



User manual

Version 1.1

PV Rapid Shutdown System FR-PVMS



Scan code to learn more

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Preface

Instruction

This user manual describes in detail the installation and operation of PV Rapid Shutdown System(PVRSS). Before installing and operating the equipment, you should read and understand all the instructions and be familiar with the relevant safety in relevant paragraphs.

Target Group

This user manual is intended for operators and end users.

Signs

The following signs may appear in this article, and their meanings are as follows.

Signs	Instructions
	Indicates a hazardous situation which,if not avoided, will result in death or serious injury.
	Indicates a hazardous situation which,if not avoided, could result in death or serious injury.
	Indicates a hazardous situation which,if not avoided, could result in minor or moderate injury.
	Indicates a situation which,if not avoided, can result in property damage. It is not safety warning information, and does not involve personal, equipment and environmental damage.
 Note	Protrudes important or critical information, best practices, tips, etc. It is not safety warning information, and does not involve personal, equipment and environmental damage.

1 Safety Precautions

To prevent personal injury and property damage, read this section carefully and observe all safety information at all times.

Requirements of operators

Operators must have the following skills:

- Knowledge of how PVRSS works and is operated.
- Training in how to deal with the dangers and risks associated with installing, using electrical devices and installations.
- Knowledge of and compliance with this document and all safety information.

Installation



- Do not touch any parts other than those required for wiring during installation.
 - All electrical connections must meet the electrical standards of the country or region where they are located.
-



- Make sure that the switch of the main controller or main control box is always OFF during the configuration process.
-



- Please read this user manual carefully before installation. If the equipment is damaged resulting from violation of the regulations specified in this document, our company has the right not to guarantee the quality.
-

Function check



- Make sure that the switch of the controller or main control box is OFF before touching any part of the photovoltaic system or product.
-

Operation



- Make sure that the main controller or main control box and the inverter are both OFF before connecting the inverter.
-



- The tail modules are extremely hot when they are in operation, and touching those can cause severe burns and personal injury.
-

2 Product Overview

2.1 Description

PV Rapid Shutdown System (PVRSS) is one of the important safety components of distributed photovoltaic system.

Functions

Its main function is to reduce the voltage of 30cm away from the PV module to below 30V within 30s after the shutdown device is started. When the building where the PV module is located requires maintenance or firefighting, it can effectively prevent potential safety hazards such as electric shocks, and protect the lives of maintenance personnel and firefighters.

System Components

PV Rapid Shutdown System (PVRSS) is mainly composed of the following PV rapid shutdown devices:



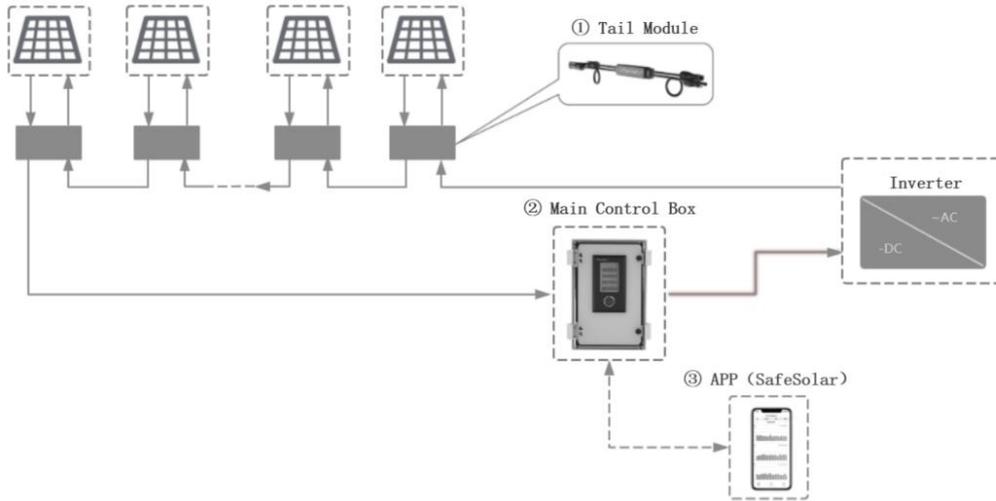
1. **Tail Module**(FR-PVMS-TSCA): A rapid shutdown module with monitoring, which can quickly shut down the PV strings and transmit the information of the PV strings to the head module by the PLC signal.
2. **Head Module**(FR-PVMS-HKA): Controls the tail module by the PLC signal, and transmit the information to the main controller by RS485.
3. **Main Controller**(FR-PVMS-MDEA): Displays the power and other information of the PV strings, and transmit the data to the cloud platform at the same time. Users can remotely control it by the mobile phone APP(SafeSolar).
4. **Main Control Box**(FR-PVMS-BDEA): Consists of Head Module, Main Controller and Box(an optional scheme).

Features

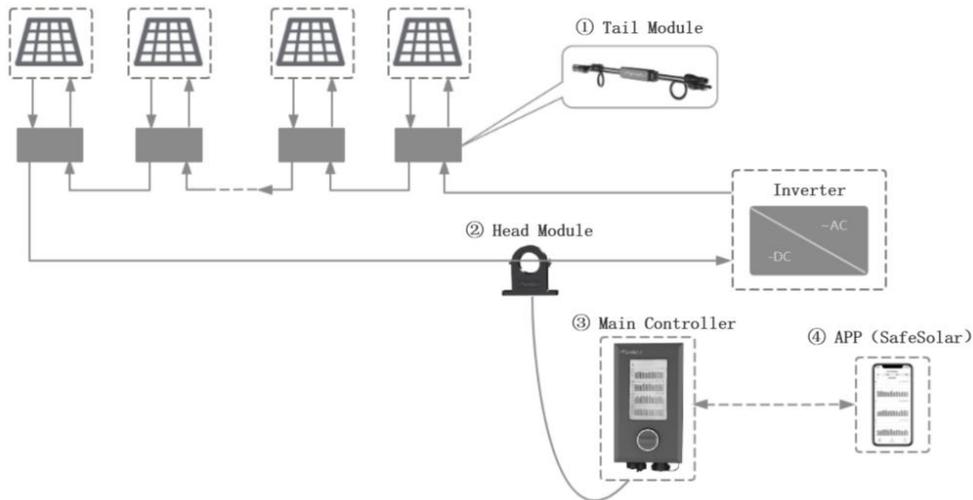
- Rapid shutdown meets NEC 2017 & 2020(690.12) requirements
- Integrates current, voltage, temperature, power monitoring
- Hi-speed Bidirectional PLC communication
- Max 25A current support
- Fonrich own technology, without IP risk

