OpenWay® Riva CAM3S and CAM3M Installation Guide

INSTALLATION GUIDE

02 March 2020

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OpenWay® Riva CAM3S and CAM3M Installation Guide

02 March 2020

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Table of Contents

New in this Document

Table shows the revision history for this guide, providing a description of the changes.

Table 1 Document Revision History

Revision	Date	Description
815-0080-00	27 February 2020	■ New document.

1 About This Guide

This guide provides the steps to install two CAM3x devices: the CAM3S and the CAM3M. The major difference between them is the CAM3S is for a Star deployment and the CAM3M is for a Mesh deployment.

- CAM3S - The Connected Grid Router (CGR) Adaptive Communications Technology (ACT) Module version 3 for a Star network deployment, or CAM3S installs into the Cisco® Connected Grid Router (CGR) model 1240. The CAM3S is for Star deployments and uses the remote antenna.
- CAM3M - The Connected Grid Router (CGR) Adaptive Communications Technology (ACT) Module version 3 for a Mesh network deployment, or CAM3M installs into the Cisco® Connected Grid Router (CGR) model 1240. The CAM3M is for Mesh deployments and uses the WPAN antenna.

Additionally, the guide provides information about: Star and Mesh deployment installation, Radio Frequency (RF) and Power Line Communications (PLC) installation, ACT Coupler Unit installation, replacing an existing CAM with a new CAM3S/CAM3M in the field and RF Filter installation.

This guide is designed for field installers who are familiar with the CGR, its function, and its operation.

For further information about the base CGR installation, refer to the *Cisco 1240 Connected Grid Router Hardware Installation Guide.*

The guide is divided into the following topics:

- **Introduction**
- **Installation Kits**
- **Star and Mesh Deployment Installation**
- **Radio Frequency and Power Line Carrier Installation**
- **ACT Coupler Unit Installation (CAM3M Only)**
- **Replacing an Existing CAM with a New CAM3S/CAM3M in the Field**
- **RF Filter Installation**

CGR IOS Compatibility

Ensure you are running the correct IOS version on your CGR.

Important! For new installations, or for a Star deployment running IOS v15.6.3m1, on your CGR you must upgrade to IOS v15.8.3m1. However, for existing Mesh deployments, no IOS upgrade is required.

For detailed information about how to upgrade your IOS version, See *CGR IOS Upgrade Guide*, (815-0001-xx).

Guide Conventions

The following visual elements are used throughout this guide, when applicable.

Warning! This icon and text indicates hazardous situation, which if not avoided, could result in death or injury.

Caution: This icon and text indicates a potentially dangerous procedure. Instructions contained in the warning must be followed. Failure to do so may result in damage to the device.

Important! This icon and text indicates important things the user should pay attention to.

Note: This icon and text designates information of a special note.

Tip: This icon and text indicates information to make things easier to use.

Related Product Documentation

Table 2 Product Related Documentation

Document Name	Software Version	Part Number	Link
CGR IOS Upgrade Guide	v15.5 or later	815-0001-xx	N/A
Cisco 1240 Connected Grid Router Hardware Installation Guide	N/A	N/A	**Cisco 1240 Connected Grid Router Hardware Installation Guide**

Table 2 Product Related Documentation (continued)

Document Name	Software Version	Part Number	Link
Cisco CGR1000 IOx Application Development Cook Book	N/A	N/A	**Cisco CGR1000 IOx Application Development Cook Book**
OpenWay Riva System Upgrade Guide GSR 5.0	GSR 5.0	TDC-8011-xx	N/A
Note: The last two or three numbers of the document part number denote the revision number and are subject to change without notice.			

Regulatory Compliance

Labeling for USA and Canada

The following information appears on labels on the exterior of the CGR and only applies to FCC/ISED models:

- FCC ID: LDKALTMT0556
- IC: 2461B-ALTMT0556
- Model: CGR 1240

Contains (for the CGR):

- FCC ID: N7NMC7355
- IC: 2417C-MC7355
- Model: MC7355

or,

- FCC ID: N7NMC7455
- IC: 2417C-MC7455
- Model: MC7455

Note: The FCC ID, IC and Model numbers vary depending on the Cisco CGR unit.

Contains (for the CAM3):

- FCC ID: EO9OW3
- IC: 864A-OW3
- Model: OW3
- Model Name: CAM3

The following information may also appear on an exterior label:

"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."

FCC Compliance

This device complies with Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference that may cause undesirable operation.

This device must be installed to provide a separation distance of at least 20 centimeters (7.9 inches) from all persons to be compliant with regulatory RF exposure.

USA FCC Part 15, Class B

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 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.

Caution: To ensure system performance, this device and antenna shall not be changed or modified without the express approval of Itron. Per FCC rules, unapproved modifications or operation beyond or in conflict with these instructions for use could void the user's authority to operate the equipment.

Canada ISED (Innovation, Science and Economic Development) Compliance

This device contains license-exempt transmitter(s)receiver(s) that comply with Innovation, Science and Economic Development Canada’s license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. *L'appareil ne doit pas produire de brouillage; et*
2. *L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

Under Innovation, Science and Economic Development Canada regulations, this radio transmitter may only operate using a antenna of a type and maximum (or lesser) gain approved for the transmitter by Innovation, Science and Economic Development Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

The radio transmitter (IC: 864A-OW3) has been approved by Innovation, Science and Economic Development Canada (ISED) to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC: 864A-OW3) est conforme aux CNR d'Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessus et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

RF Exposure (FCC/ISED)

This equipment complies with radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between this device's radiators and your body. These transmitters must not be co-located or operating in conjunction with any other antennas or transmitters, that are not part of the CGR Host router and CAM3 module.

Cet équipement est conforme aux limites d'exposition aux radiations définies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à une distance minimale de 20 cm entre les radiateurs de l'appareil et votre corps. d'autres antennes ou émetteurs ne faisant pas partie du routeur hôte CGR et du module CAM3.

Professional Installation

These antennas are intended for professional installation by the integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this antenna.

Caution: If Ethernet is used, the cable length must not exceed two meters in total. Lengths longer than two meters are not approved and do not meet FCC and ISED compliance requirements.

Modification and Repairs

To ensure FCC compliance and system performance, this device, antenna and/or coaxial assembly shall not be changed or modified without the express written approval of Itron. Any unauthorized modification will void the user's authority to operate the equipment.

Warning! This device contains no user serviceable parts. Attempts to repair this device by unauthorized personnel may subject the person to shock hazard if removal of protected covers is attempted. Unauthorized repair voids the warranty and/or maintenance contract with your company.

Electromagnetic Compatibility

Caution: Use only approved accessories with this equipment. All cables must be high quality, shielded, and correctly terminated. Unapproved modifications or operation beyond or in conflict with these use instructions may void the authority's authorization to operate the equipment.

2 Introduction

This chapter covers the following topics:

- **CAM3S/CAM3M Overview**
- **OpenWay® Riva Communication System Overview**

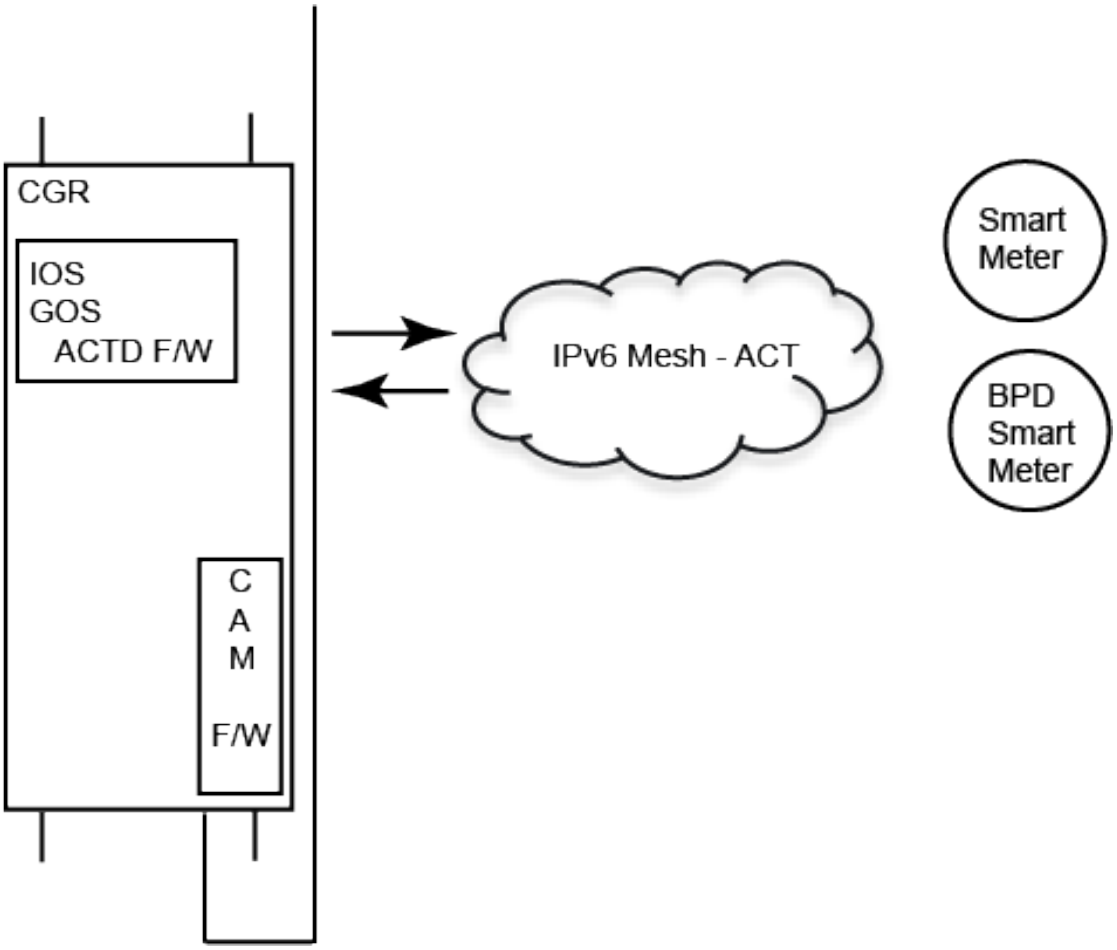
CAM3S/CAM3M Overview

This section provides information about the modules. In general, the CAM3S/CAM3M provides connectivity to supported devices, like Electricity Meters, and Battery Powered Devices, on the Itron OpenWay® Riva Communication system when installed into a CGR. See **OpenWay® Riva Communication System Overview** .

The CGR ACT Module (CAM) resides inside the Cisco® CGR and acts as the root-node within the network, routing packets and information from meters or grid devices between the Adaptive Communication Technology (ACT) network and the headend (OWOC-CM). The CAM3S/CAM3M supports adaptive communications, that allows meters and grid devices to interact with each other while dynamically switching between Radio Frequency (RF) and Power Line Carrier (PLC) to ensure the fastest and most reliable path.

In addition to the module residing in the CGR. The CGR contains two operating systems: a Cisco® Internetwork Operating system (IOS) and a Cisco® Guest Operating System (GOS). The IOS runs on the CGR and enables data communications between network nodes. The GOS runs on the CGR and provides a virtual connectivity. The IOS forwards traffic from GOS through regular IP forwarding mechanisms. Furthermore, the ACTD firmware runs on the CGR. The ACTD firmware servers as a communication gateway between the CGR's operating system (IOS) and the CAM3S/CAM3M. Also, the CAM3S/CAM3M also contains its own firmware. The CAM3S/CAM3M firmware provides communication to the smart meters. When the CGR is deployed in a star configuration with Battery Powered Device (BPD), a remote antenna is required to ensure optimal radio performance. See figure.

Figure 3 CAM3S/CAM3M Functionality



The CAM3S/CAM3M's physical features include: a RF QMA Connector, and a 6-Pin Power Line Carrier (PLC) Signal Cable Connector among others. See figure.

Figure 4 CAM3S/CAM3M Major Parts Front View Photo

Table 5 CAM3S/CAM3M Major Parts

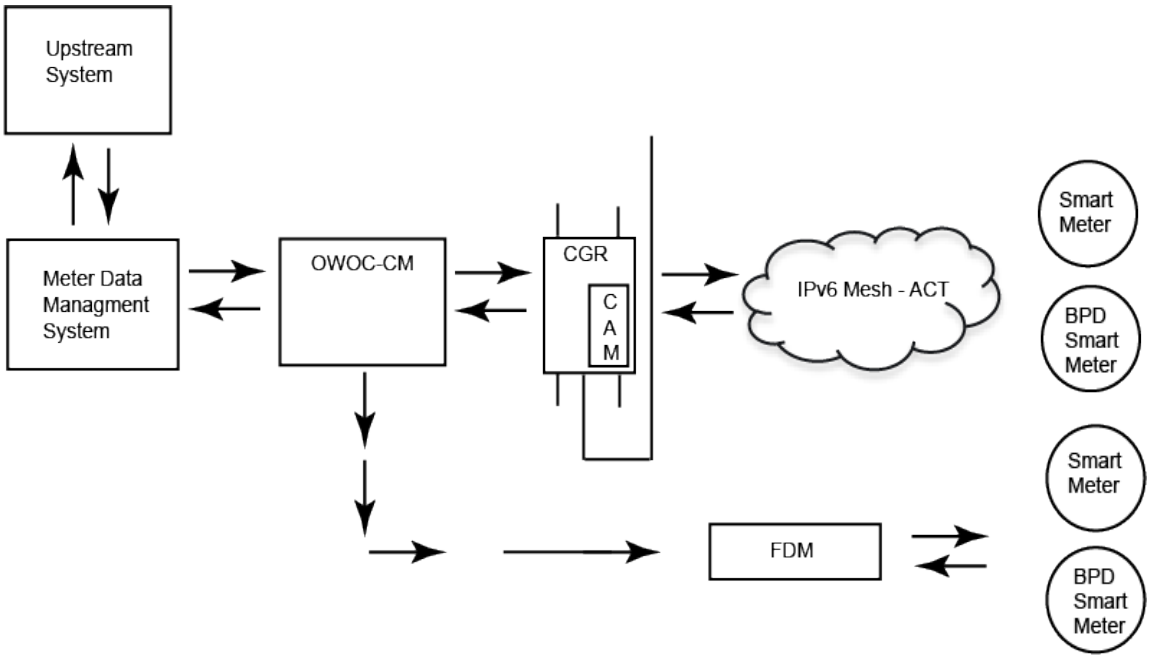
Reference Number	Item	Details
1	Radio Frequency (RF) QMA Connector	Provides a connection for the Radio Frequency (RF) Antenna Cable. For use with either a Wireless Personal Area Network (WPAN) antenna or a remote antenna based on your application needs.
2	6-Pin Power Line Carrier (PLC) Signal Connector	Provides a connection for the PLC Signal Cable.
3	Handle(s)	Helps in inserting and removing the module from the CGR. And used to tie down cable using plastic tie wraps.
4	Retaining Screw (s) Phillips	Secures the module into the slot of the Connected Grid Router (CGR).

OpenWay® Riva Communication System Overview

The communication system features an innovative multimedia IPv6 network that uses both Radio Frequency (RF) and Power Line Carrier (PLC) links within a mesh to route messages and data between standards-based smart meters Device Language Message Specification/Companion Specification for Energy Metering (DLMS/COSEM) and the headend system.

The communication module enables utilities to deploy the network without specifically planning for segregation of RF and PLC environments. Intelligence in the communication module chooses the communication link quality and modulation scheme that support the best possible data rate. Data rates of up to 600Kbps are achievable by this multimedia mesh. This is done automatically in real-time by the modules without any need for pre- programming or path hard-coding. The communication modules create their own multi-hop environment using the best available physical path for communication where the routing is managed by standardized Internet Engineering Task Force (IETF) routing protocols that are independent of the physical link. See figure.

Figure 6 OpenWay Riva Communication Solution Network



3 Installation Kits

This chapter covers the following topics:

> **Note:** In accordance with FCC rules, unapproved modifications or operation beyond or in conflict with these use instructions could void the user's authority to operate the equipment. Unauthorized access or modifications to the CGR voids the warranty.

> **Note:** Not all kits are required for all installations.

CAM3S/CAM3M Installation Kit

The following items are included in the CAM3S/CAM3M installation kit (K574319-005):

- One (1) CGR ACT Module 3 (CAM3S/CAM3M)
- One (1) Regulatory label

Lightning Arrestor Kit

This kit contains the following item:

- One (1) lightning arrestor (MSE-0417-002-R)

> **Note:** This is an optional kit that is required when connecting the CAM to an external antenna via Coaxial cable.

RF Filter Kit

The following items are included in the RF Filter installation kit (KIT-9036-001):

- Mounting bracket
- CGR to RF Filter cable
- RF Filter
- Lightning arrestor

Note: This kit is optional. This kit is required for Star deployments using CAM1 and for Star/Mesh deployments in Australia using CAM1, or CAM3. Mesh and Star deployments outside of Australia do not require the RF Filter. The filter can be removed when upgrading CAM1 Star deployments to CAM3S (outside of Australia).

Coaxial Cable Kit

The following items are included in the coaxial cable kit (KIT-9033-001):

- One (1) coaxial cable (5 meters in length)

Antennas and Antenna Kits

Each CGR/CAM3 installation requires one of the supported antennas for proper operation. The CGR/CAM3 has been designed and approved per FCC and ISED rules to operate with these antennas.

Caution: Antennas not approved by Itron are strictly prohibited for use with this device. Installing the CAM3 with an unapproved antenna voids the product warranty and can void the user's authority to operate this equipment. This section describes the following approved antenna kits:

- 915MHz 5.15dBi (KIT-0049-001)
- 915MHz 5.5dBi (KIT-0073-001)
- 915MHz 8.15dBi (KIT-0018-007)
- 915MHz 2.8dBi (ANT-MP2-I-OUT-M)

Antenna Supported Specifications

This table provides the specifications for the supported 915MHz antennas. The CAM3 is designed to operate with the antennas listed here. Antennas not listed here are strictly prohibited for use with the CAM3. The required antenna impedance is 50Ω.

