WHITEPAPER

ECU-C Advanced Function Introduction

The APsystems Energy Communication Unit (ECU-C) is the information gateway for our microinverters. The unit collects module performance data from each individual microinverter and transfers this information to an Internet database in real time. Meanwhile, the unit has real-time data storage, remote control, and advanced functions. This paper mainly introduces the wiring of production / consumption Current Transformers (CTs) and the advanced functions (meter function, zero export function, redundant energy control function, three-phase balance function).

- ✪ Wiring of Production / Consumption CT

- ✪ Meter Function

- ✪ Zero Export Function

- ✪ Redundant Energy Control Function

- ✪ Three-phase Balance Function

Wiring of Production / Consumption CT

This diagram is representative of a three-phase system: each phase needs to be equipped with 1CT (Current Transformer). You will need a total of 6 CTs: 3 to measure PV production (one CT per phase), 3 to measure grid injection/reinjection (one CT per phase). For single phase system, the wiring principle is the same as for the three-phase system, but requires in total only 2 CTs: 1 for PV production, 1 for grid injection/reinjection.
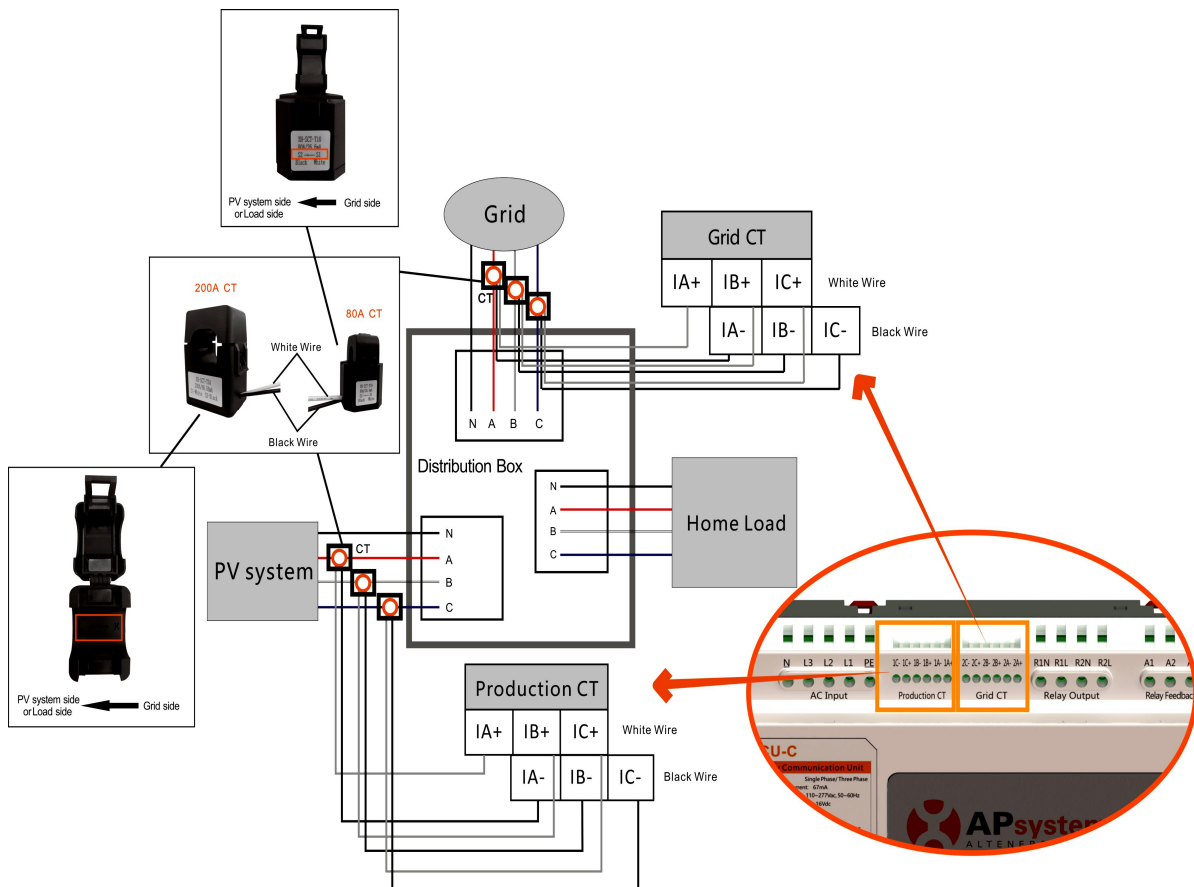

Figure 1 Wiring diagram for three-phase system

> **Note**
>
> ⊗ The CT must be connected in such the way that the arrow is pointing away from the grid side.
>
> ⊗ APsystems supplies 2 types of CTs: 80A or 200A. Choose according to desired performances.
>
> ⊗ Make sure to use CTs provided by APsystems. Other CTs brands, even with similar specifications, will not work.
>
> ⊗ White wire of the CT: connect to the "+" side,Black wire of the CT: connect to the "-" side, each phase needs to be properly connected to the right pins: L1 to A1, L2 to B1, L3 to C3.

