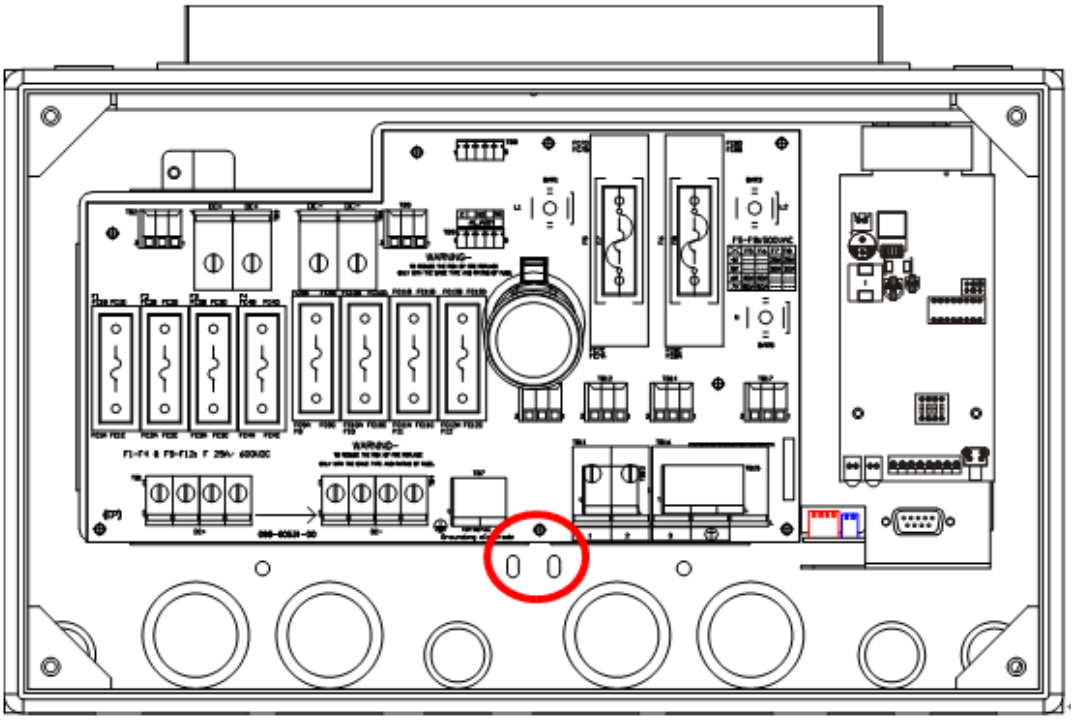


Figure 5.4.11: Screwing Location for the Security Screws

6. Wiring Box Overview

6.1 Hardware Structures

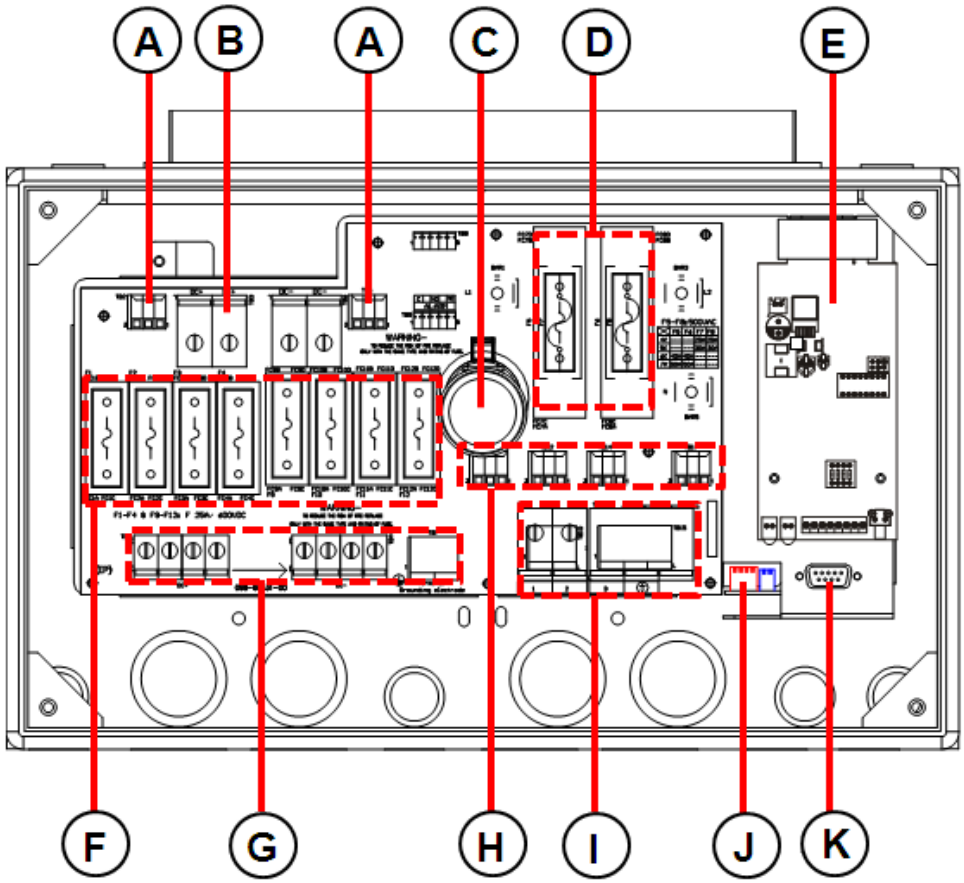


Figure 6.1.1: Wiring Box Structures

A. Protection MOV for DC Input side
B. DC bypass terminal
C. DC/AC Disconnect
D. 2 fuse holder for AC Output Side (Shipped with dummy fuses)
E. Modbus Card
F. 8 fuse holders for DC Input (Shipped with dummy fuses)
G. DC input terminal
H. Protection MOV for AC Output side
I. AC output terminal
J. AC Utility configuration dip switch
K. RS232 Interface Port

6.2 Hardware Functioning

A. Protection MOV for DC Input Side

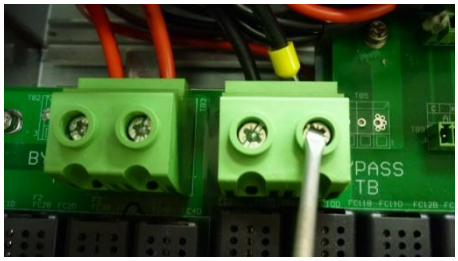
It is the surge protection that is equipped and used to protect input circuit against excessive voltage on the DC connections.

B. Bypass Terminal block for DC Input Side

It is the bypass terminal block for solar (+) and solar (–) polarity that used to co-operate with an external combiner box and external fuses. The maximum current of this DC input bypass terminal block is 38A and the required torque values of the screws is 17.4 lbf-in (20 Kgf-cm).

When the PV Inverter is connected to the PV module through an external combiner and external fuses are used, the configuration of DC input cable can be connected with the bypass terminal block directly.

Positive (+) Polarity Position



Negative (–) Polarity Position

Figure 6.2.1: Connecting DC Cables with Bypass Terminal

	IMPORTANT If the DC input cable is connected with the bypass terminal block directly, it is important to ensure the limitation of maximum current is below 38A through a single pair cable as figure 6.2.1 mentioned.

C. DC/AC Disconnect

It is the disconnect switch that is used to turn-on and turn-off the power of the PV Inverter. The switch disconnects both the DC and AC voltage to and from the PV Inverter.

	Electric shock It is important to avoid touching the DC and AC cabling area during the procedures even if the AC/DC switch of PV inverter has been switched off. This is because live powers still remaining with the cables, please beware.

D. AC Protection

I) If an external AC breaker or fuse protector is installed, it is not necessary to implement AC protection fuses within the wiring box. The specification of external breakers or fuses shall meet the recommended ratings listed in the following table.

II) If there is no external AC breaker or fuse protector installed, it is recommended to have AC protection fuses installed to the AC side. And the AC fuse that can be selected from the recommended list as below table indicates.

To ensure the rating of the fuses that are used for the each model is correct, it is strongly recommended the installer purchase the AC fuses that have already been tested by CPS.

The recommended list for the AC Fuses:

Table 6.2.1: AC Fuse Specification

Model	Manufacturer	Part Numbers	Fuses Rating
CPS SCE4KTL-O/US	Littelfuse	KLC 25	25A / 600VAC
CPS SCE5KTL-O/US	Littelfuse	KLC 30	30A / 600VAC
CPS SCE6KTL-O/US	Littelfuse	L50S 40	40A / 500VAC
CPS SCE7KTL-O/US	Littelfuse	L50S 50	50A / 500VAC

E. Communications slot for Modbus

PV inverter has an extended slot for a communication interface in the wiring box as indicated in the figure below. Through installing a Modbus card to use this slot, please remove the cover of the wiring box following (Please refer to page 24) insert the card into the slot reinstalled the cover of the wiring box (Please refer to page 52).

For further information, please contact with your dealer.

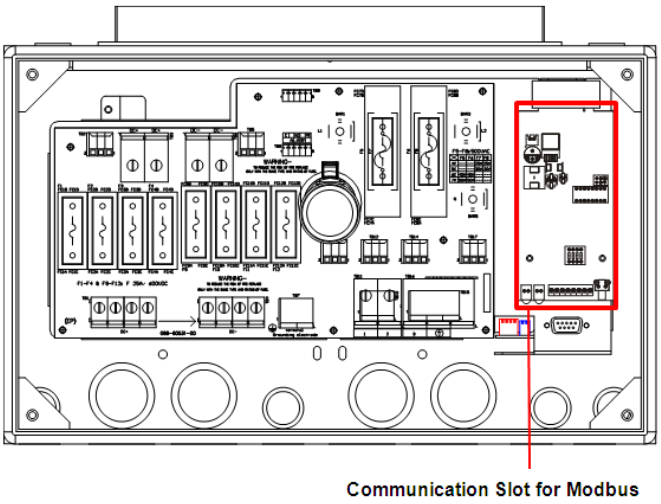
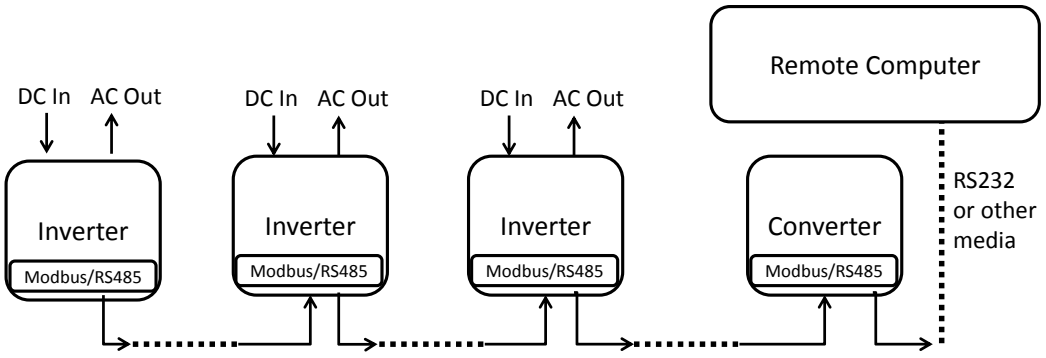


Figure 6.2.2: Connection slot for Modbus

After installation of Modbus card, user can link PC with Inverters and monitor their real-time operation status remotely.

When wiring Modbus card from Inverter to Modbus/ RS485 to RS232 Converter, we connect opposite pins of Modbus which means Receive Pin to Transmit Pin, and Transmit Pin to Receive Pin. See framed area below.



Inverter to inverter correct pin configuration:
Pin T+(Transmit+) to T+(Transmit+)
Pin T-(Transmit-) to T-(Transmit-)
Pin R+(Receive+) to R+(Receive+)
Pin R-(Receive-) to R+(Receive-)

Inverter to logger correct pin configuration:
Pin T+(Transmit+) to R+(Receive+)
Pin T-(Transmit-) to R-(Receive-)
Pin R+(Receive+) to T+(Transmit+)
Pin R-(Receive-) to T-(Transmit-)

Figure 6.2.3: Framed area of Connection

F. Modbus Card

I) INSTALLATION and CONNECTION:

	CAUTION The PCB SERMB is an accessory for the PV Inverter series The installation has to be done with the unit OFF. Don't install the PCB is you see damaged on it.

