

## M215 Microinverter Installation Planning

### The M215 Microinverter

The M215 Microinverter™ is a powerful and efficient grid-tied microinverter. It is compatible with most 60-cell PV modules (up to 270 Watts or higher) and installs quickly and easily. It works with both three-phase 208 Vac or single-phase 240 Vac services in North America. A separate model is available for 230 Vac service in other regions.

For detailed installation information, refer to the **M215 Installation and Operations Manual** and the **M215 Quick Install Guide** at

<http://www.enphase.com/support/downloads>.



### Microinverter Compatibility

The M215 pairs only with a 60-cell PV module. Refer to <http://www.enphase.com/support/downloads> for a list of **electrically**-compatible PV modules. To ensure **mechanical** compatibility, be sure to order the correct module connector type for both the M215 and PV module.

Model Number	Electrical Compatibility	Module Connector Type
M215-60-2LL-S22 M215-60-2LL-S22-NA	60 cell PV module	MC-4 Type 2 Locking or Amphenol H4 Locking
M215-60-2LL-S23 M215-60-2LL-S23-NA	60 cell PV module	Tyco Solarlock Locking*

**\*Note:** Tyco connectors on PV modules can vary in polarity, and either the male or female connector may be positive. Only the MALE positive will mate with Enphase Microinverters with S23 connectors. Be sure to order the correct connector type for both microinverter and PV module from your distributor.

As a rule, the electrically-positive output of the PV module always connects to the positive input of the microinverter. However, PV modules come with a variety of labels. For more information, refer to **Mating Microinverters with PV Modules for Correct Polarity** at <http://www.enphase.com/support/downloads>.

### Branch Circuit Capacity

Do not exceed the maximum number of microinverters in an AC branch circuit as listed in the following table. You must protect each microinverter AC branch circuit with a 20A maximum breaker.

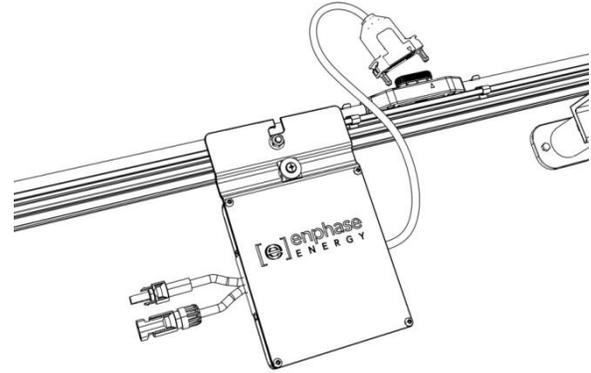
Maximum number of M215s per 20 amp AC Branch Circuit	
Service type	Max M215s per AC branch
240V	17
208V	25

## The Enphase Engage Cable

The M215 has integrated DC and AC cables and connectors (see illustration). The DC connectors attach to the PV module, while the AC connector attaches directly to the Engage Cable. No additional cabling is needed.

The Engage Cable is a continuous length of 12 AWG, outdoor rated cable, with integrated connectors for microinverters. These connectors are preinstalled along the entire cable and spaced to accommodate either portrait and landscape PV module orientations.

To install the cable, just roll out the desired length of cable and cut it to size. One end is wired directly into the junction box at the head of the branch circuit, eliminating the need for a separate AC interconnect cable. The other end is sealed from the environment using an Engage Terminator. The M215 AC cable connectors are then plugged into the regularly spaced connectors as shown.

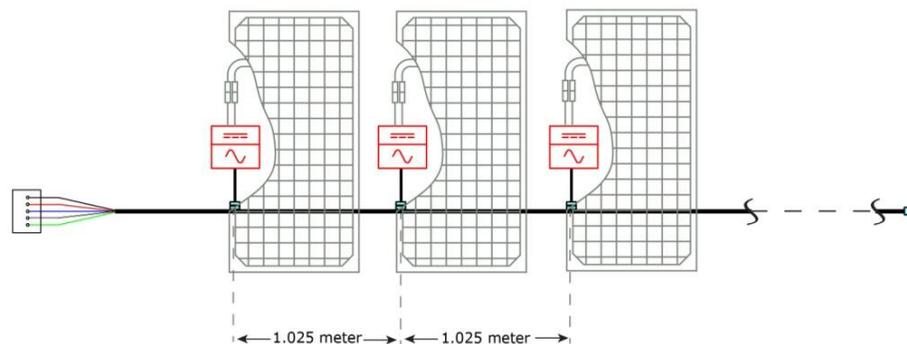


The Engage Cable is available in two connector spacing options and two voltage types: 240 Vac and 208 Vac. To fit differing needs, the cabling is available in a variety of lengths.

