

Power Control System Installation Guide

for LG Electronics ESS Home 5/8 (RBA005K0A0F / RBA008K0A00)



<http://www.lg.com/us/ess>

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Power Control System for the LG Electronics ESS Home 5/8

- The Power Control System (PCS) of LG Electronics ESS Home 5 and 8 is an a Supplementary PCS. Supplementary PCS are systems or devices intended for use in circuits with an overcurrent device suitable for service, feeder, or branch circuit protection.
- The PCS shall comply with NEC 210.20, 705.12 or NFPA 70 2020 edition section 705.13
- The LG Electronics ESS Home 5/8 supports Import Only Mode as a PCS Operating mode for PCS functionality.
 - Import Only Mode ensures the LG Electronics ESS Home 5/8 never exports any active power to the grid (Area EPS).
- The LG Electronics ESS Home 5/8 provides three system working scenarios: PV Self-consumption, ToU (Time-of-Use), and Backup only. If the PCS functionality is enabled, all working scenarios will operate within the constraint of the Import Only Mode.

Home 5/8 Components

- The LG Electronics ESS Home 5/8 (RBA005K0A0F / RBA008K0A00) consist of two different devices: the SE Box and the Home 5/8. These devices are needed to use the PCS functionality. The following table shows the devices required for PCS functionality and their part number.

< Table 1. Part Numbers & Ratings >

Device	Part Number	Maximum continuous output current
Home 5 / 8	RA500K16A11 / RA768K16A11	20.84 A / 31.25 A (@240 V)
SE Box (PCS Controller, Export limit CT)	REA200AP0	160 A (@240 V)

- The Export Limit CTs are assembled in a UL-approved factory line, where the direction has been verified. These CTs do not need to be installed on the site.
- The Export Limit CTs sense the current of the SE Box PCS-controlled conductor.
- The PV CT is only intended for monitoring, which is not covered by PCS functionality

INFO

- It is only possible to set PCS to enabled or disabled in the field through the SE Box HMI LCD.
(No set value of current)
- When PCS is enabled, the "Import Only Mode" is fixed in the software.

Configuring PCS in LG Electronics ESS Home 5/8

- Follow and complete all setup wizards on the HMI LCD to make sure the CT polarity is correct. This ensures the correct main connection (L1, L2) in the SE Box, as the CTs have been assembled in a UL-approved factory line.
- The PCS-controlled current setting for each PCS-controlled conductor or bus bar shall be indicated with a field-applied marking label on the conductor or in close proximity to the busbar.
- The LG Electronics ESS Home 5/8 supports "Import Only Mode" of PCS operating mode as the AC-coupled ESS and the backfeed current of the ESS is limited by zero. On the label below, write the back feed current by the PV inverter only.

<Label 1. PCS-Controlled Current Setting>

PCS controlled current setting : Amps

The maximum operating current of this system may be controlled electronically.
Refer to manufacturer's instructions for more information.