Typical Application

Tail Module+Head Module+Main Controller+APP



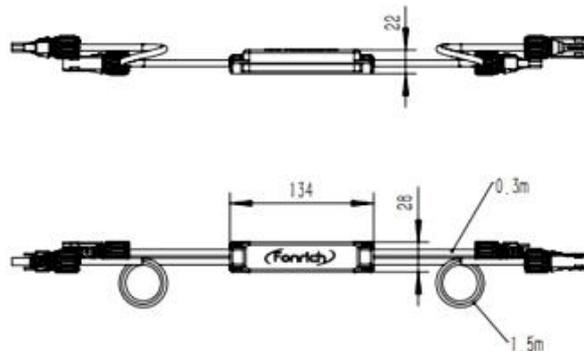
Tail Module+Main Control Box+APP



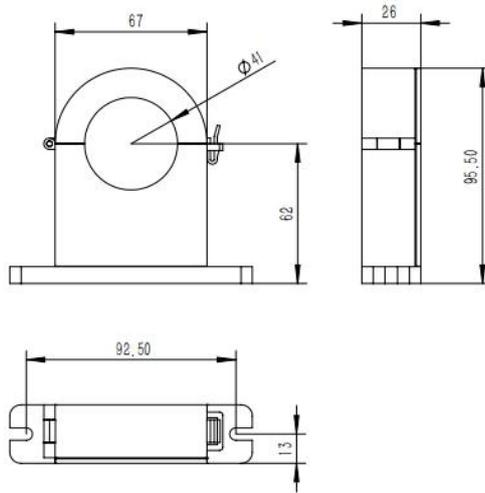
2.2 Appearance

2.2.1 Dimensions(mm)

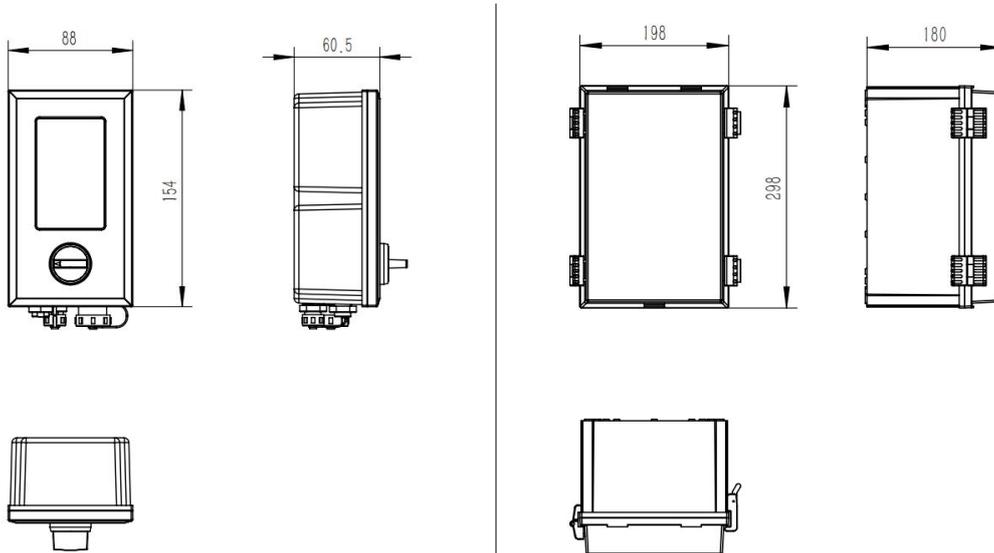
Tail Module



Head Module



Main Controller and Main Control Box



Main Controller

Main Control Box

2.2.2 Local Display

The main controller or main control box of PVRSS is equipped with an LCD display, which displays information such as the power of each PV string in real time.

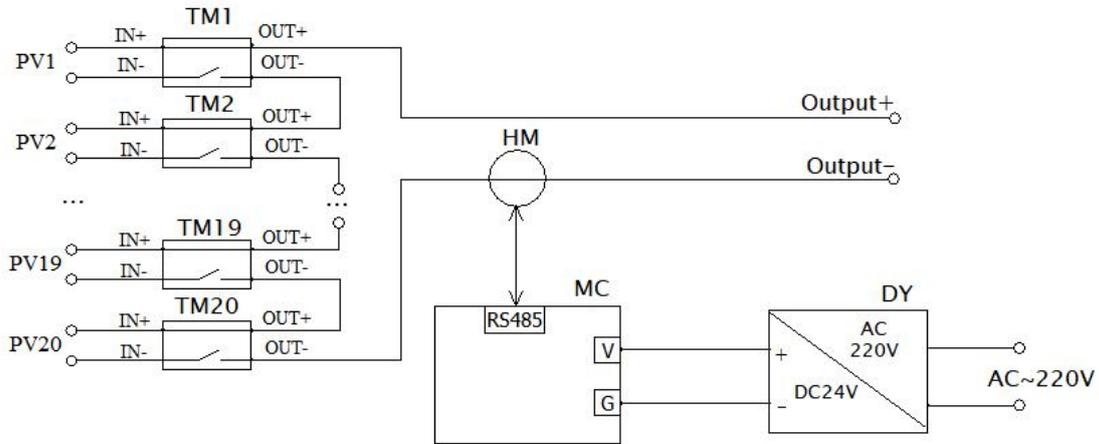


The meaning of each icon on the display.

- ON/OFF : Indicates that the system is ON or OFF.
- △ : Indicates that the main controller is being configured.
- ☁ : Indicates that the system has been connected to Fonrich Cloud.
- ⌚ : Indicates that the system is running normally.
- 📶 : Indicates that the Bluetooth of the main controller is turned on.
- 📶 : Indicates that the main controller has been connected to WiFi.
- 🌐 : Indicates that the main controller has been connected to the Ethernet.

2.3 Principles of Design

Schematic Diagram



3 Installation



- Do not touch any parts other than those required for wiring during installation.
- All electrical connections must meet the electrical standards of the country or region where they are located.