- Before installing the PCB, it is necessary to configure the dip-switch as indicate on following page. (the factory setting are: mode 1, Baud-Rate 9600)
- Connect the RS485/RS422 line to the connector on front panel, as show on Fig 1.
- It is suggested to use twisted cable section 0.22mm2, (AWG24)1.
- If the RS485 is connected one PV Inverter only, or if the PV Inverter is the last in the serial connection, it is necessary to set the SW3-4 to ON position.
- If in the RS422 is connected one PV Inverter only, or if the PV Inverter is the last in the serial connection, it is necessary to set both SW3-3 and SW3-4 to ON position.
- Start the PV Inverter and verify the PCB.

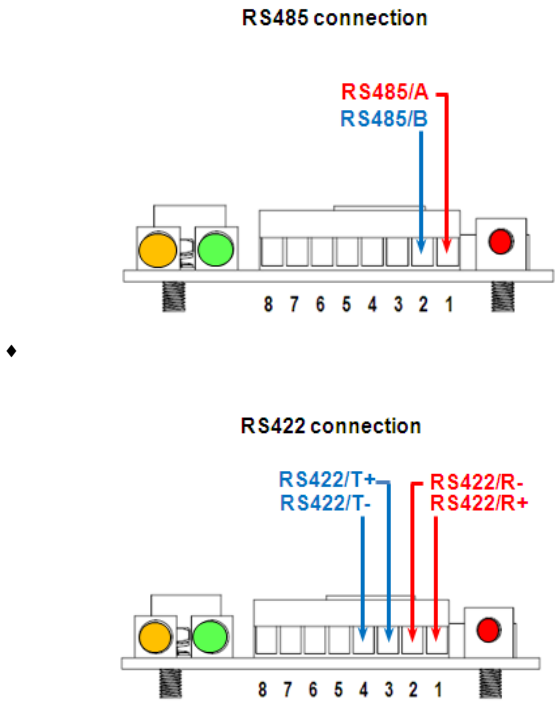
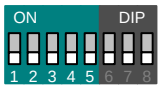
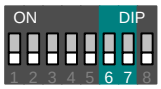
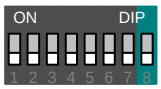


Figure 6.2.4: RS 485/RS422 connections

[1] The GND is available at Port 6 and Port 8 which refer to the internal GND system.

II) CONFIGURATION:

- On the PCB are presented 2 dip switch blocks for the configuration:

<table>
<tr><th>ID</th><th>Function</th><th>Dip</th><th colspan="2">Description: SW2</th></tr>
<tr><td>1</td><td>Slave Address</td><td>DIP1-5</td><td> 
</td><td>Modbus Slave number: 1-31
<table>
<tr><th>DIP5</th><th>DIP4</th><th>DIP3</th><th>DIP2</th><th>DIP1</th><th>IND</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>1</td></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>2</td></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>3</td></tr>
<tr><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>31</td></tr>
</table>
N.B. Address 0 is reserved.</td></tr>
<tr><td>2</td><td>Baud Rate setting</td><td>DIP6-7</td><td> 
</td><td>
<table>
<tr><th>DIP7</th><th>DIP6</th><th>BAUD</th></tr>
<tr><td>OFF</td><td>OFF</td><td>1200</td></tr>
<tr><td>OFF</td><td>ON</td><td>2400</td></tr>
<tr><td>ON</td><td>OFF</td><td>4800</td></tr>
<tr><td>ON</td><td>ON</td><td>9600</td></tr>
</table></td></tr>
<tr><td>3</td><td>Reserved</td><td>DIP8</td><td> 
</td><td></td></tr>
</table>

ID	Function	Dip	Description: SW3	
4	Protocol Selection	DIP1		DIP 1 OFF = Modbus DIP 1 ON = RS485
5	RS485A load	DIP3		DIP 3 OFF = no load on line
6	RS485B load	DIP4		DIP 4 OFF = no load on line

- LED:

	YELLOW LED (Modbus communication)	GREEN LED (Internal state)
OFF	No communication with AP	Faulty board
ON	--	Power supply ok, the board is not communicating with the inverter
BLINKING *(500ms ON- 500ms OFF)*	Modbus ok[2]	Communication with inverter is ok

- [2] This flag is set each time the board receives a valid Modbus command and reset, after one second if not receiving any other command.

III) Problems and solution:

Problem	***Possible cause***	***Solution***
The PCB don't start	PCB not well fix on SLOT Inverter is OFF PCB broken	Control the PCB fixing on SLOT ; verify if the Inverter is OFF If the problem still present contact service.
The PCB don't communicate with the inverter (green led ON)	Initialization error, waiting for communication condition	The system is waiting for command reset. Reset the PCB by stop and restart the Inverter.
The PCB don't communicates with the Modbus SW	Wrong connection RS485 line Wrong setting	Verify the cable connection. Verify the RS485 terminal resistor setting

♦

IV) TECHNICAL FEATURES

♦ See the table below for the technical features of the board.

Feature	***Specification***
Part number	S0SER02MB
Insulated power supply SELV	12VDC
Description	Modbus Protocol conversion board for Solar inverters
Modbus commands suppurated	0x04 single or multiple reading 0x06 for the commands sending
Configurable baud rate	1200 / 2400 / 4800 / 9600 bps
Slave address	Node 1-31 (0 reserved), via dip switches
Serial connections	4 wires RS422 or 2 wires RS485 up to a maximum of 31 slaves on the same line
Compatibility	PV Inverter Series
Operating temperatures	-10°~60°C
Humidity	0-95% without condensing
Consumption	< 1W
Leds	Green Led: power supply ok and communication with the inverter Yellow Led : Modbus Communication
Standard	CE
Dimension LxWxH [mm]	132 x 60 x 10.5

G. DC Protection

This is the over current and over voltage protection that is used for the Direct Current (DC) side. Please refer to configuration diagram that shown in Appendix I to connect have a proper configuration for the DC side of PV system.

The PV Inverter is shipped with dummy fuses (solid aluminum cylinders in the shape of the proper fuses). Since there are four pairs of DC input ports, four fuse holders shall be equipped for the four positive (+) polarity ports and others fuse holders are equipped for the four negative (-) polarity ports. Therefore, there are supports to have eight fuse folders, total, to the DC-side as shown in figure 6.2.5:

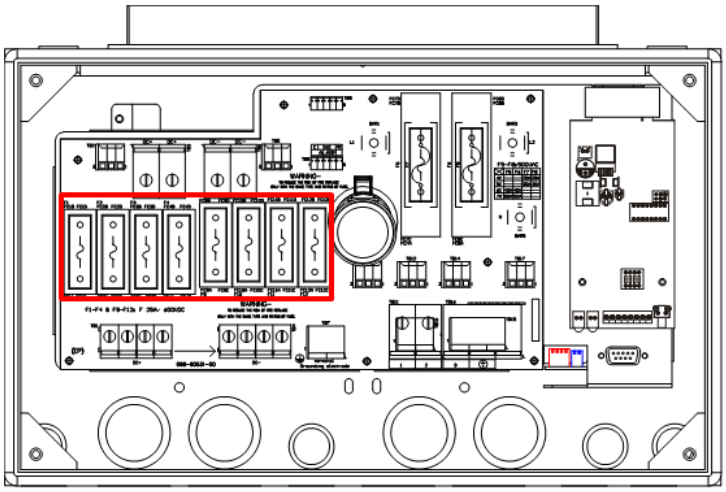


Figure 6.2.5: Location of DC Fuses Holders

	IMPORTANT The PV Inverter is shipped with a dummy fuse in the fuse holder. It is necessary to select the proper series fuse depending with the solar modules that are used. Remove all dummy fuses prior to installation and operation.

The installer or qualified service personnel should select the required DC fuses during the installing procedure. The rating selection of the DC protection fuses should be selected based on the amount of solar modules connected in the PV system.

The criterion of fuse selection can be calculated by a standard formula in order to help the installer or service personnel to select the correct rating of fuse.

The standard formula for DC Fuse Selection:
Nominal Voltage of fuse must be 600V_{DC} Rating and the fuse should be selected between 1.56 x Isc < I_N

Assume the maximum short circuit current (Isc) of the solar module used is 4.85A. The rating of the selected fuse must have a nominal current greater than 1.25 times but less than 1.6 times the short circuit current as ***1.56 x Isc < I_N***

Calculated by Standard Formula:

A) 4.85A x 1.56 = 7.56A

B) Implemented the above result within ***1.56 x Isc < I_N***

C) The calculation result will be 7.56A < I_N. That means installer must to select a fuse rating that is greater than 7.56 A, but must lesser than 9.70 A. Refer to the products information provided from Littelfuse factory, we are able to select KLKD008, 8A, 600V_{DC} DC as the protection fuse for the DC input side.

	IMPORTANT The fuse calculation for the fuse selection is referring to the requirements (information) that had been indicated within the ***National Electrical Code(NEC), ANSI/NFPA 70.*** To ensure trouble-free fuse protection, Eaton recommends using fuses that have been tested by Eaton. The specifications for fuses from Littelfuse and KLKD series can be downloaded from www.littelfuse.com. It is important to follow the standard formula in order to select the proper rating of fuse for DC protection. And the size of the DC and AC wiring must to meet with the required size of cables as description at chapter H) DC input terminal block and chapter J) AC output terminal block in the section 6.2.

H. DC Input Terminal Block

It is the terminal block that is used to connect the DC cables from the PV modules. In order to have a trouble free connection, it is recommended to connect PV modules of the same type, same quantity, with an identical configuration of strings.

However, ***the size selection of DC cables should be referred to cable size requirement in the National Electrical Code(NEC), ANSI/NFPA 70*** in order to select the proper size of DC cables that can be used with the PV inverter.

I. Protection MOV for AC Output Side

It is the surge protection that is used to protect the output circuit against excessive voltage of the AC connections.

J. AC Output Terminal Block

It is the terminal block that is used to connect AC cables from the utility system, also known as the public grid. Each model of the Eaton grid-tied PV Inverter requires different sizes of AC cables. The following table indicated the cable size and torque values that are required for position (1) pole / position (2) pole / position (3) pole in the AC terminal block when a 208 grid-tied PV system is applied with the PV inverter:

Table 6.2.3: Standard AC Cables

<table>
<tr><th colspan="2">Model / Terminal block</th><th>CPS SCE4KTL-O/US</th><th>CPS SCE5KTL-O/US</th><th>CPS SCE6KTL-O/US</th><th>CPS SCE7KTL-O/US</th></tr>
<tr><td rowspan="3">Terminal block labeled with (1), (2), (3)</td><td>Admissible conductor size</td><td colspan="2">10 AWG</td><td>8 AWG</td><td>6 AWG</td></tr>
<tr><td colspan="4">90 °C / 194 °F, Copper</td></tr>
<tr><td>Torque value</td><td colspan="2">15.6 lbf-in (18 Kgf-cm)</td><td colspan="2">33.1 lbf-in (38.1 Kgf-cm)</td></tr>
<tr><td rowspan="2">Terminal block labeled with (G)</td><td>Admissible conductor size</td><td colspan="4">10AWG</td></tr>
<tr><td>Torque value</td><td colspan="2">15.6 lbf-in (18 Kgf-cm)</td><td colspan="2">33.1 lbf-in (38.1 Kgf-cm)</td></tr>
</table>

	IMPORTANT The selection for the AC cable size for the Position 1 / Position 2 / Position 3 is referred to the table 310.16 in the National Electrical Code (NEC).

