

MANUAL

# Energy Storage System

Please read this manual carefully before installing your equipment and retain it for future reference.

MODEL

A005KEEN261

D007KEEN261

# IMPORTANT SAFETY INSTRUCTIONS

## General safety instructions

This manual contains important instructions for the installation and maintenance of the LG Electronics ESS inverter.

LG Electronics ESS inverters are designed and tested to meet all applicable North American and International safety standards. However, like all electrical and electronic equipment, safety precautions must be observed and followed during installation and operation of the LG Electronics ESS inverters to reduce the risk of personal injury and to ensure a safe installation.

Installation, commissioning, service, and maintenance of LG Electronics ESS inverters must only be performed by qualified personnel who are licensed and/or satisfy state and local jurisdiction regulations.

Before starting installation or commissioning of the LG Electronics ESS models, read through the entire manual and note all precautionary statements.

All US electrical installations must comply and be in accordance with all state, local and utility regulations, and National Electrical Code ANSI/NFPA 70.

Installations in Canada, must be done in accordance with applicable Canadian standards.

## Safety symbols and terminology



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



**WARNING** indicates a hazardous situation which could result in death or serious injury if not avoided.



**CAUTION** indicates a hazardous situation which could result in minor or moderate injury if not avoided.



**NOTICE** indicates a situation that can result in property damage if not avoided.



**INFORMATION** indicates a note of important information that will ensure optimal operation of the system.



**HIGH VOLTAGE WARNING!** Indicates hazardous high voltages are present which will result in death or serious injury if not avoided. Thus, only authorized and trained personnel should install and/or maintain this product.



Hot surface



Equipment grounding conductor (PE)



Wait for a prescribed amount of time before engaging in the indicated action.

## Safety Instructions

The LG Electronics ESS inverter installation must be performed by an authorized electrician in accordance with local and National Electrical Code ANSI/NFPA 70 and OSHA requirements.

- The inverter section contains no user-serviceable parts. For all service and maintenance, the inverter should be returned to a LG Electronics Authorized Service Center.
- Read all of these instructions, cautions, and warnings for the LG Electronics ESS inverter and associated ESS equipment (PV panel, RSD, Battery pack, ATS, Energy meter, etc.) documentation.
- Approval must be received by the appropriate local utility as required by national and state interconnection regulations before connecting the LG Electronics ESS inverter to the AC distribution grid.
- The LG Electronics ESS inverter must be connected only by qualified personnel.
- During operation, the inverter wiring and connections can have hazardous high voltages and currents present. Only authorized and qualified personnel shall install and/or perform maintenance on the inverter.
- The inverter chassis and heat sink may become hot during certain operations.

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## Installation

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# Introduction

The LG Electronics ESS inverter not only meets the safety requirements of UL 1741, but also complies with the specifications for Grid Support Utility Interactive Inverters that support a more stable utility grid.

In the following technical description, the precise functions are explained to the installer, as well as the user, which are required for the installation, operational start-up and handling of the LG Electronics ESS inverter.

With this device, you have acquired an LG Electronics ESS inverter for connection of energy storage and/or photovoltaic systems to your grid. This LG Electronics ESS inverter is characterized by an advanced housing design and state-of-the-art high-frequency technology, which enable the highest levels of efficiency.

The LG Electronics ESS inverter includes advanced controls, such as anti-islanding protection, and communicates through an RS485 (EIA485) interface.

The LG Electronics ESS inverter is usable indoors and outdoors. It fulfills the directives of ANSI/NFPA 70, UL 1741, UL 1741 SA, IEEE 1547 and IEEE 1547.1 for parallel operation of power generation plants on low-voltage networks of regional electrical utility companies.

The function of the anti-islanding protection (automatic isolation point for in-plant generation systems) stipulates compliance with the specifications of UL1741, UL 1741 SA and IEEE 1547.

## System

In the following description, the precise functions are explained to the installer, as well as the user, which are required for the installation, operational start-up and handling of the LG Electronics ESS inverter.

The LG Electronics ESS inverter converts direct current from the solar cells into alternating current. This enables you to feed your self-produced solar energy into the public grid.

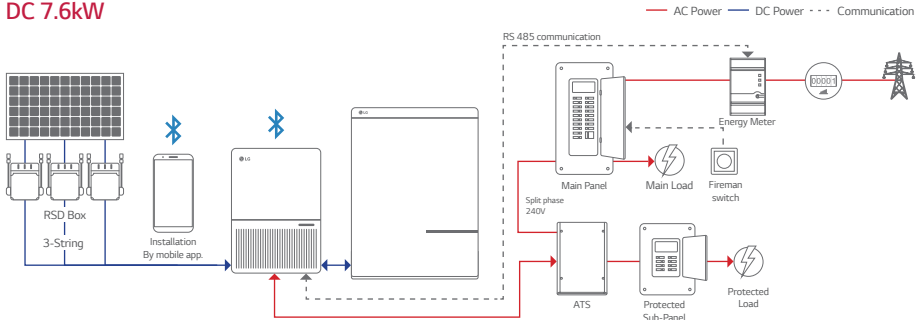
The efficient maximum power point tracking and maximum capacity utilization of the solar energy plant is ensured even in cases of cloudy skies.

The string concept means that PV modules are always connected in series (in a string) and/or that strings with the same voltage are connected in parallel to the LG Electronics ESS inverter with the aim of significantly reducing the photovoltaic system's cabling requirements.

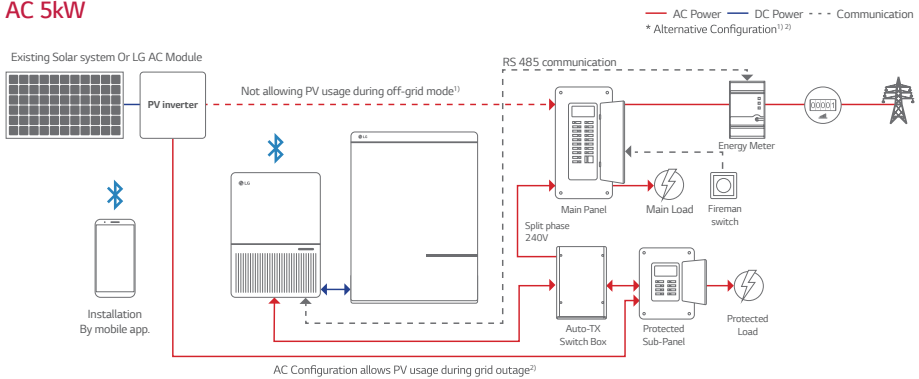
The fact that the modules are connected in strings also means that the photovoltaic system can be perfectly matched to the LG Electronics ESS inverter's input voltage range.

The inverter is a transformerless type without galvanic isolation. Therefore, the inverter may only be operated with ungrounded PV arrays. Furthermore, the PV array must be installed in accordance with locally valid regulations for ungrounded PV arrays. Additionally, the PV array (PV modules and cabling) must have appropriate protective insulation, and the PV modules used must be suitable for use with this inverter. PV modules with a high capacity to ground may only be used if their coupling capacity does not exceed 1,200 nF with 60 Hz grid.

## DC 7.6kW



## AC 5kW



\* A detailed description of the AC configuration allows PV usage during grid outage is provided in the appendix.

### < System Overview >

## PV modules

For the DC-coupled system, the PV modules work in MPPT mode or power reduction mode according to system operational mode. The maximum number of PV strings is three. For the AC-coupled system, there is the option to have no solar modules connected to the LG Electronics ESS inverter at all, and the PV power option will be deactivated.

## Battery Pack

The Battery Pack can store surplus energy generated from rooftop solar modules for use when needed. When the sun has set, energy demand is high, or there is a black-out, you can use the energy stored in your Energy Storage System to meet your energy needs at no extra cost. Unlike a grid-tied solar system which automatically switches off, a battery storage system allows you to keep generating and consuming energy when the grid goes down.

## RSD

The RSD provides an automatic disconnect of residential or small commercial PV systems, fully compliant with the Rapid Shutdown requirements of NEC 2014 Article 690.12.

## ATS

The auto transfer switch (ATS) is an electrical device that switches the home's load between grid power and backup power. The ATS is automatically triggered when it senses the grid has been lost/restored.

## Meter

The Meter is used by the inverter for import / export or consumption readings, and manages the battery charge / discharge accordingly for smart energy management applications, including self-consumption, zero export or Time of Use Rates (TOU). The meter communicates with the inverter via RS485.

## Grid

240 V and 208 V grid are supported. This can be configured via the mobile App.

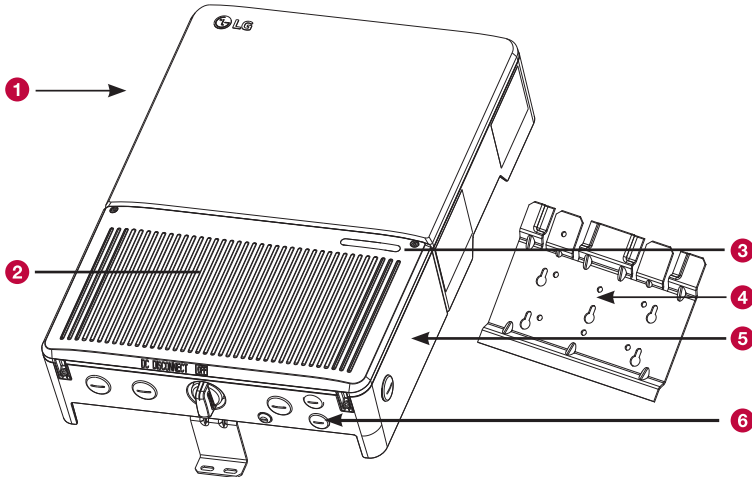
## Android/iOS APP

A powerful tool for monitoring, configuration or diagnostics, the App is connected to the inverter via Bluetooth.

## LG Electronics Cloud

The inverter communicates with the LG Electronics cloud via a WiFi gateway installed within the inverter. Also, the WiFi gateway can push data directly to the customer's cloud or third-party cloud.

## Equipment overview

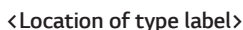


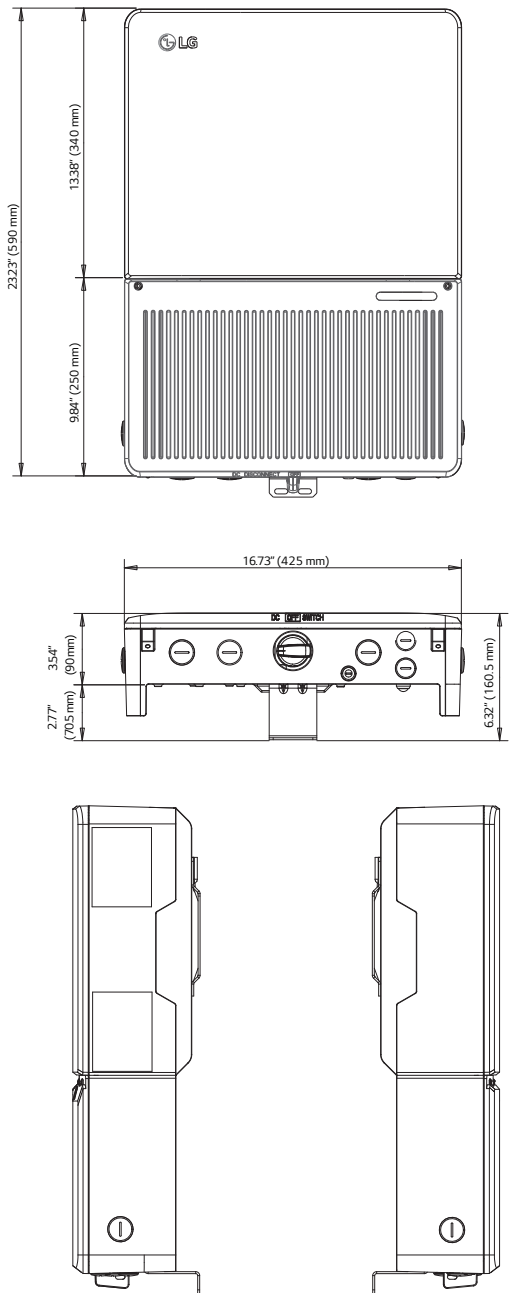
### < Exterior view of inverter main components >

- 1 Inverter Power Box - This is the inverter section of the assembly. This section is sealed at the factory and there are no user-serviceable parts inside. All wiring to install the inverter is done in the wiring box.
  - 2 Wiring Box Cover - This is the cover for the wiring compartment. Please note the DC disconnect must be in the OFF position before this cover can be removed.
  - 3 LED Lights - The five LED lights indicate errors or status.
  - 4 Mounting Plate - The inverter comes with a mounting plate that allows easy assembly of the inverter to a wall.
  - 5 Wiring Box - This is the compartment where all the wiring for the inverter inputs and outputs plus the RS485 communication are done.
  - 6 Conduit Plugs - There are 5 - 3/4" conduit openings and 2 - 1/2" conduit openings. Each conduit opening comes fitted with a conduit plug that should be removed before installing conduit fittings. Conduit fittings need to be watertight with either NEMA 4, 4X, 6, or 6X rated, and an insulated type is preferred.
- The DC Disconnect is shown with the lock in the OFF position. There is an opening on the disconnect where a padlock can be attached.

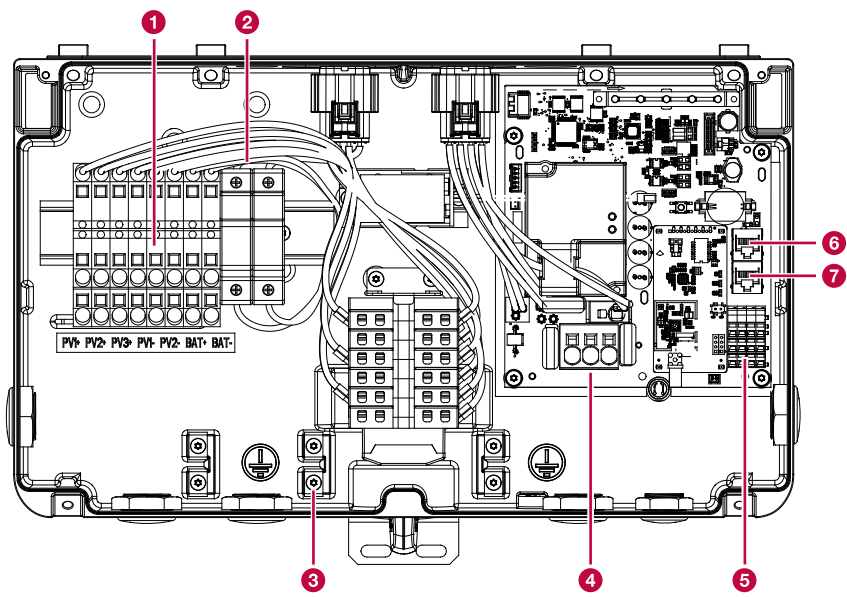
## 1

The main caution labels in English and French are on the right side of the inverter.





