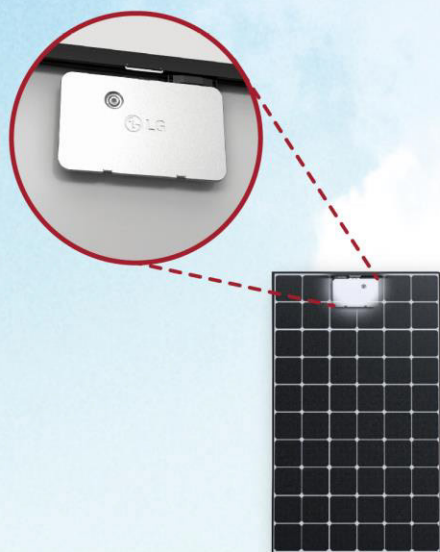


AC Module System Installation Manual



LGXXA1C-V5

Important!

Please read the AC Module System Installation Manual before installing, wiring, or using this product in any way. Failure to comply with these instructions may invalidate the Warranty.



This AC Module System Installation Manual ("Manual") may contain inaccuracies and/or typographical errors and may be changed or updated at any time by LG Electronics ("LGE") without notice.

Please read the Manual before installing, wiring, or using this Product in any way. Failure to comply with the instructions outlined in the Manual may void the Product's limited warranty.

Should you have any questions, you may contact LGE at lgprosolar@lge.com before starting the installation process.



Contents

1 Safety	6
1-1 Safety Symbol	6
1-2 Circuit Symbol	6
1-3 Important Safety Instructions	7
1-4 FCC Guidelines	9
2 Introduction	10
3 Installation	11
3-1 Instructions before Installation	11
3-2 Checking the Installation Site	12
3-3 Inspecting Components of an AC Module	13
3-4 Inspecting Components of EnerBox2	14
3-5 Wiring Diagram of AC Module System	15
3-6 Installing the AC Junction Box and PV Rack	16
3-7 Mounting the AC module	17
3-8 Coupling AC cable Connectors	22
3-9 Building an Array of AC modules	24
3-10 Building Blocks of an Array	26
3-11 Grounding	35
3-12 Connecting Array of AC Modules to Distribution Panel	38
3-13 Grid Voltage Measurement	45
3-14 Grid Frequency Measurement	46
3-15 Energizing the Installed AC Module System	47



Contents

4 Communication	48
4-1 EnerBox2 Components	49
4-2 Simple Diagram for Communication System Configuration	49
4-3 EnerBox2 installation procedure	50
4-4 EnerVu2 Monitoring system (Installer account)	64
4-5 EnerVu2 Monitoring system (Homeowner account)	71
4-6 EnerVu2 Mobile Monitoring Application (Installer account)	73
4-7 EnerVu2 Mobile Monitoring Application (Homeowner account)	76
5 Troubleshooting Guide	80
5-1 EnerBox2 Inspection	80
5-2 Replacing an EnerBox2	81
5-3 Check the PLC Level	83
5-4 Microinverter Detection Issues	84
5-5 Internet Connection Issues	86
5-6 Microinverter Operation Issues	88
5-7 Grid Voltage Measurement	91
5-8 Grid Frequency Measurement	92
6 Event List and Description	93
6-1 EnerBox2 Displays and Controls	93
6-2 Web Monitoring System Event List	95



Contents

7 Maintenance	97
8 Accessories	98
9 Product Specifications	100
9-1 AC module , LGXXXA1C-V5	100
9-2 AC Cables	102
9-3 EnerBox2	103
10 Warranty	104
11 Transportation and Storage	104
12 Contact	104
Appendix 1 –AC module Installation Map	105
Appendix 2 – Module Installation & Load Guide	106
Appendix 3 – Alternative Equipment Grounding Devices	107

Revisions Table

Date	Version	Description of change	Remark
2018.03.19	1.0	First Release	Installation Manual
2018.05.29	1.1	Deletion of 'Proposition 65'	








1 Safety

Note and comply with the safety guidelines of this manual while handling AC modules. Failure to comply may result in severe damage to the equipment and/or fatal injuries.






1-1 Safety Symbol

Safety symbols are used to prevent property losses and human life damages during the operation of this equipment.

Safety Symbol	Description
	Failure to comply with the instructions may cause severe injury or immediate death.
	Failure to comply with the instructions may cause severe injury or death.
	Failure to comply with the instructions may cause injury or property damage.
	Failure to comply with the instructions may cause severe injury or immediate death by electricity.
	Failure to comply with the instructions may cause injury or property damage by fire.

1-2 Circuit Symbol

Circuit symbols are used to describe the AC module circuit in this manual

Circuit symbol	Description
	DC current supply. Generated from PV module.
	AC current supply. Generated from utility and microinverter. Used in electric appliances.
	Symbol representing the phase of AC current.
	Equipment Grounding Conductor (EGC). Conductor connecting normally non-current carrying metal parts of equipment together.
	Grounding Electrode Conductor (GEC). Conductor connecting EGC and neutral conductor to the ground for grounding.



1-3 Important Safety Instructions

DANGER

- To prevent the risk of electric shock, do not touch any terminals in operation and wait for a few minutes after turning a circuit breaker off. It may be energized in the open position.
- To prevent the risk of arcing, do not disconnect the cable connector while in operation.
- Do not contact electrically active parts of the panel, such as terminals, without appropriate safety gear. Contact may result in lethal spark or electric shock.
- To prevent the risk of electric shock, do not touch the glass surface or frame of the solar module after installation.
- Do not use or install AC modules if the module is broken or torn. Failure to comply may result in electric shock.

WARNING

- To prevent the risk of burns, do not touch AC modules during operation.
- For safety, only qualified personnel with proper training and certifications should service modules.
- To prevent the risk of electric shock, stay away from any damaged modules. Do not operate the module if you find broken glass or torn back sheets in any module.
- Removing the microinverter cover may void the warranty. No serviceable parts inside. Refer to qualified personnel for service.
- For proper operation, make sure to use AC cables, connectors and accessories provided by LG Electronics. Parts that are not LG parts or parts that are supplied by LG may cause critical danger.
- For proper operation, the AC module must be connected to a dedicated branch circuit.
- To prevent the risk of fire, do not connect any device between the AC module and circuit breaker. Circuit breaker may not work properly.
- Before installation, make sure to check that the area of location meets requirements for proper and safe installation.
- Perform all work in dry conditions and use only dry tools. Do not handle wet panels without appropriate protective equipment.
- Damaged modules must be treated with the appropriate protective equipment.
- Do not approach the damaged or broken module unless you are an authorized or qualified personnel.
- Waste, electrical parts, bolts, nuts, conductors or any other debris must be cleared after installation.
- Do not bend AC cables. While under stress, it may cause module damage. Cable bending radius should be more than 5 times the cable diameter, at least.



⚠ CAUTION

- Use proper equipment, connectors, wires and buttresses for the installation of the module.
- To reduce the risk of accidents, install the AC modules during mild weather. For rainy or snowy days, electric shock hazard exists. On windy days, it may be dangerous to move the AC modules.
- To prevent the risk of injury, do not apply pressure to the module (ex. placing heavy objects or stepping on the module).
- To prevent the risk of injury, do not drop the module. Modules must be gently handled and placed down with care.
- For proper operation, do not scratch the coating surface of the frame. It may increase the corrosion of the frame.
- For proper operation, do not artificially concentrate sunlight on the module surface.
- Addition of holes in the frame or glass of the module may decrease the strength and integrity of the frame or glass.
- Do not remove warning labels. Do not apply a shock to microinverter of the module or pull the AC cable. Do not remove the labels attached on the module except the detachable label for installation map.
- Store the module in its original package until installation.
- Do not use any kind of oil or lubricant on the module's parts, as it can damage the AC Module.



- AC modules shall be mounted with racking and mounting products certified and listed for system fire class rating in accordance with UL1703 edition 2014 and UL2703 edition 2014.
- The System Fire Class Rating of the module or panel in a mounting system in combination with a roof covering must meet the requirements to achieve the specified System Fire Class Rating for a non-BIPV module or panel.
- For better air circulation along the backside of the AC module, it is recommended to install the PV rack with a gap of at least 4 inches (100mm) between the back of the module and roof surface. It may affect UL listing and fire class if it is less than 4 inches (100mm).
- Please check voltage range for use before installation of AC modules and EnerBox2. Refer to Section **9 Product Specifications**.
- When installed on a roof, the PV module must be mounted over a fire-resistant roof. The fire resistance of the PV module is class C according to ANSI/UL790.
- It is recommended to check with local authorities for fire safety guidelines and requirements for any buildings or structures on to which the panels will be installed.



- Both AC and DC voltage sources are terminated inside this equipment.
- Each circuit must be individually disconnected before servicing.
- When the photovoltaic array is exposed to light, it supplies a DC voltage to this equipment.
- AC module arrays need to be connected only to a dedicated branch circuit.



1-4 FCC Guidelines

For Microinverter & Communication Gateway (EnerBox2)

You are cautioned that changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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 instruction, may cause harmful interference to radio communication. 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 receiver.
- Connect the equipment into 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.

For Communication Gateway (EnerBox2)

Indoor use only

FCC Caution: For indoor use only; outdoor use or in any other environments not covered in this manual may violate the FCC regulation and void the user's authority to use the product.

Specially, within the 5.15-5.25 GHz band, U-NII device is restricted to indoor operations to reduce any potential for harmful interference to co-channel MSS operations.

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 a minimum distance of 8.87 inches (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.

CAUTION: Regulations of the FCC and FAA prohibit airborne operation of radio-frequency wireless devices because their signals could interfere with critical aircraft instruments.



2 Introduction

The LG AC module consists of a DC module and a microinverter. Without any additional equipment, it converts the solar energy to AC power which can be consumed by electric appliances in a home or can be supplied to the utility.

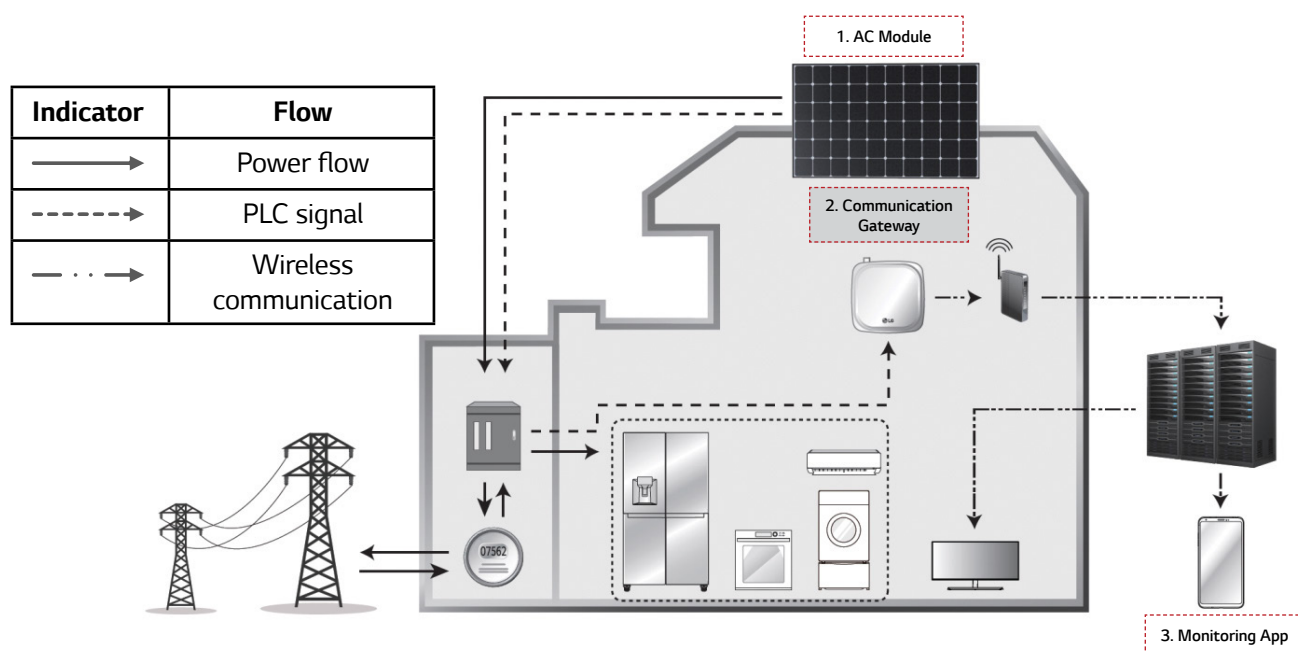
The Advantage of AC Module System

The AC module produced by LG Electronics is delivered with the microinverter pre-installed on the DC module, which eliminates installation steps to connect the microinverter to a DC module.

Also, the AC module provides better flexibility for building PV arrays. The AC module is equipped with two separate AC cable connectors (male and female). Thus the two AC cable connectors enable landscape or portrait orientation without requiring any trunk cables.

The advantages reduce total and labor costs.

AC Module System



In this diagram, AC modules will produce power during daytime. The produced energy can be consumed by home appliances like a fridge, TVs, etc. If the power generation is more than total power consumption in the house, the power should flow to the grid. Power flow is described as ———→.

The EnerBox2 utilizes power line communication (PLC) to collect data from each AC module. The PLC matters for communication between microinverters and a EnerBox2. The PLC signal is depicted as -----→.

The EnerBox2 sends data to the web server through a home router. Internet connection of the EnerBox2 is possible with Wi-Fi or a LAN cable. Wireless communication is described as - . . →.



3 Installation

3-1 Instructions before Installation

- LG AC module is a “Grid Support Utility Interactive Inverter”, which requires approval from the corresponding authority prior to connection with the utility grid. Contact the applicable local government agencies and/or utility company.
- Installation, maintenance, and supervision may only be carried out by a qualified and authorized installer to ensure the safety of workers and systems.
- Read and follow the installation guidelines specified in this manual. Installation with unapproved methods may result in injuries including fatal injuries and/or damage to the equipment.
- If it is necessary to use an installation method which is not specified in the installation manual, please contact LG Electronics. Failure to comply may void the warranty and the module certificate.
- After arrival of AC modules, check for possible damage during transportation. Damaged modules should not be installed. Request an exchange by contacting LG Electronics.
- Secure all necessary permits and licenses to install the solar modules.
- Store the AC modules in original packing before installation.
- Keep the AC modules in a clear and secured area. Any particles or moisture may cause malfunction of AC cable's contactors.
- Consider the weight of AC module before installation.
- Do not work alone. Install AC modules with a team of at least 2 persons for safe installation.
- To prevent the risk of accidents, use proper PPE (Personal Protective Equipment) including helmets and gloves at all times.
- If installation location is high above ground, make sure to use Fall Protection System during the installation.
- Plan the installation work in moderate weather. There is a risk of electric shock when it is raining or snowing.
- Partial shadowing may substantially reduce energy production.
- Check whether all parts used for the installation are certified for outdoor usage.
- Keep the solar module and system away from children at all times.
- During the AC module installation, do not let children play near the module and the system.
- Care must be taken to avoid low tilt angles which may cause dirt to buildup on the glass. A buildup of dirt may cause performance degradation.
- Dirt build-up on the surface of the panel may cause active solar cells to be shaded and electrical performance to be impaired.
- Carry out the installation according to the local electric code.



3-2 Checking the Installation Site

Check whether the target site of installation meets the following requirements:

- Do not install AC modules near highly combustible structures or materials.
- Do not install AC modules where the maximum ambient temperature exceeds 65°C (149°F).
- Do not install AC modules at a place under direct exposure to salt water or ammonia.
- Do not install AC modules at a place easily accessible to people.
- Do not install AC modules indoors or on a moving vehicle.

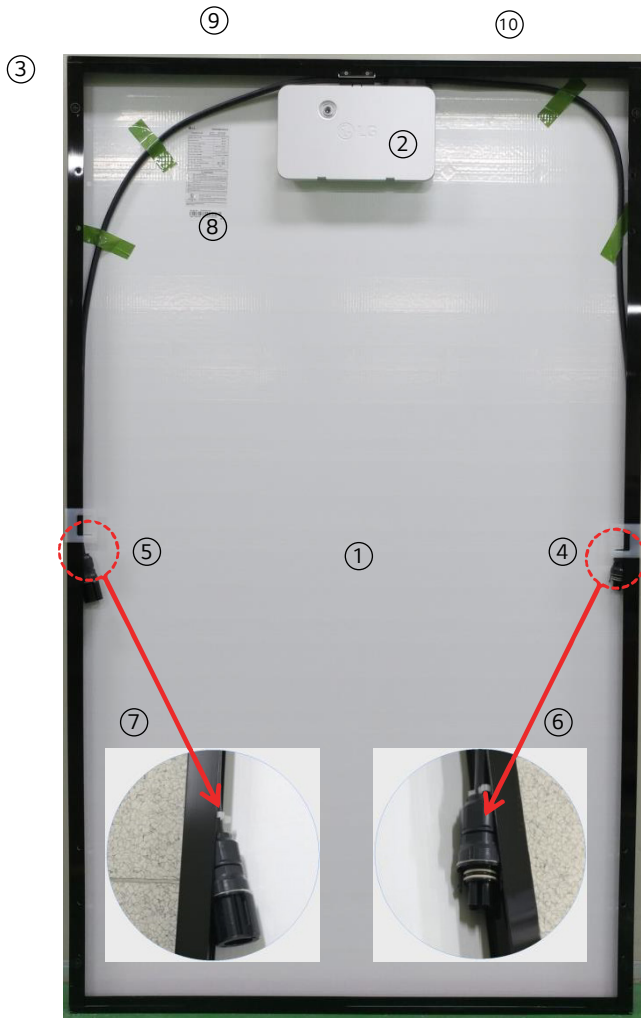
In an environment having frequent lightning storms, an auxiliary grounding may need to be established by the installer, which is connected directly from the AC module system to the ground.

If the target installation structure lies on an uneven surface, do not forcefully modify the module to fit in the structure. Make sure that the installation structure has been set up to provide a flat surface. Unreliable structures may cause damage to the product during and/or after installation.



3-3 Inspecting Components of an AC Module

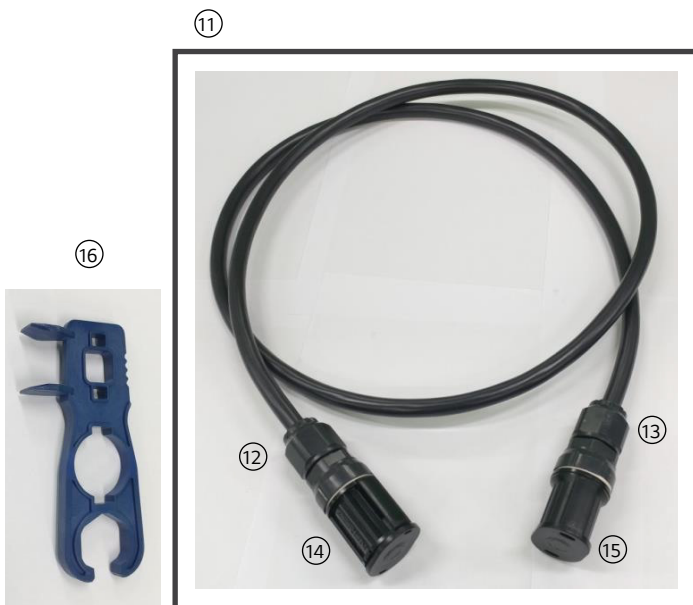
After receiving products, inspect all parts for possible deformity or malfunction.



AC Module

1. **DC Module**
converts the solar energy to DC power.
2. **Microinverter**
converts DC power generated by each PV module to AC power.
3. **AC module frame**
is a structural system to protect and support a DC module and a microinverter.
4. **AC Cable Male Connector**
can be connected with an AC cable female connector or a female end cap.
5. **AC Cable Female Connector**
can be connected with an AC cable male connector or a male end cap.
6. **AC Cable Male Connector Holder**
holds the cable preventing it from getting free.
7. **AC Cable Female Connector Holder**
holds the cable preventing it from getting free.
8. **Product Label**
indicates product specification and MAC ID number.
9. **Detachable MAC ID**
is for a customer to place it on a map for record.
10. **Model number**
represents its model number.

Accessory (Contact distributor to order)



11. **Extension Cable (serviceable as a transition cable)**
has both female/male connectors paired with male/female end cap.
12. **Male Connector**
can be used for connection with a female connector or a female end cap.
13. **Female Connector**
can be used for connection with a male connector or a male end cap.
14. **Female End Cap**
is for sealing a male connector.
15. **Male End Cap**
is for sealing a female connector.
16. **Unlocking Tool**
for handling male and female connectors.



3-4 Inspecting Components of EnerBox2

After completing the installation of AC module on the rooftop or other site, next step is to install the communication gateway (EnerBox2) which enables homeowners and installers to monitor power production of individual AC module or the entire array on a daily, monthly or annual basis. The communication system is simple to connect the gateway with each microinverter and an internet router. Power Line Communication (PLC) method facilitates communication between the gateway and each microinverter, then the gateway collecting energy and performance data from the AC modules in real time transmits the accumulated log data to a web server through an internet router.



EnerBox2



③ EnerBox2 left-side



④ EnerBox2 bottom-side

EnerBox2 (Gateway) (Contact distributor to order)

1. **EnerBox2**
is to collect energy harvest volume data from installed AC modules.
2. **Wi-Fi antenna**
is attached on the body of EnerBox2 for wireless connection of an EnerBox2 to a homeowner's existing router. A router is not provided by LG Electronics.
3. **EnerBox2 left-side**
provides many functions including reset, buttons, LEDs, etc.
4. **EnerBox2 bottom-side**
provides slots for power cable, LAN cable and USBs.
5. **EnerBox2 power cable**
is used to provide power to EnerBox2 for operation.
6. **Lan Cable**
to connect the router in case wireless service is not provided by a router.
7. **Wall mount bracket**
can be used for the EnerBox2 to be installed on a wall.
8. **Wall mount bracket screws**
hold the wall mount bracket on a wall.



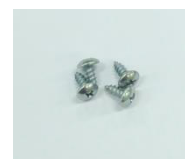
⑤ EnerBox2 power cable



⑥ Lan Cable



⑦ Wall mount bracket

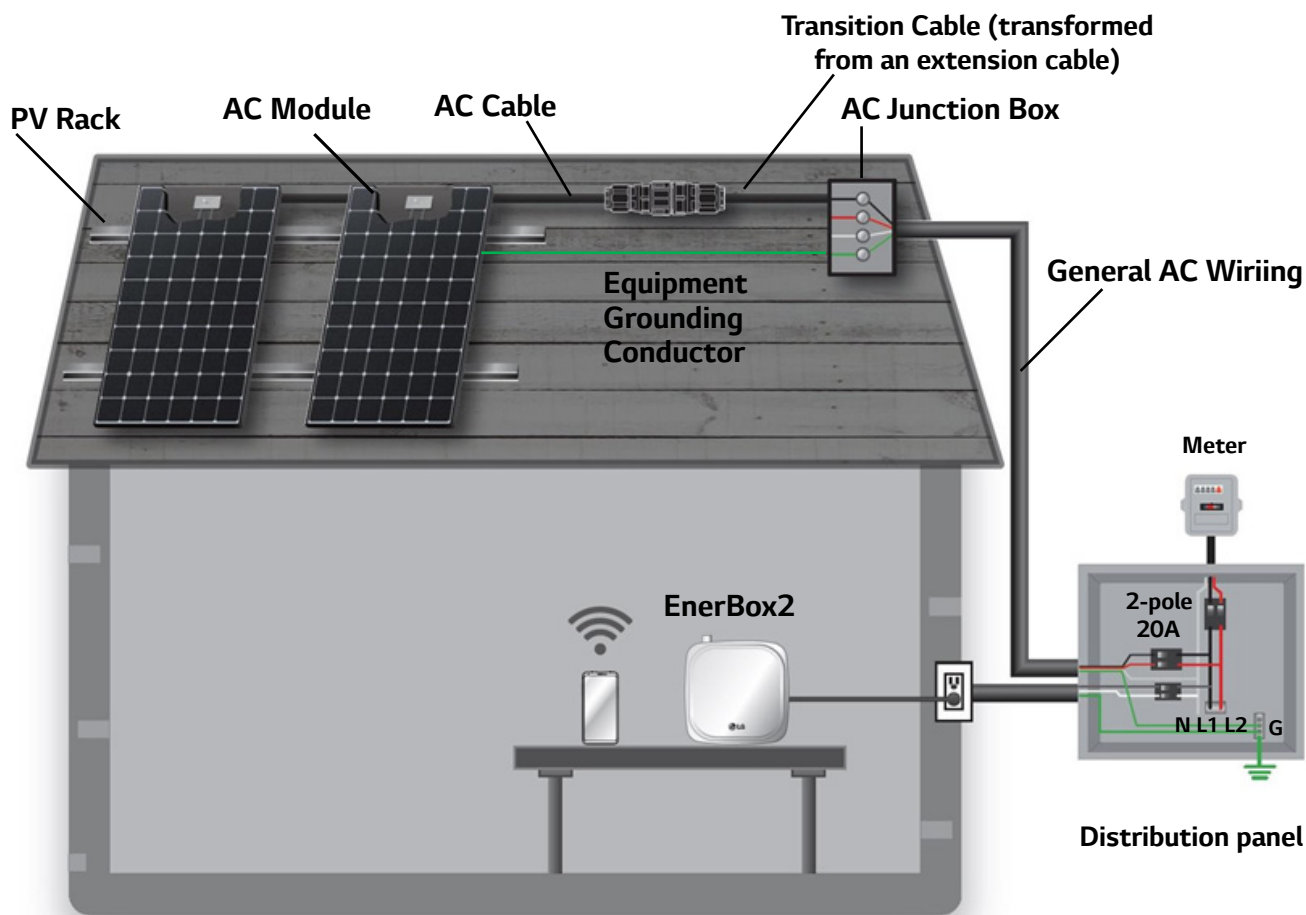


⑧ Wall mount bracket screws



3-5 Wiring Diagram of AC Module System

Below is a sample diagram of the AC module system.



1. AC module

- Consists of a DC module and a microinverter.
- Performs power conversion from solar power to AC Power and maximizes power generation by performing MPPT (Maximum Power Point Tracking).

2. EnerBox2 (Communication Gateway)

- Collects data from the installed AC module system via AC cable.
- Uses wireless connection to transmit data to a server.

3. Monitoring App

- Monitors how much power is produced by the AC module system.
- Transmits the condition of the system to the service center in case of a problem.



- PV rack: Structure used to attach AC modules on surfaces like roofs, empty plots, etc.
- AC junction box: Container for electrical connections of AC wiring.
- Distribution panel: Component of an electricity supply system which divides an electrical power feed into subsidiary circuits, while providing a protective fuse or circuit breaker for each circuit, in a common enclosure.



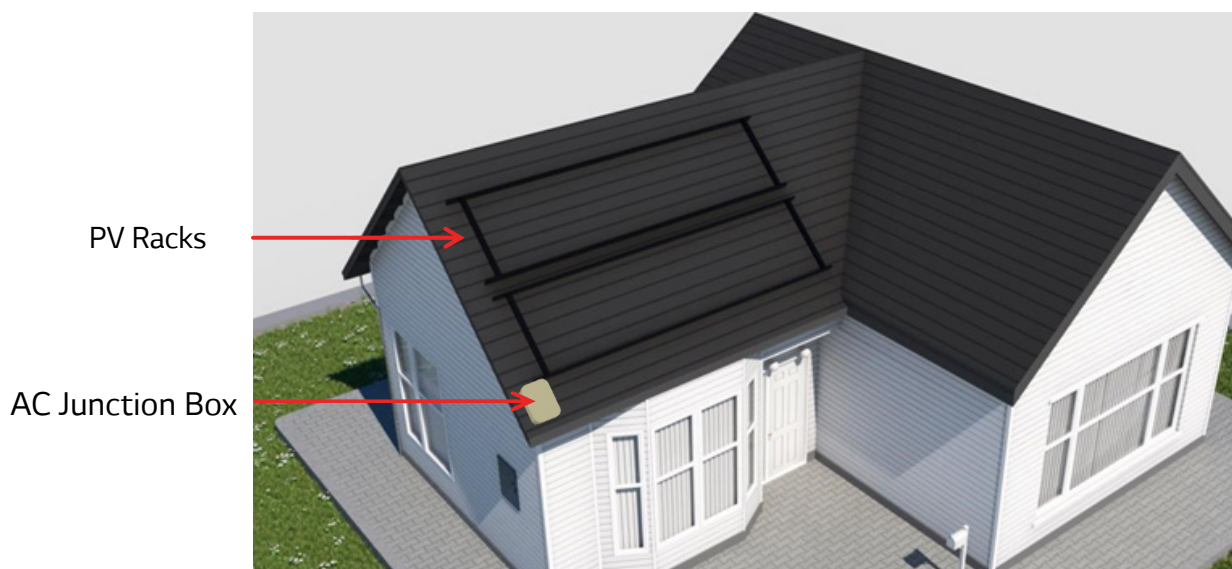
3-6 Installing the AC Junction Box and PV Rack

Before Installing the AC junction box and PV rack, be aware of the following requirements:

- Determine appropriate solar panel angle maximizing the amount of sunlight. This depends on geographical conditions.
- To make better air circulation along the backside of the AC module, it is recommended to install the PV rack with a gap of at least 4 inches (100mm) between the back of the module and roof surface. It might affect UL listing and fire class if it is less than 4 inches (100mm).
- Install AC junction box near the AC module.
- Install using the parts approved in the installation region.

Construct the overall frame of the solar system in the following order:

- Install the PV rack according to the number of modules per array and the dimensions of the AC module. (refer to **Chapter 9. Product Specification**)
- Inspect the installation site and design possible combination of arrays that fits into the installation site. If there are any vents or obstacles that make array build difficult, go to **3-9 Building an array of AC modules** to get ideas to design an array.
- Install the AC junction box near the PV rack. Select the size and type of AC junction box suitable for connection type according to the output voltage. (refer to **3-12 Connecting Array of AC Modules-to-Distribution Panel**)
- Make sure that the AC junction box is protected by weatherproofing materials or substances.
- Please use appropriate conduit or ducts for wires.



All procedures should be carried out by qualified installers. LG Electronics does not provide or cover warranties for PV racks and the AC junction box.



PV module specification (conditions of 1000W/m² irradiance and 25°C (77°F) solar cell temperature)

Operation temperature

Maximum operation temperature: 65°C (149°F).

Minimum operation temperature: -40°C (-40°F).

Design strength

Refer to **Appendix 2 – Module Installation & Load Guide**

Notes

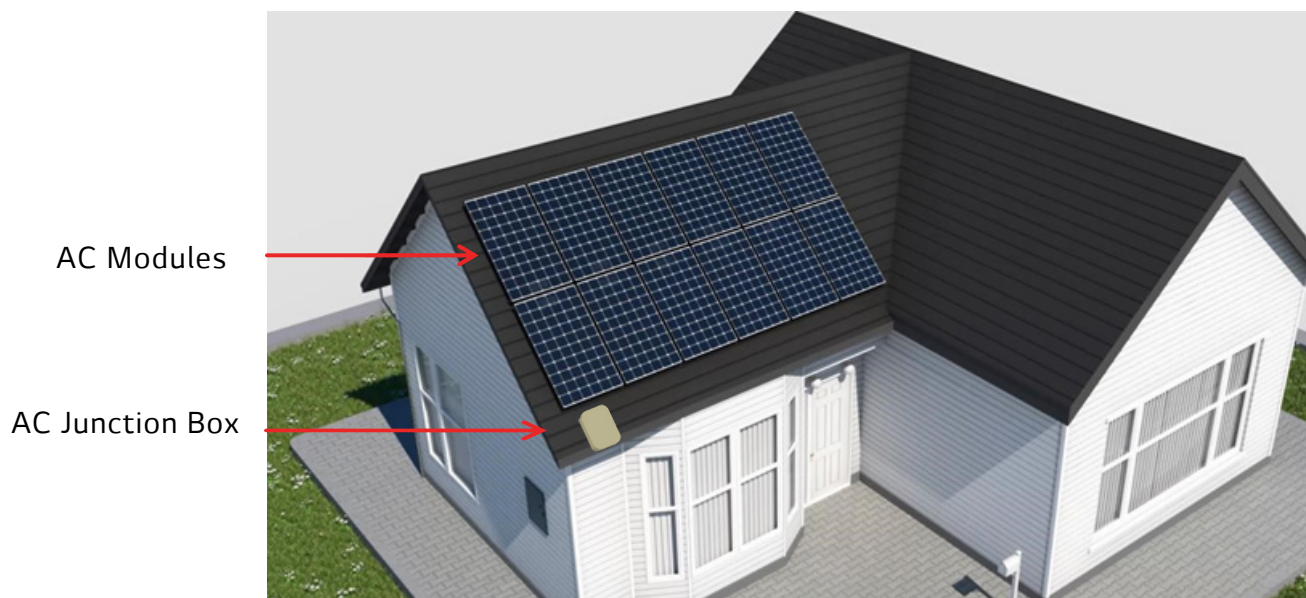
-LG AC module should not be operated in locations where direct contact to salt water or ammonia exists.



3-7 Mounting the AC module

Before mounting AC module in the PV rack, be aware of the following requirements:

- Check that all parts of the product are intact and operational.
- Check that the cable connectors are not damaged.
- Do not install the AC modules horizontally. It will make it difficult for dust to be washed off by rain naturally. Accumulation of dust, dirt or soil may be a cause of performance degradation.
- When installed on a roof, the PV module must be mounted over a fire-resistant roof. The fire resistance of the PV module is class C according to ANSI/UL790.
- For proper operation, do not remove AC module frame or replace with another frame.
- Do not make extra holes on the AC module frame. Additional holes on the frame may weaken the strength of the frame and cause damage.
- To avoid the tensile strain from the thermal expansion, it is recommended to leave a space more than 6mm (0.236 inches) between AC modules frames.
- Mount LG AC module to PV rack with 4~5N•m torque.
- For reliable connection, make sure that the AC module frame and a PV rack are surely fastened enough to prevent the AC modules from getting loose.
- When installing modules in areas of heavy snow, special care should be taken to install the modules in a manner that provides sufficient strength for meeting local code requirements.



Guides for mounting AC modules on the PV racks are explained on the following pages.



- When an AC module is exposed to light, it supplies a DC voltage to a microinverter. Therefore, the LED on the microinverter will illuminate in red if it is not connected to the grid.

WARNING



- To prevent the danger of electric shock, do not touch metal parts inside the AC cable connectors.



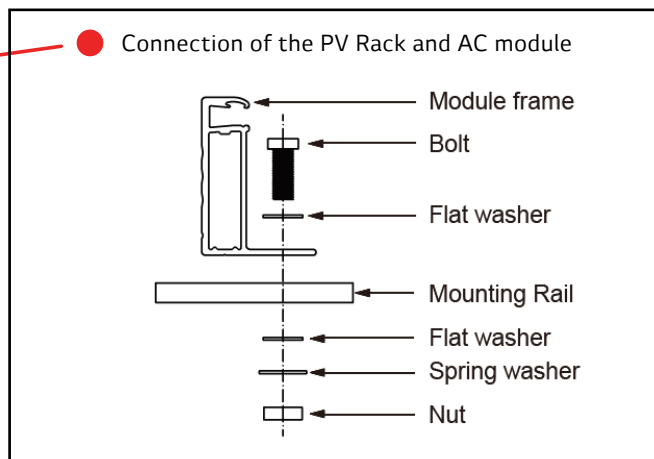
Mount AC module to the PV rack in the following order:

- Bolting type uses manufactured holes on the AC module frames to attach the AC modules on PV rack or support structure. Use at least 4 mounting holes (2 on right and 2 on left frame) to securely hold the AC modules on the structure. This mounting type is tested by a Nationally-Recognized Testing Laboratory.
- The AC module can be mounted by using clamps or fixing plates. Steps and procedures need to be carried out based on a manual provided by the clamp or fixing plate manufacturers. The type is evaluated by LG internal test, not tested by a Nationally-Recognized Testing Laboratory.
- Bolts, clamps or fixing plates must be installed according to the manufacturer's specific instructions.
- Do not apply too much pressure on the AC module frame to a degree that the frame deforms.
- Please follow instructions and manuals specified by bolt, clamp or fixing plate manufacturers.
- Make sure that any clamps or fixing plates do not contact the front glass and do not deform the frame. Also, be sure to avoid shadowing effects caused by the clamps or fixing plates.
- It is recommended to check with local authorities for fire safety guidelines and requirements for any buildings or structures onto which the panels will be installed.

Bolting type



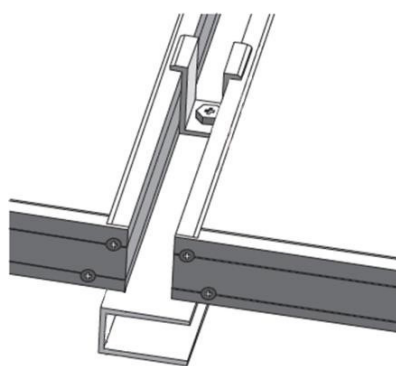
Rear side



Clamp or fixing plate type



AC module frame clamps for an example



- Bolting Type is tested by a Nationally-Recognized Testing Laboratory. Refer to Appendix 2.
- Clamp or fixing plate type is not tested by a Nationally-Recognized Testing Laboratory. The type is evaluated by LG internal test.

⚠ WARNING

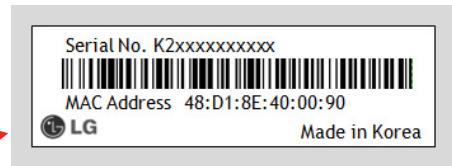


- To prevent the danger of electric shock, do not attach or connect AC modules to the grid before the installation.
- The actual grid connection should be done after all installation procedures are completed.



Mount AC module to the PV rack in the following order

- Place AC modules on the PV rack with a minimum gap of 6mm (0.236 inches) between each module. To prevent the risk of slipping during installation, mount AC modules one by one.
- Peel the adhesive label attached on the side of AC module frame and attach the identification label on LG AC module Installation map. The map makes it easy for customers to identify the physical location of a particular AC module. Each AC module has two MAC ID labels. One is placed under the product specification label. And the other is the detachable MAC ID label.



- The layout of the array will be utilized for building a monitoring system allowing a customer to check the amount of energy harvested.
- The AC modules can be mounted in landscape or portrait orientation, as illustrated below.
- When the AC module is mounted on a PV rack rail, ensure that the rail is inside the range specified in Appendix 2 – Module Installation & Load Guide. The range varies depending on mounting methods.
- Appendix 2 guides you how to place PV rack rails and clamps in connection with AC modules.

Design Strength (Basic Load)

- 60Cell Modules: 75lb/ft2
- Detail of mounting distance is below.

	60 cell	① : 200mm (7.9 in) ② : 300mm (11.8 in)
※ This mounting method uses frame bolt holes. ※ Please refer to Appendix 2 –Module Installation & Load Guide .		

