

Installation and Operations Manual

# Enphase Micro-Inverter Models M190-72-208 and M190-72-240





## Contact Information

Enphase Energy Inc.  
201 1<sup>st</sup> Street, Suite 300  
Petaluma, CA 94952  
Phone: 707-763-4784 Toll Free: (877) 797-4743  
Fax: 707-763-0784  
  
[www.enphaseenergy.com](http://www.enphaseenergy.com)  
[info@enphaseenergy.com](mailto:info@enphaseenergy.com)

## FCC Compliance

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment 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.

Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate the equipment.



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## Important Safety Information

### Read this First

**This manual contains important instructions to follow during installation and maintenance of the Enphase Micro-inverter.**

**To reduce the risk of electrical shock, and to ensure the safe installation and operation of the Enphase Micro-inverter, the following safety symbols appear throughout this document to indicate dangerous conditions and important safety instructions.**



**WARNING:** This indicates a situation where failure to follow instructions may cause a serious hardware failure if not applied appropriately. Use extreme caution when performing this task.



**NOTE:** This indicates information particularly important for optimal system operation. Follow these instructions closely.

### Safety Instructions

- Perform all electrical installations in accordance with all local electrical codes and the National Electrical Code (NEC), ANSI/NFPA 70.
- Be aware that only qualified personnel should install and/or replace Enphase Micro-inverters.
- Do not attempt to repair the Enphase Micro-inverter; it contains no user-serviceable parts. If it fails, please contact Enphase customer service to obtain an RMA number and start the replacement process. Tampering with or opening the Enphase Micro-inverter will void the warranty.
- Before installing or using the Enphase Micro-inverter, please read all instructions and cautionary markings in the technical description and on the Enphase Micro-inverter system and the PV-array.
- Connect the Enphase Micro-inverter to the electrical utility grid only after receiving prior approval from the utility company.
- Be aware that the body of the Enphase Micro-inverter is the heat sink and can reach a temperature of 80°C. To reduce risk of burns, do not touch.
- Do NOT disconnect the PV module from the Enphase Micro-inverter without first removing AC power.



**NOTE:** For Enphase Micro-inverter Warranty Terms and Conditions, see the Appendix of this manual.

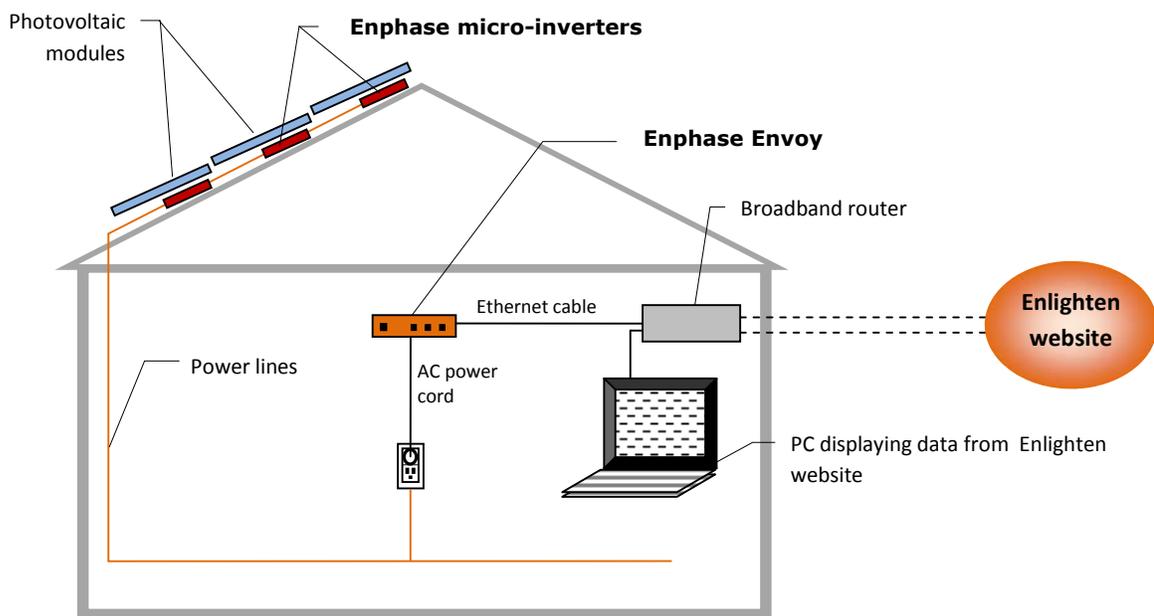
# 1 The Enphase Micro-Inverter System

The Enphase Micro-inverter system is the world’s most technologically advanced inverter system for use in utility-interactive applications. This manual details the safe installation and operation of the Enphase Micro-inverter.

The three key elements of an Enphase Micro-inverter System are:

- the Enphase Micro-inverter
- the Enphase Envoy communications gateway
- the Enphase Enlighten™ web-based monitoring and analysis

This integrated system maximizes energy harvest, increases system reliability, and simplifies design, installation and management.



## How the Micro-Inverter Works

The Enphase Micro-inverter maximizes energy production from your photovoltaic (PV) array. Each Enphase Micro-inverter is individually connected to one PV module in your array. This unique configuration means that an individual Maximum Peak Power Point Tracker (MPPT) controls each PV module. This insures that the maximum power available from each PV module is exported to the utility grid regardless of the performance of the other PV modules in the array. That is, although individual PV modules in the array may be affected by shading, soiling, orientation, or module mismatch, the Enphase Micro-inverter insures top performance for its associated PV module. The result is maximum energy production from your PV system.

