

Revenue Grade Meter (RGM)

for Enphase Metering and Management Solution™



Contact Information

Enphase Energy Inc.
1420 N. McDowell Blvd.
Petaluma, CA 94954

<http://www.enphase.com>
info@enphaseenergy.com
support@enphaseenergy.com

FCC Approvals

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.

WARNING: To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm (8 inches) or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operations at closer distances than this are not recommended.

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

Other Information

Product information is subject to change without notice. All trademarks are recognized as the property of their respective owners.

User documentation is updated frequently; Check the Enphase website (<http://www.enphase.com/support/downloads>) for the latest information.

Copyright © 2012 Enphase Energy. All rights reserved.

Table of Contents

Important Safety Information	5
Read this First	5
Safety Instructions	5
The Enphase Metering and Management Solution	6
Preparing for RGM Installation.....	7
Parts and Tools Required.....	7
Required Enphase Equipment	7
Optional Enphase Equipment	7
Other Tools and Equipment	7
Before Installing the RGM.....	8
Install the PV System and Verify Site Service	8
Turn Off the Solar Backfeed Breaker(s).....	8
Install the Form 2S Meter Socket	8
Installing the RGM.....	9
Installation Workflows.....	9
Workflow 1: Install a Preprovisioned RGM.....	9
Preprovision the RGM before Visiting the Site.....	10
Step 1. Activate (Register) the System	10
Step 2. Connect the Envoy and Insert the ZigBee Stick	11
Step 3. Configure the RGM	12
Install the Preprovisioned RGM at the Site.....	13
Step 4. Install the RGM.....	13
Step 5. Power Up the RGM.....	13
Step 6. Verify the Installation	13
Step 7. Install the Meter Band.....	14
Step 8. Build the Virtual Array	14
Workflow 2: Install and Provision an RGM on Site	15
Step 1. Install the RGM.....	15
Step 2. Power Up the RGM.....	15
Step 3. Activate (Register) the System	16
Step 4. Verify Envoy Installation and Insert the ZigBee Stick.....	17
Step 5. Configure the RGM	18
Step 6. Verify the Installation	19
Step 7. Install the Meter Band.....	19
Step 8. Build the Virtual Array	19
Enable API Access (Optional)	21
Install a Repeater (Optional).....	22
Step 1. Plug the Repeater into a Wall Outlet	22
Step 2. Configure the Repeater	22
Step 3. Mate the Repeater.....	23
Remove a Repeater	23
Operation.....	24
How to Read the Envoy's ZigBee Device Configuration Page.....	24
How to Read the RGM Display	24
How to View a Production Report in Enlighten	24

How to Read the RGM LED	25
Error Reporting and Troubleshooting	26
Do I Need a Repeater?	26
Status and Event Messages.....	27
Meter Status Messages on the Envoy LCD	27
RGM Event Messages.....	27
Troubleshooting	28
Issues Observed at the RGM	28
RGM Issues Observed at the Envoy Interface.....	29
RGM Issues Observed on the Envoy LCD	30
When to Contact Enphase	30
Replacing an RGM.....	31
Step 1. Turn Off the Solar Backfeed Breakers(s) in the Main Load Center	31
Step 2. Remove the Old RGM	31
Step 3. Install the Replacement RGM	31
Step 4. Unmanage the RGM.....	32
Step 5. Install and Configure the New ZigBee Stick	32
Step 6. Power Up the RGM.....	32
Step 7. Verify the Installation	33
Step 8. Install the Meter Band.....	33
Step 9: Retire the Old RGM in Enlighten	33
Technical Data	34
Specifications, Compliance, and Ordering Information	34
RGM Specifications and Compliance	34
Sample RGM Wiring Diagram – Single Branch	35
Sample RGM Wiring Diagram – Multiple Branches	36

Important Safety Information

Read this First

This manual contains important instructions for use during installation and maintenance of the Enphase-Compatible Revenue Grade Meter (RGM), a component of the Enphase Metering and Management Solution (EMMS). Follow the instructions in this section to install the RGM.

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



DANGER / WARNING! This indicates a situation where failure to follow instructions may be a safety hazard or cause equipment malfunction. Use extreme caution and follow instructions carefully.



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

Safety Instructions

- This equipment must be installed by a licensed electrician in accordance with all locally recognized electrical codes, including National Electrical Code (NEC), ANSI/NFPA 70.
- Use this equipment only with a safety certified meter socket.
- Read and follow all instructions and cautionary markings for the RGM and for the meter socket you are using.
- Do not attempt to open or repair the following items:
 - Enphase-Compatible Revenue Grade Meter (RGM)
 - ZigBee USB stick for RGM
 - ZigBee Repeater for RGM

These items contain no user-serviceable parts. If any of these items fails, please contact Enphase customer service to obtain an RMA (return merchandise authorization) number and start the replacement process. Tampering with or opening these items will void the warranty.

- 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.

The Enphase Metering and Management Solution

The Enphase Metering and Management Solution delivers a single platform to manage both microinverter and meter data. The Solution monitors a single phase Enphase Microinverter System and measures its power production with revenue grade accuracy. At the same time, it meets the needs of Power Purchase Agreement providers (PPAs), third party solar financiers and solar installers requiring a Revenue Grade Meter.

System elements include:

- Enphase-Compatible Revenue Grade Meter (RGM)
- ZigBee USB stick for RGM (for use only with the Enphase Envoy Communications Gateway™)
- Enphase Envoy Communications Gateway™
- Enphase Enlighten™ web-based monitoring and analysis software

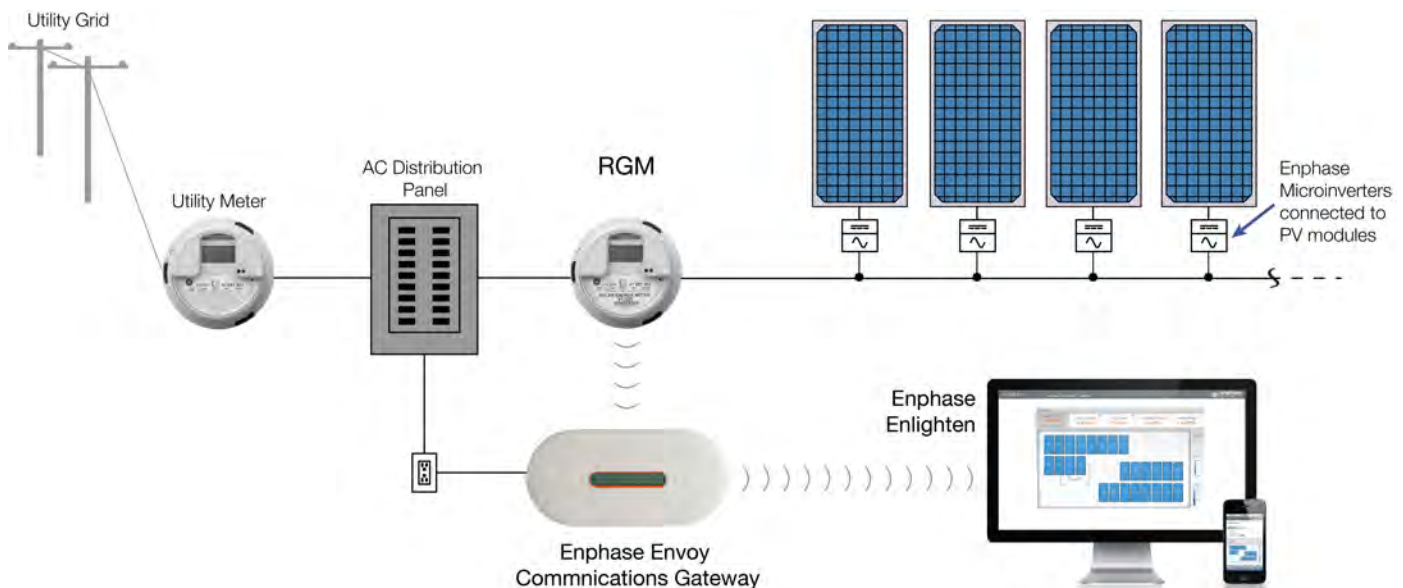
This manual describes installation of the RGM, also known as the RGM-MTR-01, Enphase compatible, GE i210+ Revenue Grade Meter with integrated ZigBee communication by Silver Spring Networks.

