Installing **Enphase M250** and **M215** Microinverters

To install the Enphase M250 and M215 Microinverters™ read and follow all warnings and instructions in this guide and in the *Enphase M250 and M215 Microinverter Installation and Operation Manual* at: [enphase.com/support](http://enphase.com/support). Safety warnings are listed on the back of this guide.

Because ground fault protection (GFP) is integrated into the M250 and M215 microinverters, the models listed in this guide do not require a grounding electrode conductor (GEC) between microinverters. To support GFP, use only PV modules equipped with DC cables labeled **PV Wire** or **PV Cable**.

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**PREPARATION**

A ) Download the Enphase Installer Toolkit™ mobile app and open it to log in to your Enlighten account. With this app, you can scan microinverter serial numbers and connect to the Envoy-S to track system installation progress. To download, go to [enphase.com/toolkit](http://enphase.com/toolkit) or scan the QR code at right.

B ) Refer to the following table and check PV module electrical compatibility at: [enphase.com/en-us/support/module-compatibility](http://enphase.com/en-us/support/module-compatibility).

<table>
<thead>
<tr>
<th>Microinverter model</th>
<th>PV module cell count</th>
</tr>
</thead>
<tbody>
<tr>
<td>M215-60-2LL-S22:IG</td>
<td>Pair only with 60-cell modules.</td>
</tr>
<tr>
<td>M250-60-2LL-S22</td>
<td></td>
</tr>
<tr>
<td>M250-60-2LL-S25</td>
<td></td>
</tr>
<tr>
<td>M250-72-2LL-S22</td>
<td>Pair with 60- or 72-cell modules.</td>
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<tr>
<td>M250-72-2LL-S25</td>
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<tr>
<td>M250-72-2LL-S22-US</td>
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</tbody>
</table>

To ensure mechanical compatibility, order the correct connector type (MC-4 locking or Amphenol H4) for both microinverter and PV module from your distributor.

C ) In addition to the Enphase Microinverters, PV modules and racking, you will need these **Enphase items**:
- Enphase Envoy or Envoy-S™ communications gateway (required to monitor solar production)
- Enphase Engage Cable™, single-phase 240 VAC or three-phase 208 VAC, as needed
- Tie wraps or cable clips
- Enphase Sealing Caps (for any unused drops on the Engage Cable)
- Enphase Terminators (one needed at the end of each AC branch circuit)
- Enphase Disconnect Tool (number 2 and 3 Phillips screwdrivers can be substituted)

D ) Check that you have these **other items**:
- Outdoor-rated, weather-proof AC junction box(es)
- Gland or strain relief fitting (one per AC junction box)
- Number 2 and 3 Phillips screwdrivers
- Torque wrench, sockets, wrenches for mounting hardware
- Adjustable wrench or open-ended wrench (for terminators)
- Hand-held mirror (to view LEDs on the undersides of the microinverters)

E ) Protect your system with lightning and/or surge suppression devices. It is also important to have insurance that protects against lightning and electrical surges.

F ) Plan your AC branch circuits to meet the following limits for maximum number of microinverters per branch when protected with a 20-amp maximum over-current protection device (OCPD).

<table>
<thead>
<tr>
<th>Service type</th>
<th>Max. M250s per branch circuit</th>
<th>Max. M215s per branch circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-phase 240 VAC</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Three-phase 208 VAC</td>
<td>24</td>
<td>25</td>
</tr>
</tbody>
</table>

G ) Size the AC wire gauge to account for voltage rise. Select the correct wire size based on the distance from the beginning of the microinverter AC branch circuit to the breaker in the load center. Design for a voltage rise total of less than 2% for the sections from the microinverter AC branch circuit to the breaker in the load center. Refer to the Voltage Rise Technical Brief at [enphase.com/support](http://enphase.com/support) for more information.

