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*Note：Since Guangzhou Sanjing Electric Co.,Ltd has a policy of continuous product improvement, it reserves the right to change design and specifications without notices.

*Edition No.:V1.2_E(MC)

User Manual

SAJ Solar Inverter

Sununo-TL Series

www.saj-solar.com

Preface

Thank you for choosing SAJ solar inverter. We are happy to provide you with first-class products and quality service.

The manual includes installation, operation, maintenance, troubleshooting, and safety notice. As long as you follow the instruction of this manual, you will get the professional guidance and our wholehearted service.

Customer-orientation is our forever commitment. We hope this "User Manual" become your good helper in solar power generation.

This manual subjects to change at regular intervals according to customer's feedback.

Please check the latest version at www.saj-solar.com

Guangzhou Sanjing Electric Co., Ltd.

GREEN TECHNIC GREEN FUTURE

Contents

SAJ User Manual

1. NOTES ON THIS MANUAL

1.1 SCOPE OF VALIDATION

This User Manual discribes instructions and detailed procedures for installing, operating, maintaining, and troubleshooting of the following SAJ grid-tie inverters:

Sununo– TL1.5K, Sununo– TL2K, Sununo– TL3KB, Sununo– TL4KB,

Sununo– TL3KA, Sununo– TL4KA, Sununo– TL5K

SU3KMTLI, SU4KMTLI, SU5KMTLI

Please keep this manual all time available in case of emergency.

1.2 SYMBOLS USED

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, can result in death or serious injury or moderate injury.

CAUTION

CAUTION indicates a hazardous condition which, if not avoided, can result in minor or moderate injury.

NOTICE

NOTICE indicates a situation that can result in potential damage, if not avoided.

1.3 TARGET GROUP

Only qualified electricians who have read and fully understood all safety regulation contained in this manual can install, maintain and repair the inverter. Operators must be aware of the high-voltage device.

2. PREPARATION

2.1 SYSTEM DEMONSTRATION

Solar energy generation systems, based on photovoltaic modules, nowadays represent the most suitable solution to reduce the energy consumption produced by oil and gas.

The solar inverter is a key device in a solar energy system. It performs the conversion of the variable DC output of the PV modules into a clean sinusoidal 50Hz/60Hz AC current that is then directly applied to the commercial electrical grid or to a local grid electrical network.

Typically, solar inverter includes communication function to monitor operating condition, firmware to update and control the grid connection. Depending on the grid infrastructure, cabled (RS-485, CAN, Power Line Communication, Ethernet) or cableless (Bluetooth, ZigBee/IEEE802.15.4) networking options can be used.

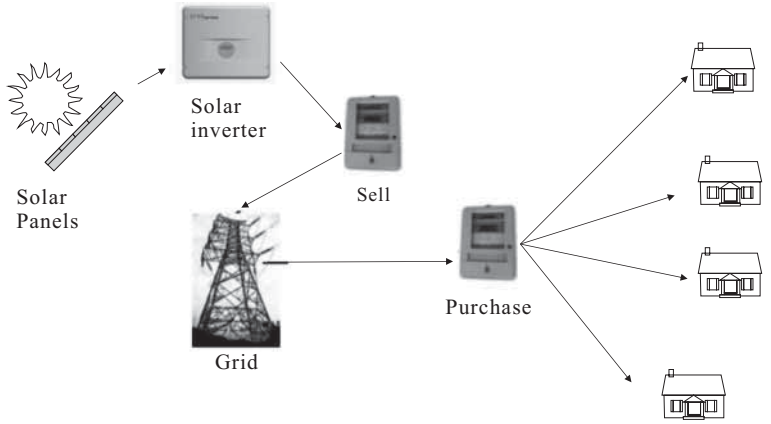


Figure 2.1

2.2 SAFETY INSTRUCTIONS

DANGER

• DANGER due to electrical shock and high voltage

• Do not touch the operating component of the inverter, it might result in burning or death.

• To prevent risk of electric shock during installation and maintenance, please make sure that all AC and DC terminals are plugged out.

• Do not touch the surface of the inverter while the housing is wet, it might lead to electrical shock.

• Do not stay close to the inverter while there are severe weather conditions including storm, lighting, etc.

• Before opening the housing, the SAJ inverter must be disconnected from the grid and PV generator; you must wait at least five minutes to let the energy storage capacitors fully discharged after disconnecting from power source.

WARNING

• The installation， service ， recycling and disposal of the inverters must be performed by qualified personnel only in compliance with national and local standards and regulations.

• Any unauthorized actions including modification of product functionality of any form may cause lethal hazard to the operator, third parties, the units or their property. SAJ is not responsible for the loss and deny these warranty claims.

• The SAJ inverter must only be operated with PV generator. Do not connect any other source of energy to the SAJ inverter.

• Be sure that the PV generator and inverter are well grounded in order to protect properties and persons.

CAUTION

• The PV inverter will become hot during operation. Please don't touch the heat sink or peripheral surface during or shortly after operation.

• Risk of damage due to improper modifications.

• Never modify or manipulate the inverter or other components of the system.

• For radiation prevention, do not stay closer than 20cm to the inverter for any length of time.

NOTICE

• Public utility only.

• The PV inverter is designed to feed AC power directly to the public utility power grid; do not connect AC output of the inverter to any private AC equipment.

2.3 EXPLANATIONS OF SYMBOLS ON INVERTER

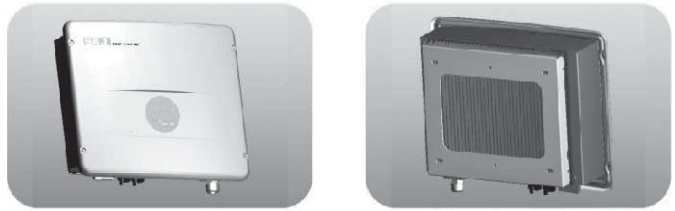
Symbol	Description
	Dangerous electrical voltage This device is directly connected to public grid, thus all work to the inverter shall only be carried out by qualified personnel.
5min	**DANGER to life due to high electrical voltage!** There might be residual currents in inverter because of large capacitors. Wait **5 MINUTES** before you remove the front lid.
	NOTICE, danger! This is directly connected with electricity generators and public grid.
	Danger of hot surface The components inside the inverter will release a lot of heat during operation. Do not touch metal plate housing during operating.
	An error has occurred Please go to Chapter 9 “Troubleshooting” to remedy the error.
	This device SHALL NOT be disposed of in residential waste Please go to Chapter 8 “Recycling and Disposal” for proper treatments.
	Without Transformer This inverter does not use transformer for the isolation function.
TUV SUD	**Certified safety** The inverter complies with the requirement of the Equipment and Product Safety Act in Europe.
CE	**CE Mark** Equipment with the CE mark fulfills the basic requirements of the Guideline Governing Low-Voltage and Electro-magnetic Compatibility.
SAA	SAA Mark The inverter complies with the requirement of Equipment and Product Safety Act in Australia.
ATTENTION! Risk of electric shock! Only authorized personnel are allowed to do disassembly, modification or maintenance. Any resulting defect or damage (device/person) is not covered by SAJ guaranty.	**No unauthorized perforations or modifications** Any unauthorized perforations or modifications are strictly forbidden, if any defect or damage (device/person) is occurred, SAJ shall not take any responsibility for it.

3.PRODUCT INFORMATION

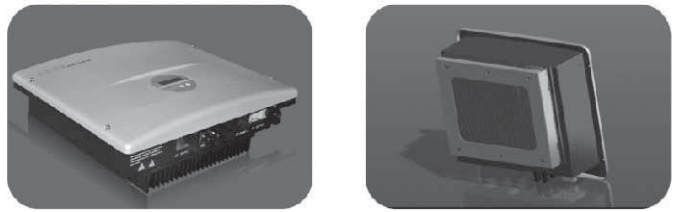
3.1 OVERVIEW

Industrial design Reduced Heat Sink

Sununo-TL1.5K/2K



Sununo-TL3KB/4KB



Sununo-TL 3KA/4KA/5K

SU3KMTLI/SU4KMTLI/SU5KMTLI

Figure 3.1

3.2 MAJOR CHARACTERISTICS

SAJ grid - tie solar inverter has following characteristics which make SAJ grid - tie solar inverter “High Efficiency, High input voltage with more PV panels in series.”

- High input voltage with more PV panels in series.
- Two independent MPP trackers for flexible configuration and easy installation.
- Ultra-high MPP tracking efficiency for full power range.
- Transformerless design.
- Multi communication interfaces,including RS485,Ethernet RJ45,Wi-Fi.
- Multi language display.
- Easy LCD operation with multi-language display.
- DC switch (optional).
- High-grade power components.
- Small size, light weight, easy installation.

Besides, following functions methods are integrated in SAJ grid - tie solar inverter:

- Internal overvoltage protection
- DC insulation monitoring
- DC side varistor
- Ground fault protection
- Grid monitoring
- Ground fault current monitoring
- Anti-islanding protection

3.3 DATASHEET

Type	Sununo-TL1.5K	Sununo-TL2K
Input (DC)		
Max. DC Power [W]	1800	2300
Max. DC Voltage [V]	480	
MPPT Voltage Range [V]	120-384	
MPPT Voltage Range[V](Full Load)	164-384	190-384
DC Nominal Voltage [V]	360	
Start Voltage [V]	150	
Min. DC Voltage [V]	100	
Max. DC Current Input [A]	11	12
Number of DC Connection Sets	1	
Number of MPP Trackers	1	
DC Switch	Optional	
Output (AC)		
Rated AC Power [W]	1500	2000
Max. AC Power [W]	1650	2000
Rated AC Current [A]	6.5	8.7
Max. AC Current [A]	8.5	11.0
Norminal AC Voltage/Range	220V, 230V, 240V/180V-280V	
Grid Frequency/Range	50Hz, 60Hz/ ±5Hz	
Power Factor(cos φ)	>0.99 [full load]	
AC Current Distortion (THD)	< 2%	
Consumption at Night [W]	<0.2	
Consumption at Standby [W]	6	
Efficiency		
Max. Efficiency	97.4%	97.4%
Euro Efficiency (at 360Vdc)	96.5%	96.7%
MPPT Accuracy	>99.5%	
Protection		
Internal Overvoltage Protection	Integrated	
DC Insulation Monitoring	Integrated	
DC Side Varistors	Integrated	
Direct Current Monitoring	Integrated	
Ground Fault Current Monitoring	Integrated	
Grid Monitoring	Integrated	
AC Short Current Protection	Integrated	
Thermal Protection	Integrated	
Anti-island protection monitoring	AFD	
Interface		
AC Connection	Terminals	
DC Connection	MC4/H4	
LCD Display	LCD(16x2 Characters, Backlight) & LED(3 Lights)	
Display Language	Multi Language	
Datalogger & Communication	2*RS485(Standard), Wi-Fi/Ethernet(Optional)	
General Data		
Isolation	Transformerless	
Operating Temperature Range	-25°C to +60°C [45°C to 60°C with derating]	
Cooling Method	Natural Convection	
Ambient Humidity	0% to 98% Non-condensing	
Site Altitude above Sea Level	Up to 2000m	
Noise Emission (dBA)	<40	
IP Protection	IP65 [Indoor or Outdoor Installation]	
Mounting	Rear Panel	
Dimensions (WxHxD) [mm]	415*313*140	
Weight [kg]	11	
Standard Warranty (Year)	5 / 10 / 15 / 20 / 25 [Optional]	
Safety Class Compliance	As3100, IEC62109-1/-2	
EMC Compliance	EN61000-6-2, EN61000-6-3, EN61000-3-2, EN61000-3-3	
Grid Protection Compliance	VDE 0126-1-1/A1, VDE 4105, G83, RD1699, C10/11, AS4777.3, EN50438, CGC/CF004	