The RGM is a single phase, watt-hour, revenue grade meter. It measures energy production from the array and sends data to the Envoy Communications Gateway™, which then forwards the data to Enlighten™ over the Internet.



NOTE: The RGM does not replace the utility meter, but works along side it. The electric meter installed by your local utility measures net electric **consumption**, while the RGM measures solar **production**.

The RGM works with 240V service and requires a form 2S meter socket for installation. For more information, see the Technical Data page 34 of this manual.



Preparing for RGM Installation

The instructions in this manual do not cover installation of the PV system (microinverters, PV modules, racking, and associated hardware) or the Envoy Communications Gateway.

- For information on microinverter installation, refer to the Enphase Microinverter Installation Manual for the model being installed at <http://www.enphase.com/support/downloads>.
- For information on Envoy Installation, refer to the [Envoy Installation and Operation Manual](#).



DANGER: Be aware that installation of this equipment includes risk of electric shock. Installation must be done by a certified electrician.



WARNING: Do not reuse an RGM in a second location! An RGM permanently retains information from its original installation and cannot be reset.



NOTE: We do not recommend reusing a ZigBee stick in a second location.

Parts and Tools Required

In addition to the existing PV system (microinverters, PV modules, racking, and associated hardware), you will need the following equipment.

Required Enphase Equipment

- Enphase Compatible GE i210+ Revenue Grade Meter (RGM) with integrated ZigBee (RGM-MTR-01)
- ZigBee USB stick for Envoy communication with RGM (RGM-ZGB-01)
- Enphase Envoy Communications Gateway (ENV-120-01)

Optional Enphase Equipment

Enphase recommends that you take a repeater (Enphase order number RGM-RR-01) with you when installing an RGM. To determine if you need a Repeater, see “Do I Need a Repeater?” on page 26.

Other Tools and Equipment

- Appropriate tools for meter socket and meter installation
- A form 2S meter socket
- If there is more than one solar branch circuit, you must add a dedicated subpanel on the array side of the RGM
- Laptop or other computer to configure the Envoy for the RGM
- A broadband router with an always-on Internet connection

Before Installing the RGM

Install the PV System and Verify Site Service

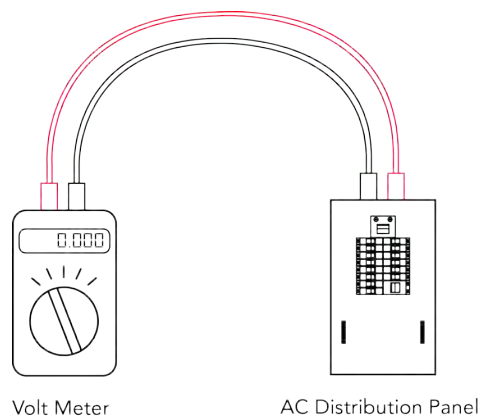
- Verify that you have installed the PV modules, microinverters, and Envoy before installing the RGM.



NOTE: So that you can verify RGM operation and see evidence of power produced after installing the RGM, it is best practice to install the RGM as the last element in the Enphase solar microinverter system.

- Measure AC line voltage at the electrical utility connection to confirm that it is within range. The following table shows acceptable ranges.

Single phase 240 Volt AC	
L1 to L2	211 to 264 VAC
L1, L2 to neutral	106 to 132 VAC



Volt Meter

AC Distribution Panel

Turn Off the Solar Backfeed Breaker(s)

- Turn off the solar backfeed breaker in the main load center.
- Verify that the AC branch circuits are not energized.

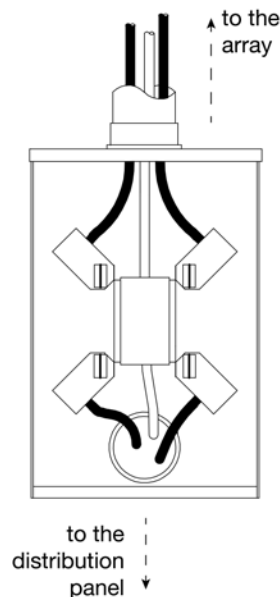
Install the Form 2S Meter Socket

- Reference the sample wiring diagrams on pages 35 and 36.
- Install the socket near the load center. The socket must be wired in series, not in parallel.
- Wire the socket **so that the top meter contacts connect to the array**. If there are multiple solar circuits, you must combine them, so that all circuits connect to the socket.



WARNING: Wire the socket so that the top meter contacts connect to the array! Otherwise, power produced will register as consumed.

- Conductors from the array may be narrower than would normally be landed at this type of socket. In this case, be careful to place the conductors so that they do not slip out of place and to ensure adequate contact with the socket terminals.



Installing the RGM

Follow the instructions in this section to install the RGM.

Installation Workflows

There are two recommended workflows for RGM installation. Choose the workflow that best suits your needs. The two alternatives are:

- You can preprovision one or more RGMs to ready them for physical installation, thus eliminating the need to bring a laptop computer to the installation site.
- You can install and configure an RGM on site. In this case, you will need to bring a laptop computer to the installation site.

Workflow 1: Install a Preprovisioned RGM

In this workflow, perform steps one through three in advance, before traveling to the installation site. Perform steps 4 through 9 on site at the same time you install the meter socket. (See “Install the Form 2S Meter Socket” on page 8.)



NOTE: With this workflow, you must maintain matched sets of preprovisioned Envoy, ZigBee stick and RGM. If preprovisioned units become mixed, you must provision them again before or during physical installation.

The following pages detail these steps:

Before Visiting the Site, Preprovision the RGM

- Step 1** – Activate (Register) the System
- Step 2** – Connect the Envoy and Insert the ZigBee Stick
- Step 3** – Configure the RGM

Install the Preprovisioned RGM at the Site

- Step 4** – Install the RGM
- Step 5** – Power Up the RGM
- Step 6** – Verify the Installation
- Step 7** – Install the Meter Band
- Step 8** – Build the Virtual Array

Preprovision the RGM before Visiting the Site

Step 1. Activate (Register) the System

To activate the site in Enlighten, perform the following steps.

- Log into the Enlighten installer portal. (Go to enlighten.enphaseenergy.com and enter your email address (username) and password or create a new Enlighten account)
- From the Installer Dashboard, click **Add New Activation**.
- Create a new site activation by entering the following site information:
 - a. Enter the name of the homeowner in the “System Name” field
 - b. Select “residential” as the system type
 - c. Check the “This is a PPA or Leased System” checkbox.
 - d. For System Host, enter the homeowner information, or leave this information blank. (This information is optional or you can enter it later.)
 - e. Enter the homeowner street address in the “Location Information”
 - f. In the “Owner Information” section enter the email address supplied by the third party owner.

Add New System

*System Name

*System Type

☒ This is a PPA or Leased System

System Host

The system host is the resident of the building where the system is installed.

First Name

Last Name

Email

Phone

Owner Information

The system owner is the contact at the Lease or PPA company.

Email

Location Information

Street Address

Street Address 2

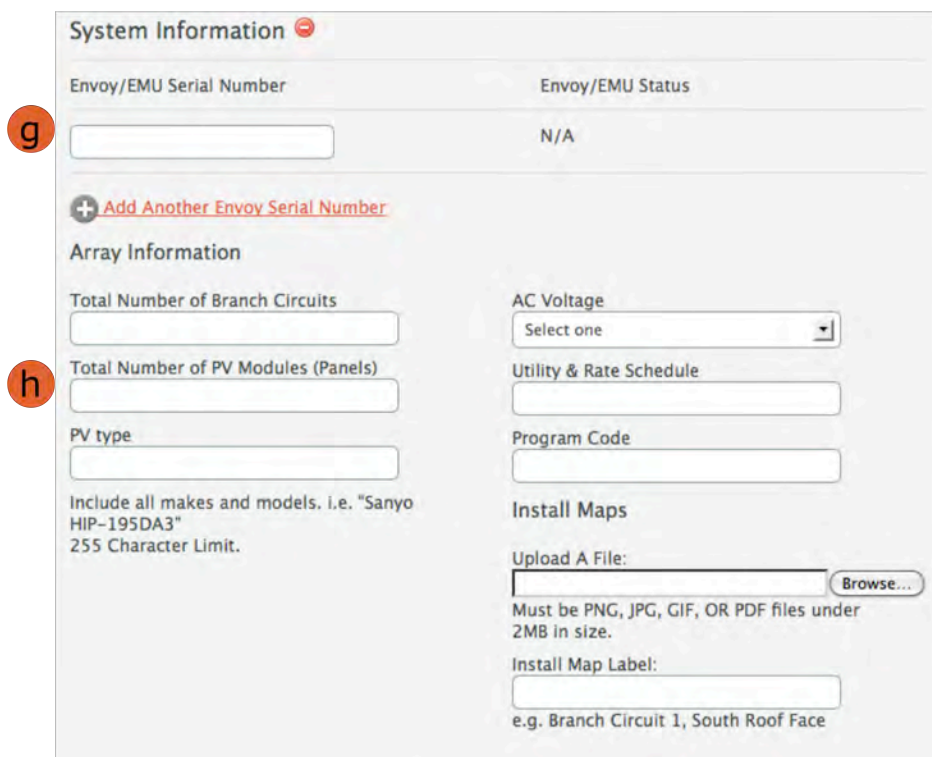
City


Country

State/Province

Zip/Postal Code

- g. Enter the Envoy serial number under “System Information”
- h. Enter the total number of branch circuits and modules under “Array Information”.
- Click **Save** to submit the form. You will receive a confirmation message: “Activation Created Successfully”.





