APstorage Sea System Installation & User Manual

(For EMEA&AU)

Table of Contents

1. Important Safety Instructions

This manual contains important instructions to be followed during installation and maintenance of the APstorage Sea system. To reduce the risk of electrical shock and ensure the safe installation and operation of the APstorage Sea system, the following symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

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

WARNING: This indicates a situation where failure to follow instructions may be a safety hazard or cause equipment malfunction. Use extreme caution and follow instructions carefully.

NOTE: This indicates information that is very important for optimal system operation. Follow instructions closely.

1.1 Safety Instructions

IMPORTANT SAFETY INSTRUCTIONS. SAVE THESE INSTRUCTIONS. This guide contains important instructions that you must follow during installation and maintenance of the PCS. Failing to follow any of these instructions may void the warranty. Follow all of the instructions in this manual. These instructions are key to the installation and maintenance of the APstorage Sea system. These instructions are not meant to be a complete explanation of how to design and install APstorage Sea systems. All installations must comply with national and local electrical codes and standards.

DANGER: - Only qualified professionals should install and/or replace the APstorage Sea system.
- Perform all electrical installations in accordance with local codes.
- To reduce risk of burns, do not touch the body of the PCS. (APstorage Sea system includes 2 main elements: PCS (APsystems Power Conversion System) and the battery cells.

WARNING: - Do NOT attempt to repair the APstorage Sea system. If it shows abnormal performance, contact
APsystems Customer Support to obtain adequate support. Damaging or opening the APstorage Sea system will void the warranty.

NOTE: - Before installing or using the APstorage Sea system, please read all instructions and Cautionary markings in the technical documents and on the APstorage Sea system.

1.2 Radio Interference Statement

The equipment which could radiate radio frequency energy and this might cause harmful interference to radio communications if not following the instructions when installing and using the equipment. But there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, the following measures might resolve the issues:

A) Relocate the receiving antenna and keep it well away from the equipment.
B) Consult the dealer or an experienced radio / TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate the equipment.

1. Important Safety Instructions

1.3 Communication Disclaimer

EMA system provides a friendly interface to monitor the working status of the whole energy storage system. At the same time, it can also help to locate problems during system maintenance. In case communication has been loss for more than 24 hours, please contact the technical support of APsystems.

1.4 Symbols replace words on the equipment, on a display, or in manuals

APstorage	Trademark
	Caution, risk of electric shock
	Refer to the operating instructions
	Caution, hot surface.
5min	Danger to life due to high voltage. Cut off all power and wait at least 5 minutes before any work is carried out in the inverter.
	This device SHALL NOT be disposed of in residential waste Please go to Chapter 9 "Recycling and Disposal" for proper treatments.
CE	CE mark is attached to the solar inverter to verify that the unit follows the provisions of the European Low Voltage and EMC Directives.
Qualified personnel	Person adequately advised or supervised by an electrically skilled person to enable him or her to perceive risks and to avoid hazards which electricity can create. For the purpose of the safety information of this manual, a "qualified person" is someone who is familiar with requirements for safety, refrigeration system and EMC and is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures. The inverter and endues system may only be commissioned and operated by qualified personnel.

2. APstorage Sea System Introduction

APstorage Sea system is a complete and independent AC coupling storage solution for residential PV installations. It can be used with any new or already installed PV systems without changing equipment in place.
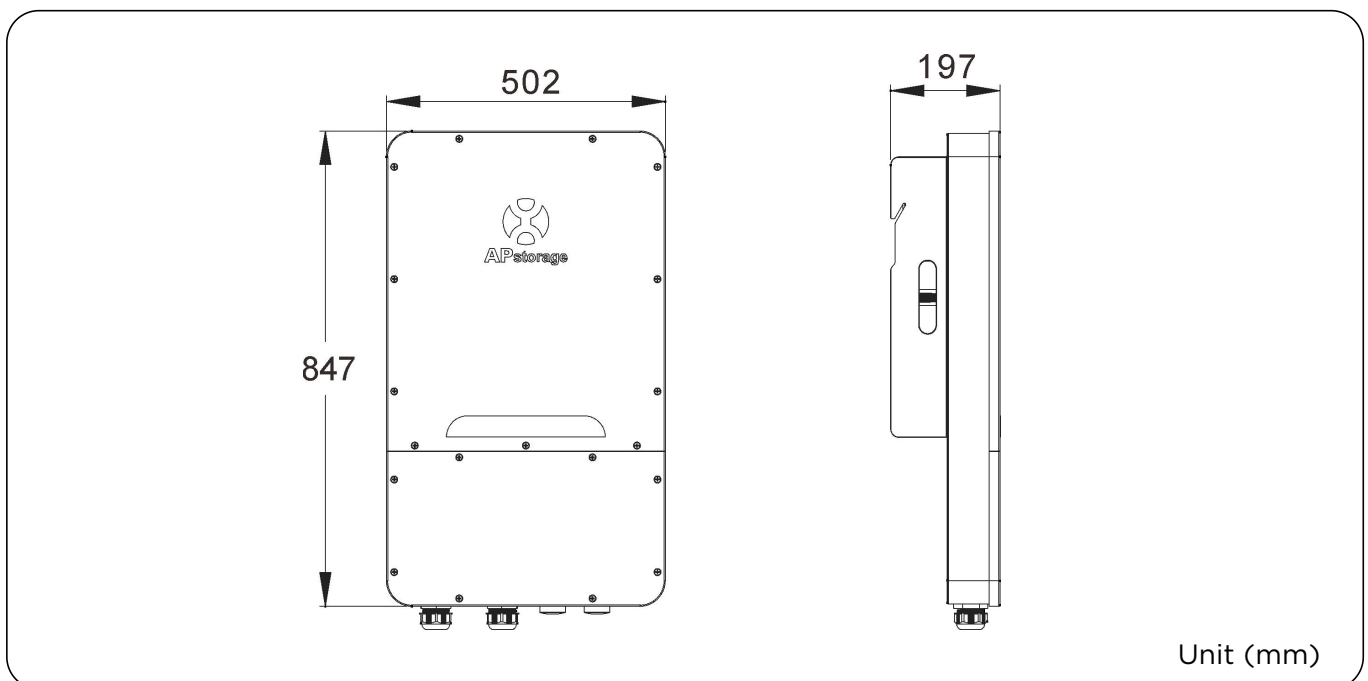
Power Conversion System（PCS）

One PCS can be connected to 1~3 battery packs. When 2~3 battery packs are connected, they need to be connected in parallel (see connection diagram in the Battery User Manual).

APstorage will help home-owners to optimize their utility bill, offering full flexibility to manage their electrical consumption. Several modes are indeed available (Backup power, residual power self-use and advanced mode).

2.1 Dimensions

502

197

847

Unit (mm)

2. APstorage Sea System Introduction

2.2 Basic System Architecture

A typical APstorage Sea system includes two main elements:
- Sea System Inverter. The Sea System Inverter is a smart Power Conversion System(PCS). The PCS includes a build-in ECU (Energy Communication Unit) to ensure monitoring of the overall system once up and running
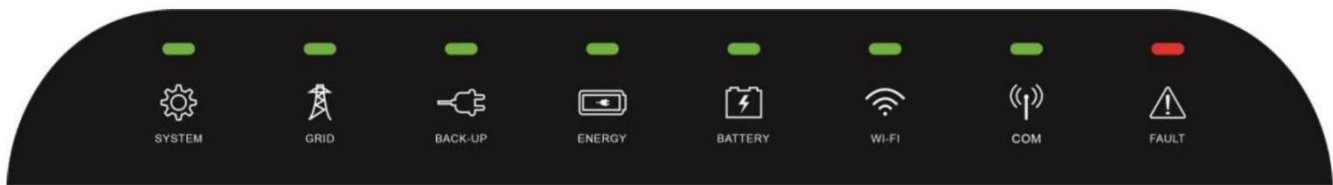- One Battery pack
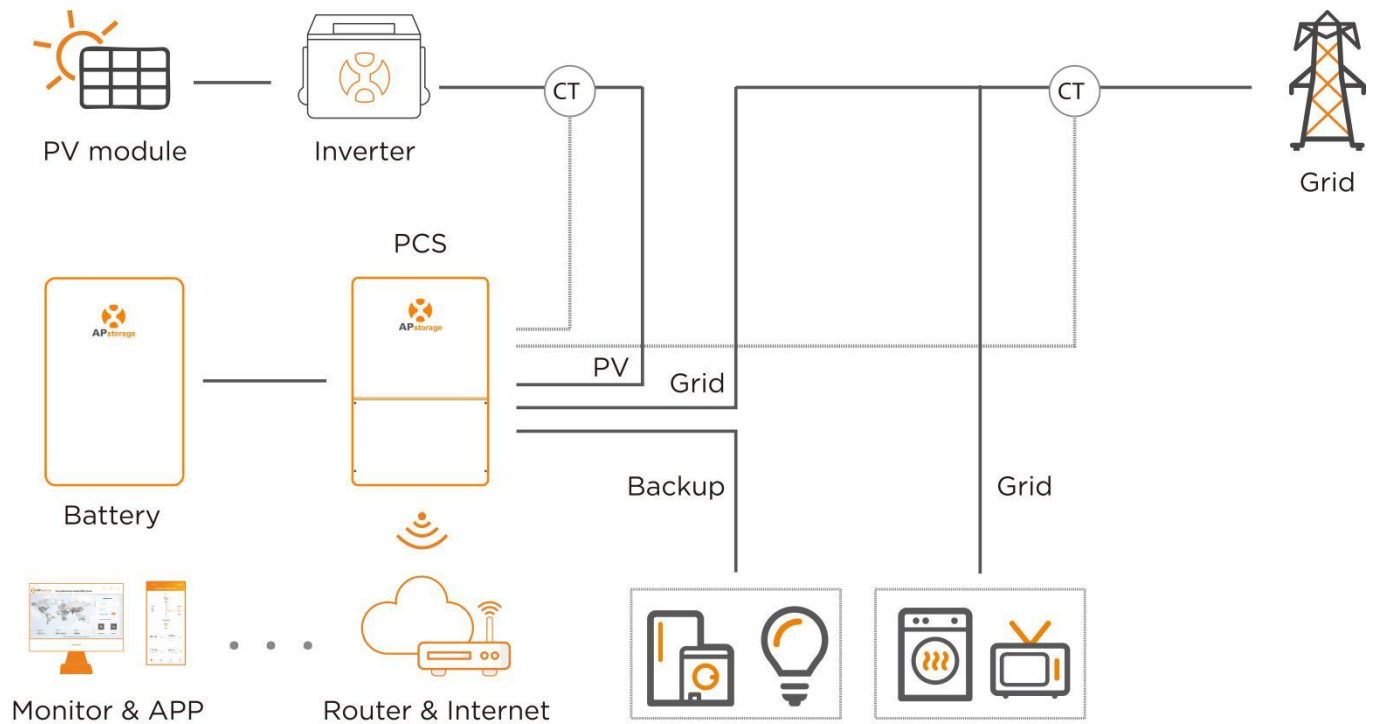
i	**NOTE:** In the APstorage Sea system, the battery is one of the key components. Therefore, it is necessary to keep the installation environment well ventilated, please refer to APbattery user manual.

2. APstorage Sea System Introduction

2.3 LED

There are eight LED indicators on the PCS unit, indicating the working state of the PCS.

| LED	Condition	Description
SYSTEM	Light on constantly	The system is operating
	Light flashing	The system is starting up
	Light off	The system shutdown
GRID	Light on constantly	The grid exists and is connected
	Light flashing	The grid exists but is not connected
	Light off	The grid does not exist
BACK UP	Light on constantly	The backup system is operating
	Light off	The backup is off
ENERGY	Light on constantly	Buy energy from grid
	Light flashing 1	Zero output
	Light flashing 2	Supplying energy to grid
	Light off	The grid is not connected or system is not operating
BATTERY	Light on constantly	The battery is charging
	Light flashing 1	The battery is discharging
	Light flashing 2	The battery SOC is low
	Light off	The battery is disconnected
WI-FI	Light on constantly	The WiFi is connected to the router
	Light flashing 1	The WiFi is not connected to the router
	Light off	The WiFi function is closed
COM	Light on constantly	The battery and the internet communication are normal
	Light flashing 1	The battery communication is normal, but the internet communication is abnormal
	Light flashing 2	The battery communication is abnormal, but the internet communication is normal
	Light off	The battery and the internet communication are abnormal
FAULT	Light on constantly	Fault has occurred
	Light flashing	Back up output overload
	Light off	No fault

> **i** **NOTE:** Light flashing 1: Every 5 seconds light on for 1 second.
> Light flashing 2: Every 2 seconds light on for 1 second.

2. APstorage Sea System Introduction

2.4 PCS Connection Port

Cable Port   Antenna

Vent valve

(Bottom view of PCS)
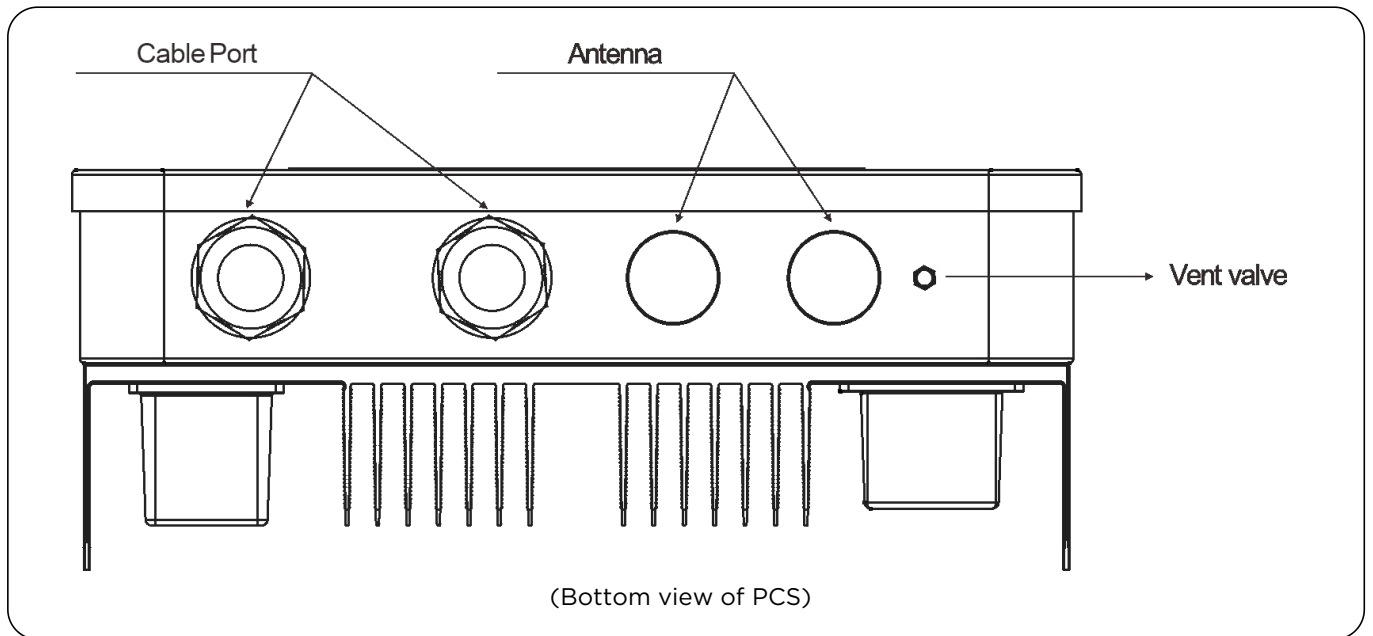
Cable port:
① DC cable: Connect the positive and negative terminals of the battery.
② AC cable: AC grid port is connected to power grid and AC backup port is off grid output.
③ Internet cable: Connect the Internet port into the router.
④ CT cable: Connect the PV CT or Grid CT cable to the PCS.
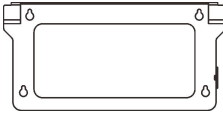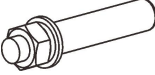(Both cable ports are available)
Antenna:
Use for Wifi and Zigbee communication.
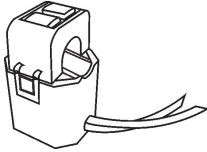
3. Installation

3.1 Packing List

PCS Packing List

KITS	PICTURES
PCS	×1
Wall-mounted Bracket	×1
Expansion screw (M8*70)	×4
Fixing screw (M6×14)	×1
CT（Current transformer）	×2(grid CT and PV CT)
Installation / User Manual	×1

i **NOTE:** The expansion screws are applicable only to cement concrete walls. For other types of walls, install expansion screws based on the wall type.

i **NOTE:** The customer purchases the combiner box for parallel connection of the batteries. Combiner box requirements: rated current of each connector≧100A.
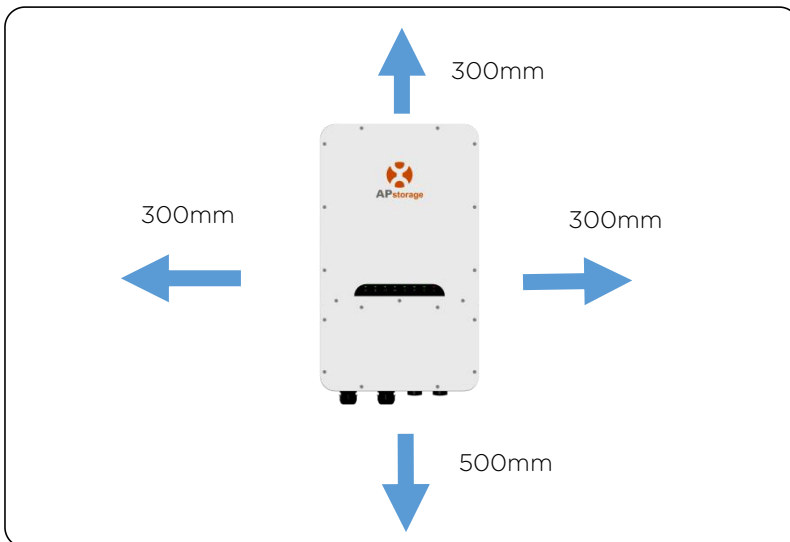
3. Installation

