



JSI-G2.5K PV Grid-Connected Inverter



User Manual

JALPOWER Corporation, Ltd.

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1. Symbols Explanation

Please note the following explanation of the symbols used in this manual.



WARNING!

This indicates a condition that can cause fatal injury or death.



NOTICE!

This indicates a condition that will help to achieve optimal system operation.



Caution!

This indicates a condition that may cause minor or moderate injury.

2 Introduction

Thank you for buying the JSI-G2.5K from the JALPOWER. We hope that the device will meet with your satisfaction when you use it with your PV plant system.

2.1 Grid-Connected PV inverter

A JSI-G2.5K grid-connected PV system is shown in Fig.1. JSI-G2.5K transforms the direct current generated by the PV array into stable alternating current and output to the utility grid.

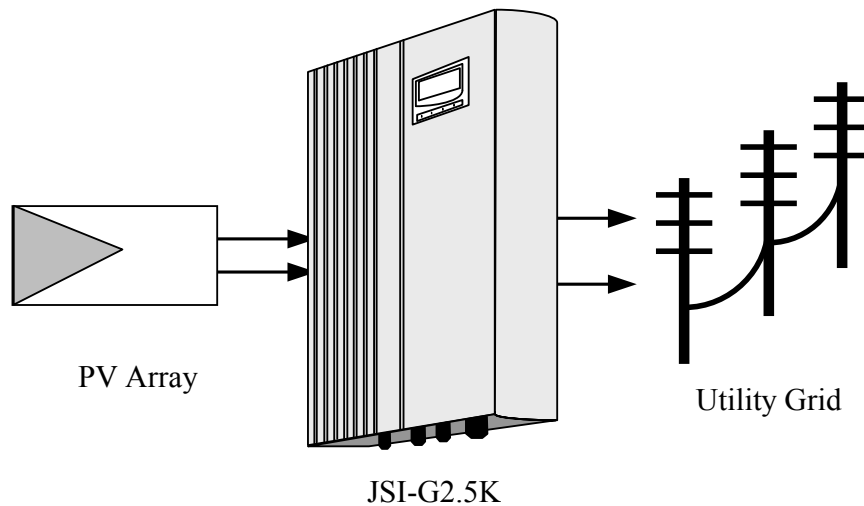


Fig.1 Grid-connected Inverter for PV power application

2.2 How to use this manual

The purpose of this manual is to provide users with detailed product information and instructions for the use of the JSI-G2.5K grid-tied PV inverter.

3. Safety Instructions

- Please read the instructions in this manual carefully before installing and operating the JSI-G2.5K.
- Always disconnect the inverter from the grid first.
- ALL CONNECTIONS SHOULD ONLY BE UNDERTAKEN BY QUALIFIED PERSONNEL.
- All electrical installations shall be done in accordance with local and national electrical codes.
- Please contact your authorized system installer if any maintenance is required.
- Connection of the JSI-G2.5K to the utility grid must be done only after receiving prior approval from the utility company and performed by qualified personnel.
- Completely disconnect the output from the PV array before connecting to the JSI-G2.5K or use other methods to prevent electrical shock hazards. This is important because if the PV array keeps connecting during the connection process may produce dangerous voltages.



WARNING!

Make sure that the DC input voltage never exceeds 450V. Higher input voltages will damage the JSI-G2.5K and will lead to the loss of any and all warranty rights.

4 General Descriptions of JSI-G2.5K

4.1 Circuit Description

Fig.2 shows the main circuit of JSI-G2.5K -a transformerless grid-connected inverter. The DC-DC boost stage increased the input DC voltage; the IGBT full-bridge converts the DC power to AC voltage and current. The AC power is then fed to the grid after being processed by a filter.

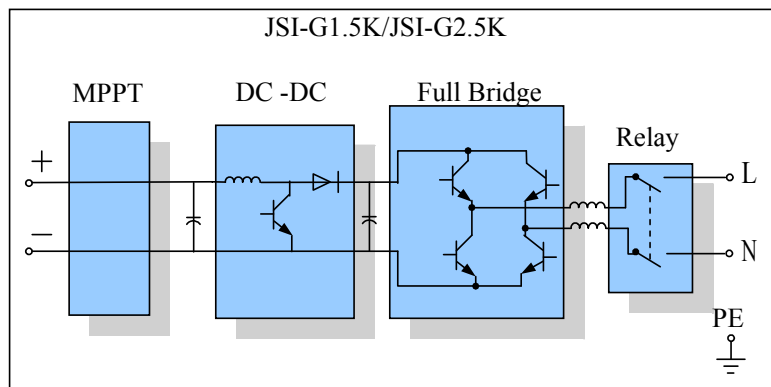


Fig.2 circuit diagram of JSI-G2.5K

4.2 Features of JSI-G2.5K

The following are the Technical features of JSI-G2.5K:

1. The fifth generation Intelligent Power Module from Mitsubishi improves the system efficiency.
2. MPPT auto-optimizing technique makes the most of the PV generation capacity.
3. Multilingual LCD display.
4. Simple parameters settings.
5. Multi communication interface.
6. High reliability due to complete protection functions.
7. Wide DC input voltage range (up to 450V DC).

4.3 The Wiring Interface

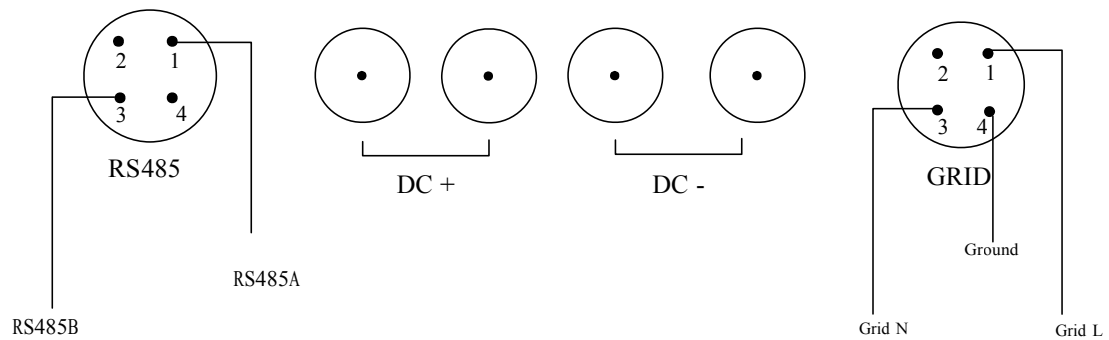


Fig.3 The wiring interface of JSI-G2.5K

Table4-1 Terminal descriptions

Terminal	Description
RS485	RS485 A: pin 1 RS485 B: pin 3
DC+	DC+: DC + input terminal
DC-	DC-: DC - input terminal
GRID	Connected to the grid. Red wire connected to the GRID L. pin 1 Black wire connected to the GRID N. pin3 Yellow-green wire connected to the ground pin4

5 Operation Description

5.1 Operation Modes

This chapter illustrates the operation modes of the JSI-G2.5K.

