

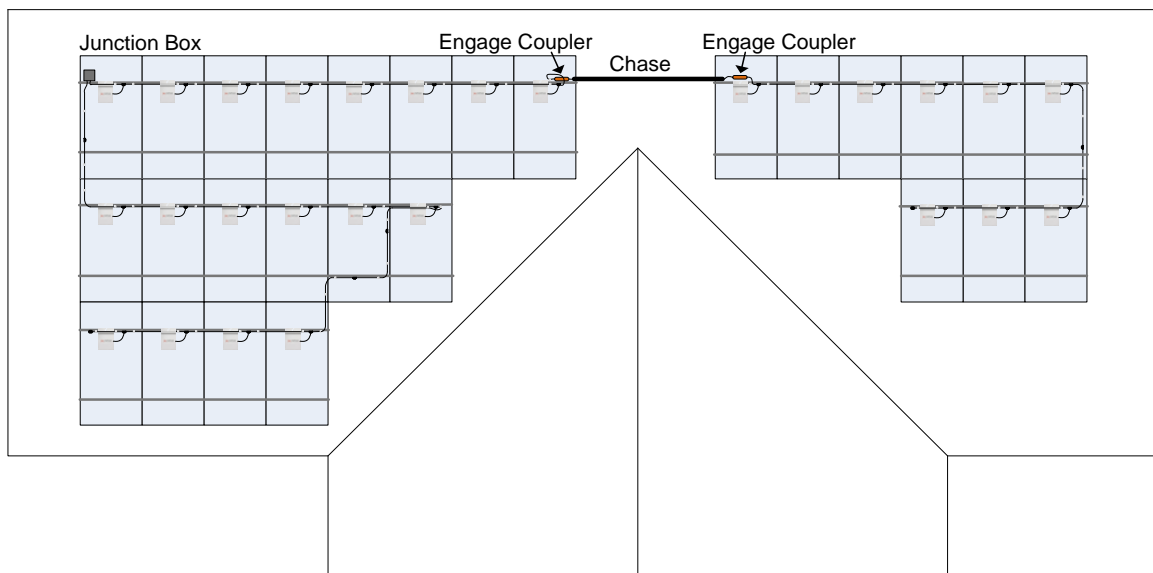
Wire Management in an Enphase System with Engage Cable

The Enphase® Microinverter System™ installs much more quickly than other PV (photovoltaic) system technologies. This is partly due to the plug-and-play nature of the Enphase Microinverters and the ease of managing the Engage™ Cable. A significant advantage of the Enphase system is that the system wiring is all AC. There is generally a lot less conduit and wiring in an Enphase installation. Also, an Enphase system has only one wire run, and that wire run is direct from the array to the main service panel. This means that an Enphase system has lower installation costs because it requires fewer conduits, less wiring, fewer wire pulls, no DC wire runs, and lower labor costs.

In all PV systems, wire management is critical to the long-term reliability of the system. While an Enphase system is not impacted by the arc fault and ground fault issues so frequent with string inverter systems, the need for proper wire management still exists.

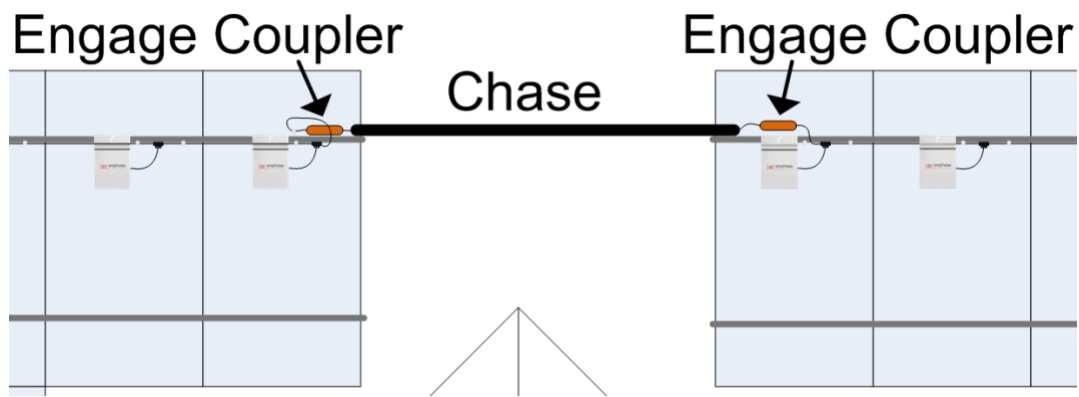
This document discusses some of the best practices for proper wire management in an Enphase system and some of the products you can use to reduce installation costs and labor time on the roof.