Micro-inverter systems are also inherently more reliable than centralized or string inverters. The distributed nature of the Micro-inverter System insures that there is no single point of system failure in the PV system. Enphase Micro-inverters are designed to operate at full power at ambient temperatures as high as 65°C (150°F). The inverter housing is designed for outdoor installation and complies with the NEMA6 environmental enclosure rating standard:

NEMA6 rating definition: Indoor or outdoor use primarily to provide a degree of protection against hose-directed water, and the entry of water during occasional temporary submersion at a limited depth, and damage from external ice formation.

PV systems using Enphase Micro-inverters are very simple to design and install. You will not need string calculations, and you can install individual PV modules in any combination of module quantity, type, age and orientation. You won't need to install cumbersome centralized or string inverters. Each Micro-inverter quickly mounts on the PV racking, directly beneath each PV module. Low voltage DC wires connect from the PV module directly to the co-located Micro-inverter, eliminating the risk of personnel exposure to lethal 600Vdc power.

Indoors, you can install the Envoy communications gateway (EMU) by plugging it into any convenient 120Vac wall socket and providing an Ethernet connection to your broadband router or modem. After installation of the Envoy, the full network of Enphase Micro-inverters automatically begins reporting to the Enphase Enlighten web server. The Enlighten software presents current and historical system performance trends, and it informs you when the PV system is not performing as expected.

These are just a few of the ways in which the Enphase Micro-inverter System provides tremendous time, material and cost savings, while maximizing energy production and providing better return on investment from your system.

### Enphase Micro-Inverter Models

The Enphase M190 Micro-inverters operate with most 60 and 72-cell PV module configurations. For more information, see the Technical Data section on page 17 of this manual. You may also refer to the Enphase website (<http://www.enphaseenergy.com/support/downloads.cfm>) for a list of approved PV module racking systems.

Model Number	Works with PV Module Type	Maximum inverters Per AC branch circuit	Module Connector Type
M190-72-208-S11	60 and 72 cell	21	MC-3 Type 1 Non-Locking
M190-72-208-S12	60 and 72 cell	21	MC-4 Type 2 Locking
M190-72-240-S11	60 and 72 cell	15	MC-3 Type 1 Non-Locking
M190-72-240-S12	60 and 72 cell	15	MC-4 Type 2 Locking

## 2 Enphase Micro-Inverter Installation

PV systems using Enphase Micro-inverters are simple to install. Each Micro-inverter quickly mounts on the PV racking, directly beneath each PV module. Low voltage DC wires connect from the PV module directly to the co-located Micro-inverter, thus eliminating the risk of personnel exposure to lethal 600Vdc power.



**WARNING:** Before installing the Enphase Micro-inverter, read all instructions and cautionary markings in the user manual, on the Enphase Micro-inverter, and on the photovoltaic array.



**WARNING:** Perform all electrical installations in accordance with all local electrical codes and the National Electrical Code (NEC), ANSI/NFPA 70.



**WARNING:** Connect the Enphase Micro-inverter to the electrical utility grid only after receiving prior approval from the utility company.



**WARNING:** Be aware that only qualified personnel should connect the Enphase Micro-inverter to the electrical utility grid.



**WARNING:** Be aware that installation of this equipment includes risk of electric shock. Normally grounded conductors may be ungrounded and energized when a ground fault is indicated.

### Parts Included

In the Micro-inverter installation kit, you'll find the following items:

- Protective end caps
- Mounting Bracket (adapter plate)
- AC interconnect cable

### Other Parts and Tools Required

In addition to your PV array and its associated hardware, you will need to provide the following:

- Junction box
- Continuous grounding conductor, grounding washers
- Number 2 Phillips screwdriver
- Sockets, wrenches for mounting hardware
- Torque wrench
- Mounting hardware suitable for module racking

