

CENTAURI ENERGY SERVER

User Manual

Model number: GF-20000-360Vdc-380Vac-3/3

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Introduction

The Centauri Energy Server is the first comprehensive, stand-alone, fully integrated power electronics hardware + software platform that delivers utility grade power from any combination of DC or AC generation sources and storage. The Centauri replaces integrated systems comprised of multiple components (PV inverter + charge controller + battery inverter + communication software and hardware + safety devices etc.) and can be deployed in any location, to service any kind of load profile (from kW to MW), with or without grid access or generator availability.

The Centauri Energy Server is equipped with high speed digital DSP core control devices, advanced high-speed IGBT, MOSFET and other power devices, combined with disturbance type (SVPWM) MPPT control technology with pulse width modulation and double transformation system so that it can quickly track the solar panel for the control system of high power, load change and high efficient multiple levels under the control of the high speed DSP system to provide the load with high quality power supply featuring stable voltage and frequency even in the cases of a sudden change of AC input voltage and AC frequency, over/under voltage.

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1. Safety Precautions:

Please comply with the following precautions for safe use:

- Installation and maintenance must be done only by authorized technicians.
- During the installation of this product, the distance between the Energy Server and the wall should be more than 300 mm to ensure ventilation and heat dissipation of the system.
- The temperature of the surface of the cabinet may rise when the product is in normal operation.
- Since the battery packs of all series inverters are external, the product should be equipped with the battery packs which should meet the requirements of the rated voltage of the equipment when in operation.
- Do not open the cabinet of the inverter, otherwise it may cause an electric shock.
- The internal inspection and maintenance should be conducted only by the authorized technical personnel.
- After the Energy Server is turned OFF, its voltage may be still high for a long time, please do not open the cabinet because it may cause an electric shock.
- The “Manual Bypass” switch is used for maintenance and repair of the product; therefore, authorized technical personnel should open it.
- This system is provided with multiple PV inputs; therefore, it should be connected with the independent loop, without the electrode grounded.
- The “EPO” button on the panel is used for the emergency stop power supply (power off) of the Energy Server, please pay attention to its operation.
- The internal short circuit of the Energy Server will lead to the risk of an electric shock or a fire, therefore under no circumstances should liquids be placed on it in order to avoid electric shock or other hazards.
- Please use the dry powder fire extinguishers in the event of a fire, because the use of the liquid fire extinguisher may cause an electric shock.
- Please install the external power switch near the Energy Server so that the power supply can be cut OFF in the event of emergency.
- Do not store or install the Energy Server:
 - Outdoors.
 - In locations without cross ventilation.
 - In locations near or where there is combustible gas, corrosive substances or dust.
 - In locations with unusually high or low temperatures (above 40°C or below 0°C) or high

humidity (90%).

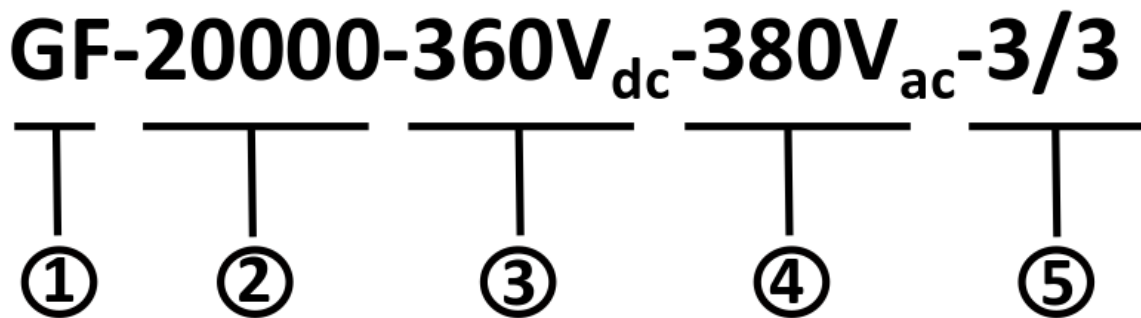


Warning!

1. The Energy Server must be reliably grounded.
2. The loss caused by the improper operation may be huge, please operate the equipment by following the requirements of specifications.

2. Energy Server Overview:

2.1 Part Number:



1. Isolated Off-Grid Type
2. Capacity of Energy Server in W
3. DC Input Voltage
4. AC Output Voltage:
5. 3/3 System Input/output

2.2 Production Profile:

The OFF-grid photovoltaic power generation system mainly consists of the PV Panels, combiner box, Energy Server, Battery and Load. The solar energy of the PV panels is sent to the combiner, after converging, solar energy is sent to the PV input of the Energy Server, where it changes the DC into AC to feed the load. At the same time, the Energy Server also changes AC into DC by rectifier and change the DC into AC to the load as shown in Fig 1.