Meter Function

ECU-C has an integral meter, it can measure the array production and net consumption from grid.
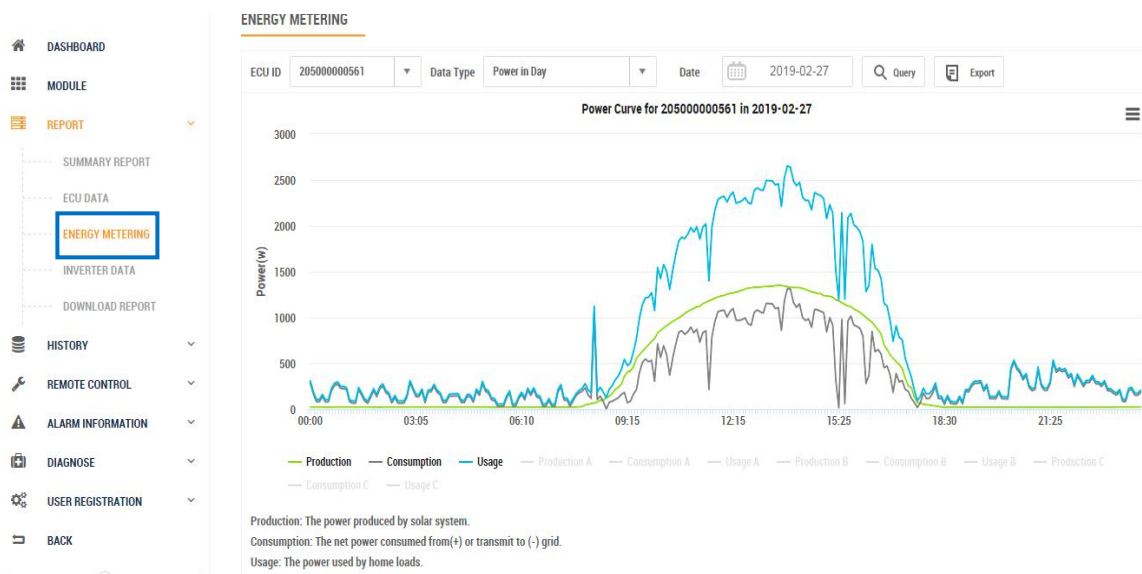

Figure 2 Energy Metering display on the EMA

> **Note:**
>
> ⊗ PV production (green curve) is measured. Grid injection/reinjection (grey curve)is measured. Household consumption (usage) is calculated (blue curve).

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In this configuration, CT is essential. By installing CT on PV side and grid side, ECU-C can quickly and accurately obtain the array production and net consumption from grid. Once the meter display is turned on, ECU-C will upload the meter data to EMA.
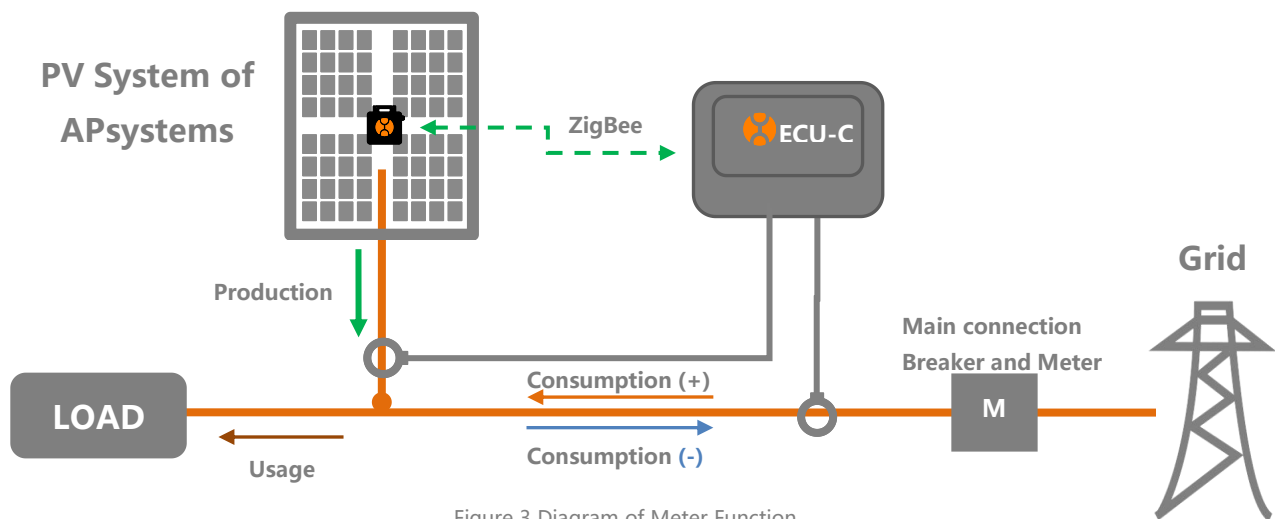