## Installation Procedure

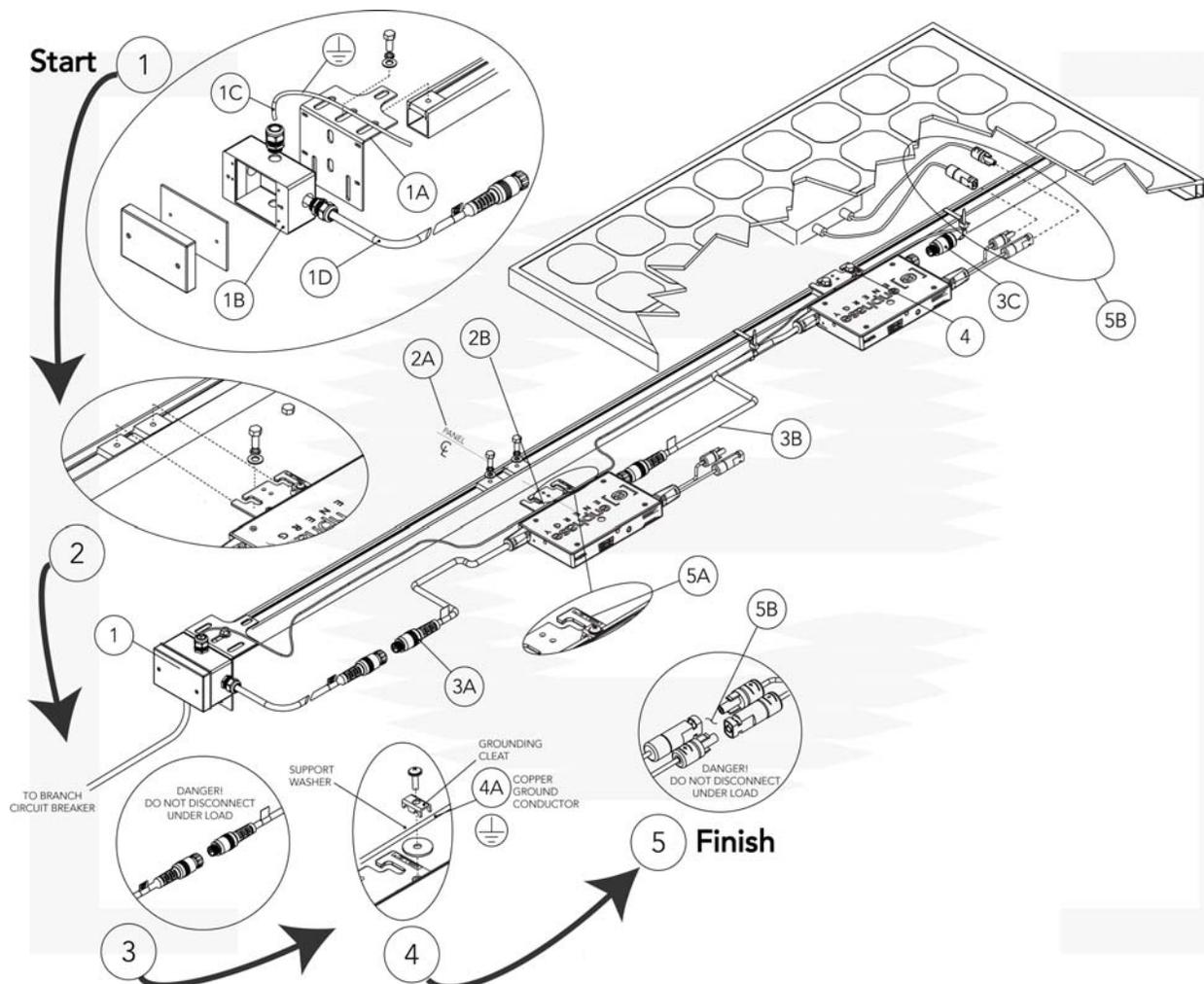
Installing the Enphase Micro-inverter System involves five key steps:

1. Installing the AC branch circuit junction box
2. Attaching the Enphase Micro-inverters to the racking
3. Connecting the Enphase Micro-inverter wiring harnesses
4. Grounding the system
5. Complete the Enphase Installation map
6. Connect the PV modules

Each of the detailed installation steps in the following sections is numerically referenced in the installation diagram below.



**WARNING:** DO NOT connect Enphase Micro-inverters to the utility grid or energize the AC circuit(s) until you have completed all of the installation procedures as described in the following sections.



### Step 1 - Install the AC Branch Circuit Junction Box

- a. Mount the Enphase Adapter Plate at a suitable location on the PV racking system (typically at the end of a row of modules).
- b. Install an appropriate junction box with adapter plate.



**WARNING:** Use electrical system components approved for wet locations only.

- c. Connect the open wire end of the Enphase AC interconnect cable into the junction box using an appropriate gland or strain relief fitting.
- d. Route the continuous Grounding Electrode Conductor (GEC) through the grounding clamp of each micro-inverter. Check local code requirements for the gauge of the GEC.

### Step 2 - Attach the Enphase Micro-Inverters to the Racking

- a. Mark the approximate centers of each PV module on the racking system. Evaluate the location of the micro-inverter with respect to the PV module junction box or any other obstructions.



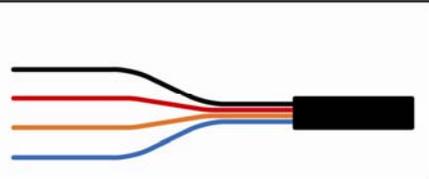
**WARNING:** Allow a minimum of .75 inches between the top of the roof and the bottom of the Micro-inverter. We also recommend that you allow 1.0 inches between the back of the PV module and the top of the inverter.

- b. Mount one Micro-inverter at each of these locations using hardware recommended by your module racking vendor.

### Step 3 - Connecting the Enphase Micro-Inverter Wiring Harnesses

Each Micro-inverter comes with one 4 pin bulkhead receptacle and one 70-inch AC wire harnesses with multi-pin connectors. (The DC input wires are approximately six inches long and are terminated with single pole MC connectors.) The AC connectors are oppositely sexed, so that multiple inverters can be connected to form one continuous AC branch circuit. When you perform this step, refer to the wiring diagram for your Micro-inverter model. These diagrams are located in the Appendix of this manual.

- a. Orient the first micro-inverter in each branch with its male connector facing the junction-box. The junction-box AC interconnect cable has a female connector. The micro-inverter can be mounted with either side facing up to accommodate cable routing. Connect the first Micro-inverter to the AC interconnect cable. All AC interconnect cables have four conductors. Wire them as follows depending on your Micro-inverter model:

<p>240 VOLT AC SPLIT PHASE WIRING BLACK - L1 RED - L2 ORANGE-UNUSED BLUE- NEUTRAL</p>	<p>208 VOLT AC THREE PHASE WIRING BLACK - L1 RED - L2 ORANGE-L3 BLUE- NEUTRAL</p>			<p>PIN 1 - BLACK PIN 2 - BLUE PIN 3 - RED PIN 4 - ORANGE</p>
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- b. Plug the AC connector of the first Micro-inverter into the connector of the next Micro-inverter, and so forth, to form a continuous AC branch circuit. Please check the Micro-inverter rating label for the maximum allowable number of Micro-inverters on one AC branch circuit.



