USER MANUAL

Krypton 12002/Krypton 13002/Krypton 15002

SOLAR INVERTER / CHARGER

Version: 1.0

Table of Contents

ABOUT THIS MANUAL

Purpose

This manual describes the assembly, installation, operation and troubleshooting of this unit. Please read this manual carefully before installations and operations. Keep this manual for future reference.

Scope

This manual provides safety and installation guidelines as well as information on tools and wiring.

SAFETY INSTRUCTIONS

⚠ **WARNING: This chapter contains important safety and operating instructions. Read and keep this manual for future reference.**

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.
2. **CAUTION** – To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
3. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
4. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
5. **CAUTION** – Only qualified personnel can install this device with battery.
6. **NEVER** charge a frozen battery.
7. For optimum operation of this inverter/charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter/charger.
8. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
9. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
10. Fuses are provided as over-current protection for the battery supply.
11. GROUNDING INSTRUCTIONS -This inverter/charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
12. NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
13. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this inverter/charger back to local dealer or service center for maintenance.
14. **WARNING:** Because this inverter is non-isolated, only three types of PV modules are acceptable: single crystalline, poly crystalline with class A-rated and CIGS modules. 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 CIGS modules, please be sure NO grounding.
15. **CAUTION:** It's required to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

INTRODUCTION

This is a multi-function inverter, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support in a single package. The comprehensive LCD display offers user-configurable and easy-accessible button operations such as battery charging current, AC or solar charging priority, and acceptable input voltage based on different applications.

Features

- Pure sine wave inverter
- Customizable status with RGB lights
- User-friendly 7-inch HMI LCD design
- Built-in WiFi for mobile monitoring (App is available) and support OTA firmware
- Supports USB On-the-Go function
- Built-in anti-dusk kit
- Reserved communication ports for BMS (RS485, CAN-BUS, RS232)
- Configurable input voltage ranges for home appliances and personal computers via LCD control panel
- Configurable output usage timer and prioritization
- Configurable charger source priority via LCD control panel
- Configurable battery charging current based on applications via LCD control panel
- Compatible to utility mains or generator power
- External CT sensor to guarantee 100% self-consumption
- Feeding power into Grid
- Dual output for smart load management
- Parallel operation with 6 units

Basic System Architecture

The following illustration shows basic application for this unit. It also required the following devices to have a complete running system:

- Generator or Utility mains.
- PV modules

Consult with your system integrator for other possible system architectures depending on your requirements.

This inverter can power various appliances in home or office environment, including motor-type appliances such as tube light, fan, refrigerator and air conditioners.

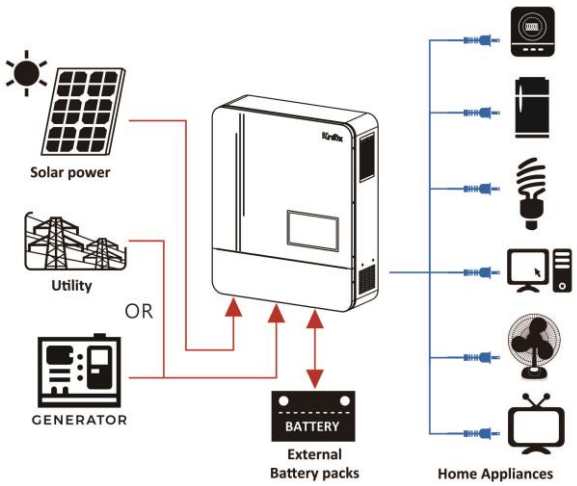
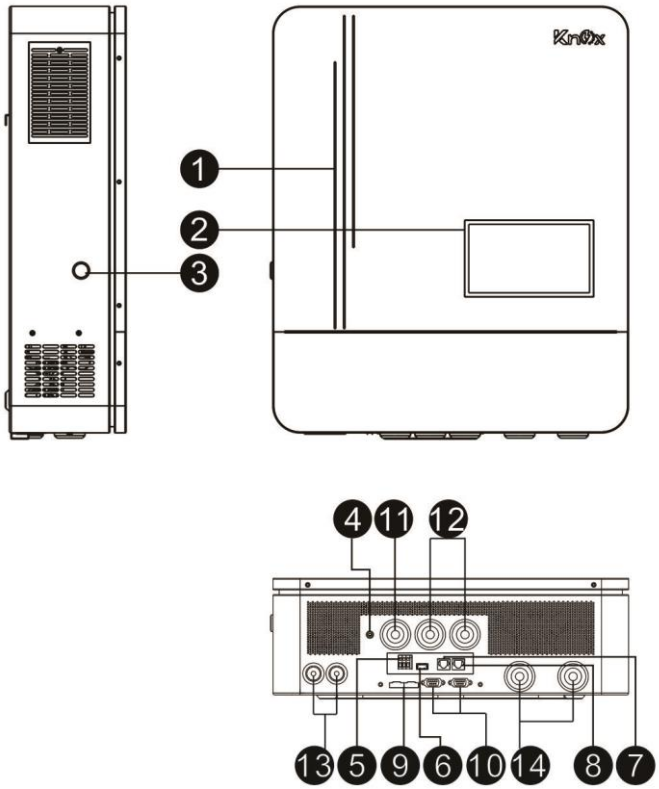


Figure 1 Basic PV System Overview

Product Overview



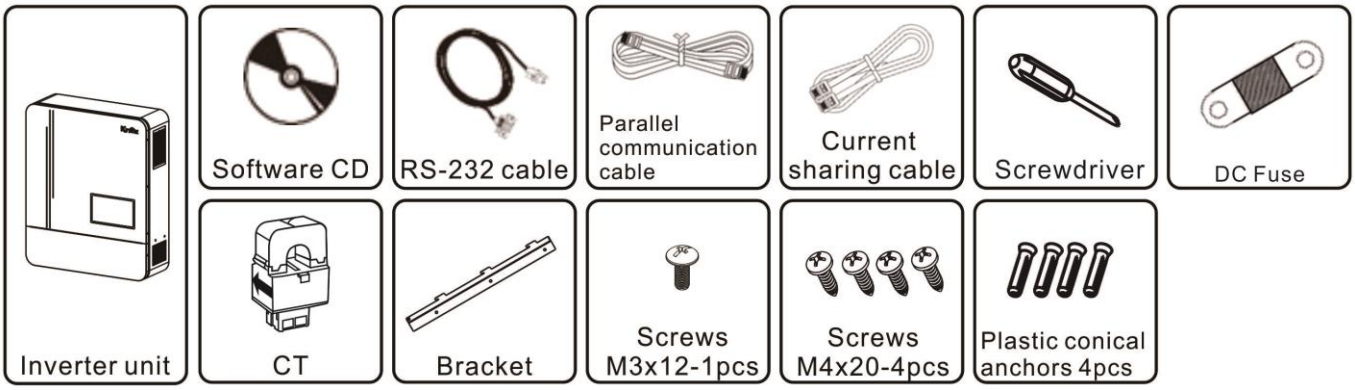
NOTE: For parallel installation and operation, please check *Appendix I.*

1. RGB LED bar
2. Touch LCD display
3. Power switch
4. CT input port
5. Dry contact terminal block
6. USB port as USB communication port and USB function port
7. RS-232 communication port
8. BMS communication port: CAN, RS-485 or RS-232
9. Current sharing port
10. Parallel communication port
11. AC input ports
12. AC output ports
13. PV input ports
14. Battery input port

INSTALLATION

Unpacking and Inspection

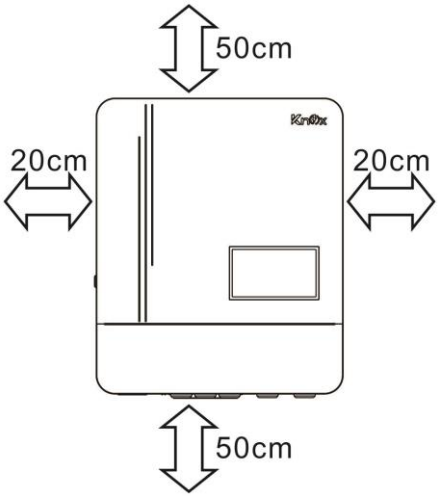
Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items inside of package (The CT is 50A inside, 200A CT is option):



Mounting the Unit

Consider the following points before selecting where to install:

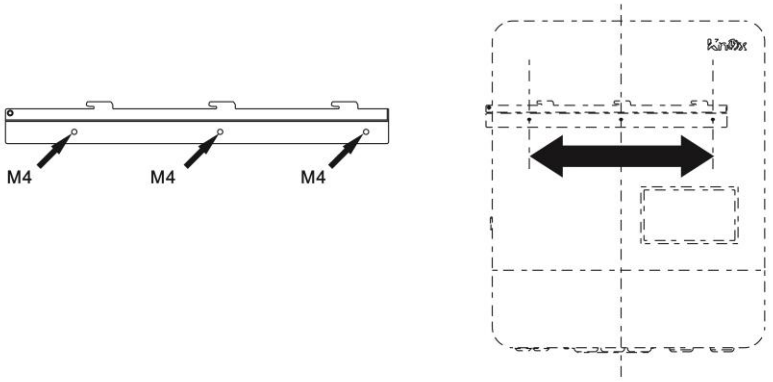
- Do not mount the inverter on flammable construction materials.
- Mount on a solid surface
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- The ambient temperature should be between 0°C and 55°C to ensure optimal operation.
- The recommended installation position is to be adhered to the wall vertically.
- Be sure to keep other objects and surfaces as shown in the right diagram to guarantee sufficient heat dissipation and to have enough space for removing wires.



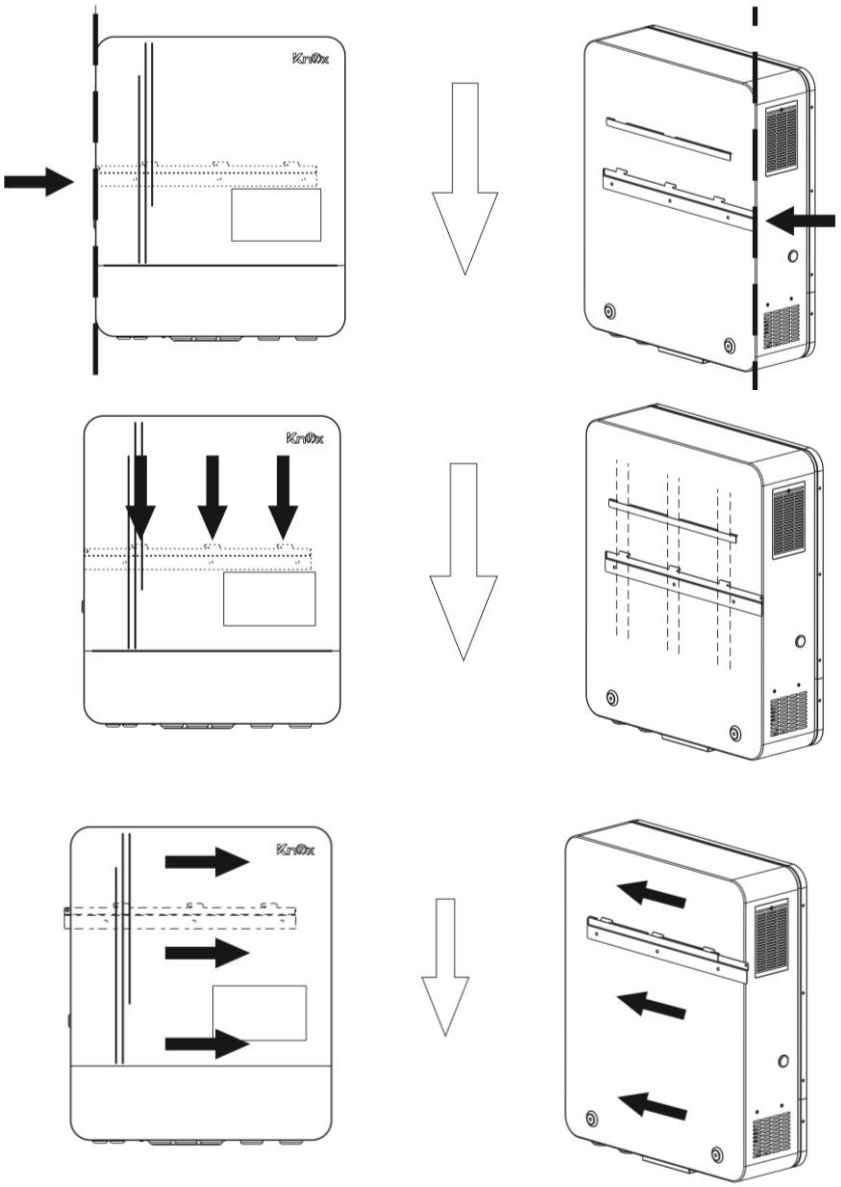
⚠ **SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.**

Installation steps:

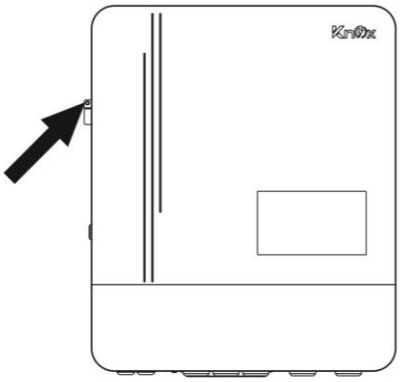
- Step 1: First, position the bracket on the wall. Mount the inverter in the center of the three screws, as shown in the diagram. Secure the bracket with three M4 screws.



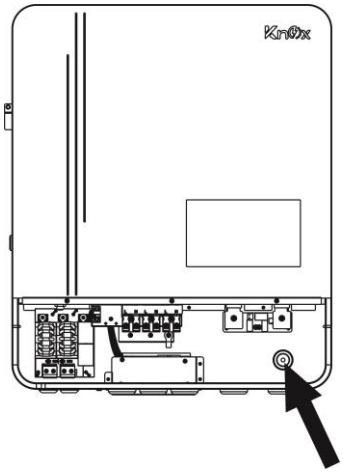
- Step 2: Move the inverter above the bracket, aligning its left side with its edge. Lower the inverter onto the bracket. Then, slide the inverter to the right until it's properly positioned.



- Step 3: Secure the edge screw on the bracket to ensure the inverter is horizontally aligned

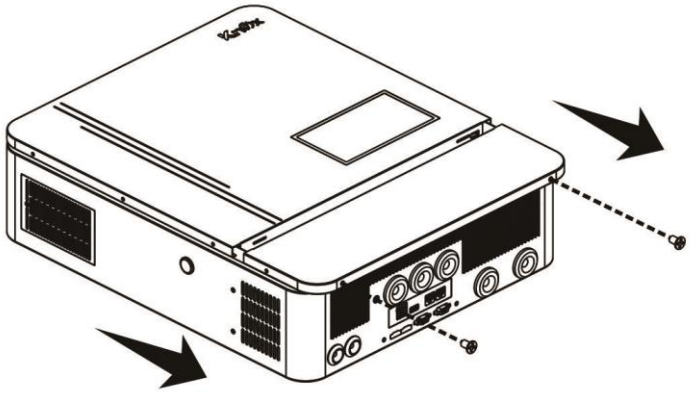


- Step 4: Secure the two screws on the terminal side to firmly mount the inverter.

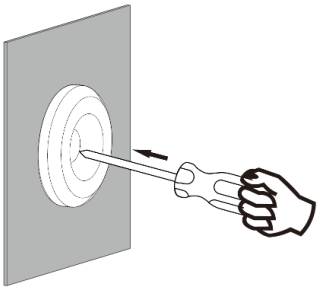


Preparation

Before connecting all wirings, please take off wiring cover by removing two screws.



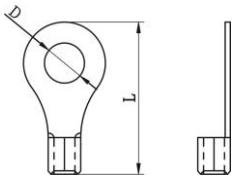
Before connecting the wires, please use a sharp object to puncture the waterproof grommet.



Battery Connection

CAUTION: For safety operation and regulation compliance, it's requested to install a separate DC over-current protector or disconnect device between battery and inverter. It may not be requested to have a disconnect device in some applications, however, it's still requested to have over-current protection installed. Please refer to typical amperage in below table as required fuse or breaker size.

Ring terminal:



WARNING! All wiring must be performed by a qualified personnel.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable and terminal size as below.

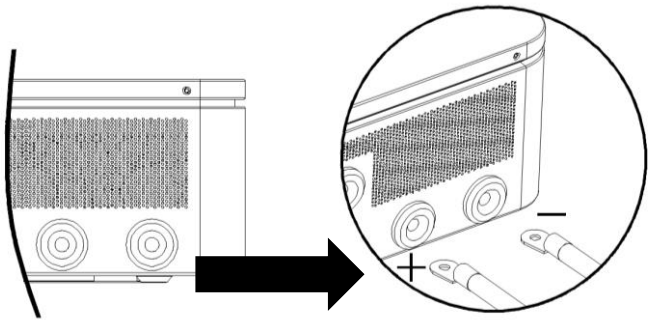
Recommended battery cable and terminal size:

Model	Typical Amperage	Battery capacity	Wire Size	Cable mm^2	Ring Terminal Dimensions		Torque value
					D (mm)	L (mm)	
Krypton 12002	196.8A	250AH	1*2/0AWG	67.4	8.4	51	5 Nm
Krypton 13002	231.5	250AH	1*3/0AWG	85	8.4	54	5 Nm
Krypton 15002	266.2A	250AH	1*3/0AWG	85	8.4	54	5 Nm

Please follow below steps to implement battery connection:

1. Assemble battery ring terminal based on recommended battery cable and terminal size.
2. Fix two cable glands into positive and negative terminals.

3. Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the nuts are tightened with torque of 5 Nm. Make sure polarity at both the battery and the inverter/charge is correctly connected and ring



⚠	**WARNING: Shock Hazard** Installation must be performed with care due to high battery voltage in series.

⚠	**CAUTION!!** Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur. **CAUTION!!** Do not apply anti-oxidant substance on the terminals before terminals are connected tightly. **CAUTION!!** Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

AC Input/Output Connection

CAUTION!! Before connecting to AC input power source, please install a **separate** AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input.

CAUTION!! There are two terminal blocks with "IN" and "OUT" markings. Please do NOT mis-connect input and output connectors.

WARNING! All wiring must be performed by a qualified personnel.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

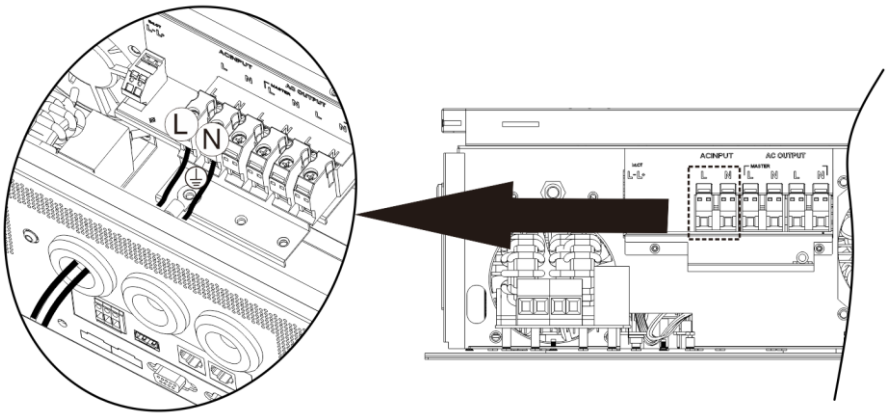
Suggested cable requirement for AC wires

Model	Gauge	Torque Value
Krypton 12002	6 AWG	1.4~ 1.6Nm
Krypton 13002	6 AWG	1.4~ 1.6Nm
Krypton 15002	6 AWG	1.4~ 1.6Nm

Please follow below steps to implement AC input/output connection:

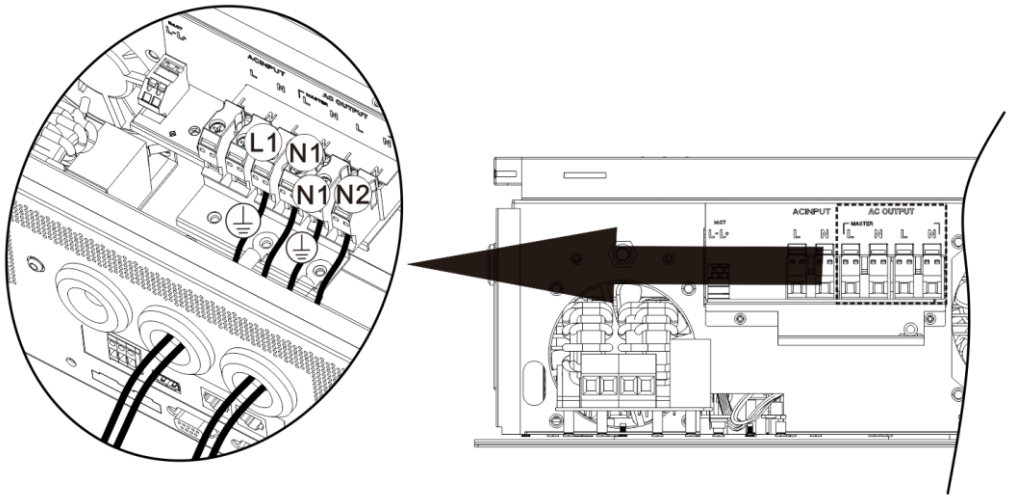
1. Before making AC input/output connection, be sure to open DC protector or disconnector first.
2. Remove insulation sleeve 10mm for six conductors. And shorten phase L and neutral conductor N 3 mm.
3. Fix two cable glands into input and output sides.
4. Insert AC input wires according to polarities indicated on terminal block and tighten the terminal screws. Be sure to connect PE protective conductor (⏚) first.

   ⏚**→Ground (yellow-green)**
   L→LINE (brown or black)
   N→Neutral (blue)



⚠	**WARNING:** Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

5. This inverter is equipped with dual-output. There are four terminals (L1/N1, L2/N2) available on output port. It's set up through LCD program or monitoring software to turn on and off the second output. Refer to "LCD setting" section for the details.
   Before making wiring of second output, please remove knockout and install the cable gland first.
   Insert AC output wires according to polarities indicated on terminal block and tighten terminal screws. Be sure to connect PE protective conductor (⏚) first.
   ⏚**→Ground (yellow-green)**
   L1→LINE (brown or black)
   N1→Neutral (blue)
   L2→LINE (brown or black)
   N2→Neutral (blue)



6. Make sure the wires are securely connected.

CAUTION: Important
Be sure to connect AC wires with correct polarity. If L and N wires are connected reversely, it may cause utility short-circuited when these inverters are worked in parallel operation.

CAUTION: Appliances such as air conditioner requires at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check manufacturer of air conditioner if it's equipped with time-delay function before installation. Otherwise, this inverter/charger will be trigger overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

PV Connection

CAUTION: Before connecting to PV modules, please install **separately** DC circuit breakers between inverter and PV modules.
NOTE1: Please use 600VDC/30A circuit breaker on each PV input.
NOTE2: The overvoltage category of the PV input is II.
Please follow the steps below to implement PV module connection:

WARNING: Because this inverter is non-isolated, only three types of PV modules are acceptable: single crystalline and poly crystalline with class A-rated and CIGS modules.
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 CIGS modules, please be sure NO grounding.
CAUTION: It's required to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

Step 1: Remove the cover plate from the PV input port

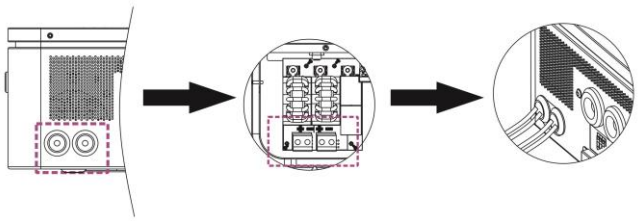
CAUTION: Keep the cover plate installed if system do not configure with PV panels.
CAUTION: Exceeding the maximum input voltage can destroy the unit!! Check the system before wire connection.

Step 2: Install GLAND BUSHING on the PV BOX first and assemble it on the system
Step 3: Confirm the positive and negative marks on the terminal to avoid wrong installation

Prepare the cable and follow the connector assembly process:

Strip one cable 8 mm on both end sides and be careful NOT to nick conductors.

Step 4: Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable to negative pole (-) of PV input connector.



WARNING! For safety and efficiency, it's very important to use appropriate cables for PV module connection. To reduce risk of injury, please use the proper cable size as recommended below.

Conductor cross-section (mm^2)	AWG no.
4~6	10~12

CAUTION: Never directly touch the terminals of inverter. It might cause lethal electric shock.

Recommended Panel Configuration
When selecting proper PV modules, please be sure to consider the following parameters:
1. Open circuit Voltage (Voc) of PV modules not to exceed maximum PV array open circuit voltage of the inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than the start-up voltage.

INVERTER MODEL	Krypton 12002	Krypton 13002	Krypton 15002
Max. PV Array Power	12000W	13000W	15000W
Max. PV Array Open Circuit Voltage	500Vdc		
PV Array MPPT Voltage Range	90Vdc~450Vdc		
Start-up Voltage (Voc)	80Vdc		

Recommended solar panel configuration:

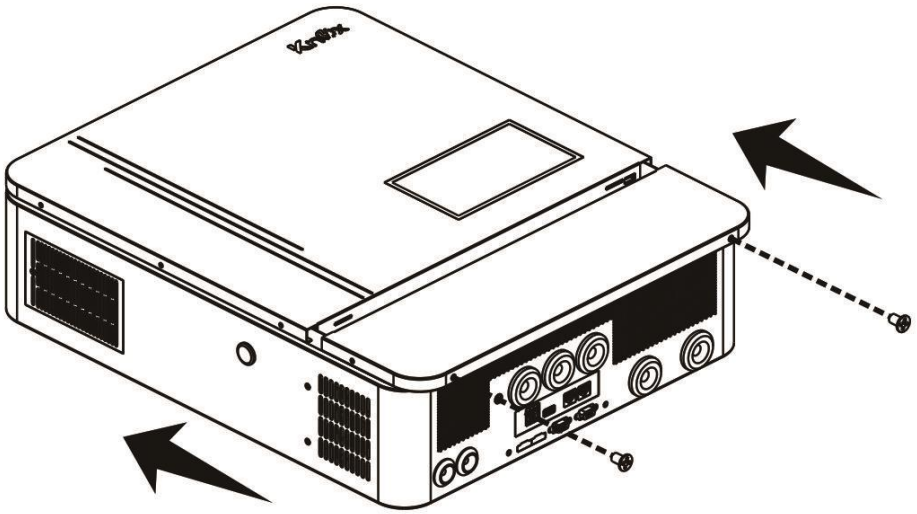
Solar Panel Spec. (reference) - 640Wp - Vmp: 36.5Vdc - Imp: 17.54A - Voc: 43.7Vdc - Isc: 18.51A	**SOLAR INPUT 1**	**SOLAR INPUT 2**	**Q'ty of panels**	**Total Input Power**
	Min in series: 3pcs, per input **Max. in series: 11pcs, per input**			
	3pcs in series	x	3pcs	1920W
	x	3pcs in series	3pcs	1920W
	9pcs in series	x	9pcs	5760W
	x	9pcs in series	9pcs	5760W
	9pcs in series	9pcs in series	18pcs	11520W
	10pcs in series	10pcs in series	20pcs	12800W
	11pcs in series	11pcs in series	22pcs	14080W

Take the720Wp PV module as an example. After considering above two parameters, the recommended module configurations are listed in the table below.

Solar Panel Spec. (reference) - 720Wp - Vmp: 40.5Vdc - Imp: 17.44A - Voc: 49.4Vdc - Isc: 18.49A	**SOLAR INPUT 1**	**SOLAR INPUT 2**	**Q'ty of panels**	**Total Input Power**
	Min in series: 3pcs, per input **Max. in series: 10pcs, per input**			
	3pcs in series	x	3pcs	1920W
	x	3pcs in series	3pcs	1920W
	10pcs in series	x	10pcs	720W
	x	10pcs in series	10pcs	7200W
	8pcs in series	8pcs in series	16pcs	11520W
	9pcs in series	9pcs in series	18pcs	12960W
	10pcs in series	10pcs in series	20pcs	14400W

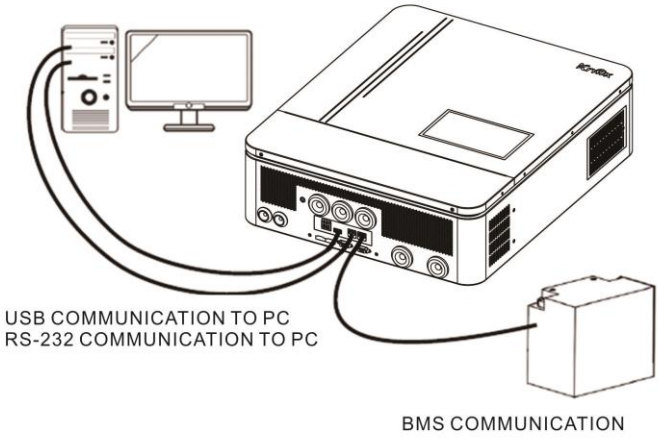
Final Assembly

After connecting all wirings, put wiring cover back by fixing two screws as shown below.