K. Utility Configuration DIP Switch

It is a utility configuration dip switch that is embedded within DC/AC wiring box. This dip switch allows the user to do different configurations of the PV Inverter in order to let it connect to the different public grid-tied PV systems using the same inverter. The dip switch is located at the right-bottom side of wiring box, which just under Modbus interface card and nearby the RS232 interface port as below shown in figure 6.2.6:

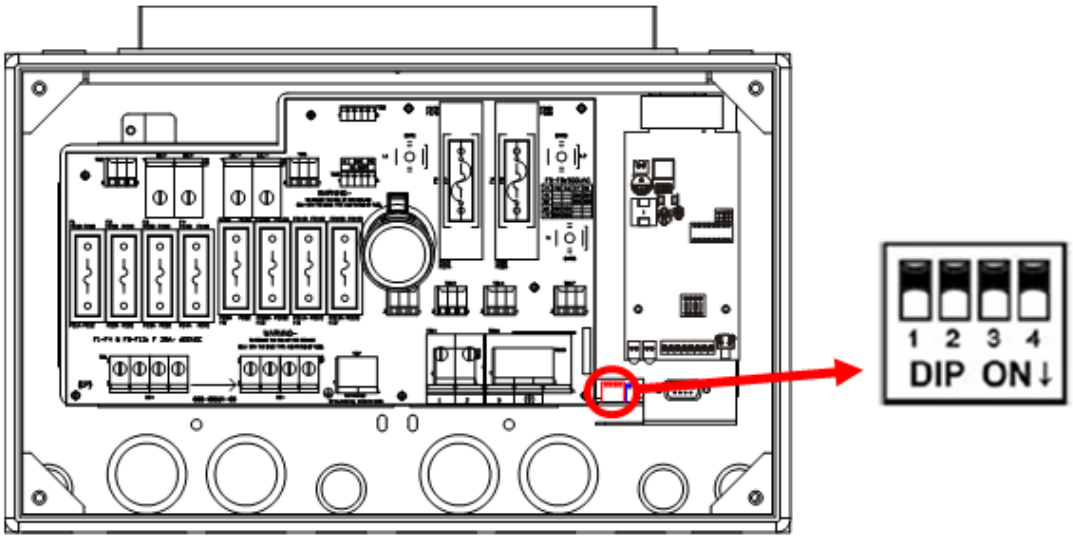
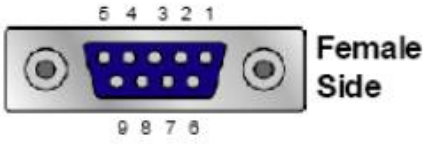


Figure 6.2.6: Utility Configuration DIP Switch

L. RS232 Interface (for service purpose)

Firmware upgrades are also available and can be done via RS 232 interface. All PV Inverters are integrated with a DB9 socket for the RS232 interface as a built-in interface in the wiring box. The pin assignment of DB9 socket is shown in the table below:



PIN	Signal Assignment
1	N.C.
2	TxD
3	RxD
4	N.C.
5	Common
6	N.C.
7	N.C.
8	N.C.
9	N.C.

Figure 6.2.7: RS232 Interface Pin Assignment

	IMPORTANT The RS232 interface and Modbus card share the same communication port, thus they are not able to work together at the same time. Before using the RS232 interface, please remember to remove the Modbus card.

6.3 Maximum AC Short-Circuit Current

According to requirements for safety protection, PV Inverters shall have a short circuit test on the AC output circuit. The following table describes the test result of the AC Short-Circuit Current that the PV Inverter had.

Table 6.3.1: AC Short-Circuit Current

Maximum Short-Circuit Current and Duration Period		
Ipeak	**Irms**	**Duration**
306A	**178A**	**<1s**

Note: Do not exceed the Irms value for choosing the output breaker.

6.4 Knockouts for the AC and DC wiring

PV Inverters is equipped with different size of knockouts in the wiring box which can be used for the cable configuration of DC-side and AC-side. For the convenience of the installer or system integrator, knockouts can be utilized in four different directions and there are two different sizes of the knockouts available to be selected as shown in figure 6.4.2 and figure 6.4.3. The diameter and number of knockouts on different sides of the Inverter are listed in Table 6.4.1 as the reference for installation.

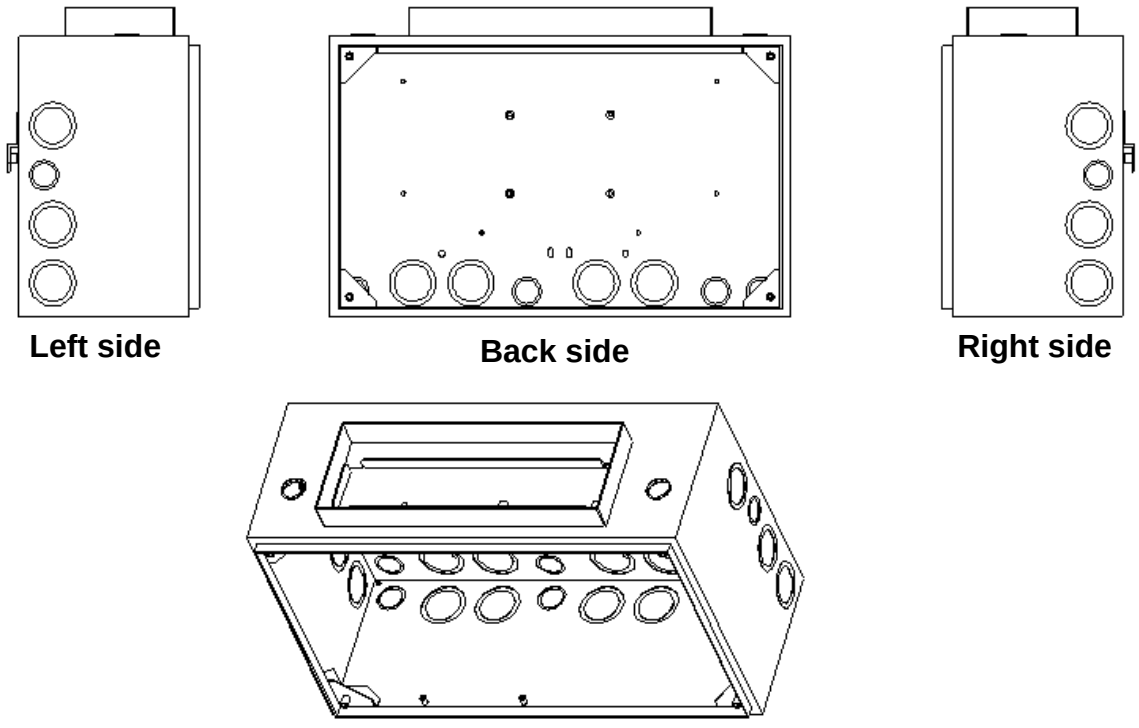


Figure 6.4.1: Knockout Directions of Wiring Box

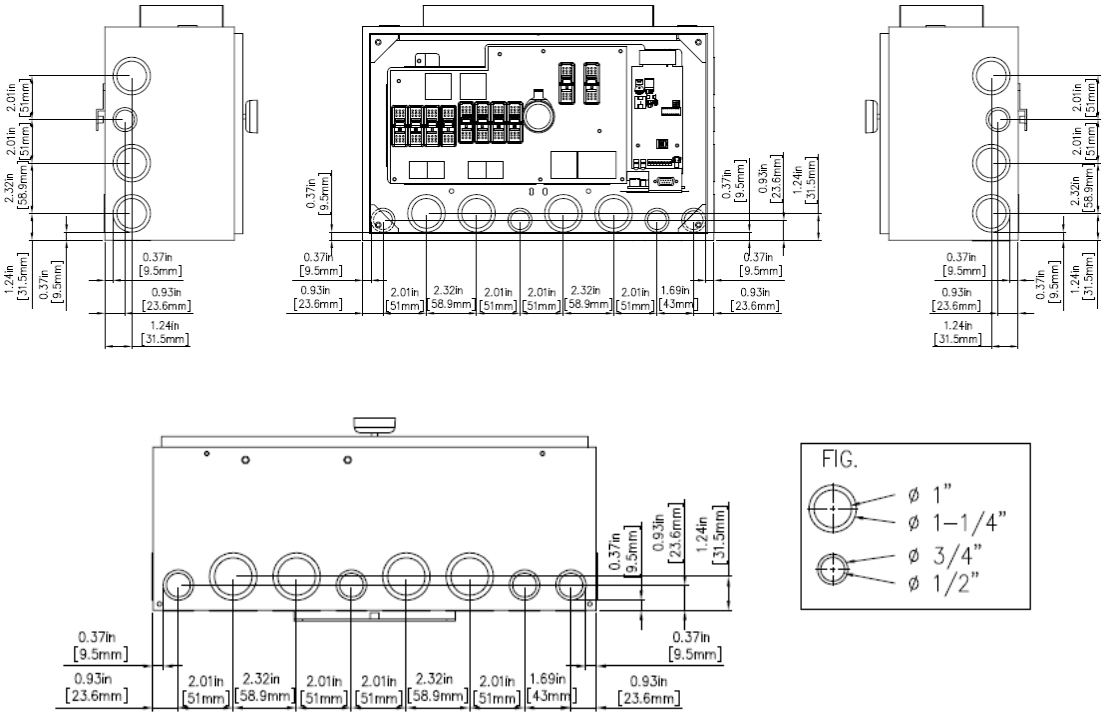


Figure 6.4.2: Dimensions of Knockouts

Table 6.4.1: Knockouts of PV Inverter

Direction	Diameter	Quantity
Bottom side	Combo 1-1/4 in. & 1 in.	4
	Combo 3/4 in. & 1/2 in.	4
Back side	Combo 1-1/4 in. & 1 in.	4
	Combo 3/4 in. & 1/2 in.	4
Let side	Combo 1-1/4 in. & 1 in.	3
	Combo 3/4 in. & 1/2 in.	1
Right side	Combo 1-1/4 in. & 1 in.	3
	Combo 3/4 in. & 1/2 in.	1

Open the knockouts for wiring

CPS PV Inverter supports configurations of wiring from different directions with conduits. For the knockouts, two different sizes can be used and the diameter of these knockouts is shown in figure 6.4.2. Each knockout has two different levels of opening area that can be used, inner level area and outer level area, as figure 6.4.3 indicates.

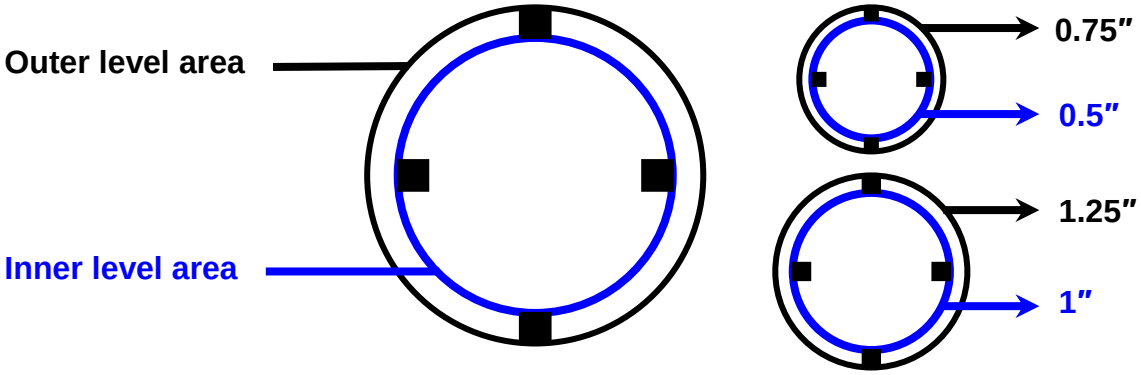


Figure 6.4.3: Levels area and the size of Knockouts

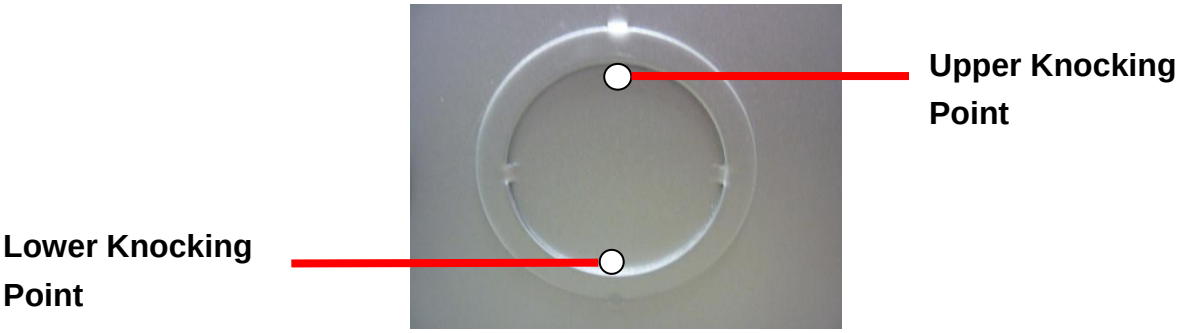


Figure 6.4.4: Knocking points of inner level

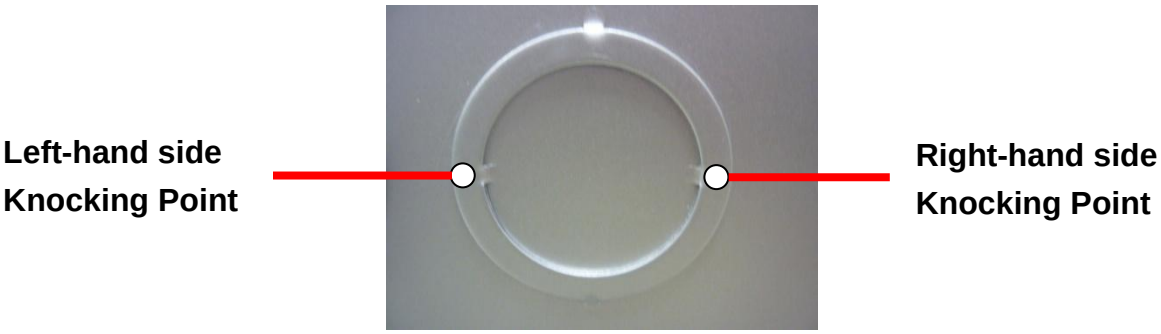


Figure 6.4.5: Knocking points of outer level

	**Tools** **A *M4 size slotted screwdriver and hammer are required for the opening procedure of knockouts.***

In order to utilize an opening hole in the inner level area, it is necessary to use the required tools such as a slotted screwdriver with a hammer to knock at the certain point repeatedly as figure 6.4.6 indicated:

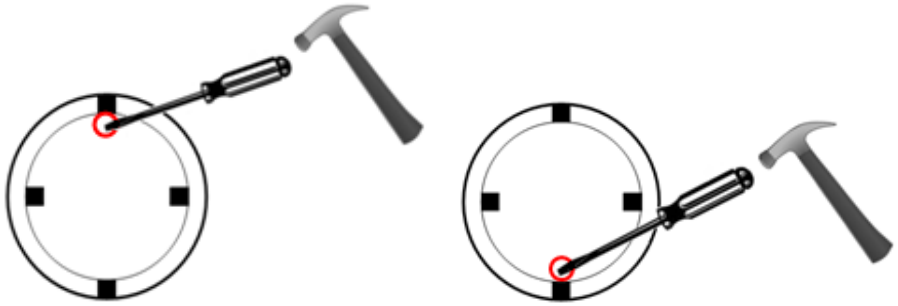


Figure 6.4.6: Knocking point of inner level

1st Step:	Use tools to target upper strike point and knock it.
2nd Step:	Use tools to target bottom strike point and knock it.
Last Step:	Repeat the 1st and 2nd steps until the hole of inner level is opened.

In order to dash an opening hole at outer level area, it is necessary to use the required tools to strike (knock) at the certain points repeatedly in order to open a hole for wiring as shown in figure 6.4.7.

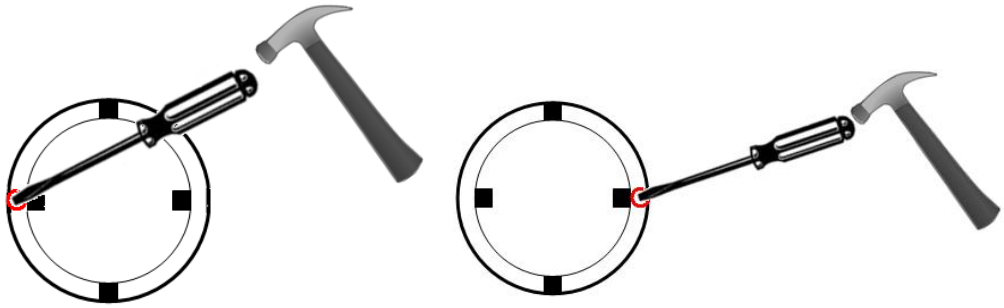


Figure 6.4.7: Knocking point of outer level

1st Step:	Use tools to target left side strike point and knock it.
2nd Step:	Use tools to target right side strike point and knock it.
Last Step:	Repeat the 1st and 2nd steps until the hole of outer level is opened.

	IMPORTANT Be sure to follow all instructions to strike/knock-out the opening hole by the proper procedures. Otherwise, the opening area of knockout can be easily damaged if improper tools are used or any improper procedures are done for the opening, please beware.

7. Connecting the PV Inverter

7.1 DC Wire Connections

Since the wiring box has been opened during mounting procedures, use the necessary tools to knock out an opening hole in the desired location on the wiring box for AC cables and insert a conduit as shown in figure 7.1.1. Second, remove the top cover of wiring box before this procedure started. Please refer to the configuration diagram in Appendix I and ensure a correct connection for the DC side of PV system.

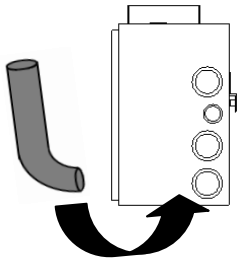


Figure 7.1.1: Insert a conduit to the wiring box

	IMPORTANT Conduit is not a part of accessories supplied with the CPS grid-tied PV Inverter. To ensure the protection class of the inverter, it is important to use the water-proof conduits.

A) Before plugging the DC connectors with the cables of PV strings, it's important to conduct polarity check by following the steps below:

i. Using multi-meter to measure the PV strings' cable ends and check the polarity

ii. The positive (+) terminal of cable should match the Female Connector

iii. The negative (-) terminal of cable should match the Male Connector

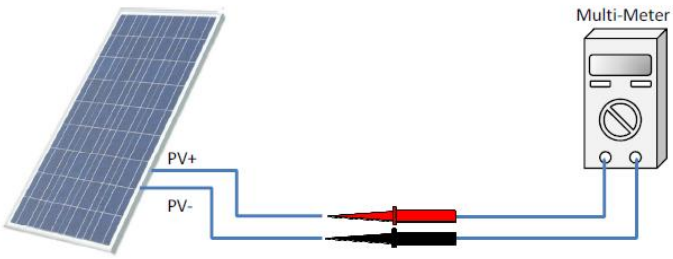


Figure 7.1.2: Polarity checking

Use multi-meter to confirm the total input power of PV strings in order to ensure the input power from PV strings will not exceed the permissible set point of 600VDC as the maximum operating voltage of PV inverter and the maximum DC input current should be within 20A for each pole of DC terminal.

	IMPORTANT Configuration of the PV modules should be done by qualified service personnel with the instructions that are provided from the manufacturer of the PV modules. Ensure the configuration for each string of the PV-system meets the specifications required by the CPS grid-tied PV Inverter.

	Multi-Meter It is important to use a multi-meter to measure the DC input voltage that is generated from the PV modules. It must not exceed 600V_{DC}.

	IMPORTANT The CPS grid-tied PV Inverter is designed with a transformer-less topology. It is recommended NOT connecting the Inverter with the PV modules that require positive (+) or negative (-) polarity to ground.

And it is also necessary to have a circuit breaker or fuse switch installed between PV modules and PV Inverter. When there are PV strings connected with the circuit breaker or fuse switch, please ensure it is turned off before connecting the DC cables to the DC input terminals of PV inverter.

B) For the DC cables, the terminal connectors are recommended to be used with cables in order to ensure the effective electric conduction between DC cables and DC terminals as shown in figure 7.1.2.

Figure 7.1.3: Terminal connectors are required for DC Cables

C) Connecting DC cables of PV strings to the DC terminal by taking the following steps:

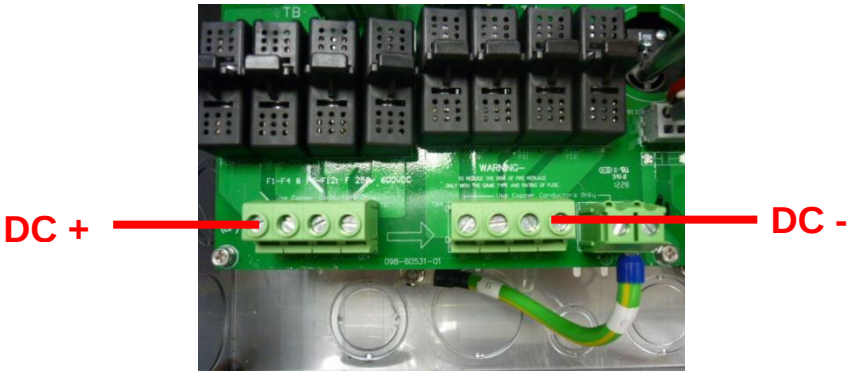


Figure 7.1.4: DC terminal for PV inverter

i. Select the proper rating for the string fuse by following the calculation that had been mentioned in section G. DC Protection of chapter 6.2
ii. Install the DC fuse in its assigned location
iii. Connecting DC positive polarity cable to the DC positive pole terminal in the wiring box
iv. Tighten the DC positive polarity cable in the DC terminal by a screwdriver with the required torque value
v. Connecting DC negative polarity cable to the DC negative pole terminal in the wiring box
vi. Tighten the DC negative polarity cable in the DC terminal by a screwdriver with the required torque value
vii. Double confirm the DC cable from the DC terminal in order to ensure all the DC cables have been tighten firmly in proper location as described in figure 7.1.5:

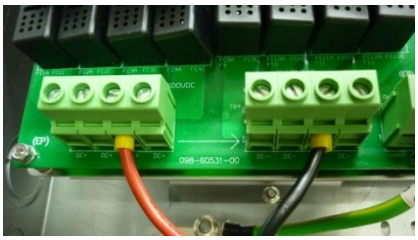


Figure 7.1.5: DC Input Terminal

	IMPORTANT *The size selection of DC cables should be referred to the cable size requirement in the National Electrical Code(NEC), ANSI/NFPA 70* that can be used with the PV inverter, please beware of this.

	WARNING Do not mix the connection with the wrong polarity. This may cause damage to the PV Inverter; therefore, it is very important to do the polarity check before connecting the DC power to the wiring box. Do not start up the PV Inverter while the fuse cover is removed. The dummy fuses must be kept within fuse holder if there is no protection fuses planned to be installed.
	CAUTION Each port (terminal) of the multi-string DC input terminal is only able to be connected with a maximum 20A input current. It is important to ensure the correct connections of the PV modules according to the electrical specifications.
	IMPORTANT It is important to follow the standard formula for the DC fuse selection if string fuses are planned to be used.
	Insulation Protection An insulation glove should be worn during the service period.

D) When the DC power is delivered from an external combiner to the wiring box of the PV Inverter, use a multi-meter to measure the DC voltage on the connected polarity port of the DC input terminal in order to ensure the DC input power is applied within the electrical specification of PV inverter.

E) At last, turn off the circuit breaker for the PV strings of DC input side and then continue with the procedures in next section in order to complete the connection for the AC side.

7.2 AC Wire Connections

Configuration of inverter with different Utility Grid Systems

CPS grid-tied PV Inverter can be installed with the following type of utility grid systems by 2 wire or 3 wire AC cables, and with a ground cables as illustrated in the table below.

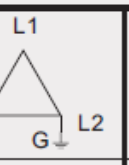
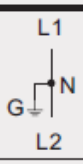
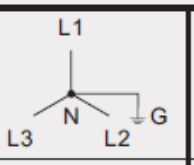
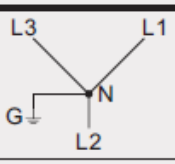
GRID STANDARD	 208V~ /240V~ 3PH - Δ				 240V~ SPLIT-PHASE				 277V~ 3PH - Y				 208Y /120V 3PH - Y			
TERMINAL	1	2	3	⏚	1	2	3	⏚	1	2	3	⏚	1	2	3	⏚
WIRE	L1	L2	-	G	L1	L2	N	G	L1	N	-	G	L1	L2	N	G

Figure 7.2.1: Utility grid systems

Acceptable PV Systems for CPS grid-tied PV Inverter:
For 208V and 240V 3-phase delta grid system, a 3-phase delta configuration can be used by the 2 AC wires connected to the Point of Common Coupling (PCC) L1 and L2 location and a ground cable connected to the L2 location as shown in the above table.

For 240V split grid system, a split-phase configuration can be used by 3 AC wires connected to the PCC's L1, L2 and N location and a ground cables connected to the N location as shown in the above table.

For 277V 3-phase Y grid system, a wye type configuration can be used by 2 AC wires connected to L1 and N locations with a ground cables connected to the N location as shown in the above table.