**WARNING:** Do NOT exceed the maximum number of Micro-inverters in an AC branch circuit, as displayed on the unit-rating label. Each Micro-inverter AC branch circuit must be sourced from a dedicated branch circuit protected by a 15A maximum breaker.

- c. Install a protective end cap on the open AC connector of the last Micro-inverter in the AC branch circuit.



**WARNING:** Make sure protective end caps have been installed on all unused AC connectors. Unused AC Micro-inverter wire harness connectors may be live when the system is energized by the utility system.



**NOTE:** Be sure to size the AC wire gauge to account for voltage drop between the AC branch circuit junction box and the point of utility inter-connection.

#### Step 4 – Grounding the System

Each Enphase Micro-inverter comes with a ground clip that can accommodate a 6-10 AWG conductor.



- a. Route a continuous GEC through each of the Micro-inverters to the NEC approved AC grounding electrode. The racking and module could be grounded to this conductor using a crimp connection. An alternative method would be to connect the micro-inverter to the grounded racking using a grounding washer approved for the racking.

**NOTE:** The AC output neutral is not bonded to ground inside the Micro-inverter.

#### Step 5 – Completing the Enphase Installation Map and Connecting the PV Modules

The Enphase Installation Map is a diagrammatic representation of the physical location of each Enphase Micro-inverter in your PV installation. Enphase creates this map from information that you provide in a system map. You can use the blank map in the Appendix to record Micro-inverter placement for your system. When your map is complete, send it to Enphase as described below. Enphase then uses this information to provide you with detailed information about the performance of your PV system and to allow you to see a graphic representation of your PV system on the Enphase Enlighten web-based monitoring and analysis. Feel free to provide your own layout if a larger or more intricate installation map is required.

- To complete your map:
  - a. Each Enphase Micro-inverter has a removable serial number label located on the top cover. Peel the removable serial number label from each

Enphase Micro-inverter and affix it to the respective location on the Enphase installation map.

- b. Send the installation map to Enphase after completion. See the Appendix section of this manual for an example installation map. You can also download installation maps and examples from [www.enphaseenergy.com/quickstart](http://www.enphaseenergy.com/quickstart). Enphase prefers to receive a digital copy of the installation map via an upload to the Enlighten web site during installation set up, or you may send it via email. If you are not able to digitally scan the map, please provide the map via fax or mail. See the contact information at the beginning of this manual for a fax number, email address, and mailing address. Remember to make a copy of the installation map for yourself if you are sending the original.
- c. After Enphase creates a graphical representation of your PV system on the Enlighten website, use the Enlighten website to view detailed performance information for your PV system. Please go to [www.enphaseenergy.com](http://www.enphaseenergy.com) for more information on the Enphase Enlighten web-based monitoring and analysis.

- To connect your PV modules:



**NOTE:** Completely install all Micro-inverters and all system inter-wiring connections prior to installing the PV modules.

**Best Practice:** Test AC first. Before you rack-mount the PV, pull and terminate all AC wiring, energize the branches, and power up the Micro-inverters to make sure that they all report into the Envoy and are operating correctly.

- a. Mount the PV modules above their corresponding Micro-inverters. Each Micro-inverter comes with two oppositely sexed multi-contact connectors.
- b. First connect the positive DC wire from the PV module to the negatively marked DC connector (female socket) of the Micro-inverter. Then connect the negative DC wire from the PV module to the positively marked DC connector (male socket) of the Micro-inverter. Repeat for all remaining PV modules using one Micro-inverter for each module.

### 3 Commissioning



**WARNING:** Connect the Enphase Micro-inverter to the electrical utility grid only after receiving prior approval from the utility company.



**WARNING:** Be aware that only qualified personnel must connect the Enphase Micro-inverter to the electrical utility grid.



**WARNING:** Ensure that all AC and DC wiring is correct. Ensure that none of the AC and DC wires are pinched or damaged. Ensure that all junction boxes are properly closed.



**Note:** The Status LED of each Micro-inverter will blink green six times to indicate normal start-up operation once DC power is applied.

To commission the Enphase Micro-inverter PV system:

1. Turn ON the AC disconnect or circuit breaker on each Micro-inverter AC branch circuit.
2. Turn ON the main utility-grid AC circuit breaker. Your system will start producing power after a five-minute wait time.
3. The Enphase micro-inverters will start to send performance data over powerline to the Envoy. The time required for all the micro-inverters in the system to report to the Envoy will vary with the number of micro-inverters in the system. The first units should be detected within 15 minutes but the entire system could take hours to detect. Please refer to the *Envoy Installation and Operation Manual* for information on the Envoy.

### 4 Operating Instructions

When the Enphase Micro-inverter is powered on when sufficient dc voltage from the module is applied. The status LED will flash green six times indicating proper start-up.



**NOTE:** In the event of a GFDI failure, the status LED will display continuous red after the fault occurs. This will persist when AC and DC power are cycled to the Micro-inverter.

You can verify proper operation of the Enphase Micro-inverters via the Envoy. See the *Envoy Installation and Operation Manual* for more information.

