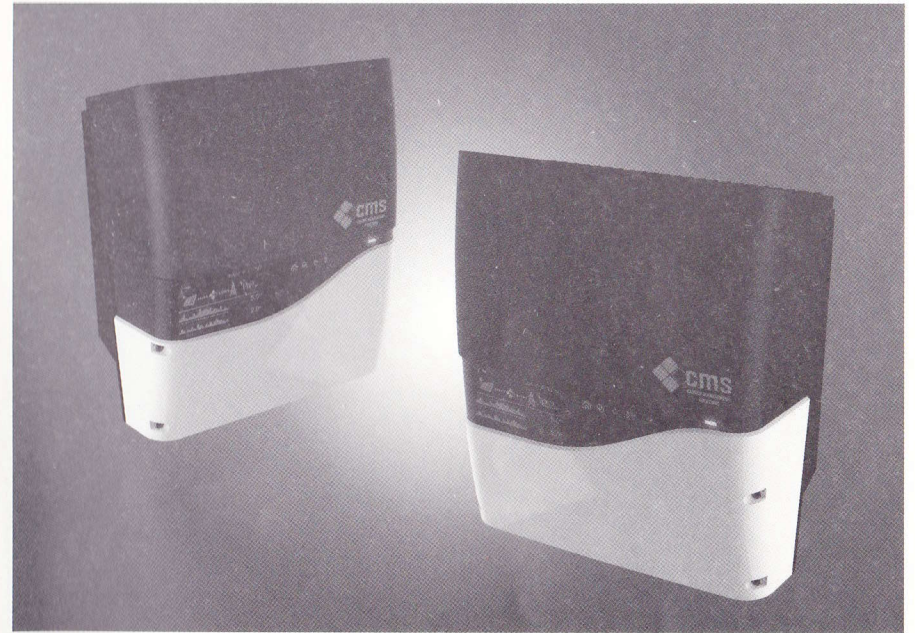


## SMART SERIES PV INVERTER



1500SS & 3000SS

## Installation & Operation Manual



MU15-B00000-0

Version 1.0 Apr. 2011

## Safety Precautions

Before starting your journey, please read the following safety instructions carefully.



### *Dangers!*

High voltage inside inverter can cause Electric shock, even when inverter is not operating.



### *Qualified personnel ONLY!*

Only Qualified technicians should install or service this unit.



### *PV modules ONLY!*

Designed for PV and solar power conversion only; do not use it for other DC sources and conversion.



### *Hot Surface*

Some metallic parts of enclosure may be hot during operation. Touch the area for operation only.

## Contact Information

Carbon Management Solutions

Free Call: 1300 902 110

FAX: +61 (0) 2 4759 3927

PO Box 126

19 John Street

Lawson, NSW 2783

<http://www.carbonmanagement.com.au/>

## Warranty Information

Warranty or liability will be void if damage caused by any, but not limited to the following:

1. Unauthorized opening of the unit
2. Installation faults such as improper environment, wiring and application
3. Working conditions beyond the unit specifications
4. Improper operation of the unit
5. Violation of safety instructions inside this manual
6. Damage during transportation
7. Any internal modification
8. Replacing or installation of unauthorized software
9. Software not provided by CMS
10. Unforeseen calamity or force majeure



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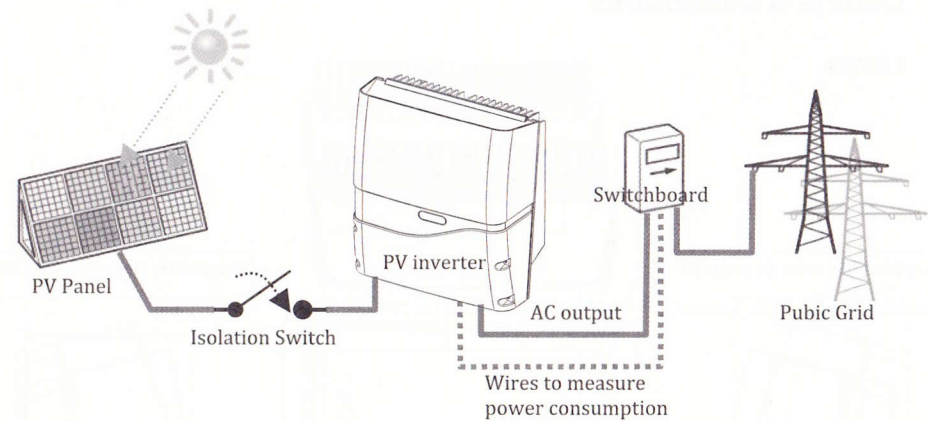
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## PV System



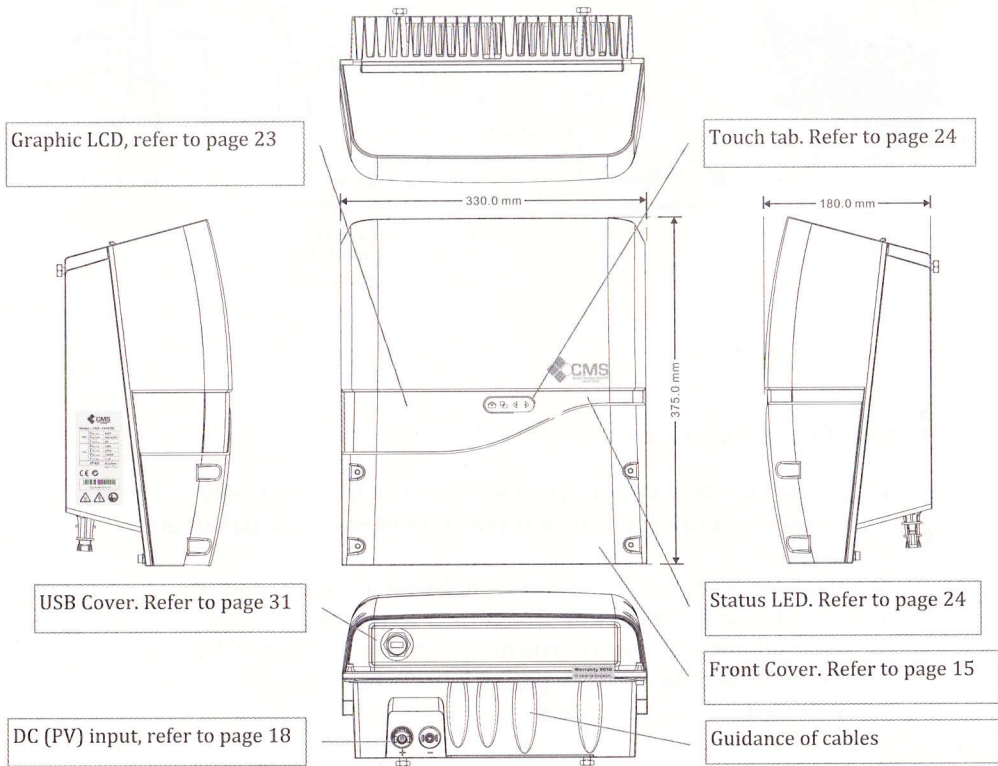
A typical PV system contains:

1. PV panels: Receive sunlight and convert it into electricity
2. Isolation Switch: To isolate connection between PV panels and inverter
3. Inverter: Converts DC power from PV panels to AC output
4. Switchboard: Connection from utility to inverter
5. Wires to measure power consumption: Connected to CT (Current Transformer) to measure power in switchboard
6. Pubic grid: Provides utility

