

## TECHINICAL BRIEF

### 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).



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## Wiring of Production / Grid 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.

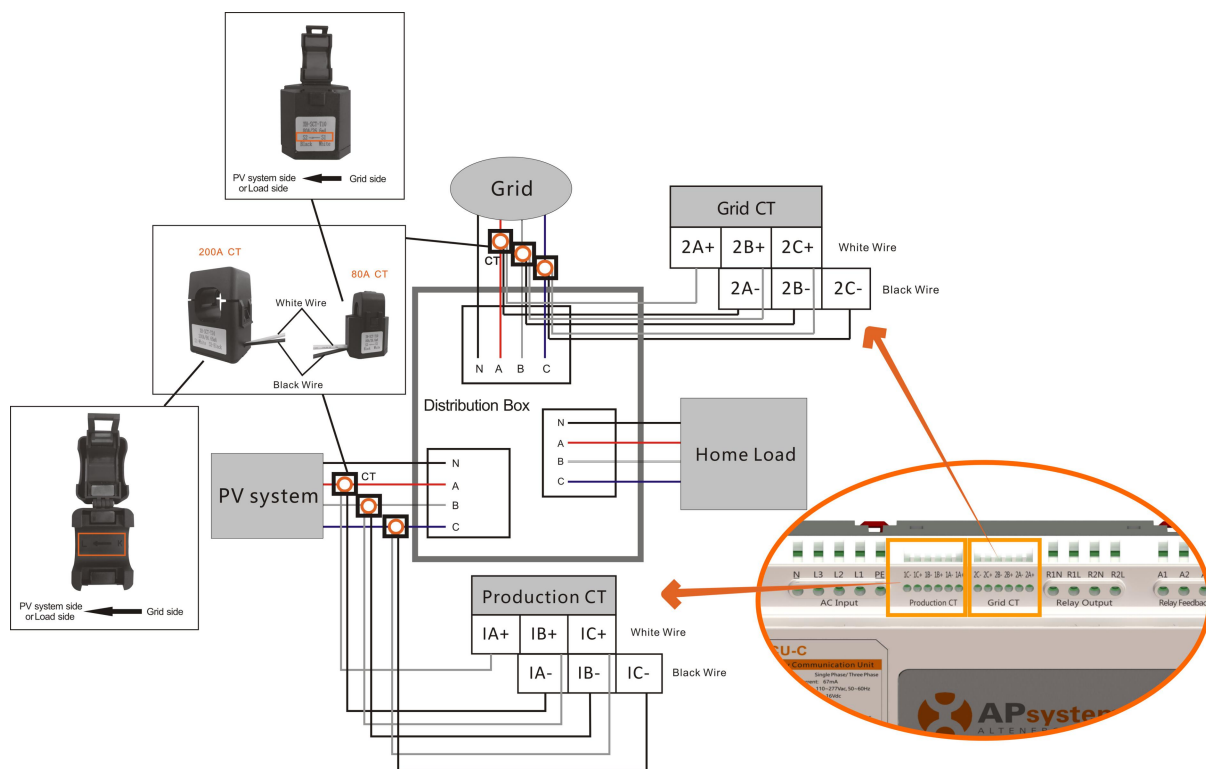


Figure 1 Wiring diagram for three-phase system



### 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 1A/2A, L2 to 1B/2B, L3 to 1C/2C.

### Meter Function

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

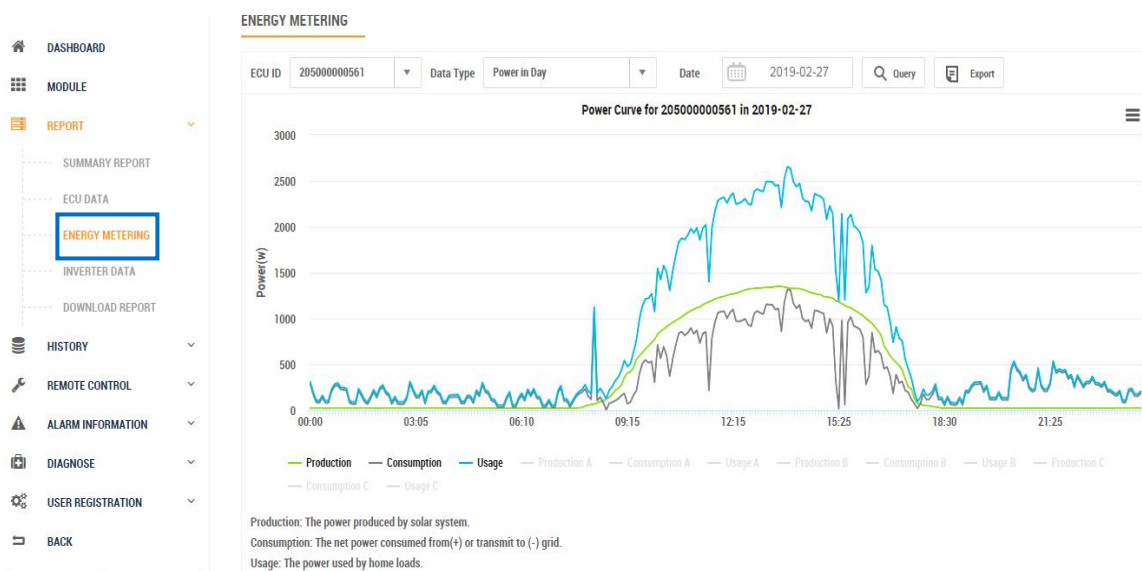


Figure 2 Energy Metering display on the EMA

### Note:

- ⚠ PV production (green curve) is measured. Grid injection/reinjection (grey curve) is measured. Household consumption (usage) is calculated (blue curve).

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.