< Dimensions of ESS inverters >



< Wiring box of inverters >

- 1 PV and Battery terminals
- 2 BAT Fuse Holders
- 3 Grounding
- 4 AC terminal
- 5 RS485 communication ports
- 6 CAN and RS485 communication ports
- 7 Ethernet and RS485 communication ports

Required torques for wiring box terminals

Terminals	Wire size permitted*	Torque
3 (Grounding)	10 - 8 AWG	16 in-lbs

\* Exception: Specified torque marked on the terminal block. All other terminals are spring type.



# Installation

## General safety

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### WARNING

Please read all of these instructions, cautions, and warnings for the LG Electronics ESS inverter and associated PV array documentation.

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### WARNING

Installation and commissioning must be performed by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements.

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### WARNING

The installation and wiring methods used in the installation of this inverter in the U.S. must comply with all US National Electric Code requirements (NEC) and local AHJ inspector requirements. In Canada, the installation and wiring methods used must comply with the Canadian Electric Code, parts I and II, and the local AHJ inspector requirements. System grounding when required by the Canadian Electrical Code, Part 1, is the responsibility of the installer.

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### CAUTION

The secondary short-circuit current rating is increased at the transfer connection point to the public electricity supply system by the nominal current of the connected ESS inverter.

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### CAUTION

To reduce the risk of fire, connect only to a circuit provided with branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.

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## Visual inspection

All LG Electronics ESS inverters are 100 % tested, packaged in a heavy duty cardboard shipping carton, and visually inspected before leaving our manufacturing facility. If you receive the inverter in a damaged shipping carton, please reject the shipment and notify the shipping company. Verify that the LG Electronics ESS shipping carton contains:

- a. Correct inverter model name
- b. Mounting plate
- c. Manual
- d. Wi-Fi antenna

Visually inspect the LG Electronics ESS inverter for any physical damage such as a bent heatsink fin and dented chassis.

If the inverter appears to be damaged or if the inverter needs to be returned, please contact your local LG Electronics representative.



### WARNING

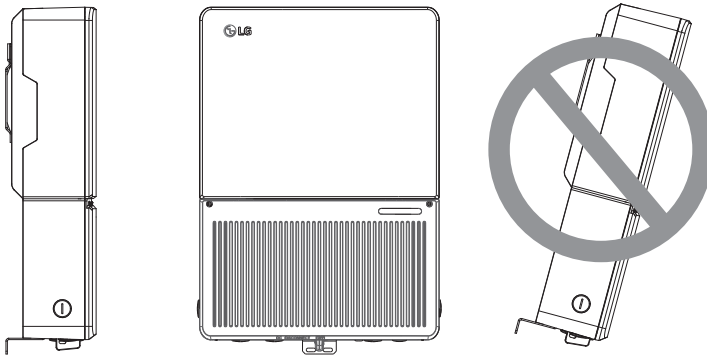


**No user serviceable parts are contained in the inverter section.** Do not attempt to open or repair the inverter. The inverter section is factory sealed to maintain its Type 4 rating. Opening the top cover of the power head will void the inverter warranty.

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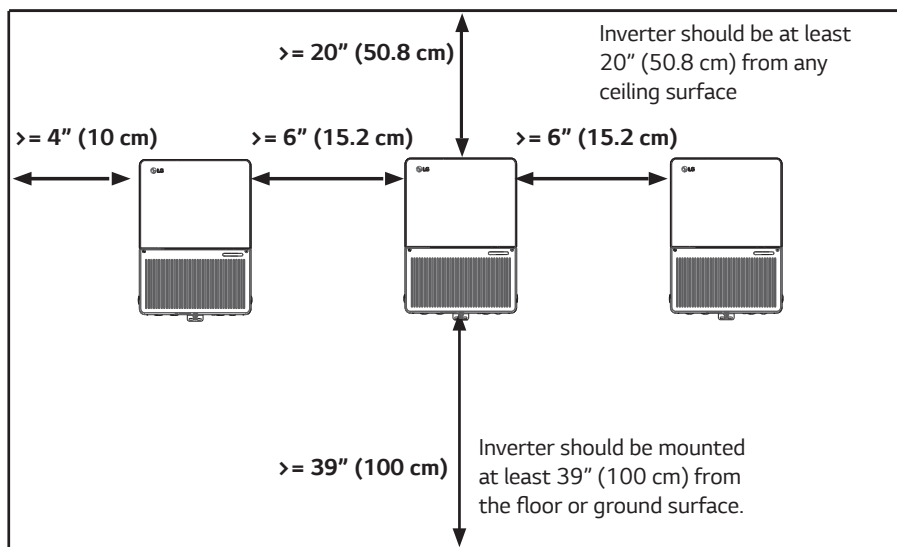
## Installation location

- Install the inverter on a non-flammable support base.
- The inverter must be mounted vertically on a flat surface.
- A minimum distance of 6" (15.2 cm) of unobstructed clearance between the inverter and other equipment and 4" (10 cm) between the inverter and a corner is required to promote free convection.
- Ensure the mounting hardware and structure can support the weight of the inverter.
- Ensure the mounting hardware meets the appropriate building code.
- Avoid installation on resonating surfaces (light construction walls etc.).
- Installation can be indoors or in protected outdoor areas.
- Avoid direct sun exposure.
- Ensure ambient temperature is within -22 °F to +149 °F (-30 °C to +65 °C) for optimal efficiency of the system.
- Despite having a Type 4 enclosure with a soiling category III certification, the inverter must not be exposed to heavy soiling.
- Unused connectors and interfaces must be covered through sealing connectors.



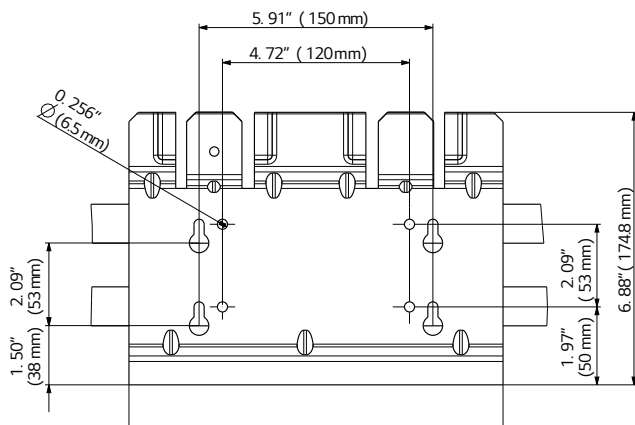
### < Mounting directions >

Please make sure the inverter is installed vertically, especially if it is to be installed outdoors.



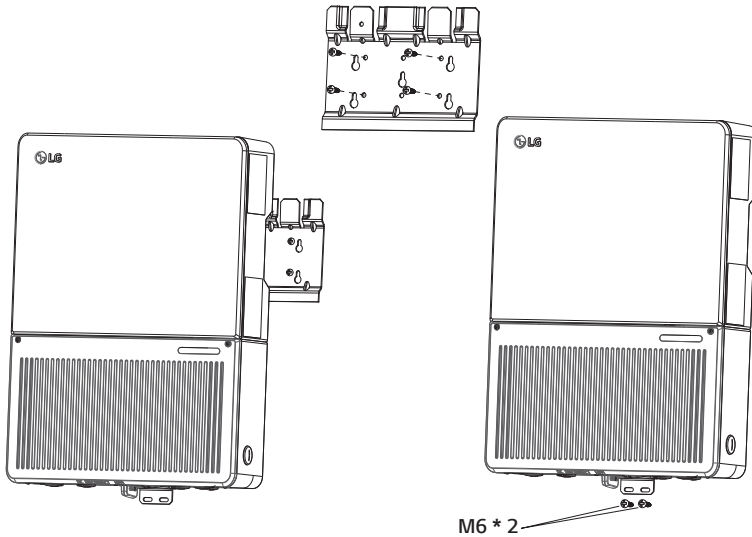
#### < Inverter clearances >

The National Electric Code may require significantly larger working clearances (see NEC Section 110.26)



#### < Dimension drawing of mounting plate >

- 1 Mount the mounting plate to the wall with at least 4 screws and anchors (Ø 1/4" (6mm)). You can use the mounting plate as a template for marking the positions of the boreholes.
- 2 Tighten the screws firmly to the wall.



### < Installing the plate and inverter on a wood stud wall >

- 1** Using the mounting plate as a template, mark four screw holes onto the wall. For 16" (40.6 cm) on center stud mounting, use the four holes that are indicated for this purpose in the figure. Make sure at least two of the holes are in the center of a stud before marking the drill location.
- 2** After marking the screw hole locations, drill the pilot holes for the appropriate screw type that will hold the weight of the inverter in the selected material. 1/4" (6 mm) lag bolts are recommended for mounting on wood framed walls.
- 3** Align the mounting plate over the pilot holes and install the mounting hardware to the mounting surface. Please tighten to the recommended torque necessary to hold the mounting plate firmly to the wall surface type.
- 4** As the inverters are heavy, they should be lifted out of the cardboard container by at least two persons.
- 5** With at least one person on each side of the inverter, lift it up and place it carefully onto the mounting plate. Install two screws in the bottom bracket on the inverter to secure the device.
- 6** Check that the inverter is seated securely on the wall.

It is recommended to use stainless steel screws, especially if installed outdoors. Verify sheer and pull-out strength of anchors or other wall attachments.

# Electrical connections

## General safety

### DANGER



PV solar arrays produce hazardous voltages and currents when exposed to light, which can create an electrical shock hazard. Use dark opaque sheets to cover the PV solar array before wiring or connecting cable terminations.

### WARNING

Read all of these instructions, cautions, and warnings for the inverter and associated PV array.

### WARNING

Installation and commissioning must be performed by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements. Use 10 AWG or greater 90°C (194 °F), copper solid or stranded wire for all DC and AC wiring to the inverter to optimize system efficiency .

### WARNING

Before connecting the inverter to the AC distribution grid, approval must be received by appropriate local utility as required by national and state interconnection regulations. The inverter must be connected only by qualified personnel.

### CAUTION

Do not attempt to open or repair the inverter, as it is factory sealed to maintain Type 4 rating. Opening the inverter will void the warranty.

### CAUTION

The PV input circuits are isolated from the enclosure. The PV system Grounding Electrode Conductor (GEC) when required by National Electric Code (NEC), ANSI/NFPA 70 Sections 690.41, 690.42, and 690.43 is the responsibility of the installer.

## Utility AC voltage

The LG Electronics ESS inverters are grid-tied to the public utility. The inverters are software configurable via the user display panel for various 208 V AC or 240 V AC 60 Hz public utility grids.

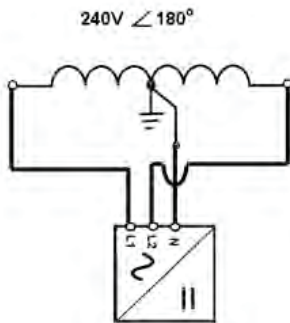
### CAUTION

The LG Electronics ESS Inverters should never be connected to a 120 V AC utility service. NEC 705.12 requires that the inverter be connected to a dedicated circuit with no other outlets or devices connected to the same circuit.

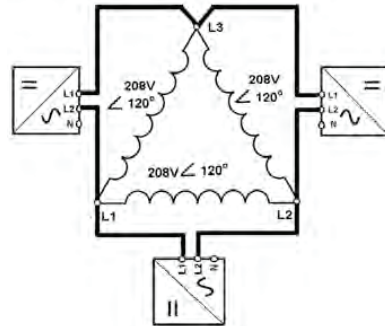
### AC connection voltage and frequency limits:

Voltage range for 208 V nominal, line to line	185 V - 226 V
Voltage range for 240 V nominal, line to line	213 V - 262 V
Frequency Range	59.3 Hz - 60.5 Hz

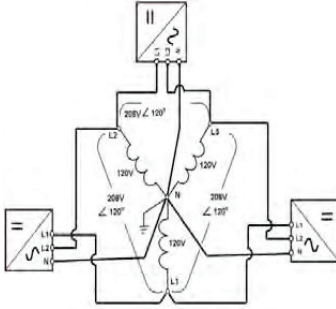
### Public grid configuration allowed:



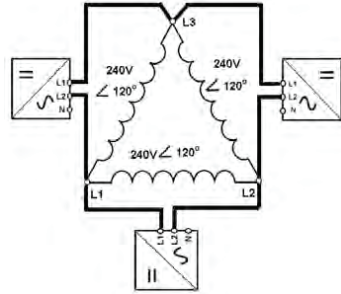
< 240 V / 120 V Split Phase AC Grid >



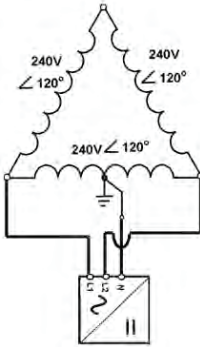
< 208 V Inverter AC Grid >



< 208 V / 120 V WYE AC Grid >

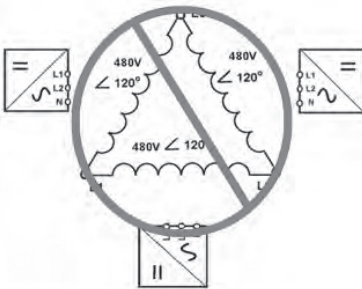


< 240 V Inverter AC Grid >

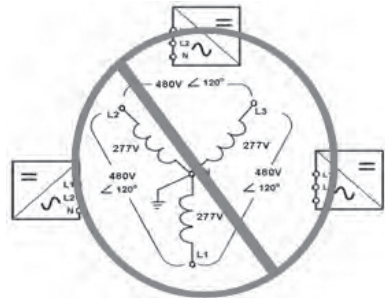


< 240 V / 120 V Stinger AC Grid >

Public Grid Configuration NOT Allowed:



< 480 V DELTA AC Grid >



< 480 V / 277 V WYE AC Grid >



## AC circuit breaker requirements

A dedicated circuit breaker in the building panelboard is required for each LG Electronics ESS inverter that is installed. There should be a circuit breaker or fuse to protect each AC line, L1 and L2. The circuit breaker should be able to handle the rated maximum output voltage and current of the inverter. Please refer to the table below to determine the appropriate circuit breaker size to avoid potential fire hazards. The National Electrical Code (NEC), ANSI/NFPA 70 or applicable local electrical codes must be followed when determining maximum branch-circuit over-current protection requirements.

### **Recommended AC branch protection : 2-pole, 40 A 240 V AC**

Please note that there is an exception to the requirement of a dedicated circuit breaker in the building panelboard for each inverter if there exists a dedicated PV system AC sub-panel that is used to combine multiple inverters. In this case, only one breaker at the main building service panelboard should be installed for a multiple inverter installation utilizing a dedicated PV system AC sub-panel.