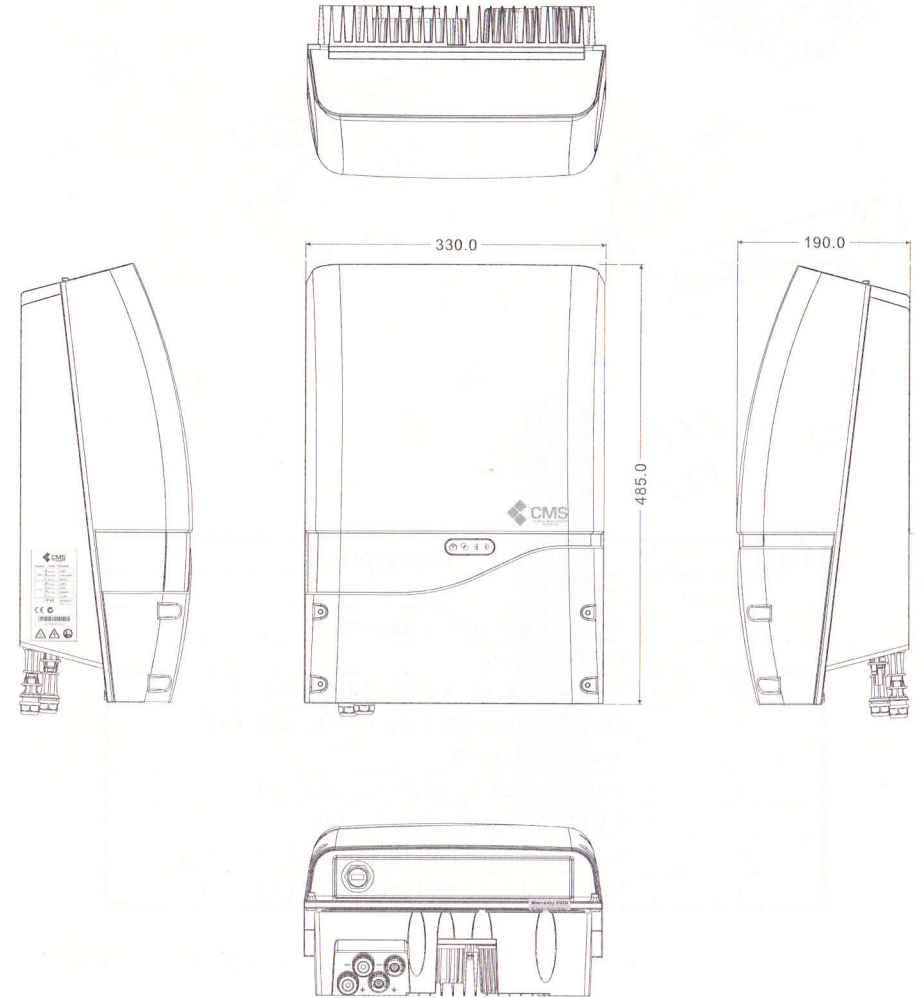
# Product Overview

## Outline & Dimensions

1500SS



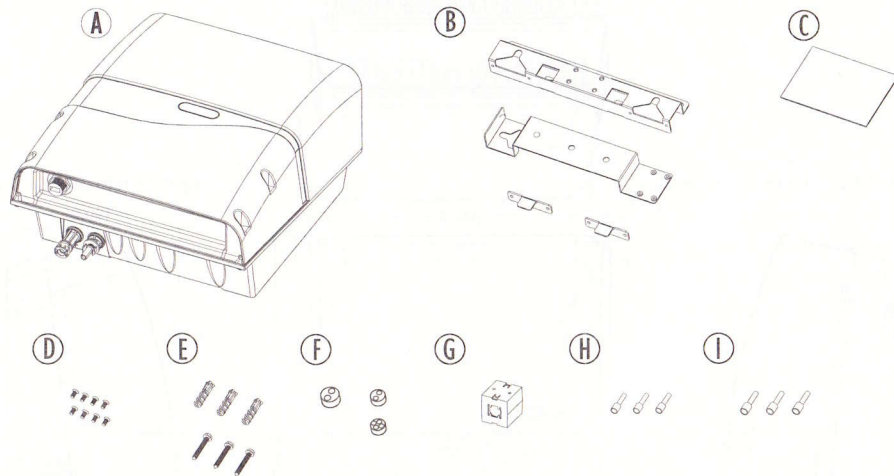
3000SS



## Installation

### Unpacking

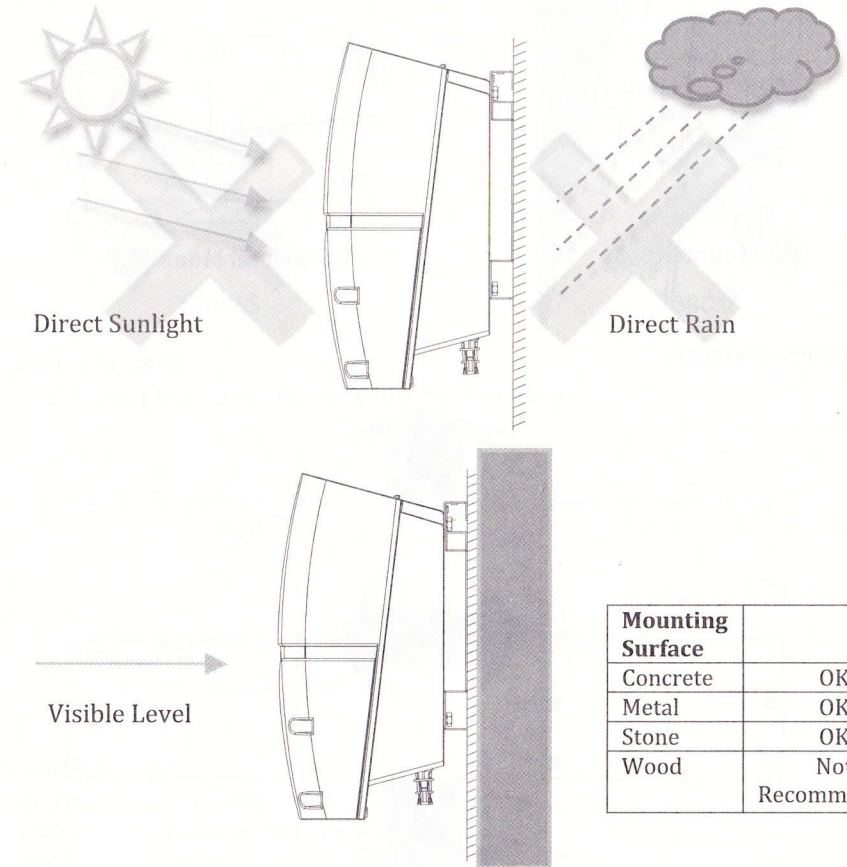
Inside the package



Item	Description
A	Inverter
B	Mounting Bracket Assembly
C	User Manual
D	M4 FlatScrews X 8,used for bracket
E	Plastic Anchor & Screws ×3,used to fix bracket on wall
F	Rubber Sealing, M20 ×2, M25 ×1
G	EMI bead for Ethernet cable
H	Insulated core end terminals (2.5 mm <sup>2</sup> )
I	Insulated core end terminals (4 mm <sup>2</sup> )

### Choosing proper location

Avoid positioning the inverter in direct sunlight or with direct exposure to rain.