■ Stand-by mode:

Standby-mode is entered due to fault or insufficient input power, at stand-by mode the inverter is ready to switch into Grid mode provided all the specified conditions are met, otherwise the inverter will keep at stand-by mode.

■ Connecting to the grid:

After all system tests have been performed and all connection conditions are met, the inverter switches from stand-by mode to connecting mode.

In this mode the inverter delivers power to the grid. This mode is the normal operational mode.

■ Fault

When faults occur, the inverter will switch off the AC side relay and go into fault or stop mode to protect the PV power system, when the fault is solved, the inverter will wait for 300 seconds and test whether all the grid connection conditions are met again, if everything is satisfied, the inverter will start to generate power.

5.2 Commissioning

The inverter works as follows when connecting to the grid:

- The PV modules are activated and start producing power.
- The JSI-G2.5K inverter starts charging the DC bus.
- If the DC input voltage exceeds 170 V, the inverter is ready for grid connection.
- The inverter checks that grid conditions are OK.
- The JSI-G2.5K starts feeding power to the grid.

5.3 Required Grid Conditions

■ GRID Conditions necessary for JSI-G2.5K operation:

● Grid voltage

The grid voltage must be within a range of 180V-260V , check table 5-1 for the adjustable voltage range. Once the grid voltage exceeds this range the JSI-G2.5K is disconnected from the grid within 0.2s.

● Grid frequency

The grid frequency must be 47-51.5Hz/57-61.5Hz, check table 5-1 for the adjustable frequency range. Once the grid frequency exceeds this range the JSI-G2.5K is disconnected from the grid with 0.2s.

Table5-1 protection parameters range

Data name	Simple explanation	Adjustable range	Default value
Vgrid-max	maximum AC voltage	240V-260V	250V
Vgrid-min	minimum AC voltage	180V-200V	180V
Fgrid-max	maximum AC frequency	50.5Hz-51.5Hz	51Hz
		60.5Hz-61.5Hz	61Hz
Fgrid-min	minimum AC frequency	47.0Hz-49.5Hz	49Hz
		57.0Hz-59.5Hz	59Hz

6 Monitoring and Display

6.1 Basic Communications

The inverter normally operates automatically, without user interaction and any maintenance.

To enable our customers to gain a thorough comprehension about the operation of the inverter, we have provided various data-collection approaches to monitor system data.

Data logger

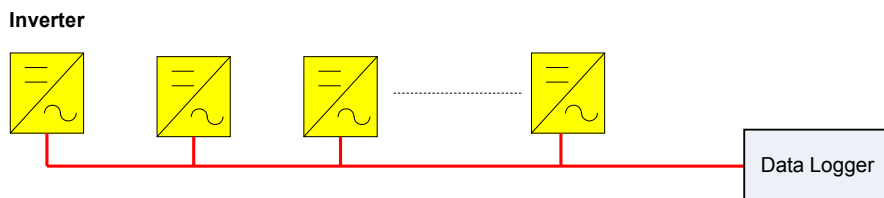


Fig.4 data logger collects data through RS485 bus

PC

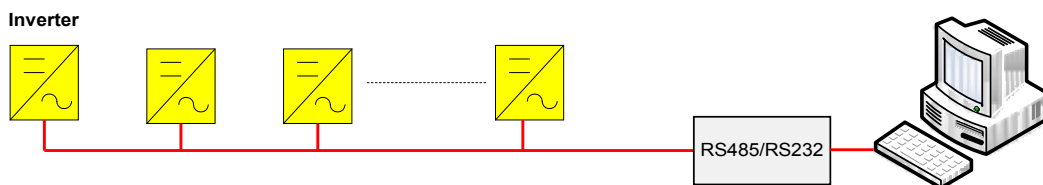


Fig.5 PC collects data through RS485 bus

Data logger+ PC

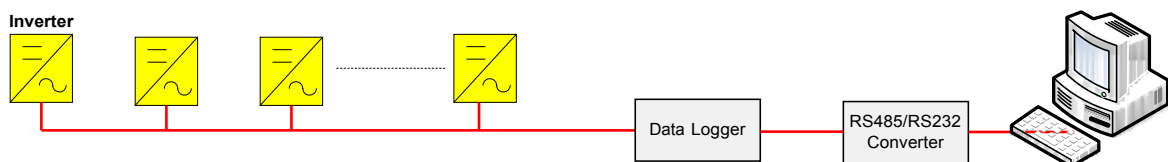


Fig.6 data logger & pc collects data through RS485 bus

6.2 LED Indicators

The inverter operates automatically without the need for user interaction or maintenance. There are two LEDs and two keys at the panel of the inverter. From the leds we can get the basic work state of the JSI-G2.5K.

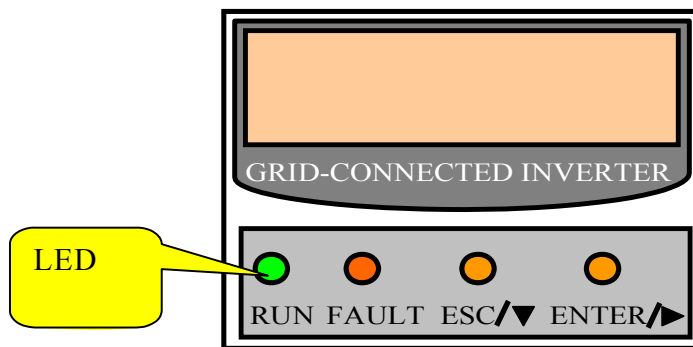


Fig.7 LED&KEY and LCD Display

Green LED: RUN

Red LED: FAULT

KEY1: ESC/▼

KEY2: ENTER/▶

Table6-1 LED descriptions

LED name	LED state	explanation
RUN LED	light	JSI-G2.5K is working
	shut	JSI-G2.5K is not working
FAULT LED	light	A fault has occurred
	shut	No fault has occurred

6.3 LCD Display

The display board is equipped with two line LCD. Users can get basic information from the LCD display.