Communication Connection

Follow below chart to connect all communication wiring.



Serial Connection: BMS port

Please select compatible lithium battery module, setup battery type on the LCD module and then build communication between Inverter and BMS. Related information could refer to appendix.

Pin assignment

PIN #	Definition	PIN #	Definition
PIN 1	X	PIN 5	RS485N
PIN 2	X	PIN 6	CANH
PIN 3	RS485P	PIN 7	CANL
PIN 4	X	PIN 8	GND

Serial Connection: COM port

Please use the supplied serial cable to connect between the inverter and your PC. Install the monitoring software from the bundled CD and follow the on-screen instructions to complete your installation. For detailed software operation, refer to the software user manual on the bundled CD.

Pin assignment

PIN #	Definition	PIN #	Definition
PIN 1	TXD from Inverter	PIN 5	X
PIN 2	RXD to Inverter	PIN 6	X
PIN 3	X	PIN 7	X
PIN 4	X	PIN 8	GND

USB port (Type A)

This port could use either connect with PC to communicate with monitoring program or USB disk to export Inverter data log, OTA firmware. Detail information refer to the LCD setting section

Pin assignment

PIN #	Definition	PIN #	Definition
PIN 1	VCC	PIN 3	D+
PIN 2	D-	PIN 4	GND

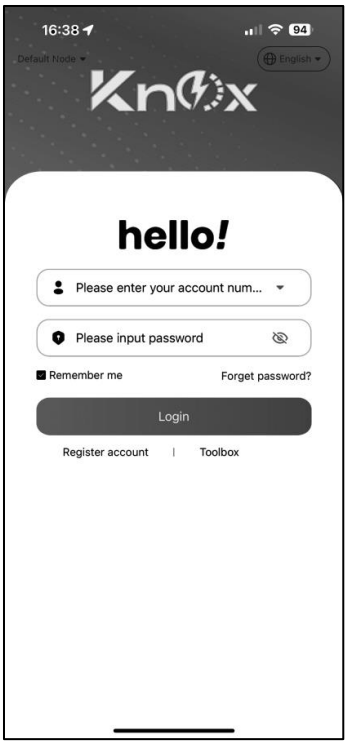
Dry Contact port

There is one dry contact (3A/250VAC) available on the rear panel. It could be used to deliver signal to external device when battery voltage reaches warning level.

Unit Status	Condition				
				NC & C	NO & C
Power Off	Unit is off and no output is powered.			Close	Open
Power On	Output is powered from Battery power or Solar energy.	Program 01 set as USB (utility first)	Battery voltage < Low DC warning voltage	Open	Close
			Battery voltage > Setting value in Program 13 or battery charging reaches floating stage	Close	Open
		Program 01 is set as SBU (SBU priority)	Battery voltage < Setting value in Program 12	Open	Close
			Battery voltage > Setting value in Program 13 or battery charging reaches floating stage	Close	Open

Wi-Fi Connection

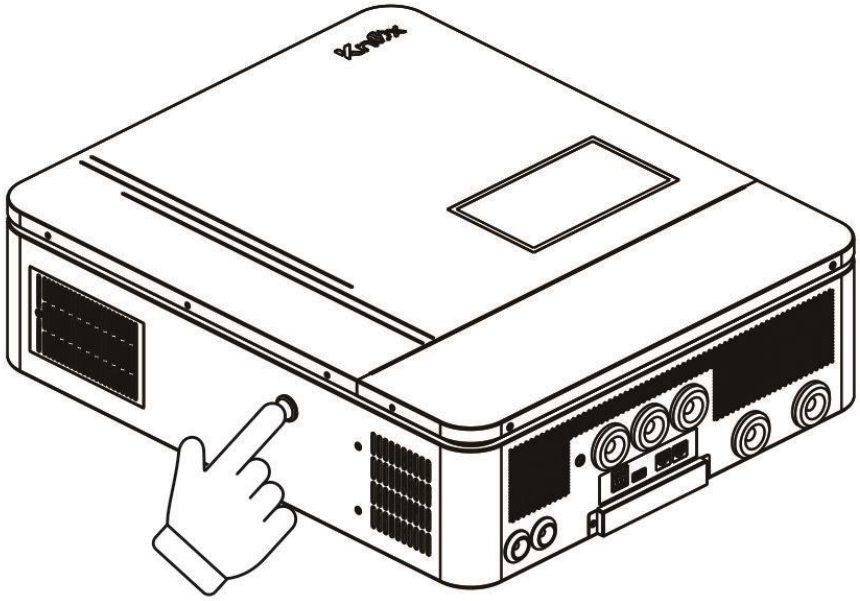
Wi-Fi module can enable wireless communication between solar inverters and the monitoring platform. Users can remotely monitor and control their inverters when they combine the Wi-Fi module with KNOXHYBRID APP. The App uses the Wi-Fi chip to provide remote monitoring data services, which is beneficial for the daily data monitoring of the inverter, querying the real-time data in the device, sending commands from the device, and operating the device remotely. The app is available for both iOS and Android.



OPERATION

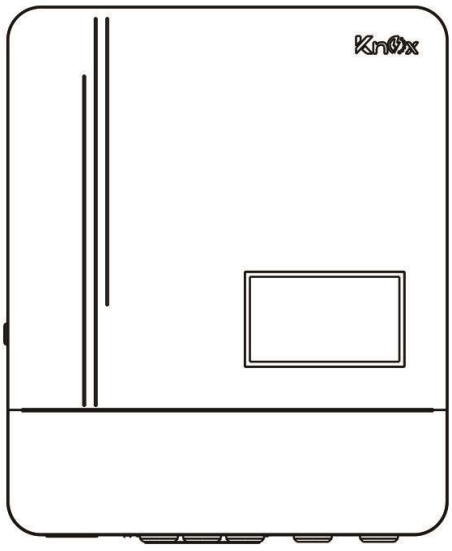
Power ON/OFF

Once the unit has been properly installed and the batteries are connected well , simply press power switch for 3~5 seconds to turn on the unit.



Operation and Display Panel

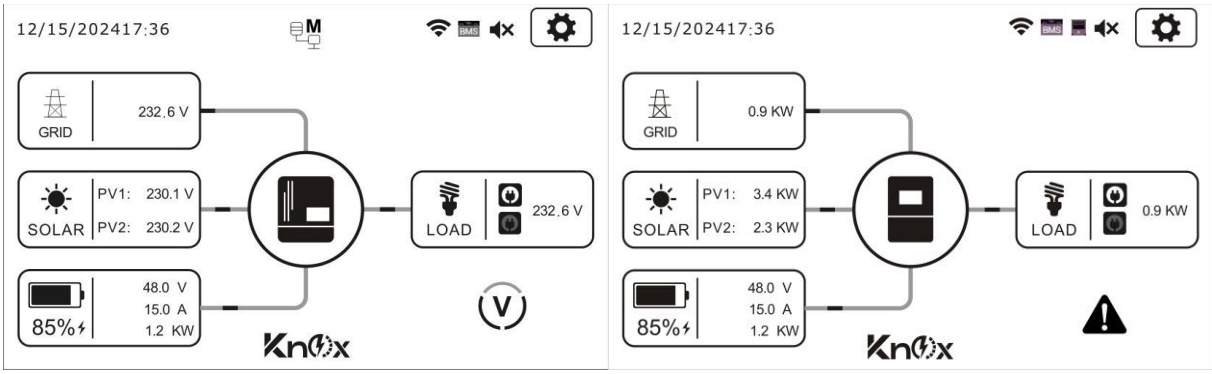
The operation and the LCD module, shown in the chart below, includes one RGB LED, one power switch, and a LCD display to indicate the operating status and input/output power information.



RGB LED Indicator		**Description**
Sky blue (according RGB setting)	Solid On	Line mode or Charge mode
Purple (according RGB setting)	Solid On	Battery Mode
	Flashing	Battery Low
Red	Solid On	Fault mode
	Flashing	Warning mode
Without LED	Standby mode	Without LED

Operation and Display Panel

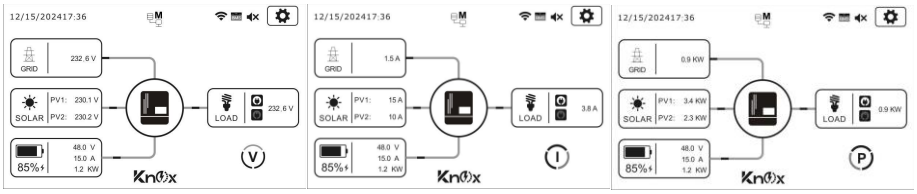
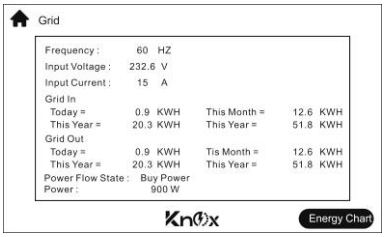
The LCD is touchscreen, below screen shows the overall information of the inverter.

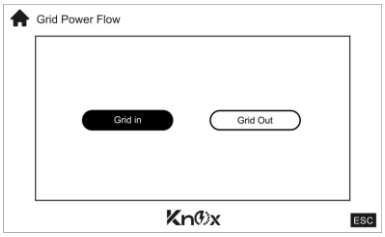


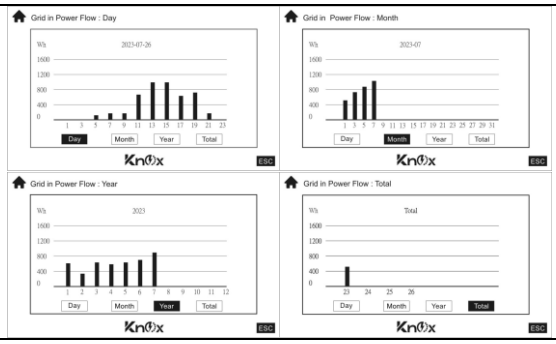
1. The top of the screen displays the time, Wi-Fi and buzzer status.
2. The top of the screen displays the time and Parallel status: Single/Master/Slave/L1,L2,L3 Phase.
3. The main screen show information including inverter solar, grid, battery, load and warning/fault Status. It also displays the direction of energy flow through arrows, clearly showing the working status of the inverter.

Pages Information

When the unit is turned on, the LCD display will show home page after few seconds.

<table>
<tr>
<td>Unit icon: Indicates the voltage, current and power information.
  </td>
<td>  </td>
</tr>
<tr>
<td>Grid detail page:
 
This page indicates grid status, voltage, frequency, current and energy.
Press “Energy Chart” enter power curve page.
Press “HOME” icon</td>
<td> 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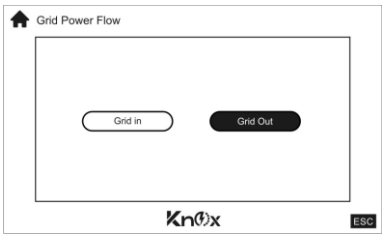
<td>return to main screen.</td>
<td> 
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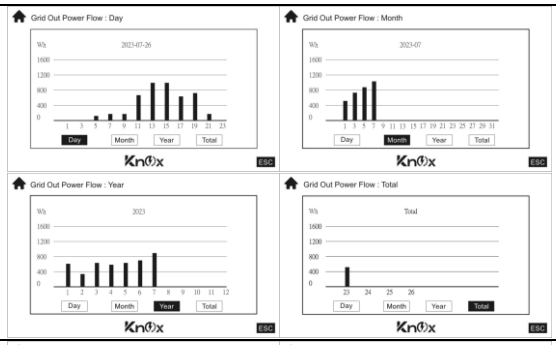
<td> 
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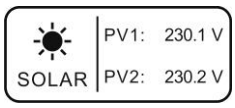
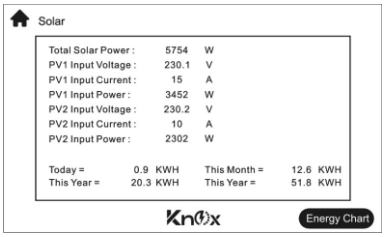
<td>PV detail page:
 

This page indicates total solar power, each PV voltage, current, power and energy.
Press “Energy Chart” enter power curve page.
Press icon return to main screen.</td>
<td> 
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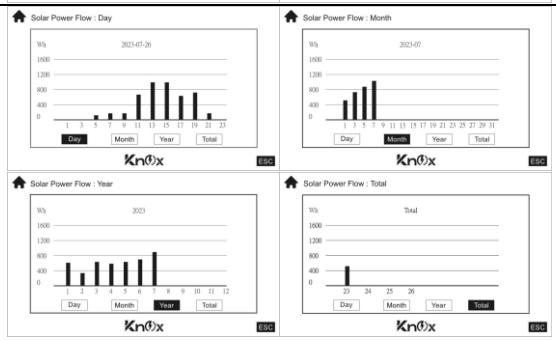
<td> 
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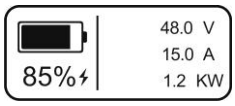
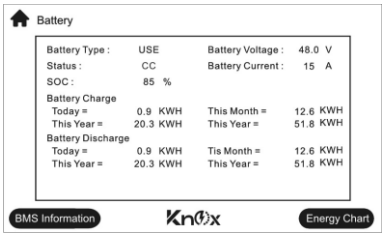
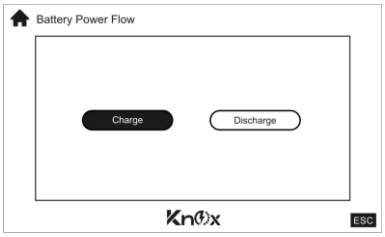
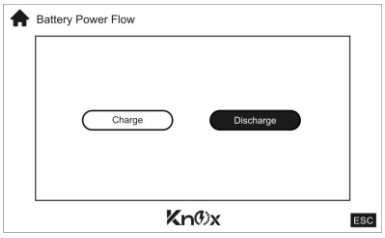
<td>Battery detail page:
 

1. This page indicates the battery type, statue, SOC, voltage, current, power and energy.
Negative means discharge, positive means charge.
2. If use lithium battery, it can press “BMS Information” to check lithium battery information.
Press “Energy Chart” enter power curve page.
Press icon return to main screen.</td>
<td> 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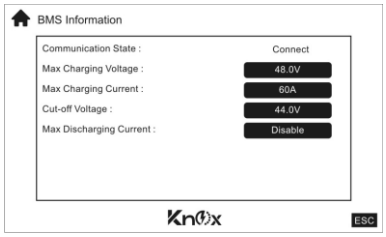
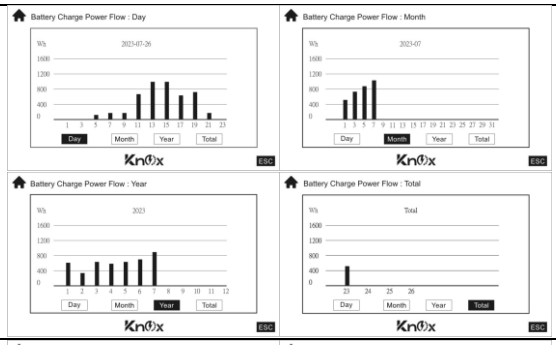
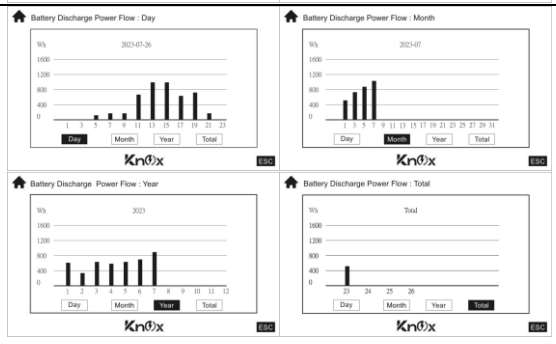
<td> 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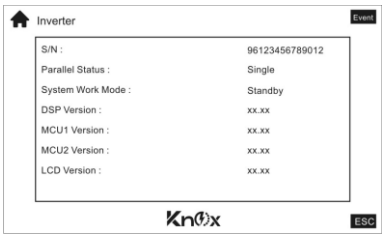
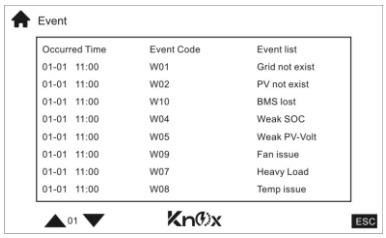
Inverter detail Page:

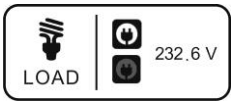
This page indicates serial number, system work mode, DSP version, MCU version, and LCD version of the inverter.
Press "Event" enter event page. This page indicates all event, warning, and fault messages.

Press  icon return to main screen.

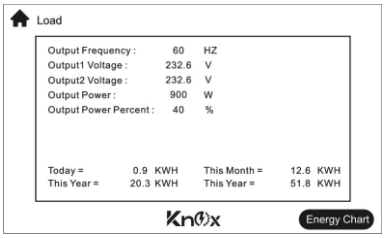


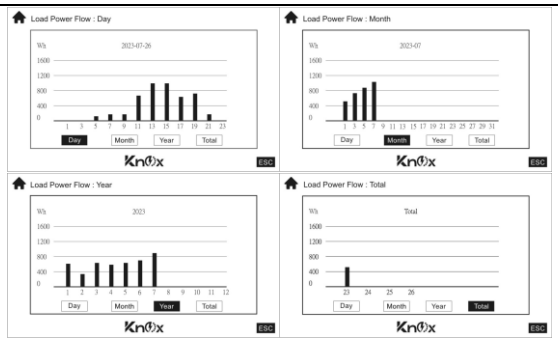


AC output detail page:



This page indicates output voltage, frequency power, load percent and load energy. These two output icon indicates main and second output on/off status.
Press "Energy Chart" enter power curve page.
Press  icon return to main screen.

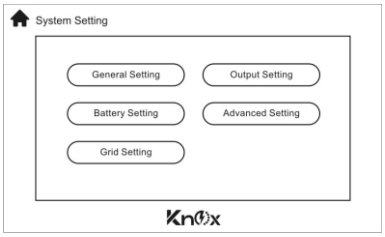




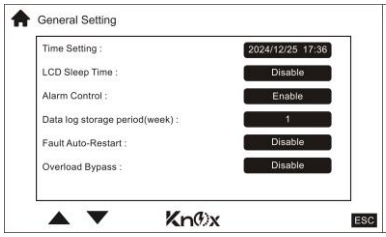
LCD Setting

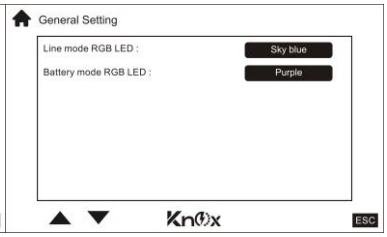
System Setting

Setting page: (tap icon) indicates all setting item

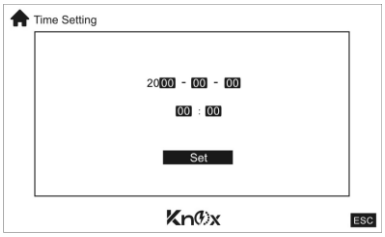


General Setting

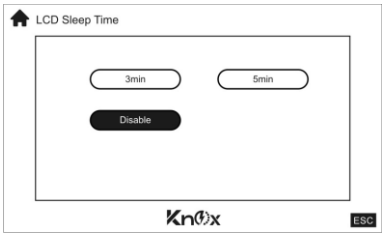




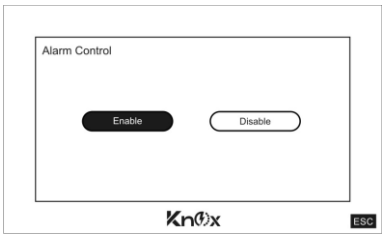
Time Setting



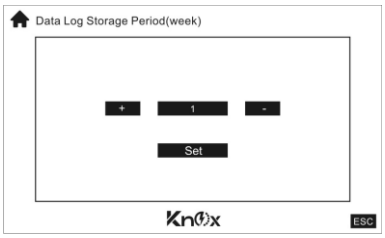
LCD Sleep Time
Default: Disable



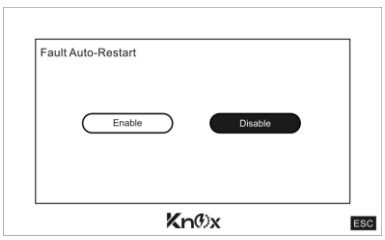
Alarm Control
Default: Enable



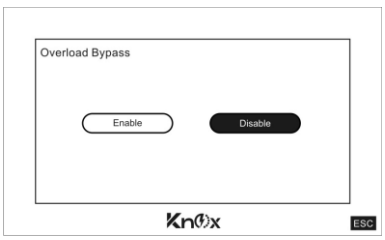
Data log Storage Period
Default: 1 Week



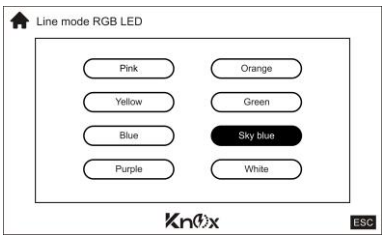
Fault Auto-Restart
Default: Disable



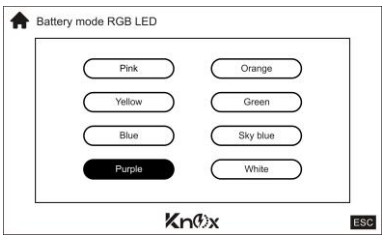
Overload Bypass
Default: Disable



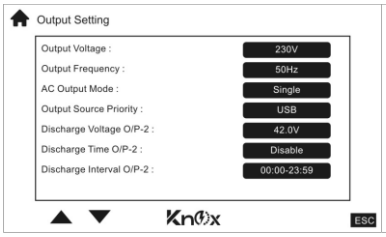
Line mode RGB LED
Default: Sky blue

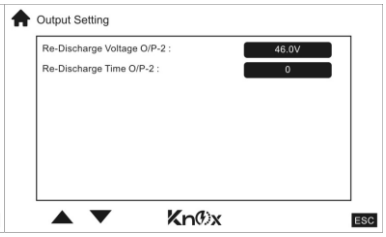


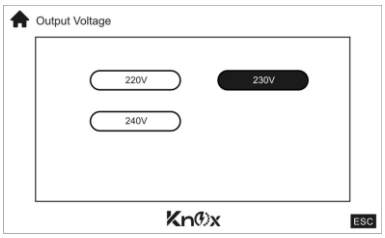
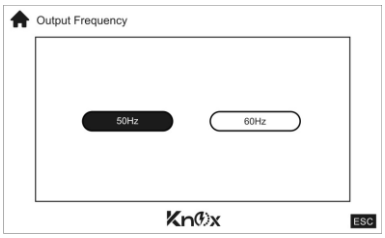
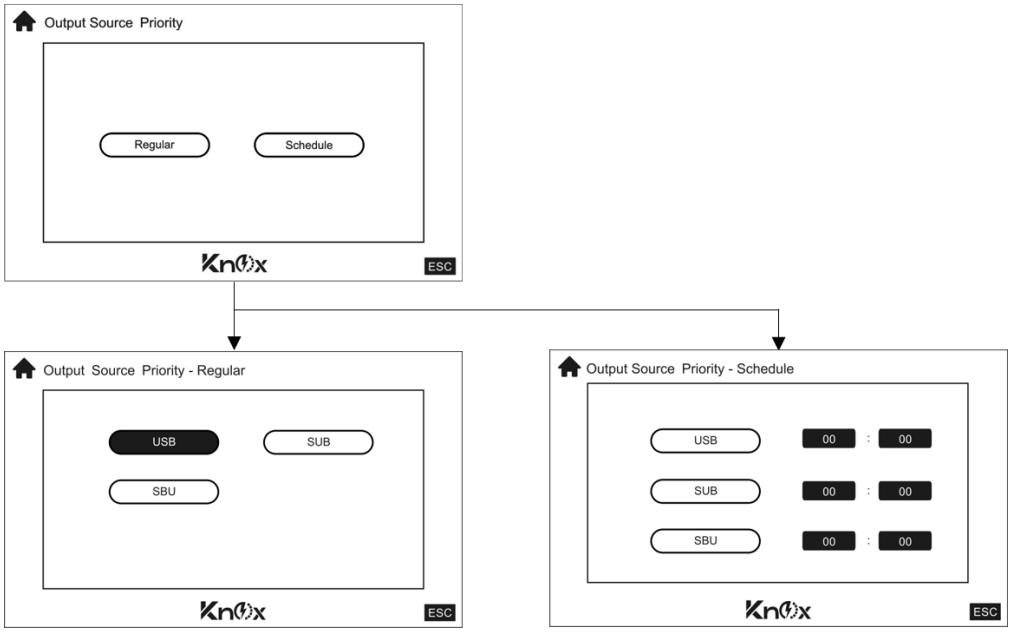
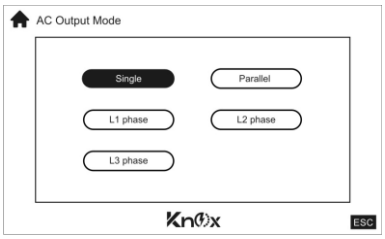
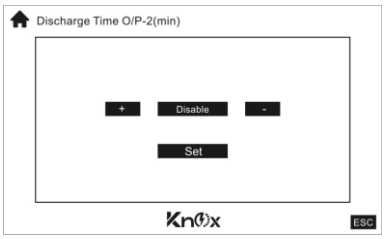
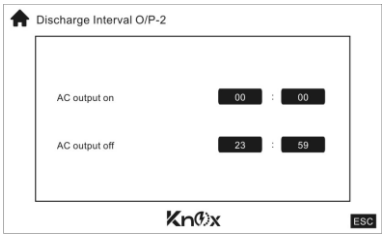
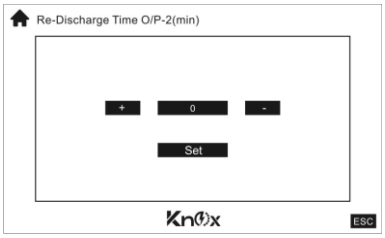
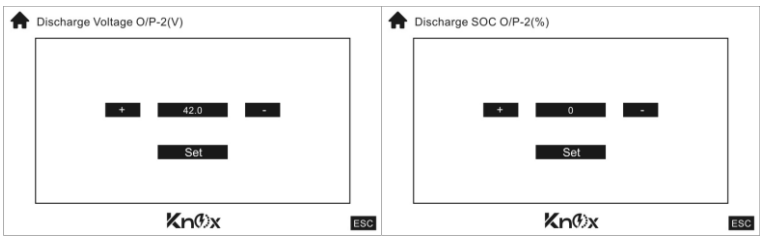
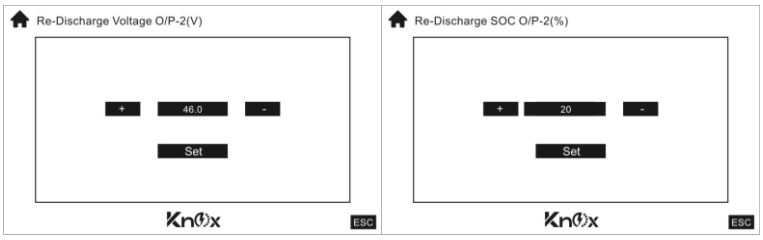
Battery mode RGB LED
Default: Purple