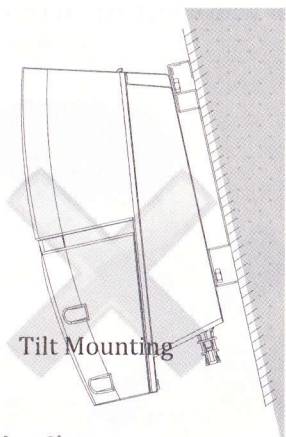
Mounting Surface	
Concrete	OK
Metal	OK
Stone	OK
Wood	Not Recommended

### Mounting Properly

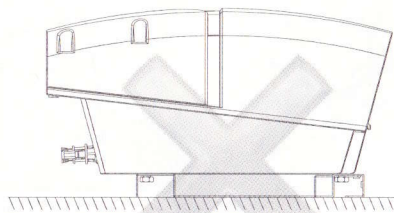
#### Direction

Mount the inverter in vertical direction; tilt or horizontal mounting should be avoided.



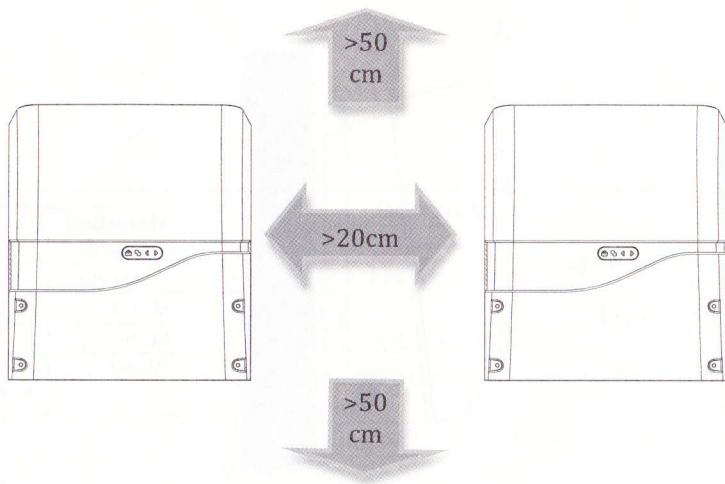


Tilt Mounting



Horizontal Mounting

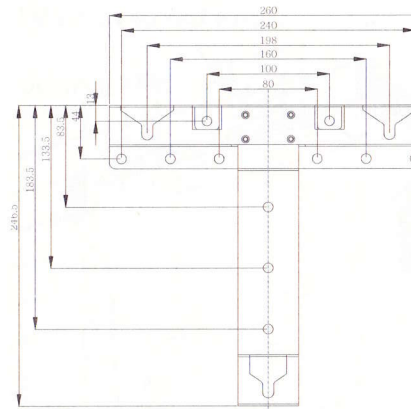
Keeping Clearance



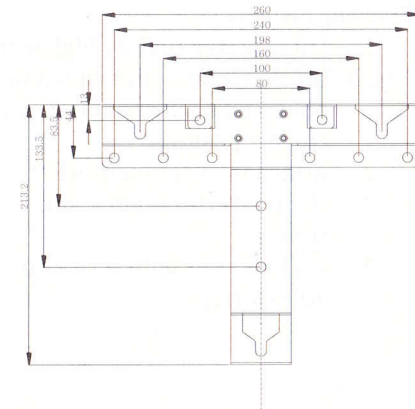
## Mounting Procedure

### Dimension of bracket

The bracket is used to support inverter on the wall. Before fixing it, refer to drilling location and dimension



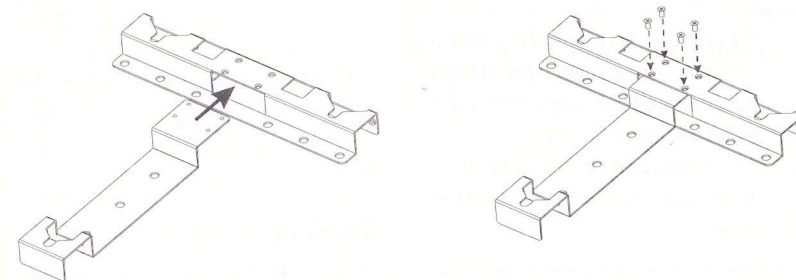
1500SS



3000SS

### Assembly bracket

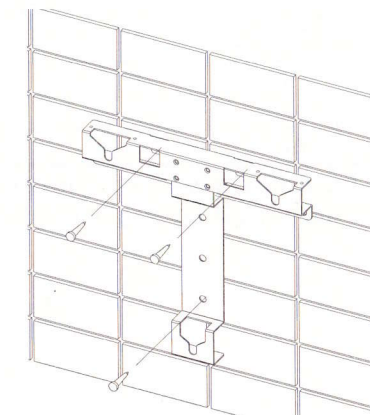
Before fixing, please assemble the bracket as below.



### Mounting bracket

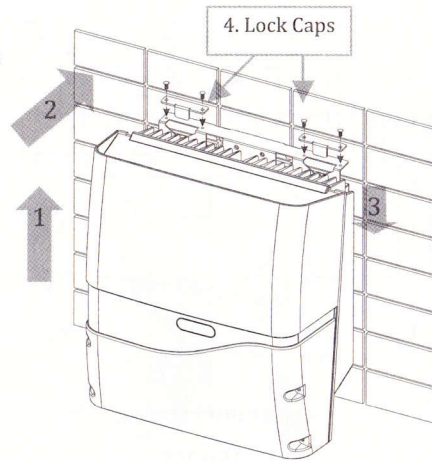
After assembly, place the bracket where you want to fix it on the wall. Drill at the correct positions, and fix bracket with the screws included in accessories.

For better support, be sure to fix at least 3 points in triangle.



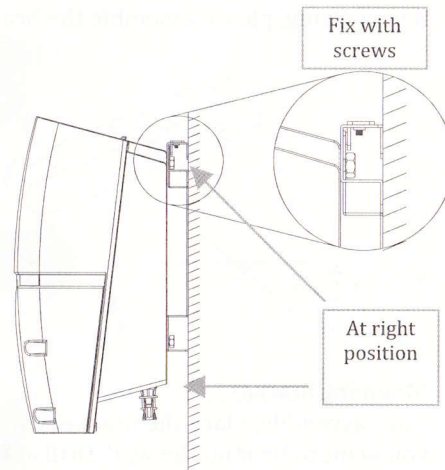
### Attaching inverter

1. Lift inverter slightly higher than bracket; make sure all fixing points on back are at the correct position
2. Attach inverter on bracket
3. Hang inverter on bracket slowly
4. Fix lock caps with screws in accessories



### Checking

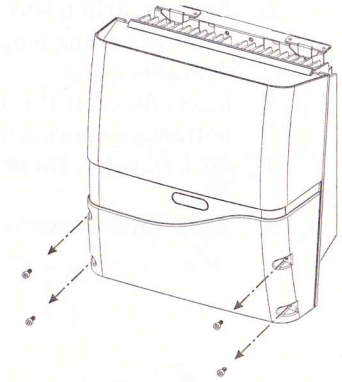
1. Check the 3 supporting points are in their correct positions
2. Check the lock caps are fixed with screws
3. Make sure inverter is well installed and secured on the wall