## Grounding electrode conductor (GEC)

Per NEC 690.47, a Grounding Electrode Conductor must be installed, and the GEC conductor must be sized in accordance with NEC article 250.166. The GEC conductor should be terminated at the GEC screw terminal inside the wiring box compartment.

## Lightning and surge protection

LG Electronics ESS inverters are designed and certified to meet stringent UL1741 / IEEE 1547 and ANSI/ IEEE 62.41/62.42 AC lightning and surge requirements; however, every PV installation is unique, thus additional external UL/NEC AC and DC surge protection and solid grounding practice is recommended.

## PV string considerations

There are a large number of PV module string combinations that will offer optimal performance from the DC-coupled type inverters due to its wide MPP range (50 V – 450 V).

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### WARNING

Use the PV module manufacturer specified V/Temp coefficient or the temperature multiplication factors given in the table in NEC 690.7 to ensure PV string voltage is less than 450 V DC. The maximum inverter PV input voltage for all possible weather conditions varies based on the location of installation.

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### INFO

System wiring voltage losses should be no greater than 1 to 2 percent for optimal system efficiency and performance.

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## Inverter connections

### General information

#### DANGER



PV solar arrays produce hazardous voltages and currents when exposed to light, which can create an electrical shock hazard. Use dark opaque sheets to cover the PV solar array before wiring or connecting cable terminations.

#### WARNING

Installation and commissioning must be performed by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements.

#### WARNING

Inputs and output circuits of this unit are isolated from the enclosure. System grounding must be done in accordance with the National Electrical Code (NEC), ANSI/NFPA 70 and Compliance is the responsibility of the installer.

#### WARNING

Ensure no live voltages are present on PV input and AC output circuits, and verify that the DC disconnect, AC disconnect, and dedicated AC branch circuit breaker are in the [OFF] position, before inverter installation.

#### WARNING

Inverter warranty is VOID if the DC input voltage exceeds the inverter 450 V DC maximum.

#### WARNING

Power fed from more than one source, more than one live circuit. Please note that all DC and AC terminals may carry current even without connected wires.

#### CAUTION

The inverter must be permanently mounted before any electrical wiring can be connected to the inverter.

#### INFO

Use solid or stranded copper conductors only. 8 AWG (9 mm<sup>2</sup>) for PV is the maximum allowed wire size.

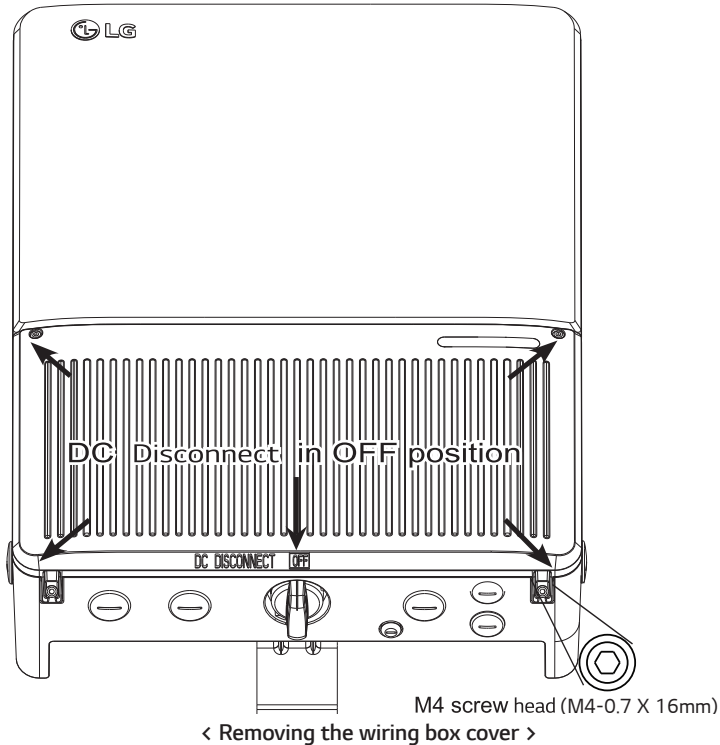
## Opening the wiring box cover

### WARNING

Ensure no live voltages are present on PV input and AC output circuits, and verify that the DC disconnect, AC disconnect, and dedicated AC branch circuit breaker are in the [OFF] position before inverter installation.

2

Installation



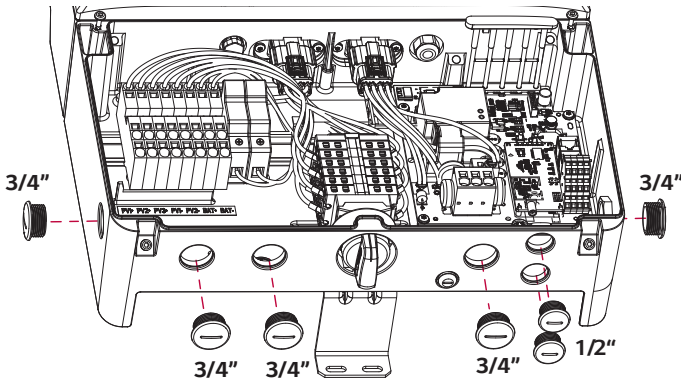
- 1 Place DC Disconnect in [OFF] position. Please note the cover cannot be removed when the DC Disconnect is in the [ON] position.
- 2 Remove the 4 cover screws indicated above with a hex screw driver.
- 3 Lift the cover upward and place off to the side.

### Required torques for wiring box cover

Part	Description	Torque
Wiring Box Cover Screws	M4 screws (Hex head x4) for attaching the wiring box cover to the wiring box	16 in-lbs

## Wiring box conduit plugs

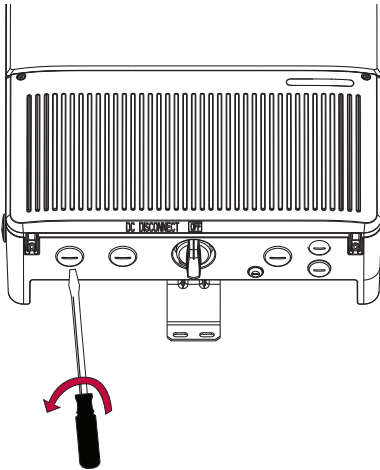
Conduit plugs are provided for 3/4" and 1/2" conduit fittings. If conduit fitting used is between 3/4" and 1/2", an appropriate conduit reducer should be used.



< Locations of wiring box conduit plugs >

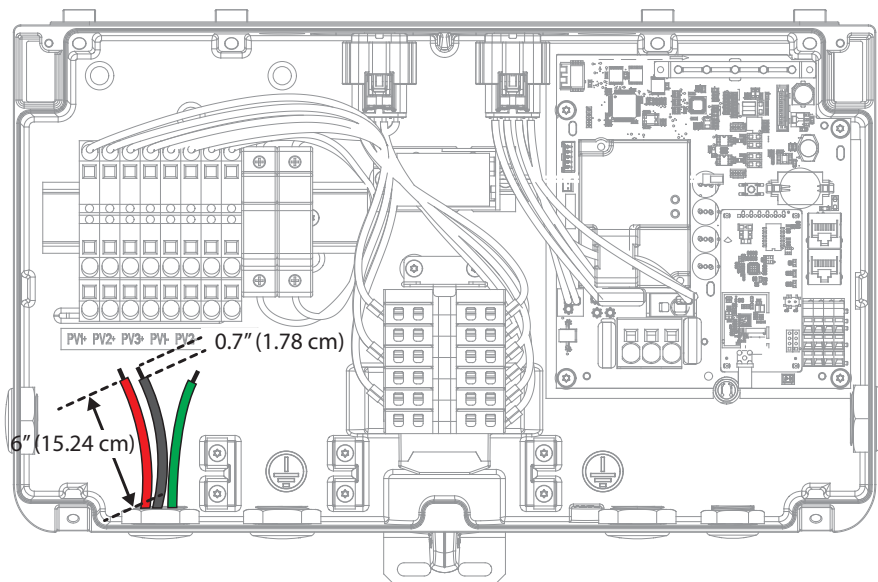


Do not enlarge the wiring compartment conduit openings, as the wiring box enclosure will be damaged, which will void the inverter warranty.



The conduit plugs are removed by placing a flat blade screwdriver in the slot on the conduit plug face and turning while gripping the nut on the inside of the enclosure to ensure it does not slip. Unscrew the nut from the conduit plug and slip the conduit plug out of the conduit opening.

< Wiring box conduit plug removal >  
(Illustration showing the removal of a conduit plug)



### < Conduit installation and wiring routing >

Conduit fittings need to be watertight with either NEMA4, 4X, 6, or 6X rated, and an insulated type is preferred. Once conduit and fittings are installed, route wiring through conduit and fitting, allowing a 6" (15.24 cm) strain relief loop within the wiring box compartment.

## PV array string input connections (Only for DC-coupled type)

### DANGER

To ensure maximum protection against hazardous contact voltages while assembling photovoltaic installations, both the positive and the negative leads must be strictly isolated electrically from the protective ground potential (PE).

### WARNING

- Risk of electric shock and fire. Use only with PV modules with a maximum system voltage rating of 450 V or higher.
- Electric shock hazard. The DC conductors of this photovoltaic system are ungrounded and may be energized.
- Electric shock hazard. The DC conductors of this photovoltaic system are ungrounded but will become intermittently grounded without indication when the inverter measures the PV array isolation.

### CAUTION

Verify DC conductor voltage polarity with voltage meter because damage to the inverter could result if the incorrect DC input polarity is connected.

### CAUTION

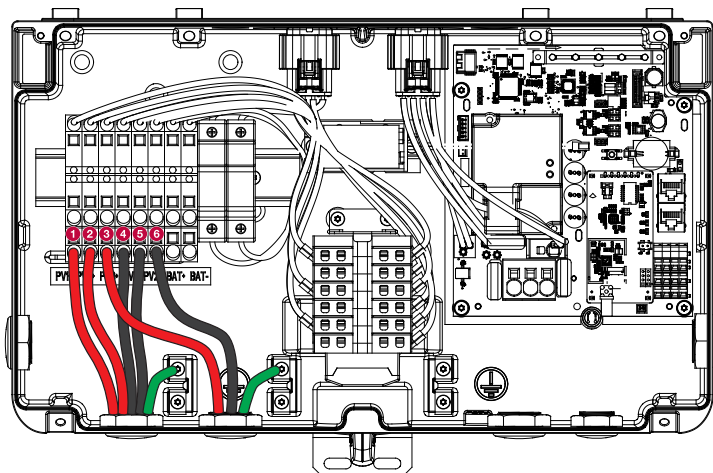
Risk of damage. Be sure that the polarity is correct when you make the connection. Connecting it incorrectly will cause damage to the inverter.

### INFO

The PV Array positive or negative leads must not be connected to ground before the inverter.

### INFO

All terminals accept solid or stranded copper 14 –8 AWG wire only. A 1/8" (3.5 mm) flat blade screw driver is recommended for tightening screw terminals to a 10.5 in-lbs. (1.2 Nm) torque.



### < Wiring box of inverters >

- |                                 |                                 |
|---------------------------------|---------------------------------|
| <b>1</b> PV1 Positive Terminals | <b>4</b> PV1 Negative Terminals |
| <b>2</b> PV2 Positive Terminals | <b>5</b> PV2 Negative Terminals |
| <b>3</b> PV3 Positive Terminals | <b>6</b> PV3 Negative Terminals |

- 1** Verify that the exposed wires are at least 6" (15.24 cm) in length to provide adequate strain relief and wire end strip length required.
- 2** Connect the positive lead from each PV array string to PV Positive Terminals (**1/2/3**) in the wiring box compartment.
- 3** Connect the negative lead from each PV array string to PV Negative Terminals (**4/5/6**) in the wiring box compartment.
- 4** Verify that connections for the DC wiring board assembly are properly wired in the wiring box compartment.
  - [RED] wire goes to [PV Positive] Terminal
  - [BLACK] wire goes to [PV Negative] Terminal

### NOTICE

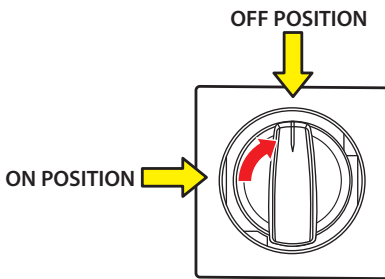
- Connect to earth grounding first.
- Electrical installations must be done in accordance with the local and national electrical safety standards.
- The grounding connector must be connected to the Grounding terminal of the distribution box correctly. Otherwise the product could be seriously damaged.
- The grounding terminal requires a ring terminal connector.



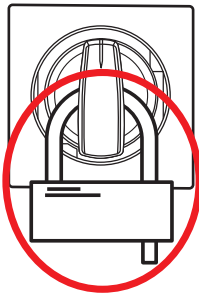
## PV switch LOCK out and TAG out procedure

2

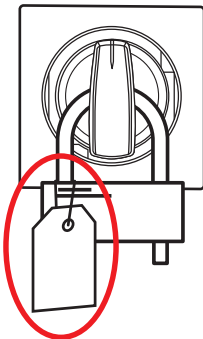
Installation



- 1 Remove power to the System by turning each operation handle of the main circuit breaker to the [OFF] Position. Then lockout each circuit breaker as shown below.

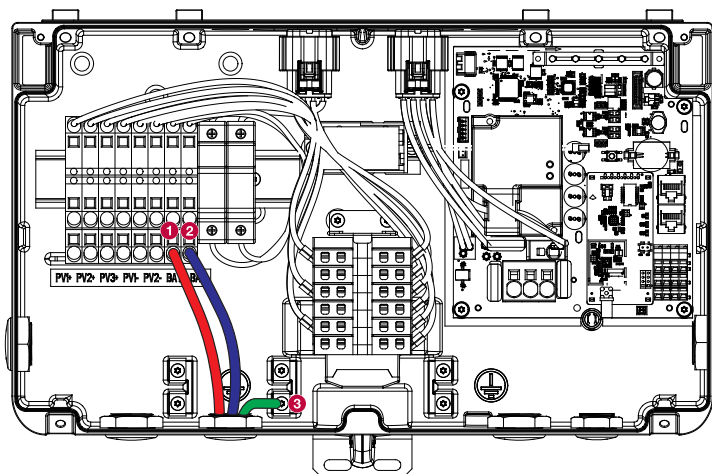


- 2 Attach a padlock. After attaching the lock, attempt to turn the circuit breaker to the ON position. The lock should prevent the circuit breaker from being turned on.



- 3 Attach a tag to the locking plate. The tag should contain the following information:
  - WHO locked the circuit breaker out
  - WHY the circuit breaker is locked out
  - WHEN the circuit breaker was locked out
  - The contact information of who locked out the circuit breaker.