## 5 Troubleshooting

Adhere to all the safety measures described throughout this manual. Qualified personnel can use the following troubleshooting steps if the PV system does not operate correctly:



**WARNING:** Do not attempt to repair the Enphase Micro-inverter; it contains no user-serviceable parts. If it fails, please contact Enphase customer service to obtain an RMA number and start the replacement process.

### Micro-Inverter Status LED Indications and Error Reporting

#### Startup LED Operation:

Six short green blinks when DC power is first applied to the Micro-inverter indicates a successful Micro-inverter startup sequence.

Six short red blinks when DC power is first applied to the Micro-inverter indicates a failure during Micro-inverter startup.

#### Post-Startup LED Operations:

**Flashing Green** - Producing power and communicating with Envoy

**Flashing Orange** – Producing power and not communicating with Envoy

**Flashing Red** – Not producing power

#### GFDI Fault:

A solid red status LED when DC power has been cycled, indicates the Micro-inverter has detected a ground fault (GFDI) error. The LED will remain red and the fault will continue to be reported by the Envoy until the error has been cleared. The error can only be cleared via the Envoy after the ground fault condition has been remedied. Contact Enphase customer support at 877-797-4743 for assistance.

#### Other Faults:

All other faults are reported to the Envoy. Refer to the *Envoy Installation and Operation Manual* for a list of additional faults and troubleshooting procedures.



**WARNING:** Be aware that only qualified personnel should troubleshoot the PV array or the Enphase Micro-inverter.



**WARNING:** Never disconnect the DC wire connectors under load. Ensure that no current is flowing in the DC wires prior to disconnecting. An opaque covering may be used to cover the module prior to disconnecting the module.



**WARNING:** Always disconnect AC power before disconnecting the PV module wires from the Enphase Micro-inverter. The AC connector of the first micro-inverter in a branch circuit is suitable as a disconnecting means once the AC branch circuit breaker in the load center has been opened.



**WARNING:** The Enphase Micro-inverters are powered by DC power from the PV modules. Make sure you disconnect the DC connections and reconnect DC power to watch for the six short LED flashes.

### Troubleshooting an Inoperable Micro-Inverter

To troubleshoot an Inoperable Micro-inverter, follow the steps in the order shown:

1. Check the connection to the utility grid. Verify the utility voltage and frequency are within allowable ranges shown in the Technical Data section on page 17 of this manual. Verify utility power is present at the inverter in question by removing AC, then DC power. **Never disconnect the DC wires while the Micro-inverter is producing power.** Re-connect the DC module connectors and watch for six short LED flashes.
2. Check the AC branch circuit interconnection harness between all the Micro-inverters. Verify each inverter is energized by the utility grid as described in the previous step.
3. Make sure that any AC disconnects are functioning properly and are closed.
4. Verify the PV module DC voltage is within the allowable range shown in the Technical Data section on page 17 of this manual.
5. Check the DC connections between the Micro-inverter and the PV module.
6. If the problem persists, please call customer support at Enphase Energy.



**WARNING:** Do not attempt to repair the Enphase Micro-inverter; it contains no user-serviceable parts. If troubleshooting methods fail, please return the Micro-inverter to your distributor for maintenance.

### Disconnecting the Enphase Micro-Inverter from the PV Module

To insure the Micro-inverter is not disconnected from the PV modules under load, adhere to the following disconnection steps in the order shown:

1. Disconnect the AC by opening the branch circuit breaker.
2. Disconnect the first AC connector in the branch circuit.
3. Cover the module with an opaque cover.
4. Using a DC current probe, verify there is no current flowing in the DC wires between the PV module and the Micro-inverter.
5. Care should be taken when measuring DC currents, most clamp-on meters must be zeroed first and tend to drift with time.

6. Disconnect the PV module DC wire connectors from the Micro-inverter.
7. Remove the Micro-inverter from the PV array racking.

## 6 Technical Data

### Technical Considerations

The Enphase M190 Micro-inverters are designed to operate with most 60 and 72-cell PV module configurations. Be sure to verify the voltage and current specifications of your PV module match with those of the Micro-inverter. For more information, refer to the Enphase website (<http://www.enphaseenergy.com/support/downloads.cfm>) for a list of approved PV module racking systems and PV modules.



**WARNING:** You must match the DC operating voltage range of the PV module with the allowable input voltage range of the Enphase Micro-inverter.



**WARNING:** The maximum open circuit voltage of the PV module must not exceed the specified maximum input voltage of the Enphase Micro-inverter.

The output voltage and current of the PV module depends on the quantity, size and temperature of the PV cells, as well as the solar insolation on each cell. The highest PV module output voltage occurs when the temperature of the cells is the lowest and the module is at open circuit (not operating). The maximum short circuit current rating of the module must be equal to or less than the maximum input DC short circuit current rating of the Micro-inverter. A list of compatible PV modules is maintained on the Enphase website (<http://www.enphaseenergy.com/support/downloads.cfm>).