**Best practice:** Center-feed the branch circuit to minimize voltage rise in a fully-populated branch.

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**How It Fits Together**

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INSTALLATION

1 Position the Enphase Engage Cable
   A) Check the labeling on the Engage Cable drop connectors to be sure that the cable matches the electrical service at the site. Use 208 VAC Engage Cable at sites with three-phase 208 VAC service, or use 240 VAC Engage Cable at sites with 240 VAC single-phase service.
   B) Plan the cable length to allow drop connectors on the Engage Cable to align with each PV module. Allow extra length for slack, cable turns, and any obstructions.
   C) Many PV modules have a central stiffening brace. Position the connectors so that they do not conflict with the braces.
   D) Cut a length of cable to meet your planned needs.
   E) Lay out the cabling along the installed racking for the AC branch circuit.

2 Install an AC Junction Box/Isolator
   A) Verify that AC voltage at the site is within range:

<table>
<thead>
<tr>
<th>240 VAC Single-Phase</th>
<th>208 VAC Three-Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 to L2</td>
<td>211 to 264 VAC</td>
</tr>
<tr>
<td>L1, L2, to N</td>
<td>106 to 132 VAC</td>
</tr>
<tr>
<td>L1, L2, L3 to N</td>
<td>183 to 229 VAC</td>
</tr>
<tr>
<td></td>
<td>106 to 132 VAC</td>
</tr>
</tbody>
</table>
   B) Install an appropriately rated, off-the-shelf junction box or isolator at a suitable location on the racking.
   C) Provide an AC connection from the AC junction box back to the electricity network connection using equipment and practices as required by local jurisdictions.

3 Attach the Microinverters to the PV Racking
   A) Mark the approximate centers of each PV module on the PV racking.
   B) Mount the microinverter right side up and under the PV module, away from rain and sun. Allow a minimum of 1.9 cm (0.75") between the roof and the microinverter. Also allow 1.3 cm (0.50") between the back of the PV module and the top of the microinverter.
   C) Torque the microinverter fasteners as follows. Do not over torque.
      - 6 mm (1/4") mounting hardware: 5 N m (45 to 50 in-lbs)
      - 8 mm (5/16") mounting hardware: 9 N m (80 to 85 in-lbs)

   WARNINGS:
   · Install the microinverter under the PV module to avoid direct exposure to rain, UV, and other harmful weather events.
   · Do not mount the microinverter upside down or in a vertical position that allows water to collect in the DC connector recess as it may have a harmful effect on the long term endurance of the unit.
   · Do not expose the AC or DC connectors (on the Engage Cable connection, PV module, or the microinverter) to harmful weather events before the connectors are mated as it may result in weather rated damage to the connection.

4 Create an Installation Map
   Create a paper installation map to record microinverter serial numbers and position in the array.
   A) Peel the removable serial number label from each microinverter and affix it to the respective location on the paper installation map.
   B) Peel the label from the Envoy and affix it to the installation map.
   C) Always keep a copy of the installation map for your records.

5 Dress the Cable
   A) Use cable clips or tie wraps to attach the cable to the racking.
   B) Dress any excess cabling in loops so that it does not contact the roof. Do not form loops smaller than 12 cm (4.75 inches) in diameter.

6 Connect the Microinverters
   A) Remove and discard the temporary shipping cap from the cable connector and connect the microinverter. Listen for two clicks as the connectors engage.
   B) Cover any unused connectors with Enphase Sealing Caps. Listen for two clicks as the connectors engage.

   WARNING: Install sealing caps on all unused AC connectors as these become live when the system is energized by the utility. Sealing caps are required for protection against moisture ingress. Do not use shipping caps to cover unused connectors.

   To remove a sealing cap or AC connector, you must use an Enphase disconnect tool or a Phillips screwdriver.
7 Terminate the Unused End of the Cable
A) Remove 60 mm of the cable sheath from the conductors.
B) Check that all the terminator parts are present.
C) Slide the hex nut onto the cable.
D) Insert the cable end all the way into the cable organizer (up to the stop).
E) Attach the cap.
F) Attach the terminated cable end to the PV racking with a cable clip or tie wrap so that the Engage Cable and terminator do not touch the roof.