INFO

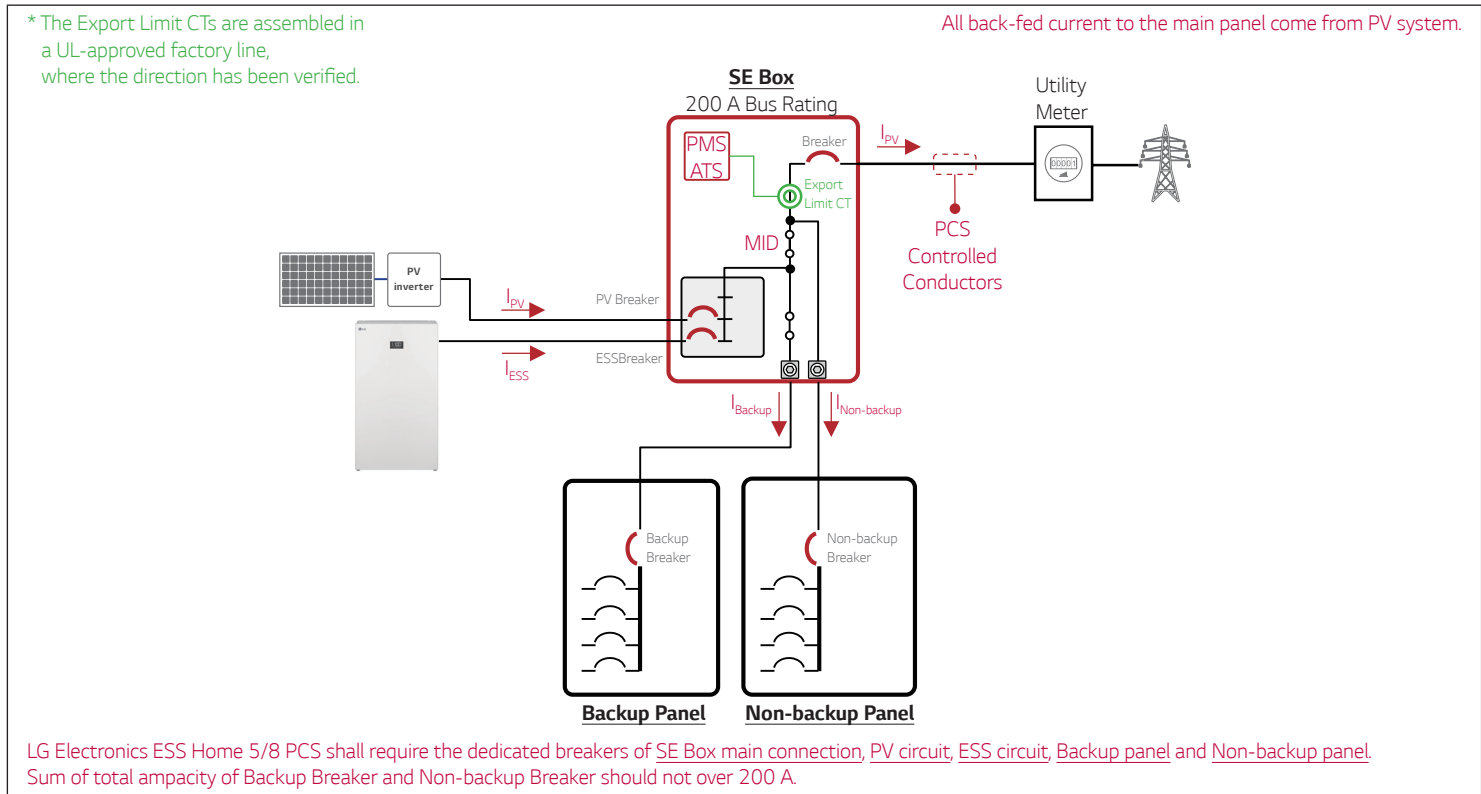
- This system is equipped with a power control system (PCS). All PCS-controlled busbars or conductors shall be protected with suitably rated overcurrent devices appropriately sized for the busbar rating or conductor ampacity.
- Notice: The maximum operating currents in controlled busbars or conductors are limited by the settings of the power control system (PCS) and may be lower than the sum of the currents of the connected controlled power sources. The PCS-controlled currents settings may be used for calculation of the design currents used in the relevant sections of NEC Article 690 and 705.