Type	Sununo-TL3KB	Sununo-TL4KB
Input (DC)		
Max. DC Power [W]	3400	4500
Max. DC Voltage [V]	550	
MPPT Voltage Range [V]	125-440	
MPPT Voltage Range[V](Full Load)	200-440	225-440
DC Nominal Voltage [V]	360	
Start Voltage [V]	150	
Min. DC Voltage [V]	100	
Max. DC Current Input [A]	17	20
Number of DC Connection Sets	2	
Number of MPP Trackers	1	
DC Switch	Optional	
Output (AC)		
Rated AC Power [W]	3000	4000
Max. AC Power [W]	3300	4400
Rated AC Current [A]	13.0	17.4/16[1]
Max. AC Current [A]	15.0	20.0/16[1]
Norminal AC Voltage/Range	220V, 230V, 240V/180V-280V	
Grid Frequency/Range	50Hz, 60Hz/ ±5Hz	
Power Factor(cos φ)	>0.99[full load]	
AC Current Distortion (THD)	< 2%	
Consumption at Night [W]	<0.2	
Consumption at Standby [W]	6	
Efficiency		
Max. Efficiency	97.7%	97.7%
Euro Efficiency (at 360Vdc)	97.1%	97.1%
MPPT Accuracy	>99.5%	
Protection		
Internal Overvoltage Protection	Integrated	
DC Insulation Monitoring	Integrated	
DC Side Varistors	Integrated	
Direct Current Monitoring	Integrated	
Ground Fault Current Monitoring	Integrated	
Grid Monitoring	Integrated	
AC Short Current Protection	Integrated	
Thermal Protection	Integrated	
Anti-island protection monitoring	AFD	
Interface		
AC Connection	Terminals	
DC Connection	MC4/H4	
LCD Display	LCD(16x2 Characters, Backlight) & LED(3 Lights)	
Display Language	Multi Language	
Datalogger & Communication	2*RS485(Standard), Wi-Fi/Ethernet(Optional)	
General Data		
Isolation	Transformerless	
Operating Temperature Range	-25°C to +60°C [45°C to 60°C with derating]	
Cooling Method	Natural Convection	
Ambient Humidity	0% to 98% Non-condensing	
Site Altitude above Sea Level	Up to 2000m	
Noise Emission (dBA)	<40	
IP Protection	IP65 [Indoor or Outdoor Installation]	
Mounting	Rear Panel	
Dimensions (WxHxD) [mm]	450*375*177	
Weight [kg]	21	
Standard Warranty (Year)	5 / 10/15/20/25 [Optional]	
Safety Class Compliance	AS3100, IEC62109-1, IEC62109-2	
EMC Compliance	EN61000-6-2, EN61000-6-3, EN61000-3-2, EN61000-3-3	
Grid Protection Compliance	VDE 0126-1-1/A1, VDE 4105, G83, RD1699, C10/11, AS4777.3, EN50438, CGC/CF004	

Remarks: Meet the grid standard AC current per phase not exceeding 16A.

Type	Sununo-TL3KA	Sununo-TL4KA
Input (DC)		
Max. DC Power [W]	3200	4200
Max. DC Voltage [V]	550	
MPPT Voltage Range [V]	125-440	
MPPT Voltage Range[V](Full Load)	200-440	
DC Nominal Voltage [V]	360	
Start Voltage [V]	150	
Min. DC Voltage [V]	100	
Max. DC Current Input A/Input B[A]	15/15	15/15
Number of DC Connection Sets	2	
Number of MPP Trackers	2	
DC Switch	Optional	
Output (AC)		
Rated AC Power [W]	3000	4000
Max. AC Power [W]	3000	4000
Rated AC Current [A]	13.0	17.4/16[1]
Max. AC Current [A]	15.0	20.0/16[1]
Norminal AC Voltage/Range	220V, 230V, 240V/180V-280V	
Grid Frequency/Range	50Hz, 60Hz/ ±5Hz	
Power Factor(cos φ)	>0.99 [full load]	
AC Current Distortion (THD)	< 2%	
Consumption at Night [W]	<0.2	
Consumption at Standby [W]	6	
Efficiency		
Max. Efficiency	97.6%	97.6%
Euro Efficiency (at 360Vdc)	96.8%	96.8%
MPPT Accuracy	>99.5%	
Protection		
Internal Overvoltage Protection	Integrated	
DC Insulation Monitoring	Integrated	
DC Side Varistors	Integrated	
Direct Current Monitoring	Integrated	
Ground Fault Current Monitoring	Integrated	
Grid Monitoring	Integrated	
AC Short Current Protection	Integrated	
Thermal Protection	Integrated	
Anti-island protection monitoring	AFD	
Interface		
AC Connection	Terminals	
DC Connection	MC4/H4	
LCD Display	LCD(16x2 Characters, Backlight) & LED(3 Lights)	
Display Language	Multi Language	
Datalogger & Communication	2*RS485(Standard), Wi-Fi/Ethernet(Optional)	
General Data		
Isolation	Transformerless	
Operating Temperature Range	-25°C to +60°C [45°C to 60°C with derating]	
Cooling Method	Natural Convection	
Ambient Humidity	0% to 98% Non-condensing	
Site Altitude above Sea Level	Up to 2000m	
Noise Emission (dBA)	<40	
IP Protection	IP65 [Indoor or Outdoor Installation]	
Mounting	Rear Panel	
Dimensions (WxHxD) [mm]	525*425*175	
Weight [kg]	23	
Standard Warranty (Year)	5 / 10/15/20/25 [Optional]	
Safety Class Compliance	AS3100, IEC62109-1, IEC62109-2	
EMC Compliance	EN61000-6-2, EN61000-6-3, EN61000-3-2, EN61000-3-3	
Grid Protection Compliance	VDE 0126-1-1/A1, VDE 4105, G83, G59, RD1699, C10/11, AS4777.3, EN50438, CGC/CF004	

Remarks: Meet the grid standard AC current per phase not exceeding 16A.

Type	Sununo-TL5K
Input (DC)	
Max. DC Power [W]	5200
Max. DC Voltage [V]	550
MPPT Voltage Range [V]	125-440
MPPT Voltage Range[V](Full Load)	200-440
DC Nominal Voltage [V]	360
Start Voltage [V]	150
Min. DC Voltage [V]	100
Max. DC Current Input A/Input B[A]	16 / 16
Number of DC Connection Sets	2
Number of MPP Trackers	2
DC Switch	Optional
Output (AC)	
Rated AC Power [W]	5000
Max. AC Power [W]	5000
Rated AC Current [A]	21.7
Max. AC Current [A]	25
Norminal AC Voltage/Range	220V, 230V, 240V/180V-280V
Grid Frequency/Range	50Hz, 60Hz/±5Hz
Power Factor(cos φ)	>0.99 [full load]
AC Current Distortion (THD)	< 2%
Consumption at Night [W]	<0.2
Consumption at Standby [W]	6
Efficiency	
Max. Efficiency	97.71%
Euro Efficiency (at 360Vdc)	97.1%
MPPT Accuracy	>99.5%
Protection	
Internal Overvoltage Protection	Integrated
DC Insulation Monitoring	Integrated
DC Side Varistors	Integrated
Direct Current Monitoring	Integrated
Ground Fault Current Monitoring	Integrated
Grid Monitoring	Integrated
AC Short Current Protection	Integrated
Thermal Protection	Integrated
Anti-island protection monitoring	AFD
Interface	
AC Connection	Terminals
DC Connection	MC4/H4
LCD Display	LCD(16x2 Characters, Backlight) & LED(3 Lights)
Display Language	Multi Language
Datalogger & Communication	2*RS485(Standard), Wi-Fi/Ethernet(Optional)
General Data	
Isolation	Transformerless
Operating Temperature Range	-25°C to +60°C [45°C to 60°C with derating]
Cooling Method	Natural Convection
Ambient Humidity	0% to 98% Non-condensing
Site Altitude above Sea Level	Up to 2000m
Noise Emission (dBA)	<40
IP Protection	IP65 [Indoor or Outdoor Installation]
Mounting	Rear Panel
Dimensions (WxHxD) [mm]	525*425*190
Weight [kg]	26
Standard Warranty (Year)	5 / 10 /15/20/25 [Optional]
Safety Class Compliance	AS3100, IEC62109-1, IEC62109-2
EMC Compliance	EN61000-6-2, EN61000-6-3, EN61000-3-2, EN61000-3-3
Grid Protection Compliance	VDE 0126-1-1/A1, VDE 4105, G83, G59, RD1699, C10/11, AS4777.3, EN50438, CGC/CF004

* Here indicastes there is another unit [VA] of these data which is applied to C10/11.

** Sununo-TL5K/4KA/3KA has different dimensions for enclosure as SU5KMTL1、SU4KMTL1、SU3KMTL1,detail see table documents.

4. UNPACKING

4.1 ASSEMBLY PARTS

After you receive the SAJ grid-tie solar inverter, please check if there is any damage on the carton. Also, please check the inside completeness and for any visible external damage on the inverter or any accessories. Contact your dealer if anything is damaged or missing.