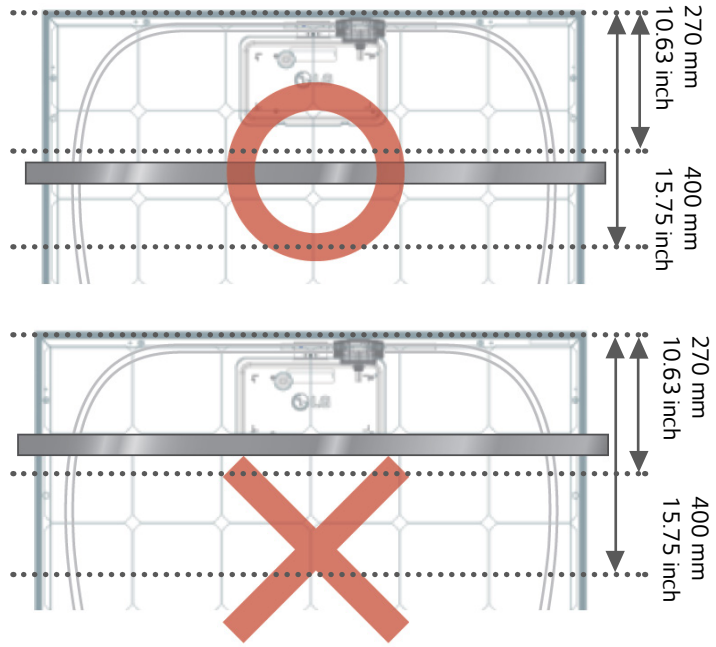
WARNING



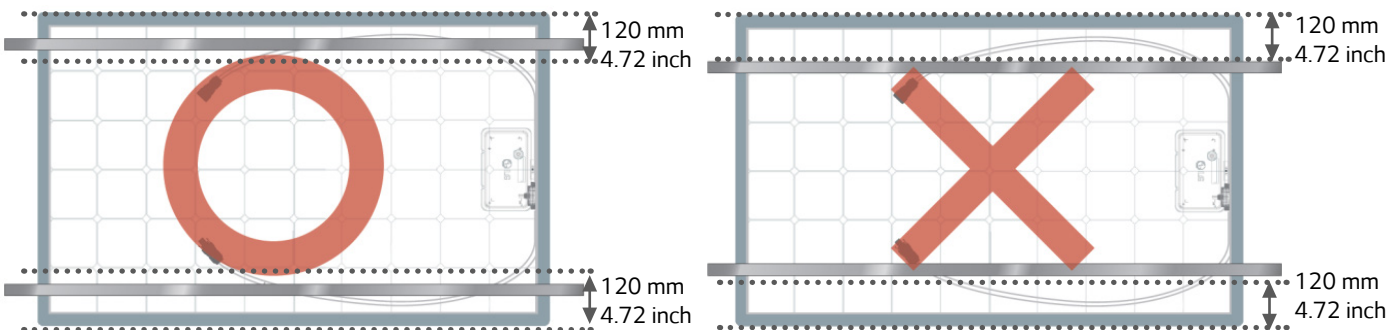
- To prevent the risk of accidents, use proper PPE (Personal Protective Equipment) including helmets and gloves at all times.
- If installation location is high above ground, make sure to use Fall Protection System during the installation.



Portrait Orientation



Landscape Orientation



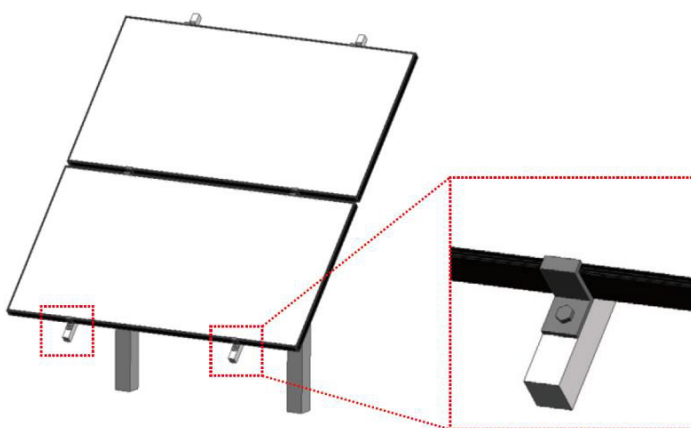
⚠ WARNING



- Check whether the male and female connectors between modules (except end cap and junction box connection) are securely connected, then proceed to install next row of modules.
- All AC cable connectors must be installed underneath the module, out of rain and sun. Do not leave AC cable connectors in an environment of long-term exposure to direct sunlight or rain.



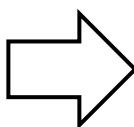
- If the installation is likely to be affected by heavy (extreme) snow, further suitable panel support is recommended on the lower row of panels.



LED indicator



Flashing red light: Solar panel is getting solar energy but it is not providing power to utility grid.



No red light: Solar panel is getting solar energy and it is providing power to utility grid.

- Connection time is set at 1 min. After you turn the circuit breaker on for the actual utility connection, the microinverter will be in operation to provide power to the grid.
- Reconnection time is set at 5 min. Reconnection time is applied if the microinverter is tripped with grid voltage and frequency abnormality. For example, if the circuit breaker is turned off during operation, the reconnection time of 5 min. will be applied. Once it starts power production, connection of 1 min. will be applied.
- After connection time or reconnection time, the microinverter will transform DC power to AC power for utility grid.



1. At night, the LED will have no light because there is no energy to make the LED illuminate.
2. During daytime, the LED will blink flashing red when the PV panel is getting solar energy but the microinverter is not providing power to grid. However, there will be no red light if it generates AC power to a utility grid.

⚠ WARNING



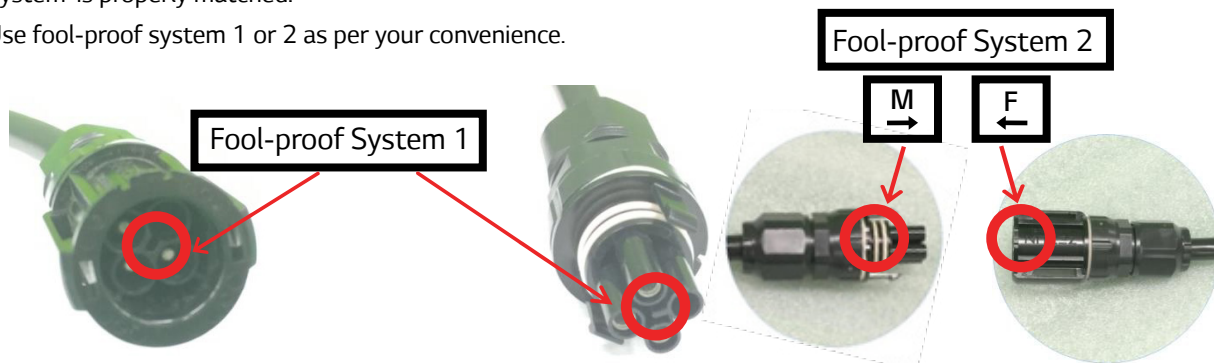
- Ensure that the microinverters are not interfered by the PV racks or ventilation structures. Do not allow any structure to put pressure on microinverters. Continuous stress or force might cause of malfunction.

3-8 Coupling AC cable Connectors

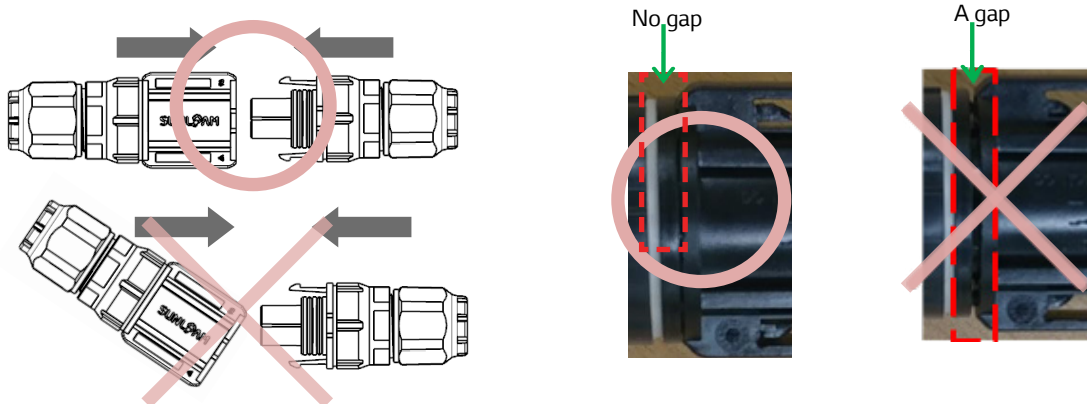
Before pairing AC cable connectors, familiarize yourself with the following descriptions specifically explaining how to handle AC cable connectors and accessories.

AC cable connector insertion

- AC cable connectors can be easily paired to connectors in the right direction.
- Before pairing two AC cable connectors, identify the locations of 'Fool-proof system' on each AC cable connector.
- Inserting the AC cable female connector into the AC cable male connector is only possible when 'Fool-proof System' is properly matched.
- Use fool-proof system 1 or 2 as per your convenience.



- Insert the AC cable female connector into the AC cable male connector horizontally. If you insert at the wrong angle, the connector can be damaged.
- When the temperature is warm and you are about to engage two connectors, you might not hear two clicks. In that case, engage connectors until there is no space (no gap) between connectors.
- Insert the connector fully into the end of the other connector until you hear two clicks.
- When the connectors are correctly connected, there should be no space between the end of a male connector and the end of a female connector.



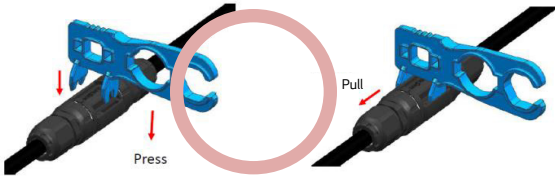
- Do not let cable be pulled too tight or hang too loose. Internal conductor may break.
- Do not allow any liquid inside to prevent danger of electric shock.
- Do not use damaged cables.
- Do not cut or transform AC cables for use.
- Frequent disassembly or connection may damage connectors.
- The size of the cables are in accordance with NEC2014. (For the size, refer to Chapter 9. Product Specification)
- For information about accessories, refer to Chapter 8. Accessories.



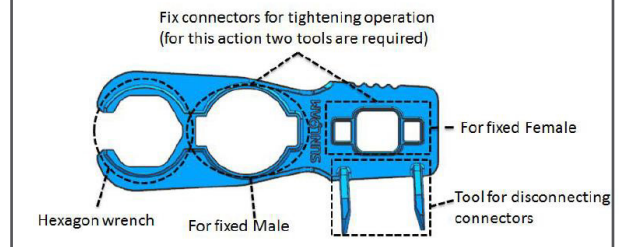
- AC cable information can be found in Chapter 8 AC Module Accessories.

- Do not bend the cable too many times. It may result in mechanical and/or electrical problems.
- Do not disconnect AC cable connectors under load.
- Use the dedicated unlocking tool to remove the connector. Do not use any other tools.
- The unlocking tool is specifically made for disconnecting the two AC cable connectors.
- The male and female connectors will be opened by fully depressing the unlocking tool into the latches.
- After the unlocking tool insertion is complete, pull the connectors apart.

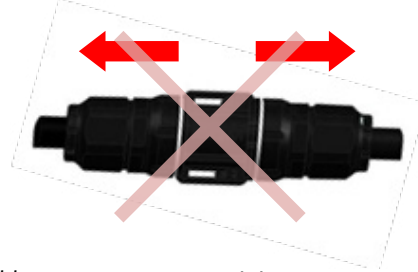
AC Cable Connector removal



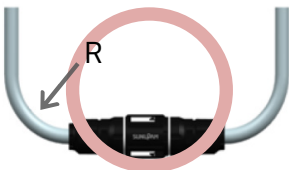
Unlocking Tool



- Avoid any external equipment interfering with the connector.
- Do not impose force on the side of the connector.
- Do not apply too much force pulling AC cables away from the connectors or the microinverter.



- The cable must not be bent, crushed or pinched where the cable connects to screw joint.
- The cable must be routed in a way that tensile stress on the conductor or connections is prevented.
- A minimum bending radius of 55mm must be maintained.



- Do not attempt to assemble connectors in wet, soiled, or dusty environment.
- Keep connectors dry and clean, and ensure that connectors have no damage or deformities.
- Avoid connectors resting on the ground or roof surface. AC cables should be kept away from the ground or roof surface. Use proper tools like cable clips for securely attaching AC cables on structures like PV racks.
- Avoid sunlight exposure and water immersion of the connectors.
- Incomplete connections can result in arcs and electrical shock.
- Check that all AC cables are securely fastened to structures.
- Ensure that all locking connectors are fully engaged and locked.
- Do not leave unconnected (unprotected) connectors exposed to the environment. Use appropriate end caps for the unconnected AC cable connectors.

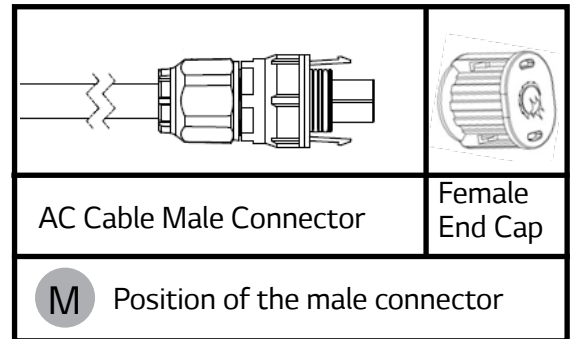
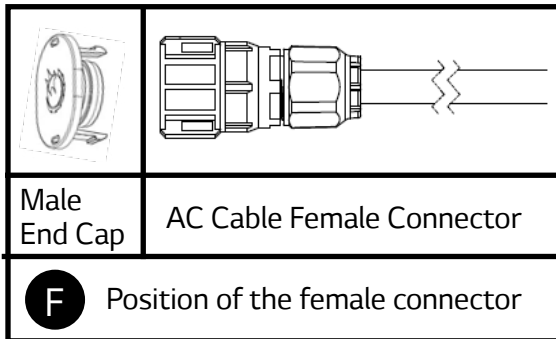
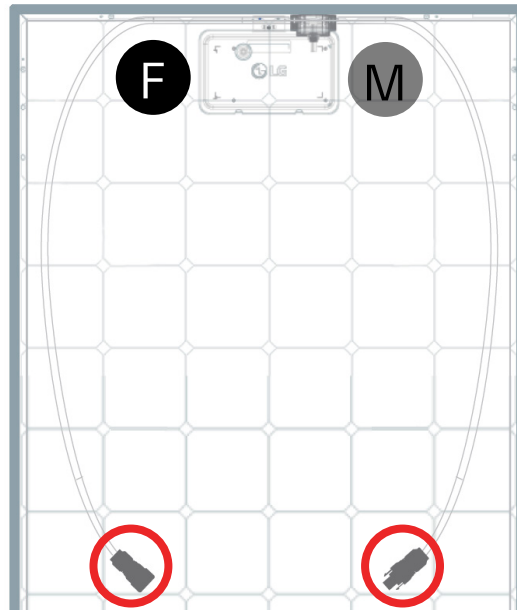
DANGER

- To prevent the danger of electric shock, make sure to turn off the circuit breaker before the installation.
- Do not disconnect AC cable connectors under load.



3-9 Building an Array of AC modules

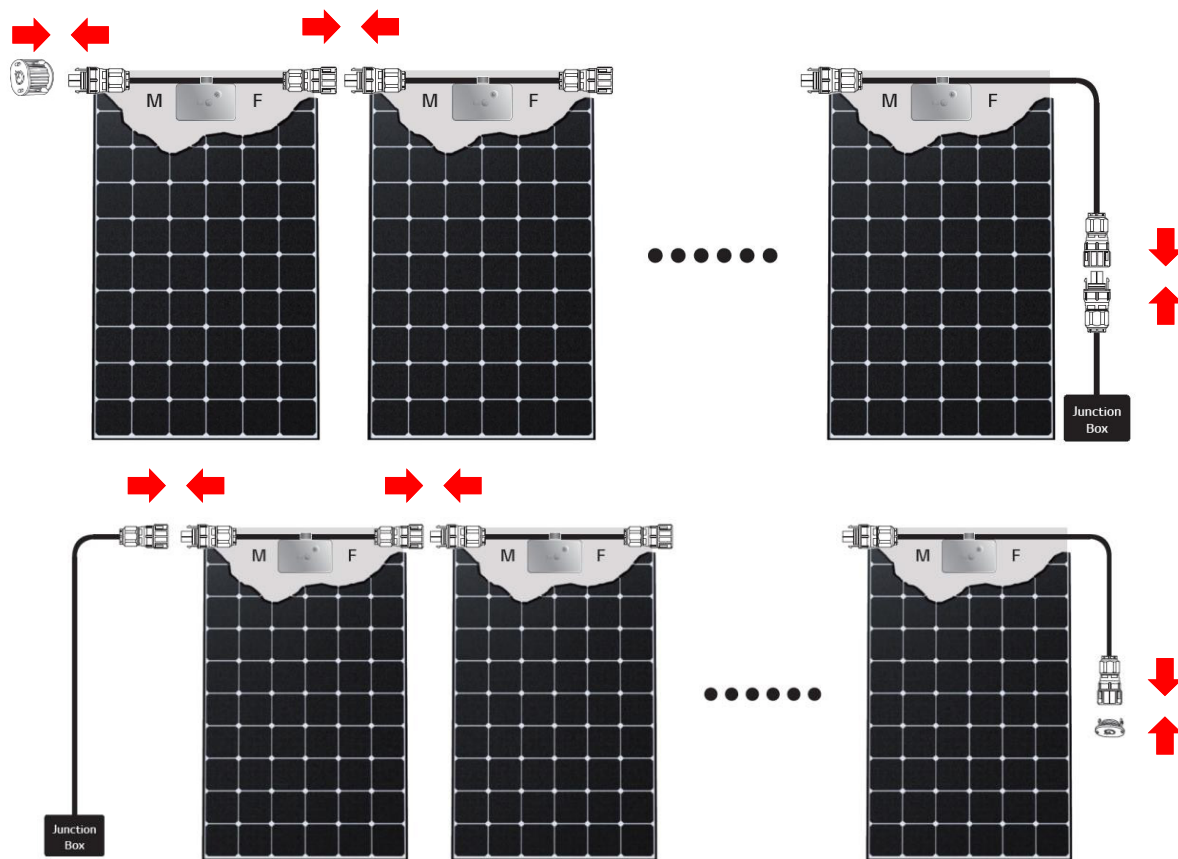
- Remove the tape securing the AC cables and connectors to the back of the module.
- Each AC module has an AC cable male connector and an AC cable female connector.
- AC cable female connector is located on the left at rear side, or the right at front side.
- AC cable male connector is placed on the right at rear side, or left at front side.
- For easy recognition of the position, the (F) below represents the location of the female connector and the (M) stands for the location of the male connector.
- Because male connector is designed to be connected with a female connector or female end cap, there is a need to keep track of the positions of male and female connectors when you build an array.
- The AC module produced by LG Electronics is delivered with the microinverter pre-installed on the DC module.
- Therefore, it eliminates installation steps for pairing DC module outputs and microinverter inputs.
- The length of the AC cables are designed to enable easy cable links throughout an array you have designed.
- Landscape, portrait or a combination of both is possible with the AC cable connectors.
- Even if there are roof vents on the target site, AC cable connection is feasible for the AC module array to circumvent the vent area.



※ The end caps are not attached on the above AC cable connectors. Male or female end caps are provided with extension cables. This diagram is for showing that each end cap has its pair.



- Do not expose the cable connections to directed, pressurized liquid (water jets, etc.).
- Do not expose the cable connections to continuous immersion.
- Do not expose the AC cable connector to continuous tension.
- Use only the connectors and cables provided by LG Electronics.
- Do not allow contamination or debris inside the connectors.
- Use cables and connectors only when all parts are present and intact.
- All AC cable connectors must be installed underneath the module, out of rain and sun. Do not leave AC cable connectors in an environment of long-term exposure to direct sunlight or rain.
- Ensure that the microinverters are not interfered by the PV racks, ventilation structures. Do not allow any structure to put pressure on microinverters. Continuous stress or force may cause malfunction.
- Attach the AC Cable to the PV racks using the cable clips. Keep the AC cables away from the ground surface or the roof.
- After checking whether pairing male and female connectors between modules (except end cap and junction box connection) are securely connected, proceed to install next row of modules.
- Seal the last AC cable connector with an appropriate end cap to add the waterproof function. Insert the end cap into the male or female connector in the arrow direction until you hear a click sound or find no gap at the edge. (Refer to the **3-8 Coupling AC cable connectors**). End caps are attached on each extension cable that you have ordered.



-AC cable connector and end cap include waterproof functions.

⚠ WARNING



- Make sure to use AC cables, extension cables and end caps provided by LG. If cables other than genuine are used, waterproofing may not be guaranteed and the permissible current of the cable may be lower than the output current of the microinverter.
- To prevent the danger of electric shock, firmly connect all connectors and end caps.



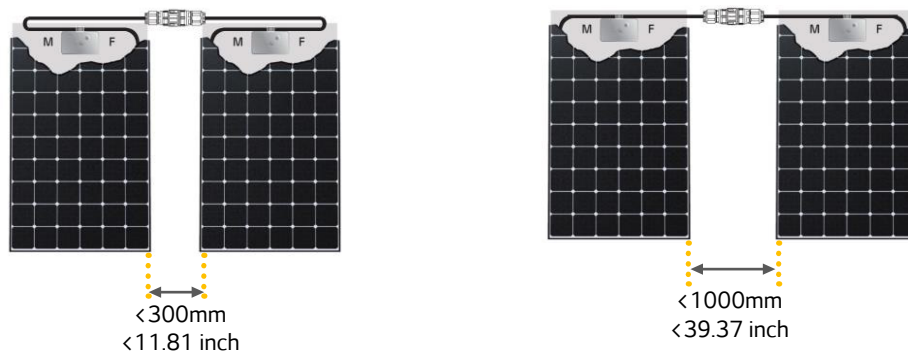
3-10 Building Blocks of an Array

6 Building Blocks

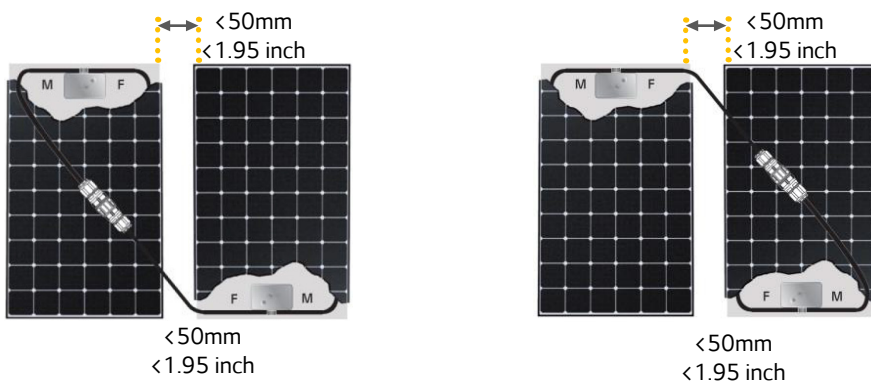
M Male connector
F Female connector

- There are 6 building blocks of AC modules which can be used in building an array. Using the 6 building blocks helps installers sketch array configuration and plan the AC cable connection. The designer needs to keep in mind that the location of female and male connectors will affect array design.
- Each building block has a limitation on the space between two AC modules because of cable length. Therefore, the space gap between two AC module frames must be kept under the value specified in each building block.
- Also, to avoid tensile strain from thermal expansion, it is recommended to leave a space more than 6 mm (0.236 inches) between AC module frames.
- This manual provides gap limitation between AC module frames for each building block. After male and female connection of two AC modules, use cable clips in order to fasten the AC cables on frames or PV racks.
- Keep the AC cables off the roof surface or ground.
- In brief, simple diagrams indicate different types of building blocks describing location of male and female connectors and gap limitation between AC module frames. So do not interpret the simple diagrams as the AC cables must make path only to the top direction from an AC module.
- In cases of portrait in reverse and landscape in common, AC cables run below the microinverter to meet another AC cable. Keep in mind to fasten the AC cables on frames or PV racks in order to keep them off of the roof surface.

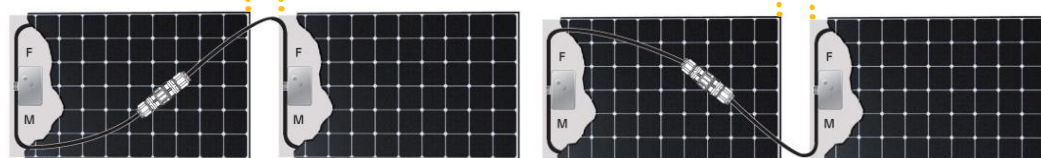
Portrait in common



Portrait in reverse



Landscape in common

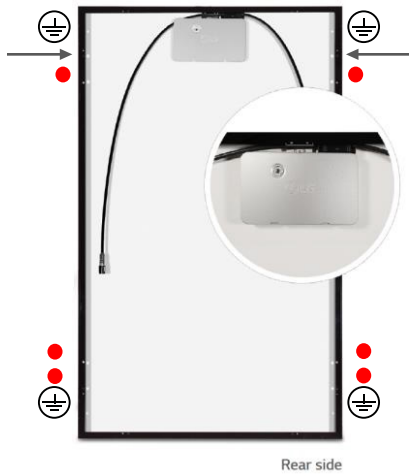


Fastening AC cables on PV racks or AC module frames

- Use cable clips in order to fasten the AC cables on AC module frames or PV racks.
- Keep the AC cables off of roof surface or ground.
- For cases of portrait in reverse or landscape in common, steps are described to recommend to fasten AC cables on AC module frames and PV racks.

For portrait in reverse or landscape in common:

- Get the AC cable paired.
- Use a mounting hole with a cable clip for fastening the AC cable on the AC module frame. Mounting holes are placed in red dots as displayed in the rear side of an AC module.
- Attach another AC cable on near PV racks.



Rear side



Location of mounting hole

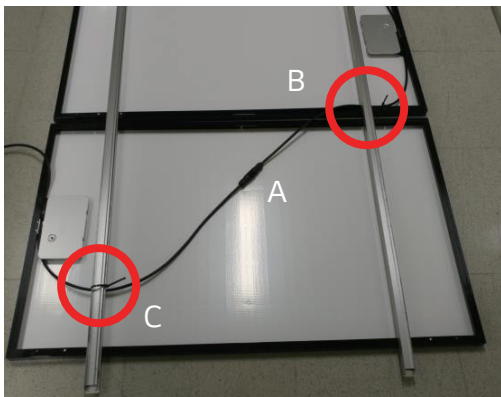


Location of grounding hole

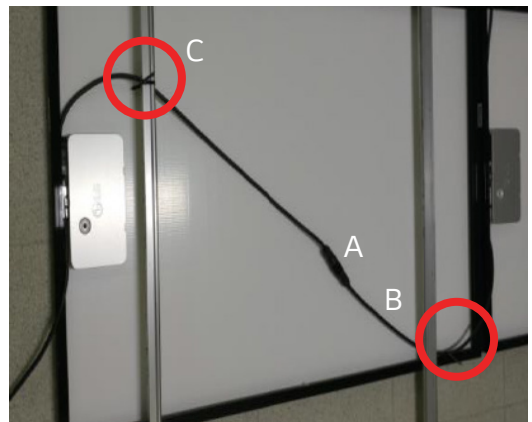
→ Mounting holes can be used for cable clip



Cable Management Clip



Portrait in reverse



Landscape in common

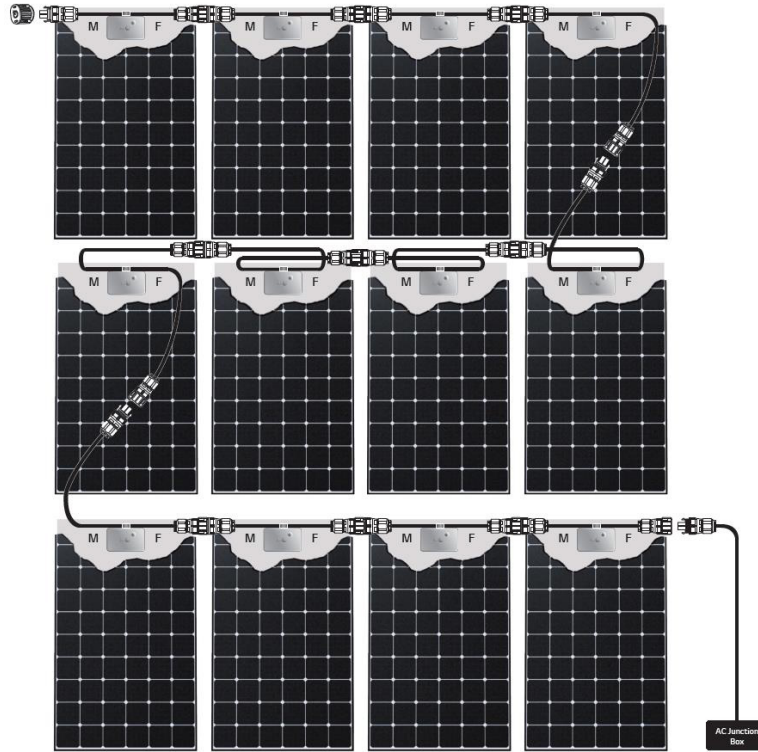


Possible combination of AC modules for array design

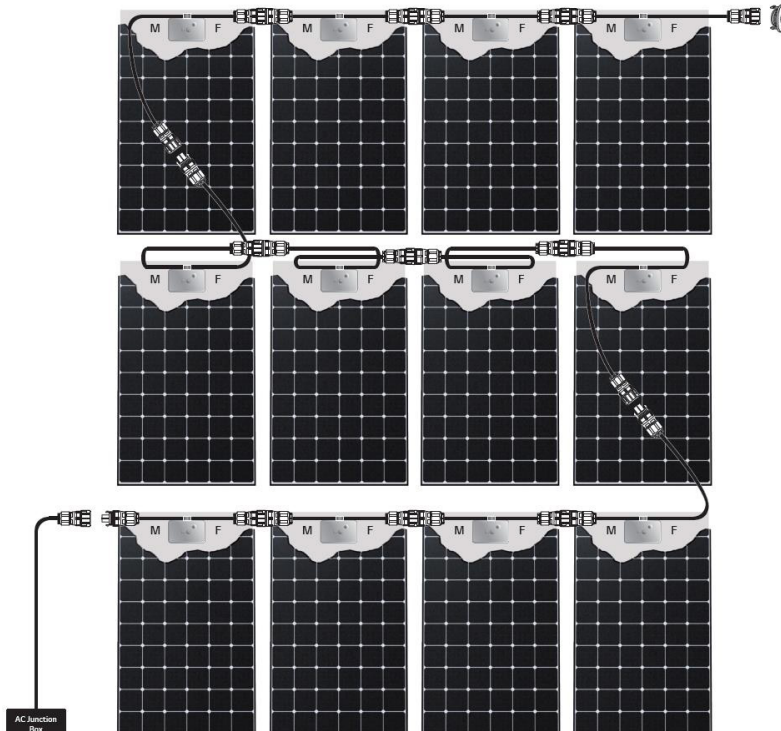
- M Male connector
- F Female connector

If AC junction box is on the right side of a 3-by-4 PV array in portrait orientation,

Use proper transition cable for connecting the array with the AC junction box. (Refer to **3-12 Connecting Array of AC Modules-to-Distribution Panel** guiding installers to make a transition cable from an extension cable) Seal the AC cable male or female connectors of the last AC module using an appropriate end cap. End caps can be found in an extension cable.



If AC junction box is on the left side of a 3-by-4 PV array in portrait orientation,



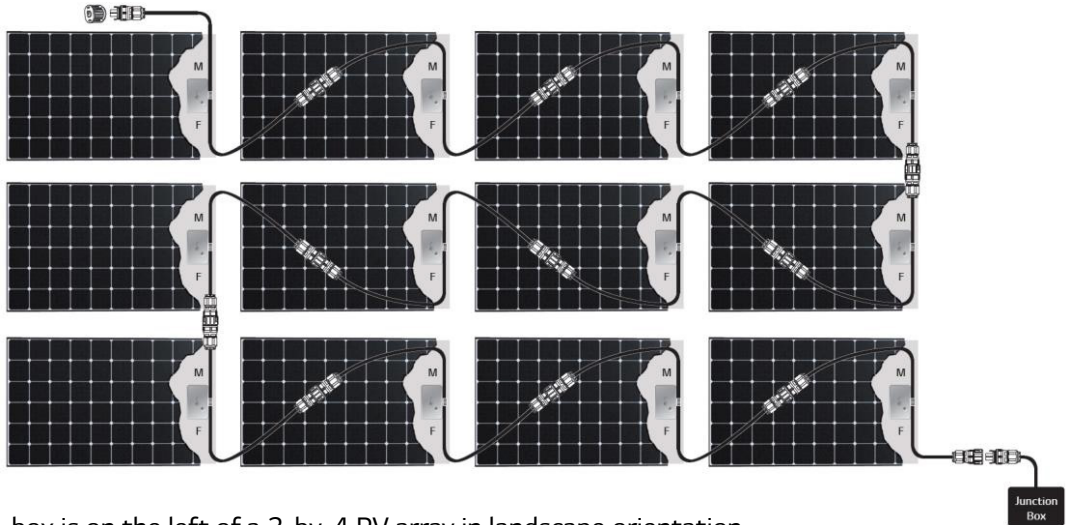


Possible combination of AC modules for array design

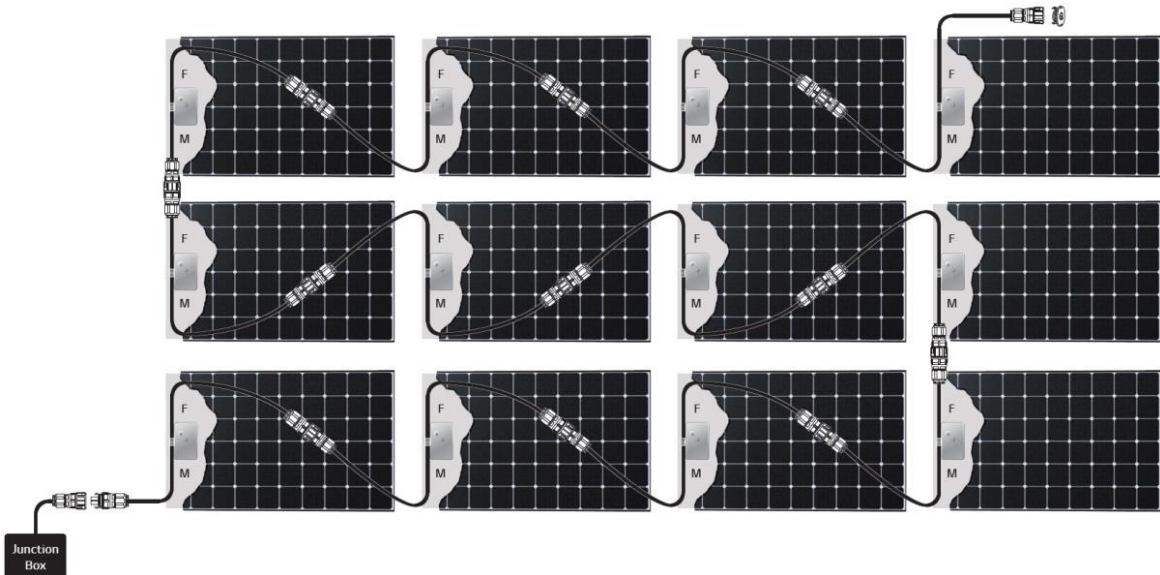
- M Male connector
- F Female connector

If AC junction box is on the right side of a 3-by-4 PV array in landscape orientation,

Use proper transition cable for connecting the array with AC junction box. (Refer to **3-12 Connecting Array of AC Modules-to-Distribution Panel** guiding installers to make a transition cable from an extension cable) Seal the AC cable male or female connector of the last AC module using an appropriate end cap. End caps can be found in an extension cable.

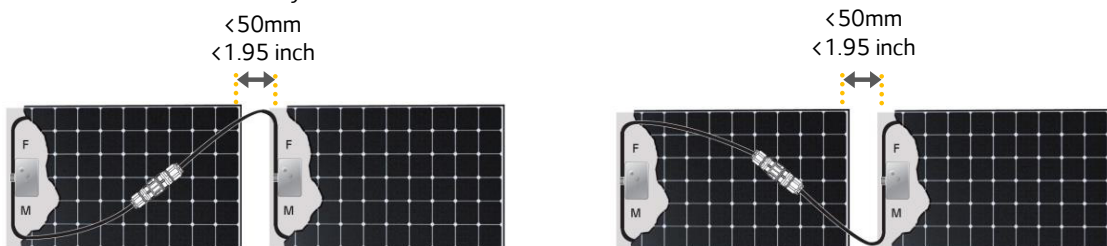


If AC junction box is on the left side of a 3-by-4 PV array in landscape orientation,



Requirement for the landscape formation.

Unlike a connection in a portrait orientation, two AC modules in a landscape orientation must be placed with a gap of at least 6mm (0.24 inch) and no more than 50mm (1.95 inch). Otherwise, the length of the AC cables is not enough for male and female connectors to be fully connected.