WARNING

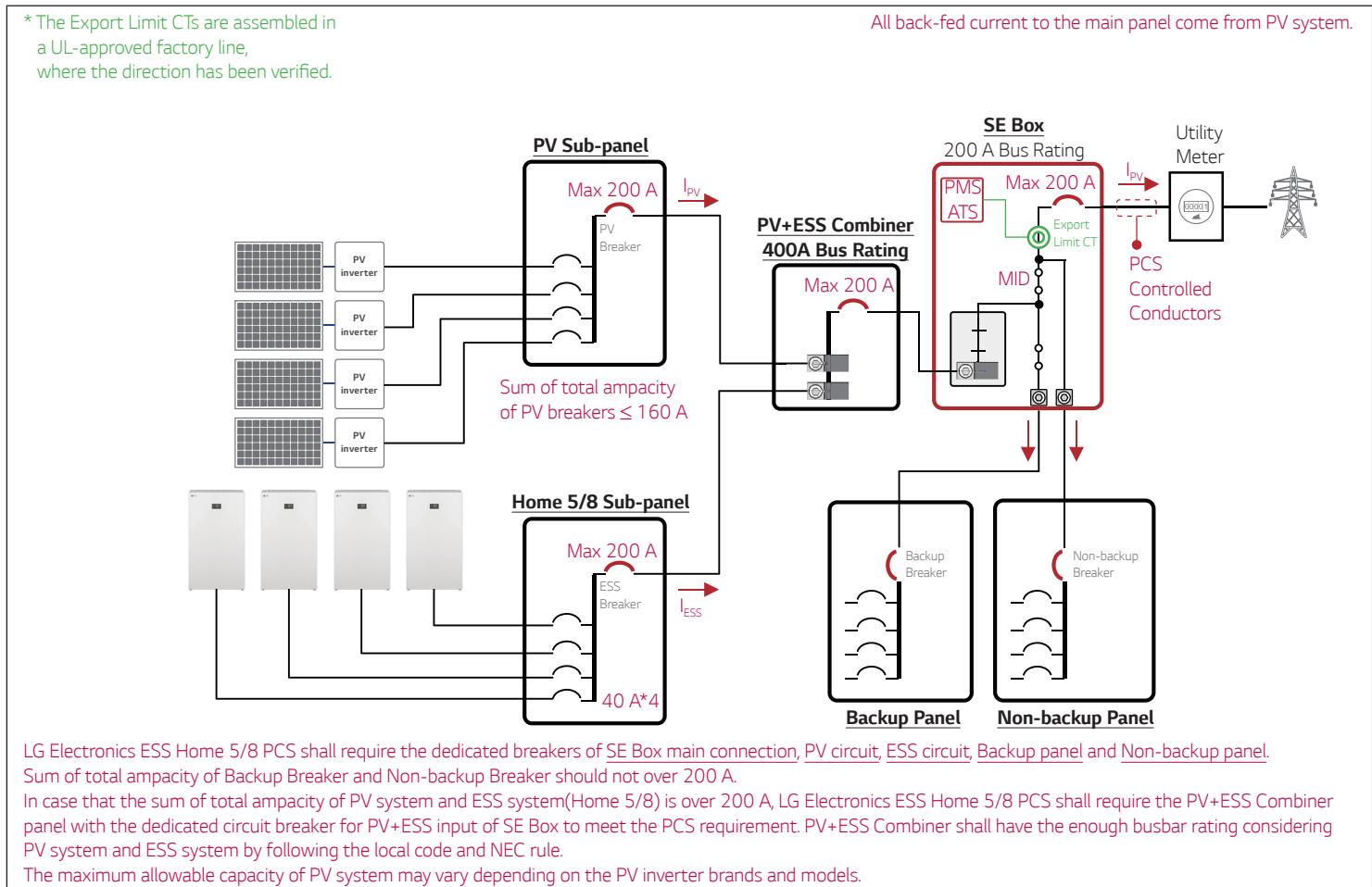
- Risk of electric shock and fire. Only qualified personnel shall be permitted to set or change the setting of the maximum operating current of the PCS. The maximum PCS operating current setting shall not exceed the busbar rating or conductor ampacity of any PCS-controlled busbar or conductor.
- If PCS functionality is required, do not connect the sub panel for Non-backup port in the SE Box and do not install the external CTs to sense other panels.

PCS Configuration(SE Box as Service Equipment)