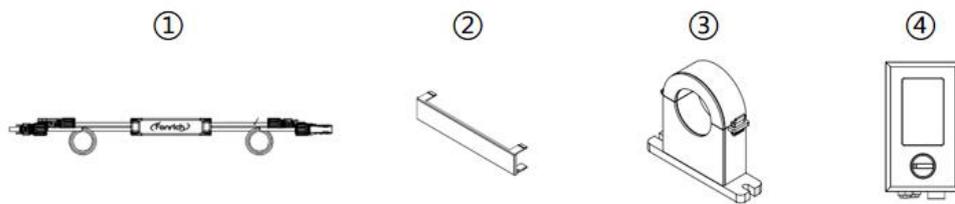
- Make sure that the switch of the main controller or main control box is OFF during the configuration process.

3.1 Scope of Delivery

Check the scope of delivery for completeness and any externally visible damage before installation. Contact your distributor if the scope of delivery is incomplete or damaged.

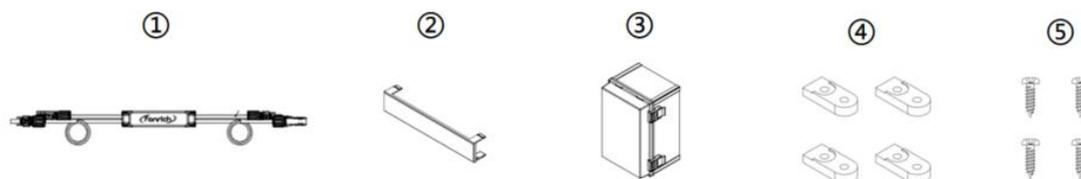
Product and accessories

Tail Module+Head Module+Main Controller



Position	Quantity	Designation
①	n	Tail Module
②	n	Back buckle
③	1	Head Module
④	1	Main Controller

Tail Module+Main Control Box



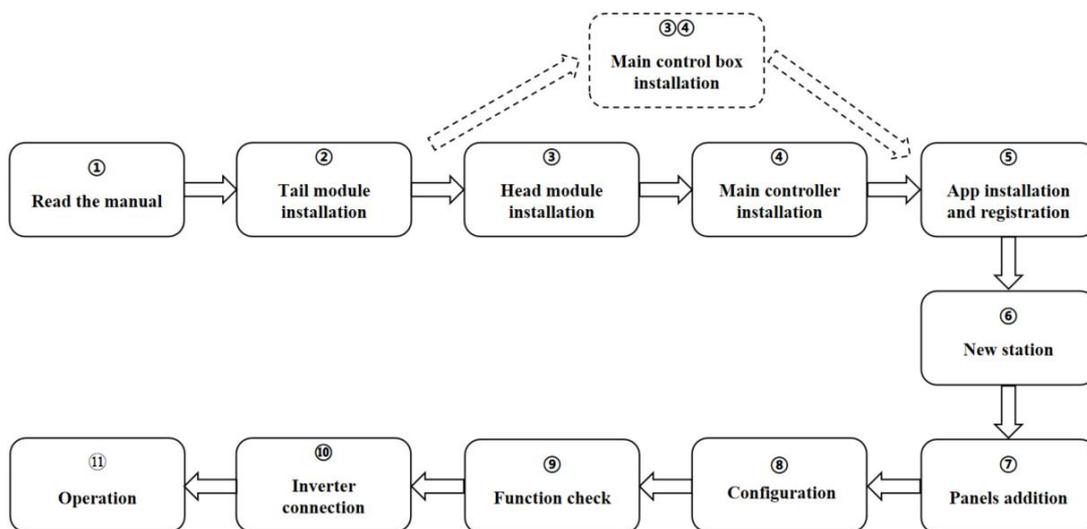
Position	Quantity	Designation
①	n	Tail Module
②	n	Back buckle
③	1	Main Control Box

④	4	Fixture
⑤	4	Cylindrical screw

Optional accessories for installation(refer to 3.3.4 installation of the main control box)

Position	Quantity	Designation
①	Steel plate(Horizontal)	2
②	Hoop(Horizontal)	1
③	Steel plate(Vertical)	2
④	Hoop(Vertical)	1

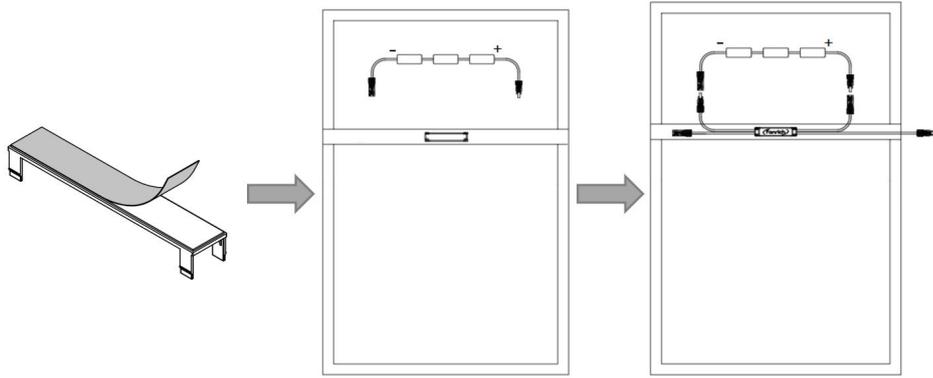
3.2 Operation flowchart



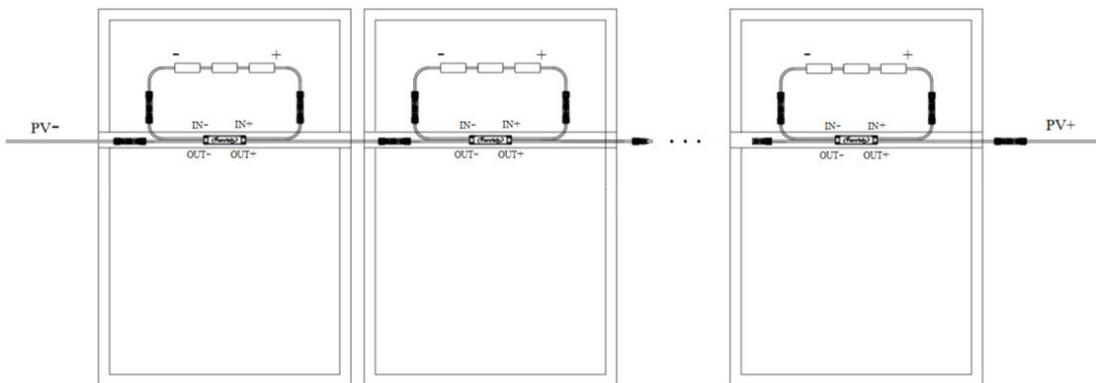
3.3 Installation

3.3.1 Tail Module Installation

- 1) Clean the surface of the position where the tail module needs to be installed.
- 2) Tear off the adhesive of the 3M glue behind the back buckle, and paste it on the cleaned position.
- 3) Clip the tail module into the back buckle (The picture is for reference, which can be adjusted according to the actual situation).