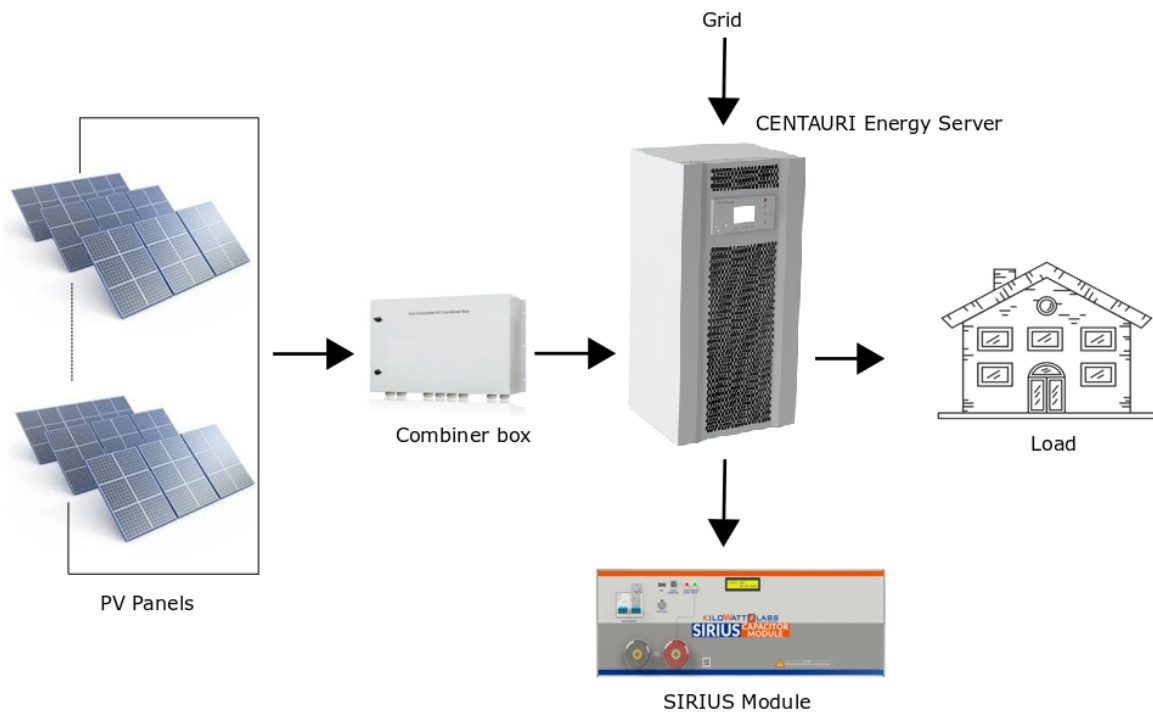


Fig 1 Composition of Off-grid Photovoltaic System

2.3 System Architecture of Product:

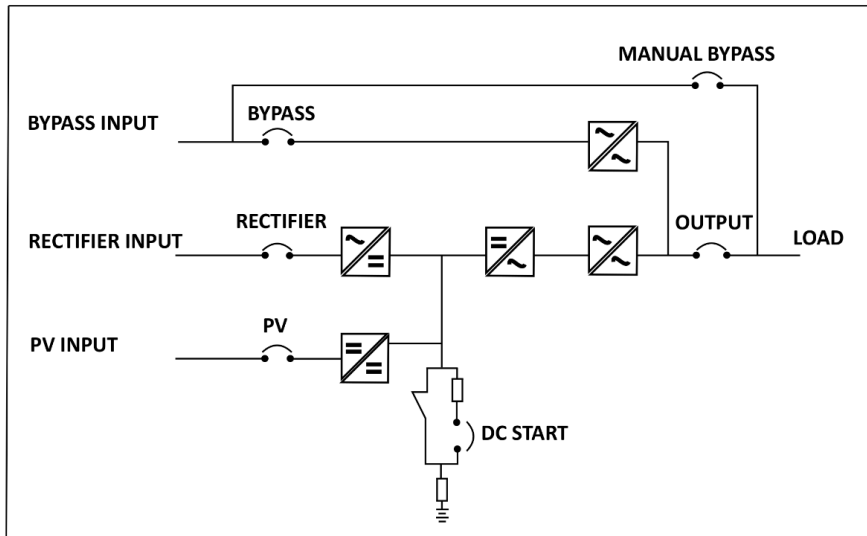


Fig 2 System Architecture of Product

3 Description of Product Control:

3.1 Control Panel:

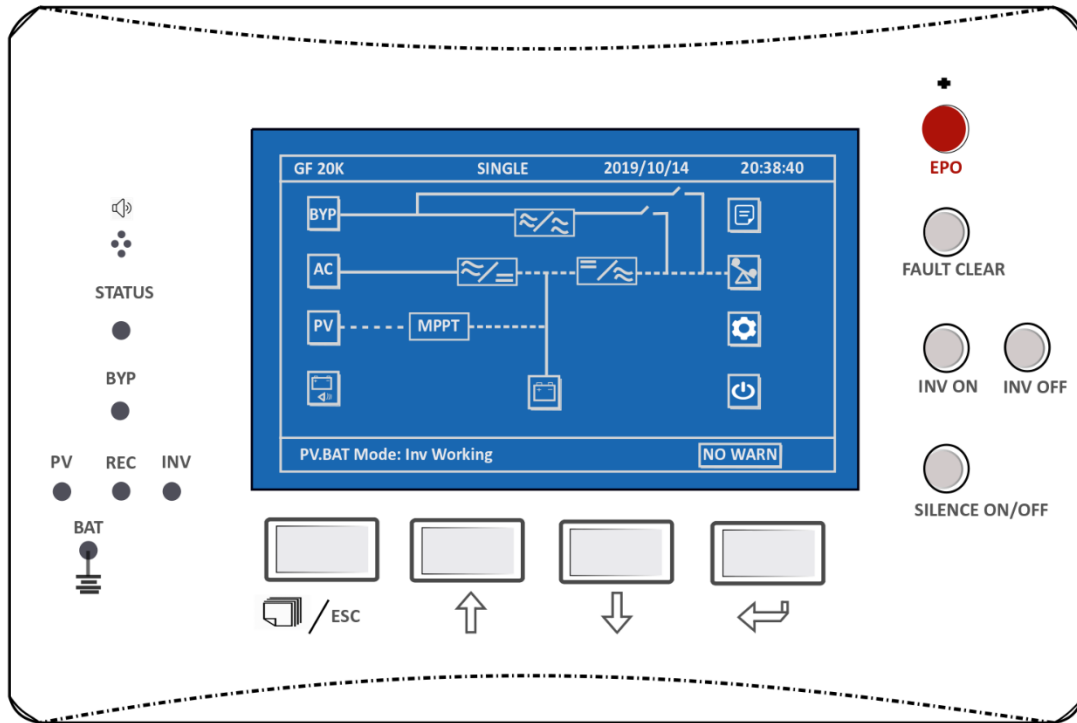


Fig 3 System Control Panel

3.2 Description of Touch Screen:

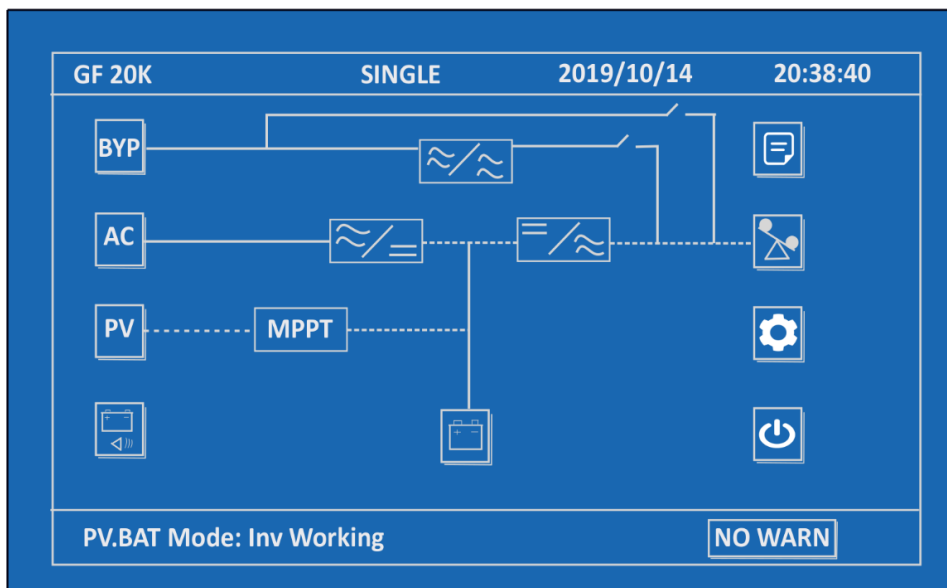






Fig 4 Description of Touch Screen

Menu Icon	Menu Name	Menu Items	Definition
	Input Parameters	Line Voltage(V)	Input line voltage of rectifier
		Current (A)	Input current of rectifier
		Frequency (Hz)	Input frequency of rectifier
		Power factor	Input power factor of rectifier
	Bypass parameters	Phase voltage (V)	Phase voltage
		Frequency (HZ)	Frequency
	Output parameters	Phase Voltage(V)	Output phase voltage of inverter
		Phase Current (A)	Output phase current of inverter
		Frequency (HZ)	Output frequency of inverter
		Power factor	Power factor of load
	Load parameters	Apparent Power (KVA)	S out: Apparent power
		Active power (KW)	P out: Active power
		Load percentages (%)	Load (Energy Server, shows by the rated load percentage)
	Parallel machine parameters	Apparent Power (KVA)	S out: Apparent power
		Active power (KW)	P out: Active power
		Single machine system without parallel machine data	When the Energy Server is set as a single machine, it only includes its own load instead of the system load.
	Battery Parameters	DC BUS voltage (V)	Operating voltage of system DC BUS















		Battery voltage (V)	Voltage of system battery pack
		Battery Current (A)	Battery charging and discharging current
		Battery temperature	Ambient temperature of current battery pack
		Environment temperature(t)	Environment temperature inside the Energy Server
		Battery Status	Battery pack switch is opened
	System Generated Energy	Generated power	Current total system generated power
		Daily Generated Energy	Daily gross generation of the system
		Gross Generation	Accumulative gross generation of the system
	MPPT (1- n) Parameters	Module version	Module software version
		PV voltage	PV voltage input by MPPT n# single Module
		PV current	PV current input by MPPT n# single Module
		Battery Voltage	Battery voltage detected by the current MPPT Module
		Charging Current	Current Battery charging voltage
		Module Status	Current Module status

Table 1a Description of Menu Icon of touch screen

Button Symbols	Name	Functions
	Setup	Click this button to enter the system setup interface.
	ON/OFF	Click this button to execute ON/OFF option and the operation is effective after confirmation.
	Battery pack parameters	Click this button to view the battery voltage and charging/discharging cutout and battery connection.
	Input parameters of rectifier	Press this button to view the operating parameters of the rectifier.
	Input parameters of bypass	Press this button to view the bypass input operating parameters.
	Output parameters	Press this button to view the system output operating parameters.
	Battery self-check and maintenance	Press this button to set battery test or terminate the test.
	History button	Press this button to view the history of the Energy Server system.
	Skip button	Press this button to view another data message in the same directory.
	Return to the main interface	The system will return to the system main control interface by pressing this button.
	Return to the superior menu	The system will return to the directory's superior menu by pressing this button.
	Page down button	Page down button
	Page up button	Press this button to turn to the front page.






	Left shift button	Press the button to move one bit to the left.
	Right shift button	Press the button to move one bit to the right.
	UP/DOWN switch button	Press this button to skip up/down.
	OK button	Press this button to confirm the operation above.
	Delete button	Press this button to delete the operation.

Table 1b Description of Button Symbol of touch screen

3.3 STATUS (System Warning LED) and Warning:

SYS-LED Status	Function Description	Buzzer Status
Red light being normally ON	EPO, emergency stop	Along beep
	Communication fault	
	System fault	
The red-light flashes once per second	Low voltage of battery	A beep per second
	The delay of bypass overload is over	
	Overload timeout for this machine	
	Fan fault	
	Output overload	
The red-light flashes once per 4 seconds	Other normal alarm information	A beep per 4 seconds
The red-light flashes once per 2 seconds	Battery test	A beep per 2 seconds

The green light is normally ON.	System normal	No beep
---------------------------------	---------------	---------

Table 2a System LED and Alarm 1

LED	The red light is normally ON	The green light is normally ON	OFF	Green lighting flash
BYP (bypass power supply)	Bypass input fault	System bypass supplies the power.	Bypass standby	No
PV(MPPTLED)	PV/MPPT fault	Running normally	MPPT is not booted.	OFF/under-voltage /OFF charging of part of MPPT Module
REC (Rectifier LED)	REC input/fault	Running normally	Rectifier shutdown	Rectifier is starting
INV (Inverter LED)	INV fault	The inverter can supply the power normally.	Inverter shutdown	Inverter soft startup stand by
BAT (Battery LED)	Battery under voltage/fault	Battery supplies the power	Normal state	Battery test/ under-voltage

Table 2b System LED and Alarm 2

3.4 Introduction of Buttons:

3.4.1 Description of Selection Button Function:

The display screen supports two control modes, namely the button control and touch control. The system default state is in the touch screen input mode, the corresponding operations are available through clicking the icon on the LCD screen.











Key	 / ESC			
Function 1	SWITCH	UP	DOWN	ENTER
Function 2	EXIT	LEFT	RIGHT	ENTER

Table 3 Description of selection Buttons

- Click the “” button on any interface to switch to the button control mode, and then press the “” button to return to the touch screen control mode.
- After clicking “” button, the user can move the cursor through pressing “” or “” button to choose the required control button and then press the “” button for confirmation.

