Residential Integrated Lithium-ion Battery System

User Manual

ALL-IN-ONE SYSTEM

Read this manual carefully before starting to install the all-in-one system.
Keep these instructions for future reference.

Read and follow these instructions!

The following precautions are intended to ensure your safety and prevent property damage. Before installing this product, be sure to read all safety instructions in this document for proper installation.

	**⚠ DANGER**
	Failure to comply with the instructions with this symbol may result in a serious accident, causing death or a severe injury.
	**⚠ WARNING**
	Failure to comply with the instructions with this symbol may result in a serious accident, causing a severe injury.
	**⚠ CAUTION**
	Failure to comply with the instructions with this symbol may result in minor or moderate injury.
	***NOTICE***
	Provides information considered important but not hazard-related. The information relates to property damage.
	**IMPORTANT**
	Indicates valuable tips for optimal installation and operation of the product

This product is designed to an integrated system, which must be performed by a qualified person trained in electrical engineering and familiar with the characteristics and safety requirements of lithium batteries. Do not use this product if you are unsure if you possess the necessary skills to complete this integration.

Table of Contents

About this Manual

To make sure that you understand the proper procedures for safe operation, this section briefly describes the purpose, audience, organization, revision history, and acronyms and abbreviations.

Purpose

The purpose of this manual is to provide information for the safe and successful installation of the product. The instructions in this manual are based on assembly of a three-cabinet system. Other configurations are possible and theses instructions can be reduced or expanded to accommodate installation of those systems.

Target Audience

This installation manual is intended for system administrators and operators who install and configure the product.

Organization

This manual is composed of the following chapters:

- Chapter 1, “Precautions,” list the considerations.
- Chapter 2, “Product Introduction,” explains the function of the product.
- Chapter 3, “Unpack the Product,” explains how to unpack the battery.
- Chapter 4, “Installation of the System,” explains how to install the product.
- Chapter 5, “Cable Connection,” explains how to connect the product.
- Chapter 6, “Activate the Product,” explains how to activate the product, to begin using the battery.
- Chapter 7, “Mode,” explains the product mode.
- Chapter 8, “Inspection, Cleaning and Maintenance,” explains how to carry out the maintenance and store the product.
- Chapter 9, “Troubleshooting,” explains some troubleshooting when some fault phenomenon occur.
- Chapter 10, “Transportation Requirements,” explains transportation requirements.

Revision History

Rev.	Description	Author	Date
0.1	First Release		2022.03.18
0.2	Add inverter description and installation guide		2022.08.31
0.3	Modify according to the client.		2023.01.09

Acronyms and Abbreviations

The following acronyms and abbreviations are used in this manual

Abbreviations	Full Name
BMS	Battery Management System
SOC	State Of Charge
SOH	State Of Health
GEN	Generator
PV	Solar Photovoltaic

1. Precautions

1.1 General Safety Precautions

The product provides a safe source of electrical energy when operated as intended and as designed. Potentially hazardous circumstances such as excessive heat or electrolyte mist may occur under improper operating conditions, damage, misuse and/or abuse. The following safety precautions and the warning messages described in this part must be observed.

If any of the following precautions are not fully understood, or if you have any questions, contact us for guidance.

Risks of explosion

- Do not subject the battery pack to strong impacts.
- Do not crush or puncture the battery pack.
- Do not dispose of the battery pack in a fire.

Risks of fire

- Do not expose the battery pack to temperatures in excess of 122 ℉.
- Do not place the battery pack near a heat source such as a fireplace.
- Do not expose the battery pack to direct sunlight.
- Do not allow the battery connectors to touch conductive objects such as wires.

Risks of electric shock

- Do not disassemble the battery pack.
- Do not touch the battery pack with wet hands.
- Do not expose the battery pack to moisture or liquids.
- Keep the battery pack away from children and animals.

Risks of damage to the battery pack

- Do not allow the battery pack to come into contact with liquids.
- Do not subject the battery pack to high pressures.

1.2 Installation Precautions

Please be aware that a battery presents a risk of electrical shock including high short-circuit current. Follow all safety precautions while operating the batteries and the inverter.

- Remove watches, rings, and other metallic accessories.
- Use tools with insulated handles in order to avoid inadvertent short circuits.

- Wear rubber gloves and safety boots.
- Do not put tools or any metal parts on the top of the batteries.
- Disconnect charging source and load before connecting or disconnecting terminals.
- Use proper lifting means when moving batteries and wear all appropriate safety clothing and equipment.
- Do not open or mutilate the batteries.
- Do not disassemble the inverter. If you need maintenance or repair, take it to a professional service center.
- To reduce risk of electric shock, disconnect all wires before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
- Never charge a frozen battery.
- Be very cautious when working with metal tools on or around batteries. Dropping a tool may cause a spark or short circuit in batteries or other electrical parts, even cause an explosion.
- Grounding instructions - this inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
- Never cause AC output and DC input short circuited. Do not connect to the mains when DC input short circuits.

	**⚠ CAUTION** ▪ Verify polarity at all connections before energizing the system. Reverse polarity at the battery terminals will void the Warranty and destroy the batteries. Do not short circuit the batteries. ▪ Do not combine FnS Lithium Batteries with other brands or chemistries; Do not mix Lithium Batteries from different installations, clients, or job sites. ▪ Do not disassemble or modify the battery. If the battery housing is damaged, do not touch exposed contents.

2. Product Introduction

All-in-one energy storage system consists of LFP battery modules, hybrid inverter and advanced remote monitoring App. It is pre-programmed ESS for backup power, TOU, zero export, peak shaving and self-consumption of solar PV. ATS automatically disconnects from the grid during power outages

and provides standby power for critical circuits.

2.1 Product Specifications

Table 2-1: Product Specifications

PV String Input Data	
Model	FSHM05010AUN
Max Recommended PV Power (w)	6500W
PV Input Voltage(V)	370V(125V～500V)
MPPT Range(V)	150V～425V
Start-up Voltage(V)	125V
PV Input Current(A)	13A+13A
No .of MPPT Trackers	2
No. of MPPT Strings Per MPPT Tracker	1+1
Battery Data	
Battery Type	$LiFePO_4$
Nominal Voltage（V）	48V
Battery Voltage Range(V)	47.5～54V
Max Charging / Discharging Current(A)	120A
Battery Storage Capacity(kWh)	9.6kWh
AC Output Data	
Rated AC Output and UPS Power(W)	5000W
Max AC Apparent Power (W)	5000W
AC Output Rated Current (A)	21.7A
Output Frequency and Voltage	50Hz; 230/240Vac
Grid Type	Single Phase
General Data	

Operating Temperature Range (℃)	-20℃～50℃
Noise(dB)	＜30dB
Max. Efficiency	97.6%
Communication With BMS	RS485, CAN
Weight(kg)	180kg
Size(W×D×H) mm	645×272×1600mm
General Data	
Grid Regulation	CEI0-21,VDE-AR-N4105, NRS097, IEC62116, IEC61727,G99,G98, VDE0126-1-1,RD1699.C10-11
Safety EMC/Standard	IEC/EN62109-1/-2,IEC/EN61000-6-1/-2/-3/-4
Battery	UL1642, UL1973, CE,IEC62133,UN38.3, UL9540A

2.2 Product Overview of the Cabinet

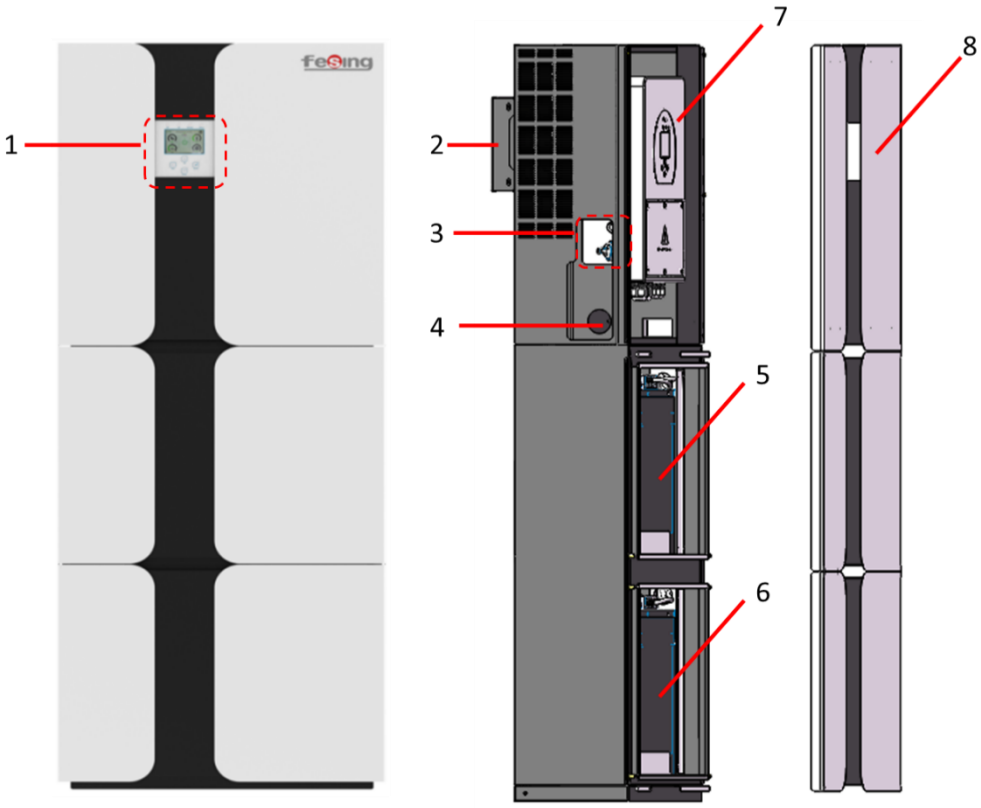


Figure 2-1: Function Introduction

1. LCD display. It can see the battery information.
2. Fixing plate. A mounting plate for securing the cabinet on wall.
3. Power on/off button. You can use this button to start the inverter.
4. Input port of the power supply, such as grid, load, gen, and PV.
5. Battery. This battery ADD address is 1.
6. Battery. This battery ADD address is 2.
7. Inverter.
8. The front cover of the cabinet.

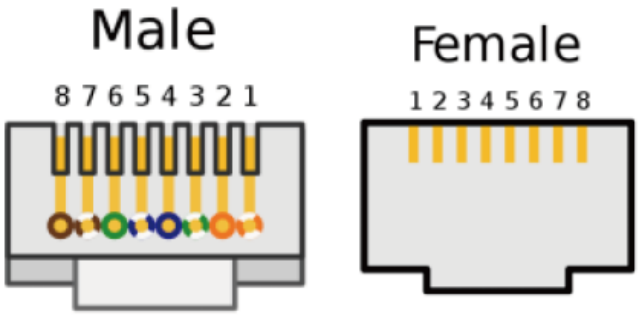
2.3 Front Panel Function Introduction of the Battery

Figure 2-2: Front Panel Function Introduction

1. Reset: Reset button, when the system is abnormal, you can use this button to reset and restore the normal operation of the system. When the RUN lamp is flashing, press the reset button until all the LED lights flash to reset the battery group; all LED lights are off. Under the state, press the reset button, all the lights turn on the battery group in turn; RUN light is on, press the reset button RUN light off to turn off the battery;

2. RS485 communication interface: Used for cascade communication or MODBUS communication;

(1) RS485/CAN Port Definition



(a) RJ45 Pin Male (b) RJ45 Pin Female

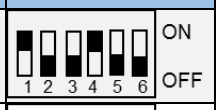
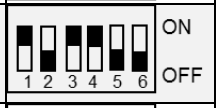
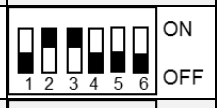
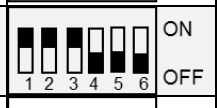
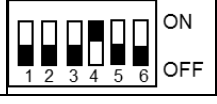
Figure 2-3: Communication Port

Table 2-2: Description of RJ45 Pin

RJ45 Pin	Signal	Meaning	Description
1	RS485 B		2-wire RS485 communication, complying with the Modbus protocol
2	RS485 A		2-wire RS485 communication, complying with the Modbus protocol
3	NC	Reserved	
4	CAN H		2-wire CAN communication, complying with the CAN protocol
5	CAN L		2-wire CAN communication, complying with the CAN protocol
6-8	NC	Reserved	

3. ADD: DIP switch, used for setting the product communication address when communication cascade;

Table 2-3: The Dialing Address Configuration of Each Battery

No.	Module Address	Battery Module ID	Picture	No.	Module Address	Battery Module ID	Picture
1	0x01	1		9	0x09	9	
2	0x02	2		10	0x0a	10	
3	0x03	3		11	0x0b	11	
4	0x04	4		12	0x0c	12	
5	0x05	5		13	0x0d	13	
6	0x06	6		14	0x0e	14	
7	0x07	7		15	0x0f	15	
8	0x08	8					

4. RUN: Run light;

5. ALM: Warning light;

6. SOC: These 4 LEDs are used to display the pack SOC. The lightning of these LEDs indicates the SOC of 10%, 25%, 50%, and 75%. For example, when SOC >75%, all 4 LEDS will be light up. If SOC> 50% and <75%, 3 LEDs will be light up. Etc.

7. The pack's negative (-) electrode.

8. The pack's positive (+) electrode.

9. Used for fixing with racks.

10. Handle: It was used to carry/move the battery.

Products specifications described herein are subject to change without prior notification.

2.4 State Indicator

Table 2-4: State Indicator

System Mode	Abnormal event	RUN	ALM	Capacity LED
				   
De-energized/ shutdown Mode		No light	No light	All no light
Stand-by Mode	Normal	Flash 1	No light	Indicate the SOC
	Alarm	Flash 1	Flash 2	Indicate the SOC
Charging	Normal	Light	No light	Indicate the SOC, the higher LED flash 2
	Alarm	Light	Flush 2	Indicate the SOC, the higher LED flash 2
	Over charge protection	Light	No light	All light
	Temp protection	Flash 1	Flash 2	Indicate the SOC
	Overcurrent, fail protection	No light	Light	All no light
Discharging	Normal	Flash 3	No light	Indicate the SOC
	Alarm	Flash 3	Flash 2	Indicate the SOC

	Low voltage protection	Flash 3	No light	All no light
	Overcurrent, Short Circuit protection	No light	Light	All no light
Failure		No light	Light	All no light
Flush 1: Light 0.25s and no light 3.75s; Flash 2: Light 0.50s and no light 0.50s; Flush 3: Light 0.50s and no light 1.50s				

2.5 Inverter Overview

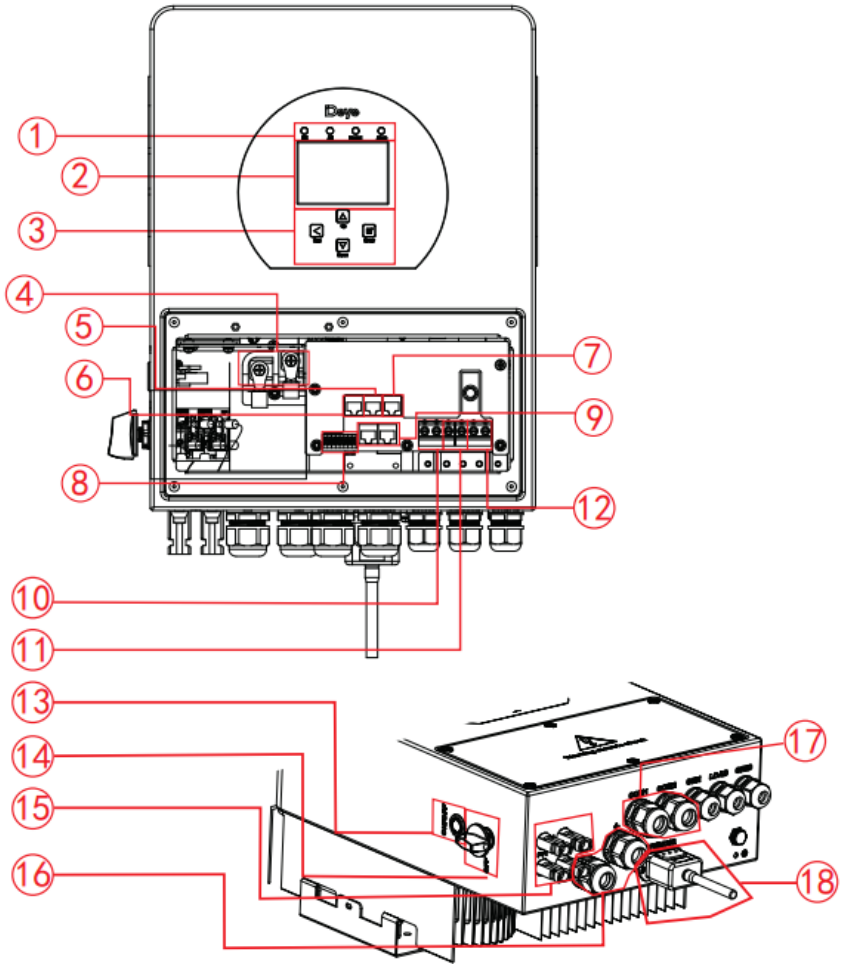


Figure 2-4: Inverter Overview

1: Inverter Indicators

2: LCD display

3: Function Buttons

4: Battery input connectors

5: RS 485 Port: for energy RS 485 communication.

6: BMS CAN Port: CAN port for battery communication.

7: Meter Port: for energy meter communication.

8: Function Port

9: Parallel port: Parallel communication port 1(CAN interface).

10: Generator input

11: Load

12: Grid

13: Power on/off button

14: DC Switch

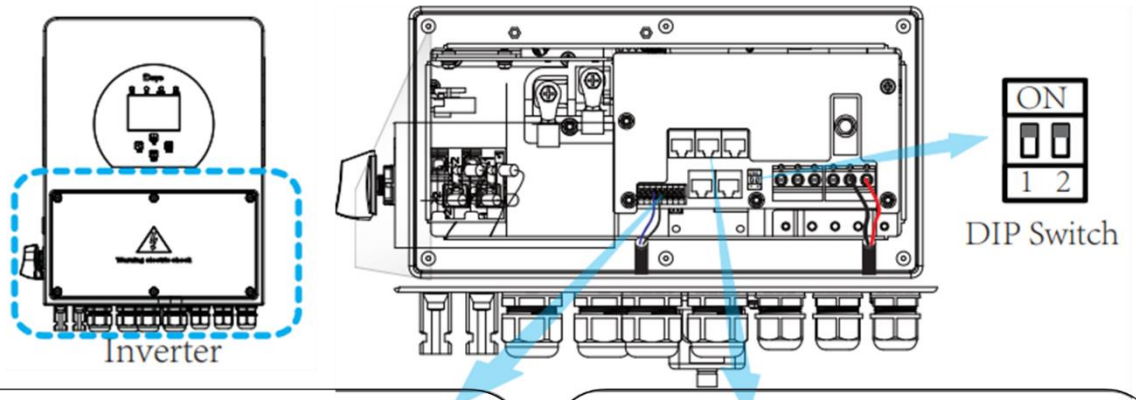
15: PV input with two MPPT

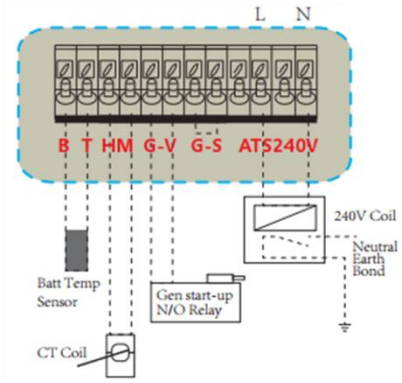
16: Battery

17: Temperature sensor

18: WiFi Interface

2.6 Inverter Function Port Definition



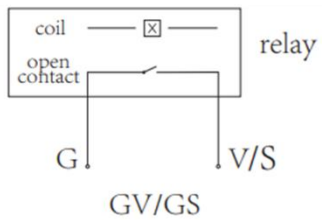


BT: battery temperature sensor for lead acid battery.

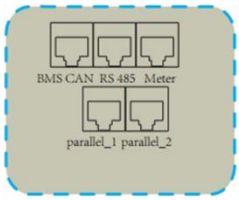
HM: current transformer for "zero export to CT" mode.

GV/GS: dry contact signal for startup the diesel generator.
When the "GEN signal" is active, the open contact (GV/GS) will switch on (no voltage output). If the "Signal ISLAND MODE" is ticked, the GS port will be the dry contact signal for startup the diesel generator. If "Signal ISLAND MODE" is not ticked, the GV port will be the dry contact signal for startup the diesel generator.

ATS: 230V output port when inverter is on.



(diesel generator startup signal)



BMS CAN: CAN port for battery communication.

*RS485: for energy meter communication.
*Some hardware versions don't have this port.

Meter: for energy meter communication.