<Figure 1. Installation case with SE Box as Service Equipment>

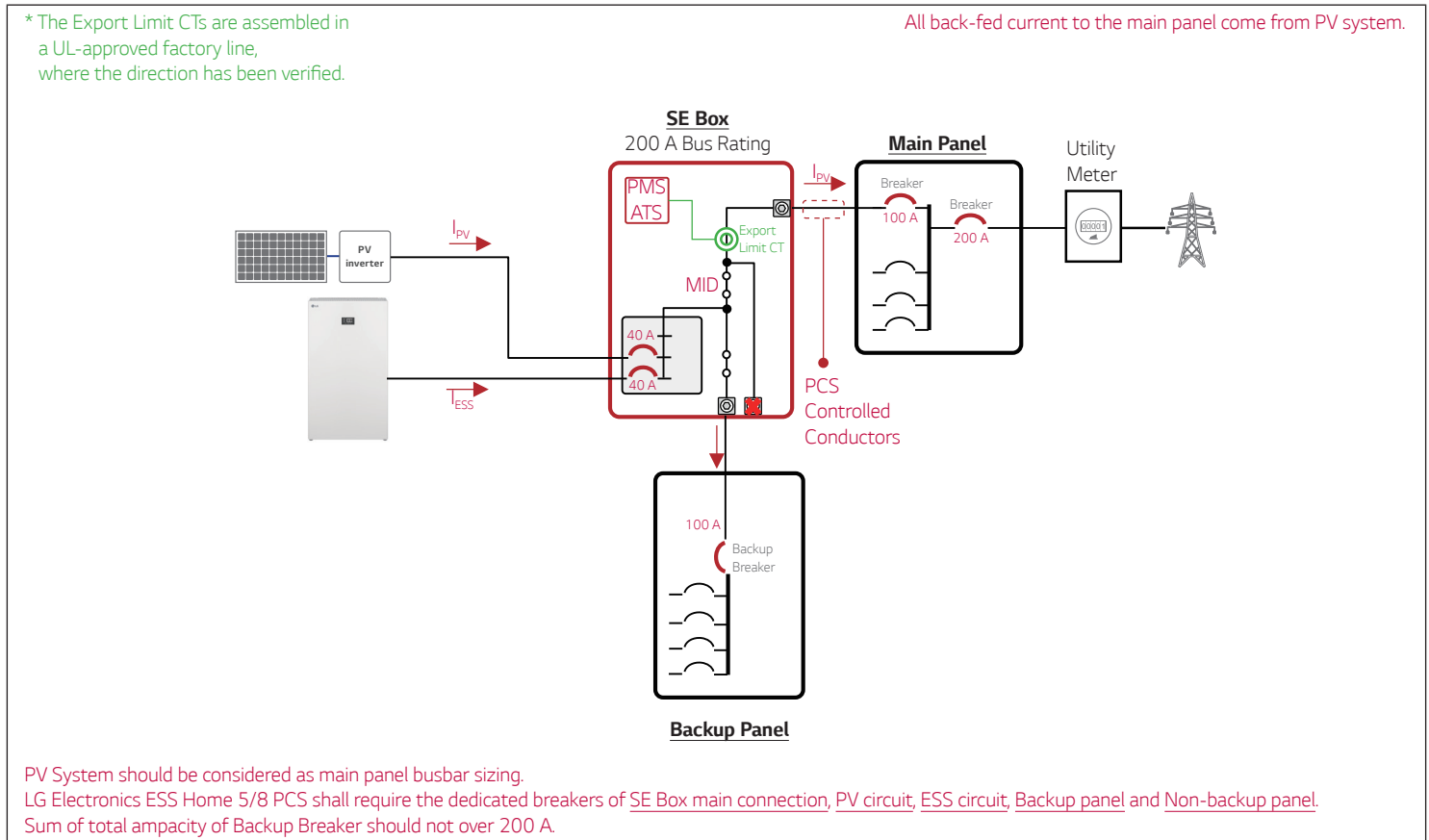


<Figure 2. Large scale installation case with SE Box as Service Equipment>



PCS Configuration(MPU Avoidance configuration)

<Figure 3. An example of MPU(Main Panel Upgrade) avoidance in Partial Backup Configuration>



- The MPU Avoidance configuration of LG Electronics ESS Home 5/8 is only allow the back-fed of PV systems. The main panel busbar shall be protected by using proper over-current protection devices applied by 120 %.
- PV circuit breaker sizing connected to SE Box can be calculate like this :

(Busbar sizing * 120 %) – Main Breaker in Main panel \geq PV Circuit Breaker

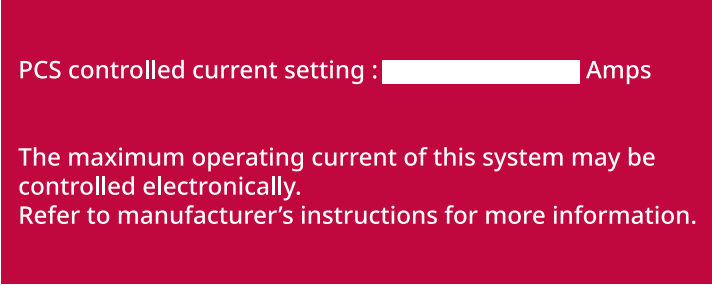
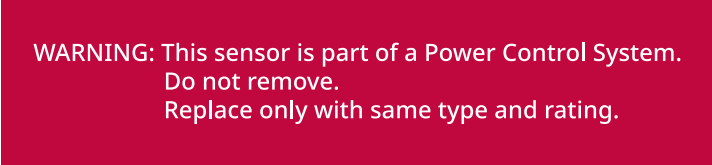
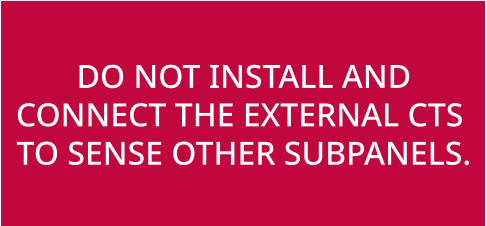