Managing Installations with Multiple Sub-Arrays



When Enphase Microinverters are installed on multiple sub-arrays or on multiple roof faces, you can choose from several approaches:

- Install a roof-mounted junction box at each sub-array where the Engage Cable is connected to the field wiring.
- Run TC-ER field cable between the arrays in open-ended chases to protect the cable and to provide additional UV protection.
- Install the cable along support cables or along rails, and transition from Engage Cable to TC-ER field cable through a junction box or an Engage Coupler (Enphase order: ET-SPLK).

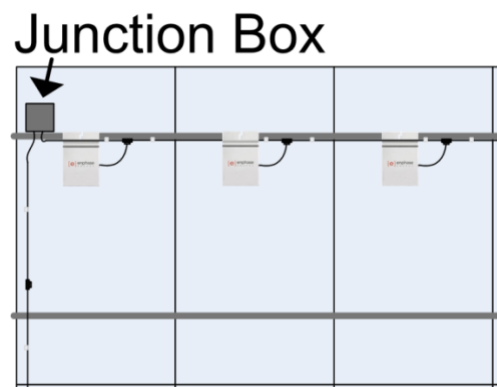


For more information on the Enphase Engage Coupler, refer to the Engage Coupler technical brief and datasheet at: <https://enphase.com/products/engage-coupler/>



AC Wire Management at the Junction Box

Wire management practices at the junction box are critical to the long-term reliability of any PV system. You can locate the junction box either underneath the modules or adjacent to the array. Installers often install the roof-mounted junction box on the side of a rail.



Follow these recommendations to prevent moisture from accumulating in the junction box. At the same time, you will significantly improve system reliability while helping to ensure that the wiring connections last for the life of the system.

- Make sure that cables enter the junction box from the side or from the bottom, never from uphill.
- Install cables with a drip loop. Secure the cable so that water drains away from the cable entry.
- Use properly sized strain reliefs and cord grips. Note that:
 - The outside diameter of the single-phase Engage Cable is 0.42" (10.75mm)
 - The outside diameter of the three-phase Engage Cable is 0.46" (11.75mm)
- Properly tighten the strain reliefs to prevent cable movement.
- Install the junction box to meet the manufacturer's recommended mounting and orientation requirements. Use NEMA 4 enclosures. (NEMA 3 enclosures have a limited mounting orientation range and may not accommodate typical rooftop installations.)
- Consider drilling a small drain hole in the bottom, lowermost corner of the junction box, so that moisture or condensate can drain out of the junction box.

Frame Mount and Cable Connector

You can use the Enphase Frame Mount and Connector Clip to attach the Enphase Microinverters directly to module frames. This may be the ideal solution for rail-less racking solutions, whether residential or commercial. When using the Enphase Frame Mount product, you can support the cabling off the roof and connect to the module frames using the Connector Clip.











DC Wire Management Products

Installers use a number of methods to support the DC module leads off the roof. Many simply loop the cable and then plug it into the microinverters, leaving the cable to rest on top of the microinverter and racking. Some clip the DC module lead to the module frame, using a clip rated for PV Cable. Clip examples follow:

Nine Fasteners	DCS-1307 PV Cable clip
Burndy / Wiley Electronics	ACME ACC-PV PV Cable Clip
Heyco Products	SunRunner PV Cable Clip



AC Wire Management Products

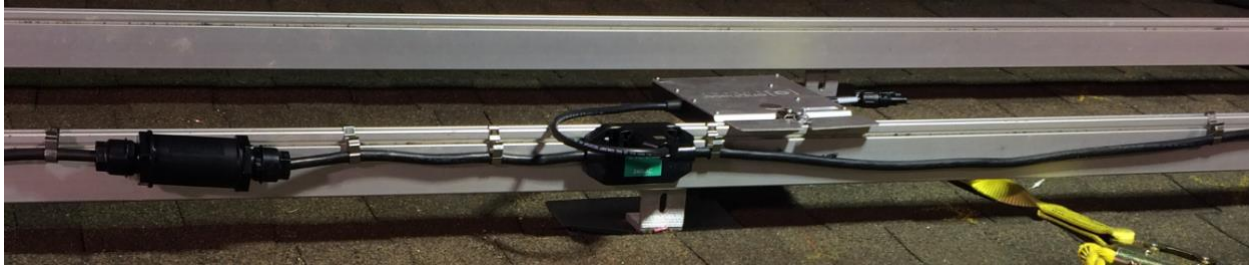
Manufacturer	Model	Rail or Module Frame	Parallel or Perpendicular	Image
Enphase Energy	ET-CLIP	Rail	When cable runs parallel to rail	
Nine Fasteners	NFI-1414	Module Frame	When cable runs parallel to module frame	
Nine Fasteners	NFI-1461	Module Frame	When cable runs parallel to module frame	
Nine Fasteners	NFI-1462	Module Frame	When cable runs perpendicular to module frame	
Burndy/Wiley	ACC-F2-90	Module Frame	When cable runs parallel or perpendicular to module frame	
Burndy/Wiley	UNIRAP	Rail	When cable runs parallel to rail or mounting system	
Heyco	SunRunner 2 Series	Rail or Module Frame	When cable runs parallel to rail or module frame	
Heyco	SunBundler	Rail	When cable runs parallel to rail or mounting system	