### Wire Connections

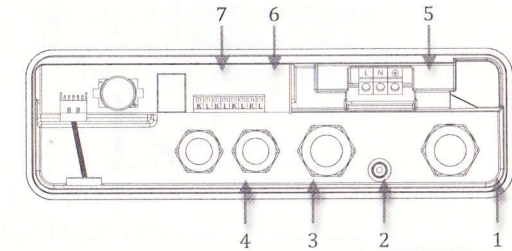
#### Opening front cover

1. Remove 4 screws on cover as shown in figure
2. Take off the cover



#### Overview of Connection Area

1. Cable Gland- AC cable
2. Cable Gland- Ethernet cable
3. Cable Gland- External current transformer
4. Cable Hole- Reserved
5. AC terminal block
6. External current transformer terminals
7. RJ45 socket (Ethernet)



#### AC wiring

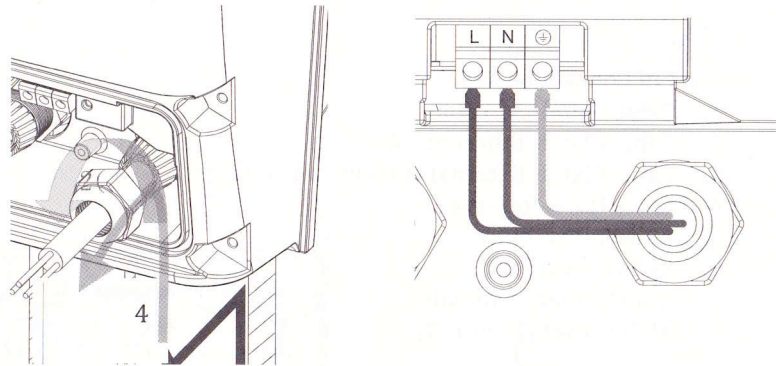
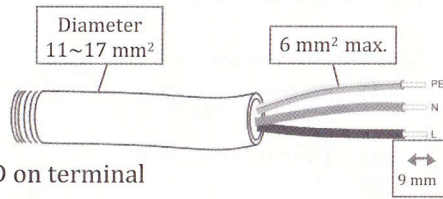
1. Prepare cables as per table below

Cross Section (mm <sup>2</sup> )	Maximum Length for 1% Loss (M)	
	1500SS	3000SS
1.5	23	Not proper
2.5	38	19
4	62	31
6	92	46

- Table above is based on single-core copper wire with maximum temperature 60°C. The actual wiring should be considered for following factors:
  - Ambient temperature
  - Wiring nearby
  - Cooling
 Please follow local standards.



2. Remove strip insulation ~ 9mm
3. Remove sealing plug, twist off the cable gland
4. Insert AC cable through bottom guidance and hole
5. Fix L (Live), N (Neutral) and GND on terminal block
6. Twist cable gland to secure cable firmly

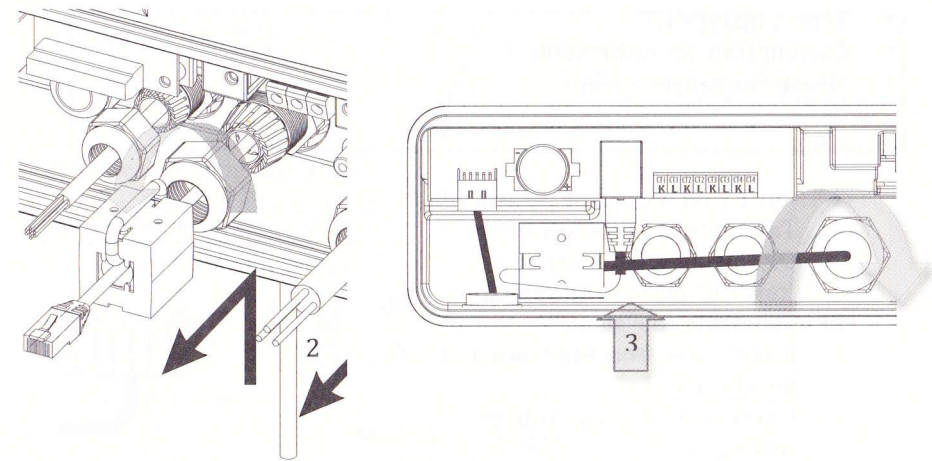


**Note of selecting wire**

To safely secure cable on terminal block, please use solid wires. If stranded wires are used, apply core end terminals supplied in accessories.

**Ethernet**

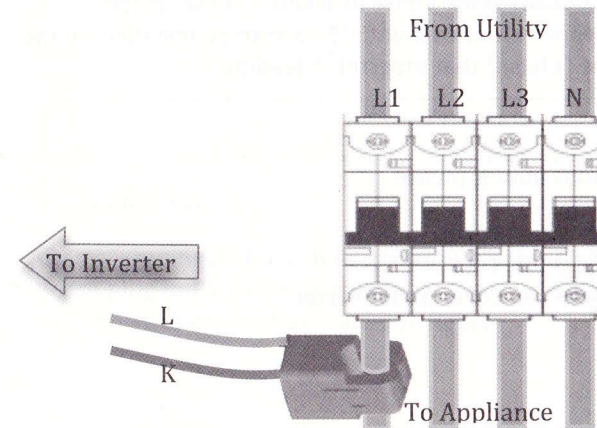
1. Twist off gland for Ethernet cable
2. Insert cable through cable guidance, hole and EMI bead as shown in figure below
3. Plug cable into socket, place bead at location shown
4. Twist gland to secure Ethernet cable
5. Check the connections and seals again



**External CT connection (Optional)**

A CT (Current Transformer) is used to measure current flowing in a wire. It helps inverter to calculate power in a line. For example, you can measure the power consumption of your home by clipping CT on wires in the distribution panel.

For single-phase applications, use one CT for the line interested; for 3-phase applications, use 3 CT's (CT1 ~ CT3) for L1~L3. CT4 is used to measure power of interested appliances such as a water heater, etc.



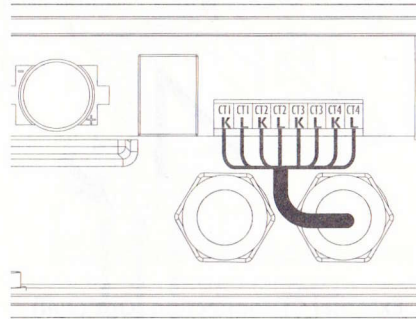
CT requirements:



- Type: Clip type CT
- Current transfer ratio: 3000: 1
- Measuring range: > 75A

To Setup:

1. Clip CT on wire to be measured. Take note of the arrow on the CT, the direction must be "toward" the load or appliance
2. Twist off cable gland
3. Insert wires from guidance and hole for CT
4. Insert wires through rubber sealing
5. Connect wires to terminal blocks
6. Turn gland and secure wires
7. Check connection and sealing again



**Correct the polarity**

To ensure correct operation, the wires labeled "L" and "K" should correspond with the terminal block labeling.



**Connect CT1 the same phase as inverter is connected**

To get proper measurement, CT1 has to be installed on the same line (phase) that inverter is feeding.