System Information 

Envoy/EMU Serial Number	Envoy/EMU Status
<input type="text"/>	N/A

[+ Add Another Envoy Serial Number](#)

Array Information

Total Number of Branch Circuits <input type="text"/>	AC Voltage Select one 
Total Number of PV Modules (Panels) <input type="text"/>	Utility & Rate Schedule <input type="text"/>
PV type <input type="text"/>	Program Code <input type="text"/>
Include all makes and models. i.e. "Sanyo HIP-195DA3" 255 Character Limit.	Install Maps Upload A File: <input type="text"/>  Must be PNG, JPG, GIF, OR PDF files under 2MB in size. Install Map Label: <input type="text"/> e.g. Branch Circuit 1, South Roof Face

Step 2. Connect the Envoy and Insert the ZigBee Stick

When powered up and connected for the first time, the Envoy may retrieve an automatic upgrade from Enphase. Because this upgrade may take up to 45 minutes, connect the Envoy before preprovisioning the RGM so that the Envoy performs the upgrade well before you begin provisioning the RGM.



WARNING: Do not unplug the Envoy during software upgrade!

- Plug the Envoy's Ethernet cable into the Ethernet port on the Envoy, and plug the other end of the Ethernet cable into a spare port on a broadband router with an active Internet connection.
- Plug the ZigBee stick into either USB port on the Envoy.
- Check that the ZigBee stick is fully seated in the USB port.
- Plug the Envoy's AC power cord into the input on the Envoy, and plug the other end of the cord into an AC outlet.

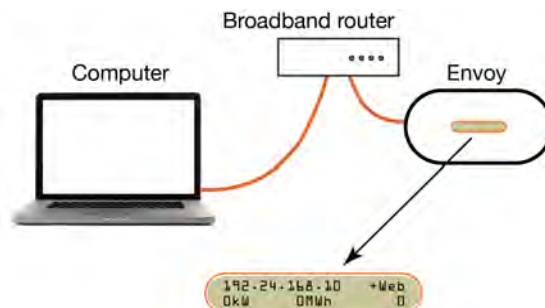


Step 3. Configure the RGM

- Open an Internet browser on a computer connected to the same local network as the Envoy.
- In the browser address window, enter the IP address displayed in the LCD screen of the Envoy.
- On the Envoy home page, verify that the current software version is R3.2.0 or greater. If the software version is lower than R3.2.0, contact support@enphaseenergy.com for an upgrade.



NOTE: If the Envoy is running software version lower than R3.2.0, completing the Enphase Activation (see page 10) and selecting the “This is a PPA or Leased System” checkbox will start an automatic Envoy upgrade to R3.2.0. **Do not unplug the Envoy during upgrade.**



- Click **Administration** to access the Administration menu. Log in using the following credentials:
 - Username: **admin**
 - Password: **admin**
- From the Administration menu, select **ZigBee Device Configuration**.



NOTE: If the ZigBee Device Configuration screen is blank, check that you have fully installed the ZigBee stick into the Envoy.

- Under **Add New ZigBee Device**, enter the Device EU164 code (16 characters) from the face of the RGM.
- Enter the Device Install Code (20 characters) from the back of the RGM.



NOTE: This is a hexadecimal number. While it may contain the letters A, B, C, D, E, and F, it does not contain letters that can be easily mistaken for numbers, such as I, S, and O.



- Click **Add Device**. The page will show the message “Install code accepted for ZigBee device. Device scan started.” The Envoy and ZigBee stick will begin the joining process.
- Once the page shows the device (RGM) Network Discovery state as “Preconfigured”, the configuration process is complete.
- Power down the Envoy for delivery to the installation site with the matching ZigBee Stick and RGM.

Install the Preprovisioned RGM at the Site

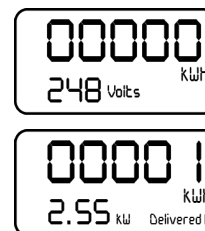
Step 4. Install the RGM

- Confirm that the solar backfeed breaker in the main load center is off.
- The RGM has current and potential terminals that extend from the back of the RGM. Orient these terminals with the socket jaws.
- Plug the meter into the form 2S socket. A spring in the socket jaws provides heavy contact force. Alternatively, some heavy-duty sockets include a handle or wrench to provide the needed contact force.
- Wait until step 7 before installing the meter band.



Step 5. Power Up the RGM

- Turn on the solar backfeed breaker in the main load center.
- Verify that the RGM LCD indicates power is on. (The LCD screen is active.)
- Check that the lower left display on the meter shows approximately 240 Volts.
- After the solar circuit has been on for five minutes, the microinverters begin to convert energy, and the meter starts to show solar production (during daylight hours). The RGM LCD lower left display indicates the kW being produced by the system. Check that the lower right display shows **"Delivered"**. The value on the lower left of the RGM LCD alternates between Volts and instantaneous power (kW).



Step 6. Verify the Installation

- After the RGM LCD has been indicating solar production for approximately five minutes, check that the Envoy LCD screen reads:

Meter status:
OK

- If the Envoy does not show a connection to the RGM after a ten minute wait, start a new ZigBee device scan from the Envoy. To do this, hold down the menu button (on the right side of the Envoy) and release it when the menu item "Scan ZigBee Network" appears.
- If the Envoy does not show a connection to the RGM within ten minutes after rescanning the ZigBee network, double-check that the EUI64 code from the meter faceplate **exactly** matches the code as typed at the Envoy interface on the ZigBee Device Configuration page. If you find that a code was entered incorrectly, select and unmanage the incorrect EUI64, then add a new device with the correct EUI64 and Install Code. If the code is correct, you may need to install a repeater. If you do not have one, order part number RGM-RR-01. To install a repeater, see "Install a Repeater" on page 22.

Step 7. Install the Meter Band

- Install the meter band that was provided with the Form 2S meter socket, as needed.

Step 8. Build the Virtual Array

- Once all the microinverters at the site are detected, and the Envoy has successfully connected to the Internet, you will be notified that the array for site can be built. Click the link provided, and use Enlighten's Array Builder to build the virtual array for the site.



NOTE: You must build the array for the Activation to be complete and for the system to begin reporting normally.

- (Optional) Upload the installation map to the site activation form in Enlighten. The installation map should include serial number stickers for all units installed at the site.

Reminder: For site data to be consistently available on Enlighten, each site must have an Enphase Envoy installed. That Envoy must be installed in an interior space as close to the load center as possible and maintain a consistent connection to the Internet.

For more information on Envoy installation, refer to the **Envoy Installation and Operation Manual** at <http://www.enphase.com/support/downloads>.

To see the Array Builder demo,
visit <http://enphase.com/support/videos/build-a-simple-array-in-enlighten/>.