3.2 Select Mounting Location

1. PCS should be installed on a solid surface, where is suitable for PCS's dimensions and weight.
2. Do not install PCS in a confined space with no ventilation.
3. If the PCS is installed outside, it should be protected under shelter from direct sunlight or bad weather conditions (like snow, rain, lightning, etc). Fully shielded installation locations are preferred.
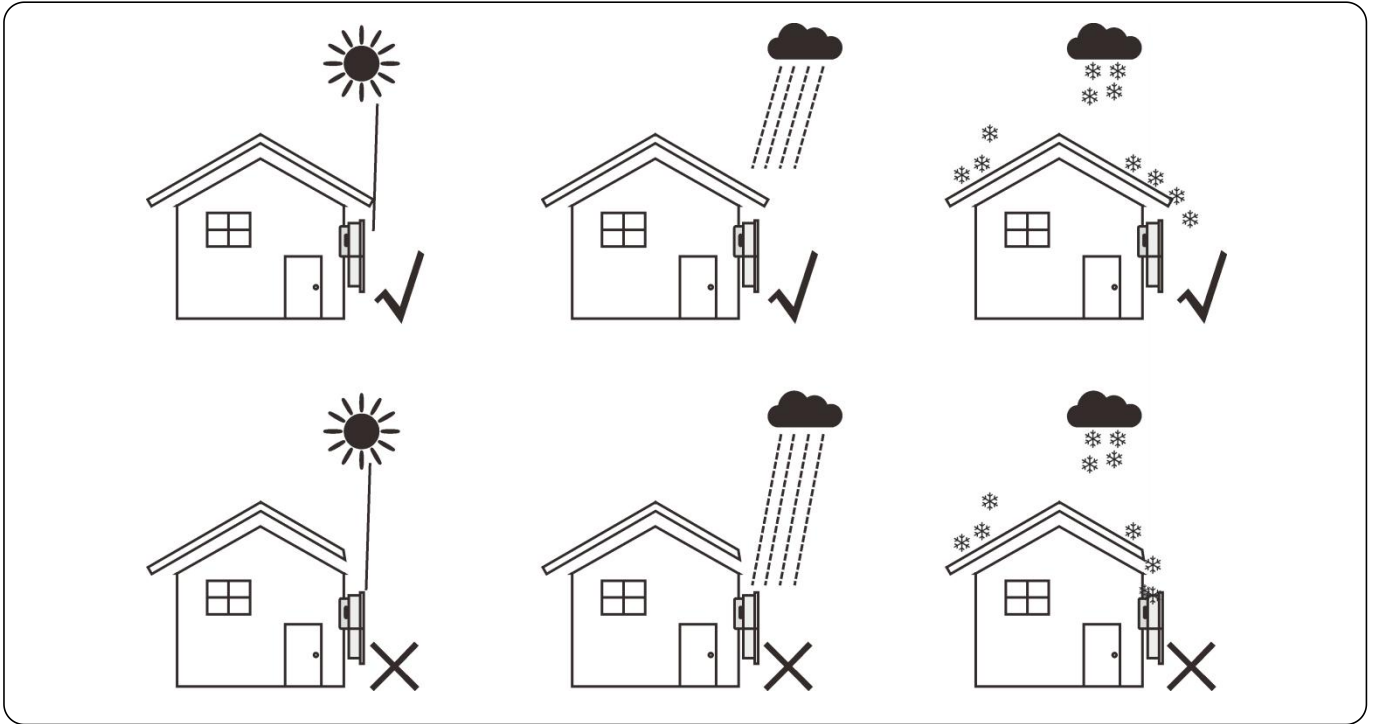
4. Please try to install APstorage vertically on the wall.

5. Make sure that the PCS is mounted "face-up": Product logo is visible after installation.

6. Leave enough space around APstorage. The specific requirements are as follows:


⚠️ **WARNING:** APstorage Sea system cannot be installed near flammable, explosive or strong electro-magnetic equipment.
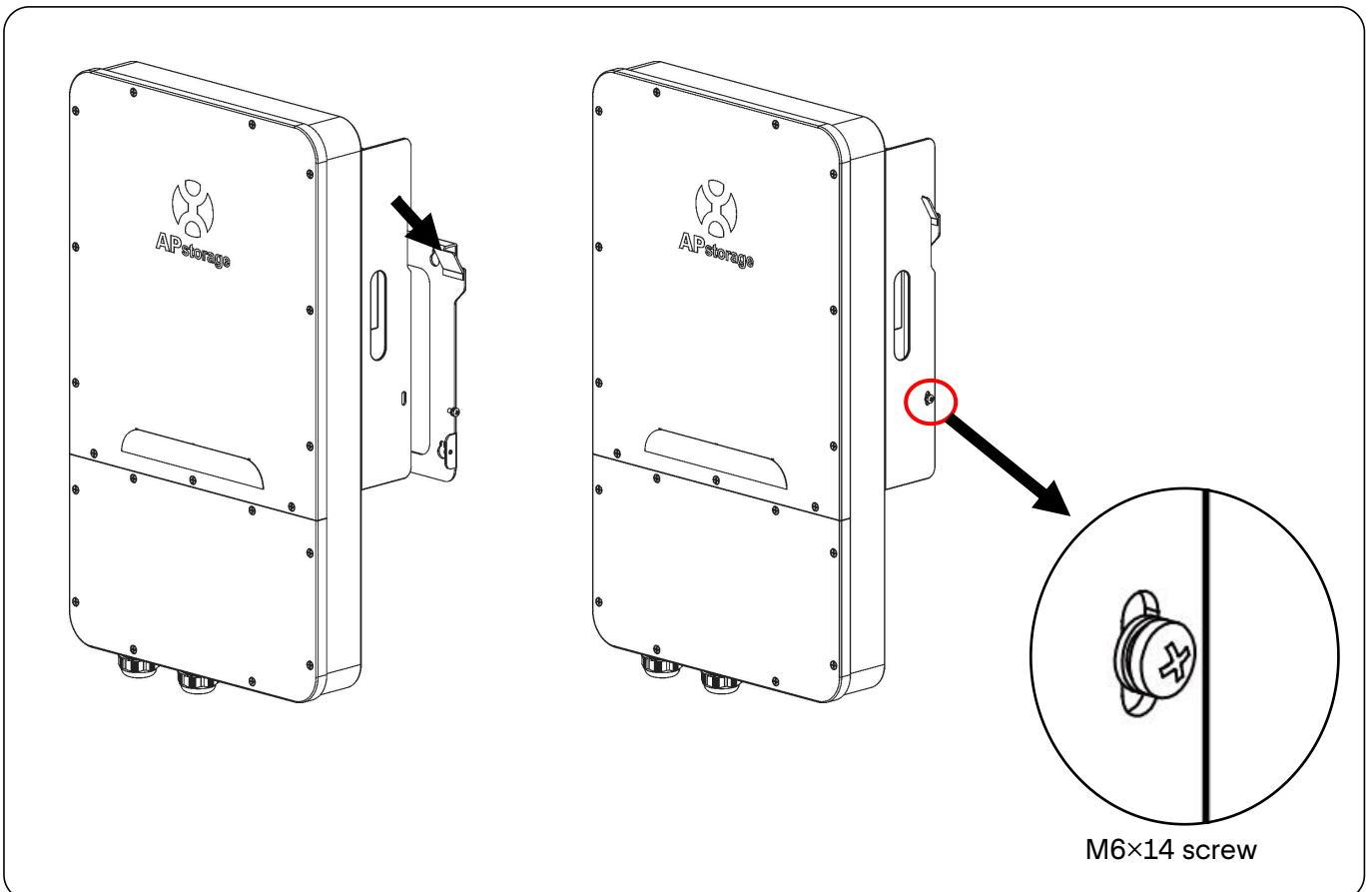
3. Installation

3.3 PCS Installation Steps

① Mark the holes position on the wall and drill holes according to wall type and expansion screws type.The configured expansion screw is drilled with a diameter of 12mm and a depth of 50-55mm.

② Put the expansion screws into the holes on the wall. Use a wrench to tighten the hex nuts, so that the expansion screws sleeve are fully expanded. Then remove the hex nuts. Hang the wall mounting bracket into the expansion screws, and use the hex nuts to fix it firmly. Make sure that the wall mounting bracket is horizontal after installation.
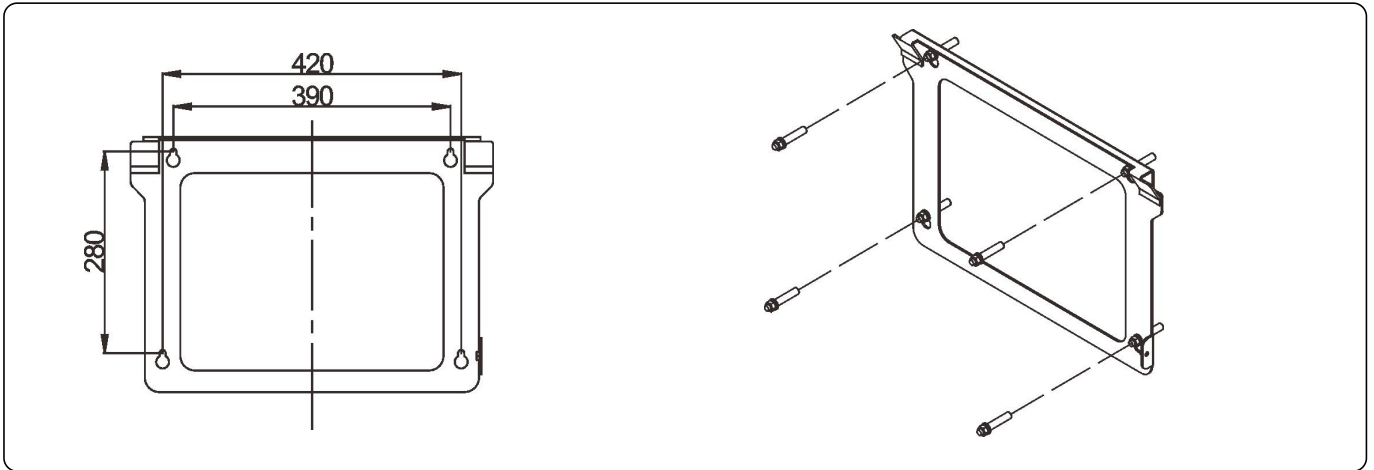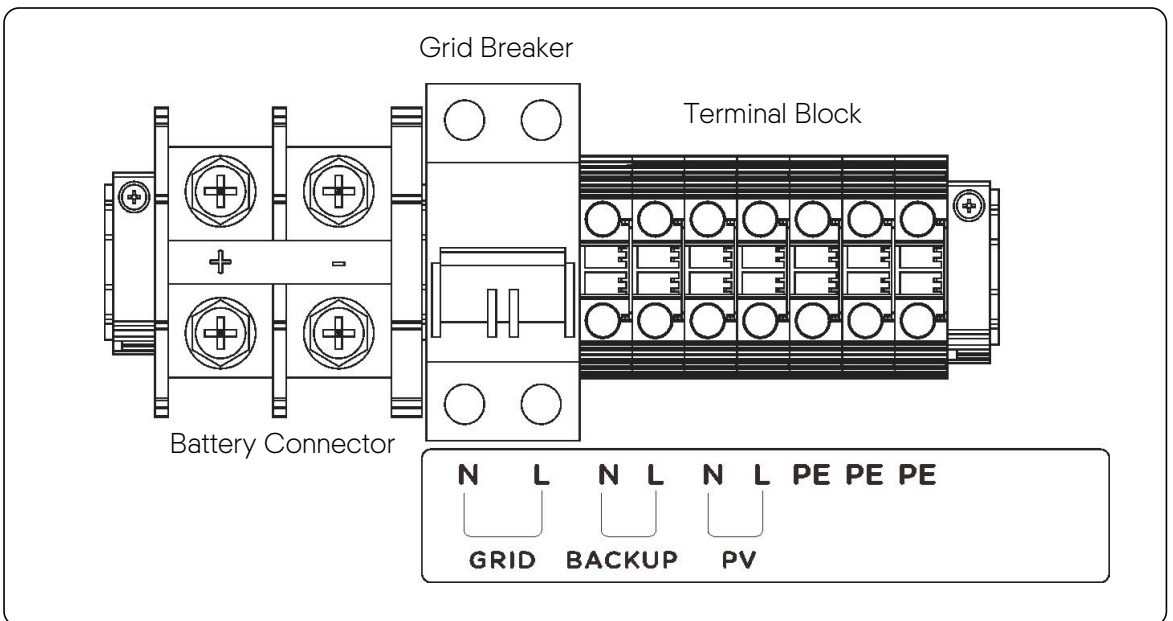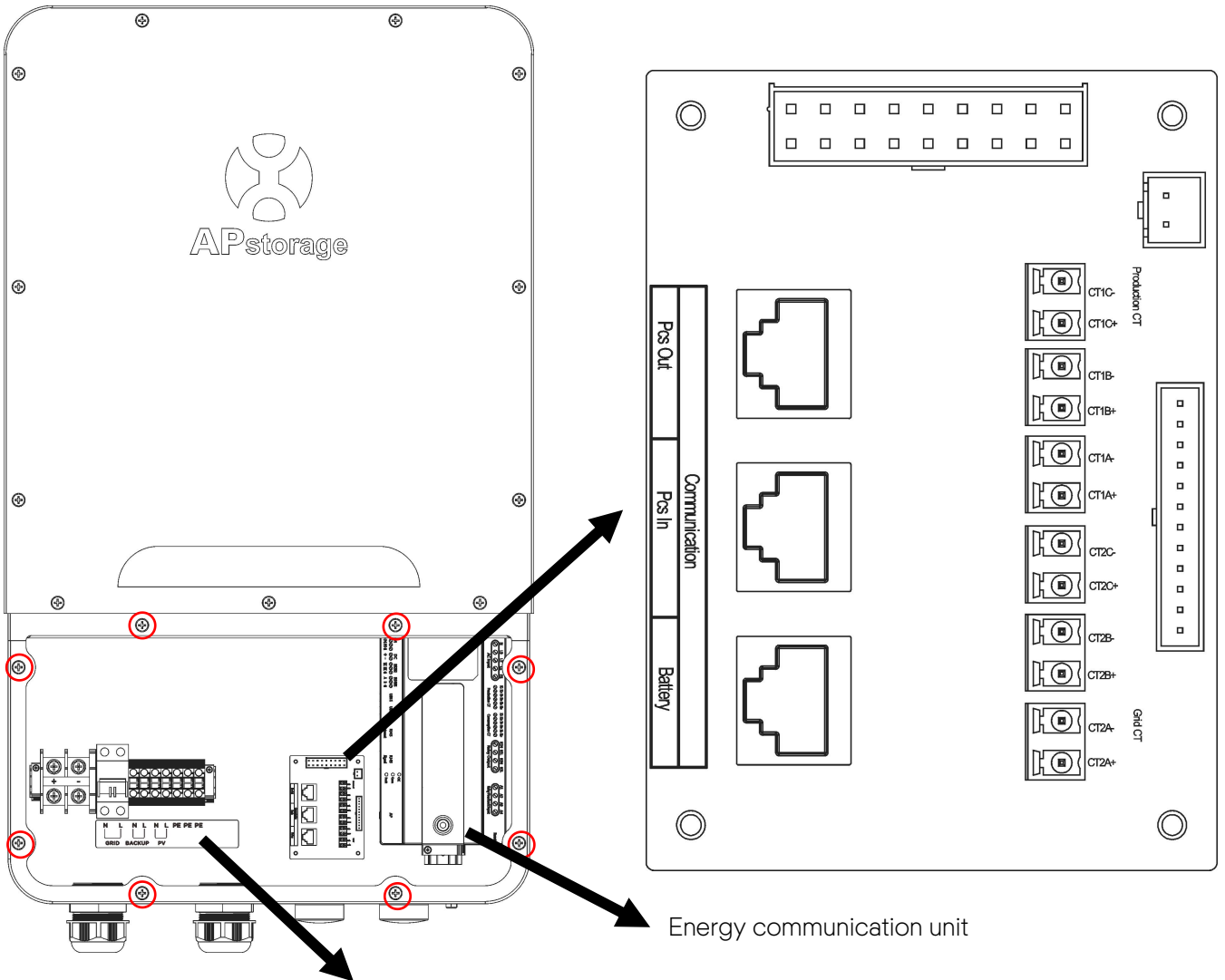

③ Lift the PCS hang it into the wall mounting bracket, and fix the PCS on wall mounting bracket with the M6×14mm screw.
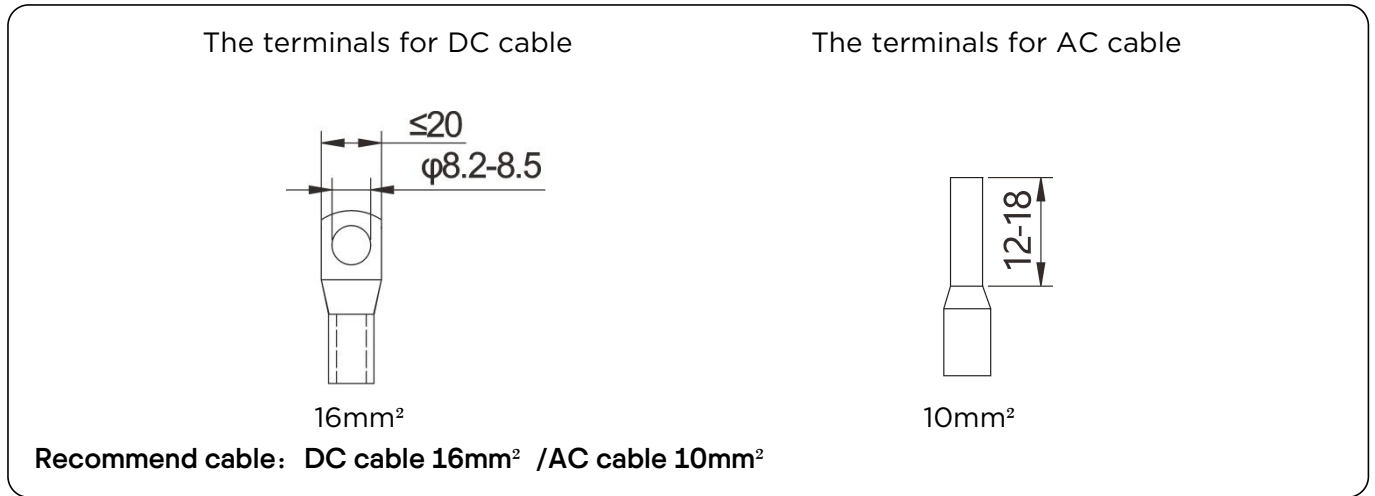

M6×14 screw

3. Installation

3.4 PCS Wiring

When wiring, you need to remove the lower cover first, just unscrew the 8 locking screws.