- If the Main Panel has 240 A busbar sizing, the available maximum PV circuit breaker is : $(240 \text{ A} * 120 \%) - 200 \text{ A} = 88 \text{ A} \geq \text{PV Circuit Breaker} \rightarrow \text{Max } 80 \text{ A}$ is available.
- If 200 A busbar in Main Panel, only 40 A is allowable for PV system.
If the PV system requires bigger ampacity than the calculated maximum ampacity, the main breaker in Main Panel can be downsized.
- If the accurate calculation required, please contact to LG.
- The system should be installed according to NEC used for reference installation guidance and local requirements.

Breaker sizing

<Table 2. The examples of breaker sizing of each dedicated circuit breaker>

Installation Case		Main Breaker In Main Panel	SE Box Main Connection	Main Breaker in Backup panel	Main Breaker in Non-backup panel	ESS Circuit Breaker	PV Circuit Breaker
SE Box as a Service Equipment	Case 1-1	-	100 A	100 A	-	100 A	100 A
	Case 1-2	-	200 A	100 A	100 A	100 A	200 A
	Case 1-3	-	200 A	200 A	-	100 A	200 A
Large-scaled Installation	Case 2-1	-	200 A	100 A	100 A	200 A	200 A
	Case 2-2	-	200 A	200 A	-	200 A	200 A
SE Box with Main Panel (MPU Avoidance)	Case 3	200 A	100 A	200 A	-	100 A	Depending on the busbar sizing of main panel

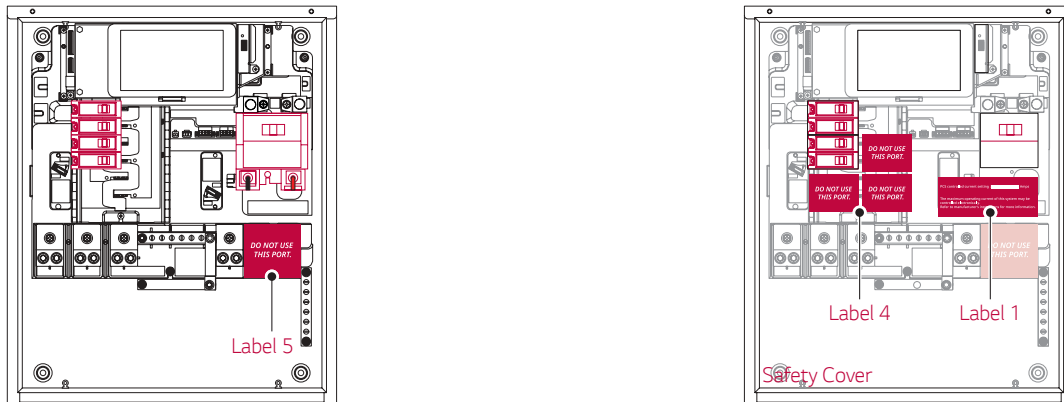
Labels

<p><Label 1. For PCS-Controlled Current Setting></p> 	<ul style="list-style-type: none"> • Label 1 is used to indicate the set current limit value. • In LG Electronics ESS Home 5/8 system, the available back-fed current to main panel or the area EPS is only PV system.
<p><Label 2. For Export Limiting CT Connection></p> 	<ul style="list-style-type: none"> • Label 2 is used to prevent export limiting CT removal. • Do not remove the internal CT connection to make sure the main connection current measurement for the whole system.
<p><Label 3. For External CT Connection></p> 	<ul style="list-style-type: none"> • Label 3 is used to prevent external CT installation. • When PCS enabled, DO NOT install external CTs to measure the main panel or another load panels.
<p><Label 4. For Breakers in SE Box></p> 	<ul style="list-style-type: none"> • Label 4 is used to avoid the unintentional connections to the internal panelboard in SE Box.
<p><Label 5. For Non-Backup Ports></p> 	<ul style="list-style-type: none"> • Label 5 can be used to avoid the non-backup port connection when the ampacity of the backup panel is 200 A. • If the backup panel's ampacity is less than 200 A, it is not necessary to attach this label.