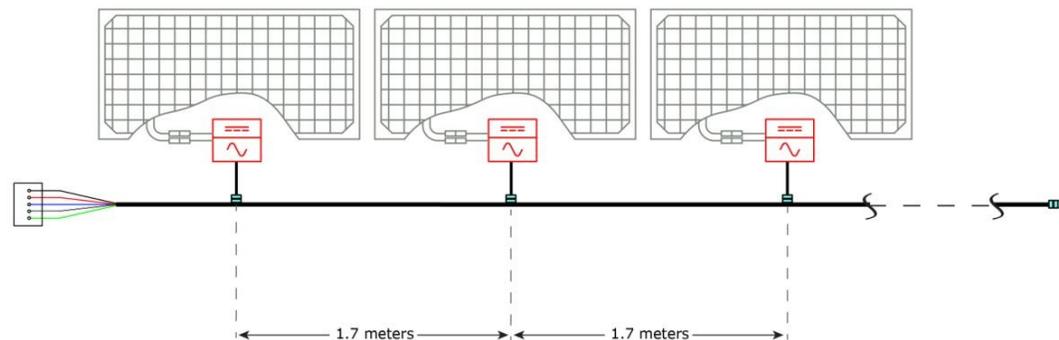
## Connector Spacing Options

The gap between connectors on the cable can be either 1.025 meters (40") or 1.7 meters (67"). The 1.025 meter spacing is best suited for connecting PV modules installed in portrait mode, while the 1.7 meter gap is best suited to PV modules installed in landscape mode.

Cabling with drop connectors spaced at 1.025 meter (40") for portrait installs

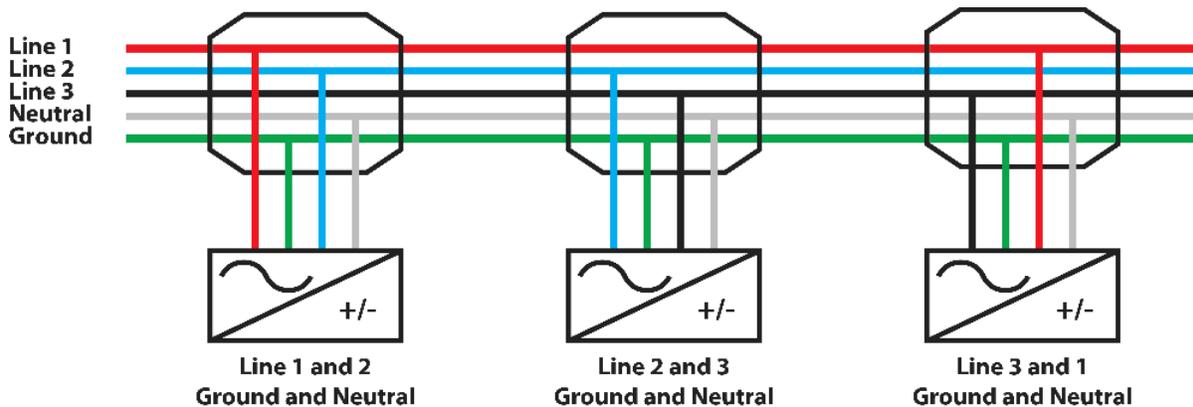


Cabling with drop connectors spaced at 1.7 meters (67") for landscape installs



## Voltage Types and Conductor Count

In North America, the Engage Cable is available for either 240VAC split phase or 208VAC three phase. **All cable connectors bear labels indicating their cable voltage designation.** Typically used for residential applications, 240VAC cabling includes four conductors. Three-phase 208VAC cabling includes five conductors, and is used for most commercial installations. Because Enphase microinverters output onto two phases, three phase cabling balances the phases by rotating the conductors from one microinverter to the next as shown in the following diagram.