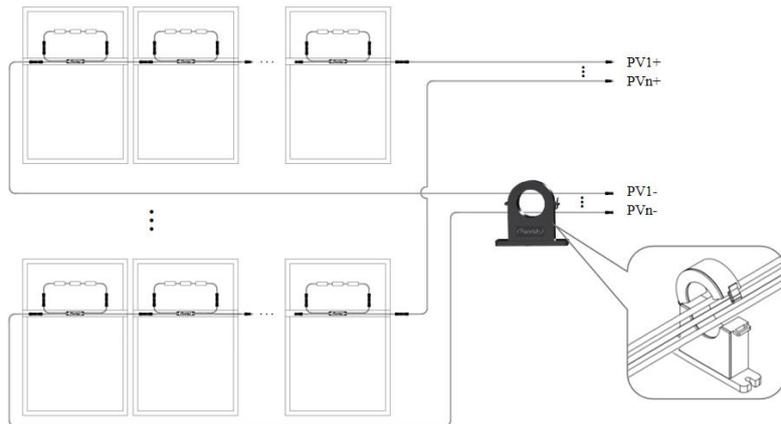


4) Connect the input and output terminals of the tail modules according to the sequence shown in the figure below.



3.3.2 Head Module Installation

- 1) Open the head module and put the output buses (PVn-) of the PV strings into the head module.
- 2) Close the head module and fasten the buckle on the right side.



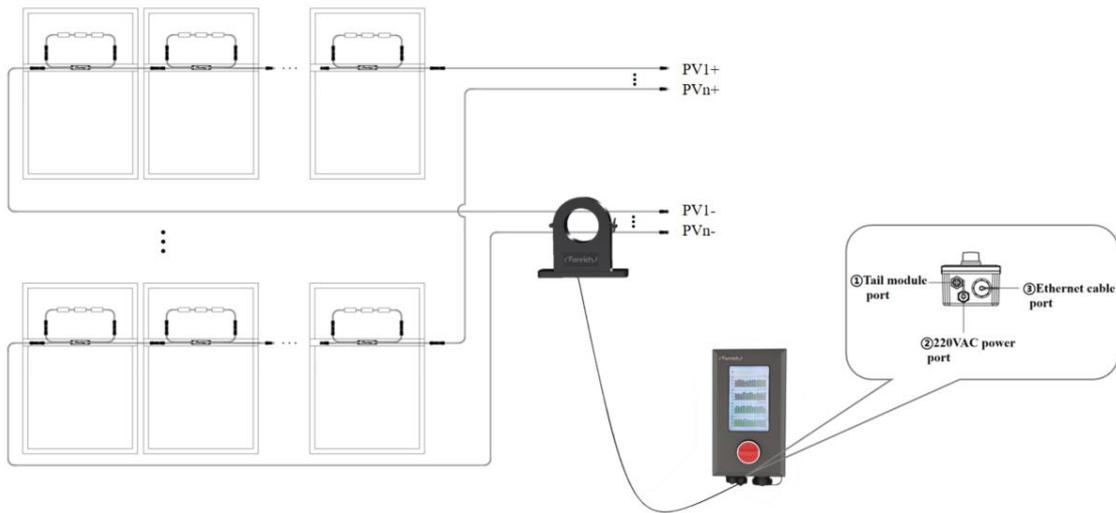
3.3.3 Main Controller Installation

The main controller has two networking methods (Refer to Chapter 3.5.2): 1. Connect the controller to the WiFi network. 2. Insert the network cable through the Ethernet port to connect to the network.

Procedure

- 1) Open the waterproof cap of the three ports.

2) Insert and lighten each port of the main controller.



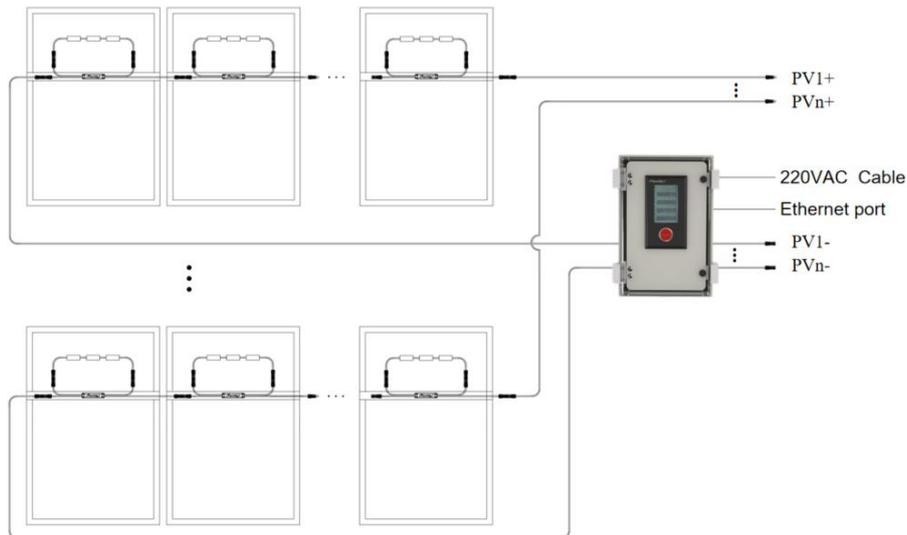
3.3.4 Main Control Box Installation(optional)

1. Main Control Box Connection

The main control box has two networking methods (Refer to Chapter 3.5.2): 1. Connect the controller to the WiFi network. 2. Insert the network cable through the Ethernet port to connect to the network.

Procedure

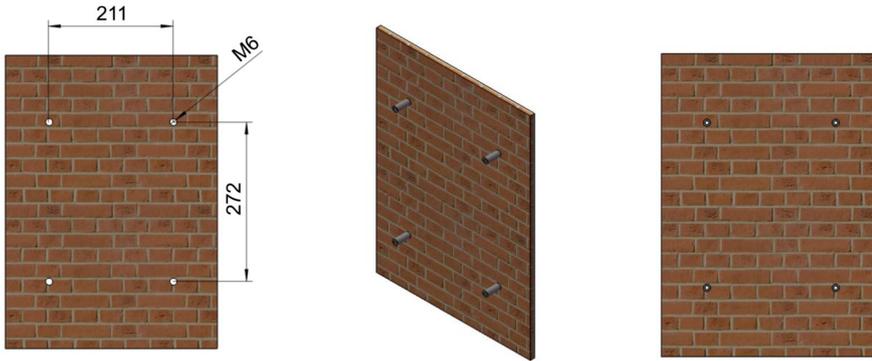
- 1) Pass the output buses of the PV strings through the head module inside the main control box.
- 2) Plug the network cable into the Ethernet port (optional).
- 3) Users can punch holes according to the actual situation.