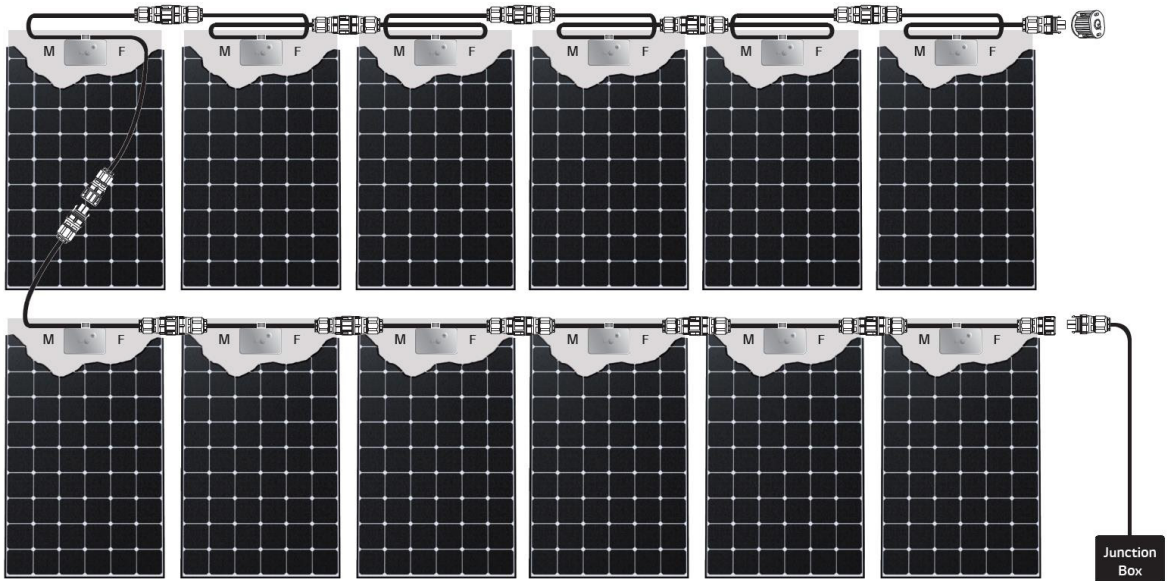
Possible combination of AC modules for array design

M Male connector

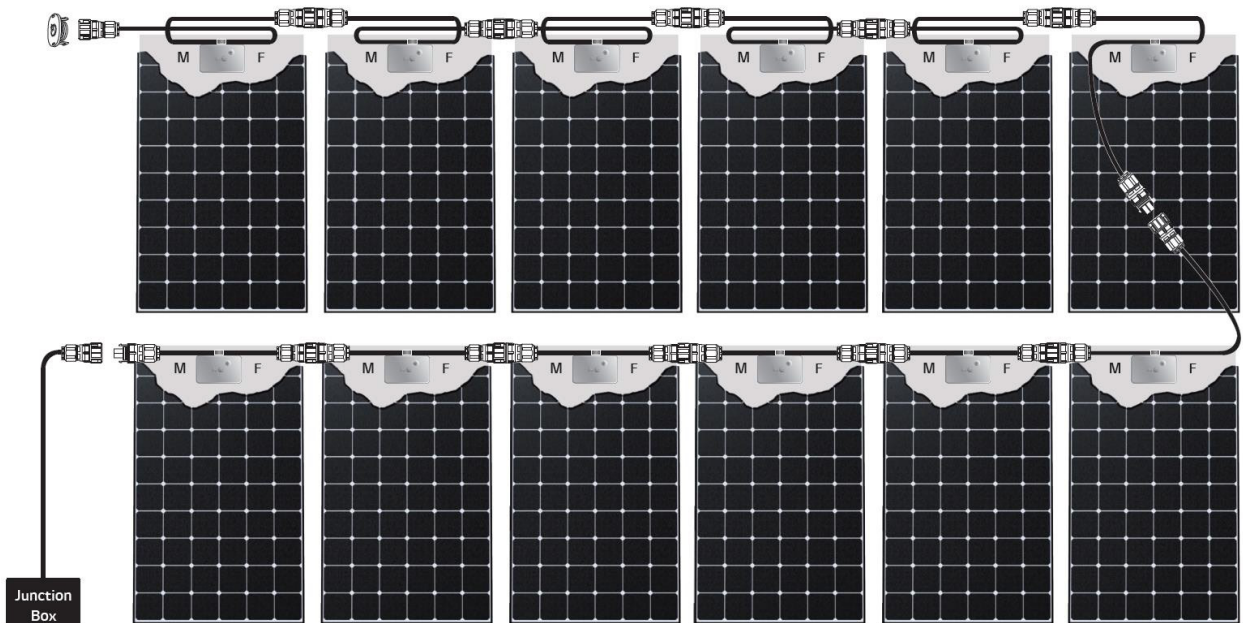
F Female connector

If AC junction box is on the right side of a 2-by-6 PV array in portrait orientation,

Use proper transition cable for connecting the array with AC junction box. (Refer to **3-12 Connecting Array of AC Modules-to-Distribution Panel** guiding installers to make a transition cable from an extension cable) Seal the AC cable male or female connector of the last AC module using an appropriate end cap. End caps can be found in an extension cable.



If AC junction box is on the left side of a 2-by-6 PV array in portrait orientation,





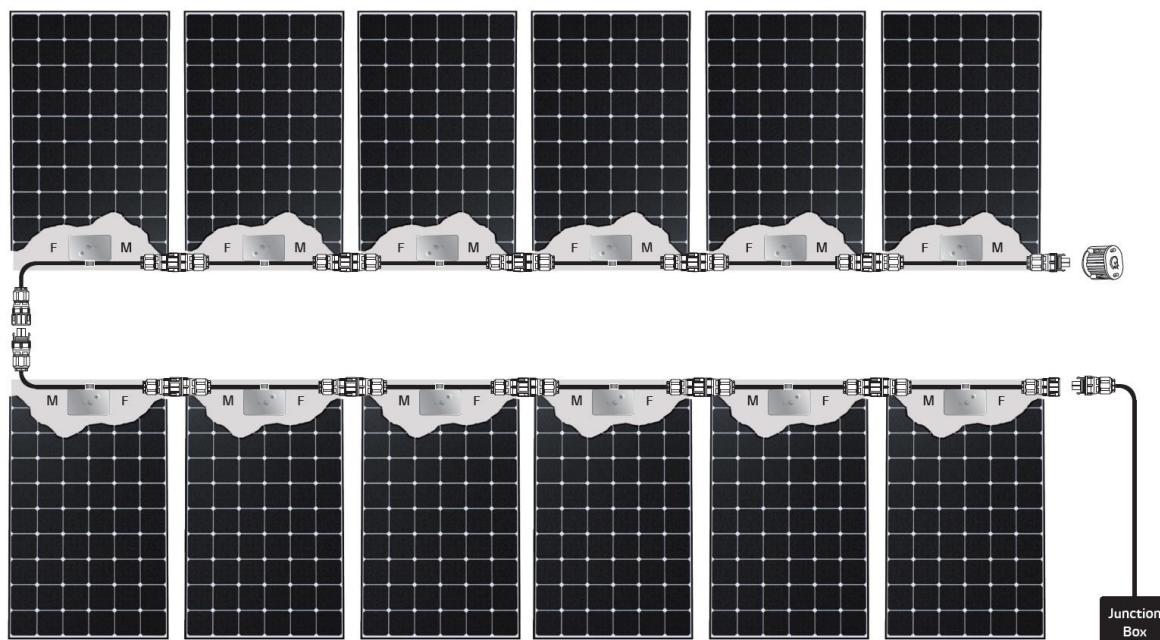
Possible combination of AC modules for array design

M Male connector

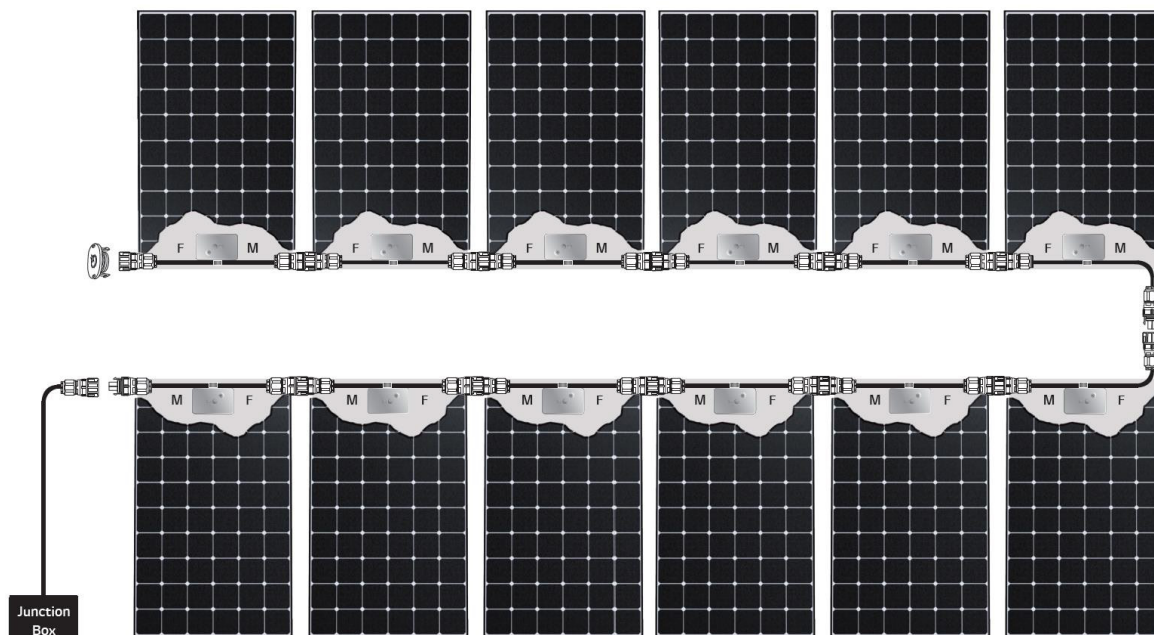
F Female connector

If AC junction box is on the right side of a 2-by-6 PV array in portrait orientation,

Use proper transition cable for connecting the array with AC junction box. (Refer to **3-12 Connecting Array of AC Modules-to-Distribution Panel** guiding installers to make a transition cable from an extension cable) Seal the AC cable male or female connector of the last AC module using an appropriate end cap. End caps can be found in an extension cable.



If AC junction box is on the left of a 2-by-6 PV array in portrait orientation,



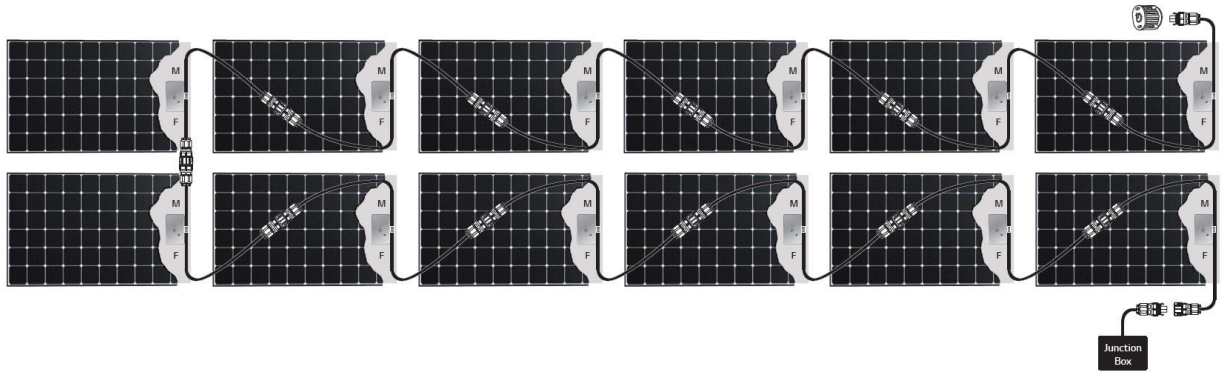


Possible combination of AC modules for array design

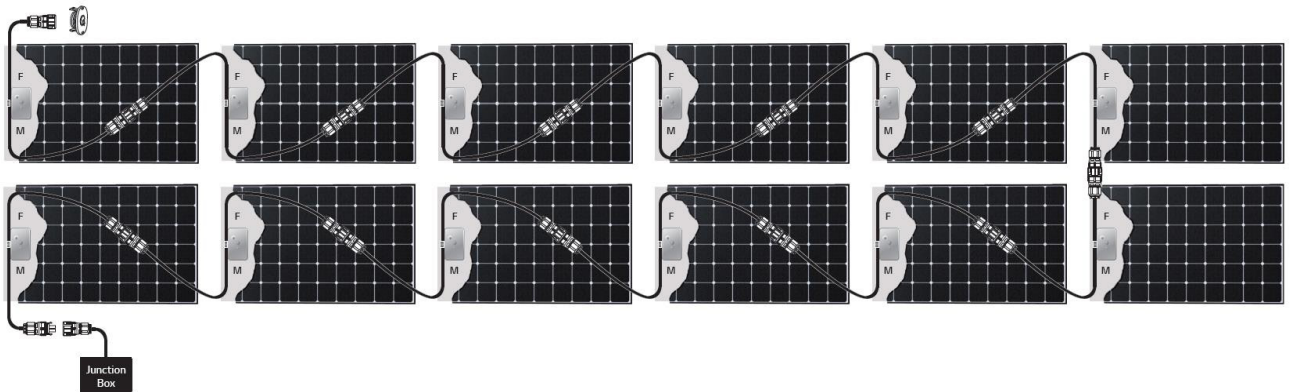
- M Male connector
- F Female connector

If AC junction box is on the right side of a 2-by-6 PV array in landscape orientation,

Use proper transition cable for connecting the array with AC junction box. (Refer to **3-12 Connecting Array of AC Modules-to-Distribution Panel** guiding installers to make a transition cable from an extension cable) Seal the AC cable male or female connector of the last AC module using an appropriate end cap. End caps can be found in an extension cable.

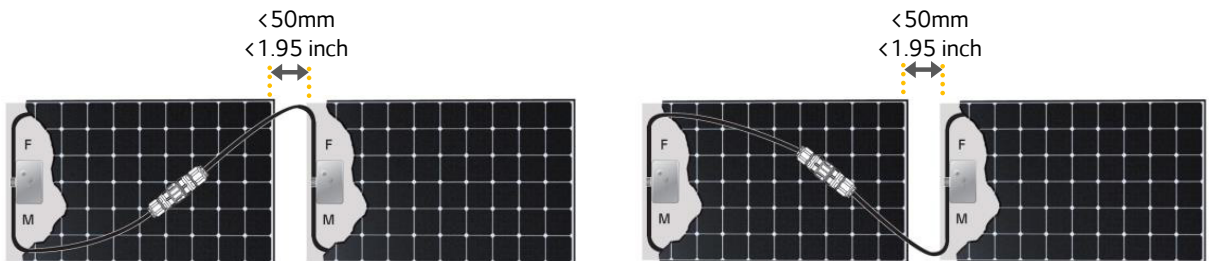


If AC junction box is on the left of a 2-by-6 PV array in landscape orientation,



Requirement for the landscape formation.

Unlike a connection in a portrait orientation, two AC modules in a landscape orientation must be placed with a gap ranging from 6mm (0.24 inch) to 50mm (1.95 inch). Otherwise, the length of the AC cables is not enough for male and female connectors to be fully connected.



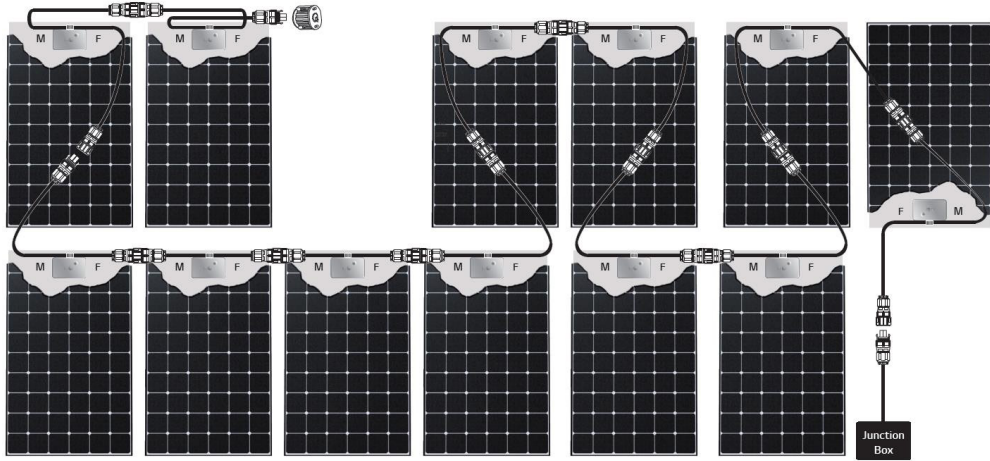


Possible combination of AC modules for array design

- M Male connector
F Female connector

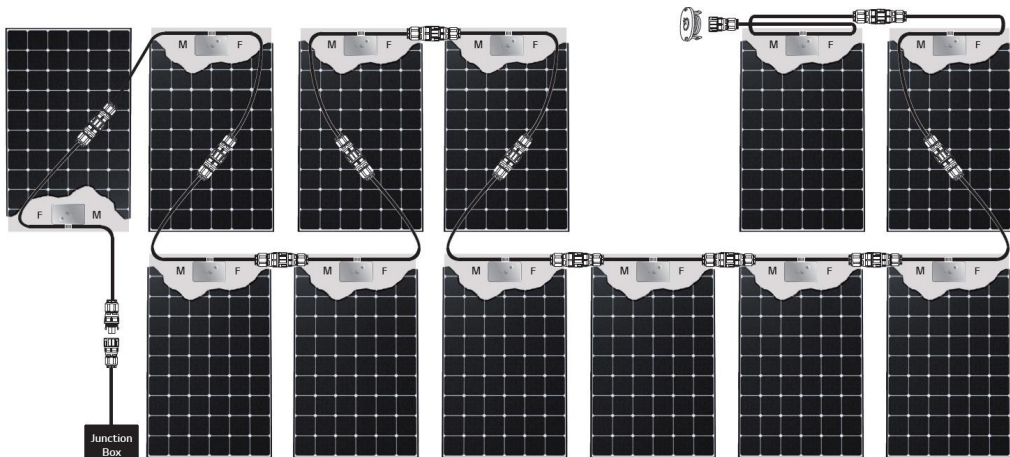
If AC junction box is on the right side of a 2-by-6 PV array in portrait orientation.

An example is described below for a case where a modification of the array design is inevitable because of a roof vent or other obstacles. The benefit of the AC module comes from a case where a connection of AC modules in reverse position can be achieved.



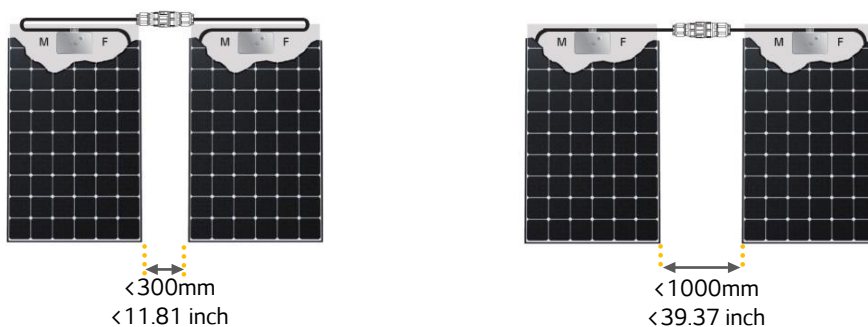
If AC junction box is on the left side of a 2-by-6 PV array in portrait orientation.

Use a proper transition cable for connecting the array with AC junction box. (Refer to **3-12 Connecting Array of AC Modules-to-Distribution Panel** guiding installers to make a transition cable from an extension cable) Seal the AC cable male or female connector of the last AC module using an appropriate end cap. End caps can be found in an extension cable.



Requirement for the connection of AC modules in reverse position.

Unlike a connection in a portrait orientation, two AC modules in a landscape orientation must be placed with a gap ranging from 6mm (0.24 inch) to 50mm (1.95 inch). Otherwise, the length of the AC cables is not enough for male and female connectors to be fully connected.





Possible combination of AC modules for array design

M Male connector

F Female connector

If AC junction box is on the right side of a 2-by-6 PV array in portrait orientation,

An example is described below for a case where a modification of the array design is inevitable because of a roof vent or other obstacles. The problem can be solved by using extension cables which are 1600 mm/63 in. long. The extension cable connectors are provided with end caps. Use the unlocking tool to remove end caps from connectors.

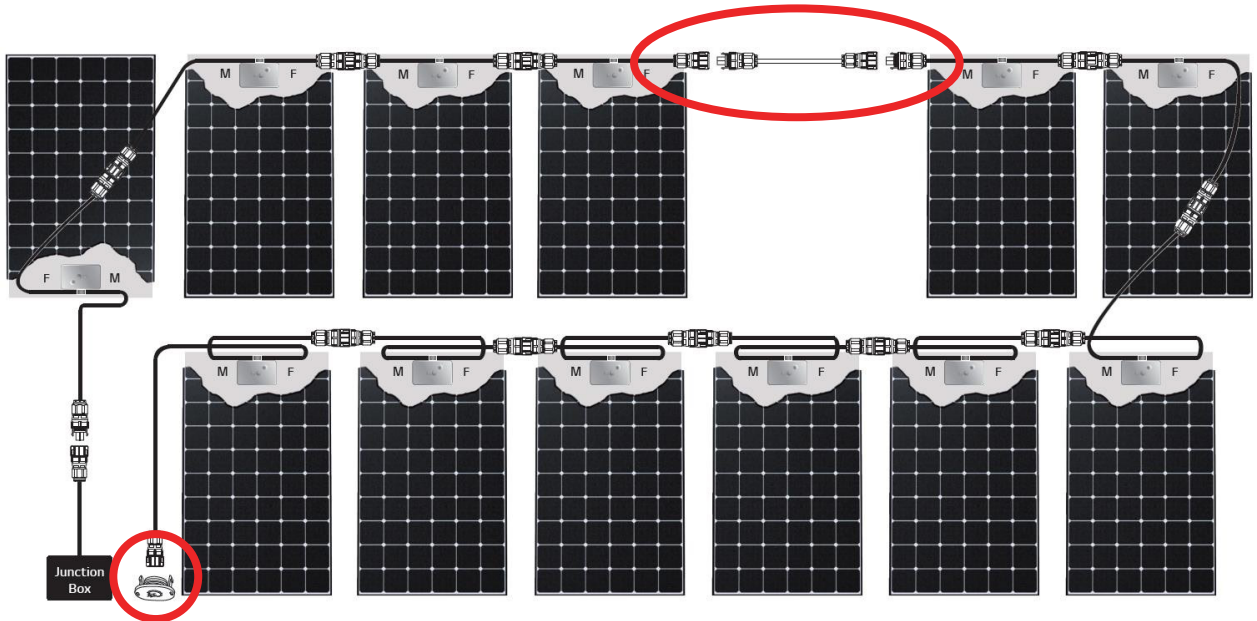


Extension Cable



Unlocking Tool

If AC junction box is on the left side of a 2-by-6 PV array in portrait orientation,






3-11 Grounding

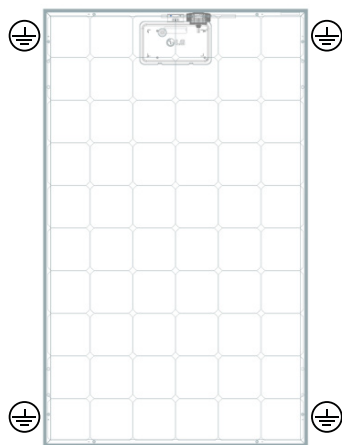
Check your information below before grounding.

Notice

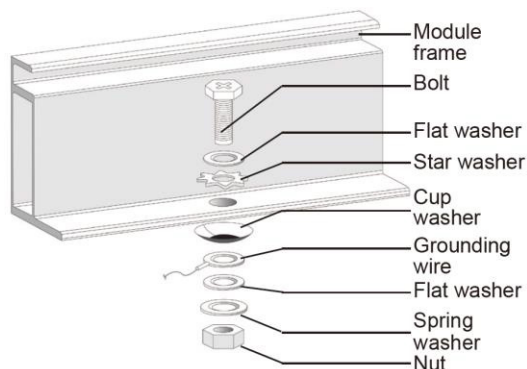
- Grounding is largely classified into equipment grounding and neutral grounding. The purpose of the equipment grounding is to prevent electric shock from contact with metal parts. Equipment grounding allows the abnormal current to flow from the equipment to the earth.
- The equipment grounding conductor and the neutral conductor are separated.
- Depending on the local code, connection between the equipment grounding conductor and the neutral conductor may be required in the distribution panel.
- In a place where lightning storms are frequent, an auxiliary grounding may need to be installed by the installer. The path comes directly from the AC module system and goes to the ground.
- To form an effective equipment grounding path, do not make any unnecessary paths.
- Make sure to follow local electric code.
- A module with exposed conductive parts is considered to be in compliance with UL 1703 only when it is electrically grounded in accordance with the instructions presented below and the requirements of the National Electrical Code.

Form the equipment grounding path from AC module to the grounded distribution panel with one connection in the following order:

- To form the effective grounding path, connect one of points marked  of a AC module frame to the PV rack.
- To electrically connect, it is recommended to use one M4 stainless steel bolt, one nut, one spring washer, two flat washers, one cup washer, and one star washer. (Minimum torque : 4~5 N·m)



● Electric connection of the PV Rack and PV Module



- Connect an equipment grounding conductor from AC module arrays to AC junction box, to form one equipment grounding system. (For grounding method, refer to **Samples for Grounding** on the next page)

※ The installation instructions shall include:

1. Wiring must be compliant with NEC Article 705.
2. Grounding methods must be compliant with NEC Article 250. Module array must be compliant with NEC Article 250 and the grounding method uses AC module frame.
3. CNL model installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part1.

⚠ WARNING



- Do not use bare-copper grounding lugs for grounding. The lugs can corrode which could result in a faulty ground circuit thereby posing risk for electric shock, electrocution or fire hazard.

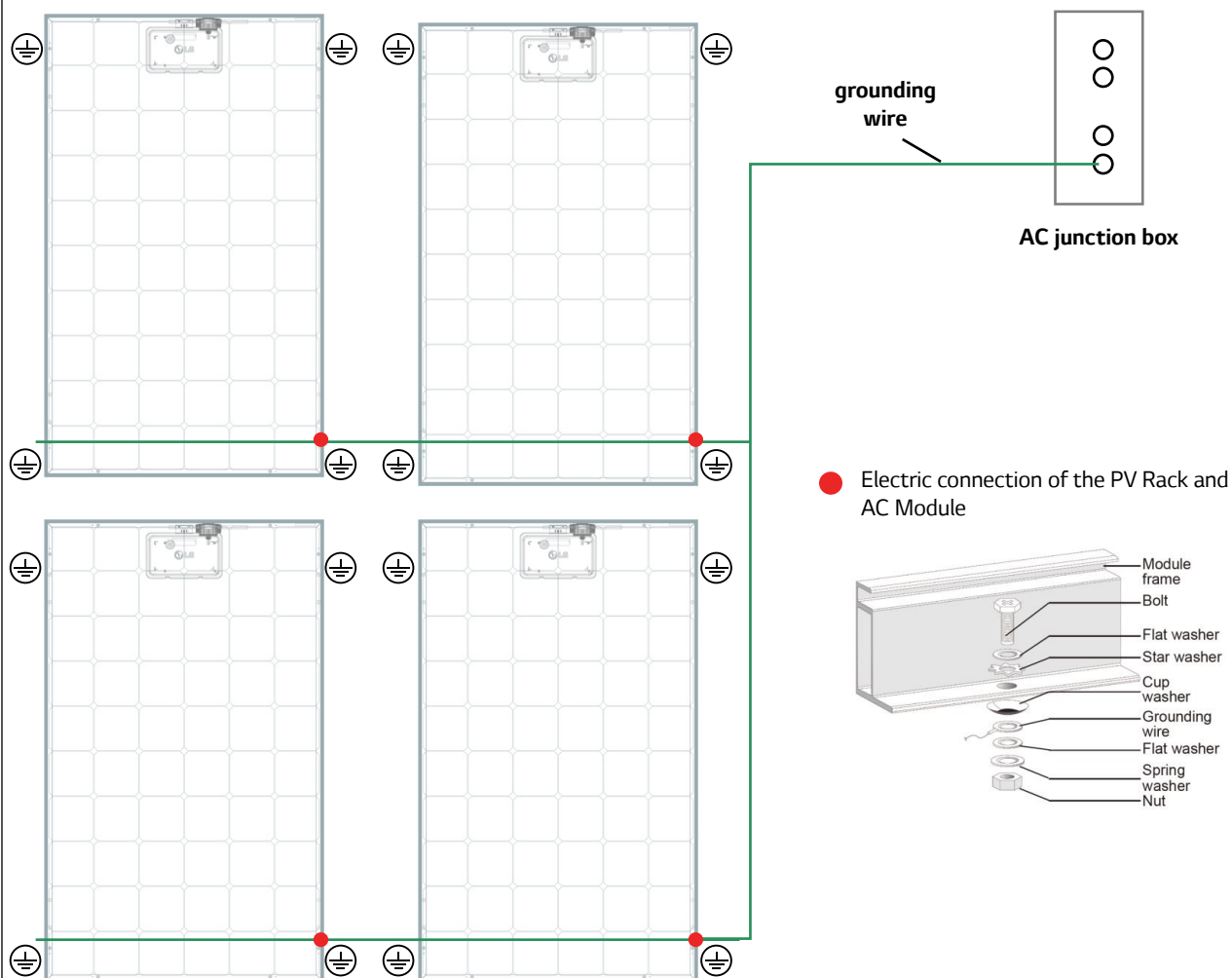


Samples for grounding

An example for the grounding method is described below.

Using ground holes on PV frames

- Determine the size of an external ground wire according to Article 690.45, NEC2014. (Grounding conductors smaller than 6 AWG shall be protected from physical damages.)
- All bare metal parts should be grounded through the connection of the PV module frame.
- Each grounding point on each PV frame is identified with ground symbol. The ground symbols are found on PV frame. This marking is etched directly into the aluminum frame.
- The combination of 2 flat washers, star washer, cup washer, spring washer, and M4 size nut and bolt made of stainless steel is required in order to provide a reliable grounding connection to the module frame.
- Use torque between 4-5N•m.



- LG AC module includes DC cables in the module's internal wiring, so no grounding is required for DC input.
- LG AC modules need to be grounded by using an external grounding equipment conductor. LG does not provide a grounding conductor.
- **The grounding method using ground holes on PV frame.**

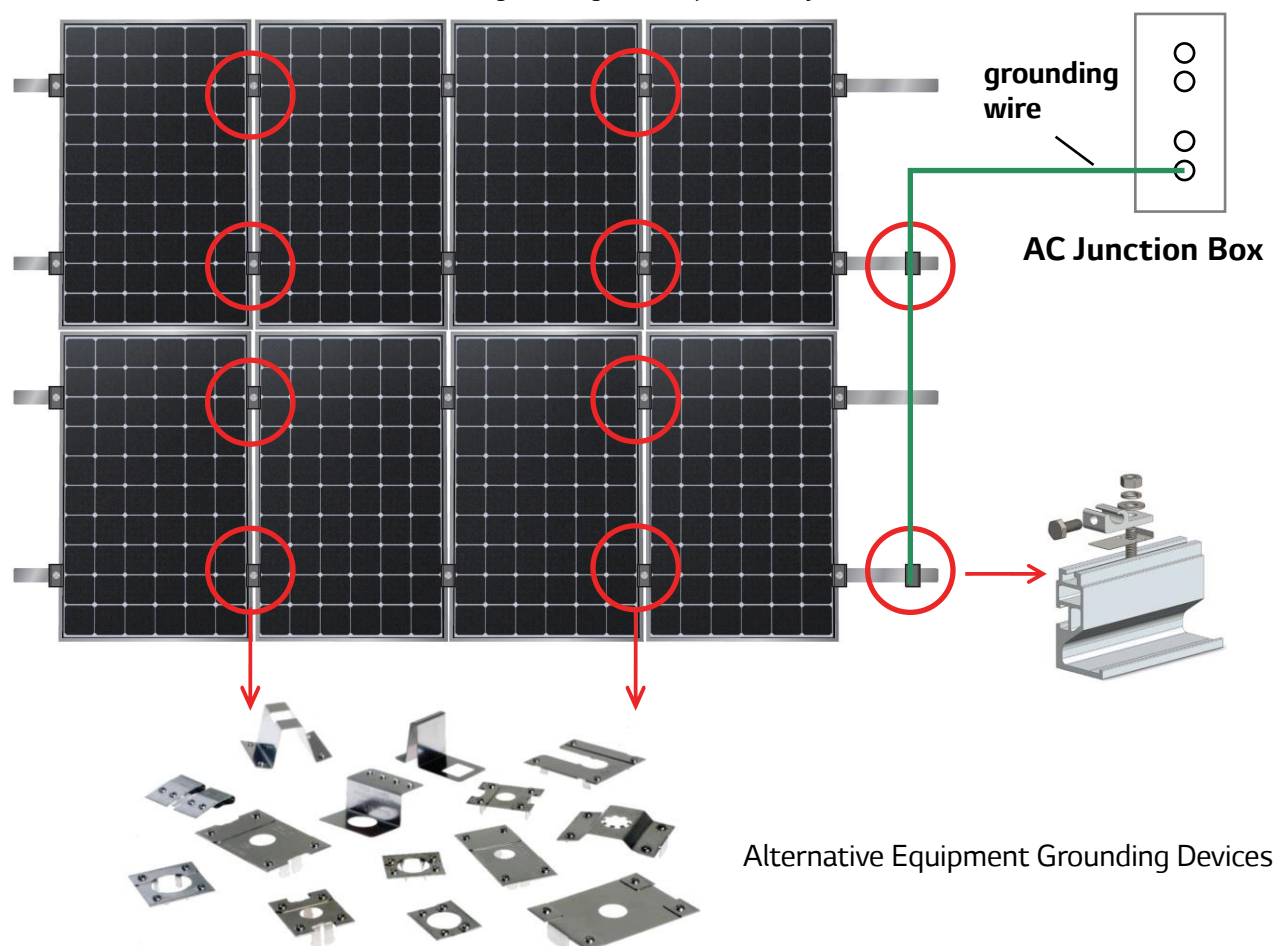


Samples for grounding

An example for the grounding method is described below.

Using alternative equipment grounding devices.

- Determine the size of an external ground wire according to Article 690.45, NEC2014.
- All bare metal parts should be grounded through the connection of the PV module frame.
- Alternative Equipment Grounding Devices are classified on a table at **Appendix 3 - Alternative Equipment Grounding Devices**.
- **Those methods and devices are not tested by UL.**
- These alternative grounding devices indicated on the appendix have been evaluated and approved by LG, not by UL.
- Please follow installation manual for the grounding devices provided by its manufacturer.



- ※ The NEC section 690.43 states that "Exposed non-current carrying metal parts of module frames, equipment, and conductor enclosures shall be grounded in accordance with 250.134 or 250.136(A) regardless of voltage."
- ※ The devices are intended for single use only. Functionality will not be guaranteed if reused.



- These alternative grounding devices indicated on the appendix have been evaluated and approved by LG, not by UL.
- Please refer to **Appendix 3 - Alternative Equipment Grounding Devices** for alternative equipment grounding devices.



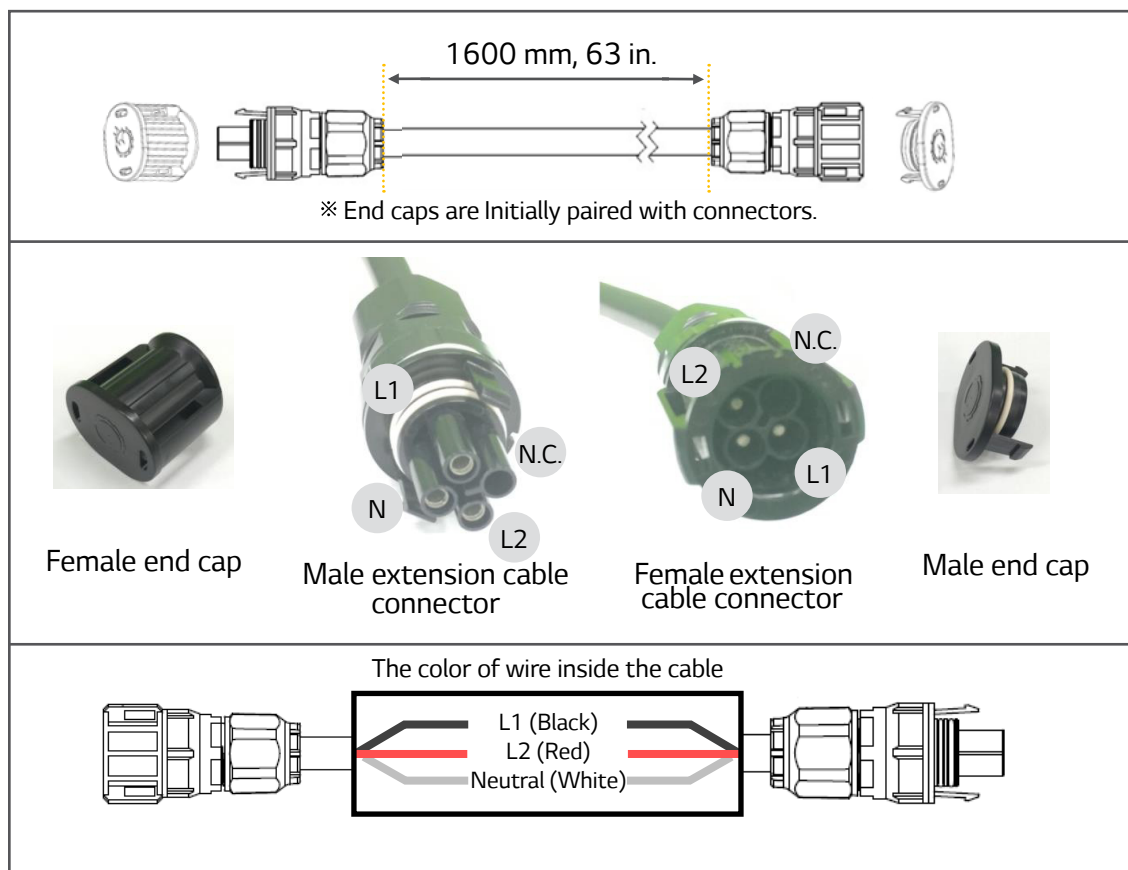
3-12 Connecting Array of AC Modules to Distribution Panel

Before connecting general AC cable from the AC junction box to distribution panel, adhere to the following items:

Notice

- To prevent the danger of electric shock, check again if the circuit breaker is turned off.
- LG does not provide separate general AC wiring coming from the distribution panel to an AC junction box.
- Undertake the Installation works using certified parts and tools.
- Do not put any liquid or metal into connectors, cables, or end caps. There is a danger of electric shock.
- Do not use any damaged cables.
- Do not use general AC conductors smaller than size of AC cables provided by LG.

Extension cable (serviceable as a transition cable)



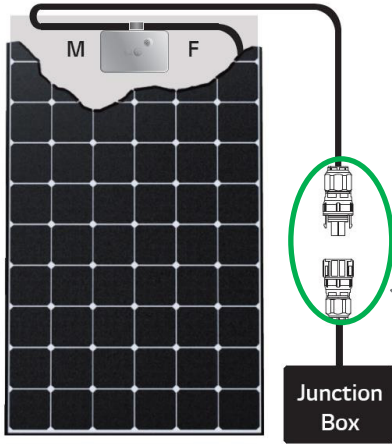
Each conductor can be identified by the color of wire.
N.C. means 'No Connection'



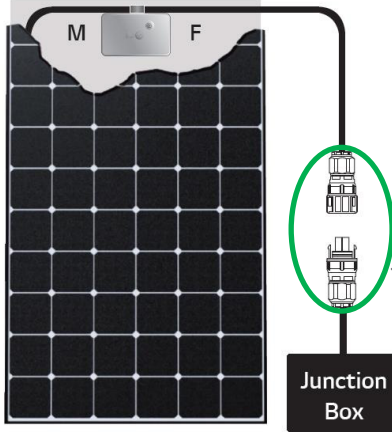
- To prevent property damage or danger to human life by fire or explosion, do not connect any load between AC module and the circuit breaker.
- To prevent the danger of electric shock, make sure to turn off the circuit breaker.