Table 7 Supported 915MHz Antenna Specifications

Specification	Itron Part Number KIT-0049-001	Itron Part Number KIT-0073-001	Itron Part Number KIT-0018-007	Cisco ANT-MP2-I-OUT-M
Default Network	Star	Star	Star	Mesh
Frequency range	902-928 MHz	902–928 MHz	902–928 MHz	698–960 MHz
Maximum gain	5.15dBi	5.5dBi	8.15dBi	2.8dBi
Horizontal Beamwidth	Omnidirectional	Omnidirectional	Omnidirectional	Omnidirectional

Table 7 Supported 915MHz Antenna Specifications (continued)

Specification	Itron Part Number KIT-0049-001	Itron Part Number KIT-0073-001	Itron Part Number KIT-0018-007	Cisco ANT-MP2-I-OUT-M
Impedance	50 Ohms	50 Ohms	50 Ohms	50 Ohms
Termination	Type N Male	Type N Male	Type N Male	MCX jack
Overall length	18.8"	18.8"	65"	3.04”
Radome diameter	1" OD	1" OD	1.31" OD	1.61" OD
Power rating	50W	50W	100W	10W
Lightning protection	Direct ground	Direct ground	Direct ground	n/a
Mounting arm length	n/a	n/a	~8 in.	Direct mounted
Weight (w/o clamps)	1 lb.	0.7 lbs.	3 lbs.	0.2 lbs.
Maximum wind speed	160 mph	160 mph	125 mph	165 mph
Wind load @ rated wind speed	n/a	n/a	57 lbs.	n/a

Note: To reduce potential radio interference to other users, select an antenna type with gain such that the Equivalent Isotropically Radiated Power (EIRP) is not more than permitted by the regulatory rules of the country where installed.

Note: The 8.15dBi antenna kit (KIT-0018-007) comes with a lightning arrestor that is for other types of installations and is optional. The lightning arrestor that is included with the RF Filter kit (KIT-9036-001) is the correct arrestor for this application.

915MHz 5.5dBi Remote Antenna Kit

The following items are included in the Remote Antenna installation kit (KIT-0073-001):

- 915MHz 5.5dBi gain antenna
- Antenna mounting kit:
  - Remote-mount adapter
  - Antenna holder
  - Mounting bracket
  - 6-inch bolts (4)
  - 1¾-inch bolts (2)

- Flat washers (6)
- Split washers (6)
- Nuts (6)
- Pipe clamp hangers (2)
- Silicone seal
- Anti-seize lubricant

Caution: Do not install a 5.5dBi antenna directly on the CGR/CAM3. Antenna installation directly on the CGR/CAM3 compromises mechanical integrity and will not meet the compliance requirements.

915MHz 5.15dBi Remote Antenna Kit

The following items are included in the Remote Antenna installation kit (KIT-0049-001):

- 915 MHz 5.15dBi gain antenna
- Antenna mounting kit:
  - Remote-mount adapter
  - Antenna holder
  - Mounting bracket
  - 6-inch bolts (4)
  - 1¾-inch bolts (2)
  - Flat washers (6)
  - Split washers (6)
  - Nuts (6)
  - Pipe clamp hangers (2)
  - Silicone seal
  - Anti-seize lubricant

Caution: Do not install a 5.5dBi antenna directly on the CGR/CAM3. Antenna installation directly on the CGR/CAM3 compromises mechanical integrity and will not meet the compliance requirements.

915MHz 8.15dBi High Gain Remote Antenna Kit

The following table provides coaxial cables that support the Remote-Mount High-Gain 915MHz antenna (KIT-0018-007). When a high-gain antenna is installed for the CAM3, follow the FCC and ISED set limits for the transmit power of the CAM3. To meet these limits, CAM3 must have the minimum required loss between the CGR and the antenna. Allow 0.1dB loss for each connector. If required, you may use 1dB attenuator(s) (similar to the Pasternack PE7002-1) to attain the desired power at the antenna.

> **Caution:** Do not install a 8.15dBi antenna directly on the CGR/CAM3. Antenna installation directly on the CGR compromises mechanical integrity and will not meet the compliance requirement for a loss of 2.2dB (for any exceptions, there is additional information, see **RF Filter Installation**) between the CGR and the 8.15dBi antenna.

Table 8 Supported Coaxial Cables for the 915MHz 8.15dBi Antenna Kit (High Gain Remote)

Coaxial Cable Specification	Total Coaxial Length		
	0–120 ft.	**121–200 ft. (High-Gain Antenna only)**	**201–250 ft. (High-Gain Antenna only)**
Standard black jacket cable	AVA5-50	AVA6-50	AVA7-50
Optional fire retardant cable	AVA5RK-50	AVA6RK-50	AVA7RK-50
Cable diameter (nominal)	⅞ in.	1¼ in.	1⅝ in.
Cable weight (lb./ft.)	0.33	0.46	0.70
Minimum bend radius	10 in.	8 in.	15 in.
Cable attenuation @ 915 MHz	~1.2 dB/100 ft.	~0.84 dB/100 ft.	~0.70 dB/100 ft.

4 Star and Mesh Deployment Installation

This chapter includes the following topics:

> ⚠ **Caution:** The CAM3S is for Star deployments and uses the remote antenna . In contrast, the CAM3M is for Mesh deployments and uses the WPAN antenna instead. This is the only difference when is comes to deployment between the two devices.

Requirements and Materials

The following procedures in this chapter, apply to CAM3S/CAM3M installations in a CGR for which the following conditions apply:

- Either the CGR does not contain an existing CAM *or* it does contain an existing CAM deployed in either a Star or Mesh configuration.
- The CGR (with the newly installed CAM3S/CAM3M) is to be deployed in a Star or Mesh configuration.

Collect the following items before you start.

- CGR model 1240
- CAM3S/CAM3M with FCC regulatory label
- Remote antenna kit (KIT-0049-001, KIT-0073-001, or KIT-0018-007)

> **Note:** For KIT-0049-001 or KIT-0073-001, a coaxial cable kit (KIT-9033-001) is required.

- Remote-Mount High-Gain 915MHz antenna (KIT-0018-007)

> **Note:** For this antenna, a coaxial cable of sufficient length is required to introduce at least the minimum required loss.

- 1/2" (13mm) socket wrench.
- A #2 Phillips or a 9/32" flat-blade screwdriver.
- 15/16" combination wrench.

Order of Installation

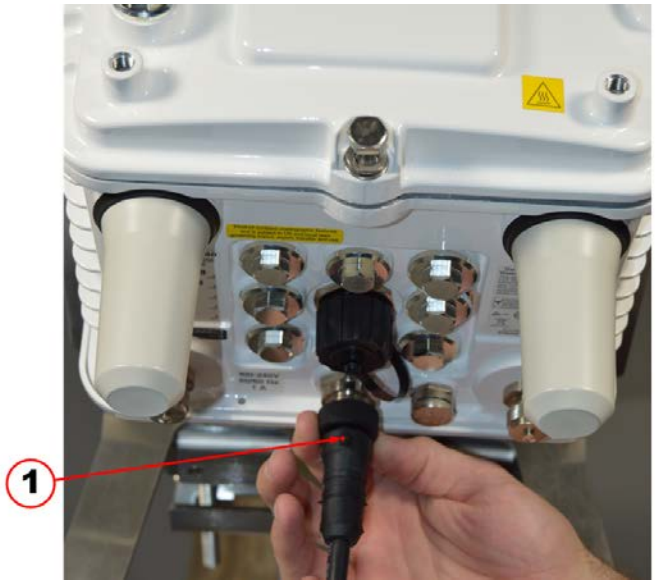
In general, this provides the order of installation that should be followed.

1. Disconnecting Power to the CGR.
2. Removing the CGR from the pole.
3. If applicable, removing the RF Filter from the pole. See **Connecting a RF Filter** and simply reverse the connection order.
4. If applicable, removing an existing CAM.
5. Installing the CAM3S/CAM3M.
6. Reinstalling the CGR back on the pole. If required, include a RF Filter. See **RF Filter Installation**.
7. Reinstalling Power and the Ground to the CGR.
8. Installing the Lightning Arrestor to the CGR.
9. This step is only applicable for a CAM3S. Installing the Remote Antenna on the pole (five feet vertical distance from the CGR),

Disconnecting Power to the CGR

1. Disable the power at the circuit, or power supply that the CGR AC Power Cable is connected.
2. Disconnect the CGR AC Power Cable, see item 1, from the AC Power Connector located on the bottom exterior of the CGR enclosure.

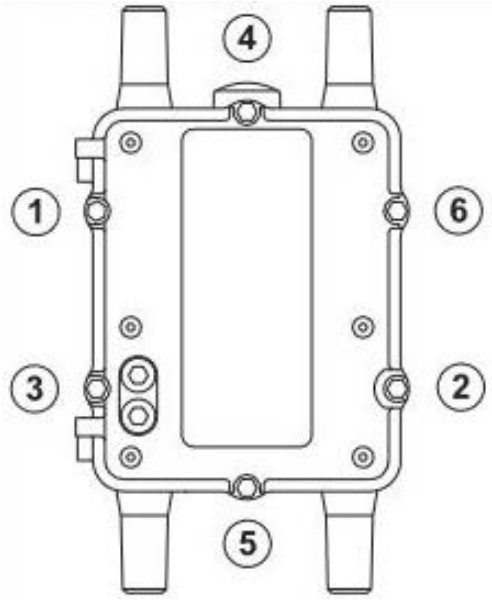
Figure 9 AC Power Cable Connection Location



3. Loosen the six captive bolts that secure the hinged CGR door using the sequence shown below and swing the door fully open. Use a 1/2" (13mm) socket wrench and apply a torque of 3 to 4 foot pounds (ft-lb).

Note: The CGR's door features an environmental seal that protects the unit against environmental elements when the door is closed. This seal creates pressure, which can cause the door to open suddenly when the last captive bolt is loosened. Ensure you loosen the six captive bolts that secure the CGR's door in the sequence shown in the figure and swing the door open.

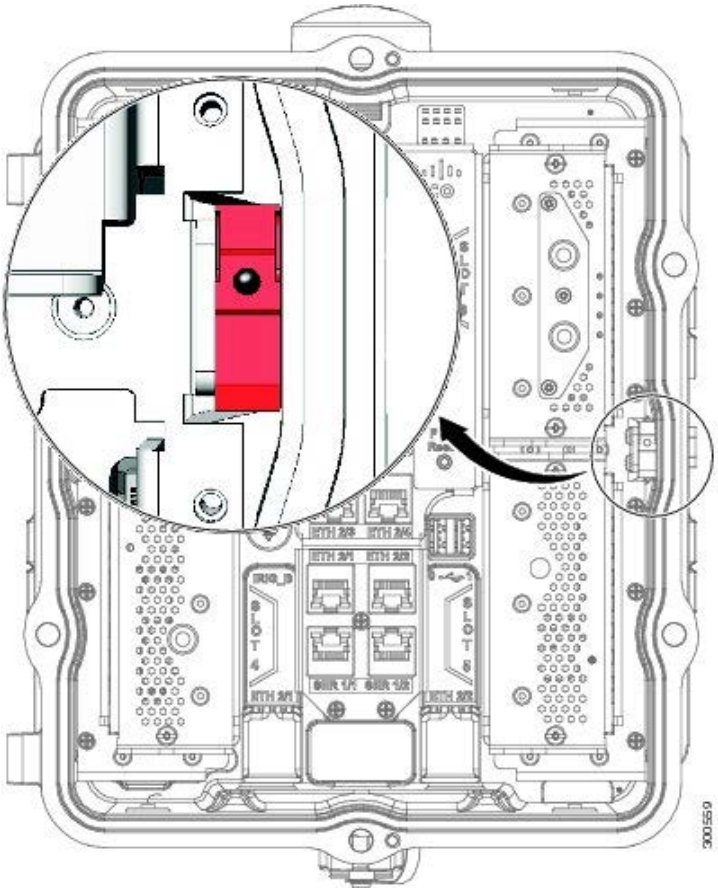
Figure 10 Six Captive Bolt Sequence to Loosen the CGR's Door



The CGR's chassis hardware features Door Sensor located inside the door, see the highlighted

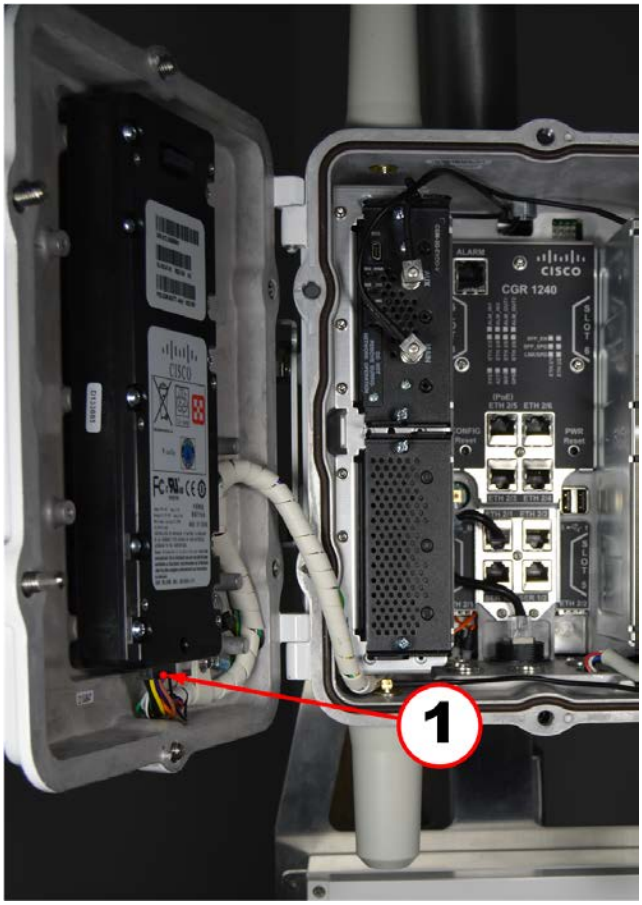
red item. The Door Sensor is a pressure-sensitive alarm switch that detects the opening and closing of the CGR's door and alerts the Field Network Director (FND)/ Cisco Grid Network Management System (CGNMS) operator to a potential security breach. When the switch detects the door has been opened or closed, it sends an event message to the CGR, which is stored in the router log file.

Figure 11 CGR's Door Sensor Location



4. Disconnect the Battery Backup Unit (BBU) Harness Cable, see item 1, from the Battery Backup Unit located on inside of the CGR's door.

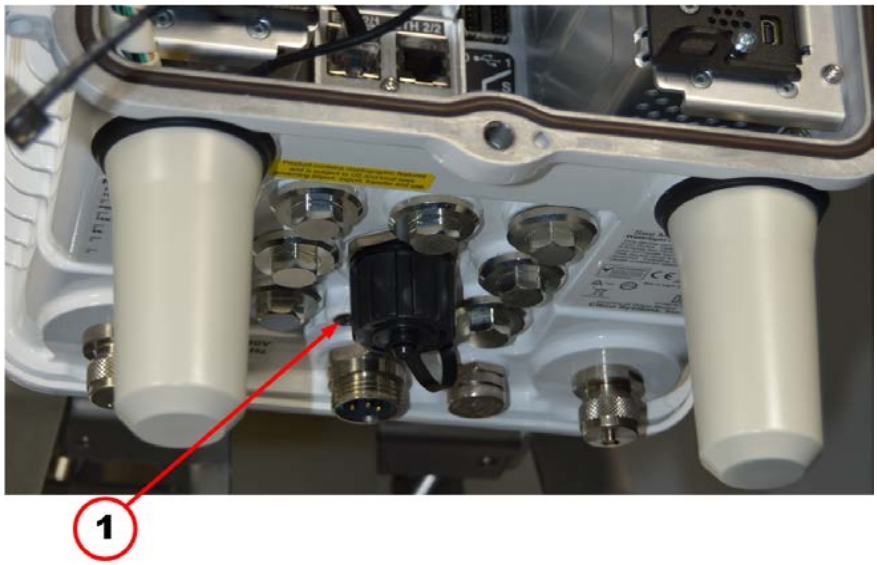
Figure 12 Battery Backup Unit (BBU) Harness Cable Connection Location



Note: For CGR's using Cisco IOS, you must disable the BBU by using the Cisco's Internetwork Operating System (IOS) Command Line Interface (CLI) and then disconnect the BBU Harness Cable. You can only disable the BBU by terminal or console access on CGR's using Cisco's Guest Operating System (GOS).

5. Check the System (SYS) LED, see item 1, to ensure the CGR's power is off. The SYS LED is located on the bottom exterior of the CGR enclosure.

6. **Figure 13** System (SYS) LED Location



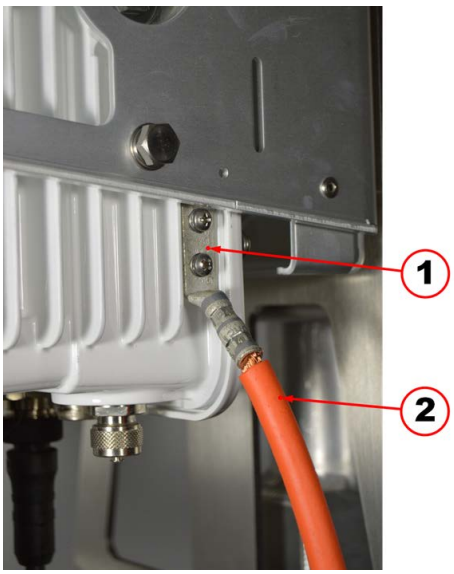
Removing the CGR from the Pole

Before the remote antenna assembly can be attached to the CGR, for a CAM3S, you must first disconnect the Power, the Ground Cable, physically unmount the CGR, and remove the CGR mounting bracket so that you can access the connection points.

> **Warning!** After removing the CGR from the pole, place the CGR on an electrostatic discharge (ESD) protected mat to prevent personal injury and/or damage to the electronic components.

1. Disconnect the power. See **Disconnecting Power to the CGR**.
2. Remove the 6AWG Ground Cable, see item 2, located on the bottom right side of the CGR by removing the two screws from the ground lug, see item 1.

Figure 14 6AWG Ground Cable and Ground Lug Location

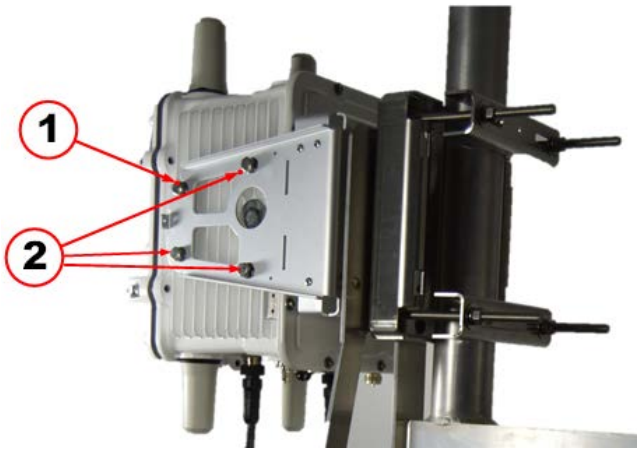


3. Remove the CGR Mounting Bracket.

a. First, loosen the top front hex bolt, see item 1, on each side of the Mounting Bracket.

b. Then, completely remove the two rear and lower front hex bolts, see item 2, on each side of the Mounting Bracket.