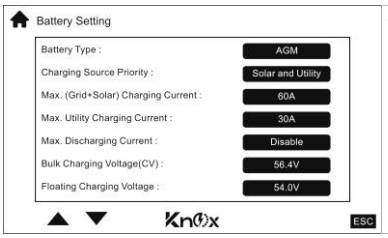


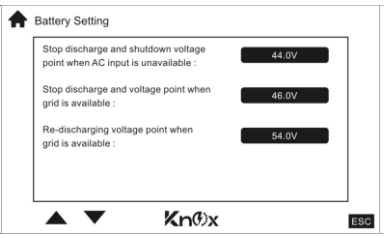
Output Setting

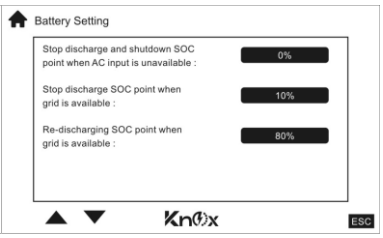


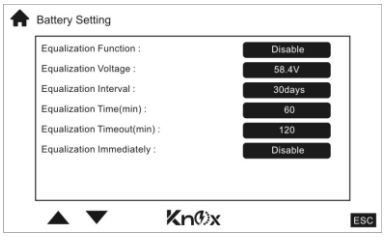


Output voltage Default: 230V		Output Frequency Default: 50Hz	
Output source priority: To configure load power source priority Regular: Priority arranged per day Schedule: Priority arranged per hours Default: USB			
AC Output mode Default: Single		Discharge Time O/P-2 Default: Disable	
Discharge Interval O/P-2 Default: 00~23		Re-Discharge Time O/P-2 Default: 0 min	
Discharge Voltage/SOC O/P-2 Default: 42.0V/0%			
Re-Discharge Voltage/SOC O/P-2 Default: 46.0V/20%			
Battery Setting			

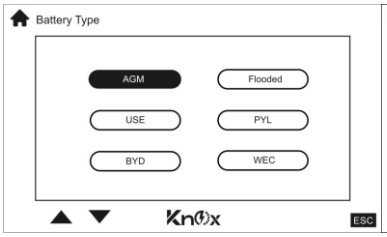


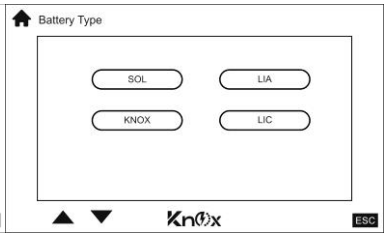






Battery Type
Default: AGM

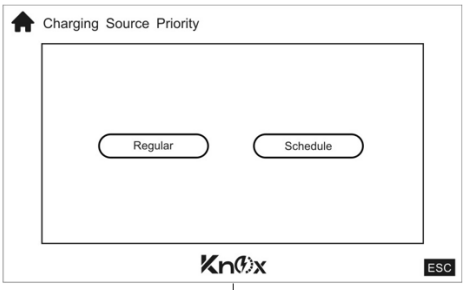


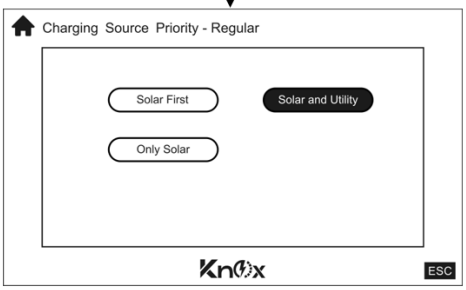


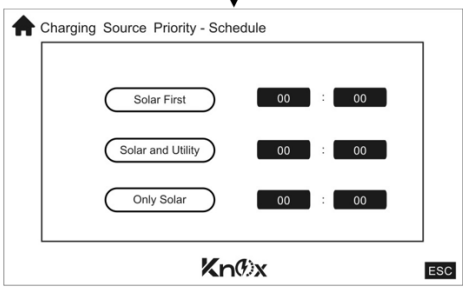
Charger source priority:
To configure charger source priority

Regular:
Priority arranged per day
Schedule:
Priority arranged per hours

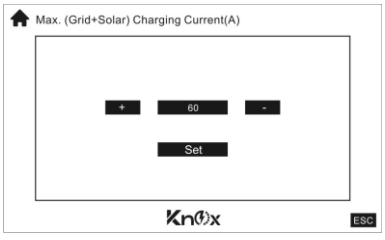
Default: Solar and Utility



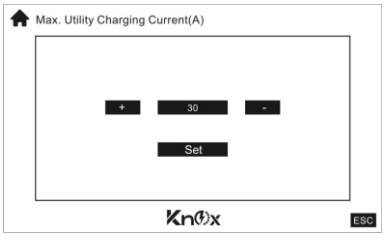




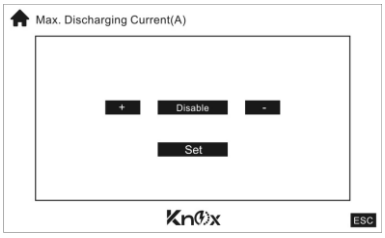
Max. (Grid+Solar) Charging Current
Default: 60A

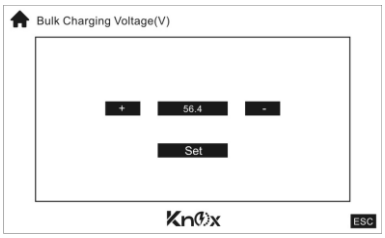
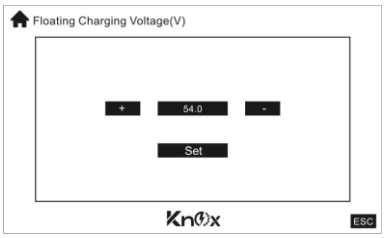
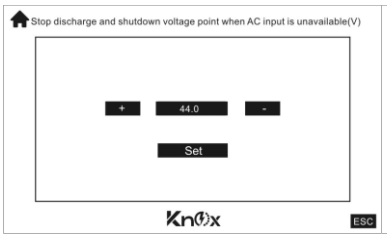
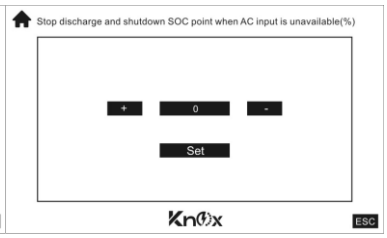
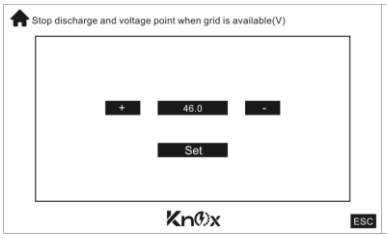
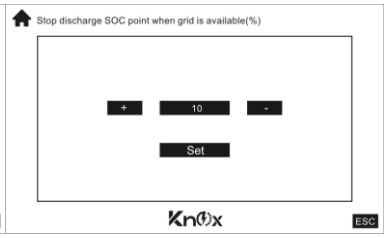
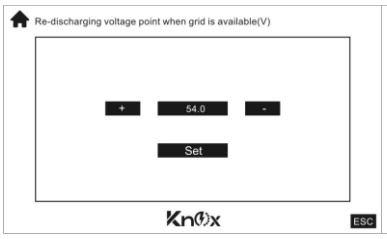
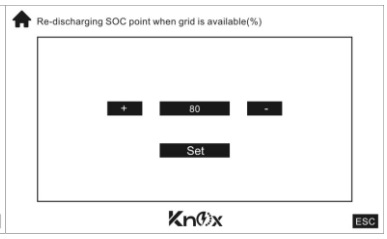
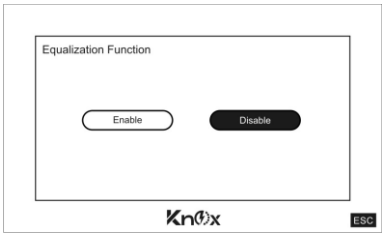
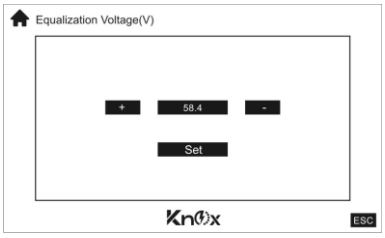
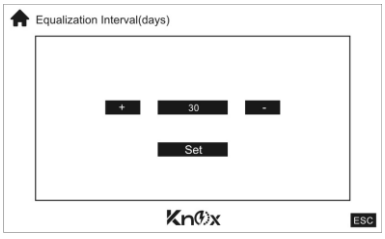
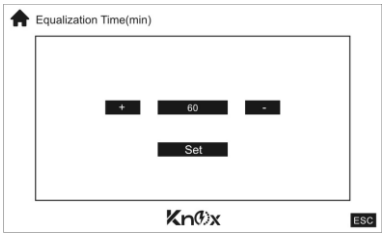
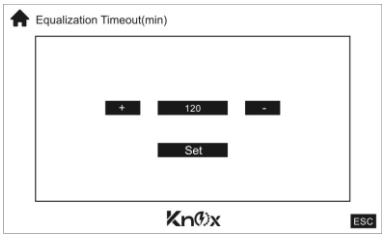
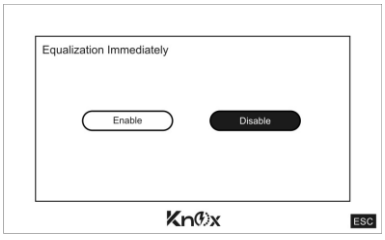


Max. Utility Charging Current (8.5k is 120A / 10k and 11.5k is 150A)
Default: 30A

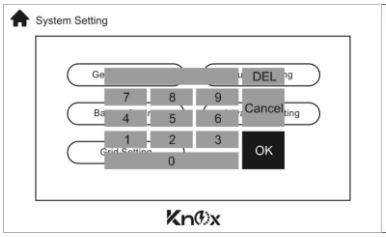


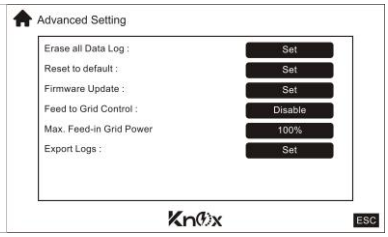
Max. Discharging Current
(8.5k is 150A / 10k and 11.5k is 200A)
Default: Disable



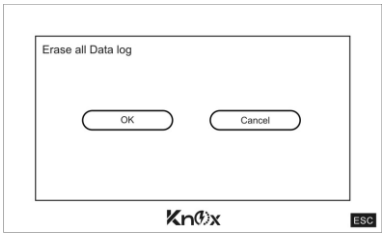
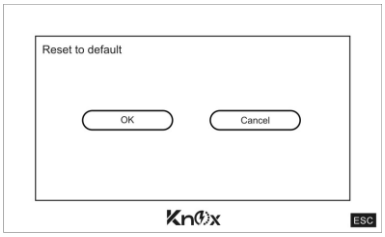
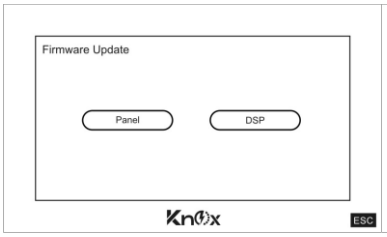
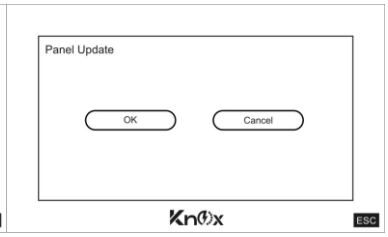
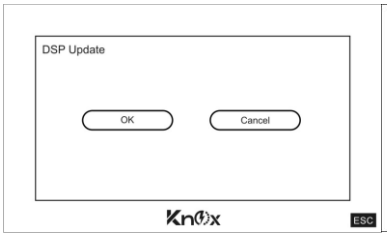
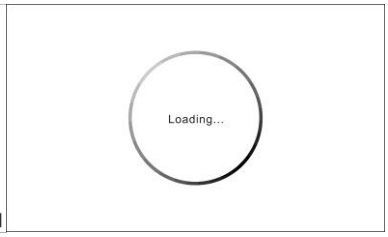
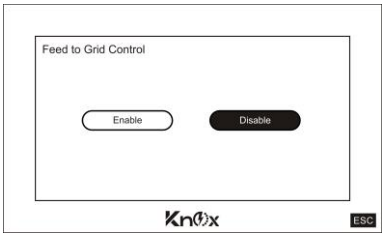
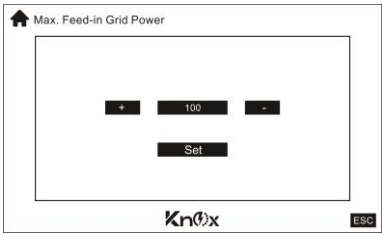
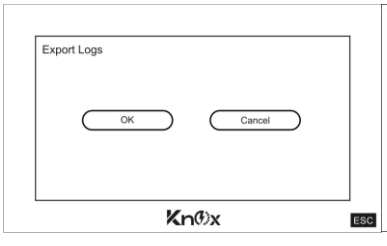
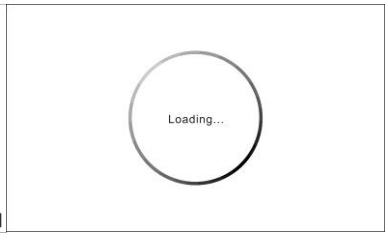
Bulk Charging Voltage (CV) Default: 56.4V		Floating Charging Voltage Default: 54.0V	
Stop Discharge and shutdown Voltage/SOC point when AC input is unavailable Default: 44.0V/0%			
Stop Discharge Voltage/SOC point when grid is available Default: 46.0V/10%			
Re- Discharging Voltage/SOC point when grid is available Default: 54.0V/80%			
Equalization Function Default: Disable		Equalization Voltage Default:58.4V	
Equalization Interval Default: 30 days		Equalization Time Default: 60 min	
Equalization Timeout Default: 120 min		Equalization Immediately Default: Disable	

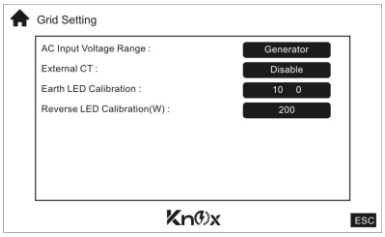
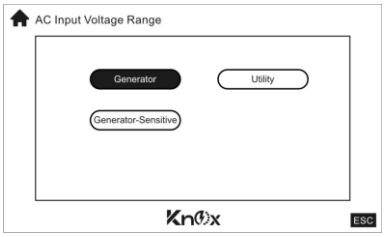
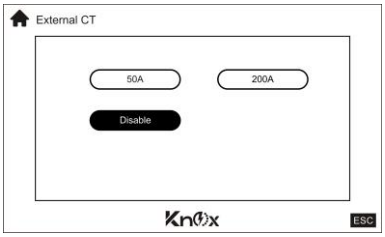
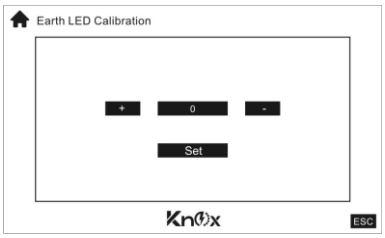
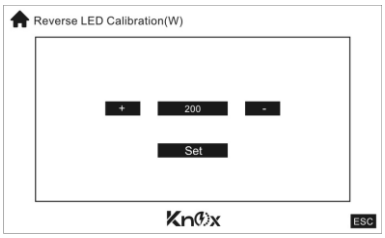
Advanced Setting





(It's necessary to enter Password **5669** to access)

Erase all Data log		Reset to default	
Firmware Update When updating the DSP or Panel, the LOADING screen will be displayed. (It need Insert an OTG USB disk and require specific file, please contact your installer)	   		
Feed to Grid Control Default: Disable			
Max. Feed-in Grid Power Default: 100%			
Export Logs When export the logs, the LOADING screen will be displayed. (It need Insert an OTG USB disk)	 		

Grid Setting			
			
AC Input Voltage Range Default: Generator		External CT Default: Disable	
Earth LED Calibration Default: 0		Reverse LED Calibration Default: 200W	

Warning and Fault List

Code Type	Code #	Event	Code Type	Code #	Event
Fault	F01	Fan fault	Fault	F16	Inv start fault
Fault	F02	High PV-volt	Fault	F17	High dc offset
Fault	F03	High bat-volt	Fault	F18	Over-load
Fault	F04	Low bat-volt	Fault	F19	Amp sense fault
Fault	F05	Output S.C.	Fault	F20	Backfeed fault
Fault	F06	High op-volt	Fault	F21	Firmware fault
Fault	F07	Low op-volt	Fault	F22	Par-CAN fault
Fault	F08	High bus-volt	Fault	F23	Par-host fault
Fault	F09	Low bus-volt	Fault	F24	Par-sync fault
Fault	F10	High PV-amp	Fault	F25	Par-bat fault
Fault	F11	High inv-amp	Fault	F26	Par-grid fault
Fault	F12	High bus-amp	Fault	F27	Par-opa fault
Fault	F13	High disc-amp	Fault	F28	Par-set fault
Fault	F14	Over temp.	Fault	F29	OP Circuit Fault
Fault	F15	Bus start fault	Fault	F33	FW Different
Warning	W01	Grid not exist	Warning	W11	Comm. Lost
Warning	W02	PV not exist	Warning	W12	Par limited
Warning	W03	Pack not exist	Warning	W13	Ip CB trip
Warning	W04	Weak SoC	Warning	W14	EQ warning
Warning	W05	Weak PV-volt	Warning	W15	MCU comm. lost
Warning	W06	Power de-rate	Warning	W16	Disable CHG& DISCHG
Warning	W07	Heavy load	Warning	W17	Disable CHG
Warning	W08	Temp issue	Warning	W18	Disable DISCHG
Warning	W09	Fan issue	Warning	W19	Force CHG
Warning	W10	BMS lost			

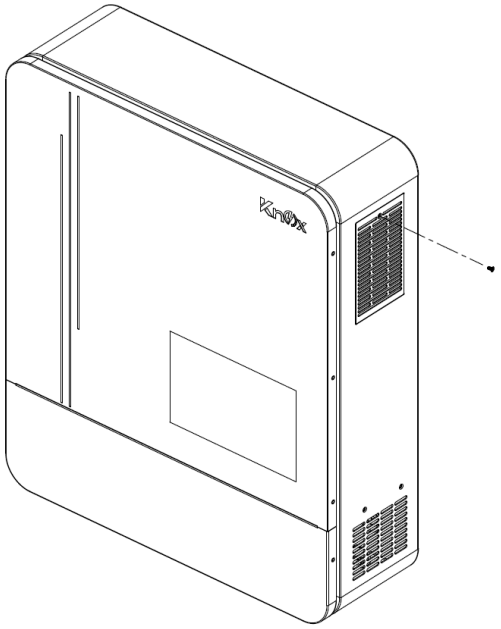
CLEARANCE AND MAINTENANCE FOR ANTI-DUST KIT

Overview

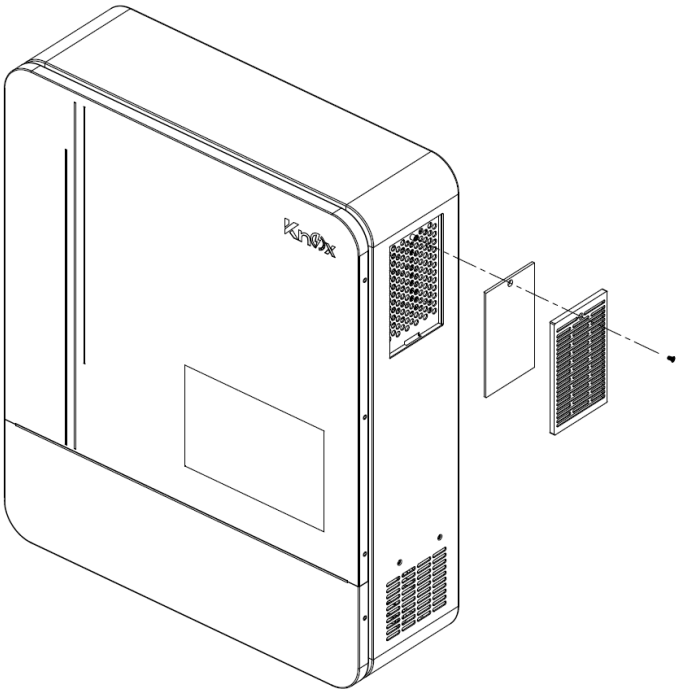
Every inverter is already installed with anti-dusk kit from factory. This kit keeps dusk from your inverter and increases product reliability in harsh environment.

Clearance and Maintenance

Step 1: Please remove the screws on the sides of the inverter.



Step 2: Then, dustproof case can be removed and take out air filter foam as shown in below chart.



Step 3: Clean air filter foam and dustproof case. After clearance, re-assemble the dust-kit back to the inverter.

NOTICE: The anti-dust kit should be cleaned from dust every one month.

BATTERY EQUALIZATION

Equalization function is added into charge controller. It reverses the buildup of negative chemical effects like stratification, a condition where acid concentration is greater at the bottom of the battery than at the top. Equalization also helps to remove sulfate crystals that might have built up on the plates. If left unchecked, this condition, called sulfation, will reduce the overall capacity of the battery. Therefore, it's recommended to equalize battery periodically.

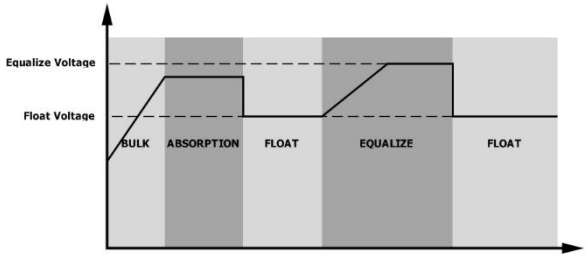
- **How to Apply Equalization Function**

You must enable battery equalization function in monitoring LCD setting Equalization function first. Then, you may apply this function in device by either one of following methods:

1. Setting equalization interval in LCD
2. Active equalization immediately in LCD

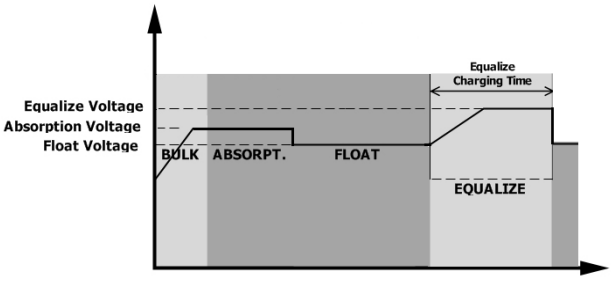
- **When to Equalize**

In float stage, when the setting equalization interval (battery equalization cycle) is arrived, or equalization is active immediately, the controller will start to enter Equalize stage.

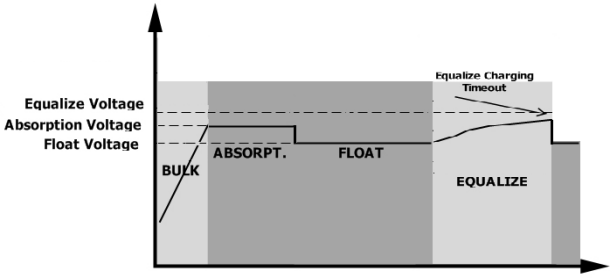


- **Equalize charging time and timeout**

In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until setting battery equalized time is arrived.



However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.



SPECIFICATIONS

Table 1 Line Mode Specifications

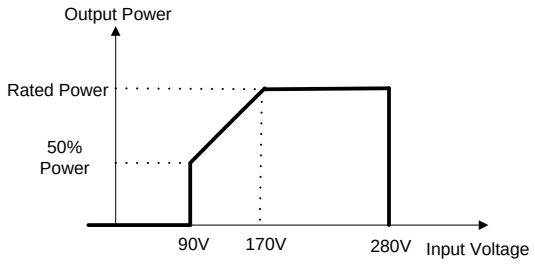
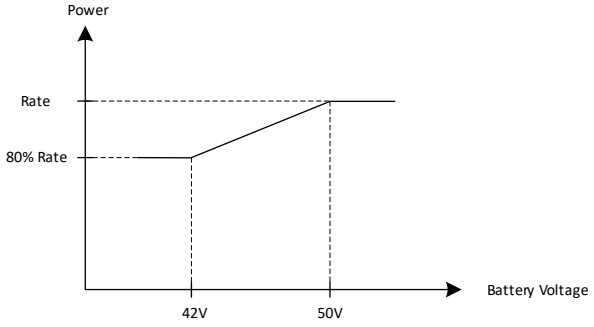
MODEL	Krypton 12002	Krypton 13002	Krypton 15002
Input Voltage Waveform	Sinusoidal (utility or generator)		
Nominal Input Voltage	230Vac		
Low Loss Voltage	170Vac±7V (UPS) 90Vac±7V (Appliances)		
Low Loss Return Voltage	180Vac±7V (UPS); 100Vac±7V (Appliances)		
High Loss Voltage	280Vac±7V		
High Loss Return Voltage	270Vac±7V		
Max AC Input Voltage	300Vac		
Max AC Input Current	60A		
Max 2nd Output Current	60A		
Nominal Input Frequency	50Hz / 60Hz (Auto detection)		
Low Loss Frequency	40±1Hz		
Low Loss Return Frequency	42±1Hz		
High Loss Frequency	65±1Hz		
High Loss Return Frequency	63±1Hz		
Output Short Circuit Protection	Line mode: Circuit Breaker (70A) Battery mode: Electronic Circuits		
Efficiency (Line Mode)	>95% (Rated R load, battery full charged)		
Transfer Time	10ms typical (UPS); 20ms typical (Appliances)		
Output power de-rating: When AC input voltage under 170V the output power will be de-rated.			

Table 2 Inverter Mode Specifications

MODEL	Krypton 12002	Krypton 13002	Krypton 15002
Rated Output Power	8.5KW	10KW	11.5KW
Output Voltage Waveform	Pure Sine Wave		
Output Voltage Regulation	230Vac±5%		
Output Frequency	60Hz or 50Hz		
Peak Efficiency	93%		
Overload Protection	10s@110%~150%load; 5s@≥150% load; 200ms @ ≥205% load	10s@105%~120%load; 5s@≥120% load; 100ms @ ≥180% load	
Surge Capacity	2* rated power for 5 seconds		
Low DC Warning Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50%	 46.0Vdc 42.8Vdc 40.4Vdc		
Low DC Warning Return Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50%	 48.0Vdc 44.8Vdc 42.4Vdc		
Low DC Cut-off Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50%	 44.0Vdc 40.8Vdc 38.4Vdc		
High DC Recovery Voltage	64Vdc	61Vdc	
High DC Cut-off Voltage	66Vdc	63Vdc	
DC Voltage Accuracy	+/-0.3V@ no load		
THDV	<5% for linear load,<10% for non-linear load @ nominal voltage		
DC Offset	≦100mV		
Power Limitation (Krypton 12002**)** When battery voltage is lower than 50Vdc, output power will be derated. If connected load is higher than this derated power, the AC output voltage will decrease until the output power reduces to this derated power. The minimum AC output voltage is output voltage setting – 10V.			

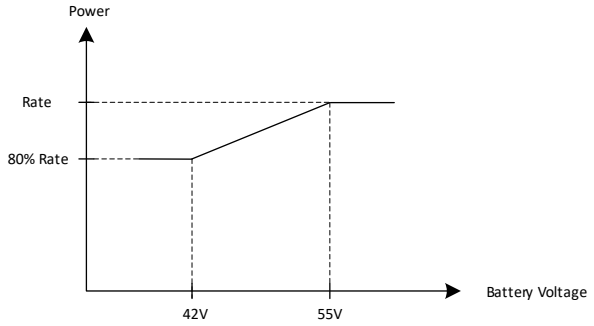
Power Limitation **(**Krypton 13002 / Krypton 15002**)** When battery voltage is lower than 55Vdc, output power will be derated. If connected load is higher than this derated power, the AC output voltage will decrease until the output power reduces to this derated power. The minimum AC output voltage is output voltage setting – 10V.	