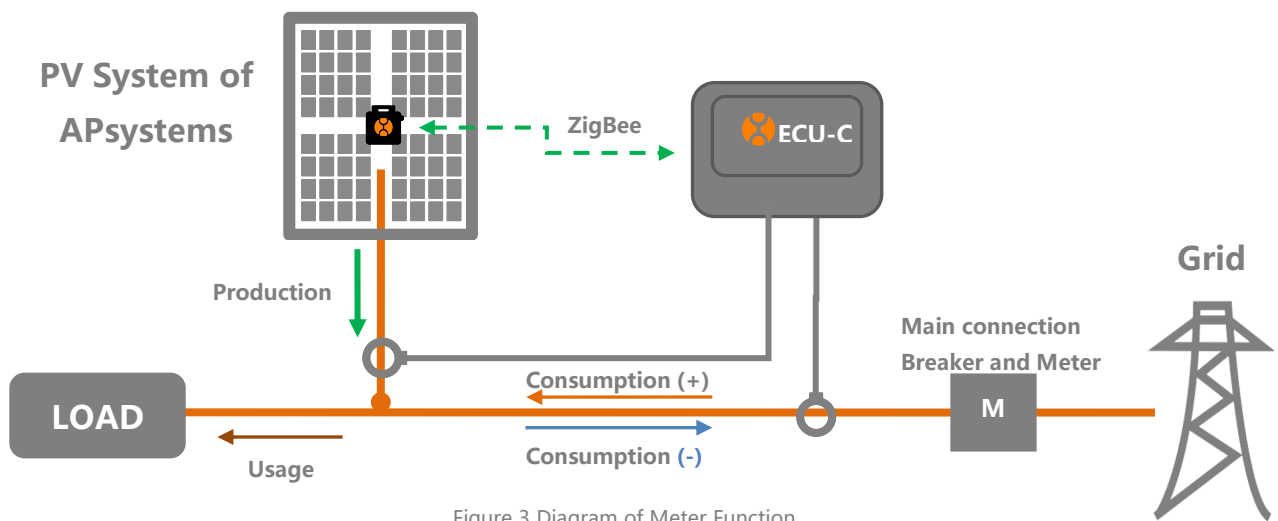


Figure 3 Diagram of Meter Function

### 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.

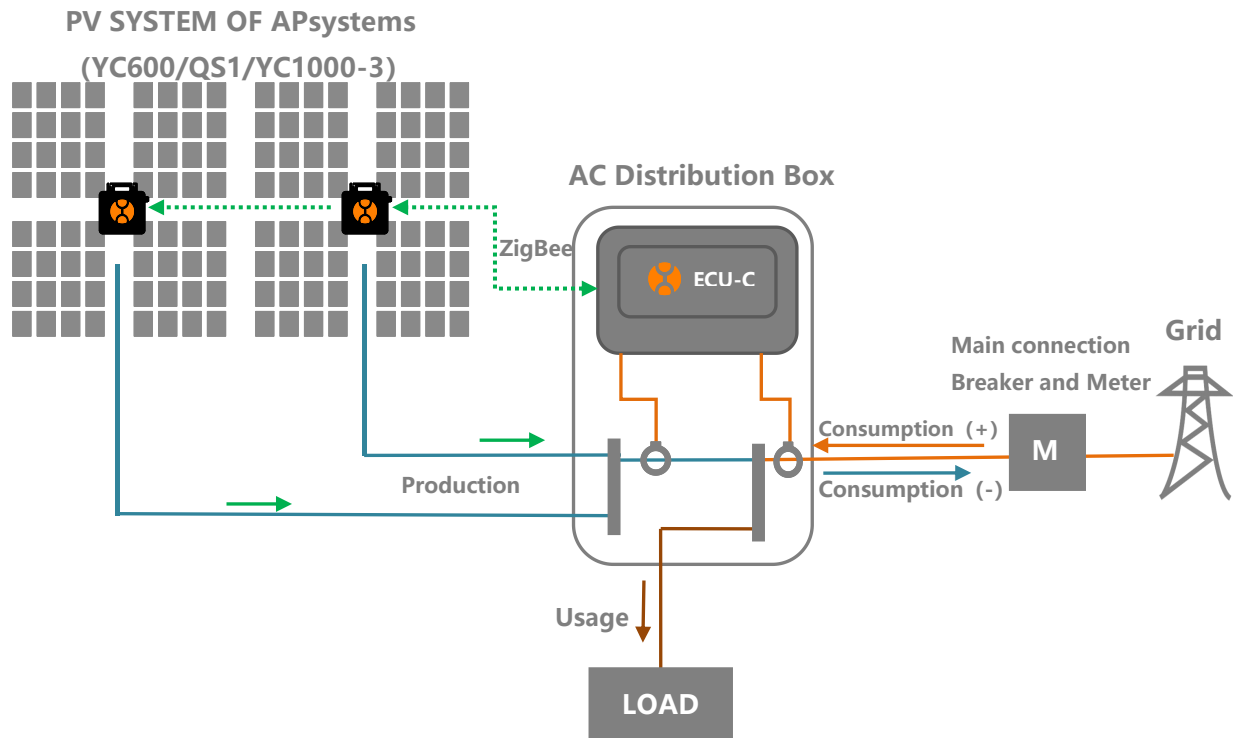


Figure 4 Diagram of Zero Export Function

**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 on "Advance" - "Zero Export".
- ⊗ Setting the "Zero Export" to the "OPEN", then set a Power Limit in kW (The default value is 0.).

### Zero Export

Zero Export

OPEN

Power Limit

0

KW

Save

**Zero Export:**After turning on the Zero Export function, if the power limit value is not filled, the default is 0, that is, when the ECU-C detects that the power generated by the photovoltaic system is uploaded to the grid (reverse power), it immediately sends a command to reduce the output power of the inverter to eliminate reverse power, when the forward power flowing from the grid to the load increases, the inverter output power increases again to dynamically adjust, which can not only achieve the anti-backflow function, but also maximize the use of solar energy.

**Power to the grid limit:**Limiting the reverse power value, such as input 3, represents the upper limit of the reverse power uploaded to the grid by the ECU through the control system power generation power limit is 3KW, and the default value is 0 by default, which is the 0-export function.

**Three-phase configuration:**If a three-phase system composed of APsystems's single-phase micro-inverters needs to realize the function of independent anti-backflow of each phase or limit the grid power, it is necessary to register the micro-inverters connected to each phase separately in the corresponding boxes.

Power

Energy

Meter Switch

CT-Ring Wiring Diagram

**Zero Export**

Redundant Energy Control

Three-phase Balance

Extended Phase Symmetry

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.



3 PHASE SETTING--215000001296

Inverter List of B Phase

Clear

☐ 802000032959  
☐ 802000034592

^

v

Inverter List of A Phase

Clear

☐ 802000033152  
☐ 802000033177

<

>

No configured Registered Inverter List

>

<

Inverter List of C Phase

Clear

☐ 802000034432

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.