## Battery wire connections



< Wiring box of inverters >

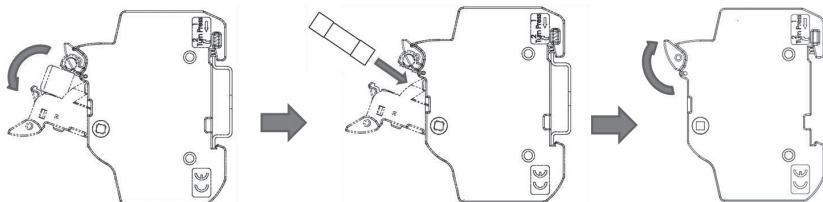
- 1 Battery Positive Terminals
- 2 Battery Negative Terminals
- 3 Grounding

- 1 Verify that the exposed wires are at least 6" (15.24 cm) in length to provide adequate strain relief and wire end strip length required.
- 2 Connect the positive lead to Battery Positive Terminals (1).
- 3 Connect the negative lead to Battery Negative Terminals (2).
- 4 Verify that connections to the DC wiring board assembly are properly wired.

### NOTICE

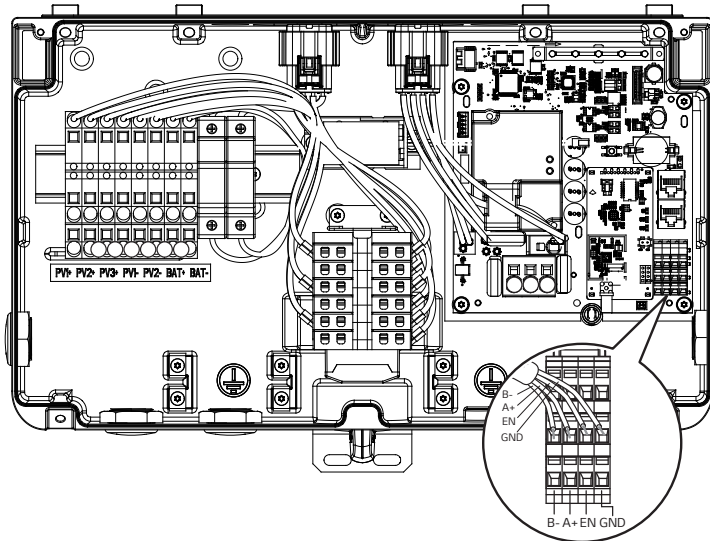
You must ensure that the positive lead connects to the positive Terminal, and the negative lead connects to the negative Terminal.

You may change the fuse as shown in the following picture. The recommended fuse type is : **Littelfuse KLKD 600 V, 30 A.**



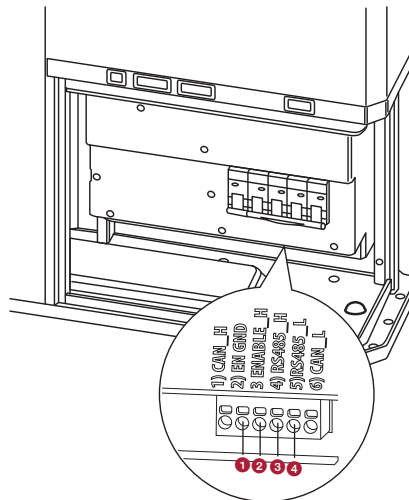
< Changing fuse >

## Battery communication cable connection



### < Wiring box of inverters >

- 1 Strip four wires of the battery pack communication cable and insert stripped wire-ends to the corresponding wire hole on the plug.
- 2 Match the names in the figure with the connectors on battery pack.

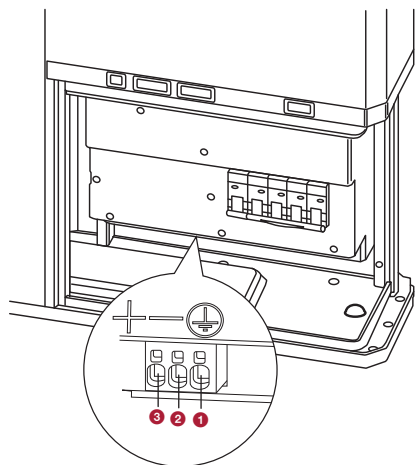


## Battery pack connections

Connection Power / Communication cables, according to the labels marked.

### INFO

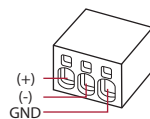
- **Commissioning should be within 180 days of manufacture date. Verify this via the unit serial number.**
- Battery cables are recommended to be 12 – 8 AWG.



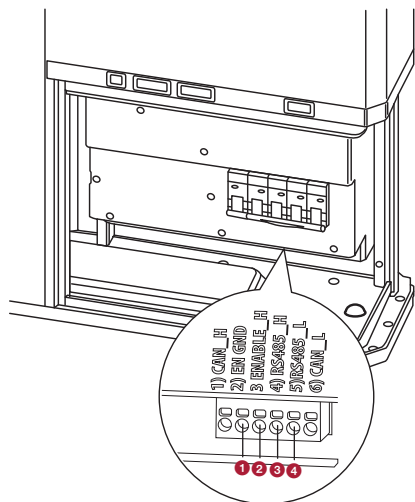
- 1 Connect the power cables to the corresponding terminals.

- 1 Ground terminal
- 2 Negative (-) terminal
- 3 Positive (+) terminal

#### Power terminal block

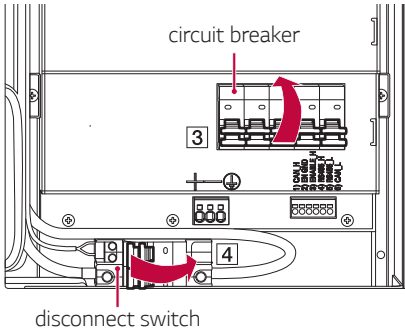


- Max cable length: 10 m (35 ft.)
- Cable Type: 4-10 mm<sup>2</sup> (12 – 8 AWG)
- DC600 V insulated



- 2 Connect the communication cables to the corresponding terminals.

- 1 Ground terminal(GND)
- 2 ENABLE\_High terminal (EN)
- 3 RS485\_High terminal (A+)
- 4 RS485\_Low terminal (B-)

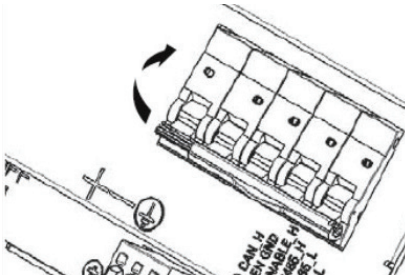


- 3** Connecting the battery pack to the inverter. For the inverter to connect the power cable and communication cable to the inverter. Then, push the disconnect switch up so that it is in the ON position.

### INFO

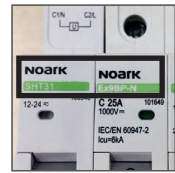
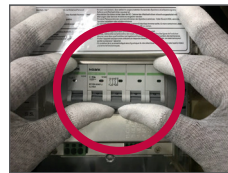
The battery must be turned off during shipping and storage to reduce self-discharge.

- 4** After turning disconnect switch ON, turn on the circuit breaker.



### CAUTION

Please turn the switch on or off by pushing the middle of the bar, where SHT31 and Ex9BP are combined. It is forbidden to push either end side of the bar. Any improper use could damage the product.



### Connect/disconnect the wire to connector sequence

- 1** Make sure the CB switch and the auxiliary switch are in the OFF position. If removing power cables, check for voltage at power cable terminal.
- 2** To remove one of the wires from its terminal, insert a small screwdriver into the rectangular hole above the terminal.
- 3** Apply slight pressure to the screwdriver, and at the same time pull out the wire.

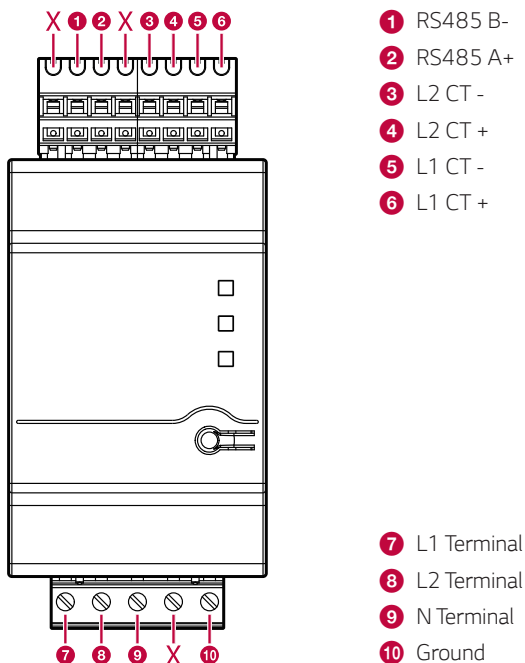
## Energy meter connections

The energy meter connection is required to get information about energy flow. Before connecting the energy meter to this product, install the energy meter. Refer to the installation manual of the energy meter for more information about energy meter installation.

### INFO

AC wire cables are recommended to be 22 – 18 AWG (0.34 – 0.75 mm<sup>2</sup>).

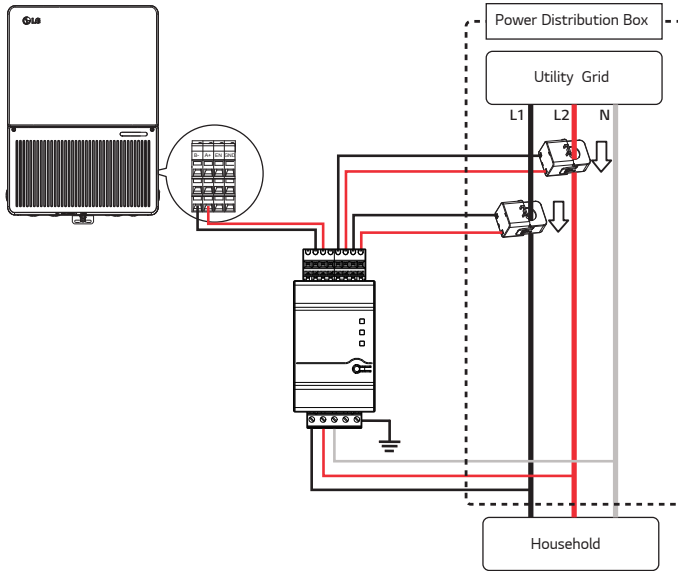
Energy meter communication cables are recommended to be 24 – 18 AWG (0.25 – 0.75 mm<sup>2</sup>).



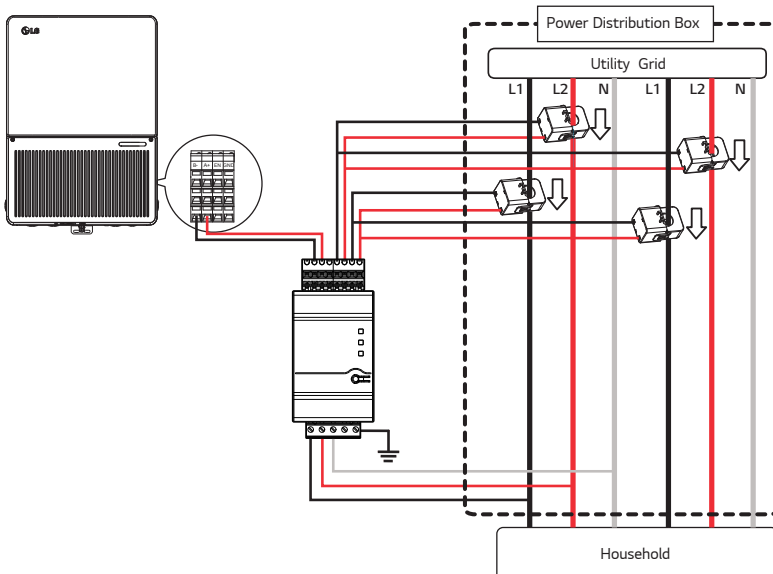
### NOTICE

Clamp the CT connected to L1 CT around the wire connected to ØL1.  
Clamp the CT connected to L2 CT around the wire connected to ØL2.

## Energy meter connection case1



## Energy meter connection case2



\* Additional CT is required. (CT's only offered in one pair.) Please contact the service center before installing.

Power Status LED

LED	LED color	Function	Indication	Troubleshooting
RUN	Green	Flashing ON/OFF (for 1 second)	Working normally	
	Red	ON for > 3 seconds	Internal error	Contact support
	Yellow	Flashing ON/OFF (for 1 second)	No communication	Check that the communication wires are connected correctly.

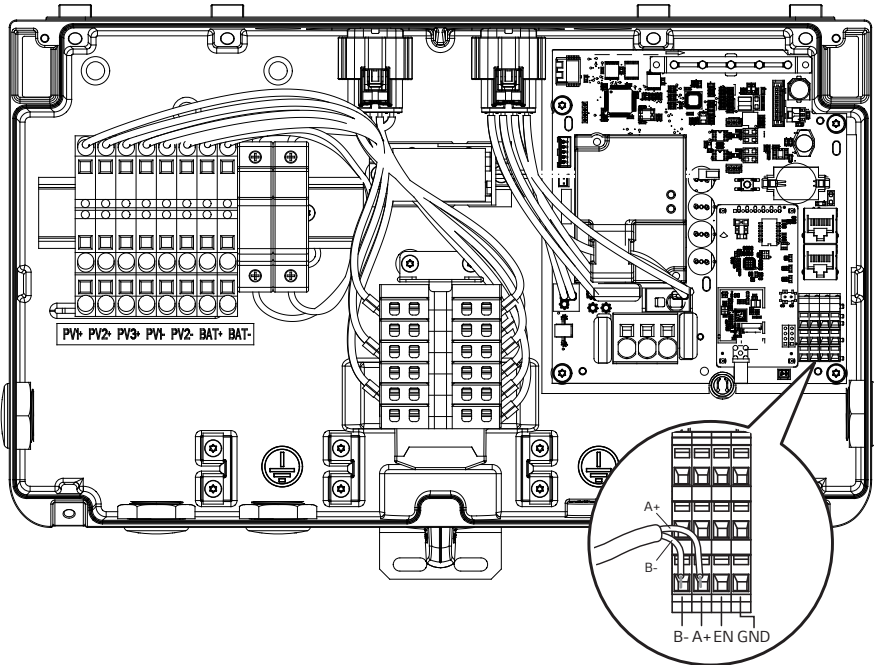
Phase Status LED

LED	LED color	Function	Indication	Troubleshooting
RUN	Green	ON for > 3 seconds	No current	
		Flashing ON/OFF (for 1 second)	Positive power	
	Red	Flashing ON/OFF (for 1 second)	Negative power	Check for reversed CTs, swapped CT wires, or CTs not matched with the lines.
		Flashing with green LED	High voltage > 130 V	Check the line voltages and the meter rating.
		Flashing with yellow LED	Low voltage < 70 V	
	Yellow	Flashing ON/OFF (for 1 second)	Break fault < 70 V	
		ON for > 3 seconds	Frequency is below 45 Hz or above 70 Hz	Check for the presence of high noise.