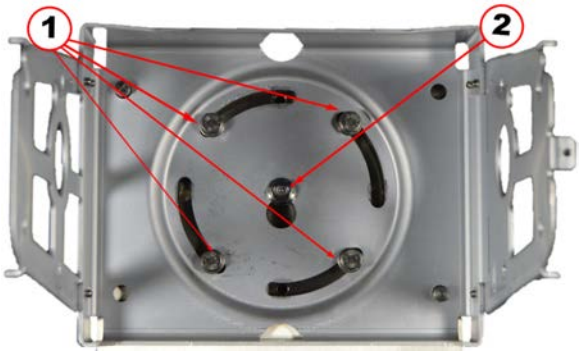
Figure 15 Mounting Bracket Side Hex Bolt Location



c. Next, remove the four hex bolts, see item 1, and set them aside.

d. Now, loosen the center self-locking hex nut, see item 2. This allows the Mounting Bracket to slide upwards and off the center stud.

Figure 16 Mounting Bracket Rear Hex Bolt Locations



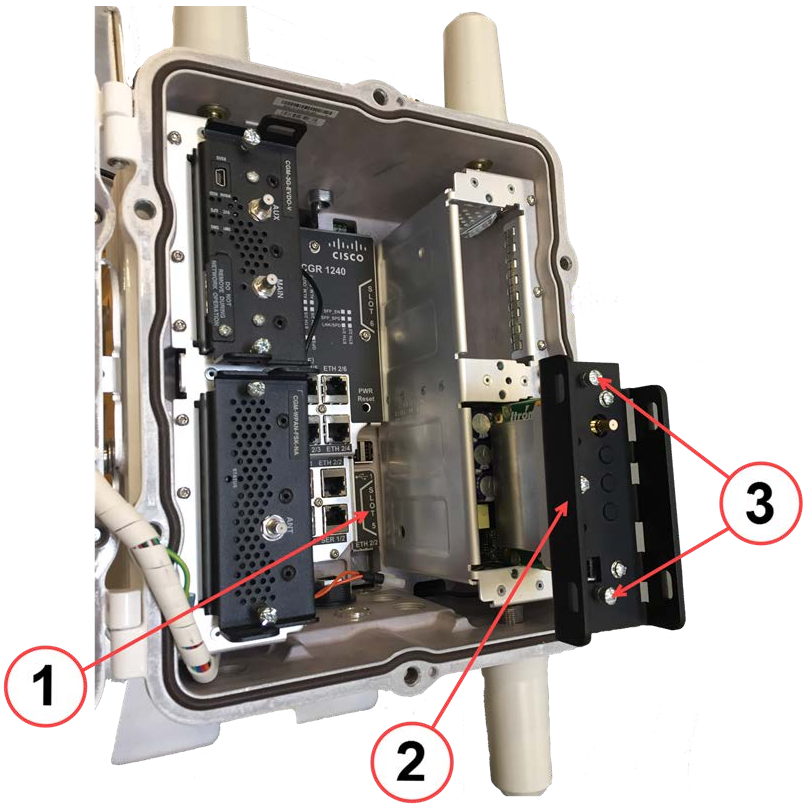
Installing the CAM3S/CAM3M

Warning! Do not install a CAM3S/CAM3M in a CGR that contains a Cisco CGR Compute Module. To allow for sufficient heat dissipation, make sure that a slot adjacent to the CAM3S/CAM3M is empty.

Important! The CAM3S/CAM3M only fits into Slot 5. This is required for sufficient heat dissipation. Additionally, this is the only slot that allows the use of up to three Battery Backup Units (BBUs).

1. Locate Slot 5 by the slot identifier label, see item 1, inside the CGR.
2. Loosen the two Phillips screws on the blank cover over Slot 5 and remove the cover. Use either a #2 Phillips or a 9/32" flat-blade screwdriver.

Figure 17 CGR's Slot 5 and CAM3M's Retaining Screws Location



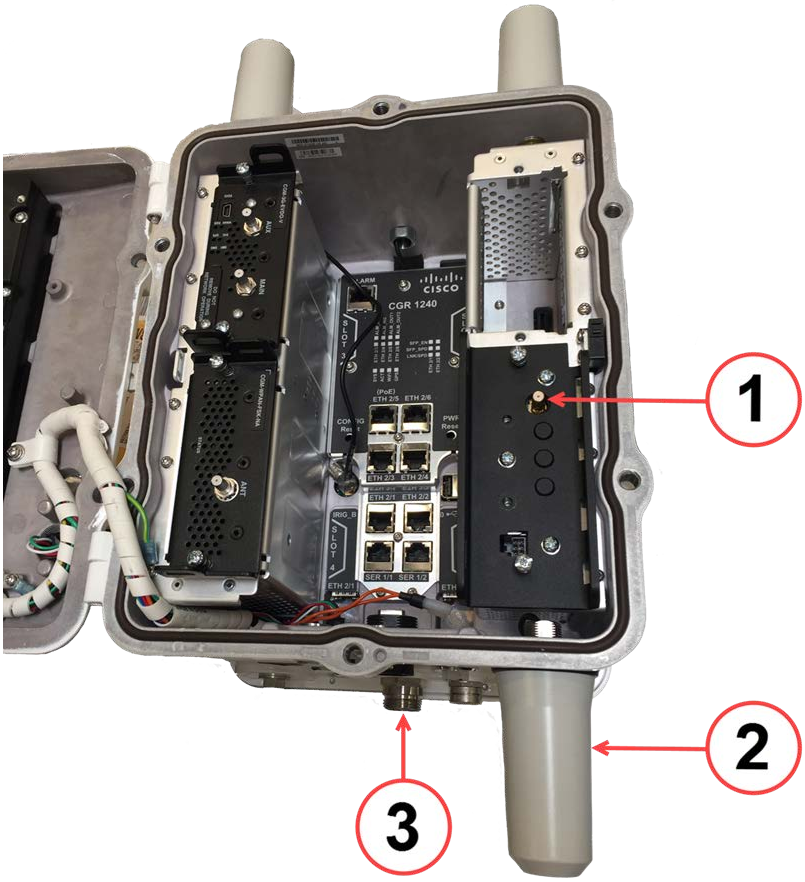
3. Insert the CAM3S/CAM3M, see item 2, into Slot 5 of the CGR. Ensure that the CAM3S/CAM3M PCBs edge connector is on the right side and aligns with the PCI-E 98-pin connector on the CGR mother board. Gently press the CAM3S/CAM3M until the card-edge connector is firmly seated into the connector.
4. Tighten the retaining screws, see item 3, on the front of the CAM3S/CAM3M, securing the CAM3S/CAM3M in place. Use either a #2 Phillips or a 9/32" flat-blade screwdriver and apply a torque of approximately 10in-lb.
5. Secure the black antenna wire from the appropriate antenna to the RF QMA Connector, see item 1, on the front of the CAM3S/CAM3M.

> **Note:** The CGR ships with two antenna connection options: the Wireless Personal Area Network (WPAN) antenna connection, see item 2, and a remote mounted antenna connection, see item 3. Internal antenna cables are provided for both options. You must select the internal antenna cable that connects to the antenna (either the WPAN or remote mounted) you are using for this installation and connect it to the RF QMA Connector, see item 1, on the front of the CAM3S/CAM3M.

For more information about the remote antenna. See **Installing the Remote Antenna**

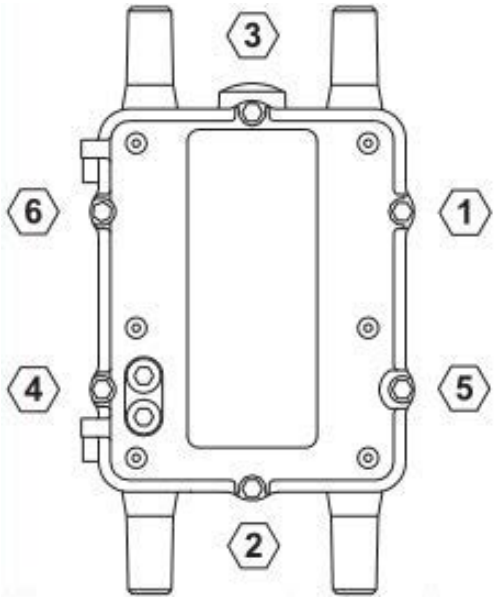
> **Note:** Ensure you route the antenna cables so it not impede the door closure. Use a single plastic cable tie to secure the antenna cable to the metal tie loop on the front of the CAM3S/CAM3M.

Figure 18 WPAN, Remote Antenna Connection and RF QMA Connector Location



6. Close the CGRs door and tighten the six captive bolts that secure the hinged door using the sequence shown in the figure. Use a 1/2" (13mm) socket wrench and apply a torque of 6 to 7ft-lb.

Figure 19 Six Captive Bolt Sequence to Tighten the CGRs Door



7. Clean the surface and affix the regulatory label (included in the CAM3S/CAM3M installation kit) to the front bottom right of the exterior of the CGRs door shown in the figure inside the red circle.

Figure 20 Regulatory Label Placement Location

The following line should be included on the label:

```
Contains: FCC ID: EO9OW3
```

Reinstalling the CGR Back on the Pole

After installing the new CAM3S/CAM3M in the CGR, you can reinstall the mounting bracket, and reinstall the CGR.

1. Insert the four (8mm x 25mm) hex bolts, see item 2, supplied with the installation kit into the threaded holes in the base mounting plate. Do not tighten bolts until all are started.

> **Note:** The four alignment slots, see item 1, in the mounting brackets allow the CGR to be rotated either clockwise or counterclockwise for alignment purposes. Inserting the mounting bolts as shown allows the CGR to rotate counterclockwise. Inserting all four bolts in the holes at the other end of the slot allows the CGR to be rotated clockwise.

2. Adjust the alignment of the CGR to the desired orientation and tighten the four mounting bolts and the self-locking hex nut on the center stud, see item 3. Use a torque of 6 to 7ft-lb when tightening the bolts and nut.

Figure 21 Hex Bolts, Alignment Slots and Self-Locking Hex Bolt Location

3. Mount the CGR to the mounting bracket by sliding the hex bolt, see red arrow in figure and item 1, in the top front position on each side of the CGR into the corresponding slot on the mounting bracket.

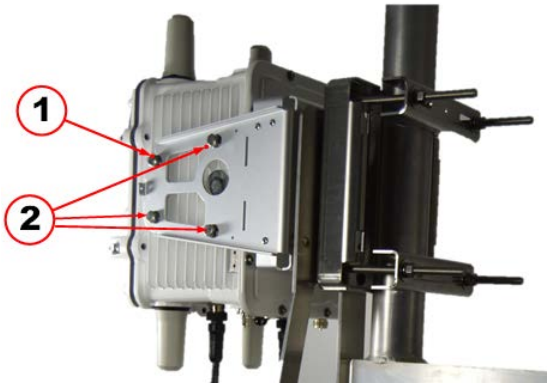
Figure 22 Mounting Bracket and Hex Bolt Installation

4. Insert the remaining three hex bolts, see item 2, on each side of the CGR into their respective places.

Note: Insert all hex bolts on each side before securing tightly.

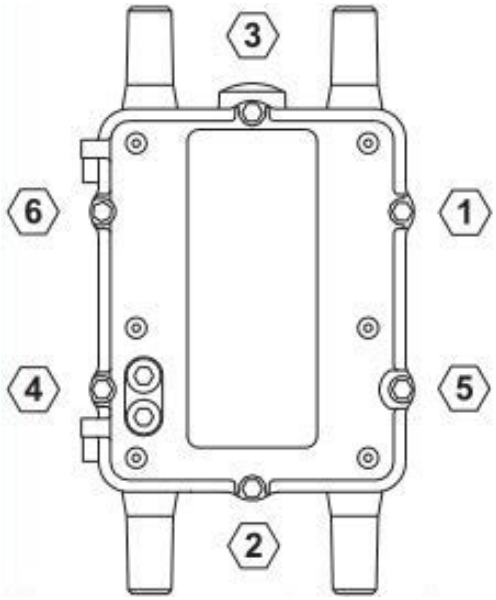
5. Tighten all hex bolts. Use a torque of 6 to 7ft-lb when tightening the bolts.

Figure 23 Hex Bolts Location on Side of CGR



6. Close the door and secure by tightening the six captive bolts using the sequence shown in figure. Use a torque of 6 to 7ft-lb when tightening the bolts.

Figure 24 Six Captive Bolt Sequence to Tighten the CGR's Door



Installing the Remote Antenna

A remote antenna is required to ensure optimal radio performance when the CGR with a CAM3 is deployed in a Star configuration for communication with Battery Powered Devices (BPDs). Standard height remote antennas are mounted directly above the CGR (3 to 5 feet above the CGR). Remote antennas can also be mounted at an extended height above the CGR.

> **Note:** Depending on the geographic region where the CGR with CAM3 is installed, a RF filter may be required with a remote antenna. A RF filter is required for installations in Australia, and other locations. A RF filter is not required for CAM3 installations in North America. See **RF Filter Installation**.

> **Caution:** The CAM3S is for Star deployments and uses the remote antenna . In contrast, the CAM3M is for Mesh deployments and uses the WPAN antenna instead. This is the only difference when is comes to deployment between the two devices.

Placement Guidelines for Remote Antenna

Antenna placement is one of the most important factors in determining overall system performance. Careful consideration must be given to proper antenna placement. Follow these general guidelines when determining the ideal location for a remote-mounted remote antenna:

- Mount the antenna vertically.
- Mount the antenna in a location where there is a clear, unobstructed, 360-degree view of the horizon. The antenna receives and transmits in all directions. Objects such as building walls,

nearby metal surfaces, or other obstructions might interfere with the proper operation of the antenna.

- Do not mount the antenna on a rooftop where nearby buildings are higher than the installation location.
- Do not mount the antenna near existing RF radiating antennas. If existing RF radiators are nearby, the horizontal separation distance must be a minimum of 30 meters and/or three meters of vertical separation. In instances where nearby RF radiators are present, conduct an inter-modulation interference study to evaluate the potential for interference and any effects it may have on system performance. Consult your Itron systems engineer for more information.
- Height is preferred for optimal performance. Itron typically recommends installing the antenna no higher than 20 to 30 meters. Check with your systems engineer.

> **Caution:** Do not install a 5.5/5.15 dBi antenna directly on the CGR. Antenna installation directly on the CGR will compromise mechanical integrity and will not meet the compliance requirements. See **915MHz 5.5dBi Remote Antenna Kit** and **915MHz 5.15dBi Remote Antenna Kit**.

> **Caution:** Do not install a 8.15 dBi antenna directly on the CGR. Antenna installation directly on the CGR will compromise mechanical integrity and will not meet the compliance requirement for a loss of 2.2dB (for any exceptions, there is additional information, see **RF Filter Installation**) between the RF filter and the 8.15 dBi antenna. See **915MHz 8.15dBi High Gain Remote Antenna Kit 915MHz 8.15dBi High Gain Remote Antenna Kit**

A side-arm antenna installation must be done if the antenna is mounted where it does not have an unobstructed 360-degree view. Refer to the following guidelines for a side-arm antenna installation:

- The minimum standoff distance is 60 centimeters, where the interfering structural members are 10 centimeters or less in diameter and spaced more than two meters apart.
- For structural members between 10 and 25 centimeters in diameter, use a sliding scale of 0.6 to 1.5 meters (for example, a 60-centimeter standoff at 10-centimeter diameter to a 150-centimeter standoff at 25-centimeter member diameter).

Remote Antenna Connections & the Lightning Arrestor

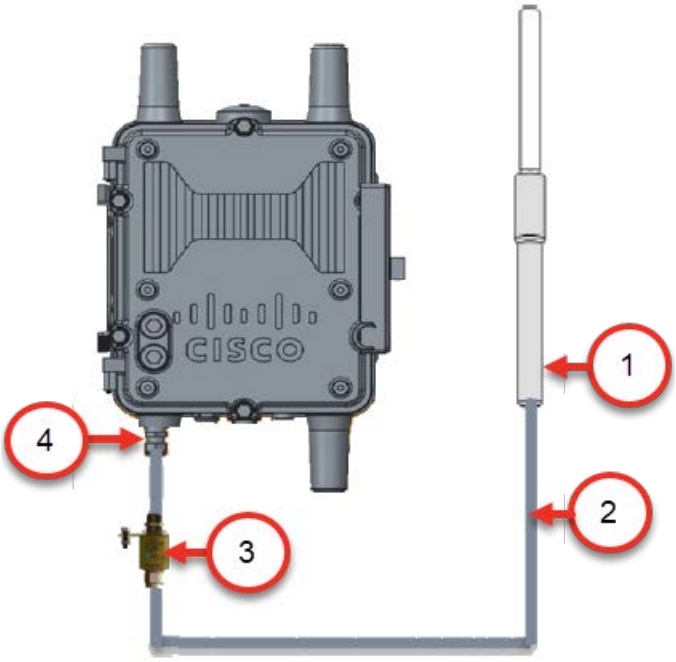
When using a remote antenna, you must install a lightning arrestor to protect the CGR in the event of a lightning strike. The lightning arrestor is fitted between the coaxial antenna cable and the CGR (or the RF Filter, if applicable). The protected end of the arrestor connects to the N

Connector on the CGR (or RF Filter). The surge end of the arrestor is connected to the antenna cable. The arrestor is also furnished with a ground lug

Caution: .The lightning arrestor must be connected to an earth-ground.

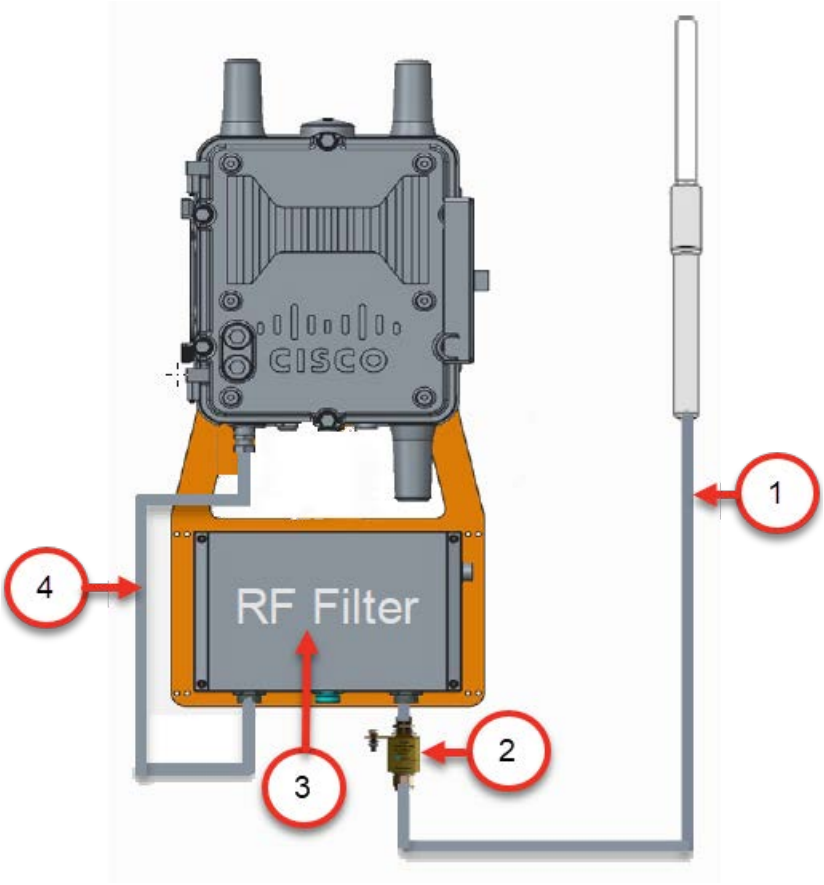
This figure shows the Remote Antenna connected to a CGR without a RF Filter. Specifically, shows the Remote Antenna, item 1, a RF Cable, item 2, the Lightning Arrestor, item 3, and the CGR's N Connector, see item 4.