3.4.2 Description of Function Buttons:

Button Symbols	Name	Functions
INV ON	ON button	When this button is pressed, the system executes the boot command and then runs after pressing the “OK” button.
INV OFF	OFF button	When this button is pressed, the system executes the shutdown command and the shutdown operation is effective by pressing the “OK” button. At this moment, the system and the output shut down.
SILENCE ON/OFF	Beep ON/OFF	The system alarm is cancelled or activated by pressing this button.
FAULT CLEAR	Clear the system fault	Press this button to clear executed abnormal protection command, the system will restart and run.
EPO	Emergency stop	When this button is pressed, the system immediately put an end to the power supply.

Table 4 Description of Function Buttons

3.5 Introduction of Breaker:

Signs	Name	Function
DC START	DC start switch	When the DC start breaker is turned ON, the system performs the battery soft start.
MANUAL BYPASS	Manual bypass switch	This breaker is only operated by the professional maintenance staff and the load will be connected directly to the bypass input by switching ON this button.
OUTPUT	Output switch	Turning ON the output breaker will make a connection between the load and the system static switch.
BYPASS	Bypass switch	Turn ON the Bypass breaker to switch ON the bypass AC input.
RECTIFIER	Rectifier switch	Turn ON the Rectifier breaker to switch ON the rectifier AC input.
PV1#	PV 1# input switch	When the switch is enabled, the system MPPT 1# will supply the power.
PV2#	PV 2# input switch	When the switch is enabled, the system MPPT 2# will supply the power.
PV3#	PV 3# input switch	When the switch is enabled, the system MPPT 3# will supply the power.
PV4#	PV 4# input switch	When the switch is enabled, the system MPPT 4# will supply the power.

Table 5 Introduction of Breaker

3.6 Introduction to Line Bank:

R	S	T	N	R	S	T	N	R	S	T	
AC INPUT			BYPASS INPUT				AC OUTPUT				

PV+4#	PV+3#	PV+2#	PV+1#	PV-4#	PV-3#	PV-2#	PV-1#
PV+ INPUT				PV- INPUT			

BAT+

BAT-

Signs	Functions
PV - INPUT	PV#1-PV#4 Input terminal pole
PV + INPUT	PV#1-PV#4 Input terminals "+" pole
AC INPUT	"R" line, "S" line and "T" line of rectifier input terminal
BYPASS INPUT	"R" line, "S" line "T" and "N" line of bypass input terminal
AC OUTPUT	"R" line, "S" line, "T" line and "N" line of system output terminal
BATT +	Battery Input terminals "+" pole
BATT -	Battery Input terminals "-" pole

Table 6 Description of Line Bank

3.7 Description of Remote-Control Signal Input:

Signs	Name	Control Method	Description of System Action
BAT.TEMP	Battery Temperature	Sensing	The battery temperature Coefficient is used for the charge compensation.
BAT.TEST	Battery Self-Check	The short circuit time is	The system performs the battery test.

INVON	System ON	no less than 0.2s	The system turns ON.
INVOFF	System OFF		The system shuts down.
FAULT CLEAR	Clear faults		Press this button to clear executed abnormal protection command, the system will restart and run.
EPO	Emergency stop		The system stops.

Table 7 Description of Remote-Control Signal Input

3.8 Description of Output Signal at System Dry Contact:

English Name	Chinese name	Normally Closed Nodes	Normally Opened Nodes
FAN FAULT	Fan fault	Fan normal	Fan fault
SYSALRAM	System alarm	No system alarm	System alarm
GENERATOR ON/OFF	Generator ON/OFF	Generator OFF	Generator ON
BAT LOW	Battery low voltage	No low voltage alarm for battery	Battery low voltage
OVERLOAD	Output overload	Output normal	Output overload
BYP FAULT	Bypass fault	Bypass input is abnormal	Bypass fault
AC FAULT	Rectifier fault	Rectifier input is abnormal	Rectifier fault
SYS FAULT	System fault	System is normal	System fault

Table 8 Description of Output Signal at System Dry Contract

4. Storage and Installation of Energy Server:

4.1 Storage:

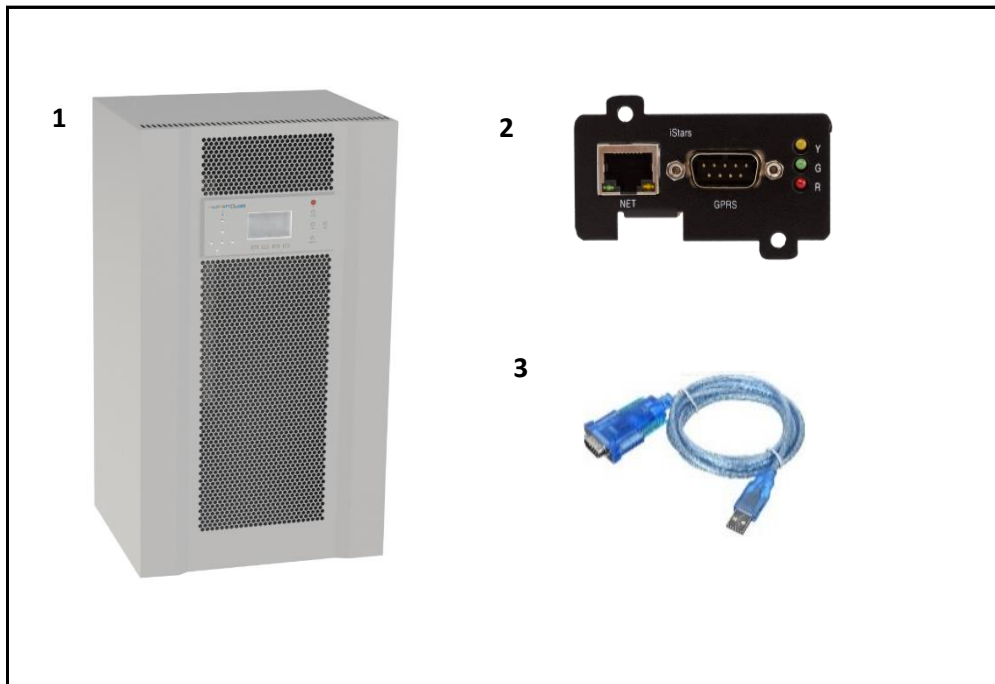
If the Energy Server is not to be installed immediately, please do not remove the packing, and store the Energy Server vertically in a dry room facing towards sunshine according to the mark on the packing box, and avoid dust and high temperature.

4.2 Installation Notices:

This section gives a general description of the requirements of the Energy Server for the site selection and wire layout of the Energy Server.

- The installation site must be provided with the professional engineers authorized by the company for the guidance of installation.
- Ground the Energy Server properly and turn OFF all switches before making electrical connections.
- The Energy Server should be installed by qualified engineers according to the descriptions in this section following the local standards.
- When connecting the battery, the voltage at the battery terminal will be more than 360 VDC which possesses the risk of the fatal danger.
 - Please take off the rings, bracelets, watches, and other metal jewelry.
 - Use tools having insulated handle(s).
 - Please wear rubber gloves.
 - If there is leakage of the battery electrolyte or the battery is broken, please replace the battery and put it in the container with the resistance to sulfate corrosion and dispose it according to the local regulations.
 - When your skin contacts the electrolyte, please wash it with water immediately.

4.3 Unpacking and Content Check:



1. Centauri Energy Server
2. SNMP Card
3. RS232 Communication wire

- When unpacking the Energy Server, please make the inspections as follows:
- Make a visual inspection to make sure whether there is no deformation, damage and dislocation or other damage in transportation on the internal or external surface of the Energy Server and the battery. If there is any damage, do not install or use the system, please notify the carrier for disposal immediately.
- Check the technical data sheet of the product to confirm whether it is the right equipment. The technical data sheet of the Energy Server is located on the label in the internal side of the front door, with the model, capacity and main parameters of the Energy Server indicated on the label.

4.4 Determination of Mounting Positions:

Please pay attention to the following requirements for the selection of the Energy Server's installation space.

- 1) The Energy Server must be installed in clean and dry room (the environment temperature within 0 ~ 40°C, the relative humidity of 5% ~ 90%, and the optimal operating temperature of 25°C). If the room temperature is 40°C, the indoor exhaust fan should be installed to ensure sufficient air flow in the room so that the equipment gets full heat dissipation in case of the rise in room temperature. It is best to be equipped with A/C system.
- 2) To facilitate the wiring daily maintenance, diagnosis, and repair of the Energy Server, please make sure that the safe space of the front and the back doors is reserved (The advisable space is 1000 mm or more to ensure that the door of the Energy Server can be fully opened, and the operators can pass the door freely).