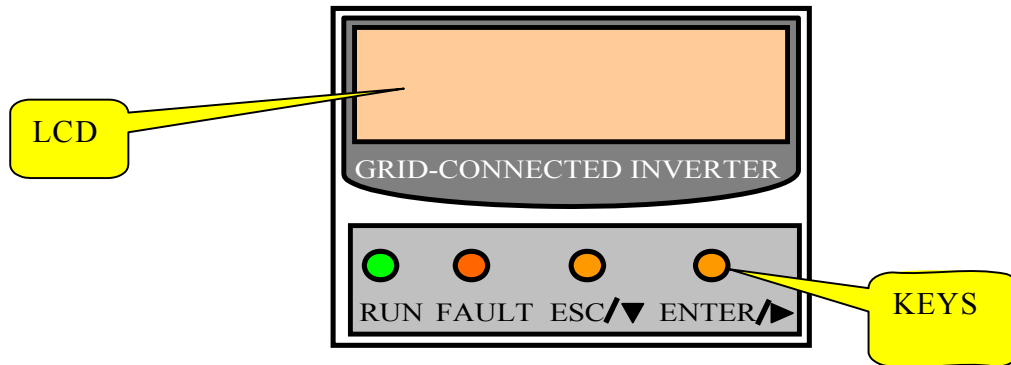


Fig.8 LCD display and key board

■ Key functions explanation

There are 2 keys in the LCD board: ESC/▼ key and ENTER /► key.

ESC/▼ key: when you press the “ESC/▼” key less than 2 seconds, this key performs the “▼” function, which is used to move the arrow up and down in the screen or increase/decrease number. (denoted by: ↓“ESC/▼”)

The “ESC/▼” key will perform “ESC” function if it is pressed longer than 2 seconds, which is used as Return/finish function. (denoted by: ↓↓“ESC/▼”)

“ENTER /►” key :when you press the “ENTER /►” key less than 2 seconds, this key performs “►”function ,which is used to move the arrow left or right in the screen. (denoted by: ↓“ENTER /►”)

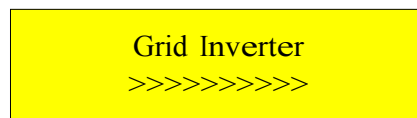
The “ENTER /►” key will perform “ENTER” function if it is pressed longer than 2 seconds, which is used to select menu item and confirm changes. (denoted by: ↓↓“ENTER /►”).

■ Activation of the background illumination

The background illumination is activated by slightly press the any key.

The background illumination is automatically deactivated after 1 minute to save power.

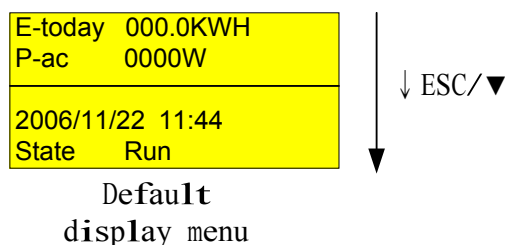
- Start-up menu



- Explanation:

This screen displays the type of the inverter. Note that this screen will only appear once after start. After about 7 seconds of this screen, the LCD display will automatically change to the default display menu.

- The default display menu



- Explanation:

This menu includes 2 separate screens. The first screen includes parameters of “E-today” and “P-ac”. “E-today” indicates the daily output energy generated by JSI-G2.5K in the unit of KWH. “P-ac” indicates the real time output power of JSI-G2.5K in the unit of KW.

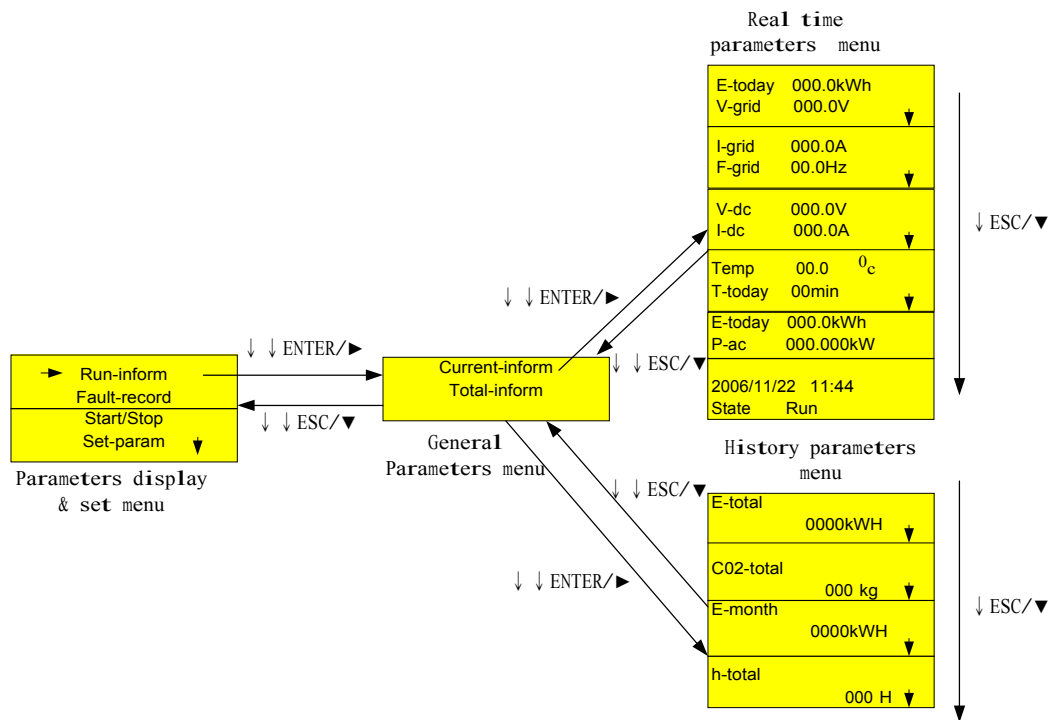
The second screen includes parameters of date/time and “state”. Date/Time display the current time and can be adjusted. The “State” shows the inverter’s working state according to table 6-2.

Table 6-2 State of the inverter

Data name	explanation
RUN	The inverter in normal (function) operation
Stand-by	The inverter in stand-by state
Stop	The inverter stops working
Com-fault	Fault of LCD-inverter communication channel

◆ Note: To quickly access the system running parameters, press (↓ESC/▼) when in any state of the above 2 screens, as shown in the figure below.

- “Run-inform” menu



- Explanation:

The “Run-inform” menu contains the “Total-inform” and “Current-inform” menu. The “Total-inform” includes history logged data such as: totally generated energy-“E-total”, monthly generated energy-“E-month”, total running hour-“h-total” and reduced CO2 weight -“CO2-total”. The “Current-inform” includes real time system data. All the data are explained in the table 6-3 and table 6-4.