Table 3 Charge Mode Specifications

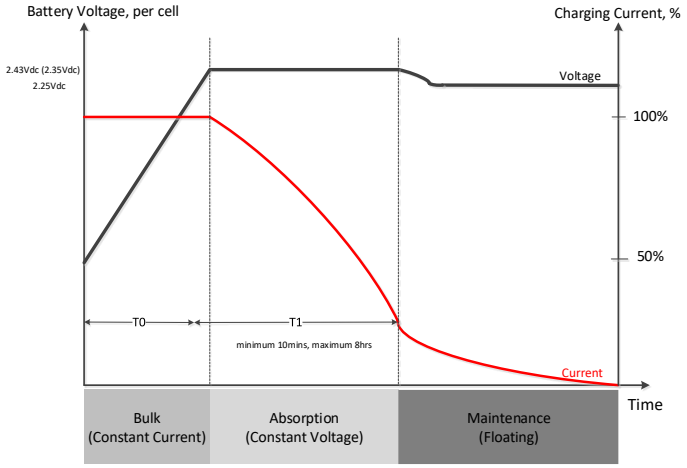
Utility Charging Mode				
MODEL		**Krypton 12002**	**Krypton 13002**	**Krypton 15002**
Charging Current (UPS) @ Nominal Input Voltage		120A	150A	
Bulk Charging Voltage	**Flooded Battery**	58.4Vdc		
	AGM / Gel Battery	56.4Vdc		
Floating Charging Voltage		54Vdc		
Overcharge Protection		66Vdc	63Vdc	
Charging Algorithm		3-Step		
Charging Curve				
Solar Input				
MODEL		**Krypton 12002**	**Krypton 13002**	**Krypton 15002**
Rated Power		12000W (7500W max. per tracker)	13000W (7500W max. per tracker)	15000W (7500W max. per tracker)
Max. PV Array Open Circuit Voltage		500Vdc		
PV Array MPPT Voltage Range		90Vdc~450Vdc		
Max. Input Current		2*30Amp (MAX 45Amp)		
Max. Charging Current		150A		
Start-up Voltage		80V +/- 5Vdc		

Table 4 General Specifications

MODEL	Krypton 12002	Krypton 13002	Krypton 15002
Safety Certification	CE		
Operating Temperature Range	-10°C to 50°C		
Storage temperature	-15°C~ 60°C		
Humidity	5% to 95% Relative Humidity (Non-condensing)		
Dimension (D*W*H), mm	156.1x 460x 551.8		
Net Weight, kg	18.4		

Table 5 Parallel Specifications

Max parallel numbers	6
Circulation Current under No Load	Max 2A
Power Unbalance Ratio	<5% @ 100% Load
Parallel communication	CAN
Transfer time in parallel mode	Max 50ms
Parallel Kit	YES

Note: Parallel feature will be disabled when only PV power is available.

TROUBLE SHOOTING

Phenomenon and/or Possible cause	What to do
No response while press the main switch.	
No Utility power and PV is applied.	Check whether the DC breaker tripped or has not yet turned on? If problem still exists, please contact the service center to repair it.
No response while pressing the main switch.	
Utility power or PV power exists.	Check whether the AC breaker tripped? Or PV voltage reaches to the operation level? If problem still exists, please contact the service center to repair it.
Output turned off, Buzzer beeps continuously, RED LED solid on	
F01 shows. Fans abnormal stopped during startup sequence	Please contact service center to replace them.
F02 shows.	Configure the PV panels lower than 450V.
F03 shows.	Disconnect the Utility and PV power. Then, re-apply again. If over-voltage alarm still sounds, the internal charger might has some problem. Please contact with service center to repair it.
F05 shows.	Check and verify if there is any load with short circuit condition? Remove the load and restart the unit again. If problem still exists, please contact the service center to repair it.
F14 shows.	Clean the anti-dust filter and keep the unit installed in a well ventilated environment.
F18 shows.	Reduce the applied load and restart the unit again.
F06, F07, F08, F09, F10, F11, F12, F13, F15, F16, F17, F19 or F20 shows.	Please restart the unit again. If problem still exists, please contact the service center to repair it.
F20 shows.	1. Restart the inverter. 2. Check if L/N cables are not connected reversely in all inverters. 3. For parallel system in single phase, make sure the sharing are connected in all inverters. For supporting three-phase system, make sure the sharing cables are connected in the inverters in the same phase, and disconnected in the inverters in different phases. If the problem remains, please contact your installer.
F22, F23, or F24 shows.	1. Check if communication cables are connected well and restart the inverter. 2. If the problem remains, please contact your installer.
F25 shows.	1. Make sure all inverters share same groups of batteries together. 2. Remove all loads and disconnect AC input and PV input. Then, check battery voltage of all inverters. If the values from all inverters are close, please check if all battery cables are the same length and same material type. Otherwise, please contact your installer to provide SOP to calibrate battery voltage of each inverter. If the problem still remains, please contact your installer.

F26 shows.	1. Check the utility wiring conncetion and restart the inverter. 2. Make sure utility starts up at same time. If there are breakers installed between utility and inverters, please be sure all breakers can be turned on AC input at same time. If the problem remains, please contact your installer.
F27 shows.	1. Restart the inverter. 2. Remove some excessive loads and re-check load information from LCD of inverters. If the values are different, please check if AC input and output cables are in the same length and material type. If the problem remains, please contact your installer.
F28 shows.	1. Switch off the inverter and check LCD setting AC output mode 2. For parallel system in single phase, make sure no 3P1, 3P2 or 3P3 is set. For upporting three-phase system, make sure no "PAL" is set on AC output mode setting 3. If the problem remains, please contact your installer.
F29 shows.	1. Check if sharing cables are connected well and restart the inverter. 2. If the problem remains, please contact your installer.
Output powered but buzzer beeps per second, RED LED flashing	
W07 shows.	Reduce load will release the warning.
W08 shows.	Clean the anti-dust filter and keep the unit installed in a well ventilated environment.
W09 shows.	Fans abnormal stopped during operation. Please contact service center to replace them.
W10 shows.	BMS communication disconnected. Please contact service center to repair it.
Output powered but no buzzer. Only record on log	
W04 shows.	Charge the battery.
W05 shows.	Reduce the load.
W06 shows.	Utility voltage lower to a certain level, the output rating will be limited.
W11 shows.	Internal communication disconnected. Please contact service center to repair it.
W16, W17, W18 or W19 shows.	Check Battery status
WiFi mark is not displayed.	
Unit can't connect to the APP.	Check the Wi-Fi function enabled and icon available on the LCD then follow the Wi-Fi installation procedure to pair the Wi-Fi module with router and APP.
No function on USB charger ports.	
No power from the USB charger ports.	Check whether the USB charger function is enabled.

Appendix I: Parallel function

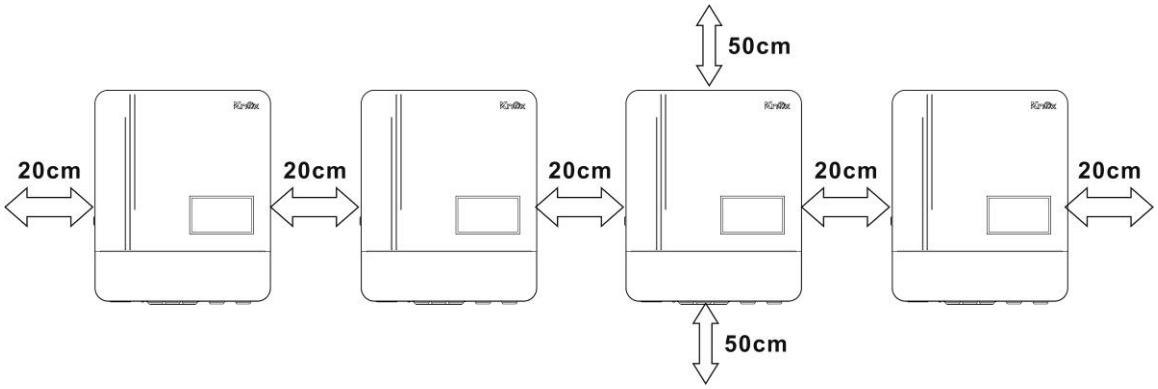
1. Introduction

This inverter can be used in parallel with two different operation modes.

1. 1. Parallel operation in single phase is with up to 6 units. The supported maximum output power for Krypton 12002 model is 51KW/51KVA. The supported maximum output power for Krypton 13002 model is 60KW/60KVA. The supported maximum output power for Krypton 15002 model is 69KW/69KVA.
2. Maximum six units work together to support three-phase equipment. Maximum four units support one phase.

2. Mounting the Unit

When installing multiple units, please follow below chart.



NOTE: For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

3. Wiring Connection

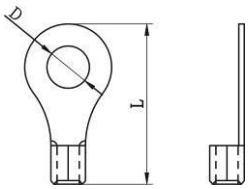
WARNING: It's REQUIRED to connect battery for parallel operation.

The cable size of each inverter is shown as below:

Recommended battery cable and terminal size for each inverter:

Model	Wire Size	Cable mm^2	Ring Terminal Dimensions		Torque value
			D (mm)	L (mm)	
Krypton 12002	1*2/0AWG	67.4	8.4	51	5 Nm
Krypton 13002	1*3/0AWG	85	8.4	54	5 Nm
Krypton 15002	1*3/0AWG	85	8.4	54	5 Nm

Ring terminal:



WARNING: Be sure the length of all battery cables is the same. Otherwise, there will be voltage difference between inverter and battery to cause parallel inverters not working.

Recommended AC input and output cable size for each inverter:

Model	AWG no.	Torque
Krypton 12002	6 AWG	1.4~ 1.6Nm
Krypton 13002	6 AWG	1.4~ 1.6Nm
Krypton 15002	6 AWG	1.4~ 1.6Nm

You need to connect the cables of each inverter together. Take the battery cables for example: You need to use a connector or bus-bar as a joint to connect the battery cables together, and then connect to the battery terminal. The cable size used from joint to battery should be X times cable size in the tables above. "X" indicates the number of inverters connected in parallel.

Regarding AC input and output, please also follow the same principle.

CAUTION!! Please install the breaker at the battery and AC input side. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of battery or AC input.

Recommended breaker specification of battery for each inverter:

Model	1 unit*
Krypton 12002/Krypton 13002	250A/70VDC
Krypton 15002	300A/70VDC

*If you want to use only one breaker at the battery side for the whole system, the rating of the breaker should be X times current of 1 unit. "X" indicates the number of inverters connected in parallel.

Recommended breaker specification of AC input with single phase:

Model	2 units	3 units	4 units	5 units	6 units
Krypton 12002/Krypton 13002/Krypton 15002	120A/230VAC	180A/230VAC	240A/230VAC	300A/230VAC	360A/230VAC

Note 1: Also, you can use 60A breaker with only 1 unit and install one breaker at its AC input in each inverter.

Note 2: Regarding three-phase system, you can use 4-pole breaker directly and the rating of the breaker should be compatible with the phase current limitation from the phase with maximum units

Recommended battery capacity

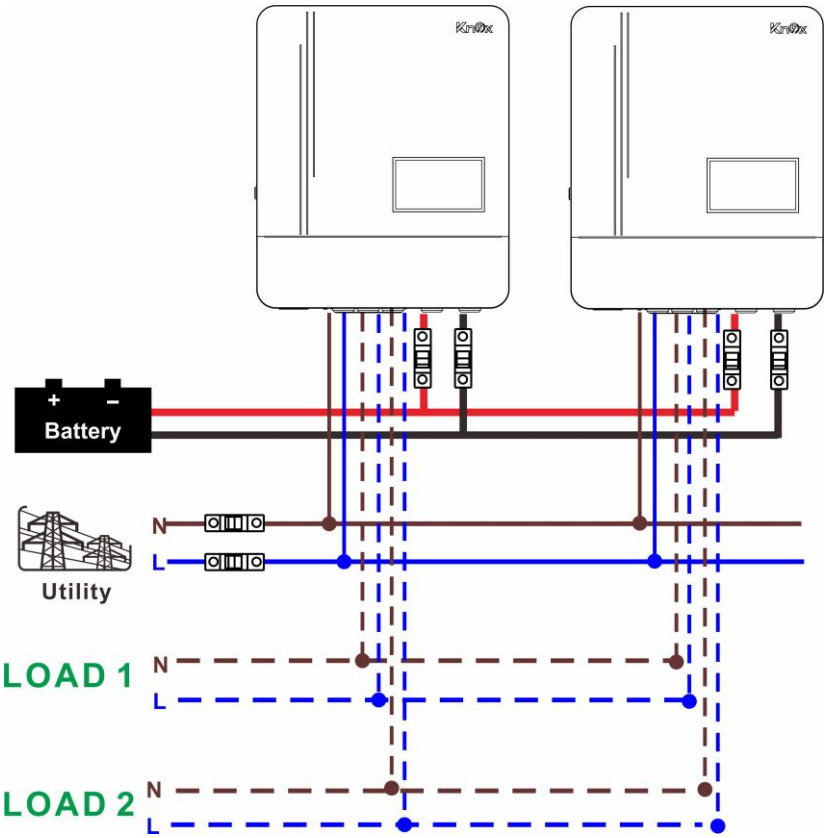
Inverter parallel numbers	2	3	4	5	6
Battery Capacity	200AH	400AH	400AH	600AH	600AH

WARNING! Be sure that all inverters will share the same battery bank. Otherwise, the inverters will transfer to fault mode.

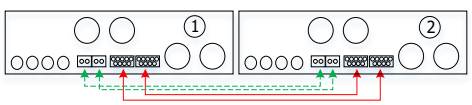
4-1. Parallel Operation in Single phase

Two inverters in parallel:

Power Connection

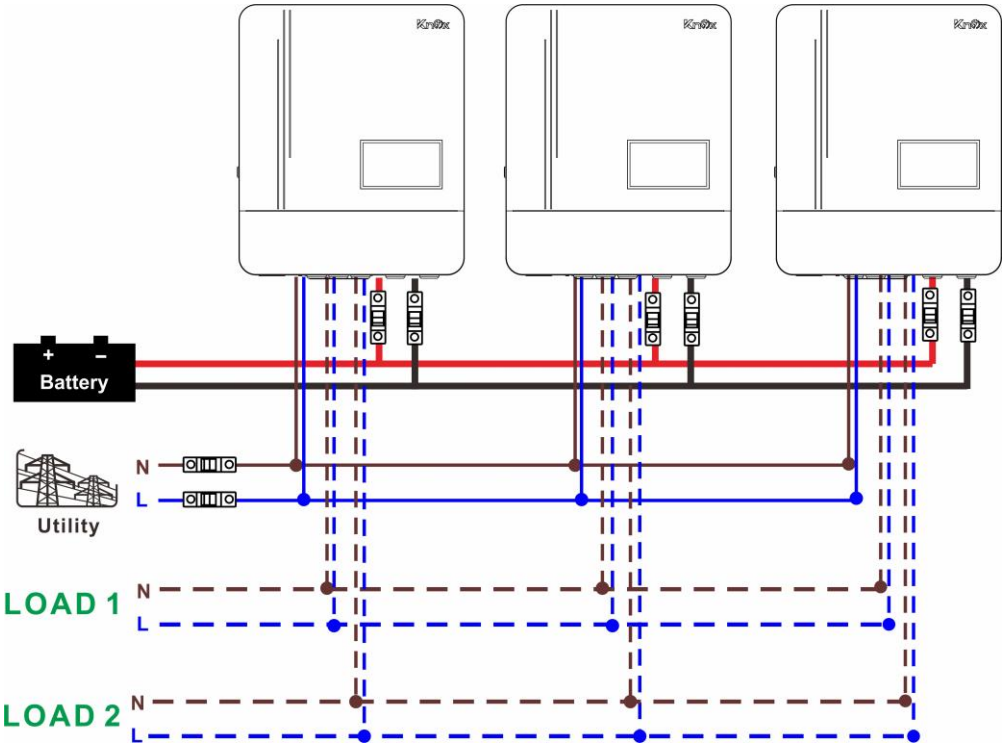


Communication Connection

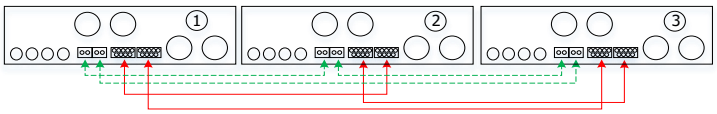


Three inverters in parallel:

Power Connection

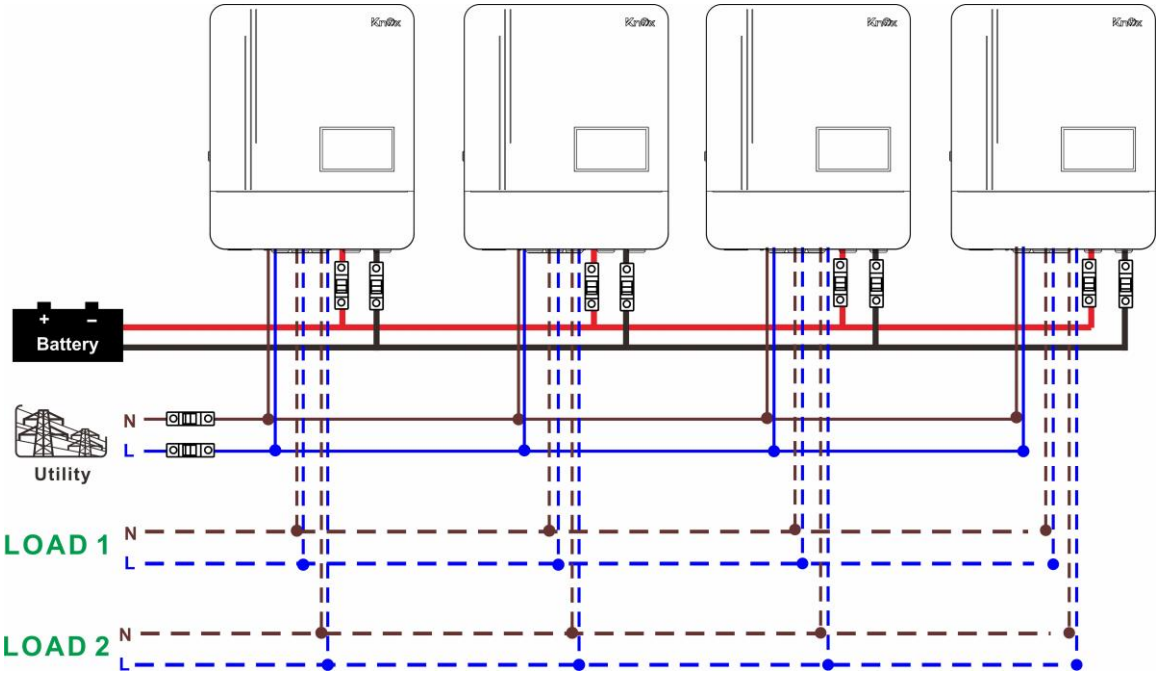


Communication Connection

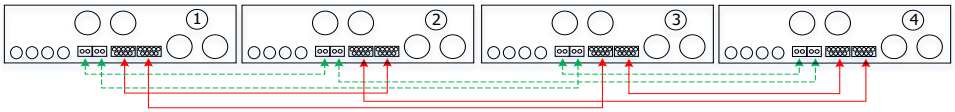


Four inverters in parallel:

Power Connection

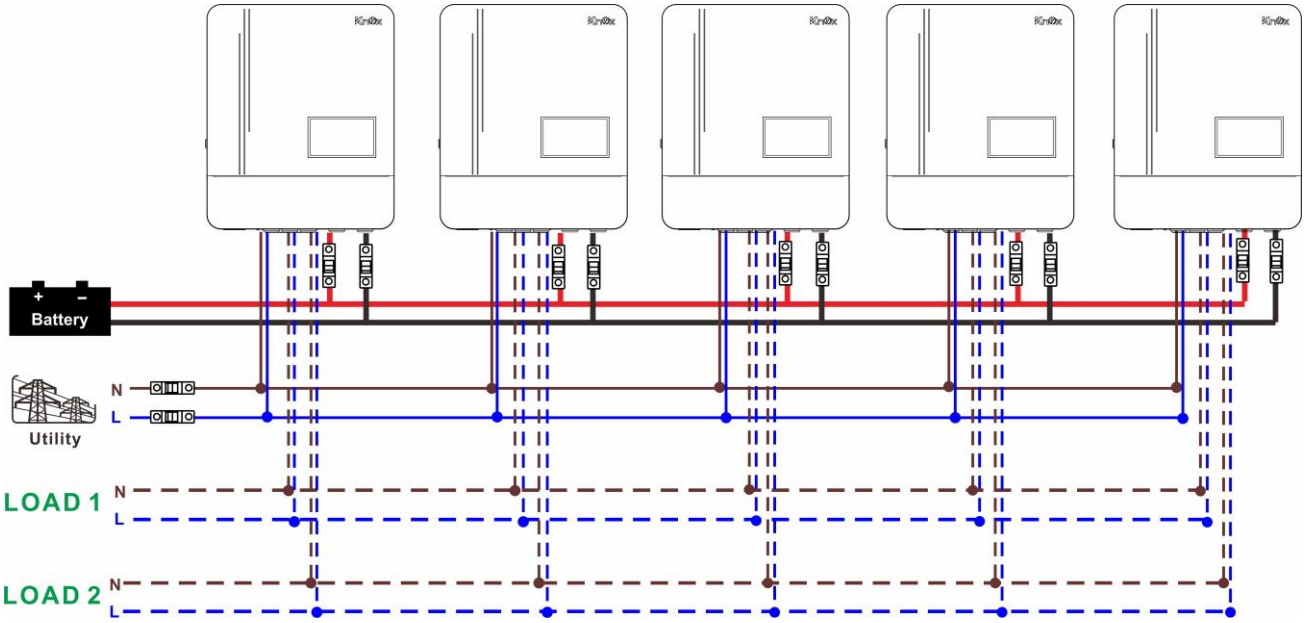


Communication Connection

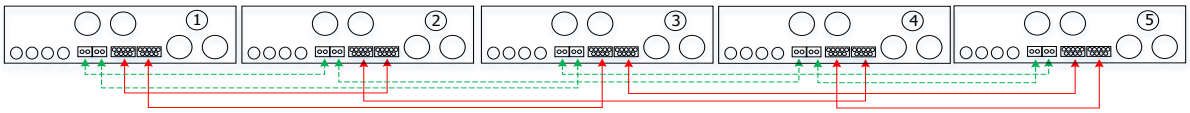


Five inverters in parallel:

Power Connection

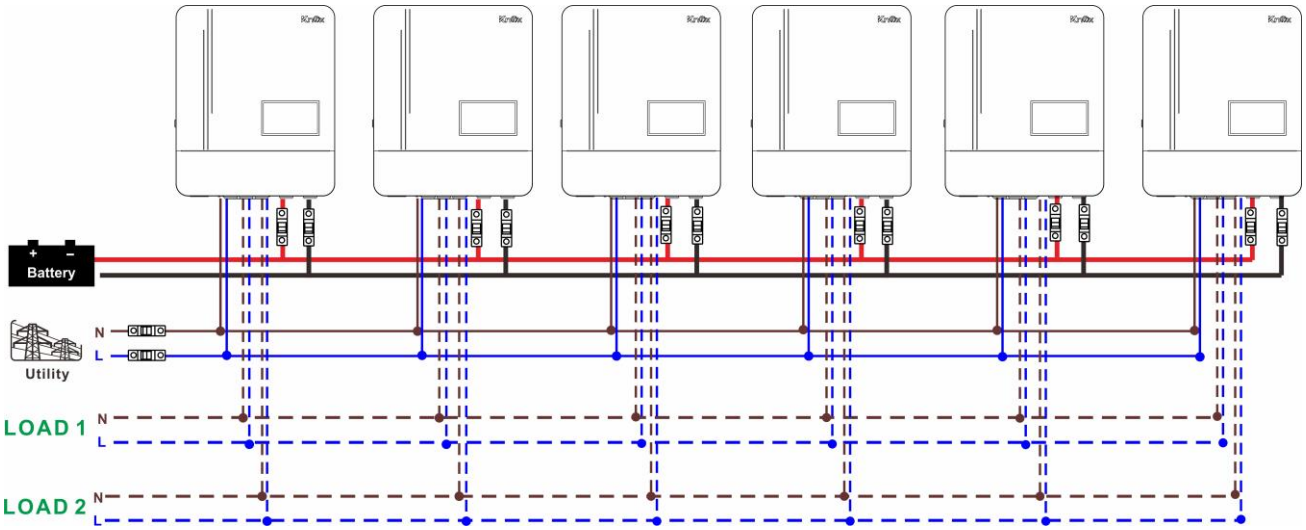


Communication Connection

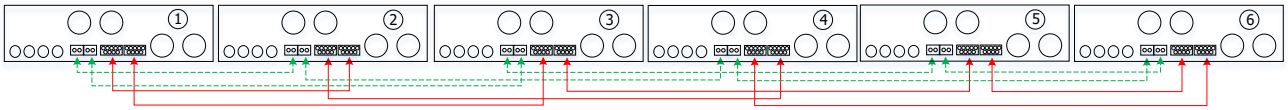


Six inverters in parallel:

Power Connection



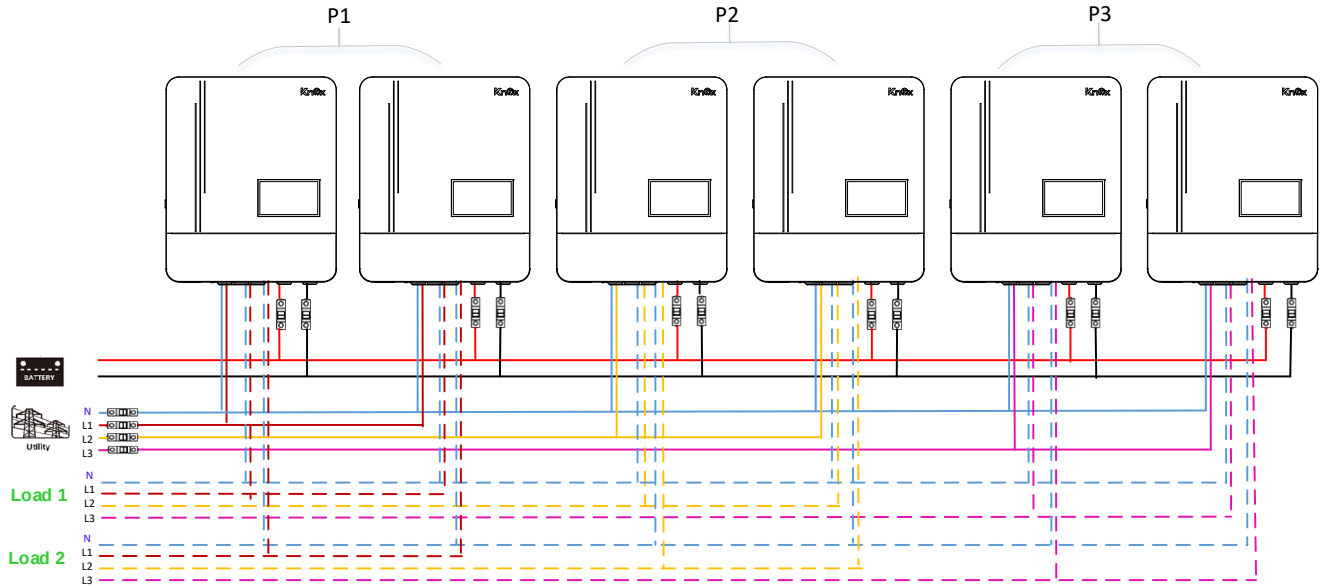
Communication Connection



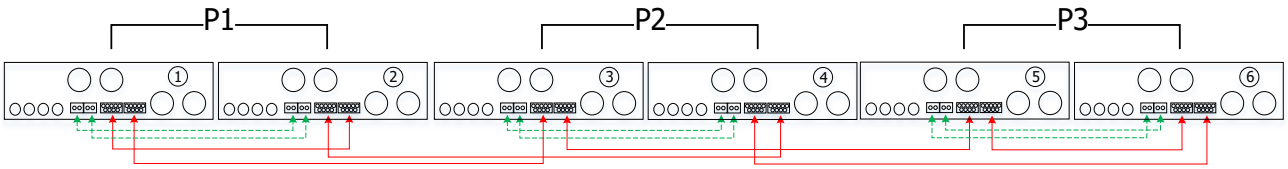
4-2. Support 3-phase equipment

Two inverters in each phase:

Power Connection

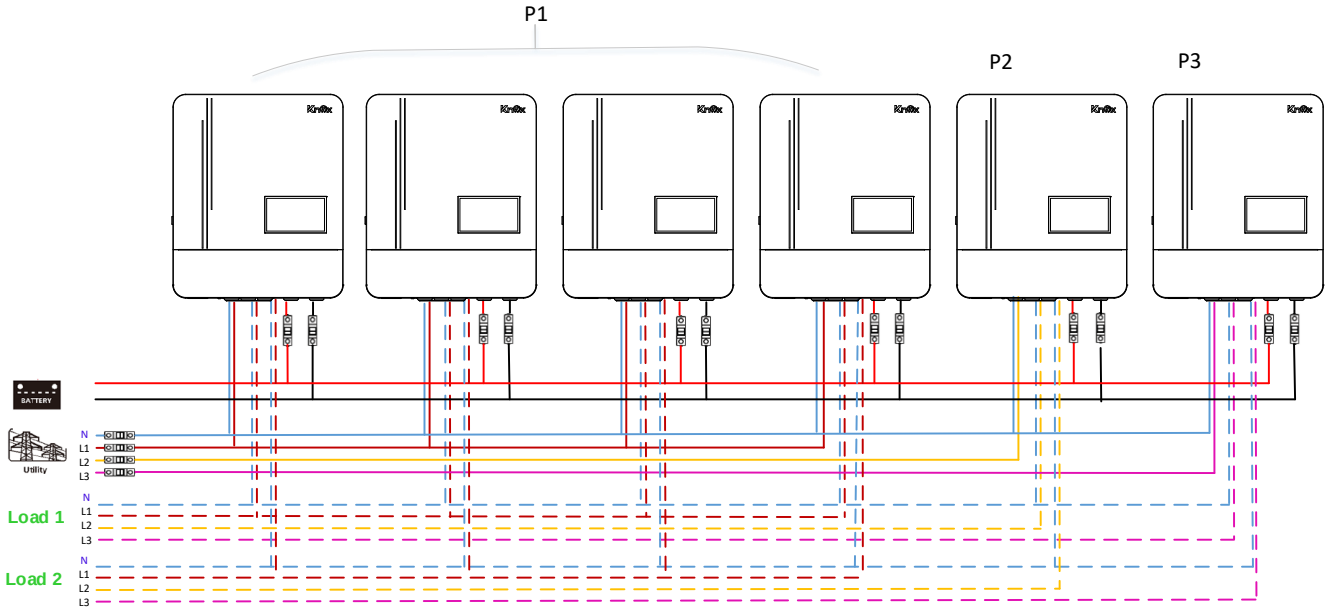


Communication Connection

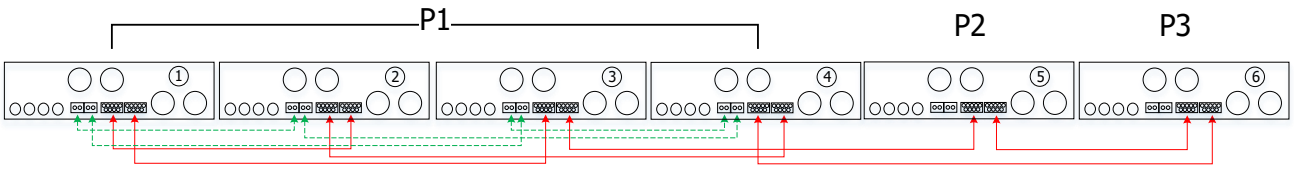


Four inverters in one phase and one inverter for the other two phases:

Power Connection

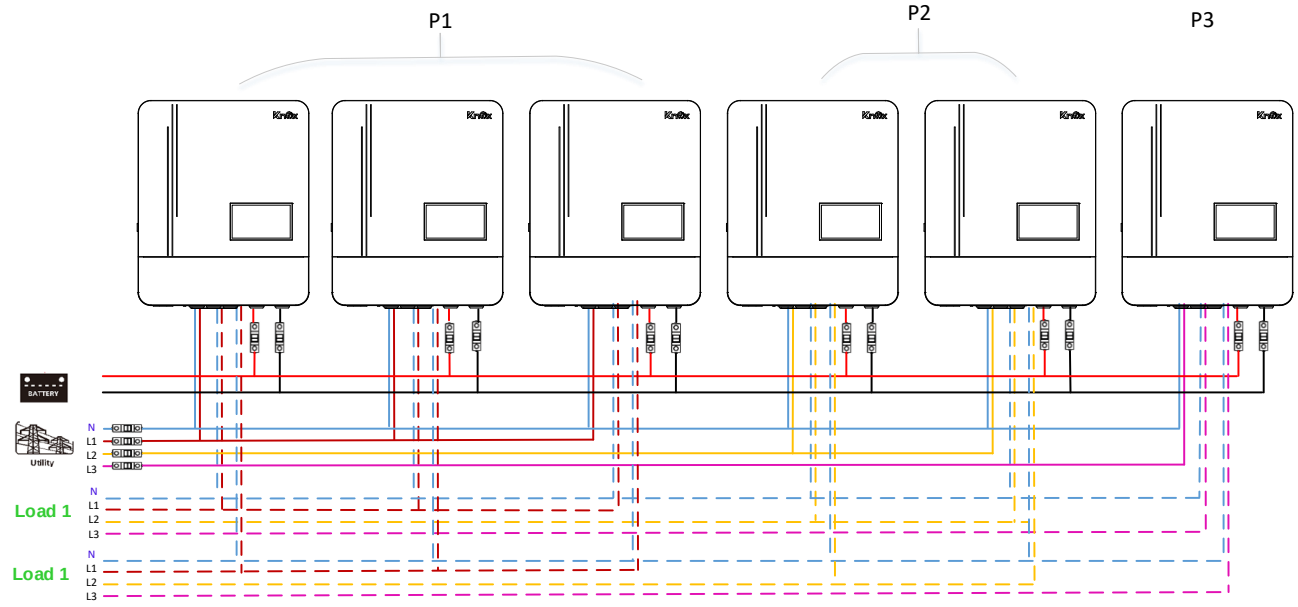


Communication Connection

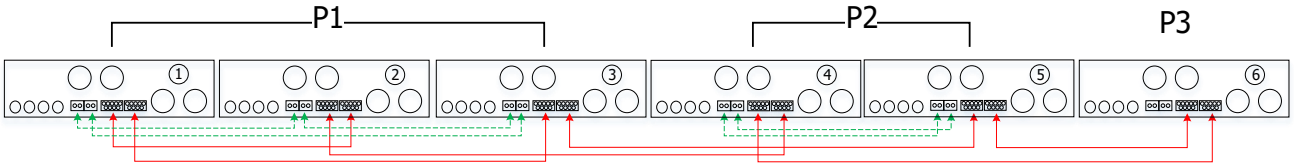


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

Power Connection

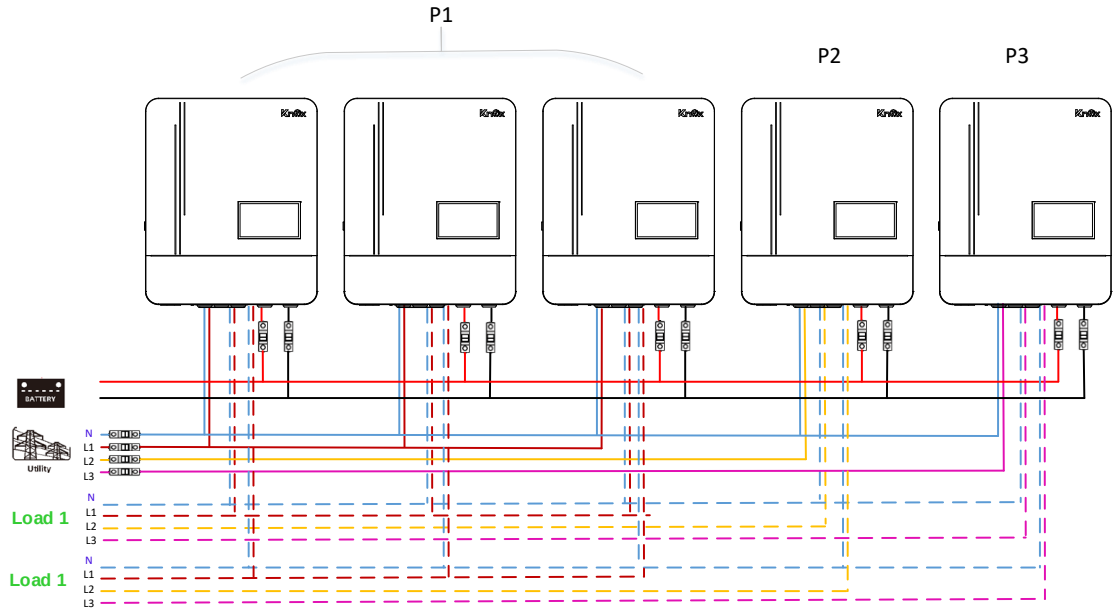


Communication Connection

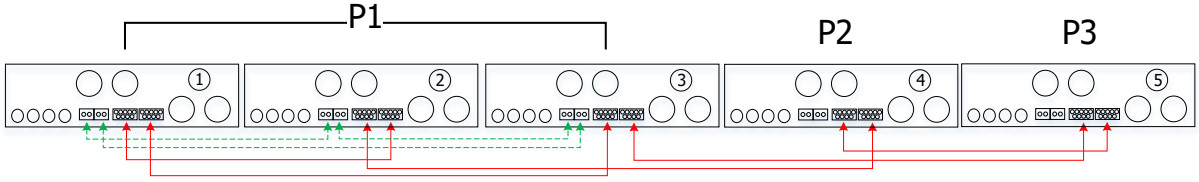


Three inverters in one phase and only one inverter for the remaining two phases:

Power Connection

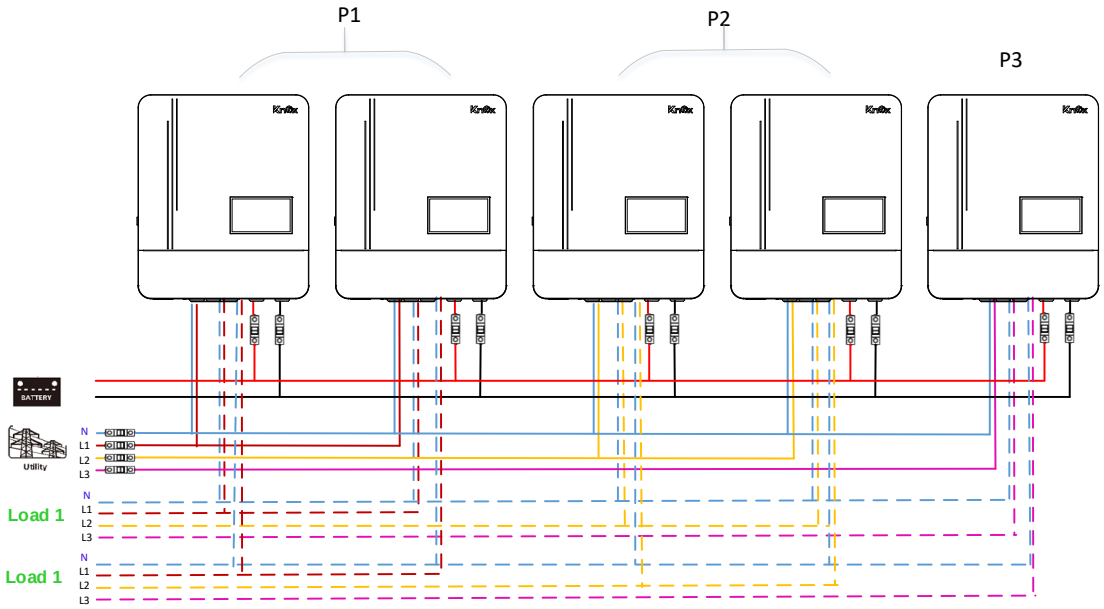


Communication Connection

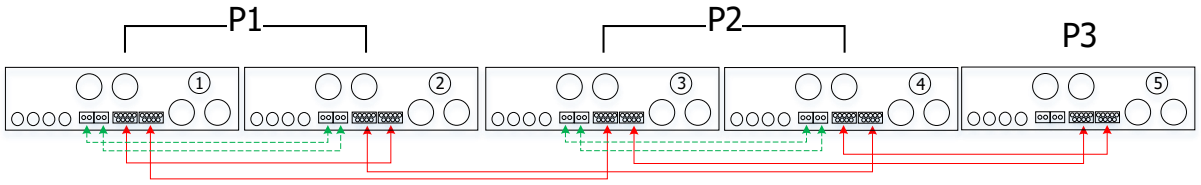


Two inverters in two phases and only one inverter for the remaining phase:

Power Connection

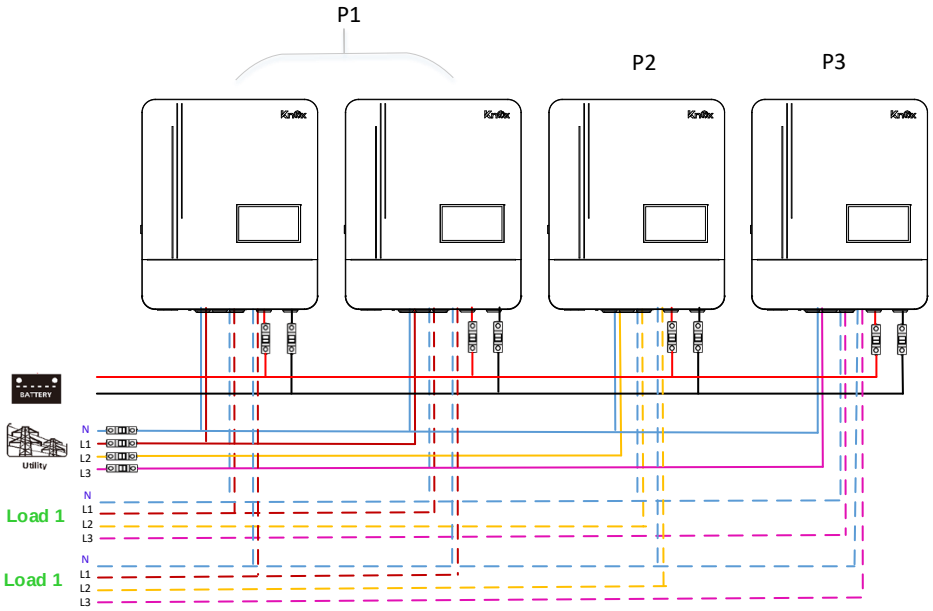


Communication Connection

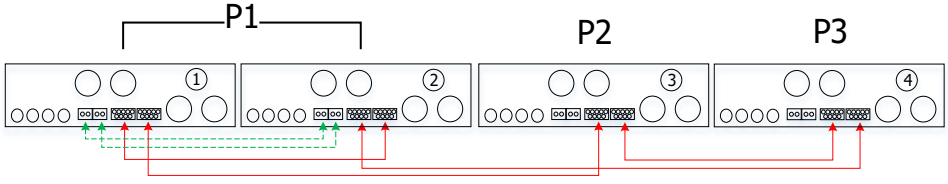


Two inverters in one phase and only one inverter for the remaining phases:

Power Connection

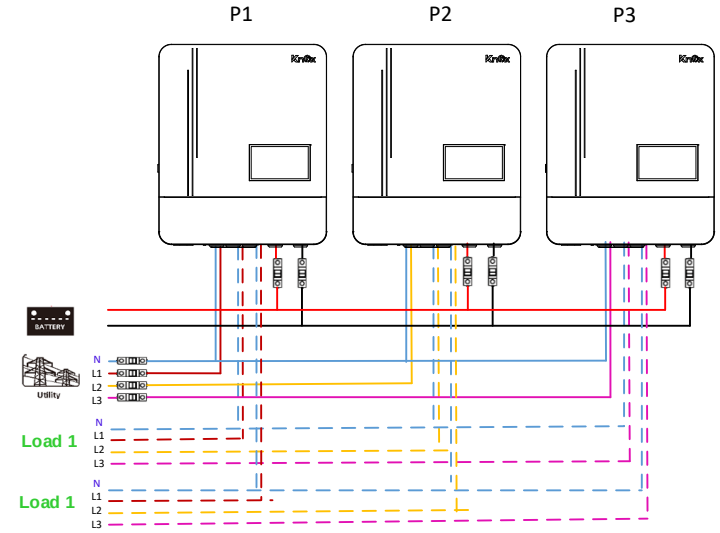


Communication Connection

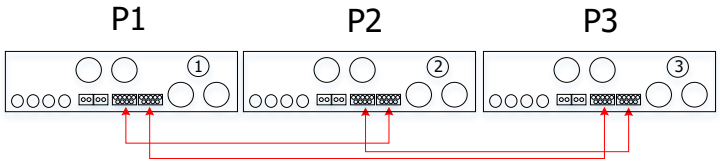


One inverter in each phase:

Power Connection



Communication Connection



WARNING: Do not connect the current sharing cable between the inverters which are in different phases. Otherwise, it may damage the inverters.

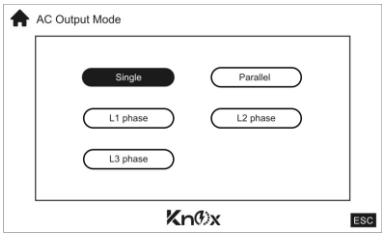
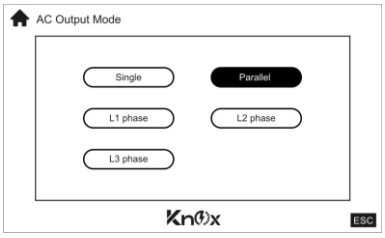
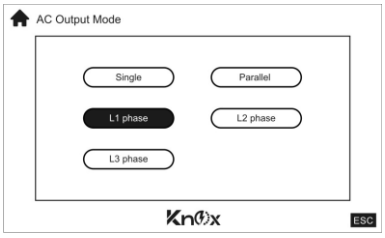
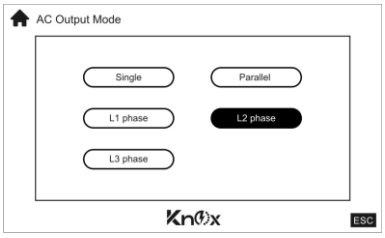
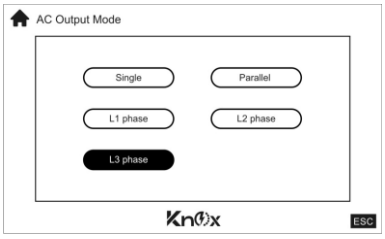
5. PV Connection

Please refer to user manual of single unit for PV Connection.

CAUTION: Each inverter should connect to PV modules separately.

6. LCD Setting and Display

Setting Program:

Program	Description	Selectable option	
28	AC output mode *This setting is able to set up only when the inverter is in standby mode. Be sure that on/off switch is in "OFF" status.	Single 	When the unit is operated alone, please select "Single" .
		Parallel 	When the units are used in parallel for single phase application, please select "Parallel". Please refer to 5-1 for detailed information.
		L1 phase: 	When the units are operated in 3-phase application, please choose "LX phase" to define each inverter. It is required to have at least 3 inverters or maximum 6 inverters to support three-phase equipment. It's required to have at least one inverter in each phase or it's up to four inverters in one phase. Please refers to 4-2 for detailed information. Please select "L1 phase" for the inverters connected to L1 phase, "L2 phase" for the inverters connected to L2 phase and "L3 phase" for the inverters connected to L3 phase. Be sure to connect share current cable to units which are on the same phase. Do NOT connect share current cable between units on different phases.
		L2 phase: 	
		L3 phase: 	

Code Reference:

Description	Icon on
Unidentified unit master or slave (During inverter initialization)	
Master unit	
Slave unit	
L1 phase	
L2 phase	
L3 phase	

7. Commissioning

Parallel in single phase

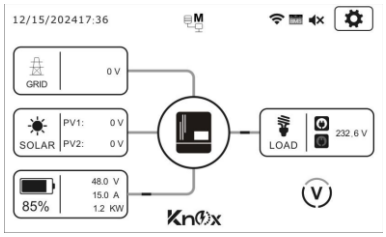
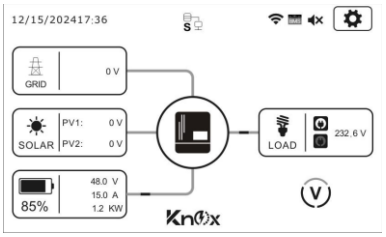
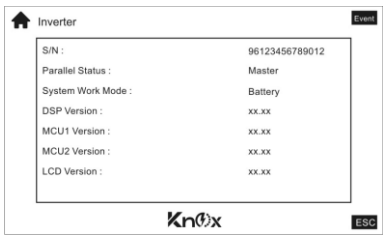
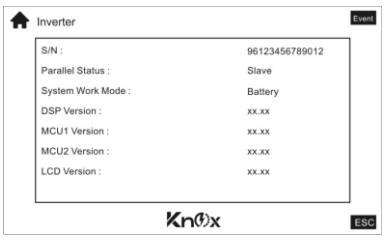
Step 1: Check the following requirements before commissioning:

- Correct wire connection
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

Step 2: Turn on each unit and set "Parallel" in LCD setting program 28 of each unit. And then shut down all units.

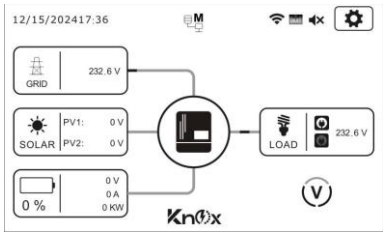
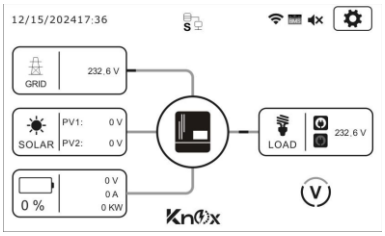
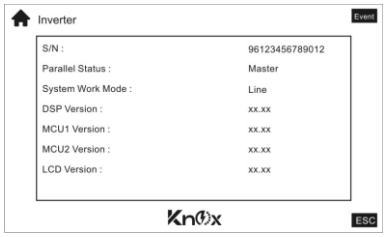
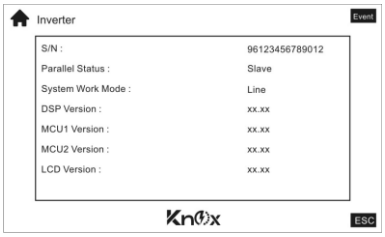
NOET: It's necessary to turn off switch when setting LCD program. Otherwise, the setting cannot be programmed.

Step 3: Turn on each unit.

LCD display in Master unit	LCD display in Slave unit
	
	

NOTE: Master and slave units are randomly defined.

Step 4: Switch on all AC breakers of Line wires in AC input. It's better to have all inverters connect to utility at the same time. If not, it will display fault 82 in following-order inverters.

LCD display in Master unit	LCD display in Slave unit
	
	

Step 5: If there is no more fault alarm, the parallel system is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

Support three-phase equipment

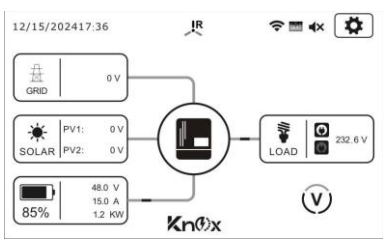
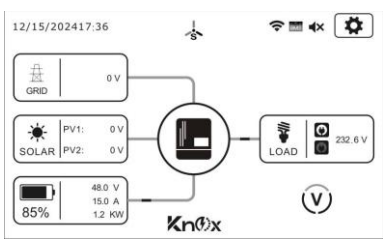
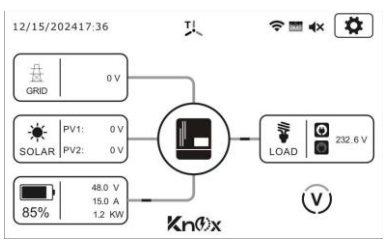
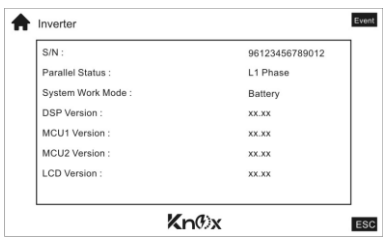
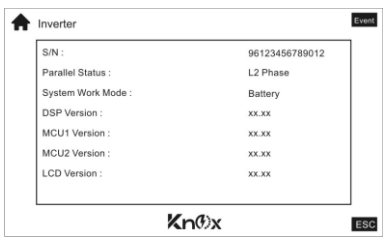
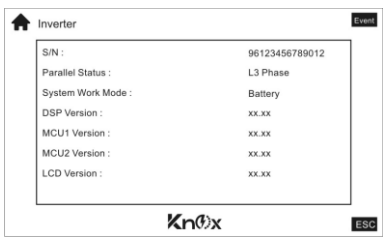
Step 1: Check the following requirements before commissioning:

- Correct wire connection
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

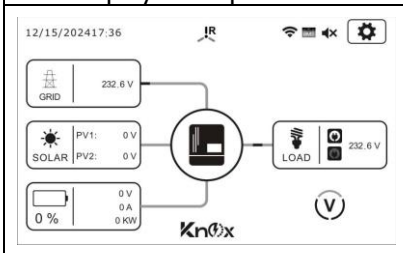
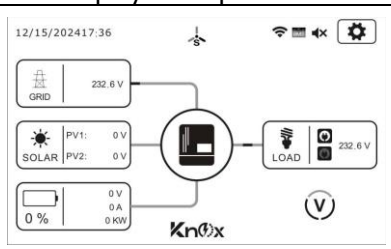
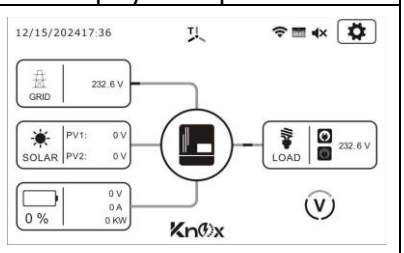
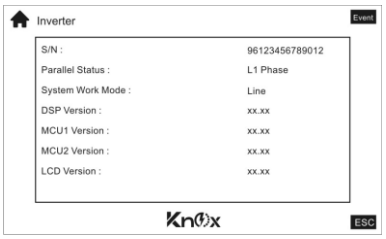
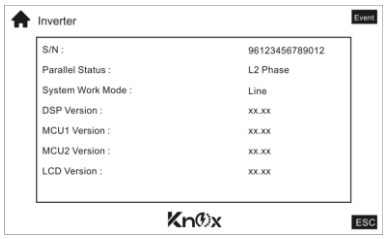
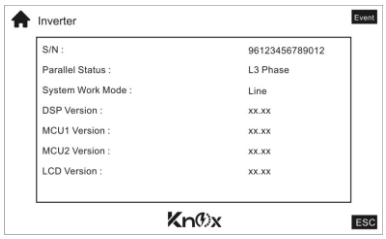
Step 2: Turn on all units and configure LCD program 28 as P1, P2 and P3 sequentially. And then shut down all units.

NOET: It's necessary to turn off switch when setting LCD program. Otherwise, the setting cannot be programmed.

Step 3: Turn on all units sequentially.

LCD display in L1-phase unit	LCD display in L2-phase unit	LCD display in L3-phase unit
		
		

Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and three phases are matched with unit setting, they will work normally.

LCD display in L1-phase unit	LCD display in L2-phase unit	LCD display in L3-phase unit
		
		

Step 5: If there is no more fault alarm, the system to support 3-phase equipment is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

Note 1: To avoid overload occurring, before turning on breakers in load side, it's better to have whole system in operation first.
Note 2: Transfer time for this operation exists. Power interruption may happen to critical devices, which cannot bear transfer time.

8. Trouble shooting

Situation		Solution
Fault Code	Fault Event Description	
20	Current feedback into the inverter is detected.	4. Restart the inverter. 5. Check if L/N cables are not connected reversely in all inverters. 6. For parallel system in single phase, make sure the sharing are connected in all inverters. For supporting three-phase system, make sure the sharing cables are connected in the inverters in the same phase, and disconnected in the inverters in different phases. 7. If the problem remains, please contact your installer.
33	The firmware version of each inverter is not the same.	1. Update all inverter firmware to the same version. 2. Check the version of each inverter via LCD setting and make sure the CPU versions are same. If not, please contact your installer to provide the firmware to update. 3. After updating, if the problem still remains, please contact your installer.
29	The output current of each inverter is different.	3. Check if sharing cables are connected well and restart the inverter. 4. If the problem remains, please contact your installer.
22	CAN data loss	3. Check if communication cables are connected well and restart the inverter. 4. If the problem remains, please contact your installer.
23	Host data loss	
24	Synchronization data loss	
25	The battery voltage of each inverter is not the same.	3. Make sure all inverters share same groups of batteries together. 4. Remove all loads and disconnect AC input and PV input. Then, check battery voltage of all inverters. If the values from all inverters are close, please check if all battery cables are the same length and same material type. Otherwise, please contact your installer to provide SOP to calibrate battery voltage of each inverter. 5. If the problem still remains, please contact your installer.