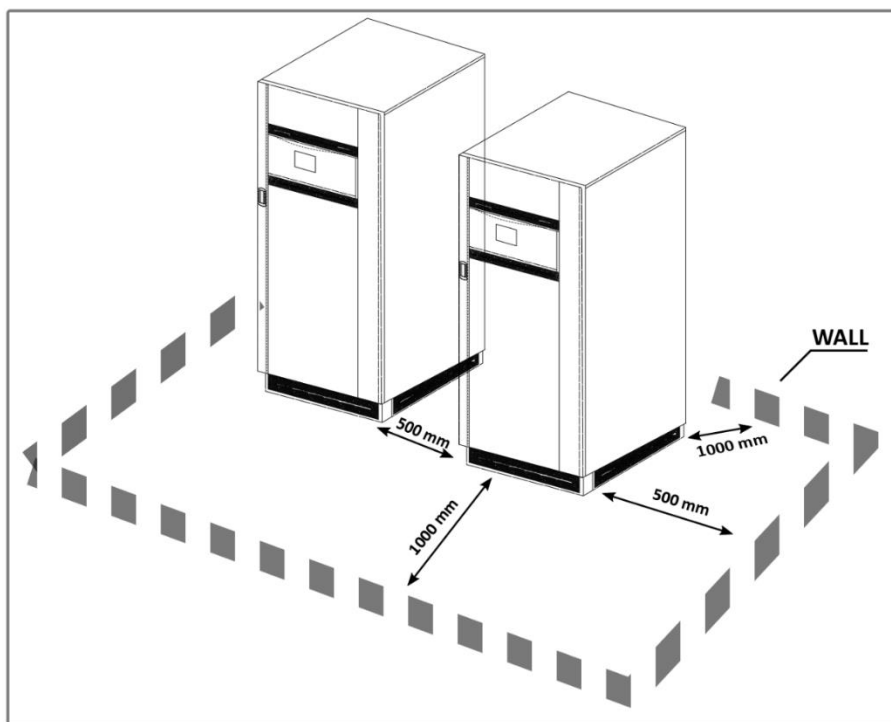


Fig 5 Schematic Diagram of System Installation

- i. For altitude greater than 1000 meters, the derating of the Energy Server should be used.
- ii. The bearing capability of the pallet should be greater than the equipment weight (The equipment weight is as shown in the technical specifications).

4.5 Cabinet Handling:

First of all, remove the surrounding rat proof baffles below the machine, and then get the mechanical arms of the special handling equipment (hoisting equipment, stackers or forklift) with the sufficient

lifting capacity stretched into the bottom of the base of the equipment. When the mechanical arms are stretched into the base in place, jack up the equipment and then place it in the predetermined installation location.

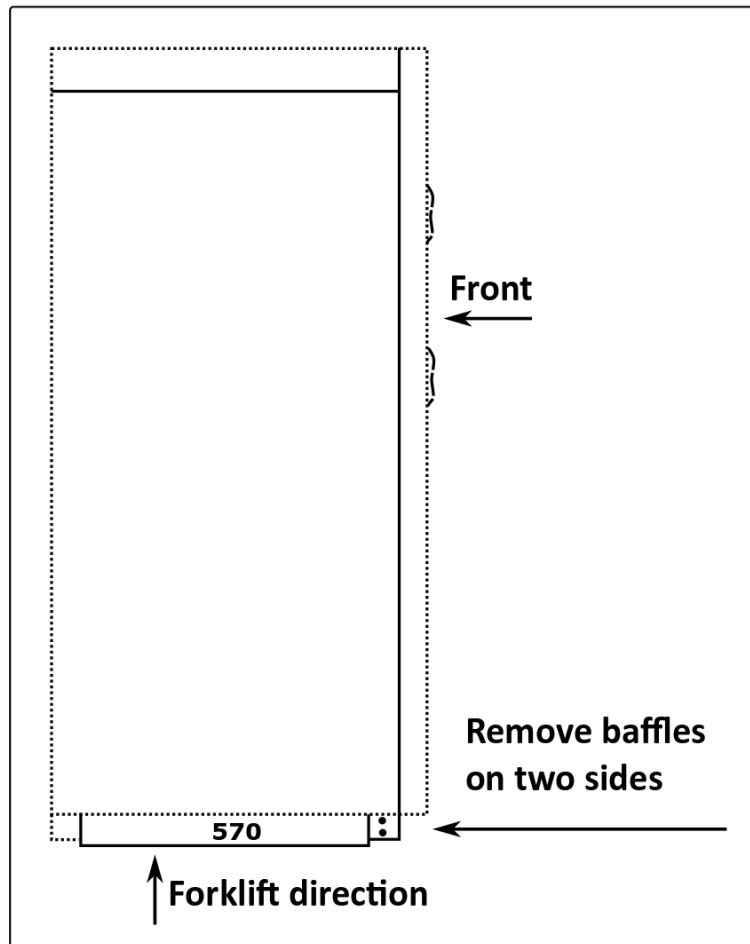


Figure 6 Schematic Diagram of System Handling

4.6 Requirements of Battery Configuration:

- **Chemical Battery:**

- The ambient temperature of the battery directly affects the service life of the battery, please refer to the characteristic curve of “Service Life of Battery” and “Environmental Temperature” for the environmental management. The optimal standard working temperature is 25°C. The long time use of the battery in high temperature will influence the discharge time of the system and the service life of the battery pack.
- The battery should be kept far away from the heat source and should be provided with the

proper ventilation to avoid the generation of explosive hydrogen and oxygen mixed gas.

→ The battery switch should be installed close to the battery as much as possible and ensure that the distance between the battery and the Energy Server is shortest as much as possible.

- **Sirius Module:**

→ Do not charge the Module when the temperature is below -30°C.

→ Do not charge the Module when temperature is above 80°C.

→ All Modules must be at 100% SOC or same voltage level before connecting in Series or in Parallel.

→ Modules cannot be connected in Series-Parallel combination under any circumstance.

4.7 Incoming Line Way of System:

The incoming lines of this product series are the lower wiring pattern. When making connection of wires, open the front door of the Energy Server, unpack the downside baffle, you will see the connection bar connected with the power cable.

4.8 Requirements of External Distribution:

- Make sure that the power of the external power supply should be more than 1.5 times of the equipment's rated power and the rated current of the power circuit breaker supply nearby the supply equipment should be more than 1.2 times (not the switch with one grade higher than the breaker) of that of the air switch of the equipment itself (RECTIFIER or BYPASS).
- The "BYPASS INPUT" and "AC INPUT" power supply system of the equipment should be equipped with the separate "Circuit Breaker" or "Over-current Protection Switch" in order to improve the reliability of equipment.
- The external power switch should be installed near the equipment so as to cut off the power supply in the emergency situation.



Note!

There is the filter capacitor of the RFI filters to earth, which may generate some leakage current, therefore the leakage protection switch should not be used for the inverter power supply in this system in case of the false triggering protection of the device.

4.9 Power Cable:

While choosing suitable external cables for connection, the following factors should be taken into account:

- i. Current capacity of power cable
- ii. Requirements of the system overload capacity
- iii. The ambient temperature
- iv. Physical support media

The qualified installation engineers should select suitable cable for connection according to local related standards and table 9. The length of the cables should be limited to 2-10 meters because too long cable can lead to the low voltage otherwise, the cross-section area of the corresponding cable should be increased.

Rated Capacity (KVA)	Standards	10	20	30	40	50	60	80	100	120
Bypass input cable	Max Current (A)	22	44	66	88	111	133	177	222	266
	National Standard (mm ²)	≥4	≥10	≥16	≥25	≥35	≥50	≥70	≥70	≥95
	American Standard (AWG)	≥12	≥6	≥4	≥2	≥1	≥0	≥000	≥000	≥0000
AC input cable	Max Current (A)	35	70	105	140	175	210	280	350	415
	National Standard (mm ²)	≥8	≥16	≥25	≥35	≥50	≥70	≥70	≥95	≥120
	American Standard (AWG)	≥8	≥4	≥2	≥1	≥0	≥000	≥000	≥0000	≥250 kcmil
Output cable area	Max Current (A)	22	44	66	88	111	133	177	222	266
	National Standard (mm ²)	≥4	≥10	≥16	≥25	≥35	≥50	≥70	≥70	≥95

	American Standard (AWG)	≥12	≥6	≥4	≥2	≥1	≥0	≥000	≥000	≥0000
Battery input cable	Max Current (A)	34	68	102	137	171	205	274	342	411
	National Standard (mm2)	≥6	≥16	≥35	≥50	≥95	≥95	≥120	≥185	≥240
	American Standard (AWG)	≥8	≥4	≥1	≥0	≥00 00	≥000 0	≥250 kcmil	≥400 kcmil	≥500 kcmil
PV input	Max Current (A)	60								
	National Standard (mm2)	≥25								
	American Standard (AWG)	≥2								

Table 9 Reference List of Power Cable

4.10 System Wiring:

1. Please make sure all external distribution switches of the Energy Server are disconnected and put the “No Closing” warning signs to prevent others from using the switches wrongly.
2. Open the front door of the Energy Server to make sure that the input switch of the Energy Server is in “OFF” state.
3. Connect the protective grounding cables and other necessary grounding cables to the connectors of the ground lines at the bottom of the Energy Server's power supply equipment.
4. Connect the “R, S, T and N” ports of the BYP INPUT (bypass input) terminal board with the corresponding “R, S, T and N” ports of the external BYP INPUT power switch or breaker in the correct phase sequence and then fasten them.
5. Connect the “R, S, T and N” ports of the AC INPUT (rectifier input) terminal board with the corresponding “R, S, T and N” ports of the external BYP INPUT power switch or breaker in the correct phase sequence and then fasten them.
6. Connect the “R, S, T” ports of the AC INPUT (rectifier input) terminal board with the corresponding “R, S, T and N” ports of the external AC INPUT (rectifier input) power switch or breaker in the correct phase sequence and then fasten them.
7. Connect “BAT +” and “BAT -” ports of the Energy Server to the output “+” and “-” poles of the battery.