Figure 25 Remote Antenna, Lighting Arrestor Connections without a RF Filter



This figure shows the Remote Antenna and a RF Filter connected to a CGR. Specifically, shows the RF Cable, item 1, that connects between the RF Filter and the Antenna, the Lightning Arrestor, item 2, the RF Filter, item 3 and the RF Cable, item 4, that connects between the CGR's N Connector and the RF Filter.

Figure 26 Remote Antenna, Lighting Arrestor Connections with a RF Filter



Assembling and Attaching the Antenna

This section describes the procedures needed to assemble the remote antenna and attach it to the CGR. You will also need to install a grounded lightning arrestor to prevent lightning damage to the CGR. See **Remote Antenna Connections & the Lightning Arrestor**.

Assembling the Remote Antenna

1. Remove the black rubber bumper from the end of the antenna.

Figure 27 Rubber Bumper Location

2. Slide the silicone seal over the base of the remote antenna.

Figure 28 Silicone Seal Application

3. Screw the remote antenna base into the top of the remote mount adapter plate.

Figure 29 Remote Antenna Base to Remote Adapter Plate

4. Push the silicone seal down over the top of the remote mount adapter plate.

Figure 30 Silicone Over the Remote Mount Adapter Plate

5. Slide the antenna holder over the silicone seal.

Figure 31 Remote Antenna Holder Over the Silicone

6. Make sure that the remote antenna holder and the adapter plate are flush on all sides

Figure 32 Inspect Remote Antenna Holder and Adapter Plate

Attaching the Remote Antenna to the CGR Mounting Bracket

Use the following procedure to attach the antenna to the CGR mounting bracket:

1. Push the 1¾" bolt through the antenna holder, the remote mount adapter plate, and the mounting bracket
2. Place the flat washer on the bolt.
3. Place the split washer on the bolt.
4. Add a drop of anti-seize lubricant to the nut and attach the nut to the bolt.
5. Replace the black rubber bumper on the end of the antenna

Figure 33 Remote Antenna to CGR Mounting Bracket

Weatherproofing the RF Connections

1. Wrap vinyl electrical tape around the connection, starting at the RF Filter and moving up the cable as shown in the figure.

Figure 34 Starting the Electrical Tape Application

The vinyl electrical tape provides a foundation for the Butyl rubber sealant, making it easier to disconnect the cable.

2. Wrap the vinyl electrical tape up the coaxial cable, overlapping each wrap as shown in the figure.

Figure 35 Fully Covered Electrical Tape Application

3. Ensure that the tape fully covers the cable strain relief.
4. Wrap a layer of Butyl rubber sealant over the vinyl electrical tape

Figure 36 Butyl Rubber Application

5. Ensure that the Butyl rubber extends past the vinyl electrical tape and onto the cable jacket.
6. Overlap the Butyl rubber so that no gap exists. The Butyl rubber self-vulcanizes over time and the seam disappears.
7. Wrap vinyl electrical tape around the Butyl rubber, starting at the filter and moving up as you did in step 1.

Figure 37 Electrical Tape Application Around the Butyl Rubber

8. Continue wrapping the vinyl electrical tape in a spiral back down to the filter. You should now have two layers of vinyl electrical tape covering the Butyl rubber.

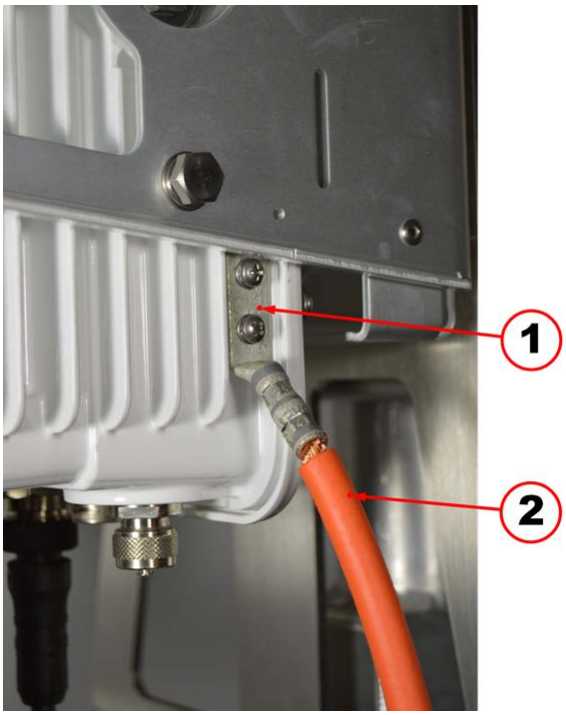
Reinstalling the Power and Ground to the CGR

After installing the new CAM3S and the remote antenna, you can reconnecting power and ground the CGR, attaching the lightning arrestor, and weatherproofing the connections.

> **Caution:** If Ethernet is used, the cable length must not exceed two meters in total. Lengths longer than two meters are not approved and do not meet FCC and ISED compliance requirements.

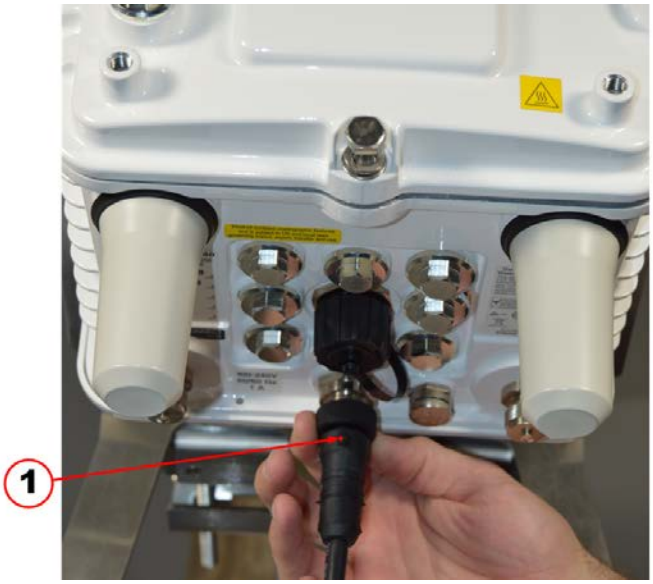
1. Reinstall the 6AWG Ground Cable, see item 2, located on the bottom right side of the CGR using the two screws into the ground lug, see item 1.

Figure 38 6AWG Ground Cable and Ground Lug Location



2. Enable the power at the circuit, or power supply that the CGR AC Power Cable is connected.
3. Install the CGR AC Power Cable, see item 1, to the AC Power Connector located on the bottom exterior of the CGR enclosure.

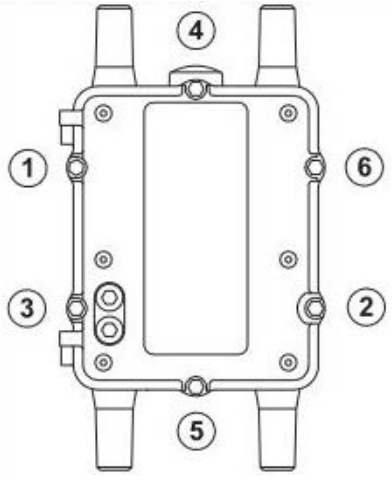
Figure 39 AC Power Cable Connection Location



4. Loosen the six captive bolts that secure the hinged CGR door using the sequence shown below and swing the door fully open. Use a 1/2" (13mm) socket wrench and apply a torque of 3 to 4 foot pounds (ft-lb).

> **Note:** The CGR door features an environmental seal that protects the unit against environmental elements when the door is closed. This seal creates pressure, which can cause the door to open suddenly when the last captive bolt is loosened. Ensure you loosen the six captive bolts that secure the CGR's door in the sequence shown in the figure and swing the door open.

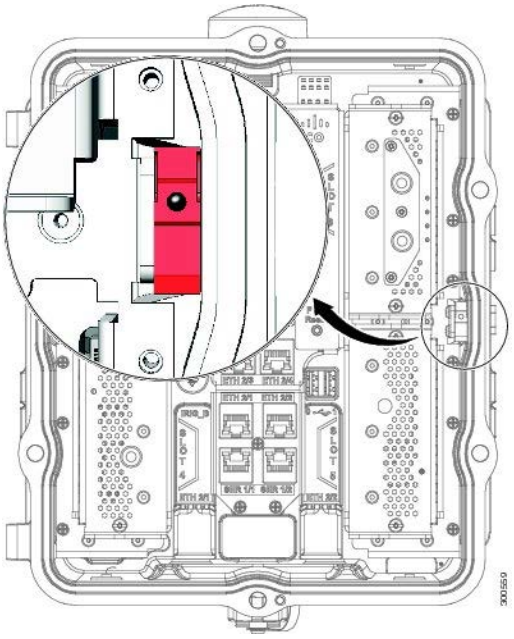
Figure 40 Six Captive Sequence to Loosen the CGR's Door



The CGR's chassis hardware features Door Sensor located inside the door, see the highlighted red item. The Door Sensor is a pressure-sensitive alarm switch that detects the opening and

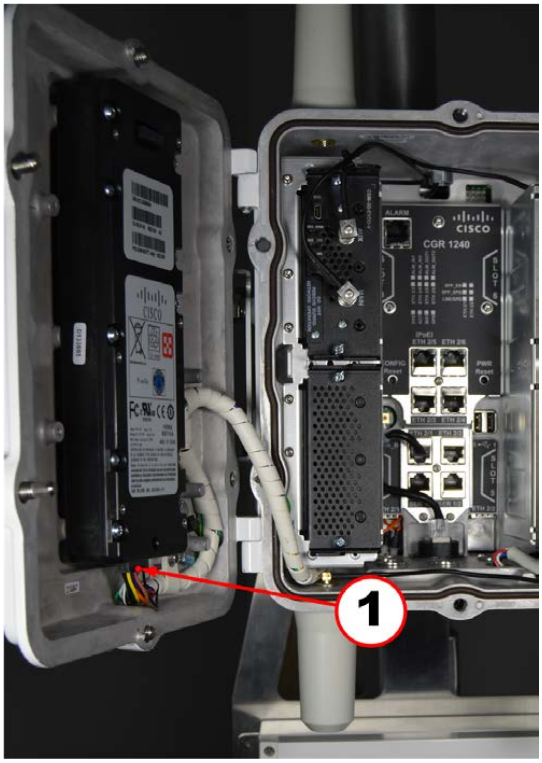
closing of the CGR's door and alerts the Field Network Director (FND)/ Cisco Grid Network Management System (CGNMS) operator to a potential security breach. When the switch detects the door has been opened or closed, it sends an event message to the CGR, which is stored in the router log file.

Figure 41 CGR's Door Sensor Location



5. Reconnect the Battery Backup Unit (BBU) Harness Cable, see item 1, from the Battery Backup Unit located on the inside of the CGR's door.

Figure 42 Battery Backup Unit (BBU) Harness Cable Connection Location



Note: For CGR's using Cisco IOS, you must disable the BBU by using the Cisco's Internetwork Operating System (IOS) Command Line Interface (CLI) and then disconnect the BBU Harness Cable. You can only disable the BBU by terminal or console access on CGR's using Cisco's Guest Operating System (GOS).

6. Check the System (SYS) LED, see item 1, to ensure the CGR's power is on. The SYS LED is located on the bottom exterior of the CGR enclosure.

Figure 43 System (SYS) LED Location

5 Radio Frequency and Power Line Carrier Installation

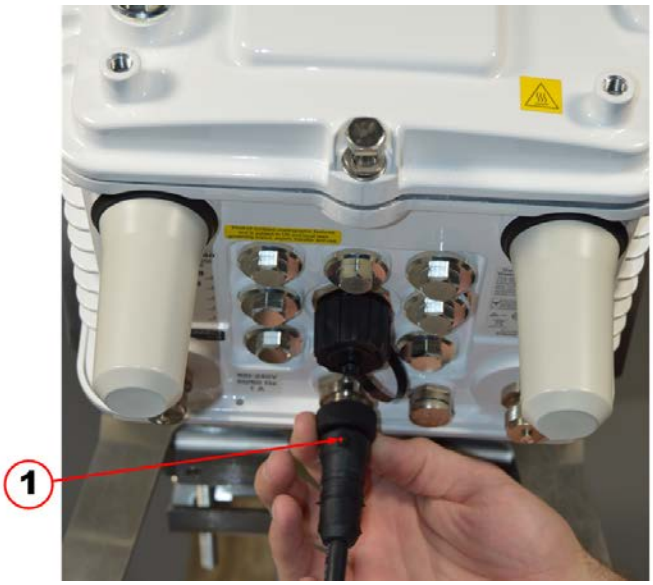
This chapter covers the following topics:

- **Disconnecting Power to the CGR**
- **Installing the CAM3S/CAM3M Using the PLC Signal Cable**

Disconnecting Power to the CGR

1. Disable the power at the circuit, or power supply that the CGR AC Power Cable is connected.
2. Disconnect the CGR AC Power Cable, see item 1, from the AC Power Connector located on the bottom exterior of the CGR enclosure.

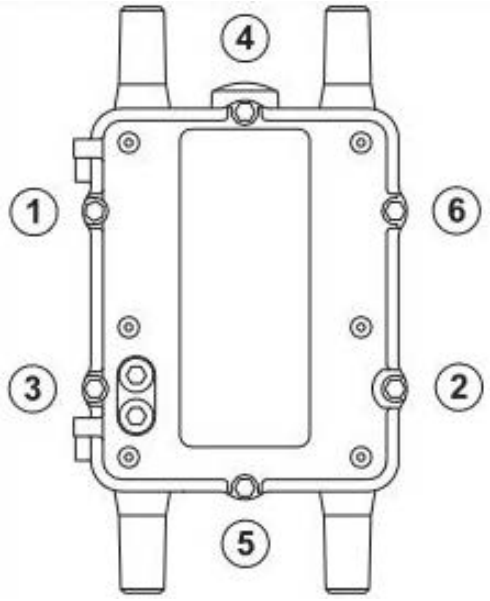
Figure 44 AC Power Cable Connection Location



3. Loosen the six captive bolts that secure the hinged CGR door using the sequence shown below and swing the door fully open. Use a 1/2" (13mm) socket wrench and apply a torque of 3 to 4 foot pounds (ft-lb).

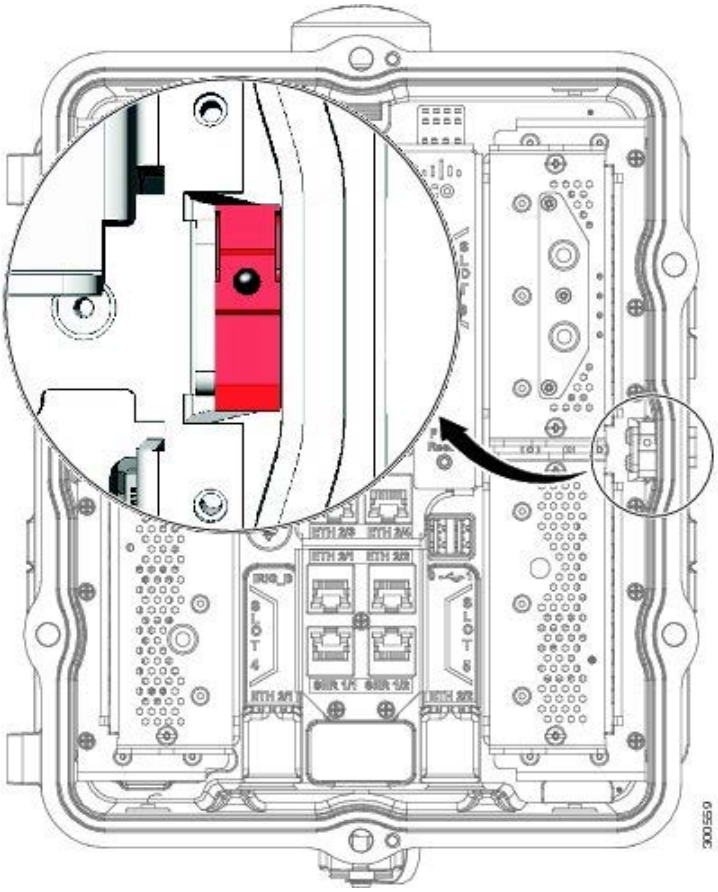
Note: The CGR's door features an environmental seal that protects the unit against environmental elements when the door is closed. This seal creates pressure, which can cause the door to open suddenly when the last captive bolt is loosened. Ensure you loosen the six captive bolts that secure the CGR's door in the sequence shown in the figure and swing the door open.