26	AC input voltage and frequency are detected different.	3. Check the utility wiring conncetion and restart the inverter. 4. Make sure utility starts up at same time. If there are breakers installed between utility and inverters, please be sure all breakers can be turned on AC input at same time. 5. If the problem remains, please contact your installer.
27	AC output current unbalance	3. Restart the inverter. 4. Remove some excessive loads and re-check load information from LCD of inverters. If the values are different, please check if AC input and output cables are in the same length and material type. 5. If the problem remains, please contact your installer.
28	AC output mode setting is different.	4. Switch off the inverter, check LCD setting on the AC output mode. 5. For parallel system in single phase, make sure no L1 phase, L2 phase or L3 phase is set on "AC Output Mode". For supporting three-phase system, please select L1, L2 or L3 phase, not "Parallel". 6. If the problem remains, please contact your installer.

Appendix II: BMS Communication Installation

1. Introduction

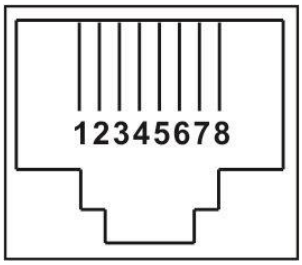
If connecting to lithium battery, it is recommended to purchase a custom-made RJ45 communication cable. Please check with your dealer or integrator for details.

This custom-made RJ45 communication cable delivers information and signal between lithium battery and the inverter. These information are listed below:

- Re-configure charging voltage, charging current and battery discharge cut-off voltage according to the lithium battery parameters.
- Have the inverter start or stop charging according to the status of lithium battery.

2. Pin Assignment for BMS Communication Port

	Definition
PIN 1	RS232TX
PIN 2	RS232RX
PIN 3	RS485B
PIN 4	NC



3. Introduction

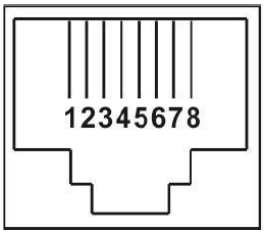
If connecting to lithium battery, it is recommended t RJ45 communication cable. Please check with your dealer or integrator for details.

This custom-made RJ45 communication cable delivers information and signal between lithium battery and the inverter. These information are listed below:

- Re-configure charging voltage, charging current and battery discharge cut-off voltage according to the lithium battery parameters.
- Have the inverter start or stop charging according to the status of lithium battery.

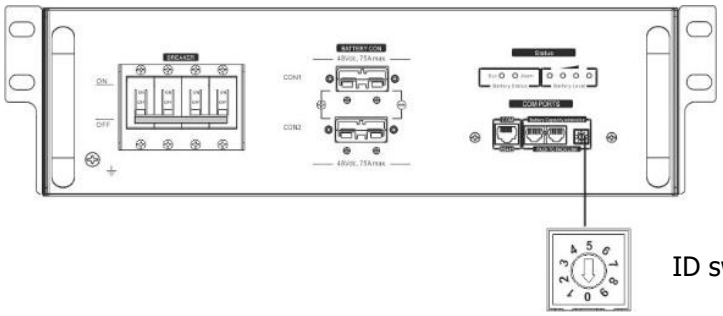
4. Pin Assignment for BMS Communication Port

	Definition
PIN 1	RS232TX
PIN 2	RS232RX
PIN 3	RS485B
PIN 4	NC
PIN 5	RS485A
PIN 6	CANH
PIN 7	CANL
PIN 8	GND



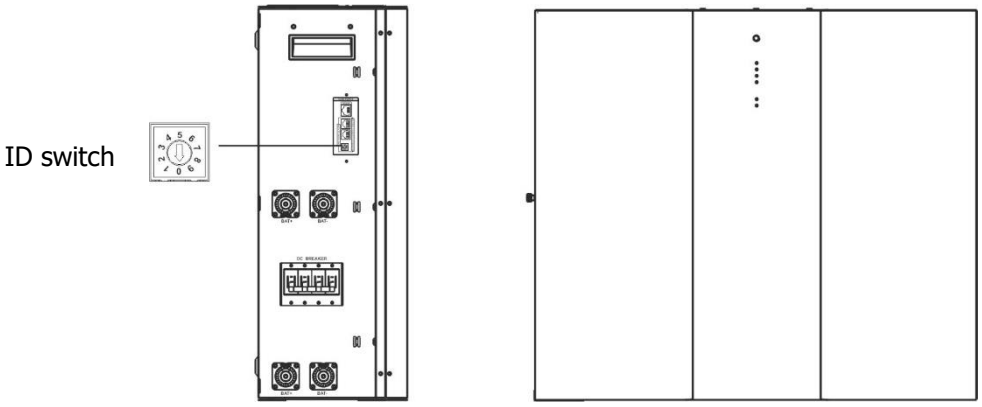
5. Lithium Battery Communication Configuration

LIO-4810-150A



ID switch

ESS LIO-I 4810



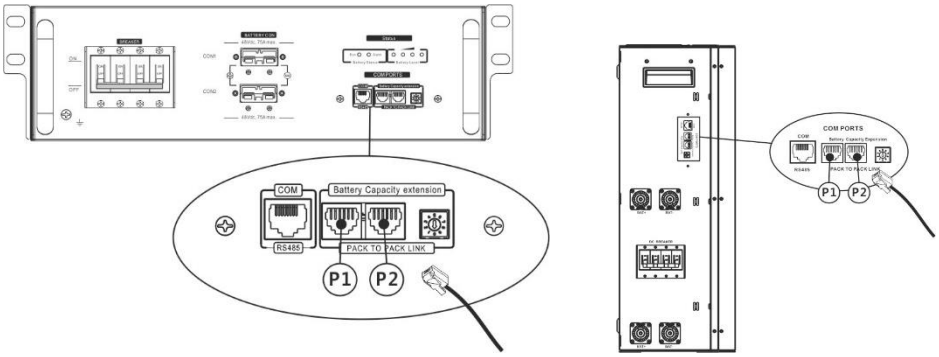
ID Switch indicates the unique ID code for each battery module. It's required to assign a unique ID to each battery module for normal operation. We can set up the ID code for each battery module by rotating the PIN number on the ID switch. From number 0 to 9, the number can be random; no particular order. Maximum 10 battery modules can be operated in parallel.

6. Installation and Operation

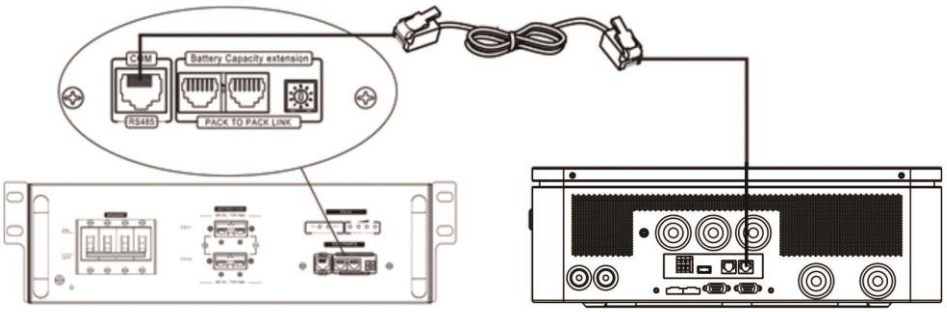
LIO-4810-150A/ESS LIO-I 4810

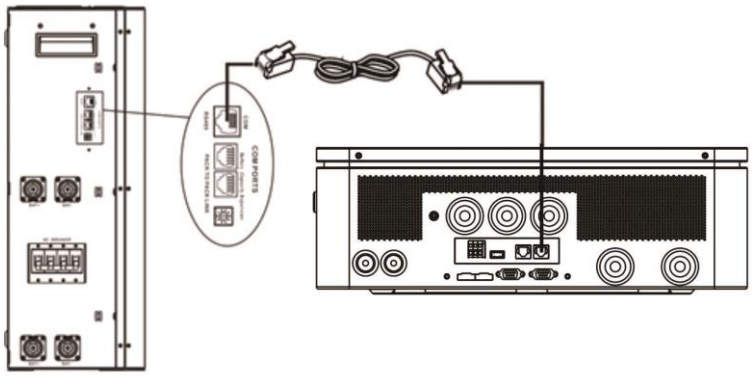
After ID no. is assigned for each battery module, please set up LCD panel in inverter and install the wiring connection as following steps.

Step 1: Use supplied RJ11 signal cable to connect into the extension port (P1 or P2).



Step 2: Use supplied RJ45 cable (from battery module package) to connect inverter and Lithium battery.



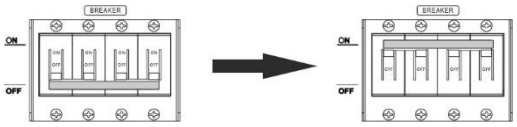


*** For multiple battery connection, please check battery manual for the details.**

Note for parallel system:

1. Only support common battery installation.
2. Use custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set this inverter battery type to "KNOX" in LCD program 5. Others should be "USE".

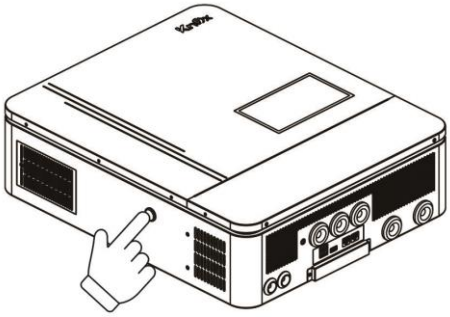
Step 3: Turn the breaker switch "ON". Now, the battery module is ready for DC output.



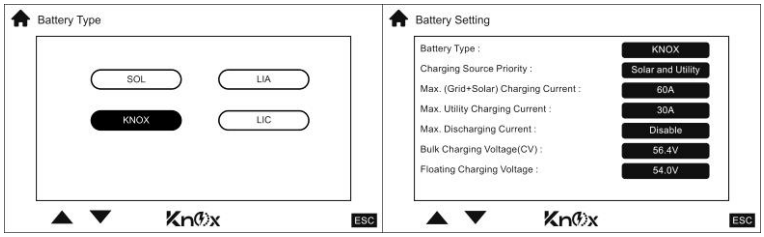
Step 4: Press Power on/off button on battery module for 5 secs, the battery module will start up.

*If the manual button cannot be approached, just simply turn on the inverter module. The battery module will be automatically turned on.

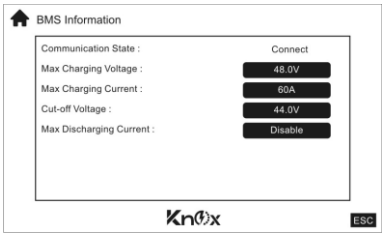
Step 5: Turn on the inverter.



Step 6. Be sure to select battery type as "KNOX" in LCD.



If communication between the inverter and battery is successful, The communication status on the BMS page will show connect.



Active Function

This function is to activate lithium battery automatically while commissioning. After battery wiring and commissioning is successfully, if battery is not detected, the inverter will automatically activate battery if the inverter is powered on.

Appendix II: The Wi-Fi Operation Guide

1. Introduction

Wi-Fi module can enable wireless communication between solar inverters and the monitoring platform. Users can remotely monitor and control their inverters when they combine the Wi-Fi module with KNOXHYBRID APP. The App uses the Wi-Fi chip to provide remote monitoring data services, which is beneficial for the daily data monitoring of the inverter, querying the real-time data in the device, sending commands from the device, and operating the device remotely. The app is available for both iOS and Android.

2. Knox APP

2-1. Download and install APP

Please find "KNOXHYBRID" APP from Apple® store or Google® Play Store. Install this APP in your mobile phone.

Or scan the following QR code with your smart phone and download KNOXHYBRID APP.

(Android system)

(iOS system)

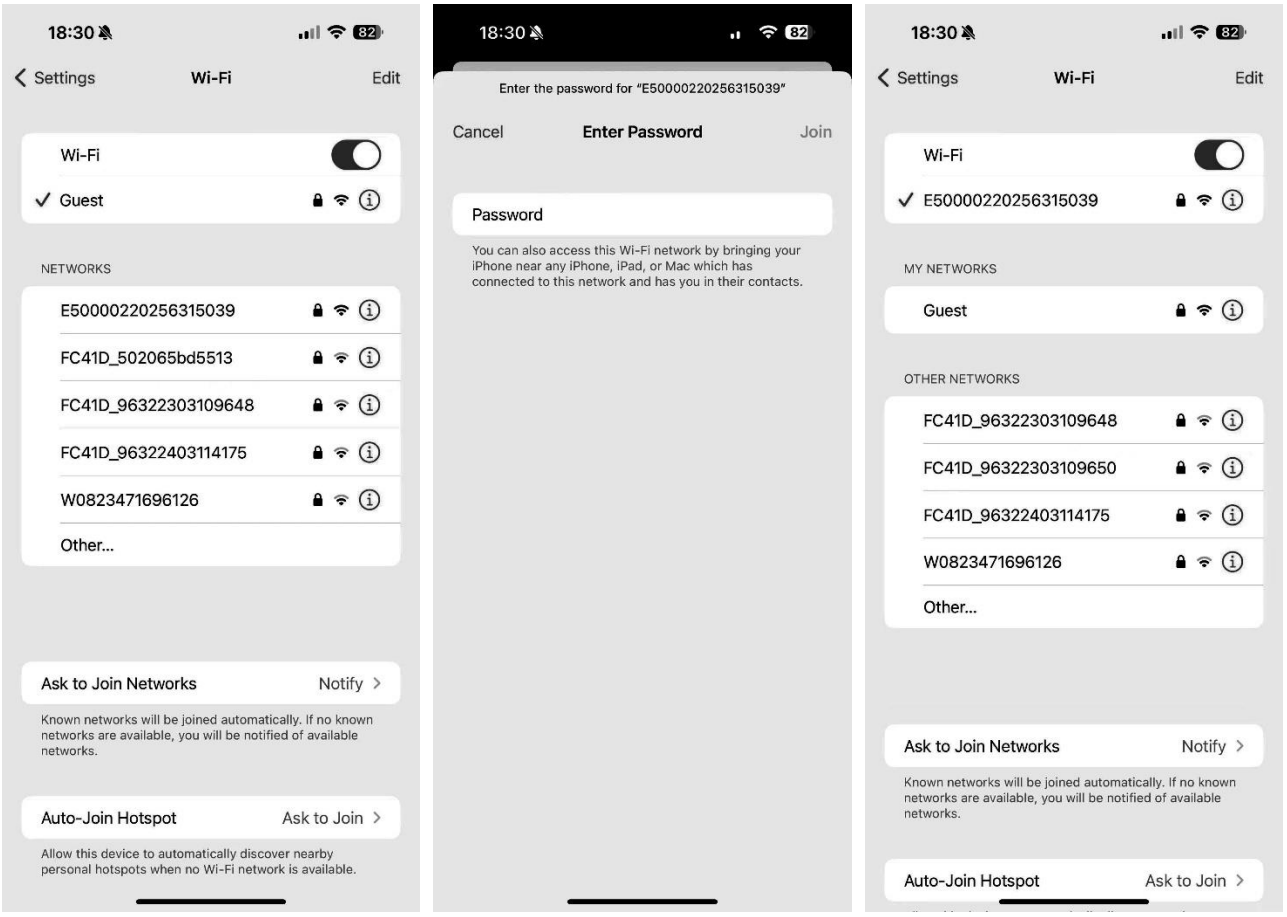
2-2. Initial Setup

Use the KNOXHYBRID app to configure the Wi-Fi module's network via local Wi-Fi or Bluetooth.

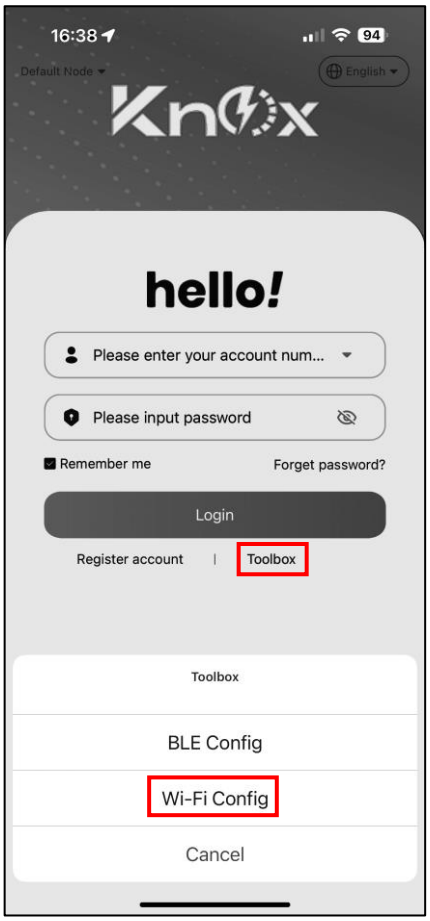
Local Wi-Fi Configuration

If you have configured the network through Bluetooth, please skip this section.

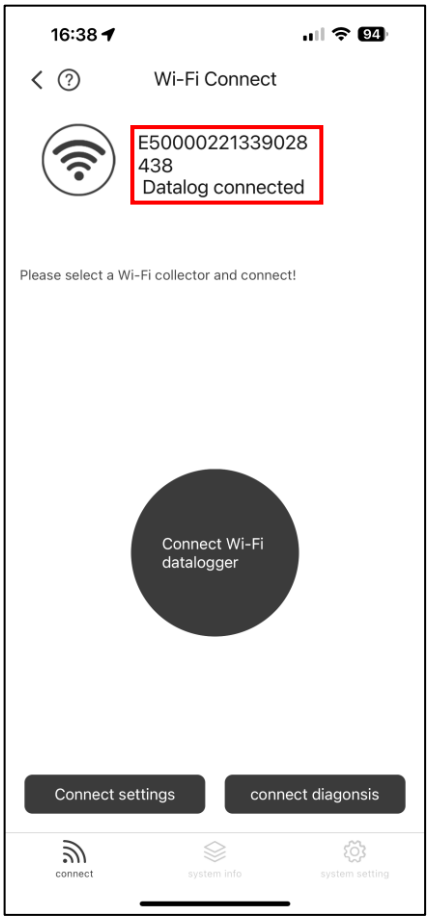
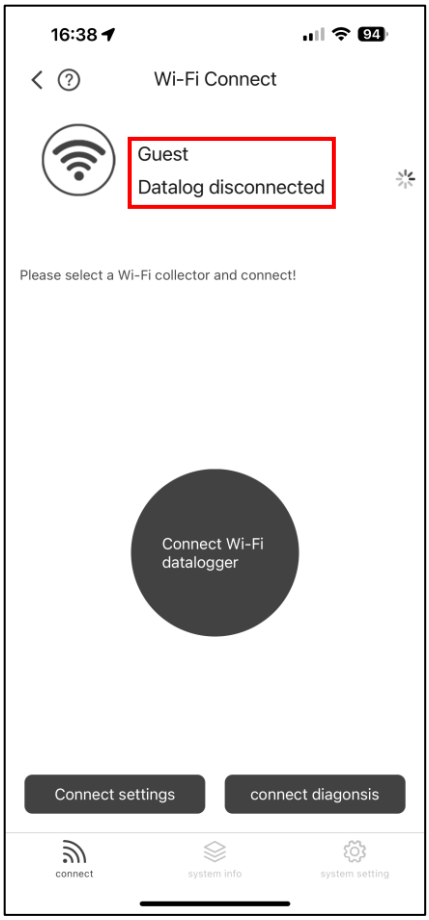
- Turn on the unit.
- Open the Wi-Fi settings on your smartphone.
- Connect your smartphone to the Wi-Fi module (the module's PN number is 18 digits).
- The default password is 12345678



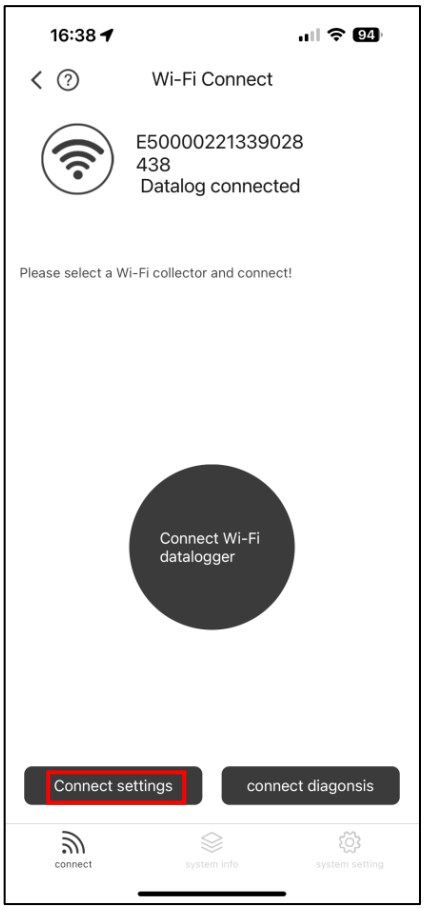
- After a successful Wi-Fi connection, open the KNOXHYBRID app on your phone. On the login page, select "Toolbox," then "Wi-Fi Config" to access the Wi-Fi configuration settings.

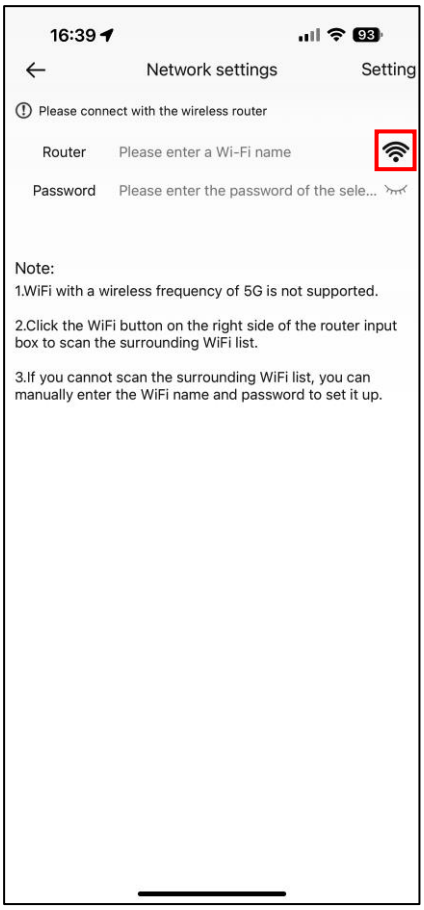


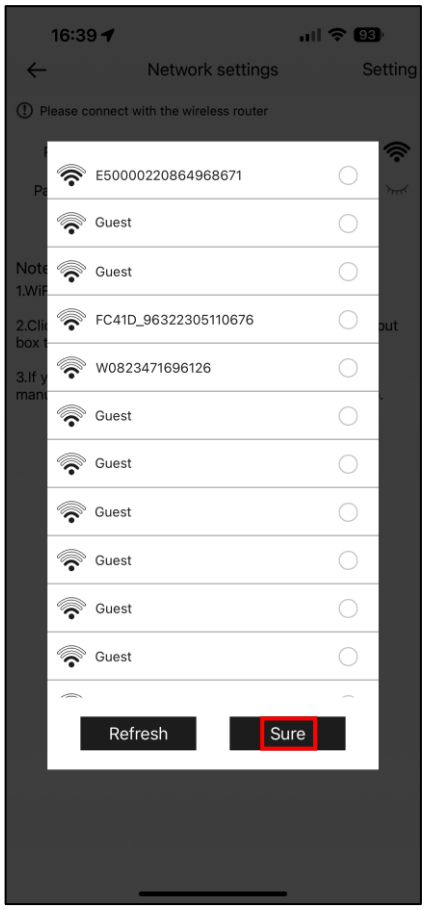
- After entering the Wi-Fi configuration page, please note that the connected Wi-Fi name **must** be the **same as your Wi-Fi module PN number**, and the status **must** be **connected**. If not, please return to the login page, connect your smart phone to the Wi-Fi module, and re-enter the Wi-Fi configuration page.

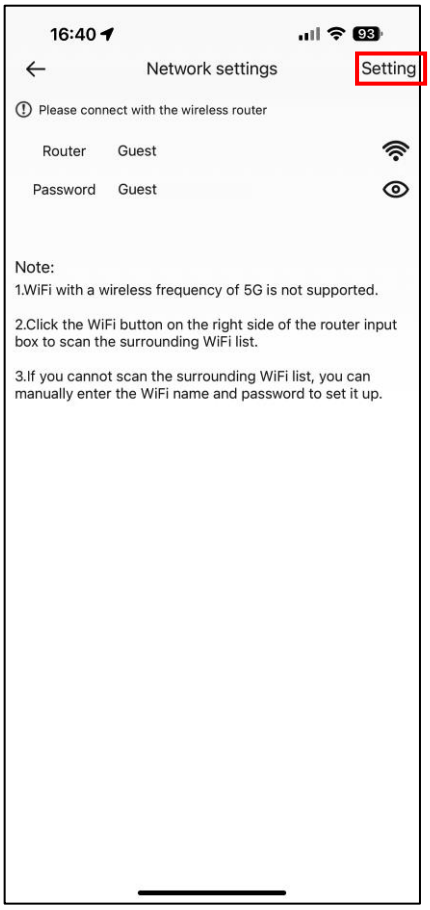
The Wi-Fi module connection is **successfully**	The Wi-Fi module connection **failed**
You can proceed to the next step to configure the network. 	Please return to the login page, connect your smart phone to the Wi-Fi module, and re-enter the Wi-Fi configuration page. 

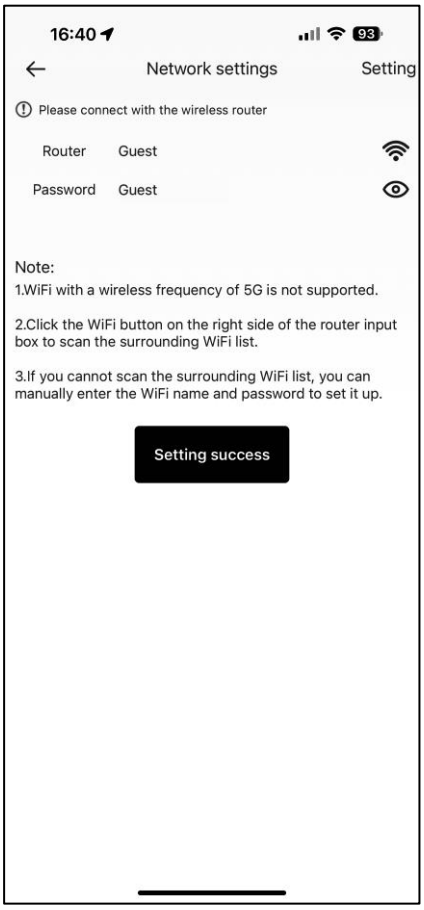
- Click “Connect settings” to manually enter the router name or click to choose the router name. Then, enter the router password and click the "Setting" to complete the setting.
  The Wi-Fi module only could connect the router at **2.4GHz**.