8 Connect to the AC Junction Box/Isolator
Connect the Engage Cable into the AC branch circuit junction box or isolator. The Engage Cable uses the following wiring color code:

<table>
<thead>
<tr>
<th>240 VAC Single-Phase Wires</th>
<th>208 VAC Three-Phase Wires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black – L1</td>
<td>Black – L1</td>
</tr>
<tr>
<td>Red – L2</td>
<td>Red – L2</td>
</tr>
<tr>
<td>White – Neutral</td>
<td>Blue – L3</td>
</tr>
<tr>
<td>Green – Ground</td>
<td>White – Neutral</td>
</tr>
<tr>
<td></td>
<td>Green – Ground</td>
</tr>
</tbody>
</table>

The green wire acts as equipment ground (EGC).

9 Connect the PV Modules
Mount the PV modules above the microinverters.

10 Energize the System
A) If applicable, turn ON the AC disconnect or circuit breaker for the branch circuit.
B) Turn ON the main utility-grid AC circuit breaker. Your system will start producing power after a five-minute wait time.
C) Check the LED on the underside of the microinverter:

<table>
<thead>
<tr>
<th>LED</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashing green</td>
<td>Normal operation. AC grid function is normal and there is communication with the Envoy.</td>
</tr>
<tr>
<td>Flashing orange</td>
<td>The AC grid is normal but there is no communication with the Envoy.</td>
</tr>
<tr>
<td>Flashing red</td>
<td>The AC grid is either not present or not within specification.</td>
</tr>
<tr>
<td>Solid red</td>
<td>There is an active &quot;DC Resistance Low, Power Off&quot; or &quot;GFDI&quot; fault. To reset, refer to the Enphase M250 and M215 Microinverter Installation and Operation Manual at: <a href="http://www.enphase.com/support">http://www.enphase.com/support</a></td>
</tr>
</tbody>
</table>

ACTIVATE MONITORING
After you have installed the microinverters, follow the procedures in the Enphase Envoy Quick Install Guide to activate system monitoring and complete the PV installation.
- Connecting the Envoy
- Detecting the microinverters
- Connecting to Enlighten
- Registering the system
- Building the virtual array
PV Rapid Shutdown Equipment (PRVS)

This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 sections 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to the following requirements:

- Microinverters and all DC connections must be installed inside the array boundary. Enphase further recommends that the microinverters and DC connectors be installed under the PV module to avoid direct exposure to rain, UV, and other harmful weather elements.
- The array boundary is defined as 305 mm (1 ft.) from the array in all directions, or 1 m (3 ft.) form the point of entry inside a building.
- This rapid shutdown system must be provided with an initiating device and (or with) status indicator which must be installed in a location readily accessible to the responders, or be connected to an automatic system which initiates rapid shutdown upon the activation of a system disconnect or activation of another type of emergency system.

The installer shall be listed and identified as a disconnecting means that plainly indicates whether it is in the "off" or "on" position. Examples are:
- Service disconnecting means
- PV system disconnecting means
- Readily accessible switch or circuit breaker

The handle position of a switch or circuit breaker is an "off" or "on" position. Examples are:
- Emergency system.
- In a system disconnect or activation of another type of emergency system.

In addition, a system disconnect or activation of another type of emergency system may be a safety disconnect or activation of another type of emergency system.

SAFETY

IMPORTANT SAFETY INSTRUCTIONS. SAVE THIS INFORMATION. This guide contains important instructions to follow during installation of the Enphase M215 and M250 Microinverter.