Figure 3 Diagram of Meter Function

Zero Export Function

The ECU-C measures the array production and net consumption from grid and will curtail power production to meet (or exceed if selected) the site consumption. If the Power Limit is set to 0 and the site is using 10kW and the array is producing 8kW the inverters will operate at 100%. Conversely, if the Power Limit is set to 0 and the site is using 3kW and the array can produce 8kW the inverters will curtail power production to meet the demand. In addition, the ECU-C is designed to dynamically adjust to the changing demand of the site automatically in real-time to realize the full potential of the array.
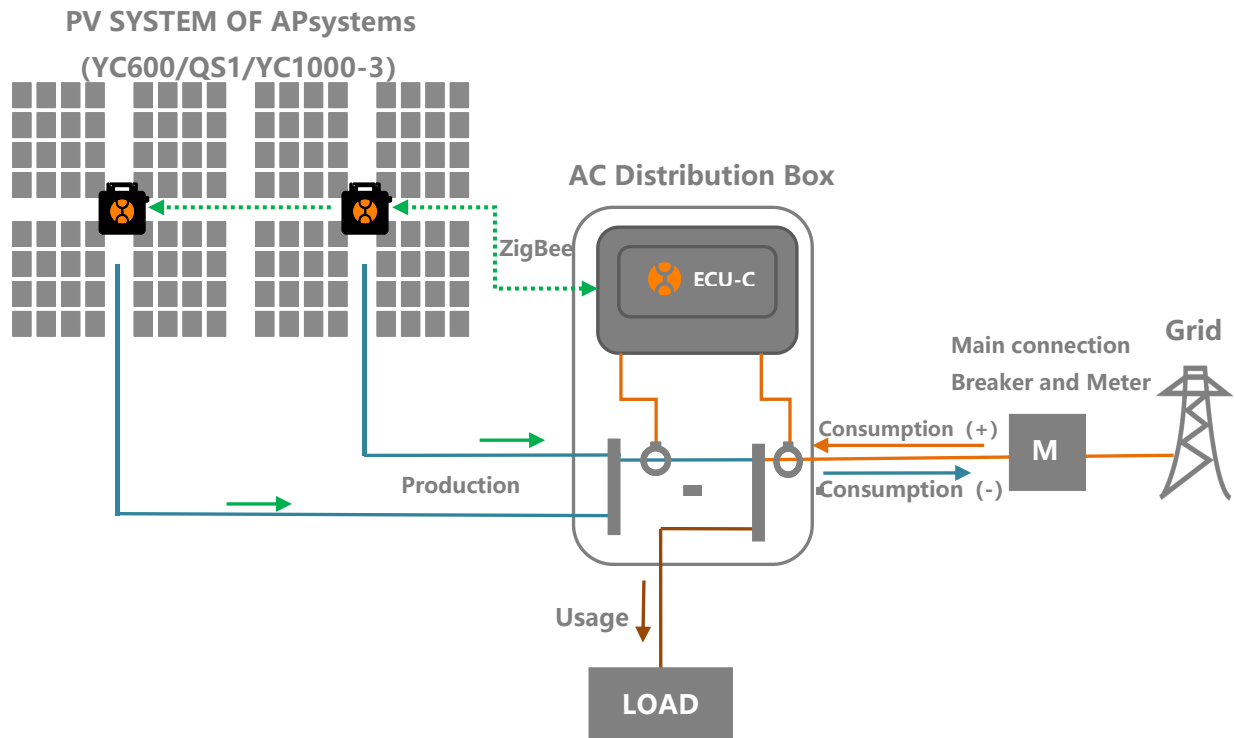
PV SYSTEM OF APsystems

(YC600/QS1/YC1000-3)

AC Distribution Box

ECU-C

ZigBee

Grid

Main connection

Breaker and Meter

M

Consumption (+)

Production

Consumption (-)

Usage

LOAD

Figure 4 Diagram of Zero Export Function

Note：

- Only works with ECU-C in Single-phase and Three-phase systems.
- Not compatible with Split-phase systems as commonly used in North American residential electrical service.