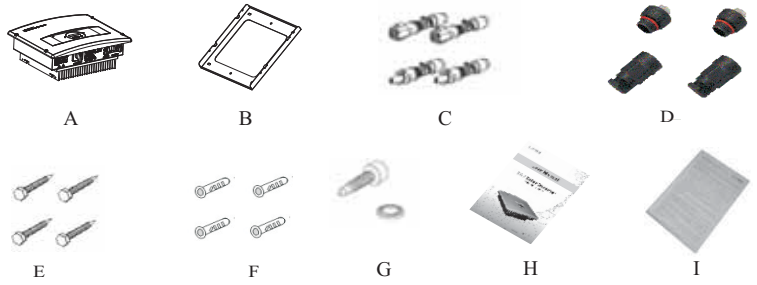


Figure 4.1

Object	Quantity	Description
A	1	SAJ grid-tie solar inverter
B	1	Rear panel
C	1 sets	DC connector (for Sununo-TL1.5K/2K)
	2 sets	DC connector (for Sununo-TL3KB/4KB/3KA/4KA/5K, SU3KMTLI, SU4KMTLI, SU5KMTLI)
D	2	RS485 connector (if attached)
E	6	M6×50 Expansion screw
F	6	Expansion tube
G	4	M4×12 Cylinder head screw and Lock washer (Sununo-TL1.5K/2K/3KB/4KB) M5×12 Cylinder head screw and Lock washer (Sununo-TL3KA/4KA/5K, SU3KMTLI, SU4KMTLI,SU5KMTLI)
H	1	User manual, including installation guide
I	1	Warranty card

4.2 FURTHER INFORMATION

If you have any further questions concerning the type of accessories or installation, please check our website www.saj-solar.com or contact our service hotline.

5. INSTALLATION

5.1 SAFETY

DANGER

• DANGER to life due to potential fire or electricity shock.

• Do not install the inverter near any inflammable or explosive items.

• This inverter will be directly connected with HIGH VOLTAGE power generation device; the installation must be performed by qualified personnel only in compliance with national and local standards and regulations.

NOTICE

• NOTICE due to the inappropriate or the harmonized installation environment may jeopardize the life span of the inverter.

• Installation directly exposed under intensive sunshine is not recommended.

• The installation site must have good ventilation condition.

5.2 MOUNTING INSTRUCTIONS

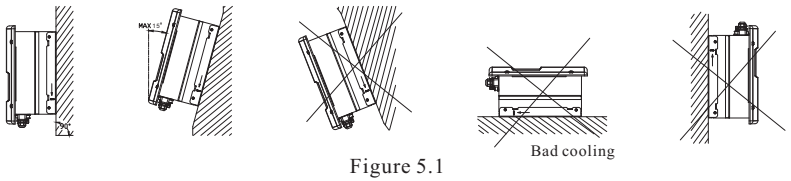


Figure 5.1

- SAJ grid - tie solar inverter is cooled by natural flow of air behind the inverter.
- SAJ grid - tie solar inverter is designed for installation both indoors and outdoors.
- Please only mount the inverter in the direction as illustrated above.

- Installation of the inverter in the vertical direction is recommended.
- Tilted backward max.15 degree is allowed.
- Never install the inverter forward, horizontally or even upside down.
- For the convenience of checking the LCD display and possible maintenance activities, please install the inverter at eye level.
- Make sure the wall you selected is strong enough to handle the screws and the weight of the inverter.
- Ensure the inverter is properly fixed to the rear panel.
- Installing the inverter under strong sunshine is not recommended; the excess heating might lead to power reduction.
- The ambient temperature of installation site should be between - 25 °C and +60 °C (between -13 °F and 140 °F) .
- Make sure enough ventilation at installation spot; insufficient ventilation may affect the operating performance of the inside electronic components, even shorten the life span of the device.

5.3 SAFETY CLEARANCE

To make sure the ventilation of the installation spot, if there are multiple SAJ grid-tie solar inverters installed in the same area, the following safety clearance shall be followed for proper ventilation conditions.

Direction	Minimum Clearance
Above	30 cm
Below	50 cm
Side	30 cm
Front	5 cm

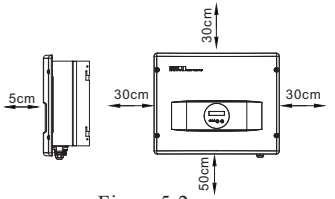
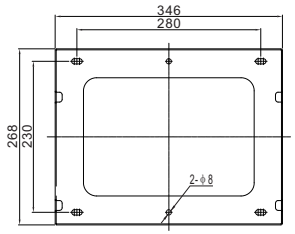


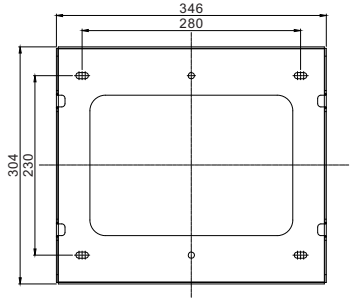
Figure5.2

5.4 MOUNTING PROCEDURE

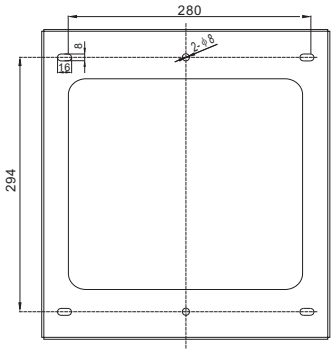
1. Use the rear panel in the package as a drilling template and mark the positions of the drill holes, as illustrated below.



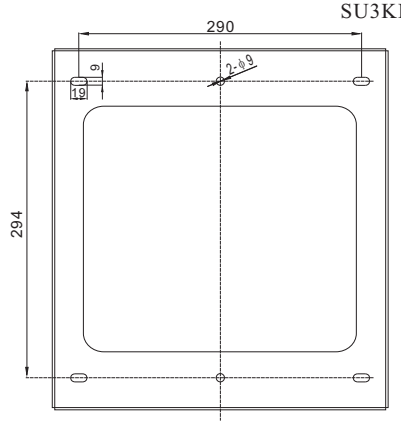
Sununo-TL1.5K/2K



Sununo-TL3KB/4KB



Sununo-TL3KA/4KA
SU3KMTLI/SU4KMTLI



Sununo-TL/5K
SU5KMTLI

Figure 5.3

2. According to the marks, drill 6 holes in the wall (in conformity with position marked in above picture), and then place expansion tubes in the holes using a rubber hammer.

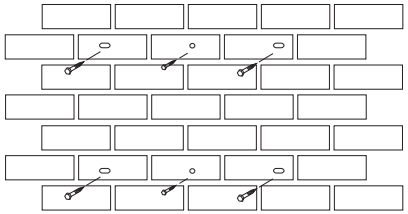


Figure 5.4

3. Mount the rear panel.
Wring six screws into the expansion tubes and tightly mount the rear panel on the wall.

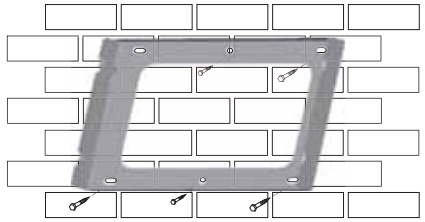


Figure 5.5

4. Carefully attach the inverter to the rear panel according to the position of the screws.Make sure the backside of the inverter is closely against the rear panel.
When two people transport the inverter, make sure each one use the hand grip in right position as illustrated in the picture.

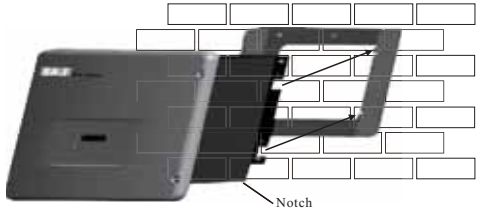


Figure 5.6

5. Pay attention to the four notches cut in both flanks of heat sink (as illustrated in above picture), which should be placed in corresponding hooks from the rear panel. Make sure that the heat sink and the rear panel are buckled together and the inverter is tightly attached to the rear panel. And tighten the screws with 5.9N • m torque.

6. Please carefully check the accessories and original carton to make sure during the installation every necessary part is used and nothing is missing.

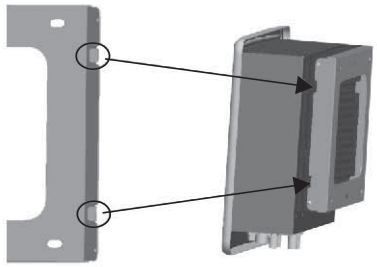


Figure 5.7

5.5 CHECK VARISTORS

If one or more of the varistors might be out of function, please check or replace the varistors according to the following steps:

1. Loosen all 4 captive screws of the removable front lid. Right after the 4 captive screws are removed, please keep them at a distance. Lift the lid upwards and remove it.

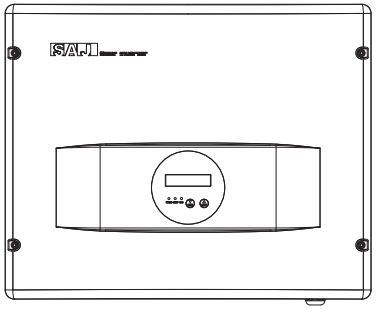
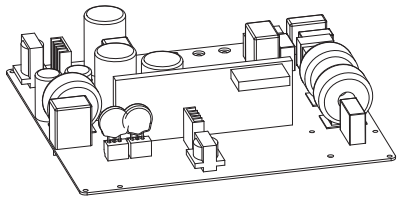
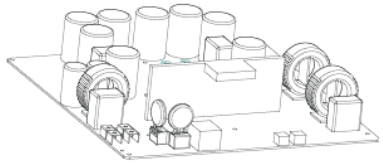


Figure 5.8

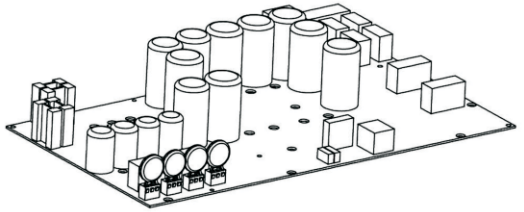
2. There are 2 varistors for Sununo-TL1.5K/2K/3KB/4KB and 4 varistors for Sununo-TL3KA/4KA/5K/SU3KMTLI/SU4KMTLI/SU5KMTLI in the left side.



Sununo-TL1.5K/2K



Sununo-TL3KB/4KB



Sununo-TL 3KA/4KA/5K
SU3KMTLI/SU4KMTLI/SU5KMTLI

Figure 5.9

3. Remove and install the varistors

Remove:

First use specified tool and insert it to three holes in the left side of the varistor, then press it to the end.