WARNING Hot surface.
WARNING Refer to safety instructions.
DANGER Risk of electric shock.
Refer to manual

Safety Symbols

DANGER! This indicates a hazardous situation, which, if not avoided, will result in death or serious injury.
WARNING! This indicates a situation where failure to follow instructions may result in property damage or minor injury.
WARNING! This indicates a situation where failure to follow instructions may result in burn or electric shock.
NOTE! This indicates information particularly important for optimal system operation.

General Safety

DANGER! Before installing or using the Enphase Microinverter, read all instructions and cautionary markings in the technical description, on the Enphase Microinverter System, and on the photovoltaic (PV) equipment.
DANGER! Risk of electric shock. Do not use Enphase equipment in a manner not specified by the manufacturer. Doing so may cause death or injury to persons, or damage to equipment.
DANGER! Risk of electric shock. Be aware that installation of this equipment includes risks of electric shock. Do not install the AC junction box without first removing AC power from the System.

WARNING! Risk of electric shock. The DC conductors of this photovoltaic system are ungrounded and may be energized.
WARNING! Risk of electric shock. Always de-energize the AC branch circuit before servicing. Never disconnect the DC connectors under load.
WARNING! Risk of electric shock. Risk of fire. Only use electrical components approved for wet locations.
WARNING! Risk of electric shock. Risk of fire. Only qualified personnel should troubleshoot, install or replace Enphase Microinverters or the Engage Cable and Accessories.
WARNING! Risk of electric shock. Risk of fire. Ensure all AC and DC wiring is correct and that none of the wires are pinched or damaged. Ensure that all AC junction boxes are properly grounded and the AC branch circuit is protected by a circuit breaker of at least 20A maximum breaker.
WARNING! Do not connect Enphase Microinverters to the grid or energize the AC circuit(s) until you have completed all of the installation procedures and have received prior approval from the utility company.
NOTE! To ensure optimal reliability and to meet warranty requirements, install the Enphase Microinverters and Engage Cable according to the instructions provided in this guide.
NOTE! Perform all electrical installations in accordance with all applicable local electrical codes, and the National Electrical Code (NEC), ANSI/NFPA 70.
NOTE! The AC and DC connectors on the cable are rated as a disconnect only when used with an Enphase Microinverter.
NOTE! Protection against lightning and resulting voltage surge must be in accordance with local codes.

Microinverter Safety

WARNING! Risk of skin burn. The body of the Enphase Microinverter is the heat sink. Under normal operating conditions, the temperature is 20°C above ambient, but under extreme conditions the microinverter can reach 90°C. To reduce risk of burns, use caution when working with microinverters.
WARNING! Risk of electric shock. Risk of fire. If the AC cable on the microinverter is damaged, do not install the microinverter.
WARNING! Risk of electric shock. Risk of fire. Do not attempt to replace the Enphase Microinverter, it contains no serviceable parts. If it fails, contact Enphase customer service to obtain an RMA (return merchandise authorization) number and start the replacement process. Tampering with or opening the Enphase Microinverter will void the warranty.
WARNING! Risk of equipment damage. Install the microinverter under the PV module to avoid direct exposure to rain, UV, and other harmful weather events. Do not mount the microinverter upside down or in a vertical position that allows water to collect in the AC connector recess as it may have a harmful effect on the term endurance of the unit. Do not expose the AC or DC connectors (on the Engage Cable connection, PV module, or to the microinverter) to hot and/or wet environments before the connectors are mated as it may result in weather rated damage to the connection.
WARNING! Risk of equipment damage. The Enphase Microinverter is not protected from damage due to moisture trapped in cabling systems. Never mount microinverters that have been left disconnected and exposed to wet conditions. This voids the Enphase warranty.
WARNING! Risk of equipment damage. The Enphase Microinverter is not protected from damage due to moisture trapped in cabling systems. Never mount microinverters that have been left disconnected and exposed to wet conditions. This voids the Enphase warranty.
WARNING! You must match the DC operating voltage of the Enphase Microinverter with the allowable input voltage range of the Enphase Microinverter.
WARNING! The maximum open circuit voltage of the PV module must not exceed the specified maximum input DC voltage of the Enphase Microinverter.