**Closing the cover**

After finishing all connections above, please

1. Check all the connections again
2. Close front cover, tighten 4 screws
3. Check sealing in between cover and inverter

**DC (PV) wiring**

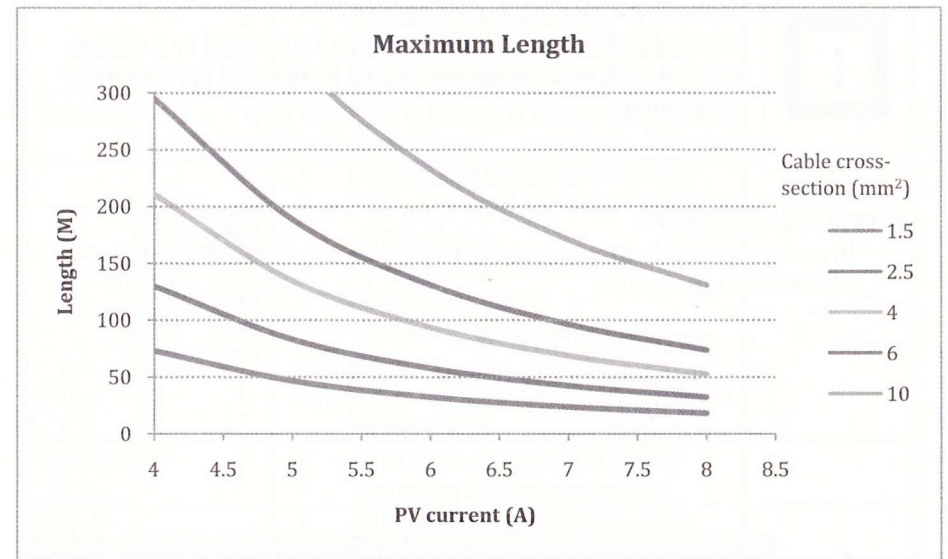
1. DC Input Rating

Model	1500SS	3000SS
Rating		

Max. Power (W)	1600	3200
Max. DCV (V)	550	550
Max. Current (A)	8	8 / string, 16A in total
String	1	2

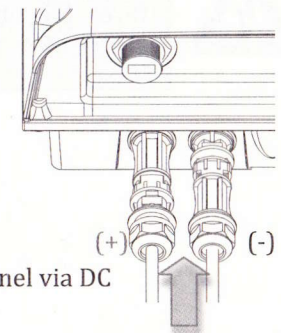
2. Use following connectors
  - Wieland PST40i1C (Preferred)
  - Multi-Contact MC4
3. Cable length limitation

Below calculation is based on 16W loss of each string. For 1500SS, it is equivalent to 1% of loss; for 3000SS, it is 0.5% of loss.



**4. Connecting PV**

After preparing all the cables and connectors, please plug in PV cables with MC4 connectors to inverter as shown in figure



From PV panel via DC switch



**Danger, Electric Shock!**

While working on DC wiring, ensure DC is completely turned off.



**Polarity check**

Before plugging in, make sure the polarity is correct. Incorrect polarity could cause malfunction.



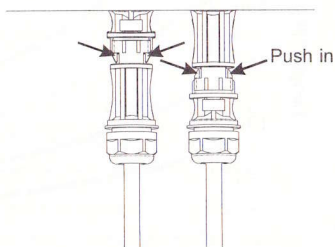
**Multiple PV connections for 3000SS**

You can either connect 2 inputs into 1 PV string or 2 strings separately. The inverter will adjust its optimal performance accordingly.

**In case of unplugging PV**

In case you need to disconnect the PV, follow the steps below:

- a. SWITCH OFF PV!
- b. Push interlock to release per figure below
- c. Pull off plugs



**Be sure to SWITCH off PV**

Direct pull off DC plugs cause dangerous arc. Be sure to switch off PV in advance

**Ready to start**

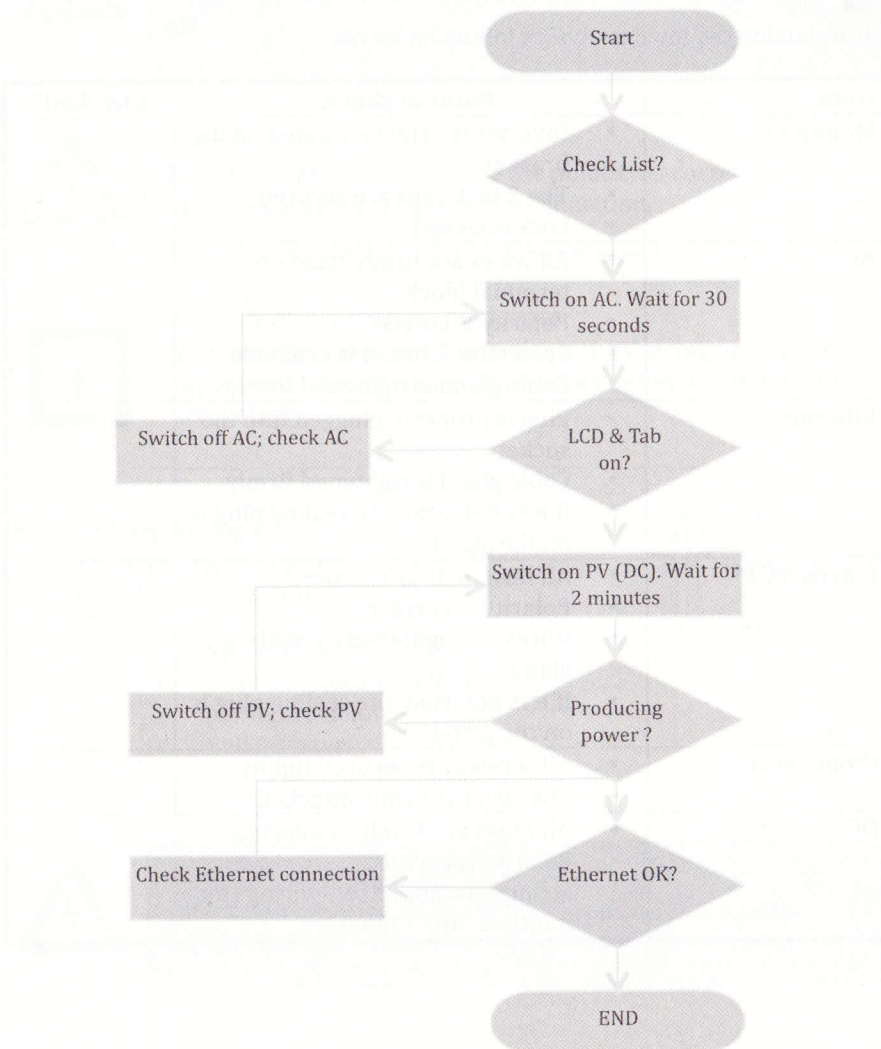
**Check List**

Before starting the inverter, check following items:

Item	Point of check	Checked?
Mounting	<ul style="list-style-type: none"> <li>• Inverter is firmly mounted on the bracket</li> <li>• The 2 lock caps are secured</li> <li>• Lock is closed</li> </ul>	
AC	<ul style="list-style-type: none"> <li>• All wires are firmly fixed on terminal block</li> <li>• Polarity is correct</li> <li>• Protective Ground is available</li> <li>• Cable gland is tightened firmly</li> </ul>	
Ethernet	<ul style="list-style-type: none"> <li>• Plug is properly plugged into the socket</li> <li>• Cable gland is tightened firmly</li> <li>• If it is not used, the sealing plug is on the gland</li> </ul>	
External CT	<ul style="list-style-type: none"> <li>• All terminals are secured</li> <li>• Polarity is correct</li> <li>• Wires are tightened by cable gland</li> <li>• If it is not used, the sealing plug is on the gland</li> </ul>	
Front cover	<ul style="list-style-type: none"> <li>• All screws are secured tightly</li> <li>• The cover is firmly attached</li> </ul>	
DC	<ul style="list-style-type: none"> <li>• All plugs are firmly connected</li> <li>• Polarity is correct</li> <li>• Strings are not mixed-wiring (for multiple MPPT models)</li> </ul>	



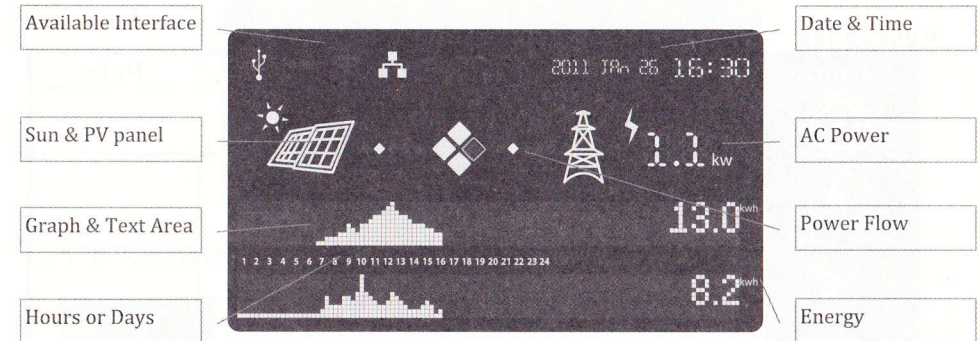
## Start-up procedure



## Operation

### Overview

#### LCD



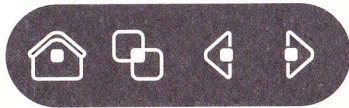
#### Icons on LCD

Icon	Description	Note
	USB. Appears while USB port is in use; flashing while accessing data	
	RS485. Reserved	
	WIFI. Reserved	
	Ethernet. Appears while Ethernet is connected	
	Sun. Appears during daytime	
	PV modules. Appears while PV is connected	
	CMS logo. Stands for inverter	
	Utility. Appears while utility power is available	
	Power feeding. Appears while inverter is feeding power	



### Touch Tab

Touch Tab is used to change frame displayed on LCD



### Icons on Tab

Icon	Description	Note
	Home. Switch back to <i>Home</i> Screen	
	Toggle. Toggling between frames or information	
	Backward. Switch to previous daily (monthly) frame	
	Forward. Switch to next daily (monthly) frame	

### Status LED

This LED indicates the operation status by its color. In normal operation, it is green; in abnormal conditions where inverter is not feeding in, it will show red.

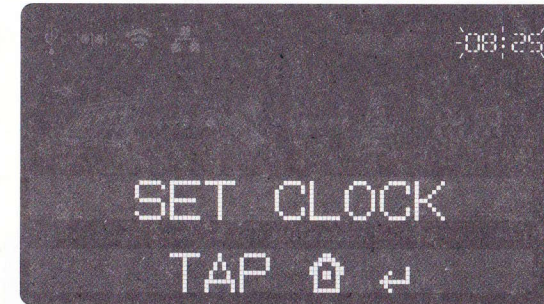
### Clock Setting

During the first installation where the internal clock has not been set, below frame automatically prompts user to set date and time.



The flashing characters are the data to set. Use the touch tab to set.

While finished entering the new setting, press to finish and confirm the new settings.



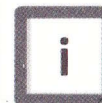
The following table describes tab functions.

Icon	Function	Note
	Confirm setting	
	Switch data views among <i>Year, Month, Day, Hour and Minute</i> .	
	Decrease number of settings	
	Increase number of settings	



#### *Incorrect Setting?*

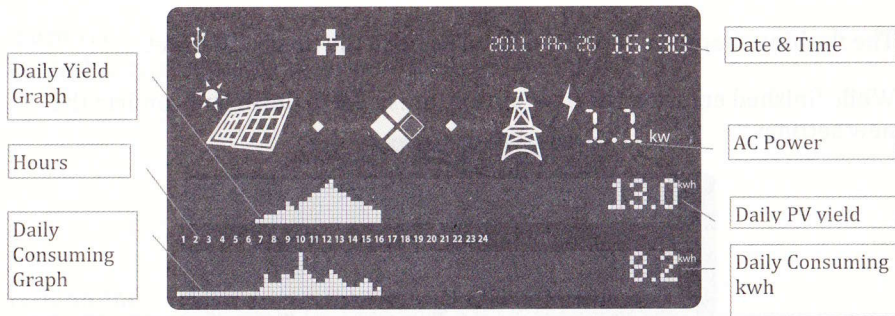
In case of incorrect setting, after inverter starts, switch to "Information frame" to set again



#### *Keeping the Clock Setting*

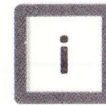
In case where the AC power is disconnected for more than 3.5 hours, the internal clock will change back to the default settings.





### Home Screen & Daily Frame

The Home Screen (Daily Frame) shows the operation data of a day. The user can switch to different days data by tapping FORWARD or BACKWORD. The date on the upper right side will change accordingly as well.



#### Consuming Graph

The reading on the graph is the sum of 3 external measurements from the CT.

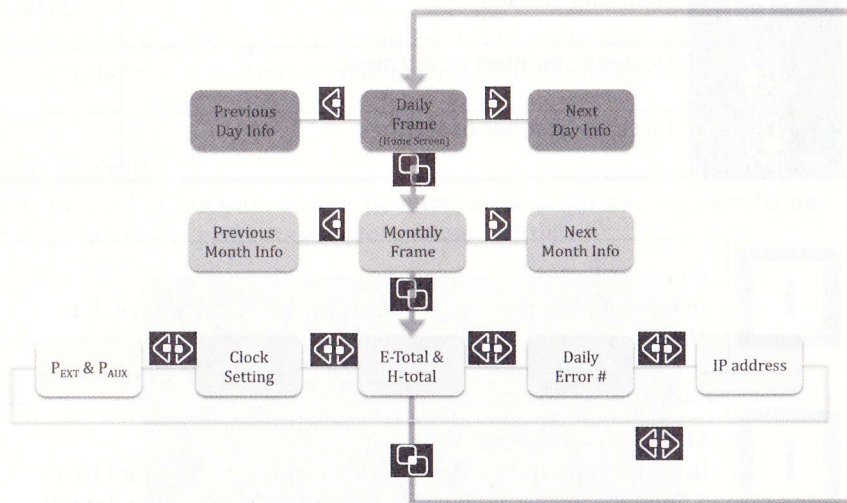


#### Clock Self-calibration

If inverter is connected to Internet, the internal clock can synchronize with a local time server automatically. To do this, you need to set the time zone and time server via internal web server. Please refer to the separated web server instruction manual.