Workflow 2: Install and Provision an RGM on Site

In this workflow, perform all steps on site at the same time that the meter socket is installed. (See “Install the Form 2S Meter Socket” on page 8.) The following pages detail these steps:

- Step 1** – Install the RGM
- Step 2** – Power Up the RGM
- Step 3** – Activate (Register) the Enphase System
- Step 4** – Verify Envoy Installation and Insert the ZigBee Stick
- Step 5** – Configure the RGM
- Step 6** – Verify the Installation
- Step 7** – Install the Meter Band
- Step 8** – Build the Virtual Array

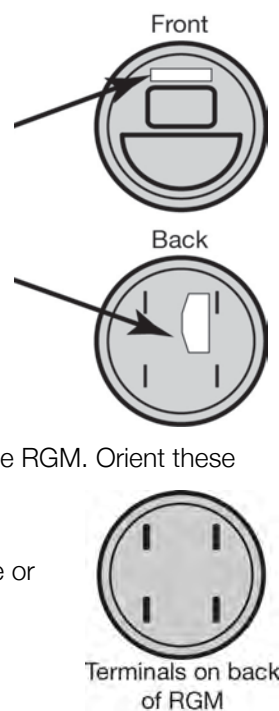
Step 1. Install the RGM

- Make note of two codes from the labels on the RGM, as you will need them later in the installation process. These codes are:
 - The Device EU164 code (16 characters) from the face of the RGM.
 - The Device Install Code (20 characters) from the back of the RGM.



Tip: If possible, take pictures of the codes with your smart phone.

- The RGM has current and potential terminals that extend from the back of the RGM. Orient these terminals with the socket jaws.
- Plug the meter into the form 2S socket. A spring in the socket jaws provides heavy contact force. Alternatively, some heavy-duty sockets include a handle or wrench to provide the needed contact force.
- Wait until step 7 before installing the meter band.



Step 2. Power Up the RGM

- Turn on the solar backfeed breaker in the main load center.
- Verify that the RGM LCD indicates power is on. (The LCD screen is active.)
- Check that the lower left display on the meter shows approximately 240 Volts.
- After the solar circuit has been on for five minutes, the meter starts to show solar production (during daylight hours). The RGM LCD lower left display indicates the kW being produced by the system. Check that the lower right display shows “**Delivered**”. The value on the lower left of the RGM LCD alternates between Volts and instantaneous power (kW).

Step 3. Activate (Register) the System

To activate the site in Enlighten, perform the following steps.

- Log into the Enlighten installer portal. (Go to enlighten.enphaseenergy.com and enter your email address (username) and password or create a new Enlighten account)
- From the Installer Dashboard, click **Add New Activation**.
- Create a new site activation by entering the following site information:
 - a. Enter the name of the homeowner in the “System Name” field
 - b. Select “residential” as the system type
 - c. Check the “This is a PPA or Leased System” checkbox.
 - d. For System Host, enter the homeowner information, or leave this information blank. (This information is optional or you can enter it later.)
 - e. Enter the homeowner street address in the “Location Information”
 - f. In the “Owner Information” section enter the email address supplied by the third party owner.

Add New System

*System Name

*System Type Residential

☒ This is a PPA or Leased System

System Host

The system host is the resident of the building where the system is installed.

First Name

Last Name

Email

Phone

Location Information

Street Address

Street Address 2

City

Country -----

State/Province -----

Zip/Postal Code

Owner Information

The system owner is the contact at the Lease or PPA company.

Email

- g. Enter the Envoy serial number under “System Information”
- h. Enter the total number of branch circuits and modules under “Array Information”.
- Click **Save** to submit the form. You will receive a confirmation message: “Activation Created Successfully”.

The screenshot shows a web form titled "System Information" with a red minus icon. It contains two main sections: "System Information" and "Array Information".

System Information:

- Envoy/EMU Serial Number:** A text input field with a red circle 'g' next to it.
- Envoy/EMU Status:** A dropdown menu showing "N/A".
- + Add Another Envoy Serial Number:** A red link with a plus icon.

Array Information:

- Total Number of Branch Circuits:** A text input field with a red circle 'h' next to it.
- Total Number of PV Modules (Panels):** A text input field.
- PV type:** A text input field.
- AC Voltage:** A dropdown menu showing "Select one".
- Utility & Rate Schedule:** A text input field.
- Program Code:** A text input field.
- Install Maps:**
 - Upload A File:** A text input field with a "Browse..." button.
 - Must be PNG, JPG, GIF, OR PDF files under 2MB in size.**
 - Install Map Label:** A text input field.
 - e.g. Branch Circuit 1, South Roof Face**

Below the PV type field, there is a note: "Include all makes and models. i.e. "Sanyo HIP-195DA3" 255 Character Limit."

Step 4. Verify Envoy Installation and Insert the ZigBee Stick

When powered up and connected for the first time, the Envoy may retrieve an automatic upgrade from Enphase. Because this upgrade may take up to 45 minutes, connect the Envoy before configuring the RGM so that the Envoy performs the upgrade well before the RGM configuration begins.



WARNING: Do not unplug the Envoy during software upgrade!

- Check that the Envoy is powered up and plugged into an AC outlet.
- Check that the Envoy has an always-on connection to the Internet.
- Plug the ZigBee stick into either USB port on the Envoy.
- Check that the ZigBee stick is fully seated in the USB port.

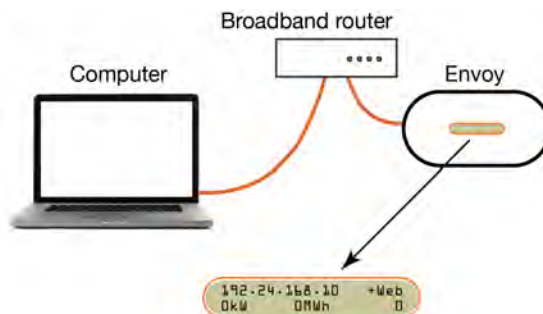


Step 5. Configure the RGM

- Open an Internet browser on a computer connected to the same local network as the Envoy.
- In the browser address window, enter the IP address displayed in the LCD screen of the Envoy.
- On the Envoy home page, verify that the current software version is R3.2.0 or greater. If the software version is lower than R3.2.0, contact support@enphaseenergy.com for an upgrade.



NOTE: If the Envoy is running software version lower than R3.2.0, completing the Enphase Activation (see page 16) and selecting the “This is a PPA or Leased System” checkbox will start an automatic Envoy upgrade to R3.2.0. **Do not unplug the Envoy during upgrade.**



- Click **Administration** to access the Administration menu. Log in using the following credentials:
 - Username: **admin**
 - Password: **admin**
- From the Administration menu, select **ZigBee Device Configuration**.



NOTE: If the ZigBee Device Configuration screen does not appear, check that you have fully installed the ZigBee stick into the Envoy.

- Under **Add New ZigBee Device**, enter the Device EUI64 code (16 characters) from the face of the RGM.
- Enter the Device Install Code (20 characters) from the back of the RGM.



NOTE: This is a hexadecimal number. While it may contain the letters A, B, C, D, E, and F, it does not contain letters that can be easily mistaken for numbers, such as I, S, and O.

- Click **Add Device**. The page should show the message “Install code accepted for ZigBee device. Device scan started.” The Envoy and ZigBee stick will begin the joining process.



- Once the page shows the device (RGM) Network Discovery state as “Active”, the configuration process is complete.

Step 6. Verify the Installation

- After the RGM LCD has been indicating solar production for approximately five minutes, check that the Envoy LCD screen reads:

<p>Meter status: OK</p>

- If the Envoy does not show a connection to the RGM after a ten minute wait, start a new ZigBee device scan from the Envoy. To do this, hold down the menu button (on the right side of the Envoy) and release it when the menu item “Scan ZigBee Network” appears.
- If the Envoy does not show a connection to the RGM within ten minutes after rescanning the ZigBee network, double-check that the EUI64 code from the meter faceplate **exactly** matches the code as typed at the Envoy interface on the ZigBee Device Configuration page. If you find that a code was entered incorrectly, select and unmanage the incorrect EUI64, then add a new device with the correct EUI64 and Install Code. If the code is correct, you may need to install a repeater. If you do not have one, order part number RGM-RR-01. To install a repeater, see “Install a Repeater” on page 22.

Step 7. Install the Meter Band

- Install the meter band that was provided with the Form 2S meter socket, as needed.

Step 8. Build the Virtual Array

- Once all the microinverters at the site are detected, and the Envoy has successfully connected to the Internet, you will be notified that the array for site can be built. Click the link provided, and use Enlighten’s Array Builder to build the virtual array for the site.



NOTE: You must build the array for the Activation to be complete and for the system to begin reporting normally.

- (Optional) Upload the installation map to the site activation form in Enlighten. The installation map should include serial number stickers for all units installed at the site.

Reminder: For site data to be consistently available on Enlighten, each site must have an Enphase Envoy installed. That Envoy must be installed in an interior space as close to the load center as possible and maintain a consistent connection to the Internet.