Labelling and Circuit breaker connections

Label 5 can be used to block the non-backup port connection when the ampacity of the backup panel is 200 A in all cases.

< Figure 4. Circuit Breakers Installation & Label Positions : PV and ESS connected to SE Box respectively >



< Figure 5. Circuit Breakers Installation & Label Positions : PV+ESS Combiner connected to SE Box thru Terminal Block >



< Figure 6. Circuit Breakers Installation & Label Positions : PV+ESS Combiner connected to SE Box thru BJ series breaker >

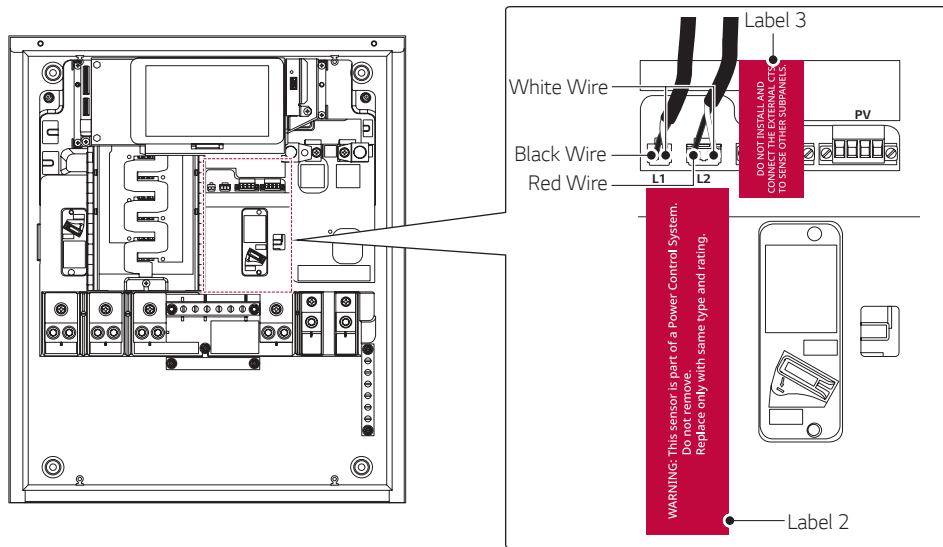


- For the PCS, a PV circuit breaker and an ESS circuit breaker can be installed on the internal panel board, where the remaining breaker spaces should NOT BE USED by putting "Label 4" on the safety cover to prevent installing breakers as in the diagram above
- For breaker sizing, refer to the each diagram in Figure 1 ~ Figure 3.
If the detailed breaker sizing calculation is required depending on the site conditions, please contact LG Sales Engineer with the site information.
 - Single line diagram, PV inverter brand and model name, breaker sizing and busbar sizing of each panels, service ampacity
- If PCS functionality is not required for the installation, it is not necessary to put all labels.

Labelling Sensor Parts and Connections

- The Export Limit CTs are assembled in a UL-approved factory line, where the direction has been verified.
- During the installation, the setup-wizard checks the CT direction (active power) and the logic circuit power connection polarity.
- The CT cables are the only accessible part during the installation. You should apply the provided labels while following the instructions when the system is configured to enable PCS functionality.
- Attach Label 1, Label 4, and Label 5 by referring to Figure 3.
Attach Label 2 and Label 3 by referring to Figure 4.

< Figure 7. CT Sensor Wire Check & Label Positions >



- The CT Sensors are UL-listed components and the specifications are stated below.
It is not possible to access these parts on the site, as the sensors are fully assembled in the factory