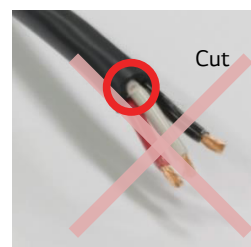
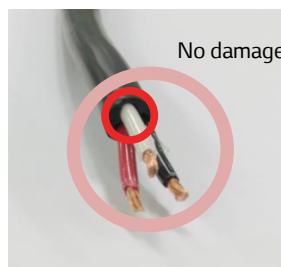
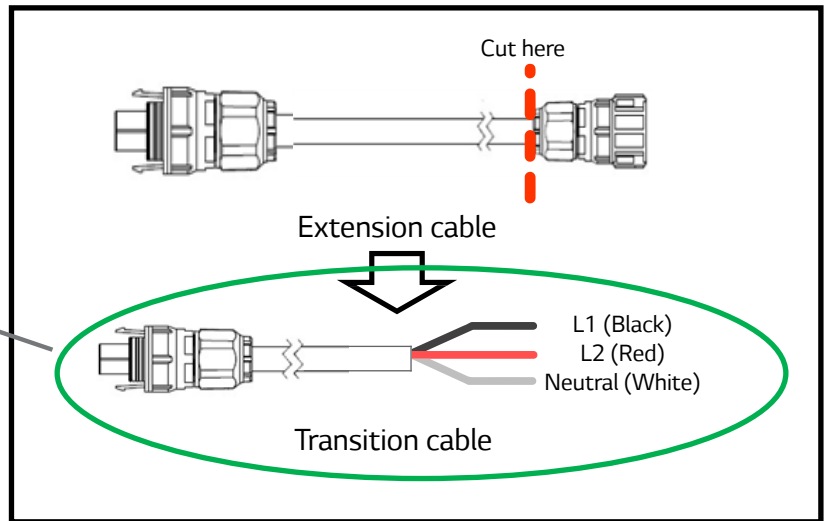
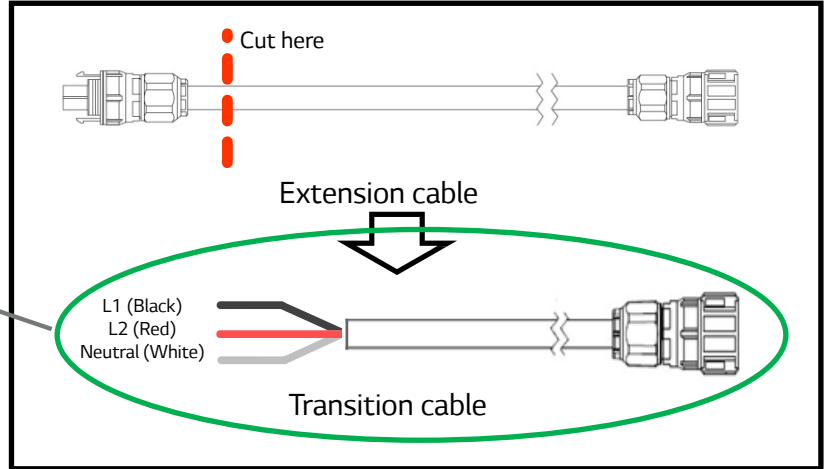
Adjust an extension cable for junction box configuration



※ Use a proper transition cable for the first AC module connector.



※ Use a proper transition cable for the first AC module connector.



※ Use appropriate tools for stripping the outer insulation of the extension cable and the inner three wires' insulation.

⚠ WARNING

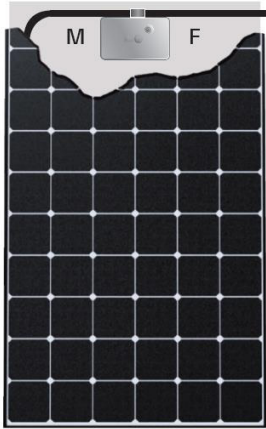


- When you cut the extension cable, please be careful about the L1, L2, Neutral wire's insulation from getting cut. Damage to the cable can be a cause of electrical short leading to a fire.
- To prevent the danger of electric shock, make sure to turn off the circuit breaker.
- Attach the AC Cable to the PV racks using the cable clips. Keep the AC cables away from the ground surface or the roof.
- All AC cable connectors must be installed underneath the module, out of rain and sun. Do not leave AC cable connectors in an environment of long-term exposure to direct sunlight or rain.
- AC wiring from the junction box to the distribution panel should be protected by a conduit.

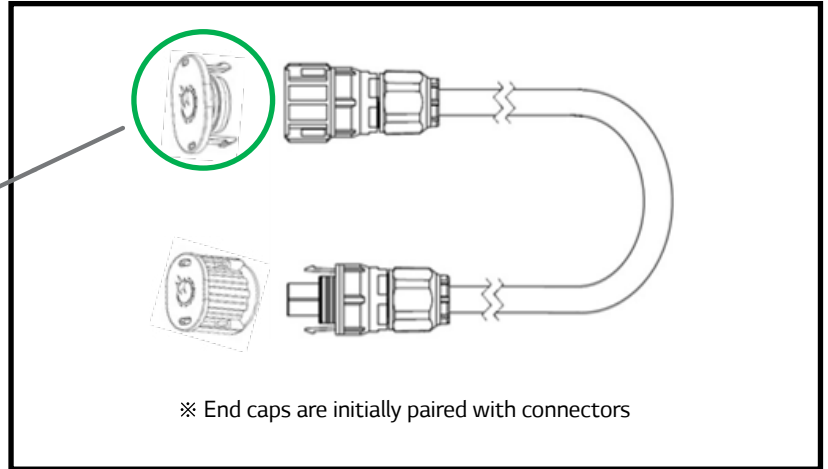


Sealing the last AC module connector

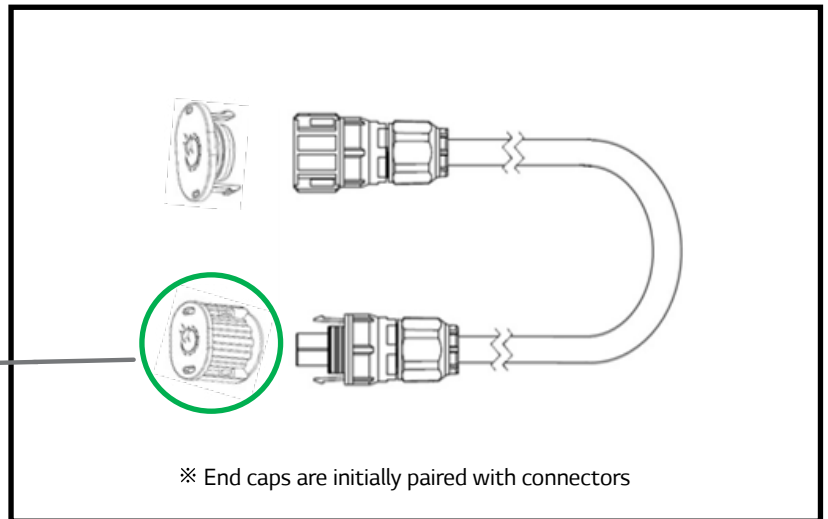
The AC cable connector of the last AC module should be sealed for weather proof function. End caps are initially paired with connectors. Installers can use a suitable end cap, as needed, for different types of connectors for the last AC module.



※ Use a proper end cap for the last AC module connector.



※ Use a proper end cap for the last AC module connector.



※ Use unlocking tool for removing an end cap from a connector. Refer to **3-8 Coupling AC cable Connectors**.

⚠ WARNING



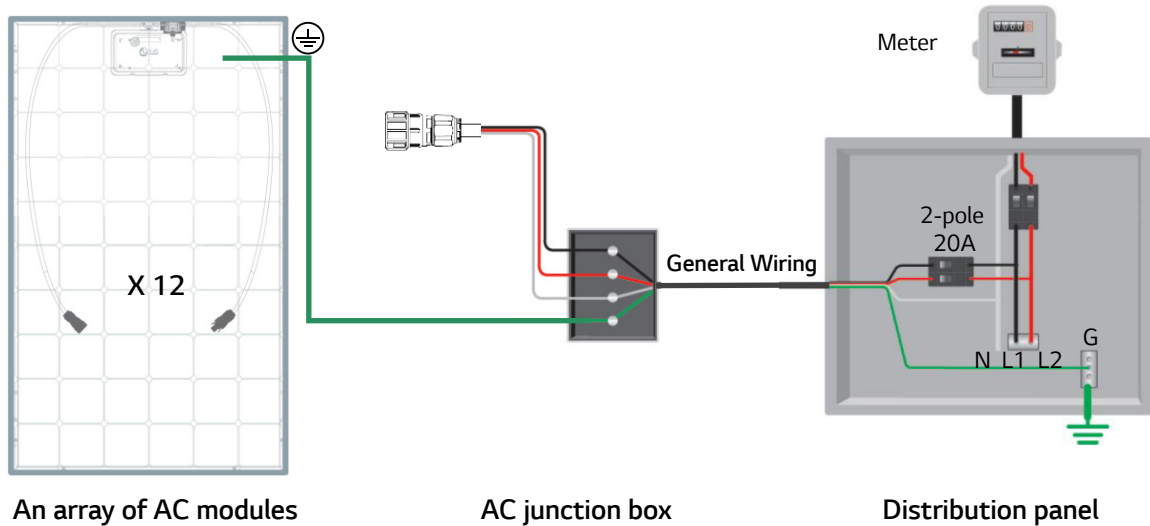
- To prevent property damage or danger to human life by fire or explosion, do not connect any load between AC module and the circuit breaker.
- To prevent the danger of the electric shock, make sure to turn off the circuit breaker.
- Attach the AC Cable to the PV racks using the cable clips. Keep the AC cables away from the ground surface or the roof.
- All of AC cable connectors must be installed underneath the module, out of rain and sun. Do not leave AC cable connectors in an environment of long-term exposure to direct sunlight or rain.
- AC cables from the junction box to the distribution panel should be protected by a conduit.



Connect the general AC cables in the following order:

AC output single phase 240VAC

There is an example for AC output cables connection of single phase 240VAC below.
The microinverter is compatible with 240VAC/120VAC and 208VAC/120VAC. No additional setting is required.



Transition Cable		
Conductor	Color	Description
L1	Black	Line to neutral voltage 120VAC
L2	Red	Line to neutral voltage 120VAC
Neutral	White	Neutral between L1 and L2
External Equipment Grounding Conductor (Array ↔ AC junction box)		
Ground	Green/Bare	Conductor to connect normally non-current carrying metal parts of equipment together
General Wiring		
L1	Black	Line to neutral voltage 120VAC
L2	Red	Line to neutral voltage 120VAC
L1-L2	-	Line to line voltage 240VAC
Neutral	White	Neutral between L1 and L2
Ground	Green	Conductor to connect normally non-current carrying metal parts of equipment together

- Step 1. Check your distribution panel to figure out what type of AC distribution system you have. Use a volt-meter to find out the phase and line-to-line voltage across L1, L2 and neutral. If the AC distribution system has 240VAC for L1-L2 and 120VAC for L1-N and L2-N, the AC modules should not be connected more than 12 AC modules per a 2-pole 20AMP circuit breaker as described above.
- Step 2. Install an AC junction box in an appropriate position for a transition cable to reach to the last AC module. If necessary, move the AC junction box close to the last AC module.
- Step 3. Check the extension/transition cables to verify they have not been pulled too tight or are hanging too loose. Attach cables on a structure like PV racks or rails using the cable clips. Also, place extension/transition cables or AC cables under a structure so that wires can avoid direct sunlight exposure and water immersion.
- Step 4. Connect the equipment's grounding conductor from all of the AC modules to the AC junction box by connecting to the distribution panel.
- Step 5. Make sure that a conduit protects wires from the AC junction box to the distribution panel from rain, snow or direct sunlight.

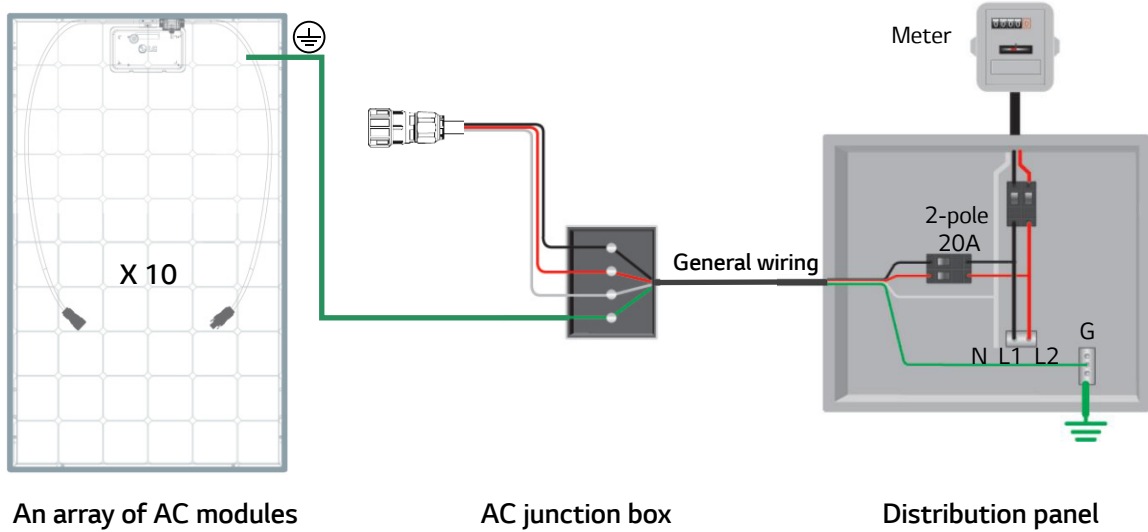


Connect the general AC cables in the following order:

AC output single phase 208VAC

There is an example for AC output cables connection of single phase 208VAC below.

The microinverter is compatible with 240VAC/120VAC and 208VAC/120VAC. No additional setting is required.



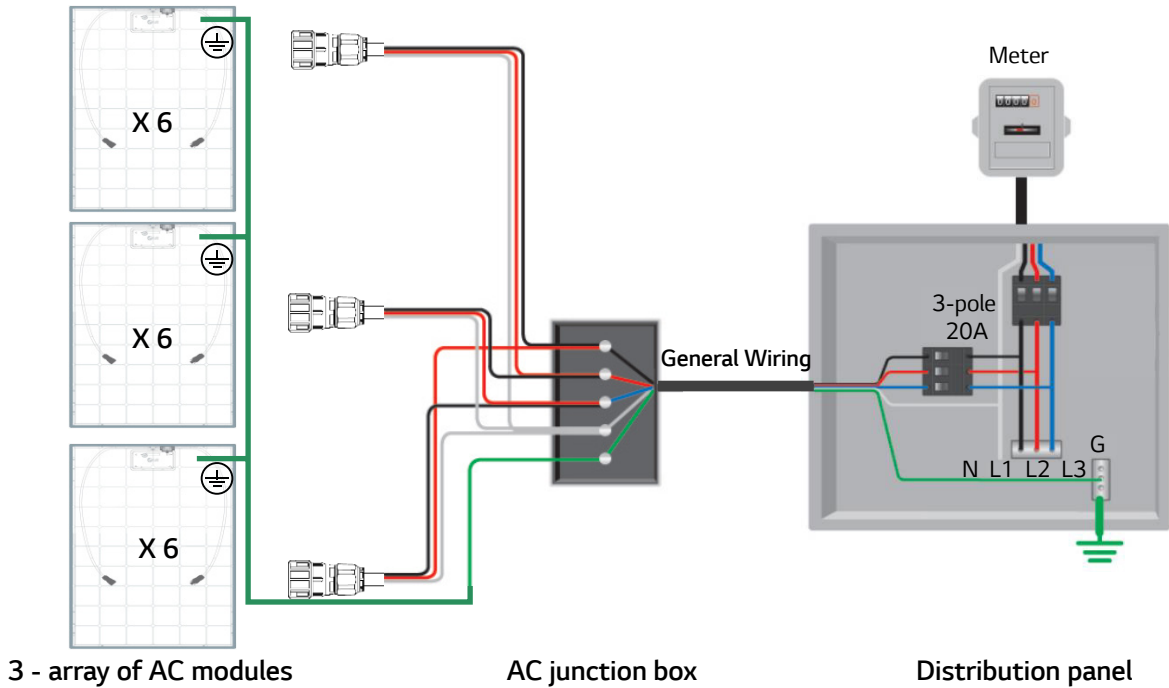
Transition Cable		
Conductor	Color	Description
L1	Black	Line to neutral voltage 120VAC
L2	Red	Line to neutral voltage 120VAC
Neutral	White	Neutral between L1 and L2
External Equipment Grounding Conductor (Array ↔ AC junction box)		
Ground	Green/Bare	Conductor to connect normally non-current carrying metal parts of equipment together
General Wiring		
L1	Black	Line to neutral voltage 120VAC
L2	Red	Line to neutral voltage 120VAC
L1-L2	-	Line to line voltage 208VAC
Neutral	White	Neutral between L1 and L2
Ground	Green	Conductor to connect normally non-current carrying metal parts of equipment together

- Step 1. Check your distribution panel to figure out what type of AC distribution system you have. Use a volt-meter to find out the phase and line-to-line voltage across L1, L2 and neutral. If the AC distribution system has 208VAC for L1-L2 and 120VAC for L1-N and L2-N, the AC modules should not be connected more than 10 AC modules per a 2-pole 20AMP circuit breaker as described above.
- Step 2. Install an AC junction box in an appropriate position for a transition cable to reach to the last AC module. If necessary, move the AC junction box close to the last AC module.
- Step 3. Check the extension/transition cables to verify they have not been pulled too tight or are hanging too loose. Attach cables on a structure like PV racks or rails using the cable clips. Also, place extension/transition cables or AC cables under a structure so that wires can avoid direct sunlight exposure and water immersion.
- Step 4. Connect the equipment's grounding conductor from all of the AC modules to the AC junction box by connecting to the distribution panel.
- Step 5. Make sure that a conduit protects wires from the AC junction box to the distribution panel from rain, snow or direct sunlight.



AC output three phase 208VAC –merge type

The three phases need to be balanced, so it is recommended to use three arrays with an equal number of AC modules in the array in each phase. Here is an example for AC output cables connected to three phase 208VAC below.



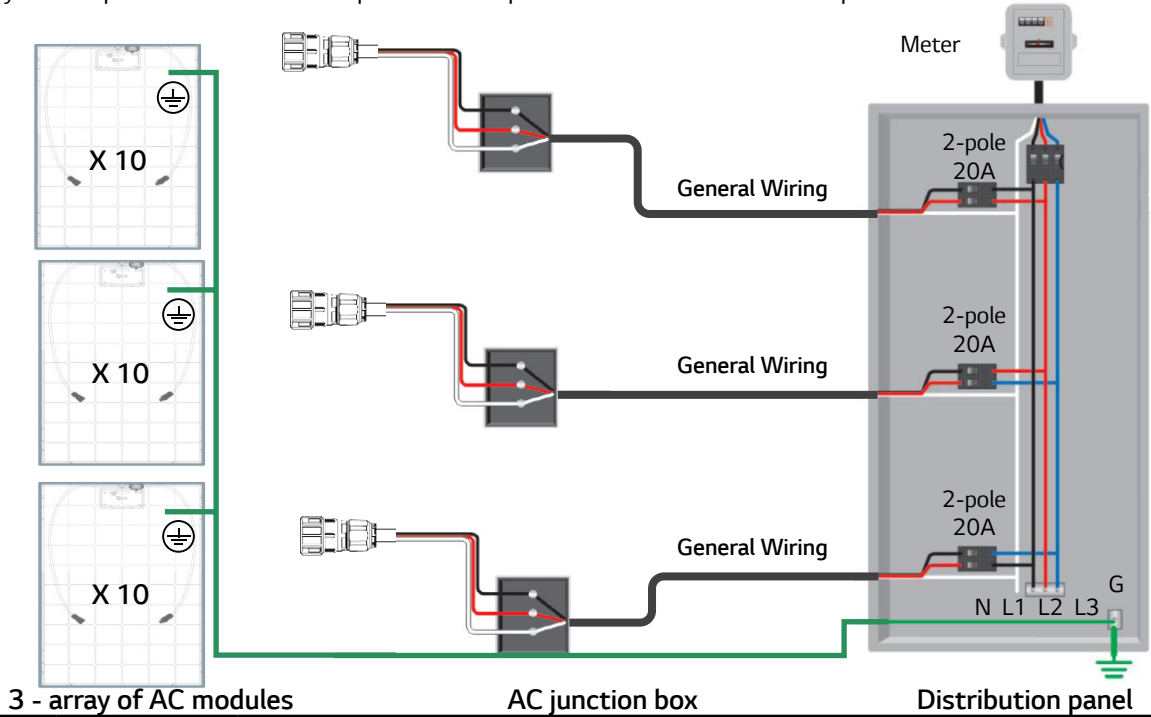
Transition Cable		
Conductor	Color	Description
L1	Black	Line to neutral voltage 120VAC
L2	Red	Line to neutral voltage 120VAC
Neutral	White	Neutral between L1 and L2
External Equipment Grounding Conductor (Array AC junction box)		
Ground	Green/Bare	Conductor to connect normally non-current carrying metal parts of equipment together
General Wiring		
L1	Black	Line to neutral voltage 120VAC
L2	Red	Line to neutral voltage 120VAC
L3	Blue	Line to neutral voltage 120VAC
L1-L2	-	Line to line voltage 208VAC
L2-L3	-	Line to line voltage 208VAC
L3-L1	-	Line to line voltage 208VAC
Neutral	White	Neutral between L1 and L2
Ground	Green	Conductor to connect normally non-current carrying metal parts of equipment together

- Step 1. Check your distribution panel to figure out what type of AC distribution system you have. Use a volt-meter to find out the phase and line-to-line voltage across L1, L2 and neutral. If the AC distribution system has 208VAC for L1-L2 and 120VAC for L1-N and L2-N, the AC modules should not be connected more than 18 AC modules for the three phase system having one 3-pole 20AMP circuit breaker at the distribution panel. And do not exceed 6 AC modules per phase.
- Step 2. Install an AC junction box in an appropriate position for a transition cable to reach to the last AC module. If necessary, move the AC junction box close to the last AC modules.
- Step 3. Check extension/transition cables to verify they have not been pulled too tight or are hanging too loose. Attach cables on a structure like PV racks or rails using the cable clips. Also, place extension/transition cables or AC cables under a structure so that wires can avoid direct sunlight exposure and water immersion.
- Step 4. Connect the equipment's grounding conductor from all of the AC modules to the AC junction box by connecting to the distribution panel.
- Step 5. Make sure that a conduit protects wires from the AC junction box to the distribution panel from rain, snow or direct sunlight.



AC output three phase 208VAC – split type

The three phases need to be balanced, so it is recommended to use three arrays with an equal number of AC modules in the array in each phase. There is an example for AC output cables connection of three phase 208VAC below.



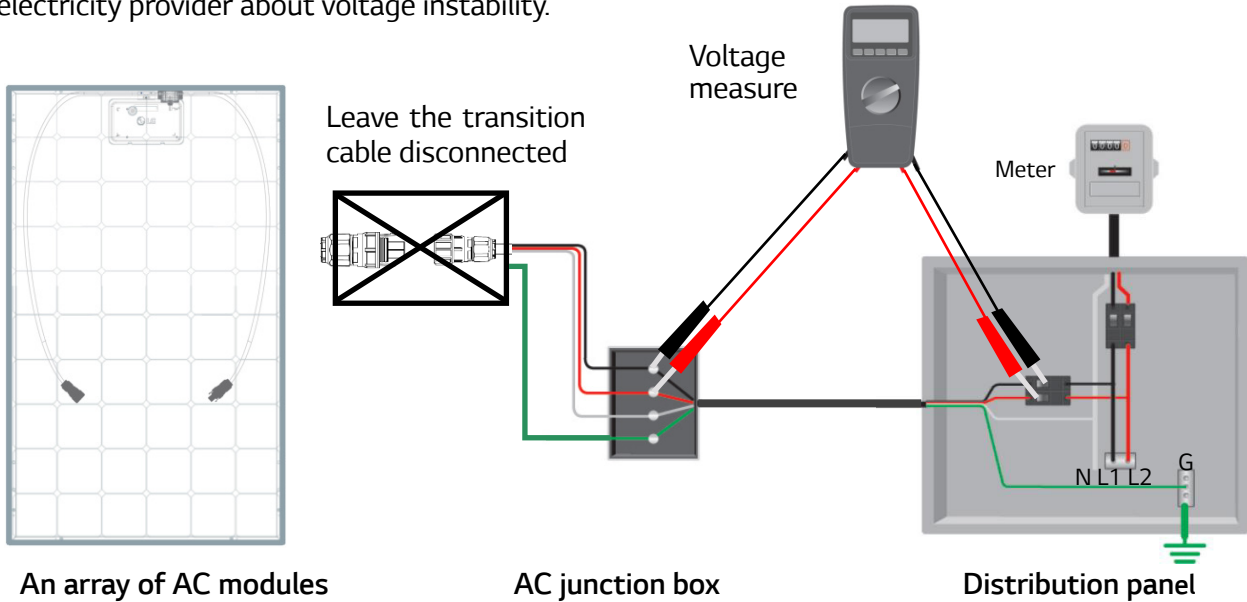
Transition Cable		
Conductor	Color	Description
L1	Black	Line to neutral voltage 120VAC
L2	Red	Line to neutral voltage 120VAC
Neutral	White	Neutral between L1 and L2
External Equipment Grounding Conductor (Array ↔ AC junction box)		
Ground	Green/Bare	Conductor to connect normally non-current carrying metal parts of equipment together
General Wiring		
L1	Black	Line to neutral voltage 120VAC
L2	Red	Line to neutral voltage 120VAC
L3	Blue	Line to neutral voltage 120VAC
L1-L2	-	Line to line voltage 208VAC
L2-L3	-	Line to line voltage 208VAC
L3-L1	-	Line to line voltage 208VAC
Neutral	White	Neutral between L1 and L2
Ground	Green	Conductor to connect normally non-current carrying metal parts of equipment together

- Step 1. Check your distribution panel to figure out what type of AC distribution system you have. Use a volt-meter to find out the phase and line-to-line voltage across L1, L2 and neutral. If the AC distribution system has 208VAC for L1-L2 and 120VAC for L1-N and L2-N, the AC modules should not be connected more than 10 AC modules for one 2-pole 20AMP circuit breaker at the distribution panel.
- Step 2. Install an AC junction box in an appropriate position for a transition cable to reach to the last AC module. If necessary, move the AC junction box close to the last AC modules.
- Step 3. Check extension/transition cables to verify they have not been pulled too tight or are hanging too loose. Attach cables on a structure like PV racks or rails using the cable clips. Also, place extension/transition cables or AC cables under a structure so that wires can avoid direct sunlight exposure and water immersion.
- Step 4. Connect the equipment's grounding conductor from all of the AC modules to the AC junction box by connecting to the distribution panel.
- Step 5. Make sure that a conduit protects wires from the AC junction box to the distribution panel from rain, snow or direct sunlight.



3-13 Grid Voltage Measurement

Measure AC voltage of the utility at the distribution panel and AC junction box using a voltmeter. Fill out the below table. If the measured voltage is out of the range which is specified in each table, ask a local electricity provider about voltage instability.



At distribution panel

Measure point	Single Phase 240V(RMS)			Single Phase 208V(RMS)			Three Phase 208V(RMS) Merge, Split Type		
	Expected	Range	Measured	Expected	Range	Measured	Expected	Range	Measured
L1 – N	120	106~132		120	106~132		120	106~132	
L2 – N	120	106~132		120	106~132		120	106~132	
L3 – N	-			-			120	106~132	
L1 – L2	240	211~264		208	183~229		208	183~229	
L2 – L3	-						208	183~229	
L3 – L1	-						208	183~229	

At AC junction box

Measure point	Single Phase 240V(RMS)			Single Phase 208V(RMS)			Three Phase 208V(RMS) Merge, Split Type		
	Expected	Range	Measured	Expected	Range	Measured	Expected	Range	Measured
L1 – N	120	106~132		120	106~132		120	106~132	
L2 – N	120	106~132		120	106~132		120	106~132	
L3 – N	-			-			120	106~132	
L1 – L2	240	211~264		208	183~229		208	183~229	
L2 – L3	-						208	183~229	
L3 – L1	-						208	183~229	

⚠ WARNING

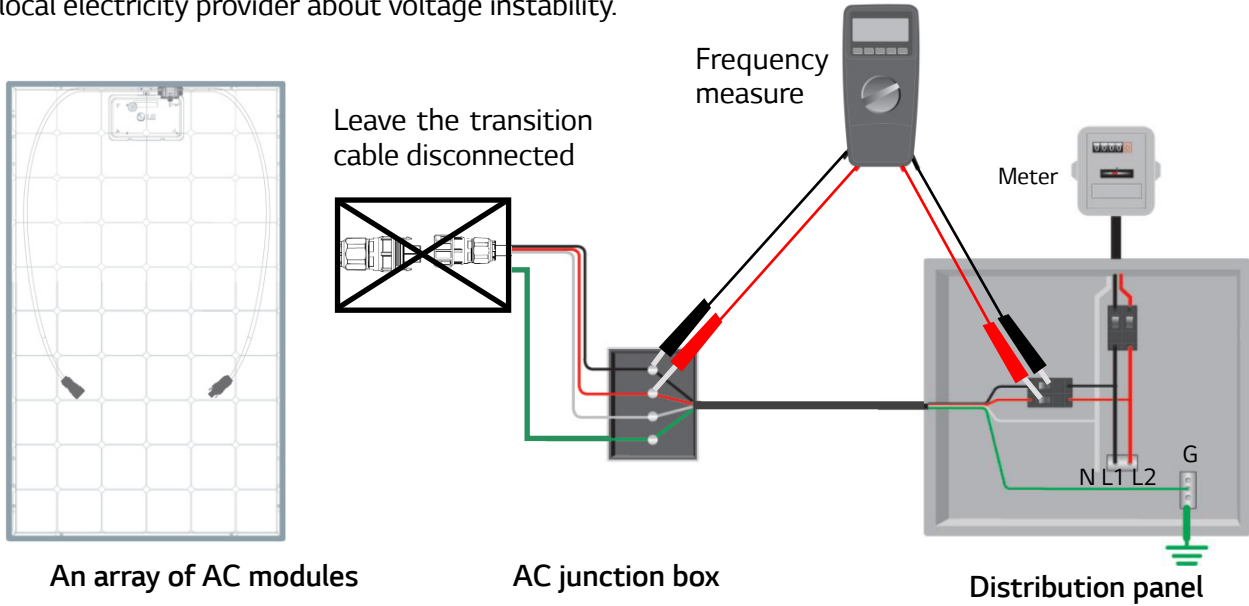


- Plan the installation work in moderate weather. There is a risk of electric shock when it is snowing or raining.
- To prevent the risk of accidents, use proper PPE (Personal Protective Equipment) including helmets, eye protection and gloves at all times.
- If installation location is high above ground, make sure to use Fall Protection System during installation.
- For safety, only qualified personnel should perform the services.



3-14 Grid Frequency Measurement

Measure grid frequency of the utility at the distribution panel and AC junction box using a voltmeter. Fill out the below table. If the measured voltage is out of the range which is specified in each table, ask a local electricity provider about voltage instability.



At distribution panel

Measure point	Single Phase 240V(RMS)			Single Phase 208V(RMS)			Three Phase 208V(RMS) Merge, Split Type		
	Expected	Range	Measured	Expected	Range	Measured	Expected	Range	Measured
L1 – N	60Hz	59.4~60.4		60Hz	59.4~60.4		60Hz	59.4~60.4	
L2 – N	60Hz	59.4~60.4		60Hz	59.4~60.4		60Hz	59.4~60.4	
L3 – N	-			-			60Hz	59.4~60.4	
L1 – L2	60Hz	59.4~60.4		60Hz	59.4~60.4		60Hz	59.4~60.4	
L2 – L3	-						60Hz	59.4~60.4	
L3 – L1	-						60Hz	59.4~60.4	

At AC junction box

Measure point	Single Phase 240V(RMS)			Single Phase 208V(RMS)			Three Phase 208V(RMS) Merge, Split Type		
	Expected	Range	Measured	Expected	Range	Measured	Expected	Range	Measured
L1 – N	60Hz	59.4~60.4		60Hz	59.4~60.4		60Hz	59.4~60.4	
L2 – N	60Hz	59.4~60.4		60Hz	59.4~60.4		60Hz	59.4~60.4	
L3 – N	-			-			60Hz	59.4~60.4	
L1 – L2	60Hz	59.4~60.4		60Hz	59.4~60.4		60Hz	59.4~60.4	
L2 – L3	-						60Hz	59.4~60.4	
L3 – L1	-						60Hz	59.4~60.4	

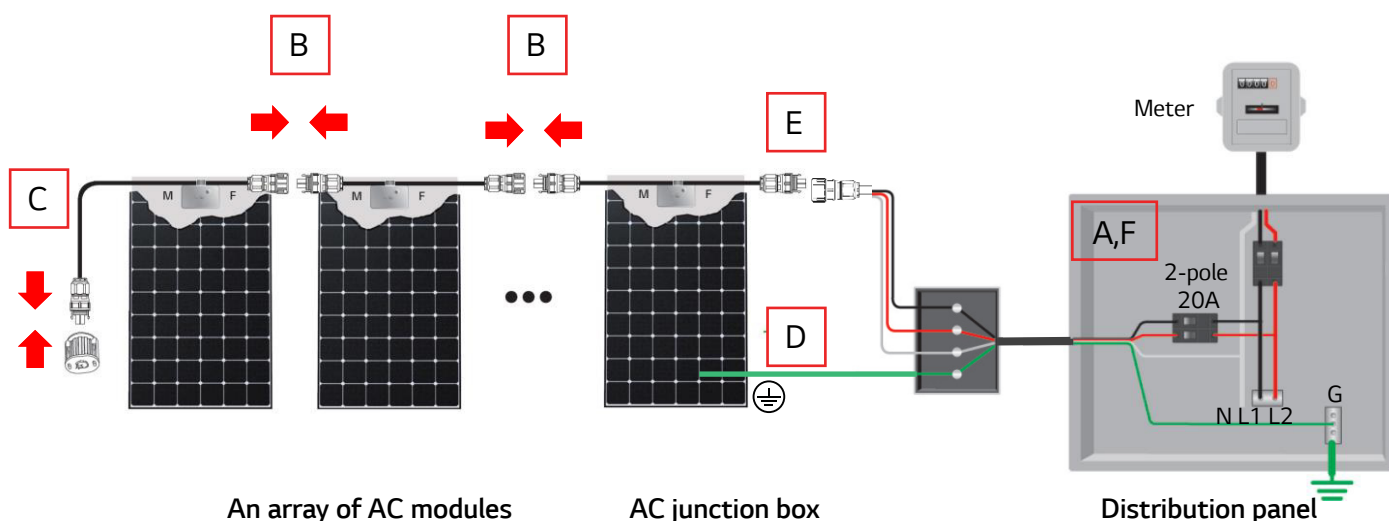
⚠ WARNING



- Plan the installation work in moderate weather. There is a risk of electric shock when it is snowing or raining.
- To prevent the risk of accidents, use proper PPE (Personal Protective Equipment) including helmets, eye protection and gloves at all times.
- If installation location is high above ground, make sure to use Fall Protection System during installation.
- For safety, only qualified personnel should perform the services.



3-15 Energizing the Installed AC Module System



- Make sure that the branch circuit breaker is initially turned off.
- Check whether all of AC cable connectors are properly engaged. Refer to **3-8 Coupling AC cable connectors** and **3-9 Building an array of AC modules**.
- Confirm that the last AC module's cable connector is appropriately sealed with an end cap.
- Ensure grounding wire connects all of AC module running to grounded distribution panel. Refer to **3-11 Grounding**.
- Engage the AC cable connector of the last AC module with connector of the transition cable which should be manually made from an extension cable.
- Turn on the circuit breaker. After approximately 6 min., the AC module system will begin producing power if sunlight is sufficient.

⚠ WARNING



- Plan the installation work in moderate weather. There is a risk of electric shock when it is raining or snowing.
- To prevent the risk of accidents, use proper PPE (Personal Protective Equipment) including helmets, eye protection and gloves at all times.
- If installation location is high above ground, make sure to use Fall Protection System during the installation.
- For safety, only qualified personnel should perform the services.



4 Communication

After completing the installation of AC modules on the rooftop or other site, next step is to install the communication gateway (EnerBox2). Before installing the gateway, adhere to the following notices:

- For reliable communication, it is recommended for the gateway (EnerBox2) to be directly installed to an outlet which is electrically connected to the distribution panel where the AC modules are also attached.
- To avoid damage and failure of the gateway, do not use at temperatures outside of 0 ~ 40°C (32 ~ 104°F).
- To avoid damage of the gateway, install the gateway in an environmentally protected location.
- To avoid malfunction of the gateway, be sure to use only the enclosed adapter and cables.
- To avoid risk of the electric shock, do not disassemble or expose to pressure.
- To avoid risk of the electric shock, do not bend or cut cables used to connect to the gateway.
- Do not expose to water.
- Only clean with a dry cloth.
- The gateway will not log energy production if the power of the gateway (EnerBox2) is off or AC cable and PLC (Power Line Communication) are disconnected. So always keep the gateway on.

WARNING

- EnerBox2's warranty may be void if cover removed. No serviceable parts inside.
- To avoid communication interference, do not connect the product to surge protector or surge protector-embedded power strips.
- It is recommended the gateway is directly connected to a 120VAC outlet.





4-1 EnerBox2 Components

After completing the installation of AC modules on the rooftop or other site, the next step is to install the communication gateway(EnerBox2) which enables home owners and installers to monitor power production of individual AC module or the entire array on a daily, monthly or an annual basis. The communication gateway is simple to setup by connecting the AC modules and internet router. Power Line Communication (PLC) method facilitates communication between the gateway and AC modules. Then the gateway collecting energy and performance data from the AC modules in real time transmits the accumulated log data to a web server through an Internet router.