## Energy meter connections (Inverter Side)

- 1 Strip two wires of the energy meter cable and insert stripped wire-ends to the corresponding wire hole on the plug.
- 2 Match the names in the figure with the connectors on the energy meter.



## Inverter AC output wire connections

### ⚠ WARNING

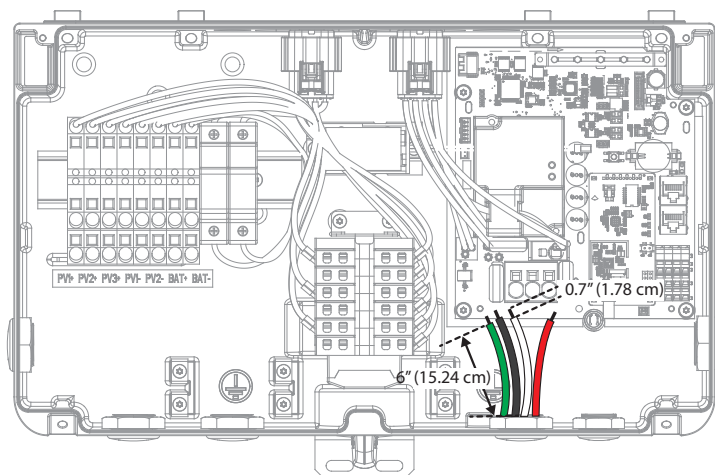
- Read all of the instructions, cautions, and warnings for the LG Electronics ESS Inverter, and associated PV array documentation.
- Installation and commissioning must be performed by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements.
- Ensure no live voltages are present on PV input and AC output circuits, and verify that the DC disconnect, AC disconnect, and dedicated AC branch circuit breaker are in the [OFF] position, before inverter installation.
- Verify that dedicated 2-pole 240 V AC or 208 V AC circuit breaker in the building electrical service panel is turned off.

### ℹ INFO

All terminals accept solid or stranded copper DC: 14 – 8 AWG wire, AC: 14 – 6 AWG wire.

### ℹ INFO

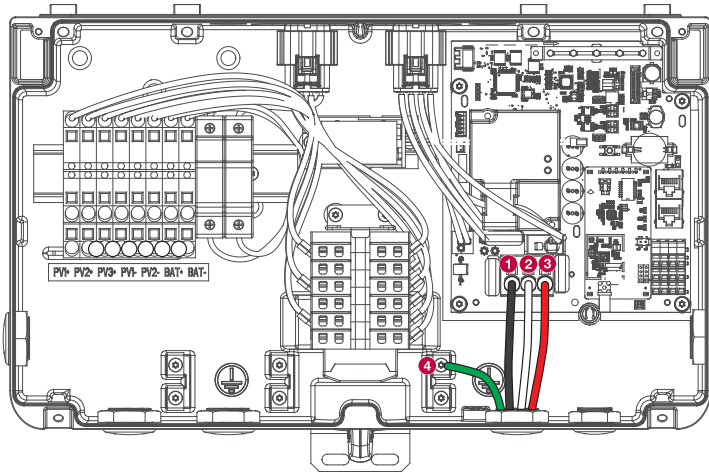
The AC output (neutral) is not bonded to ground in the inverter.



### < Conduit installation and AC wiring routing >

Conduit fittings need to be watertight with either NEMA4, 4X, 6, or 6X rated, and insulated type preferred.

Once conduit and fittings are installed, route wiring through conduit and fitting, allowing a 6" (15.24 cm) strain relief loop within the wiring box compartment.



< Wiring box AC assembly – terminal labeling >

- |                      |                      |
|----------------------|----------------------|
| <b>1</b> L1 Terminal | <b>3</b> L2 Terminal |
| <b>2</b> N Terminal  | <b>4</b> Ground      |

### WARNING

An AC disconnect may be required by your local AHJ. Please check local regulations to determine if an AC disconnect is required for your installation.

### NOTICE

Stranded copper wire should be checked so that all strands go into the terminal opening.

- 1** Mount the AC disconnect (if required by local AHJ) close enough to the inverter.
- 2** Install conduit fitting and conduit into the wiring box compartment from AC disconnect or utility service panel.
- 3** Loosely fit the conduit into the inverter's open conduit fitting and the DC disconnect or wiring box conduit fitting and then thread the inverter's AC output wires through the conduit.
- 4** Route AC wiring through conduit and verify that the exposed wires are at least 6" (15.24 cm) in length to provide adequate strain relief and wire end strip length required. Secure the conduit into both fittings, then tighten conduit fittings to the manufacturer's recommended torque.

5 Terminate inverter's AC output wires inside the AC disconnect or wiring box.

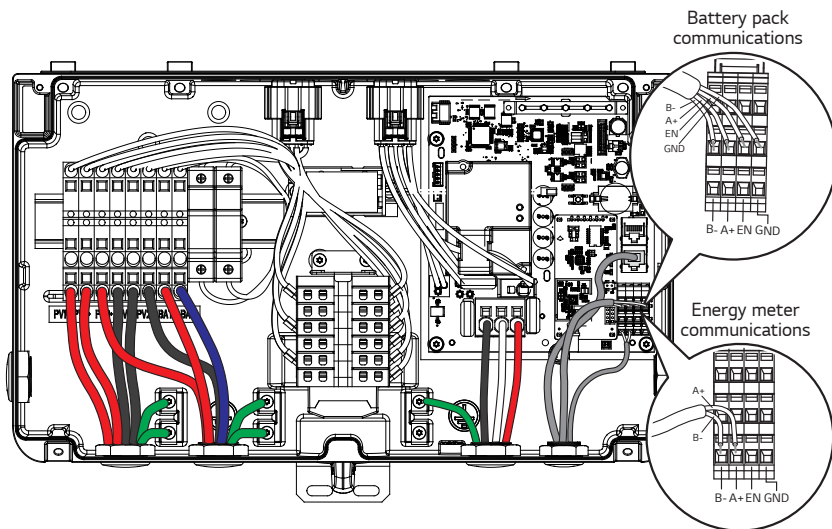
- Connect the Neutral wire to the terminal (2).
- Connect L1 wire to the terminal (1)
- Connect L2 wire to the terminal (3)
- Use a 1/8" (3.5 mm) flat blade screwdriver to tighten the screw terminal to 10.5 in-lbs (1.2 Nm) of torque for all above connections.

## NOTICE

Stranded copper wire should be checked so that all strands go into the terminal opening.

## NOTICE

If the grid type with Neutral connection is selected, please double check whether the Neutral wire is connected reliably. An unsuccessful Neutral wire connection will make the unit fail to feed in power to the grid because of the wrong phase voltage detection.

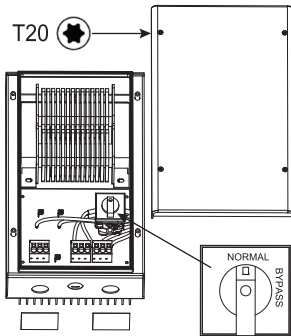


< Wiring box full connection >

## ATS wire connections

### INFO

Before the ATS connection need to install a secondary AC panel for backed-up loads (not supplied by LGE). Rewire the backed-up loads through this panel.

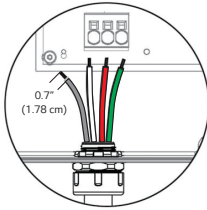


#### 1 Open the cover

- Unscrew the 4 screws on cover with a Torx20 screwdriver and remove the cover.
- Recommended screw torque: 18 in-lbs (2 Nm).

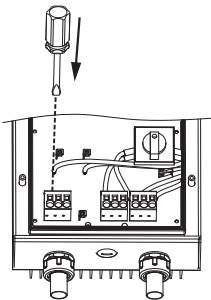
#### 2 Remove the hole tapes for installing conduit.

- AC bypass switch is on [NORMAL] status, do not change status when mounting and wiring.
- 2x 3/4" conduit holes are provided.

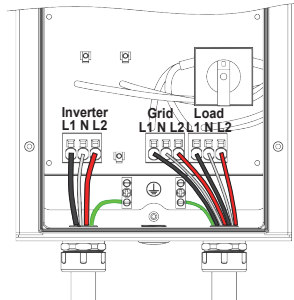


#### 3 AC Wires connection: Install 3/4" (1.78 cm) conduit into the conduit hole.

#### 4 Route AC wires through the conduit and strip the wire end to 3/4" (1.78 cm).

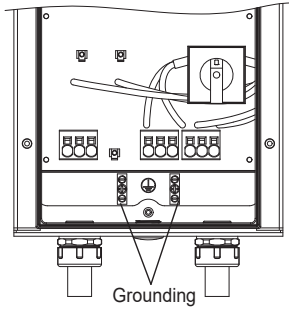


- #### 5 Use a 3/16" (5 mm) flat blade screw driver to push the spring of each terminal and connect the wires (L1, N, L2) to the connectors according to the marks.



### NOTICE

Clearly distinguish between grid and backup load connections. If there are multiple inverters in the installation, each inverter should be connected to a separate backed-up loads panel. Do not share backup output between inverters.



- 6** Connect the wire (GND) to the Grounding terminal.
- 2x Grounding Electrode Conductor is provided, it is a slot head screw type connector. The terminals accept solid or stranded copper 10-4 AWG wire, recommended screw torque is 26 in-lbs (2.9 Nm).

### NOTICE

- Verify the connection firmly again. The compatible wiring gauge is 10 – 4 AWG. It should have a capacity based on NEC 2017 article 690.8, and the use of 194 °F (90 °C) copper wire is recommended.
- Refer to the manual included in the ATS Box for more detailed information on wire connections.

## Inverter communication connections

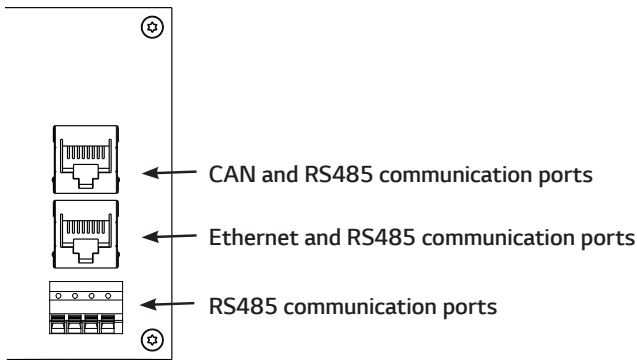


### WARNING

Read all of these instructions, cautions, and warnings for the LG Electronics ESS inverter and associated ESS equipment (PV panel, RSD, Battery pack, ATS, Energy meter, etc.) documentation.

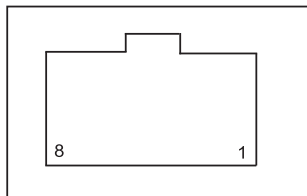
### Interface connection communication

The LG Electronics ESS inverters offer an EIA RS485 communication interface that can address up to 31 daisy chained inverters. In this case, RS485 port 1 and port 2 can only use the pin 7 and pin 8, that is RS485 TX and RS485 RX.



< communication ports >

#### Connector pin assignment

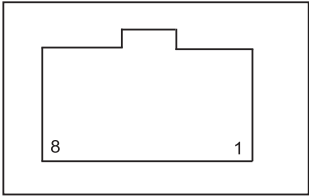


Top View

Pin	
1	CAN_H
2	CAN_L
3	Not used
4	GND selv
5	+12v selv
6	B- (RS485)
7	A+ (RS485)
8	B- (RS485)

< CAN and 485 communication ports >

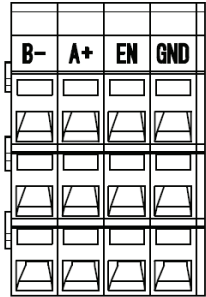
Connector pin assignment



Pin	
1	ETH_TD+
2	ETH_TD-
3	ETH_RD+
4	RS485 TX
5	RS485 RX
6	ETH_RD-
7	A+(RS485)
8	B-(RS485)

Top View

< Ethernet and 485 communication ports >



< RS485 communication ports (Energy meter and Battery) >

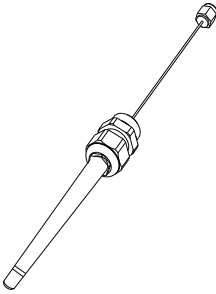


## Wi-Fi antenna connection

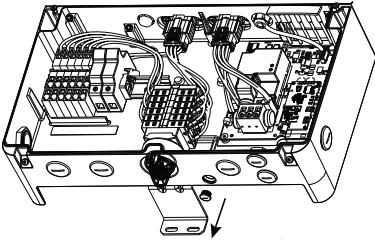
2

Installation

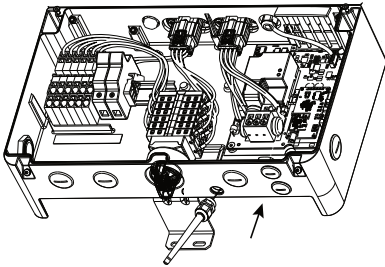
- 1 Take out the antenna. Make sure the sealant is installed well.



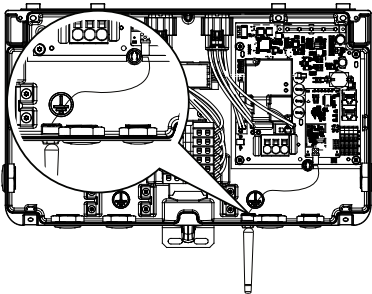
- 2 Take the cover off with tools.



- 3 Insert the antenna into the same hole and tighten with nut inside.



- 4 Connect the antenna with module.



## Connecting to a mobile device

### Installing 'LG EnerVu2 Professionals' App

Install 'LG EnerVu2 Professionals' App on your mobile device.

Download 'LG EnerVu2 Pro' from the Apple App Store or Google Play Store.

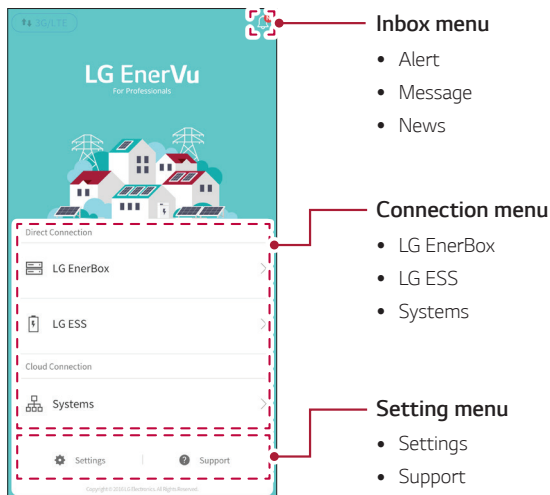


#### NOTICE

- Depending on the device, 'LG EnerVu2 Professionals' App may not work.
- LG EnerVu2 Professionals App will be available in the version of the software as follows;
  - Android O/S : Lollipop (5.0) or higher
  - iOS O/S : iPhone 6 (9.0) or higher

### About the main screen

The main screen displays system and cloud connection in the connections menu area. You can check the settings and information in the setting menu areas.