### Technical Specifications

Enphase Micro-Inverter Operating Parameters				
Topic/Model	Unit	Min	Typical	Max
<b>DC Operating Parameters</b>				
MPPT voltage range M190 models	V	22		40
Maximum DC input voltage M190 models	V			54
Maximum DC input short circuit current M190 models	A			12
Maximum DC input current M190 models	A			10
Ground fault protection	mA			1000

<b>Enphase Micro-Inverter Operating Parameters</b>				
<b>Topic/Model</b>	<b>Unit</b>	<b>Min</b>	<b>Typical</b>	<b>Max</b>
<b>AC Operating Parameters</b>				
Maximum AC output Power (-40 to 65 °C) M190 models	W	190		
Output power factor		0.95	0.99	1
Nominal AC output voltage range M190-72-240-S1x M190-72-208-S1x	Vrms Vrms	211 183	240 208	264 229
Extended AC output voltage range M190-72-240-S1x M190-72-208-S1x	Vrms Vrms	206 179	240 208	269 232
Maximum AC output current M190-72-240-S1x M190-72-208-S1x	mA mA		800 920	900 1040
Nominal AC output frequency range	Hz	59.3	60	60.5
Extended AC output frequency range	Hz	59.2	60	60.6
Maximum AC output over current protection	A			15 A
Maximum AC output fault current & duration	A <sub>p</sub> /ms			50.8/1.56
High AC Voltage trip limit accuracy	%	±2.5		
Low AC Voltage Trip limit accuracy	%	±4.0		
Frequency trip limit accuracy	Hz	±0.1		
Trip time accuracy	ms	±33		
<b>Miscellaneous Operating Parameters</b>				
Maximum inverters per AC branch circuit M190-72-240-S1x M190-72-208-S1x		1 1		15 21
Peak inverter efficiency M190-72-208-S1x	%			95.5
CEC weighted efficiency M190 models	%			95.0
Nominal MPP tracking efficiency M190 models	%			99.6
Total Harmonic Distortion	%		2.5	5
Operating temperature range	°C	-40		65
Night Tare Loss M190-72-240-S1x M190-72-208-S1x	mW mW		30 30	
Storage temperature range	°C	-40		65
<b>Features</b>				

Enphase Micro-Inverter Operating Parameters				
Topic/Model	Unit	Min	Typical	Max
Dimensions (approximate)		8" x 5 1/4" x 1 1/4"		
Weight		4.4 Lbs		
Enclosure environmental rating		NEMA6		
Cooling		Convective - no fan		
Communication		Powerline		
Standard warranty term		15 years		
Compliance		UL1741, IEEE1547, FCC Part 15 Class B		

Voltage and Frequency Limits for Utility Interaction			
Condition	Simulated utility source		Maximum time (sec) (cycles) at 60 Hz before cessation of current to the simulated utility
	Voltage (V)	Frequency (Hz)	
A	$< 0.50 V_{\text{Typical}}$	Rated	0.16
B	$0.50 V_{\text{Typical}} \leq V < 0.88 V_{\text{Typical}}$	Rated	2
C	$1.10 V_{\text{Typical}} < V < 1.20 V_{\text{Typical}}$	Rated	1
D	$1.20 V_{\text{Typical}} \leq V$	Rated	0.16
E	Rated	$f > 60.5$	0.16
F	Rated	$f < (59.8 - 57.0)$	0.16 - 300
G	Rated	$f < 57.0$	0.16

## 7 Appendix

### Limited Warranty

Enphase Energy Inc. ("**Enphase**") has developed a highly reliable Micro-inverter that is designed to withstand normal operating conditions when used for its originally intended purpose in compliance with the Enphase User Manual supplied with the originally shipped system. The Enphase limited warranty ("**Limited Warranty**") covers defects in workmanship and materials of the Enphase Micro-inverter ("**Defective Product**") for a period of fifteen (15) years from the date of original purchase of such Micro-inverter at point of sale to the originally-installed end user location (the "**Warranty Period**"). During the Warranty Period, the warranty is transferable to a different owner as long as the Micro-Inverter remains installed at the originally-installed end user location.

During the Warranty Period, Enphase will, at its option, repair or replace the Defective Product free of charge, provided that Enphase through inspection establishes the existence of a defect that is covered by the Limited Warranty. Enphase will, at its option, use new and/or reconditioned parts in repairing or replacing the Defective Product. Enphase reserves the right to use parts or products of original or improved design in the repair or replacement of Defective Product. If Enphase repairs or replaces a Defective Product, the Limited Warranty continues on the repaired or replacement product for the remainder of the original Warranty Period or ninety (90) days from the date of Enphase's return shipment of the repaired or replacement product, whichever is later.

The Limited Warranty covers both parts and labor necessary to repair the Defective Product, but does not include labor costs related to un-installing the Defective Product or re-installing the repaired or replacement product. The Limited Warranty also covers the costs of shipping repaired or replacement product from Enphase, via a non-expedited freight carrier selected by Enphase, to locations within the United States (including Alaska and Hawaii) and Canada, but not to other locations outside the United States or Canada. The Limited Warranty does not cover, and Enphase will not be responsible for, shipping damage or damage caused by mishandling by the freight carrier and any such damage is the responsibility of the freight carrier.

To obtain repair or replacement service under this Limited Warranty, the customer must comply with the following policy and procedure:

- All Defective Product must be returned with a Return Merchandise Authorization Number (RMA) which customer must request from Enphase. Before requesting the RMA, however, the customer should contact an Enphase technical support representative to evaluate and troubleshoot the problem while the Enphase Micro-inverter is in the field, since many problems can be solved in the field.
- If in-field troubleshooting does not solve the problem, Customer may request the RMA number, which request must include the following information:
  - Proof-of-purchase of the Defective Product in the form of (1) the dated purchase receipt from the original purchase of the product at point of sale to the end user, or (2) the dated dealer invoice or purchase receipt showing original equipment manufacturer (OEM) status, or (3) the dated

invoice or purchase receipt showing the product exchanged under warranty.