1. EnerBox2 Front-side



2. EnerBox2 left-side



3. EnerBox2 bottom-side



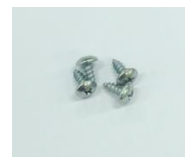
4. EnerBox2 Power-cable



5. LAN cable

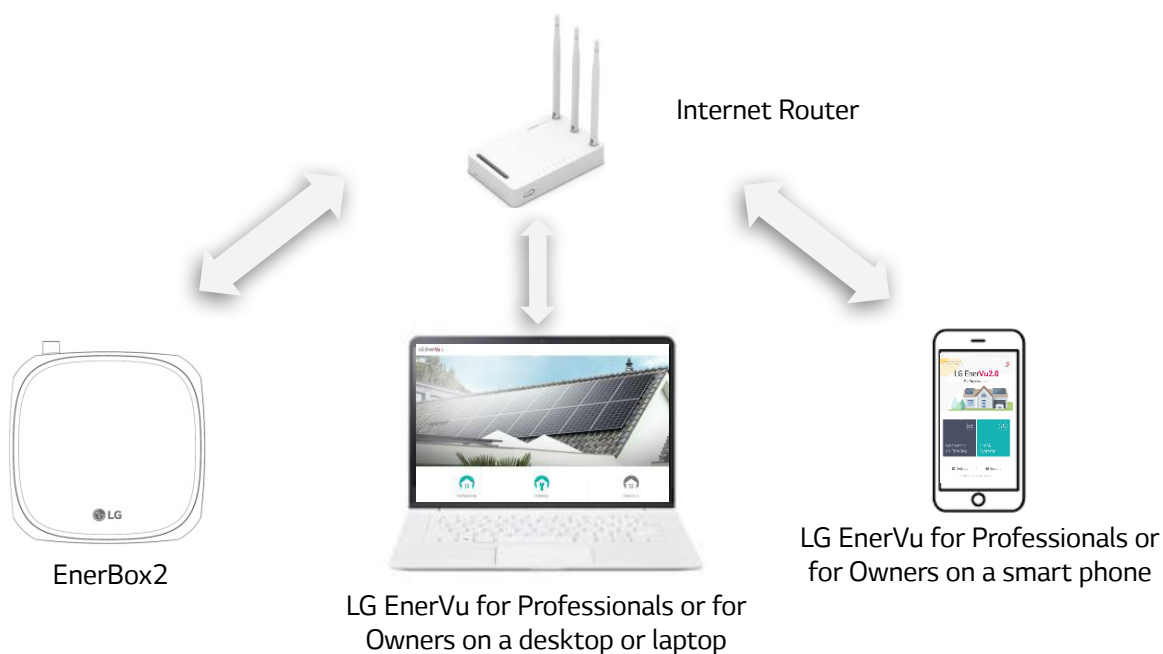


6. Wall mount bracket



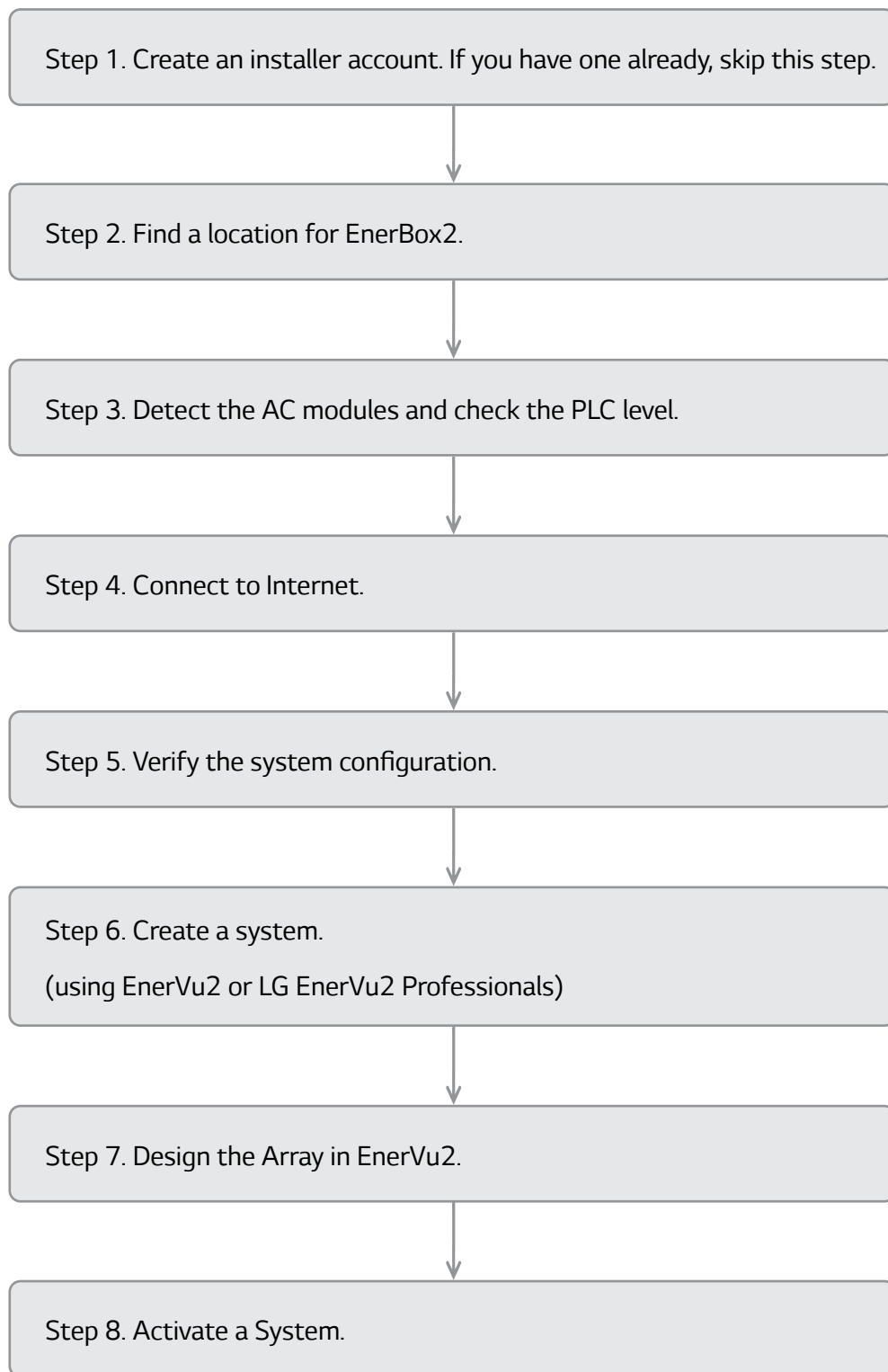
7. Wall mount bracket screws

4-2 Simple Diagram for Communication System Configuration





4-3 EnerBox2 installation procedure



※ EnerVu2 indicates a website (<https://enervu.lg-solar.com>), while LG EnerVu2 Professionals means program of mobile application. Search for the LG EnerVu Plus app in Google Play or Apple's App Store.



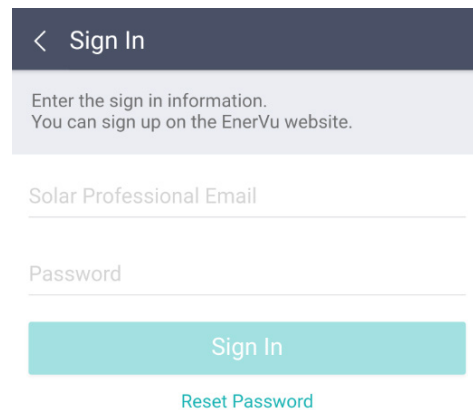
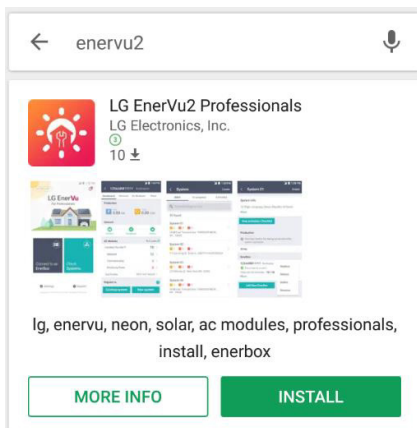
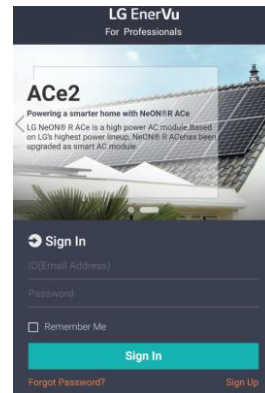
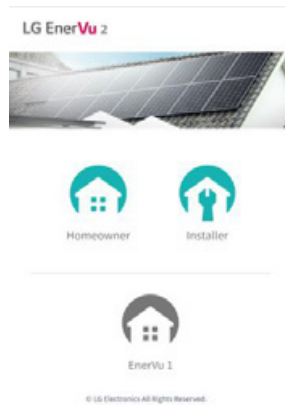
Step 1. Create an installer account. If you have one already, skip this step.

Create an installer account using a mobile phone.

- Download the EnerVu Plus app in Google Play or in Apple's App Store.
- Or you can sign up online at <http://enervu.lg-solar.com/>. If you have signed up before, please go to Step 2 directly.
- Once you generate a password through a link sent to your email, your registration is complete.



Mobile phone

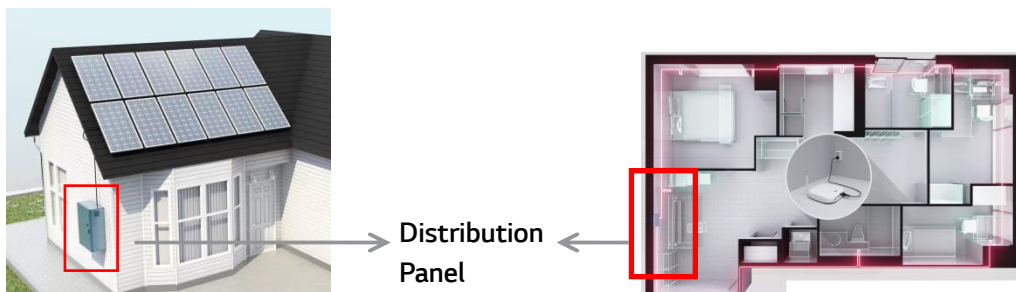


※ The mobile application is supported by Android 5.0 (Lollipop) and above versions , iOS 9 and above versions.

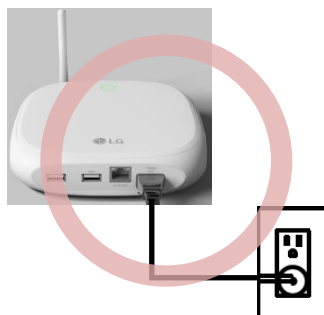


Step 2. Find a location for EnerBox2

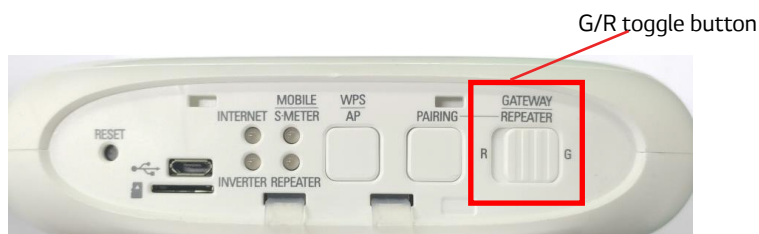
- A. Find the home's outlet that is electrically connected to the distribution panel where all of the AC modules are attached.



- B. Do not share the outlet with other home appliances like TVs, washing machines, or electronic gadgets, etc. This will create interference in communication of the EnerBox2 with AC modules.
- C. Allow the EnerBox2 to occupy the outlet exclusively.



- D. Before connecting the EnerBox2 with the power source, make sure that the gateway / repeater toggle button is positioned to the G (gateway).



EnerBox2 left-side LEDs and buttons

- E. Locate the EnerBox2 close to the main AC and plug in the EnerBox2. When the EnerBox2 starts to operate, the LED on the upper portion of the EnerBox2 will flash. Then it will turn off after the boot procedure is completed. Please do not press buttons nor pull the power cord out of the outlet during the boot procedure.

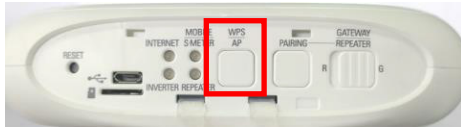


- ※ When you initiate the installed AC module system by turning the circuit breaker on inside the distribution panel, dummy fault alerts might be found on the web browser or mobile application. After the AC module system is in operation, the alerts will disappear.

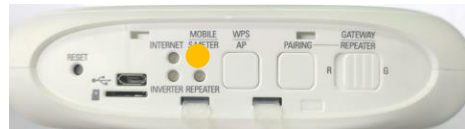


Step 3. Detect the AC modules and check the PLC level

- A. Briefly press the AP button on EnerBox2 to activate the Soft AP mode. The 'MOBILE / S-METER' LED is displayed in amber (if you push the AP button again, Soft AP mode will be deactivated).



Briefly press the AP button

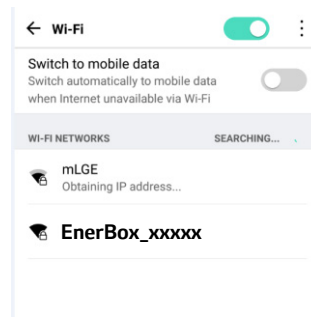


Amber color on the LED

- B. Turn Wi-Fi on in your mobile phone. Search for the SSID of **EnerBox_XXXXX** (XXXXX : five digits after EnerBox2 serial number). The password is **87654321**.



Mobile phone

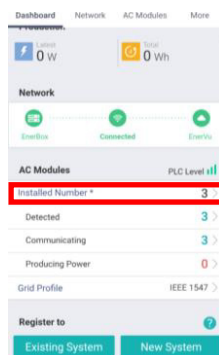


password : 87654321



EnerBox2 SSID

- C. On your mobile phone, open the LG EnerVu2 Professionals app. Tap 'Connect to an EnerBox.' It will guide you directly to the 'Dashboard.' Then touch 'Installed Number.'
- D. Put the total number of AC modules in the blank then press save.



Total Number of AC Modules

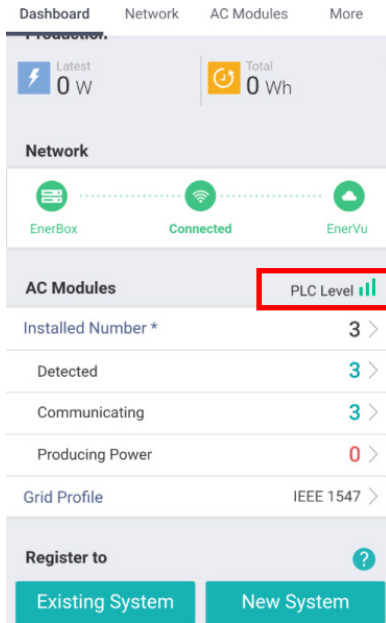
Enter the total number of AC modules that you would like to register to this EnerBox.

Number

SAVE



- E. You can check the PLC level in the dashboard. It is recommended for the PLC level to have two or three bars. If the PLC level is zero or one, relocate the EnerBox2 to a location where a few home appliances are installed or to a location closer to the main panel.

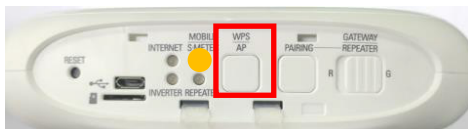


PLC level indicator

- : No PLC signal for communication. Relocate the EnerBox2 to another place.
- : Minimal PLC signal for communication. Relocate the EnerBox2 to another place.
- : Good PLC signal. Go on to next step
- : Excellent PLC signal. Go on to next step

AC Modules	PLC Level
Installed Number *	3 >
Detected	3 >
Communicating	3 >

- F. Briefly press the AP button on EnerBox2 to deactivate the Soft AP mode. The 'MOBILE / S-METER' LED will turn off.



Briefly press the AP button



The LED is off



Step 4. Connect to Internet

Method A: Wi-Fi setting with soft AP mode

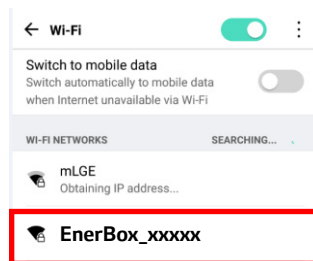
▪ Using Soft AP mode:

- A. Briefly press the AP button on EnerBox2 to activate the Soft AP mode. The 'MOBILE / S-METER' LED is displayed in amber (if you push the AP button again, Soft AP mode will be deactivated).



Amber color on the LED

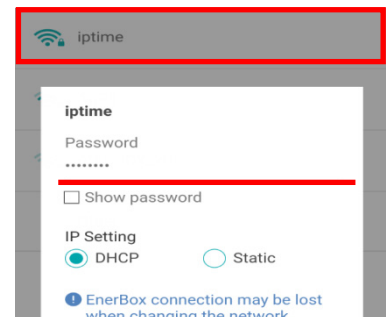
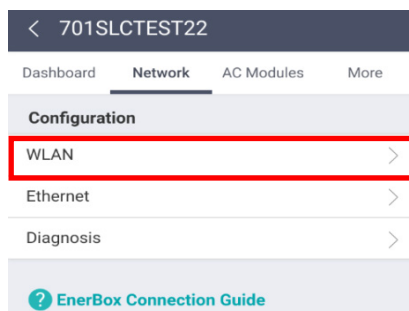
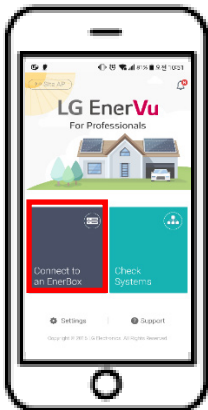
- B. Turn Wi-Fi on in your mobile phone. Search for the SSID of **EnerBox_xxxxx**.



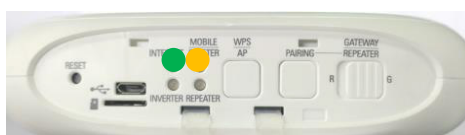
password : 87654321

- C. Then go to [Connect to an EnerBox -> Network -> WLAN].

- D. Select your **home router's** SSID then type the **password** on the blank.



- E. The Internet LED should turn solid green. If it is not, try method B.



Green on INTERNET LED

- F. If the Internet LED is solid green, briefly press the AP button on EnerBox2 to deactivate the Soft AP mode. The 'MOBILE / S-METER' LED will turn off.



- G. You may now reconnect to your normal Wi-Fi network.

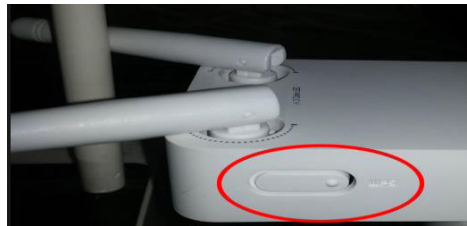
- H. Go to Step 5.

If internet connection by using the AP mode does not work, try methods described below.

Method B: WPS mode

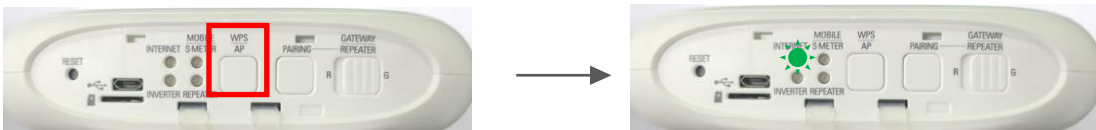
- Using WPS (Wi-Fi Protected Setup) mode:

- A. Find WPS button on your home router. If it does not have it, try Method C.



WPS button of a router.

- B. Press and hold the WPS button on the EnerBox2 for 3 seconds. When the WPS mode is activated, the INTERNET LED is displayed as flashing green.



Press and hold the WPS button for 3 sec.

Find flashing green on INTERNET LED

- C. Press the router's WPS button to connect to EnerBox2. After the internet connection is completed, the INTERNET LED will turn green. When this happens, the router's WPS button needs to be pressed within a couple of minutes.



Press WPS button of a router.



Find solid green on INTERNET LED

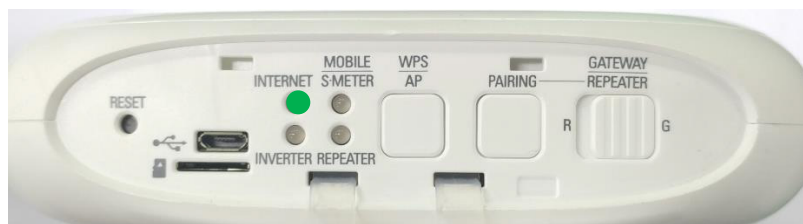
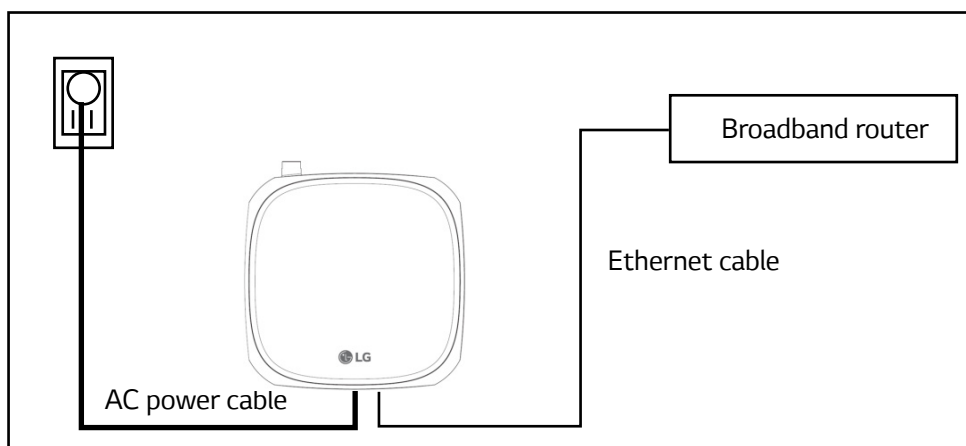
- D. Go to Step 5.



If internet connection by using the AP mode does not work, try methods described below.

Method C: Ethernet

- Plug the Ethernet cable into the Ethernet(RJ45) port on the EnerBox2 and broadband router.
- If the Ethernet cable is fully functional, LED on 'INTERNET' of EnerBox2 will turn solid green. If not, change the Ethernet cable or determine the appropriate solution.
- Make sure that you are using a Broadband router. In many cases of 'Switch / Hub', DHCP is not active. If DHCP service is not available, EnerVu Web server will not be accessible because IP address cannot be successfully assigned.



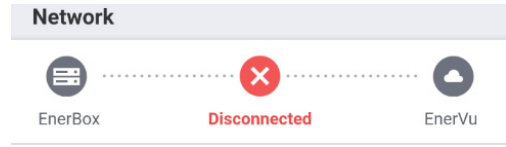
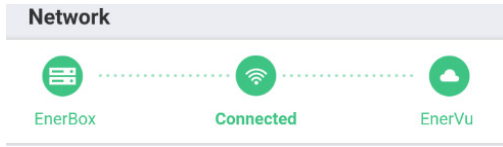
Find solid green on INTERNET LED



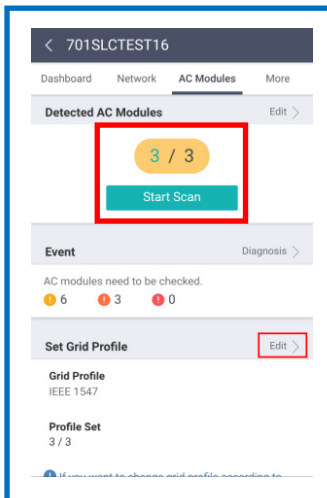
Step 5. Verify the system configuration

After connecting to the EnerBox2 through Soft AP mode, check the dashboard for the following. You can also connect to EnerBox2 through the site's routers.

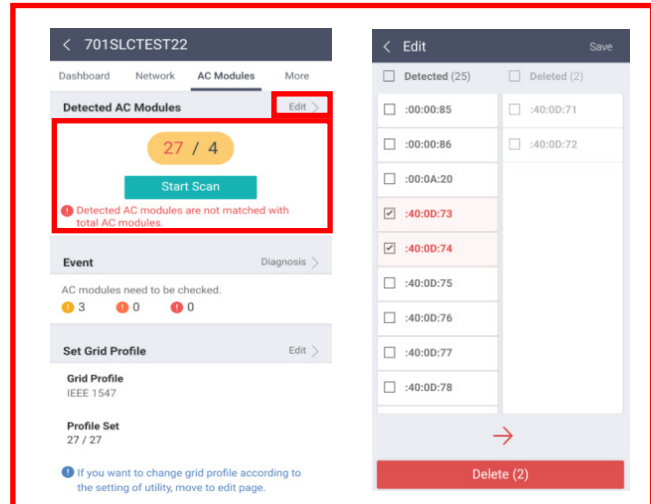
- A. Confirm that internet connection is secured.



- B. Compare 'Installed Number' of AC modules with 'Detected, Communicating or Producing Power' of AC modules. This number will be refreshed in 15 min.
- C. In areas like California, Hawaii or Molokai where Factory-installed grid profile (IEEE1547) is not applied, users can edit grid profile by going [AC module - Set Grid Profile]. It takes 15 min to update changes.
- D. Click 'Start Scan'. If the number of AC modules indicated matches the number installed then go to the next step. If the number indicated is more than installed, delete the MAC addresses that are not present in the "Installation Map" (modules may show up from an adjacent property).



The number is matched.
Go on to next steps.



The number is more than the input number.
Delete MAC addresses that you cannot find from 'Installation Map'.



- ※ Make sure that the circuit breakers for branches where all of the installed AC modules are attached are turned on.
- ※ Power production data will be refreshed within 30 min.



Step 6. Create a system

Creating a system and registering the EnerBox2 is possible by using EnerVu2 (web application) or LG EnerVu2 Professionals (mobile application).

• Using a laptop or a desktop

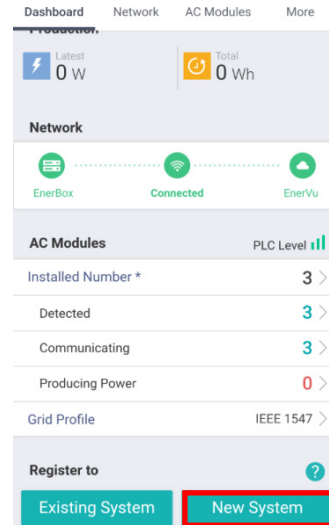
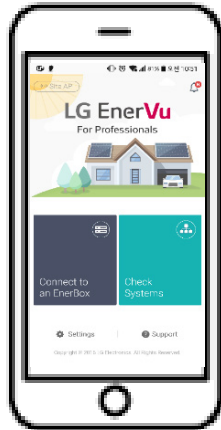
- Access and sign in to EnerVu2. URL: <https://enervu.lg-solar.com>
- To register the EnerBox2 that you have just installed on the site, press the "Create a System" button in the left global navigation bar.
- Following the Activation Checklist, fill in the System & Owner information.
- If you click the 'Save' button, an invitation e-mail will be sent to the homeowner's email typed in Owner Info.

- Fill in the EnerBox2 serial number and press check button. The serial number is attached on the EnerBox2. If the server says "This EnerBox is not verified on EnerVu. Please proceed after installation is completed", check the internet connection of the EnerBox2.
- Make sure that the inserted serial number is correct. If it is not, edit the number. If the number of 'Detected AC modules' and the number of 'Total AC modules' are not equal, modify the number of Total AC modules or click Check Module to edit.
If the number of Detected AC modules is smaller than the number of Total AC modules, 'Start Scan' needs to be performed.
If the number of Detected AC modules is larger than the number of Total AC modules, delete AC modules not in your MAC ID list. After checking the Grid profile, go to 'Design the Array'.



Using a mobile phone

- Turn Wi-Fi on in your mobile phone. Search for the SSID of the network connected with EnerBox2.
- Use your mobile phone to open the LG EnerVu2 Professionals app. Tap 'Connect to an EnerBox' and select the EnerBox2 serial number.
- To register the EnerBox2 that you have just installed on the site, press the "New System" button in bottom side of the dashboard.



- Fill in the System & Owner information. If you click the 'Save' button, an invitation e-mail will be sent to the homeowner's email typed in Owner Info.
- Design arrays via EnerVu2 (web application). It is possible to edit arrays once the system is activated.



※ Once 'Activate' button is pushed, the system will be locked in 'Activation Ready' so that it is impossible to edit information. However, after homeowner signs in to LG account, the system will complete the activation automatically. Then, monitoring and revision is possible.

< New System Save

Enter the required fields* for system creation.

System Info

System Name*
RegisterTest

Address*
Country
United States >

a14 Golf Circle Drive

Address 2

Margate

State / Prov.
Florida >

33063

Owner Info

Name*
cm

< RegisterTest Delete

System Info
a14 Golf Circle Drive, Margate, Florida 33063, United States
[More](#)

View Activation Checklist

Production
! You may monitor the energy production after system activation.

Array >

EnerBox
701SLCTEST24
There are no events.
Detected AC Modules: 3 / 3
[More](#)

Add New EnerBox

< Activation Checklist

1. Start
✓ System Info Saved*
✓ Owner Info Saved*

2. Connect
✓ EnerBox Registered*
✓ AC Modules Registered*

3. Confirm
✓ AC Modules Confirmed* >

4. Ready for Activation
✓ Array Built >
✓ Owner Confirmed*

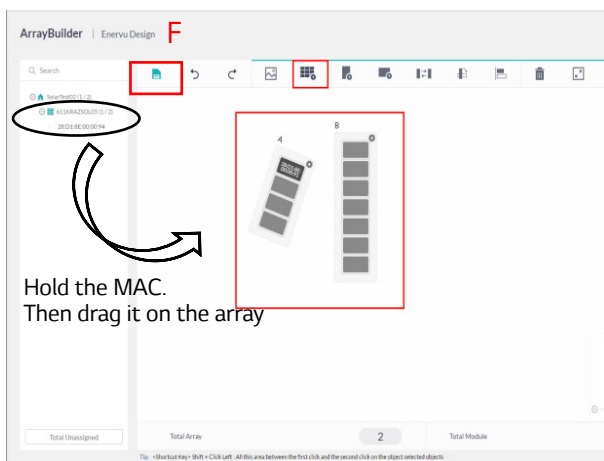
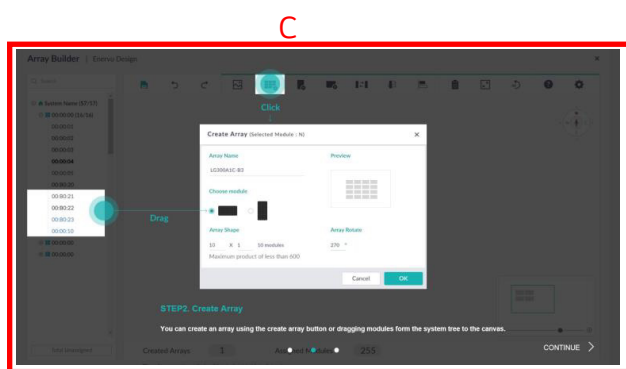
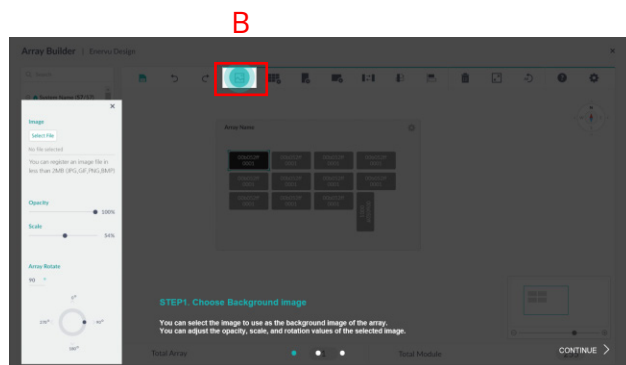
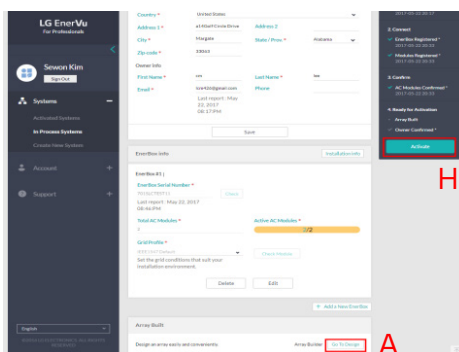
[View System Report](#)

Activate



Step 7. Design the Array in EnerVu2 using a laptop or a desktop (It is not available on the mobile application)

A. Click "Go to Design".



- B. Choose a background image in order to decorate the array builder. You can adjust the opacity, scale, and rotation of the selected image. If you don't want to put it on the background of 'Array Builder', you can skip it.
- C. Edit the modules by using shortcut keys and edit tools to describe the AC module system. After rotating an array, please adjust the position of the array then save the changes. It might be possible that the array after rotation is overlaid on another array.
- D. You can design arrays that will be presented in the system of the dashboard. After creating an array for AC modules, drag the MAC on the array for mapping. The maximum allowable number of AC modules is 600. If you want to register more than 600 AC modules, please create multiple systems on the website.
- E. Confirm whether all MAC addresses and AC modules are properly placed with a reference of 'AC module Installation map'.
- F. Save and terminate the Array builder.



- ※ At Step 7, recommended display resolution of your laptop or desktop is 1680 × 1050 or higher. If it is lower than 1680 × 1050, it might be uncomfortable to build an array because you have to scroll the window to the right or left.
- ※ After rotating an array, please adjust the position of the array then save the changes. It might be possible that the array after rotation is overlaid on another array.
- ※ Array build step is only available on the website. Mobile application does not provide the tool for editing arrays.



Step 8. Activate a System

- A. Finally, press 'Activate' on right-side button at Activation Checklist. After the homeowner signs in to their LG account with an invitation email, the system will complete the activation automatically.
- B. Then, the installer and homeowner can monitor the installed system to check out energy harvest.



LG EnerVu
For Professionals

Sewon Kim
Sign Out

System

Activated System

In progress System

Create a System

Account

Support

English

TestSystem1

System info * Is required for System Activation

System

System Name * TestSystem1 Company Name LGE

Address

Country * United States

Address 1 * 11Valley

Address 2

City * Irvine State / Prov. * California

Zip-code * 92603

Owner info

First Name * SW Last Name * KIM

Email * kimsewon31@daum.net Phone

Last Sent : Dec 28, 2017 05:47 PM

Save

Activation Checklist

1. Start

✓ System Info Saved *
Jan 7, 2018 6:39 PM

✓ Owner Info Saved *
Jan 7, 2018 6:39 PM

2. Connect

✓ EnerBox Registered *
Jan 7, 2018 7:30 PM

✓ Modules Registered *
Jan 7, 2018 7:30 PM

3. Confirm

✓ AC Modules Confirmed *
Jan 7, 2018 7:30 PM

4. Ready for Activation

✓ Array Built

✓ Owner Confirmed *

Activate

- C. Go to the site for homeowners and sign up.
- D. A window for creating an account will pop up.
- E. Agree with the terms and conditions then go to 'Create Account'
- F. The email account the homeowner has created here should be the same as the email address that the installer put on the installed system information.



LG ACCOUNT

SIGN IN CREATE ACCOUNT SWITCH USER ID FIND USER ID / RESET PASSWORD ACCOUNT MANAGEMENT CUSTOMER SUPPORT

CREATE LG ACCOUNT

Accept Terms & Conditions 3/3 Create Account 3/3 E-mail confirmation 3/3 Confirm LG Account 3/3

CREATE LG ACCOUNT

User ID **CHECK AVAILABILITY**

Password

Password confirm

Birthday Month Day Year

Country U.S.A

E-mail opt-in ☐ Sign up to receive the latest news and special offers from LG. You will be notified of important changes to the service Terms & Conditions and Privacy Policy regardless of your opt-in setting.

CONFIRM CANCEL

The email address should be identical with installed system information.



- ※ Once 'Activate' button is pushed, the system will be locked in 'Activation Ready' so that it is impossible to edit information. However, after the homeowner signs in to their LG account, the system will complete activation automatically. Then, monitoring and revision is possible.



Note 1. Visual notification of power production status.

- A. During the daytime, users can be easily informed about the power generation information by simply looking at the EnerBox2.
- B. Different colors are used to express brief power production level as described below.
- C. If red LED light or no LED light is shown during daytime and it persists continuously, please refer to 'Trouble Shooting Guide' in Installation manual.



Average power is above 60W.



Average power is below 60W.



At least one microinverter has not produced power for over 72 hours.



After sunset, there's no power production.



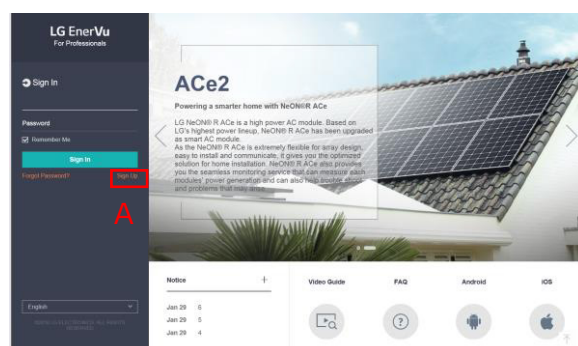
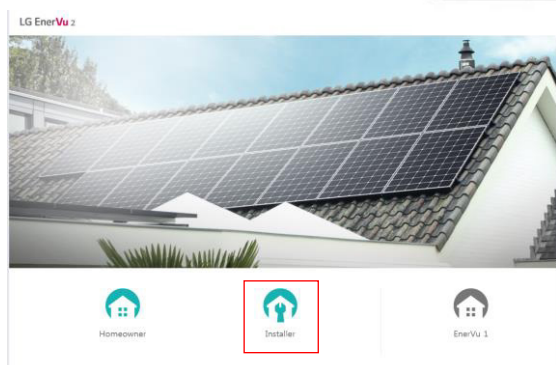
※ The Power Production LED will refresh every 15 min.



4-4 EnerVu2 Monitoring system (Installer account)

Note 1. Creating an installer account using a laptop. (LG EnerVu for Professionals)

- Sign up at the EnerVu2 URL: <http://enervu.lg-solar.com/>. If you have signed up before, please skip this step. Creating an account by using a mobile device is described in 4-3 EnerBox2 Installation procedure.
- Press the Sign Up button to go to the registration page and enter basic information (User, Company Info).
- After agreeing to the terms and conditions, you will receive an email so that you can create a password.
- Your registration is complete once you create a password.
- Sign in to LG EnerVu for Professionals URL : <http://enervu.lg-solar.com/>

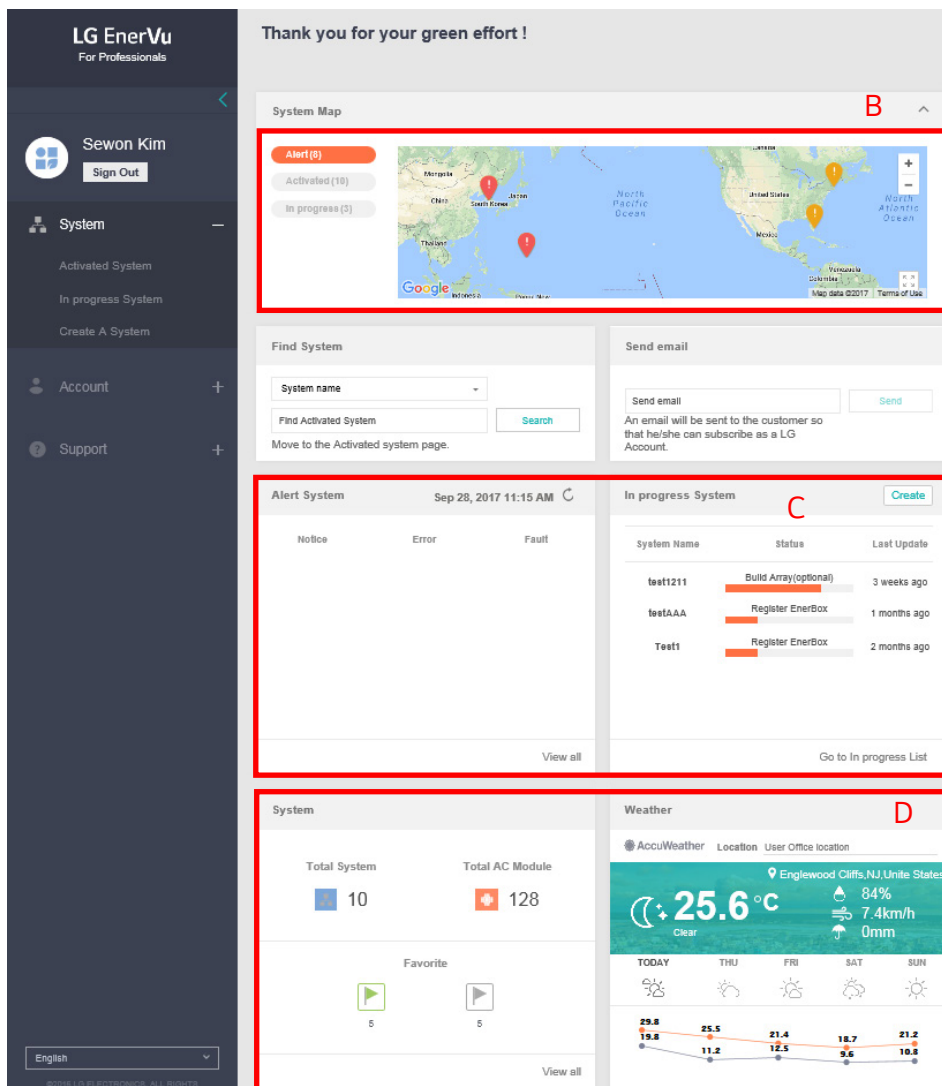




Note 2. LG EnerVu for Professionals

- A. Log in with 'LG EnerVu for Professionals' account.