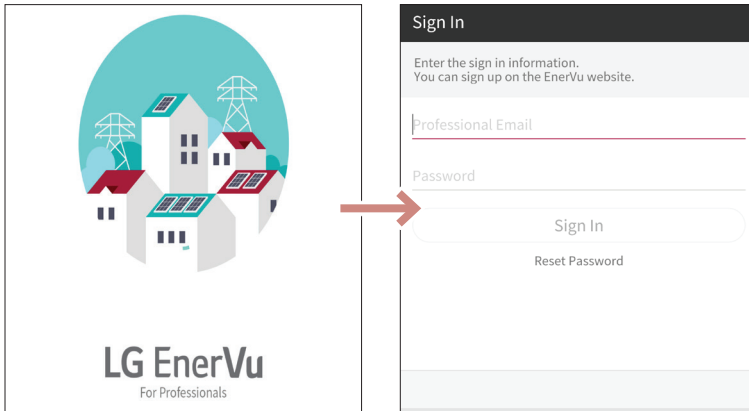


## Connect via Bluetooth

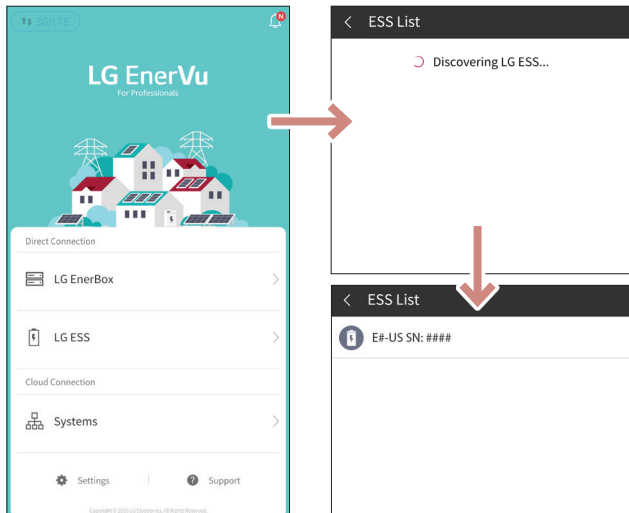
### Preparation

- To connect the mobile device with the system via bluetooth, the mobile device must support Bluetooth 4.0 or higher.
- Check the last 4 digits of the serial number and date code on the right side of the ESS unit.
- The system owner must create a LG ESS account before accessing the system.  
Visit EnerVu2 page at <http://enervu.lg-solar.com> and sign up to create an account.

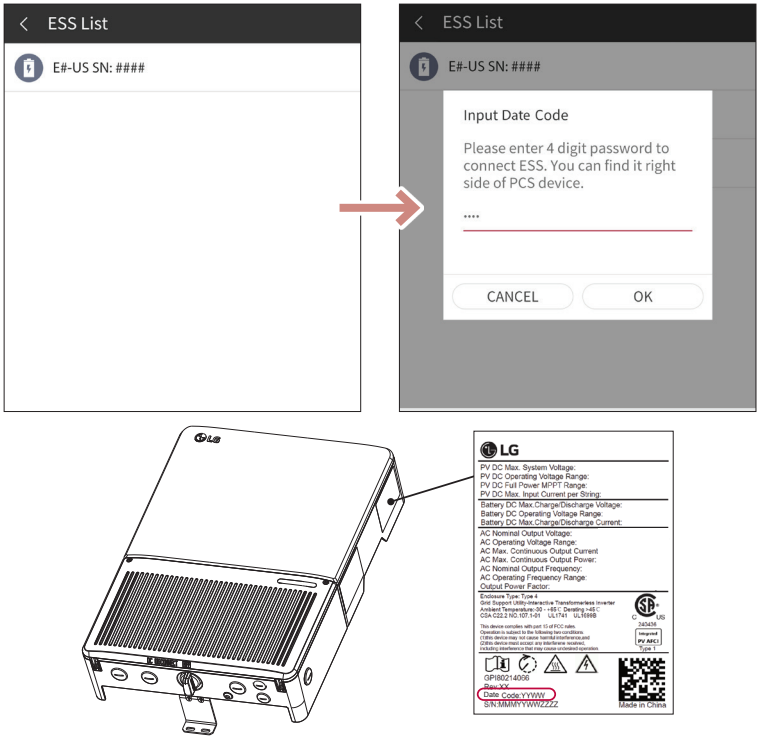
- 1 Run 'LG EnerVu2 Professionals' App on your mobile device.



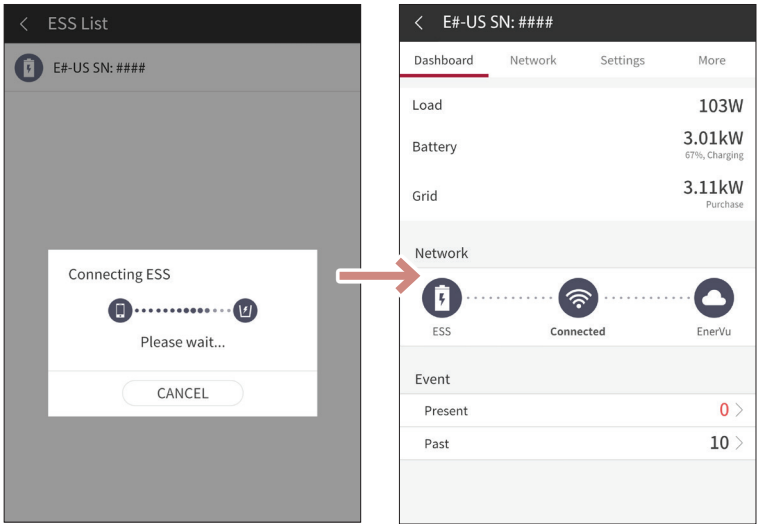
- 2 Sign in on to the App with the account you have created.  
If you have signed up before, please go to the next step.
- 3 Tap [LG ESS] button on the main screen. The installed ESS is searched:



- 4 Input the date code and select [OK] to connect to the system.  
The date code is a 4-digit number and is printed on the right side of the PCS.

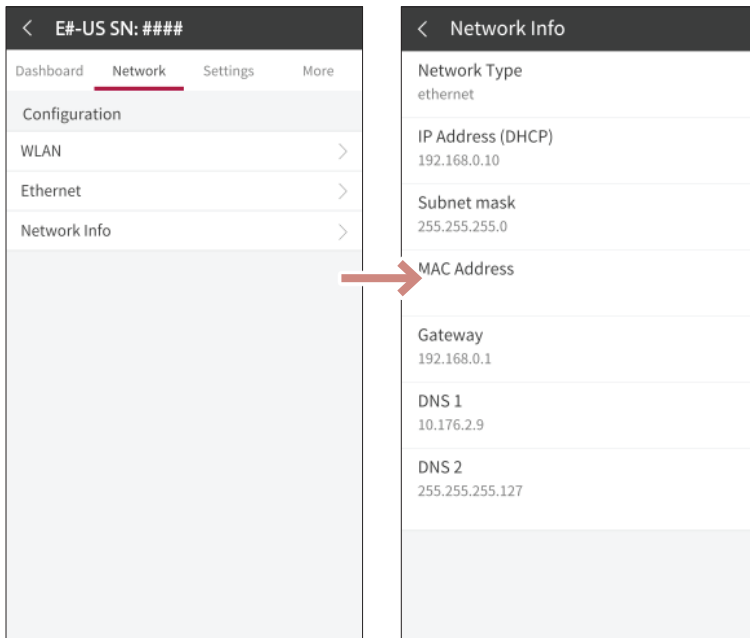


- 5 When the connection is successful, the event screen appears as shown in the figure.

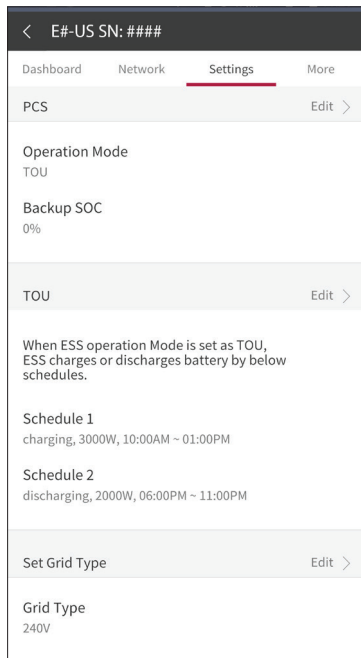


## Network Configuration

- This unit supports wired connection via Ethernet and wireless connection via WLAN for Enervu cloud connection.
- Wireless connection and wired connection can be selected at the same time. The wired connection is connected first.
- This unit does not support a static IP setting.
- If you are using a wired connection, you can use the wired Ethernet connection to your home network without any setup.
- You can check whether the internet connection is normal through the [Network] -> [Network Info] menu.



## ESS system settings



- The following items can be set in the Settings tab:

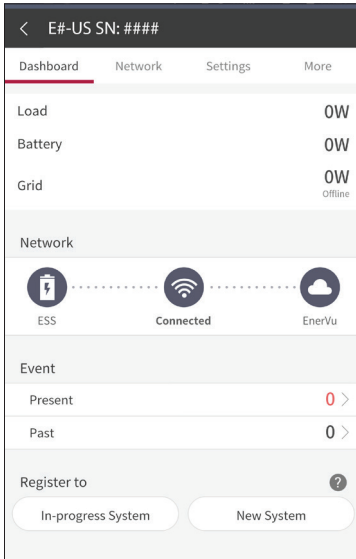
- Operation Mode
- Backup SOC
- TOU setting  
If the Operation Mode is TOU, it is operated by this setting. (Charging and Discharging schedule can be set one by one.)
- Grid Type  
240 V AC and 208 V AC grid are supported
- Grid Profile  
You can make detailed settings related to Rule21.

### CAUTION

The grid profile must be set correctly. LG Electronics does not accept liability for a missing or incorrect grid profile.

If you are not sure which grid profile data set is valid for your grid or purpose, contact your grid operator for information on which grid profile data set is to be configured.

## Registering the PCS (Mobile App)



1 Tap [New System] button on the event screen.

The screenshot shows the 'New System' registration form. The title bar includes a back arrow, 'New System', and a 'Save' button. Below the title bar, there is a prompt: 'Enter the required fields\* for system creation.' The form is divided into sections: 'System Info' and 'System Name\*'. The 'System Info' section includes fields for 'System Name', 'Address\*' (with a sub-field for 'Country' set to 'United States'), 'Address 1', 'Address 2 (Optional)', 'City', 'State / Prov.' (set to 'Alabama'), and 'Zip Code'. Each field has a corresponding input line and a right-pointing arrow indicating further options or validation.

2 Fill in the System & Home owner information.  
If you click the 'Save' button, an invitation e-mail or completion notice of registration will be sent to the homeowner's email typed in Owner Info, and the system will be created.

# Commissioning the PV system

## WARNING

Read all of these instructions, cautions, and warnings for the LG Electronics ESS inverter and associated PV array documentation.

## WARNING

Installation and commissioning must be performed by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements.

## WARNING

Verify that the dedicated 2-pole 240 V AC or 208 V AC circuit breaker in the building electrical service panelboard is turned off.

## NOTICE

Disconnect in the [OFF] position, and the PV input polarity once more simply by carefully using a 600 V DC rated digital volt meter and probing the positive (+) and negative (-) PV array connections.






## LED Indication

There are five LEDs in the front side of the inverter.



< LED Logo >

### LED Status

Label	Designation:	Color
	Operation(OPER)	Green
	Battery(BAT)	Red / Green / Yellow
	Wireless Communication (COMM)	Red / Green / Yellow
	Information (INFO)	Red / Green / Yellow
	Fault (FAULT)	Red



The LEDs indicate the operational status of the inverter

Message Category	LED Signals				Message Explanation	Example
	LED	Color	Status	Behavior		
OPER LED						
Normal operation	OPER	Green	<ON>	constantly on	The inverter feeds into the grid.	
Sync.	OPER	Green	<BLINK> or <ON>	Four LEDs form a progress bar.	The inverter is synchronizing with grid.	<b>LED signals:</b> OPER LED is ON, BAT LED is ON. COMM LED Blinks <b>Message:</b> Synchronization progress is 50%-75%.
	BAT	Green	<BLINK> or <ON>			
	COMM	Green	<BLINK> or <ON>			
	INFO	Green	<BLINK> or <ON>			
Night mode	OPER	Green	<BLINK>	1 s on, 4s off	Inverter is not producing or absorbing power (absolute power is smaller than 20W).	
BAT LED						
Battery fault	BAT	Red	<ON>	constantly on	Battery is in fault mode.	
Battery comm. fail	BAT	Yellow	<ON>	constantly on	Battery communication timeout	
Battery standby	BAT	Yellow	<BLINK>	1s on, 1s off	Battery is in standby mode	
Battery low power	BAT	Green	<BLINK>	1s on, 4s off	Absolute battery power is lower than 50W	
Battery normal	BAT	Green	<ON>	constantly on	Battery is in normal operation.	
COMM LED						
BLE fail	COMM	Red	<ON>	constantly on	BLE is in fault mode	
APP Connected	COMM	Green	<ON>	constantly on	APP is connected	
BLE is running	COMM	Green	<BLINK>	0.2s on, 0.2s off	BLE is running, only BLINK for about 5 cycles in one minute	
XBee connected	COMM	Green / Yellow	<ON>	2s Green on, 2s Yellow on	XBee is connected to Router	
XBee running	COMM	Green	<BLINK>	1s on, 1s off	XBee is running, searching for network (XBee and Gateway can't be installed at the same time)	
Gateway running	COMM	Green	<BLINK>	1s on, 1s off	Gateway is communicating with PCS (XBee and Gateway can't be installed at the same time)	