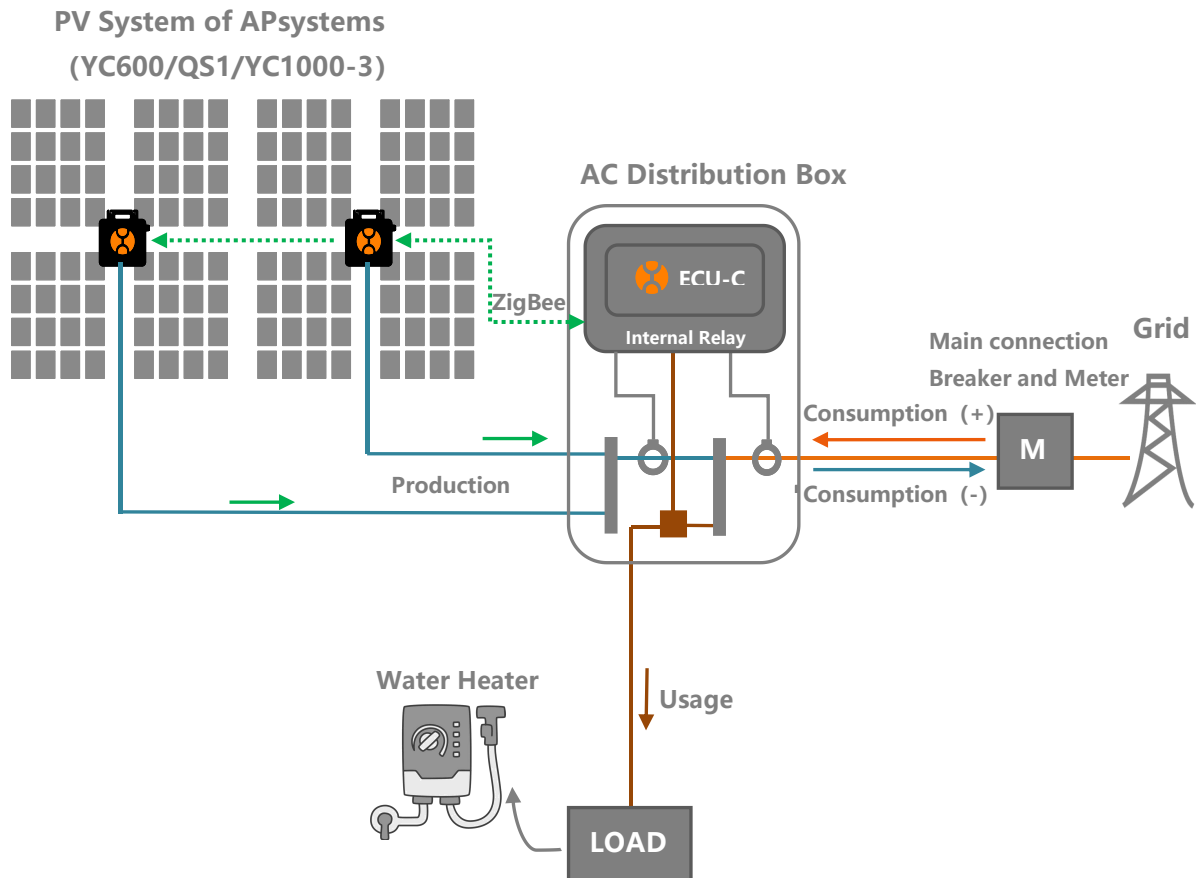


Figure 7 Diagram of Redundant Energy Control Function

Note:

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



### Contactor Connection

This diagram is for contactor connection configuration.