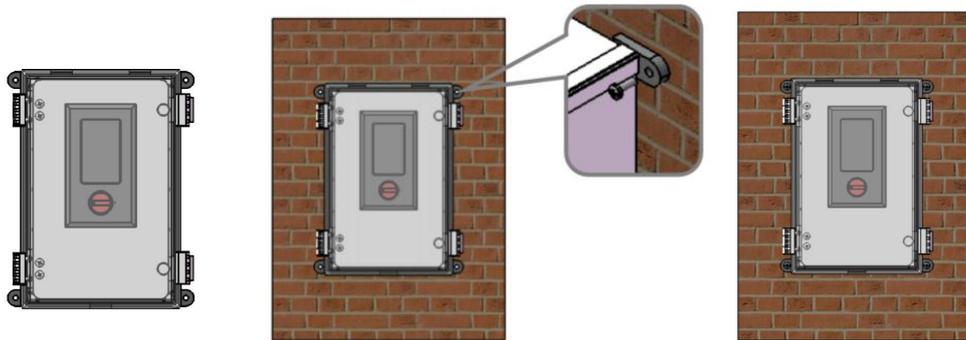
2. Main control box installation

Method 1: Hang the main control box on the wall

- 1) Use a hole punch to make four holes with a diameter of 6mm on the wall, and then put the expansion screws into the four holes.



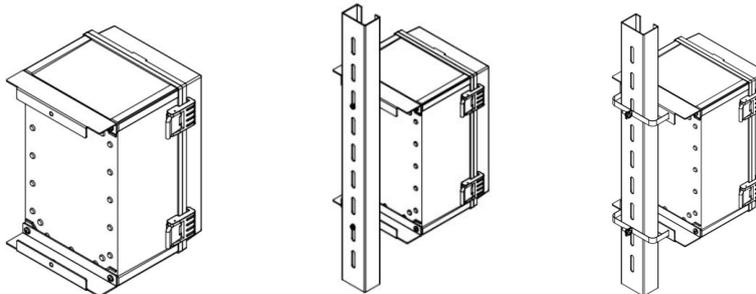
- 2) Place the fixtures at the bottom of the four corners of the main control box and fasten them with fixing screws.
- 3) Place the main control box vertically on the wall and fix it with screws.



Method 2: Hang the main control box on the column

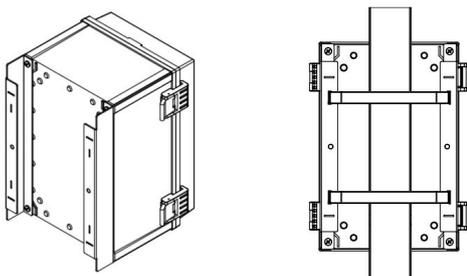
Horizontal installation

- 1) Fix the two steel plates horizontally on the main control box with screws.
- 2) Use screws to fix the main control box on the column with holes, or use a hoop to fix the main control box on the column.



Vertical installation

- 1) Fix the two steel plates vertically to the main control box with screws.
- 2) Fix the main control box on the pillar with a hoop.



3.4 APP Configuration

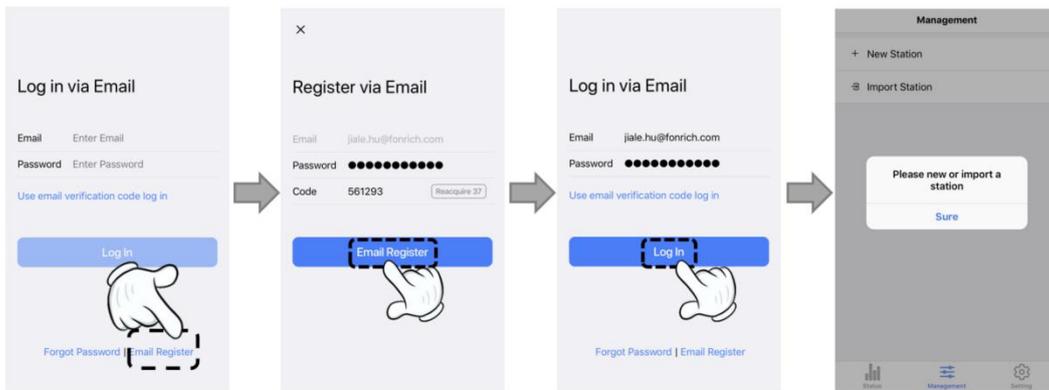
3.4.1 APP Download

PV rapid shutdown system (PVRSS) has a matching mobile phone APP (Fonrich SafeSolar)

- IOS users can download Fonrich SafeSolar in the APP Store.
- Android users can download Fonrich SafeSolar on the FONRICH website (www.fonrich.com).

3.4.2 APP registration and login

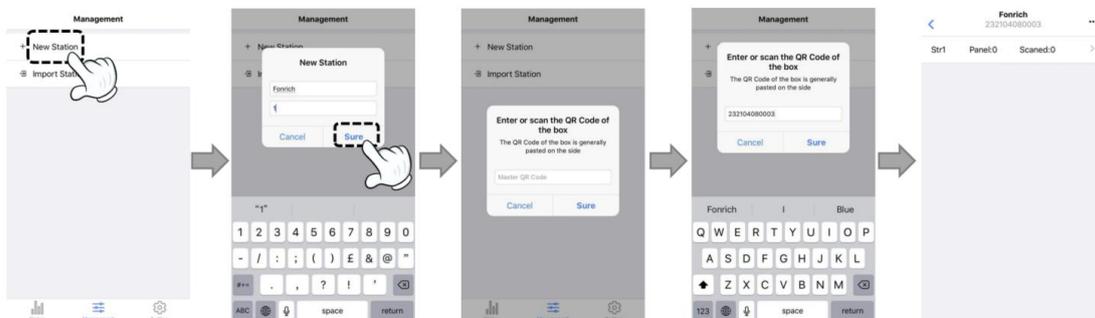
- 1) Click [**Email register**], follow the prompts for email registration.
- 2) Enter Email and password, then click [**Login In**].