Figure 45 Six Captive Bolt Sequence to Loosen the CGR's Door



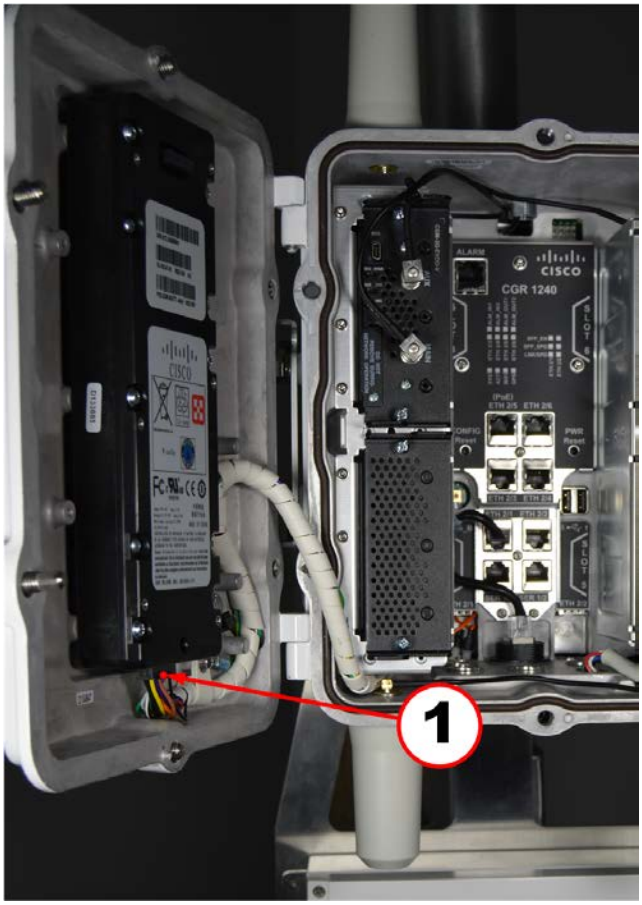
The CGR's chassis hardware features Door Sensor located inside the door, see the highlighted red item. The Door Sensor is a pressure-sensitive alarm switch that detects the opening and closing of the CGR's door and alerts the Field Network Director (FND)/ Cisco Grid Network Management System (CGNMS) operator to a potential security breach. When the switch detects the door has been opened or closed, it sends an event message to the CGR, which is stored in the router log file.

Figure 46 CGR's Door Sensor Location



4. Disconnect the Battery Backup Unit (BBU) Harness Cable, see item 1, from the Battery Backup Unit located on inside of the CGR's door.

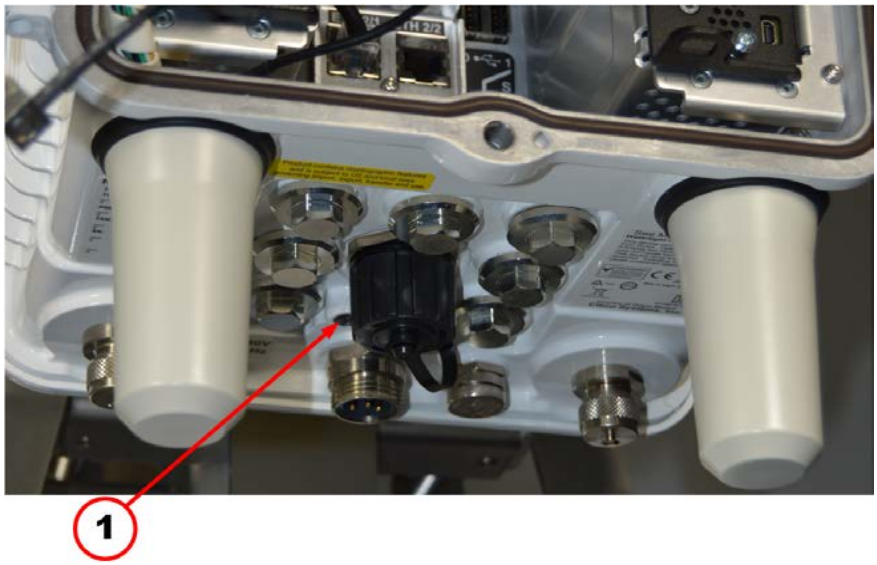
Figure 47 Battery Backup Unit (BBU) Harness Cable Connection Location



Note: For CGR's using Cisco IOS, you must disable the BBU by using the Cisco's Internetwork Operating System (IOS) Command Line Interface (CLI) and then disconnect the BBU Harness Cable. You can only disable the BBU by terminal or console access on CGR's using Cisco's Guest Operating System (GOS).

5. Check the System (SYS) LED, see item 1, to ensure the CGR's power is off. The SYS LED is located on the bottom exterior of the CGR enclosure.

6. **Figure 48** System (SYS) LED Location

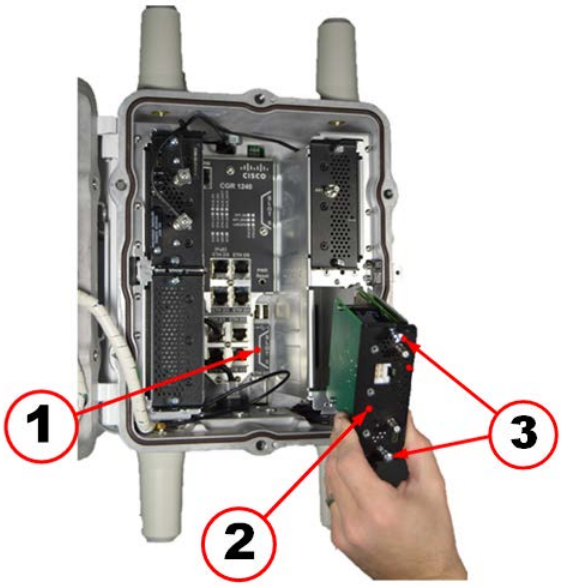


Installing the CAM3S/CAM3M Using the PLC Signal Cable

> **Caution:** Do not connect PLC to a 3 Phase circuit, this configuration is not approved and does not meet FCC and ISED compliance requirements.

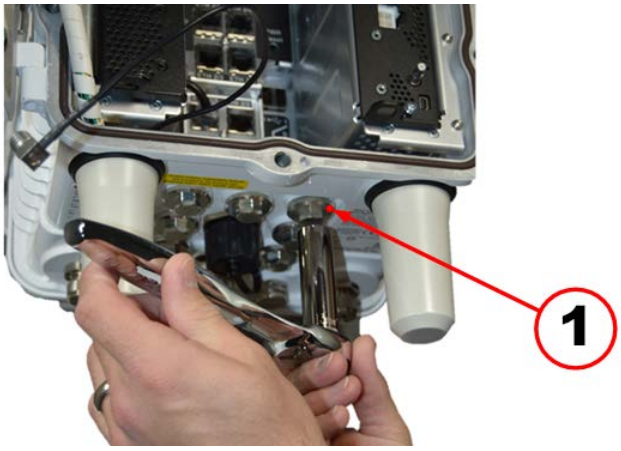
1. Locate Slot 5 by the slot identifier label, see item 1, inside the CGR.
2. Loosen the two captive screws on the blank cover over Slot 5 and remove the cover. Use either a #2 Phillips or a 9/32" flat blade screwdriver.
3. Insert the CAM3S/CAM3M in Slot 5 of the CGR. Ensure that the CAM3S/CAM3M PCBs edge connector is on the right side and aligns with the Peripheral Component Interconnect Express (PCI-E) 98-pin connector on the CGR mother board. Gently press the CAM3S/CAM3M until the card-edge connector is firmly seated into the connector.
4. Tighten the retaining screws, see item 3, on the front of the CAM3S/CAM3M, securing the module in place. Use either a #2 Phillips or a 9/32" flat blade screwdriver and apply a torque of approximately 10in-lb.

Figure 49 Slot 5 Label, CAMS3/CAM3M and Retaining Screws Location



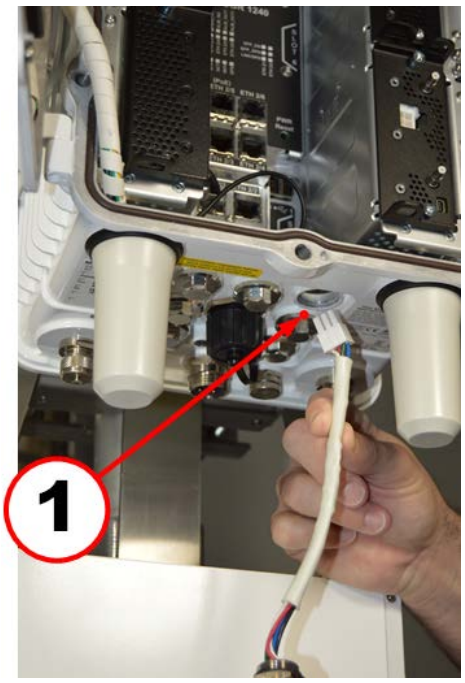
5. Remove the PLC Signal Cable Hex bolt plug, see item 1, using a 1/2" (13mm) socket wrench.

Figure 50 Hex Bolt Plug Location for PLC Signal Cable



6. Insert the PLC signal cable, see item 1, into the bottom of the CGR.

Figure 51 PLC Signal Cable Insertion Location

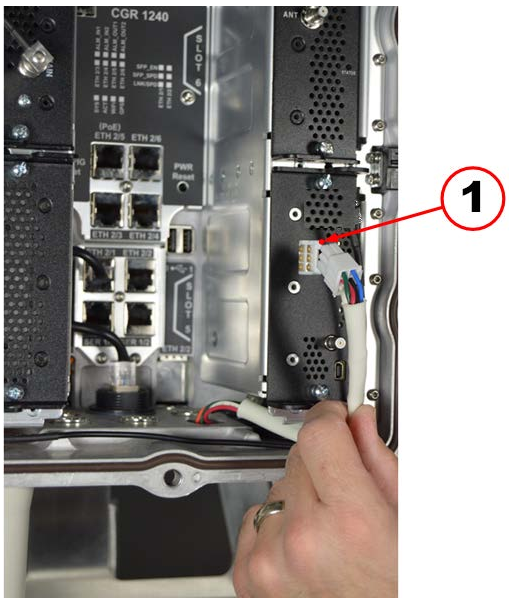


7. Route he PLC Signal Cable through the hole, see item.
8. Secure the Cable Gland into the threaded hole, as shown. Use a 15/16" combination wrench to secure the cable gland.

Figure 52 PLC Signal Cable and Cable Gland Location

9. Insert the PLC Signal Cable into the 6-Pin connector, see item 1, on the front of the CAM3S/CAM3M.

Figure 53 6-Pin Connector Location

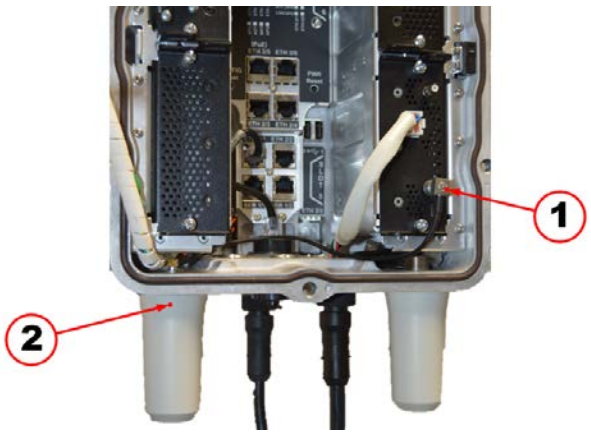


10. Secure the black antenna wire from the appropriate antenna to the RF QMA Connector, see item 1, on the front of the CAM3S/CAM3M.

Note: The CGR ships with two antenna connection options: the Wireless Personal Area Network (WPAN) antenna, see item 2, and a remote mounted antenna. Internal antenna cables are provided for both options. You must select the internal antenna cable that connects to antenna (either the WPAN for the CAM3M, or remote mounted for the CAM3M) being used for this installation and connect it to the RF QMA Connector, see item 1, on the front of the CAM3S/CAM3M.

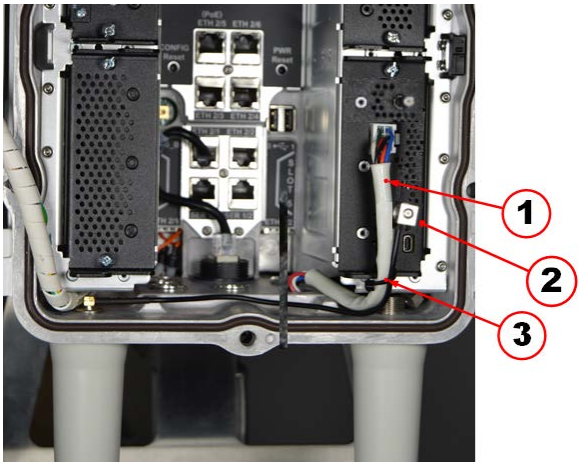
Caution: The CAM3S is for Star deployments and uses the remote antenna . In contrast, the CAM3M is for Mesh deployments and uses the WPAN antenna instead. This is the only difference when is comes to deployment between the two devices.

Figure 54 RF QMA Connector and WPAN Antenna Connection Location



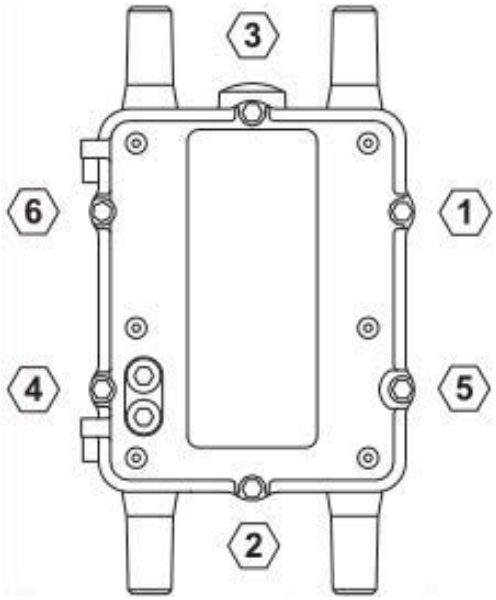
11. Ensure that the cables are routed so that they do not interfere with door closure. Use a single plastic cable tie, see item 3, to secure both the PLC Signal Cable, see item 1 and the antenna cable, see item 2, to the tie loop on the front of the CAM3S/CAM3M.

Figure 55 Signal Cable, RF Antenna Cable and Plastic Cable Tie Location



12. Close the CGR's door and tighten the six captive bolts the secure the hinged door using the sequence shown in the figure. Use a 1/2" (13mm) socket wrench and apply a torque of 6 to 7ft-lb.

Figure 56 Six Bolt Sequence to Tighten the CGR's Door



13. Clean the surface and affix the regulatory label (included in the CAM3S/CAM3M installation kit) to the front bottom right of the exterior of the CGR's door shown in the figure inside the red circle.

Figure 57 FCC Regulatory Label Placement

The following line should be included on the label:

```
Contains: FCC ID: EO9OW3
```

6 ACT Coupler Unit Installation (CAM3M Only)

This chapter covers the following topics:

- **Removing the CGR from the Pole**
- **Reinstalling the CGR**
- **Installing the ACT Coupler Unit**

Adaptive Communication Technology (ACT) Coupler Unit Function

The Adaptive Communication Technology (ACT) Coupler Unit, in general, provides electrical isolation and signal conditioning between a CAM3M and the power line. It is connected to the low voltage (120/240VAC) side of the local transformer to enable Power Line Carrier (PLC) communications to the meters on that circuit.

To install the CGR refer to the CGR installation procedure in the *Cisco 1240 Connected Grid Router Hardware Installation Guide.*

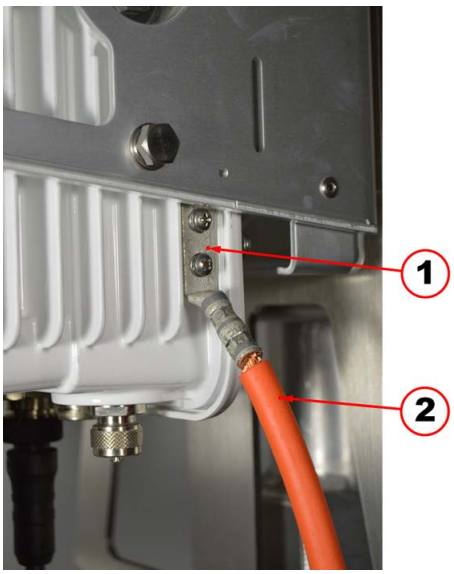
Removing the CGR from the Pole

Before the installing the ACT Coupler Unit, you must first disconnect the Power, the Ground Cable, physically unmount the CGR, and remove the CGR mounting bracket.

> **Warning!** After removing the CGR from the pole, place the CGR on an electrostatic discharge (ESD) protected mat to prevent personal injury and/or damage to the electronic components.

1. Disconnect the power. See **Disconnecting Power to the CGR**.
2. Remove the 6AWG Ground Cable, see item 2, located on the bottom right side of the CGR by removing the two screws from the ground lug, see item 1.

Figure 58 6AWG Ground Cable and Ground Lug Location

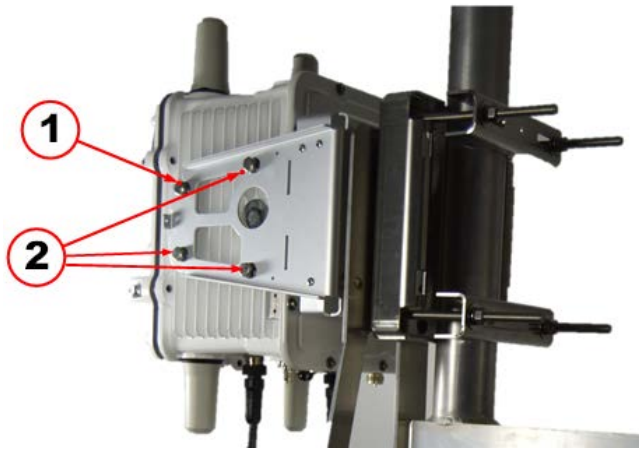


3. Remove the CGR Mounting Bracket.

a. First, loosen the top front hex bolt, see item 1, on each side of the Mounting Bracket.

b. Then, completely remove the two rear and lower front hex bolts, see item 2, on each side of the Mounting Bracket.

Figure 59 Mounting Bracket Side Hex Bolt Location

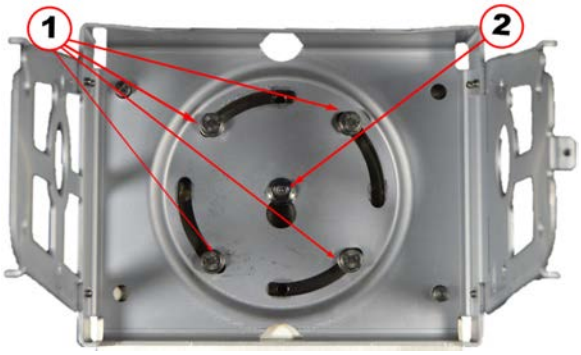


c. Next, remove the four hex bolts, see item 1, and set them aside.

> **Note:** Longer bolts are required to accommodate the ACT Coupler Unit bracket and are provided in the ACT Coupler Unit installation kit.

d. Now, loosen the center self-locking hex nut, see item 2. This allows the Mounting Bracket to slide upwards and off the center stud.

Figure 60 Mounting Bracket Rear Hex Bolt Locations



4. Slide the ACT Coupler Unit Mounting Bracket keyhole slot over the center stud with self-locking hex nut, see item 1, on the pole mount base plate.