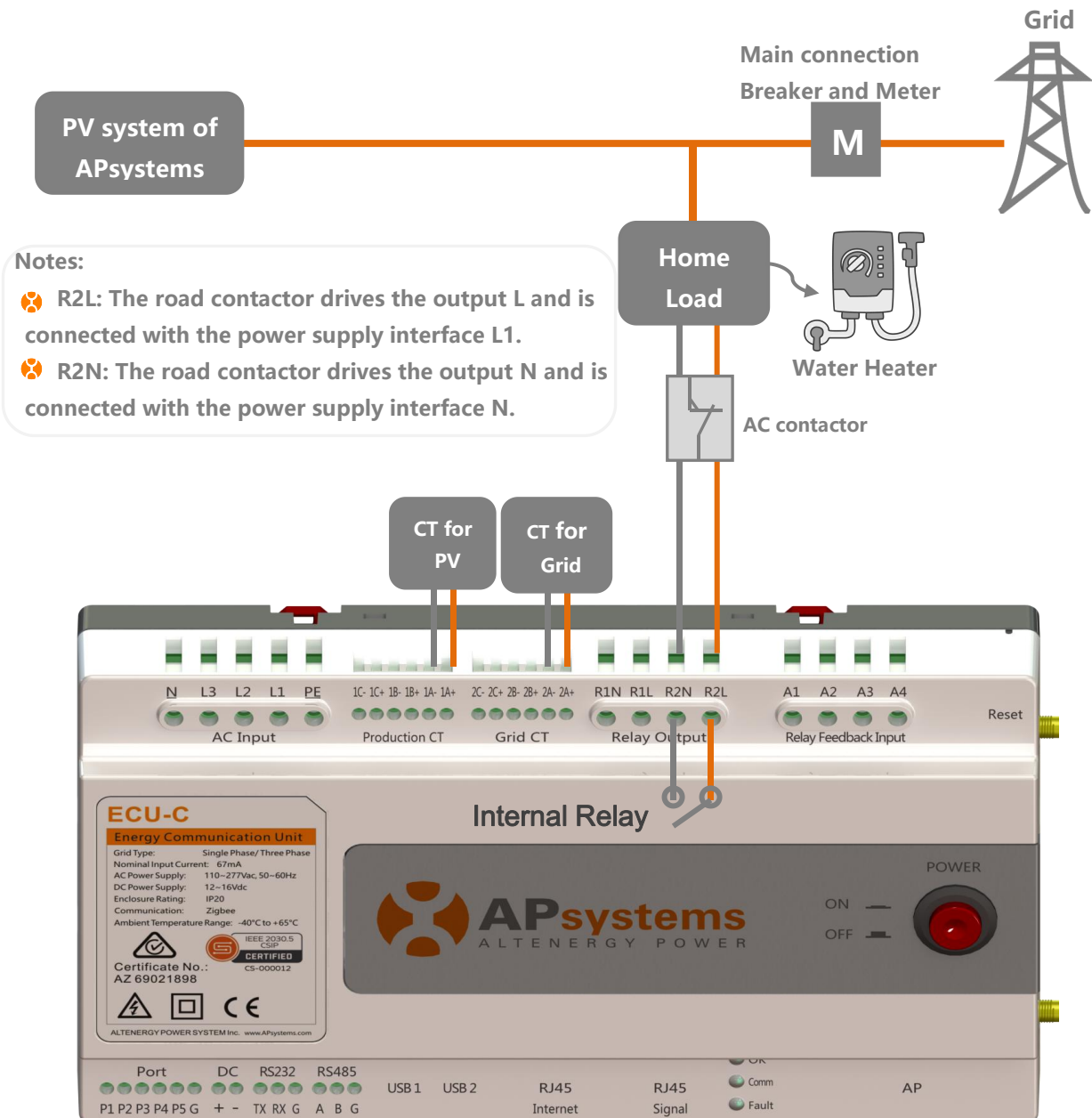


Figure 8 Contactor connection diagram

## How to use the Redundant Energy Control Function

- ✧ Login to the local interface of ECU;
- ✧ Click on “Advance” - “Redundant Energy Control” .
- ✧ Setting the “Redundant Energy Control” to the “OPEN”, then set a Power Limit in kW.



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**Redundant Energy Control**

Redundant Energy Control
OPEN ▼

Power Limit

2.1
KW

Save

**Redundant energy control:** This function is to control the opening of the external AC contactor by closing the ECU-C relay when the power of the uploaded power grid reaches a certain power value, so as to supply power to external electrical equipment (such as a water heater), try to consume the electrical energy uploaded to the grid at the local load.

**Threshold:** It indicates that when the power of the uploaded power grid reaches this value, the relay is closed, and the external contactor is controlled to conduct. For example, the power of the water heater is 2KW, and the turn-on threshold can be set to 2KW, so that when the upload grid power exceeds 2KW, the water heater is powered by the relay control and does not consume grid power.

**Note:** This function is currently only applicable to single-phase systems.

Redundant Energy Control

Power
Energy
Meter Switch
CT-Ring Wiring Diagram
Zero Export
Three-phase Balance
Extended Phase Symmetry

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.