Energy communication unit

Grid Breaker

Terminal Block

Battery Connector

N L   N L   N L   PE PE PE

GRID   BACKUP   PV

3. Installation

When wiring, you need to crimp appropriate terminals on the cable (as shown for dimensions). The cables and terminals need to be prepared by yourself or purchased from APsystems.

The terminals for DC cable

≤20
φ8.2-8.5

16mm²

The terminals for AC cable

12-18

10mm²

Recommend cable：DC cable 16mm² /AC cable 10mm²

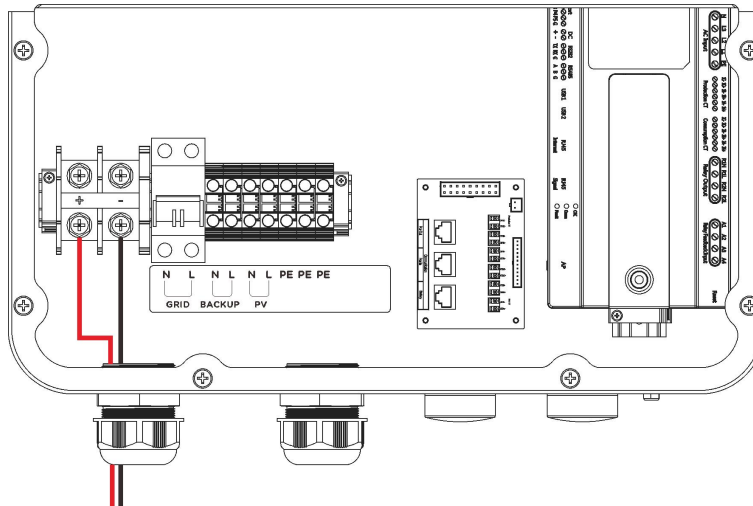PCS has been installed with cable glands before delivery. If connection is required through pipe (prepare pipe by yourself), remove cable glands on the BOX first.

1   2

PIPE 1-1/2"
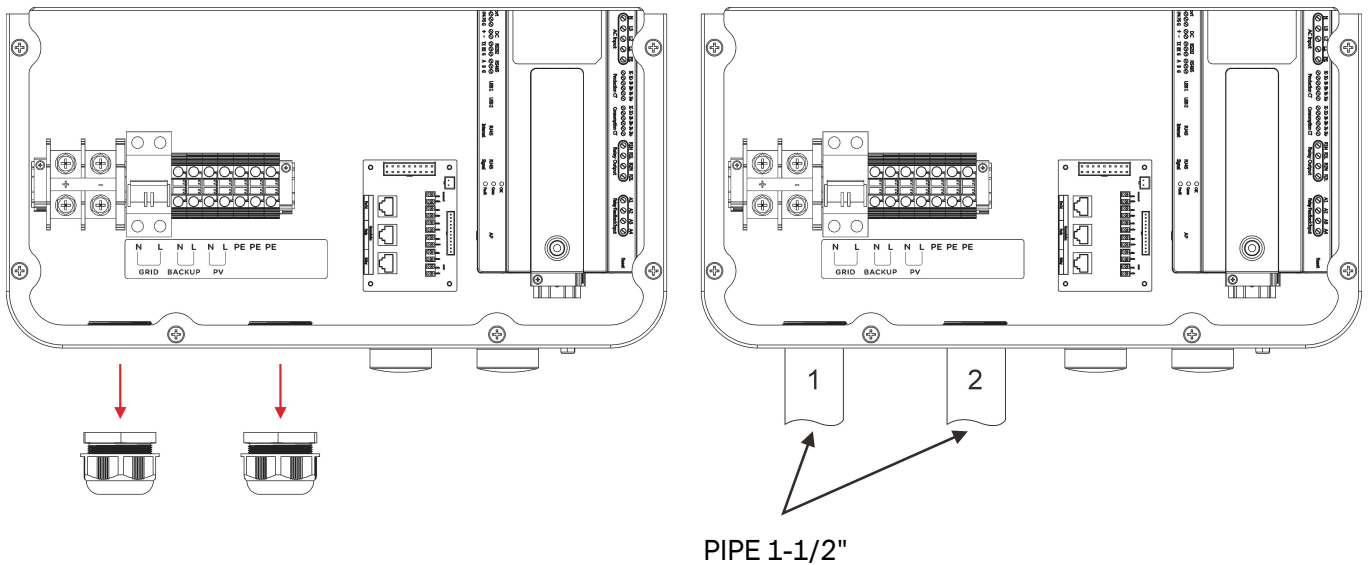
3. Installation

3.4.1 DC Wiring

Connect the DC cable to the PCS through the cable gland. As shown, connect wire + & - to Battery connector.
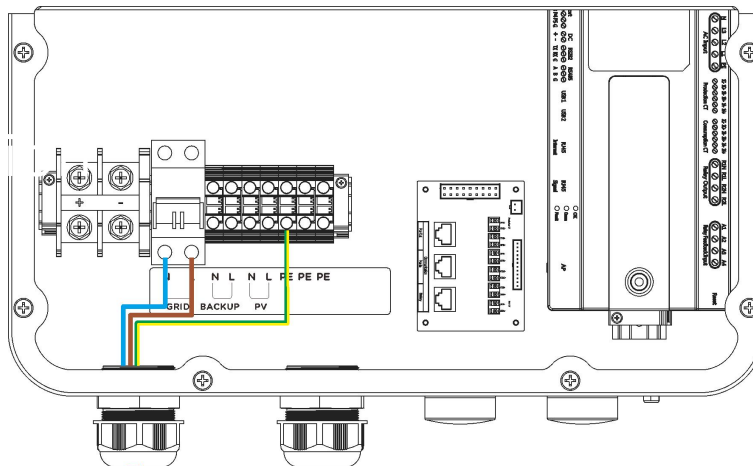
Torque value：40lb.in

Battery

Wire+: Red/Orange   Wire-: Black

3.4.2 AC Wiring

3.4.2.1 Connect the grid AC cables to the PCS through the cable gland. As shown,connect wire L and wire N to grid breaker, connect wire PE to the earth terminal Block.

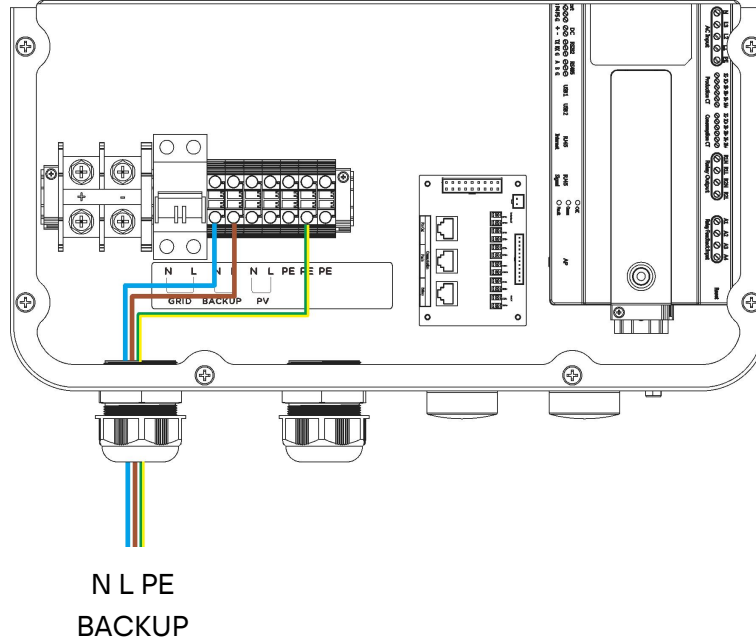Torque value：27lb.in

N L PE

GRID

N-Blue; L-Brown; PE-Yellow&Green

> **i** **NOTE:** Make sure connect the live wire to L, connect the neutral wire to N, otherwise the precision of CT will be affected.

3. Installation

3.4.2.2 Connect the backup AC cables to the PCS through the cable gland. As shown,connect wire N to terminal Block ,and connect wire PE to the earth terminal Block.
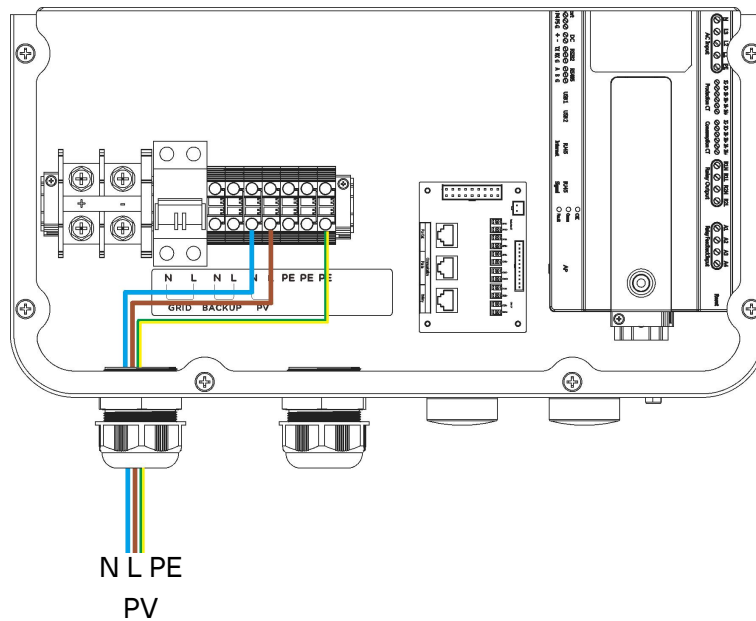Torque value：27lb.in

N L PE
BACKUP

N-Blue; L-Brown; PE-Yellow&Green

3.4.2.3 Connect the PV AC cables to the PCS through the cable gland. As shown,connect wire N to terminal Block ,and connect wire PE to the earth terminal Block.
Torque value：27lb.in

N L PE
PV

N-Blue; L-Brown; PE-Yellow&Green

> **NOTE:** Make sure connect the live wire to L, connect the neutral wire to N, otherwise the preci sion of CT will be affected.

3. Installation

3.4.3 Communication Wiring

3.4.3.1 Internet Communication

Using the Internet cable, connect the Internet port into the router. The PCS also can be connected to router via Wi-Fi, please refer to the chapter 4.5.3.1.

3.5.3.2 Battery Communication
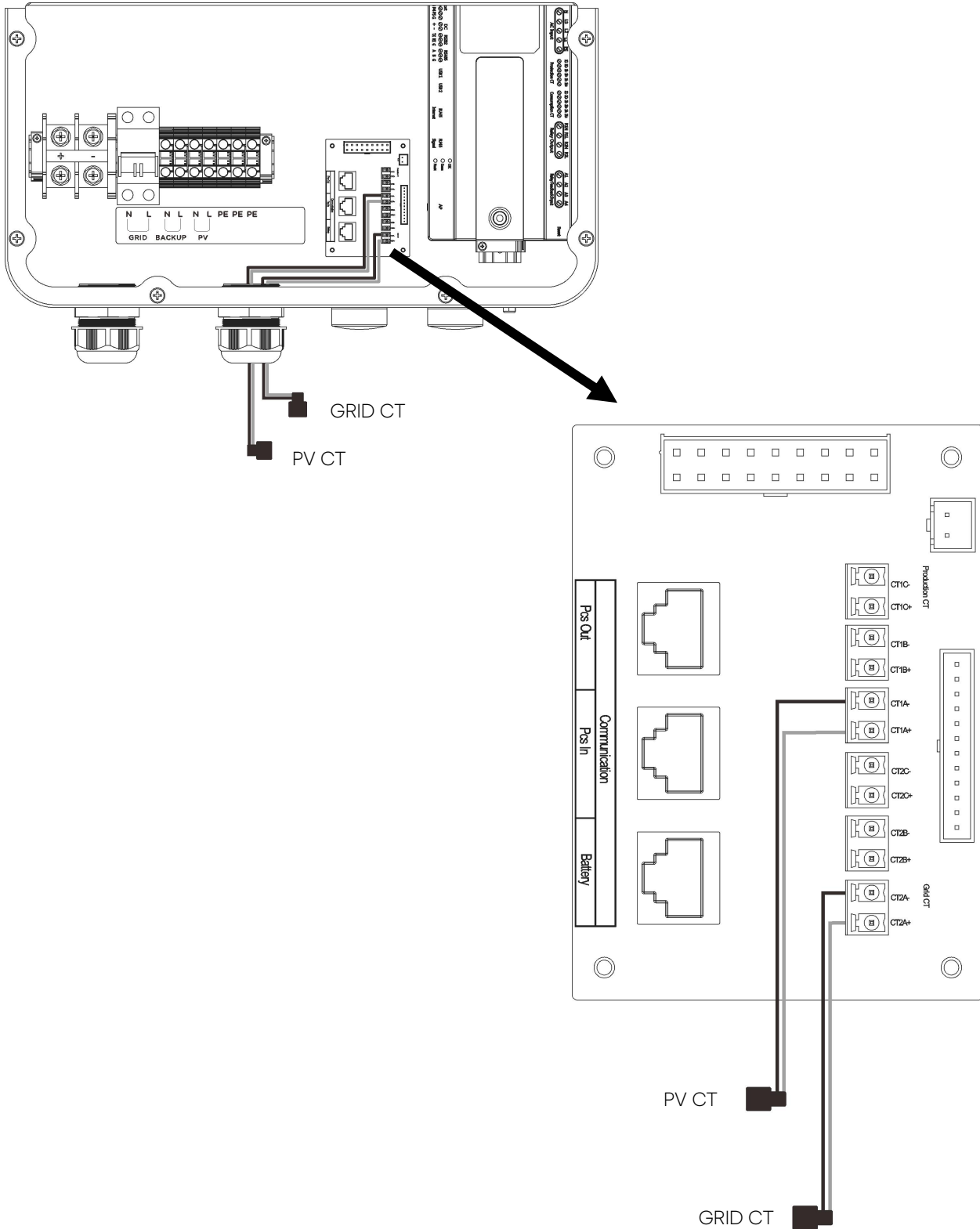
Connect the Battery's RJ45 port to PCS's RJ45 port.

Battery Communication

Internet Communication

Communication		
Pcs Out	Pcs In	Battery
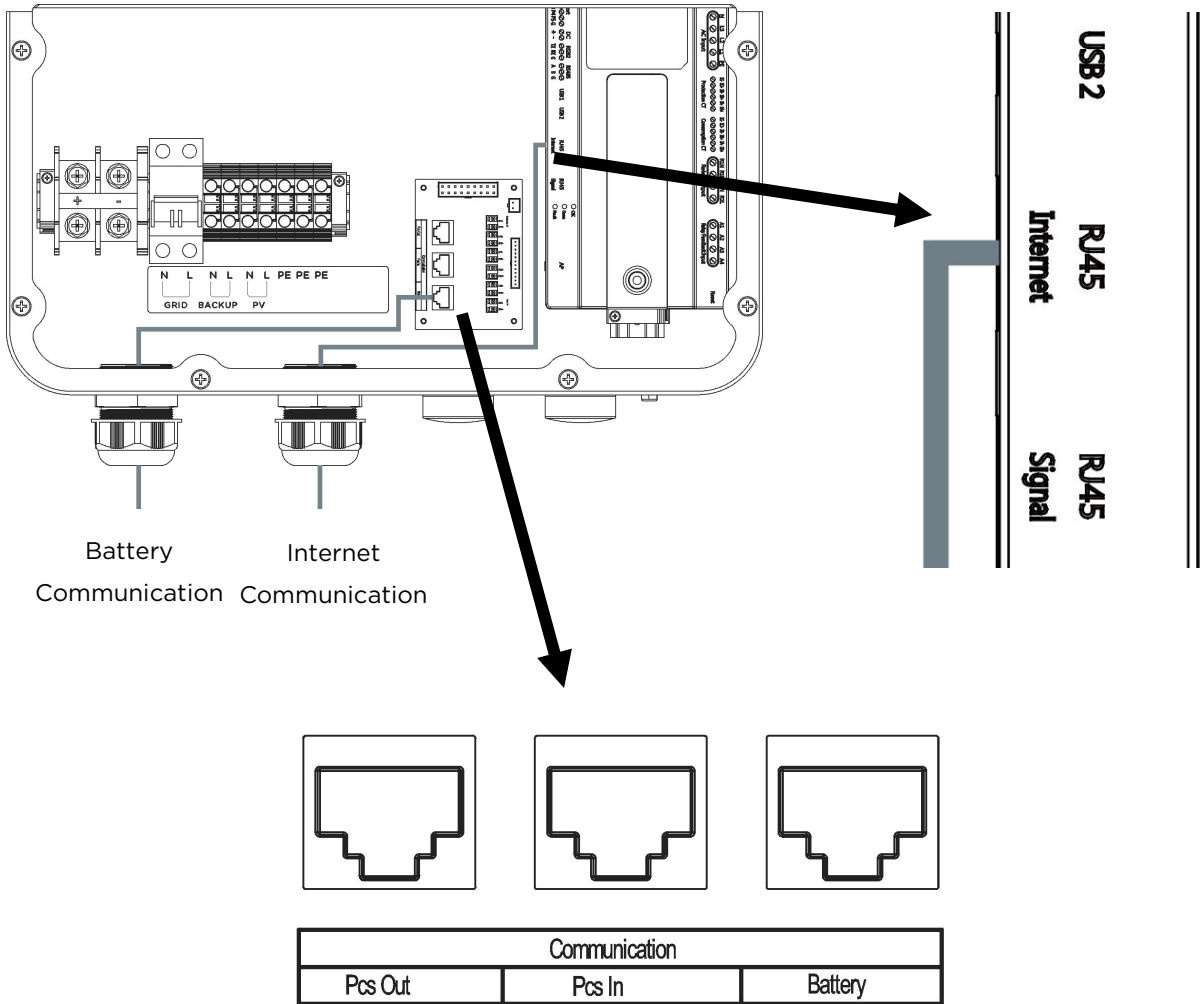
3. Installation

3.4.4 CT Wiring

Connect the PV CT cable to the PV CT port of the PCS. Connect the GRID CT cable to the GRID CT port of the PCS.