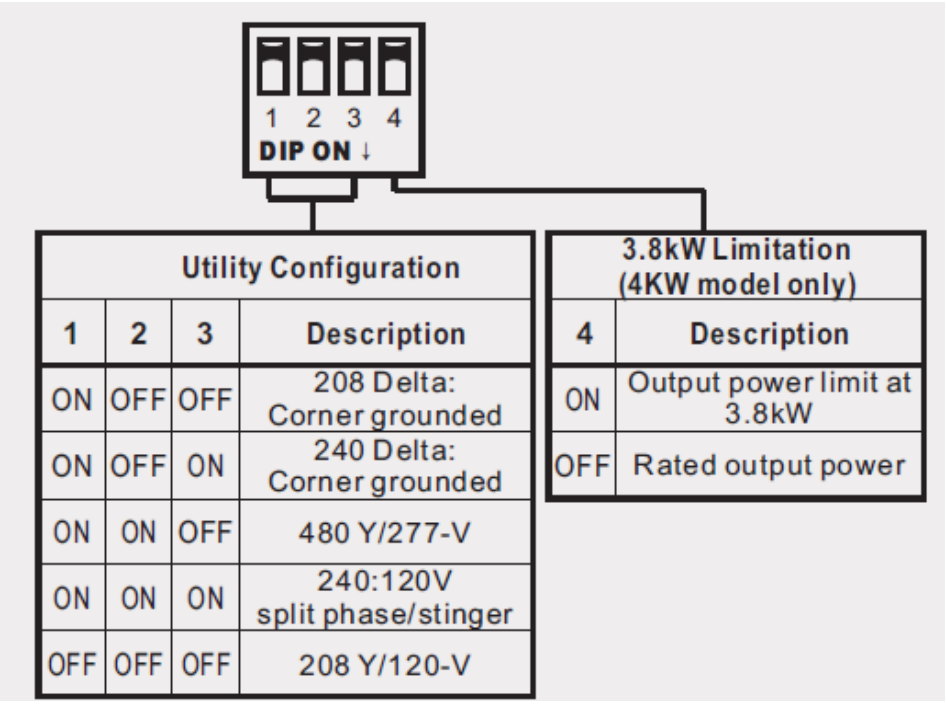
For 208Y /120V 3-phase Y grid system, a wye type configuration can be used by 3 AC wires connected to L1, L2, and N with a ground cable connected to the N location as shown in the above table.

	WARNING Configuration of utility grid connections is required to be completed by a licensed technician or electrical contractor. Ensure the correct sized AC cables are used!

	DANGER The Alternating Current (AC) source is directly connected to the terminals in the PV Inverter. All connections between public utility and the PV inverter's Alternating Current (AC) terminals must be operated and serviced by a licensed technician.

The utility-configuration dip switch is embedded within wiring box to ensure the PV Inverter can be used in the different utility grid systems. The configuration setting of this dip switch is described in figure 7.2.1. The following tables described the functions that can be enabled through the PIN configuration on the utility configuration dip switch. It is recommended that a qualified service personnel complete the configuration of this DIP switch during the installation period.

Utility configuration setting



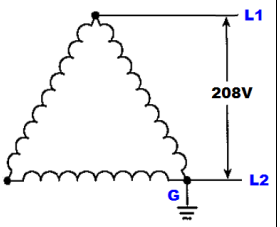
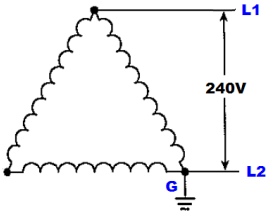
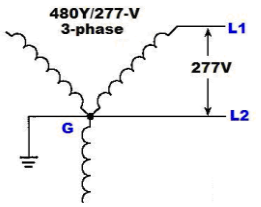
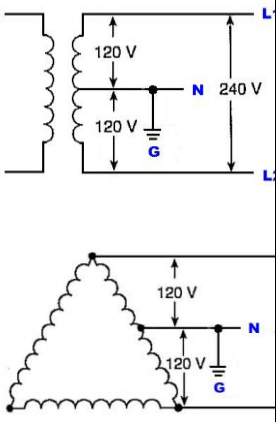
Utility Configuration			
1	2	3	Description
ON	OFF	OFF	208 Delta: Corner grounded
ON	OFF	ON	240 Delta: Corner grounded
ON	ON	OFF	480 Y/277-V
ON	ON	ON	240:120V split phase/stinger
OFF	OFF	OFF	208 Y/120-V

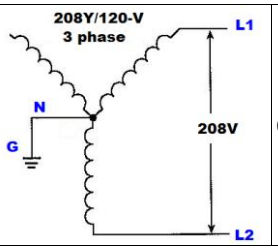
3.8kW Limitation (4KW model only)	
4	Description
ON	Output power limit at 3.8kW
OFF	Rated output power

Figure 7.2.2: Utility Configuration Setting DIP Switch

	IMPORTANT It is important to complete the DIP switch settings before starting the AC wiring connections.

Table 7.2.1: Utility Configuration

	Utility Configuration				Description	AC Terminal				LCD Display
	DIP switch Setting									
	Pin 1	Pin 2	Pin 3	DIP switch		1	2	3	⏚	
	ON	OFF	OFF		208 Delta: Corner grounded	L1	L2	—	G	XKW **208 Delta: Corner grounded**
	ON	OFF	ON		240 Delta: Corner grounded	L1	L2	—	G	XKW **240 Delta: Corner grounded**
	ON	ON	OFF		480 Y/277-V	L1	L2	—	G	XKW **277Vac System**
	ON	ON	ON		240V:120V split phase 240V:120V Stinger	L1	L2	N	G	XKW **240Vac Split**

	OFF	OFF	OFF		208Y/120-V	L1	L2	N	G	XKW **208Y/120-V**

Note: The neutral conductor is required to be the same gauge as the phase conductors.

Configuration for the AC Wiring:

A) After the DC wiring connection is finished, start to dash an open hole for the AC cables, insert the conduit, and tighten with the conduit gland.

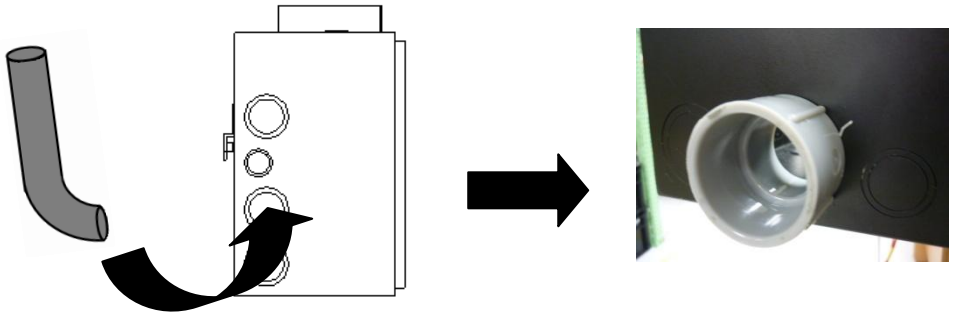


Figure 7.2.3: Insert a conduit through an open hole

B) Ensure the AC utility system is compatible with CPS grid-tied PV Inverter. Confirm the specific kind of utility system being used, and then select the corresponding setting of utility configuration DIP switch as per the instructions in Table 7.2.1 before the procedures for AC connection.

C) Use a multi-meter to measure the AC voltage from the combiner box for AC utility. It is important to confirm the configuration of AC utility matches with that of the utility configuration DIP switch.

D) Refer to the information in the table 310.16 of the National Electrical Code (NEC), and select the proper size of AC cables for the Position 1 pole / Position 2 pole / Position 3 pole. Refer to the column 2 of table 18.1 in the UL1741 electrical code, and select the proper size of ground cable for the AC terminal.

The following table shows the information of cable size and torque values that should be used in the position (1) pole / position (2) pole / position (3) pole in the AC terminal when a 208V grid system is applied with the PV inverter.

Table 7.2.2: AC Cables Size

Inverter Model / Terminal block		CPS SCE4KTL-O/US	CPS SCE5KTL-O/US	CPS SCE6KTL-O/US	CPS SCE7KTL-O/US
Terminal block labeled with (1), (2), (3)	Admissible conductor size	10 AWG		8 AWG	6 AWG
		90 °C / 194 °F, Copper			
	Torque value	15.6 lbf-in (18 Kgf-cm)		33.1 lbf-in (38.1 Kgf-cm)	
Terminal block labeled with (G)	Admissible conductor size	10AWG			
	Torque value	15.6 lbf-in (18 Kgf-cm)		33.1 lbf-in (38.1 Kgf-cm)	

IMPORTANT
The selection for the AC cable size and required torque values for the Position 1 / Position 2 / Position 3 is referred to the table 310.16 in the National Electrical Code (NEC).

E) Connect the AC cables with PV inverter by inserting them through the conduits into wiring box as figure 7.2.4 shown:

Figure 7.2.4: Insert the AC cables through conduit

F) For the AC cables, the terminal connectors are recommended to be used with AC cables in order to ensure the effective electric conduction between AC cables and AC terminals as shown in figure 7.2.5.

Figure 7.2.5: Terminal connectors are required for AC Cables

G) Confirm the selected grid system is compatible with the PV inverter. Then connect the AC cables to correct positions as per the symbol on the configuration label for the AC cables in the wiring box.

Figure 7.2.6 shows the AC cable connections when a 208V grid system is applied with the PV inverter. L-phase cable is connected to position (1) pole, Neutral cable is connected to position (2) pole and ground cable is connected to the ground symbol pole. On the other hand, please ensure the setting of the AC DIP switch has been set correctly with the applied grid system.

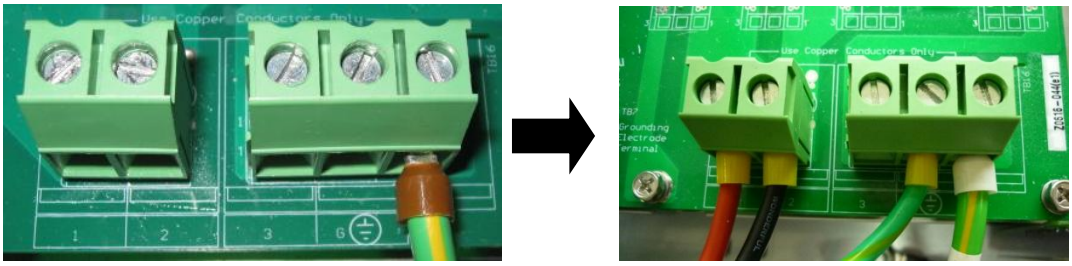


Figure 7.2.6: Connect the AC Cables to Correct Positions

H) Tighten the screws for the AC cables with the required torque values as listed in the Table 7.2.2. Then turn on the circuit breaker from the utility panel or switchboard, and use a multi-meter to measure whether the AC voltage of PV system is normal and the connection is correct.

I) Check the condition of the conduits again to ensure all conduits are tightly locked and sealed for the protection against rain and dust before the top cover is reinstalled on the wiring box.

J) Lastly, reinstall the top cover of wiring box by tightening 2*M4 and 4*M5 screws as shown below:

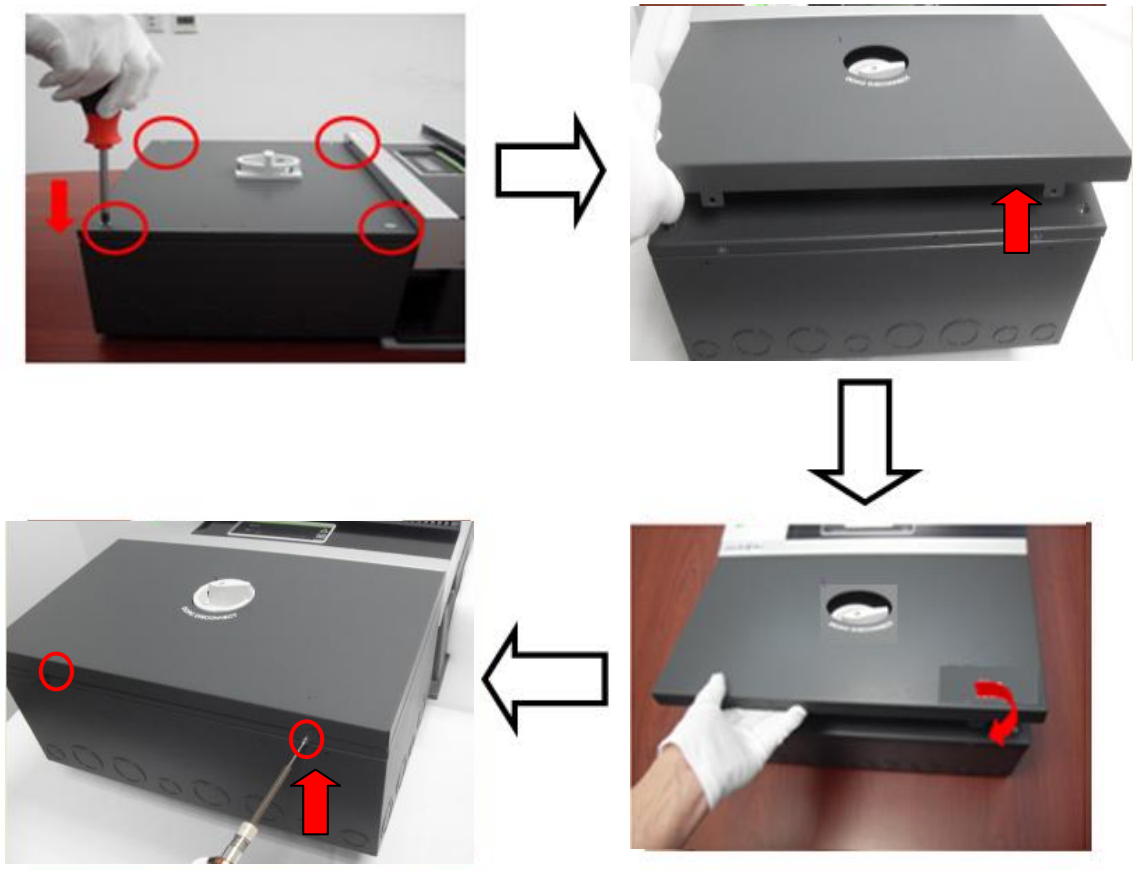
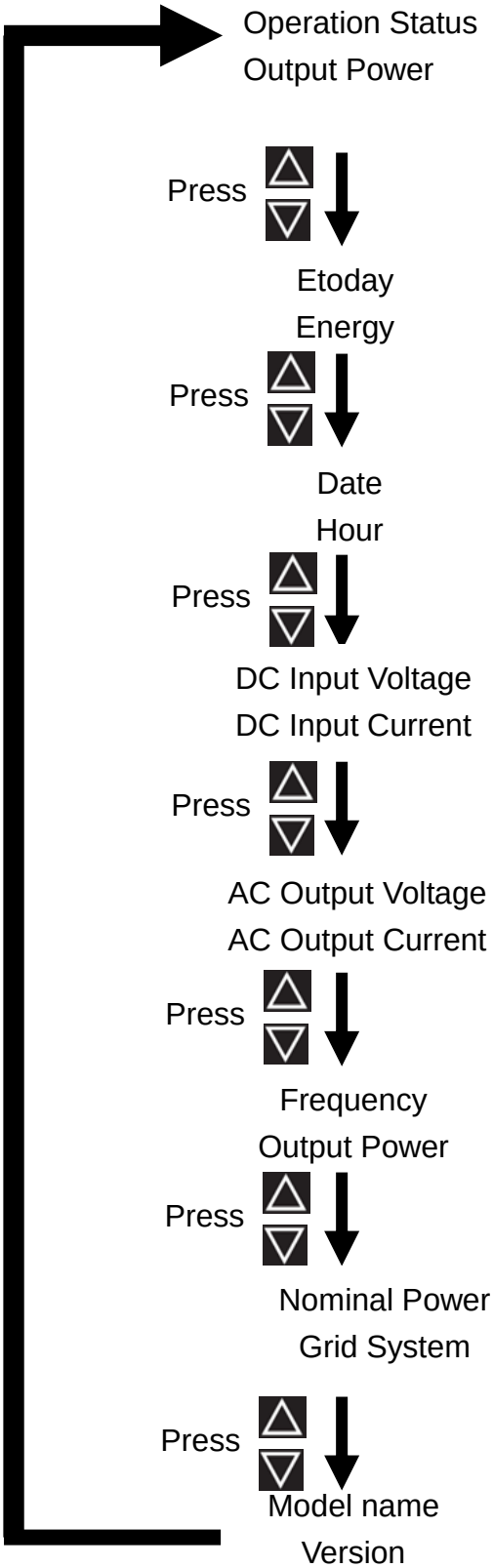


Figure 7.2.7: Reinstall the top cover of wiring box

8. LCD Display and Function Structure

8.1 First Level Display Menu



Definition of Level 1 display menu

Operating and Output power Status

Display the operation status and the instant-output power of the unit.

Etoday and Energy Menu

Display the output energy that is produced on the current day and the total energy that is produced since the PV Inverter was installed.

Date and Hour Menu

Display date and time of the current day.

DC Voltage and DC Current Menu

Display the DC voltage and DC current from the PV array.

AC Voltage and AC Current Menu

Display the output AC voltage and AC current.

Frequency and Output Power

Display the AC frequency and the instant-output power of the unit.

Nominal Power and Grid System Menu

Display the nominal power of the PV Inverter and voltage of the AC utility system.

Model Name and Version

Display Model name and the firmware version.

Figure 8.1.1: First level display menu

8.2 Second Level Display Menu

8.2.1 Daily, Weekly and Monthly Energy Display Menu

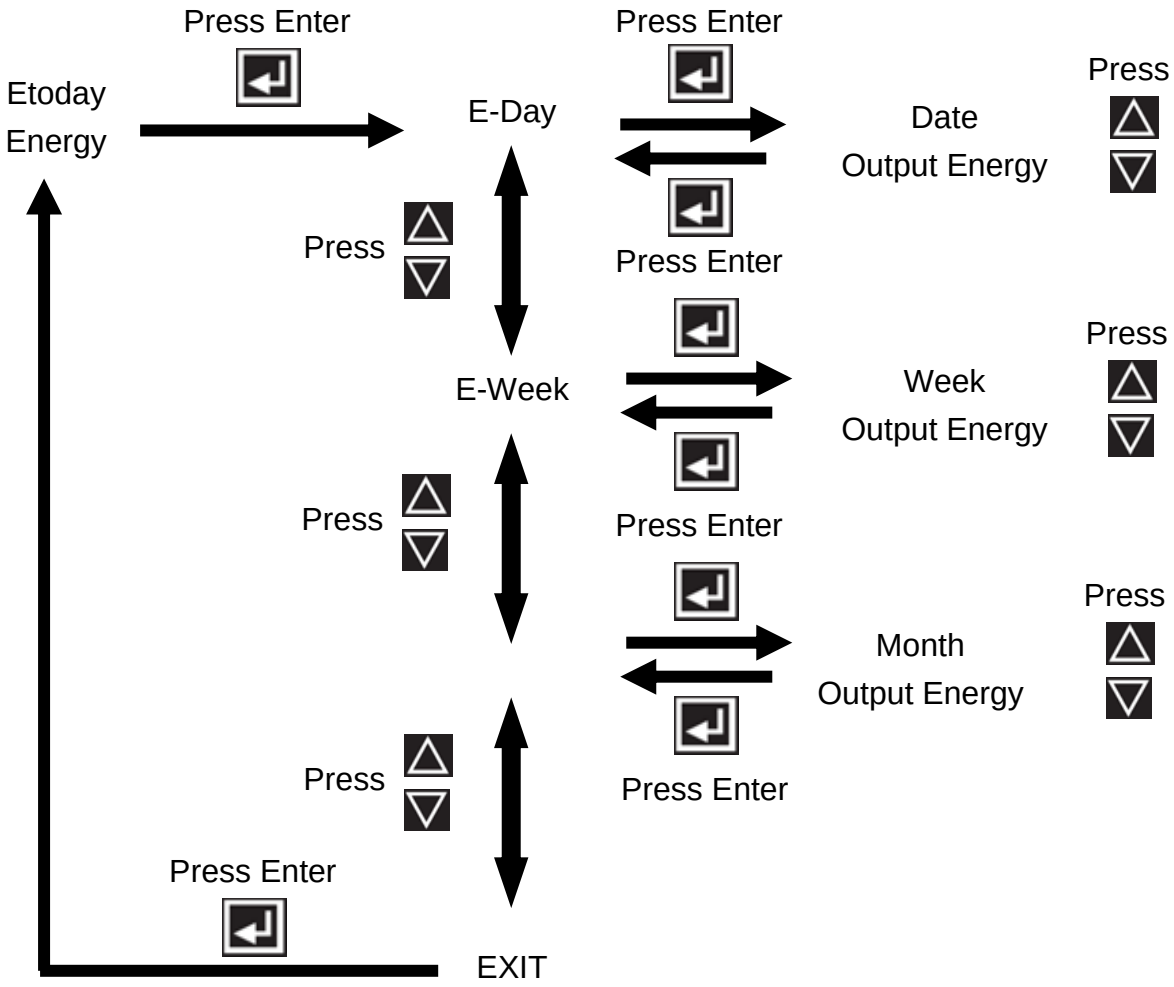


Figure 8.2.1: Second level display menu

E-Day Display Menu

It is a menu that will display the output energy for the past 30 days.

E-Week Display Menu

It is a menu that will display the output energy for the past 52 weeks.

E-Month Display Menu

It is a menu that will display output energy for the past 12 months.

EXIT Display Menu

It is a menu that is used to return back to Etoday menu, the level 1 display menu.

8.2.2 Date and Hour Display Menu

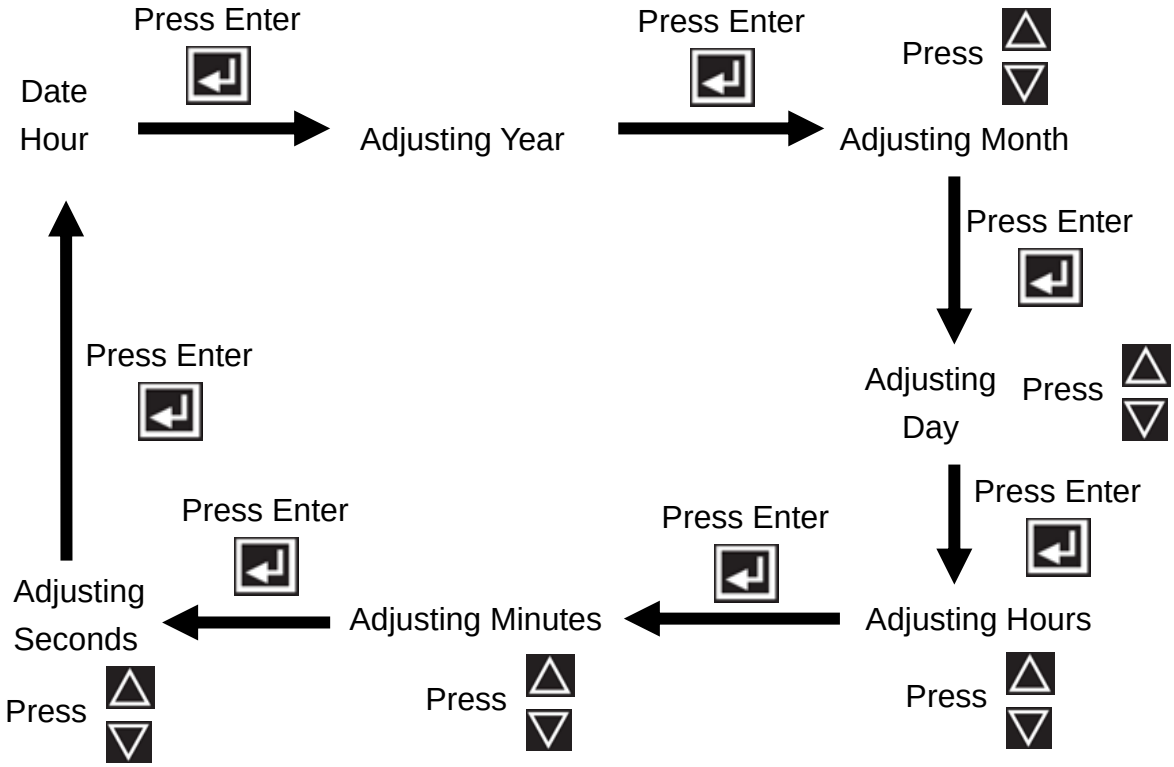


Figure 8.2.2: Date and Hour display menu

	IMPORTANT The Enter button is the control button that is used to enter subdirectory for the configurations and the direction control buttons are used to rotate between each menu.

Date Adjusting Menu

It is the date and hour setting menu that is used to change date and time of the PV Inverter. The Enter button is used to change between different units of time and the direction buttons are used to adjust the value of the unit, such as year, month, day, hour, minute and second.

	IMPORTANT Operational data will be recorded by the date and hour. Therefore, it is important to ensure the time of inverter is adjusted correctly.

9. Maintenance

9.1 Replace the external cooling fan

For ***CPS SCE4KTL-O/US and CPS SCE5KTL-O/US*** models, there is no cooling fan designed for the external housing, but an internal fan designed in PV inverter for the thermal management. Therefore, **"FAN Lock"** is the only failures message that user will receive from the LCD if the operation of internal cooling fan has failed. If this situation happens, please contact our after-sales service center for further instructions.