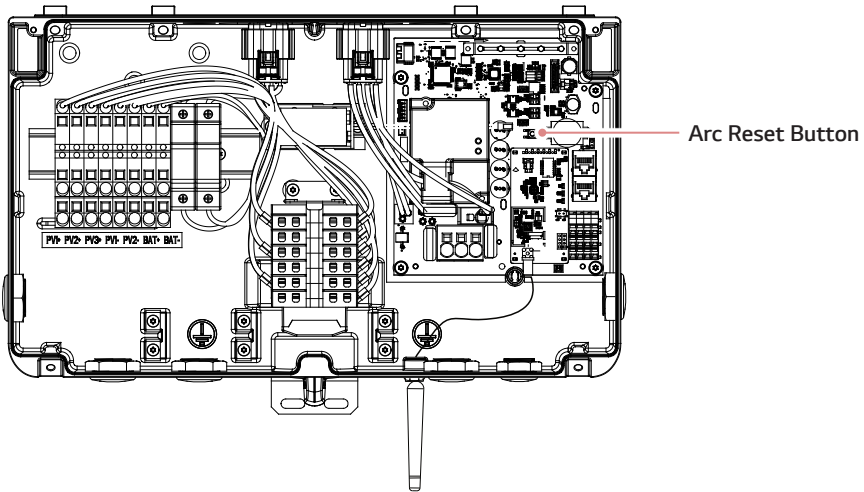
Message Category	LED Signals				Message Explanation	Example
	LED	Color	Status	Behavior		
INFO LED						
Firmware upgrade	INFO	Yellow	<BLINK>	1 s on, 1 s off	Firmware upgrading is ongoing	
Reset button is pressed	INFO	Green	<BLINK>	Varied behavior	<p>When reset button is pressed for different time duration, the blinking behavior is different, and after releasing the button, different actions will be executed.</p> <p>[1] Press time duration: &lt; 2.5 s Blink behavior: constantly on Action: No action</p> <p>[2] Press time duration: 2.5 - 9.5 s Blink behavior: 0.2 s on, 0.2 s off Action: Clear ARC fault</p> <p>[3] Press time duration: 9.5 - 16.5 s Blink behavior: 0.4 s on, 0.4 s off Action: Gateway reset</p> <p>[4] Press time duration: &gt; 16.5 s Blink behavior: 1 s on, 1 s off Action: Delta reserved</p> <p>Notes:</p> <ul style="list-style-type: none"><li>Action will not be executed 3 s later after the button is released. If the button is pressed again within 3 s, the former action will be cancelled and start triggering of new expected action.</li><li>LED indication behavior will be ended after 5 s later after the button is released.</li></ul>	<p><b>LED signals:</b> INFO LED is blinking with Green, and 0.2 s on and 0.2 s off</p> <p><b>Message:</b> Reset button is clicked for more than 2.5 s and less than 9.5 s, and if release the button, ARC fault clear action will be executed</p>
Receiving image	INFO	Green	<BLINK>	1 s on, 1 s off	Inverter is receiving image file	
Equipment alarm	INFO	Yellow	<ON>	constantly on	External event occurs and inverter is unable to run	
FAULT LED						
Arc fault	FAULT	Red	<ON>	constantly on	Arc fault occurs	
Ground fault	FAULT	Red	<BLINK>	1 s on, 1 s off	Ground fault occurs	
Others						
Initialization	OPER	Green	<ON>	On until done	Inverter initialization after powering on AC	
	BAT	Green	<ON>	On until done		
	COMM	Green	<ON>	On until done		
	INFO	Green	<ON>	On until done		

## Button

### Arc reset

There is a button located inside the wiring box. For this button, there are the following functions.

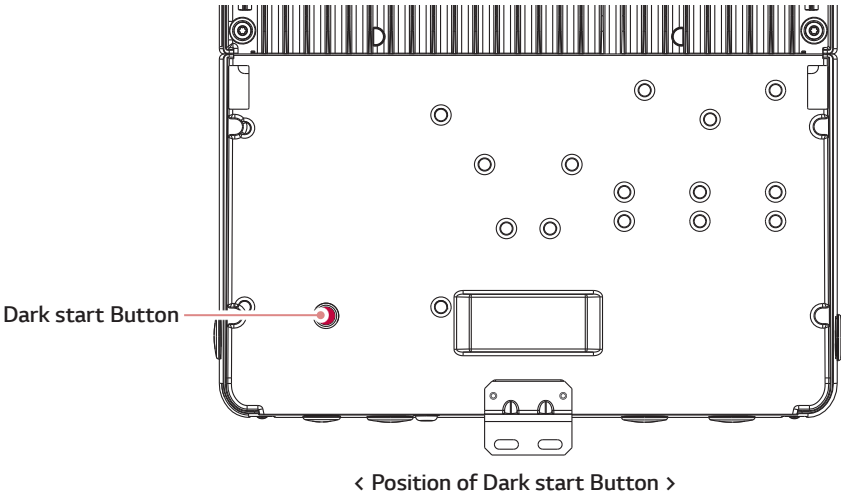
Button	Application	Trigger condition
Arc reset	Clear arc fault.	Press the button for 3-5 seconds.
Arc self-test	If there is no arc fault, run arc self-test	Press the button for 3-5 seconds.
Gateway reset	Gateway reset to factory status	Press the button for more than 10 seconds.



< Position of Arc Reset Button >

Dark start

Button	Application	Trigger condition
Dark start	During grid outage, when the whole system shutdowns for some reason, and can't recover by itself. Press this button to wake up battery or the whole system.	Press the button for more than 5 seconds.



Inverter turn-on procedure

- 1 Turn on the dedicated 2-pole 240 V AC or 208 V AC circuit breaker in the building electrical service panel (put in closed position). If there is AC disconnect, turn on the AC disconnect.
- 2 Check for inverter initialization (four LED indicators are illuminated with Green).
- 3 Turn on the Battery disconnect switch and circuit breaker.
- 4 Turn on the DC(PV) disconnect switch(turn to "ON" position).
- 5 Refer to installation section for setup process that needs to be completed before the inverter can begin feeding power to the grid.

Inverter turn-off procedure

- 1 Turn off the DC(PV) disconnect (turn to "OFF" position).
- 2 Turn off the Battery circuit breaker and disconnect switch.
- 3 If there is AC disconnect, turn off the AC disconnect.
- 4 Turn off the dedicated 2-pole 240 Vac or 208 Vac circuit breaker in the building electrical service panel (put in open position).

# Maintenance

## Production information

### NOTICE

All production information is provided for orientation purposes only. The measuring devices and meters provided by the electricity supply company are the authoritative source of information for invoicing.

## Repair

### DANGER



**Danger of death from hazardous voltage.** Hazardous voltage is applied to the inverter during operation. Hazardous voltage is still present 5 minutes after all power sources have been disconnected.

- Never open the inverter. The inverter contains no components that are to be maintained or repaired by the operator or installer. Opening the cover will void the warranty.

### NOTICE

The inverter contains no components that are to be maintained by the operator or installer.

## Decommissioning

### DANGER



**Danger of death or severe injuries from dangerous voltage**

- Disconnect the inverter from the grid before removing or inserting the AC connections.

### DANGER



**Danger of death or severe injuries from dangerous voltage.** Dangerous voltages can be present at the DC connections of the inverter.

- Never disconnect the PV modules when the inverter is under load. First switch off the grid connection so that the inverter cannot feed energy into the grid. Then open the DC disconnecter.
- Secure the DC connections against being touched.

**WARNING**

**Danger of injury due to heavy weight.** The inverter is heavy. Incorrect handling can lead to injuries.

- The inverter must be lifted and carried by two people.

- 1 Switch off the AC cable to be free of voltage.
- 2 Open the DC disconnecter.
- 3 Remove all cables from the inverter.
- 4 Unscrew the inverter from the wall bracket.
- 5 Lift the inverter from the wall bracket.

## Inspecting regularly

It is recommended to check the operating status and connection status once a year. Inspection should be done by a technician or authorized professionals. Contact authorized dealer or where you purchased the LG Electronics ESS.

## Disposing of the product

When the product reaches to the end of its service life or a defect in the product is beyond repair, dispose of the product according to the disposal regulations for electronic waste in your area. Disposal of the product must be carried out by qualified personnel only. Contact the authorized dealer where you purchased the LG Electronics ESS.

## Contact

If you have technical problems or questions, contact the installation company or LGE.

1. Installation Company

Address :

Tel :

2. LGE

LG Electronics Inc,

201 James Record RD, Huntsville, AL 35824

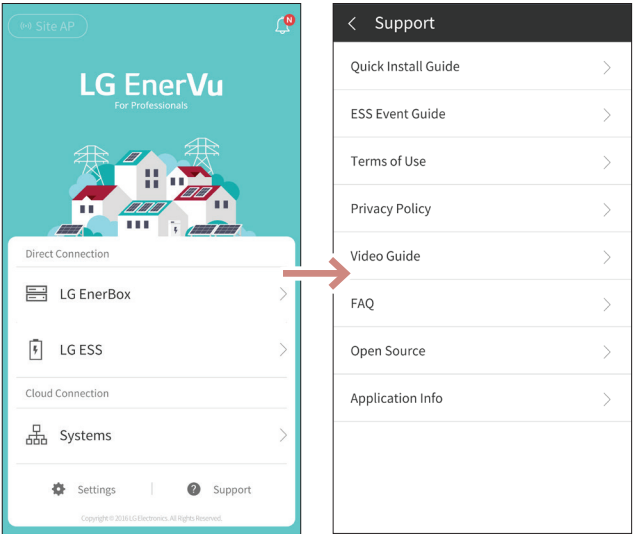
888-865-3026 (Option 4 – Solar/ESS)

[ESSSVC@lge.com](mailto:ESSSVC@lge.com)

# Troubleshooting

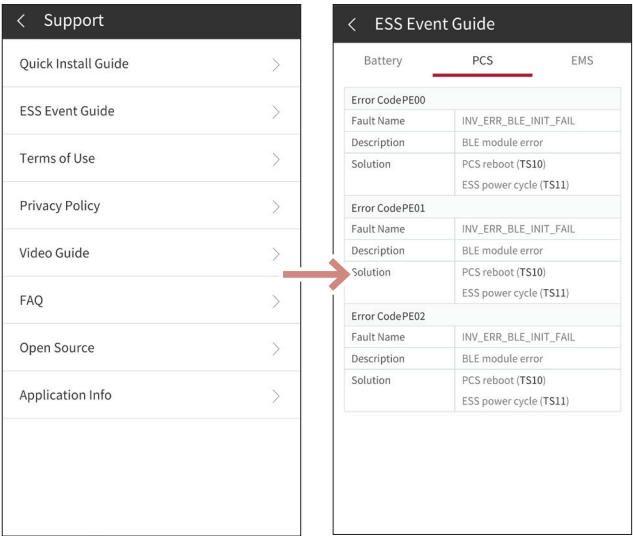
Event messages and troubleshooting can be easily found in the mobile app.

1 Tap [Support] button on the main screen. The event screen appears as shown in the figure.



2 Tap [ESS Event Guide] button on the support screen. The ESS event guide screen appears as shown in the figure.

Event messages are divided into three categories: Battery, PCS, EMS.



3 There is more information on troubleshooting by selecting the TS number on the Solutions tab.

< ESS Event Guide

Battery PCS EMS

Error CodePE00	
Fault Name	INV_ERR_BLE_INIT_FAIL
Description	BLE module error
Solution	PCS reboot (TS10) ESS power cycle (TS11)
Error CodePE01	
Fault Name	INV_ERR_BLE_INIT_FAIL
Description	BLE module error
Solution	PCS reboot (TS10) ESS power cycle (TS11)
Error CodePE02	
Fault Name	INV_ERR_BLE_INIT_FAIL
Description	BLE module error
Solution	PCS reboot (TS10) ESS power cycle (TS11)

< TS11

Description

Turn off DC switch, battery breaker and AC breaker, wait until all LEDs on PCS are off. Then turn on these switch or breaker again.

Operation Sequence

1. Turn off DC switch of PCS
2. Turn off CB of each battery
3. Turn off Grid or turn off AC breaker
4. Wait for 1 minute. During the process, you can see all LEDs on PCS are off.
5. Turn off Control Switch(black) of each battery (to restart BMS)
6. Wait for 5 seconds
7. Turn on Control Switch(black) of each battery
8. Turn on Grid or turn on AC breaker
9. Turn on CB of each battery
10. Turn on DC switch of PCS



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mbed TLS 2.4.0	Apache-2.0	Copyright (c) 2006-2016, ARM Limited
sds 2.0.0	BSD-2-Clause-NetBSD	Copyright (c) 2006-2014, Salvatore Sanfilippo <antirez at gmail dot com>

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- MIT : <http://opensource.lge.com/license/MIT.html>

# Specifications

## PV input

	LG AC 5kW	LG DC 7.6kW
Model Name	A005KEEN261	D007KEEN261
Absolute Maximum Input Voltage		450 V DC
Start-up Voltage		120 V DC
Operational DC Voltage Range		50 – 450 V DC
Full Power MPPT Range		270 – 450 V DC
Maximum Current per MPPT		12 A DC
MPP Tracker		3
Maximum Allowable MPPT In-Parallel	N/A	2(String)
MPPT Scan (Shading Option)		15min (high) / ~ 30min (default) / ~ 60min (low) Full range scan take less than 5s
MPPT Efficiency		>99.6% (Static), >99.3% (Dynamic)
DC Disconnect		Integrated
Input Terminal		Spring Type

## Battery Input / Output

	LG AC 5kW	LG DC 7.6kW
Compatible Battery Pack Size	9.8 to 19.6 kWh @77°F(25°C ) Max. 2 in parallel	
Rated I/O Power	5000 W	5000 W
Peak I/O Power(10 sec)	6000 W	7000 W
Acceptable Input Voltage Range	Charge/Discharge : 400 – 450 V DC / 350 – 430 V DC	
Rated I/O Current	Max. Charge/Discharge Current : 11.9 A@420 V / 14.3 A@350 V	
Peak I/O Current (10 sec)	18.9 A@370 V	
Cycle Efficiency Charging to Discharging (PCS Only)	Peak > 95 %	
DC Disconnect	Internal	
Fuse Rating	Fuse Rating 30 A	
Battery Terminal	Spring Type	

AC Output (On-Grid Mode)

	LG AC 5kW	LG DC 7.6kW
Maximum Output Power	5000 W	8000 W
Grid Voltage Range	a) 240 V AC +10%/-12%, (L-L) b) 208 V AC +10%/-12%, (L-L)	
Maximum AC Current	24 A AC	32 A AC
Frequency Range	59.3 – 60.5 Hz	
Power Factor	Cos phi = 0.85c – 0.85i Adjustable	
Harmonics Distortion	THD < 3%	
Grid support compliance	UL 1741 SA, CA Rule 21, HECO	
Revenue Grade Meter *	Optional	Built-in RGM
Output Terminal	Spring Type	

\* Complies with ANSI C12.20

AC Output (Off-Grid Mode)

	LG AC 5kW	LG DC 7.6kW
Output	Pure Sine-wave Voltage	
Maximum Output Power	5000 W	
Peak Output Power (10 sec)	6000 W	
AC Output Voltage Range	240 V AC	
Maximum AC current	21 A	
Peak AC Current (10 sec)	25 A	
Frequency Range	59.3 – 60.5 Hz	
Voltage Harmonics Distortion @ 100% resistor load	THD < 5%	
Maximum allowed Crest Factor	2.5 @5000W	

General PV to AC

	LG AC 5kW	LG DC 7.6kW
Isolation Level	Transformer-less	
Type of Converter	DC/AC	
CEC Efficiency	N/A	97.50%
Operating Temperature	-22 °F – 149 °F/ -30 °C – 65 °C	
De-rating Start Temp.	Higher than 113 °F (45 °C)	
Humidity	0 – 95%	
Maximum Operating Altitude	3000m above sea level De-rating above 2000m	
Audible Noise	< 40 dBA @ 1m	
MTBF	>500k hrs Calculated Acc. MIL Handbook	