The Enphase Engage 240V, single-phase cable has an outside diameter of 10.75mm (0.425")

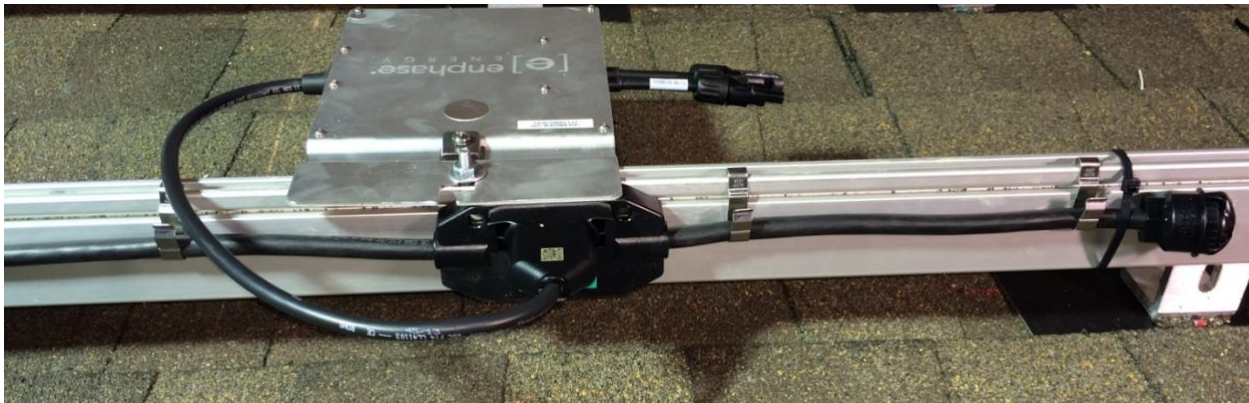
The Enphase Engage 208V, three-phase cable has an outside diameter of 11.75mm (0.463")

Supporting the Engage Cable

In a roof mount installation, you will often install the Engage Cable before installing the modules. In these cases, support the Engage Cable at each connector and attach the cable to the module frame when spanning from row to row. You must support the cable off the roof.

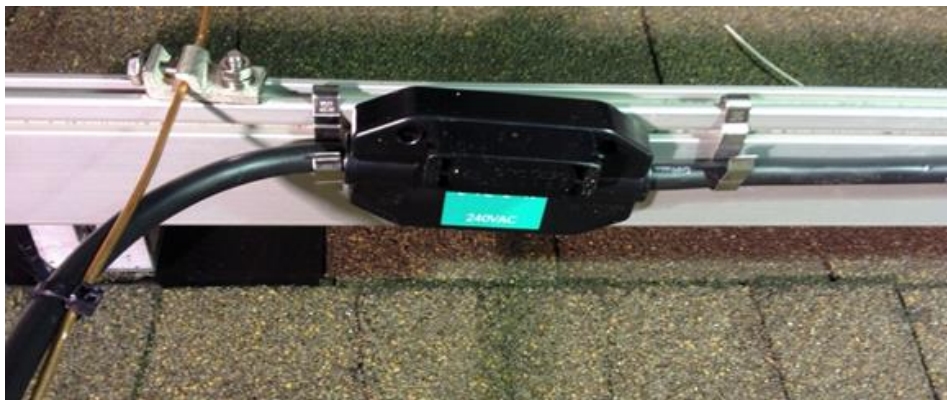


Install the Engage Cable terminators (Enphase order: ET-TERM) at the ends of all cable sections. Install the terminators properly to prevent conductor faults and to prevent water from entering the cabling.



Install watertight seals (Enphase order: ET-SEAL) on all unused connectors on the Engage Cable to prevent water ingress into the cable, damage to the system, and potential fault conditions. Using these seals helps to eliminate avoidable service calls.

When running the cable between arrays, support the cable with clips on the module frames or by securing it to a grounding conductor (if used).



Supporting the DC Module Leads

Prepare the modules by using clips on the leads to prevent the leads from resting on the roof. It is best to prepare the modules on the ground, prior to the module installation. Install the wire clips and DC module leads to allow for easy connection to the microinverter while also supporting the conductors off of the roof.



Once the modules are prepared, install them on the racking. Secure any loose wires or cables to the module frames with properly sized wire clips. When the installation is complete, support all conductors off of the roof.



Proper wire management is one of the most critical steps to ensuring a long lasting and reliable PV installation. Use the instructions provided here to ensure a trouble-free installation and to help reduce the number of service calls to the site.

If needed, contact Enphase Customer Support at enphase.com/en-us/support/contact.