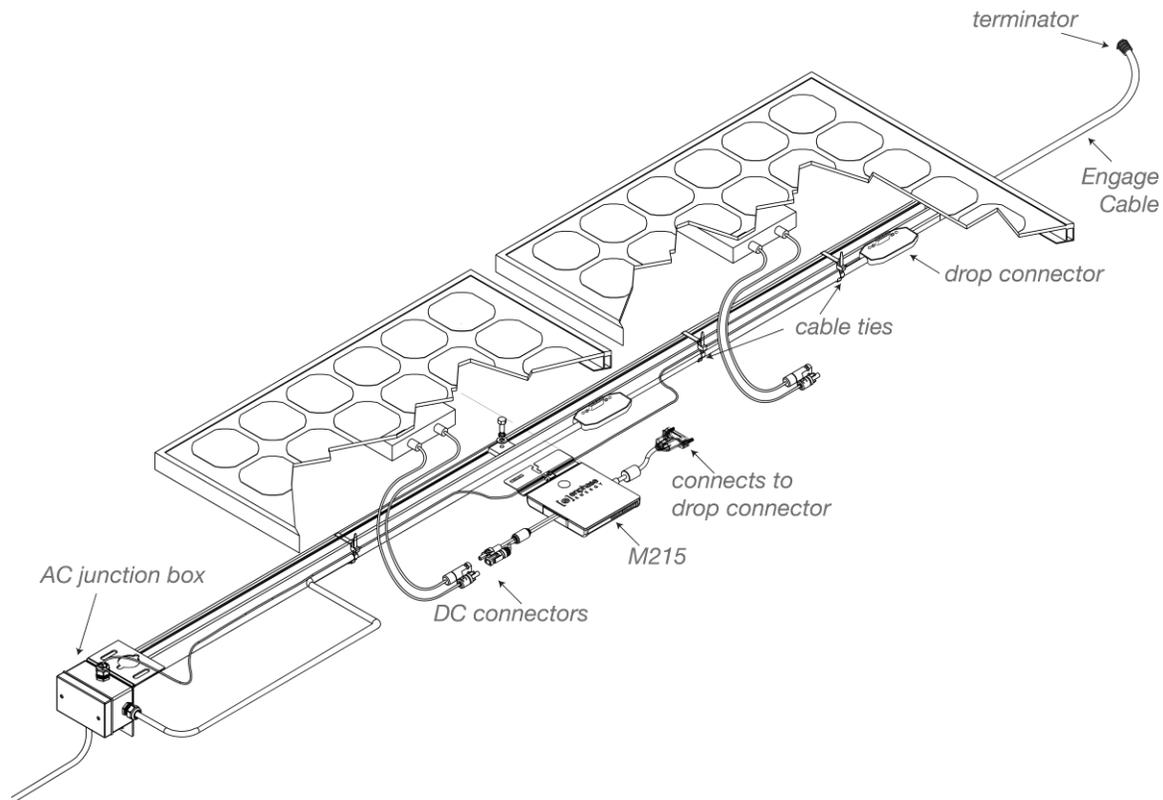
## Cabling Length Options

Engage Cabling is available in shorter lengths with 30 or 40 connectors, depending upon voltage type. Longer lengths can be ordered and cut to suit per order. Ordering options include:

Model Number	Voltage type/ conductor #	Connector count	Connector spacing	PV module orientation	Approx. weight
ET10-240-40	240VAC, 4 conductor	40 connectors	1.025 m (40")	Portrait	18.1 kg (40 lbs)
ET17-240-40	240VAC, 4 conductor	40 connectors	1.7 m (67")	Landscape	20.4 kg (45 lbs)
ET10-208-30	208VAC, 5 conductor	30 connectors	1.025 m (40")	Portrait	13.6 kg (30 lbs)
ET17-208-30	208VAC, 5 conductor	30 connectors	1.7 m (67")	Landscape	15.9 kg (35 lbs)
ET10-240-BULK	240VAC, 4 conductor	240 connectors	1.025 m (40")	Portrait	over 90 kg (200 lbs)
ET17-240-BULK	240VAC, 4 conductor	240 connectors	1.7 m (67")	Landscape	over 90 kg (200 lbs)
ET10-208-BULK	208VAC, 5 conductor	240 connectors	1.025 m (40")	Portrait	over 90 kg (200 lbs)
ET17-208-BULK	208VAC, 5 conductor	240 connectors	1.7 m (67")	Landscape	over 90 kg (200 lbs)

## How it All Fits Together

In the following diagram, the M215 Microinverter and the Engage Cable are shown together with racking, grounding and PV modules.