For ***CPS SCE6KTL-O/US and CPS SCE7KTL-O/US*** models, there is an external cooling fan and the internal cooling fan designed in PV inverter for the thermal management.
The external fan is located at the top of PV Inverter as shown in figure 9.1.2. When the cooling fan is not working properly, user will receive three different kinds of failure messages from the LCD.
1. "FAN Lock" is the first kind of failure message that will be shown on the LCD when both external and internal cooling fans are not working properly.
2. "FAN1 Lock" is the second kind of failure message when the external cooling fan is not working properly.
3. "FAN2 Lock" is the third kind of failure message when the internal cooling fan is not worked properly.
If "FAN1 Lock" is indicated on the CPS SCE6KTL-O/US and CPS SCE7KTL-O/US models, please check whether there is any obstacle (stopping) blocking the external fan. When no obstacle is found, users can follow the procedures to change the external cooling fan to see whether the cooling fan problem can be fixed by changing a new cooling fan. If the "***FAN Lock***" or "***FAN2 Lock***" is indicated on the CPS SCE6KTL-O/US and CPS SCE7KTL-O/US models, please contact our after-sales service center for further instructions since the internal cooling fan is not working properly.

	IMPORTANT If the "**FAN2 LOCK**" is indicated on the CPS SCE6KTL-O/US and CPS SCE7KTL-O/US models or "**FAN LOCK**" on the CPS SCE4KTL-O/US and CPS SCE5KTL-O/US models, this means the interior cooling fan inside the main housing of PV Inverter is probably defective and needs to be replaced. Please contact our after-sales service center for further assistance.

If the cooling fan is too dirty, a vacuum cleaner can be used to clean the PV Inverter from the top. If the cleaning procedure does not fixed the problem, call our after-sales service personnel to determine the status of the cooling fan and make a replacement. The following procedures describes how to change the cooling fan, please read and understand all procedures before doing so.

A) Switch off the DC/AC disconnect switch and wait for at least three minutes to discharge the stored energy in the PV inverter.

Figure 9.1.1: Turn off DC/AC switch

B) Unfastening all screws located in each corner as highlighted in figure 9.1.2. After the screws are removed, take off the top cover of the cooling fan from PV Inverter as shown in the figure below:

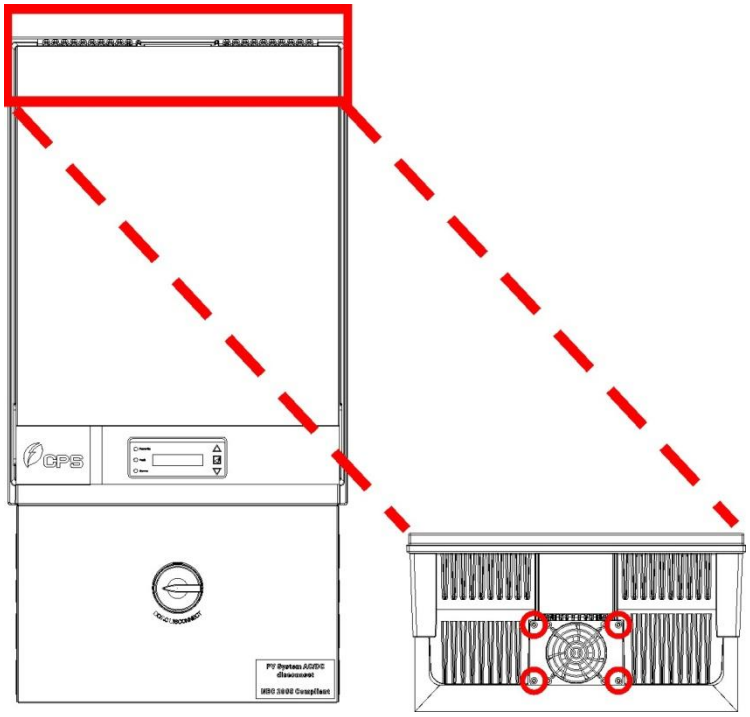


Figure 9.1.2: Screws for the external cooling fan

C) Taken out the cooling fan, and then disconnect the power cable of the cooling fan as shown in Figure 9.1.3.

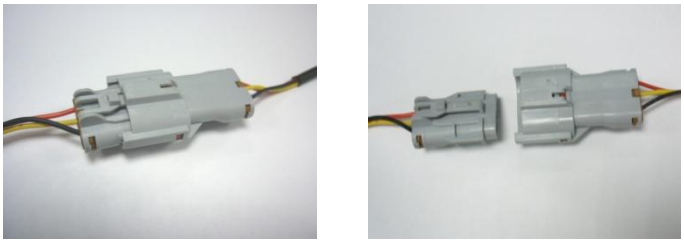


Figure 9.1.3: Disconnect the power cables of the cooling fan

D) Replace with a new cooling fan by connecting its power cable to PV Inverter. Then re-tighten the 4 screws at the top cover.

E) Switch on the DC/AC disconnect switch to complete the fan replacement procedure.

9.2 Clean the LCD Display

If the screen of the LCD display and the LED indicators are dusty and not readable, please use a piece of damp cloth to clean the surface.

9.3 Install or Replace the DC/AC fuse

	Insulation Protection The insulation gloves should be worn during wiring, replacing fuses and installing components.
	ELECTRIC SHOCK There is a risk of electric shock from the energy stored in the capacitors. Therefore, it is necessary not to remove the top cover of wiring box until 3 minutes after DC/AC disconnect switch is turned off. It is necessary to turn off the external DC/AC breakers if they exist. Otherwise, it is important to disconnect all the PV modules and AC utility connections before the service of fuse replacement. The PV Inverter must be disconnected from all sources of power supply. Refer service to only qualified service personnel.

	IMPORTANT The selection of the DC fuses must follow the instructions outlined in chapter f. DC protection of section 6.2 within the manual.

A) Remove the fuse cover from the fuse holders as shown in figure 9.3.1:

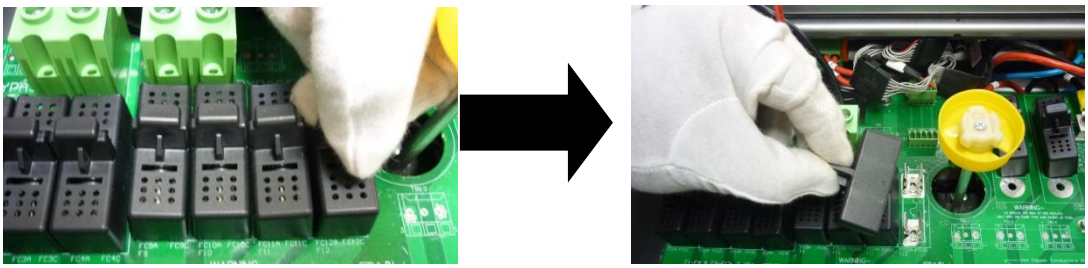


Figure 9.3.1: Remove the fuse cover

B) Next, take off the broken fuse or dummy fuse from the fuse cover as shown in figure 9.3.2:

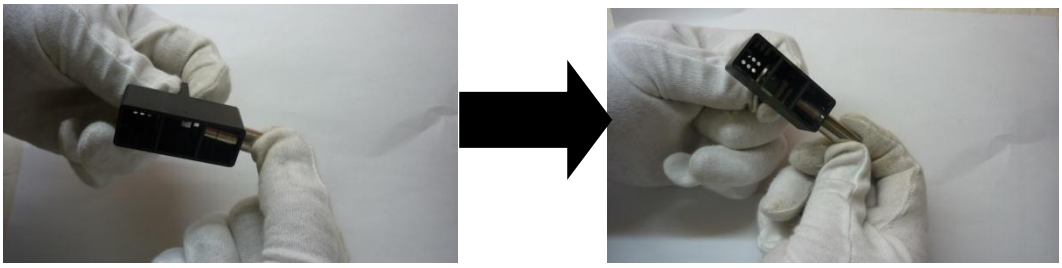


Figure 9.3.2: Take off the broken fuse

C) Insert a new fuse into the fuse cover. Ensure the fuse is selected from the recommended list of brands and rating as described in the DC and AC protection chapters in section 6.2 of this manual.

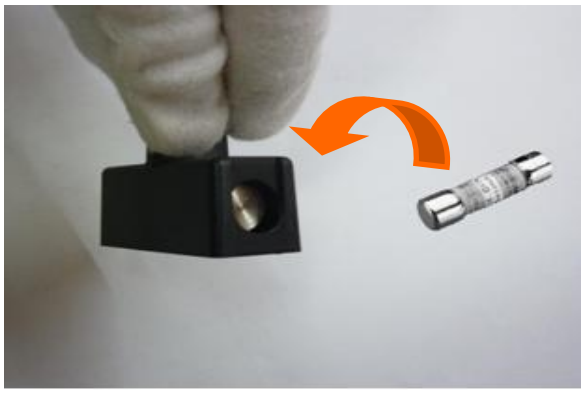


Figure 9.3.3: Install a new fuse

D) Install the fuse cover with the new fuse into the correct fuse holder as shown in figure 9.3.4. It is important to ensure the fuse cover is inserted tightly into fuse holder in order to complete the fuse replacement and re-installation procedure.

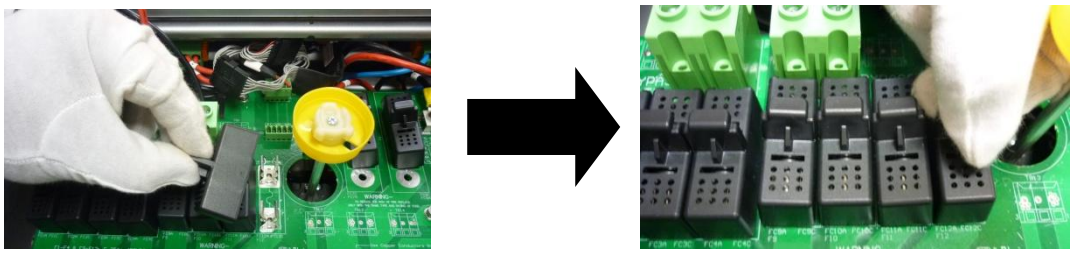


Figure 9.3.4: Install the fuse cover

10. Specifications

Model		CPS SCE4KTL-O/US	CPS SCE5KTL-O/US	CPS SCE6KTL-O/US	CPS SCE7KTL-O/US
Market		North America			
Input (DC)					
Max. PV Power		4.8 KW	6 KW	7.2 KW	8.4 KW
Nominal DC Input Power		4.1KW	5.2KW	6.2KW	7.3KW
Nominal DC voltage		360 V	360 V	360 V	360 V
Max. PV open voltage		600 V	600 V	600 V	600 V
Start-up DC Input Voltage		150 V	150 V	150 V	150 V
Operating DC Input Voltage Range[1]		100 ~ 515 V	100 ~ 515 V	100 ~ 515 V	100 ~ 515 V
MPPT Voltage Range		225 ~ 500 V	200 ~ 500 V	200 ~ 500 V	200 ~ 500 V
Number of MPP tracker(s)		1	1	1	1
Number of DC Input Pairs		4	4	4	4
Max. DC current		19 A	26 A	32 A	37 A
Max. Input Current per String		20A	20A	20A	20A
DC insulation resistance[2]		> 2MΩ			
DC Disconnection Type		Switch			
Output (AC)					
Nominal AC power @ 240Vac & 277Vac		4000W	5000W	6000W	7000W
Nominal AC power @ 208Vac		3800W	4600W	6000W	7000W
Max. AC power @ 240Vac & 277Vac		4000W	5000W	6000W	7000W
Max. AC power @ 208Vac		3800W	4600W	6000W	7000W
Grid Connection Type		Single phase / 240V Split phase (Refer to 5.4)			
Rated Output Voltage		240V Split phase			
Operational voltage range / Firmware setting value	208V system[3]	186~225V			
	240V system[4]	215~260V			

[1] This is the DC voltage range that inverter can feed power to the grid.
[2] The DC resistance requirement for positive or negative terminal to chassis ground.
[3] Regulation range: 183~229Vac
[4] Regulation range: 211~264Vac

Model		CPS SCE4KTL-O/US	CPS SCE5KTL-O/US	CPS SCE6KTL-O/US	CPS SCE7KTL-O/US
	277V system[5]	248~300V			
Rated Output Frequency		60Hz			
Power Factor		>0.99			
Output Frequency Range[6]		59.3-60.5Hz			
Current THD		<3%			
AC Disconnection Type		Switch			
Nominal AC current @ 208Vac		18.3A	22.1A	28.9A	33.7A
Nominal AC current @ 240Vac		16.7 A	20.8 A	25 A	29.2A
Nominal AC current @ 277Vac		14.4 A	18.1 A	21.7 A	25.3A
Max. AC current[7] @ 208Vac system		18.5A	22.5A	30A	35A
Max. AC current[7] @ 240Vac system		18.5A	22.5A	28.5A	33.2A
Max. AC current[7] @ 277Vac system		16.4A	20.5A	24.6A	28.7A
System					
Topology		Transformerless			
Max. Efficiency		97.5%			
CEC efficiency		97%			
Stand-by / Night Consumption[8]		<7W / <0.2W			
Environment					
Protection Degree		NEMA 3R			
Cooling		Forced air cooling			
Operating Humidity		0-95%, non-condensing			
Operating Altitude		6562ft / 2000m without derating			
Operating temperature range[9]		-25 ~ +50℃			

[5] Regulation range: 244~305Vac
[6] Regulation range: 59.3~60.5 Hz
[7] The max OCPD(Over Current Protection Device) rating should not exceed the value in Table 6.3.1
[8] Test condition of night power consumption: 240Vac
[9] The LCD panel working temperature must be above -20℃. The inverter can work normally without LCD display between -20℃ and -25℃.