GRID CT

PV CT

Pcs Out

Communication

Pcs In

Battery

Production CT

CT1C-
CT1C+
CT1B-
CT1B+
CT1A-
CT1A+
CT2C-
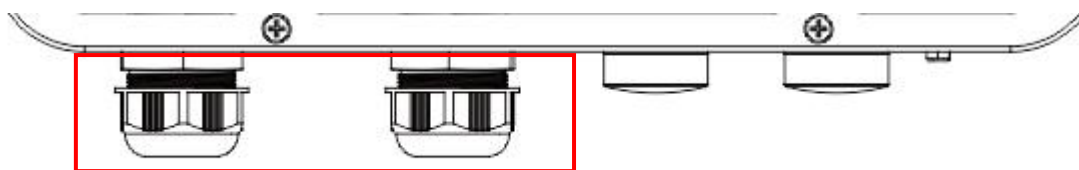CT2C+
CT2B-
CT2B+

Grid CT

CT2A-
CT2A+

PV CT

GRID CT

3. Installation

The direction of CTs: The arrows on the GRID CT should point from grid to distribution box and the arrows on the PV CT from distribution box to PV.
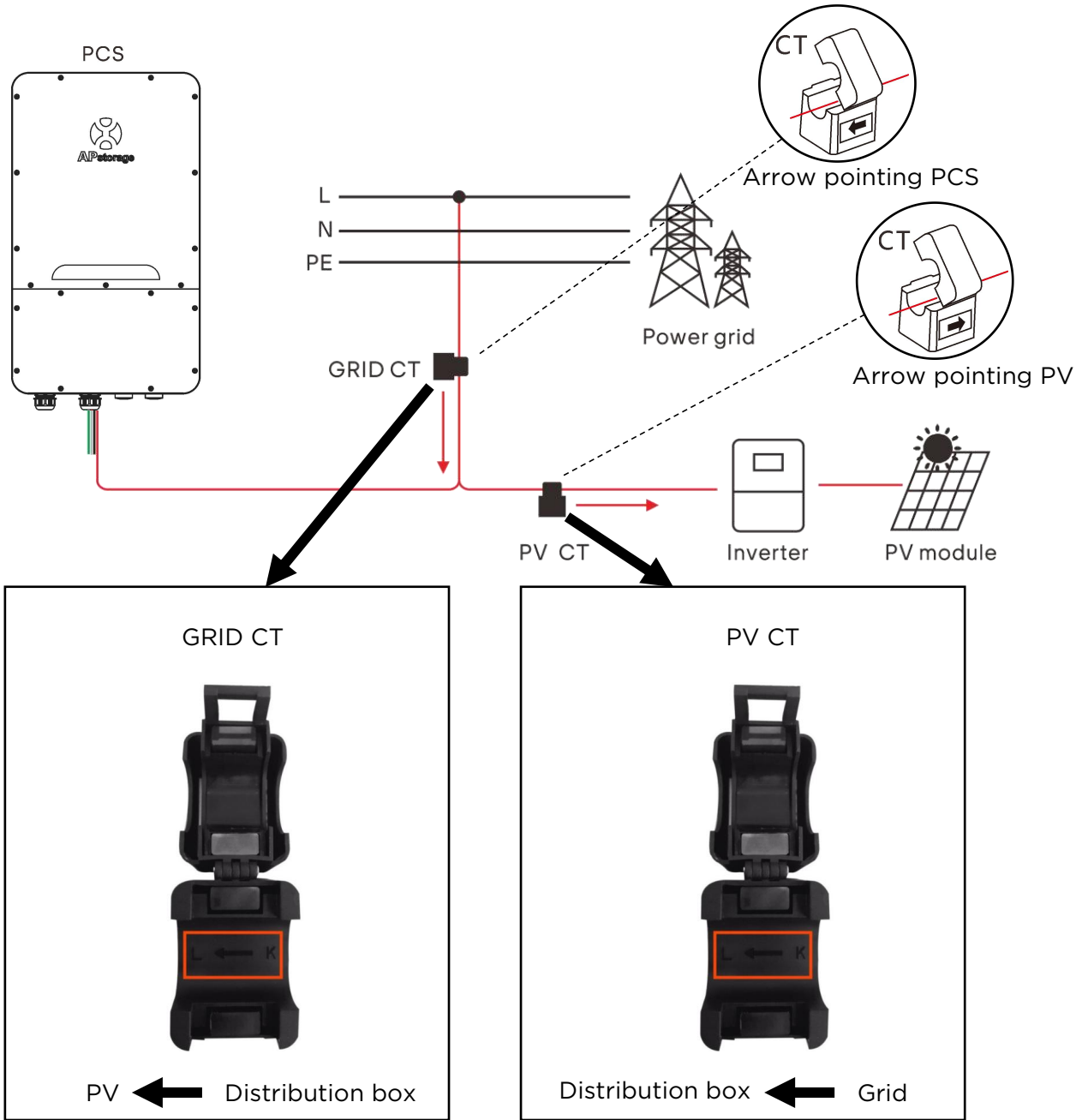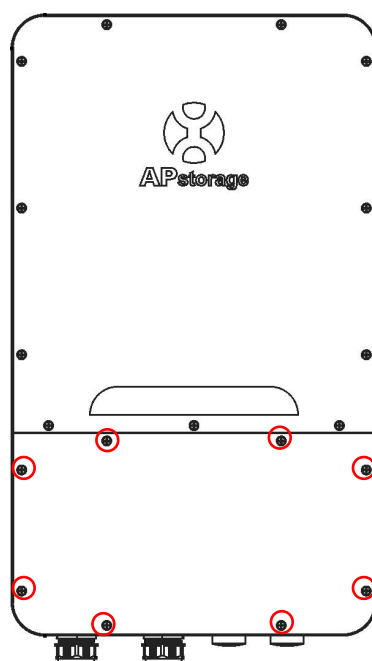
3. Installation

> ℹ️ **NOTE:** After the wiring is completed, the nuts of the cable gland must be tightened.

3.5 Install the Lower Cover

As shown,screwing the 8 screws back.
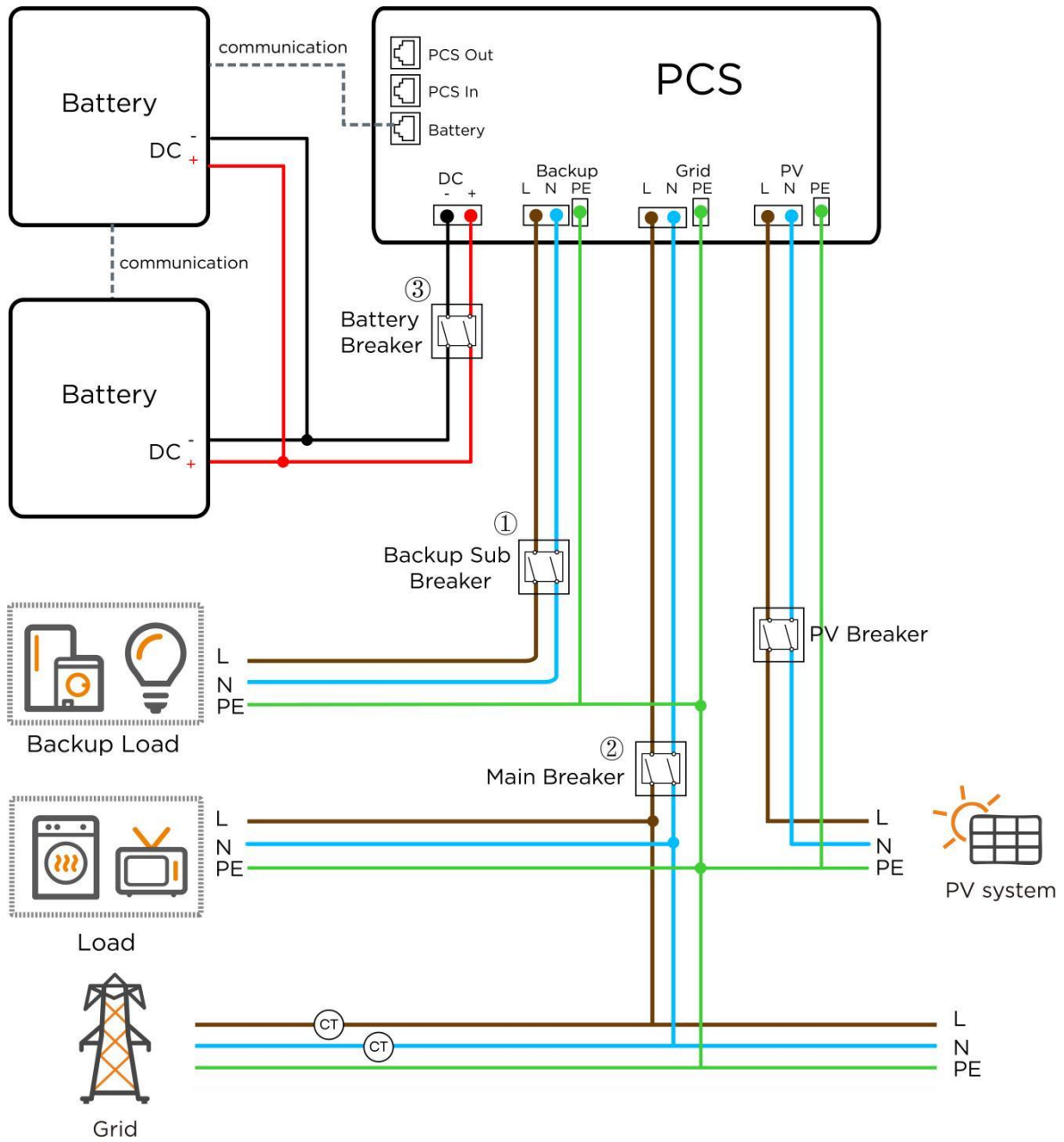
3. Installation

3.6 PV System to APstorage Pairing

1. Identify the largest maximum single load power rating (kW) that you want to backup, and select the absolute minimum number of PCS units required to meet the 2017 NEC 690.10->710.15(A) requirements. The maximum allowed number of ELS-5K units that can be connected in parallel is 2.
2. Based on the estimated backup loads for the user defined time period, calculate the required energy storage (kWh) capacity and the minimum number of battery required.
3. Refer the Table 1 to calculate the maximum PV system power (PV system 1) to connect to the backup side, if the total PV system power is larger than Max PV system power, connect the excess power (PV system 2) to the grid side.

Table 1: Maximum PV system power for storage system for backup operation

ELS-5K units	Battery units	Max PV system power (kWac)
1	1	3.75
1	>=2	7.5
2	2	7.5
2	3	11.25
2	>=4	15

3. Installation

3.7 Wiring Diagram

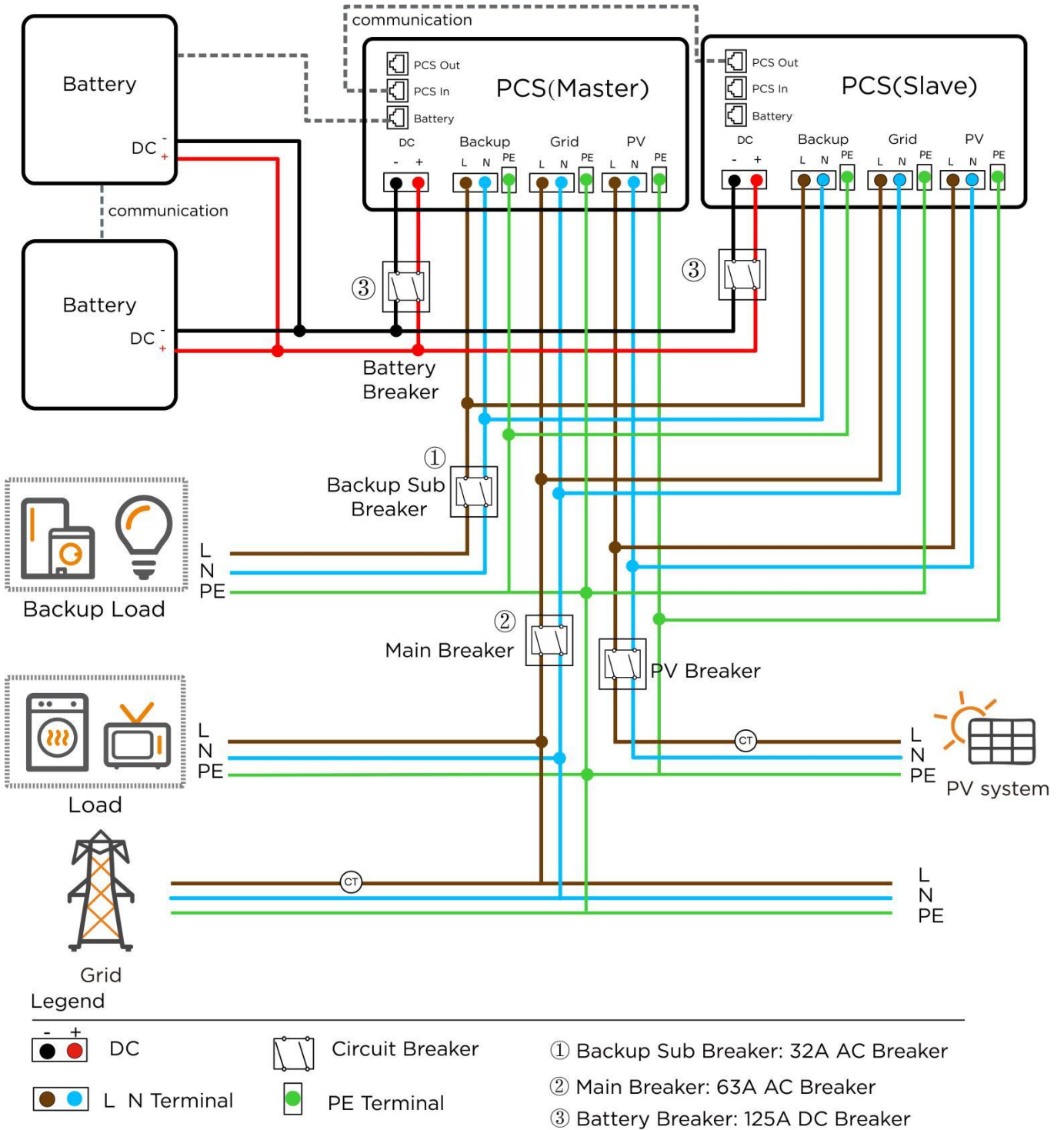**Legend**

DC	Circuit Breaker	① Backup Sub Breaker: 32A AC Breaker
L N Terminal	PE Terminal	② Main Breaker: 63A AC Breaker
		③ Battery Breaker: 125A DC Breaker

# 3. Installation

3.8 Parallel Wirng Diagram

Please refer chapter 4.5.6 to set the PCS work in parallel.

① Backup Sub Breaker: 32A AC Breaker
② Main Breaker: 63A AC Breaker
③ Battery Breaker: 125A DC Breaker

3. Installation

3.9 PCS Parallel Wiring Steps

Step 1. Connect the battery DC cable and the battery communication cable (do not connect the communication cable between PCS and PCS).
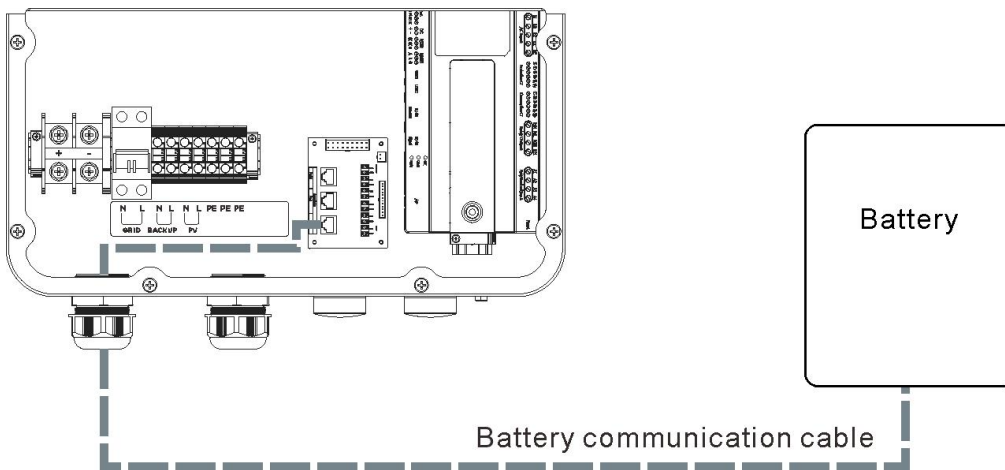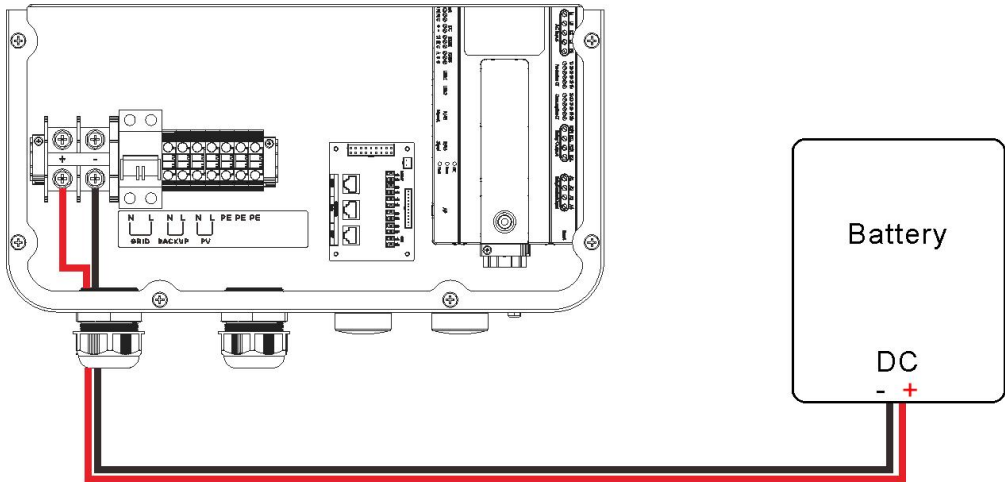
Step 2. Use the APP to set one as the master and one as the slave (Please refer chapter 4.5.6 to set the PCS work in parallel.)