Figure 61 ACT Coupler Unit Mounting Bracket Center Stud with Self-Locking Hex Nut

5. Position the CGR Mounting Bracket over the center stud with self-locking hex nut, see item 3, and slide down behind hex nut.

Figure 62 CGR Mounting Bracket Over Center Stud with Self-Locking Hex Nut

6. Insert the four (8mm x 25mm) mounting screws supplied with the installation kit into the threaded holes in the base mounting plate. Do not tighten bolts until all are started.

> **Note:** The four alignment slots in the mounting brackets allow the CGR and the ACT Coupler Unit to rotate either clockwise or counterclockwise for alignment purposes. Inserted as shown, the mounting bolts allow the unit to rotate counterclockwise. Inserting all four bolts in the holes at the other end of the slot allows the unit to rotate clockwise.

7. Adjust the alignment of the CGR and the ACT Coupler Unit to the desired orientation and tighten the four mounting bolts and the hex nut on the center stud. Use a torque of 6 to 7ft-lb when tightening the bolts and nut.

Reinstalling the CGR

1. Mount the CGR to the mounting bracket by sliding the hex bolt, see red arrow in figure and item 1, in the top front position on each side of the CGR into the corresponding slot on the mounting bracket.

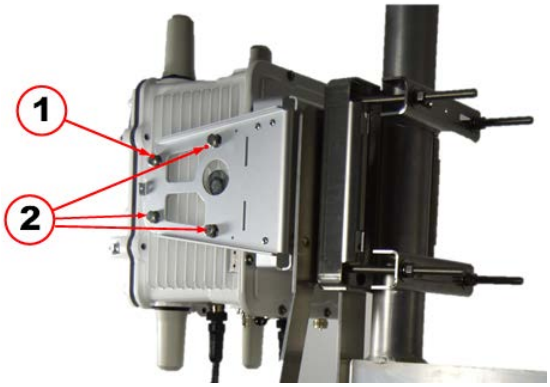
Figure 63 Mounting Bracket and Hex Bolt Installation

2. Insert the remaining three hex bolts, see item 2, on each side of the CGR into their respective places.

Note: Insert all hex bolts on each side before securing tightly.

3. Tighten all hex bolts. Use a torque of 6 to 7ft-lb when tightening the bolts.

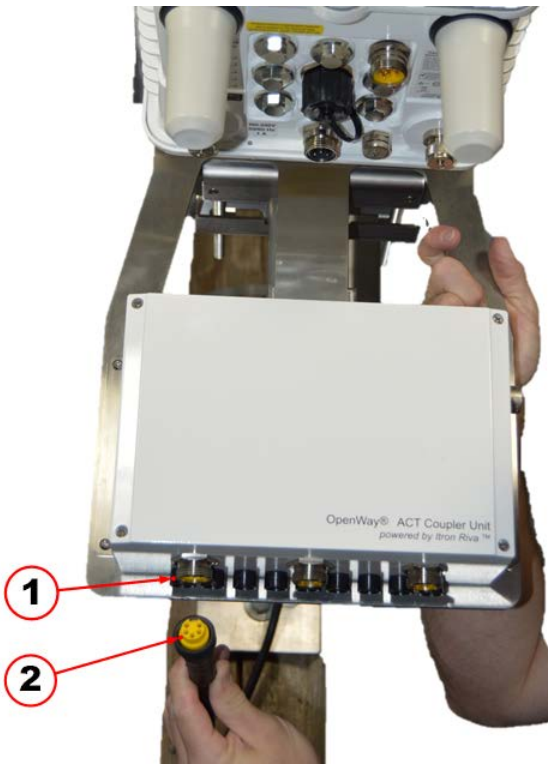
Figure 64 Hex Bolts Location on Side of CGR



Installing the ACT Coupler Unit

1. Connect the 5-Pin Female External Power Supply Cable, see item 2, to the left-most Bulkhead Connector, see item 1, (AC Power Input) on the bottom of the ACT Coupler Unit.

Figure 65 AC Power Connection Location



2. Wire the 5 pin cable to the low voltage side of the transformer using the tables indicating the applicable wiring diagrams.

Table 66 Single Phase Wiring (110/240VAC)

Cable Color	Function	Wire#
Black	Neutral	1
Black	Line 1	2
Black	No connection and should be insulated.	3
Black	No connection and should be insulated.	4
Green/Yellow	Ground	5

Warning! Ensure you follow the wiring diagrams. The no connected wires should be insulated to avoid connections with individuals or other items. Uninsulated wires are a hazardous situation, which if not avoided, could result in death or injury.

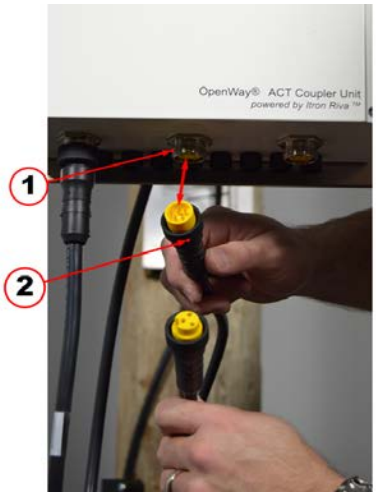
Table 67 Split Phase Wiring (240VAC)

Cable Color	Function	Wire#
Black	Neutral	1
Black	Line 1	2
Black	Line 2	3
Black	No connection and should be insulated.	4
Green/Yellow	Ground	5

Caution: No other voltages or any form of three phase power should be connected. A 3 Phase circuit does not meet FCC or ISED compliance requirements.

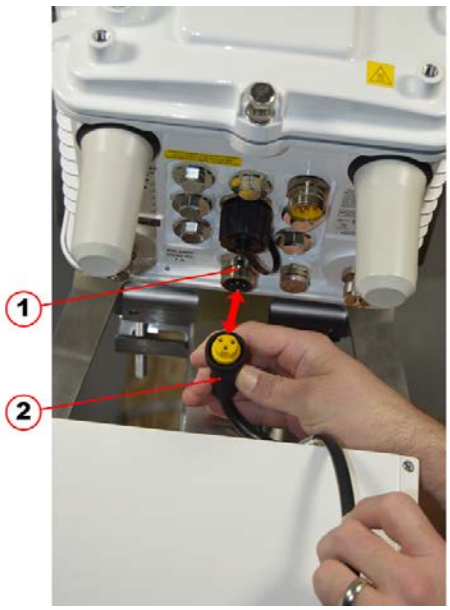
3. Connect the 5-Pin Male end connector of the ACT Coupler Unit, see item 2, to the CGR Power to the center Bulkhead Connector, see item 1, (Power Output) on the bottom of the ACT Coupler Unit.

Figure 68 Power Output Connection Location



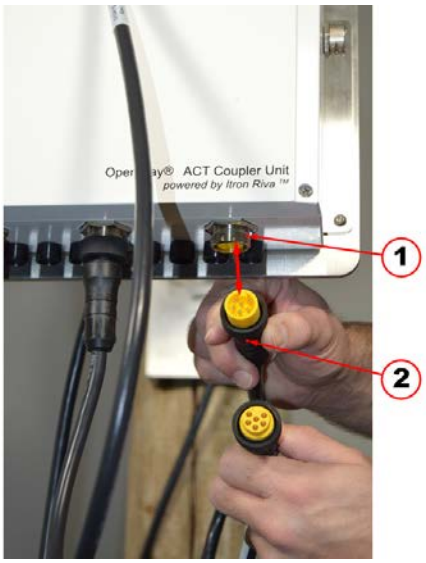
4. Connect the 3-Pin Female end of the ACT Coupler Unit, see item 2, to the CGR Power Cable to the Bulkhead Connector, see item 1, (Power Input) on the bottom of the ACT Coupler Unit.

Figure 69 Power Input Connection on the CGR Location



5. Connect the 6-Pin Male end of the PLC Signal Cable, see item 2, to the PLC Bulkhead Connector, see item 1, on the bottom of the ACT Coupler Unit.

Figure 70 PLC Signal Cable Connection on the ACT Coupler Unit Location

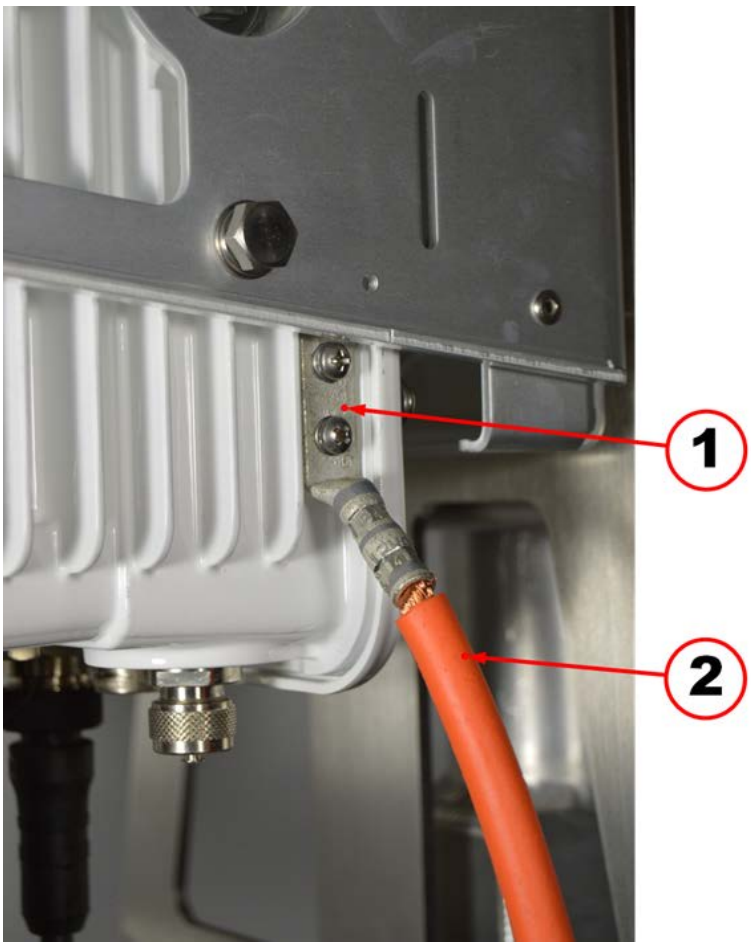


6. Connect the 6-Pin Female end of the PLC Signal Cable, see item 2, to the Male PLC Signal Bulkhead Connector, see item 1, on the bottom of the CGR.

Figure 71 PLC Signal Cable Connection to the CGR Location

7. Insert the two screws into the ground lug, see item 1, to connect the ground cable, see item 2, to the CGR. Use a torque of 10 to 12ft-lb when tightening the screws.

Figure 72 Ground Cable and Lug Screws Location



7 Replacing an Existing CAM with a New CAM3S/CAM3M in the Field

This chapter covers the following topics:

- **Removing an Existing CAM**
- **Installing the New CAM3S/CAM3M**

Important! In some geographic territories, such as North America (NAM), the RF Filter is not needed with a CAM3S and may be removed if it is already installed for an earlier CAM. In this case, the remote antenna can be installed without the filter, but it should NOT be connected directly to the CGR.

Important! Prior to replacing a CAM with a new CAM3S, ensure you install a new IOS and ACTD. See *CGR IOS Upgrade Guide*, (815-0001-xx). Also, for details about the three use cases, see *OpenWay Riva System Upgrade Guide GSR 5.0*, (TDC-8011-xx).

Warning! The CAM3S/CAM3M is not hot swappable.

Caution: The CAM3S is for Star deployments and uses the remote antenna . In contrast, the CAM3M is for Mesh deployments and uses the WPAN antenna instead. This is the only difference when is comes to deployment between the two devices.

Note: Use the same steps in this chapter when replacing a non-functioning CAM3S/CAM3M with a new CAM3S/CAM3M.

Requirements and Materials

The following procedures in this chapter are necessary for successfully replacing an existing CAM with a new CAM3S/CAM3M.

Collect the following items before you start.

- 1/2" (13mm) socket wrench to loosen the CGR door hex bolts
- Laptop with USB port running PuTTY or similar terminal application. PuTTY is a terminal emulator, serial console and network file transfer application. It supports several network protocols including SCP, SSH, Telnet, rlogin and raw socket connection.

Note: Go to the PuTTY website to download the latest version of the application: **https://www.putty.org/**.

- Credentials for CGR access
- New CAM3S/CAM3M

Note: The CAM3S/CAM3M ships in an anti-static shipping bag. Do not remove the CAM3S/CAM3M from the anti-static shipping bag until it is ready to be placed into the CGR. Save the anti-static shipping bag for the removed CAM.

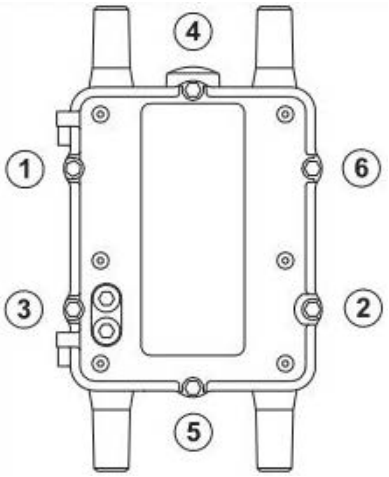
- Available Field Network Director (FND)/ Cisco Grid Network Management System (CGNMS) FND/CGNMS operator (utility office or Itron Managed Services) to verify CAM3S/CAM3M operation
- CGR communications port access
- Cisco DB9–RJ45 serial cable and USB-to-Serial adapter cable
- Permanent marker

Removing an Existing CAM

1. Loosen the six captive bolts that secure the hinged CGR door using the sequence shown below and swing the door fully open. Use a 1/2" (13mm) socket wrench and apply a torque of 3 to 4 foot pounds (ft-lb).

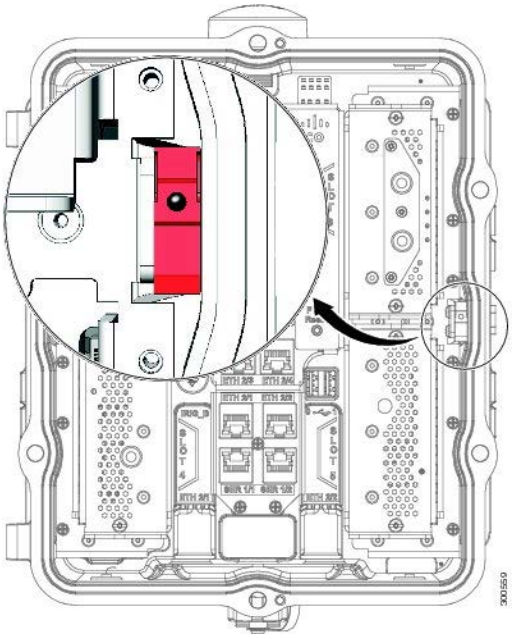
Note: The CGR door features an environmental seal that protects the unit against environmental elements when the door is closed. This seal creates pressure, which can cause the door to open suddenly when the last captive bolt is loosened. Ensure you loosen the six captive bolts that secure the CGR's door in the sequence shown in the figure and swing the door open.

Figure 73 Six Captive Bolt Sequence to Loosen the CGR's Door



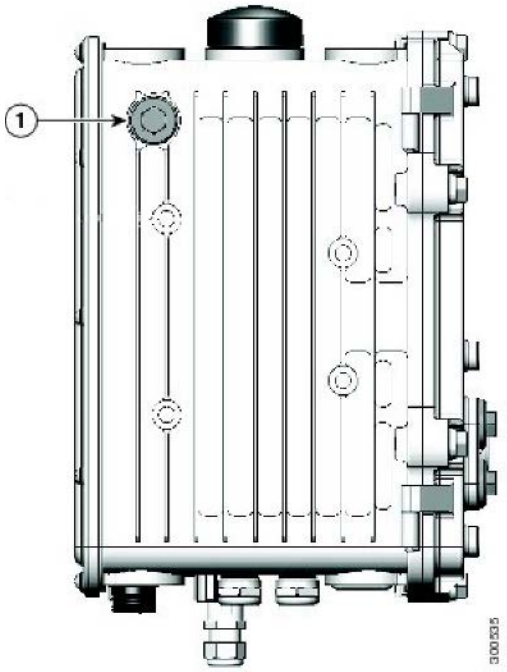
The CGR's chassis hardware features Door Sensor located inside the door, see the highlighted red item. The Door Sensor is a pressure-sensitive alarm switch that detects the opening and closing of the CGR's door and alerts the Field Network Director (FND)/ Cisco Grid Network Management System (CGNMS) FND/CGNMS operator to a potential security breach. When the switch detects the door has been opened or closed, it sends an event message to the CGR, which is stored in the router log file.

Figure 74 CGR's Door Sensor Location



2. Remove the 1/2" (13mm) Hex bolt plug, see item 1, located on the right hand side top of the CGR to gain access to the RJ45 connector.

Figure 75 Hex Bolt Plug - RJ45 Connector Location



3. Locate the Cisco DB9-RJ45 Serial Cable , and the USB-to-Serial Adapter Cable. Both are shown connected in figure. The left-most blue cable is the DB9-RJ45 Serial Cable and the right-most cable is the USB-to-Serial Adapter Cable.

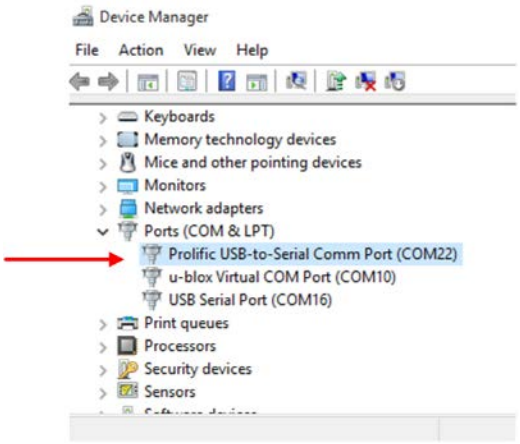
Figure 76 Cisco DB9-RJ45 Serial Cable and USB-to-Serial Adapter Cable

4. Plug the blue Cisco DB9-RJ45 Serial Cable, RJ45 end, into the CGR's RJ45 Connector, see figure, that you accessed located on the right hand side top of the CGR.