WARNING! Risk of equipment damage. The Enphase Microinverters of this photovoltaic system only with a standard, compatible PV module with appropriate fill-factor, voltage, and current ratings. Use Enphase microinverters with high efficiency, smart PV modules, fuel cells, wind or water turbines, DC generators, and non-Enphase batteries, etc. These devices do not behave like standard PV modules, so operation and compliance is not guaranteed. These devices may also damage the Enphase Microinverter by exceeding its electrical rating, making the system potentially unsafe.
WARNING! Risk of electric shock. Risk of fire. Only qualified personnel should install or replace the Enphase Microinverter to the utility grid.
NOTE! The Enphase Microinverter has field-adjustable voltage and frequency trip points that may require additional local requirements. Only an authorized installer with the permission and following requirements of the local electrical authorities should make adjustments.

Engage Cable and Accessory Safety

DANGER! Risk of electric shock. Do not install the Engage Cable terminator cap while power is connected.
WARNING! Risk of electric shock. Risk of fire. When stripping the sheath from the Engage Cable, make sure the conductors are not damaged. If the exposed wires are damaged, the system may not function properly.
WARNING! Risk of electric shock. Risk of fire. Do not leave AC connectors on the Engage Cable uncovered for an extended period. If you do not replace the microinverter immediately, you must cover any unused connector with a sealing cap. Do not reuse sealing caps.
WARNING! Risk of electric shock. Make sure protective sealing caps have been installed on all unused AC connectors. Unused AC connectors are live when the system is energized. Do not reuse sealing caps.
WARNING! Use the terminator only once. If you open the terminator during installation, the latching mechanism is destroyed. If the latching mechanism is defective, do not use the terminator. Do not manipulate or manipulate the latching mechanism.
WARNING! When installing the Engage Cable, ensure any loose cable to minimize tripping hazard.
NOTE! There are two release-holes in the drop connector on the cable. These are not for mounting but are used to disconnect the connector. Keep these release holes clear and accessible.
WARNING! Looping the Engage Cable, do not form loops smaller than 4.75 inches (12 cm) in diameter.
NOTE! If you need to remove a sealing cap, you must use the Enphase disconnect tool or a #3 Phillips screwdriver. Do not reuse sealing caps.
NOTE! When installing the Engage Cable and accessories, adhere to the following:
- Do not expose the terminator cap or cable connections to direct, pressurized liquid (water jets, etc.).
- Do not expose the terminator cap or cable connections to continuous immersion.
- Do not expose the terminator cap or cable connections to continuous tension (e.g. tension due to pulling or bending the cable near the connection).
- Use only the connectors and cables provided by Enphase for the microinverter.
- Do not install or use in potentially explosive environments.
- Do not install the terminator to come into contact with open flame.
- Make sure that all terminal caps are seated correctly in the wire organizer.
- Fit the terminator cap using only the prescribed tools and in the prescribed manner.
- Use the terminator to seal the conductor end of the Engage Cable connection.
- Do not use the shipping cap to cover unused connectors. The shipping cap does not provide an adequate seal.
- Enphase sealing caps are required to protect against moisture ingress.

Enphase Customer Support: enphase.com/en-us/support/contact

140-00803-02
Scan completed map and upload it to Enphase. Click “Add a New System” at https://enlighten.enphaseenergy.com. Use this map to build the virtual array in Enlighten’s Array Builder.


<table>
<thead>
<tr>
<th>Panel Group/Grupo de los paneles:</th>
<th>Customer/Cliente:</th>
<th>Installer/Instalador:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azimuth/Azimut:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tilt/Inclinación:</td>
<td></td>
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<tr>
<td>Sheet/Hoja ______ of/de ______</td>
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<th>A</th>
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To Sheet / A la hoja de: ________