Step 3. Reconnect the communication cable between PCS and PCS.
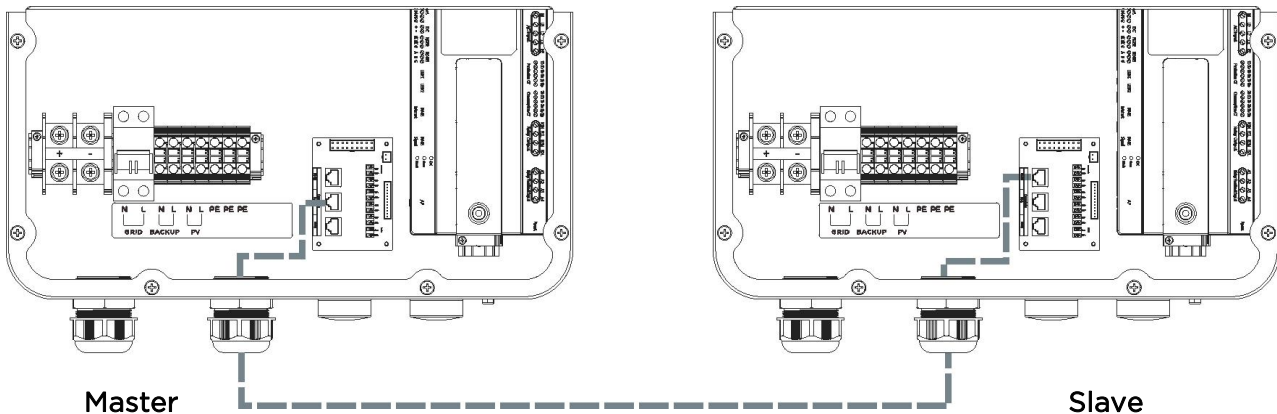
Master   Slave

Step 4. Use the APP to connect to the host, enter the PCS management interface, and automatically search for 2 PCS IDs, which are the master and the slave.

Step 5. Connect all the wires according to the above parallel diagram and use them.

3. Installation

3.10 Start-up Sequence

3.10.1 Power ON
Once the unit has been properly installed and the batteries are connected well, turn on the batteries, then turn on the Battery Breaker, Grid Breaker, Backup Breaker and Main breaker to power the system.

3.10.2 Check the System
Please refer the chapter 4.5.1 to check the system.

> **WARNING:** Installation must be performed with care.
> Before making the final DC connection or closing DC breaker/disconnect, be sure positive(+) must be connect to positive(+) and negative(-) must be connected to negative(-). Reverse polarity connection on battery will damage the inverter.

4. APstorage User Interface

Professional and certified Installer can commission, monitor and maintain the APstorage solution and performance via the EMA Manager APP. Please search the APP in APP Store or Google Play, or use mobile browser to scan the QR codes to download the APP. (EMA App is for end user, EMA Manager is for installer). Or click the link to download the APP: http://q-r.to/1OrC

4.1 Configurate APstorage with EMA Manager

The APstorage Sea System has been designed with local connection and management functionality. You can access this local functionality through EMA Manager.
Click "*Local access*" to enter this function.
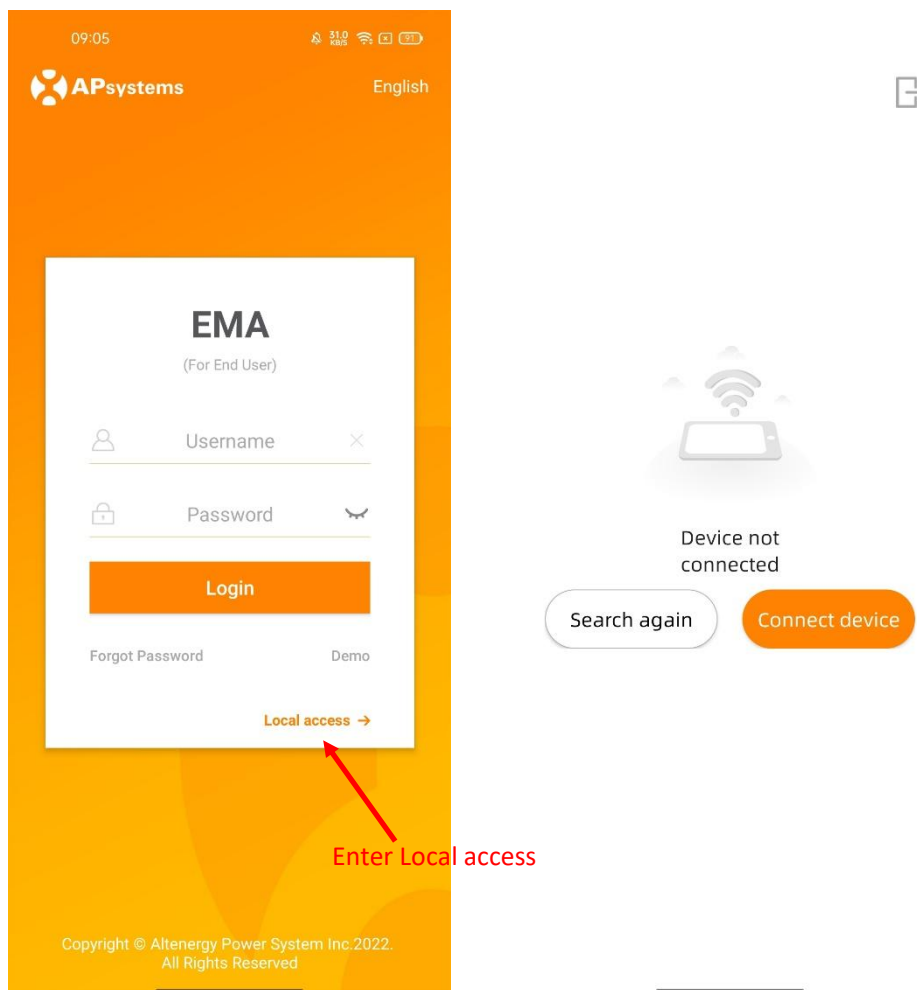
You will be noticed if your smartphone or tablet is not initially connected to the hotspot of the APstorage Sea System or the router to which the APstorage Sea System is connected.

- Step1: Open Wi-Fi setting in your smartphone, connect to the hotspot of the APstorage Sea System,the format of the hotspot is ECU-WIFI_XXXX, XXXX being the last four digits of the built-in ECU.Also you can connect to the router which the APstorage Sea System is connected.

4. APstorage User Interface

the hotspot of the APstorage Sea System

The hotspot of the router
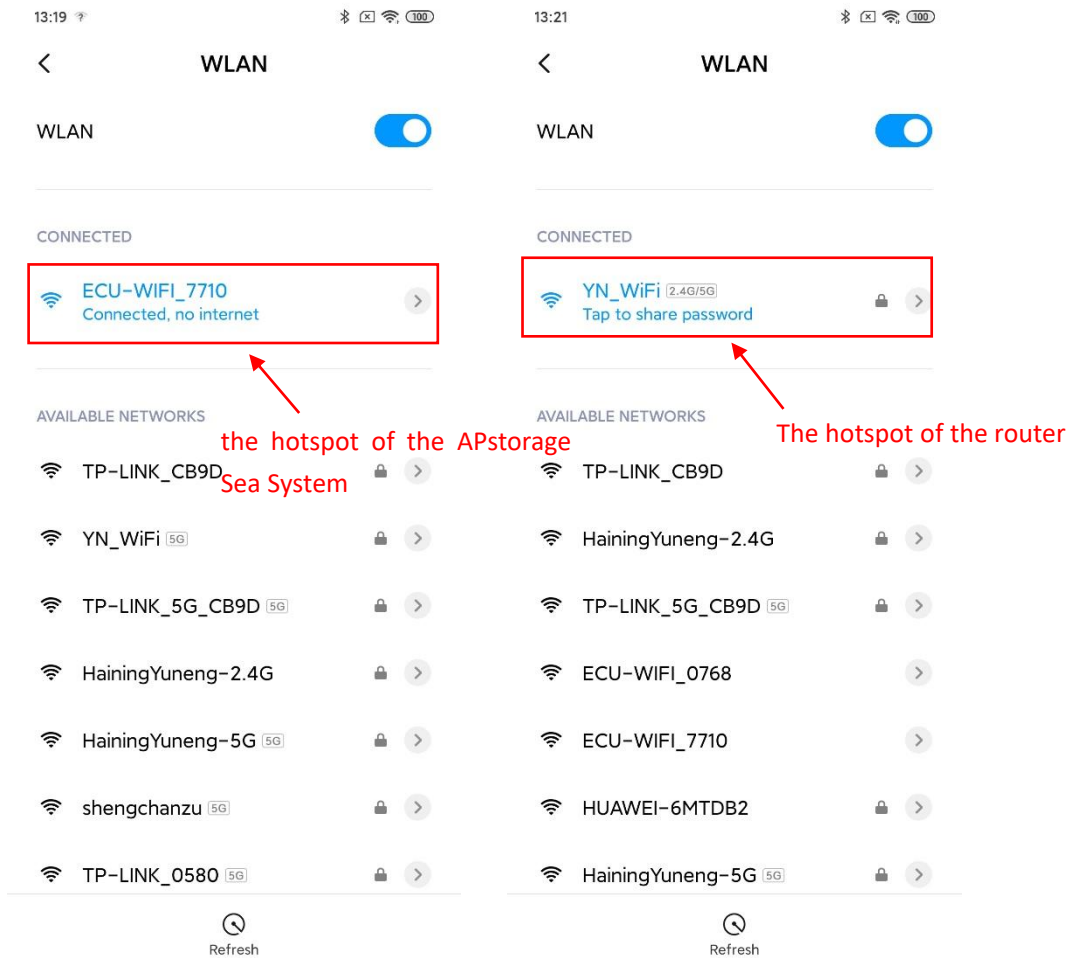
- Step 2: Open EMA Manager.
- Step 3: Click "*Local access*"

You can use this APP to connect the APStorage Sea System to the router via Lan or Wlan. (Please refer chapter 4.5.3)

4. APstorage User Interface

4.2 Home Page

4.2.1 Once connected to the build-in ECU hot-spot, you can enter the homepage, You can switch ECUs in the LAN by clicking the drop-down box. It can be switched only when the mobile phone and ECU are connected to the same router.
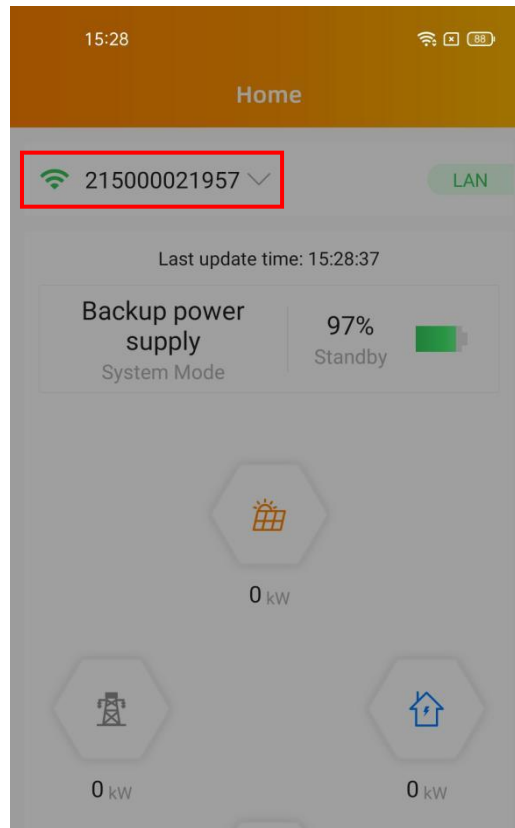
4. APstorage User Interface

4.2.2 You can view the system ID, charge and discharge status, real-time power, SOC, today's charged energy, total charged energy since installed, and CO_2 reduction.
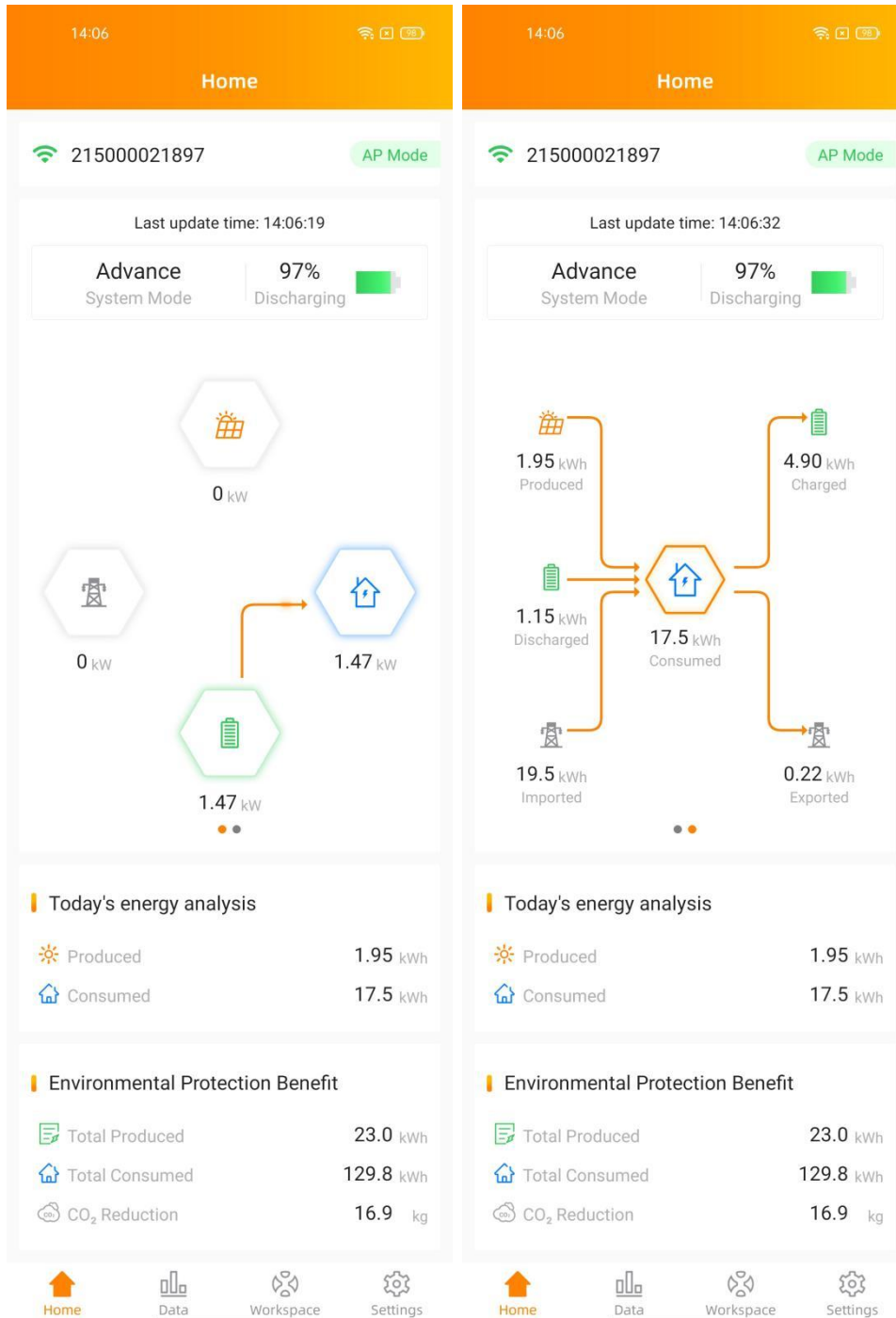
4. APstorage User Interface

4.3 Module

This page displays the real-time power of the photovoltaic inverter.
Click the Module, the detailed information of the inverter will be displayed, including the inverter ID, PV module power, grid voltage, frequency and temperature.
You need to install PV module to view these data.