Parallel 1: Parallel communication port 1 (CAN interface).

Parallel 2: Parallel communication port 2 (CAN interface).

DRMs: for Australia market only.

DIP switch: Parallel communication resistor
If the number of inverters in the parallel system is less than or equal to 6, all inverter's DIP switch (1&2) need be ON position.

If the number of inverters in parallel system exceeds 6, the main 6pcs inverter's DIP switch needs to be ON position. And the other inverter DIP switch (1&2) needs to be OFF position

Figure 2-5: Inverter Function Port

3. Unpack the Product

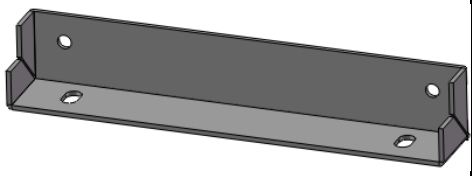
The cabinet, battery and the related accessories are packed in the steel belt wooden box. Use tools to open the steel belt on the upper cover plate of the packing box. After opening the packing box, confirm the product components according to the parts list.

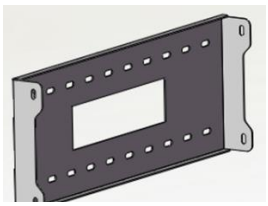
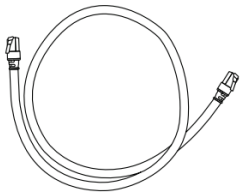
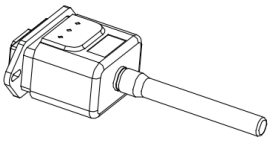
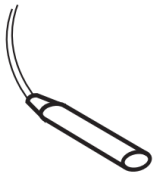
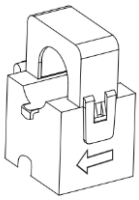
	⚠WARNING
	Violent unpacking is strictly prohibited. If the all-in-one system is found to be broken, deformed or other abnormal conditions, the user shall immediately stop using the battery and contact us.

3.1 Parts List

Check the part during unpacking.

Table 3-1: Parts Lists of the battery

Part No.	Items	Appearance	Usage	Remarks
1	RS485 communication line		Apply to Modbus protocol. Connect the battery and the computer.	Used to monitor and debug the battery
2	Mounting Plate for Battery Fixation		Fix the battery on the cabinet	These three parts are fixed in the cabinet when packaging.
3	Sheet-metal Part for Cabinet Fixation		Fix the battery on the wall	

4	Fixing plate		A mounting plate for securing the cabinet on wall	
5	Parallel communication cable		Ethernet cable connection for RS485 communication port to battery modules	
6	L-type Hexagon wrench		Tool	
7	Wi-Fi-Plug (optional)		Wifi monitoring	
8	Battery temperature sensor		Temperature sensor connection for lead-acid battery	It is not applicable for Lithium-ion battery.
9	Sensor Clamp		\	Detail description is shown in ‘5.9 CT Connection’ in page 38.

3.2 Inspecting the Cabinet

After unpacking the cabinet, check for:

- Structural damage
- Paint peeling
- Damaged or protruding screws.

3.3 Inspection of the Modules

After unpacking the battery, inverter and the cabinet, check for:

- Physical damage to the exterior
- Damaged or protruding screws
- Proper voltage of the battery modules using the battery tester. (when the battery is activated).

4. Installation of the System

This system must be installed by qualified, trained workers familiar with the required instruments.

Use appropriate lifting methods when moving the batteries.

Table 4-1: Recommended Tools and Instruments

No.	Items	Usage	Appearance
1	Electric drill	Install the expansion bolts	
2	Screwdriver or Bit	To fasten battery and assemblies to the cabinet frames	
3	Box Cutter	Opening boxes	
4	Insulated Hexagon Wrench	Installing front cover of the cabinet	

⚠ WARNING

- Be sure to use insulated tools (torque wrench, extension, socket, etc.).
- All the instruments must be insulated and no metal articles (e.g. watch, ring) should be present in the installation area.
- All power switches must be turned off in advance.
- Prepare a CO_2 fire extinguisher, a first aid kit, and an AED (automated external defibrillator) before installation.

⚠ CAUTION

Heavy Object

Can cause muscle strain or back injury.

Use lifting aids and proper lifting techniques when moving trays, batteries and other heavy objects.

4.1 Open the Cabinet Door

As shown in Figure 4-1, use L-type hexagon wrench to remove bolts on the front cover to open the cabinet.

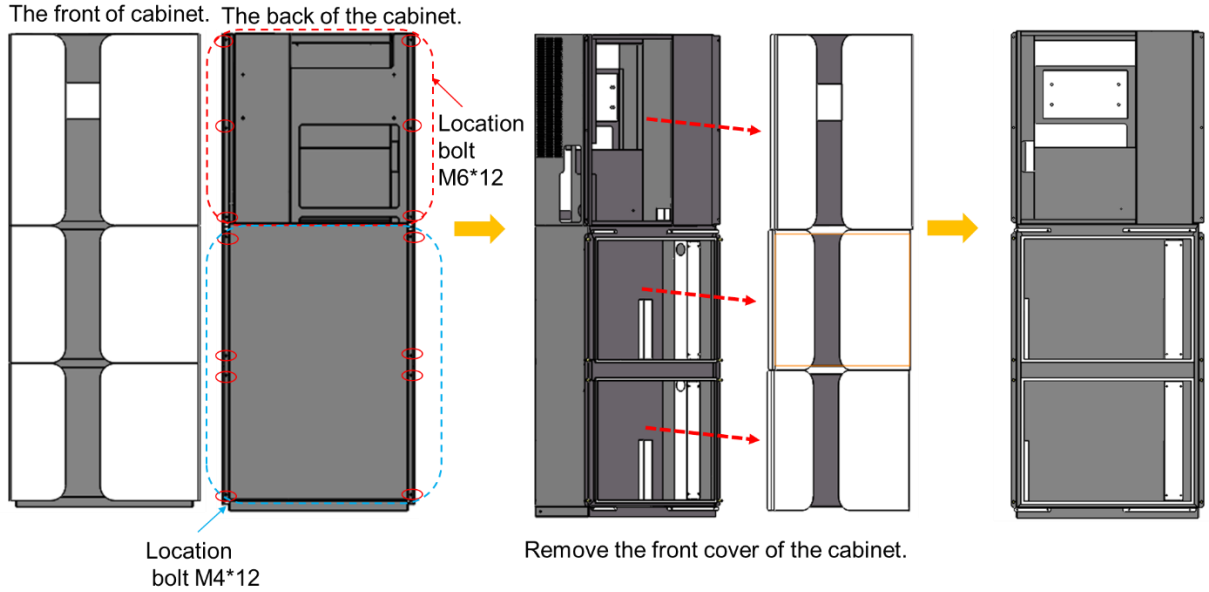


Figure 4-1: Open the Cabinet Door

	NOTICE ▪ When tightening the screws, make sure they are at a straight angle from the cabinet terminals to avoid damage to the nuts inside. ▪ Assemble the screws using L-type hexagon wrench within the fastening torque of less than 4 Nm (M4*12) and 8 Nm (M6*12).

4.2 Install the Inverter

1. After opening the cabinet front cover, place the inverter near the cabinet.
2. Install the inverter on the cabinet.

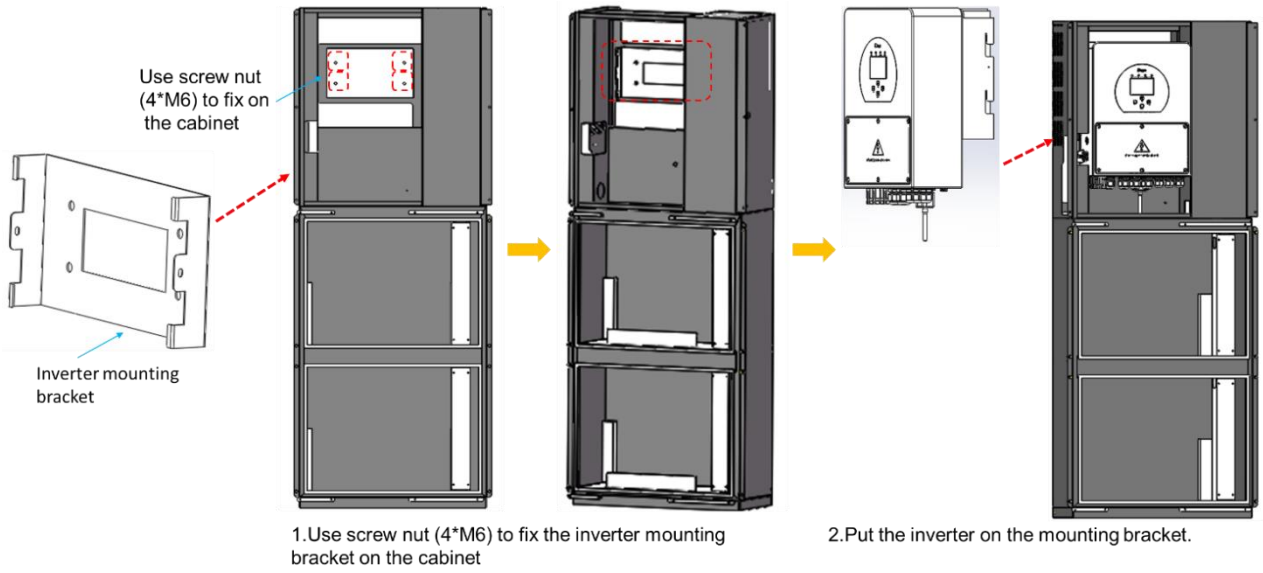


Figure 4-2: Install the Inverter

	NOTICE ▪ When tightening the screws, make sure they are at a straight angle from the cabinet terminals to avoid damage to the nuts inside. ▪ Use a suitable tool to screw the bolts within the fastening torque of less than 8 Nm (M6).

4.3 Confirm the Cabinet Installation Position

Mark the size of the anchor hole according to the drawing in Figure 4-3.

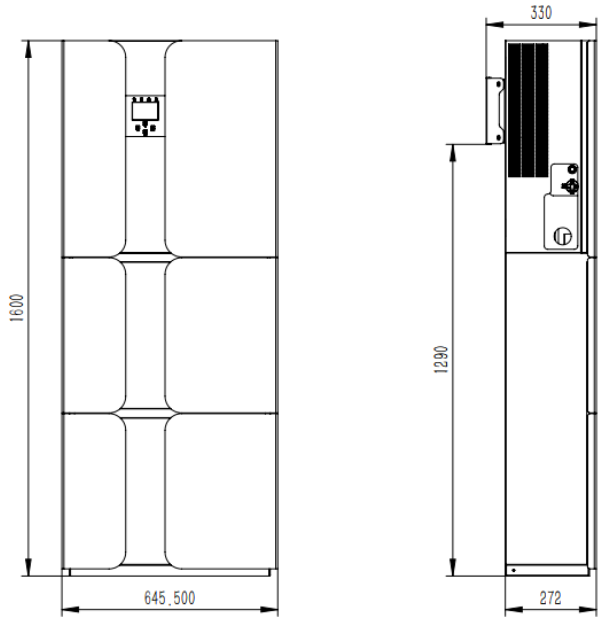


Figure 4-3: The Dimension Drawing of the Cabinet

4.4 Install of the Cabinet Mounting Plate

As shown in Figure 4-4, place the cabinet to the installation position and fasten the mounting plate on the cabinet.

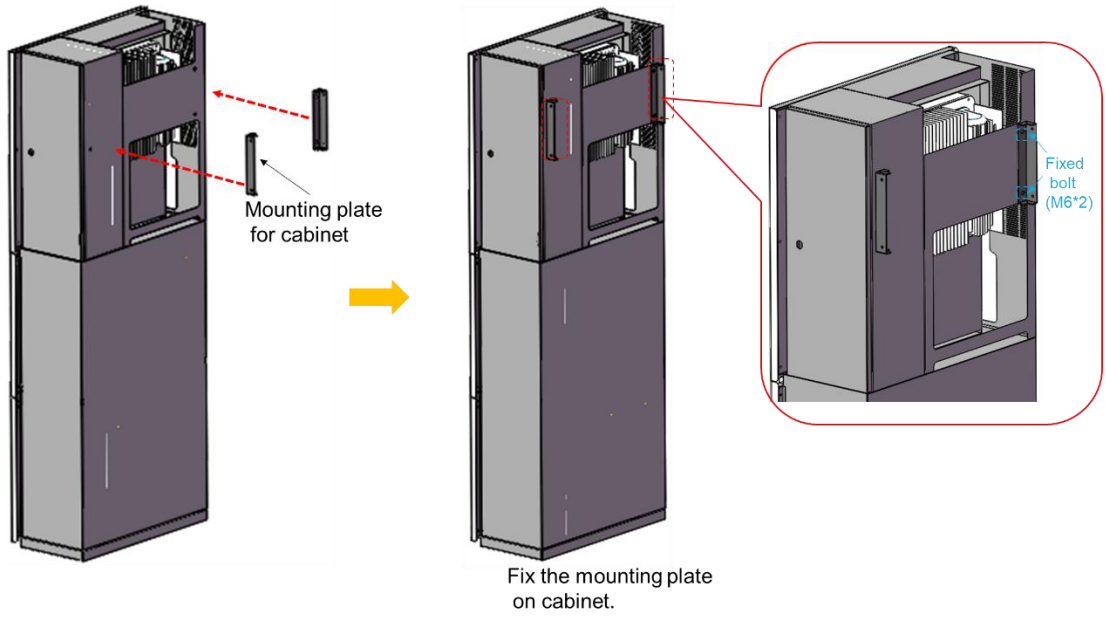


Figure 4-4: Install of the Cabinet Mounting Plate

	NOTICE
	▪ When tightening the screws, make sure they are at a straight angle from the cabinet terminals to avoid damage to the nuts inside. ▪ Assemble the screws suitable screwdriver within the fastening torque of less than 8 Nm.

4.5 Install of the Cabinet on the Wall

4.5.1 Install the Stainless Steel Ani-collision Bolt

Choose the recommend drill head to drill 4 holes on the wall, 52-60mm deep.

1. Use a proper hammer to fit the expansion bolt into the holes.
2. Carry the inverter and holding it, make sure the hanger aim at the expansion bolt, fix the cabinet on the wall.
3. Fasten the screw head of the expansion bolt to finish the mounting.

4.5.2 Install of the Cabinet on the Wall

1. Place the fixing plate to the installation position and fasten the fixing plate to the wall. As shown in Figure 4-3, the distance from the ground is 1290mm.
2. Move the cabinet close to the fixing plate. The bolt hole of the two parts are alignment.
3. Fasten the cabinet and the fixing plate.

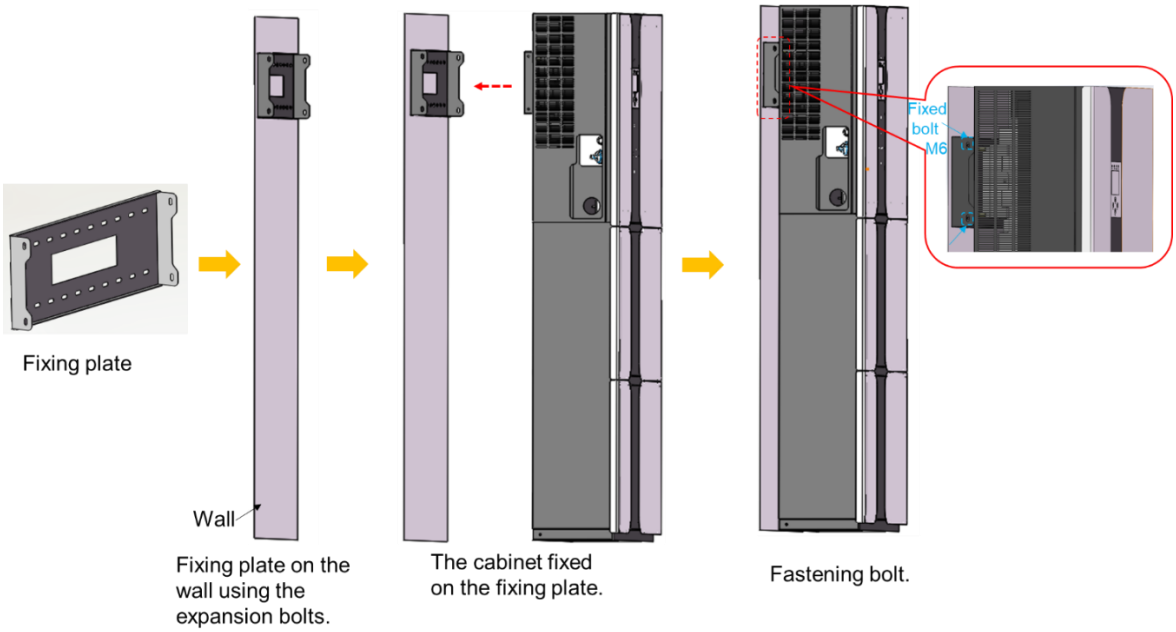


Figure 4-5: Install of the Cabinet on the Wall

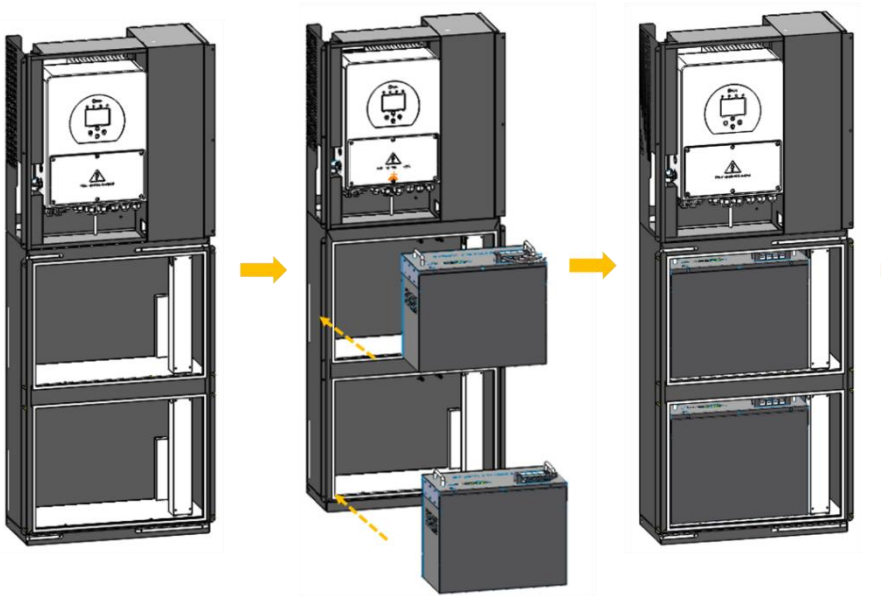
	NOTICE
	▪ When tightening the screws, make sure they are at a straight angle from the cabinet terminals to avoid damage to the nuts inside. ▪ Assemble the screws suitable screwdriver within the fastening torque of less than 8 Nm .

Installation Precaution:

- Please select a vertical wall with load-bearing capacity for installation, suitable for installation on concrete or other non-flammable surfaces, installation is shown below.
- Not near the television Antenna or antenna cable.
- Not higher than altitude of about 2000 meters above sea level.
- Not in environment of precipitation or humidity (>95%).

4.6 Place the Battery

1. Transport battery modules near the cabinet. Confirm the battery is power off.
2. Place the battery modules on the cabinet.



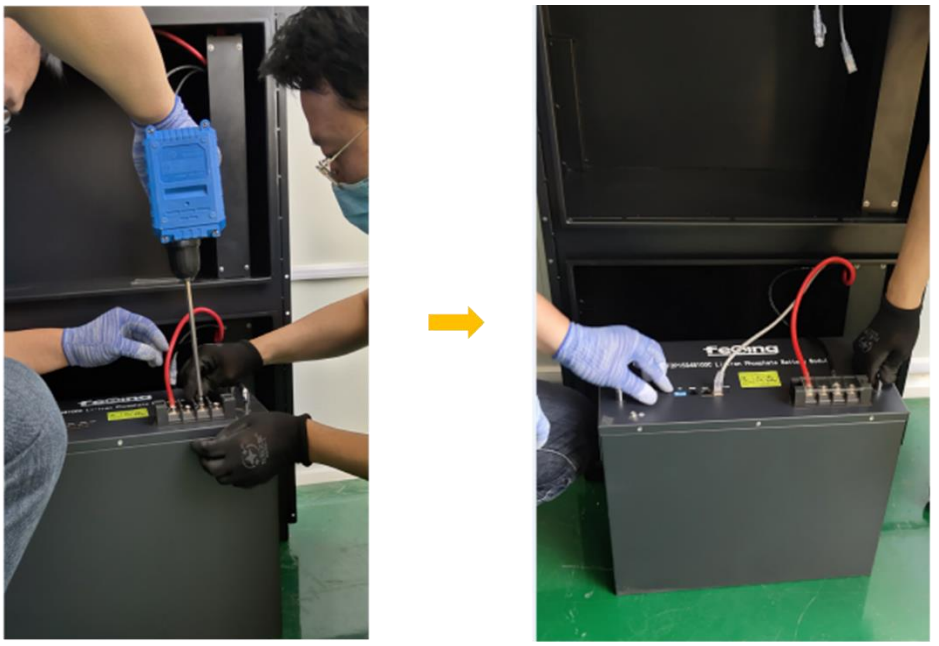
1.Place the battery in the cabinet

Figure 4-6: Place the Battery

4.7 Busbar to Battery Cable Connection and Communication Cable Connection

1. As shown in Figure 4-7 and Figure 4-8, connect the positive cables of the two batteries between the batteries and the busbar, respectively. Connect the negative cables of the two batteries between the two batteries and the busbar, respectively.
2. As shown in Figure 4-9, connect the communication cable between the two batteries. Connect the communication cable between the inverter and the battery.
3. Set the battery communication address of the two batteries. The address of battery on the upside is 1. The bottom address is 2.
4. Sort the cables and fasten the battery cables to the perforated bracket with cable ties.