LG EnerVu for Professionals URL: <http://enervu.lg-solar.com/>



- B. System map depicts a world map where a user easily finds each AC module system installed and registered by the user account. You can zoom the map in or out by holding a Ctrl key and scrolling a mouse wheel.
- C. Alerts and systems in progress are displayed here so that users can find current conditions within the overall AC module system. If you click 'Notice', 'Error' or 'Fault', relevant systems will be listed. Clickable system name will guide you to a system monitoring page.
- D. Total number of registered system and AC modules can be found here. A weather forecast is provided here from 'AccuWeather'. If you put your location in the 'User Office Location', the daily weather forecast can be identified. Or you can set it at 'Account' => 'Company Info'



Note 3. LG EnerVu for Professionals

- Select Activated system. A list of installed systems are on display with simple data.
- Click a system that you have created.
- The list can be easily obtained by clicking the excel icon. An excel file will be automatically generated to help the user stack data or report a list. Also, 'Setting-Table Data' is provided to freely select columns you want to show in the excel file or on the display window.

Favorite										
	System Name	Alert	Status	City	State, Province	Installed On	Last Report	Current Power	Today	
1	SeochoTestJongil1	No issue	Normal	Tamuning		Sep 26, 2017	Sep 28, 2017 3:41 PM	2223	19.01kWh	
2	SeochoRooftop	Notice(22)	AC Module Not Reported	Tamuning		Aug 28, 2017	Sep 19, 2017 10:25 AM	0	0.0Wh	
3	TrackerTest	Fault(1)	Mismatch	Tamuning		Aug 09, 2017	Sep 28, 2017 12:22 PM	0	0.0Wh	
4	SolarGumiRooftopNew	Fault(1)	Detected AC Modules	Tamuning		Jul 07, 2017	Sep 15, 2017 3:14 PM	0	0.0Wh	
5	SolarGumiTracker	Notice(1)	Mismatch	Tamuning		Jun 21, 2017	Jul 13, 2017 10:55 AM	0	0.0Wh	
6	Longterm	Notice(2)	Internet Connection Failed	Boston	Massachusetts	Jun 02, 2017	Jun 20, 2017 3:21 AM	0	0.0Wh	
7	Steve Kyong	Error(1)	AC Voltage High	Henderson	Nevada	Jun 01, 2017	Sep 27, 2017 10:39 PM	0	49.6kWh	
8	IDRDemo	No issue	Normal	Margate	Florida	May 04, 2017	Jul 6, 2017 8:43 PM	0	0.0Wh	
9	ChamberTest	Notice(4)	AC Module Not Reported	Tamuning		Apr 30, 2017	Jun 7, 2017 12:06 PM	0	0.0Wh	
10	SolarGumiRooftop	Notice(6)	AC Module Not Reported	Tamuning		Apr 25, 2017	Jul 7, 2017 9:37 AM	0	0.0Wh	
11		Notice(1)	Internet Connection Failed	Boston				0	0.0Wh	

Setting-Table Data

Please pick you want to show

☒ System Name
 ☒ State, Prov.

☒ Alert
 ☒ Installed On

☒ Status
 ☒ Last Report

☐ System ID
 ☒ Current Power

☐ Micro Inverter
 ☒ Today

☐ Company Name
 ☒ Past 7 Days

☐ Owner
 ☒ This Month

☐ Zip-code
 ☒ Lifetime

☒ City
 ☒ Grid Profile

OK



Note 4. LG EnerVu for Professionals

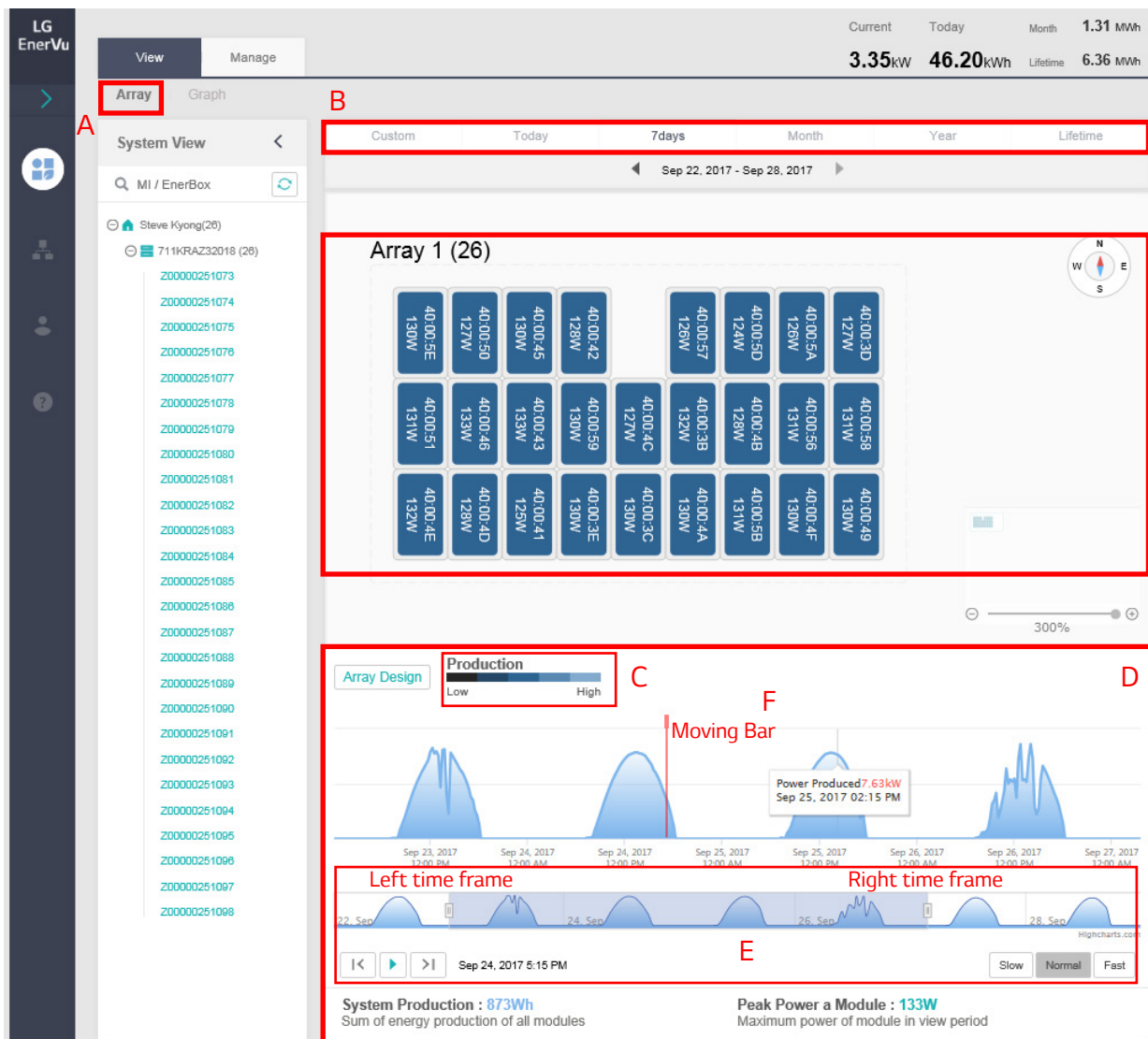
- A. Systems – Menu to view or create systems.
Activated system – Energy harvest data can be monitored on daily, weekly, monthly or annual basis. This is only possible after installation of AC modules and a monitoring system is established.
In Process System – This shows systems in development.
Create a System – This is for registering a new AC module system.
- B. Account – Account and Company information.
Company Information – Information about a main office and branch offices can be generated and modified.
Solar Professionals – You can register personnel working for the company. The menu will be useful for sharing basic information of staff.
My Account – Account information is managed in this menu and notification preferences can be set. Also, the International System of Unit (SI) can be changed between Fahrenheit scale(°F) and Celsius scale (°C).
Change Password – You can change Password
- C. Support – System manuals, frequently asked questions (FAQ), terms and privacy can be found in the menu.
- D. VIEW – Menu for checking energy production trend which includes:
 - 1) amount of energy produced by each AC module within a set period.
 - 2) graphs showing produced power at a specific time.
- MANAGE – Menu for managing the system and options to request detailed information of system, Gateway, and Microinverter. Any generated alerts can be identified and various reports can be generated.
- E. MI List – Microinverter ID List
- F. At Array and Graph, you can see data by specifying a period. For example, daily, weekly, monthly, and annual energy harvest trends can be monitored.
- G. Array View – Check the array created with the Array Design tool, and check the power generation and location of microinverter.
- H. Create or Modify arrays information.
- I. Graphs showing power generation trend from the installed AC module system.



Note 5. System's Power Production Animation at LG EnerVu for Professionals

- Select 'View' – 'Array' button for a function showing:
 - amount of energy produced by each AC module within a set period, and
 - graphs showing produced power at a specific time.
- Set a period with which total amount of energy will be specified on the virtual array.
- Blue color saturation is used to describe the intensity of energy production on each AC module in order to give a visual difference on power production level. If you choose an AC module on the system tree or on the array, the AC module will be marked with a popup which makes it possible to see 'Graph', 'Report' and 'Alerts'.
- Power Production graphs show power from the AC module system at a specific time. The power generated from the AC module system depends on weather conditions, shadows caused by clouds, structures, etc. You can hover your mouse pointer near a line of the graph so that a mini-popup will indicate how much power is produced at a certain time. This function is available with Today/7 days setting.
- Set left and right time frames for widening or reducing the time frame. Overall time frame can be changed by setting a period depicted in B.

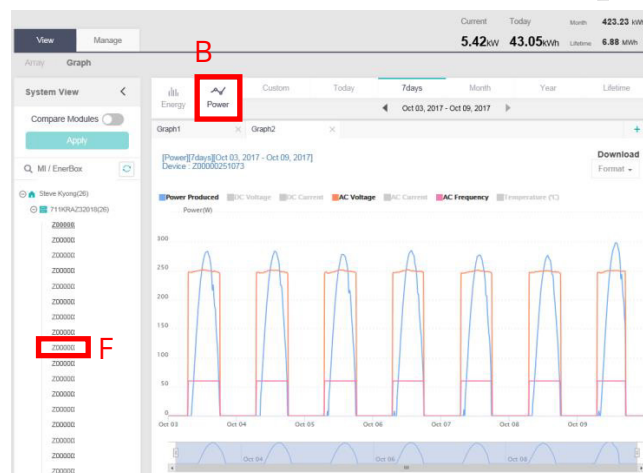
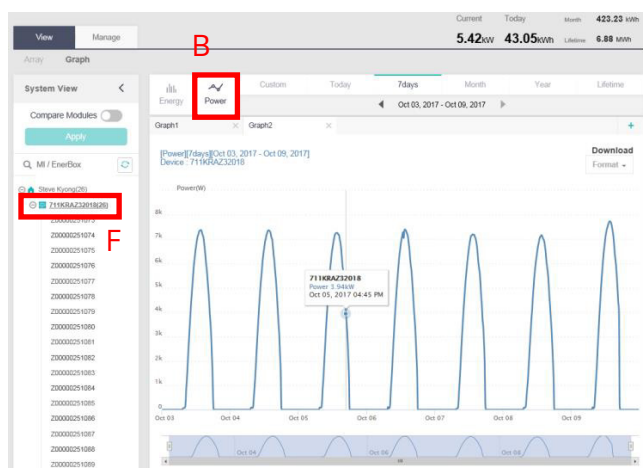
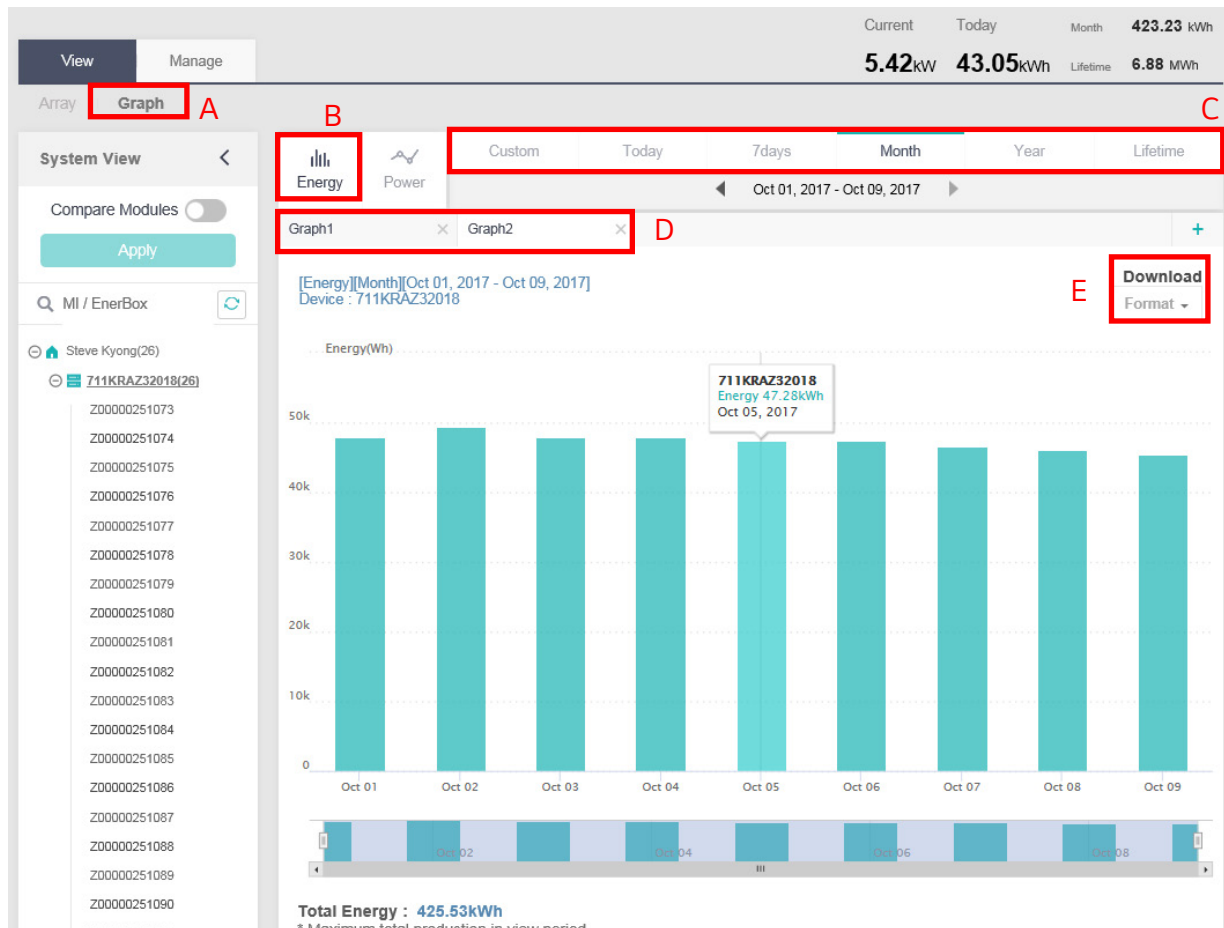
Animation speed level can be chosen with Slow, Normal or Fast. Then click the start button located on the left side of the graph.
- A moving bar will be in motion from the far-left location of the graph to the end. As it moves, the color intensity of each AC module in the array shows power production level visually.





Note 6. System's Power Production Animation at LG EnerVu for Professionals

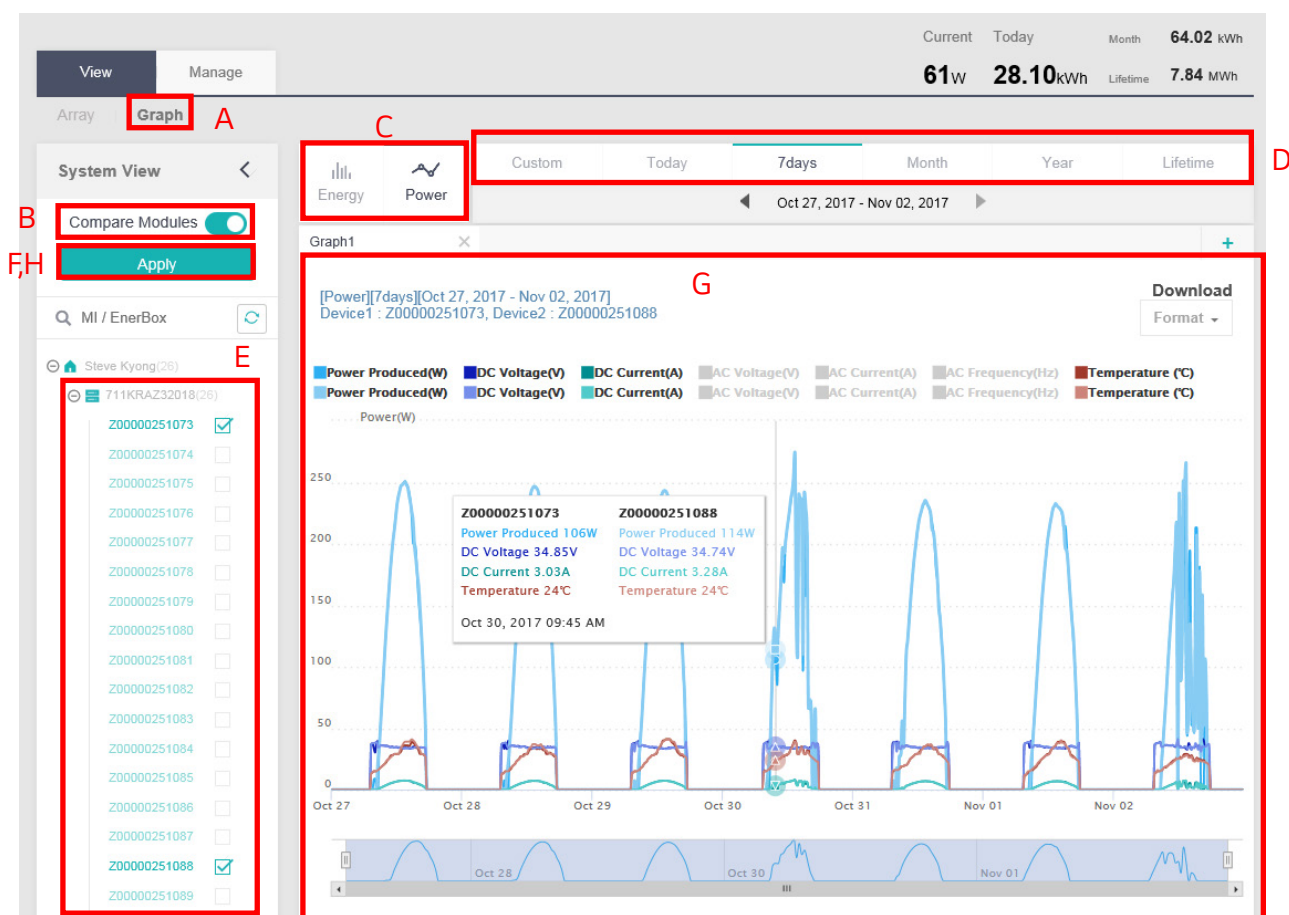
- Select 'Graph'.
- Click 'Energy' to see energy production (Wh) trend. Or select 'Power' to see power (W) that is generated at a specific time.
- Set an appropriate time frame. Select the system or an AC module to check energy and power production.
- Multiple graphs can be created in tabs. New tabs show data with the previous setting. So change the settings for graphs that you want to check.
- The graphs can be downloaded in a format that you have selected.
- For 'Power' setting, users can find more parameters that an individual microinverter has collected (only for ONE AC module). If you selected the system consisting of all AC modules, total power production trend can be viewed.





Note 7. Comparison of an AC module with another AC module

- Select 'Graph'.
- Make sure the 'Compare Modules' slider is at the correct position.
- Click 'Energy' to see energy production (Wh) trend. Or Select 'Power' to see power (W) that is generated at a specific time.
- Set an appropriate time frame.
- Check the two modules you want to compare.
- After selecting two modules, press the 'Apply' button.
- Then you can compare two AC modules for power, DC voltage/current, etc. Also, if you hover your mouse pointer on the graphs, actual values are displayed with a pop-up. Detailed information can be found only at 'Power'.
- Once you have changed the setting, please click on the 'Apply' button again. Changes will be applied once you click the 'Apply' button.

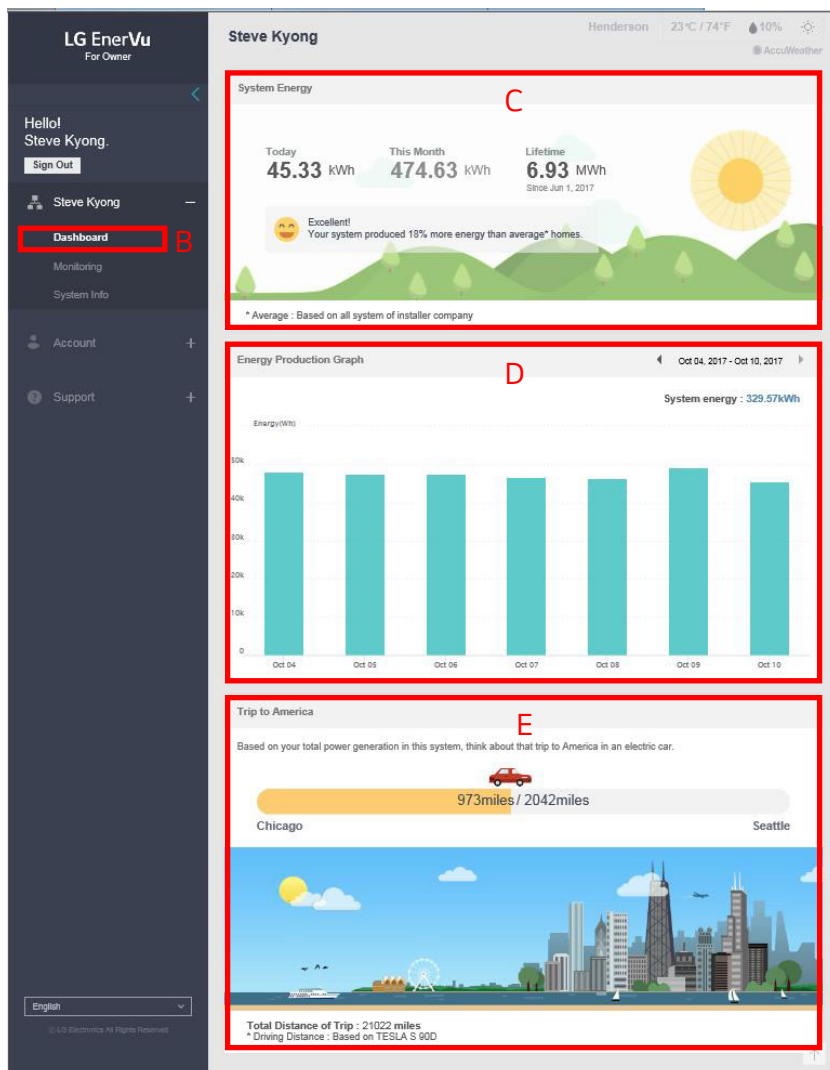




4-5 EnerVu2 Monitoring system (Homeowner account)

Note 1. LG EnerVu for Owner

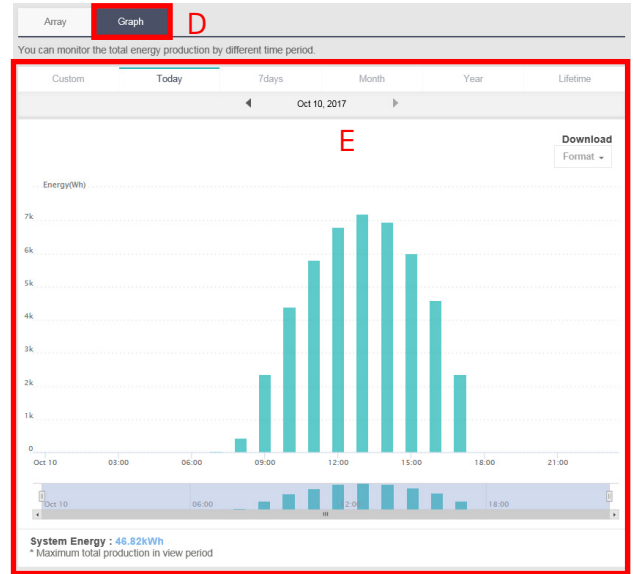
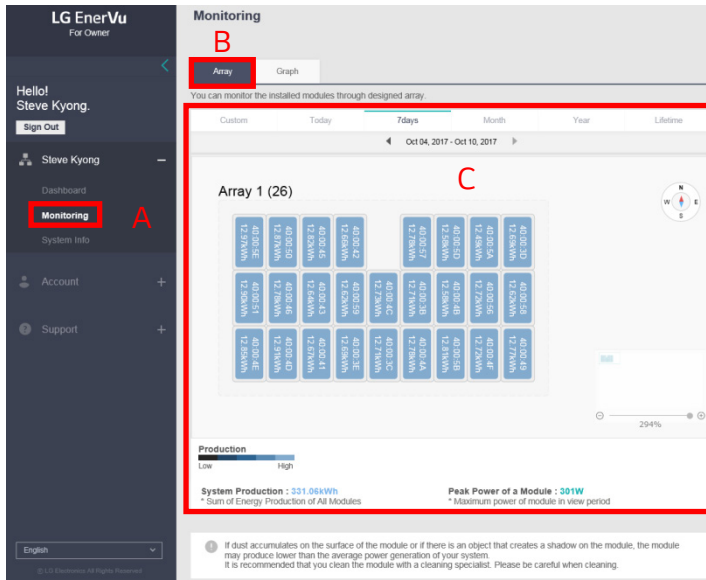
- A. Log in to 'LG EnerVu for Owner' account.
LG EnerVu for owner URL : <https://enervu.lg-solar.com>
- B. The user has three options to choose from.
Dashboard : C,D,E are shown on 'Dashboard'.
Monitoring
System Info
- C. System Energy provides information representing energy production.
- D. Energy Production Graph allows a homeowner to observe general energy production trend quickly.
- E. Trip to America simply demonstrates an electric car on a road in order to simply show how the solar energy contributes to alleviating air pollution.



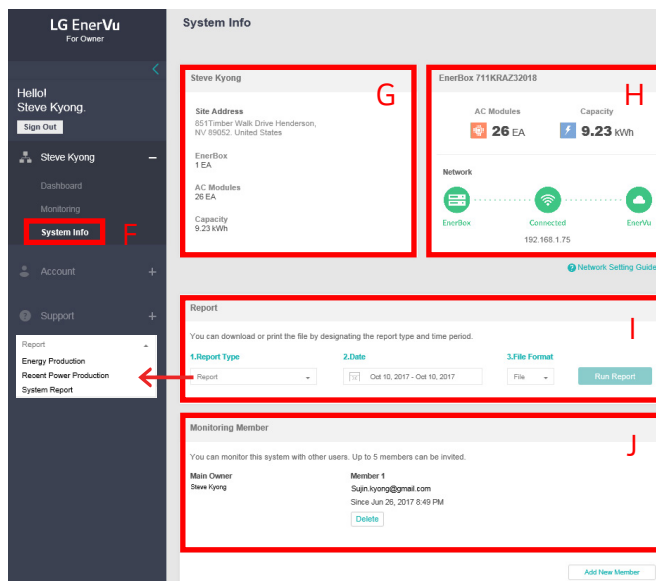


Note 2. LG EnerVu for Owner

- Select 'Monitoring' menu displayed on the left.
- Click 'Array' to see the virtual array that the installer has already set.
- The AC module system shows total energy production on each AC module depending on how you set the time period.
- Click 'Graph' to see energy production trend during a period you have set. It can also be saved in various formats.
- The AC module system shows energy production on each AC module depending on how you set the time period.



- Select 'System Info' if setting system information is needed.
- It shows brief information about the homeowner's system information.
- It depicts current status of the installed AC modules and communication network.
- A report can be selected for 1) Energy Production, 2) Recent Power Production, 3) System Report. After setting the date and file format, a report can be created if you click 'Run Report'.
- You can monitor this system with other users. Up to 5 members can be invited.





4-6 EnerVu2 Mobile Monitoring Application (Installer account)

Note 1. LG EnerVu mobile main page

(LG EnerVu for Professionals)

A. Connection method for EnerBox2

- Site AP: connection using a router
- 3G/LTE: connection using 3G/LTE
- EnerBox AP: connection using Soft AP

B. Notices (“n” when it has new notices)

- Alert: notice for system alert
- Message: listing a system of activation or transfer
- News: Notice or Announcement

C. Connect to an EnerBox

- Dashboard: offering power generation and system status
- Network: where internet setting for EnerVu can be changed
- AC modules: for giving individual AC Module conditions
- More: helping users find EnerBox2 F/W version and EnerBox2 Event

D. Check Systems

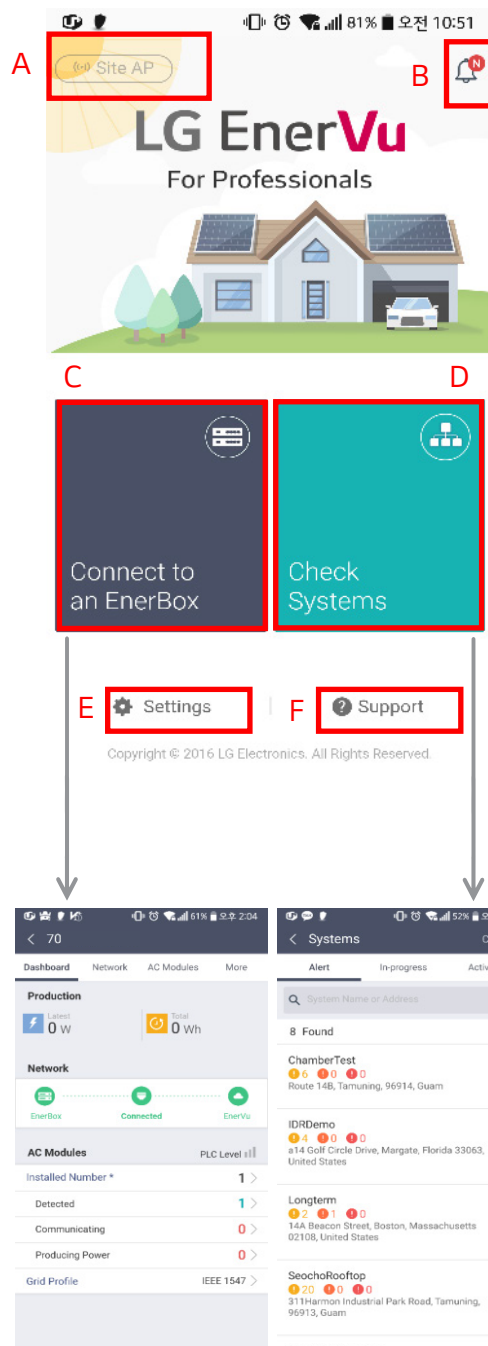
- Alert: showing systems having any alerts
- In-progress: listing systems in process of activation
- Activated: representing systems ready to view energy production

E. Settings

- Firmware download
- Language selection
- Firebase Analytics
- Sign Out

F. Support

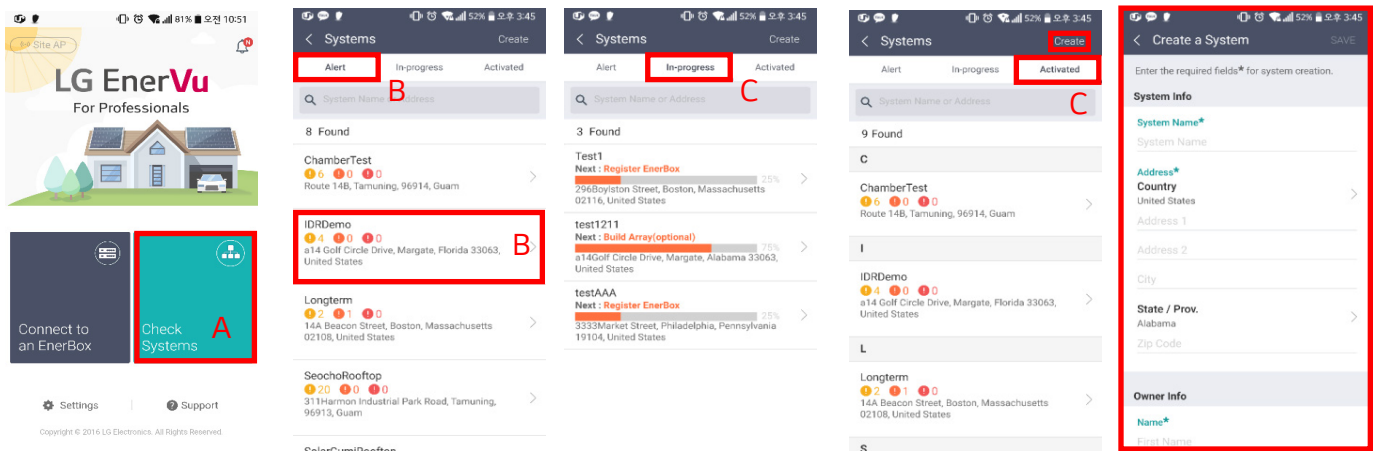
- Terms of Use
- Privacy Policy
- Video Guide
- FAQ
- Open Source
- Application Info



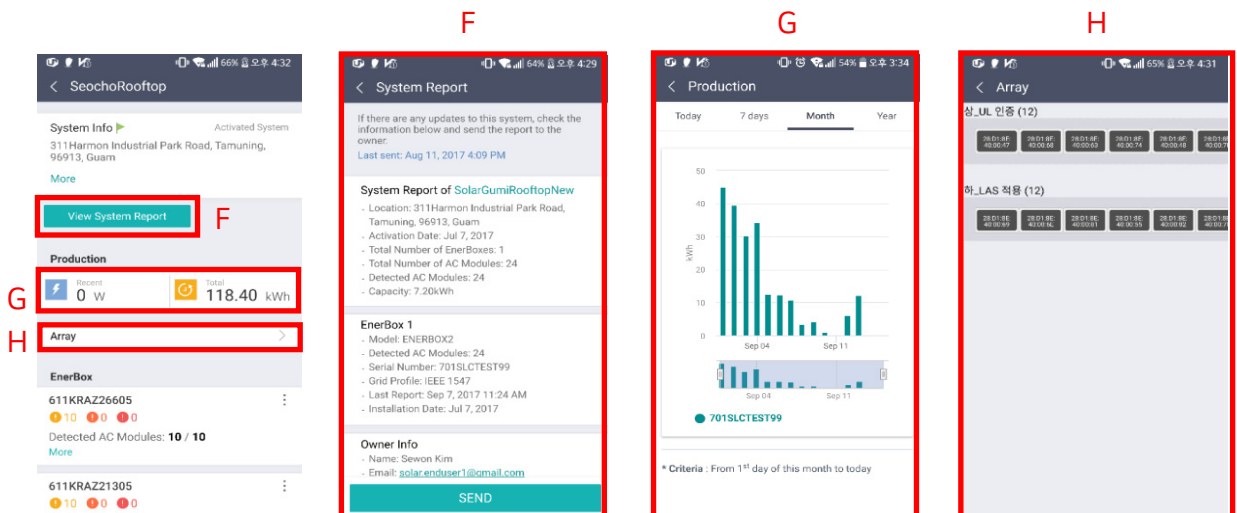


Note 2. LG EnerVu mobile 'Check Systems' (Installer account)

- Touch 'Check Systems'
- The 'Alert' tab allows installers to discover any system having alerts. The reported alerts can be used for troubleshooting. Specific information can be found if you touch a particular system that you want to investigate.
- The 'In-progress' tab lists systems which are in the process of registration. If a system is fully done for the web-monitoring, the system will be located in the 'Activated' tab.
- All registered systems are located in the 'Activated' tab. From this tab, mobile web-monitoring activity can be viewed.
- You may create a new system if you touch 'Create' on top right of the screen. However, it is recommended to create a system from the web site for ease of use.



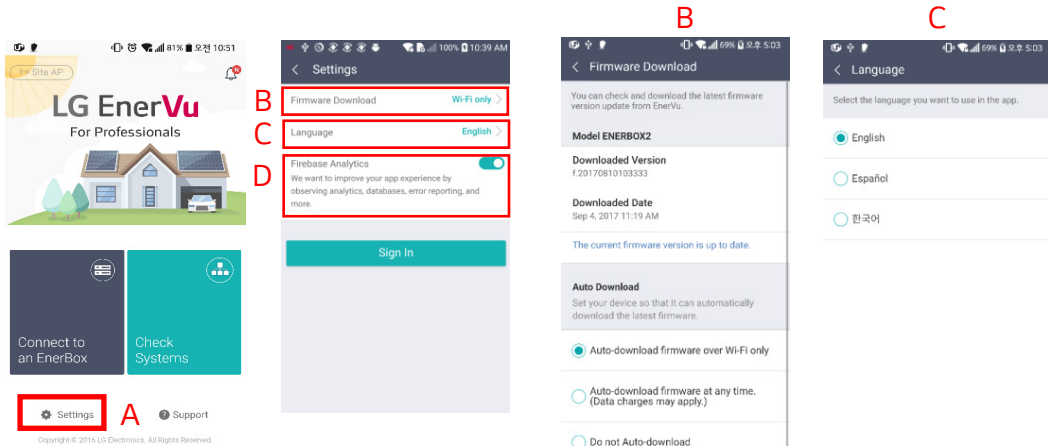
- If there are any updates on the system, send the system report to the owner to let him/her be aware of the changes.
- Energy production trend is on display with a time frame.
- The virtual array will be described with MAC address on each AC module. You can only check the location of the AC module and MAC address that you have built on website.



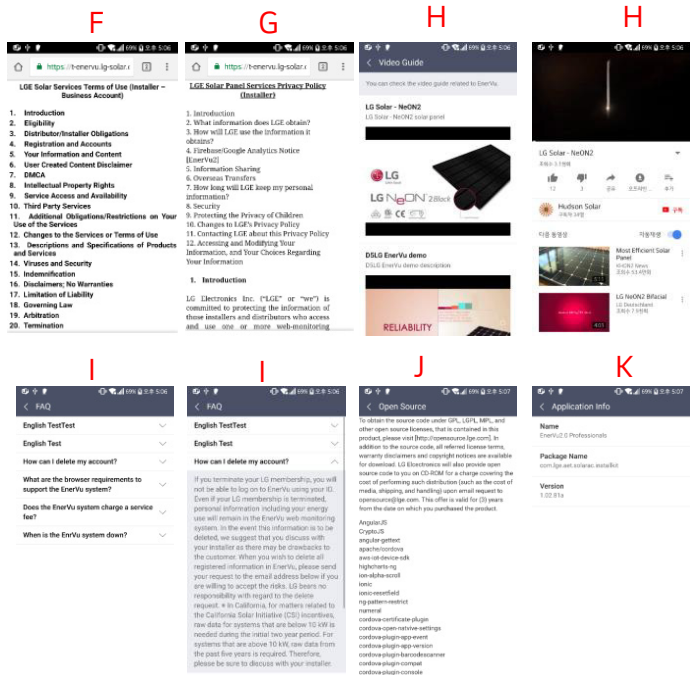
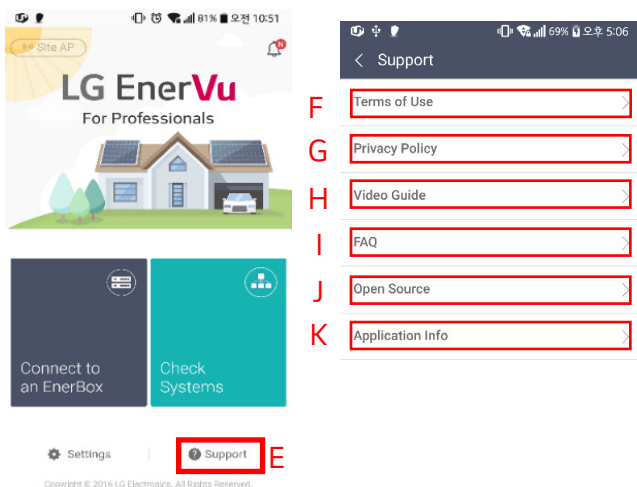


Note 3 LG EnerVu mobile (Installer account)

- Touch 'Settings'
- You can check and download the latest app version update from your mobile.
- There is an option to choose a language that you want to set.
- Firebase Analytics provides an option for users to allow/disallow sending logs to a webserver.