APstorage Installation / User Manual
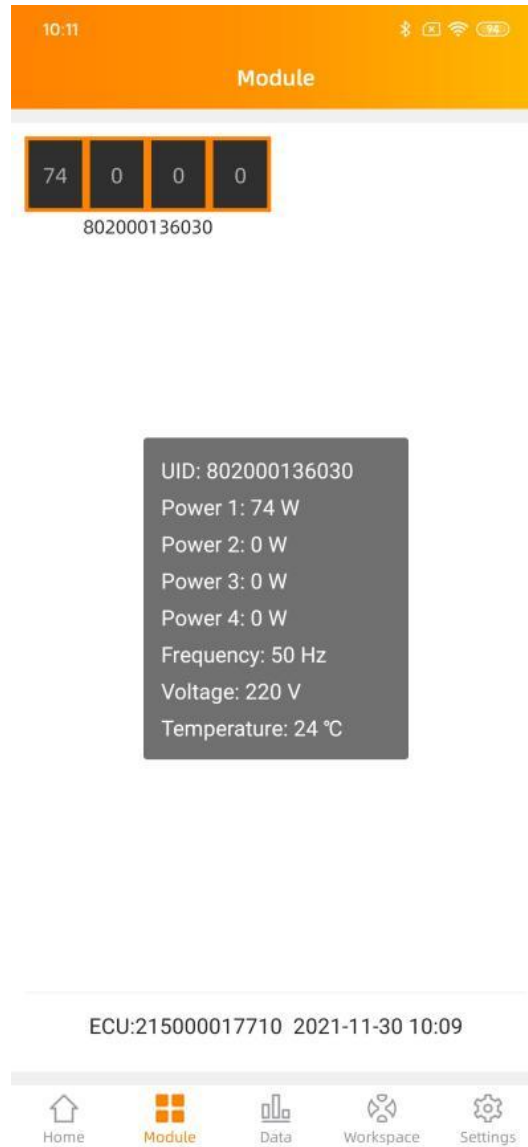
4. APstorage User Interface

4.4 Data

4.4.1 Data overview
This page is used to display the system overview.Select a date to view the system's power summary information and power distribution information and its graph.
Click the "Energy" "Power" button to view the energy and power chart of the system for the day.
Select Daily, Monthly or Yearly to display the current month, current year, and historical data.
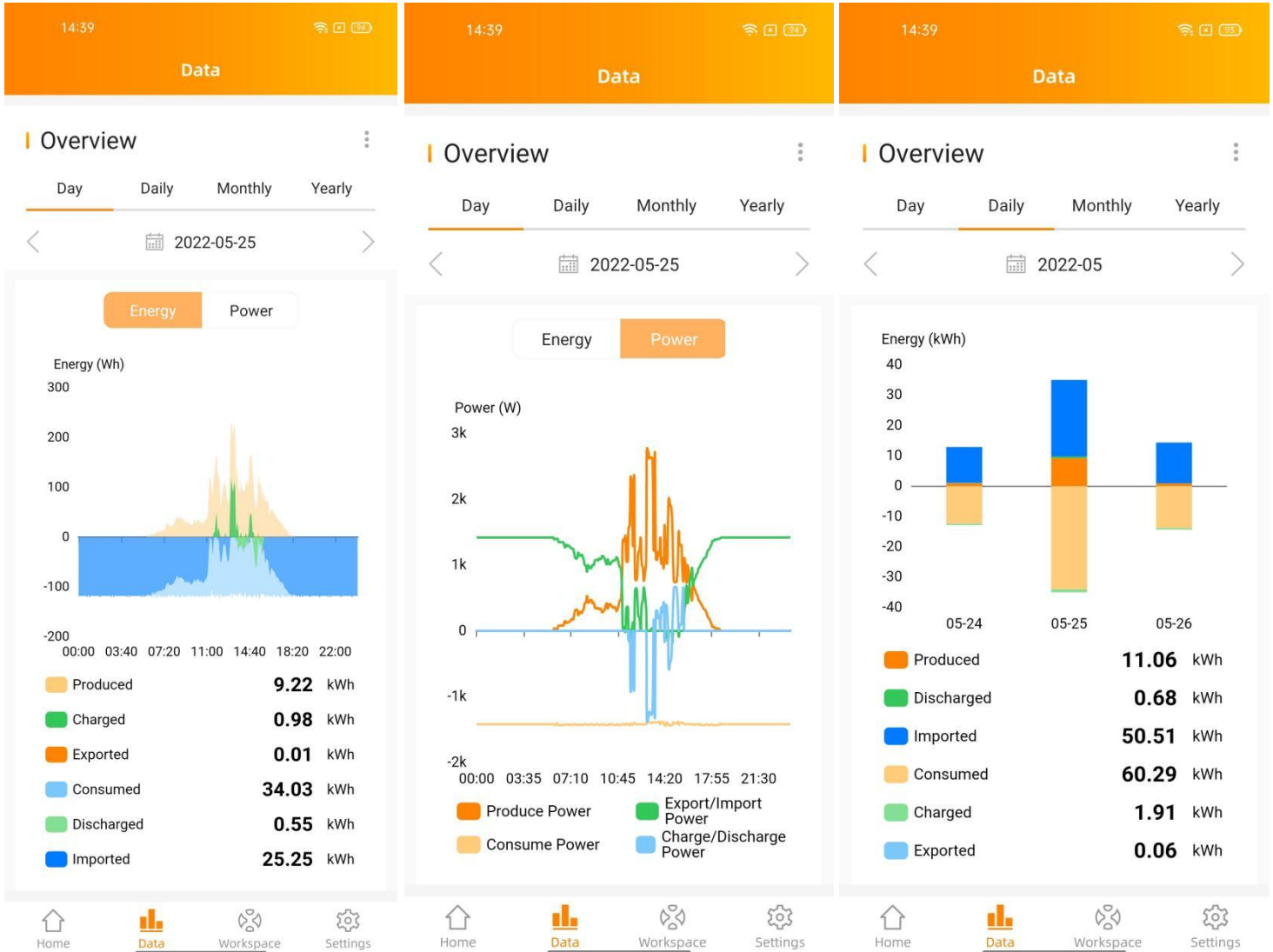
4. APstorage User Interface

4.4.2 Storage data
The daily energy storage power curve is displayed on this page. Select a date to view the historical power and electricity curve of energy storage.
Select Daily Monthly or Yearly to display the current month, current year, and historical data curve.

APstorage Installation / User Manual
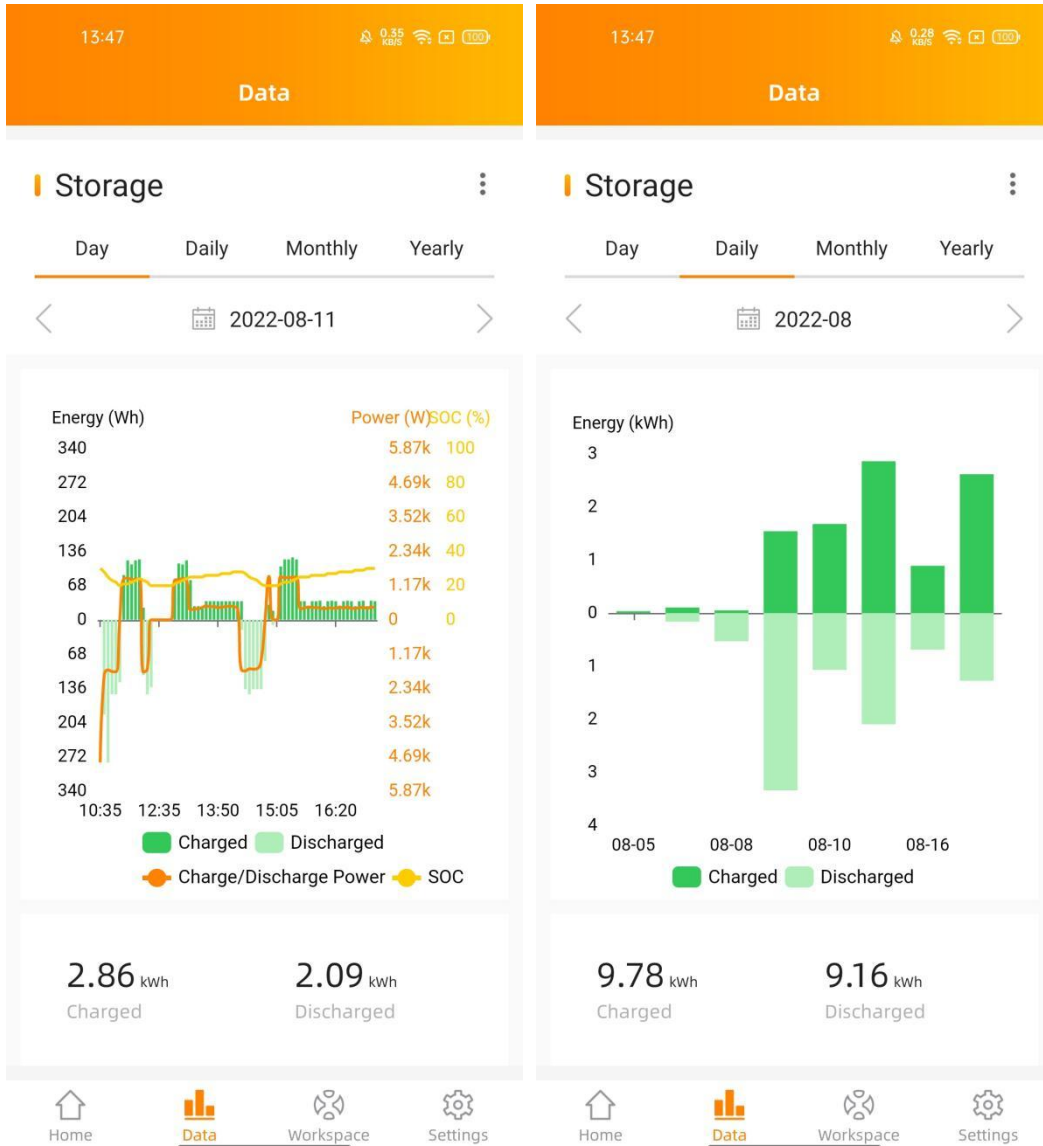
4. APstorage User Interface

4.4.3 ECU data

The daily photovoltaic power curve is displayed on this page. Select the date to view the PV system data.

Select Daily Monthly or Yearly to display the current month, current year, and historical power curve.

You need to install PV system to view these data.
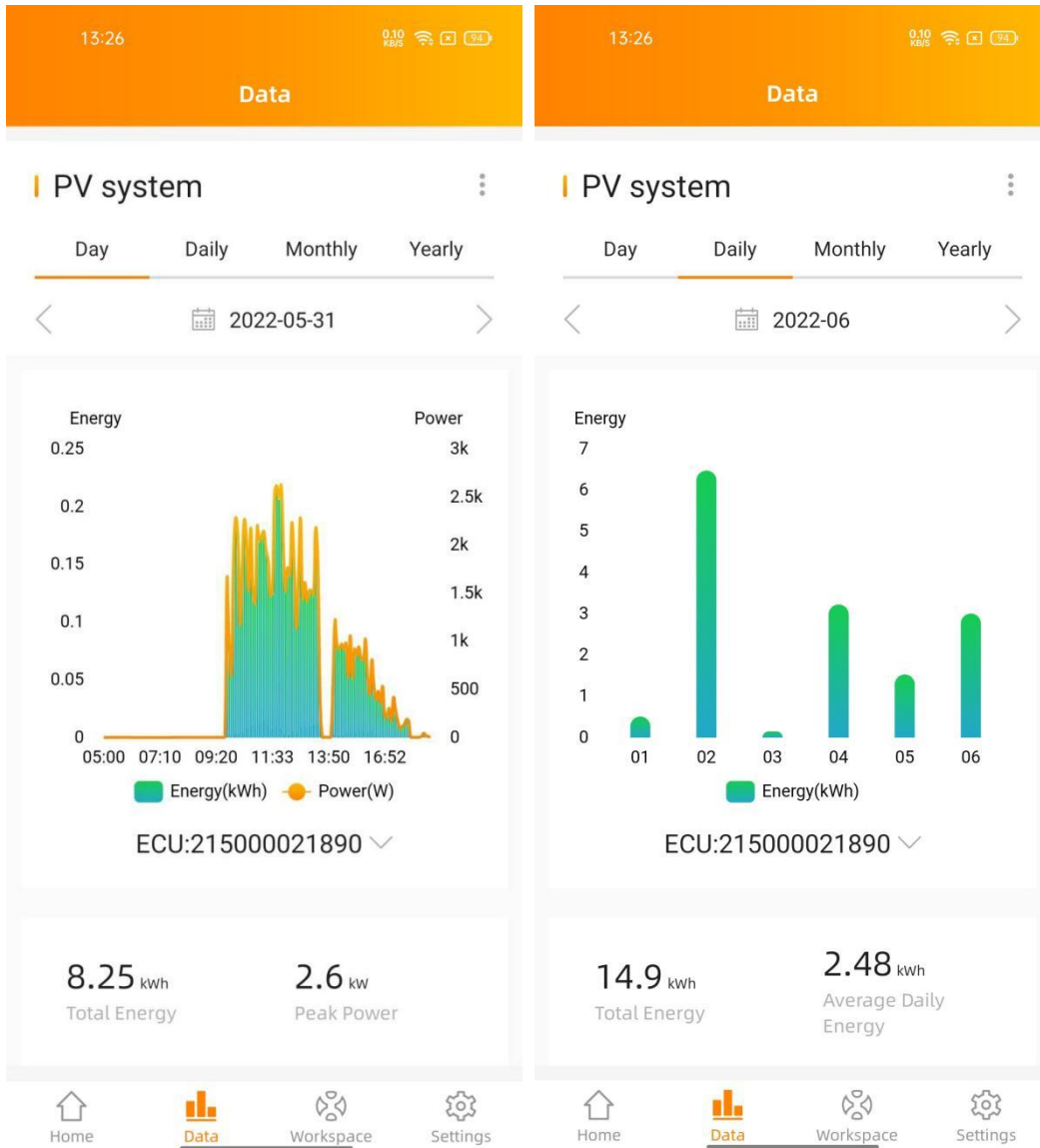
4. APstorage User Interface

4.5 Workbench

The workbench displays the latest communication time, and currently supported function catalog. Click the corresponding button to enter the function page.
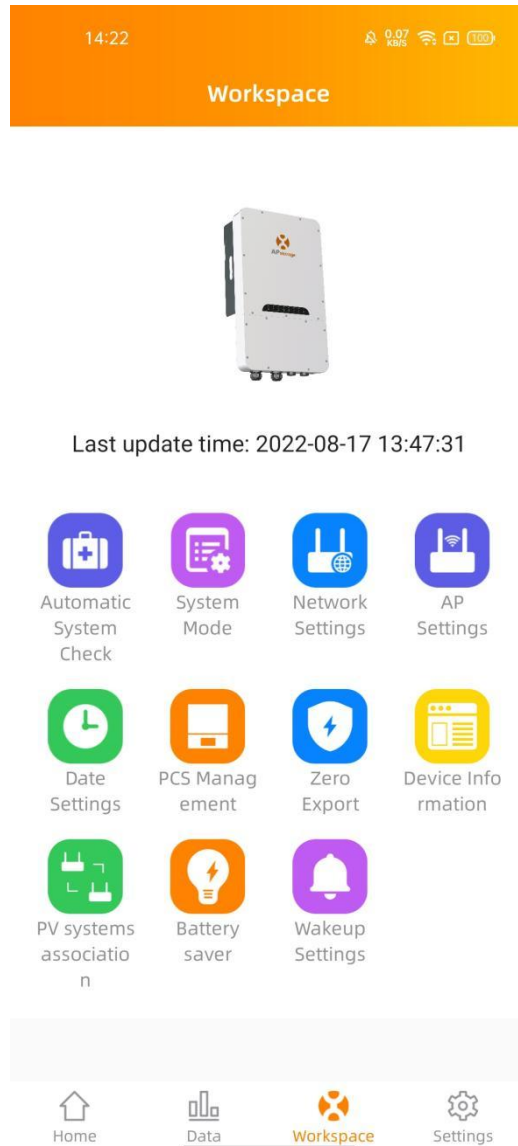
4. APstorage User Interface

4.5.1 Automatic System Check
Enter the Automatic System Check interface, you can check the APstorage information. If there is an alarm, you can click to view the detailed information.
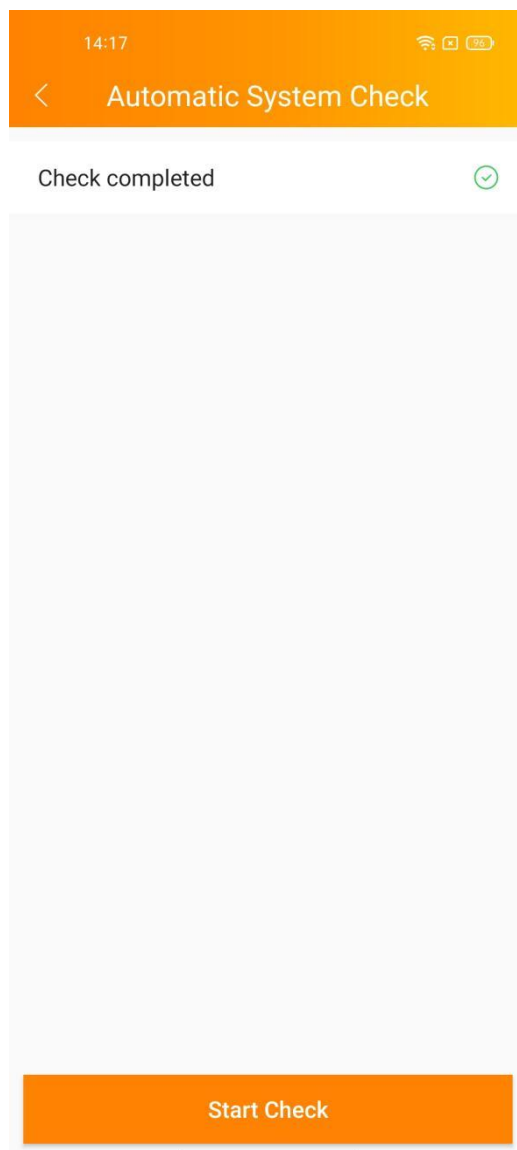
4. APstorage User Interface

4.5.2 System Mode

The system mode of the APstorage Sea System includes battery backup mode, residual power Self-Consumption mode and advanced mode. If you need to set the system working mode, please select the corresponding working mode and set the parameters, and then click "OK".