Export Limited CT: Carlo Gavazzi / CTD-1X.200.1.XXX

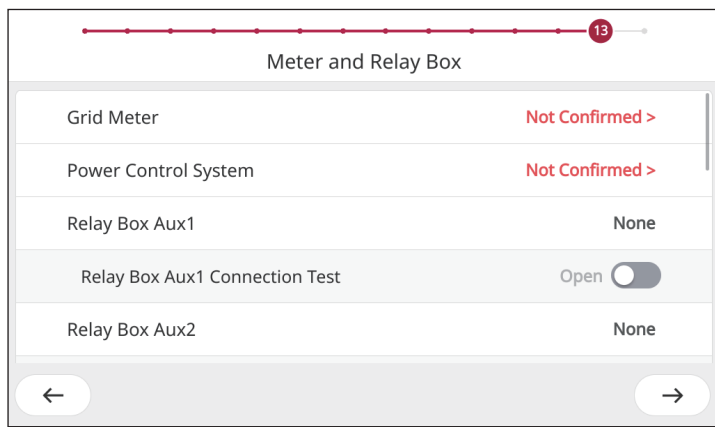
Current Transformer - R/C (XODW2) , TYPE CTD1X.200.1A.XXX, manufactured by CARLO GAVAZZI CONTROLS S P A (E328505) , Primary current = 200 A, Secondary current = 1 A, 600 V class system, 105 °C.

Grid Meter and PCS Setting in the Setup Wizard

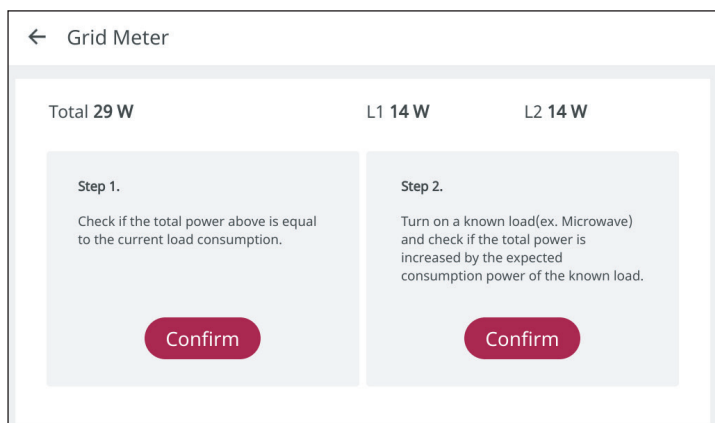
- Once the system is configured as a PCS, the Home 5/8 continues to run in Import Only Mode for the ESS. The ESS will never export ESS active power to the SE Box upstream, which means that the ESS will never backfeed the active power to the Area EPS.
- If a setting change is required, please contact LG service.

INFO

- PCS functionality is supported with software version V1.1.1712 or higher.
 - If the HMI LCD cannot be powered on, check the AC power connections. Control circuit power loss can cause the HMI LCD to not power on.
- 1 The Grid Meter and Power Control System can be found on step 13 of the Setup Wizard. For correct system operation and Power Control System setting, check and confirm the system connections and settings.
Tap "Not Confirmed" on the Grid Meter.

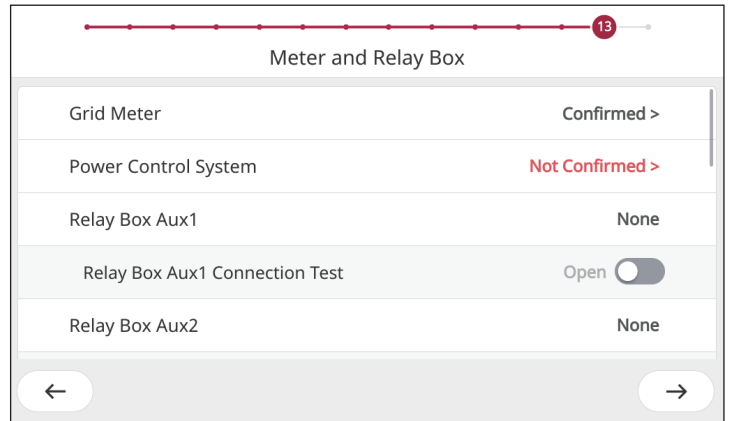


- 2 Follow the instruction on the HMI screen to make sure the power connection polarity for the right meter sensing (mis-wiring, reverse wiring, and incorrect installation).
In this step, the PV system and ESS (Home 5/8) should be de-energized to check the CT direction (active power) and the power connection polarity.