For more information on Envoy installation, refer to the **Envoy Installation and Operation Manual** at <http://www.enphase.com/support/downloads>.

For an Array Builder demo, see <http://enphase.com/support/videos/build-a-simple-array-in-enlighten/>.

Add Array

1 Choose orientation of modules within array

☒
☐

You can mix the orientation of modules and rotate them in a moment.

2 Rough shape

3 rows x 3 columns = 9 modules

Once the array is created you can add, subtract and move modules easily to create an accurate plan.

3 Azimuth

°

Azimuth is the difference, measured in 0-359 degrees, from true North.

Enable API Access (Optional)

Enphase gives the system owner access to the site when the site installation and turn up is complete. Once granted access, the system owner can enable API access. API access allows the integration of system data with in-house billing, CRM, or reporting functions.

To enable API access:

- Log in to Enlighten. (Go to enlighten.enphaseenergy.com/login and enter your email address (username) and password.)



NOTE: Only the system owner can enable API access for their system(s).

- For each new site installed, click “**Settings**”.



- Click “**Allow API access to my system data**” so that a check appears in the box.

Access

Access by Installer [?](#)

☒ Grant installer, PPA Services, access to view this system.

Access by Others

System Lists [?](#)

☐ Allow Enphase Energy to include my system in the [list of solar installations](#) on their website

☐ Allow NJR Home Services to include my system in the list of solar installations on their website

API Settings

☒ Allow API access to my system data. I understand that use of the API is subject to the [Enphase Energy API License Agreement](#).

Visitors [?](#)

☐ Allow visitors to my system

Privacy Settings

☒ The system will be listed as "PPA Services"

☐ The system will be listed as "Residential System"

Save

- Click **Save** to apply the updated settings for the site.

For more information about the API go to enphase.com/api.

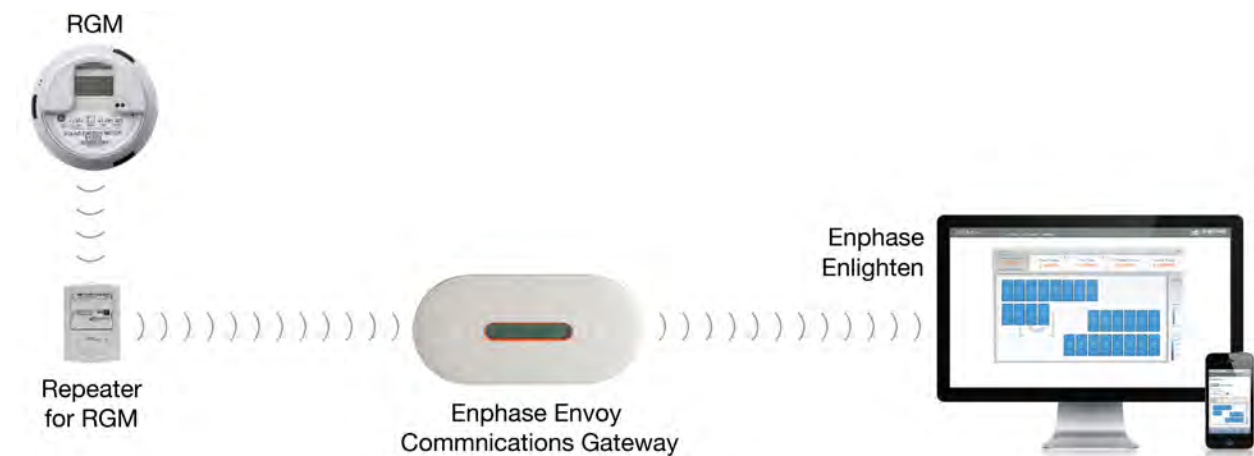
Install a Repeater (Optional)

The radio used in the RGM has a long range. However, some sites have either long distances or enough obstructions that the RGM and the Envoy cannot reach each other. These sites require a repeater. The repeater will pass on any messages it receives.

To help determine if you need a repeater, see “Do I Need a Repeater?” on page 26.



NOTE: If you determine that a repeater is needed at the site, install an Enphase repeater (part number RGM-RR-01). Other repeater models will not work between the RGM and the ZigBee stick.



Step 1. Plug the Repeater into a Wall Outlet

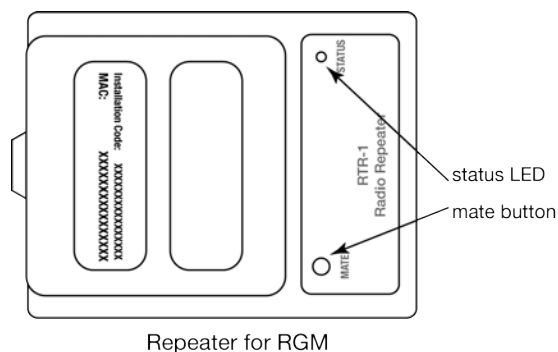
- Locate an AC outlet halfway between the RGM and the Envoy.
- If a midway point is not available, place the repeater closer to the Envoy side of the midway point.
- Ensure that the RGM and Envoy are operational by verifying that the LCD screens are active.

Step 2. Configure the Repeater

- Open an Internet browser on a computer connected to the same local network as the Envoy.
- In the browser address window, enter the IP address displayed in the LCD screen of the Envoy.
- Click **Administration** to access the Administration menu. Log in.
 - Username: **admin**
 - Password: **admin**
- From the Administration menu, select **ZigBee Device Configuration**.
- Under Add New ZigBee Device, enter both the Device EUI64 code (16-character **MAC** address) and the Device Install Code (16-character **Installation Code**) from the face of the repeater.
- Click **Add Device**. The page then shows the message “Install code accepted for ZigBee device. Device scan started.”

Step 3. Mate the Repeater

- Within three minutes, press the **Mate** button on the repeater **for 10 seconds**. When the repeater is mated and operational, the status LED on the repeater will turn green.
- If these steps do not result in a successful mate, contact Enphase Customer Support at support@enphaseenergy.com.

**Remove a Repeater**

If you remove a repeater from a site, it must be “Unmanaged” from within the Envoy Interface. To unmanage the repeater:

- Open an Internet browser on a computer connected to the same local network as the Envoy.
- In the browser address window, enter the IP address displayed in the LCD screen of the Envoy.
- Click **Administration** to access the Administration menu. Log in using the following credentials:
 - Username: **admin**
 - Password: **admin**
- From the Administration menu, select **ZigBee Device Configuration**.
- Under **ZigBee Devices Managed by this Envoy**, select the repeater and click **Unmanage Selected Devices**.
- Unplug the repeater.

Operation

The RGM begins operating once it is powered up (as described on page 15). No other action is required. The following sections describe the various system indicators.

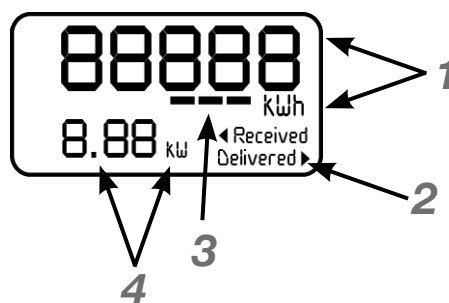
How to Read the Envoy's ZigBee Device Configuration Page

In the Envoy interface, the ZigBee Device Configuration Page shows ZigBee device status. The various states are:

- **Preconfigured** - Provisioned but not yet active on the ZigBee network
- **Active** - Device is active, or has been active, on the ZigBee network
- **Key Establishing** - In the process of negotiating ZigBee network keys. This is a brief transitional state. If a device remains in this state, the key establishment has failed.
- **Service Discovery** - The USB stick is searching for services supplied by the ZigBee device. If a device remains in this state, device discovery has failed.
- **To be determined** - After successful key negotiation, the RGM scanner displays this message while it locates the device part number and device name.

How to Read the RGM Display

- Accumulated kWh display. The RGM shows accumulated energy produced by the system.
- Energy flow direction indicator. A correctly wired meter shows energy "Delivered" rather than "Received".
- Dashes indicate the energy flow rate.
- Toggles between AC Volts and instantaneous AC power (kW).



How to View a Production Report in Enlighten

To view an RGM production report in Enlighten, perform the following steps.



NOTE: Enlighten's Revenue Grade Meter **report** does not show production data for the current day.