3.4.3 New and Import Station

New Station

- 1) Click [**New Station**].
- 2) Enter the name of the station and the number of strings, and click [**Confirm**].
- 3) Click [**Sure**] to enter the scanning interface, scan the QR code on the right side of the controller or main control box, or manually enter the code on the right side of the controller or main control box.
- 4) Click [**Sure**].



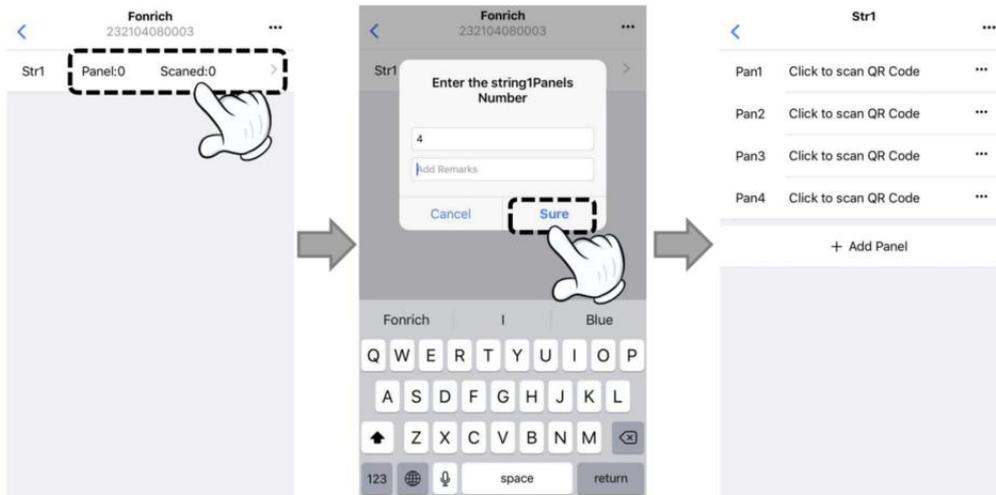
Import Station

- 1) Click [**Import Station**].
- 2) Enter the name of the station and the number of strings, and click [**Confirm**].

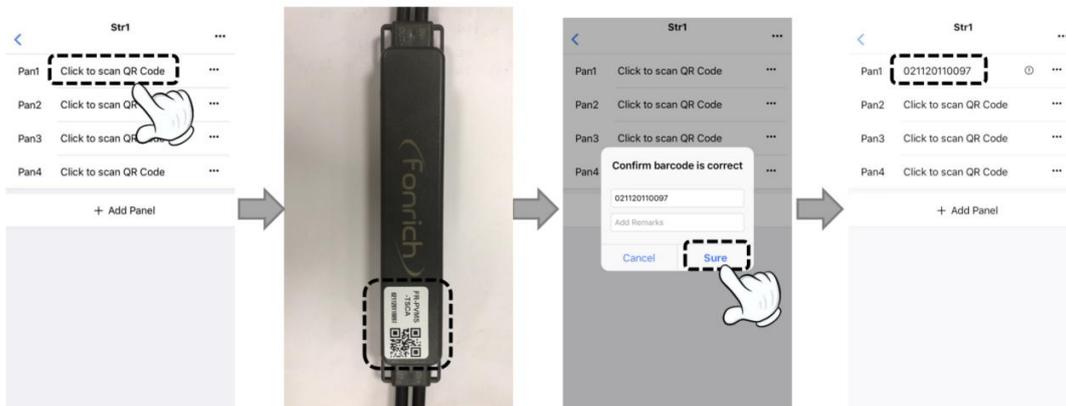
- 3) Click [**Sure**] to enter the scanning interface, scan the QR code on the right side of the controller or main control box or manually enter the code on the right side of the controller or main control box.
- 4) Click [**Sure**].

3.4.4 Panels addition

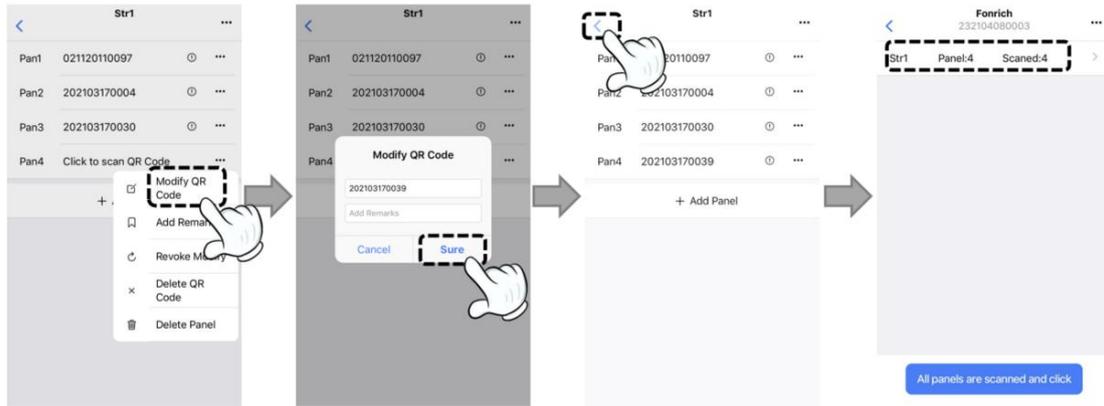
- 1) Click [**Panel:0 Scaned:0**].
- 2) Enter the number of panels in string1, and click [**Sure**].



- 3) Click [**Click to scan QR Code**].
- 4) Scan and check the code on the tail module, and click [**Sure**].



- 5) Click [**Modify QR Code**] .
- 6) Enter the code manually,and click [**Sure**].
- 7) After scanning all the codes, click the upper left corner to return to the string interface, you can see that all the panels have been scanned.



3.5 Configuration

NOTICE

- Make sure that the switch of the main controller or main control box is always OFF during the configuration process.

3.5.1 Power On

Connect the power cable of the controller or main control box to 220VAC, and the controller or main control box will display [Please configure the device] to prompt users to configure the device.