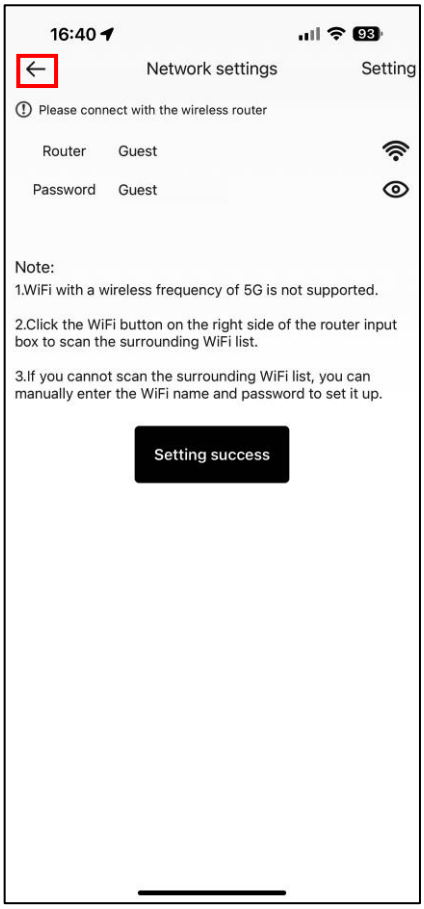


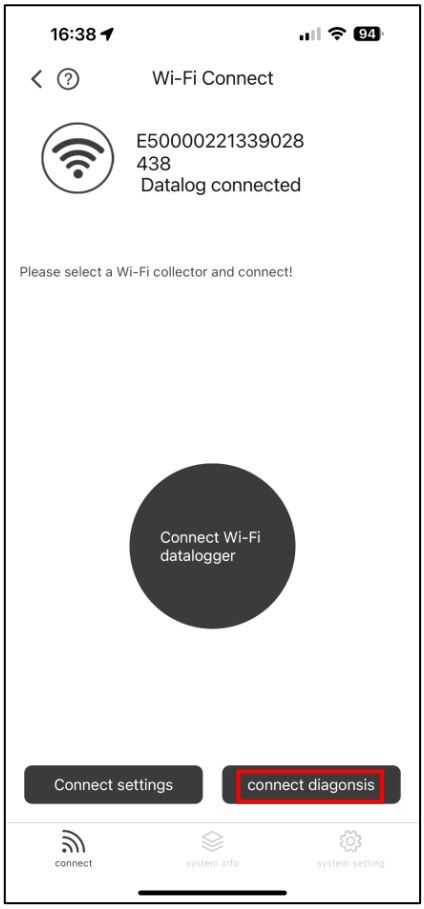


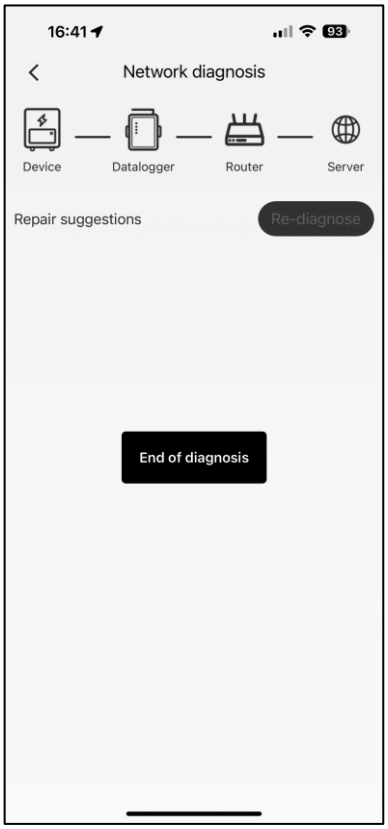
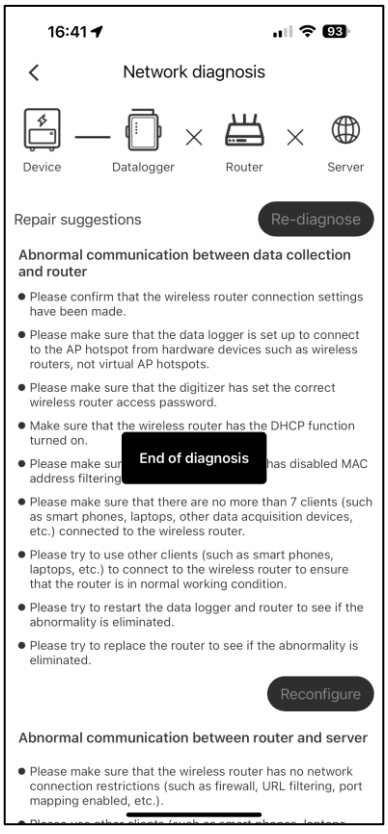




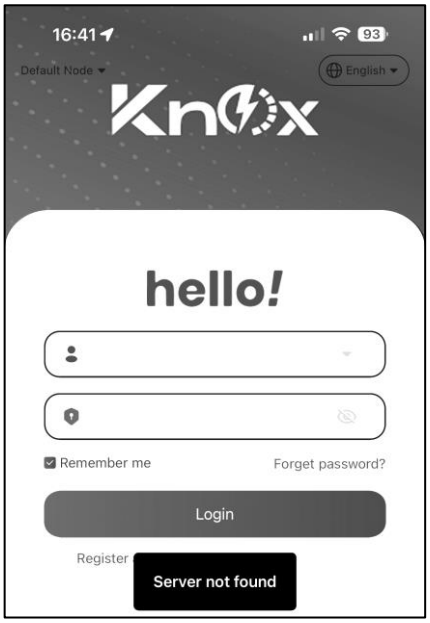
- Click ← to return to the Wi-Fi configuration page. Click "Connect diagnosis" to check the connection status.





The configuration is **successfully**	The configuration **failed**
Green lines between device, datalogger, router, and server. 	Red crosses between device, datalogger, router, and server. Please refer to APP instructions to re-configure. 

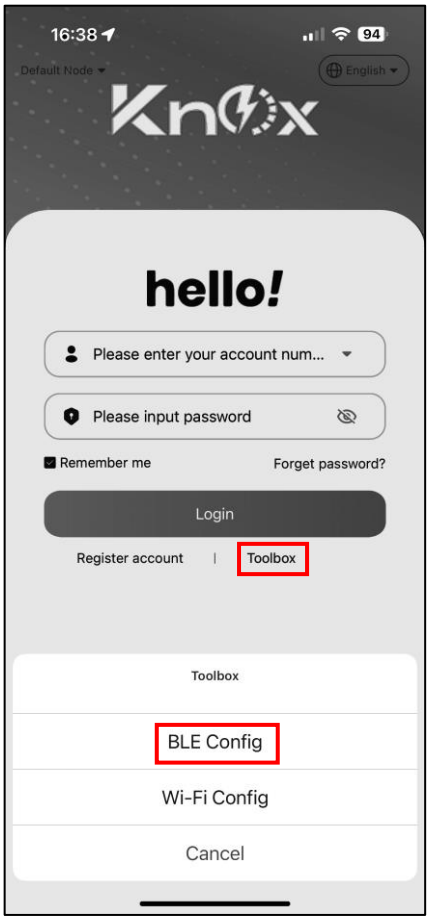
- After configuring Wi-Fi, please **forget** the Wi-Fi module on your smartphone to avoid automatic reconnection and unable to access the network. The login page will prompt "Server not found".



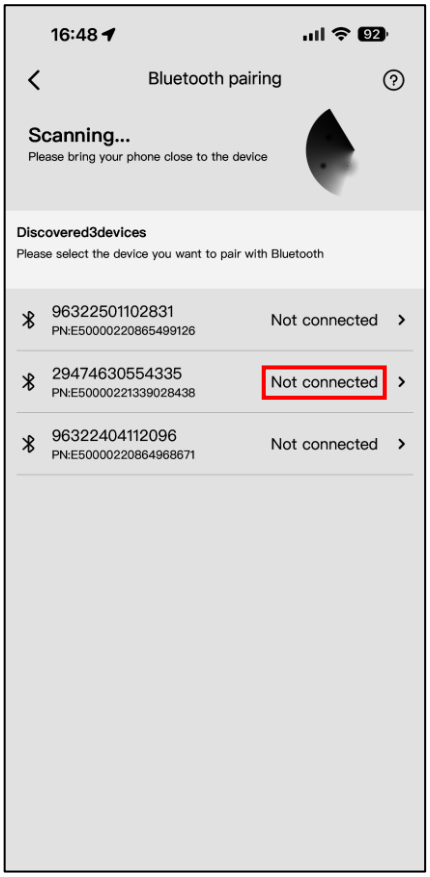
Bluetooth Configuration

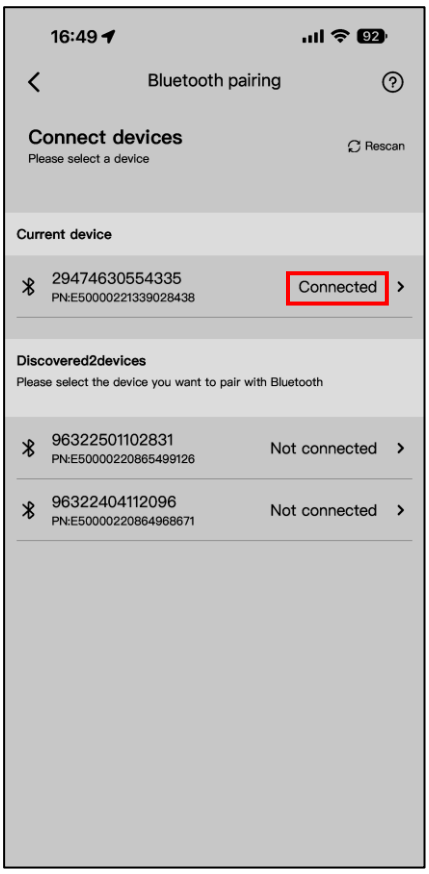
If you have configured the network through Wi-Fi, please skip this section.

- Turn on the unit.
- Open the Bluetooth from your smart phone.
- Click the KNOXHYBRID APP installed in the phone to enter the login page. Then, click the "Toolbox" and choose "BLE Config" to enter the Bluetooth configuration page.

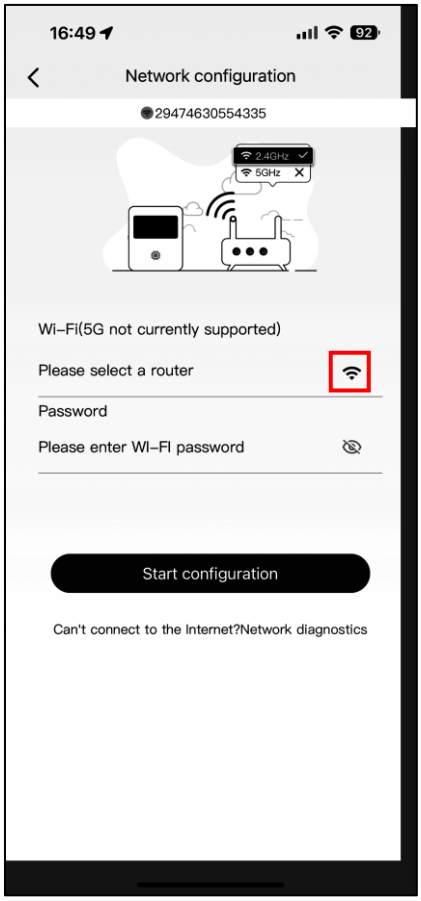


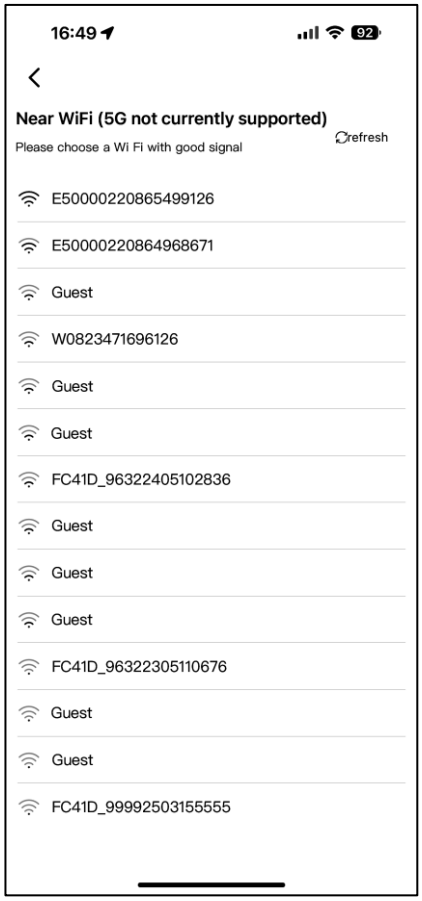
- Connect your smartphone to the Wi-Fi module through Bluetooth.

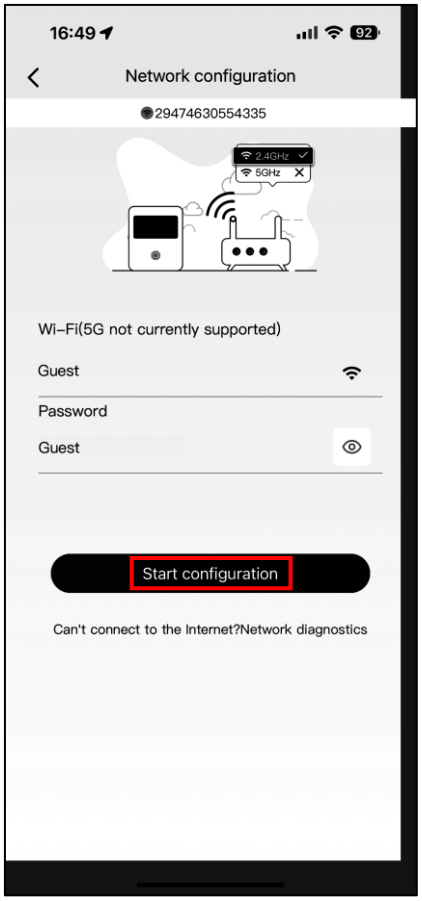


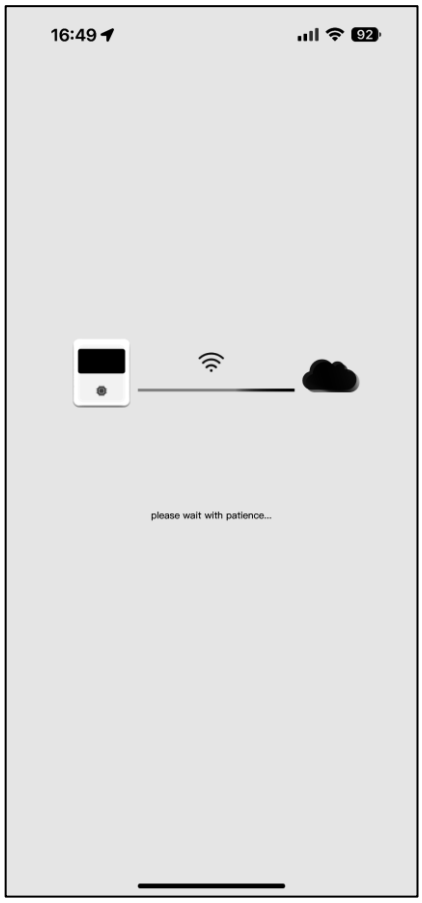


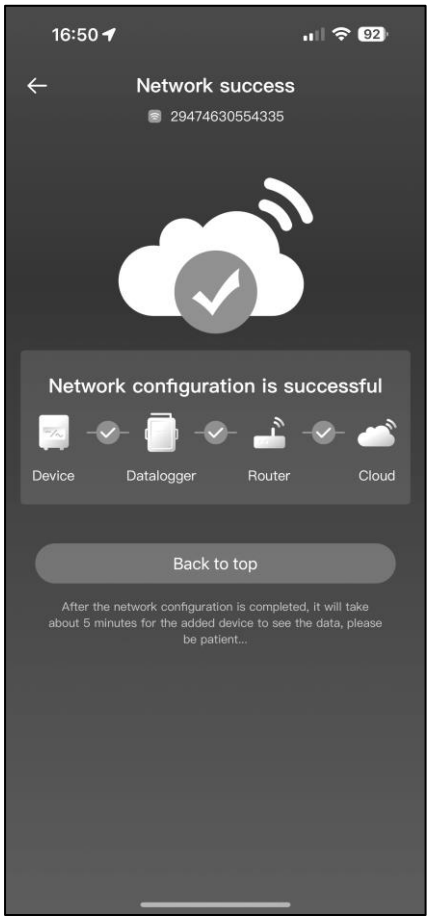
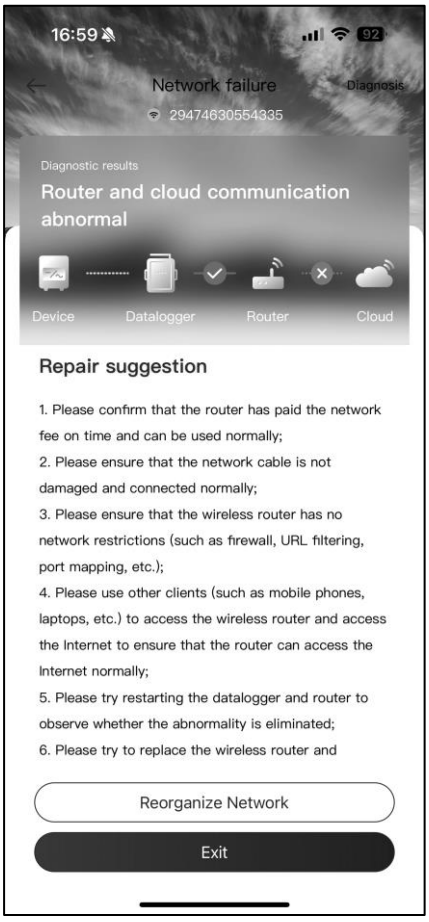
- Manually enter the router name or click  to choose the router name, enter the router password, and then click the "Setting" to complete the setting. Click “Start configuration” to check the connection status. The Wi-Fi module only could connect the router at **2.4GHz**.



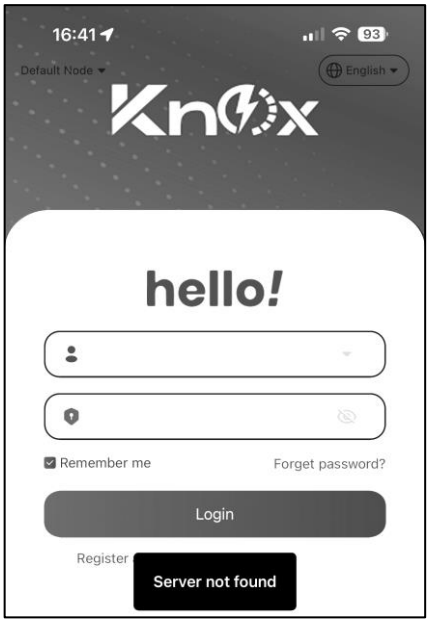






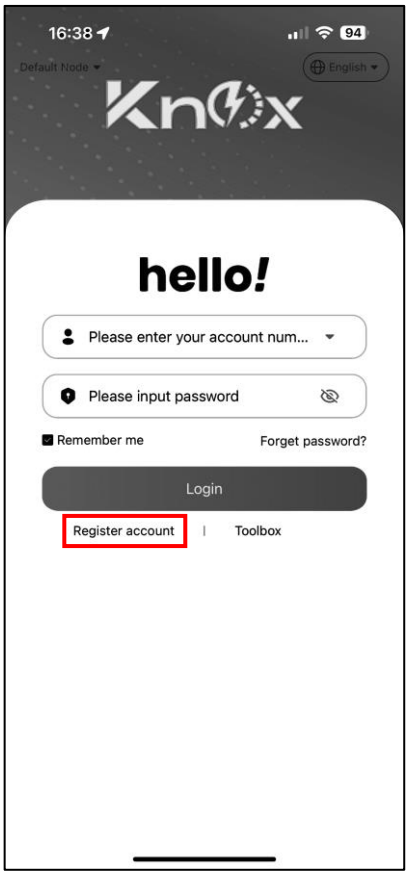
The configuration is **successfully**	The configuration **failed**
Green lines between device, datalogger, router, and server. 	Red crosses between device, datalogger, router, and server. Please refer to APP instructions to reconfigure. 

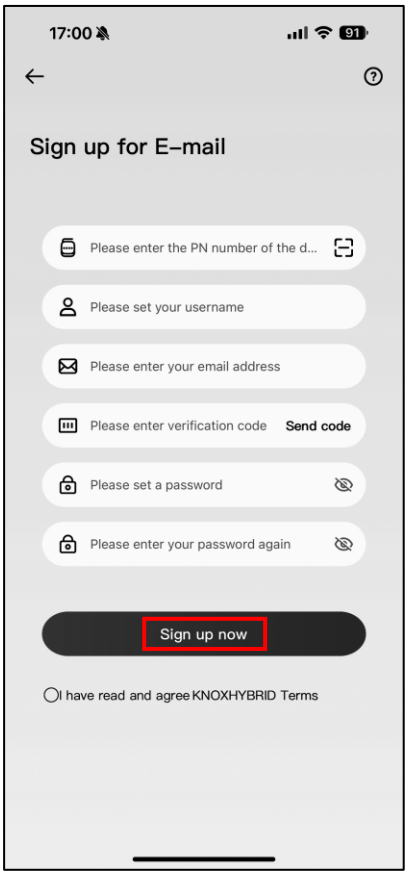
- After configuring Bluetooth, please **disconnect** the Wi-Fi module from your smartphone's Bluetooth settings to prevent automatic reconnection and unable to access the network. The login page will prompt "Server not found".

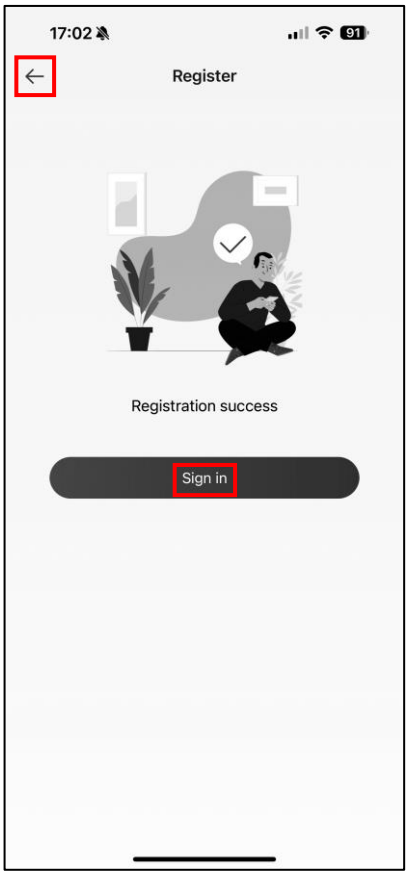


2-3 Registration and login

- Connect your smart phone to the router.
- Registration at first time.
- Click the "Register" to enter registration page and fill in the information. Once registration is complete, click "Sign in" or click ← to return to the home page. Then, enter the registered username and password to log in.

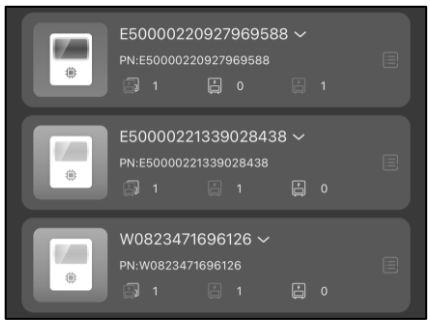






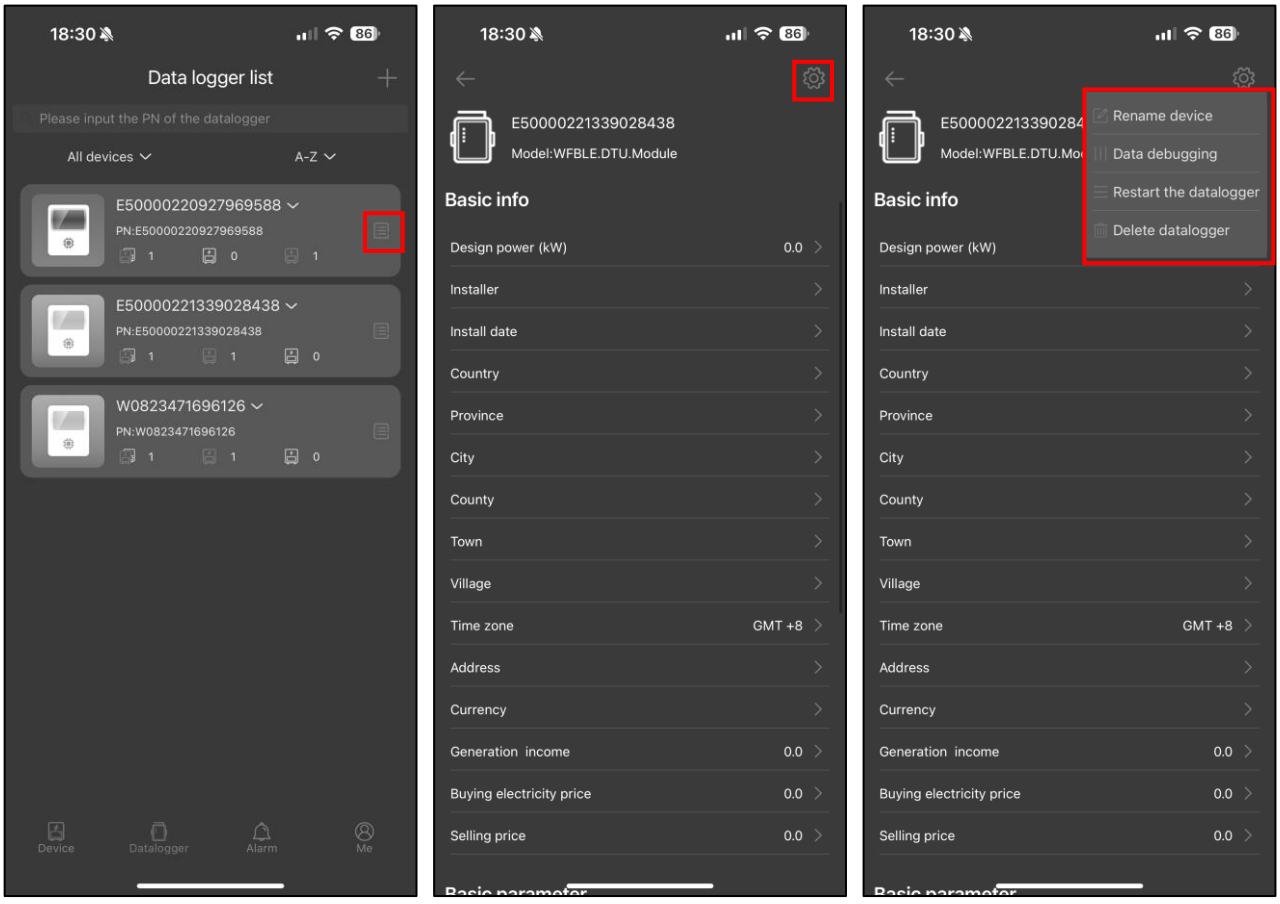
2-4 Datalogger

- After login, the default Home page will appear.
- Choose Datalogger page to see the Wi-Fi module list.
  - Gray icon means Wi-Fi module is offline. Please refer to 2-2 Initial Setup to choose local Wi-Fi or Bluetooth configure Wi-Fi module network.
  - Green icon means Wi-Fi module is online.



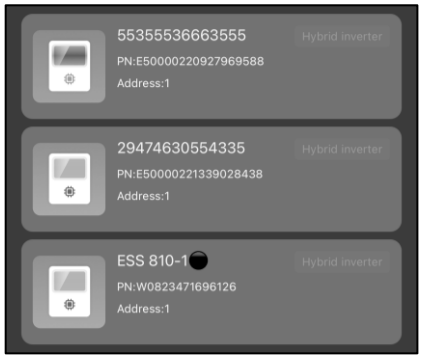
- Click  to see the Wi-Fi module information.

- Click  to rename device, data debugging, restart the datalogger, and delete datalogger.
  - Rename device: rename the Wi-Fi module name.
  - Data debugging: send RS232 commands to the inverter in hexadecimal format.
  - Restart the datalogger: restart the Wi-Fi module.
  - Delete datalogger: delete the Wi-Fi module. The inverter information in the device page will **also be deleted**. Once deleted, you **can** add datalogger under another account.