Click for details
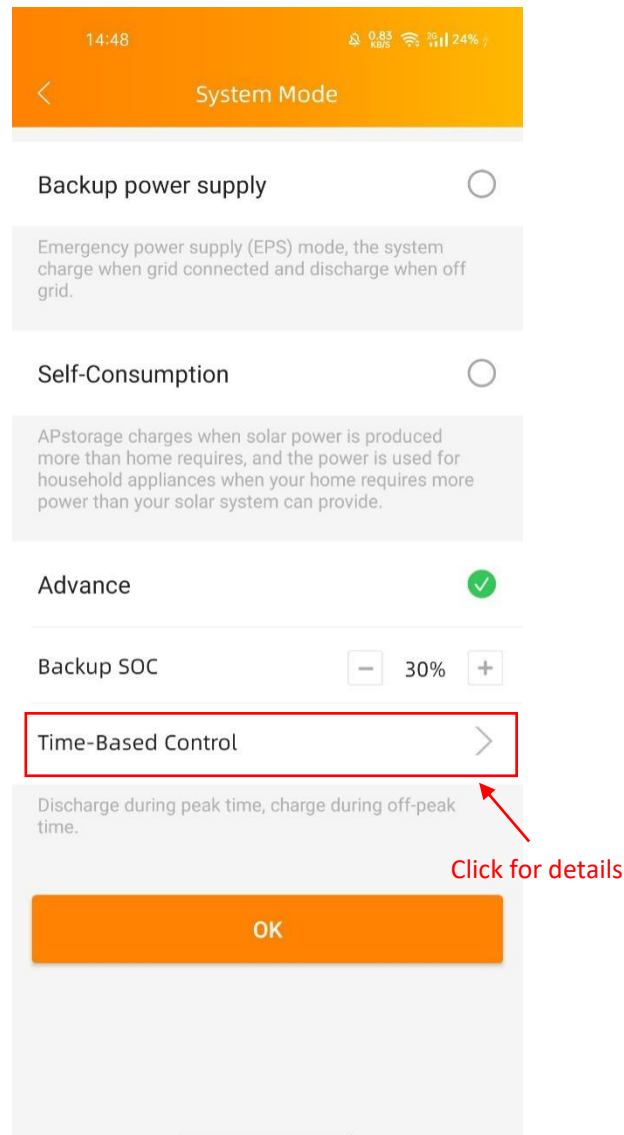
4. APstorage User Interface

4.5.2.1 Time-Based Control
Click "Time-Based Control", you can view the list of peak times and off-peak times currently set. You can edit the time ranges by clicking on it. Click the "Add" button to select the peak time or off-peak time to be added.
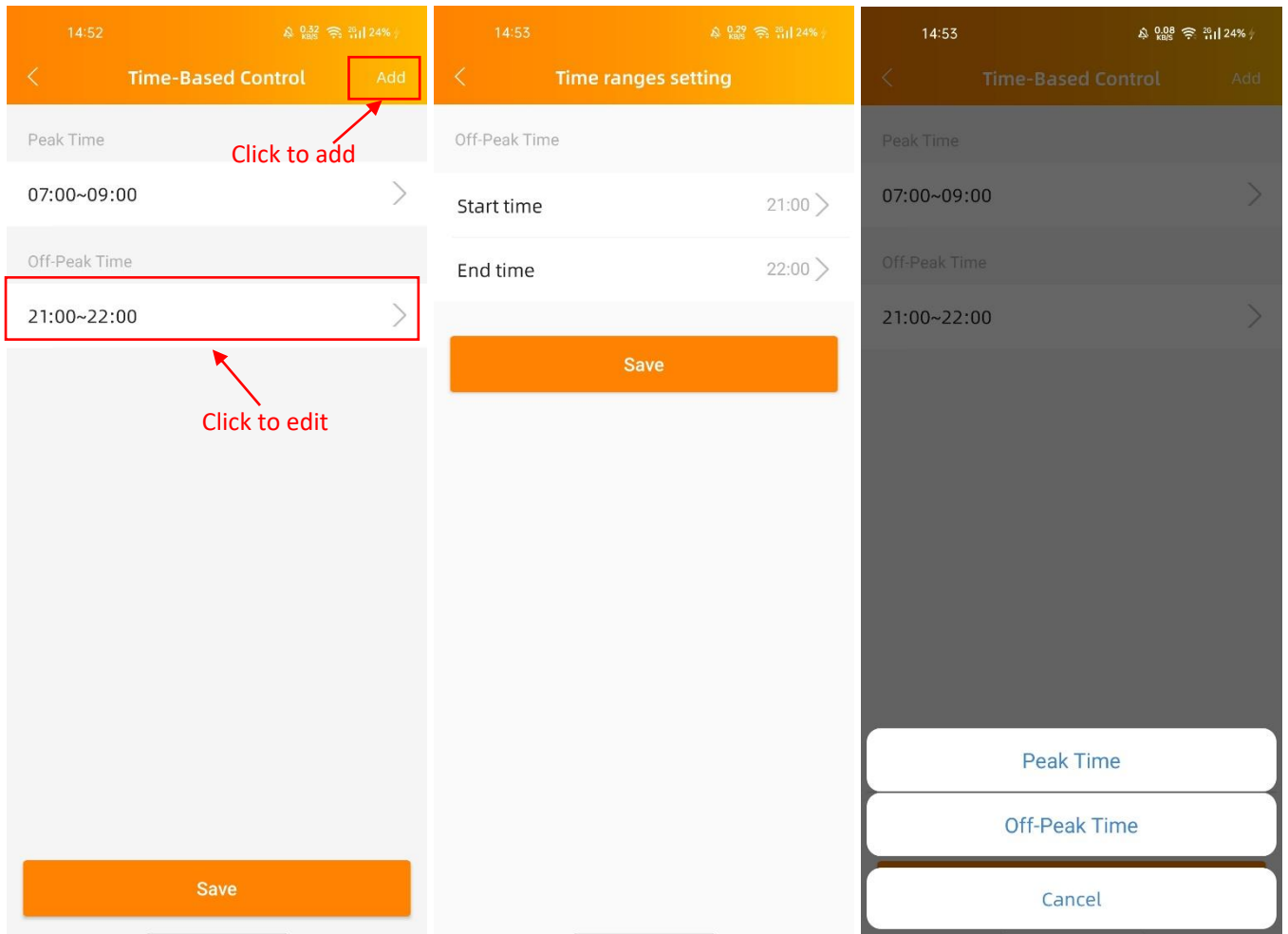
4. APstorage User Interface

4.5.3 Network Setting
Click the button to enter the WLAN Settings or LAN Settings page.
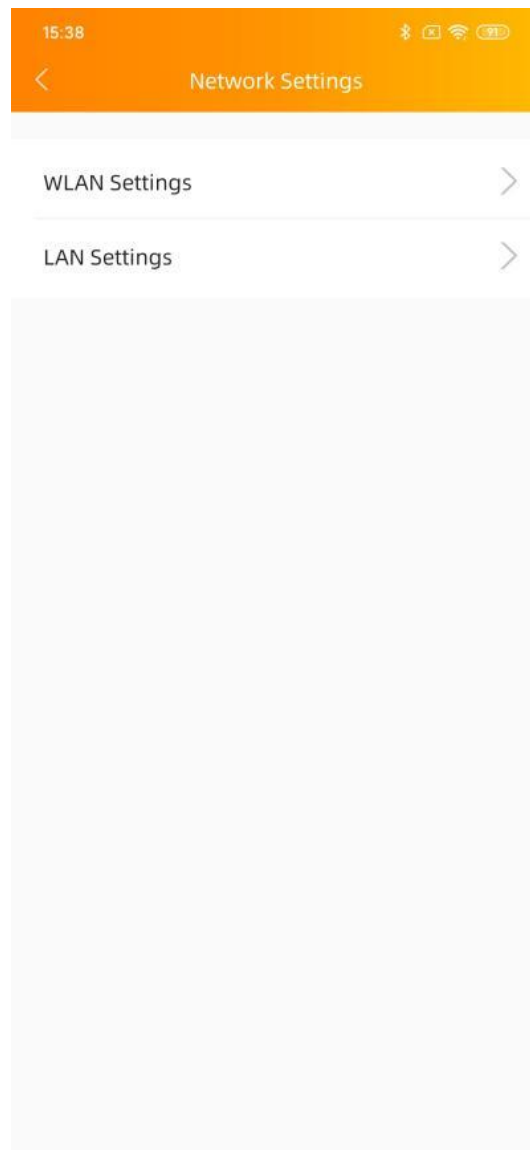
4. APstorage User Interface

4.5.3.1 WLAN Settings
This interface will display the WLAN connection status of the ECU.
Scroll down the screen and the available SSID will be displayed.
Click SSID, and enter the password.
After entering the password, the ECU will restart. Please reconnect the ECU.
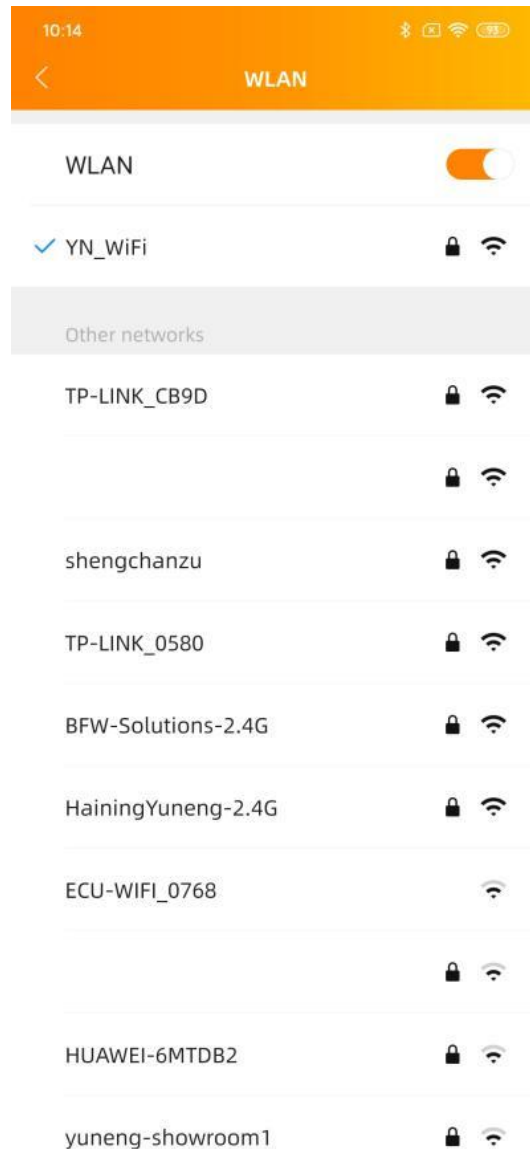
4.5.3.2 LAN Settings

The LAN setting of ECU is divided into automatically obtaining IP address and using fixed IP address.

Obtaining an IP address automatically (recommended) means that the router will automatically assign the IP to the ECU.
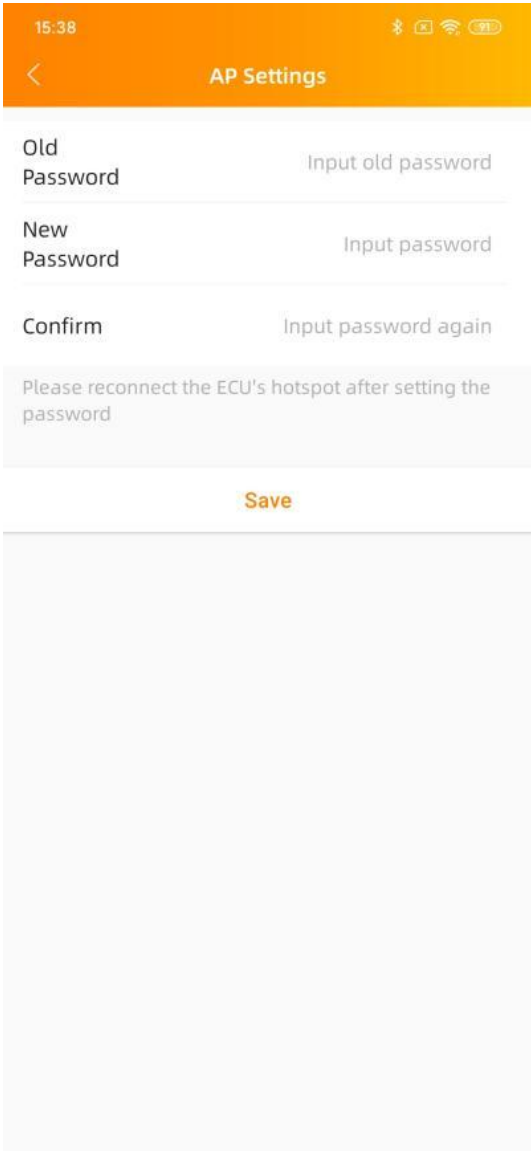
When using a fixed IP, please enter the IP address, subnet mask, default gateway, preferred DNS server and alternate DNS server.

10:14	✻ ⊠ 🗢 📶
<	LAN

Obtain an IP address automatically	🟠
MAC address	80:97:1B:02:E4:B4
IP address	192.168.131.228

10:14	✻ ⊠ 🗢 📶
<	LAN

Obtain an IP address automatically	⚪
MAC address	80:97:1B:02:E4:B4
IP address	192.168.131.228
Subnet mask	255.255.255.0
Default gateway	0
Preferred DNS server	119.29.29.29
Alternate DNS server	182.254.116.116
Update	

4. APstorage User Interface

4.5.4 Hotspot Settings
Enter the hotspot setting interface, you can change the hotspot password of ECU. After setting the password, please reconnect to the hotspot of the ECU.

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4. APstorage User Interface

4.5.5 Data Settings
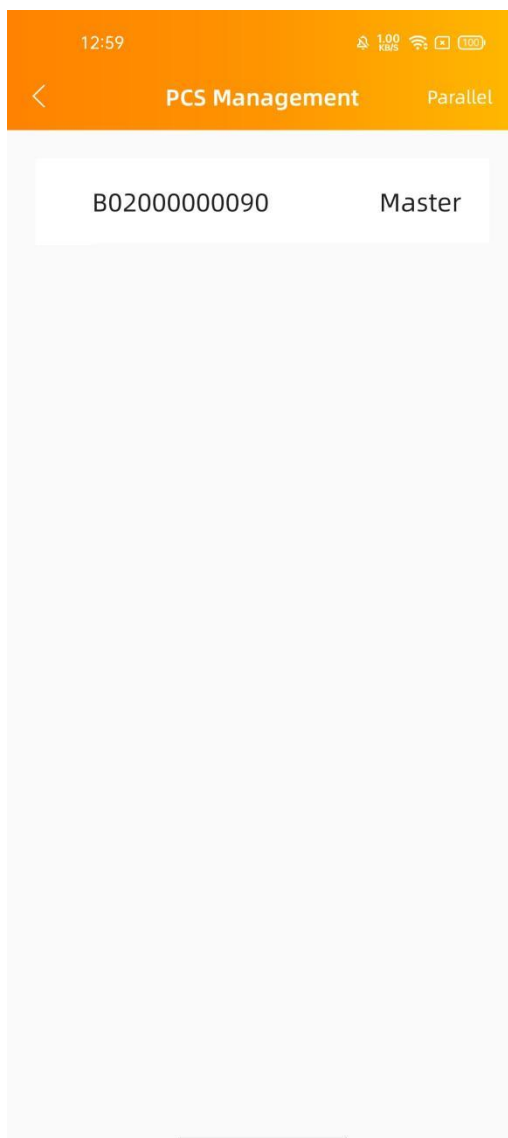After entering this page, the time will be displayed on the right. Click on the date, time, and time zone to modify.
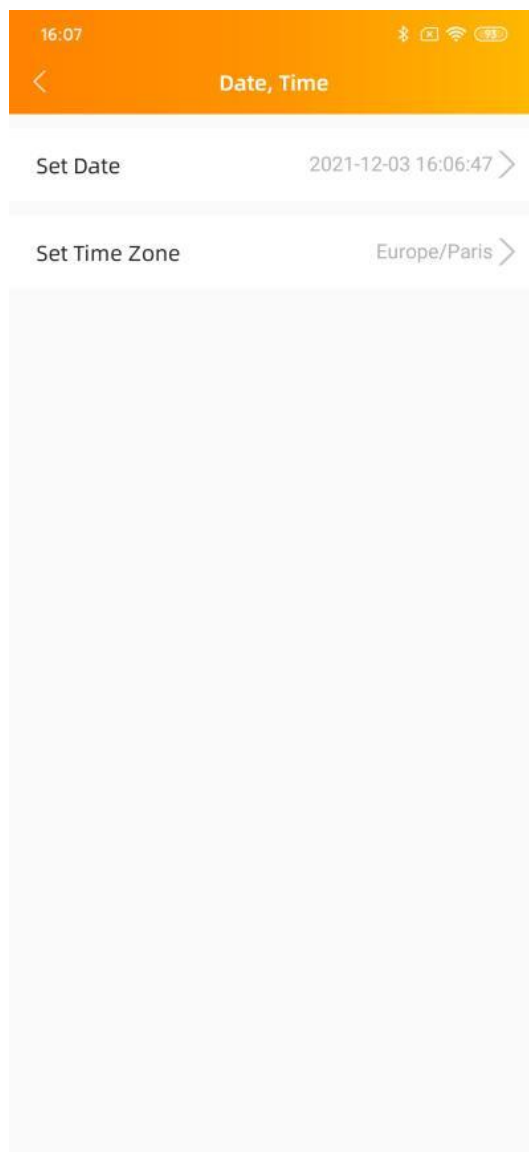
4. APstorage User Interface

4.5.6 PCS

This page displays a list of PCSs in the system. If the PCS supports the master-slave setting, you can click "Parallel" to enter the Parallel page.

NOTE: Unconfigured PCS，must be set as "Master" or "Slave" to use parallel function.