	**NOTICE** ▪ When tightening the screws, make sure they are at a straight angle from the battery module terminals to avoid damage to the nuts inside. ▪ Assemble the screws using a Phillips-head within the fastening torque of less than 8.0 Nm.



1.Connect the positive and the negative cables.

2.Connect the communication cable.
3.Set the battery ADD address.

Figure 4-7: Battery Cable Connection

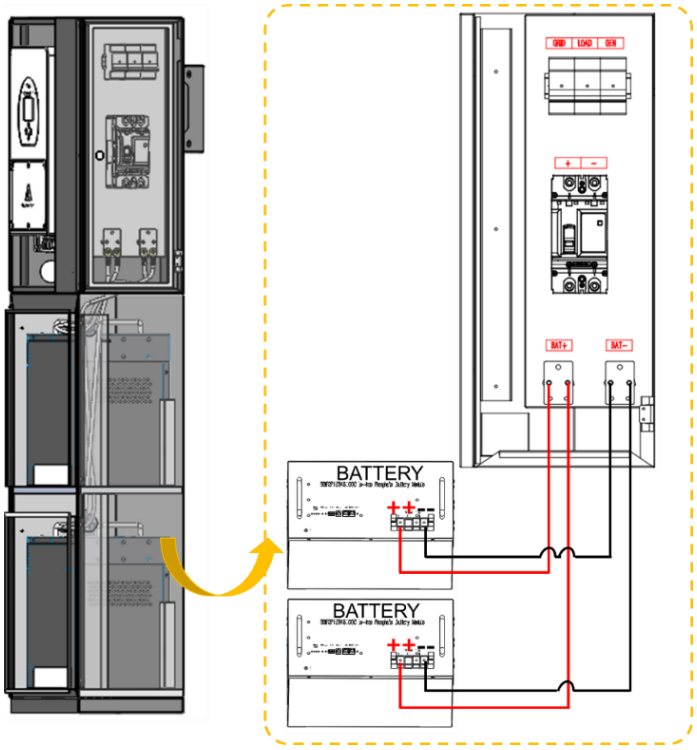


Figure 4-8: Installing Negative and Positive Cables

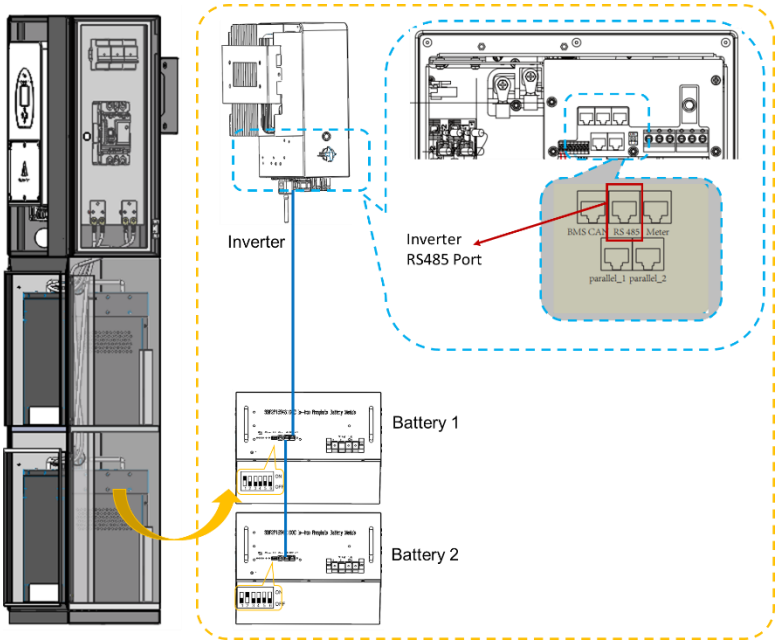


Figure 4-9: Communication Cable Connection

⚠ CAUTION

- Before connection, make sure to close the battery, inverter and the breaker.
- DO NOT deviate from the sequence of steps below.
- Exercise extreme caution prevent the terminals from contacting anything except their intended mounting points.
- The polarity of a terminal or a wire connected to the terminal is on the front of each module. Exercise extreme caution to prevent the terminals and/or wires with opposite polarity from contacting with each other.
- It is necessary to avoid any non-insulating contact between the negative terminal and the positive terminal of the battery or the cabinet during the connection process. This can effectively avoid issues such as sparking or short circuit.
- The maximum voltage of the battery is no more than 60V, which is higher than the safe voltage of 36V. Therefore, we still recommend that the battery terminals or other exposed parts should not be directly touched during the installation.

4.8 Fasten the Battery

As shown in Figure 4-10, fasten the two batteries on the cabinet.

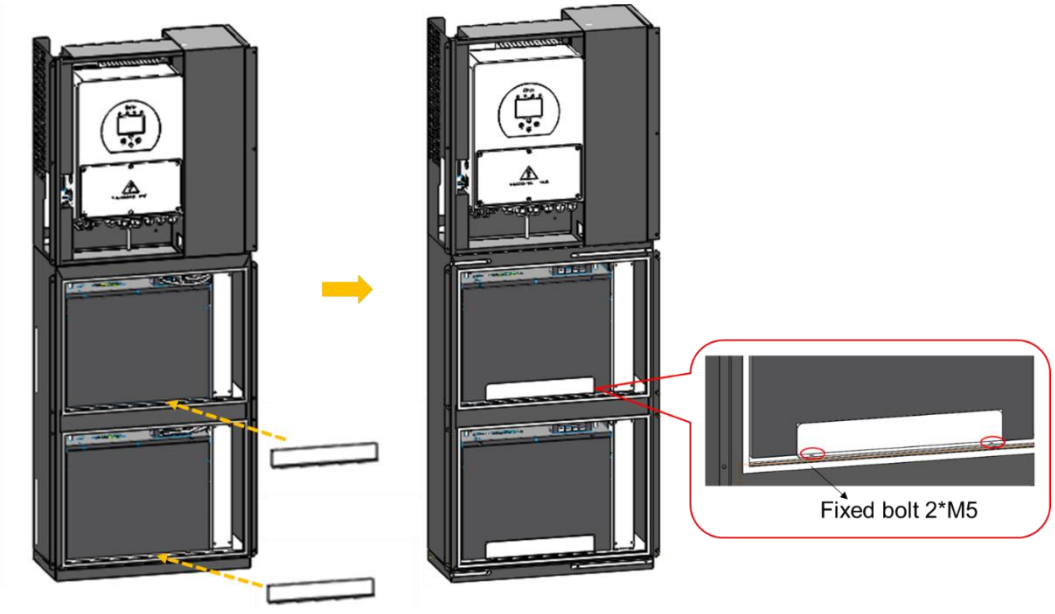


Figure 4-10: Fasten the Battery

NOTICE

- When tightening the screws, make sure they are at a straight angle from the battery module terminals to avoid damage to the nuts inside.
- Assemble the screws using a Phillips-head within the fastening torque of less than 5.0 Nm.

5. Cable Connection

NOTICE

- Before connect the cable with the inverter, the worker must confirm the output switch of the inverter has been turn off, to prevent the risk of fire or electric shock.

5.1 Inverter to Breaker Cable Connection

1. Connect the positive cable between the breaker and the inverter. After connecting the cable, fastening bolt immediately to avoid dropping.
2. Connect the negative cable between the breaker and the inverter. After connecting the cable, fastening bolt immediately to avoid dropping.
3. Sort the cables and fasten the battery cables to the perforated bracket with cable ties.

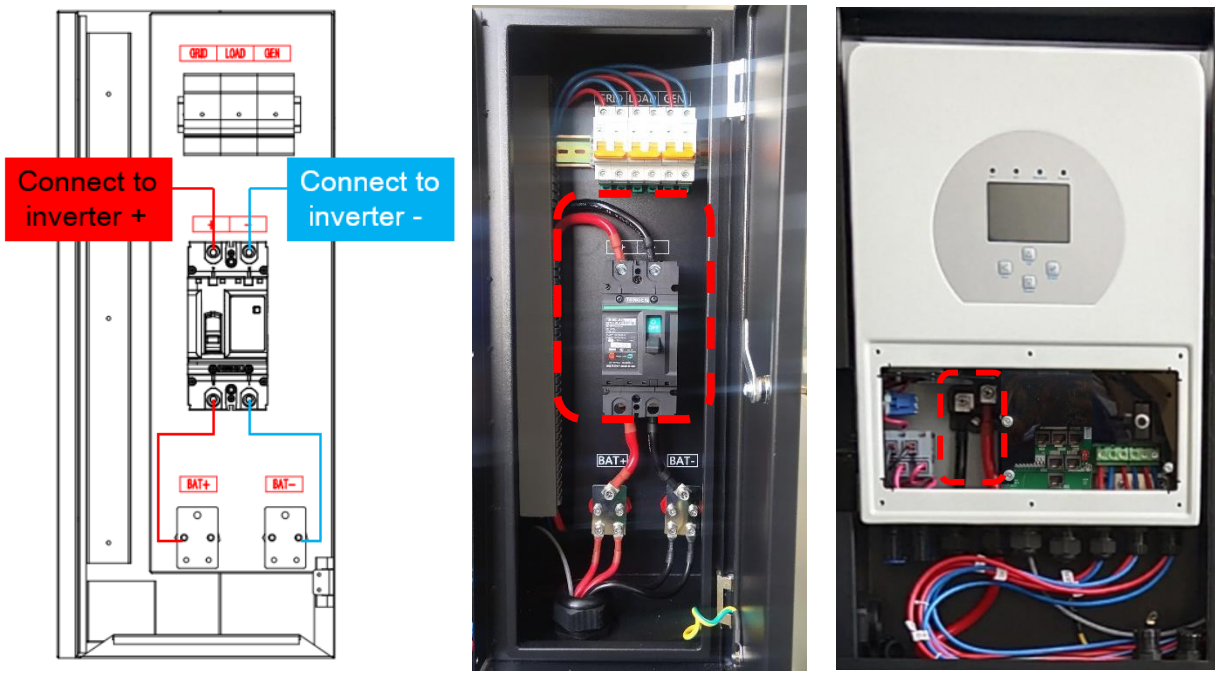


Figure 5-1: Cable Connection between Inverter and Breaker

	**NOTICE** ▪ When tightening the screws, make sure they are at a straight angle from the battery module terminals to avoid damage to the nuts inside. ▪ Use a suitable screwdriver to screw the bolts and fasten the bolt by the screwdriver, make sure the bolts are tightened with torque of 6±1 N.M in clockwise direction.

5.2 Inverter to Switch Cable Connection

1. Connect the ‘GRID L’ cable and ‘GRID N’ between the Switch and the inverter, respectively. After connecting the cable, fastening bolt immediately to avoid dropping.
2. Connect the ‘LOAD L’ cable and ‘LOAD N’ between the Switch and the inverter, respectively. After connecting the cable, fastening bolt immediately to avoid dropping.
3. Connect the ‘GEN L’ cable and ‘GEN N’ between the Switch and the inverter, respectively. After connecting the cable, fastening bolt immediately to avoid dropping.
4. Sort the cables and fasten the battery cables to the perforated bracket with cable ties.

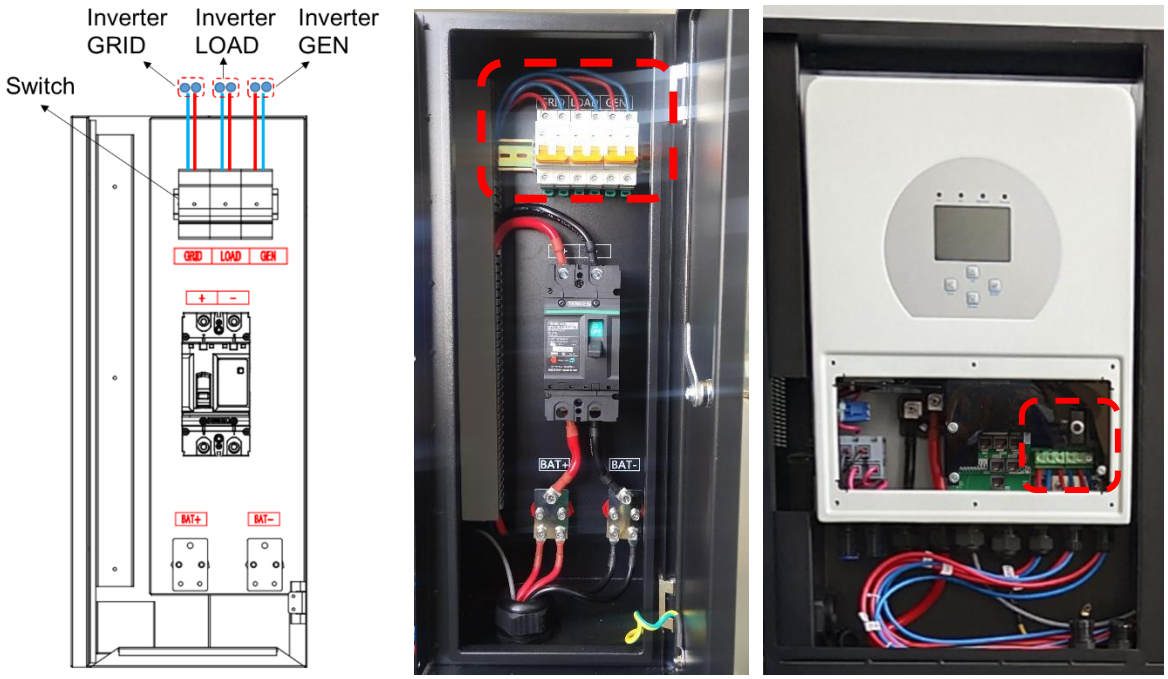


Figure 5-2: Inverter to Switch Cable Connection

	NOTICE
	▪ When tightening the screws, make sure they are at a straight angle from the battery module terminals to avoid damage to the nuts inside. ▪ Use a suitable screwdriver to unscrew the bolts and fit the battery connectors in, then fasten the bolt by the screwdriver, make sure the bolts are tightened with torque of 2 N.M in clockwise direction.

5.3 External Power Supply to Switch Cable Connection

1. Connect the ‘GRID L’ cable and ‘GRID N’ between the Switch and external power supply respectively. After connecting the cable, fastening bolt immediately to avoid dropping.
2. Connect the ‘LOAD L’ cable and ‘LOAD N’ between the Switch and external power supply, respectively. After connecting the cable, fastening bolt immediately to avoid dropping.
3. Connect the ‘GEN L’ cable and ‘GEN N’ between the Switch and external power supply, respectively. After connecting the cable, fastening bolt immediately to avoid dropping.
4. Sort the cables and fasten the battery cables to the perforated bracket with cable ties.

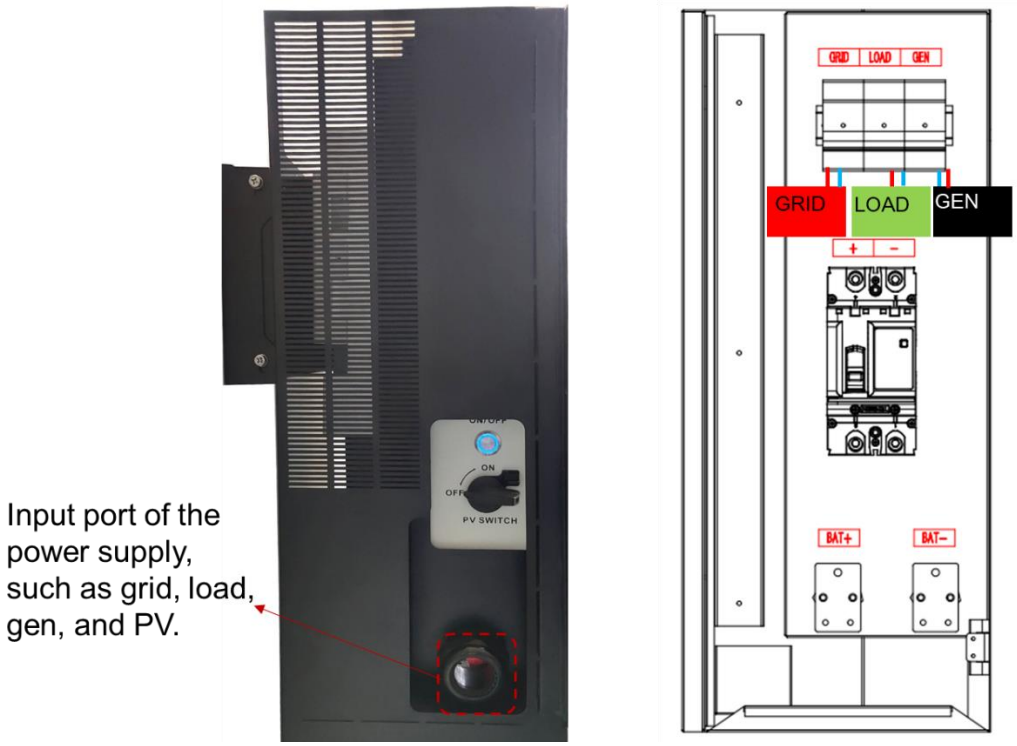


Figure 5-3: External Power Supply to Switch Cable Connection

	**NOTICE** ▪ When tightening the screws, make sure they are at a straight angle from the battery module terminals to avoid damage to the nuts inside. ▪ Use a suitable screwdriver to unscrew the bolts and fit the battery connectors in, then fasten the bolt by the screwdriver, make sure the bolts are tightened with torque of 2 N.M in clockwise direction.

5.4 Earth Connection between Inverter and Cabinet (mandatory)

Ground cable shall be connected to ground plate on grid side to prevent electric shock when the original protective conductor fails.

As shown in Figure 5-4, connect the earth cable between the cabinet and the inverter.

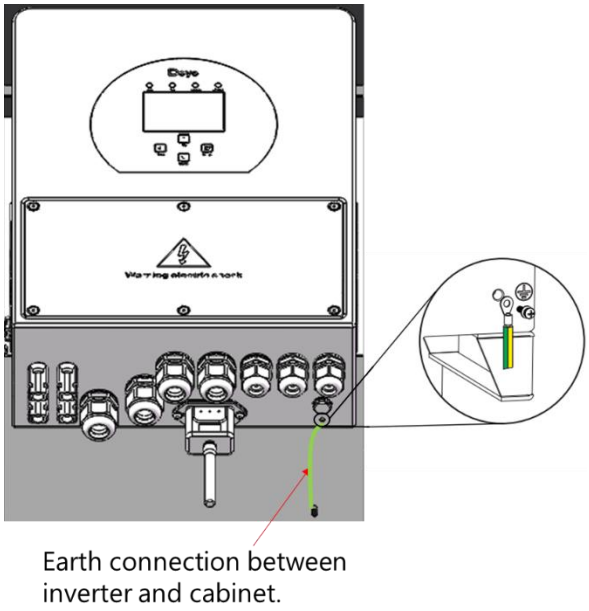


Figure 5-4: Inverter Earth Connection

	NOTICE
	▪ When tightening the screws, make sure they are at a straight angle from the battery module terminals to avoid damage to the nuts inside. ▪ Use a suitable screwdriver to screw the bolts and fasten the bolt by the screwdriver, make sure the bolts are tightened with torque of 5 N.M in clockwise direction.

5.5 Earth Connection between Battery and Cabinet

As shown in Figure 5-5, connect the earth cable between the cabinet and the battery.