- Terms of Use
- Privacy Policy
- Video Guide
- FAQ
- Open Source
- Application Info

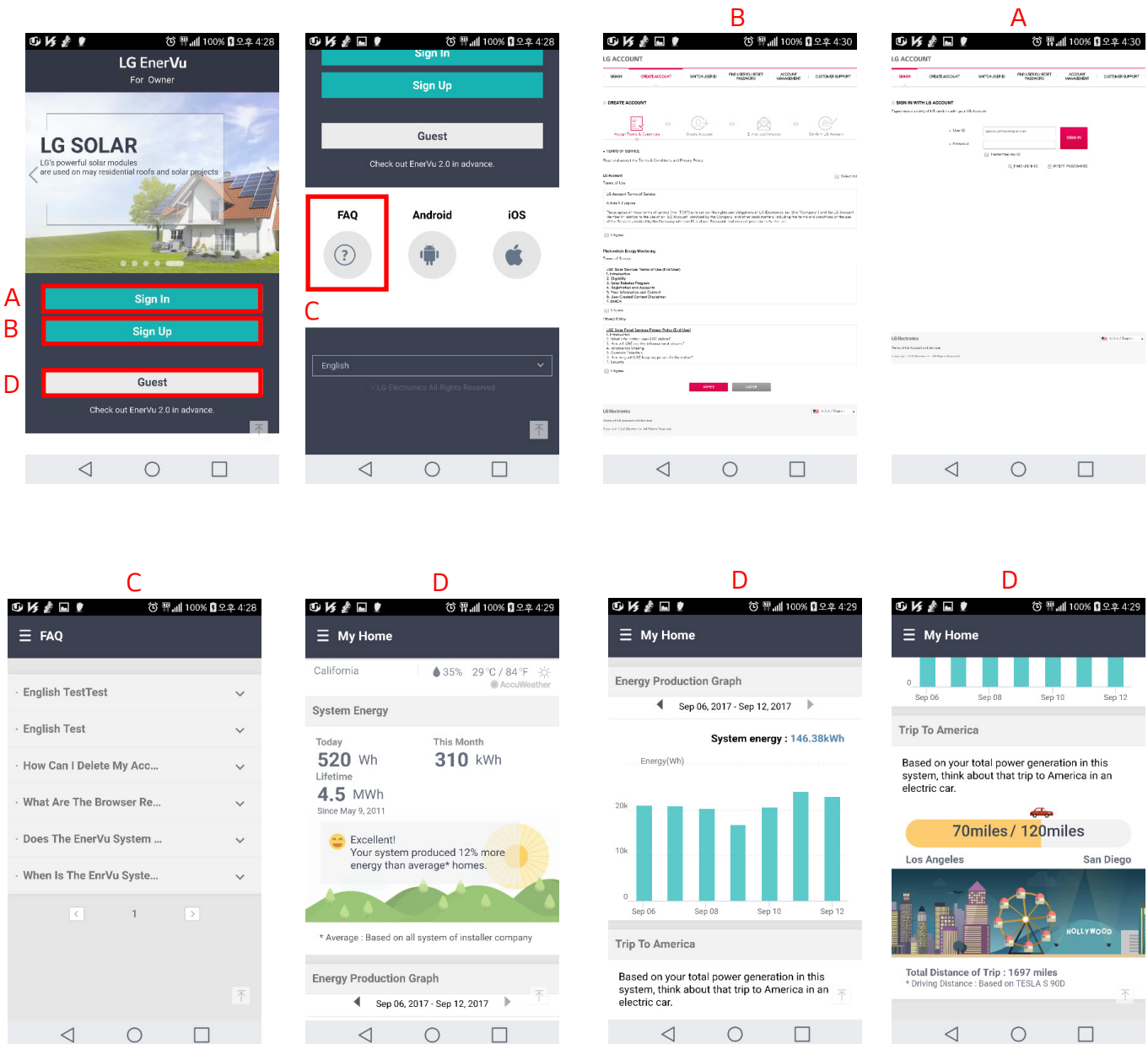




4-7 EnerVu2 Mobile Monitoring Application (Homeowner account)

Note 1. LG EnerVu mobile (LG EnerVu for Owner)

- Sign in with your user ID and password.
- A user can create an account with a mobile phone.
- If you scroll down, you will see more options. FAQ helps a user find out useful resources to solve potential problems.
- After touching 'Guest', an example of screen layout will be depicted. The 'Energy Production Graph' is based on random values which will be automatically generated.

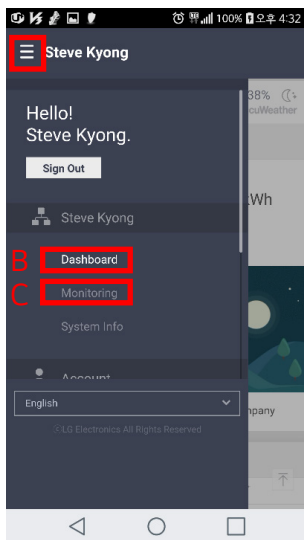




Note 2. LG EnerVu mobile (Homeowner account)

- Sign in with an ID and a password.
- The dashboard provides a brief description about solar energy generation produced by the installed AC module system. Weather conditions, night or daytime, and concise summary for energy production are demonstrated in this section. Also, a graph representing solar energy generation within a specific time is on display. Particularly, a simple comparison of the produced solar energy with electricity consumption by an electric car is illustrated to show how the installed AC module systems contribute to a cleaner environment.
- Mobile monitoring is available on the left side. The built AC module array is on the screen. Set a period for which total amount of energy will be specified on the virtual array. Blue color saturation is used to describe the intensity of energy production on each AC module in order to give visual difference on power production level. Also, graphs can be utilized to know how much solar energy is produced within a time period.

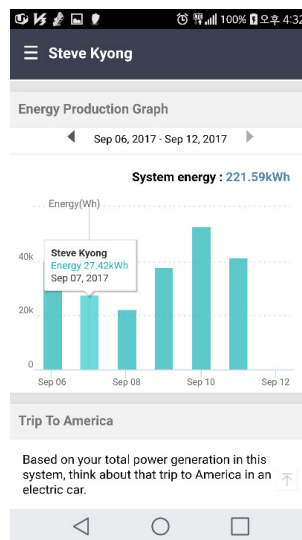
A



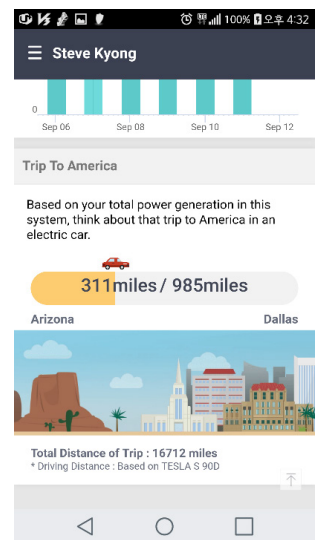
B



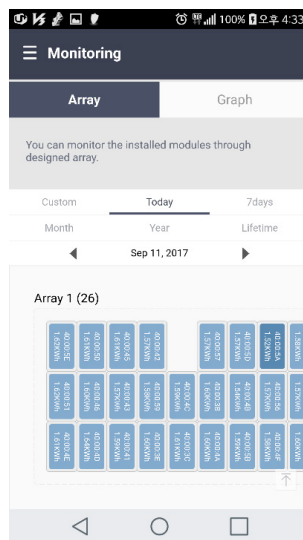
B



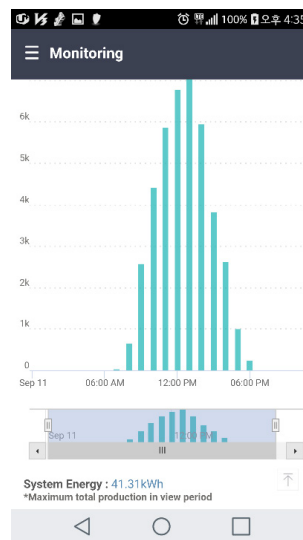
B



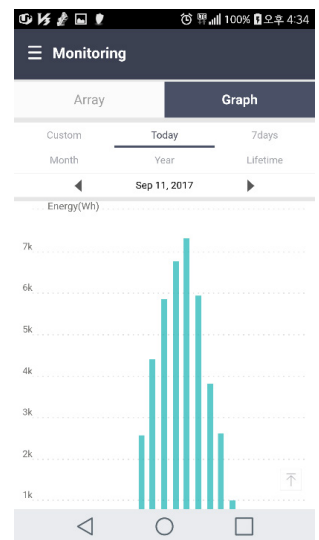
C



C



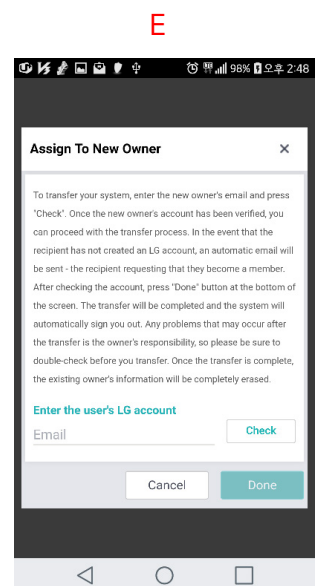
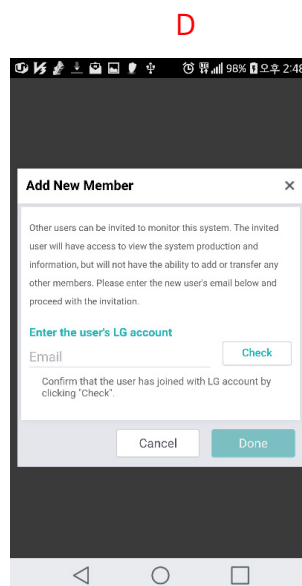
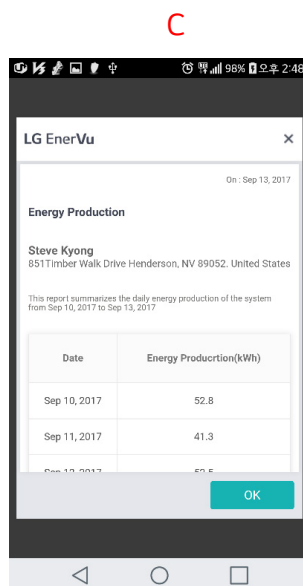
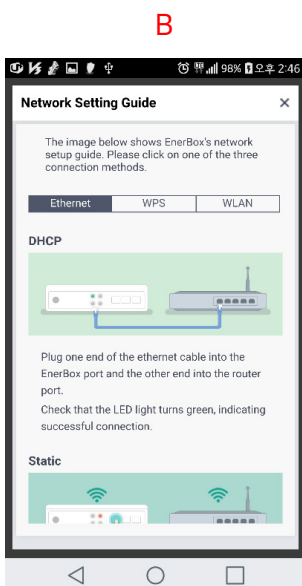
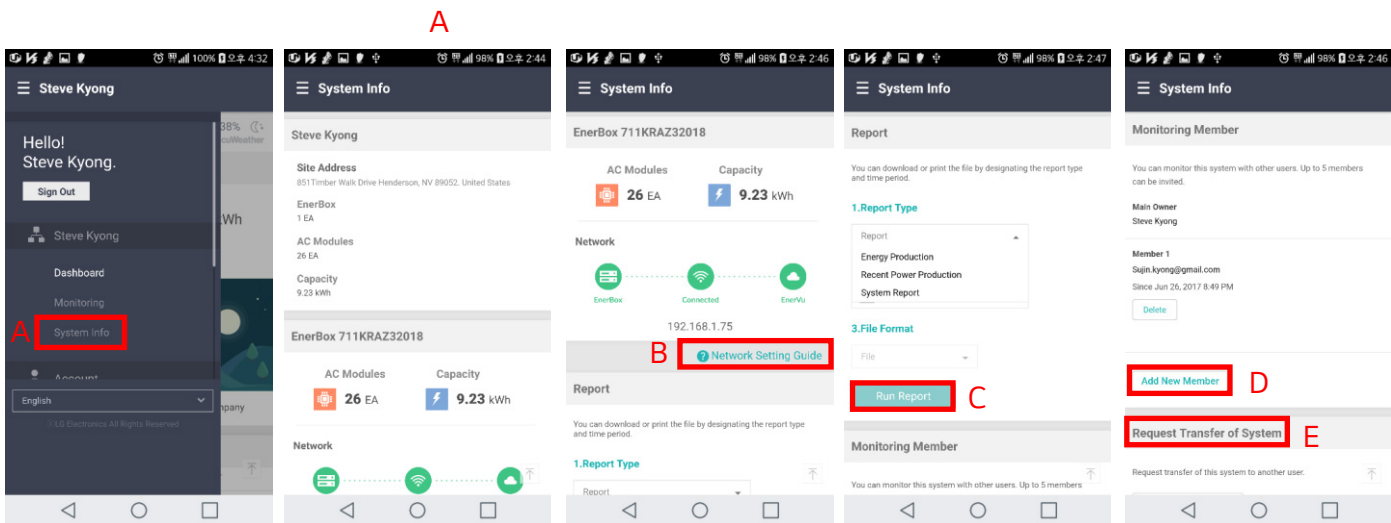
C





Note 3. LG EnerVu mobile (Homeowner account)

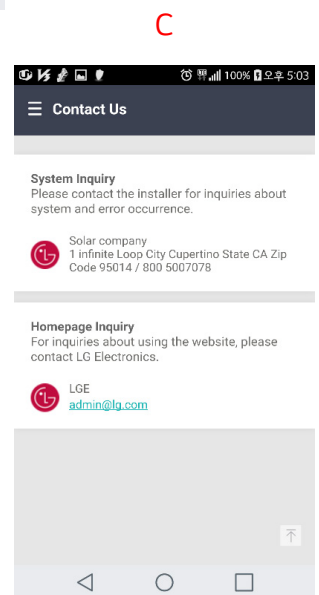
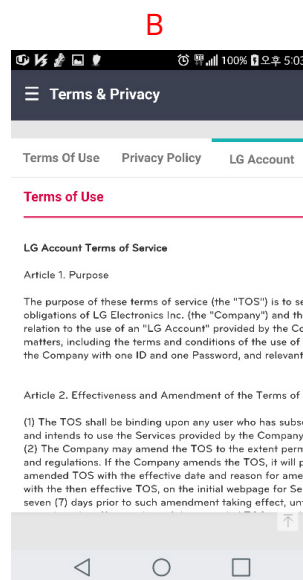
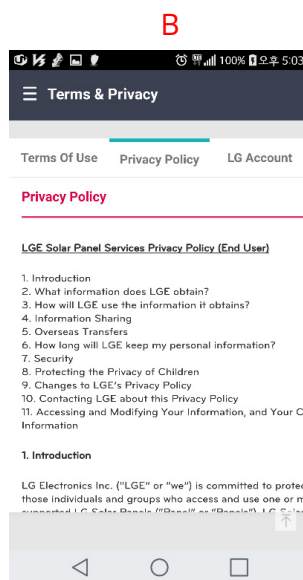
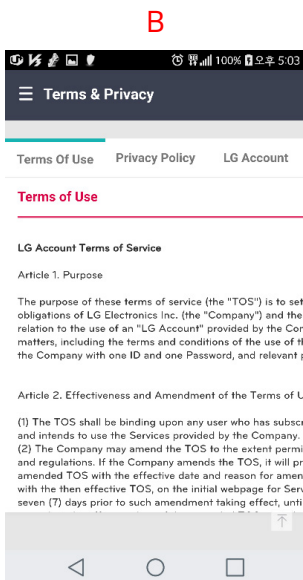
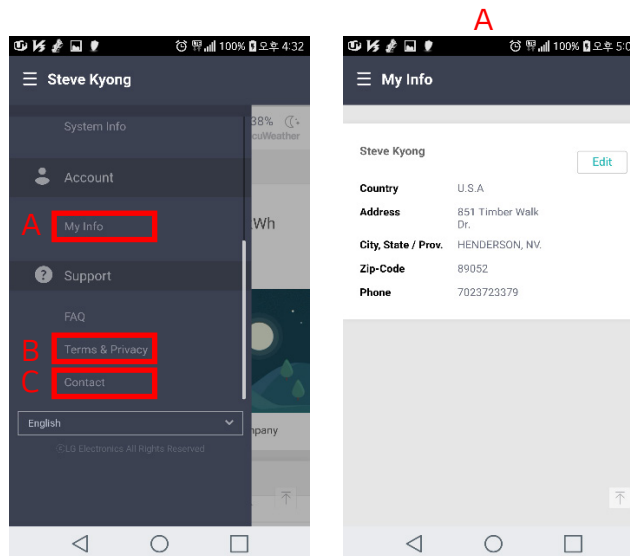
- Touch 'System Info' Variable tasks are available including changing system information, getting system data, adding a new member or requesting account transfer.
- If connection between EnerBox2 and EnerVu is not guaranteed, select 'Network Setting Guide' for trouble shooting.
- If data of energy production or system report is needed in a form of files, select 'Run Report' after setting 'Report Type', 'Date' and 'File Format'.
- Other users can be invited to monitor the system. The invited user will have access to view the system information and data, but will not be authorized to add or transfer the account.
- To transfer your account, enter a new owner's email and press 'Check'. Once the new owner's account has been verified, you can proceed with the transfer process. Please take these steps carefully. Once the transfer is completed, the existing owner's information will be completely erased.





Note 4. LG EnerVu mobile (Homeowner account)

- Select 'Account' > 'My Info' if it is necessary to edit homeowner information.
- 'Terms & Privacy' can be used to check rights and obligations. There are 3 taps consisting of 'Terms of Use', 'Privacy Policy' and 'LG Account'
- System Inquiry - Please contact the installer for inquiries about system and error occurrence. Homepage Inquiry - For inquiries about using the website, please contact LG Electronics.



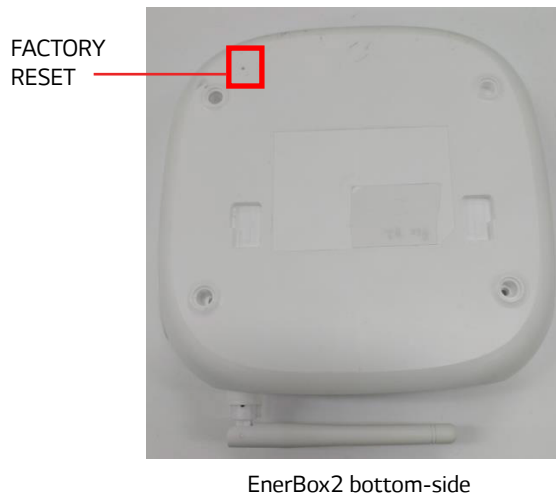
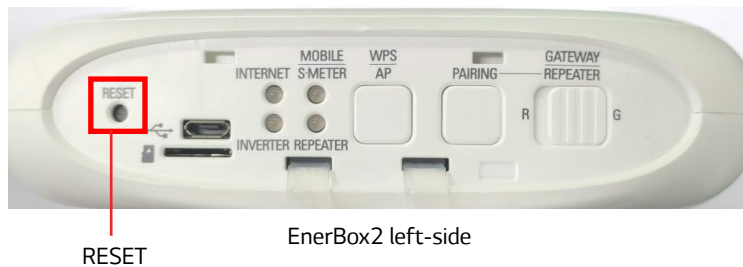


5 Troubleshooting Guide

5-1 EnerBox2 Inspection

If EnerBox2 doesn't work as guided in the manual, please follow these steps before troubleshooting.

- Make sure that the power cord is fully inserted into the power outlet and into the EnerBox2 body. If everything is normal, the LED on the upper position of the EnerBox2 will be flashing light then will turn off after the boot procedure is completed.
- Check the EnerBox2 operation mode. Enerbox2 is usually used in the GATEWAY mode.
- Reboot the EnerBox2 by pressing the 'RESET' pin. If everything is normal, the LEDs will be flashing light then turned off after the boot procedure is completed.
- For another solution, push the 'FACTORY RESET' for 3 seconds. The button is placed on the bottom of the EnerBox2. Four LEDs will be flashing in amber. When it is done, they will be flashing in green. Then, press the 'RESET' button for reboot.
- Please follow the other steps described in this manual. If problems persists, contact LG for technical support.





5-2 Replacing an EnerBox2

First, physically install the new Enerbox2 using the following procedure:

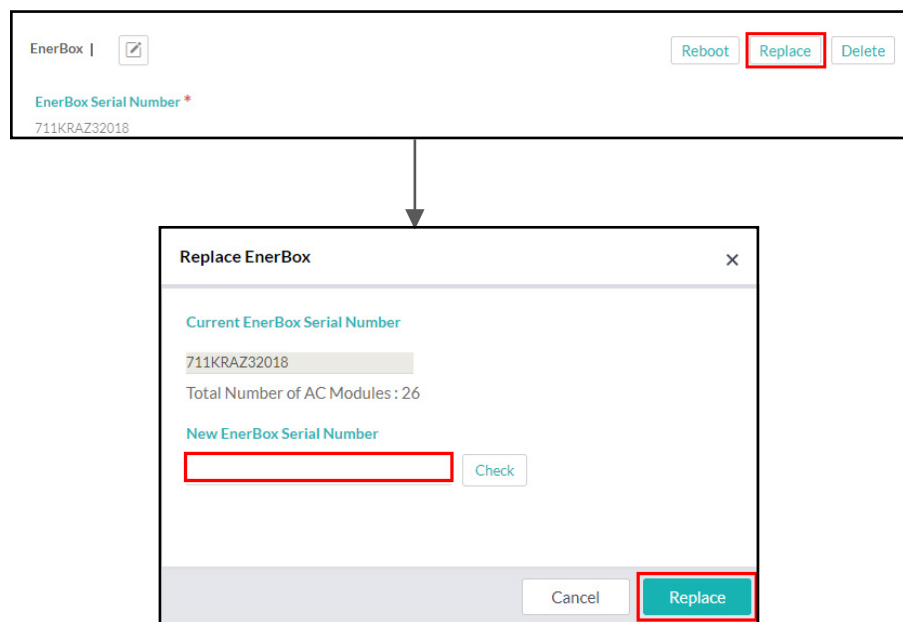
1. Unplug the power cord of the old EnerBox2
2. Place the new EnerBox2 at the same location. Connect the power cord to the new EnerBox2 and a power outlet (same outlet used by the old EnerBox2).
3. Enable the installed EnerBox2 access to the Internet in reference of the AC Module System Installation Manual where 4-3 installing EnerBox2 describes Step 2.

Since you are transferring the information from the Web server to the new EnerBox2, you need to connect to the Internet to use the 'Replace' function.

• Using EnerVu2's website

Select for [System -> Activated System -> Select the system -> Manage -> EnerBox Info -> View Detail].

As before, you can find the 'Replace' button by pressing EnerBox2 S/N in the left System View or by clicking 'View Detail' in the EnerBox Info.

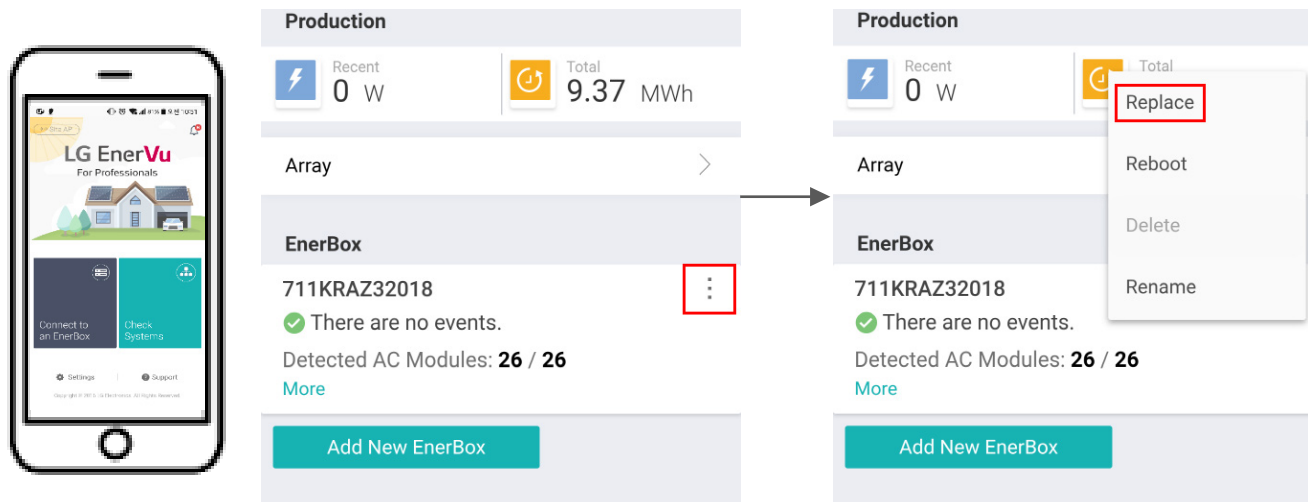
When you press the 'Replace' button, the above pop-up window will appear. Enter the newly installed EnerBox2 S/N. Verify it with the 'Check' button, and click 'Replace' at the bottom right in order to perform communication between EnerBox2 and the Web server.

- ※ Replace function should be performed after physical installation in steps 1 - 3 above. If the newly installed EnerBox2 does not connect to the Internet, the Replace function cannot be executed because the EnerBox2 S/N verification has not been made.



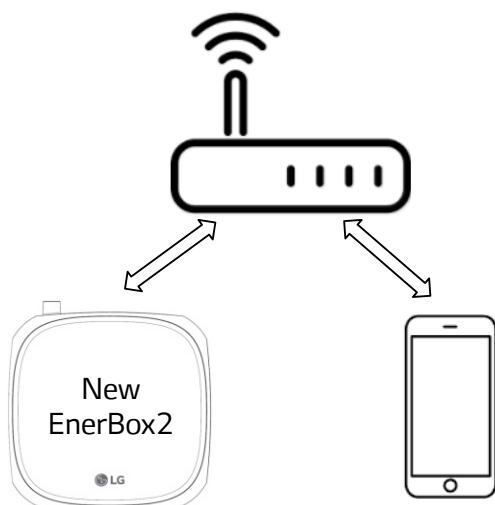
Using LG EnerVu2 Professionals

You can find the 'Reboot' button by selecting [Check Systems -> Activated -> Select a system -> EnerBox]. The button is on the right.

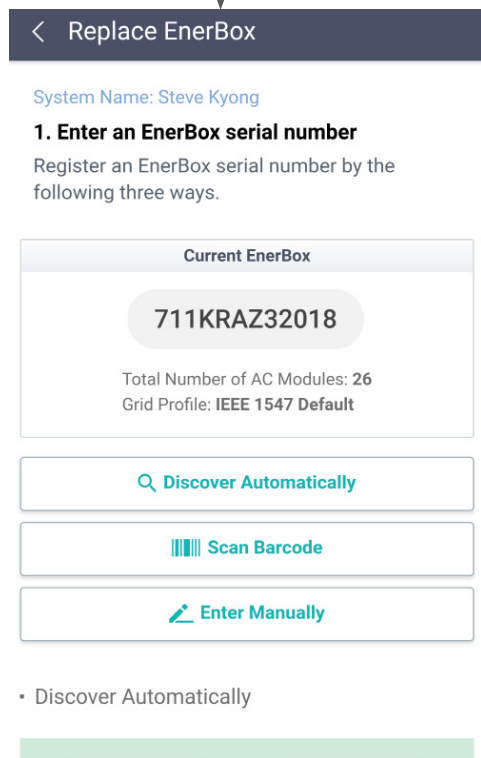


When you press the 'Replace' button, you will see three ways to enter the new EnerBox2 S/N as shown below.

- Discover Automatically
If the home router is connected together as shown below, discover the EnerBox2 automatically.



- Scan Barcode
Scan Barcode for EnerBox2 registration. Utilize your mobile phone camera to scan barcode placed on the bottom of the EnerBox2.
- Enter Manually
Enter S/N manually.





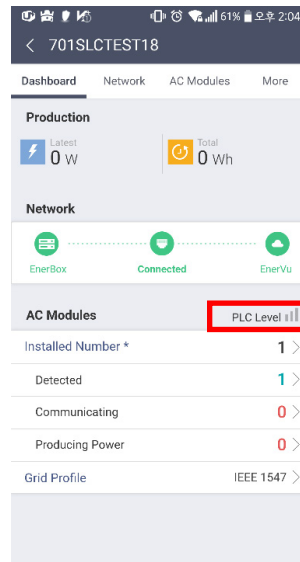
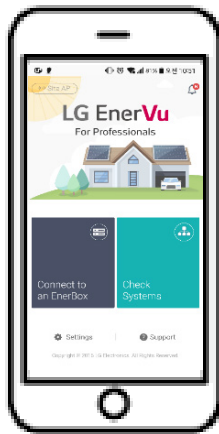
5-3 Check the PLC Level

It is recommended for the PLC level to have two or three bars. It will be the best if the outlet has the shortest electrical path from the distribution panel where all of the AC modules are attached. If the PLC level is zero or one, relocate the EnerBox2 to a location where a few home appliances are installed or closer to the distribution panel. Refer to '5-4 Micro Inverter Detection Issues' when the relocation of EnerBox2 cannot solve the problem.

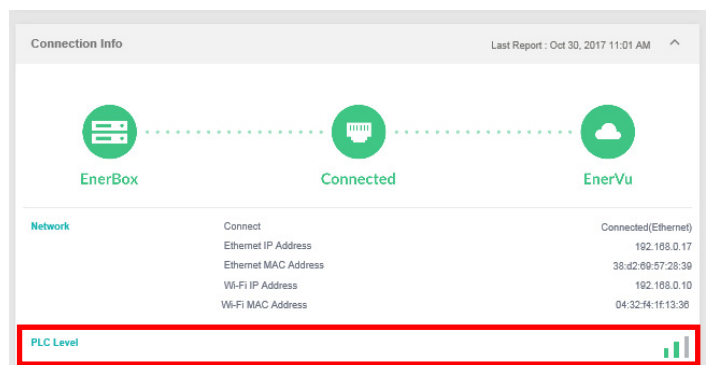
PLC level indicator

- : Inappropriate PLC level for communication
- : Intermittent communication failure is imminent
- : Decent PLC level
- : Excellent PLC level

In App: Tap on the 'Dashboard' for checking 'PLC Level'. Then check out the PLC level.



In website: It is also possible to check the PLC level via website if the system has completed activation. Select [Manage -> EnerBox info -> View detail].





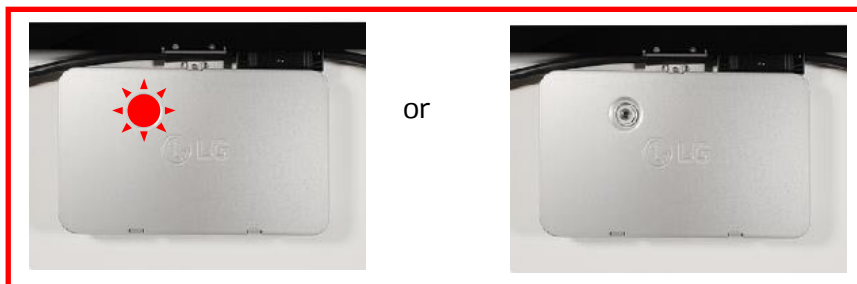
5-4 Microinverter Detection Issues

Troubleshoot power line communication issues as follows:

Issue: When the number of detected AC modules is not matched with the number of installed AC modules:

'Detected AC modules' is smaller than 'Installed Number'

- Follow the checklist below:
 - ✓ Rescan AC modules using the app and let the EnerBox2 find all of the installed AC modules.
 - ✓ Check LED status.



Grid connectivity	Grid connection (5 min. after grid connection)	Grid disconnection	Case
LED Status	LED off	LED off	abnormal A
	Red Blinking LED	LED off	abnormal B
	Red Blinking LED	Red Blinking LED	abnormal C
	LED off	Red Blinking LED	normal

Abnormality case A, B

- A. Check that the solar panel is actually getting sunlight. If it persists continuously, contact LG Electronics. to replace the product.

Abnormality case C

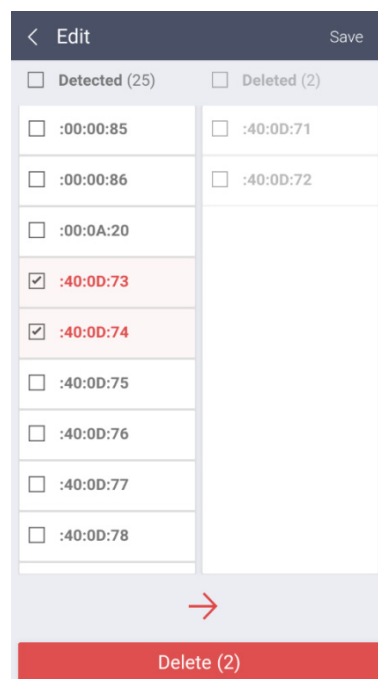
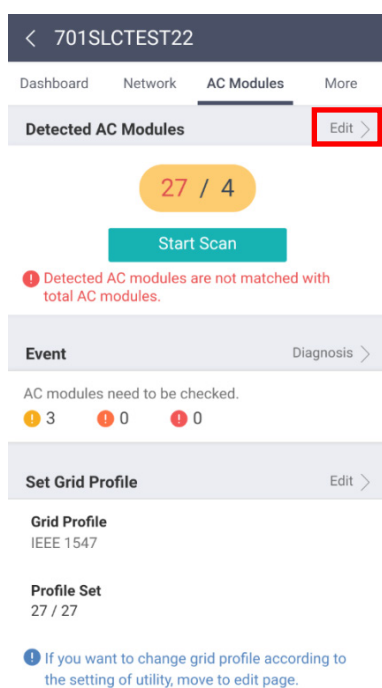
- A. Measure voltages.
- B. Measure frequencies.
- C. Measure ambient temperature and check if it is in the range of -40 to 65 °C (-40 to 145 °F).
- D. Please check that all of the AC cable connectors are properly connected.

If problems persists despite the above measure, follow the steps below.

- Relocate the EnerBox2 to a location where a few home appliances are installed. Or allow the EnerBox2 to occupy an outlet exclusively.
- Install another EnerBox2 inside a sub-panel or a distribution panel.



- 'Detected AC modules' is larger than 'Installed Number'.
- Follow the checklist below:
 - ✓ Make sure that the number of installed AC modules is accurate in the activated system.
 - ✓ Select [Detected AC Module-Edit]. Then bring up the installation map where all of the MAC addresses are attached. Compare it with the list in the app. Find and delete the one which is not in the installation map. Then save it to be updated.





5-5 Internet Connection Issues

Issue: Internet LED is Solid Amber or Off



While LG Electronics provides technical support on EnerBox2, LG Electronics has no responsibility for a router which is made by another manufacturer. If a connection failure between the EnerBox2 and a router occurs, check first whether your laptop or mobile phone is connected to the Internet. Take a quick measure by doing the steps below:

- A. Turn off the modem, the router and the EnerBox2.
- B. Turn on the modem first. Wait for a few minutes.
- C. Turn on the router. Wait for a few minutes. It needs time for the network to retrieve the IP address.
- D. Then turn on EnerBox2.

If your router is providing Internet service with no problems, then follow the steps described below. EnerBox2 can be a host in a network with particular settings like a laptop or mobile phone.

To troubleshoot this issue:

- When the Internet LED is solid amber, check the setting of site owner's broadband router. This is a case in which EnerBox2 can only access the local network but not the Internet / EnerVu Web server. It might be solved if the router has been set with a firewall setting, MAC filtering, or inactive DHCP service. Refer to the manual provided by the manufacturer of the router.

Check the router's settings

▪ Firewall

EnerBox2 uses TCP Protocol/443 port to communicate with a server. If outbound firewall rules are applied on the home router, you must configure a static IP address for the EnerBox2 and add new rules that allow outbound access for the home router.

▪ MAC filtering

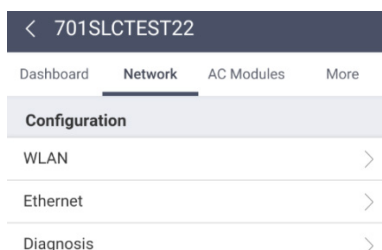
If MAC filtering is set on the home router, disable the MAC filtering. Refer to the manual provided by a manufacturer of the router.



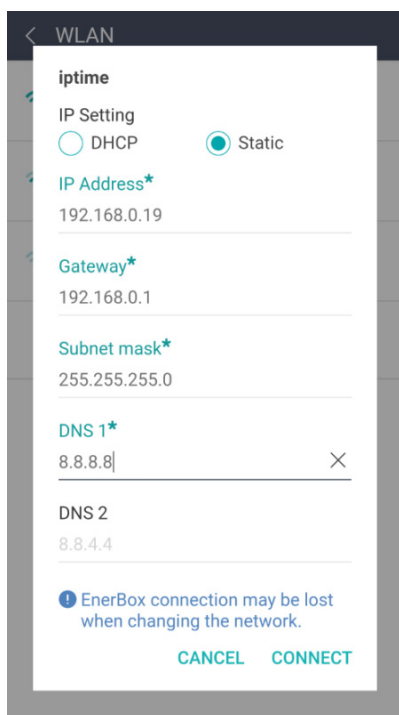
Issue: How to set the static IP address.

When an EnerBox2 tries to access to the Internet, it will automatically receive the IP address from the router's DHCP (Dynamic Host Configuration Protocol) server. However, based on circumstances, an EnerBox2 can manually set the static IP address.

1. Push the AP button for Soft AP mode. Refer to Method B, Notice #7.
2. Select [Dashboard -> Network]. Then select WLAN or Ethernet.



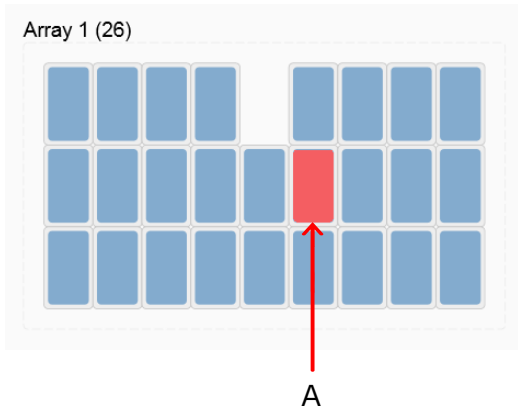
3. For WLAN, select SSID of the target router and put the password on the blank.
4. For the IP setting, select Static and put the appropriate information on each space.