How to use the Zero Export function

- Login to the local interface of ECU-C;
- Click the "Advance" - "Zero Export".
- Setting the "Zero Export'' to the "On", then set a Power Limit in kW (The default value is 0.).

Figure 5 "Zero Export" setting interface

Three Phase setting

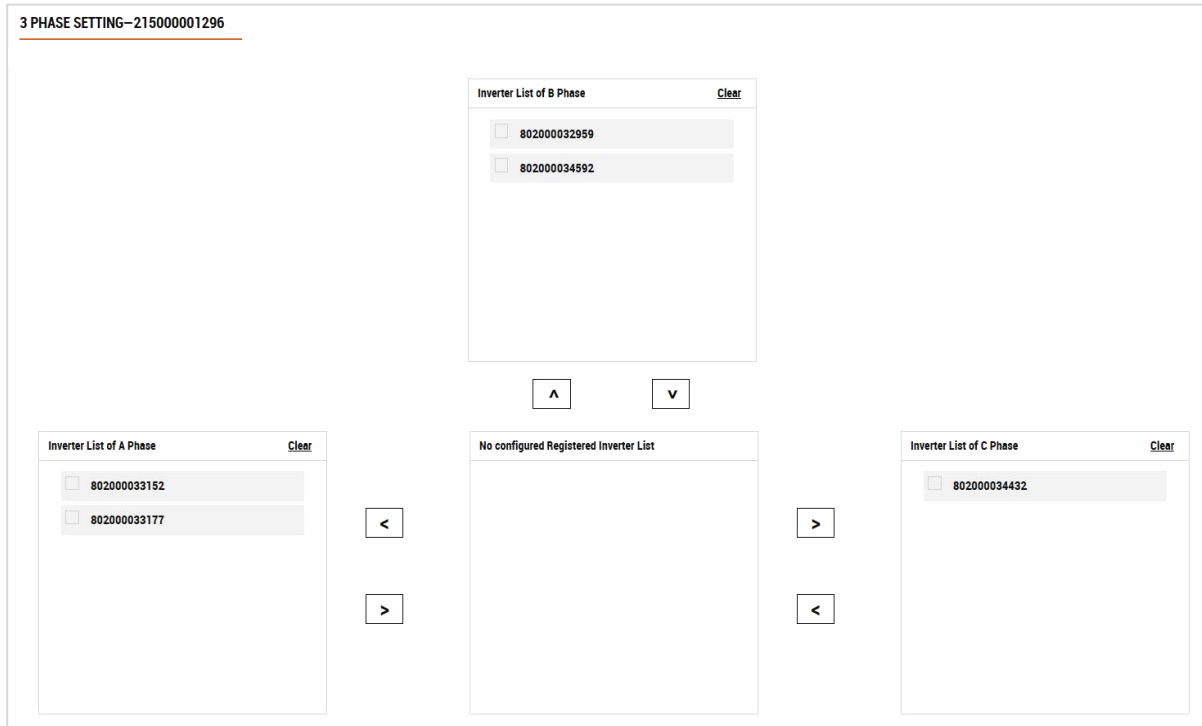User needs to click the "three-phase configure" button to bind the inverters into corresponding phase.