8. Connect “PV INPUT 1#—4# +” and “PV INPUT 1#—4# -” poles of the Energy Server to the “output +” and “output -” poles of the corresponding PV combiner boxes of PV1 # - PV4#. Besides, the electrode and the grounding terminal should not be shared among the different groups.
9. Insert one end of the temperature sensor of the battery pack freely supplied with the device into BAT. TEMP, and the other end stretched into the Middle battery of the Battery Pack.
10. Confirm that all switches of the Energy Server are completely shut down and the external switches of “rectifier power supply, the bypass power supply and the battery pack” are switched on, and then use the multimeter to test and make sure that the voltage and polarity of the system comply with the relevant requirements of the system rated voltage.
11. Install all protective cover plates in place.

4.11 Communication Interface:

Energy Server has RS485 and RS232 interface to communicate with Host PC for:

- Measurement Monitoring
- Alarm Monitoring
- System Configuration
- Measurement Calibration
- Manual/Auto Data Logging\Module firmware updating
- Internal SD card reading/refreshing
- Statistical Analyzing/ Graphical result
- The system is provided with the preset “SNMP” card port (SNMP card for option) to facilitate the users to realize the remote monitoring (option).

4.12 Signal Interface:

- The control signal input interface refers to the 2Pin interface, therefore the corresponding order can be conducted when in short circuit, as shown in the following figure.

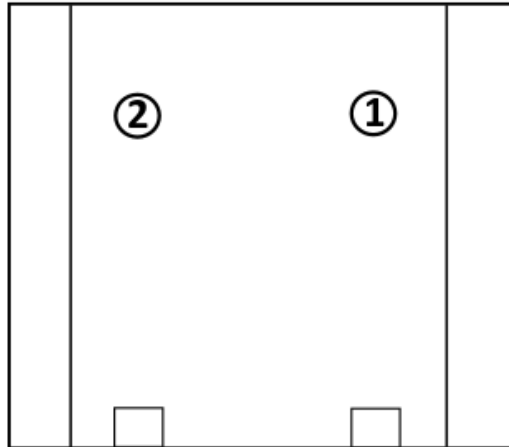


Fig 7 Signal Interface of Remote Control

- The output signal interface (dry contact) belongs to 3Pin interface, therefore the user can choose the “normally open” mode or “normally closed” mode (as shown in the following figure) according to the demand of the site.

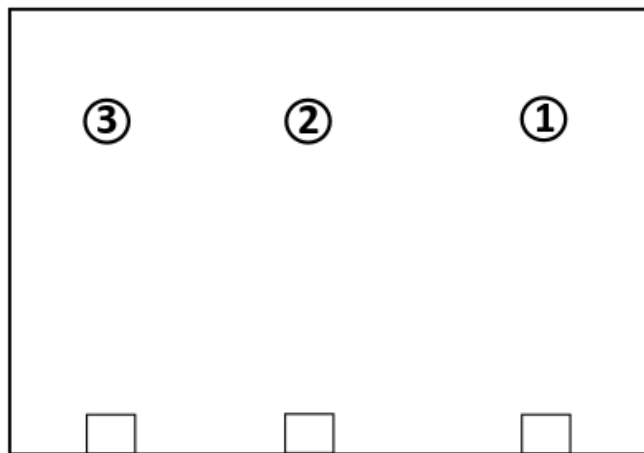


Fig 8 Signal Interface of Output Dry Contact

Pin 1 for normally open contact

Pin 2 for common port

Pin 3 for normally closed contact


5. Operating Instructions:



Note!

- All buttons for the user operation involved in the operation steps and LED display are shown in the "Product Profile".
- Please carefully read the instructions before conducting any operation, in order to avoid the personnel injury or equipment damage caused by the improper operation.

5.1 Daily ON/OFF:

→ Click “” button or press the “INV ON / INV OFF” button on the panel for the ON/ OFF operation.



Note!


This step is used to boot the inverter under the complete power-down condition, it is assumed that the inverter is installed and has passed the debugging by the engineers, as well as the external power switch has been closed.

Warning!


- The operation steps can make the output terminal of the Energy Server voltage.
- If necessary, please disconnect the connection of the lower load and then paste the warning sign on the joint of the load.
- The component with its protective cover plate opened with the tool is the part which the user cannot operate.
- Only the maintenance support personnel given the technology license by the company can open the protective cover plate of Energy Server.

5.1.1 Daily on Steps:

1. Switch ON the output switch of the battery.
2. Switch ON the input switch of the external power (RECTIFIER, BYPASS) of the Energy Server.
3. Switch ON the DC START switch of the Energy Server.
4. Switch ON the RECTIFIER and BYPASS switches of the Energy Server.

5. Switch ON the switches of “PV 1 # - PV 4 #” in turn.
6. Press the “INV ON” button of the panel and confirm the dialogue information of the touch screen to boot the machine.
Touch operation: Click the “” button on the main interface and then select the “Boot” option and click “OK” button.
7. Switch ON the output switch.

5.1.2 Daily OFF Steps:

1. Press the “INV OFF” button of the panel and confirm the dialogue information of the touch screen.
Touch operation: Click the “” button “OFF” button and “OK” button in turn, the system will switch OFF the machine.
2. Turn OFF the output switch.
3. Switch OFF the switches of “PV 1# - PV 4#” in turn.
4. Switch OFF the RECTIFIER and BYPASS switches of the Energy Server.
5. Switch OFF the DC START switch of the Energy Server.
6. Switch OFF the RECTIFIER and BYPASS input switches of the external power of the Energy Server.
7. Switch OFF the switches of the battery.

5.2 Emergency Stop Operation:

In case of an emergency (such as an electric shock, a fire, a flood, etc.), please press the red “EPO” button on the panel to perform the emergency stop command. After the button is pressed, the system immediately cuts OFF all the outputs (including the inverter output and the bypass output, battery charging or discharging). When the machine is shut down, please perform “OFF” operation and then conduct the “ON” operation when the display screen and LED of the system are fully closed, please pay attention to all operations above.

5.3 Clear Operation for System Fault:

When the Energy Server is shut down, over-temperature of the rectifier and the Energy Server, overload being more than or equal to 150%, DC BUS instantaneous overvoltage, abnormal protection, etc., please confirm that the fault has disappeared according to the prompt of the alarm information on the screen, and then press “FAULT CLEAR” button on the panel. The system will automatically clear away the history faults and will restart for normal working.



Note!

The system itself has functions of self-diagnosis and self-restore, therefore it is stated that three times of faults will be effective within an hour, however, if the fault still exists, and when the frequency of the fault occurrence exceeds the stated value, the system will run automatically after waiting for 1 hour.

5.4 Operation Steps of Maintenance Bypass:

5.4.1 Manual Bypass ON:

During the maintenance and repair, first of all enter the “Inverter Setup” interface of the control panel to set the system for “Manual Bypass ON” mode before conducting the operation of “Manual Maintenance” switch, and then turn ON the “Manual Bypass” switch and turn OFF the system output switch.





Note!

Please read the warning information in section 1 and operate the maintenance bypass carefully. Otherwise, it may damage the inverter or cause the power failure of the load, even may threaten the lives of people.

5.4.2 Entering Service Mode:



The power supply of the load by the inverter is switched into the direct connection state of the load with the AC input bypass power supply through the maintenance bypass switch by conducting the following steps.

1. After the bypass parameters is detected and confirmed being normal, please click “” button on the main interfaces→ “USER” button→ input password (the default password is “87654321”) and “” button, and then enter “INV SET” interface “MANU BYP” interface successively to select “ON” option and click “YES” button. At this point, the Energy Server supplies the power to the load through the static bypass system.
2. Remove the buckle from “MANUAL BYPASS” switch and then switch ON the “MANUAL BYPASS” switch; at this point, the load is powered up by the maintenance BYPASS power supply and the static BYPASS power of the Energy Server in parallel.


3. Press the “OFF” button on the panel and then click “OK” button on the touch screen, the system will immediately shut down.
4. Manually disconnect all switches, including “RECTIFIER”, “BYPASS”, “DC START”, “OUTPUT”, “PV 1 # - PV 4 #” and external “battery pack”.
5. At this moment, the operation switching the inverter output into the maintenance bypass has been completed, the load is powered up by the maintenance bypass, the fans of the machine stop running and the inverter is shut down completely. However, the voltage of the DC BUS in the internal of the machine is still high. Once the DC BUS is discharged completely, the maintenance personnel can take the routine maintenance or repair the inverter, while in the repair mode, the load equipment is not provided with the AC power fault protection.

5.4.3 Exit Service Mode:

When the maintenance work is complete, the state of no-fault protection of AC power for the load is switched into the state with the power supply protection by the inverter by conducting the following steps.

- 1) Carefully confirm that there is nothing left in the cabinet of the Energy Server and the internal connecting wires of the Energy Server recover to the state before the maintenance.
- 2) Boot the system following the “Daily ON Steps”, at this moment, the inverter is in standby state and the “INV” LED flashes.
- 3) Turn OFF the maintenance bypass switch and put on the dismantled buckle in place.
- 4) Click “” button on the main interface → “USER” button → and input the password (the default password is “87654321”) and then click “” button, and then enter “INV SET” interface “MANU BYP” interface successively to select “OFF” option and click “YES” button. At this point, the maintenance steps have completed and the load is powered up by the inverter instead of the bypass system.

5.5 System Setup:

Click “” button to enter the system setup interface.

5.5.1 Advanced Setup:

→ Click the “Advanced Setup” button and enter the advanced setup interface by entering the

advanced password, which is only done by the authorized technical personnel.