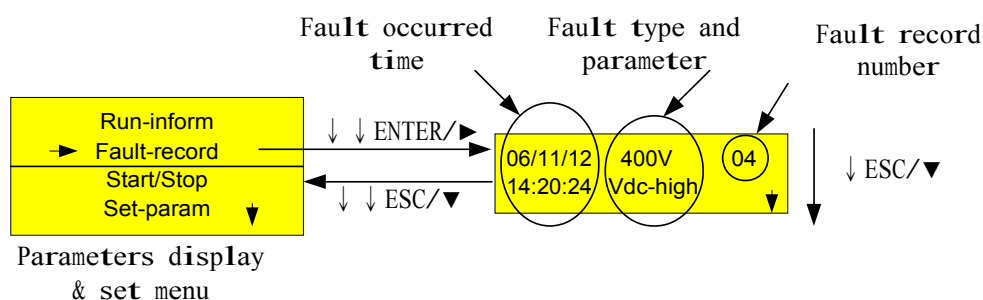
Table6-3 Electrical real time data (Current-inform)

Data name	explanation	Unit
V-grid	Grid voltage	V
I-grid	Output AC current	A
F-grid	Grid frequency	Hz
V-dc	DC Voltage (of PV array)	V
I-dc	DC Current (of PV array)	A
P-ac	Output ac power	W
E-today	Energy generated today	KWH
E-month	Energy generated this month	KWH
E-total	The whole generated Energy	KWH

Table6-4. Non-electrical real time data (Total-inform)

Data name	explanation	Unit
Temp	Temperature within the enclosure	℃
T-today	The Operation time of today	Min
T-total	Total hours of Operation time	H
CO2-total	Reduced CO2 weight	Kg
2006/11/22 11:44	The current date/time	

● “Fault-record” menu



➤ Explanation

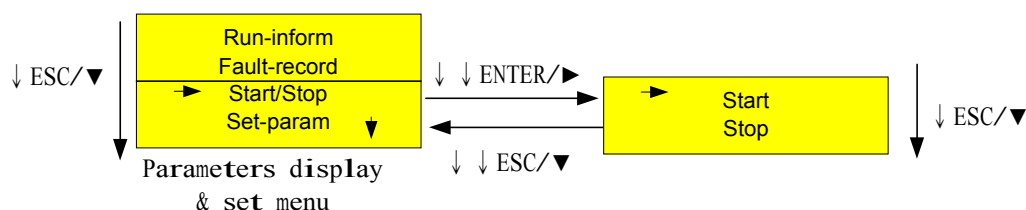
The “Fault-record” menu displays the latest 20 fault records, which includes fault type(see table 6-5) 、 fault occurred time 、 fault parameter and fault record number(within 20) .

- ◆ Note that the fault record number is created in the order of fault occurred time: the latest fault record number is always 01; the oldest fault record number is always 20(suppose there is at least 20 fault records), etc.

Table6-5 Fault type with simple explanation

Fault name	Fault reason	explanation
Vdc-high	DC	DC voltage high
Vac-high	Grid	AC voltage high
Vac-low	Grid	AC voltage low
F-fault	Grid	Grid frequency fault
Island	Grid	Island fault
IPM-flt	Internal fault	IPM fault

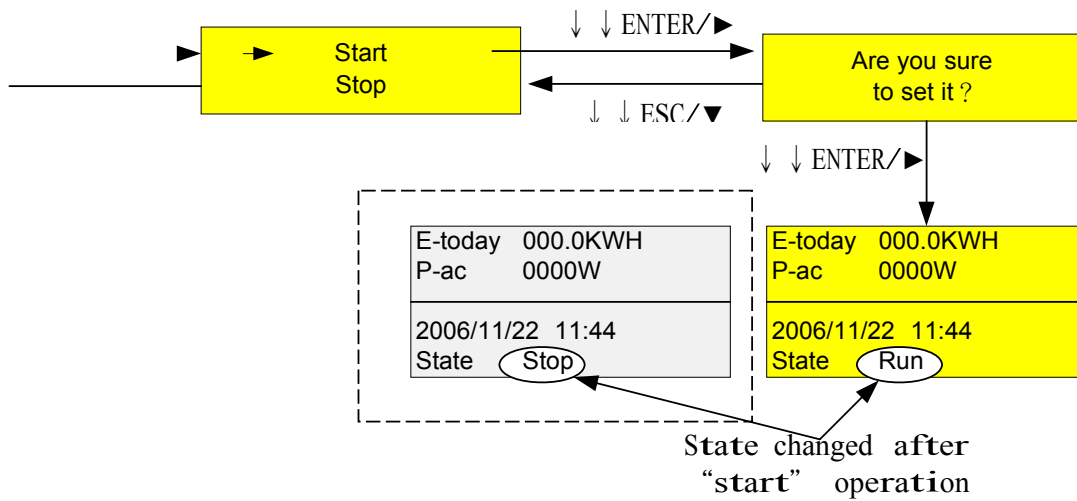
● The start and stop menu



➤ Explanation

The “Start/Stop” menu can control the start and stop state of the inverter.

- Start process through LCD

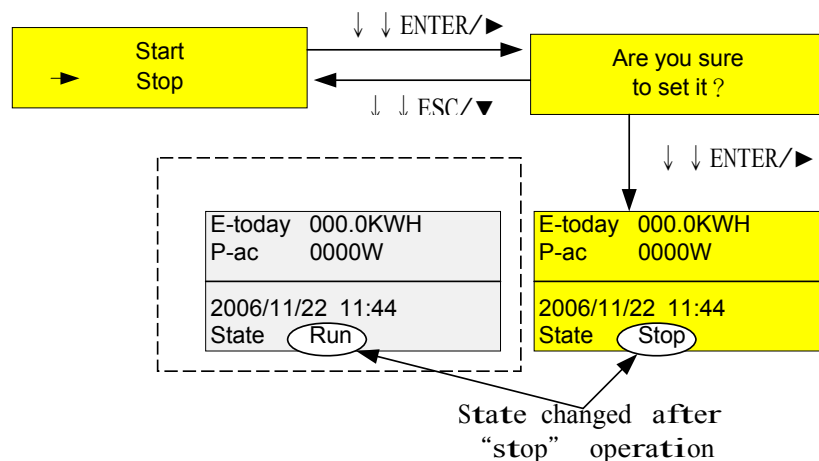


➤ Explanation:

This command is needed to restart the system after a LCD stop operation by user. The state shown in the default display menu will change after start operation.

The state of the inverter won't change if the inverter is already running when perform this command.