Figure 6 "three-phase configure" setting interface

Redundant Energy Control Function

This function is to control the opening of the external AC contactor by closing the ECU-C relay when the uploaded power to grid reaches a certain power value, to supply power to external electrical equipment e.g., water heater, pool pump, air conditioner, etc. The power requirements of a water heater are 2kW, and the turn-on threshold can be set to 2.1kW (recommended to always take a margin), so when the uploaded power to grid exceeds 2KW, the water heater is powered by the relay control and does not consume grid power.
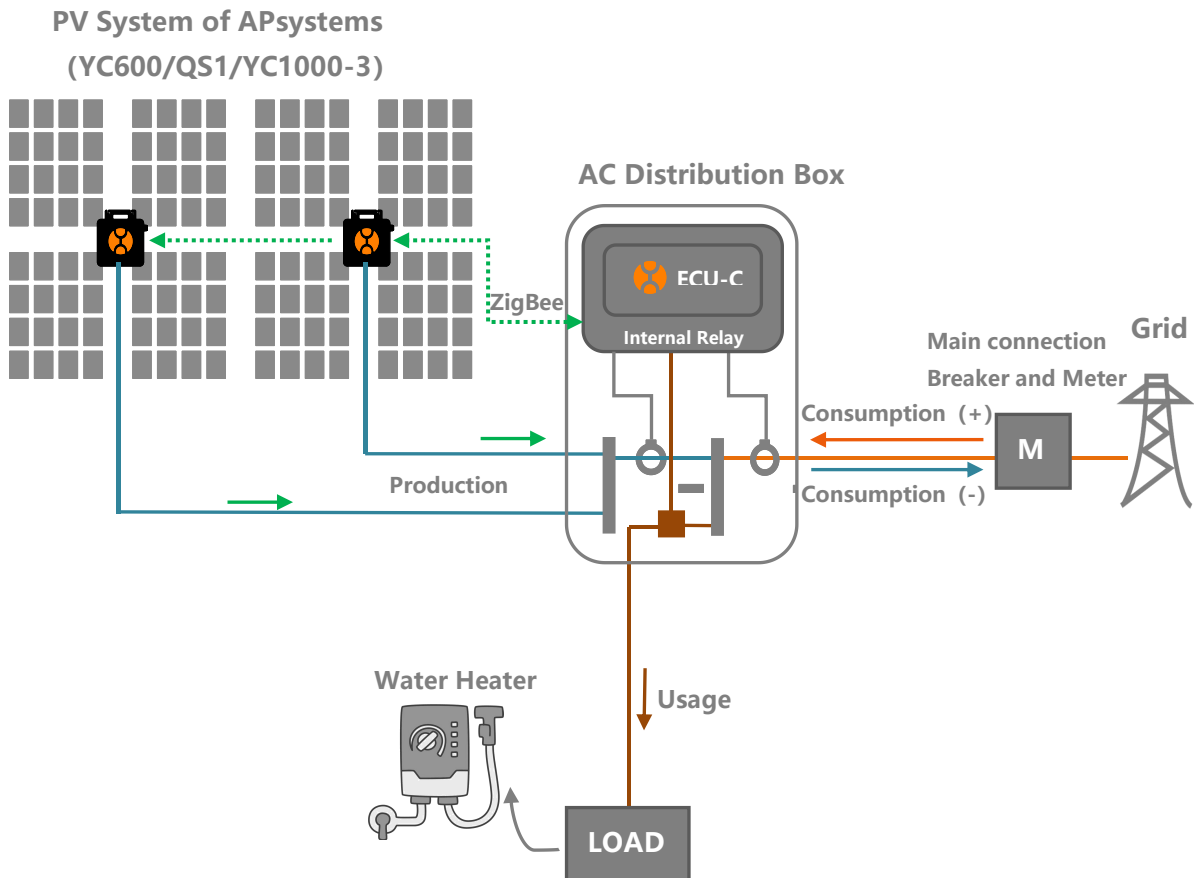
**PV System of APsystems
(YC600/QS1/YC1000-3)**

AC Distribution Box

ECU-C

Internal Relay

ZigBee

**Main connection
Breaker and Meter**

Grid

Consumption（+）

M

Production

Consumption（-）

Water Heater

Usage

LOAD

Figure 7 Diagram of Redundant Energy Control Function

Note：

 Only works with ECU-C in Single-phase system.