Pull the varistor out.

Install:

Use specified tool and insert it to three holes in the left side of the varistor, then press it to the end.

Press the varistor in.

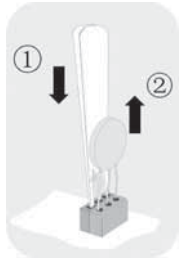


Figure 5.10

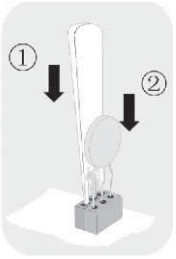


Figure 5.11

4. Put the lid back and re-screw all 4 screws, make sure the lid is tightening to the inverter.

5.6 MAINTENANCE

Ask your installer to check for proper inverter operation at regular intervals.

5.7 MODULE TECHNOLOGY

SAJ grid - tie solar inverters provide the optimal solution for any module. Transformerless-type SAJ grid-tie solar inverters are designed for ungrounded modules, especially for the crystalline silicon photovoltaic modules, such as monocrystalline silicon and polycrystalline silicon. While the thin-film modules are not suitable for SAJ transformerless inverters.

5.8 POLLUTION DEGREE

SAJ grid-tie solar inverters comply with the pollution degree 3.

5.9 OVERVOLTAGE CATEGORY

Overvoltage category III applies to SAJ grid - tie solar inverter AC terminals. For PV circuits in general, Overvoltage Category II is assumed.

6. ELECTRICAL CONNECTION

6.1 SAFETY

DANGER

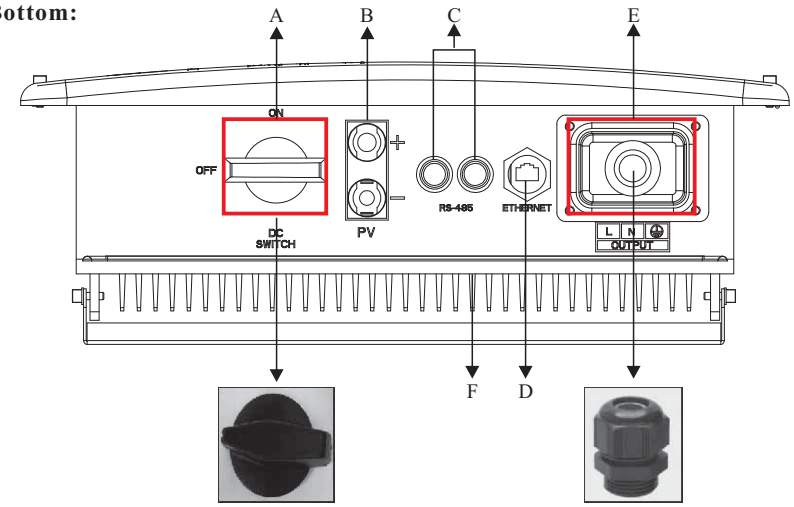
- DANGER to life due to potential fire or electricity shock.
- With the inverter powered, comply with all prevailing national regulations on accidents prevention.
- This inverter will be directly connected with HIGH VOLTAGE power generation device; the installation must be performed by qualified personnel only in compliance with national and local standards and regulations.

NOTICE

- Electrical connections shall be carried out in accordance with the applicable regulations, such as conductor sections, fuses, earthing protection.

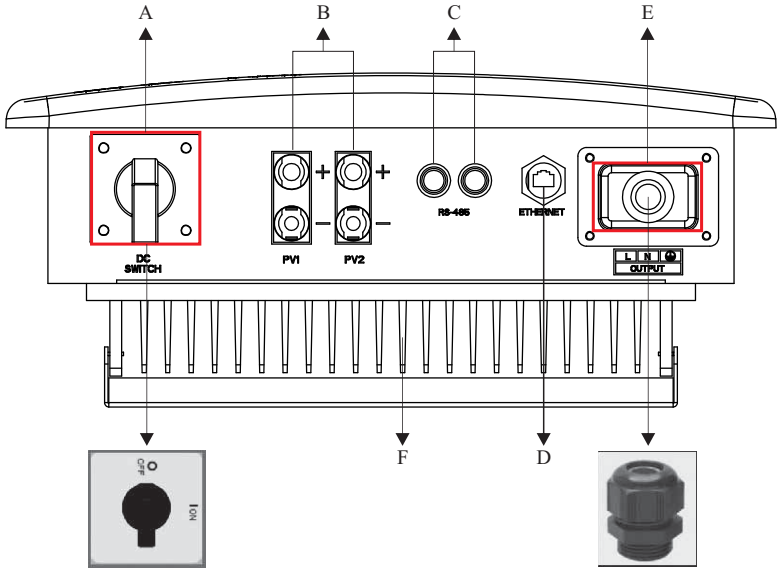
6.2 OVERVIEW OF CONNECTION AREA

Bottom:



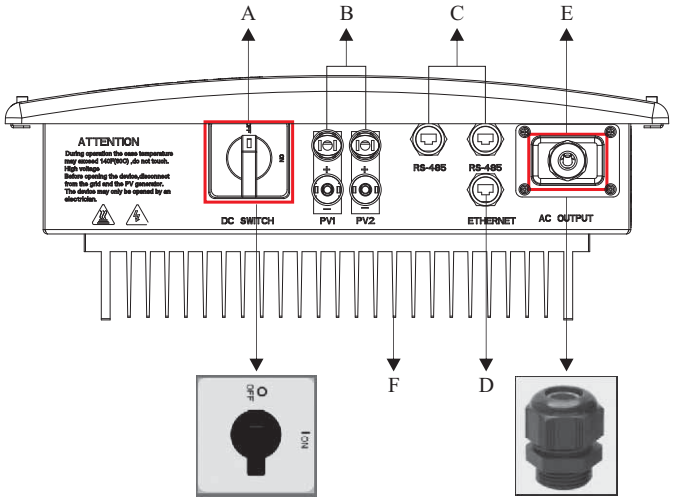
Sununo-TL1.5K/2K

Bottom:



Sununo-TL 3KB/4KB

Bottom:



Sununo-TL3KA/4KA/5K/SU3KMTLI/SU4KMTLI
SU5KMTLI /Figure 6.1

Object	Description
A	DC switch to turn off the inverter manually(optional)
B	DC input
C	Plug for connecting the RS485 communication module
D	Plug for connecting Ethernet communication module(optional)
E	AC output
F	Heat sink

6.3 AC SIDE CONNECTION

NOTICE

- The cross-section of the AC cable should be more than 12 AWG for Sununo-TL1.5K/2K and 10 AWG for Sununo-TL3KB/4KB/3KA/4KA/5K,SU3KMTLI SU4KMTLI/SU5KMTLI and Cable Range ϕ9-14mm.

DANGER

• DANGER to life due to potential fire or electricity shock.
• Never connect or disconnect the connectors under load.

Integrated RCD and RCM

The SAJ grid - tie solar inverter is equipped with integrated RCD (Residual Current Protective Device) and RCM (Residual Current Operated Monitor). The current sensor will detect the volume of the leakage current and compare it with the pre-set value. If the leakage current is above the permitted range, the RCD will disconnect the inverter from the AC load.

The SAJ grid-tie solar inverter will probably cause a DC current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product. Provided an AC current or pulse current is caused in the external protective earthing conductor, an RCD or RCM of Type AC or Type A as alternative can be permitted putting into use.

Assembly Instructions:

1. Strip the cable with the length 0.276 inches (9/32″) - (7mm) and please be careful NOT to nick conductors.

0.276 inches(9/32″)-(7mm)

Figure 6.2

2. Screw off and separate each component of AC connector as follows.

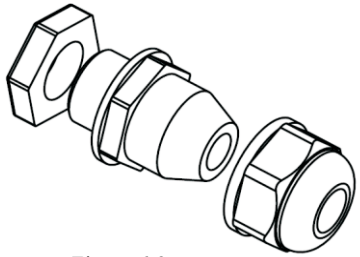


Figure 6.3

3. Pass the cable through each component from right to the left as follows. Tighten the screws with 3.0N • m torque.

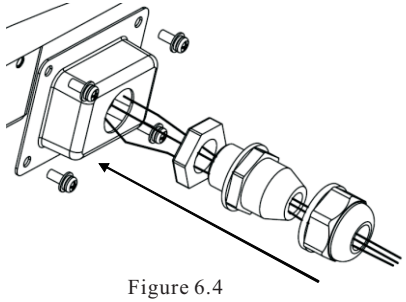


Figure 6.4

4. Use a screw driver and loose the three screws at the side of the straight plug. Then insert the stripped N, L and PE cable accordingly to the corresponding position and fully tighten the screws.

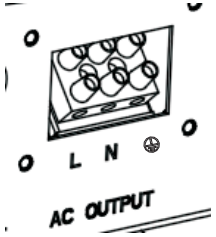
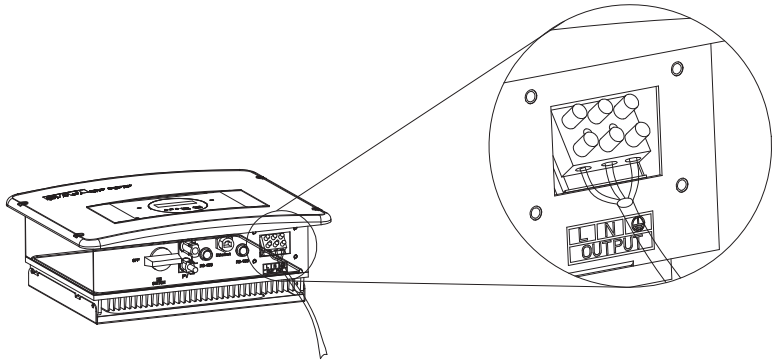


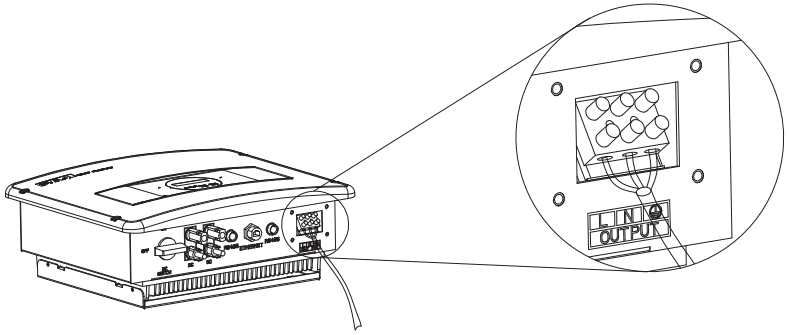
Figure 6.5

Connect L, N and protective conductor (⏚) to the AC terminal in accordance with the label.