5.5.1.1 System Mode setting:

→ Click the “SYS CONF” button to select one kind of mode : “MODE GF” or “MODE G/GF” Press “YES” for confirmation.

5.5.1.2 PV Auto Power-ON Setting:

PV automatic Power-ON: The automatic Power-ON operation is activated in the following two situations.

1) When the battery shuts down due to low voltage and if PV is sufficient, the Energy Server will execute the automatic Power-ON command.

2) When the Energy Server has any fault and shuts down and if PV is Sufficient, the system will automatically clear away the fault.

- **Operation steps of PV automatic power-on:** Click the “AUTO ON” button to turn ON or turn OFF this function. The system is in “OPEN” status by default.

5.5.1.3 Input Setup of Battery Parameters:

- **Operation Method:**

→ Click the “BAT CONF” button to enter the corresponding setup interface.

Warning: The battery parameter setup will affect the reliability and security of the system and may lead to the battery damage, please input the actual data of the system to ensure the safe use of the battery and the system reliability.

- **Setup of Battery Capacity:**


→ Click “battery capacity” and set it according to battery capacity. System default is “100AH” and set range is “30AH-9999AH”. Click “Confirm” to activate.

- **Setup of Battery Pack Quantity:**

Click the “BAT GROUP” to choose the actual number of battery pack (Pay attention to the coefficient when being multiplied by the battery capacity). The operation above will be effective after confirmation.

- **Setup of Charging Rate:**

Click the “CMGRATE” button and then enter the charging rate according to the battery characteristics

and click the “” to confirm the operation. (C for battery capacity, the system will calculate the standard charging current based on the total capacity of the battery, with the system default for (0.15 C x 100 AH = 15 A).

- **Setup of Battery Type (Reserved option):**

Click the “BAT TYPE” button to select “LEAD” or “LITH” option and then confirm the operation by pressing button.


- **Setup of Quantity of Batteries (Fine-tuning setup):**

Click the “BAT CELL” to enter the corresponding setting interface, and then input the standard quantity of the batteries used in this system (Base on the standard of 2V unit batteries, the standard quantity of batteries for this system is 180, with the maximum set value of 166-182) and then press “YES” button to confirm the operation.


- **Setup of Temperature Configuration:**

Click on “TEMPCMP” button to enter the corresponding setting interface (The default setting of the system is 2 mV, but the engineers can choose the appropriate parameter according to the requirements of the battery characteristics), and then click “YES” button to confirm the operation (without the temperature sensor, the system will conduct the ambient temperature compensation).

- **Setup of DOD (depth of discharge):**

Click “DOD” and enter setting interface. This value is for power supply priority transfer point, battery end of testing point and battery low voltage alarm point. System default value is 1.89V and set range is 1.85-2.1 V. Click “” to activate.

- **Setup of EOD (end of discharge):**

Click “EOD” and enter setting interface. System default value is 1.75V and set range is 1.58-1.83V. Click “” to activate.

5.5.1.4 Password Setting:

- **Operation method:**

- Click the “OPEN SET” button to enter the corresponding setting interface.
- Click “Password Lock” button, the system will display “LOCK PWD” Information.
- Click the button again, the system will display “OPEN” or “CLOSE” information.
- Click the “YES” button to confirm the setting.

5.5.1.5 Other Settings:

- **Operation method:**

Click the “OTHERSET” button to enter the corresponding setup interface.

- **Factory Reset:**

When you click the “DEFAULT” button and then click “YES” button to confirm the operation, the system will be switched to the factory setting state and all the original user settings will be cleared away, please conduct the operations above carefully! If the operation is necessary, be sure to set the relevant parameters according to the requirements of the site system configuration to ensure the system is in safe and reliable operation.

- **Clear Records:**

When you click the “CLRLOG” button and then click “YES” button to confirm the operation, the system will clear away all historical information.

5.5.2 User Setup:

Operation method:

→ Click the “USER” button and enter the password to enter the corresponding setting interface.

→ The user setting operation can only be done by the user or the technicians.

5.5.2.1 MPPT Setup:

MPPT setup is used to turn ON or turn OFF the MPPT Module.

5.5.2.2 INV Setup:

Manual Bypass: When the system maintenance is required, the manual bypass system should be opened. The power supply of the system is forcefully switched to the bypass system. When the system maintenance is completed, the inverter output of the system can only be seen when the manual bypass system is shut down.

5.5.2.3 Off-Peak Setup:

The Off-peak setup menu includes three options as follows:

- **Off-peak electricity consumption:** During the set time, the system will shut OFF the rectifier. The PV and the battery will supply the power to the load until the battery voltage become low. The system will then open the rectifier to conduct the limited current (1 A) charging.
- **Normal charging:** When the current time reaches the set time, the system will turn ON the rectifier.

The PV and the rectifier will supply the power to the load and the battery.


- **Limited current charging:** During the set time, the rectifier conducts the limited current charging.

5.5.2.4 Protocol Setup:


The protocol setup refers to the setup of 485 communication protocol, including three setup options as follows:

- 1) Address: It is 1 by default.
- 2) Baud rate: It is 2400 by default.
- 3) Calibration: no

5.5.2.5 Language Selection:

The menu and data on the touch screen can be indicated in Chinese and English. The system will enter the “USER” interface by clicking the “” setup icon on the main interface, Click the “LANGUAGE” button to select the desired language.

5.5.2.6 Setup of Date and Time:

The system will enter the “USER” interface by clicking the “” setup icon on the main interface, click the “Date/time” button to set the current time and date of the Energy Server.

5.5.2.7 Setup of Date Format:

The date can be displayed in the following two formats by setting “DATE FOR”.

- 1) Year/Month/Day
- 2) Month/Day/Year

5.5.2.8 User Password/Control Password:

The system has password protection feature to secure the important control operations. The default password is “87654321”. When the password is enabled, the test of the Energy Server and the battery cannot be conducted until entering the password and confirming it.

5.5.2.9 Touch Screen Calibration:

The touch screen calibration “CALIB” is used to calibrate the center of the screen, that is, when the system factory settings are restored, it is necessary to calibrate the touch screen and during the calibration of the touch screen, please click the cross center of the screen according to the prompt.

6. Description of Working Principle:

6.1 PV and AC normal:

1. When PV Power is higher than load power, it will supply power to the load first and the extra power will be used to charge the battery. In this case, if PV charge current is high enough, AC will not be used but if PV charge current is not enough, AC will help to charge the battery automatically.

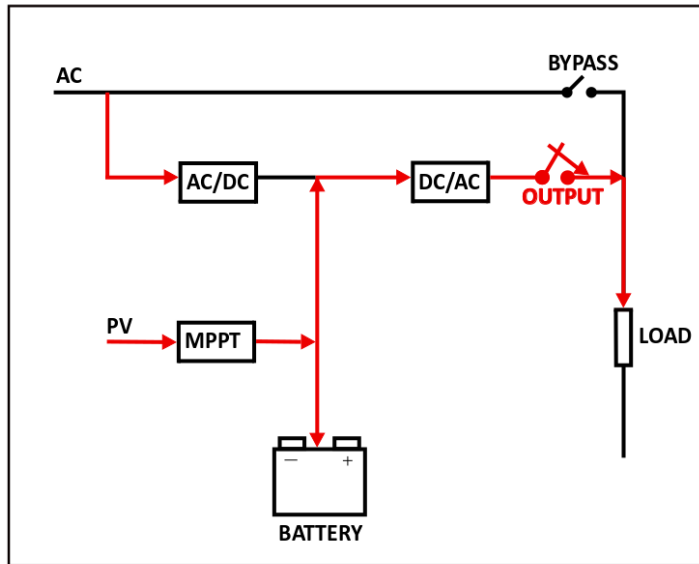


Fig 9 Normal Mode 1 of PV and AC

2. When the PV power is less than the load power, both the PV and AC will supply the power to the load and battery.

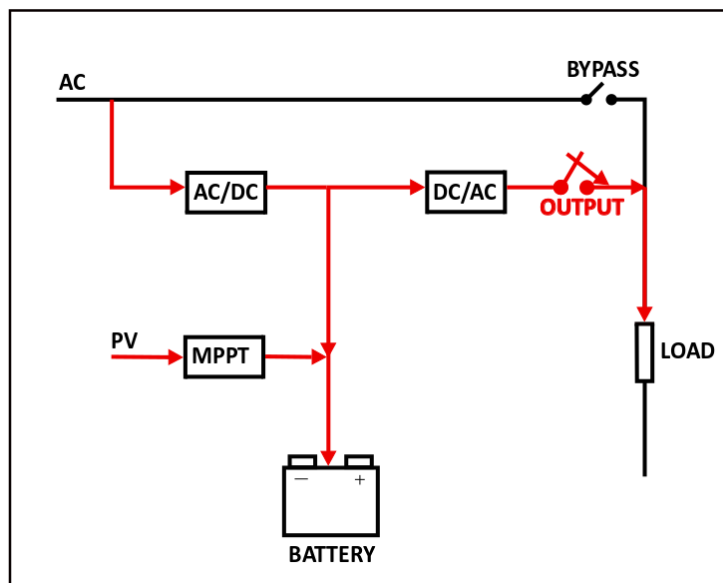


Fig 10 Normal Mode 2 of PV and AC

6.2 AC abnormal or Absent:

1. When the PV power is higher than the load power and AC fails, the PV power will support the load first and the extra power will be used to charge the battery.