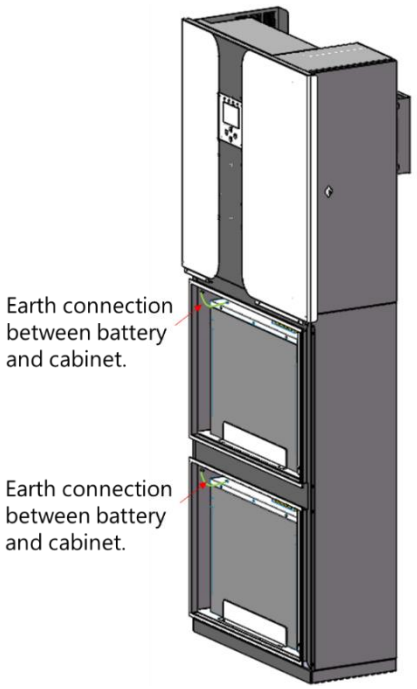


Figure 5-5: Earth Connection between Battery and Cabinet

5.6 Earth Connection between Ground and Cabinet

As shown in Figure 5-6, connect the earth cable between the cabinet and ground.

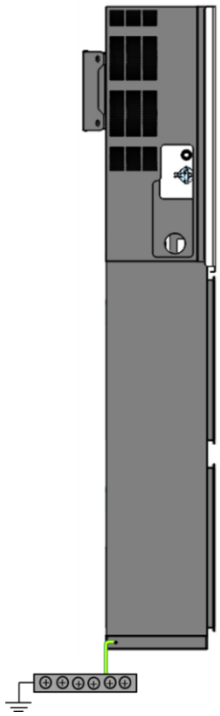


Figure 5-6: Earth Connection between Ground and Cabinet

NOTICE

- When tightening the screws, make sure they are at a straight angle from the battery module terminals to avoid damage to the nuts inside.
- Assemble the screws using a Phillips-head within the fastening torque of less than 5 Nm.

5.7 PV Connection

Before connecting to PV modules, please install a separately DC circuit breaker between inverter and PV modules. It is very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size as below.

To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter. When using PV modules, please be sure PV+ don't ground and PV- don't ground. It is requested to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

5.8 PV Module Selection:

When selecting proper PV modules, please be sure to consider below parameters:

1) Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.

2) Open circuit Voltage (Voc) of PV modules should be higher than min. start voltage.

5.9 CT Connection

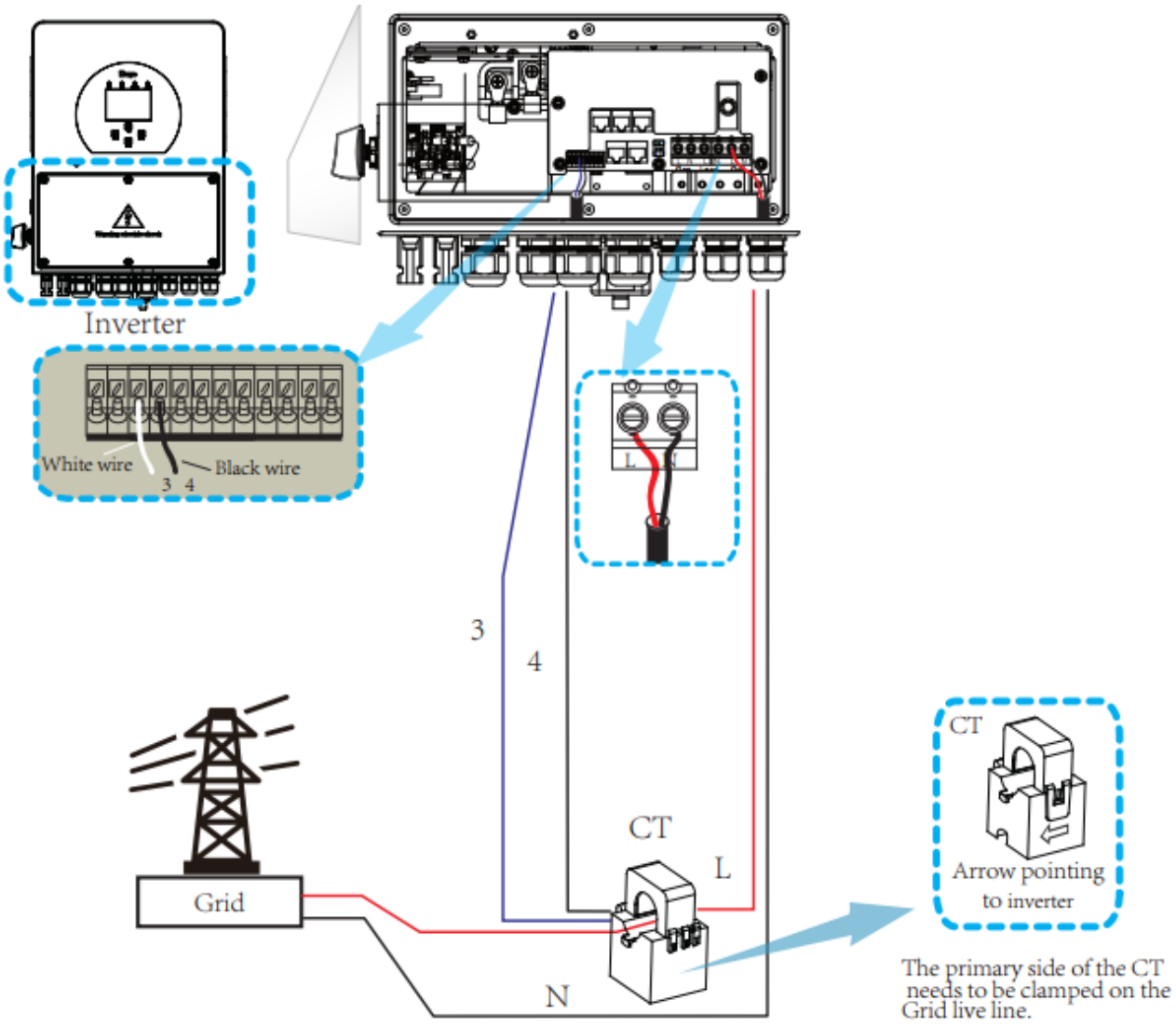


Figure 5-7: CT Connection

*Note: when the reading of the load power on the LCD is not correct, please reverse the CT arrow.

5.10 Meter Connection

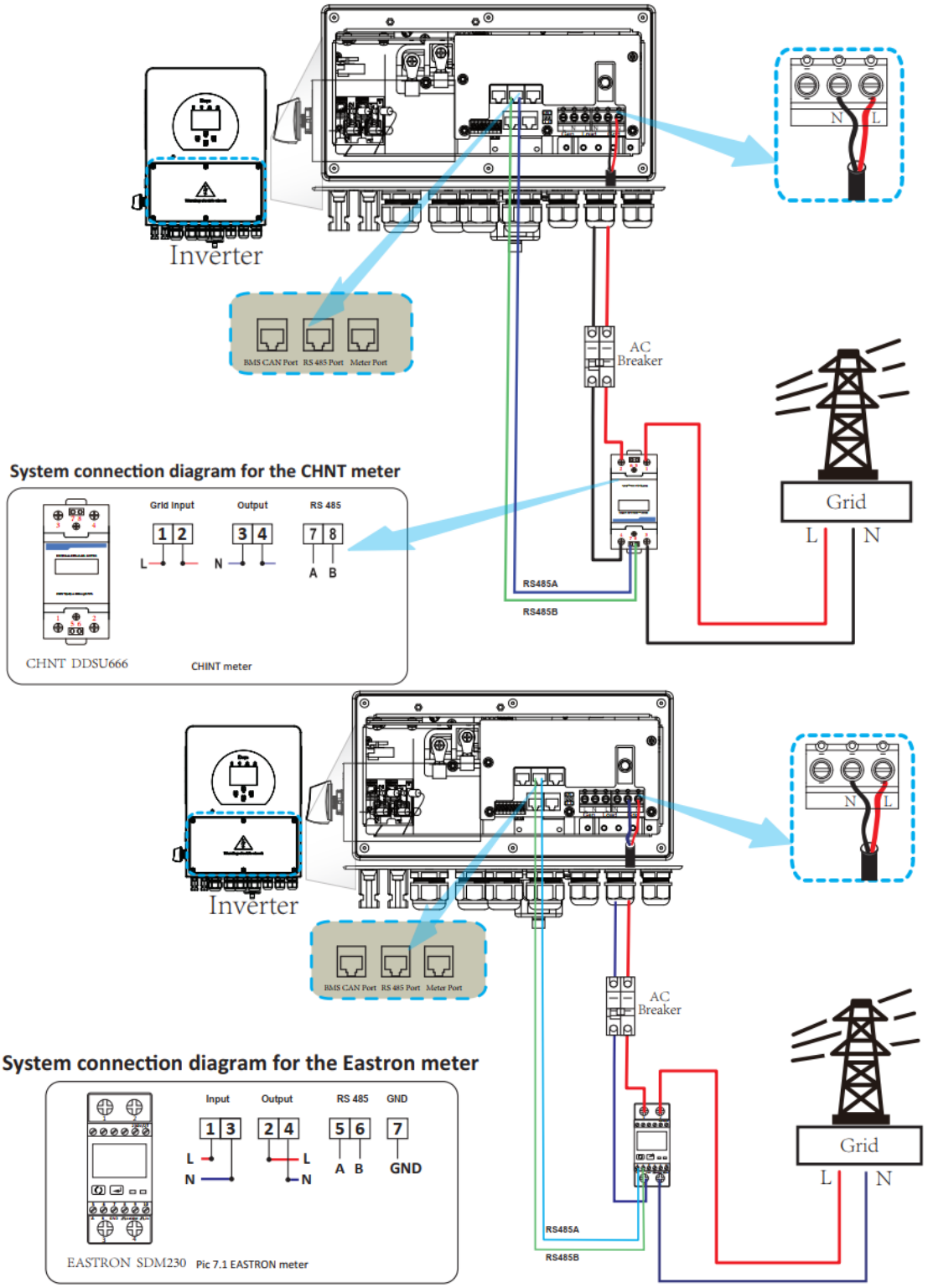
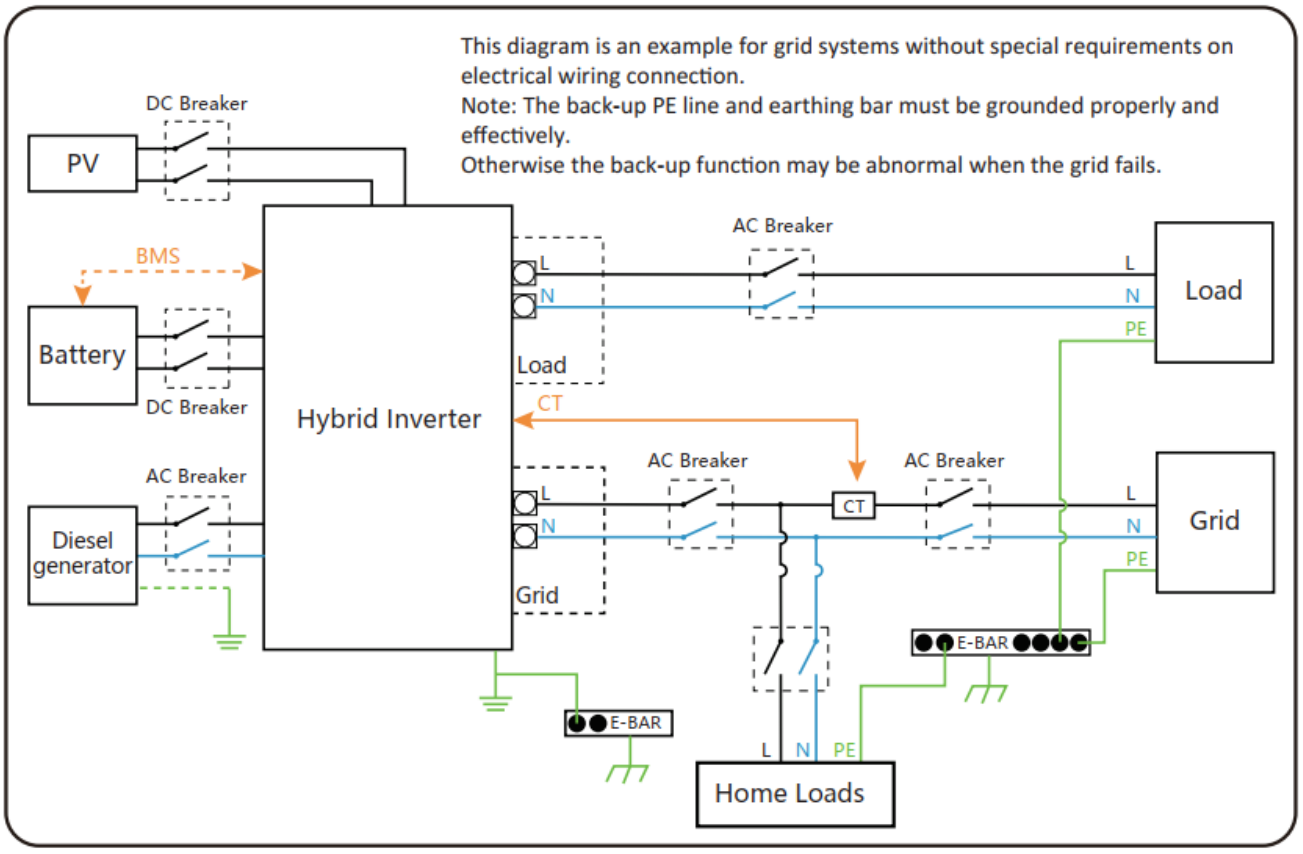


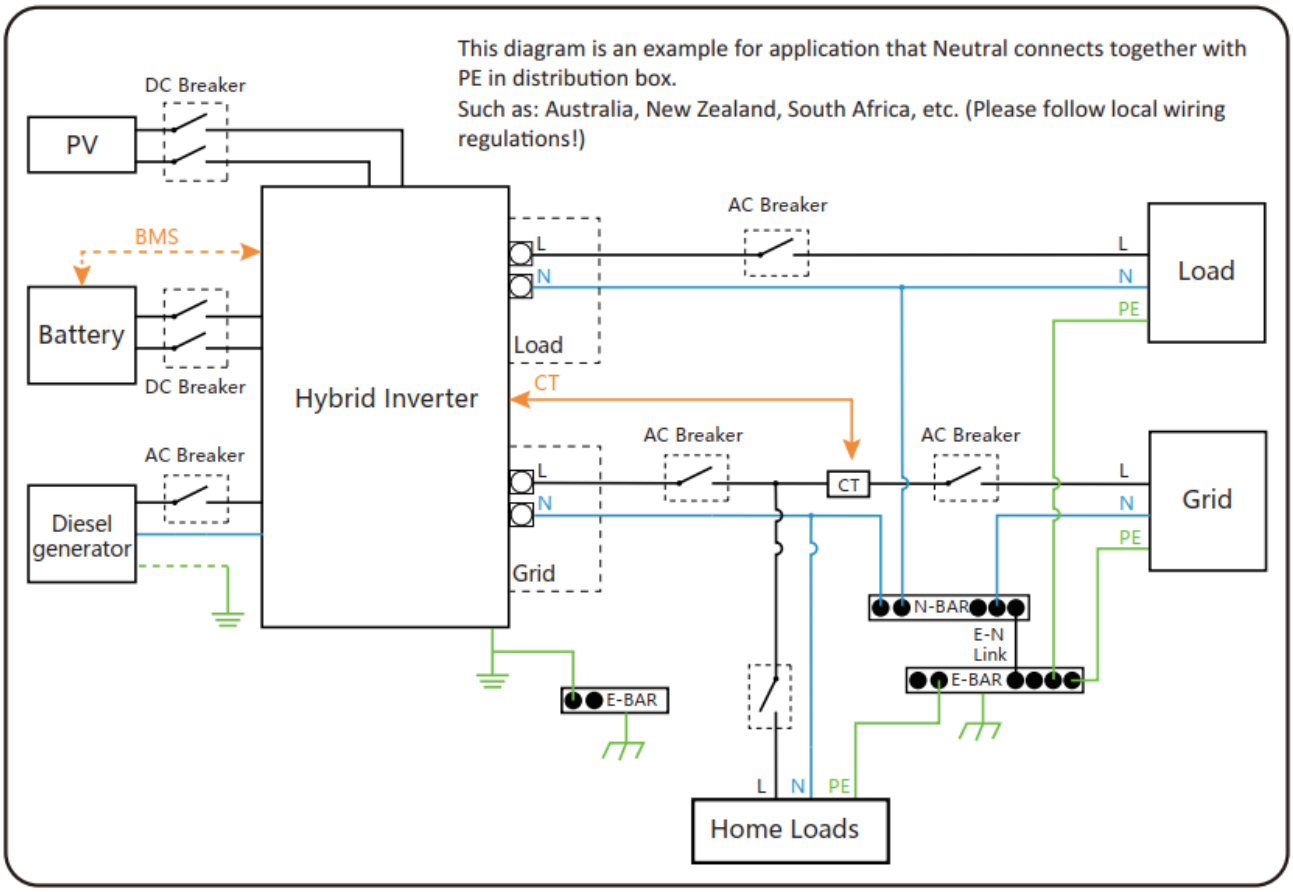
Figure 5-8: Meter Connection

5.11 WIFI Connection

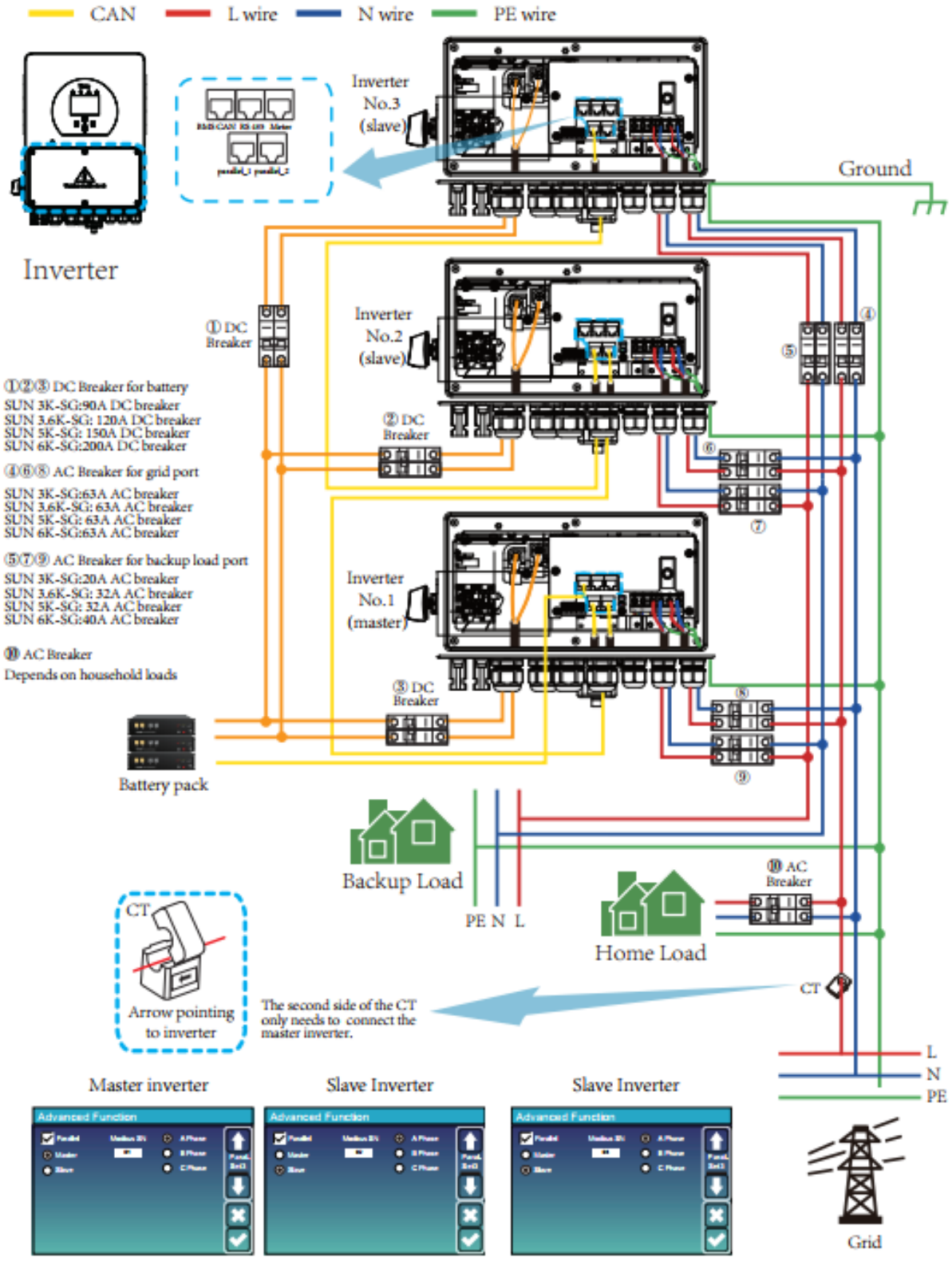
For the configuration of Wi-Fi Plug, please refer to illustrations of the Wi-Fi Plug.