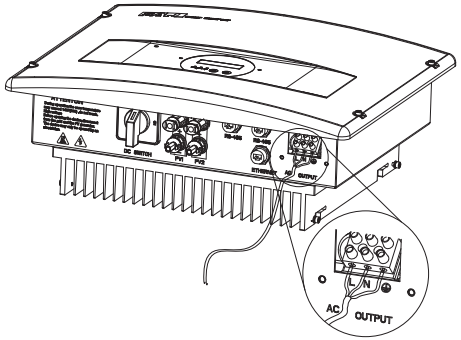
To do this , the insulated earthing conductor must be 5mm longer than the insulated L and N conductors! L and N must not be swapped.The ground wire shall be larger than phase conductor.



Sununo-TL1.5K/2K



Sununo-TL 3KB/4KB



Sununo-TL3KA/4KA/5K
Figure 6.6

5. Aim the terminals on the straight plug to the holes of the grommet, and then compress them together.

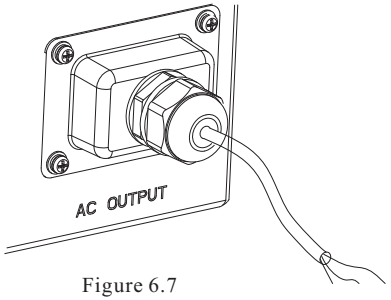


Figure 6.7

6. Finally, connect the straight plug to the AC terminal on inverter. Pay attention to the polarity of the terminals to avoid wrong connecting.

6.4 DC SIDE CONNECTION

NOTE:

The cable length on DC side should not exceed 30 m.

For Sununo – TL 1.5K/2K/3KB/4KB, there is just one MPP Tracker. These single MPPT inverters require same type module with same quantity, identical alignment and tilt.

For Sununo–TL3KA/4KA/5K,SU3KMTLI/SU4KMTLI/SU5KMTLI, there are two MPP Trackers for the two string inputs. Unlike the traditional single MPPT inverters which require same type module, same quantity, identical alignment and tilt, the multi-MPPT SAJ grid-tie inverters can deal with different solar modules, different quantity, different alignment and tilt, thus can withstand harshest environmental conditions.

Inverter Type	MPP Tracker	Max. DC Power (W)	Max.DC Voltage	Max.DC Current/per string(A)
Sununo-TL1.5K	1	1800	480V	11A
Sununo-TL2K		2300		12A
Sununo-TL3KB		3400	550V	17A
Sununo-TL4KB		4500		20A
Sununo-TL3KA, SU3KMTLI	2	3200		15A/15A
Sununo-TL4KA, SU4KMTLI		4200		15A/15A
Sununo-TL5K, SU5KMTLI		5200		16A/16A

DANGER

- DANGER to life due to potential fire or electricity shock.
- Never connect or disconnect the connectors under load.

NOTICE

• If only one string input is used for DC connection, please use the sealing plug to seal the left DC input set to ensure the inverter IP 65 protection.

NOTICE

• Before electrical connection setup, installer shall make sure the inverter is isolated and disconnected from the PV source and AC grid.

• The inverter may only be operated with PV generators (Class A PV modules according to IEC 61730 and cabling) of protection class II. Do not connect any sources of energy other than PV modules to the inverter.

NOTICE

No mixed connections between input zones(for Sununo-TL 3KB/4KB and Sununo-TL3KA/4KA/5K, SU3KMTLI/SU4KMTLI/SU5KMTLI).

• For instance, if the positive pole of a string is connected at input zone 1 and the negative pole at input zone 2, this is called a mixed connection.

• Only connect strings at one input zone and never mix the input zones 1 and 2!

The DC connectors come pre-assembled and the caps are loose. The whole connector will include the male side and female side as showed below:

Male side connector (M)

Female side connector (F)

Figure 6.8

Assembly Instructions:

1. Strip the cable with the length 0.276 inches (9/32")-(7mm) and please be careful NOT to nick conductors.

0.276 inches(9/32")-(7mm)

Figure 6.9

Use specified strip tool in this step. Adjust the strip stopper and put the cable in corresponding notch to strip the length of 7mm. See below figures.

Figure 6.10

Figure 6.11

2. Insert stripped cable into contact barrel and insure all conductor strands are captured in the contact barrel and the conductors are visible in the contact barrel observation hole. See below figures.

Pin contact

Barrel observation hole
Conductor should be visible

Figure 6.12

Socket contact

Barrel observation hole
Conductor should be visible

Figure 6.13

3. Crimp contact barrel by using the hex crimping die. ensure it is fixed.See below figures.

Crimped pin contact

Crimped socket contact

Figure 6.14

Cable requirements:

Cable Size	Cable pull – out force requirement
2.5 mm^2	Min. 310 N (70 Lbs)
4 mm^2	Min. 400 N (90 Lbs)
6 mm^2	Min. 450 N (100 Lbs)
10 mm^2	Min. 500 N (110 Lbs)

4. Insert contact cable assembly into back of male and female connector. A “click” should be heard or felt when the contact cable assembly is seated correctly. See below figures.

Male side connector (M)
Figure 6.15

Female side connector (F)
Figure 6.16

5. Wrest the cap by using the torque of 2.6~2.9N • m.

Figure 6.17

6. After wrested the cap tightly, align the 2 half connectors and mate them together by hand until a “click” is heard or felt.

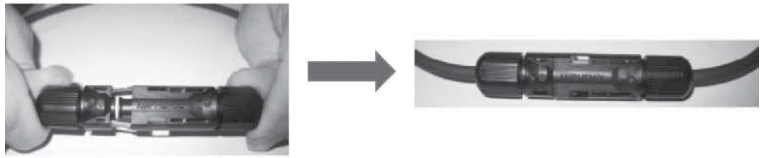


Figure 6.18

6.5 DC SIDE DISCONNECTION

Only qualified electricians who have fully understood all safety regulation contained in this manual can disconnect and maintain the DC connectros.

6.6 COMMUNICATION AND MONITORING SETTING

SAJ solar inverter offers 2 communication solutions for users: RS485 (standard) and Ethernet (optional). All the SAJ products involved in the solar monitoring system are:

Sununo-TL series solar inverters: single phase transformerless on-grid solar inverters, such as Sununo-TL1.5K/2K/3KA/4KA/5K, SU3KMTL1/ SU4KMTL1/SU5KMTL1

SAJ Logger: data logger for local monitoring and maintenance of solar power plants,can be registered through SAJ Web Portal.

SAJ Web Portal: free monitoring application through web, iPhone,iPAD and Android App. Internet access must be ensured for the inverter network configuration before SAJ Web Portal service registration.

SAJ Web Server: the local web monitoring application through web browser built in all SAJ inverters.For more detail information, please refer to SAJ Monitoring Solution through www.saj-soalr.com

Note : The text lines in the following Figures indicates communication cable

6.6.1Communication through RS485

RS485 can be used for both single-point and multi-point communication. At present, RS485 can communicate and monitor up to 32-inverters.

RS485 Single-point Monitoring

Communication of a single inverter is shown in Figure1 as below. Users can connect inverter's RS485 port to PC through RS485/232 Module.

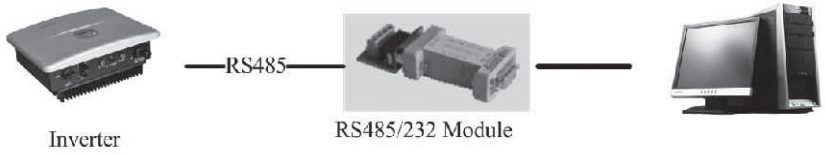


Figure 6.19 Communication of a Single Inverter

RS485 Multi-point Monitoring

To realize multi-point monitoring of SAJ solar inverter, we offer 2configurations as shown in below:

(1) PC Multi-point Monitoring

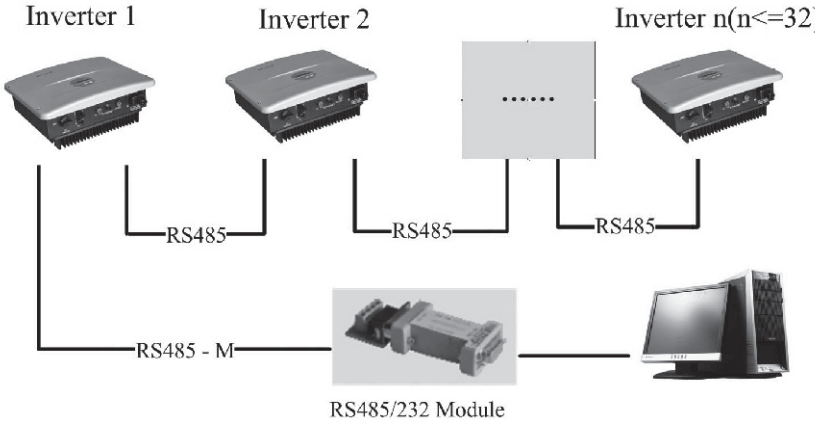


Figure 6.20 PC Multipoint Monitoring

(2) SAJ Logger Multipoint Monitoring

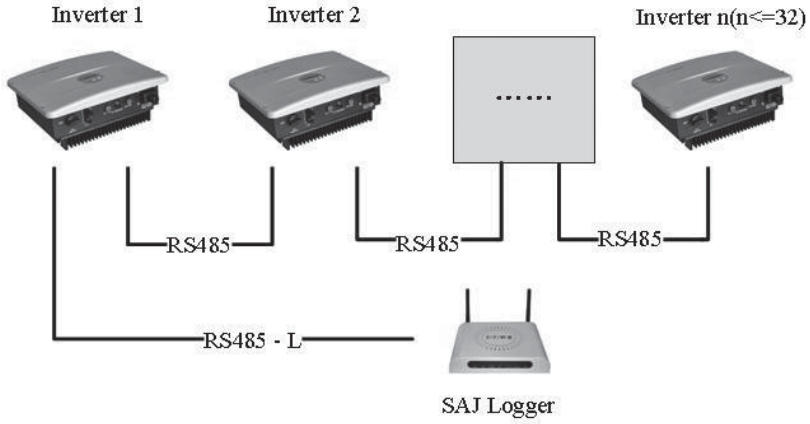


Figure 6.21 PC + SAJ Logger Multipoint Monitoring

Connection Procedures

1、Inverter 1 connects to Inverter 2 through RS485 cable; Inverter 2 connects to Inverter 3 through RS485 cable. In the same way to connect all inverters.