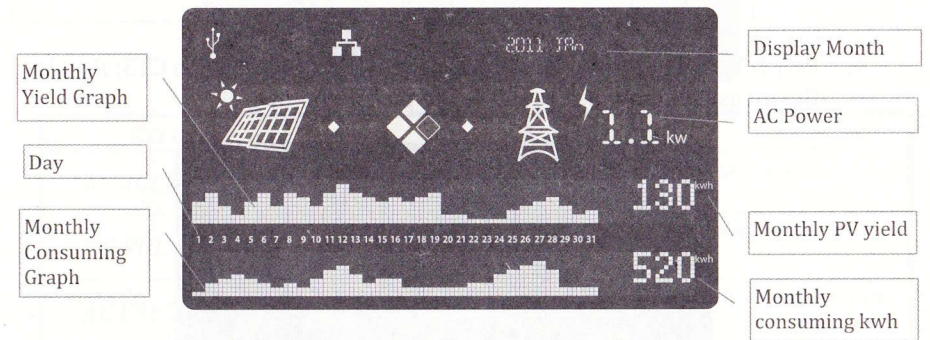
## Frames

### Operation Chart



Tap at any frame back to Home Screen

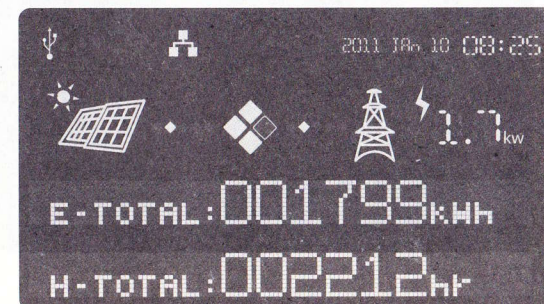
### Monthly Frame



The monthly Frame shows the operation data of a full month. The user can switch to view a different months data by tapping FORWARD or BACKWORD. The month (shown on upper-right side) will change accordingly as well.

### Operation Frame

This frame shows the operation information of inverter. There are five sub-frames as below:





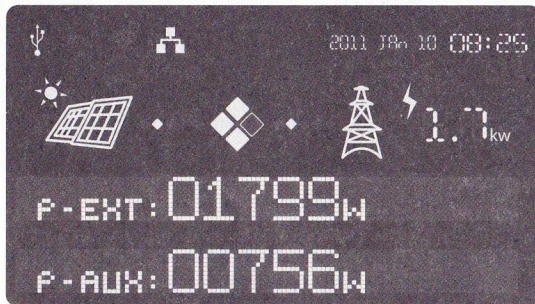
1. ERROR#: Shows number of errors detected by inverter in that day
2. E-Total & H-Total: Shows E-Total (Total accumulated Energy) in kWh and H-Total (Total operating hours of inverter) in hour
3. IP ADDRESS: If IP of this inverter is assigned, it will show the IP address in XXX.XXX.XXX.XXX format. If IP is not assigned, the default IP is 192.168.0.1



#### Firmware Version

The numbers appearing on lower-right part of IP address frame are the firmware versions. You may need to provide those numbers in case where service is ever necessary.

4.  $P_{EXT}$  &  $P_{AUX}$ :  $P_{EXT}$  is the total power measured from CT1 to CT3;  $P_{AUX}$  is the measured power form CT4. See picture below.

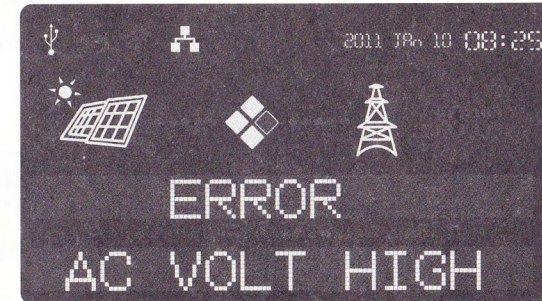


5. Clock setting: To set the clock of inverter. Tap to start setting as per below picture. For more detail, refer to Clock Setting section.



#### Error Frame

An error is an abnormal situation in the functioning of the solar system. The frame shows up automatically after detection of error. The second text line indicates error type. Error types are defined as table below:



Error	Explanation
AC VOLT HIGH	Grid (AC) voltage is higher than the preset operation range
AC VOLT LOW	Grid (AC) voltage is lower the preset operation range
AC FREQ HIGH	Grid frequency is higher than the preset operation range
AC FREQ LOW	Grid frequency is lower the preset operation range
PV VOLT HIGH	PV voltage is higher than allowable voltage
PV ISUL LOW	The insulation resistance between either PV (+) or PV (-) to earth is lower 2M ohm
KEEP PV OFF	Internal capacitor short, user has to turn off PV immediately
C1~C7	Reserved for internal recording



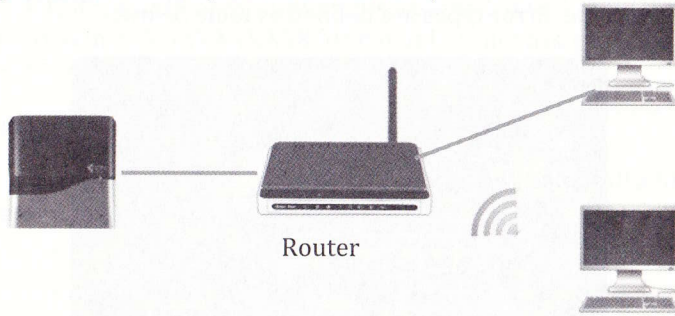
#### Note for "KEEP PV OFF"

On reading this message, please switch off PV system immediately. DO NOT turn it on again for any reason. Call immediately for service.



## Network and Internet

### Accessing inverter in a LAN (Local Area Network)



Above figure is a typical connection in LAN. Computers in the LAN can access inverter via a router.

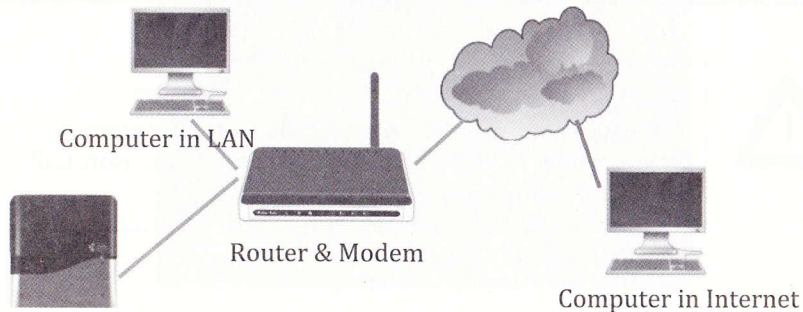
Usually, the router assigns an IP to the inverter by DHCP algorithm. You can manually assign an IP to inverter by the router as well. No matter which way, once an IP is assigned, inverter will show up the IP address automatically. User can now access inverter by web browser or supported software.



#### Access without router

You can access inverter by connecting a computer directly. In this case, use default IP 192.168.0.1

### Accessing inverter via Internet



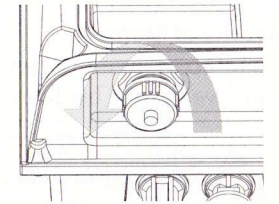
The above figure shows how to access the data via Internet. Similar to LAN application, you can also access the inverter by web browser or software on your computer. However, usually there is a firewall which will block direct access from Internet. To overcome this, you need to set up NAT (Network Address Translation) of the router. For detail information, refer to information provided by router.