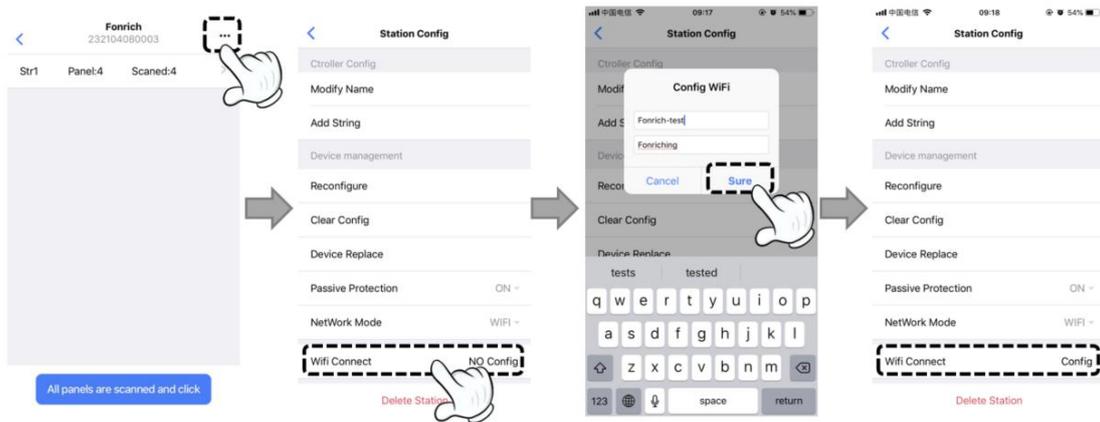
3.5.2 Networking

1. WiFi Networking

The default networking method of the controller or main control box is WiFi. Use Fonrich SafeSolar APP to connect the controller or main control box to WiFi.

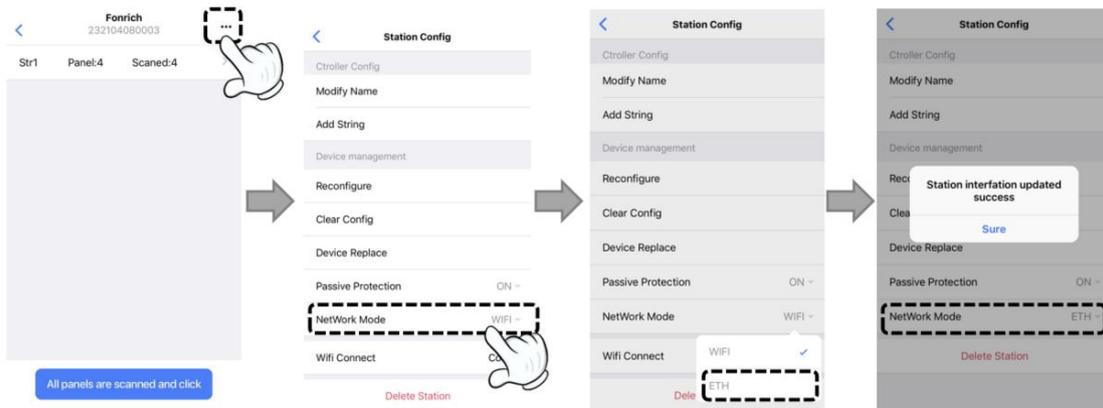
Procedure

- 1) Make sure that the Bluetooth and network (WiFi or 4G) of the mobile phone are turned on.
- 2) Click [...] on the string interface of the station.
- 3) Click [WiFi Connect], then enter the WiFi name and password.
- 4) Click Sure. You can see [Configured] in the WiFi configuration column.



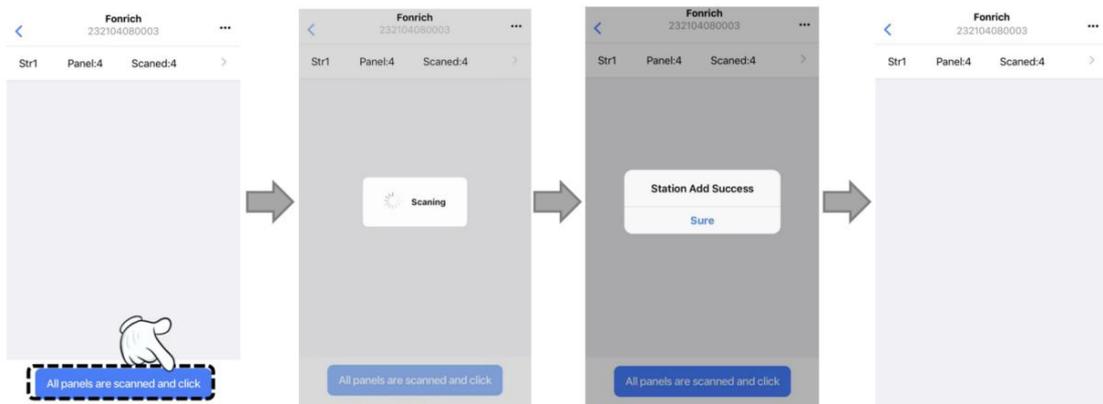
2. ETH Networking(optional)

- 1) Click [...] on the string interface of the station.
- 2) Click [**Network Mode**], select [**ETH**].
- 3) Plug the network cable into the Ethernet port (optional).



3.5.3 Station Configuration

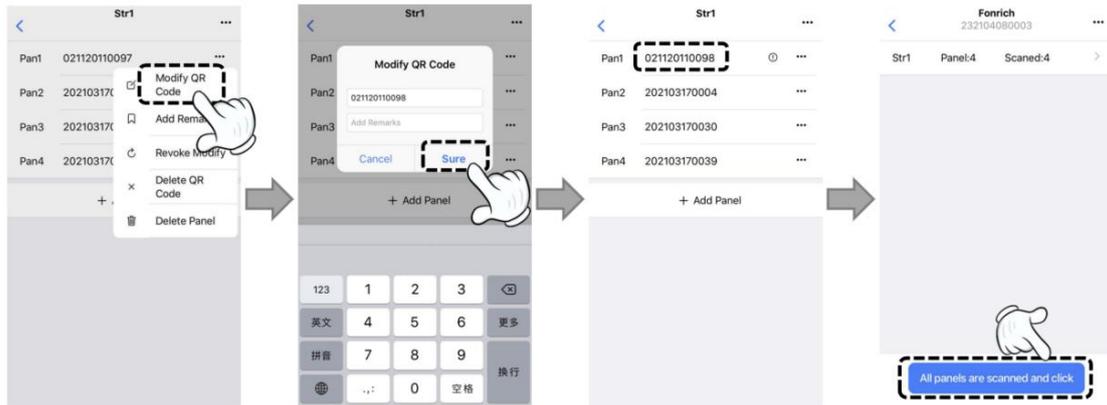
- 1) Click [**All panels are scanned and click**] on the string interface of the station.
- 2) After the completion, it will prompt [**Station Added Success**]. At this time, all strings and components in the station are successfully written into the controller or main control box.