5.12 Wiring System for Inverter

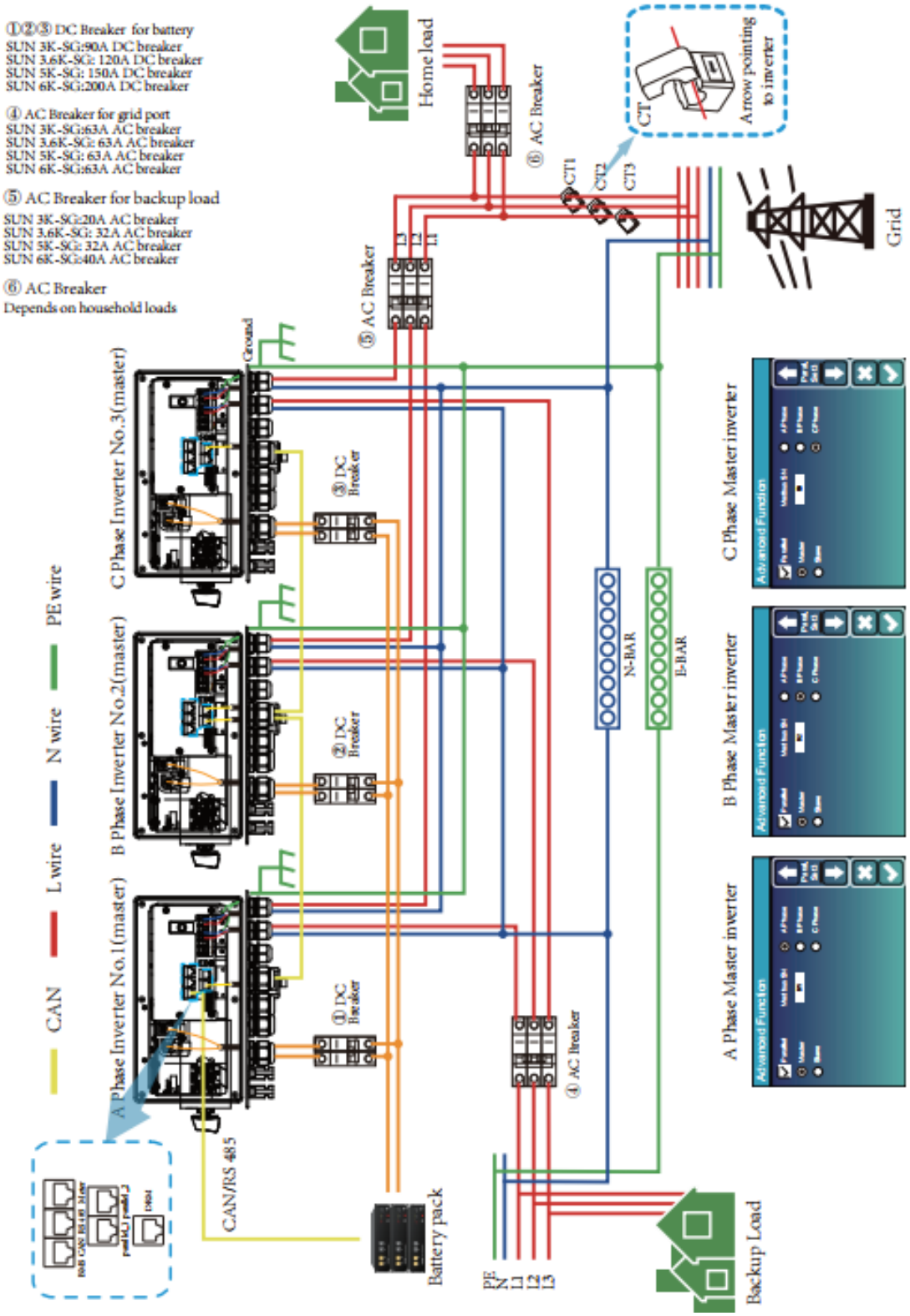



This diagram is an example for application that Neutral connects together with PE in distribution box.
Such as: Australia, New Zealand, South Africa, etc. (Please follow local wiring regulations!)
DC Breaker
PV
BMS
Battery
DC Breaker
AC Breaker
Diesel generator
Hybrid Inverter
L
N
Load
AC Breaker
L
N
PE
Load
CT
AC Breaker
AC Breaker
CT
L
N
PE
Grid
Grid
N-BAR
E-N Link
E-BAR
E-BAR
L
N
PE
Home Loads

5.13 Single Phase Parallel Connection Diagram



5.14 Three Phase Parallel Inverter



5.15 Visual Inspection of the Connection

After connecting the battery, the external power supply, check for:

- Usage of positive and negative cables.
- Connection of the positive and negative terminals.
- All the bolts are tightened.
- Cables fixation and the appearance.
- The setting of the dialing address.

The installation of the protecting cover.

	**⚠ CAUTION** ▪ Before connection, make sure to close the battery, inverter, and the breaker. ▪ Please follow the instructions to protect the module BMS against damage. ▪ Exercise extreme caution prevent the terminals from contacting anything except their intended mounting points. ▪ Terminals and their connected wires have either positive or negative polarity (Positive: +; Negative-). The polarity of a terminal or a wire connected to the terminal is on the front of each module. Exercise extreme caution to prevent the terminals and/or wires with opposite polarity from contacting with each other.

	**IMPORTANT** ▪ Confirm the well connection of the parallel busbar. Dangling may lead to severe heat and lead to the imbalance of the battery. ▪ The installation direction of parallel busbar must correct. ▪ Before connect the busbar with the rectifier, the worker must confirm the output switch of the rectifier has been turn off, to prevent the risk of fire or electric shock.

6. Activate the Product

6.1 Power ON/OFF

1. After installation, wiring, and configuration are completed, you must check all the connection. When the connections are correctly, and then press reset button to activate the battery. The green working light on the front panel of the battery flashes, indicating that the battery is normal.
2. Turn the breaker to ON position.
3. Press the inverter green **Power on/off button**（Shown in Figure 2-4: Inverter Overview in page 17-18）.
4. View the battery information on the switch screen.

6.2 Operation and Display Panel

The operation and display panel, shown in Table 6-1, is on the front panel of the inverter. It includes four indicators, four function keys and a LCD display, indicating the operating status and input/output power information.

Table 6-1: LED Indicators

LED Indicator		Messages
DC	Green led solid light	PV Connection normal
AC	Green led solid light	Grid Connection normal
Normal	Green led solid light	Inverter operating normal
Alarm	Red led solid light	Malfunction or warning

6.3 LCD Display Icons

The LCD is touchscreen, below screen shows the overall information of the inverter.

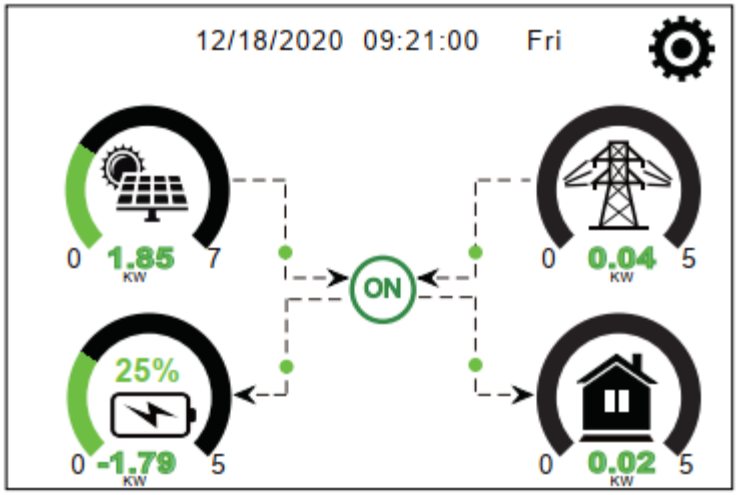


Figure 6-1: Overall Information of the Inverter

1. The icon in the center of the home screen indicates that the system is Normal operation. If it turns into "comm./FXX" , it means the inverter has communication errors or other errors, the error message will display under this icon(FXX errors, detail error info can be viewed in the System Alarms menu).

2. At the top of the screen is the time.

3. System Setup Icon, Press this set button, you can enter into the system setup screen which including Basic Setup, Battery Setup, Grid Setup, System Work Mode, Generator port use, Advanced function and Li-Batt info.

4. The main screen showing the info including Solar, Grid, Load and Battery. Its also displaying the energy flow direction by arrow. When the power is approximate to high level, the color on the panels will changing from green to red so system info showing vividly on the main screen.

- PV power and Load power always keep positive.
- Grid power negative means sell to grid, positive means get from grid.
- Battery power negative means charge, positive means discharge.

6.4 LCD Operation Flow Chart

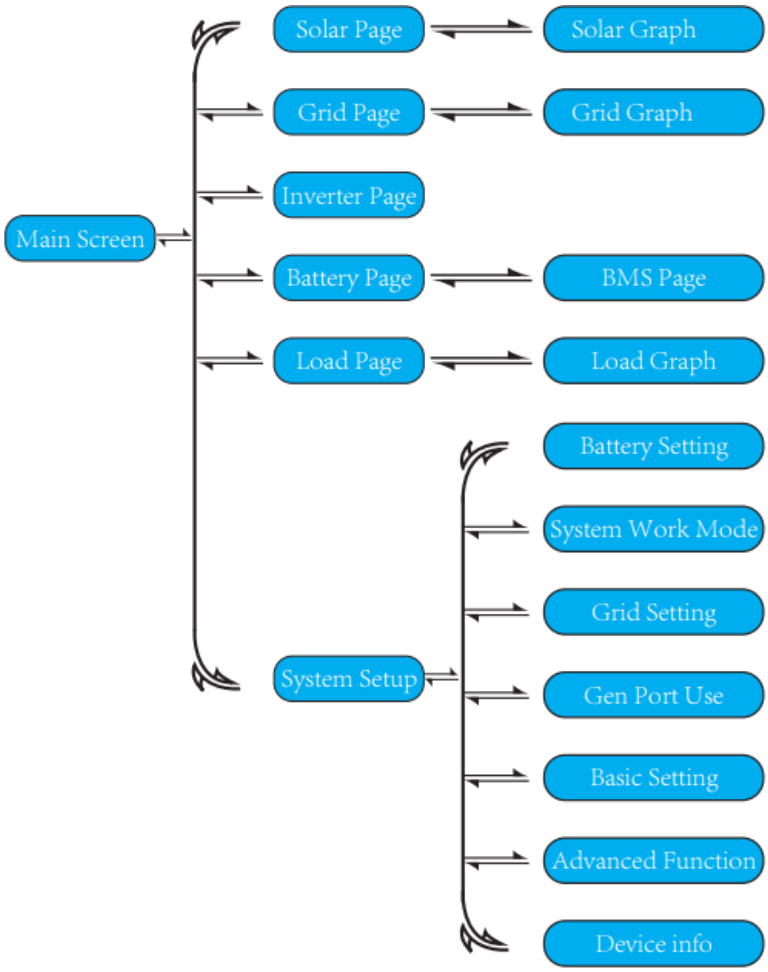
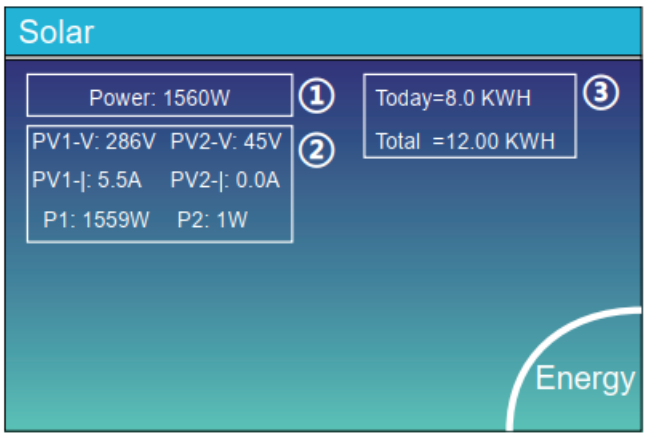


Figure 6-2: LCD Operation Flow Chart

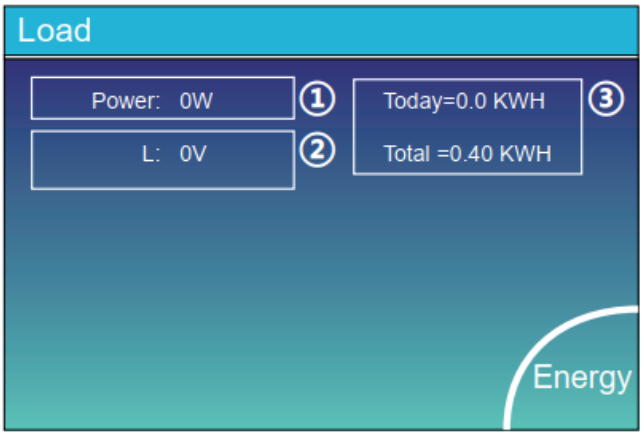
6.5 Solar Power Curve



This is Solar Panel detail page.

① Solar Panel Generation.
② Voltage, Current, Power for each MPPT.
③ Solar Panel energy for Day and Total.

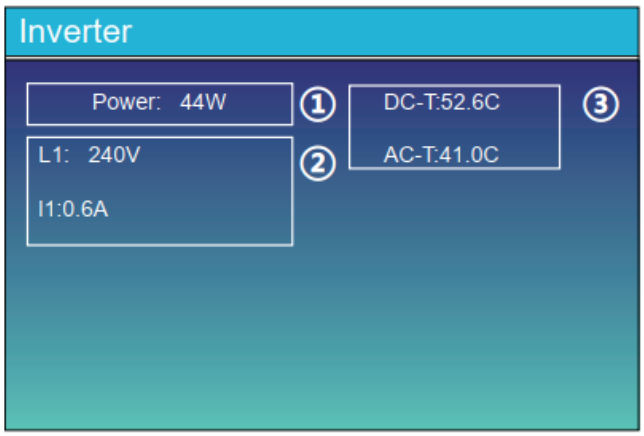
Press the "Energy "button will enter into the power curve page.



This is Back-up Load detail page.

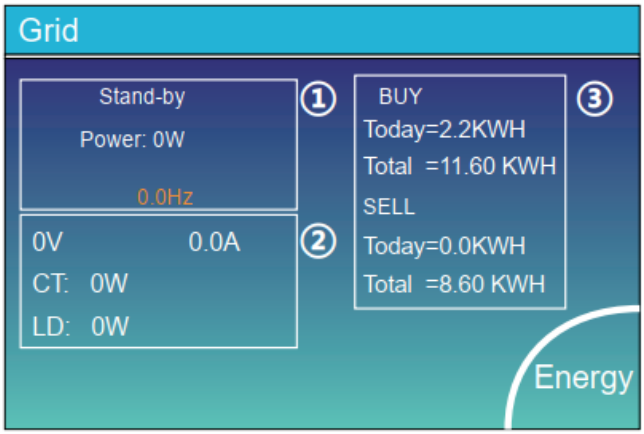
① Back-up Power.
② Voltage, Power for each Phase.
③ Back-up consumption for Day and Total.

Press the "Energy " button will enter into the power curve page.



This is Inverter detail page.

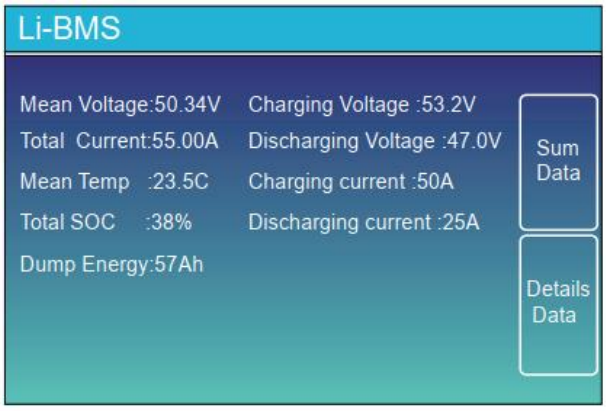
① Inverter Generation.
② Voltage, Current, Power for each Phase.
③ *DC-T: mean DC-DC temperature,
AC-T: mean Heat-sink temperature.
*Note: this part info is not avaiable for some LCD FW.



This is Grid detail page.

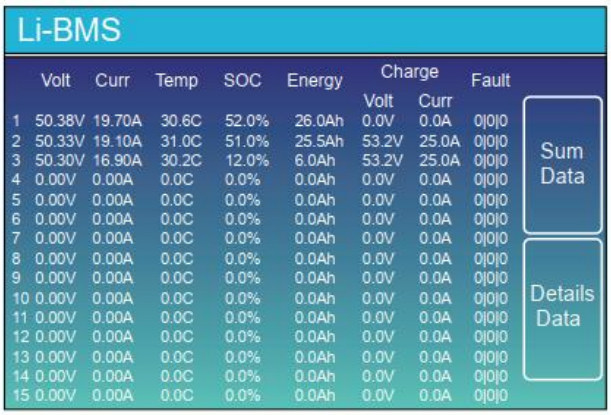
① Status, Power, Frequency.
② L: Voltage for each Phase
CT: Power detected by the external current sensors
LD: Power detected using internal sensors on AC grid in/out breaker
③ BUY: Energy from Grid to Inverter,
SELL: Energy from Inverter to grid.

Press the "Energy " button will enter into the power curve page.

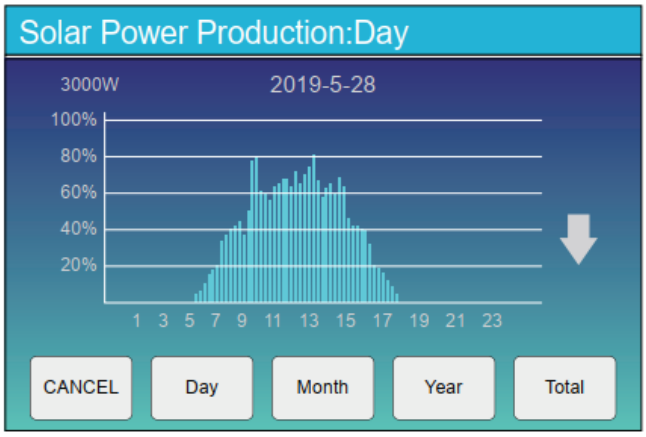


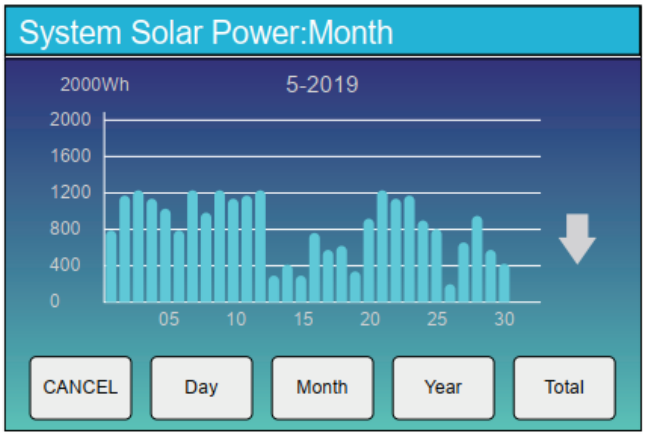
This is Battery detail page.

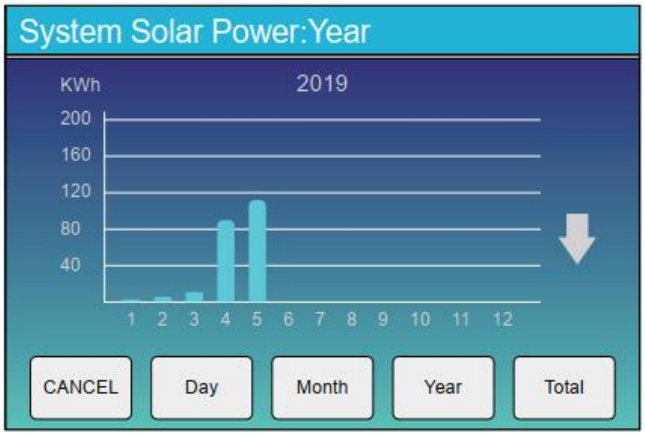
if you use Lithium Battery, you can enter BMS page.