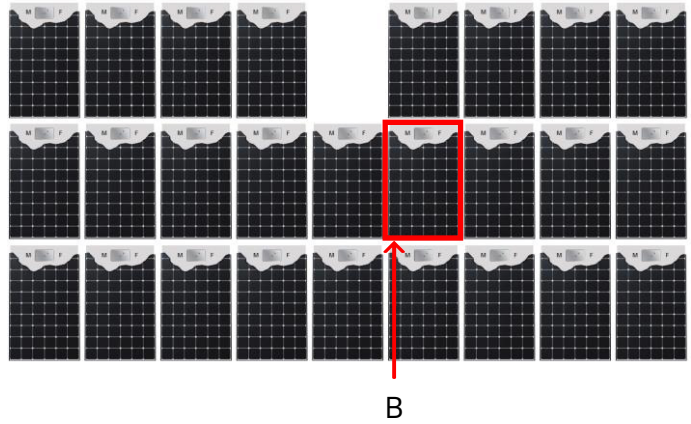
※ When WLAN is already connected and you want to set static IP, terminate the WLAN connection then proceed with the steps from the start.



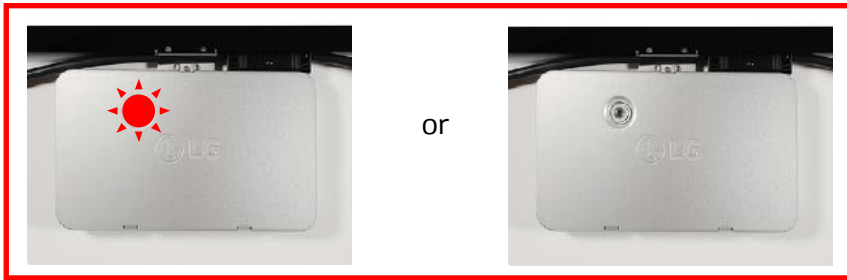
5-6 Microinverter Operation Issues



Web Monitoring system



Installed AC module system



C : Check LED status

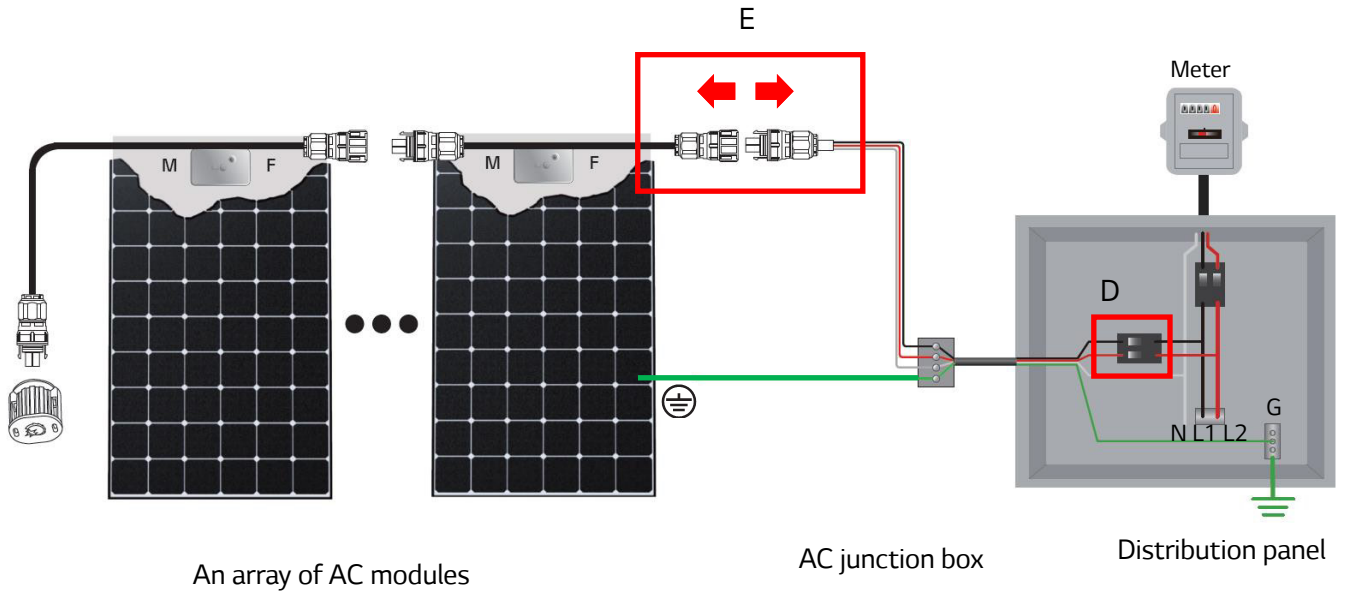
- If the web monitoring system notifies you that particular AC modules are not communicating with the EnerBox2, then write down the location of the AC module and MAC address.
- Find out the physical location of the target AC modules. Please make sure that you are equipped with proper Personal Protective Equipment that can protect you.
- During the daytime, check whether the LED blinks red or shows no lights. And keep the LED status in mind or write it down in your notes.

Grid connectivity	Grid connection (5 min. after grid connection)	Grid disconnection	Case
LED Status	LED off	LED off	abnormal A
	Red Blinking LED	LED off	abnormal B
	Red Blinking LED	Red Blinking LED	abnormal C
	LED off	Red Blinking LED	normal

⚠ WARNING



- Plan the installation work in moderate weather. There is a risk of electric shock when it is raining or snowing.
- To prevent the risk of accidents, use proper PPE (Personal Protective Equipment) including helmets, eye protection and gloves at all times.
- If installation location is high above ground, make sure to use the Fall Protection System during the installation.



F : Check LED status

- D. Investigate the distribution panel and find the circuit breaker that works only for the branch where all of the AC modules are attached. Then turn the circuit breaker off.
- E. Disengage the AC connectors for the last module which is connected to the AC junction box. For this step, make sure that the circuit breaker is properly turned off. Do not disconnect the AC cable connectors under load.
- F. During the daytime, check whether the LED blinks red or shows no lights. And keep the LED status in mind or write it down in your notes.

Grid connectivity	Grid connection (5 min. after grid connection)	Grid disconnection	Case
LED Status	LED off	LED off	abnormal A
	Red Blinking LED	LED off	abnormal B
	Red Blinking LED	Red Blinking LED	abnormal C
	LED off	Red Blinking LED	normal

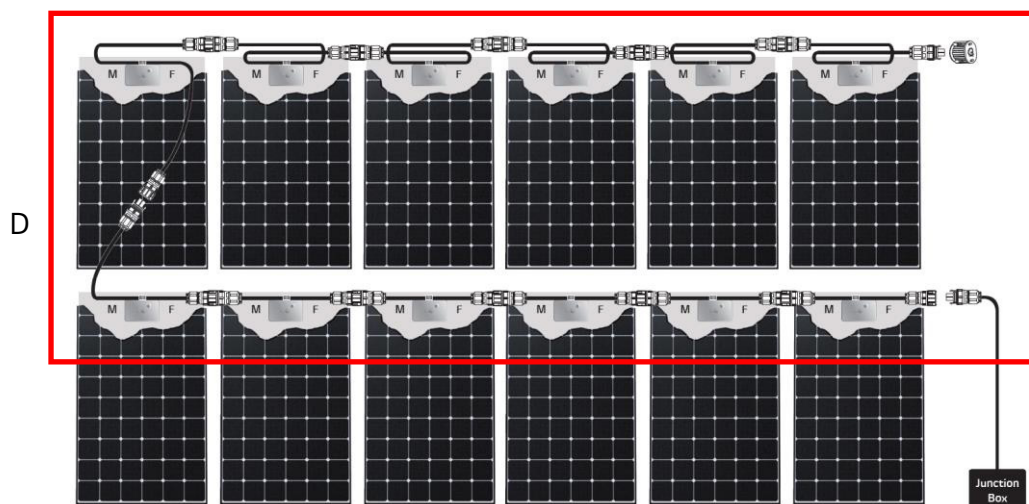


Abnormality case A, B

- A. Check that the solar panel is actually getting sunlight. If the problem persists continuously, contact LG Electronics. to replace the product.

Abnormality case C

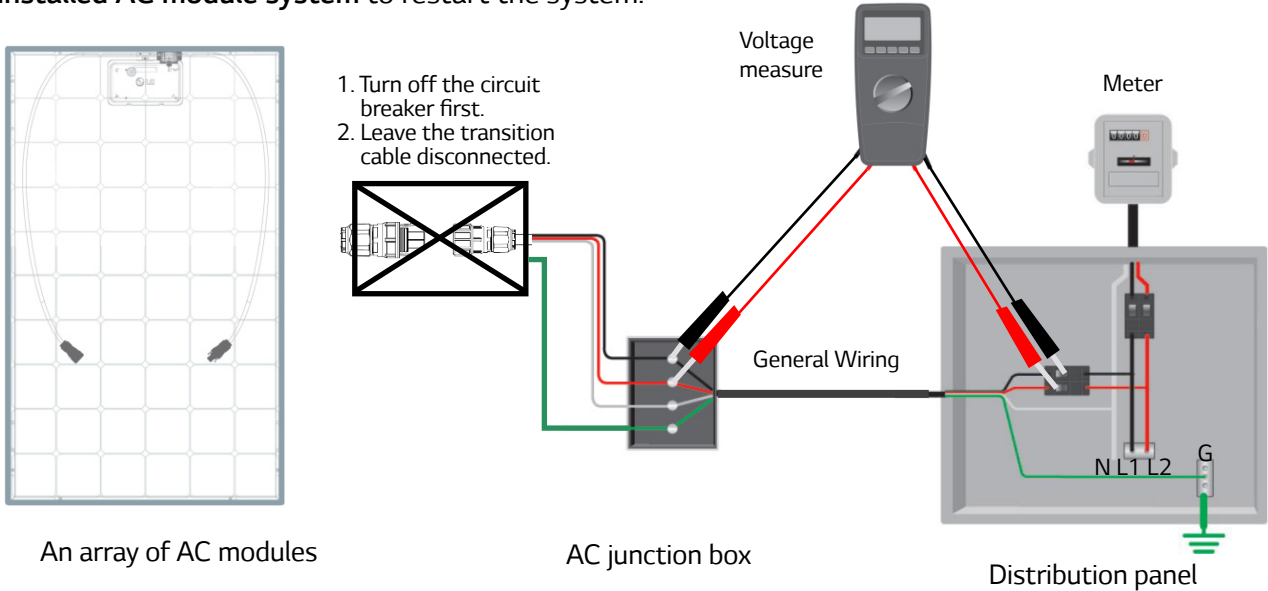
- A. Measure voltages described in the 5-7 Grid Voltage Measurement.
- B. Measure frequencies described in the 5-8 Grid Frequency Measurement.
- C. Measure the ambient temperature and check if it is in the range of -40 to 65°C (-40 to 145°F).
- D. Please check that all of the AC cable connectors are properly connected with the reference described in the AC Module System Installation Manual. Then try to follow steps of 5-6 for Micro inverter Operation Issues again.
- E. If the problem persists continuously, contact LG Electronics. to replace the product.





5-7 Grid Voltage Measurement

Measure AC voltage of the utility at the distribution panel and AC junction box using a voltmeter. Fill out the below table. If the measured voltage is out of the range which is specified in each table, then ask the local electricity provider about voltage instability. After the work, please follow **3-15 Energize the installed AC module system** to restart the system.



At distribution panel

Measure point	Single Phase 240V(RMS)			Single Phase 208V(RMS)			Three Phase 208V(RMS) Merge, Split Type		
	Expected	Range	Measured	Expected	Range	Measured	Expected	Range	Measured
L1 - N	120	106~132		120	106~132		120	106~132	
L2 - N	120	106~132		120	106~132		120	106~132	
L3 - N	-			-			120	106~132	
L1 - L2	240	211~264		208	183~229		208	183~229	
L2 - L3	-						208	183~229	
L3 - L1	-						208	183~229	

At AC junction box

Measure point	Single Phase 240V(RMS)			Single Phase 208V(RMS)			Three Phase 208V(RMS) Merge, Split Type		
	Expected	Range	Measured	Expected	Range	Measured	Expected	Range	Measured
L1 - N	120	106~132		120	106~132		120	106~132	
L2 - N	120	106~132		120	106~132		120	106~132	
L3 - N	-			-			120	106~132	
L1 - L2	240	211~264		208	183~229		208	183~229	
L2 - L3	-						208	183~229	
L3 - L1	-						208	183~229	

⚠ WARNING

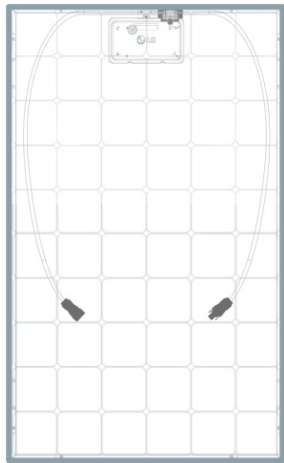


- Plan the installation work in moderate weather. There is a risk of electric shock when it is raining or snowing.
- To prevent the risk of accidents, use proper PPE (Personal Protective Equipment) including helmets, eye protection and gloves at all times.
- If installation location is high above ground, make sure to use Fall Protection System during the installation.
- For safety, only qualified personnel should undertake the work.

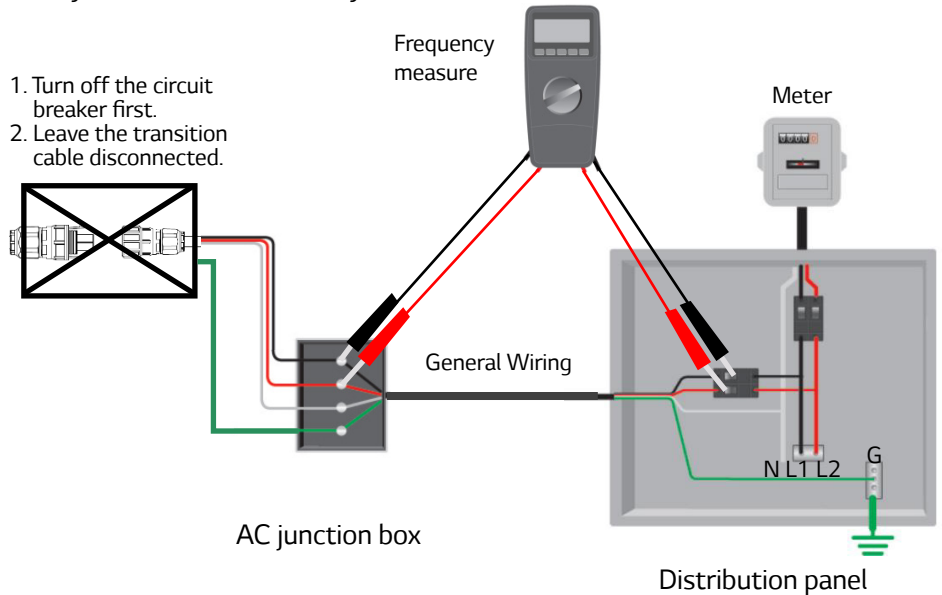


5-8 Grid Frequency Measurement

Measure grid frequency of the utility at the distribution panel and AC junction box using a voltmeter. Fill out the below table. If the measured frequency is out of the range which is specified in each table, then ask the local electricity provider about voltage frequency instability. After the work, please follow 3-15 Energize the installed AC module system to restart the system.



An array of AC modules



At distribution panel

Measure point	Single Phase 240V(RMS)			Single Phase 208V(RMS)			Three Phase 208V(RMS) Merge, Split Type		
	Expected	Range	Measured	Expected	Range	Measured	Expected	Range	Measured
L1 – N	60Hz	59.3~60.5		60Hz	59.3~60.5		60Hz	59.3~60.5	
L2 – N	60Hz	59.3~60.5		60Hz	59.3~60.5		60Hz	59.3~60.5	
L3 – N	-			-			60Hz	59.3~60.5	
L1 – L2	60Hz	59.3~60.5		60Hz	59.3~60.5		60Hz	59.3~60.5	
L2 – L3	-						60Hz	59.3~60.5	
L3 – L1	-						60Hz	59.3~60.5	

At AC junction box

Measure point	Single Phase 240V(RMS)			Single Phase 208V(RMS)			Three Phase 208V(RMS) Merge, Split Type		
	Expected	Range	Measured	Expected	Range	Measured	Expected	Range	Measured
L1 – N	60Hz	59.3~60.5		60Hz	59.3~60.5		60Hz	59.3~60.5	
L2 – N	60Hz	59.3~60.5		60Hz	59.3~60.5		60Hz	59.3~60.5	
L3 – N	-			-			60Hz	59.3~60.5	
L1 – L2	60Hz	59.3~60.5		60Hz	59.3~60.5		60Hz	59.3~60.5	
L2 – L3	-						60Hz	59.3~60.5	
L3 – L1	-						60Hz	59.3~60.5	

⚠ WARNING



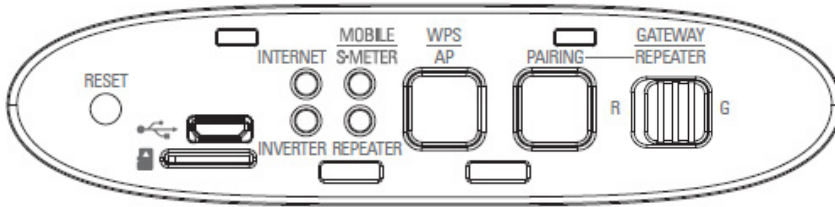
- Plan the installation work in moderate weather. There is a risk of electric shock when it is raining snowing.
- To prevent the risk of accidents, use proper PPE (Personal Protective Equipment) including helmets, eye protection and gloves at all times.
- If installation location is high above ground, make sure to use Fall Protection System during the installation.
- For safety, only qualified personnel should undertake the work.



6 Event List and Description

6-1 EnerBox2 Displays and Controls

The LEDs on the EnerBox2 are solid green when a function is enabled or performing as expected, flashing when an operation is in progress, or solid amber when troubleshooting is required (except Soft AP operation).



No.	Button and Switch	Description	Remarks
1	WPS/AP	WPS/AP mode enable button - short press: AP mode (AP starts and stops with toggle)- long press (for 3 seconds): WPS mode (No switch to WPS disable and auto disable after 2 minutes.)	
3	PAIRING	Repeater pairing button short press: Enter pairing mode (Pairing starts and stops with toggle) long press (for 3 seconds): Delete the registered Gateway and Repeater.	To pair, press the Repeater and GW pairing button each other
2	GATEWAY REPEATER	Mode Select Switch (Gateway or Repeater)	Reboot is required if mode is changed while power is on
4	RESET	EnerBox2 rebooting button	It takes about 30 seconds
5	Factory Reset (rear)	Factory-installed reset button long press (for 3 seconds): Initializing to factory default state.	



6-2 EnerBox2 LED

No.	LED	State	Description
1	All	Flashing Green	Software upgrade in progress Factory reset in progress (factory reset button pushed)
		Flashing Amber	After software upgrade and factory reset
2	INTERNET	Green	Communicating with EnerVu2
		Flashing Green	WPS mode enable
		Amber	Local network only (Connected with Home AP but not internet)
		Off	No network connection
3	MOBILE/ S-METER	Green	Zigbee paired
		Flashing Green	Zigbee pairing progress
		Amber	AP mode enable
		Flashing Amber	Zigbee connection issued
		Off	AP mode & Zigbee disconnected
4	INVERTER	Green	All Microinverters are communicating
		Flashing Green	While one or more is communicating with gateway, scan is in operation
		Amber	At least one Microinverter is not communicating
		Flashing Amber	While it is not communicating with any microinverter, scan is in operation
		Off	Microinverters are not communicating (include low light or night time)
5	REPEATER	Green	Repeater and gateway are paired
		Flashing Green	Repeater and gateway scan in progress
		Flashing Amber	Initialize the repeater and gateway list
		Off	Non-paired
6	Power production (Front)	Flashing Green	Average power is above 60W
		Flashing Yellow	Average power is below 60W
		Red	At least one Microinverter does not produce power over 72 hours
		Off	No power production



6-2 Web Monitoring System Event List

Cause Device	Event Code	Impact	Event Name (App / Web)	Event Class	Description	Remarks
MI	MI_ANG_ERR	Notice	AC Frequency changing too fast	Angle Status	NOTICE. Angle Status - 1: Angle Error (Notice #3 - AC Frequency Changing Too Fast)	AC Frequency is the frequency at which voltage varies on the utility grid. This value is changing more rapidly than allowed. And this events are usually transient and reconverted by the utility.
	MI_IAC_OVR	Error	AC Current High	Iac Status	ERROR. Iac Status - 1: Iac Over (Error #3 - AC Current Too High)	AC Output current from the AC Module is higher than allowed.
	MI_IPV_OVR	Error	DC Current High	Ipv Status	ERROR. Ipv Status- 1: Ipv Over (1: Error #2 - DC Current Too High)	DC Input current from the AC Module is higher than allowed.
	MI_NOT_RPT	Notice	AC Module Not Reported	MI Comm. Status	NOTICE. Cannot communicate with AC Module	Communication is temporarily unstable. This condition should correct itself.
	MI_THM_OP N	Error	Inverter Failure	Thermistor Status	ERROR. Thermistor Status - 10: Thermistor Open (10: Error #6 Thermistor Open)	AC Module has been in failure mode.
	MI_THM_SHT	Error	Inverter Failure	Thermistor Status	ERROR. Thermistor Status - 11: Thermistor Short (11: Error #8 Thermistor Short)	AC Module has been in failure mode.
	MI_TMP_PRT	Error	Temperature Protection	Temperature Protection	ERROR. Temperature Protection - 1: Temp. Protection (Error #5 Temperature Protection)	Temperature from the AC Module Inverter is hotter than allowed. And AC Module locks itself to protect the micro inverter from heat. This condition usually clears with out intervention.
	MI_VAC_OVR	Notice	AC Voltage High	Vac Status	NOTICE. Vac Status 10: Vac Over (Notice #1 - AC Voltage High)	AC Voltage coming from the utility has been higher than allowed. This condition should correct itself.
	MI_VAC_UND	Notice	AC Voltage Low	Vac Status	NOTICE. Vac Status 11: Vac Under (Notice #2 - AC Volatage Low)	AC Voltage coming from the utility has been lower than allowed. This condition should correct itself.



Cause Device	Event Code	Impact	Event Name (App / Web)	Event Class	Description	Remarks
MI	MI_VDC_OVR	Error	Inverter Failure Error	Vdc Status	ERROR. Iac Status - 1: Vdc Over (Error #4 DC Link Voltage High)	AC Module has been in failure mode.
	MI_VFR_OVR	Notice	AC Frequency High	Vfreq Status	NOTICE. Vfreq Status 10: Vfreq Over	AC Frequency is the frequency at which voltage varies on the utility grid. AC Frequency coming from the utility is higher than allowed. These events are usually transient and recovered by the utility. No action is required unless the condition persists.
	MI_VFR_UND	Notice	AC Frequency Low	Vfreq Status	NOTICE. Vfreq Status 11: Vfreq Under	AC Frequency is the frequency at which voltage varies on the utility grid. AC Frequency coming from the utility is lower than allowed. These events are usually transient and recovered by the utility. No action is required unless the condition persists.
	MI_VPV_OVR	Error	DC Voltage High	Vpv Status	ERROR. Vpv Status -10: Vpv Over (Error #1 - DC Voltage Too High)	DC Input voltage from the AC Module is higher than allowed.
	MI_VPV_UND	Notice	DC Voltage Low	Vpv Status	NOTICE. Vpv Status -11: Vpv Under (Error#7 - DC Voltage Too Low)	DC Input voltage from the AC Module is too low. This is usually a normal condition during hours of low light and at dawn and dusk. If this condition does happen during hours of full daylight, the AC Module may be heavily shaded or covered by snow.



7 Maintenance

- Ensure that AC cable connectors are tightly connected and the wiring works properly.
- Conduct periodic inspection of the AC modules for any damages on the front glass, back sheet, frame, AC junction box, microinverters, circuit breakers, conduits, Earth Grounding path, or external electrical connections.
- No aggressive and abrasive cleansers or chemicals such as alkali chemicals including ammonia-based solutions should ever be used on the treated front glass.
- Always wear rubber gloves for electrical insulation while maintaining, washing or cleaning panels.
- Deposits of foreign material on the frame surface can be cleaned using a wet sponge or cloth and dried by air or by using a clean chamois.
- All works related to repair shall be carried out by the approved installer for the safety of workers and systems.
- Do not use any kind of oil or lubricant on any of the module's parts, it can damage the AC Module.

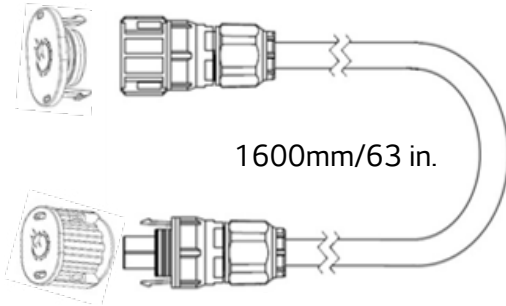
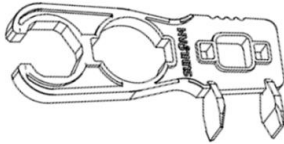
WARNING



- To prevent a risk of burn, do not touch the metal part of the AC module in operation with bare hands.
- To prevent the risk of arcing, do not disconnect the cable connector in operation.




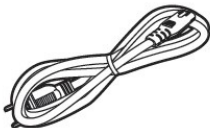


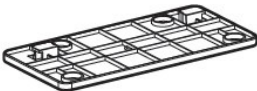
8 Accessories

Item	Model No.	Diagram	Details
Extension Cable	LEE16-FM3.AU1	 <p>1600mm/63 in.</p>	<p>-Used to connect two AC modules.</p> <p>-Usable as an extension cable or a transition cable</p> <p>-End caps are initially paired with connectors.</p> <p>-The length 1600 mm/63 in. includes only cable length. (excluded connector length)</p>
Unlocking Tool	LAC-UNLOCK2.AU1		<p>- Used in the disassembly of the connector</p>



- Accessories are not included in the AC module. Contact the distributor for purchase.
- Use the unlocking tool to remove end caps from the extension cable.



Item	Diagram		Details	
EnerBox2 Components			- Used for communication with AC modules.	
			- Used for providing power to the EnerBox2.	
			- Used in a case of wired LAN.	
		- Used for mounting the Ener-Box2 on wall.		- Used for mounting the EnerBox2 on wall.



- Accessories are not included in the AC module. Contact the distributor for purchase.



9 Product Specifications

9-1 AC module , LGXXA1C-V5

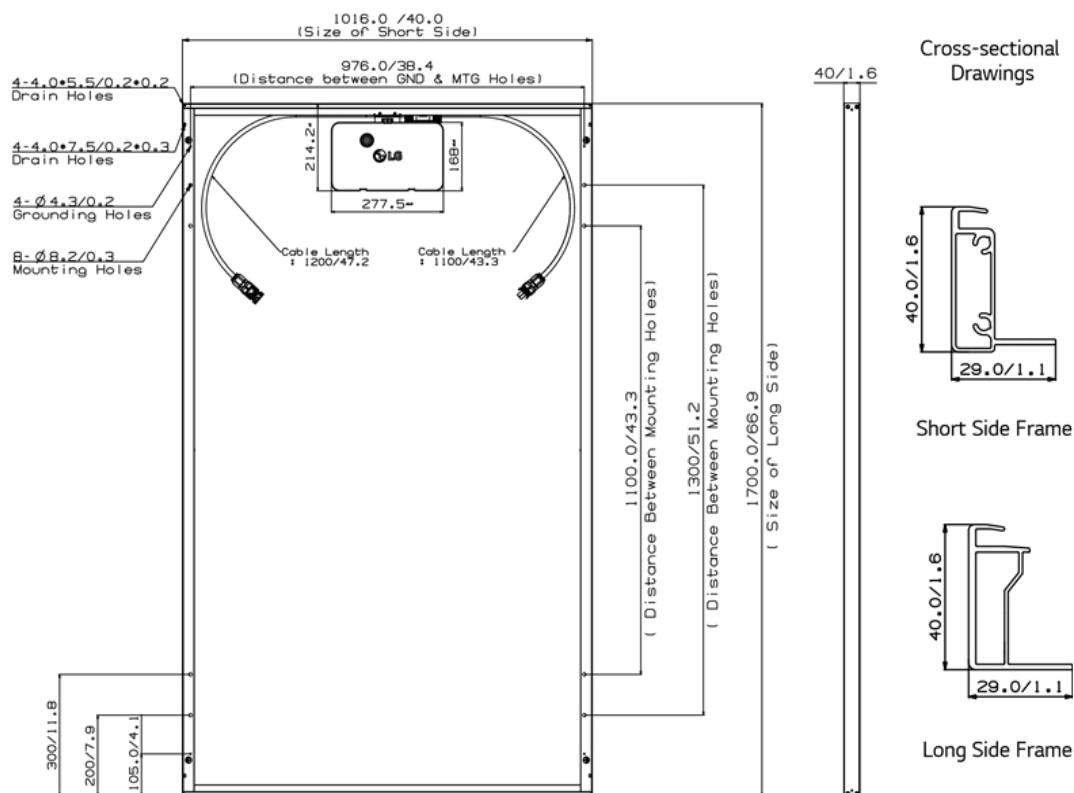
DC Input				
Parameter	Section	LG370A1C-V5	LG375A1C-V5	LG380A1C-V5
Power	Max.	370W	375W	380W
	Tolerance	0% to 2%		
Voltage	Voc	42.8V	42.8V	42.9V
	Vmpp	37V	37V	37.2V
	Tolerance	-5% to +5%		
Current	Isc	10.82A	10.82A	10.84A
	Imp	10.01A	10.01A	10.17A
	Tolerance	-5% to +5%		
Note : PV module was measured at STC (Standard Test Condition: Irradiation 1,000W/m², Cell temp. 25°C (77°F), 1.5AM)				
AC Output				
Parameter	Section	240VAC		208VAC
Power	Inverter Rated Continuous	320W		320W
Voltage	Nominal(Range)	240V (211V to 264V)		208V (183V to 229V)
Current	Nominal Output	1.33A		1.54A
Frequency	Nominal(Range)	60Hz (59.3Hz to 60.5Hz)		
Power Factor (adjustable)		1/0.8 leading...0.8 lagging		
CEC Weighted Efficiency (California Energy Commission)		97%		96.5%
Max. Number of AC Modules ¹⁾		12 EA		10 EA
Certification				
DC module		UL1703, IEC61215, IEC 61730, Safety Class II		
AC module		UL1741, IEEE1547, UL1741SA FCC Part 15 Class B		
IEEE 1547 (Default)				
Parameter	Range	Clearing Time (s)		
Phase Voltage	V < 50%	0.16		
	50% ≤ V < 88%	2.00		
	110% ≤ V < 120%	1.00		
	V ≥ 120%	0.16		
Frequency	> 60.5 Hz	0.16		
	< 59.3 Hz	0.16		
<div>• After the micro inverter got tripped by voltage or frequency abnormality, it takes about 5 min for the AC module to operate.</div> <div>• If it got tripped by other reasons or it is connected with the utility after sunrise, it takes about 1 min for the AC module to operate.</div> <div>1) Refer to 3-12 Connecting Array of AC Modules to Distribution Panel regarding Maximum number of AC Modules.</div>				



Module Fire Performance		Type 1
Environmental Rating		NEMA 6 (IP67)
Mechanical Data		
Micro Inverter	Micro Inverter Model (Grid Support Utility Interactive)	LM320UE-A2
	Operating ambient temperature	-40 to 65 °C (-40 to 149 °F)
	Storage temperature	-40 to 90 °C (-40 to 194 °F)
AC Module	Length	1700mm
	Width	1016mm
	Height	40mm
	Weight	20.0kg
	Cable length (male)	1100mm
	Cable length (female)	1200mm

Dimensions (LGXXA1C-A5)

Unit: mm / in.





9-2 AC Cables

- AC Cable Ass'y (attached on a microinverter) and Extension Cable (Accessory)

Technical Data	
Standard	UL9703
Rated Voltage	600V AC
Temperature Range	-40 to 85 °C (-40 to 185 °F)
Rated Current	20A
Protection Degree	IP68
Wire Size Range	3C 12 AWG
Diameter Range of Cable	ø 11 mm



9-3 EnerBox2

Internal Communication with AC module			
Type	Broadband Power Line Communication (IEEE1901)		
Sample Rate	15 minutes		
Bandwidth	2MHz ~ 28MHz		
Maximum Node	600		
Internal Communication with Smart-meter			
Wireless Communication	IEEE802.15.4 ZigBee		
External Communication			
Wired Communication	IEEE802.3 10BASE-T/100BASE-TX Ethernet		
Wireless Communication	IEEE802.11b,g,n		
Power Requirement			
	Min.	Typ.	Max.
Input Voltage	90 V _{rms}	100~264 V _{rms}	277 V _{rms}
Input Current	0.45 A _{rms}	0.24 A _{rms}	0.21 A _{rms}
Frequency	47 Hz	50/60 Hz	63 Hz
Phase	Single		
Lightening Surge	3kV IEC61547		
Mechanical Properties			
Dimension (W x H x D)	155.8 x 173.4 x 38.2 [mm]		
Weight	0.4 kg		
Operating Temperature	0 to 60 °C (32 to 140 °F)		
Enclosure Rating	IP30		
Certifications and Warranty			
Certifications	FCC Part 15 Class B ETL (Conforms to UL Std. 60950-1)		
Limited Warranty	5 years		



10 Warranty

Disclaimer of Liability

- By starting the installation process, the installer is acknowledging that he/she has read and completely understands this Installation Manual. He/She further acknowledges that if he/she had any questions regarding this installation manual he/she would have contacted LG with any questions or concerns prior to installation.
- By installing an LG Solar module, the installer is fully agreeing not to sue LG, its affiliated companies, successors, or assigns, its administrators, directors, agents, officers, volunteers and employees, other participants in any activity connected to installation, operation, or service of LG Solar Modules, and if applicable, will discharge above listed parties from all liabilities, claims, demands, losses, or damages on his/her account caused or alleged to be caused in whole or in part by the negligence of the LG affiliated companies, successors, or assigns, its administrators, directors, agents, officers, volunteers and employees.

Disposal

- Please contact us if you have any inquiries related to the disposal or recycling of solar modules from LG Electronics.

11 Transportation and Storage

- Keep AC modules tight in position during transportation on a truck, a ship, etc.
- If banding is loose modules will be shaken, which may cause damage like glass breaking.
- Do not stack on more than one pallet. Maximum height is two pallets. Severe stacking can cause stress to the AC modules
- Keep all modules in their original packaging prior to installation.

12 Contact

LG Electronics U.S.A., Inc.

1000 Sylvan Ave, Englewood Cliffs, NJ 07632

Contact : lg.solar@lge.com

<http://www.lgsolarusa.com>



Project Title: Total AC modules: Total Arrays (AC junction box): Sheet _____ of _____		Customer Information:		Installer Information:		N S E W (Mark one)	
1		2		3		4	
A							
B							
C							
D							
E							
F							
		EnerBox2 serial number:		AC module Installation Map		Life's Good	

↑ Link to Sheet _____

↑ Link to Sheet _____

↓ Link to Sheet _____

↓ Link to Sheet _____



Appendix 2 – Module Installation & Load Guide

Mechanical Installation: LGXXXA1C-V5

Fig. 1 Bolting Type		Fig. 2 Clamping Type	
A: 200mm(7.9 in) B: 300mm(11.8 in)	Front: 6000Pa(125psf) Rear: 5400Pa(113psf)	A: 270mm(10.6 in) B: 400mm(15.7 in)	Front: 6000Pa(125psf) Rear: 5400Pa(113psf)
Fig. 3 Clamping Type		Fig. 4 Clamping Type	
A: 270mm(10.6 in) B: 400mm(15.7 in)	Front: 4300Pa(125psf) Rear: 4300Pa(113psf)	A: 120mm(4.7 in) B: 200mm(7.9 in)	Front: 1800Pa(37.5psf) Rear: 1800Pa(37.5psf) Front: 2850Pa(50psf) Rear: 2850Pa(50psf)
Fig. 5 Clamping Type		Fig. 6 Clamping Type	
A: 200mm(7.9 in) B: 400mm(15.7 in)	Front: 6000Pa(125psf) Rear: 5400Pa(113psf)	A: 120mm (4.7in)	*4point(①) Front: 1800Pa(37.5psf) Rear: 1800Pa(37.5psf)
C: 120mm(4.7 in)	Front: 3200Pa(67psf) Rear: 1800Pa(37.5psf)	A: 120mm B: 843±100mm (33.2±3.9 in)	6point (①+②) Front: 6000Pa(125psf) Rear: 5400Pa(113psf)
Note) All mechanical installation method(Fig. 1 to Fig. 6) in this appendix were not tested by UL. (UL 1703, ULC 1703). It is evaluated by an LG internal test.			



Appendix 3 – Alternative Equipment Grounding Devices

This appendix defines alternative grounding methods for LG AC modules and applies to the LG Module Installation manual and listed manufacturer's installation guide. These alternative grounding devices indicated on this page have been evaluated and approved by LG, not by UL. If such devices are to be used to meet the requirement in UL 1703, additional adequate tests shall be conducted in accordance with UL1703 additionally.

Products		Remark
Manufacture	Ground Devices	
Everest	Everest Solar Universal Bonding Clamp	
IronRidge	IronRidge IG (Integrated Grounding) Clamp / UFO Mid Clamp	
Unirac	Unirac Bonding Mid Clamp / SunFrame Micro Rail / Wire Bonding Clip w/ 8 AWG	
Panel Claw	Standard Claw / Long Claw / PolaBear III Claw	
Quickmount PV	Quick Rack Panel Clamp	
SnapNrack	SnapNrack Bonding Mid Clamp / SnapLink for RL system	
Ecolibrium	EcoX Clamp and Coupling assembly / EcoFoot Clamp	
Pegasus	Pegasus LightSpeed Corners	
Schletter	Rapid Grounding Module Clamps	
Dynorax	DynoBond	
Roof Tech	Roof Tech Bonding Plate	
ILSCO	ILSCO SGB-4 Solar Grounding Lug	
TYCO	TYCO 2058729 / 2106831 SolarLock Grounding Assy	
Wiley Burndy	WEEB LUG / WEEB KMC in combination with Everest clamp / WEEB DMC in combination with IronRidge clamp / Wiley WEEB UMC or UGC-1 in combination with Unirac clamp / WEEB PMC in combination with Pro Solar clamp / WEEB DPW in combination with DPW Solar clamp	

Important Notes

1. The NEC section 690.43 states, "Exposed non-current carrying metal parts of module frame, equipment and conductor enclosures shall be grounded in accordance with 250.134 or 250.136(A) regardless of voltage."
2. Functionality will not be guaranteed if reused.



FCC Supplier's Declaration of Conformity 47 CFR § 2.1077 Compliance Information

Unique Identifier: Model XXXXX

Responsible Party –U.S. Contact Information

LG Electronics USA, Inc.
111 Sylvan Ave Englewood Cliffs, New Jersey
07632

Email: lg.environmental@lge.com

<http://www.lgsolarusa.com>

This document is subject to change without notice.

LG, LG logo and Life's Good are trademarks of LG Electronics, Inc. worldwide. Trademarks and intellectual properties of LG Electronics, Inc. are protected by international copyright laws.

Document : II-AC-UL-V1-EN-201803