- Model number of the Defective Product
  - Serial number of the Defective Product
  - Detailed description of the defect
  - Shipping address for return of the repaired or replacement product
- All Defective Product authorized for return must be returned in the original shipping container or other packaging that is equally protective of the product
  - The returned Defective Product must not have been disassembled or modified without the prior written authorization of Enphase

The Limited Warranty does not cover normal wear and tear of Enphase Micro-inverters or costs related to the removal, installation, or troubleshooting of the customer's electrical systems. The Limited Warranty does not apply to, and Enphase will not be responsible for, any defect in or damage to any Enphase Micro-inverter: (1) that has been misused, neglected, tampered with, altered, or otherwise damaged, either internally or externally; (2) that has been improperly installed, operated, handled or used, including use under conditions for which the product was not designed, use in an unsuitable environment, or use in a manner contrary to the Enphase User Manual or applicable laws or regulations; (3) that has been subjected to fire, water, generalized corrosion, biological infestations, acts of God, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Enphase Micro-inverter specifications, including high input voltage from generators or lightning strikes; (4) that has been subjected to incidental or consequential damage caused by defects of other components of the solar system; or (5) if the original identification markings (including trademark or serial number) of such Micro-inverter have been defaced, altered, or removed. The Limited Warranty does not extend beyond the original cost of the Enphase Micro-inverter.

THE LIMITED WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY ENPHASE AND, WHERE PERMITTED BY LAW, IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, QUALITY, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OR WARRANTIES AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN MANUALS OR OTHER DOCUMENTATION. IN NO EVENT WILL ENPHASE BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING, WHETHER IN CONTRACT OR TORT, INCLUDING WITHOUT LIMITATION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, OR ANY PERSONAL INJURY.

To the extent any implied warranties are required under applicable law to apply to the Enphase Micro-inverter, such implied warranties shall be limited in duration to the Warranty Period, to the extent permitted by applicable law. Some states and provinces do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply.



This Limited Warranty gives the customer specific legal rights, and the customer may have other rights that may vary from state to state or province to province.