Contactor Connection
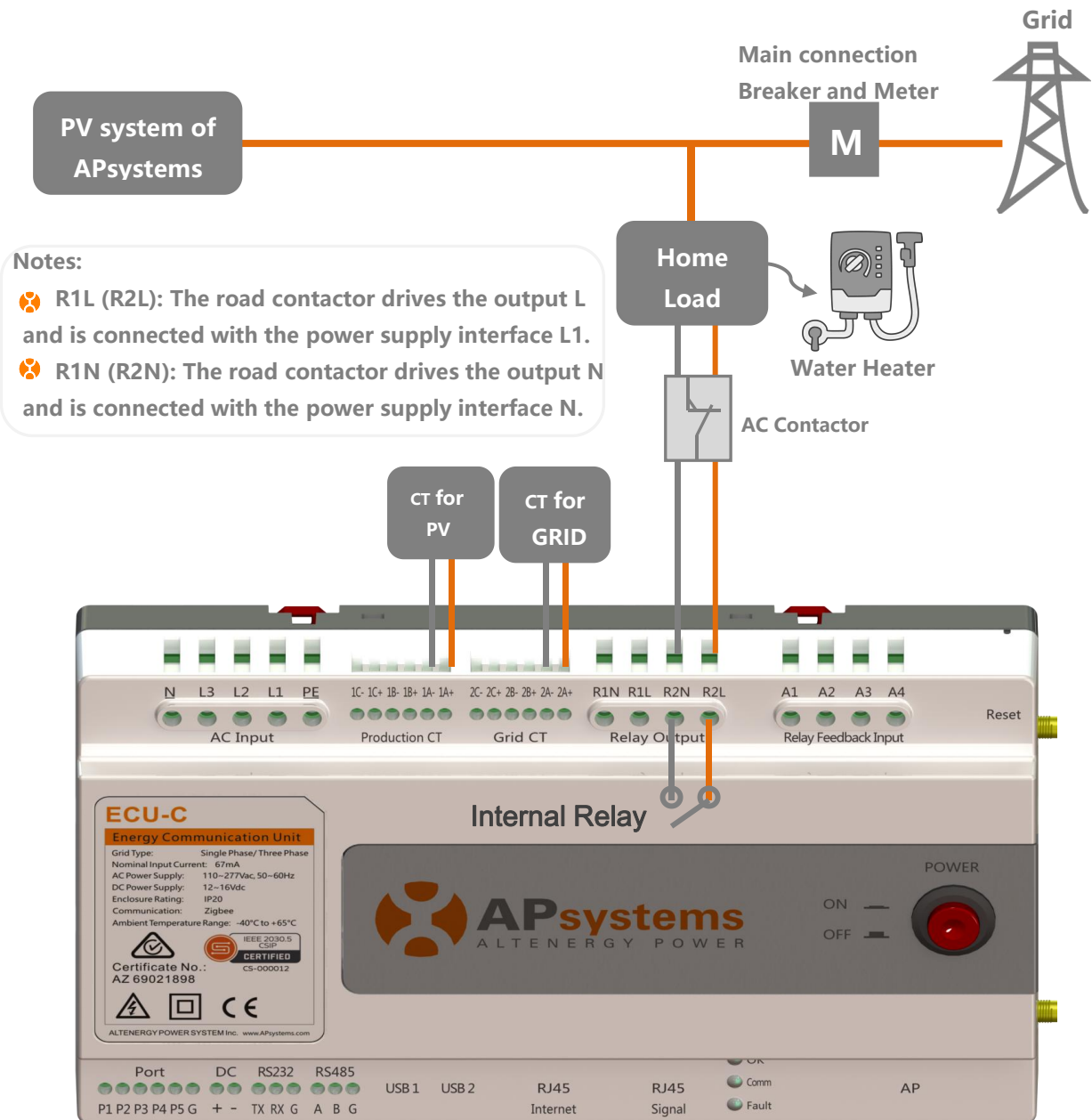
This diagram is for contactor connection configuration.

Grid

Main connection Breaker and Meter

M

PV system of APsystems

Home Load

Water Heater

AC Contactor

Notes:

⊗ **R1L (R2L): The road contactor drives the output L and is connected with the power supply interface L1.**

⊗ **R1N (R2N): The road contactor drives the output N and is connected with the power supply interface N.**

CT for PV

CT for GRID

N	L3	L2	L1	PE	1C- 1C+ 1B- 1B+ 1A- 1A+	2C- 2C+ 2B- 2B+ 2A- 2A+	R1N R1L R2N R2L	A1 A2 A3 A4	Reset
	AC Input				Production CT	Grid CT	Relay Output	Relay Feedback Input	

Internal Relay

ECU-C
Energy Communication Unit

Grid Type: Single Phase/ Three Phase
Nominal Input Current: 67mA
AC Power Supply: 110~277Vac, 50~60Hz
DC Power Supply: 12~16Vdc
Enclosure Rating: IP20
Communication: Zigbee
Ambient Temperature Range: -40°C to +65°C

IEEE 2030.5 CSIP CERTIFIED CS-000012

Certificate No.: AZ 69021898

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POWER

ON ▬

OFF ▬

Port	DC	RS232	RS485					OK	
P1 P2 P3 P4 P5 G	+ −	TX RX G	A B G	USB 1	USB 2	RJ45	RJ45	Comm	AP
						Internet	Signal	Fault	

Figure 8   Contactor connection diagram

How to use the Redundant Energy Control Function

⊗ Login to the local interface of ECU;

⊗ Click the "Advance" - "Redundant Energy Control" .

⊗ Setting the "Redundant Energy Control" to the "OPEN", then set a Power Limit in kW.