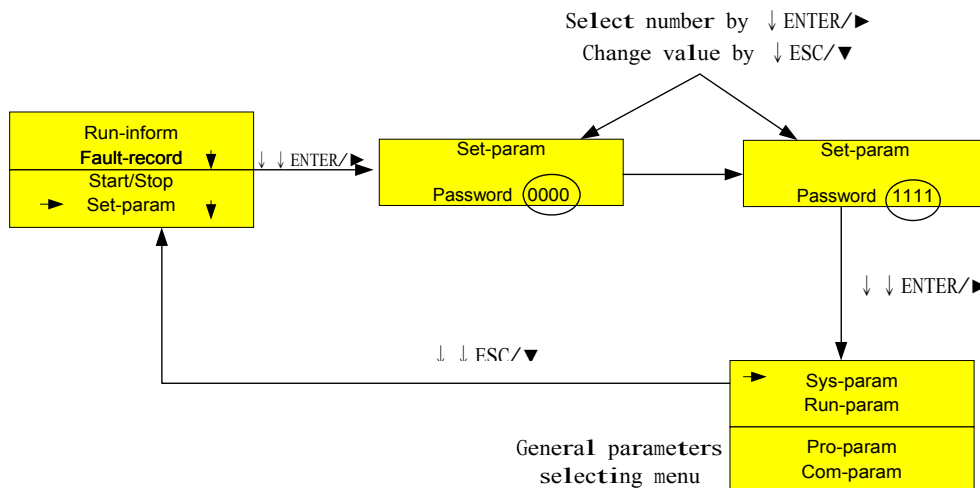
- Stop process through LCD



➤ Explanation:

This command is helpful when users want to stop the operation of the inverter. The state shown in the default display menu will change after stop operation.

● The general parameters selecting menu



➤ Explanation

Users must input the password before setting parameters. The default password is 1111.

This screen contains “Sys-param” , “Run-param”, “Pro-param”and “Com-param”.

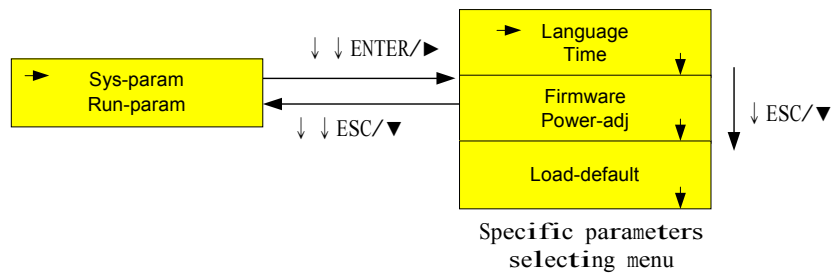
“Sys-param” contains basic running parameters of the inverter.

“Run-param”contains nothing.

“Pro-param”contains the adjustable system protection parameters.

“Com-param” contains basic communication parameters of the inverter.

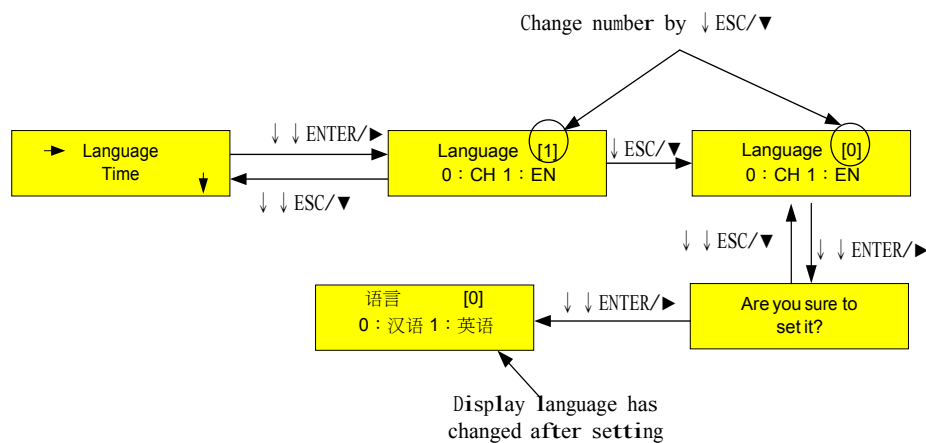
- The specific parameters selecting menu



- Explanation

The adjustable parameters of “Sys-param” includes display language-Language 、 display time-Time 、 generated energy display value-Power-adj and load default task-load default .The firmware version will only be helpful for the maintenance personnel and useless to users.

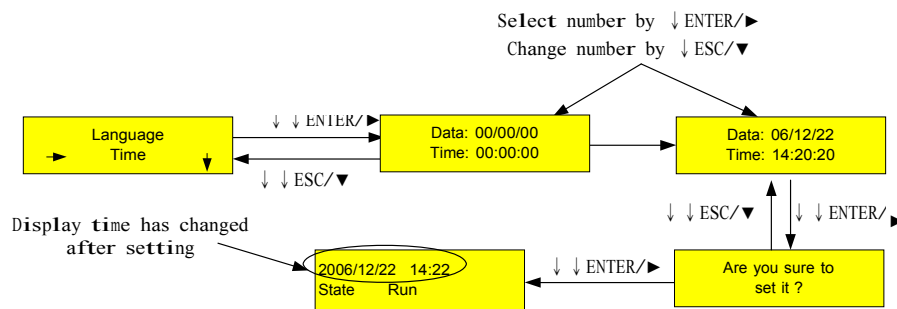
- The display language adjustment menu



- Explanation

Users can set the LCD display language in this screen, there are 2 languages can be selected: CH represents Chinese, EN represents English.

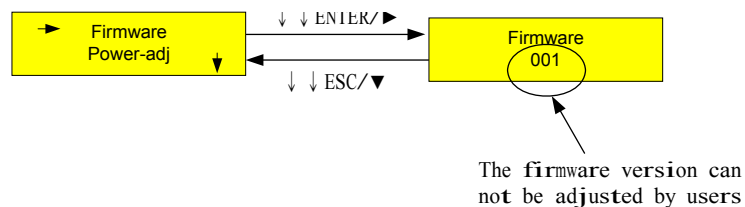
- The display time adjustment menu



- Explanation

The date format is year/month/date, the time format is hour/minute/second. Note that the hour display is in 24 hours type.

- The firmware version menu(not open to users)

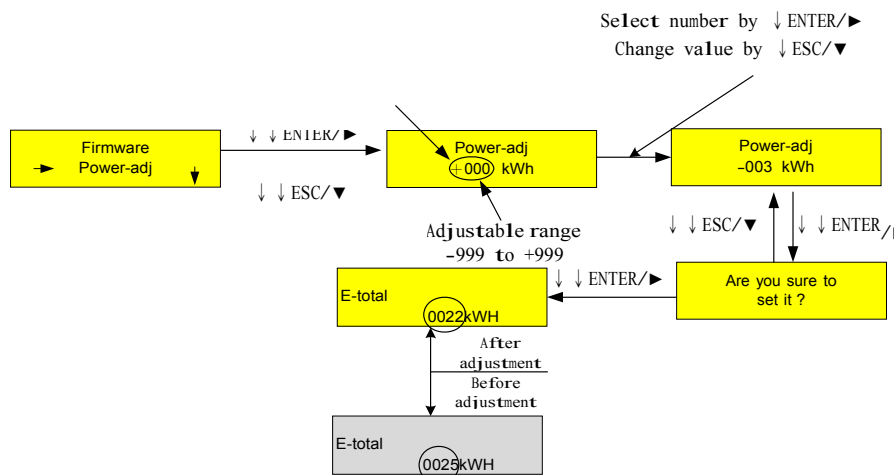


- Explanation:

This firmware version display screen is only provided to maintenance personnel and cannot be adjusted by users.