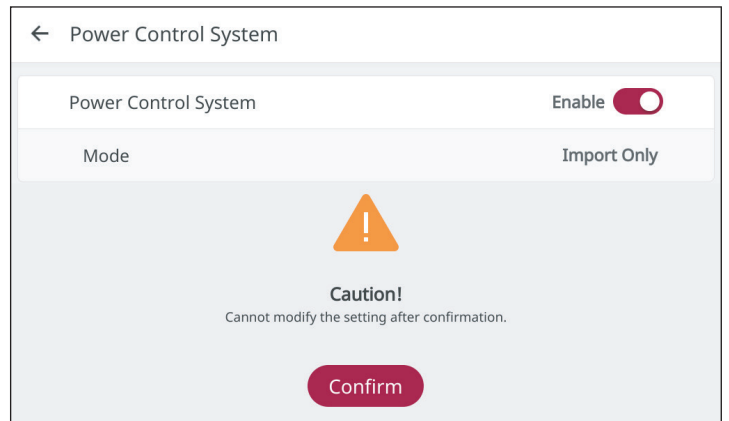
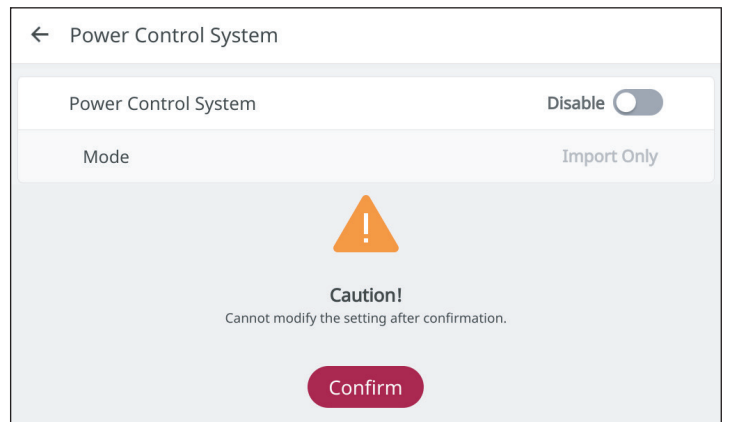


- If the grid meter shows the negative values while PV and ESS were de-energized, check the CT cable and AC power connections. (Make sure PV and ESS de-energized.)
- Back to the previous menu after confirming the Grid Meter setting.

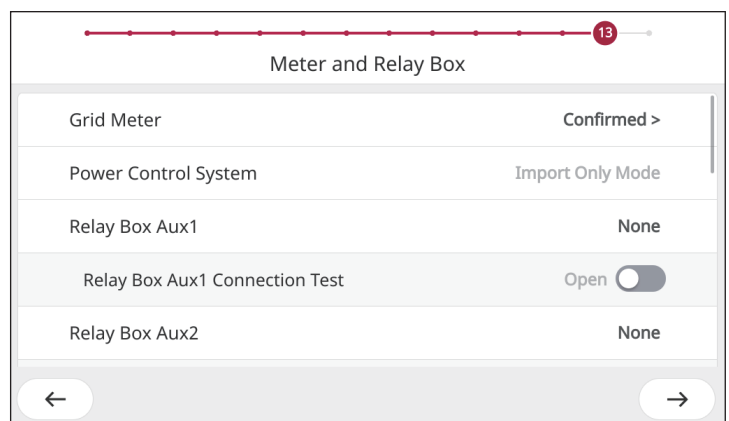
- 3 Tap "Not Confirmed" on the Power Control System



- 4 Tap the toggle button to "Enable" and tap "Confirm." Once confirmed, this setting cannot be changed. Tap the back button on the top left.



- 5 If set correctly, both categories will be marked as "Confirmed" as shown below.



- If Power Control System setting change is required, please contact LG service.

Checklist for PCS Functionality

Check points	Confirmation
Was the breaker sizing correctly installed by following the LG instruction guide?	<input type="checkbox"/>
Was the dedicated circuit breaker of SE Box installed?	<input type="checkbox"/>
Was the dedicated circuit breaker of PV system installed?	<input type="checkbox"/>
Was the dedicated circuit breaker of ESS system(Home) installed?	<input type="checkbox"/>
Was the dedicated circuit breaker of PV+ESS combiner panel installed? (Large-scaled only)	<input type="checkbox"/>
Were the labels attached correctly? Label 1~4 is necessary. Label 5 is depending on backup panel sizing.	<input type="checkbox"/>
Did you make sure whole system have same voltage polarity?	<input type="checkbox"/>
Did you enable PCS functionality on HMI LCD?	<input type="checkbox"/>
Did you check PV and ESS breakers were only installed on the internal panelboard of SE Box? (Do not connect other circuits on the internal panelboard of SE Box.)	<input type="checkbox"/>