- 3) At this time, the main controller or main control box will display [**Configuring**], indicating that the controller or main control box is configuring.
- 4) After waiting for 5-10 minutes, the controller or main control box will automatically jump to the status display interface. The configuration is complete.

3.5.4 Panels Modify

- 1) Modify the code of the panel.
- 2) Return to the string interface, Click [**All panels are scanned and click**].
- 3) After the completion, it will prompt [**Station is added successfully**]. the panel is successfully modified.



- 4) At this time, the main controller or main control box will display [Configuring], indicating that the controller or main control box is configuring.
- 5) After waiting for 5-10 minutes, the controller or main control box will automatically jump to the status display interface. The configuration is complete.

4 Function Check

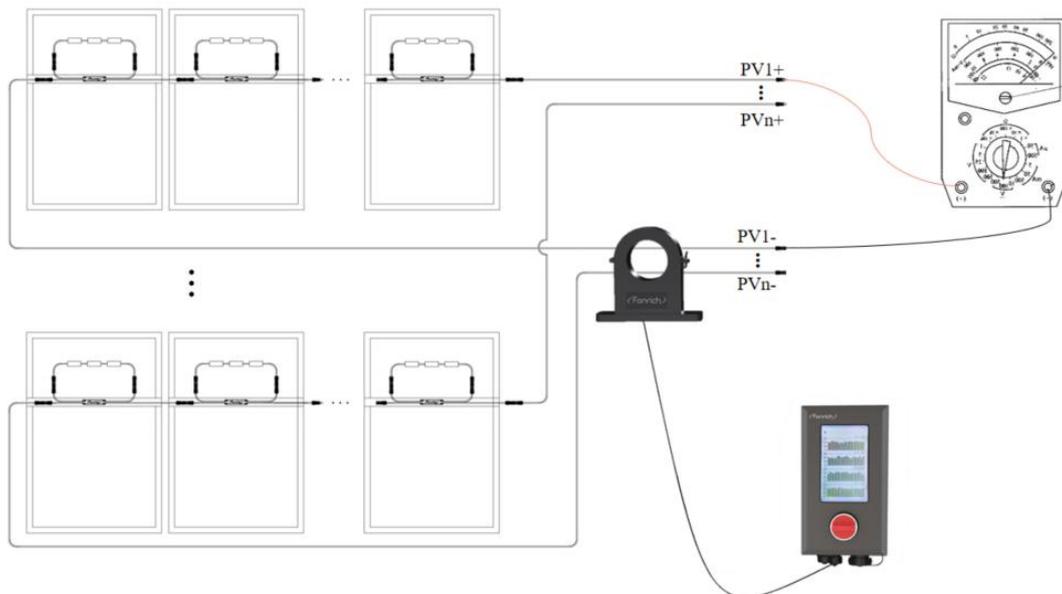


- Make sure that the switch of the controller or main control box is OFF before touching any part of the photovoltaic system or product.

After the PVRSS has been installed and the main controller or main control box has been configured, perform a functional check of the PVRSS.

Procedure

- 1) Use a multimeter to measure the voltage between the positive and negative poles of each PV series bus.
- 2) The voltage V_{off} is measured when the switch of the controller or main control box is OFF.
- 3) The voltage V_{on} is measured when the switch of the controller or main control box is ON.
- 4) If $V_{off} \approx V_{on} / 100$, the PVRSS has been configured.



5 Operation



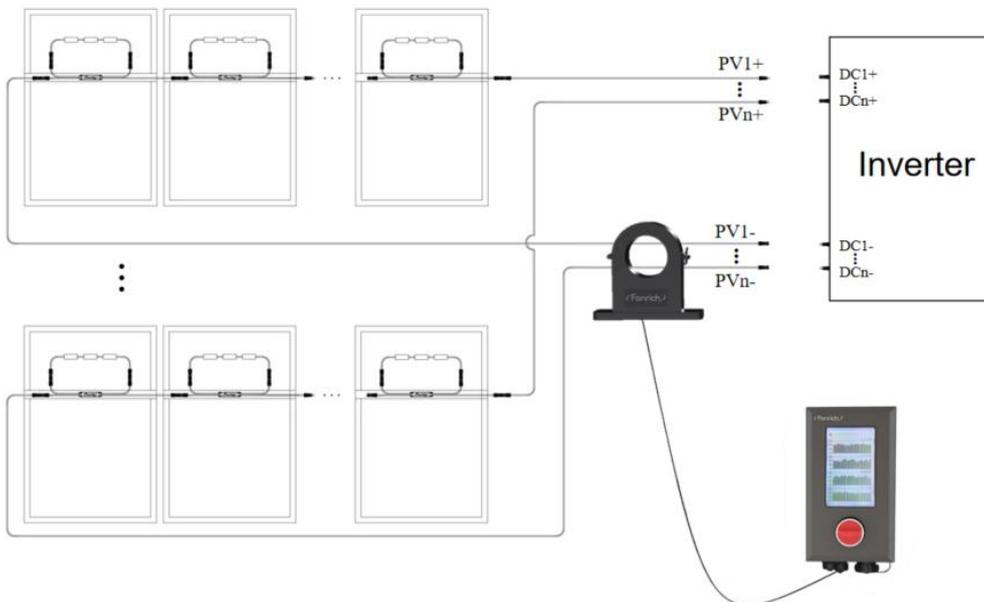
- Make sure that the main controller or main control box and the inverter are both OFF before connecting the inverter.



- The tail modules are extremely hot when they are in operation, and touching those can cause severe burns and personal injury.

5.1 Inverter Connection

Connect the output buses of each PV string and inverter in order.



5.2 Operation

Procedure

- 1) Set the switch of the main controller or main control box to ON.
- 2) Turn on the inverter.
- 3) Wait for 2-5 minutes, the LCD will display the information of each PV string. At the same time, users can monitor the information of the power station in real time on the status interface of Fonrich SafeSolar, as shown in the figure below.



LCD Display



APP Display

6 Appendix

6.1 Revision Log

Version number	Change content	Revision date
1.0	First edition	2021.06.04
1.1	Updated certain content of 3.3 Installation. Updated certain content of 3.5.2 Networking.	2021.07.23

6.2 Contact Us

If you have technical problems with our products, please contact us.

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