Figure 9 "Redundant Energy Control" setting interface

Three-phase Balance Function

If a three-phase system comprised of APsystems' Single-phase microinverters e.g., YC600 or QS1, the user will have to manually configure which inverters serial numbers are connected to each separate phase in the 'Inverter 3-Phase Configuration' section and then select Save. There are two different methods for Phase loss detection; through an external CT for the fastest and most accurate response time and through the microinverter data collected every five minutes, a slower and less accurate method but does not require an external CT.
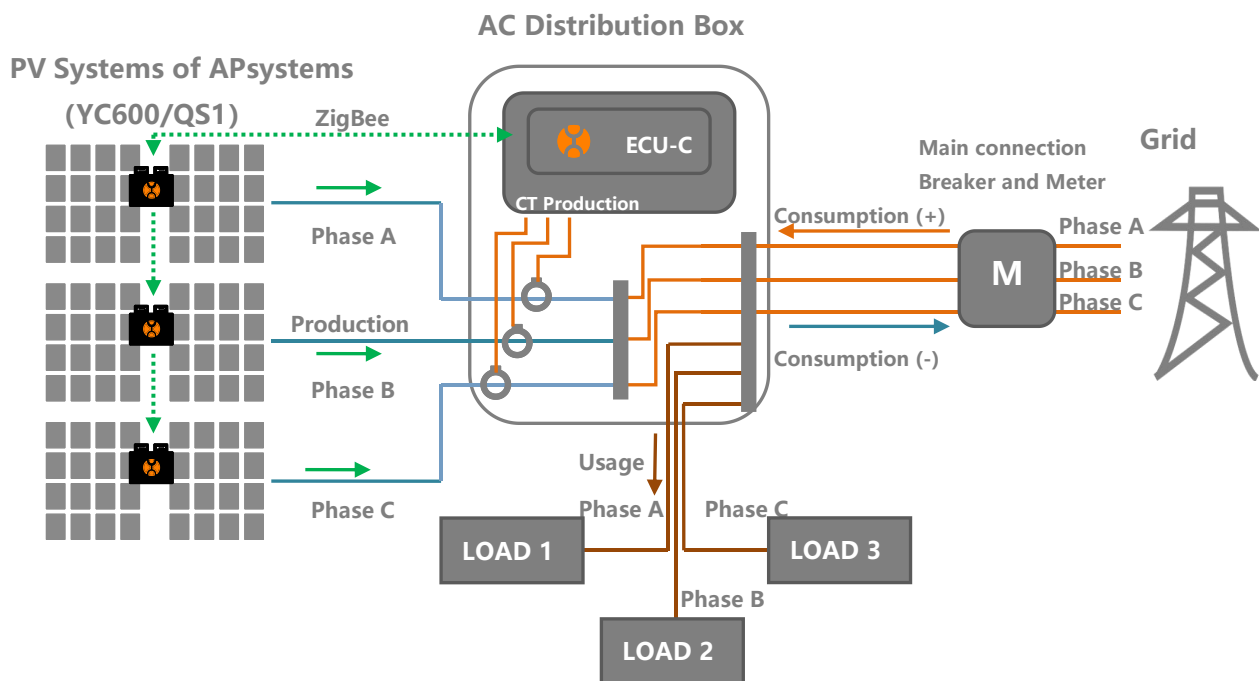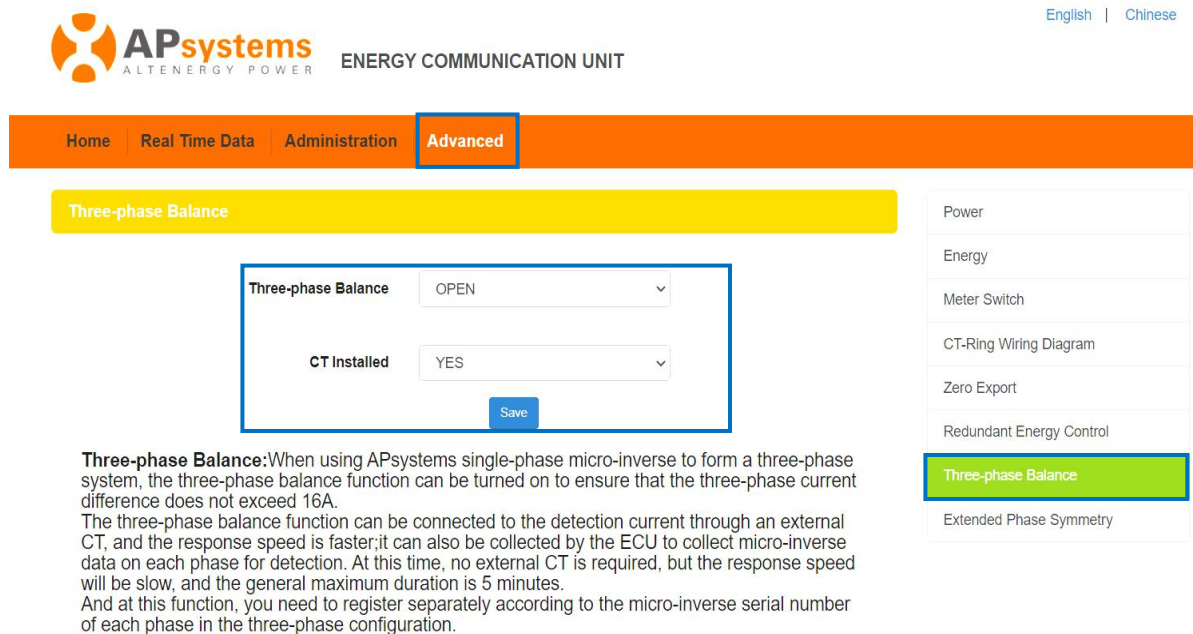
Figure 10 Diagram of Three-phase Balance Function