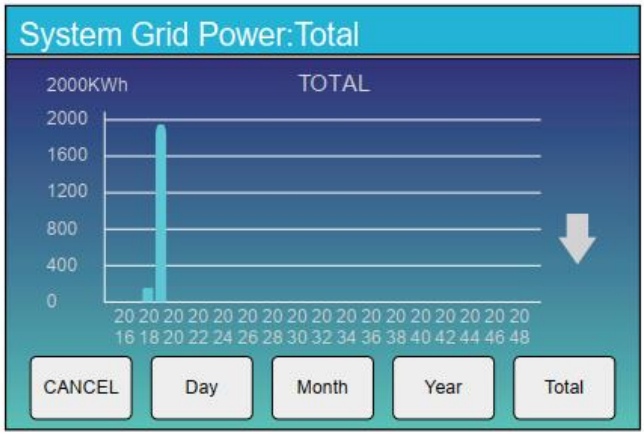


6. 6 Curve Page-Solar & Load & Grid



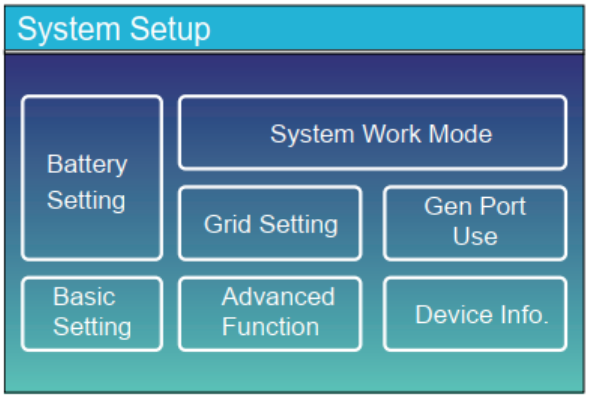






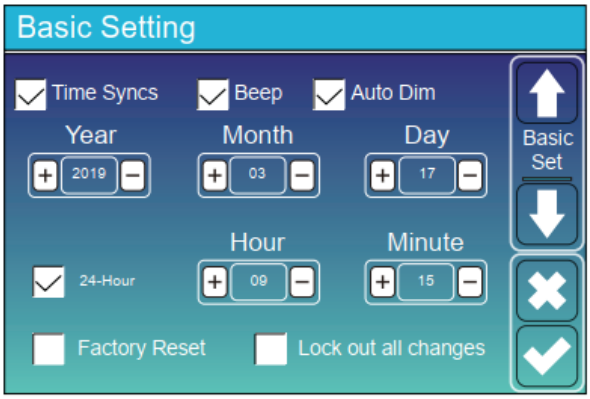
Solar power curve for daily, monthly, yearly and total can be roughly checked on the LCD, for more accuracy power generation, pls check on the monitoring system. Click the up and down arrow to check power curve of different period.

6.7 System Setup Menu

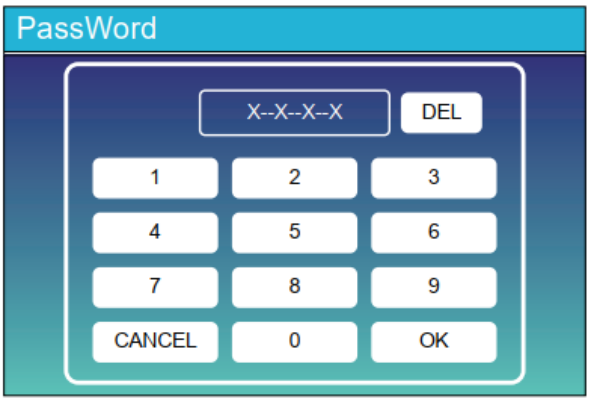


This is System Setup page.

6.8 Basic Setup Menu



Factory Reset: Reset all parameters of the inverter.
Lock out all changes: Enable this menu for setting parameters that require locking and cannot be set up. Before performing a successful factory reset and locking the systems, to keep all changes you need to type in a password to enable the setting.
The password for factory settings is 9999 and for lock out is 7777.

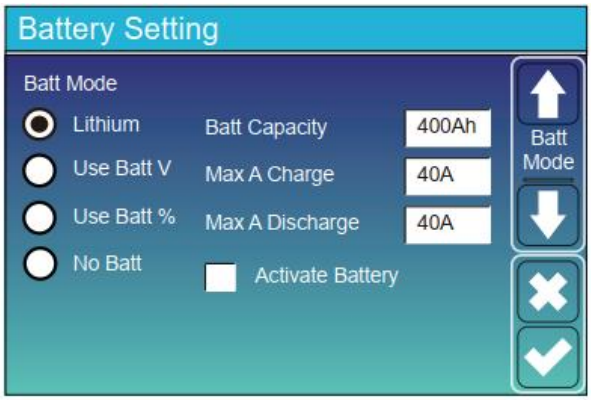


Factory Reset PassWork: 9999

Lock out all changes PassWork: 7777

System selfchek: After ticking this item, it needs input the password.
The default password is 1234

6.9 Battery Setup Menu



Battery capacity: it tells hybrid inverter to know your battery bank size.

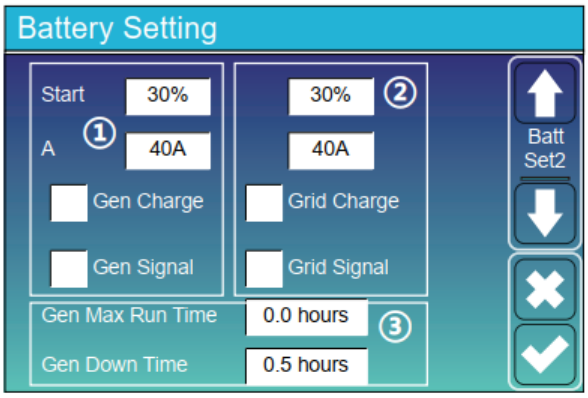
Use Batt V: Use Battery Voltage for all the settings (V).

Use Batt %: Use Battery SOC for all the settings (%).

Max. A charge/discharge: Max battery charge/discharge current(0-115A for 5KW model, 0-90A for 3.6KW model).
For AGM and Flooded, we recommend Ah battery size x 20%= Charge/Discharge amps.
. For Lithium, we recommend Ah battery size x 50% = Charge/Discharge amps.
. For Gel, follow manufacturer' s instructions.

No Batt: tick this item if no battery is connected to the system.

Active battery: This feature will help recover a battery that is over discharged by slowly charging from the solar array or grid.



This is Battery Setup page. ① ③

Start =30%: Percent S.O.C at 30% system will AutoStart a connected generator to charge the battery bank.

A = 40A: Charge rate of 40A from the attached generator in Amps.

Gen Charge: uses the gen input of the system to charge battery bank from an attached generator.

Gen Signal: Normally open relay that closes when the Gen Start signal state is active.

Gen Max Run Time: It indicates the longest time Generator can run in one day, when time is up, the Generator will be turned off. 24H means that it does not shut down all the time.

Gen Down Time: It indicates the delay time of the Generator to shut down after it has reached the running time.

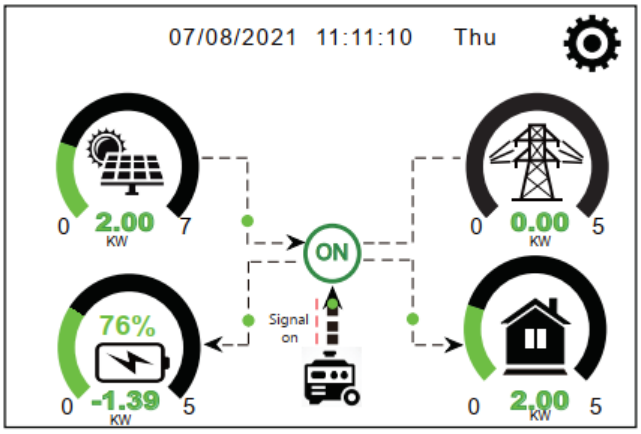
This is Grid Charge, you need select. ②

Start =30%: No use， Just for customization.

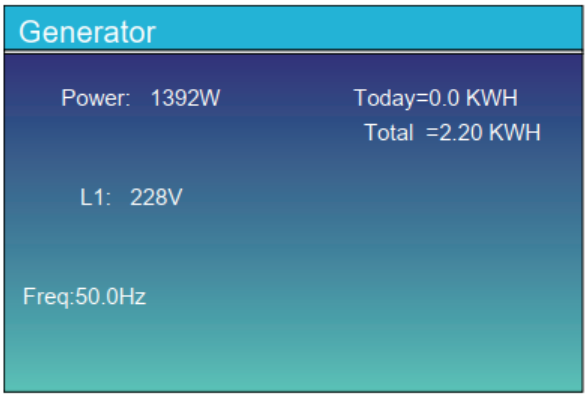
A = 40A: It indicates the Current that the Grid charges the Battery.

Grid Charge: It indicates that the grid charges the battery.

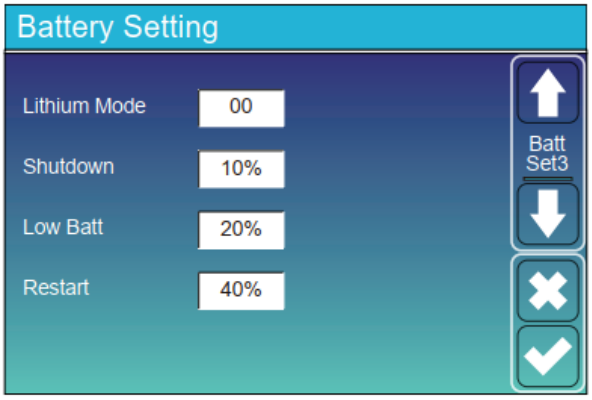
Grid Signal: Disable.



This page tells the PV and diesel generator power the load and battery.



This page tells generator output voltage, frequency, power. And, how much energy is used from generator.

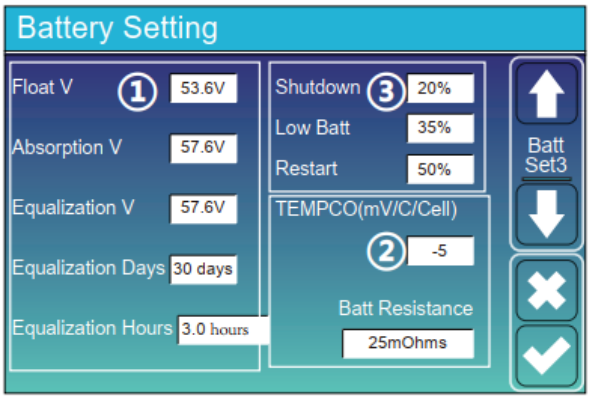


Lithium Mode: This is BMS protocol.Please reference the document(Approved Battery).

Shutdown 10%: It indicates the inverter will shutdown if the SOC below this value.

Low Batt 20%: It indicates the inverter will alarm if the SOC below this value.

Restart 40%: Battery voltage at 40% AC output will resume.



There are 3 stages of charging the Battery . ①

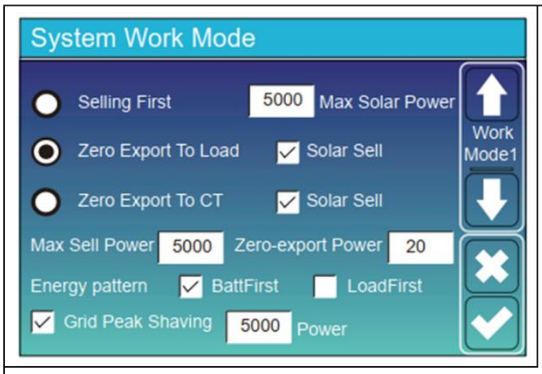
This is for professional installers, you can keep it if you do not know. ②

Shutdown 20%: The inverter will shutdown if the SOC below this value.

Low Batt 35%: The inverter will alarm if the SOC below this value. ③

Restart 50%: Battery SOC at 50% AC output will resume.

6.10 System Work Mode Setup Menu



Work Mode

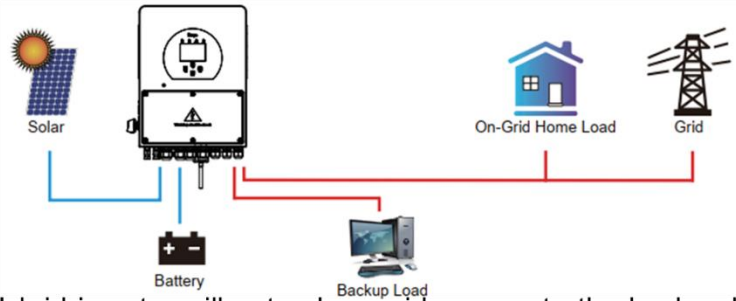
Selling First: This Mode allows hybrid inverter to sell back any excess power produced by the solar panels to the grid. If time of use is active, the battery energy also can be sold into grid.

The PV energy will be used to power the load and charge the battery and then excess energy will flow to grid.

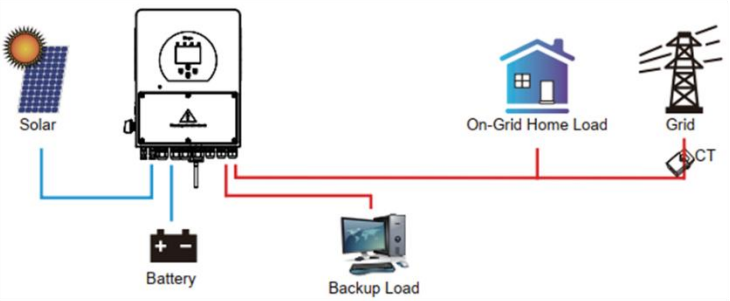
Power source priority for the load is as follows:

1. Solar Panels.
2. Grid.
3. Batteries (until programmable % discharge is reached).

Zero Export To Load: Hybrid inverter will only provide power to the backup load connected. The hybrid inverter will neither provide power to the home load nor sell power to grid. The built-in CT will detect power flowing back to the grid and will reduce the power of the inverter only to supply the local load and charge the battery.



Zero Export To CT: Hybrid inverter will not only provide power to the backup load connected but also give power to the home load connected. If PV power and battery power is insufficient, it will take grid energy as supplement. The hybrid inverter will not sell power to grid. In this mode, a CT is needed. The installation method of the CT please refer to chapter 3.6 CT Connection. The external CT will detect power flowing back to the grid and will reduce the power of the inverter only to supply the local load, charge battery and home load.



Solar Sell: “Solar sell” is for Zero export to load or Zero export to CT: when this item is active, the surplus energy can be sold back to grid. When it is active, PV Power source priority usage is as follows: load consumption and charge battery and feed into grid.

Max. sell power: Allowed the maximum output power to flow to grid.

Zero-export Power: for zero-export mode, it tells the grid output power. Recommend to set it as 20-100W to ensure the hybrid inverter won't feed power to grid.

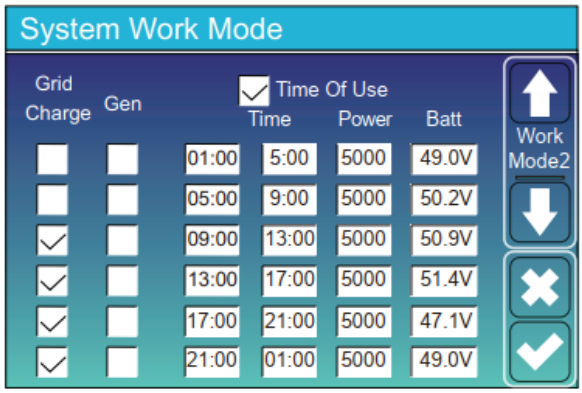
Energy Pattern: PV Power source priority.

Batt First: PV power is firstly used to charge the battery and then used to power the load. If PV power is insufficient, grid will make supplement for battery and load simultaneously.

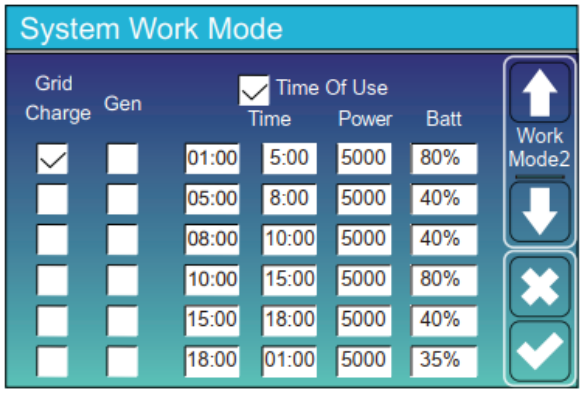
Load First: PV power is firstly used to power the load and then used to charge the battery. If PV power is insufficient, grid will make supplement for battery and load simultaneously.

Max Solar Power: allowed the maximum DC input power.

Grid Peak-shaving: when it is active, grid output power will be limited within the set value. If the load power exceeds the allowed value, it will take PV energy and battery as supplement. If still can’t meet the load requirement, grid power will increase to meet the load needs.



Time of use: it is used to program when to use grid or generator to charge the battery, and when to discharge the battery to power the load. Only tick "Time Of Use" then the follow items (Grid, charge, time, power etc.) will take effect.
Note: when in selling first mode and click time of use, the battery power can be sold into grid.
Grid charge: utilize grid to charge the battery in a time period.
Gen charge: utilize diesel generator to charge the battery in a time period.
Time: real time, range of 01:00-24:00.
Power: Max. discharge power of battery allowed.
Batt(V or SOC %): battery SOC % or voltage at when the action is to happen.



For example:

During 01:00-05:00, when battery SOC is lower than 80%, it will use grid to charge the battery until battery SOC reaches 80%.

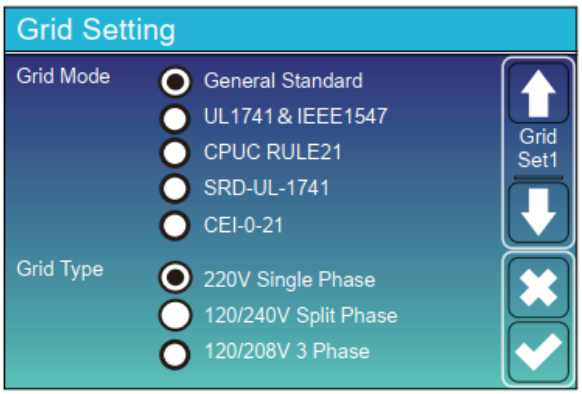
During 05:00-08:00 and 08:00-10:00, when battery SOC is higher than 40%, hybrid inverter will discharge the battery until the SOC reaches 40%.

During 10:00-15:00, when battery SOC is higher than 80%, hybrid inverter will discharge the battery until the SOC reaches 80%.

During 15:00-18:00, when battery SOC is higher than 40%, hybrid inverter will discharge the battery until the SOC reaches 40%.

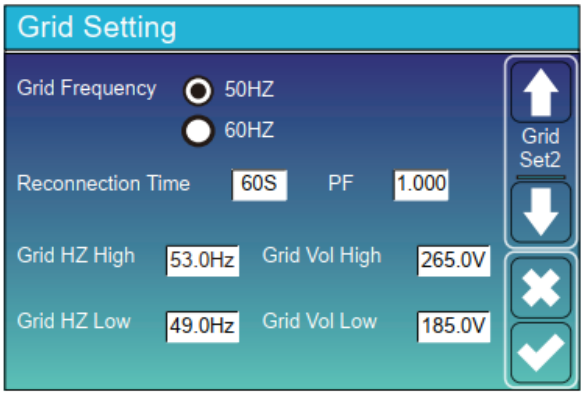
During 18:00-01:00, when battery SOC is higher than 35%, hybrid inverter will discharge the battery until the SOC reaches 35%.

6.11 Grid Setup Menu



Please select the correct Grid Mode in your local area. If you are not sure, please choose General Standard.

Please select the correct Grid Type in your local area, otherwise the machine will not work or be damaged.

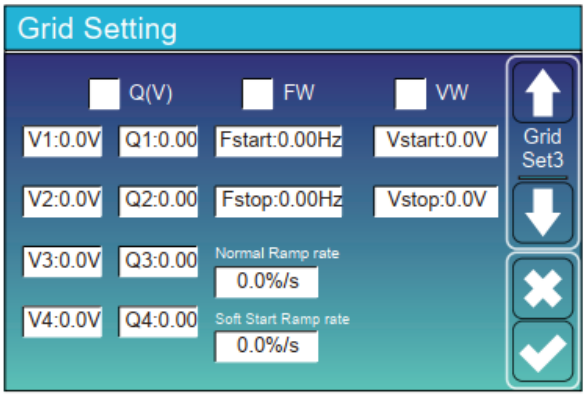


UL1741&IEEE1547, CPUC RULE21, SRD-UL-1741

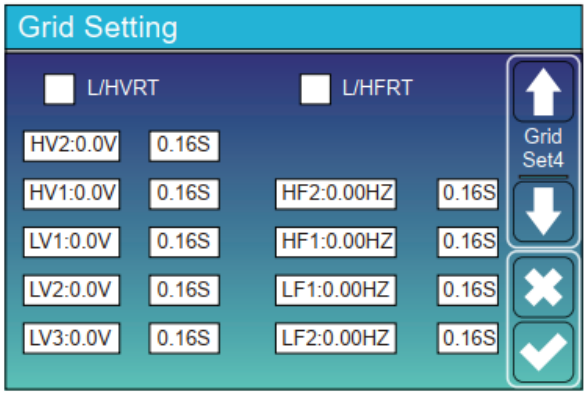
No need to set the function of this interface.