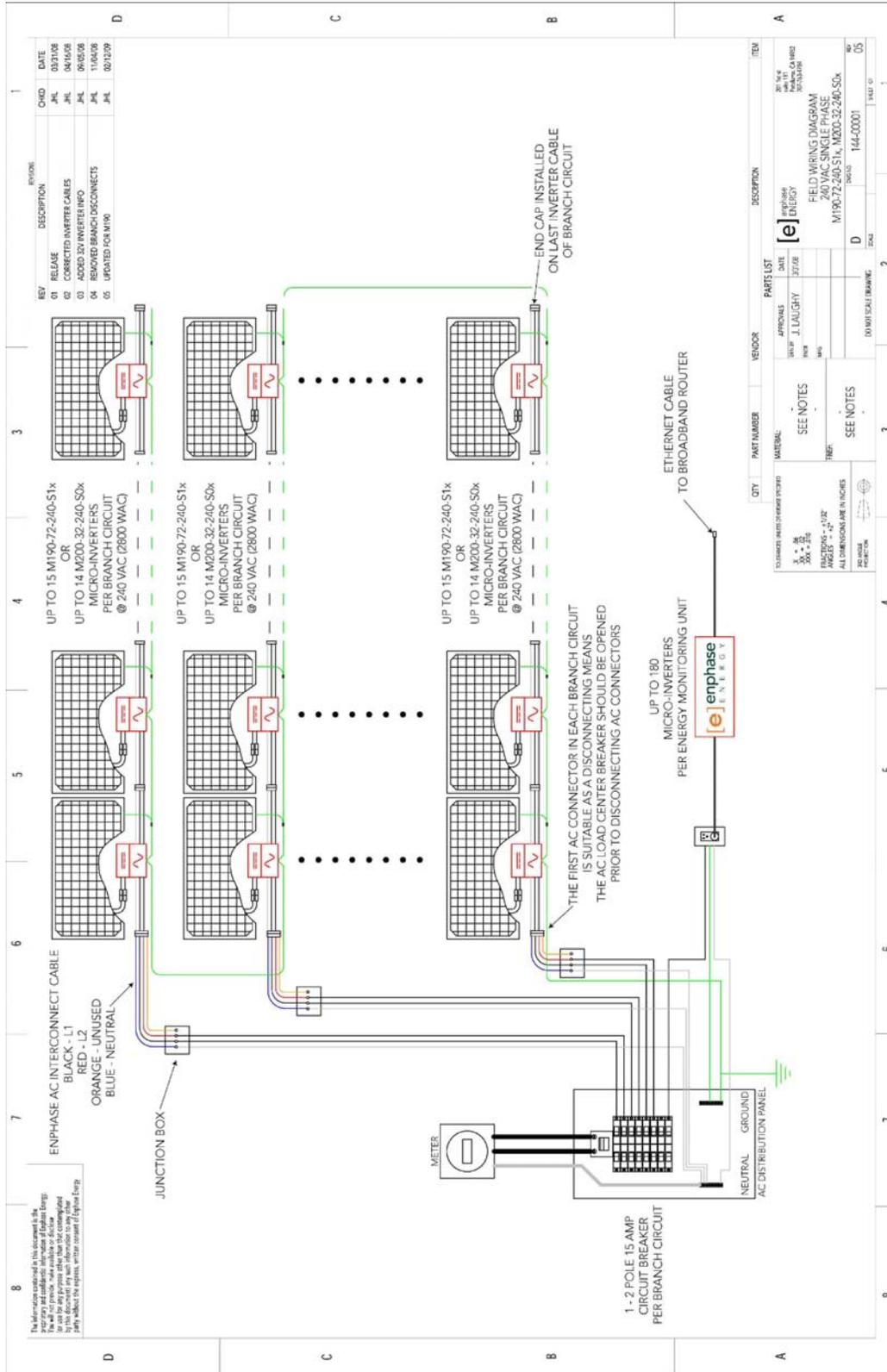


**Enphase Installation Map**

Panel Group: Azimuth: Tilt: sheet ___ of ___	To Sheet: _____		Customer information:		Installer information:		N S E W (circle one) 
	1	2	3	4	5	6	
A							
B							
C							
D							
E							
F							
G							
H							
J							
K							
L							
M							
Fax to: 707-763-0784			EMU Serial Label				DOCUMENT NUMBER 140-00003 REGION 01
To Sheet: _____		To Sheet: _____		To Sheet: _____		To Sheet: _____	

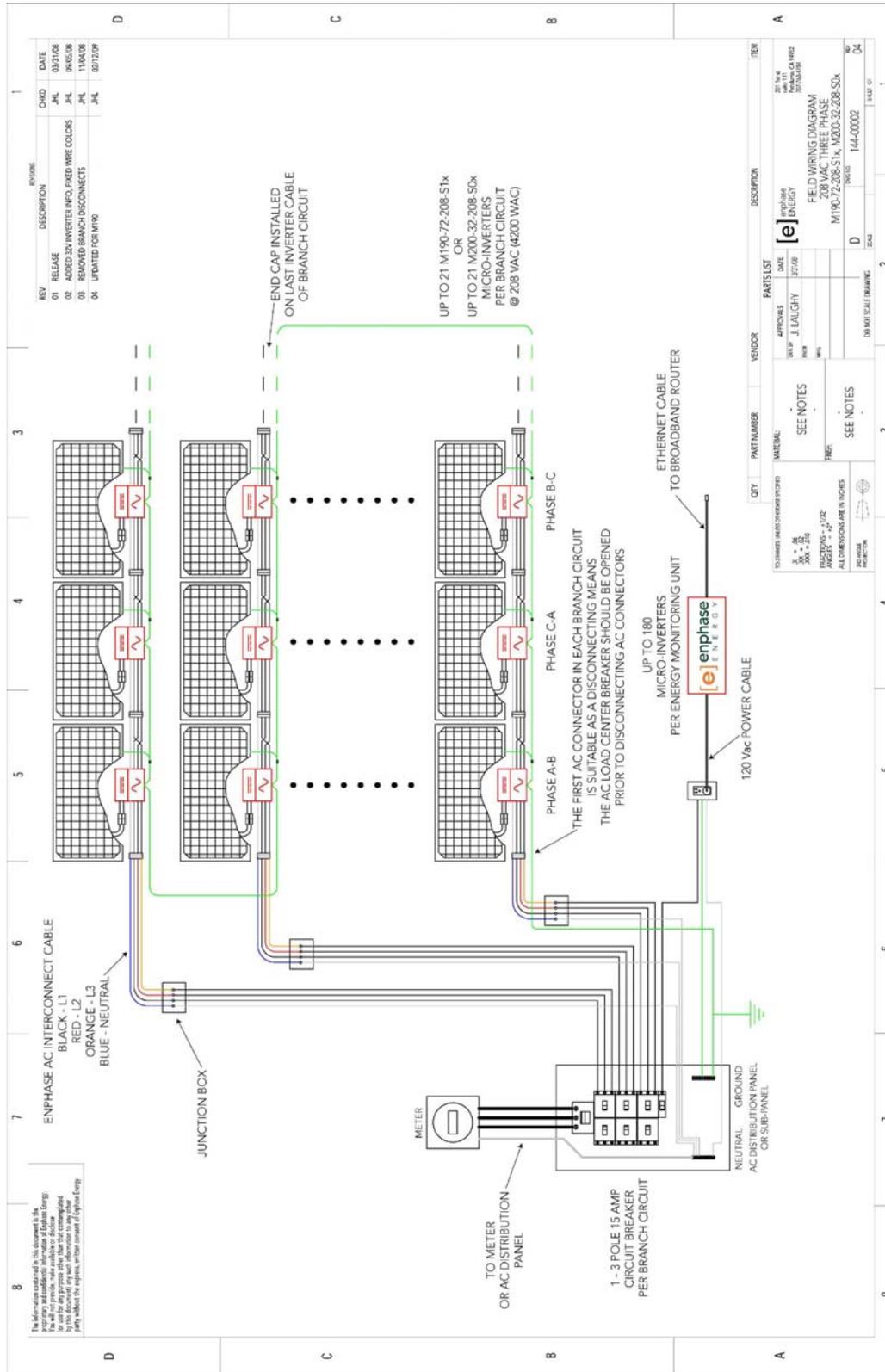


### Sample Wiring Diagram – M190-72-240-S1x





### Sample Wiring Diagram – M190-72-208-S1x





Enphase Energy Inc.  
201 1<sup>st</sup> Street, Suite 300  
Petaluma, CA 94952  
Phone: 707-763-4784  
TOLL FREE: 877-797-4743  
Fax: 707-763-0784  
[www.enphaseenergy.com](http://www.enphaseenergy.com)  
[info@enphaseenergy.com](mailto:info@enphaseenergy.com)