4. APstorage User Interface

4.5.6.1 PCS Parallel

Select "master" or "slave" and click "save" to complete the setting. After setting, you can see whether PCS is master or slave。

| i | **NOTE:** After the setting is completed, the system will restart, please reconnect the system. |
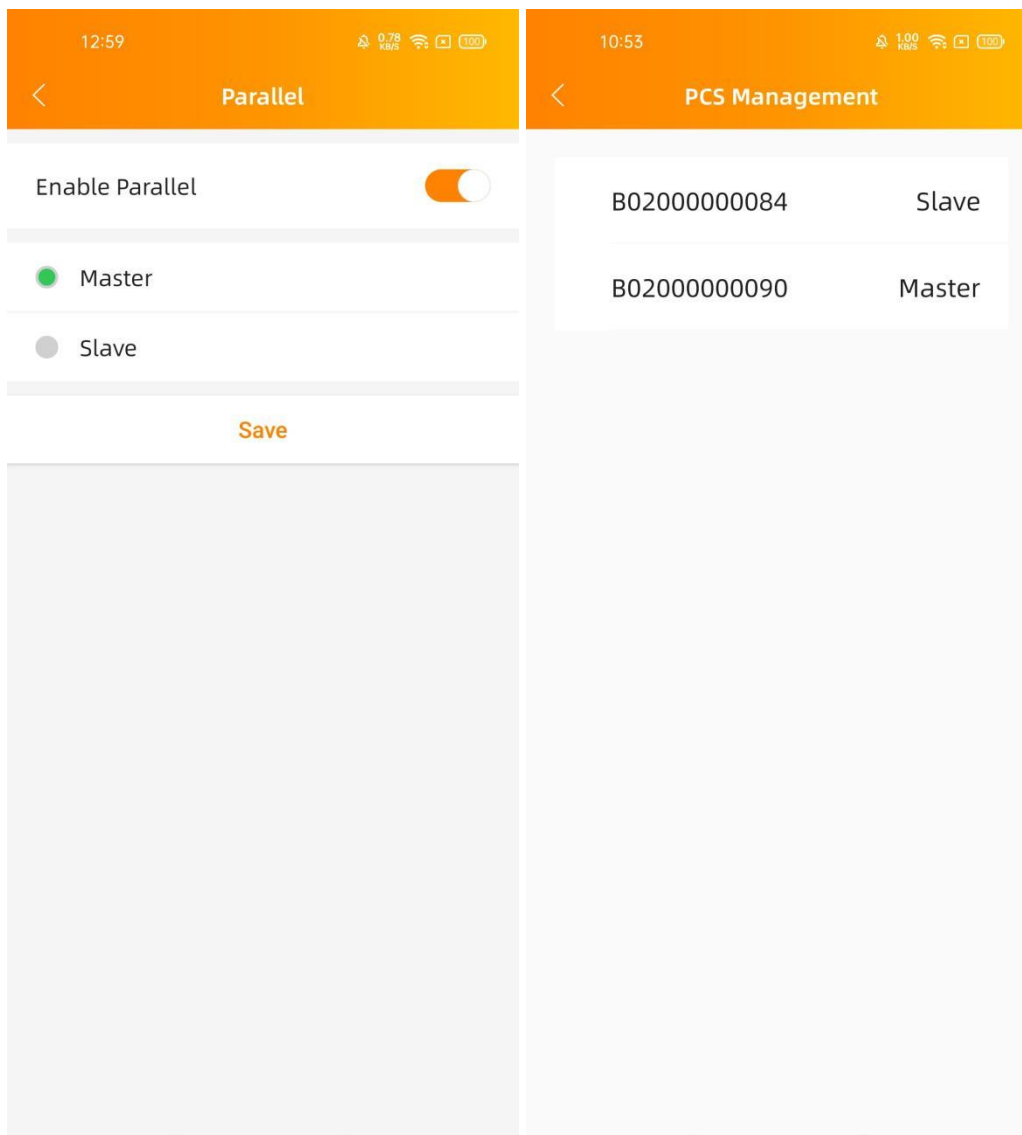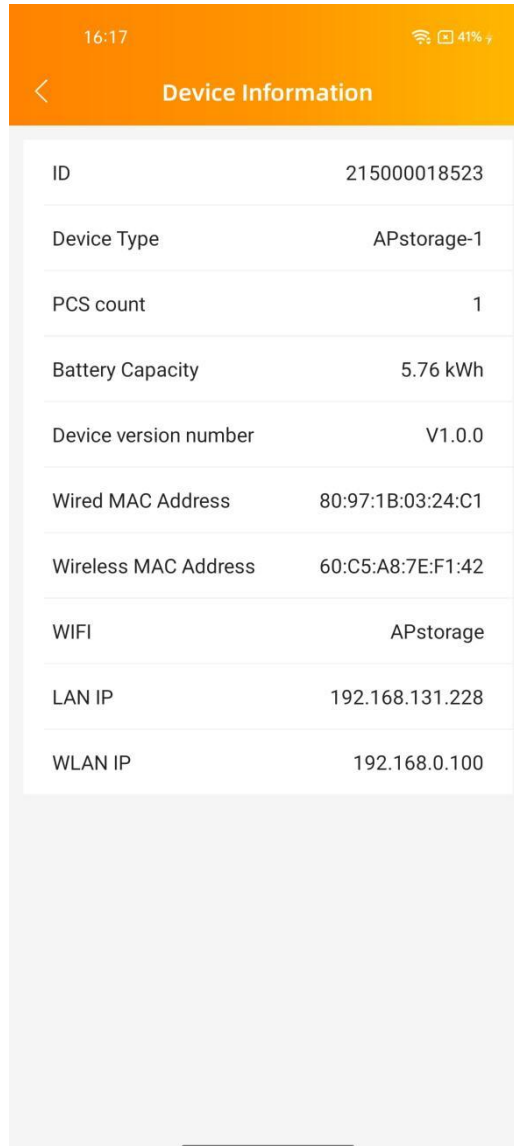
4.5.7 Zero Export
When the APstorage Sea system is associated to an APsystems PV system, if needed, the Zero Export function can limit the PV output power to the grid, and the user can set the maximum allowable reverse current power when the Zero Export function is turned on.
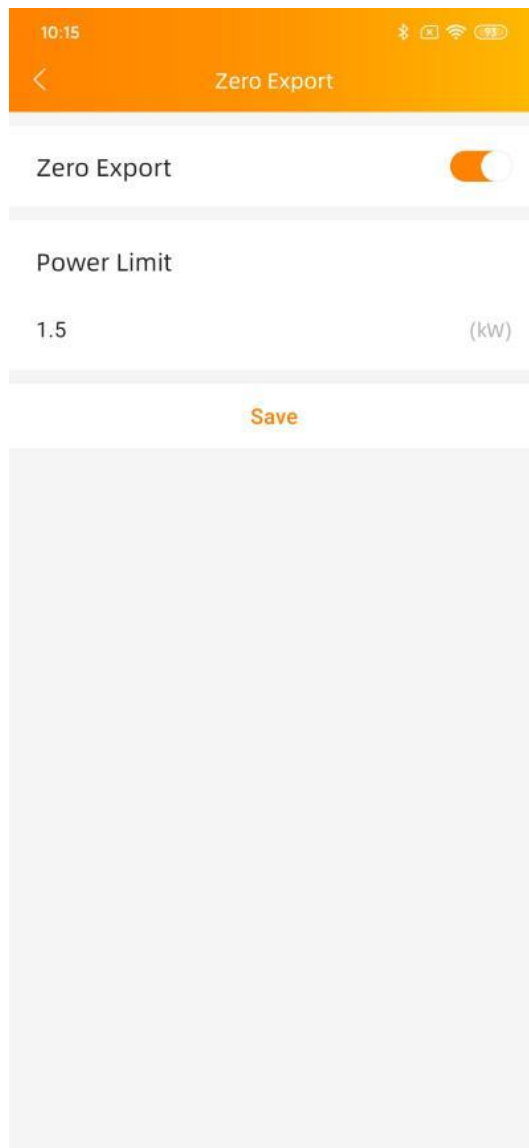
4. APstorage User Interface

4.5.8 Device Information
The device information page displays the device ID, device type, PCS number, battery capacity, device version number, wired and wireless network MAC, currently connected router SSID, IP address.
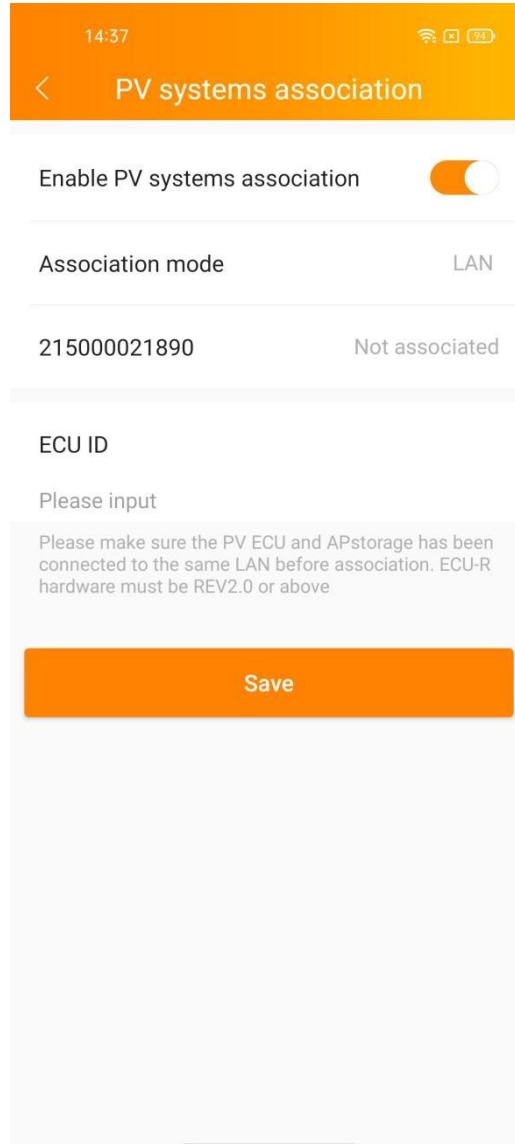
4. APstorage User Interface

4.5.9 Associate with PV system

Enter this page, you can view the current association status.
If you have installed APsystem microinverters with ECU, you can associate the APstorage with PV system. Enter the PV ECU's ID, then click Save, the APstorage will associate with PV system automatically. It is necessary if you want to turn on zero export function.

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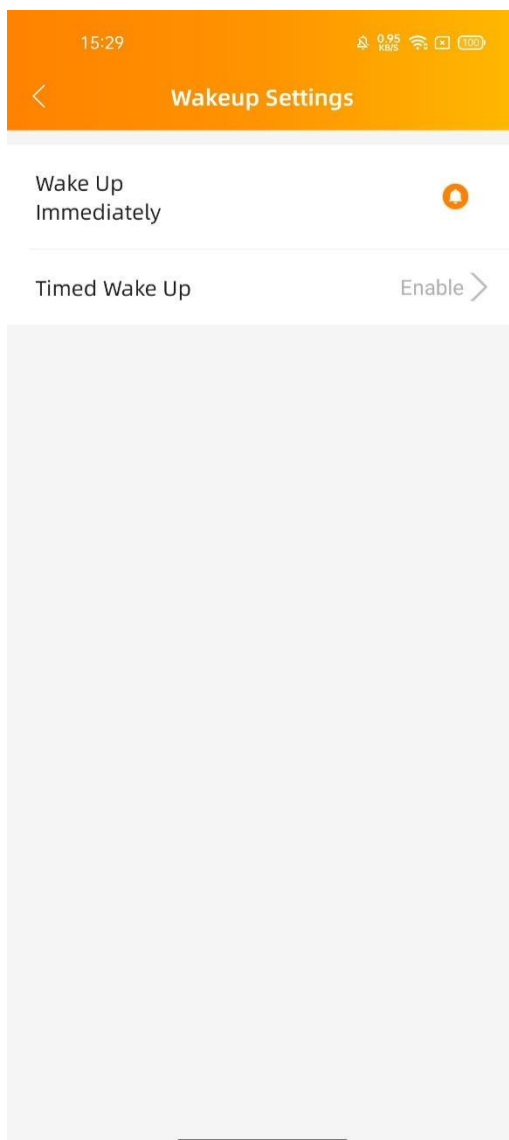
4.5.10 Battery saver
Enter this page, you can enable battery saver, after enable battery saver, if APstorage doesn't charge or discharge for an hour, it will go to sleep.
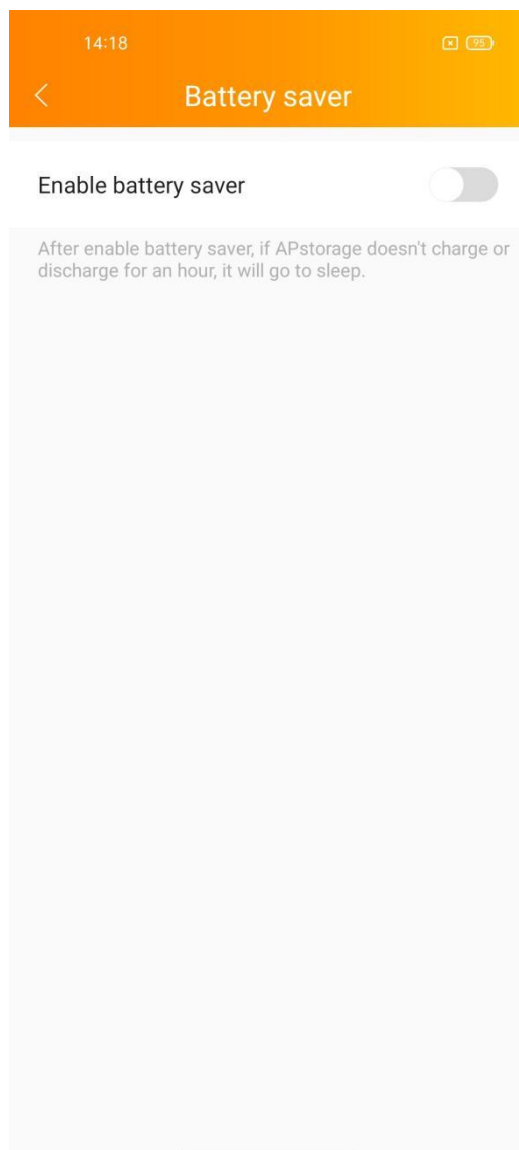
4.5.11 Wakeup Settings
When the PCS is off-grid and sleep,you can wake up the system immediately or timed wake up.
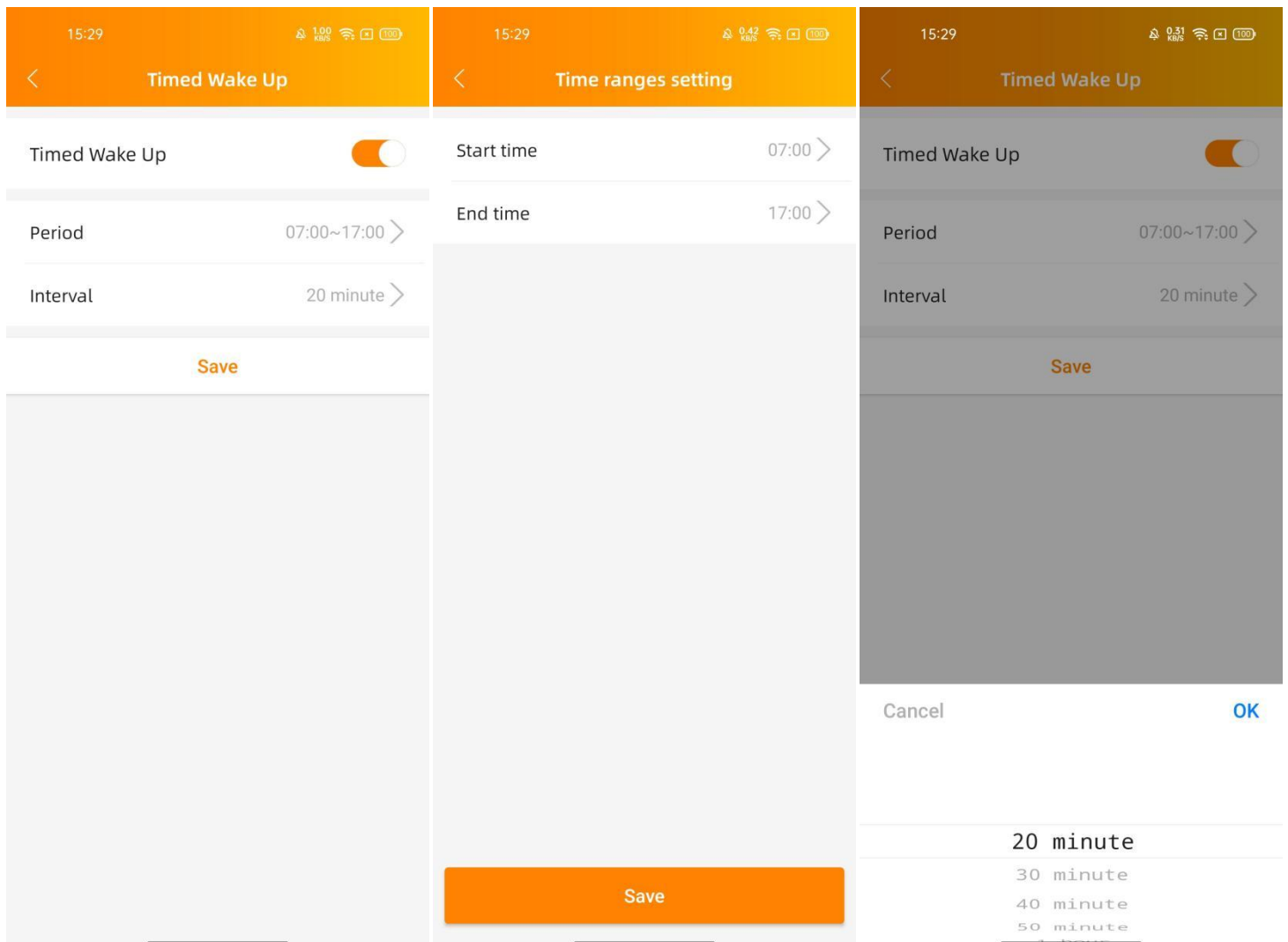If you click "Wake Up Immediately",the system will wake up immediately.

4. APstorage User Interface
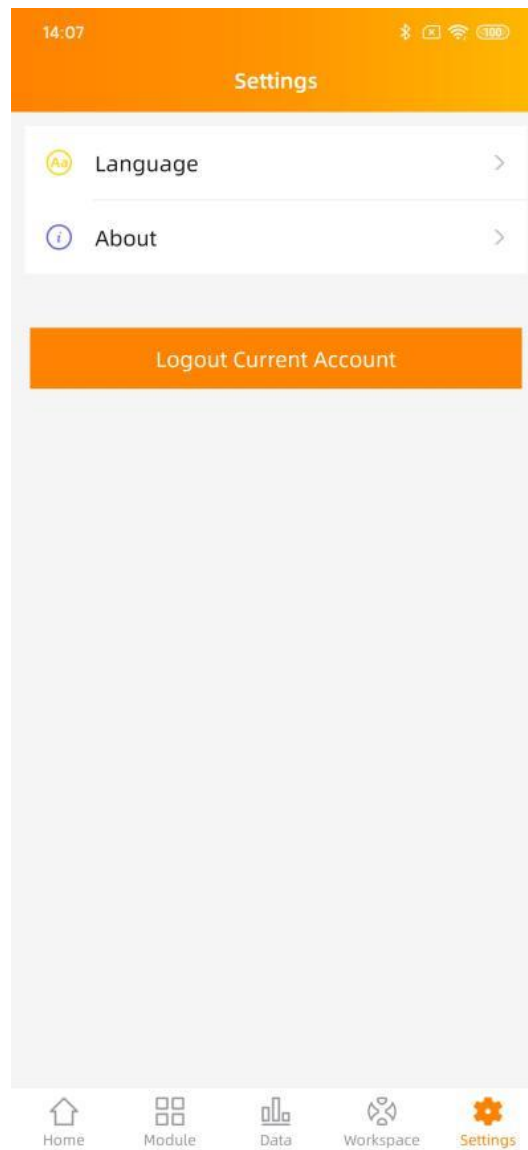
4.5.11.1 Timed Wake Up
On this page, you can set the wake-up time period and interval.

4. APstorage User Interface

4.6 Settings

Select "Language" to set the APP language, and "About" to view the APP introduction.

5. Contact Information

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For technical data, please refer to the datasheet at https://emea.apsystems.com/resources/library/