Model	CPS SCE4KTL-O/US	CPS SCE5KTL-O/US	CPS SCE6KTL-O/US	CPS SCE7KTL-O/US
Display and Communication				
Display	LCD + LED			
Communication	RS232, Modbus			
Mechanical Data				
Dimensions (WxHxD)	17.0x33.4x8.4in / 434x850x213mm			
Weight	86lbs / 39kg	90lbs / 41kg	101lbs / 46kg	101lbs / 46kg
Safety				
Safety and EMC Standard	UL1741: 2010, CSA C22.2 No.107.1-01, FCC PART15 Class B			
Grid Standard	IEEE1547: 2003, IEEE1547.1: 2005			

11. Trouble Shooting

11.1 Display Message Table

It is important to understand all operational and error messages that could appear on the LCD display. The error messages that appear are especially important because service personnel will need this information reported in order to help them define the failure and correct it.

I) Working Status Messages

Operation Condition	Messages	Descriptions
Power Off	No Display	1. Initial condition: Before system startup voltage (150V) 2. PV Inverter is totally shutdown, Vpv < 80V
Initialization and Waiting	Waiting	1. Initial condition: When PV voltage is higher than 150V, inverter is waiting for feeding to the grid 2. After Startup: Input voltage range is at 80 ~ 100V
Check Grid	Checking xxxS	When PV voltage > 150V, inverter is checking grid conditions
Feeding Grid	Normal	Inverter is feeding power to the grid
FLASH	FLASH	FLASH Firmware

II) Monitoring Parameter Messages

Operation Condition	Messages	Descriptions
Instantaneous Output Power	Pac= xxxx.xW	The real time output power in xxxx.xW
Cumulated energy information	Energy= xxxxxxkWh	Total energy that has been fed to the grid since inverter was installed
Today's energy information	Etoday= xxx.xkWh	Daily energy that has been fed to the grid
Grid Voltage	Vac=xxx.xV	Grid voltage in xxx.x VAC
Grid Frequency	Frequency = xx.xHz	Grid frequency in xx.xHz
Feeding Current	Iac=xx.xA	Feeding current amount in xx.xA

PV Array Voltage	Vdc=xxx.xV	Input voltage from PV array, xxx.xVDC
PV Array Current	Idc=xx.xA	Input current from PV array, xx.xA

III) System Information Messages

Operation Condition	Messages	Descriptions
Model Display	CPS SCExKTL-O/US	Inverter Model
LCD Display Lock	Lock	Hold the present display message
Waiting for reconnecting to the grid	Reconnect in xxx S	The time for reconnecting to the grid

IV) System Fault Messages

Operation Condition	Messages	Descriptions
Isolation Failure	Isolation Fault	Ground-fault of the PV-modules or failure of surge voltage protection
Grid Failure	Grid Fault	Measured data from Grid is beyond the specification (voltage & frequency)
No Utility	No Utility	Utility is not available
Input Voltage too High	PV over voltage	Input voltage higher than the 600V
Ground I Fault	Ground I Fault	Leakage current on ground conductor is too high

V) Inverter Fault Messages

Operation Condition	Messages	Descriptions
Consistent Fault	Consistent Fault	The readings of 2 microprocessors are not consistent. It could be caused by CPU and/or other circuit not functioning properly.
Fan Lock	Fan Lock	All the cooling fans of the unit are locked and not functioning (All models)
Fan1 Lock	Fan1 Lock	Internal fan abnormal (only for CPS SCE6KTL-O/US and CPS SCE7KTL-O/US)
Fan2 Lock	Fan2 Lock	External fan abnormal (only for CPS SCE6KTL-O/US and CPS SCE7KTL-O/US)
Temperature too high	Over temperature	The internal temperature is higher than normally allowed value
Output Relay Failure	Relay failure	The relay between the inverter and grid is not functioning

Output DC Injection too high	DC Inj high	Output DC current injection is too high
EEPROM Problem	EEPROM failure	The inside EEPROM has data access problem

Operation Condition	Messages	Descriptions
Communication failure between microprocessors	SCI failure	Communication between the inside MCU is abnormal
DC bus voltage is too high	High DC bus	The DC BUS inside is higher than expected
GFCI detection abnormal	GFCI Failure	The GFCI detection circuit is abnormal
Resistance stick abnormal	Damp Fail	The function of resistance stick is abnormal

11.2 Trouble Shooting Actions

Trouble shooting action for System Faults Messages

A) Isolation Fault

Conditions: The resistance between the PV + or PV – and grounding is outside the permissible range, <2MΩ.

Corrective Actions:

- ✓ Restart the inverter again.
- ✓ If fault still occurs after the unit is restarted, contact the system installer immediately
- ✓ Ask the system installer to check if the PV Inverter and PV Modules are properly insulated throughout the solar system.

B) Grid Fault

Conditions: The grid voltage or grid frequency of the PV Inverter is not within the permissible range. This can be caused by improper connection of the AC side; wrong setting of the utility dip switch or the local grid condition is out of acceptable range.

Corrective Actions:

- ✓ Check the grid voltage and frequency information from the LCD displays
- ✓ If the detected grid voltage is within permissible range, restart the PV Inverter and try again. If fault remains, contact the system

installer to check the grid voltage and cable connections between PV Inverter and Utility system.

- ✓ If detected grid voltage is out of permissible range, contact the system installer to check the feed-in AC voltage and contact the utility operator for further action.

C) No Utility

Conditions: Utility is not available. This can occur if the AC fuse is broken, No AC connections from utility system, or broken AC cables.

Corrective Actions:

- ✓ Check the Utility system and the AC connections of the PV Inverter
- ✓ Check the AC fuses of the PV Inverter
- ✓ If failure remains, disconnect the PV Inverter and contact the system installer.

D) PV Over Voltage

Conditions: DC voltage fed by the PV module is higher than permissible range, 600Vdc.

Corrective Actions:

- ✓ Disconnected PV modules immediately.
- ✓ Check the configuration of the strings for the PV modules and ensure the maximum input voltage is lower than 600V.

E) Ground I Fault

Conditions: Leakage current on ground conductor is too high.

Corrective Actions:

- ✓ Check the AC Cables Connections, especially the grounding cables. Ensure all the cables are connected properly.
- ✓ Restart the PV Inverter.
- ✓ If fault remains, disconnect the PV Inverter and contact the system installer.

Trouble Shooting Actions for Inverter Faults Messages

A) Consistent Fault

Conditions: The readings between two microprocessors of control board are not consistent. It could be caused by the DSP and/or other circuits not functioning properly.

Corrective Actions:

- ✓ Restart the PV Inverter.
- ✓ If fault remains, disconnect the PV Inverter and contact the inverter installer.

B) FAN1 Lock (CPS SCE6KTL-O/US and CPS SCE7KTL-O/US)

Conditions: The external cooling fan of PV Inverter is not working properly.

Corrective Actions

- ✓ Visually check the front cooling fan and remove the obstacle if any.
- ✓ If the top fan is not functioning, it may be replaced as per the instructions described in section 9.1.
- ✓ If fault remains, disconnect the PV Inverter and contact the inverter installer.

C) Over Temperature:

Conditions: The internal temperature is higher than normal value

Corrective Actions:

- ✓ Disconnect PV Inverter for a period of time (>30 minutes) and then restart the PV Inverter.
- ✓ If fault remains, disconnect the PV Inverter and contact the inverter installer. Select a new location for the installation if it is necessary.

D) Relay Fault:

Fault Conditions: The relay between inverter and grid is not functioning.

Corrective Actions:

- ✓ Restart the PV Inverter.
- ✓ If fault remains, disconnect the PV Inverter and contact the inverter installer.

E) DC Inj. high

Fault Conditions: Output DC current injection is too high.

Corrective Actions:

- ✓ Check the connection of the DC Input.
- ✓ Restart the PV Inverter.
- ✓ If fault remains, disconnect the PV Inverter and contact the inverter installer.

F) EEPROM Failures

Conditions: EEPROM inside has data access problem.

Corrective Actions:

- ✓ Restart the PV Inverter.
- ✓ If fault remains, disconnect the PV Inverter and contact the inverter installer.

G) SCI failure

- ✓ Conditions: Communication between the inside MCU is abnormal.

Corrective Actions:

- ✓ Restart the PV Inverter.
- ✓ If fault remains, disconnect the PV Inverter and contact the inverter installer.

H) High DC bus

- ✓ Conditions: The DC BUS inside is higher than expected.

Corrective Actions:

- ✓ Restart the PV Inverter.
- ✓ If fault remains, disconnect the PV Inverter and contact the inverter installer.

I) GFCI Failure

Conditions: The GFCI detection circuit is abnormal.

Corrective Actions:

- ✓ Check the grounding cable of the PV Inverter
- ✓ Restart the PV Inverter.
- ✓ If fault remains, contact the inverter installer to check the grounding of the PV Inverter.
- ✓ If the fault remains, disconnect the PV Inverter and contact the inverter installer.

J) Damp Fail

Condition: The resistance stick is working outside the permissible range.

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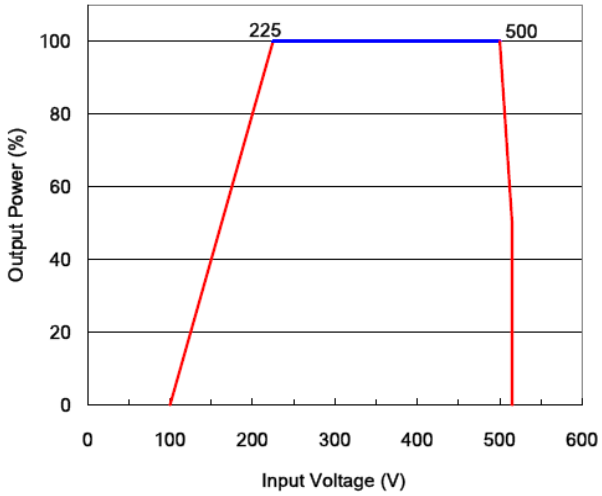
Corrective Actions:

- ✓ Restart the PV Inverter.
- ✓ If fault remains, disconnect the PV Inverter and contact the inverter installer.

12. Power Curve

Allowable Output Power vs. String Voltage as shown below.

CPS SCE4KTL-O/US



CPS SCE5KTL-O/US, CPS SCE6KTL-O/US, CPS SCE7KTL-O/US

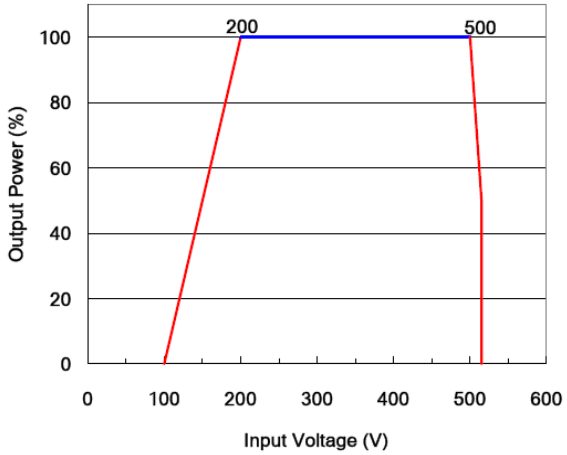


Figure 12.1.1: Line loss vs. cable length

Appendix: Configuration of Wiring Box