2、Inverter 1 connects to RS485/232 Module through RS485-M cable or connects to SAJ Logger through RS485-C cable.

3、Connect RS485/232 Module to PC's RS232 port, or connect SAJ Logger to PC through Router.

4、Open the internal web server of SAJ logger for plant and inverter monitoring.

6.6.2 Communication through Ethernet RJ45

When users choose Ethernet communication solution, users can access to Inverter real-time information through Inverter IP address, or through SAJ Logger IP address. The configuration is shown in Figure6.22 as below:

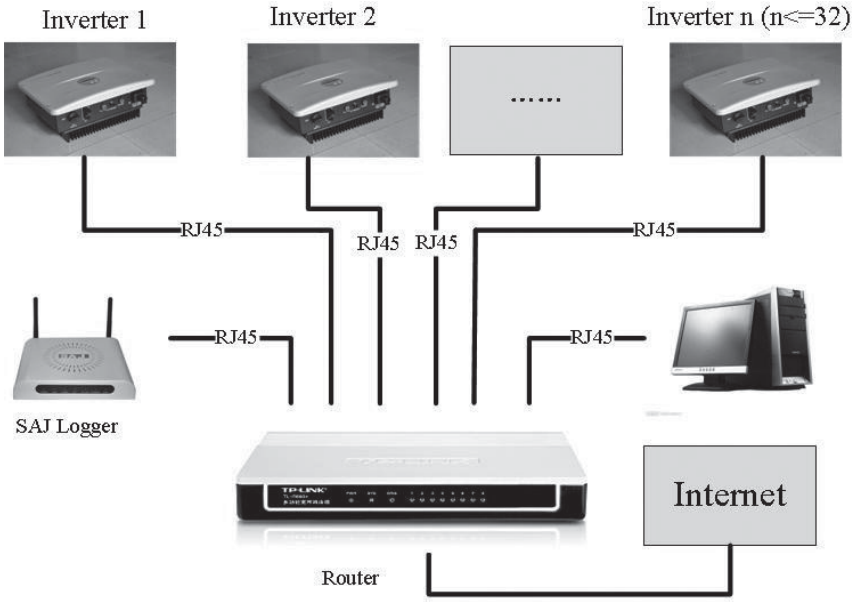


Figure 6.22 Communication through Ethernet RJ45

6.6.3 Cable Assembly Instructions

Cable:All cables mentioned in this Manual are 5E Shielded Cable, as shown in Figure6.23:

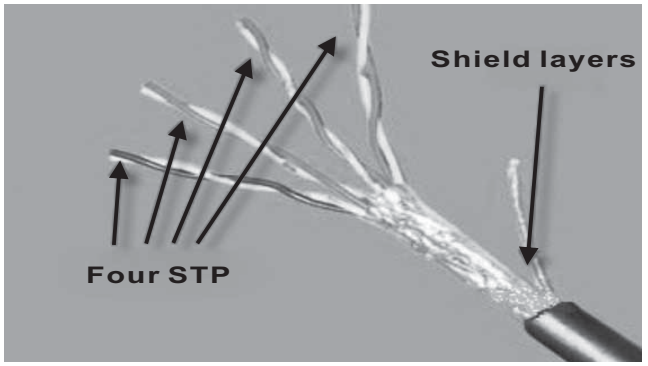


Figure 6.23 5E Shielded Cable

Terminals：According to different communication solutions, users may need at least one of the below terminals. They are 3Pin Connector and RJ45 Plug as shown in Figure6.24 and Figure6.25.

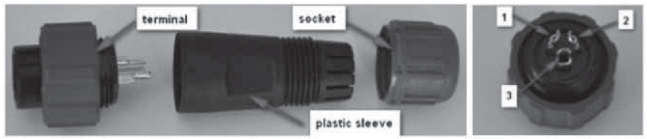


Figure 6.24 3Pin Connector

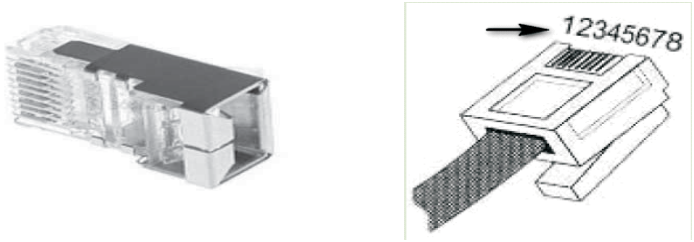


Figure 6.25 RJ45 Plug and Its Pin Number

Tools

When making a communication cable , the professional tools shown in Figure6.26 below are needed.

Figure 6.26 Tools for making a communicate cable

RS485 cable

When Inverters use RS485 for monitoring, users need RS485 cables to connect between Inverters for multipoint monitor. In this case, we provide Connection by using the 3Pin Connector as shown in Figure6.24.

Each end of the cable should be connected to the Connector according to Table 1. Make sure they are fixed well.

Connector No.	Wire
1	Blue & White
2	Blue
3	Metal shielded wire

Table 1 RS485 Cable Assembly Order

RS485-M cable

RS485-M cable is used to connect Inverter and RS485/232 Module. Users only use 2 wires of the 5E cable to connect to the Connector and the RS485/232 Module according to Table 2. Make sure they are fixed well.

Wire	Connector No.	RS485 /232 Module
Blue & White	1	D-/B
Blue	2	D+/A

Table 2 RS485-M Cable Assembly Order

RS485-L cable

RS485-L cable is used to connect Inverter and SAJ Logger when inverters are monitored via RS485. One end of the cable uses 3Pin Connectors, and the other end uses RJ45 Plug. Connection is shown in Table 3 as below:

Wire	Connector No.	RJ45 plug's Pin NO
Blue & White	1	5
Blue	2	4

Table 3 RS485-L Cable Assembly Order

RJ45 cable

RJ45 cable is the standard cable for Ethernet communication. Users can buy this cable in stores, or can assemble RJ45 cable as below:

Each end of the cable must be connected to RJ45 Plug according to Table 4. Make sure they are fixed well.

RJ45 plug's Pin NO	One RJ45 plug's Wire color	The other RJ45 plug's Wire color
1	White & Green	White & Orange
2	Green	Orange
3	White & Orange	White & Green
4	Blue	Blue
5	White & Blue	White & Blue
6	Orange	Green
7	White & Brown	White & Brown
8	Brown	Brown

Table 4 RJ45 Cable Assembly Order

7. LCD Operation

7.1 LCD DISPLAY

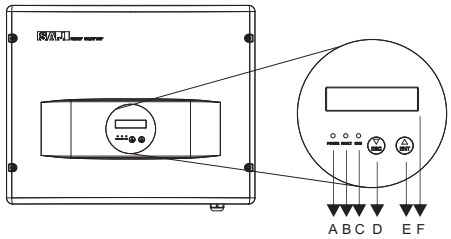


Figure 7.1

Object	Description
A	LED light – POWER. Yellow light shines when the inverter is energized.
B	LED light-FAULT. Red light shines when fault occurs in the inverter and automatically goes out when the fault is removed.
C	LED light-RUN. Green light flashes when the inverter runs good.
D	▼/ESC
E	▲/ENT
F	LCD screen for viewing the running data & recorded information, and setting parameters.

7.2 Operation Method

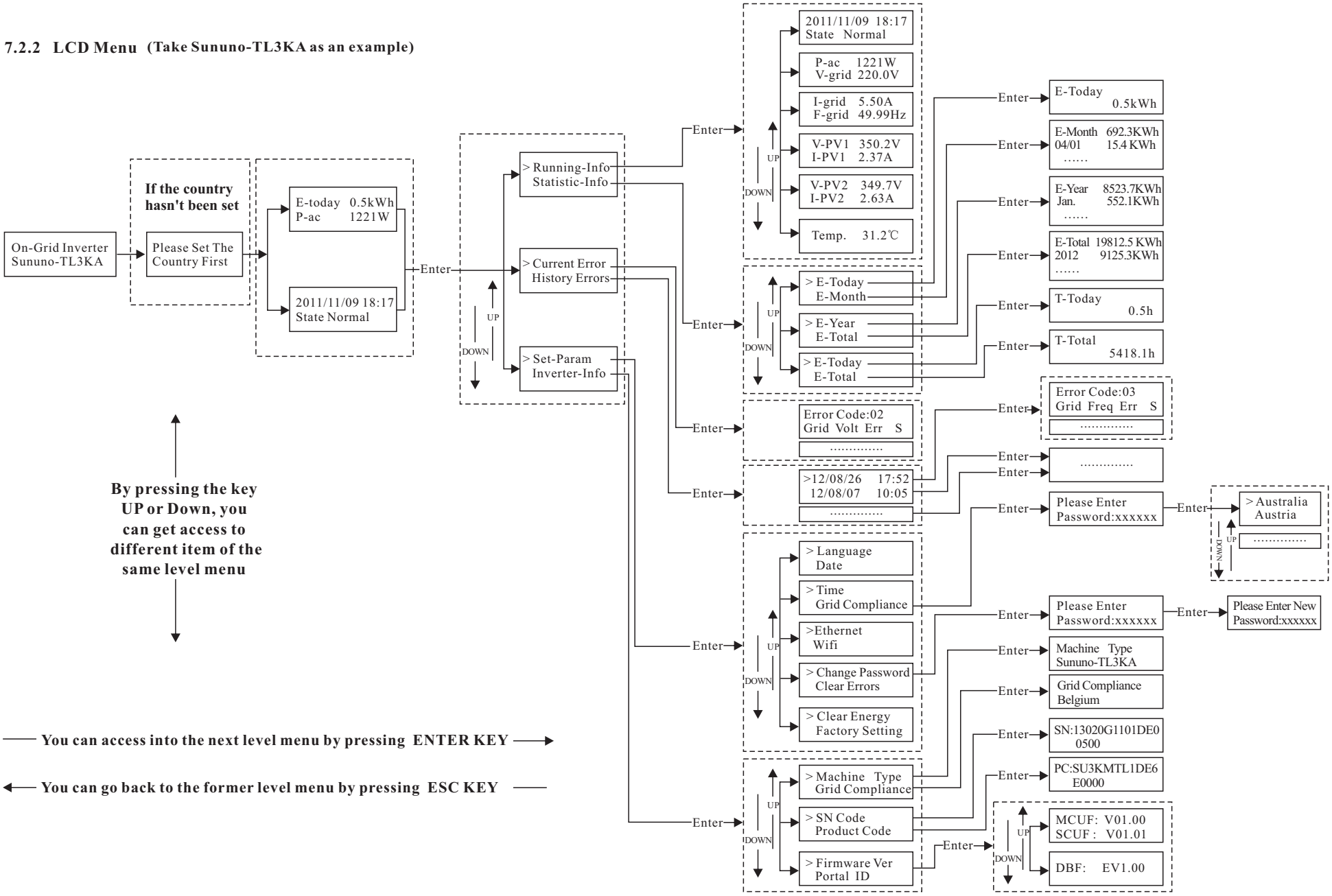
7.2.1 BUTTON FUNCTION

SAJ grid-tie solar inverter offers two buttons for user to look up running information and configure parameters. The two buttons can be reused.