- ◆ Note: the first two digits “20” of year (like 2006) cannot be changed and the second “45” will not be displayed in the menu.

- The displayed generated energy adjustment menu

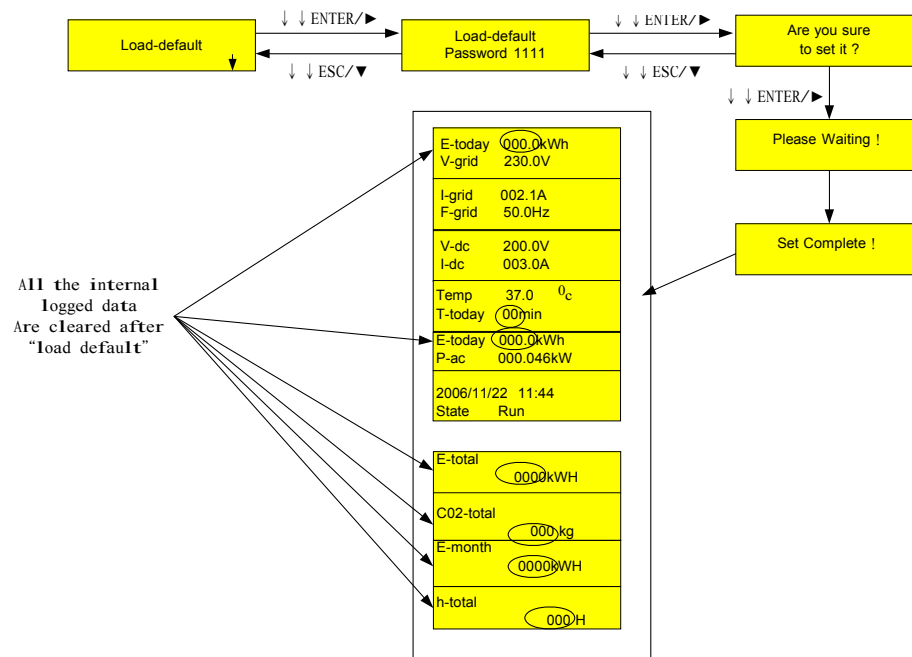


➤ Explanation:

This generated power adjustment screen is useful in case the total -power displayed by LCD has difference with reading value from the external power measuring device (like an electrical meter).

The adjustable range is from -999-+999 kWh.

● The load default menu

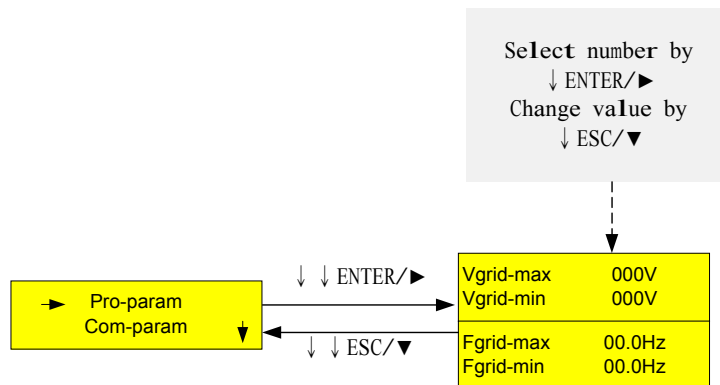


➤ Explanation

Users can clear the logged data by using “Load-fault”. After inputting the correct password (1111), and confirm this command (↓ ↓ “ENTER / ►”). After the appearing of “Set Complete” screen, all the logged parameters are cleared.

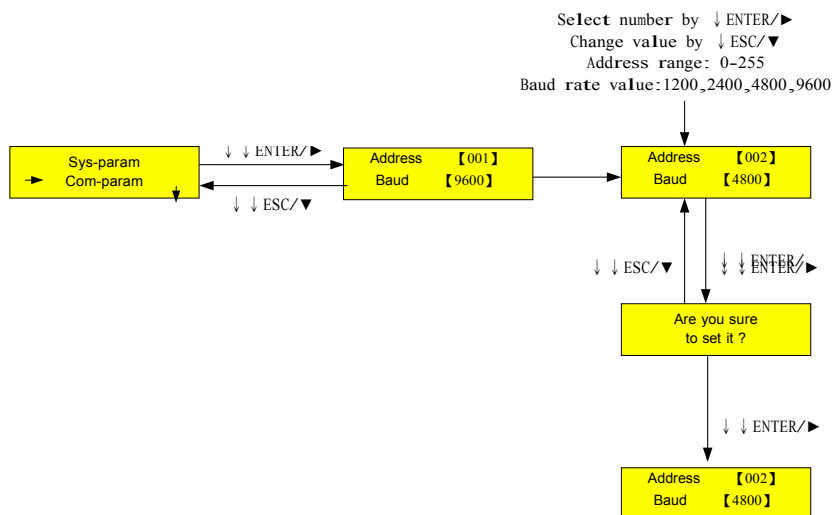
◆ Note that the load default operation is irreversible.

- The protection parameters adjustment menu



➤ Explanation

Users can set the maximum allowable grid voltage 、the minimum allowable grid voltage ; the maximum allowable grid frequency 、and the minimum allowable grid frequency, please check table 5-1.



➤ Explanation:

2 communication parameters can be altered in this menu: the address and the baud rate.

The “Address” parameter is useful to separate the current inverter from other inverters to avoid address violation when an upper machine is utilized to monitoring multiple inverters. The “baud rate” parameter decides the baud rate between the inverter and upper machine. Four alternative values can be selected: 1200, 2400, 4800 and 9600 bps.

7 Installation

This chapter gives installation instructions for JSI-G2.5K.

7.1 Checking for Shipping Damage

The JSI-G2.5K inverters are thoroughly checked and tested rigorously before they are shipped. Even though they are delivered in a rugged, heavy cardboard box, the inverters can be damaged in shipping which typically is the shipping company's fault. So you should check the inverter before installation.

Please inspect the inverter thoroughly after it is delivered. If any damage is seen please immediately notify the shipping company. If there is any question about potential shipping damage, contact JALPOWER Power Supply. A photo of the damage may be helpful.

Do not accept unit if visibly damaged or note visible damage when signing shipping company receipt. Please report the damage immediately to the shipping company. Do not remove the unit from packaging.