General Standard

Please select the correct Grid Frequency in your local area.
You can hole this in default value.

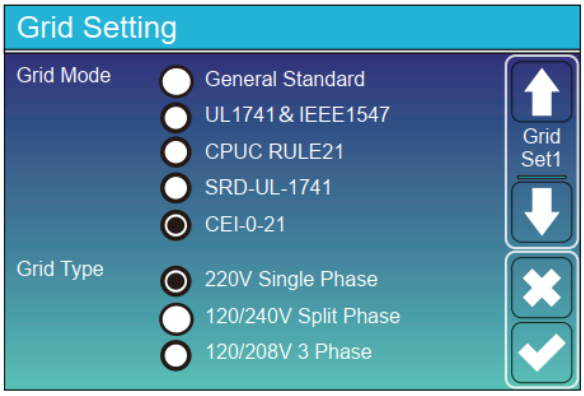


For California only.

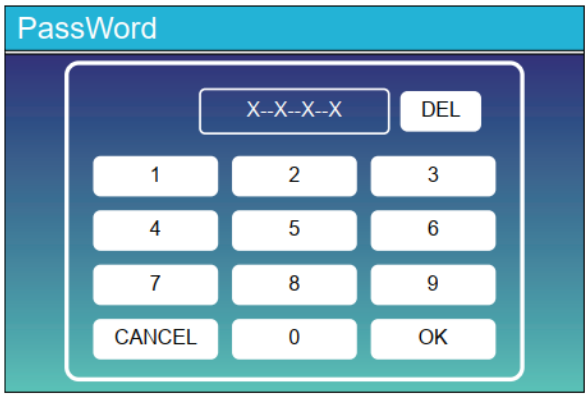


For California only.

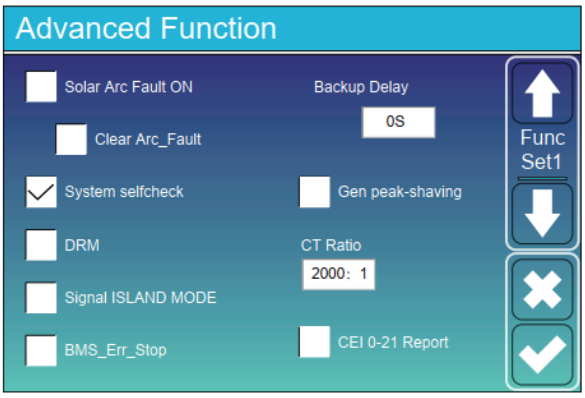
6.12 The method of CEI-021 Standard Self-Check



Firstly, tick the “CEI-021” and “220V single phase/50Hz” on the grid setting menu.



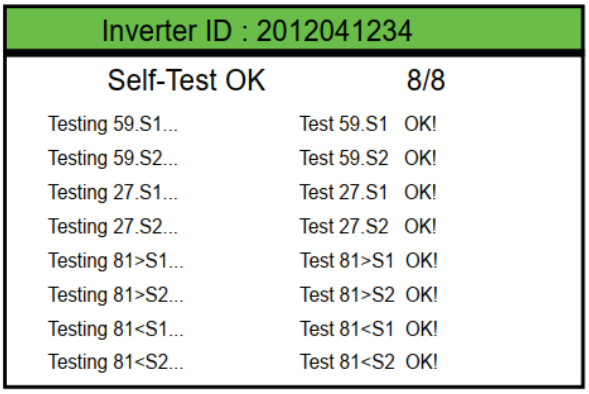
The default password is 1234
After input the password and then tick "OK"`



Secondly, tick “System selfchek” ,
then it will ask you input the password,
and the default password is 1234.

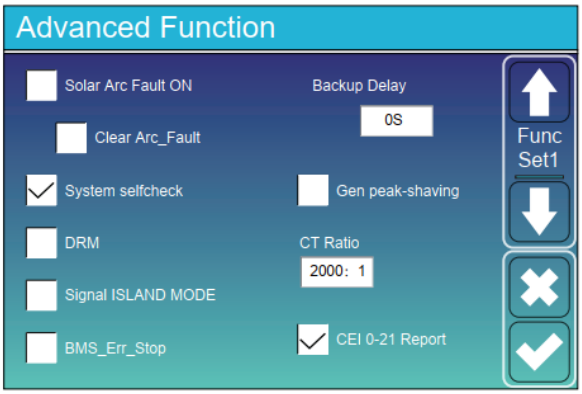
Note: please don’t tick “CEI-021 Report ”.

This “System selfcheck” program is valid only after choosing grid type as "CEI-021".

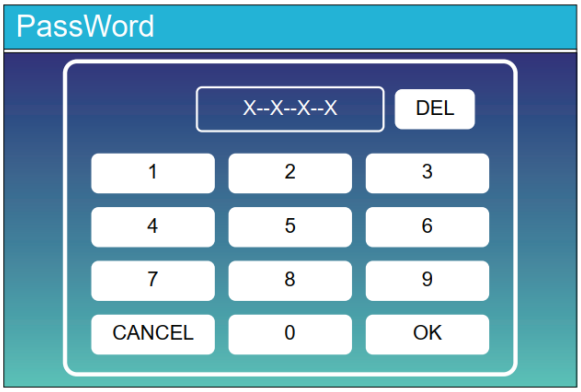


During the self-test process, all the indicators will be on and the alarm keeps on.

When all the test items shows OK, which means the self-test is completed successfully.



then press “esc” button to quit from this page.
Tick “system selfcheck”on the Advanced function menu and tick “CEI-021 Report”.

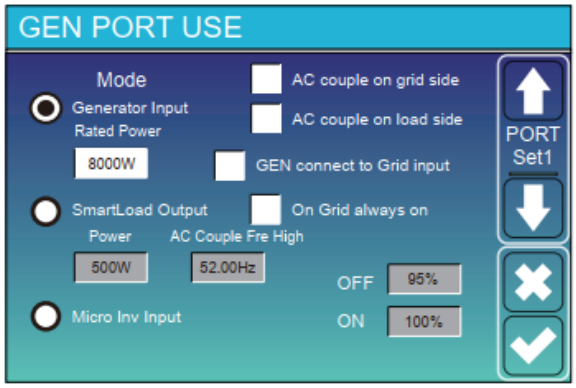


System selfchek: After ticking this item,
it needs input the password.
The default password is 1234.
After input the password and then tick "OK"`

Inverter ID : 2012041234			
Self-Test Report			
59.S1 threshold253V	900ms	59.S1: 228V	902ms
59.S2 threshold264.5V	200ms	59.S2: 229V	204ms
27.S1 threshold195.5V	1500ms	27.S1: 228V	1508ms
27.S2 threshold 34.5V	200ms	27.S2: 227V	205ms
81>.S1 threshold 50.2Hz	100ms	81>.S1: 49.9Hz	103ms
81>.S2 threshold 51.5Hz	100ms	81>.S2: 49.9Hz	107ms
81<.S1 threshold 49.8Hz	100ms	81<.S1: 50.0Hz	95ms
81<.S2 threshold 47.5Hz	100ms	81<.S2: 50.1Hz	97ms

This page will shows the test result of "CEI-021 self-check".

6.13 Generator Port Use Setup Menu



Generator input rated power: allowed Max. power from diesel generator.
GEN connect to grid input: connect the diesel generator to the grid input port.
Smart Load Output: This mode utilizes the Gen input connection as an output which only receives power when the battery SOC and PV power is above a user programmable threshold.
e.g. Power=500W, ON: 100%, OFF=95%: When the PV power exceeds 500W, and battery bank SOC reaches 100%, Smart Load Port will switch on automatically and power the load connected. When the battery bank SOC < 95% or PV power < 500w, the Smart Load Port will switch off automatically.

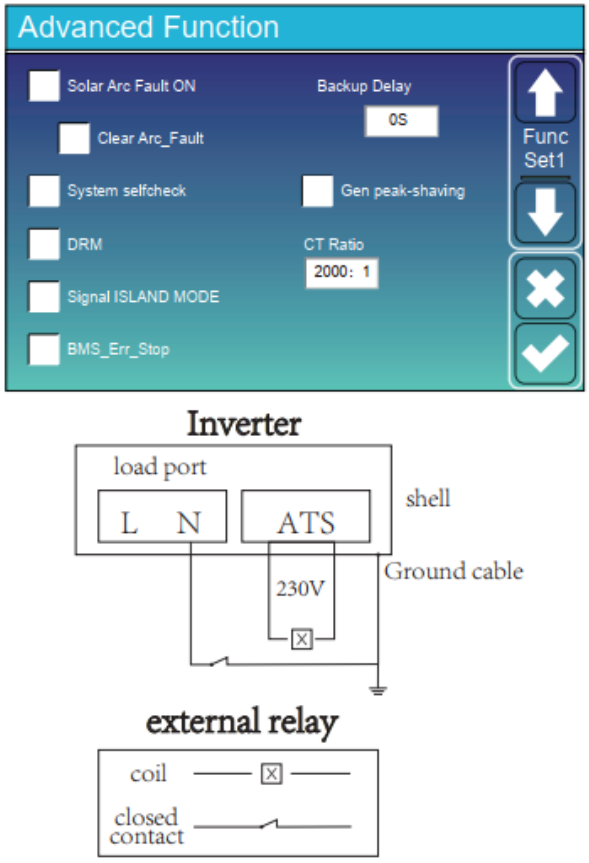
Smart Load OFF Batt
• Battery SOC at which the Smart load will switch off.
Smart Load ON Batt
• Battery SOC at which the Smart load will switch on. Also, the PV input power should exceed the setting value (Power) simultaneously and then the Smart load will switch on.
On Grid always on: When click "on Grid always on" the smart load will switch on when the grid is present.
Micro Inv Input: To use the Generator input port as a micro-inverter on grid inverter input (AC coupled), this feature will also work with "Grid-Tied" inverters.

* Micro Inv Input OFF: when the battery SOC exceeds setting value, Microinveter or grid-tied inverter will shut down.
* Micro Inv Input ON: when the battery SOC is lower than setting value, Microinveter or grid-tied inverter will start to work.

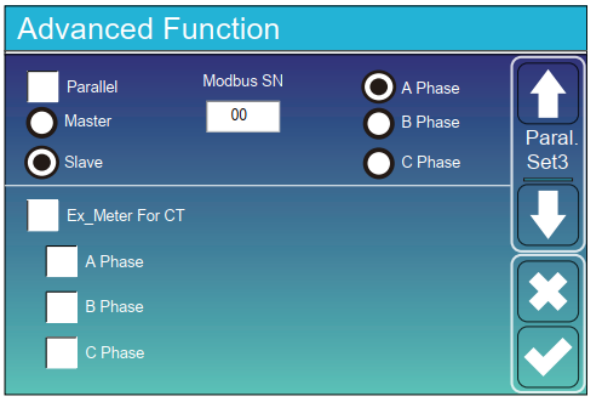
AC Couple Fre High: If choosing"Micro Inv input", as the battery SOC reaches gradually setting value (OFF), During the process, the microinverter output power will decrease linear. When the battery SOC equals to the setting value (OFF), the system frequency will become the setting value (AC couple Fre high) and the Microinverter will stop working.
Stop exporting power produced by the microinverter to the grid.

* Note: Micro Inv Input OFF and On is valid for some certain FW version only.
* AC couple on load side: connecting the output of on-grid inverter at the load port of the hybrid inverter. In this situation, the hybrid inverter will not able to show the load power correctly.
* AC couple on grid side: this function is reserved.
* Note: Some firmware versions don't have this function.

6.14 Advanced Function Setup Menu

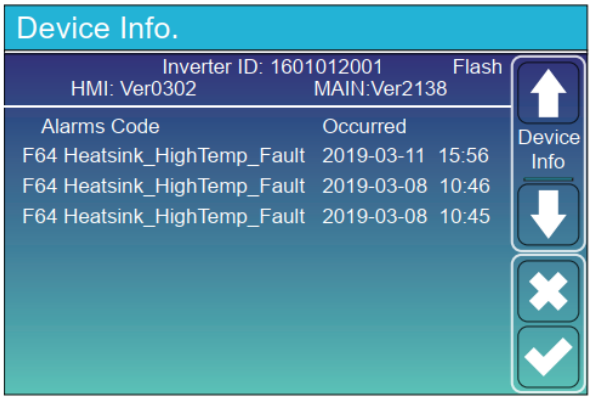


Solar Arc Fault ON: This is only for US.
System selfcheck: Disable. this is only for factory.
Gen Peak-shaving: Enable When the power of the generator exceeds the rated value of it, the inverter will provide the redundant part to ensure that the generator will not overload.
DRM: For AS4777 standard
Backup Delay: Reserved
BMS_Err_Stop: When it is active, if the battery BMS failed to communicate with inverter, the inverter will stop working and report fault.
Signal island mode: when the inverter connects grid, the ATS port will output 230Vac and it is used to cuts off Earth-Neutral(load port N line) bond via connect external relay. When the inverter disconnects from the grid, ATS port voltage will be 0 and the Earth-Neutral bond keeps on. More details, please refer to left picture.



Ex_Meter For CT: when in Three phase system with CHNT Three phase energy meter (DTSU666), click corresponding phase where hybrid inverter is connected. e.g. when the hybrid inverter output connects to A phase, please click A Phase.

6.15 Device Info Setup Menu



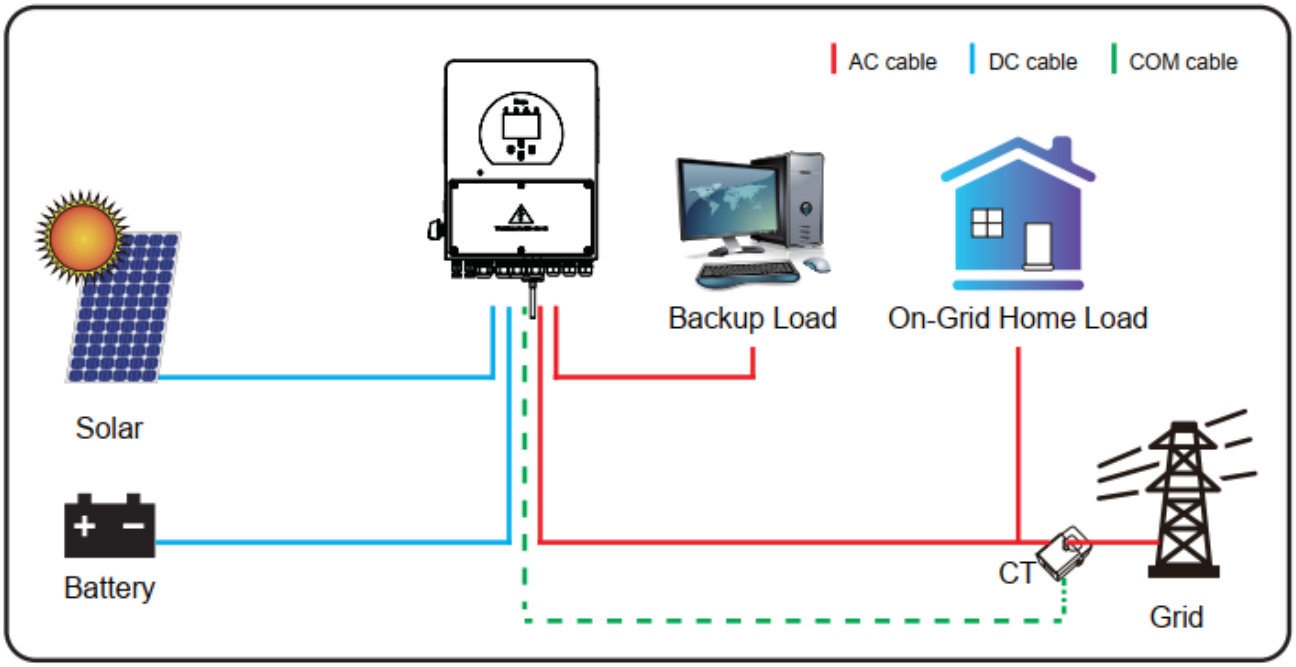
This page show Inverter ID, Inverter version and alarm codes.