## Microinverter Installation Requirements

- Allow a minimum of 1.9 cm (0.75 inches) between the roof and the bottom of the microinverter.
- Allow 1.3 cm (0.50 inches) between the back of the PV module and the top of the microinverter.
- You must install the M215 under the module, out of rain and sun.
- Do not mount the microinverter in a position that allows long-term exposure to direct sunlight or in a vertical orientation that allows water to collect in the DC connector recess.
- Installing the microinverter black side up or vertically, with the DC connectors facing up, is not permitted.

## Racking Compatibility

The M215 Microinverter and Engage Cabling are compatible with a variety of racking systems. For a list of approved PV racking types, refer to the Racking Compatibility document at (<http://www.enphase.com/support/downloads>).

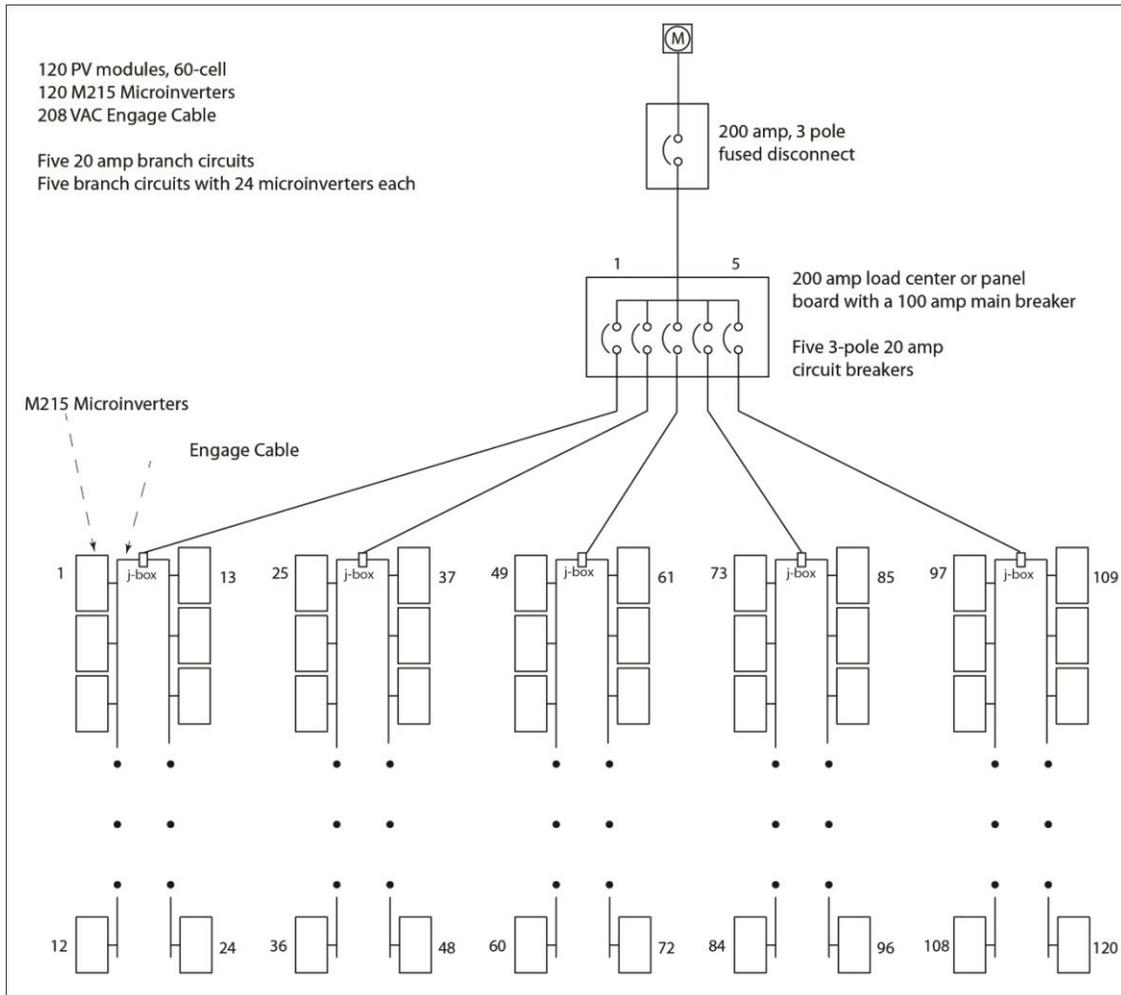
## Planning for Cable Lengths and Type

The Engage Cable is flexible enough to adapt to almost any solar design. To determine the length and cable type that you need, take into account the following considerations:

- **The number of Enphase Microinverters to be installed on the AC branch.** Be certain to allocate the correct number of connectors, including extra connectors for gaps and turns.
- **Additional length required to reach from the AC branch circuit junction box to the first microinverter.** If greater than half a connector cable interval is needed, it may be necessary to include one (or more) unused connectors in order to span this distance. Unused connectors must be covered with Enphase sealing caps.
- **Additional length required to reach from one row of PV modules to the next.** If the PV modules are laid out in multiple rows, the distance from one row to the next often requires additional cabling length.
- **Bend radius.** When planning cabling turns or loops, you must account for a minimum bend radius of 6.7 cm (2.625”).
- **Multiple sub-arrays.** Often, the AC branch circuit may be composed of several smaller sub-arrays across more than one roof plane. In this case, the cable is cut to service each smaller array, and the sub-arrays are connected together using appropriately rated runs of conduit. The transition from cable to conduit is accomplished using an outdoor rated junction box, as required by the NEC and local code. Unused connectors must be covered with Enphase sealing caps.
- **Mixture of PV modules in both portrait and landscape installation.** Often, PV installations use modules installed in mixed orientation (both portrait and landscape orientation). In this case there are three choices for cabling:
  1. Engage Cable with 1.025 meter spacing between connectors results in cleanest install for the modules in portrait mode. For modules placed in landscape mode, plan for an unused connector between each PV module to achieve the required additional distance. Unused connectors must be covered with Enphase watertight sealing caps.
  2. Engage Cable with 1.7-meter spacing between connectors results in cleanest install for the modules in landscape mode, but requires that any additional cable length between PV modules in portrait mode be coiled and dressed so that cabling does not contact the roof. Again, unused connectors must be covered with Enphase sealing caps.
  3. Another solution when modules are installed in mixed orientation is to transition between 1.025 and 1.7-meter spacing cable options using an outdoor rated junction box. This junction box can be installed to the racking.

## Example Installation: Layout & Parts Needed, 208 Vac Commercial

The following installation diagram shows an example with five branches. The 208V layout shows five center-fed branches with 24 microinverters each. The PV modules are in landscape orientation. Tables following the diagram list required and optional equipment.



## Enphase Items Required

Quantity	Description	Order Number
120	M215 Microinverter	M215-60-2LL-S22 or M215-60-2LL-S23
3 packs	Cable clips (each pack contains 100 clips)	ET-CLIP-100
1 pack	Disconnect tool (each pack contains five tools)	ET-DISC-05
1 pack	Branch terminator (each pack contains 10 terminators)	ET-TERM-10
1	Engage Cable divided into ten lengths: Each length should be about 20.4 meters (67 feet) with 12 connectors.	ET17-208-BULK
1 pack	Watertight Sealing caps (each pack contains 10). Required only if there are any unused connectors; Unused connectors <b>must</b> be covered with this cap.	ET-SEAL-10
1	Envoy Communications Gateway -or- LCF Envoy (Line Communications Filter) <sup>1</sup>	ENV-120 ELCF-120-001
as needed	Engage Coupler (each pack contains five Couplers). Used for splicing two AC power cables within an array.	ET-SPLK-05

## Non-Enphase Items Required

Quantity	Description
120	60-cell PV module
5	Weather-proof (NEMA) junction box
5	Three-pole 20 amp circuit breaker
1	Three-pole 200 amp circuit breaker
1	200 amp load center
1	Lightning protection device (3-phase AC surge protector)
as needed	Homerun conductors
as needed	Continuous grounding conductor
as needed	Torque wrench, sockets, wrenches for mounting hardware
as needed	Adjustable wrench or open-ended wrench (for terminator caps)
as needed	Inspection mirror (for viewing indicator lights on the undersides of the microinverters)

<sup>1</sup> An LCF Envoy may be required for systems that are 30kW in size or larger.