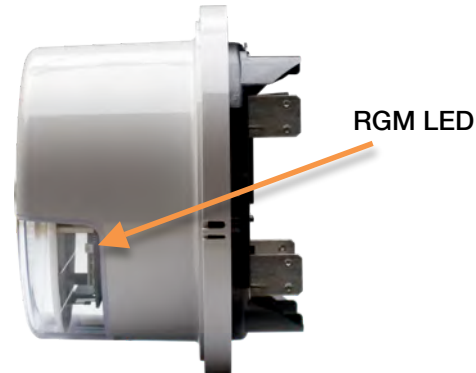
- Log into the existing Enlighten installer portal. (Go to enlighten.enphaseenergy.com/login and enter your email address (username) and password.)
- From the Installer Dashboard, in the "System Finder" enter the System Name.
- Click the system name for the site.
- Click **Reports**.
- From the "Select a Report" drop down menu, select **Power Meter Output**.
- From the "Select one" drop down menu, select the **Revenue Grade Meter**.

- Select a start and end date.
- Click **Submit**.

The resulting report shows production, as measured by the RGM, for each 15-minute interval in the date range. There is also a total for the date range at the bottom of the report.

How to Read the RGM LED

As shown in the following table, on power up, the RGM LED is in the **Unjoined / New Join** state and attempts to join an available ZigBee network every 30 seconds. This continues indefinitely. In this state, the LED blinks once every three seconds.



State	LED On duration (ms)	LED Off duration (ms)	Description
Unjoined / New Join	500	2500	LED blinks once every 3 seconds.
Rejoin	500	1500	LED blinks once every 2 seconds.
Joining	125	125	LED blinks 4 times per second.
Joined	0	0	LED off.
Link Error	500	500	LED blinks once per second.
Identify	250	250	LED blinks twice per second.

- When a network is available, the RGM transitions to the **Joining** state, during which time it synchronizes with the Envoy. If the event joining fails, the state transitions to **Unjoined**. If the join is successful the RGM transitions to the **Joined** state, during which time the LED is off.
- If the RGM detects a link failure, it transitions back to the **Link Error** state and the LED blinks once per second. If the link is reestablished within 15 minutes, the RGM transitions back to **Joined**. If the **Link Error** state exceeds 15 minutes, the RGM cycles between **New Join** and **Rejoin** states. In the **Rejoin** state, the LED blinks once every two seconds.
- The RGM executes two attempts every 30 seconds, at each state, to Join or Rejoin before transitioning to the next state.
- Power cycling the RGM when in a **Joined** state results in the Join / Rejoin cycle.
- Certain Envoy processes can trigger an **Identify** state during which the LED blinks twice per second according to the ZigBee specification. This is used to visually identify a particular device.

Error Reporting and Troubleshooting



WARNING: Do not attempt to repair the RGM; it contains no user-serviceable parts. If it fails, please contact Enphase customer service to obtain an RMA (return merchandise authorization) number to start the replacement process.

Do I Need a Repeater?

Repeater operational distance will vary depending upon the obstructions and distance between the RGM and the ZigBee stick.



NOTE: You can relocate the Envoy in an attempt to improve ZigBee communication. If you do this, remember that the Envoy needs to be as close to the PV load center as possible. You must also wait ten minutes for the Envoy to start showing Meter status information on the Envoy LCD again after it has been power down and restarted.

The site needs a repeater if any of the following continues to occur even after relocating the Envoy:

- On the ZigBee Device Configuration page of the Envoy Interface, the RGM remains in “Service Discovery” state, even though the RGM is operational.
- The Envoy LCD shows "Meter status: Failure to report" more than once a day or for more than 24 hours at a time.
- Enlighten shows "ZigBee device failed to report" more than once a day or for more than 24 hours at a time.
- The Inventory page of the Envoy Interface shows a meter status of “Unavailable” or “Failure to Report” more than once a day or for more than 24 hours at a time.
- The Envoy LCD has never displayed a Meter status.
 - If the Envoy does not show a connection to the RGM after a 10-minute wait, double-check that the EUI64 code from the meter faceplate **exactly** matches the code as typed at the Envoy interface on the ZigBee Device Configuration page. If you find that a code was entered incorrectly, select and unmanage the incorrect EUI64, then add a new device with the correct EUI64 and Install Code.
 - If the code is correct, you may need to install a repeater.

For instructions on installing a Repeater, see “Install a Repeater” on page 22.

Status and Event Messages

Meter Status Messages on the Envoy LCD

The Envoy LCD screen reports Meter Status as follows.

Meter status: OK

- **Meter Status: OK**
This means that the RGM is working as it should.
- **Meter Status: Unavailable**
This means that the USB stick is not present.
 - Make sure that the USB ZigBee radio stick is fully inserted into the Envoy.
 - Remove and reinsert the USB stick into the USB slot on the rear of the Envoy.
 - Some Envoys have a second USB port. Try moving the USB stick to the other port.
 - Power cycle the Envoy to restart the Envoy to USB communications.
- **Meter Status: Failed to Report**
This means that the USB stick at the Envoy is not receiving the RGM ZigBee messages. This may indicate that the distance between the RGM and the Envoy is too great for effective communication.
 - Make sure that the solar backfeed breaker in the main load center is on and that the meter LCD indicates the meter is on.
 - Temporarily relocate the Envoy near the RGM and see if the Meter status reads "Ok". If so, a ZigBee repeater may be needed. (Follow the steps in "Install a Repeater" on page 22.)
- **Meter Status: Meter Error**
The meter has failed. Contact your installer to arrange for installation of a replacement meter.
- **Meter Status: Poor Power Quality**
The Revenue Grade Meter reports that the AC voltage coming from the **utility** is either too low or too high as specified by applicable regional standards. This is usually a temporary condition that will clear when power quality from the local utility returns to normal.

RGM Event Messages

The following Event Messages, if they occur, will appear in the Envoy interface and in Enlighten.

- **RGM Error**
Recommended Action: Contact your installer to arrange for installation of a replacement meter.
Description: The RGM has failed.
- **RGM Power Quality Warning**
Recommended Action: No action is required unless the condition persists.
Description: The RGM reports that the AC voltage coming from the **utility** is either too low or too high as specified by applicable regional standards. This is usually a temporary condition that will clear when power quality from the local utility returns to normal.
If the condition persists: Contact your installer.

Troubleshooting

This section covers troubleshooting issues observed at the Envoy, on the Envoy interface, and at the RGM.

Issues Observed at the RGM

Problem	Probable Cause(s)	Solution(s)
RGM overheats	<ul style="list-style-type: none"> • Meter socket has insufficient capacity or is not adequately wired. • Meter is overloaded. • Poor connection at socket terminal. 	Contact your installer to: <ul style="list-style-type: none"> • Replace the meter socket with a heavy-duty model. • Use transformer rated installation. • Replace socket terminal.
RGM display is blank	<ul style="list-style-type: none"> • The solar circuit is de-energized. • The RGM may have defective internal wiring. 	Contact your installer to: <ul style="list-style-type: none"> • Check that all of the solar AC disconnects are closed and the solar backfeed breaker in the main load center is ON. • Check circuit voltages. • Check that the voltage leads are properly connected, and check the wires for damage.
“Power Quality Warning” displayed on RGM	<ul style="list-style-type: none"> • The RGM reports that the AC voltage coming from the utility is either too low or too high as specified by applicable regional standards. This is usually a temporary condition that will clear when power quality from the local utility returns to normal. 	<ul style="list-style-type: none"> • If the condition persists, contact your installer.
“ERROR” displayed on RGM	<ul style="list-style-type: none"> • The RGM detected an internal condition that may affect meter data. The meter has failed. 	<ul style="list-style-type: none"> • Contact your installer to arrange for installation of a replacement meter.
Left and Right arrows are both flashing, but RGM does not show “Received” or “Delivered”. Accumulated production remains all zeroes.	<ul style="list-style-type: none"> • The RGM is miswired. • The meter is wired in parallel rather than in series. • The solar AC disconnects or solar backfeed breaker in the main load center may be open. • The microinverters are in the five-minute anti-islanding state, per regulatory requirement. 	<ul style="list-style-type: none"> • Contact your installer to wire the meter according the wiring diagram on page 35. • Check that all of the solar AC disconnects are closed and the solar backfeed breaker in the main load center is ON. • Wait five minutes for the anti-islanding state to clear.