■ 7.2 Basic Installation Requirements

The IP level of JSI-G2.5K is IP41, so it can only be installed indoors.

A list of these requirements is shown below:

- It is advised not to install the inverter in living quarters, since the inverter may produce some operating noise (< 40 dB).
- Avoid installing the inverter in a location subject to vibrations.
- The LED and display should always be legible for users.
- The ambient temperature should remain from -20°C to 40°C.
- It is important to have air freely circulating around the inverter; therefore keep the area within 30 centimeters of the inverter free from obstacles.
- The inverter should be mounted in a well-ventilated area.
- Avoid mounting the inverter in a dusty area

7.2 Mechanical Mounting

7.2.1 Safety Mounting Instructions

As with any electrical system, touching live components can be hazardous to life and limb. This device contains DC voltage of up to 450V and the grid voltage up to 260 V.



WARNING!

Only a qualified person can work on this equipment. This work is only permissible if the AC and DC power supplies are safely disconnected from the JSI-G2.5K.



WARNING!

Before any maintenance, always wait for approx.10 minutes so that the capacitors in the JSI-G2.5K can discharge. Only then may the cover be opened.

7.2.2 Device Dimensions and Weight

The external dimensions and weight of the JSI-G2.5K is in fig 10.

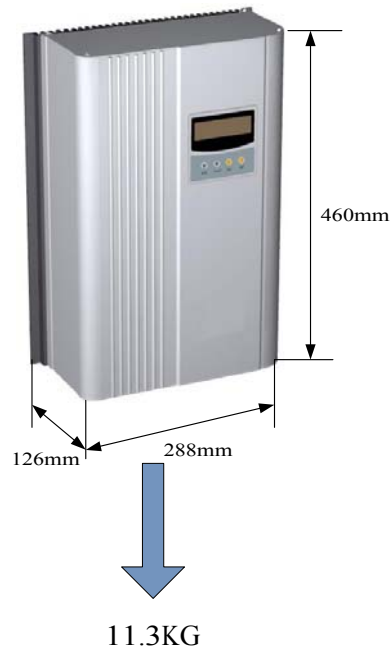


Fig.10 Dimensions and weight of JSI-G2.5K



NOTICE!

The ambient temperature should be within -20°C and +40°C.



Caution!

Some parts of the JSI-G2.5K can reach temperature of over 80°C. Keep a suitable distance from flammable materials!



WARNING!

Never install the JSI-G2.5K in areas that contain explosive atmospheres (battery rooms, fuel storage rooms etc).

7.2.3 Mounting Requirements

- Mounting Place

The JSI-G2.5K has a relatively high weight of 11.3kg. Please keep this in mind when selecting the place where and how to mount the JSI-G2.5K.



NOTICE!

The ambient temperature should be within -20°C and +40°C. The JSI-G2.5K should be installed in a place where it is not exposed to direct sunlight.



WARNING!

Some parts of the JSI-G2.5K can reach temperature over 80°C. Keep a suitable distance to flammable materials!



WARNING!

Never install the JSI-G2.5K in areas that likely contain explosive atmospheres (battery rooms, fuel storage rooms etc.)!



NOTICE!

Since the AC and DC connections are wired to the breakers and or junction box only, there is no need to open the inverter enclosure during installation.

7.3 Electrical Connection

7.3.1 Electrical Connection Requirements

- Grid 230V AC

The JSI-G2.5K is designed for 230V grid (single phase). The voltage should be within 180V to 260V and the frequency should be the frequency should be 47-51.5/57-61.5Hz.

Grid Voltage Range:	180V-260V
Grid Frequency Range:	47-51.5/57-61.5Hz

- PV array limit

Max. PV Power:	2.8 KW
Max. PV Voltage :	450V

- ground

The inverter must be grounded in compliance with local safety codes using appropriately sized protective conductors.



Notice!

All electrical installations must comply with all local and national electrical codes.



WARNING: Make sure that the DC input voltage never exceeds 450V. Higher input voltages will damage the JSI-G2.5K.

7.3.2 Wires connection

The complete wiring for a JSI-G2.5K is shown schematically in the Fig.11.