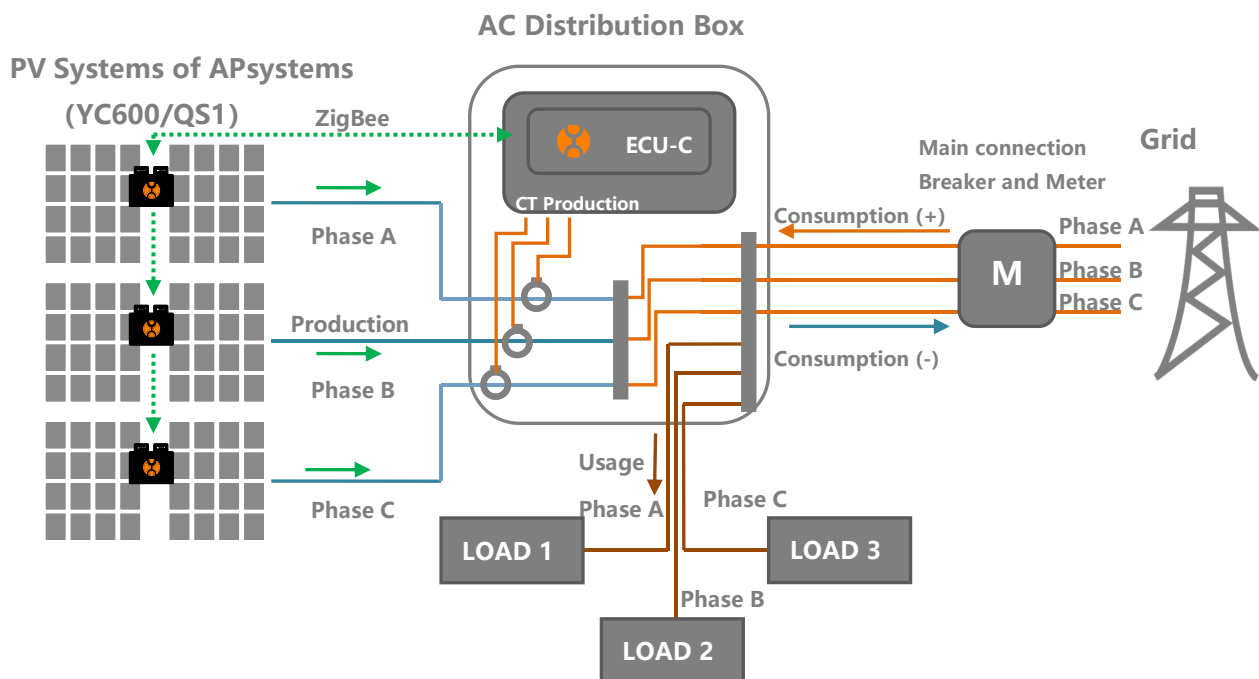



Figure 10 Diagram of Three-phase Balance Function

### 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.
- ⚡ For this function, PV side ( production side ) must be measured with CTs, and the grid side is optional.

## How to use the Three-phase Balance Function

- ✧ Login to the local interface of ECU;
- ✧ Click on “Advance” - “Three-phase Balance”.
- ✧ Setting the “Three-phase Balance” to the “OPEN”, then set “CT Installed” to the “YES”.



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Three-phase Balance

Three-phase Balance
OPEN ▼

CT Installed
YES ▼

Save

**Three-phase Balance:** When using APsystems single-phase micro-inverse to form a three-phase system, the three-phase balance function can be turned on to ensure that the three-phase current difference does not exceed 16A.

The three-phase balance function can be connected to the detection current through an external CT, and the response speed is faster; it can also be collected by the ECU to collect micro-inverse data on each phase for detection. At this time, no external CT is required, but the response speed will be slow, and the general maximum duration is 5 minutes.

And at this function, you need to register separately according to the micro-inverse serial number of each phase in the three-phase configuration.

Power

Energy

Meter Switch

CT-Ring Wiring Diagram

Zero Export

Redundant Energy Control

Three-phase Balance

Extended Phase Symmetry

Figure 11 “Three-phase Balance” setting interface

### Three Phase setting

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

The screenshot displays the '3 PHASE SETTING' interface for a device with ID 215000001296. The interface is organized into three main columns, each representing a phase: A, B, and C. Each column contains a list of inverters with checkboxes for selection. The 'Inverter List of A Phase' and 'Inverter List of B Phase' are currently populated with two inverters each, while the 'Inverter List of C Phase' contains one. A central area labeled 'No configured Registered Inverter List' is flanked by navigation arrows. The 'Inverter List of B Phase' is positioned at the top, while the others are at the bottom.

Phase	Inverter ID	Selected
A Phase	802000033152	<input type="checkbox"/>
	802000033177	<input type="checkbox"/>
B Phase	802000032959	<input type="checkbox"/>
	802000034592	<input type="checkbox"/>
C Phase	802000034432	<input type="checkbox"/>

Figure 12 "Three-phase configure" setting interface