> Note
>
> ⊗ Only works with ECU-C in Three-phase systems using single phase micros.
>
> ⊗ The balance is set to ensure that phase difference does not exceed 16 Amps.
>
> ⊗ PV side must be measured with CTs.

How to use the Three-phase Balance Function

⊗ Login to the local interface of ECU;

⊗ Click the "Advance" - "Three-phase Balance".

⊗ Setting the "Three-phase Balance" to the "OPEN", then set "CT Installed" to the "YES".

Figure 11 "Redundant Energy Control" setting interface

Three Phase setting

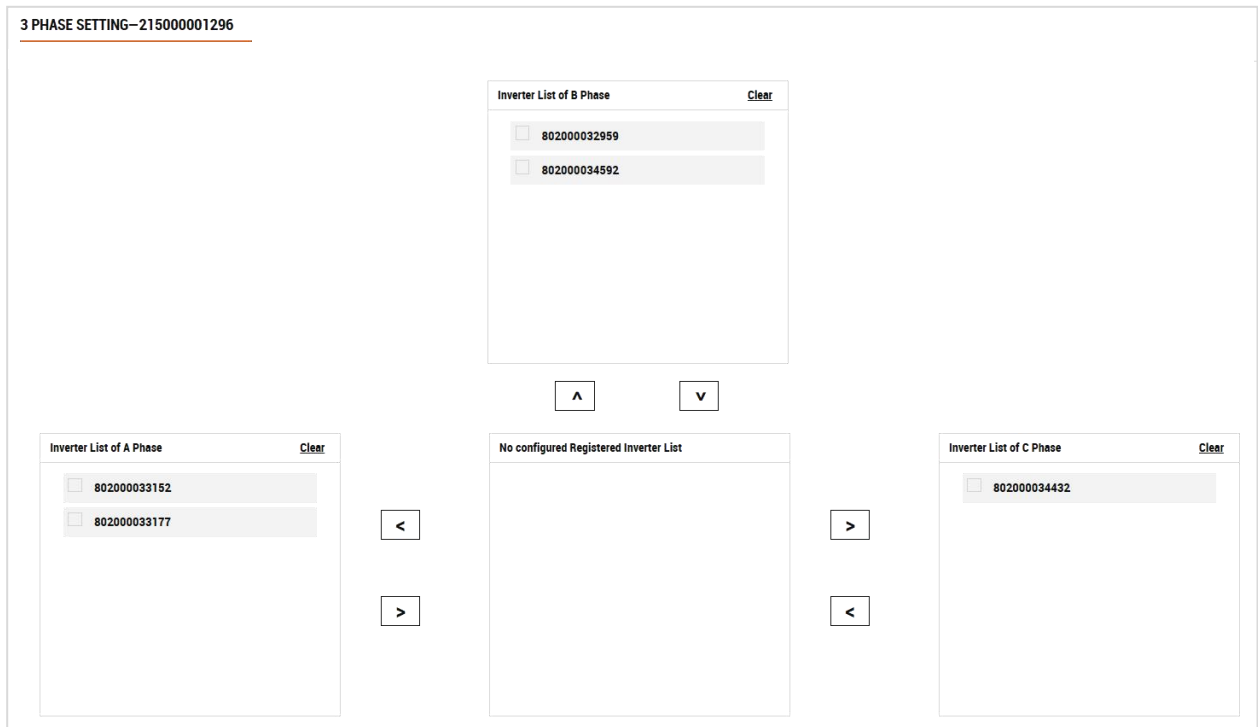User needs to click the "three-phase configure" button to bind the inverters into corresponding phase.

Figure 12 "three-phase configure" setting interface