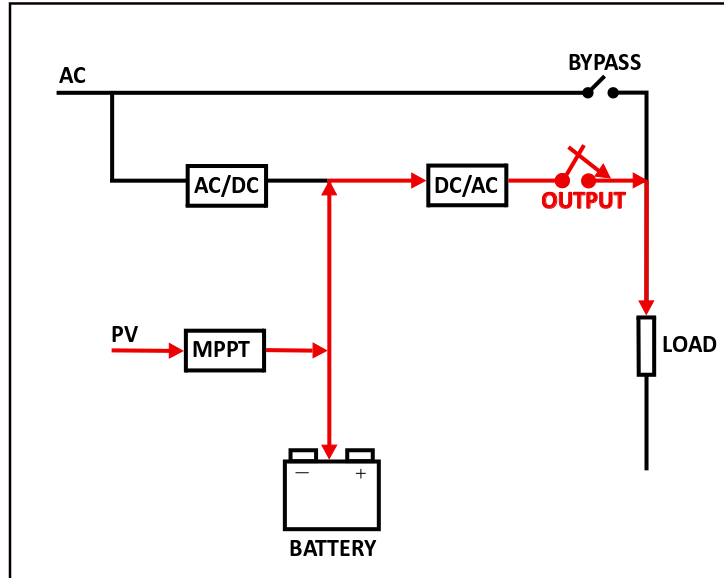


Fig 11 AC Abnormal Mode 1

2. When the PV power is less than the load power and AC fails, the PV together with the battery will supply the power to the load. When the battery reaches to low cut off voltage, the system will automatically shut down and the PV will charge the battery. When the battery is fully charged again or AC runs normally, the system will be ON automatically.

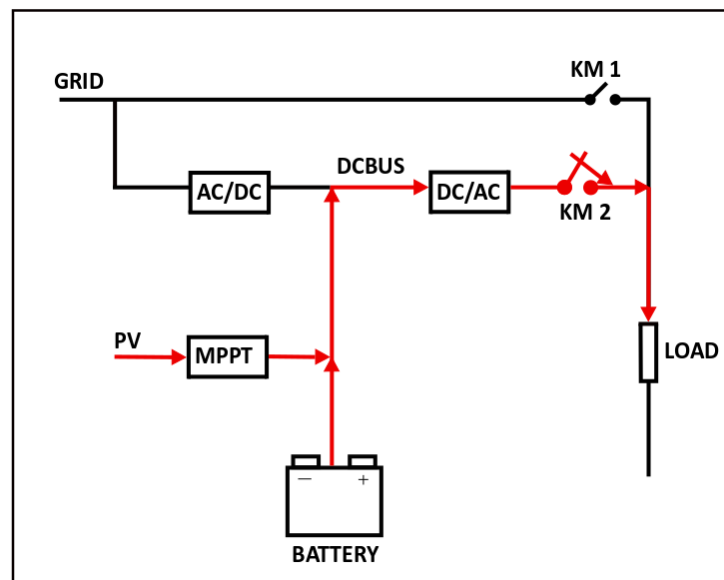


Fig 12 AC Abnormal Mode 2

6.3 Off-Peak Power Consumption:

1. AC charger OFF: If system has been set AC input OFF or battery low voltage in power supply priority mode, the rectifier will turn OFF AC charger in set time. PV and rectifier will supply the load first, and PV extra power will be used to charge the battery.

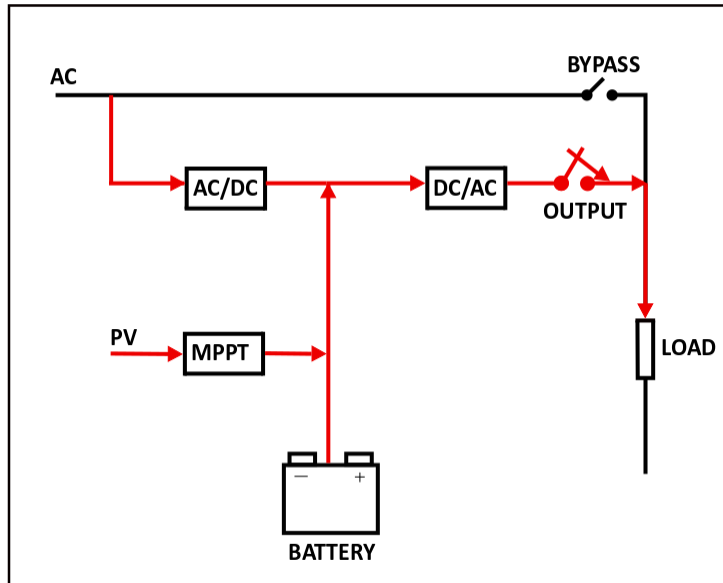


Fig 13 Off-Peak Setup Mode 1

2. Power Supply Priority: After system set in power supply priority mode, system will turn OFF the rectifier. Load will be supplied by PV and battery. System will turn to AC charger OFF mode until battery discharge to DOD point automatically.

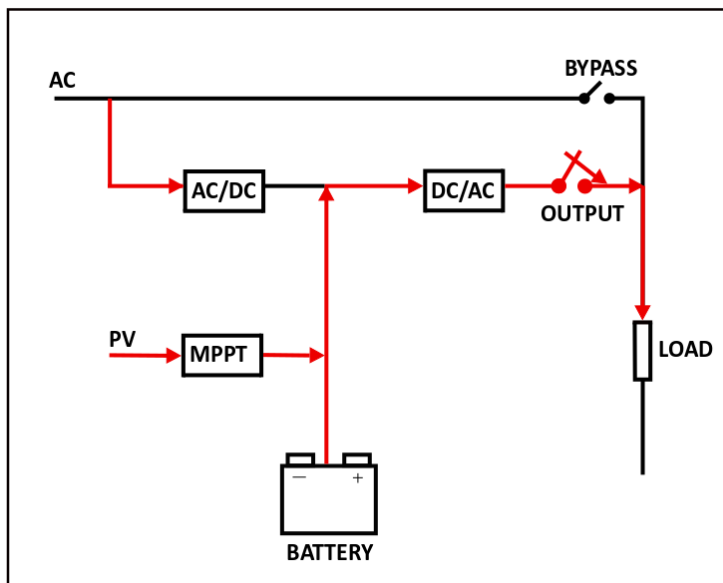


Fig 14 Off-Peak Setup Mode 2

3. Energy storage priority: System will turn on rectifier according to user settings. Load and battery will be supplied by PV and rectifier.

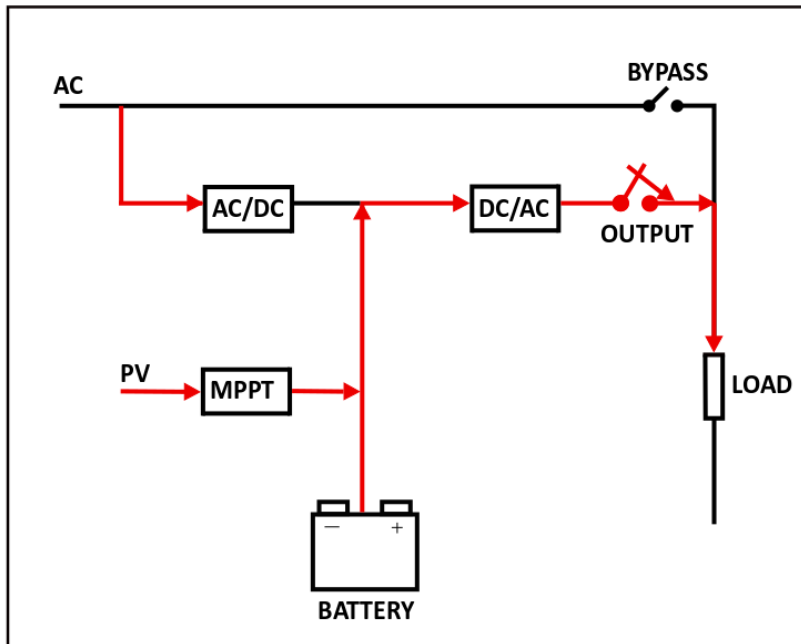


Fig 15 Off-Peak Setup Mode 3

6.4 System failure:

1. When the system fails, the system power supply mode will be switched to the bypass power supply mode, and the PV will recharge the battery through the MPPT system.

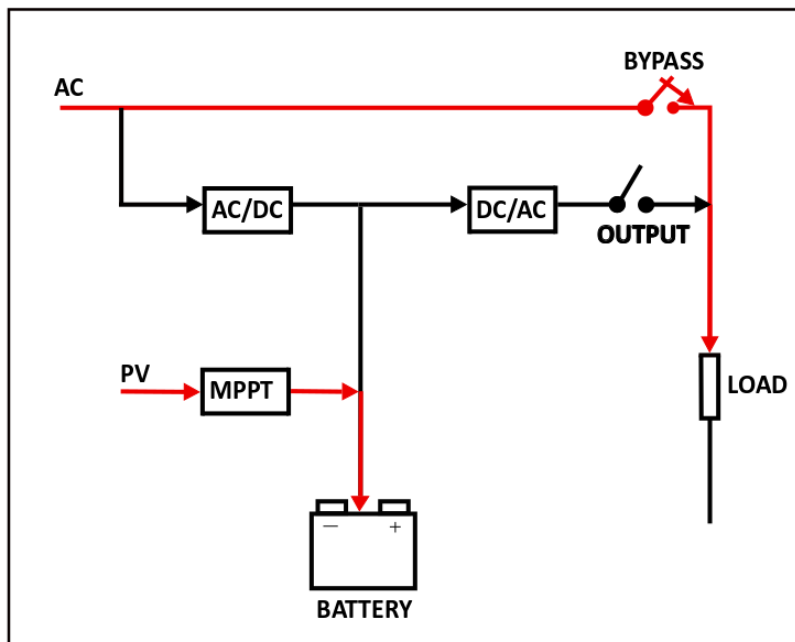


Fig 16 Mode 4 for Off-peak Electricity Consumption

7. Maintenance:

7.1 Preventive Maintenance:


The preventive maintenance can make the system reliability and prolong its service life.