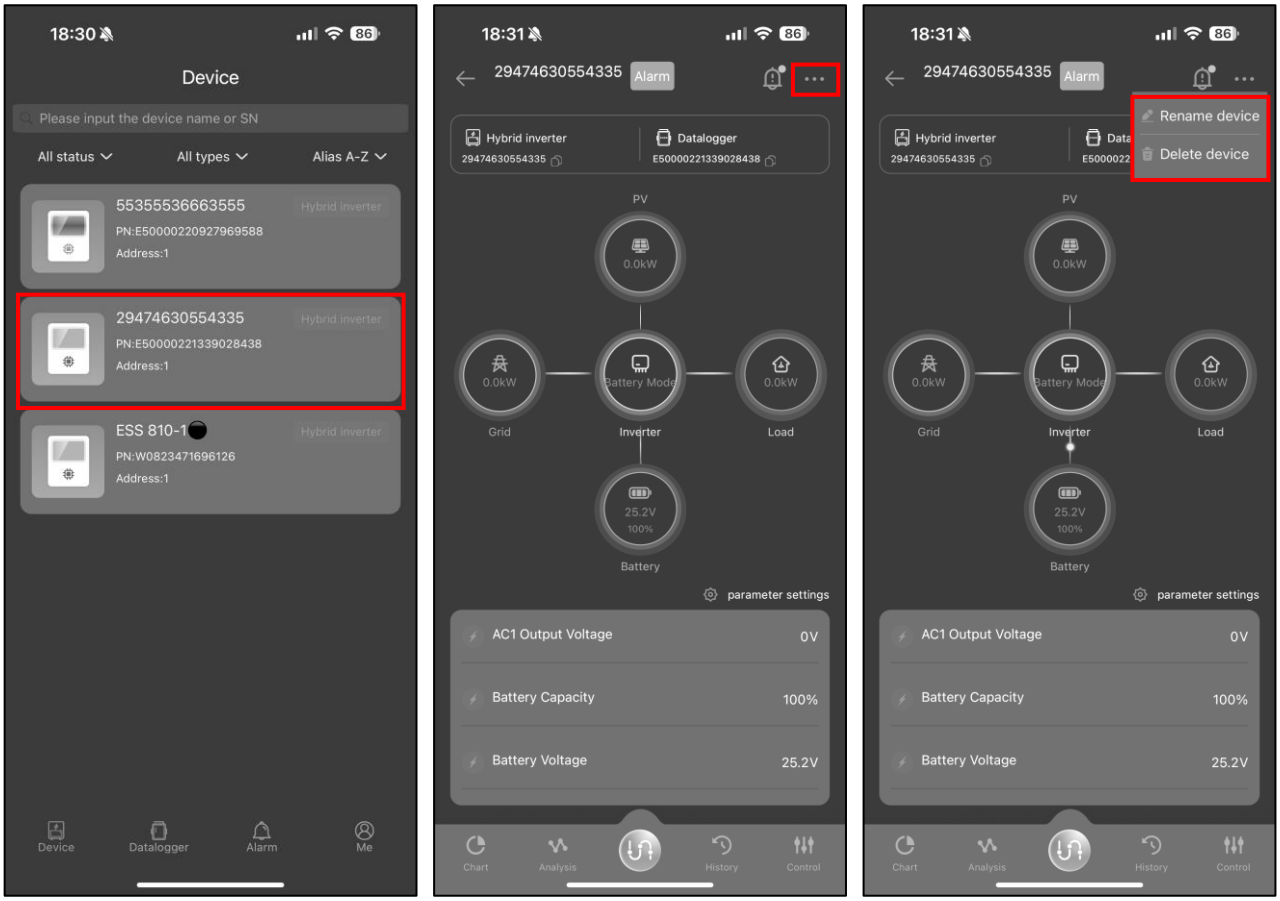
2-5 Device

- Choose Device page to see the inverter list.
  - Gray icon means inverter is offline.
  - Green icon means inverter is online and no warnings and faults.
  - Yellow icon means inverter is online and has a warning.
  - Red icon means inverter is online and has a fault.

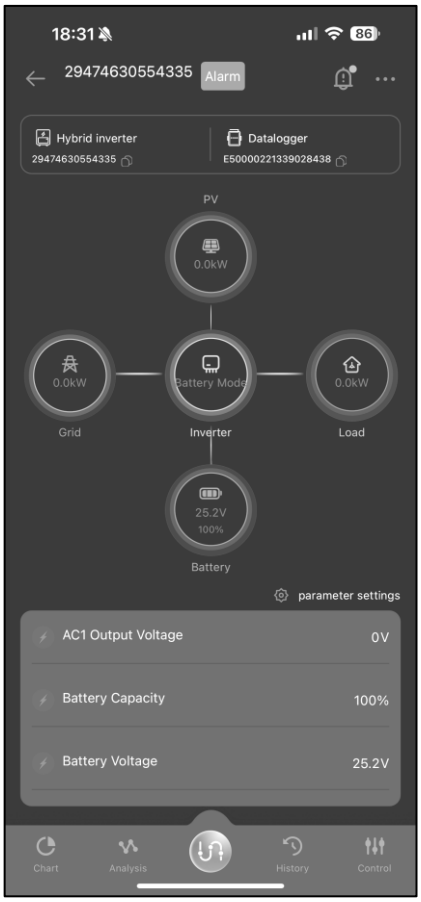


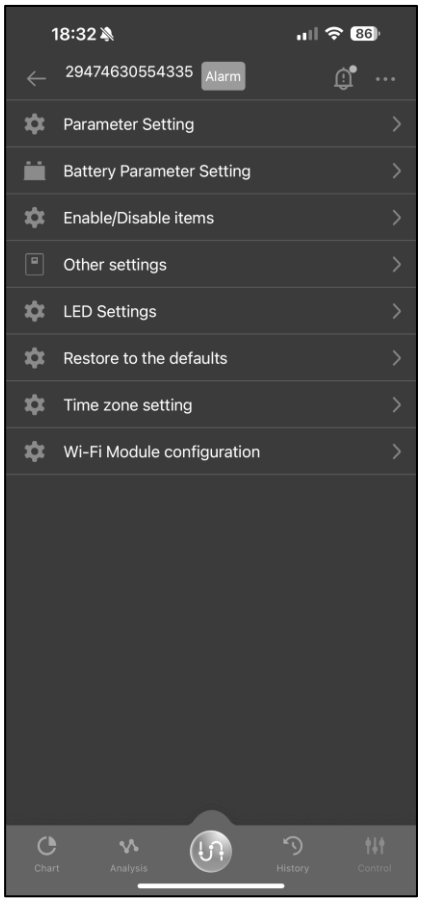
- Click  to see the inverter information.

- Click  to rename device or delete device.
  - Rename device: rename the inverter name.
  - Delete device: delete the inverter. The Wi-Fi module information in the datalogger page will **not be deleted**. Even if deleted, you **cannot** add Wi-Fi module under another account.

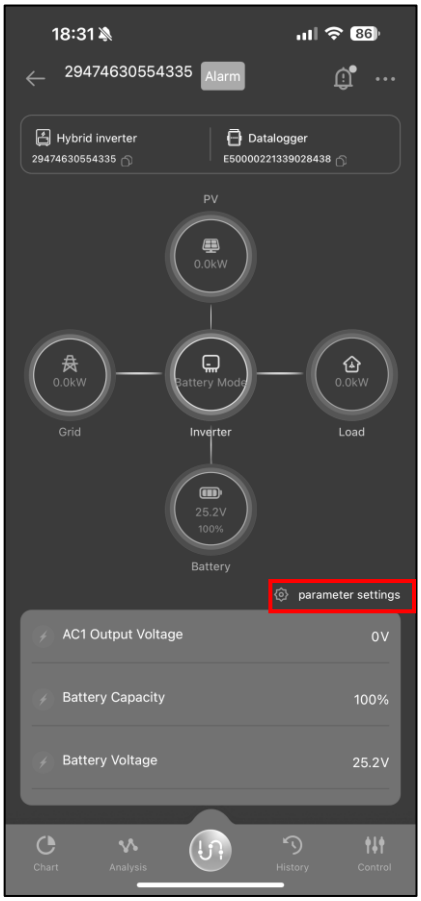


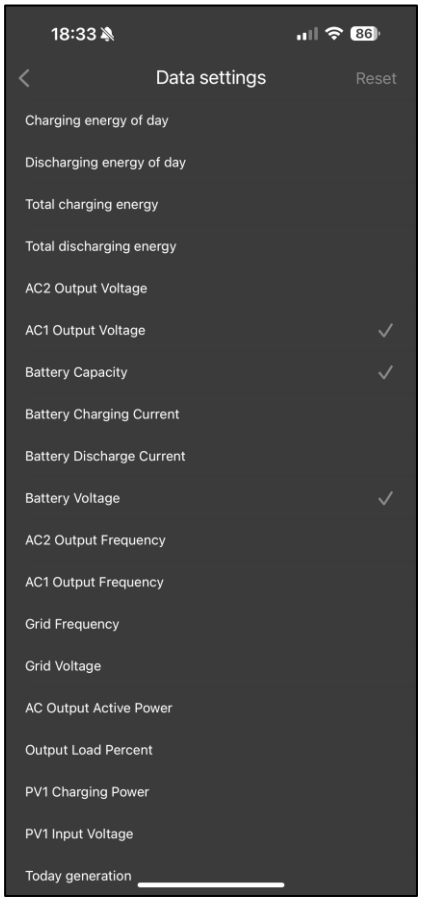
- Click "Control" to enter setting parameters page. The setting items on the parameter page will be different based on different models.

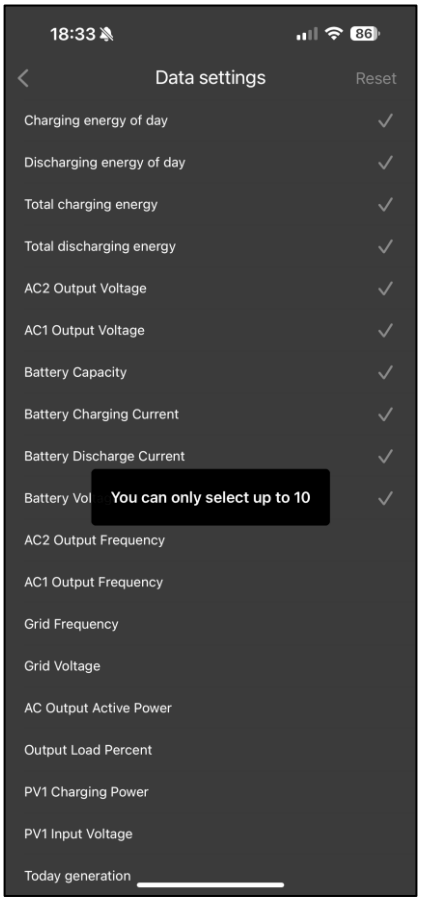




- Click "  " to see the inverter real-time data. Click "parameter settings" to choose data you want to see on the real time page. You can choose up to **10 data**.







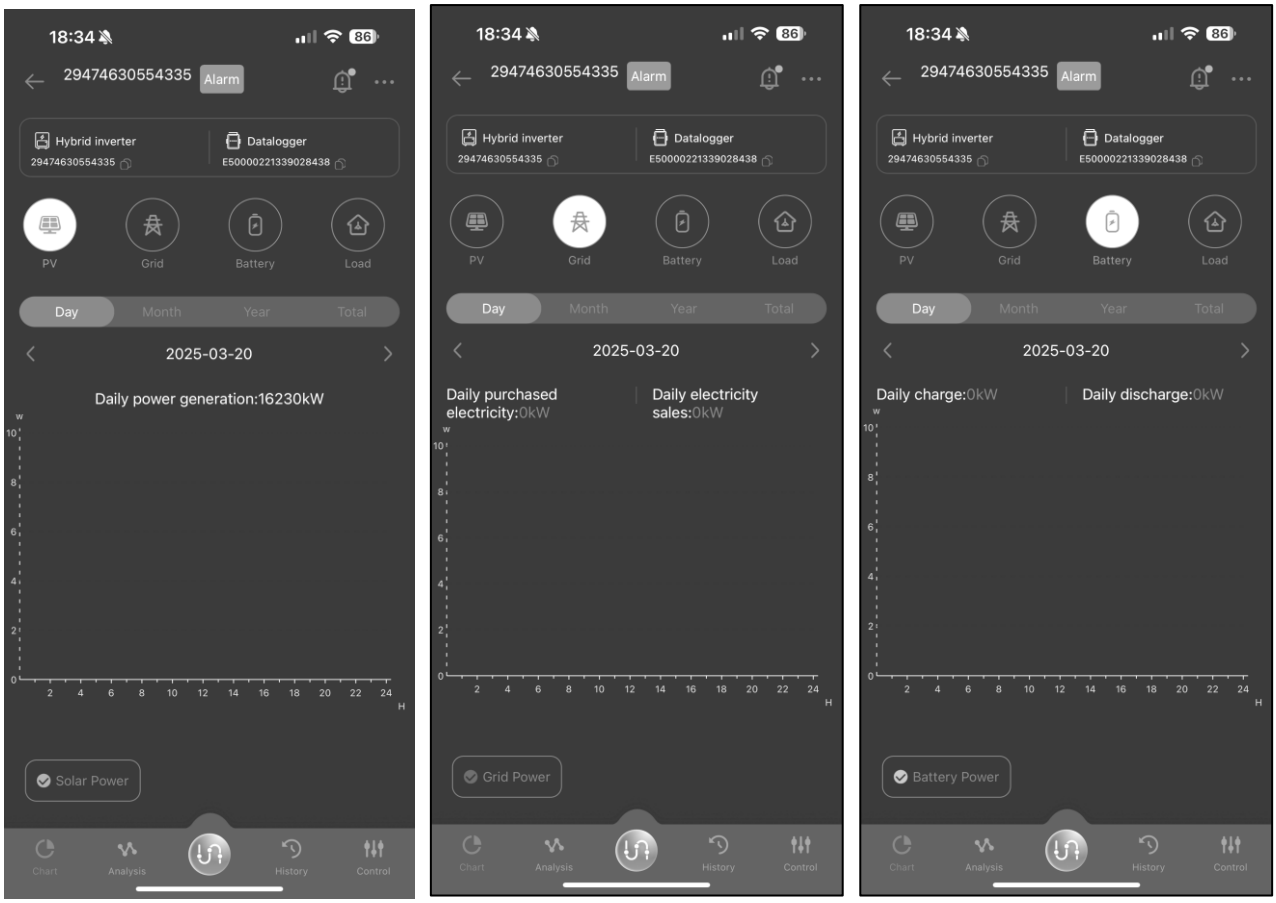
- Click “Chart” to see the inverter solar, grid, battery and load power per hour, day, month and year.

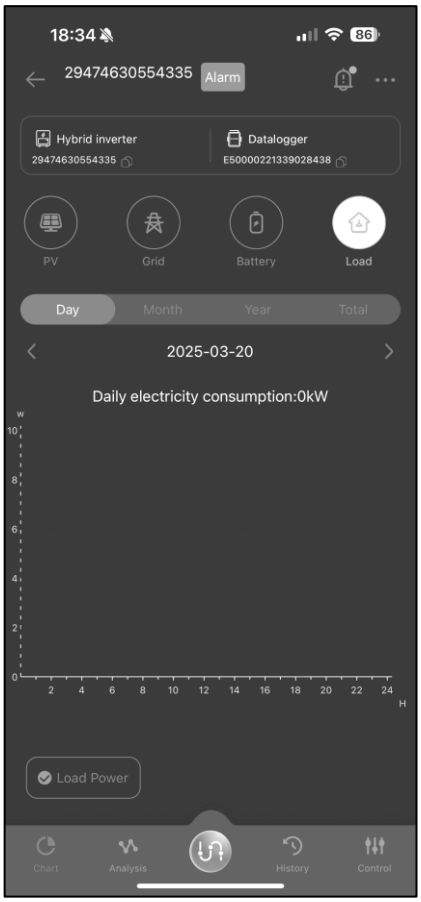
  Day: Click the button to query the hourly power generation data of the current day.

  Month: Click the button to query the daily power generation data of the current month.

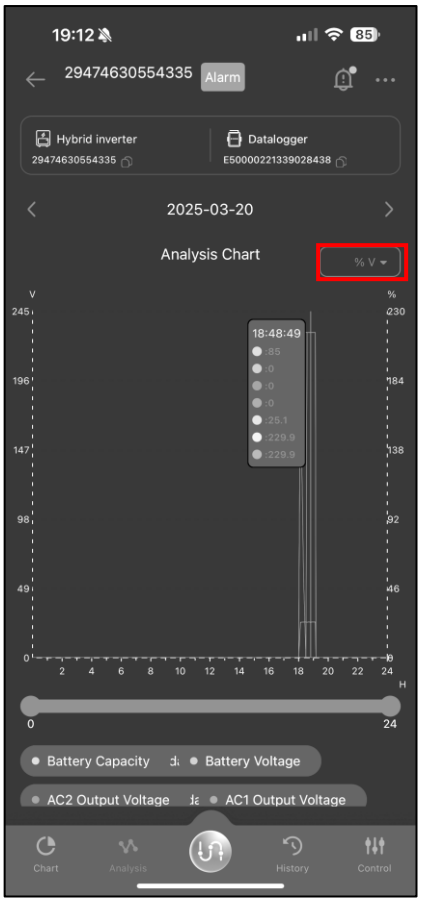
  Year: Click the button to query the monthly power generation data of the current year.

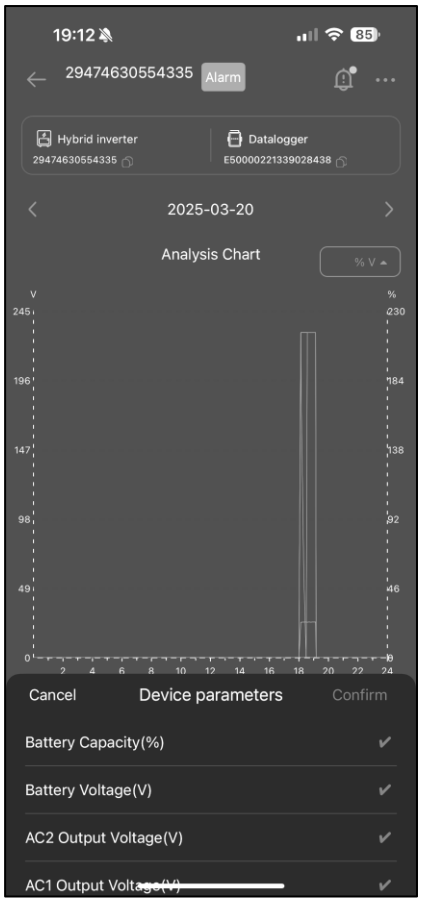
  Total: Click the button to query the annual power generation data.



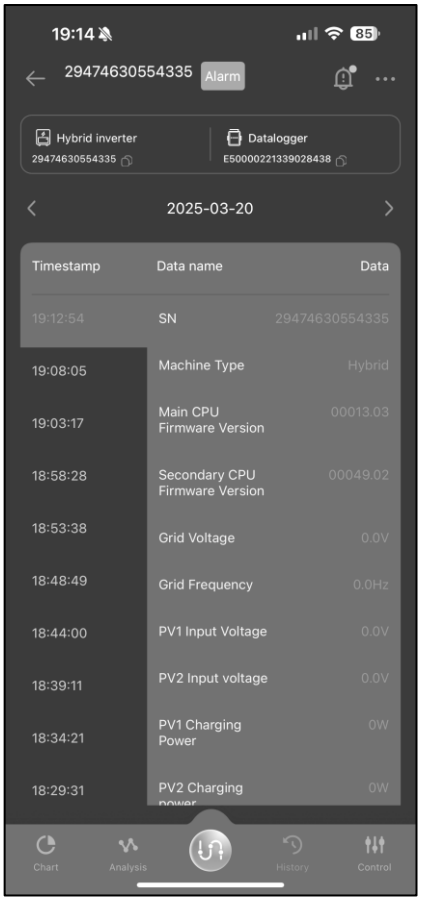


- Click "Analysis" to see the inverter data per hour. Click "SelectedXTerm" to choose the data you want to compare. You can choose up to **2 different units** such as energy (kWh) and current (A).

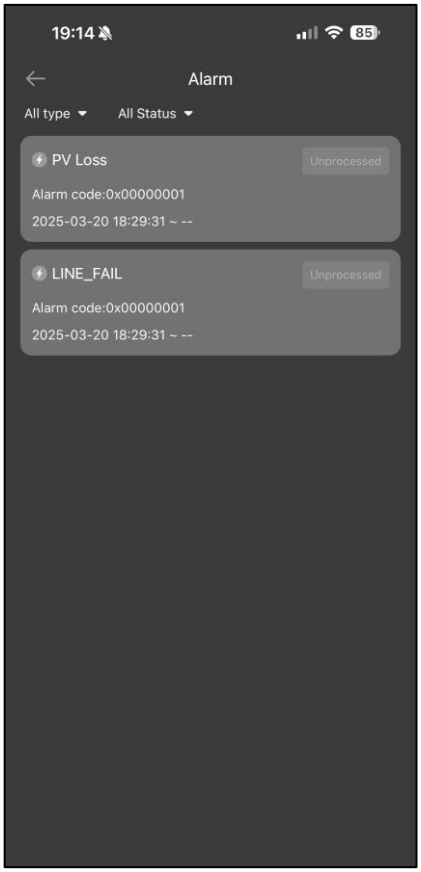




- Click “History” to see the inverter history.



- Click “  ” to see the inverter warning and fault.

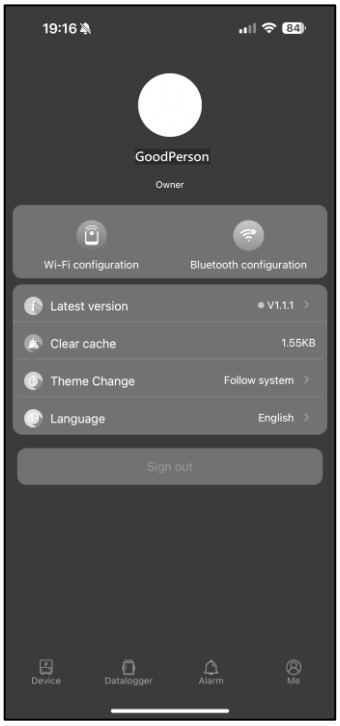


2-6 Alarm

- Choose Alarm page to see the warning and fault list of all inverters.

2-7 Me

- Choose Me page to see account information and app version.
- Click "Username" to modify nick name and password, and check if the mail has been bound. If the mail is bound, you can retrieve password through mail.
- Click "Theme Change" to modify app background, "Language" to change language and check app is the latest version.

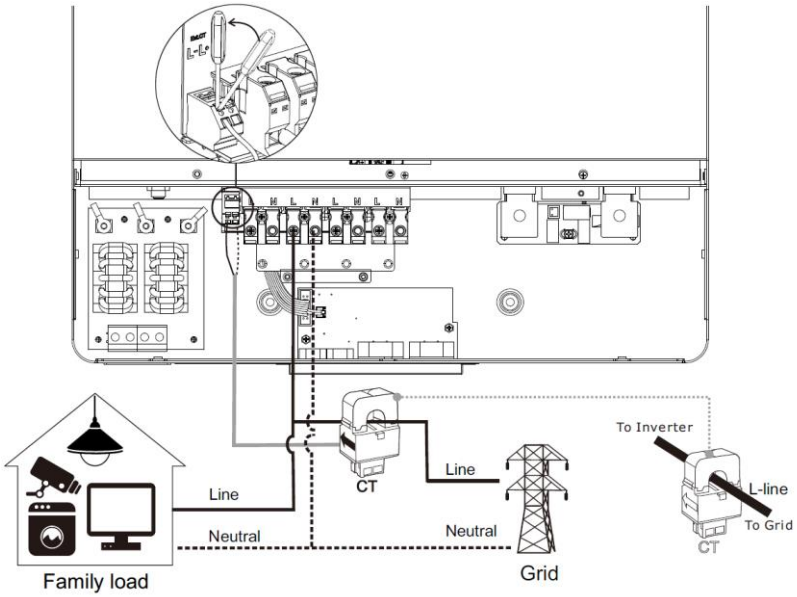


Appendix IV: The CT Operation Guide

With the CT connected, the solar inverter can be easily integrated into the existing household system. The CT can be used to control power generation and the battery charging of the inverter.

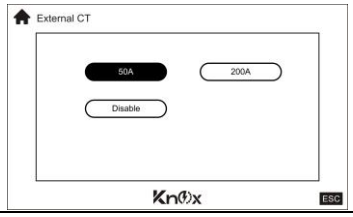
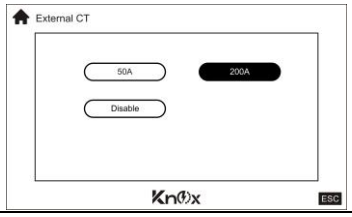
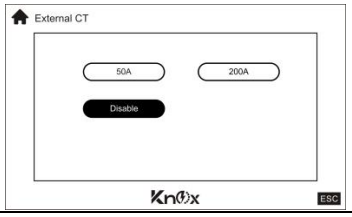
Single commissioning

Step 1. Power off the inverter and connect the external CT to install on the spring terminal block. Be noted the mark of current flow direction on the CT should point to the inverter and the polarity on connecting CT wires on the terminal block should be followed as "L+" vs red wire and "L-" vs white wire.



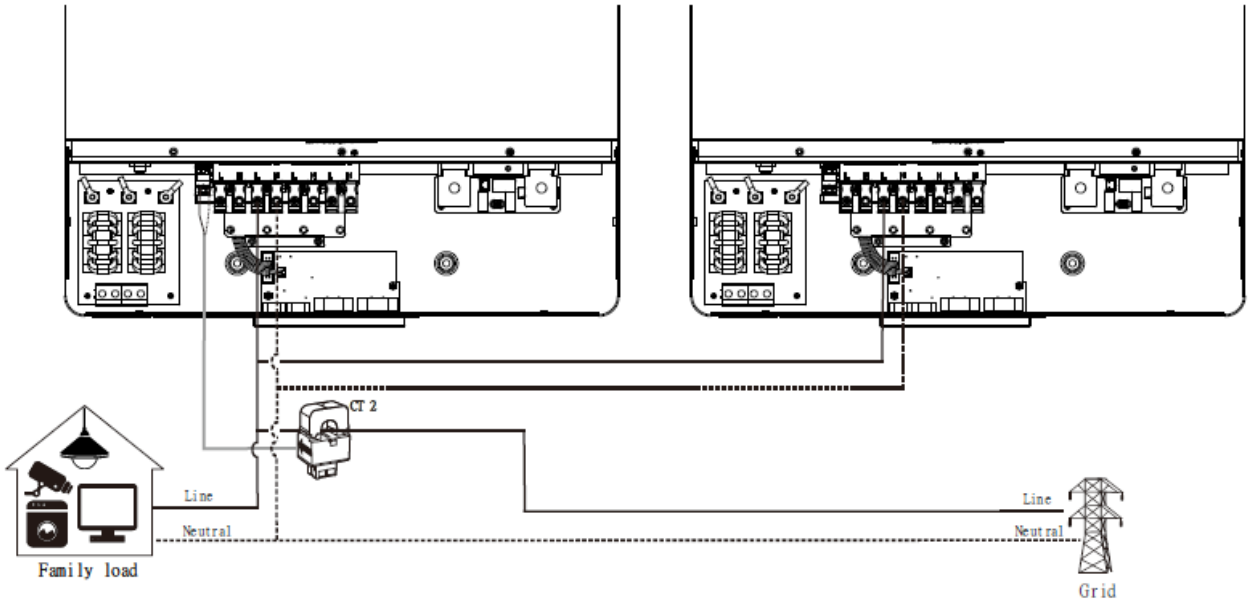
Step 2: Power on all inverters, wake up the LCD and modify the Settings.

Step 3: Enter LCD setting on the inverter with CT sensor connected and change External CT function to "50A/200A".

External CT function	50A 	200A 	Disable (default) 

Parallel commissioning

Step 1. Power off the inverters and connect the CT sensor according to the wiring diagram below. For other parallel circuits, please follow Appendix I.

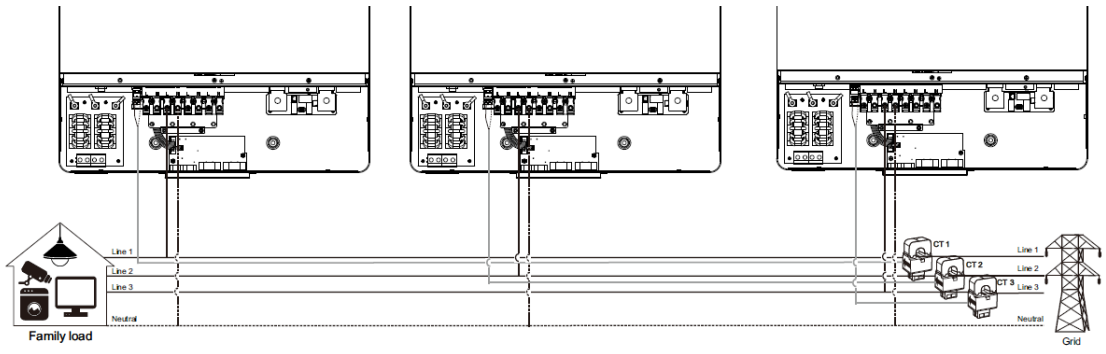


Step 2: Power on all inverters, wake up the LCD and modify the Settings.

Step 3: Enter LCD setting on the inverter with CT sensor connected and change External CT function to "Enable".

Three-phase commissioning

Step 1. Power off the inverters and connect the CT sensor according to the wiring diagram below. For other parallel circuits, please follow Appendix I.



Step 2: Power on all inverters, wake up the LCD and modify the Settings.

Step 3: Enter LCD setting on the inverter with CT sensor connected and change External CT function to "Enable".

IMPORTANT ATTENTION:

If applying CT function during parallel operation, it only needs one inverter from the parallel system connected to CT sensor. Be sure to enable LCD external CT function on the one inverter with CT connected and set up 'Disable' on the remaining inverters. Otherwise, it will cause CT function not working during parallel operation.