Figure 77 RJ45 Connector Location

5. Open the Windows Device Manager and locate the Prolific USB-to-Serial Comm Port and assign.

Figure 78 Windows Device Manager USB to Serial Com Port Selected



6. Open a new PuTTY session, see figure, and perform the following steps:

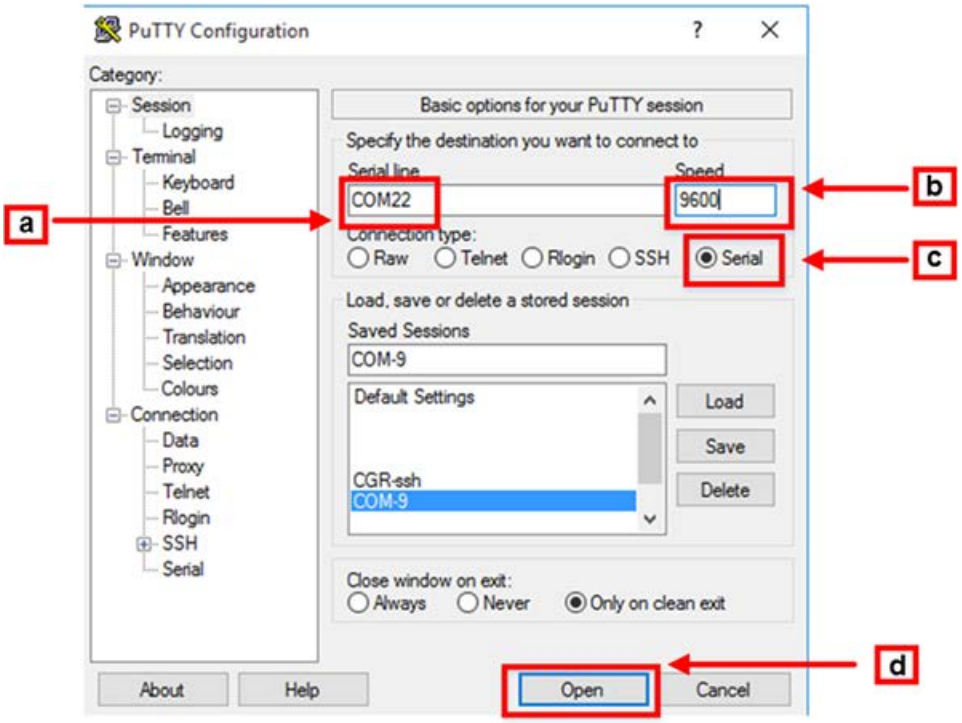
a. Enter the Com Port value in the Serial Line field, see item a, COM22 shown as an example.

b. Set the port Speed to 9600, see item b, in the Speed field. This is the baud rate.

c. Select Serial, see item c, in the Connection Type field.

d. Click the Open button, see item d.

Figure 79 PuTTY Configuration Screen



After the PuTTY application connects to the CGR, a console terminal appears. If you do not see a console terminal prompt, press the Enter key until the console terminal prompt appears. If you still do not get a prompt, exit the PuTTY application and switch the baud rate (Speed) to a new baud rate other than 9600. Make sure that the cable is attached and undamaged.

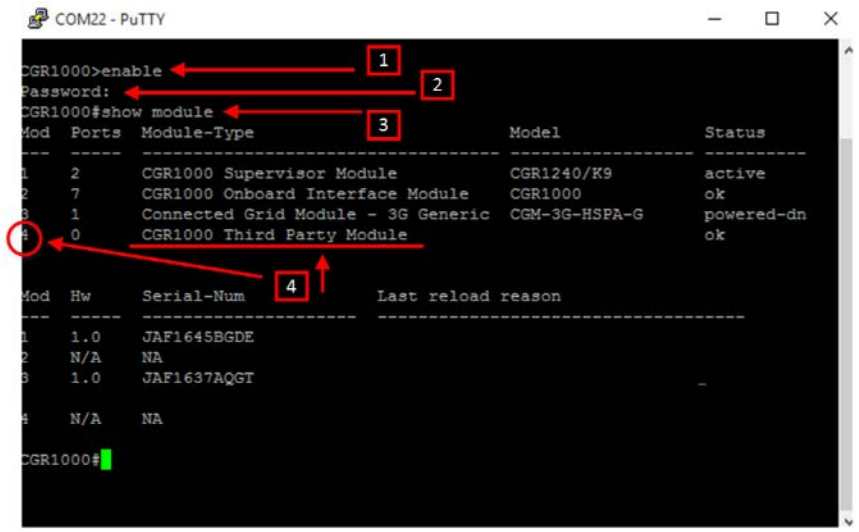
> **Important!** The CAM3S/CAM3M only fits into Slot 5 of the CGR. In this example, the existing CAM is located in Slot 4. If your existing CAM is located in Slot 5, the same procedure applies.

7. Type `enable` at the prompt, see item 1.
8. Type the console password and press the Enter key, see item 2.

> **Note:** The password for every CGR is different. The password does not appear on the screen.

9. Type `show module`, see item 3.
10. Confirm that the Itron CAM location is shown. For example, CGR 1000 Third Party Module, Mod 4 is Slot 4. The Status of ok indicates the CAM is powered and active.

Figure 80 PuTTY Screen - Confirm CAM Slot Location

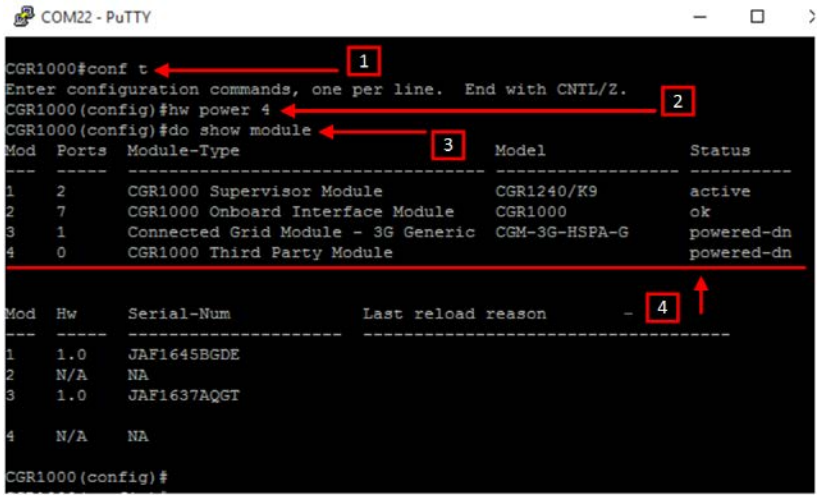


Important! The CAM3S/CAM3M only fits into Slot 5 of the CGR. In this example, the existing CAM is located in Slot 4. If your existing CAM is located in Slot 5, the same procedure applies.

11. Type `conf t` (configuration terminal). The prompt changes to (config), see item 1.
12. Type `hw power 4`. The CAM in Slot 4 in this example, see item 2.
13. Type `do show module`, see item 3.
14. If successful, the Status indicates `powered-dn` (powered down), see item 4.

Note: If powered down is not showing, verify the (config) shows in the prompt. If not, re-enter `conf t`. Once (config) shows in the prompt, issue the `hw power 4` commend a second time. Verify that the Status is `powered-dn` with another `do show module` command.

Figure 81 PuTTY Screen - Power Down CAM

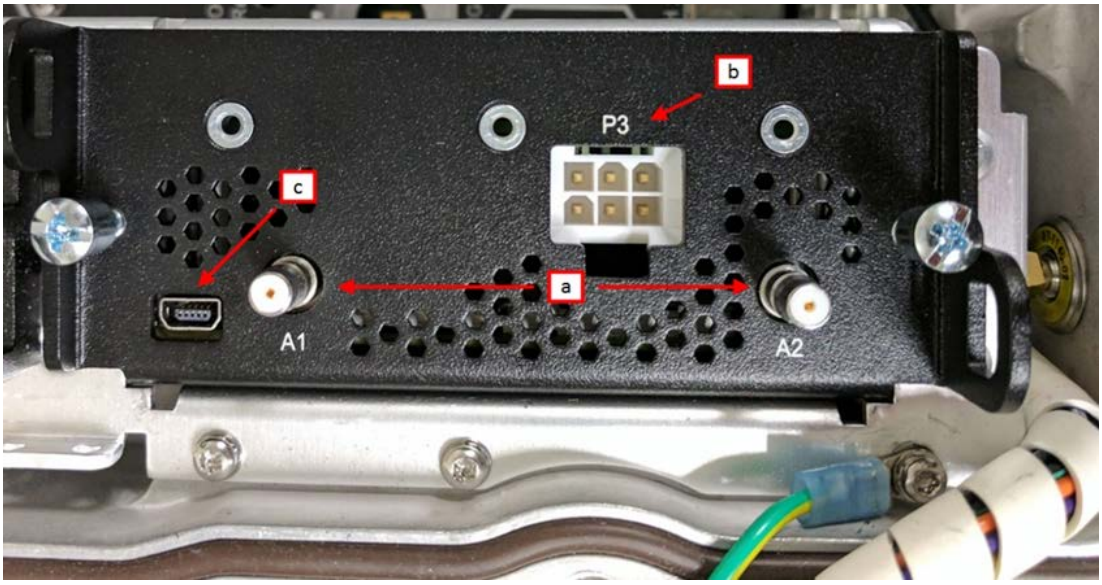


After you have powered down the existing CAM, verify its actual location.

> **Important!** The CAM3S/CAM3M only fits into Slot 5 of the CGR. In this example, the existing CAM is located in Slot 4. If your existing CAM is located in Slot 5, the same procedure applies.

15. Locate the actual Slot used by the existing CAM as identified using the PuTTY application.
16. Visually verify the Slot is occupied by the existing CAM. The CAM features include: 2 RF QMA Connectors, see item a, and 1 6-Pin PLC Connector that is 4.20mm size, see item b, 1 mini USB Connector, see item c. All located on the front.

Figure 82 CAM Features



After visually verifying the existing CAM, it may be removed from the CGR.

17. Remove the RF coaxial cable from the existing CAM's RF QMA Connector, see item 1.
18. If applicable, remove the PLC Signal Cable from the 6-Pin Connector, see item b.
19. Remove the two Phillips screws securing the CAM into the CGR, see item 2.
20. Grasp both of the handles, see item 3. And pull up and out to slide the CAM out of the CGR.

Figure 83 CAM Handles, Phillips Screws and RF QMA Connector Location

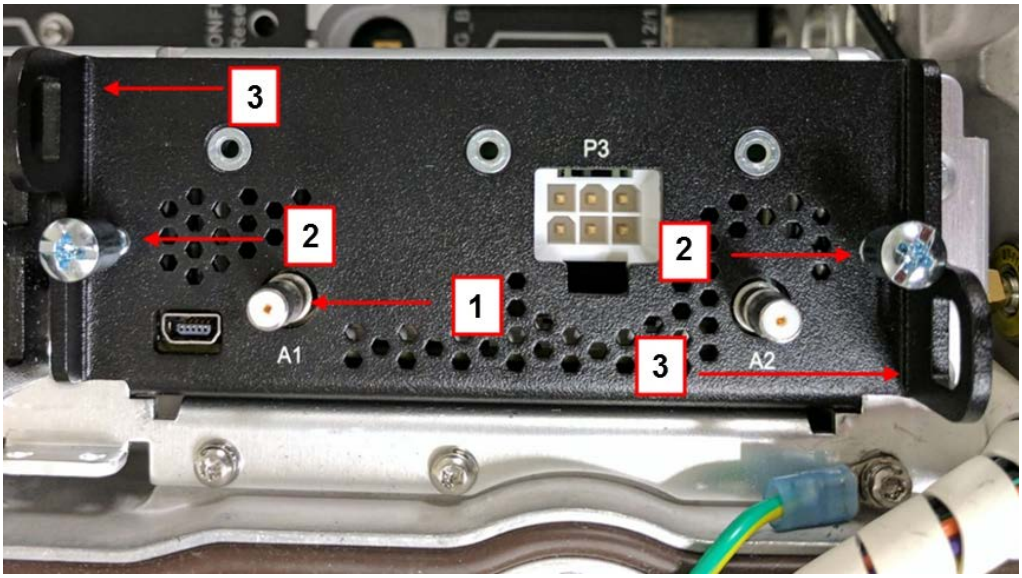


Figure 84 Sliding the Existing CAM Out of the CGR

21. Once the CAM is removed, remove the new CAM3S/CAM3M from its antistatic bag, and now place the CAM into the anti-static bag.

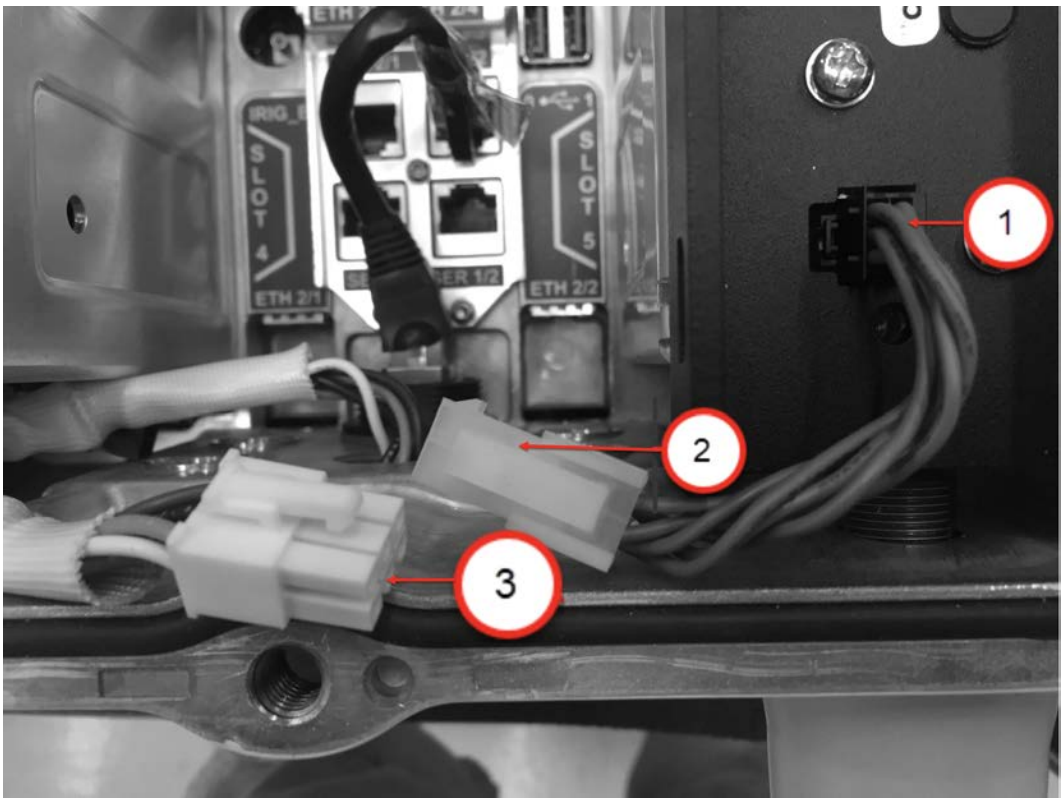
Installing the New CAM3S/CAM3M

1. Insert the new CAM3S/CAM3M into Slot 5. Lightly push down on the CAM3S/CAM3M's handles. You may need to vertically rock it to fully seat.

> ⚠ **Caution:** Do not force the CAM3S/CAM3M into place.

2. Tighten the two Phillips screws securing the CAM3S/CAM3M into the CGR. Torque the captive screws to approximately 10in-lb.
3. Insert the RF Cable onto the QMA Connector.
4. Insert the 2.5mm end of the Bulkhead Connector Assembly Extension Cable (P/N 590-0420-00) into the 6-Pin Connector, see item 1, on the front of the CAM3S/CAM3M. Insert the 4.20mm end, see item 2, into the PLC Signal Cable, see item 3. The Bulkhead Connector Assembly Extension Cable (P/N 590-0420-00) converts the 6-Pin from a 4.20mm to 2.5mm size.

Figure 85 Using the Bulkhead Connector Assembly Extension Cable



While replacing the CAM, the CGR may have automatically logged you out. The CGR automatically logs out the user after 10 to 15 minutes of inactivity. Log back on to the CGR and return to the (config) prompt as described earlier.

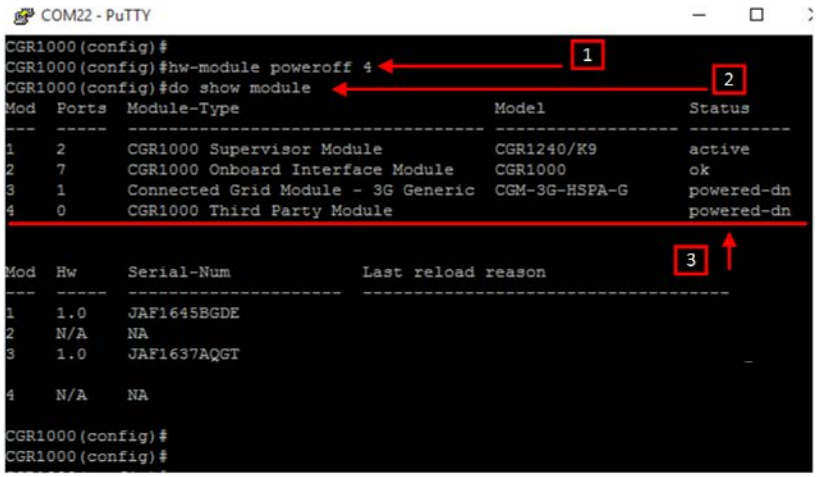
Important! The CAM3S/CAM3M only fits into Slot 5 of the CGR. In this example, the existing CAM is located in Slot 4. If your existing CAM is located in Slot 5, the same procedure applies.

5. At the config prompt, enter `hw-module power off 4` (Slot 4), see item 1.

Note: If the CAM is located in Slot 5, enter `hw-module poweroff 5`.

6. At the config prompt, enter `do show module`, see item 2.
7. Verify that the new Status indicates `powered-dn`, see item 3.

Figure 86 PuTTY Screen - CAM3M Power Up



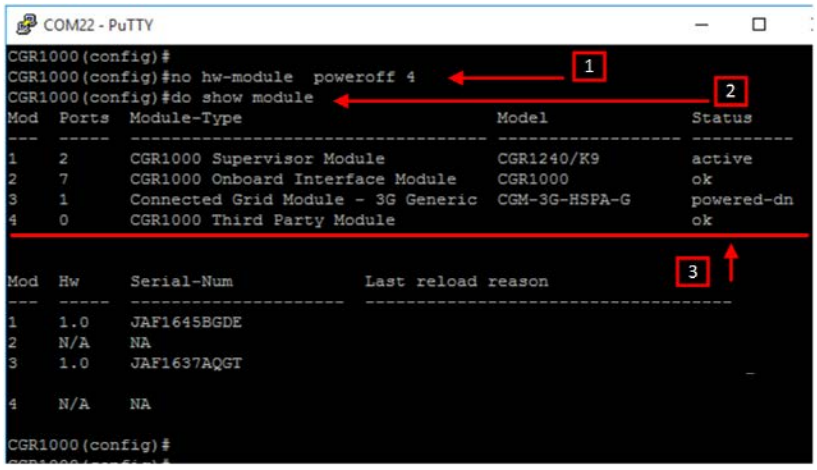
Important! The CAM3S/CAM3M only fits into Slot 5 of the CGR. In this example, the existing CAM is located in Slot 4. If your existing CAM is located in Slot 5, the same procedure applies.