The following inspections should be conducted every month:

- Turn OFF the Energy Server (see the operation steps).
- Inspect and make sure that the vent is not blocked.
- Inspect whether there is too much dust on the cover.
- Inspect whether the connecting cables of input, output and the battery are connected firmly and whether the insulation layer of the cables is in good condition.
- Ensure that the product is not affected with damp.
- Start-up operation (ON/OFF operation for the product).

7.2 Maintenance of Battery:

The sealed battery (lead-acid or lithium-ion) is used for the maintenance of the Energy Server. Its service life will be shortened dramatically with the preservation and use environment, the discharge frequency of the battery and the temperature rise. Even if the battery is not used, its performance will gradually decline, therefore it is recommended that one discharge test (Make sure the battery test should be executed in the condition of the normal bypass power supply) is conducted every three months when there is no power outage for a long term. The inspection methods of the battery are shown as follows (At the end of the use limit of the battery, the battery performance will decline sharply, therefore be sure to keep in mind the following inspection and maintenance methods):

1. Click the "" button on the main interface of the display screen to select the "BAT TEST" option and then input the "Control Password" (The default password is: 87654321) and click "YES" button to choose "Battery Self-check" option. At this point, the Energy Server closes the MPPT and the rectifier; the battery discharges; the "REC" LED on the panel is OFF; the "MPPT" red light is ON and the "BAT" LED flashes in green.
2. When the Energy Server detects the low voltage alarm of the battery (The depth of discharge can be adjusted by itself), and the "battery manual maintenance succeeds" information is indicated on the lower left corner of the LCD panel, it shows that the battery manual maintenance has been completed. After the completion of the manual maintenance, the Energy Server and the rectifier are started normally, and the output is continuously switched to the AC inverter output and

recharges the battery. If necessary, the maintenance staff only needs to select the “CLR TEST” option in the “Test Order” menu to stop the battery manual maintenance, at this moment, the inverter will run in the normal working mode.

3. Under the normal use condition, the service life of the battery is about 1~3 years. Under the conditions of higher temperature, more frequent discharging and deeper depth of discharge, the service life of the battery reduces to 0.5-1 year.
4. With ageing of the battery, the performance of the battery gets poor. When the battery health drops down to about 80% of the initial value, the discharge time decreases accordingly. The battery should be tested every month instead of 3 months.
5. Dustproof treatment:
 - Remove the dust and dirt on the battery.
 - Check whether all internal wires of the battery are connected firmly or broken, and when necessary, it must be replaced and repaired.
 - Make sure that the batteries and battery terminals are tightened.

7.3 Troubleshooting:

- **Operation methods:**

→ Click “” for check.

7.3.1 Common Troubleshooting:

Alarm Information	Explanation	Solutions
AC fault	The phase sequence, voltage, frequency or voltage unbalance of the rectifier’s input power supply goes wrong.	Check and make sure that the voltage and the frequency of the input power supply is according to the requirement of the system equipment and whether the switch is normal.
AC Volt Fail	The AC voltage exceeds the system rated voltage.	Adjust the system input power or wait for recovery (short fault).
AC Freq Fail	The AC frequency exceeds the system rated value.	Adjust the system input power or wait for recovery (short fault).


AC Phase Abnormal	The AC phase sequence is not correctly connected.	Adjust any two phases of the system input lines.
Bypass Over Load Protect	When the bypass load is more than or equal to 150%, the bypass output will be cut OFF.	When the load shedding is less than 90%, the bypass output will be restored by pressing “FAULT CLEAR” button.
Inv Over Load	When the inverter load is not less than 150% and the overload time is finished, or the inverter is shut down for protection.	
Output Over Load	The load is more than 105%.	Get the load shedding to be less than 90%.
REC Fault	After the rectifier is started, the rectified voltage is lower than the system set value.	Press “FAULT CLEAR” button for recovery. If the fault still exists, please ask the local authorized technician for service.
Bus Over Volt	High-voltage protection of DC BUS.	
BUS Soft Start Fail	The soft boot of the rectifier fails.	
Charge Fault	The charging current is larger than the set value.	
Bus Low Volt Shutdown	The voltage of battery discharge and DC BUS is lower than minimum set value.	The system will not automatically boot until the AC recovers or the PV is sufficient and the battery capacity is not less than 90%.
Bat Low Volt	The battery voltage is lower than the set value.	
Bat EOD	The battery voltage is lower than the minimum.	

Limit Num Of Hour Switch	When the switching frequency of the inverter is 5 within an hour, no matter whether the frequency is increased, only the total time should be calculated.	After waiting for one hour, the system will check the switching frequency, if it is OK then the system will boot automatically.
Bypass Fault	The phase sequence, voltage, frequency or voltage unbalance of the bypass input power supply goes wrong.	Check and make sure that the voltage and frequency of the input power supply comply with the requirements of the Energy Server and whether the switches are in normal operation.
BYP Phase Abnormal	The bypass phase sequence is reverse.	Adjust any two phases of the system input lines.
Bypass volt abnormal	AC voltage exceeds the system rated value.	Adjust the system input power or wait for recovery (short fault).
Bypass frequency ultra-trace	The inverter bypass frequency is out of the bypass tracking.	
BYP STS Fault	Bypass SCR fault	Press "FAULT CLEAR" button for recovery. If the fault still exists, please ask the local authorized technicians for service.
INV STS Fault	Inverter SCR fault	
INV-A Under/Over Volt	The output voltage of inverter A is higher/lower than the required value.	
INV-B Under/Over Volt	The output voltage of inverter B is higher/lower than the required value.	
INV IGBT Over Current	The current of the inverter is larger than the set value.	
INV Soft Start Fail	The soft boot of the inverter fails.	

Over Temp	System high-temperature protection.	
Fan fault	The system has detected the normal rotation of the fan.	Please ask the local authorized technician for service.
Output Short	The effective maximum output current of the three-phase is more than 5 times of the rated value within 100ms, namely short circuit protection.	Confirm whether the connecting wire of the load or the load itself is in normal state and then press “FAULT CLEAR” button for recovery.
EPO	Press the red button on the panel or conduct the remote EPO operation.	Remove the remote EPO order and execute the “OFF” operation steps and then execute the “ON” steps after the system power is cut OFF.
BAT disconnect	The breaker of the battery is switched OFF.	Check whether the output air switch of the battery or the battery itself is in good condition.
Parallel connection fault	<p>The PE2 refers to single parallel set interface (“1—parallel operation”).</p> <p>PF13 refers to the parallel wires being connected well. (“1”-OK for connection, one of the following cases goes wrong:</p> <ol style="list-style-type: none"> 1.The connection of the parallel wires for the single machine is OK. 2.The connection of the parallel wires for the parallel machines fails. 	
Remarks: “exist” refers that the fault arises and “clear” refers that the fault disappears.		

Table 10 Comparison Table of Common Faults

7.3.2 MPPT Troubleshooting:

Click “” to switch the inverter and MPPT information for check.

Alarm Information	Explanation	Solutions
PV In Reverts	The polarity of PV input line of the MPPT*# module is reversed.	Check and adjust polarity of PV input line of the MPPT*# module.
Module Fail	MPPT system fault	Please ask the local authorized technician for service.
Comm Fail	MPPT communication is interrupted.	Confirm whether screws of MPPT module are loose. Please ask the local authorized technician for service.
Over Current	The power of PV polar plate is too high and there is instant overcurrent.	Check whether the power of the polar pole confirms to the system rated value.
Over-Temp	The power of the polar plate is too high or the local environment temperature rises too high or the high-temperature of the module is caused by the fan fault.	Confirm whether the power of the polar pole and the environment temperature exceed the system requirements. Please ask the local authorized technician for service.
BUS Over Volt	The transient loading/unloading causes the fluctuation of DC BUS.	The system automatic adjustment recovers one minute later.
PV In.C Over.V	The transient loading/unloading causes the fluctuation of DC BUS.	If the overvoltage phenomenon lasts for a long time, please ask the local authorized technician for service.

PV Over Volt	The set voltage of the polar plate is too high.	Reduce the Voc voltage of the polar plates in series.
PV under-voltage	Poor illumination	Confirm the direction and the pavement gradient of the polar plate.
MPPT is not detected.	MPPT shutdown of the communication blackout.	<ul style="list-style-type: none"> • The MPPT system shuts down and exits automatically at night. • Turn ON input switches of PV1#-PV4#. • The fixed screws of MPPT module are loose, please fasten them. • Please ask the local authorized technician for service.
Remarks: “exist” refers that the fault arises and “clear” refers that the fault disappears.		

Table 11 MPPT Warning Information