Name	Operation	Description
▼/ ESC	Press less than one second	It indicates the"▼"button, which can move the cursor downwards in the menu, or decrease the setting value.
	Press more than one second	It indicates the "ESC"button, which can return to parent menu or cancel the demand.
▲/ ENT	Press less than one second	It indicates the "▲" button, which can move the cursor upward in the menu, or increase the setting value.
	Press more than one second	It indicates the "ENT"button, which can enter submenu or confirm the command.

NOTE: The back light of LCD screen will go out to save power if there is no button operation in one minute. You can activate it by pressing any button.

7.2.2 LCD Menu (Take Sununo-TL3KA as an example)



SAJ User Manual

7.2.3 Set The Country First

When the solar inverter begins to run for the first time, please configure the country of usage, and the inverter LCD will display as below:

Please Set The
Country First

Please press the "ENT" button, LCD will show the countries for option. Users can press "▼ " or"▲ ″ to move the cursor">"to select the correct country and press "ENT" button to confirm the selection.

Note: The configuration of the country of usage must be set before inverter starts to run for its first time, otherwise the inverter will not on-gird.

If users choose an incorrect country, it could lead to the inverter not running properly or reporting error frequently. Please make sure you select the correct country. User can enter the menu of "Inverter-Info->Grid Compliance" to check whether the setting is correct.

If users can not fond out the corrsponding country,please stop the setting and contact the after sales for confirmatior.

7.2.4 State

If the country has been set, the LCD shows the machine type when the inverter is started up, then it automatically displays the inverter operation status: Normal,Wait, Shutdown, Fault, P-Fault, Update.

Data name	Explanation
Normal	The inverter in normal (function) operation
Wait	The inverter in stand-by state
Shutdown	The inverter stops working
Fault	A fault occurs during operation
P-fault	A fault occurs repeatedly and has reached a certain times during operation
Update	The state of updating firmware

Press “ENT” to enter the second level menus.

> Running-Info
Statistic-Info

> Current Error
History Errors

> Set-Param
Inverter-Info

7.2.5 Running-Info

1.The “Running-Info” includes real time system data. All the data are explained in the following Table.

Electrical Real Time Data (Running-Info)

Data name	Explanation	Unit
P-ac	Output AC power	W
V-grid	Grid voltage	V
I-grid	Output AC current	A
F-grid	Grid frequency	Hz
V-PV1	DC Voltage of PV array1	V
I-PV1	DC Current of PV array1	A
V-PV2*	DC Voltage of PV array2	V
I-PV2*	DC Current of PV array2	A
Temp.	The temperature of the inverter	℃

*: The single MPPT inverters Sununo-TL1.5K/2K/3KB/4KB do not have these two items.

7.2.6 Statistic-Info

“Statistic-Info” includes some statistics information. All the data are explained in the following table.

Data name	Explanation	Unit
E-Today	The generated energy of current day	kWh
E-Month	Total generated energy of the month and the daily generated energy of current month	kWh
E-Year	Total generated energy of current year and the monthly generated energy of current year.	kWh
E-Total	The total energy generated by the inverter and total generated energy of the year.	kWh
T-Today	The operating time of current day	h
T-Total	Total hours of operation time	h

7.2.7 Current Error

If any of the following messages occurs in LCD Screen, and the status LED Light “Fault” is on, there is one or more error that has been detected by SAJ grid-tie solar Inverter.

Please go to Chapter 9 “TROUBLESHOOTING” for further information

Error		Explanation	Type of Error
Consistent Err	S	Consistent Error (Slave**)	Error
Grid Volt Err	S	Grid Voltage Error (Slave)	
Grid Freq Err	S	Grid Frequency Error (Slave)	
Grid Loss Err	S	Grid Loss Error (Slave)	
Bus Over Volt	S	Bus Over voltage(Slave)	
GFCI Err	S	GFCI Error (Slave)	
Over-TEMP.	S	Over-temperature (Slave)	
PV Over Volt	S	PV-Overvoltage (Slave)	
AC Over Current	M	AC-Overcurrent (Master*)	
Isolation Err	M	Isolation Error (Master)	
Grid Volt Err	M	Grid Voltage Error (Master)	
Grid Freq Err	M	Grid Frequency Error (Master)	
V-Grid 10m Err	M	Grid Voltage 10min Error (Master)	
DCI Err	M	DCI Error(Master)	
GFCI Err	M	GFCI Error (Master)	
Over-TEMP.	M	Over-temperature (Master)	
Other Err	S	Other Error (Slave)	Permanent Error
Int. Comm Err	S	Internal Communication Error (Slave)	
CurrSensor Err	S	Current Sensor Error (Slave)	

Error		Explanation	Type of Error
Varistor Err	S	Varistor Error (Slave)	Permanent Error
2.5V Ref Err	S	2.5V Ref Error (Slave)	
Other Err	M	Other Error (Master)	
CurrSensor Err	M	Current Sensor Error (Master)	
GFCI Dvc Err	M	GFCI Device Error (Master)	
Int. Comm Err	M	Internal Communication Error (Master)	
E2PROM R/W Err	M	E2PROM R/W Error (Master)	
2.5V Ref Err	M	2.5V Ref Error (Master)	
DCI Device Err	M	DCI Device Error(Master)	
Relay Err	M	Relay Error (Master)	

* "Master" is inverter's main controlling and processing unit.
* "Slave" is inverter's subordinate controlling and processing unit.

7.2.8 History Errors

When enter the History Errors menu if one or more error had happened, we can see the error occurred time. Move the cursor to the desired error time, press ENT to see the detailed error information (see the above table)

```
>11/11/09 12:00
 11/11/07 15:12
```

7.2.9 Set-Param

Note: Every parameter is effective after the below menus have been confirmed.

```
Are you sure
to set it?
```

```
Set complete!
```

Language :
The inverter will support multi language:English, German and French etc. in the future, please refer to SAJ service people for latest information. Press "▼" or "▲" button to choose one language. Press ESC or ENT to exit when "Set Complete!" appears.

```
Language    [0]
0:EN 1:GE 2:FR
```

Date :
This setting includes "year, month and date". Press "▼" or "▲" button to choose one of the items: year/ month/date, press ENT to make the cursor "^" point to the selected item. Then press "▼" or "▲" button to set the parameter.

Press ENT to confirm this item setting, then it automatically points to the next item setting. Repeat the operation steps to set other item.

When the three items have been set, "Are you sure to set it?" will appear; press ENT to confirm it. Then press ESC or ENT to exit when "Set Complete!" appears.

```
Date: 2011/10/31
           ^
```

Time :
This setting includes "hour, minute and second".
Please refer to the operation steps of "Date Setting".

```
Time : 15:48:28
       ^
```

Grid Compliance(Only for SAJ or SAJ representative):
The Gird Compliance may be different in the different countries. If the chosen country of "Grid Compliance" is incorrect, we can modify it by this menu.
Enter to the "Gird Compliance" and confirm the password, then press"▼ " or"▲ " button to select the country. Please press "ENT" button to confirm after finish the selection.

Ethernet :
The inverter system can get an IP address by using DHCP (Dynamic host configuration protocol) when out of factory. If the action fails in 40 seconds, the system will use the default address:192.168.1.111（gateway：192. 168. 1. 1, Subnet mask：255. 255. 255. 0）.

If user manually set an IP address, the system will use it all the time. To recover the IP by using DHCP, User can configure the inverter to obtain the IP address automatically, then the inverter will automatically restart and adopt DHCP to get the IP address.

The manual setting step is as follows:
Enter the Ethernet->manual setting menu, and press "▼" or "▲" button to set every figure, press ENT to confirm, and then it automatically points to next figure. When all the figures have been set, "Are you sure to set it?" will appear; press ENT to confirm it. Press ESC or ENT to exit when "Set Complete!" appears.

Wifi:
Do not support this function temporary.

Change Password(Only for SAJ or SAJ representative):
User can change the password by the "Change Password" menu.

Clear Errors:
Be caution that this operation will clear up the history error records.
If user wants to clear up the history error records, move the cursor and press ENT to enter the sub-items, press ENT to confirm the setting when the below menu occurs. Press ESC or ENT to exit when "Set Complete!" appears.

Clear Energy:
Be caution that this operation will clear up the generated energy data of E-Today、E-Month、E-Year、E-total、T-Today、T-Total etc.
If user wants to clear up the generated energy record, move the cursor to "clear energy" and press “ENT”to enter the sub-items, press “ENT” to confirm the setting when the below menu occurs. Press ESC or ENT to exit when "Set complete!" appears.

Factory Setting(Only for SAJ or SAJ representative):
Note: This operation will erase all history data record, such as generated energy, error logs etc. And the password and Grid Compliance will be set back to default settings.
Enter “Factory Setting” menu to enter the password, the system will required users to re-confirm “Factory Setting”. Press “ENT” button to confirm. You can see “Set complete” to finished the “ Factory setting” and press “ESC” or “ENT” to exit the “ Set complete”

7.2.10 Inverter-Info

User can read the inverter detailed machine information:

> Machine Type
Grid Compliance

> SN code
Product Code

> Firmware Ver

User can enter the corresponding sub-menu to see the detailed information .
Enter the “Firmware Ver” , it will show the firmware version of master control unit, slave control unit, display board (the firmware version will vary when it is updated)

8. RECYCLING AND DISPOSAL

WARNING

This device shall not be disposed of in residential waste.

To comply with European Directive 2002/96/EC on waste Electrical and Electronic Equipment and its implementation as national law, electrical equipment that has reached the end of its life must be collected separately and returned to an approved recycling facility. Any device that you no longer required must be returned to your dealer or you must find an approved collection and recycling facility in your area.