RGM Issues Observed at the Envoy Interface

Problem	Probable Cause(s) and Solution(s)
Configuration (provisioning) difficulties.	<ul style="list-style-type: none"> • Use the ZigBee Device Configuration menu option to provision the RGM. • Do not use the Power Meter Configuration menu option. (This option is used with another device that is unrelated to the RGM.) • Follow the configuration instructions on page 18 of this manual.
The install code is not accepted in the Envoy interface.	<ul style="list-style-type: none"> • Check the Device EUI64 and Install codes, and re-enter the correct values.
In the Envoy interface, the "Network Discovery State" does not change to Active within four minutes.	<ul style="list-style-type: none"> • Press the "Scan ZigBee Network" button to start another scan.
Inventory page shows RGM to be "Unavailable"	<ul style="list-style-type: none"> • Make sure that the USB ZigBee radio stick is fully inserted into the Envoy. • Some Envoys have a second USB port. Try moving the USB stick to the other port. • Power cycle the Envoy (unplug it and plug it back in) to restart the Envoy to USB communications.
Inventory page shows RGM "Failure to Report"	<ul style="list-style-type: none"> • Check that all of the solar AC disconnects are closed and the solar backfeed breaker in the main load center is ON. • Check that the meter LCD indicates the meter is on. • Temporarily relocate the Envoy near the RGM and see if the Meter status reads "OK". If so, then a ZigBee repeater may be needed (follow the steps in "Install a Repeater" on page 22.
Inventory page shows ACVOOR (AC Voltage out of range) against one or more microinverters	<ul style="list-style-type: none"> • Make sure L1 and L2 were wired properly. Check that the meter socket was wired so that the top meter contacts connect to the array, and the bottom meter contacts connect to the AC distribution panel. • If there are multiple solar circuits, you must combine them, so that all circuits connect to the socket.

RGM Issues Observed on the Envoy LCD

Problem	Probable Cause(s) and Solution(s)
Envoy LCD shows "---W" for the current power	<ul style="list-style-type: none"> The Envoy LCD should also show one of the following Meter Status readings: "Unavailable", or "Failure to report". See the following two rows in this table.
Envoy LCD shows "Meter status: Unavailable" (Enlighten will also show "ZigBee USB stick removed".)	<ul style="list-style-type: none"> Make sure that the USB ZigBee radio stick is fully inserted into the Envoy USB port. Some Envoys have a second USB port. Try moving the USB stick to the other port. Power cycle the Envoy (unplug it and plug it back in) to restart the Envoy to USB communications.
Envoy LCD shows "Meter status: Failure to report" (Enlighten will also show "ZigBee device failed to report")	<ul style="list-style-type: none"> Check that all of the solar AC disconnects are closed and the solar backfeed breaker in the main load center is ON. Check that the meter LCD indicates the meter is on. Temporarily relocate the Envoy near the RGM and see if the Meter status reads "Ok". If so, a ZigBee repeater may be needed. (Follow the steps in "Install a Repeater" on page 22.)
Envoy LCD does not show Meter status information after the Envoy has recently been restarted and/or relocated.	<ul style="list-style-type: none"> You must wait ten minutes for the Envoy to start showing meter status information on the Envoy LCD again after it has been powered down and restarted.
Envoy LCD has never displayed a Meter status.	<ul style="list-style-type: none"> Temporarily relocate the Envoy near the RGM and see if the Meter status reads "Ok". If so, a ZigBee repeater may be needed. (Follow the steps in "Install a Repeater" on page 22.)

When to Contact Enphase

If, after following the troubleshooting information listed in the previous sections, the RGM is not functioning properly, collect the following information and contact Enphase at support@enphaseenergy.com:

- What does RGM LCD show?
- What does Envoy LCD show?
- What does the Inventory screen show for the **RGM Device Status**?
- What does /admin/lib/admin_zigbee_display show for the **Network Discovery State**?

Replacing an RGM

If an RGM fails, you can replace it. Once replaced, you will see cumulative energy totals on the Envoy and in Enlighten. However, the RGM will display the energy total for that RGM only.

Follow the instructions in this section to replace an RGM.

Step 1. Turn Off the Solar Backfeed Breaker(s) in the Main Load Center

- Verify that the AC branch circuits are not energized.



WARNING: DO NOT energize the solar circuit(s) until you have completed all of the installation procedures as described in the following sections.

Step 2. Remove the Old RGM

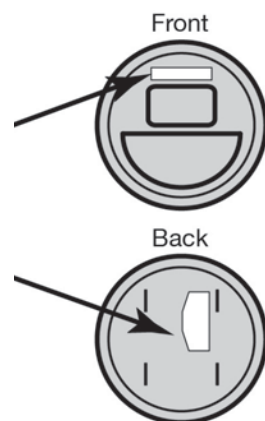
- Remove the meter band.
- Use a rubber mallet on the meter periphery to coax the meter out of the socket.
- Unplug the meter from the form 2S socket.

Step 3. Install the Replacement RGM

- Make note of two codes from the labels on the RGM, as you will need them later in the installation process. These codes are:
 - The Device EU164 code (16 characters) from the face of the RGM.
 - The Device Install Code (20 characters) from the back of the RGM.



Tip: If possible, take pictures of the codes with your smart phone.



- The RGM has current and potential terminals that extend from the back of the RGM. Orient these terminals with the socket jaws.
- Plug the meter into the form 2S socket. A spring in the socket jaws provides heavy contact force. Alternatively, some heavy-duty sockets include a handle or wrench to provide the needed contact force.
- Wait until step 8 before installing the meter band.



Step 4. Unmanage the RGM

- Open an Internet browser on a computer connected to the same local network as the Envoy.
- In the browser address window, enter the IP address displayed in the LCD screen of the Envoy.
- Click **Administration** to access the Administration menu. Log in using the following credentials:
 - Username: **admin**
 - Password: **admin**
- From the Administration menu, select **ZigBee Device Configuration**.
- Under **ZigBee Devices Managed by this Envoy**, select the old meter and click **Unmanage Selected Devices**.
- Remove the old ZigBee stick from the Envoy USB port.

Step 5. Install and Configure the New ZigBee Stick

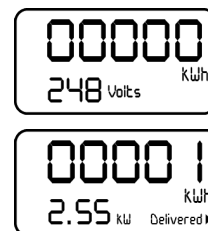
- Insert the new ZigBee stick into the Envoy USB port.
- Enter the Device EU164 code (16 characters) from the face of the RGM.
- Enter the Device Install Code (20 characters) from the back of the RGM.



- Click **Add Device**. The page should show the message “Install code accepted for ZigBee device. Device scan started.”

Step 6. Power Up the RGM

- Turn on the solar backfeed breaker in the main load center.
- Verify that the RGM LCD indicates power is on. (The LCD screen is active.)
- Check that the lower left display on the meter shows approximately 240 Volts.
- After the solar circuit has been on for five minutes, the microinverters begin to convert energy, and the meter will start to show solar production (during daylight hours). The RGM LCD lower left display will indicate the kW being produced by the system. Check that the lower right display shows “**Delivered**”. The value on the lower left of the RGM LCD alternates between Volts and instantaneous power (kW).



Step 7. Verify the Installation

- After approximately five minutes, check that the Envoy LCD screen reads:

<p>Meter status: OK</p>

- If the Envoy does not show a connection to the RGM after a ten minute wait, start a new ZigBee device scan from the Envoy. To do this, hold down the menu button (on the right side of the Envoy) and release it when the menu item “Scan ZigBee Network” appears.
- If the Envoy does not show a connection to the RGM ten minutes after rescanning the ZigBee network, double-check that the EUI64 code from the meter faceplate exactly matches the code as typed at the Envoy interface on the ZigBee Device Configuration page. If you find that a code was entered incorrectly, select and unmanage the incorrect EUI64, then add a new device with the correct EUI64 and Install Code. If the code is correct, you may need to install a repeater. If you do not have one, order part number RGM-RR-01. To install a repeater, see “Install a Repeater” on page 22.

Step 8. Install the Meter Band

- Install the meter band that was provided with the Form 2S meter socket, as needed.