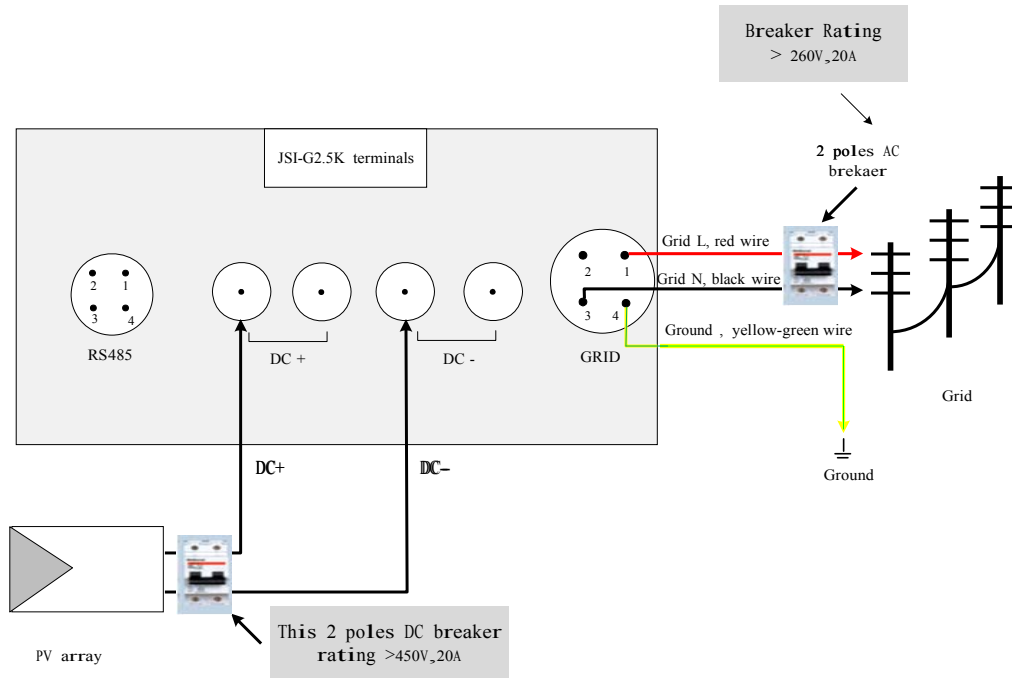


Fig. 11 Simplified electrical connection diagram

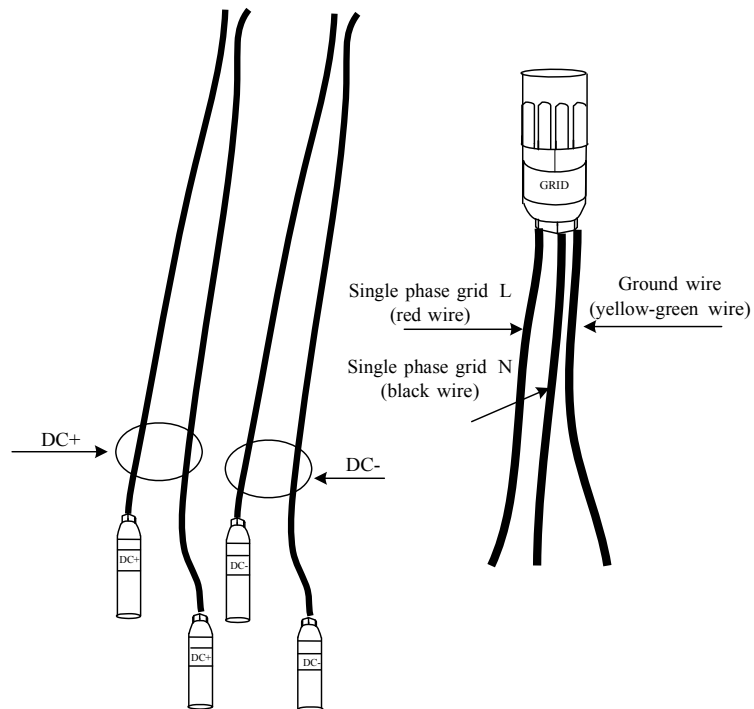


Fig. 12 attached wires for JSI-G2.5K



Caution!

The wiring of the inverter's AC and DC cables must only be done with the DC and AC circuit breakers are in the off state.

Please follow the Fig.11 to connect the wires:

- Connect the wires of the DC cable as follows:
 - ✧ JSI-G2.5K “DC+” wire to the PV array +.
 - ✧ JSI-G2.5K “DC-” wire to the PV array -.

Note: there are 2 input ports of PV array, we recommend users at least connect 2 channels with each channel maximum current no more than 10A and total current no more than 20A.

- Connect the wires of the AC cable as follows:
 - ✧ JSI-G2.5K's “L” wire to the grid”L”.
 - ✧ JSI-G2.5K's “N” wire to the grid”N”.
 - ✧ JSI-G2.5K “GND” wire to the ground.



Caution!

Make sure all the wires are firmly tightened.

7.4 Communication Installation

Fig.13 shows the communication installation of the JSI-G2.5K with the PC by RS485 serial communication port .

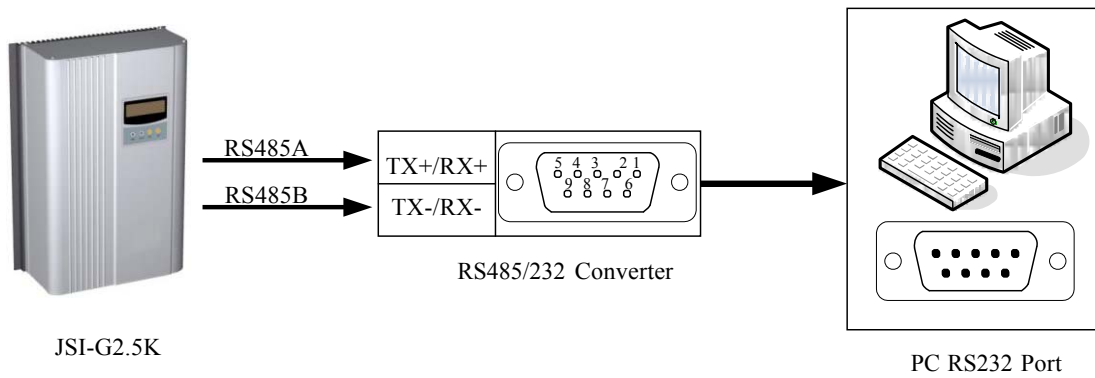


Fig.13 Communication network



Fig.14 RS485/RS232 converter

7.5 Start and close

7.5.1 Start the Inverter

To turn on the inverter, please follow the steps below.

- 1) Switch on the DC side circuit breaker
- 2) Switch on the AC side breaker
- 3) The inverter will check whether that voltage, impedance and frequency parameters are within operating range.
- 4) If the parameters check is correct, then the LCD will display the normal working screen.
- 5) Then the inverter will export to the grid and the green Power LED will continuously lit (provided there is enough PV power).

7.5.2 Close the Inverter

- 1) If users want to shut down the inverter, please refer to stop command in the LCD menu in chapter 6.
- 2) If users want to shut down the inverter immediately, first switch off the AC side breaker then switch off the DC side breaker, incorrect switch off order may cause danger to the personnel and damage to the inverter.

8 Technical Data

8.1 Electrical Specifications

■ Input Data

Max. PV Power	2800W
Max. Number of Input Strings	2
Max. Input Current	20A
MPP Voltage Range	150-380V
Maximum DC Voltage	450V

■ Output Data

Nominal AC output power	2500W
AC Voltage Range	180 – 260 V AC
AC Frequency Range	47-51.5/57-61.5Hz
Power Factor	>0.99 at nominal power
Peak Efficiency	95 %
European Efficiency	93 %
Internal consumption during stand-by	<0.5W
THD of Output Current	< 3 % at nominal power

8.2 Mechanical Specifications

Dimensions(W x H x D)	288 x 460x 126 mm
Weight	11.3 kg
Ingress Class	IP41 (indoor)
Operating Temperature	− 20℃ ~ + 40℃

8.3 Features

Cooling	natural cooling
Display	LCD
Communication	RS485/Ethernet(Optional)/GPRS(Optional)
EMC	EN61000-6-2 EN61000-6-4
Safety	EN 50178

9. Appendix

9.1 Exclusion of Liability

The content of these documents is periodically checked and revised, when necessary, please call us or check our website www.JALPOWER.com for the information. However discrepancies cannot be excluded. No guarantee is made for the completeness of these documents. Please contact our company or distributors to get the latest version.

Guarantee or liability claims for damages of any kind are excluded if they are caused by one or more of the following:

- .Improper or inappropriate use of the product
- .Operating the product in an unintended environment
- .Operating the product when ignoring relevant safety regulations in the deployment location
- .Ignoring safety warnings and instructions contained in all documents relevant to the product
- .Operating the product under incorrect safety or protection conditions
- .Altering the product or supplied software without authority
- .The product malfunctions due to operating attached or neighboring devices beyond allowed limit values.

In case of unforeseen calamity or force majeure.

9.2 Contact Us

If you have any questions about or technical problems with the JSI-G2.5K, our hotline will be happy to assist you. Please keep the following data when contacting



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