Ignoring this EU Directive may have severe affects on the environment and your health.

9. TROUBLESHOOTING

Error Code	Message	Corresponding Action
01	**“Slave Consistent Error”** Following cause might lead to this error: • Interference device	If this event occurs often: • Please contact local agent or SAJ Service line.
02	**“Slave Grid Voltage Error”** • The grid voltage has gone up/down that out of the permitted range of local grid regulations. Following causes might lead to this error: • Grid voltage is too high/low at the point of common coupling to the inverter. • For safety consideration, the inverter will disconnect itself from the grid for a short time, and it will automatically reconnect to the grid after a short time if the grid voltage is back to the permitted range.	• Check the grid voltage. • Check the grid connection of the inverter. • If the grid voltage goes beyond the permitted range of local grid conditions, please ask the utility operator if the voltage can be adjusted at the feed-in point or if changes in the values of the monitored operational limits are possible. • If the grid voltage that checked is within the permitted range, yet this error is still showing in the LCD screen, please contact local agent or SAJ Service line.
03	**“Slave Grid Frequency Error”** • The grid frequency has left the permitted range. • For safety consideration, the inverter will disconnect itself from the grid for a short period of time, and it will reconnect to the grid automatically after a short period of time if the grid frequency is back to the permitted range.	• Within safety scope, check the grid frequency and observe how often major deviations occur. • If there are repeated frequency turbulences which lead to this error, please ask the utility operator if modification of the operating parameter is possible. • If this error is not solvable, Please contact local agent or SAJ Service line.

Error Code	Message	Corresponding Action
04	**"Slave Grid Loss Error"** • The inverter has detected an error in the cabling and cannot connect to the grid. Following causes might lead to this error: • Grid connection installation failure. • Cabling failure.	• Check AC installation. • Check grid connection. • If this error is not solvable, Please contact local agent or SAJ Service line.
05	**"Slave Bus Over voltage"** • The voltage of the Bus which paralleling connected with the string is too high. Following causes might lead to this error: • The DC input voltage connected to the inverter is too high. • Sudden DC surge. • For safety consideration, the inverter will shut down itself.	• Please immediately disconnect the inverter from the PV strings (see chapter 6.5 "DC Side Disconnection") or else the inverter might be damaged. • Check the DC voltage of the strings for adherence to the maximum input voltage of the inverter, before you reconnect the inverter to the PV strings.
06	**"Slave GFCI Error"** • The inverter has detected a ground Err in the PV generator.	• The installer of the PV generator must solve the ground faults before you re-connect the strings. • If this error is not solvable, Please contact local agent or SAJ Service line.

Error Code	Message	Corresponding Action
07	**"Slave Over-temperature"** • The delivered power of the inverter was reduced below rated power because of abnormal temperature within 0.5s. Following causes might lead to this error: • At least one or more of the thermally monitored varistors are defective. • Overheating inside. • Not sufficient ventilation.	If this event occurs often: • Check the varistors. • Please ensure sufficient ventilation. • If this error is not solvable, please contact local agent or SAJ Service line.
08	**"Slave PV-Over voltage"** • The DC input voltage which connects to the inverter is too high. Following causes might lead to this error: • The open-circuit voltage of the PV generator is higher than the maximum DC input voltage of the inverter. • Sudden DC surge. • Environment temperature too high.	• Please immediately disconnect the inverter from the PV strings (see chapter 6.5 "DC Side Disconnection") or else the inverter might be damaged. • Check the DC voltage of the strings for adherence to the maximum input voltage of the inverter, before you reconnect the inverter to the PV strings.
09	**"Master AC-Over current"** • The detected AC current has exceeded the pre-set Max. AC Current. Following causes might lead to this error: • Short circuit happens in the output circuit.	If this event occurs often: • Please contact local agent or SAJ Service line.

Error Code	Message	Corresponding Action
10	**"Master Isolation Error"** ● There is a sudden isolation Err detected by the inverter. Normally this fault will only exist for a very short period of time and shall not have any bad influence to the inverter.	If this event occurs often: ● Please contact local agent or SAJ Service line.
11	**"Master Grid Voltage Error"** ● The grid voltage has gone up/down that out of the permitted range of local grid regulations. Following causes might lead to this error: ● Grid voltage is too high/low at the point of common coupling to the inverter. ● For safety consideration, the inverter will disconnect itself from the grid for a short time, and it will automatically reconnect to the grid after a short time if the grid voltage is back to the permitted range.	● Check the grid voltage. ● Check the grid connection of the inverter. ● If the grid voltage goes beyond the permitted range of local grid conditions, please ask the utility operator if the voltage can be adjusted at the feed-in point or if changes in the values of the monitored operational limits are possible. ● If the grid voltage that checked is within the permitted range, yet this error is still showing in the LCD screen, please contact local agent or SAJ Service line.
12	**"Master Grid Frequency Error"** ● The grid frequency has left the permitted range. ● For safety consideration, the inverter will disconnect itself from the grid for a short period of time, and it will reconnect to the grid automatically after a short period of time if the grid frequency is back to the permitted range.	● Within safety scope, check the grid frequency and observe how often major deviations occur. ● If there are repeated frequency turbulences which lead to this error, please ask the utility operator if modification of the operating parameter is possible. ● If this error is not solvable, Please contact local agent or SAJ Service line.

Error Code	Message	Corresponding Action
13	**"Master Voltage 10min Error"** • The average grid voltage over 10 minutes has been outside the permitted range according to local grid regulations. Following causes might lead to this error: • Grid voltage is too high at the point of common coupling to the inverter. • Grid impedance at the terminal of the inverter is too high. • For safety consideration, the inverter will disconnect itself from the grid for a short period of time, and it will reconnect to the grid automatically after a short period of time if the grid voltage is back to the permitted range.	• Check the grid voltage. • Check the grid connection of the inverter. • If the grid voltage exceeds the permitted range because of local grid conditions, please ask the utility operator if the voltage can be adjusted at the feed-in point or if changes in the values of the monitored operational limits are possible. • If the grid voltage that checked is within the permitted range, yet this error is still showing in the LCD screen, Please contact local agent or SAJ Service line.
14	**"Master DCI Error"** ● The direct component of the AC current is out of the permitted range.	If this event occurs often: ● Please contact local agent or SAJ Service line.
15	**"Master GFCI Error"** ● The inverter has detected a ground Err in the PV generator.	● The installer of the PV generator must solve the ground faults before you re-connect the strings. ● If this error is not solvable, Please contact local agent or SAJ Service line.

Error Code	Message	Corresponding Action
16	"**Master Over-temperature**" • The delivered power of the inverter was reduced below rated power because of abnormal temperature within 0.5s. Following causes might lead to this error: • At least one or more of the thermally monitored varistors are defective. • Overheating inside. • Not sufficient ventilation.	If this event occurs often: • Check the varistors. • Please ensure sufficient ventilation. • If this error is not solvable, please contact local agent or SAJ Service line.
17	**"Slave Other Error"** ● A Err has occurred in one or more major components of the inverter. ● For safety consideration, the inverter will shutdown itself.	If this event occurs: ● Please contact local agent or SAJ Service line.
18	**"Slave Internal Communication Error"** ● A fault has occurred in the internal communication of the inverter.	If this event occurs often: ● Please contact local agent or SAJ Service line.
19	**"Slave Current Sensor Error"** ● A Err has occurred in one or more current sensor of the inverter. ● For safety consideration, the inverter will shutdown itself.	If this event occurs: ● Please contact local agent or SAJ Service line.

Error Code	Message	Corresponding Action
20	**"Slave Varistor Error"** ● At least one of the varistors from the DC side is defected. Following causes might lead to this error: ● Varistor is bust due to over-voltage protection.	If this event occurs: • Please check the varistors as chapter 5.5 "Check Varistors". • If this error is not solvable, Please contact local agent or SAJ Service line.
21	**"Slave 2.5V Ref Error"** ● The CPU voltage that detected by internal sensor is deviating the pre-set 2.5V reference line.	If this event occurs: ● Please contact local agent or SAJ Service line.
22	**"Master Other Error"** ● A Err has occurred in one or more major components of the inverter. ● For safety consideration, the inverter will shutdown itself.	If this event occurs: ● Please contact local agent or SAJ Service line.
23	**"Master Current Sensor Error"** ● A Err has occurred in one or more current sensor of the inverter. ● For safety consideration, the inverter will shutdown itself.	If this event occurs: ● Please contact local agent or SAJ Service line.
24	**"Master GFCI Device Error"** ● The internal sensor has detected that the GFCI Device is out of function. ● For safety consideration, the inverter will shutdown itself.	If this event occurs often: ● Please contact local agent or SAJ Service line.

Error Code	Message	Corresponding Action
25	"**Master Internal Communication Error**" • A fault has occurred in the internal communication of the inverter.	If this event occurs often: • Please contact local agent or SAJ Service line.
26	"**Master E2PROM R/W Error**" • Internal device Err. • For safety consideration, the inverter will shutdown itself.	If this event occurs often: • Please contact local agent or SAJ Service line.
27	"**Master 2.5V Ref Error**" • The CPU voltage that detected by internal sensor is deviating the pre-set 2.5V reference line.	If this event occurs: • Please contact local agent or SAJ Service line.
28	"**Master DCI Device Error**" **• The internal sensor has detected that the DCI Device is out of the function.**	If this event occurs often: • Please contact local agent or SAJ Service line.
29	"**Master Relay Error**" • A fault has occurred in the relay which will automatically disconnect the inverter from the grid. • For safety consideration ,the inverter will shutdown itself.	If this event occurs often: • Please contact local agent or SAJ Service line.

10. Guaranty Service

Please refer to the warranty card.

11. Contact SAJ

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ABBREVIATION

LCD	Liquid Crystal Display
LED	Light Emitting Diode
MPPT	Maximum Power Point Tracking
PV	Photovoltaic
GFCI	Ground Fault Current Interrupter
Vdc	Voltage at the DC side
Vac	Voltage at the AC side
Vmpp	Voltage at the Maximum Power Point
Impp	Amperage at Maximum Power Point
Voc	Open Circuit Voltage
Isc	Short Circuit Current
AC	Alternating Current (Form of electricity supplied by Utility Company)
DC	Direct Current (Form of electricity generated by PV modules)
VDE 0126-1-1	German standards for establishing suitability for Grid Connection of the Inverter.
DC Switch	Switch in the DC Circuit. Disconnects DC source from Inverter. May be integrated or external to Inverter.