Step 9: Retire the Old RGM in Enlighten

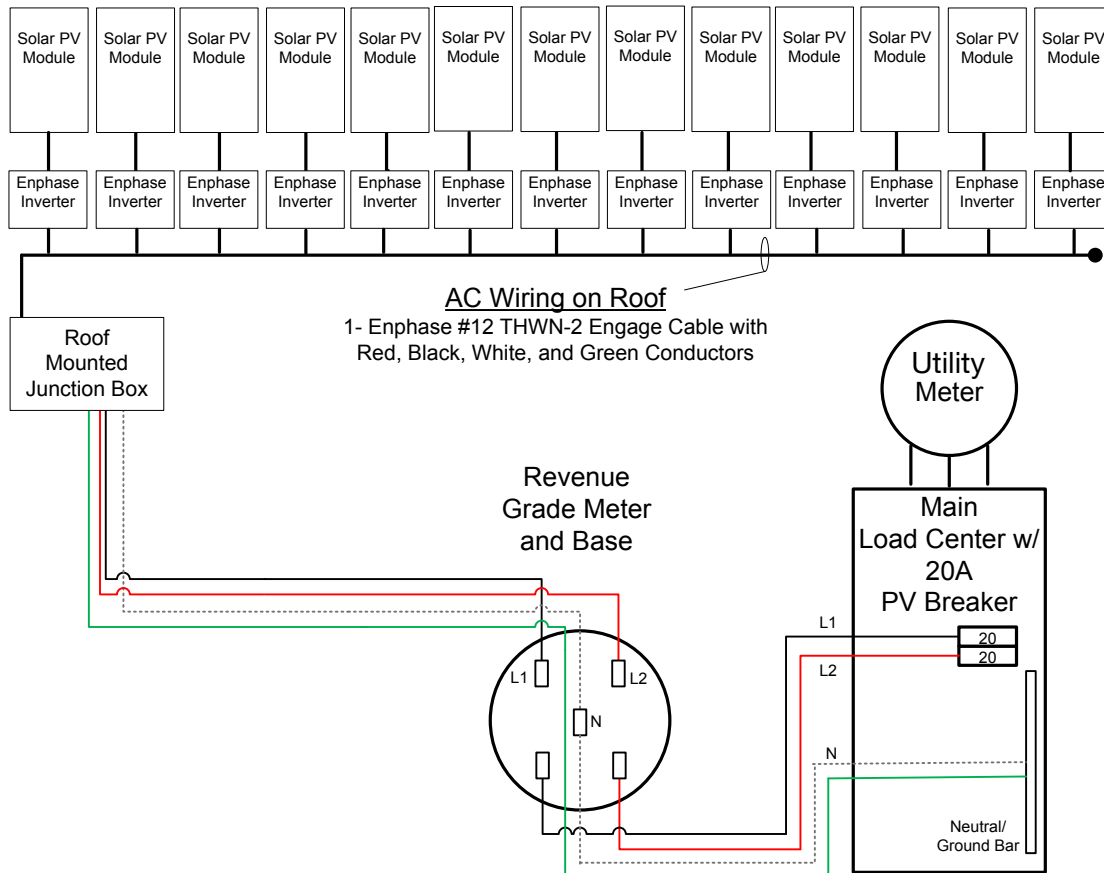
- Email support@enphaseenergy.com and request that the old RGM be retired.
- Include the site name and the EUI64 codes from both the old RGM and the new RGM in your email. This code is the 16-character code from the label on the face of the RGM.

Technical Data

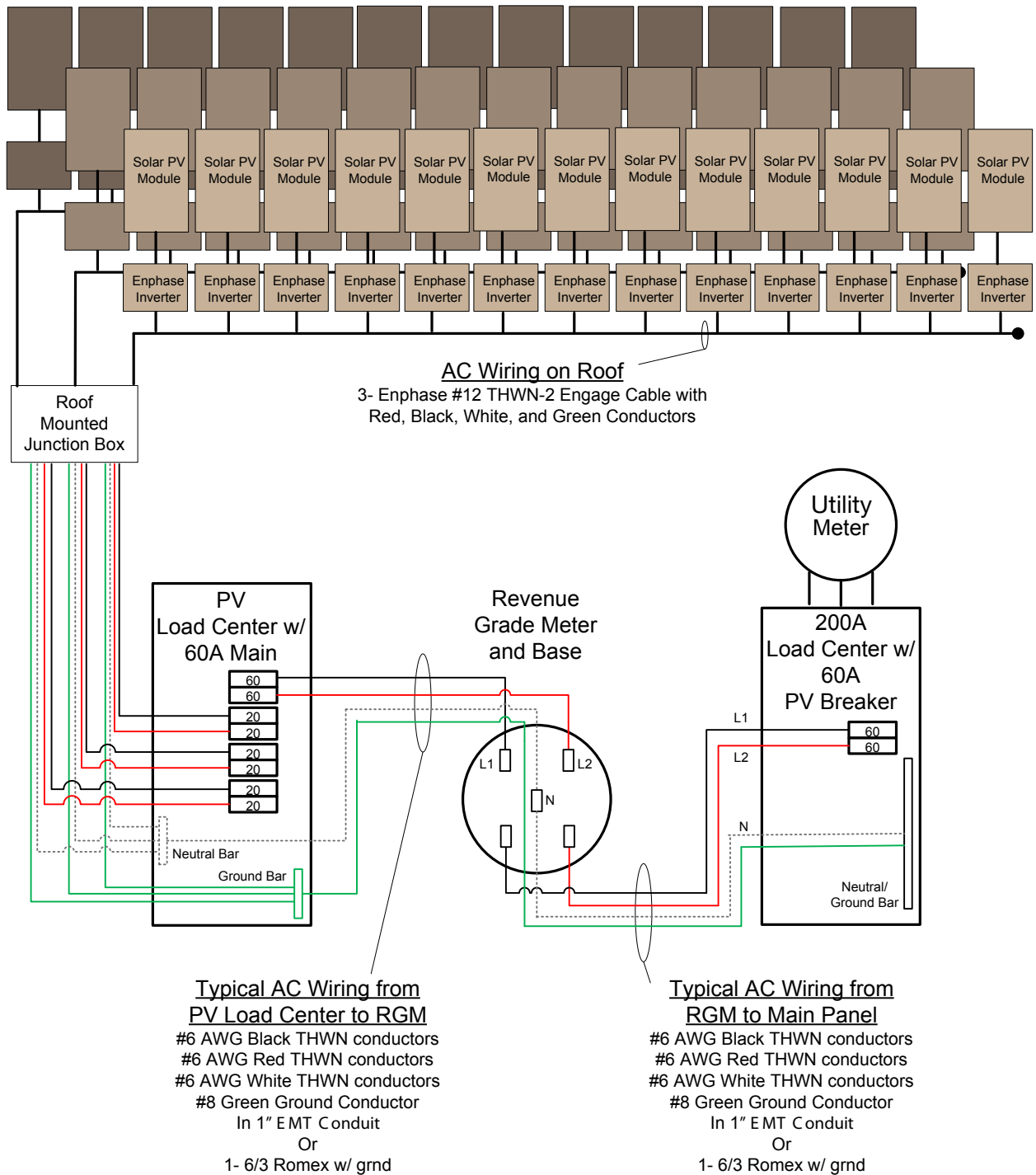
Specifications, Compliance, and Ordering Information

RGM Specifications and Compliance	
Circuit Type	3-wire
Volts	240
Voltage range	+10% / -20% of rated voltage (240VAC)
Meter Dimensions (WxD)	7.0" x 5.0"
Meter Weight	1.7 lbs
Temperature	-40°C to +85°C (-40° to 185°F)
LCD display	5-digit
Cover	Polycarbonate
Typical accuracy	Within +/- 0.2%
Typical starting watts	5 watts or less
Typical watts loss	0.5 watts
Compliance	ANSI C12.1, C12.10, C12.20, C37.90.1, FCC Part 15 Class B
Metering and Management Solution Ordering Information	
RGM-MTR-01	Enphase Compatible GE i210+ Revenue Grade Meter (RGM) with integrated ZigBee communication (by SilverSpring).
RGM-ZGB-01	ZigBee USB stick for Envoy communication with RGM
ENV-120-01	Envoy Communications Gateway with bridge pair
Enlighten Software	Free with Envoy
RGM-RR-01	ZigBee Repeater for RGM (optional - long distance only)

Sample RGM Wiring Diagram – Single Branch



Sample RGM Wiring Diagram – Multiple Branches



Enphase Energy Inc.
1420 N. McDowell Blvd.
Petaluma, CA 94954
www.enphase.com
info@enphaseenergy.com
support@enphaseenergy.com