## Using USB

### Plug in USB stick

To access inverter data, you can plug in a pre-formatted USB stick into port beneath the inverter. The stick must be FAT or FAT32 formatted.

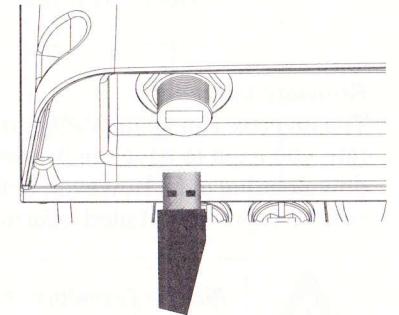
Remove the cap and plug in a USB stick. If inverter recognizes the device, the USB icon on LCD should light up.



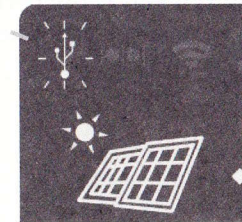
### Downloading data

After plugging in the USB, all data inside the inverter will be downloaded to the stick automatically. During download, USB icon is blinking.

After downloading, while USB icon is steadily on, you can then safely unplug the stick. The data will be saved to the stick already.



USB icon is blinking during access





#### **Data Format**

There will be 2 data files downloaded. The first one is for SQLite; the other is a CSV (Common Separation Value).



#### **Notice of Firmware Upgrade**

If the USB stick contains firmware software for an update, the inverter will not download data onto USB stick.

#### **Capacity of Memory**

The internal memory can store up to 3 years worth of data. Any data older than 3 years will be deleted automatically by the logger.



#### **Backup Data Periodically**

Once data in the logger has been deleted, it can not be recovered. Therefore it's recommended to backup the data periodically if you wish to retain this information.

#### **Firmware Upgrade**

The inverter can be upgraded to the latest firmware version by USB. To do this, you need to have the firmware in a USB stick. The process is similar to downloading data. However, before doing this, please consult your local service for more detailed information.



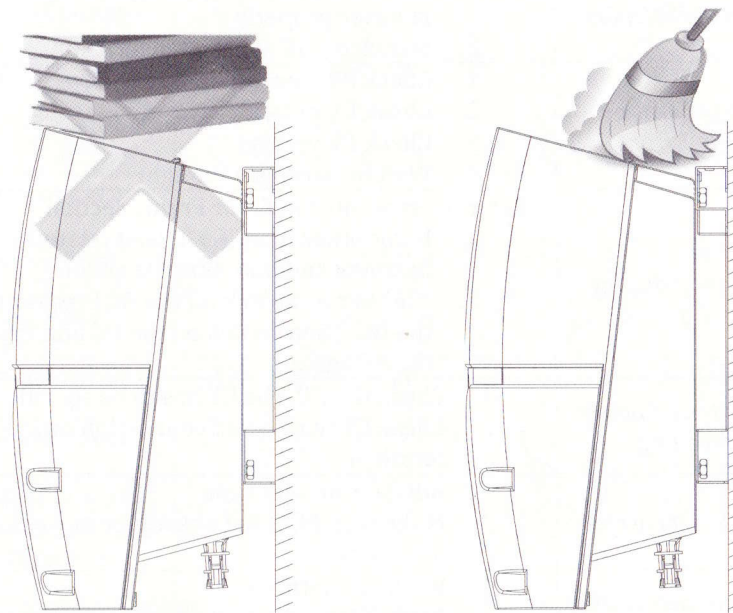
#### **Risk for Firmware Update**

We do not recommend customers perform firmware upgrades as it may cause permanent failure. If inverter is working normally, it is not necessary to do any upgrades.

## **Maintenance**

Usually, this inverter does not require any special care during its lifetime. However, for best results, please follow below points:

1. Make sure no obstacle are placed on the top of inverter
2. Clean up any dust on inverter, especially over the heat sink on a regular basis
3. Check operation and status of inverter
4. Check all wiring and cables





## Trouble Shooting

During normal operation, the inverter display screen will show the Operation Frame (on page 26). However, should the unit detect any problems on the system it may display one of the readings from the below table. If the problem is not resolved, please contact your local service for further assistance.

Trouble	Treatment
<i>No display or incorrect display</i>	<ol style="list-style-type: none"> <li>1. Check AC connection such as fuse, breaker and wiring. Be sure AC is connected to inverter properly</li> <li>2. Switch off AC and switch on again</li> </ol>
<i>No generation (No Error)</i>	<ol style="list-style-type: none"> <li>1. Check PV connection and wiring</li> <li>2. Check PV polarity</li> <li>3. Check PV voltage</li> <li>4. Wait for stronger sunlight</li> </ol>
<i>Error on display</i>	<p>Refer to error table in Error Frame section</p> <ol style="list-style-type: none"> <li>1. Error other than "C#": Read related meaning and take suitable action</li> <li>2. "C#" Error: Switch off the AC breaker than the DC. Then switch on the DC and then the AC again</li> </ol>
<i>No External power reading</i>	<ol style="list-style-type: none"> <li>1. Check the CT. The CT has to be specific one</li> <li>2. Check CT wiring and connection on its terminal</li> </ol>
<i>Clock is incorrect</i>	<ol style="list-style-type: none"> <li>1. Adjust it to right time</li> <li>2. Make sure AC is not absent for more than 3.5 hours</li> </ol>
<i>Can not detect USB device</i>	<ol style="list-style-type: none"> <li>1. Replace another one</li> <li>2. Restart inverter by switching off and on again</li> </ol>
<i>Ethernet does not work</i>	<ol style="list-style-type: none"> <li>1. Check connection and wiring</li> <li>2. Make sure your router has the DHCP function</li> </ol>
<i>Generated power is less than expected</i>	<ol style="list-style-type: none"> <li>1. Check module installation environment</li> <li>2. Ensure inverter is not in direct sun light</li> <li>3. Remove any objects on the inverter</li> <li>4. Check its ambient temperature</li> </ol>

## Specifications

Model	Unit	CMS-1500SS	CMS-3000SS
<b>Input (DC)</b>			
Max. Power	W	1600	3200
MPPT Range	V	200~450	200~450
Max. DC Voltage	V	550	550
Max. DC Current	A	8	8 x 2
MPP Tracker No.		1	2
<b>Output (AC)</b>			
Nom. Power	W	1500	3000
Max. Power	W	1500	3000
Nominal Voltage	V	230	230
Voltage Range	V	200~265	200~265
Maximum Current	A	7.1	14.3
<b>Efficiency</b>			
Max. Efficiency	%	96	97
Euro- Eta	%	94	95.5
<b>General</b>			
Temp. Range	°C	-20 ~ 40	-20 ~ 40
Topology		Transformerless	Transformerless



Protection		IP65	IP65
Humidity	%	0~100%	0~100%
Cooling		Convection	Convection
<b>Features</b>			
LCD		Icon Graphic Display	
Interface		USB, Ethernet	
Data Logging		Yes. 3 years	
<b>Mechanical</b>			
W x H x D	cm	330x375x180	330x485x190
Weight	Kg	11.9	17.6
Input String		1	2
Output Connection		Terminal Block labeled with L, N and Earth	
<b>Compliance</b>			
Grid Monitoring		AS4771 (2005)	
Safety		AS/NZ 3100 (2002)	
EMC Emission		EN61000-6-3	
EMC Immunity		EN61000-6-1	

*\*Specifications are subject to change without prior notice*