HMI: LCD version

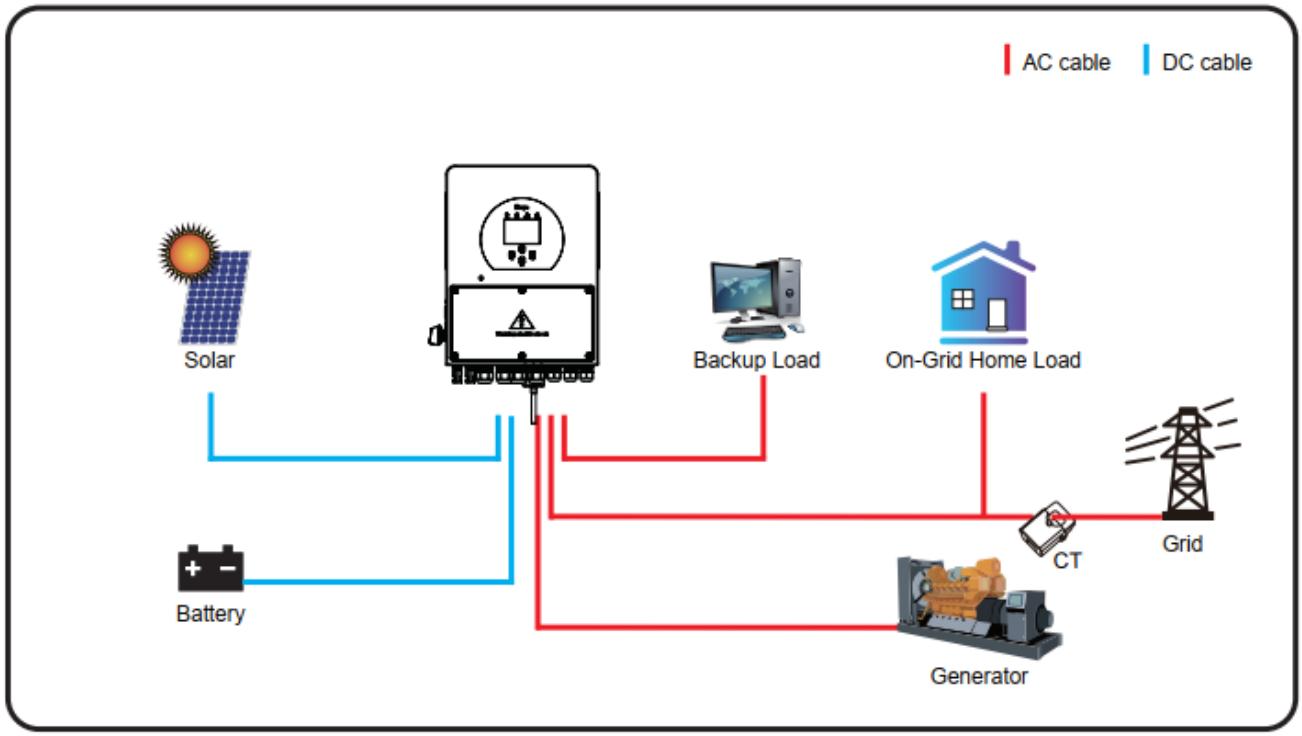
MAIN: Control board FW version

7. Mode

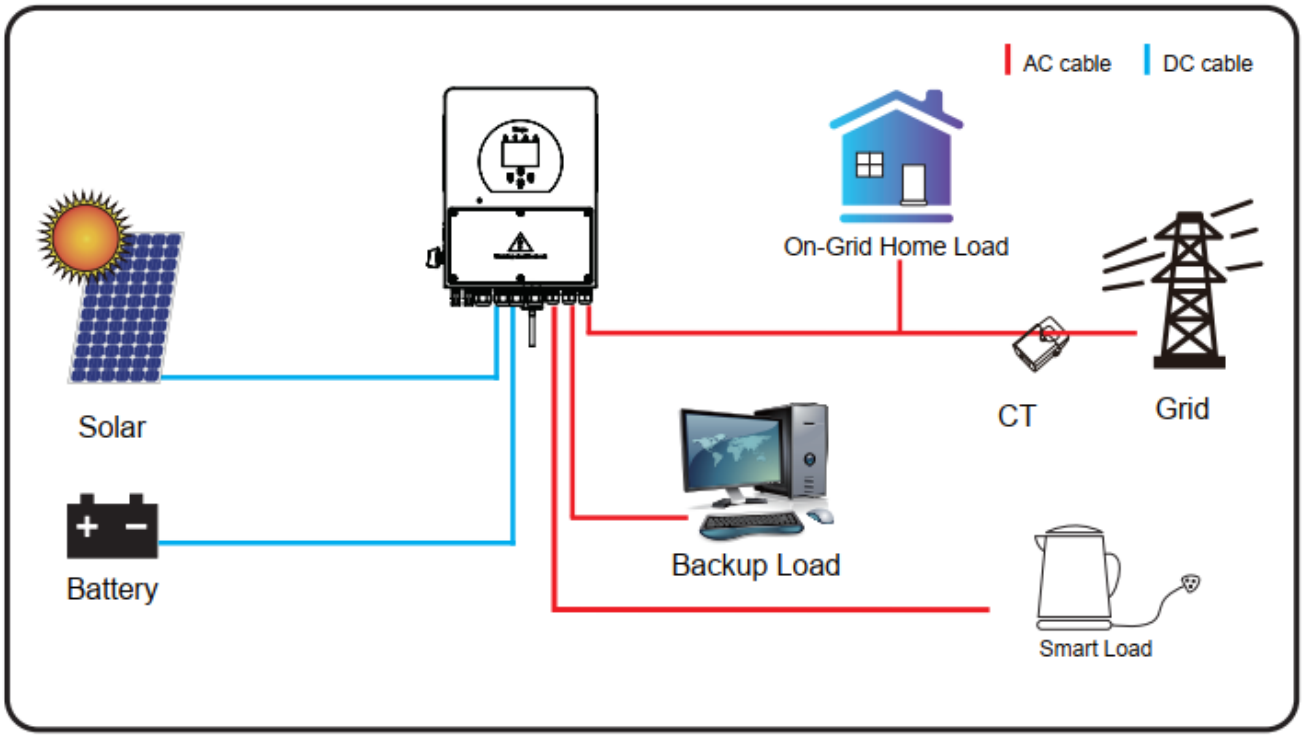
Mode I: Basic



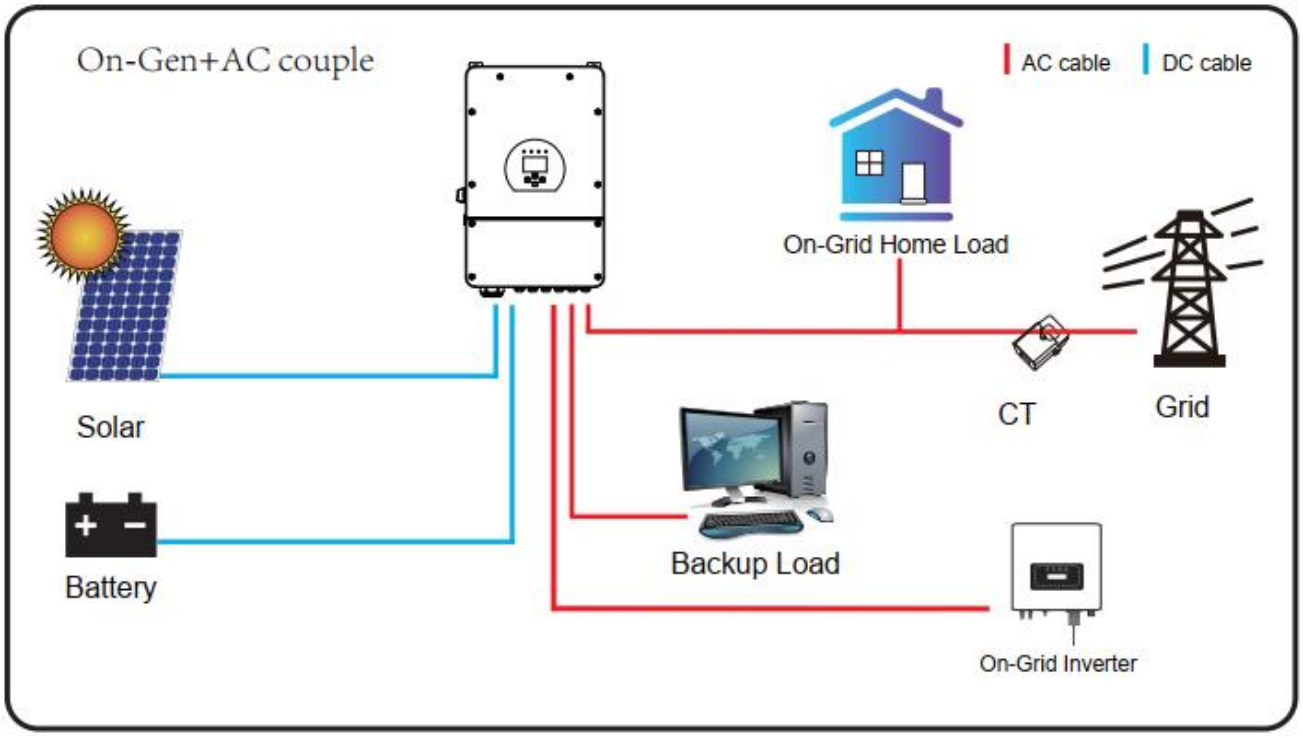
Mode II: With Generator

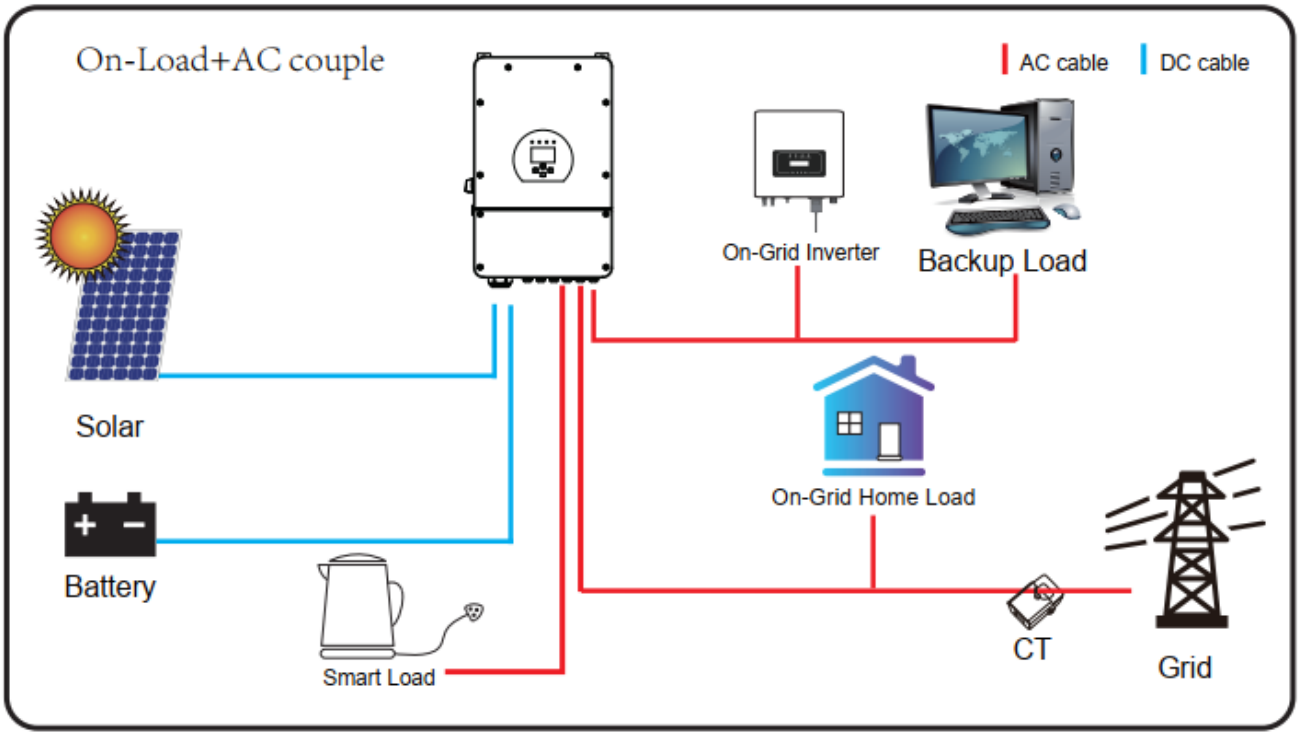


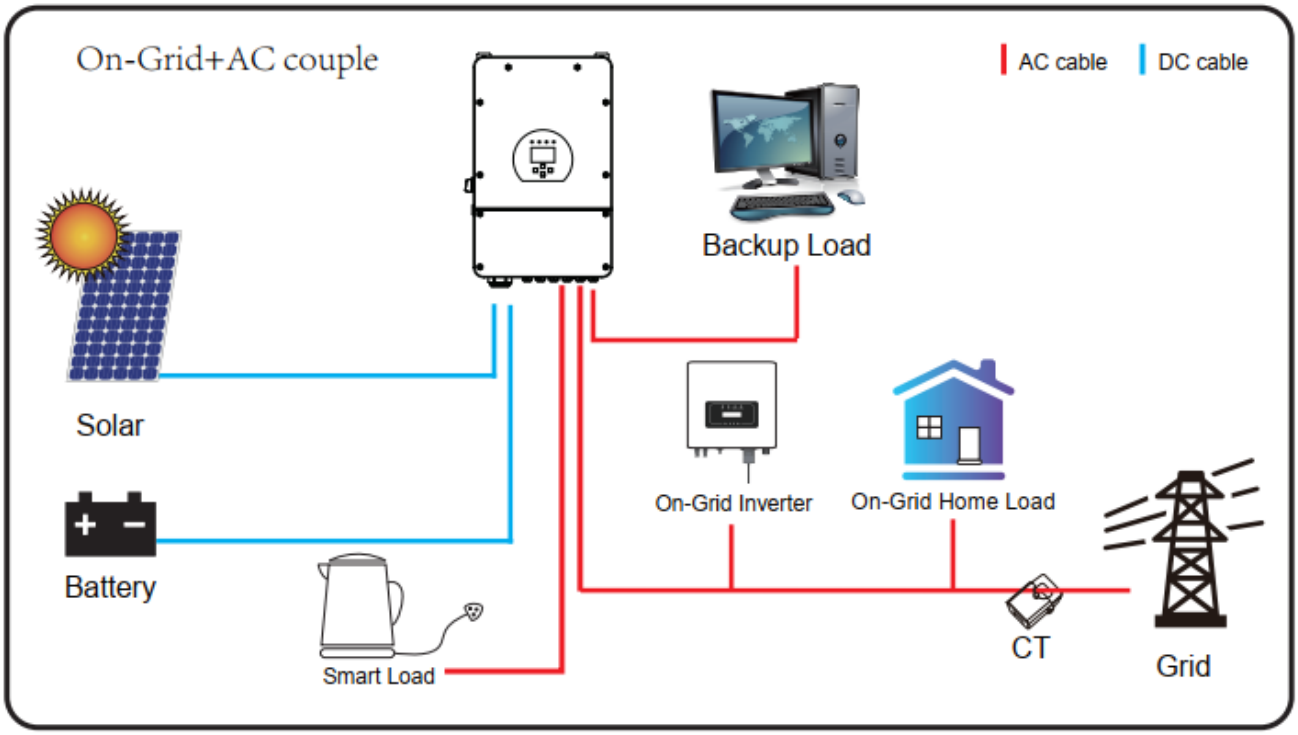
Mode III: With Smart-Load



Mode IV: AC Couple







The 1st priority power of the system is always the PV power, then 2nd and 3rd priority power will be the battery bank or grid according to the settings. The last power backup will be the Generator if it is available.

8. Inspection, Cleaning and Maintenance

8.1 General Information

- The battery product is not fully charged. It is recommended that the installation be completed within 3 months after arrival.
- During the maintenance process, do not re-install the battery in the battery product. Otherwise, the performance of the battery will be reduced.
- It is forbidden to dismantle any battery in the battery product, and it is forbidden to dissect the battery.
- After the battery product is over-discharged, it is recommended to charge the battery within 48 hours. The battery product can also be charged in parallel. After the battery product is

connected in parallel, the charger only needs to connect the output port of any product battery.

- Never attempt to open or dismantle the battery! The inside of the battery does not contain serviceable parts.
- Disconnect the Li-Ion battery from all loads and charging devices before performing cleaning and maintenance activities.
- Place the enclosed protective caps over the terminals before cleaning and maintenance activities to avoid the risk of contacting the terminals.

8.2 Inspection

- Inspect for loose and/or damaged wiring and contacts, cracks, deformations, leakage or damage of any other kind. If damage to the battery is found, it must be replaced. Do not attempt to charge or use a damaged battery. Do not touch the liquid from a ruptured battery.
- Regularly check the battery's state of charge. Lithium Iron Phosphate batteries will slowly self-discharge when not in use or whilst in storage.
- Consider replacing the battery with a new one if you note either of the following conditions:
  - The battery run time drops below 80% of the original run time.
  - The battery charge time increases significantly.

8.3 Cleaning

If necessary, clean the Li-Ion battery with a soft, dry cloth. Never use liquids, solvents, or abrasives to clean the Li-Ion battery.

8.4 Maintenance

The Li-Ion battery is maintenance free. Charge the battery to approximately > 80% of its capacity at least once every year to preserve the battery's capacity.

8.5 Storage

- The battery product should be stored in a dry, cool and cool environment;
- If the battery product is not used for a long time, it is recommended to make a supplement every three months or so, discharge it to the cutoff voltage with $0.2C_{10}A$ current, and then charge with $0.2C_{10}A$ current for about 3 hours to prevent the battery product from over-discharging due to long storage time. Keep electricity at 40-70% when stored.
- When the battery product is stored, the source of ignition or high temperature should be avoided and it should be kept away from explosive and flammable areas.

9. Troubleshooting

9.1 Troubleshooting of the Battery

To determine the status of the battery, users must use additional battery status monitoring software to examine the protection mode. Refer to the installation manual about using the monitoring software. Once the user knows the protection mode, refer to the following sections for solutions.

Table 8-1: Troubleshooting of the battery

NO.	Possible Problem	Cause Analysis	Solution
1	Battery products cannot be discharged	Battery is in normal mode. Green LED is lit. Defective wiring.	Check the positive and negative cable connection. Press the reset switch and see if it clears the protection.
		Battery is in De-energized/shutdown mode. No LED is lit.	Charge the battery or press the reset switch.
		Red LED is lit.	Some Protection event trigged, you need to connect the battery using the Battery Studio to view the information from the battery. According to the protection event information, choose the right way to release the protection. Or consult your reseller or Sacred Sun support.
2	Battery products cannot be charged	Battery is in normal mode. Green LED is lit. Defective wiring.	Check the positive and negative cable connection. Press the reset switch and see if it clears the protection.
		Red LED is lit.	Some Protection event trigged, you need to connect the battery using the Battery Studio to view the information from the battery. According to the protection event information, choose the right way to release the protection. Or consult your reseller or Sacred Sun support.

3	The capacity of the battery has decreased.	The cells within the batteries are not properly balanced, causing them to discharge at different rates.	Perform one full charge cycle to balance the cells.
		The State of Health of the battery has a low value.	The loss is probably caused by battery aging. This process cannot be reversed.

By checking the above data and sending the data to the service personnel of our company, the service personnel of our company will reply the corresponding solution after receiving the data.

9.2 Troubleshooting of the Inverter

If any of the fault messages listed in Table 6-1 appear on your inverter and the fault has not been removed after restarting, please contact your local dealer or service center. You need to have the following information ready.

1. Inverter serial number;
2. Distributor or service center of the inverter;
3. On-grid power generation date;
4. The problem description (including the fault code and indicator status displayed on the LCD) is as detailed as possible.
5. Your contact information. In order to give you a clearer understanding of the inverter's fault information, we will list all possible fault codes and their descriptions when the inverter is not working properly.

Table 8-2: Troubleshooting of the Inverter

1	Error code	Description	Solutions
2	F08	GFDI _Relay_Failure	When inverter is in Split phase(120/240Vac) or three-phase system (120/208Vac) system, the backu Troubleshooting needs to connect ground;
3	F13	Working mode change	1. When the grid type and frequency changed it will report F13;

			2. When the battery mode was changed to “No battery” mode, it will report F13; 3. For some old FW version, it will report F13 when the system work mode changed; 4. Generally, it will disappear automatically when shows F13; 5. If still same, and turn off the DC switch and AC switch and wait for one minute and then turn on the DC/AC switch;
4	F18	AC over current fault of hardware	AC side over current fault 1. Please check whether the backup load power and common load power are within the range; 2. Restart and check whether it is in normal;
5	F20	DC over current fault of the hardware	DC side over current fault 1. Check PV module connect and battery connect; 2. When in the off-grid mode, the inverter startup with big power load, it may report F20. Please reduce the load power connected; 3. Turn off the DC switch and AC switch and then wait one minute, then turn on the DC/AC switch again;
6	F22	Tz_EmergStop_Fault	Please contact your installer for help
7	F23	AC leakage current is transient over current	Leakage current fault 1. Check PV side cable ground connection. 2. Restart the system 2~3 times.
8	F24	DC insulation impedance failure	PV isolation resistance is too low 1. Check the connection of PV panels and inverter is firmly and correctly; 2. Check whether the PE cable of inverter is connected to ground;
9	F26	The DC busbar is unbalanced	1. Please wait for a while and check whether it is normal; 2. When the hybrid in split phase mode, and the load of L1 and load of L2 is big different, it will report the F26. 3. Restart the system 2~3 times.
10	F29	Parallel CANBus	1. When in parallel mode, check the parallel communication

		fault	cable connection and hybrid inverter communication address setting; 2. During the parallel system startup period, inverters will report F29. when all inverters are in ON status, it will disappear automatically;
11	F34	ACO vercurrent fault	1. Check the backup load connected, make sure it is in allowed power range;
12	F35	No AC grid	No Utility 1. Please confirm grid is lost or not; 2. Check the grid connection is good or not; 3. Check the switch between inverter and grid is on or not;
13	F41	Parallel system stop	Check the hybrid inverter working status. If there's 1 pcs hybrid inverter is in OFF status, the other hybrid inverters may report F41 fault in parallel system.
14	F42	AC line low voltage	Grid voltage fault 1. Check the AC voltage is in the range of standard voltage in specification; 2. Check whether grid AC cables are firmly and correctly connected;
15	F47	AC over frequency	Grid frequency out of range 1. Check the frequency is in the range of specification or not; 2. Check whether AC cables are firmly and correctly connected;
16	F48	AC lower frequency	Grid frequency out of range 1. Check the frequency is in the range of specification or not; 2. Check whether AC cables are firmly and correctly connected;
17	F56	DC busbar voltage is too low	Battery voltage low 1. Check whether battery voltage is too low; 2. If the battery voltage is too low, using PV or grid to charge the battery;

18	F58	BMS communication fault	1. it tells the communication between hybrid inverter and battery BMS disconnected when "BMS_Err-Stop" is active; 2. if don’t want to see this happen, you can disable "BMS_Err-Stop" item on the LCD;
19	F63	ARC fault	1. ARC fault detection is only for US market; 2. Check PV module cable connection and clear the fault;
20	F64	Heat sink high temperature failure	Heat sink temperature is too high 1. Check whether the work environment temperature is too high; 2. Turn off the inverter for 10mins and restart;

Under the guidance of our company, customers return our products so that our company can provide service of maintenance or replacement of products of the same value. Customers need to pay the necessary freight and other related costs. Any replacement or repair of the product will cover the remaining warranty period of the product. If any part of the product or product is replaced by the company itself during the warranty period, all rights and interests of the replacement product or component belong to the company.

Factory warranty does not include damage due to the following reasons:

- Damage during transportation of equipment；
- Damage caused by incorrect installation or commissioning；
- Damage caused by failure to comply with operation instructions, installation instructions or maintenance instructions；
- Damage caused by attempts to modify, alter or repair products；
- Damage caused by incorrect use or operation；
- Damage caused by insufficient ventilation of equipment；
- Damage caused by failure to comply with applicable safety standards or regulations；
- Damage caused by natural disasters or force majeure (e.g. floods, lightning, overvoltage, storms, fires, etc.)

In addition, normal wear or any other failure will not affect the basic operation of the product.

Any external scratches, stains or natural mechanical wear does not represent a defect in the product.

10. Transportation Requirements

The battery products should be transported after packaging and during the transportation process, severe vibration, impact or extrusion should be prevented to prevent sun and rain. It can be transported using vehicles such as cars, trains and ships.

Always check all applicable local, national, and international regulations before transporting a Lithium Iron Phosphate battery.

Transporting an end-of-life, damaged, or recalled battery may, in certain cases, be specially limited or prohibited.

The transport of the Li-Ion battery falls under hazard class UN3480, class 9. For transport over water, air and land, the battery falls within packaging group PI965 Section I.

Use Class 9 Miscellaneous Dangerous Goods and UN Identification labels for transportation of lithium ion batteries which are assigned Class 9. Refer to relevant transportation documents.

Visit www.iata.org for the complete transport regulations and packing instructions for this product. The relevant information for Lithium batteries can be found under “Programs” > “Cargo” > “Dangerous goods (HAZMAT)”.

Figure 10-1: Class 9 Miscellaneous Dangerous Goods and UN Identification Label

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