Mechanical Design

	LG AC 5kW	LG DC 7.6kW
Dimensions (W*L*H)	425 X 590 X 150 [mm]	
Weight	21 kg/46.3 lb	
Cooling	Natural Convection	
Enclosure Material	Aluminum Alloy	
Installation Type	Wall Mount, Horizontal support Indoor and Outdoor	
Enclosure Protection	NEMA Type 4	
Warranty	10 years	

Interface

	LG AC 5kW	LG DC 7.6kW
Indicator	5 LEDs	
Protocol	Modbus (SunSpec)	
Ethernet (optional)	Standard (IPv4, IPv6 Supported)	
Human Machine Interface (HMI)	BLE (Support 4.0 or higher) Settings can be done through APP from Mobile phone	
Remote Diagnose/Monitoring	Bi-direction Through Cloud	
Remote Firmware Update	Through Cloud (Optional)	
Rapid Shutdown System	Integrated	

Accessory

	LG AC 5kW	LG DC 7.6kW
Rapid Shutdown Box	-	Offered by LG Electronics
Energy Meter	Offered by LG Electronics	
Auto-Transfer Switch	Offered by LG Electronics	

Standards

Safety Mark	CSA
General Safety	UL1741, CSA 22.2 No. 107-01
Software Safety	UL1998
Grid	IEEE1547, IEEE1547.1
EMC	FCC part 15 Class B
AFCI	UL1699B (Type 1)
Integrated meter	ANSI C12.20 (meets 0.5% accuracy)
Grid support regulation	California Rule 21, HECO Compliant

Wireless module Specifications

FCC ID (Wifi)	2AMVP-VCB5001LNW
Frequency Range	2412 MHz - 2462 MHz
Output Power (Max)	IEEE 802.11b: 18.56 dBm
	IEEE 802.11g: 22.97 dBm
	IEEE 802.11n: 22.68 dBm
FCC ID (Bluetooth)	S9NSPBTLERF
Frequency Range	2402 MHz - 2480 MHz
Output Power (Max)	4.20 dBm

# FCC compliance information

## [USA]

### FCC Notice

The following notice covers the transmitter module contained in this product.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1) this device may not cause harmful interference; and
- 2) this device must accept any interference received, including interference that may cause undesired operation of the device.

Any changes or modifications in construction of this device which are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### FCC RF Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Supplier's Declaration of Conformity	
Trade Name	LG
Responsible Party	LG Electronics USA, Inc.
Address	1000 Sylvan Ave Englewood Cliffs, NJ 07632
Telephone	(201)266-2215

[CANADA]

Industry Canada Statement (For transmitter module contained in this product)

This device complies with Industry Canada's applicable licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

IC Radiation Exposure Statement

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm (7.8 inches) between the antenna and your body.

NOTE: THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY RADIO OR TV INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS TO THIS EQUIPMENT. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

WARNING

[For product having the wireless function using 5 GHz frequency bands]

- (i) the device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
- (ii) for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;
- (iii) for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits specified for point-to-point and non-point-to-point operation as appropriate; and
- (iv) the worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in Section 6.2.2(3) shall be clearly indicated.(devices operating in the band 5250-5350 MHz with a maximum e.i.r.p. greater than 200 mW)

- (v) High-power radars are allocated as primary users (i.e. priority users) of the bands 5250–5350 MHz and 5650–5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.

### Avis d'Industrie Canada (pour le module de transmission compris dans le produit)

Cet appareil est conforme aux normes CNR d'Industrie Canada applicables aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes :

- 1) Cet appareil ne doit pas provoquer d'interférences, et
- 2) Cet appareil doit accepter toutes les interférences, y compris celles pouvant entraîner son dysfonctionnement.

### Énoncé d'IC concernant l'exposition à la radiation

Cet appareil est conforme aux limites d'exposition aux rayonnements d'Industrie Canada pour un environnement non contrôlé. Cet appareil doit être installé et utilisé de façon à garder une distance minimale de 20 cm (7,8 pouces) entre la source de rayonnement et votre corps.

REMARQUE : LE FABRICANT N'EST PAS RESPONSABLE DES INTERFÉRENCES RADIOÉLECTRIQUES CAUSÉES PAR DES MODIFICATIONS NON AUTORISÉES APPORTÉES À CET APPAREIL. DE TELLES MODIFICATIONS POURRAIENT ANNULER L'AUTORISATION ACCORDÉE À L'UTILISATEUR DE FAIRE FONCTIONNER L'APPAREIL.

### AVERTISSEMENTS

[Pour un produit doté de la fonction sans fil utilisant la bande de fréquences 5 GHz]

- i) les dispositifs fonctionnant dans la bande de 5 150 à 5 250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;
- ii) pour les dispositifs munis d'antennes amovibles, le gain maximal d'antenne permis pour les dispositifs utilisant les bandes de 5 250 à 5 350 MHz et de 5 470 à 5 725 MHz doit être conforme à la limite de la p.i.re;
- iii) pour les dispositifs munis d'antennes amovibles, le gain maximal d'antenne permis (pour les dispositifs utilisant la bande de 5 725 à 5 850 MHz) doit être conforme à la limite de la p.i.re. spécifiée pour l'exploitation point à point et l'exploitation non point à point, selon le cas;
- iv) les pires angles d'inclinaison nécessaires pour rester conforme à l'exigence de la p.i.re. applicable au masque d'élévation, et énoncée à la section 6.2.2 3), doivent être clairement indiqués. (les dispositifs fonctionnant dans la bande de 5 250 à 5 350 MHz et dont la p.i.re. maximale dépasse 200 mW)
- v) les utilisateurs de radars de haute puissance sont désignés utilisateurs principaux (c.-à-d., qu'ils ont la priorité) des bandes de 5 250 à 5 350 MHz et de 5 650 à 5 850 MHz et, d'autre part, que ces radars pourraient causer du brouillage et/ou des dommages aux dispositifs de RL-EL.



# Glossary

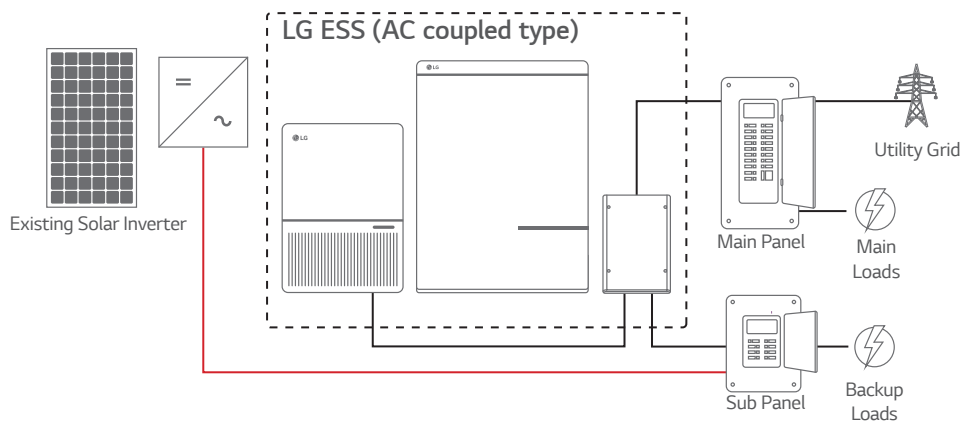
	Explanation
AC	Abbreviation for "Alternating Current."
AFCI	Abbreviation for "Arc-Fault Circuit Interrupters."
AHJ	Abbreviation for "Authority Having Jurisdiction."
Anti-islanding protection	This is a unit for grid monitoring with assigned switching elements (anti-islanding protection) and is an automatic isolation point for small power generation systems (to 30 kWp).
Basic Insulation	Insulation to provide basic protection against electric shock.
CEC	Abbreviation for the California Energy Commission
CEC Efficiency	CEC Efficiency is the California Energy Commission Efficiency rating, a performance rating for modules and inverters based on the real environment that a system will be in.
CSA	Abbreviation for the Canadian Standards Association.
DC	Abbreviation for "Direct Current."
EMC	The Electro-Magnetic Compatibility (EMC) concerns the technical and legal basics of the mutual influencing of electrical devices through electromagnetic fields caused by them in electrical engineering.
ESS	Energy Storage System
FCC	FCC is the abbreviation for Federal Communications Commission.
Galvanic isolation	No conductive connection between two component parts.
GEC	Grounding Electrode Conductor
GND	Ground
IEEE	The Institute of Electrical and Electronics Engineers or IEEE (read I-Triple-E) is an international non-profit, professional organization for the advancement of technology related to electricity.
IMI	Isolation Monitor Interrupter

	Explanation
Initialization	Under initialization (cf. English to initialize) is understood the part of the loading process of a program, in which the storage space required for the execution (e.g. variable, code, buffers ...) for the program is reserved and is filled with initial values
ISC	Short Circuit Current
Local utility company	A local utility company is a company which generates electrical energy and distributes it over the public grid.
MPP	The Maximum Power Point is the point on the current-voltage (I-V) curve of a module, where the product of current and voltage has its maximum value.
NEC	The National Electrical Code (NEC), or NFPA 70, is a United States standard for the safe installation of electrical wiring and equipment.
Nominal power	Nominal power is the maximum permissible continuous power output indicated by the manufacturer for a device or a system. Usually the device is also optimized so that the efficiency is at its maximum in case of operation with nominal power.
Nominal current	Nominal current is the absorbed current in case of electrical devices if the device is supplied with the nominal voltage and yields its nominal power.
PE	In electric systems and cables a protective earth conductor is frequently employed. This is also called grounding wire, protective grounding device, soil, grounding or PE (protective earth).
Photovoltaics (abbr.: PV)	The conversion of PV energy into electrical energy. The name is composed of the component parts: Photos - the Greek word for light - and Volta - after Alessandro Volta, a pioneer in electrical research.
Power dissipation	Power dissipation is designated as the difference between absorbed power and power of a device or process yielded. Power dissipation is released mainly as heat.
PV cell	PV cells are large-surface photodiodes which convert light energy (generally sunlight) into electrical energy. This comes about by utilization of the photoelectric effect (photovoltaics)
PV generator	System comprising of a number of PV modules.
PV module	Part of a PV generator; converts PV energy into electrical energy.
RJ45	Abbreviation for standardized eight-pole electrical connector. RJ stands for Registered Jack (standardized socket).

Explanation	
RS485 (EIA485)	Differential voltage interface on which the genuine signal is transmitted on one core and the negated (or negative) signal on the other core.
Separate grid system	Energy supply equipment which is completely independent of an interconnected grid.
String	Designates a group of electrical PV modules connected in series.
UL	Stands for Underwriters Laboratory, a non-profit organization that sets standards for different product categories and tests products to make sure they meet the standards.
VOC	Open Circuit Voltage

# Application Notes

## AC Charging on Islanded Backup Mode for LG Energy Storage System (A005KEEN261)



### Pre-requisites

1. Existing solar inverter should be connected sub panel.
2. Existing solar inverter should be supported setting value as follows.

#### - Ramp rate

- Soft-start ramp-up rate : under 200 W/s
- Normal ramp-up rate : under 200 W/s

#### - Frequency-watt mode

- Response time : 0
- Hysteresis : Disable
- Start Frequency : 60.1 Hz (Max)
- Gradient : 250 %/Hz (Min)

#### - L/HFRT

- High Frequency1 (HF1) : 60.5 Hz (Min)
- High Frequency2 (HF2) : 60.5 Hz (Min)

### Operating procedures

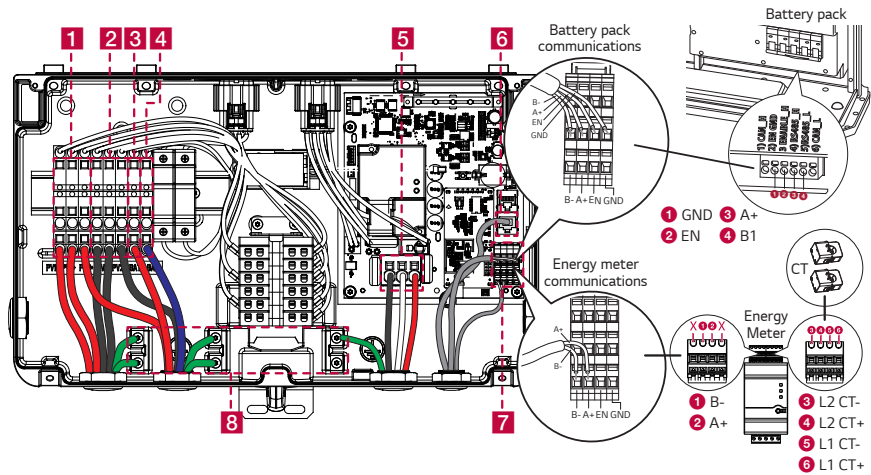
1. The utility grid is black out. Then existing solar inverter stopped.
2. ESS go to backup mode, starting discharging and make frequency and voltage.
3. Existing solar inverter restart with soft start ramp. : It will be restarted within 5 minutes(reconnection time)
4. Existing solar inverter can generate power to feed backup loads.
5. ESS decrease discharging power and existing solar inverter increase output power.
6. ESS start to control frequency when backup loads equal with feeding power.
7. ESS can charge from solar inverter.



It may occur protection error because RESU10H response time is too long for this function.

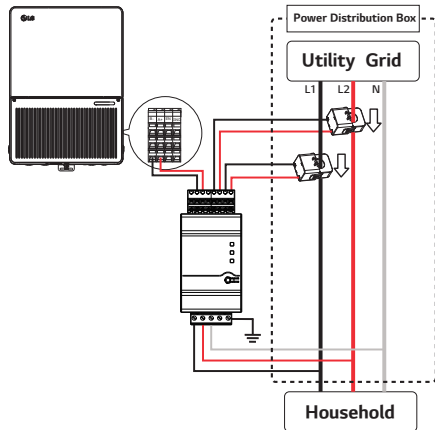
# Quick Installation Guide

## Overview of the Connection



Position	Designation	AWG	Torque
1	PV1 - 3 Positive(+) Terminals	14 - 8	1.2 N·m 1/8" flat blade screwdriver
2	PV1 - 3 Negative(-) Terminals		
3	Battery Positive(+) Terminals	12 - 8	
4	Battery Negative(-) Terminals		
5	AC terminals	14 - 6	3/32" flat blade screwdriver
6	Ethernet Communication Port	24 - 18	
7	RS485 Communication Ports	10 - 8	1.8 N·m Torx20 screwdriver
8	Grounding		
	Wiringbox cover		2.0 N·m 0.7 mm hex screwdriver

## Energy meter connection



## ATS connection