8. At the config prompt, enter `hw-module power off 4` (Slot 4), see item 1.

Note: If the CAM is located in Slot 5, enter `hw-module poweroff 5`.

9. At the config prompt, enter `do show module`, see item 2.
10. Verify that the new Status indicates `ok`, see item 3.

Figure 87 PuTTY Screen -CAM Status

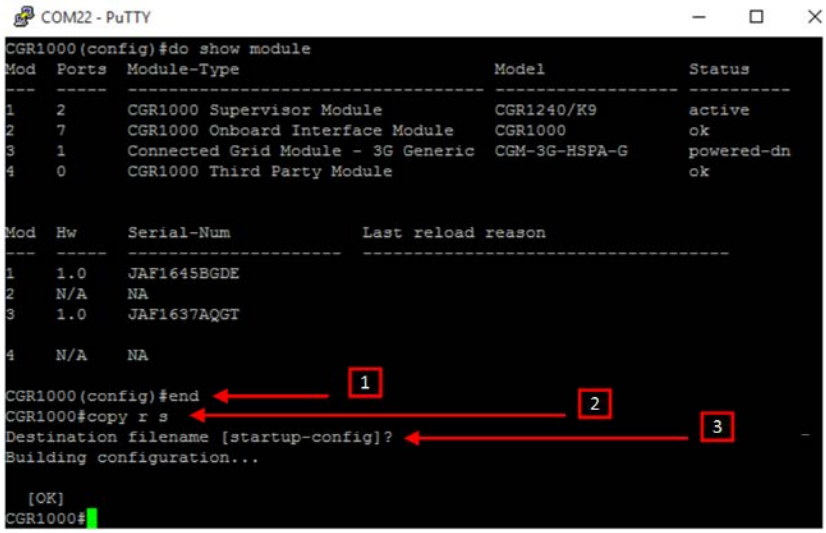


After PuTTY connects to the CGR, a console terminal appears. If you do not see a terminal prompt, press Enter until the terminal prompt appears. If you still do not get a prompt, exit PuTTY and switch to another baud rate other than 9600.

Note: Make sure that the cable is attached and undamaged.

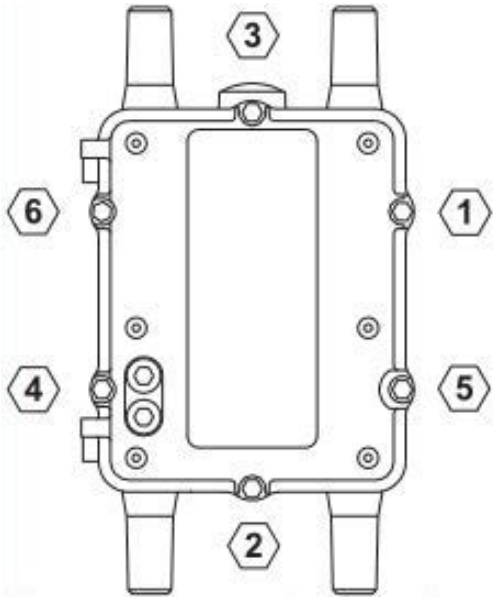
11. Type `enable` at the prompt.
12. Type the console password and press Enter.
13. At the config prompt, enter `end`to return to the original command prompt, see item 1.
14. Enter `copy r s` at the prompt, see item 2.
15. When prompted for Destination filename, enter start-up-config" and pres Enter, see item 3.
16. Type `exit` at the prompt.
17. Call your local Field Network Director (FND)/ Cisco Grid Network Management System (CGNMS) FND/CGNMA operator to confirm CAM3S/CAM3M operation. When operation is confirmed, you can unplug the console cable.

Figure 88 PuTTY Screen - CAM3M End



18. Close the door and secure by tightening the six captive bolts using the sequence shown in figure. Use a torque of 6 to 7ft-lb when tightening the bolts.

Figure 89 Six Captive Bolt Sequence to Tighten the CGR's Door



19. Remove the old CAM compliance label from the CGR. If peeling off the label is unsuccessful, use a permanent marker to mark through the FCC and IC IDs, as they are no longer valid.
20. Clean the surface and affix the regulatory label (included in the CAM3S/CAM3M installation kit) to the front bottom right of the exterior of the CGR's door shown in the figure inside the red circle.

Figure 90 Update the FCC Regulatory Label

The following line should be included on the label:

```
Contains: FCC ID EO9OW3
```

Changing the IPv6 Prefix Address of the CGR

> **Note:** The following example is for replacing an installed CAM1 with a CAM3M. However, changing the IPv6 Address also applies when: replacing CAM1 with CAM3S, replacing CAM3M with another CAM3M, and replacing CAM3S with another CAM3S.

When replacing a CAM1 with a CAM3M in a field deployed situation, you must change the IPv6 Prefix Address of the CGR at the Dynamic Host Configuration Protocol (DHCP) server to ensure proper communication with the Battery Powered Devices (BPDs) and Main Powered Devices (MPDs) within the Mesh.

If you do not change the IPv6 Address, after the CAM3M is installed, it retains the old Personal Area Network Identifier (PAN ID) and Service Set Identifier (SSID). When this occurs, communication is lost with the Battery Powered Devices (BPDs) and Main Powered Devices (MPDs) within the Mesh.

> **Important!** Ensure you note the SSID of the CAM3M before installation and verify the SSID after installation.

After the CAM1 has been powered down, verified using Putty, and physically removed from Slot 5 of the CGR. Then proceed to the following steps.

> **Note:** Steps 1 through 3 do not affect the service, and should be done anytime before replacing the CAM1 and upgrading the CGR.

1. Verify that each device in the CAM1 cell is registered with Field Network Director (FND) and in an Up state.
2. Upgrade the CGR's IOS to 15.8(3)M3b via the FND, using the following commands. Navigate to **Config** --> **Firmware Update**, select the **Firmware Update Group** in which the CGR resides, click the **Upload Image** button. From the **Upload Image** box, choose IOS-CGR from the **Select Type** drop-down box, choose cgr1000-universalk9-bundle.SPA.158-3.M3b from the **Select an Image** drop-down box, check the **Install IOx Node** from this bundle box and click the **Upload Image** button.
3. Create a new IPv6 prefix in DHCP server using either CPNR, or Infoblox as detailed here:

a. On the CPNR DHCP server, create a Prefix that uses the new IPv6 base address that is to be used by the CAM3 once it is provisioned. Assigning a new IPv6 base address causes the CAM3 to acquire a new IPv6 address and forces the CAM3 to acquire a new PAN ID and causes all of the devices in the Destination Oriented Directed Acyclic Graph (DODAG) to reauthenticate.

> **Note:** If you are unfamiliar with this process, please contact your Itron representative for assistance.

b. In Infoblox DHCP server, go to **Data Management** > **IPAM** and add the new IPv6 Network to be used by the CAM3M once it is provisioned.

> **Note:** If you are unfamiliar with this process, please contact your Itron representative for assistance.

> **Note:** The following steps affect your mesh service and should be executed just before starting to replace the CAM1 and upgrading the CGR.

4. On the CGR hosting the CAM1, remove the current version of Adaptive Communications Technology Daemon (ACTD) using the following commands:

```
show iox application actd
iox application uninstall actd
```

5. Delete the CAM1 from the FND before you add the CAM3M using the FND commands. Navigate to **Devices** > **Field Devices** > **Select CAM1** (check the box next to the CAM) > **More Action** > **Remove Devices**.
6. Import the CAM3M into the FND using the FND commands. Navigate to **Devices** > **Field Devices** > **Add Devices**. Browse to the directory where the Import file for the CAM3M is located, select it and click **Add**.
7. Open a Putty session to the CGR and power on the CAM1 using the following commands:

```
config t
 no hw-module poweroff 5
 end
```

> **Note:** Step 7, assumes the CAM1 is installed in slot 5 of the CGR.

8. Verify that the CAM1 has been powered down using the following commands:

```
show module
```

> **Note:** The command output should show that module 5 is `powered-dn`

9. Physically remove the CAM1 from the CGR.
10. Edit the existing CGR FND Import Common Separated Values (CSV) file and update it with the new IPv6 Prefix in the following fields: meshPrefixConfig, meshAddressConfig, gosGwyV6Address (or ioxGwyV6Address). Then update the CGR properties in FND using the following commands. Navigate to **Devices** > **Field Devices** > **Bulk Operations** > **Change Device Properties**. Browse to the directory where the updated CGR Import file for the CGR is located, select it and click **Change**.
11. Open **Config Properties** tab in **Devices** > **Field Devices** > **CGR Device** info page to verify that Prefix Config, IP Address Config and IOx Node Gateway IPv6 Address is changed reflecting the new IPv6 Prefix.

12. Install the CGR's IOS to 15.8(3)M3b via the FND, using the following commands. Navigate to **Config** > **Firmware Update**, select the **Firmware Update Group** in which the CGR resides, click the **Install Image** button.

> **Note:** It may take one hour to complete, then FND should display UPGRADE_COMPLETE.

13. Check the new IPv6 prefix is updated in the CGR configuration using the CGR CLI `show ipv6 int L0`. Under Global unicast address(es) verify that the listed IPv6 address and subnet were derived from the new IPv6 base address that was entered into the CNR, or Infoblox in Step3.

> **Note:** You can also verify the IPv6 Prefix is updated in the FND **CGR Device info** > **Running Configuration** tab.

14. Physically install the CAM3 into the slot in the CGR where the CAM1 was installed.
15. From a Putty session to the CGR, power on the CAM3 using the following commands:

```
config t
no hw-module poweroff 5
end
```

16. From a Putty session to the CGR, type the following command to verify that IOx is registered with the CGR:

```
Show iox host list
```

EXAMPLE OUTPUT

```
ZTDGLO-FAR361#show iox host list

Host Name IPV4 Address IPV6 Address IOX Client Version
ZTDGLO-FAR361-GOS-1 10.8.178.58 fe80::4603:a7ff:fe45:90ac 0.4
------------------------------------------------------------------------
```

17. Upgrade the new ACTD via the FND, using the following ioxclient commands:

```
ioxclient.exe pr a FAR361
ioxclient.exe application list
ioxclient.exe application install actd <dir path>\app-actd-ver-4.5.8.tar
ioxclient.exe application list
ioxclient.exe application activate actd
ioxclient.exe application start actd
ioxclient.exe application list
```

> **Note:** You can upgrade the ACTD using FDN. First, navigate to **Config** > **Firmware Update**, select the **Firmware Update Group** in which the CGR resides, click the **Upload Image** button. From the **Upload Image** box, choose **ACTD-CGR** from the **Select Type** drop-down box, choose app-actd-ver4.5.8.tar from the **Select an Image** drop-down box, and click the **Upload Image** button. Second, once the upload is completed the **Install Image** button is available, click **Install Image** button and wait until it is completed.

18. Verify that a mesh network forms under the newly installed and configured CAM3.
19. From FND, Verify that the CAM3M is properly registered with the FND with the new PAN ID and that all endpoints are visible in the routing tree.

Updating the Data Rate

The type of firmware loaded on to the CAM3S and the Battery Powered Devices (BPDs) at the factory dictates the CAM3S and BPDs data rate.

- Historically CAM modules in the Star deployment were shipped with a 10kbps default data rate, and these CAM modules communicated with Battery Powered Devices (BPDs) at this 10kbps data rate in a Star configuration. The default communication data rate remains at 10kbps in CAM3S and the BPDs shipping from the factory. Thus, unless you state otherwise, you receive a CAM3S with a 10kbps Data Rate.
- If your intention is to order CAM3S modules and the BPDs that operate at the 25kbps data rate, then they should be ordered with the GSR 5.1 firmware set. CAM3S modules or the BPDs that are ordered with the GSR 5.1 firmware set not only operate at 25kbps data rate, but they also have Network Security feature turned “OFF” on them.

For any existing field deployments, in the Star configuration, that need to be upgraded to operate at 25kbps data rate, then perform the following steps:

- If the existing deployment is functioning using CAM1 modules, then these CAM1 modules need to be replaced with CAM3S modules with GSR 5.1 firmware set loaded on them.
- If the existing deployment is functioning using CAM3S modules, but at 10kbps data rate, then the firmware of these CAM3S modules need to be upgraded to the GSR 5.1 firmware.
- Firmware of all the associated BPDs in the deployment should also be upgraded to the GSR 5.1 firmware.

Firmware selections for the 25kbps data rate are:

- For CAM3S: 428935-004 GSR 5.1 STAR - Network Security OFF & 25K Data Rate
- For BPDs (500G, 500W, OWR-GRD): Please refer to the *OpenWay Riva GSR 5.1 System Release Notes* (815-0181-00*), Intelis Gas Meters Release Notes* (815-0172-00), *500W ERT® Modules Release Notes* (815-0182-00), and *500G ERT® Modules Release Notes* (815-0220-00).

A Specifications

The following table lists the technical specifications.

Table 91 CAM3S/CAM3M Technical Specifications

Type	Items	Details	
Connectors	RF	1 - antenna port, QMA female	
	PLC Single	1 - 6-Pin male, 2.5mm size	
Communications	Frequency Hopping Spread Spectrum	Depending on regulatory domain and mode For USA/Canada: 64 or 512 channels Number of channels will vary for other countries and regions.	
	RF Band	915MHz ISM	
	RF Operational Bands (Riva)	Frequency Range*	902 to 928MHz
		Radio Output Power*	500mW to 1W
	RF Modulation Options	802.15.4g OFDM option 3	200kbps to 600kbps Max. Data Rate
		802.15.4g FSK	10kbps to 150kbps Max. Data Rate for initial CAM3S/CAM3M
		Long Range Mode DSSS	12.5kbps Max. Data Rate
	OpenWay Mesh Modulation Options	OFDM Option3	600kbps
		OFDM Option3	200kbps
		FSK	150kbps
		DSSS Long Range Mode	12.5kbps
	PLC Modulation Options	D8PSK	200kbps Max. Data Rate
		DQPSK	165kbps Max. Data Rate
		DBPSK	100kbps Max. Data Rate
		ROBO	34kbps Max. Data Rate
Physical Dimensions	CAM3S/CAM3M	13.7cm H x 12.0cm W x5.4cm D, (5.4" H x 4.7" W x 2.1" D)	

Table 91 CAM3S/CAM3M Technical Specifications (continued)

Type	Items	Details
Operating Conditions	Temperature	-25°C to +70°C (-40°F to +158°F)
	Relative Humidity	5% to 95% non-condensing
	Shock	IEC 68-2-31, operating, 50mm
	Vibration	IEC 68-2-31 to levels from IEC 721-3-2
Non-Operating Conditions	Temperature	-25°C to +70°C (-40°F to +158°F)
	Relative Humidity	5% to 95% non-condensing
	Altitude	3014m (10,000 feet); maximum operating temperature is derated with increasing altitude per IEEE 1613a-2008
Weight	CAM3S/CAM3M	365g, (12.88oz)
Agency Approvals	FCC parts 1, 2, and 15, Class B	
	Canada ISED (Innovation, Science and Economic Development) Compliance	
	ISED RSS 102, RSS 210, RSS 247 and RSS GEN	
	Or other regulators depending on country or region the CAM3 is configured for.	
* Frequency Range and Radio Output Power vary depending on what country or region the CAM3 is configured for.		

B RF Filter Installation

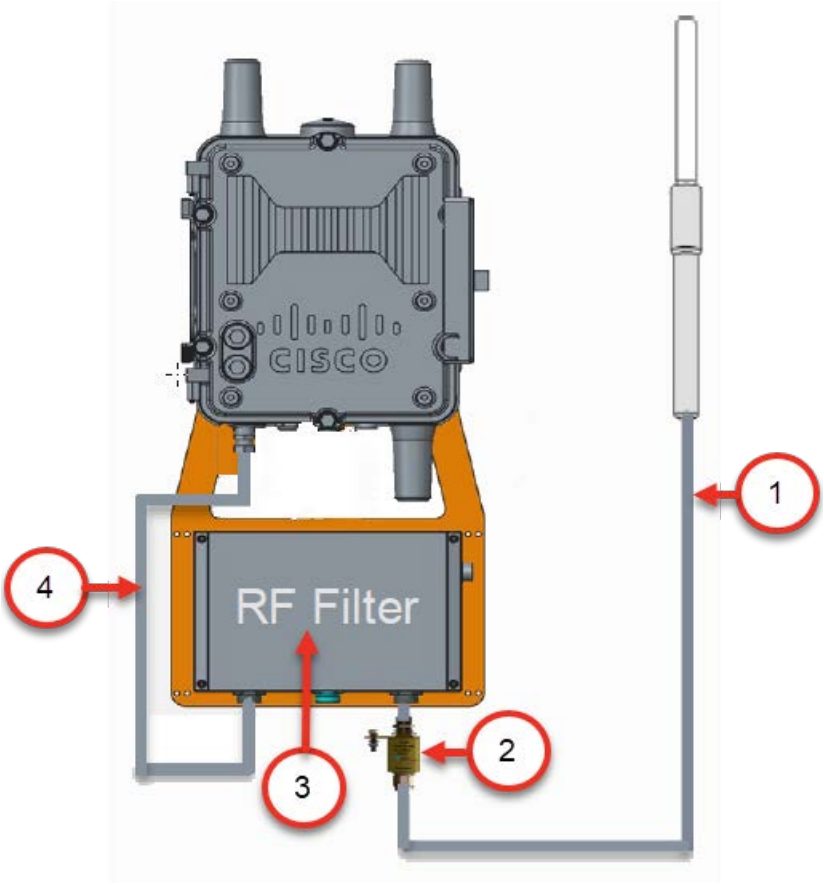
This section describes installing a RF Filter to an existing pole-mounted CGR using the remote antenna option. To install the CGR, refer to the CGR installation procedure in the *Cisco 1240 Connected Grid Router Hardware Installation Guide.*

> **Note:** Depending on the geographic region where the CGR is installed, a RF filter may be required with a remote antenna. A RF filter is required for installations in Australia, and other locations. A RF filter is not required for installations in North America. See **Australia Applications**.

Standard height remote antennas are mounted directly above the CGR (3–5 feet above the CGR) and connected to the RF Filter with a remote RF cable. Remote antennas can be mounted at an extended height above the CGR. The coaxial RF cable from the RF Filter to an antenna mounted at an extended height will be locally sourced to the required length needed for specific antenna mounting locations (½" superflex is recommended for extensions less than 35 feet).

This figure shows the remote antenna and RF filter connected to a CGR. Specifically, shows the RF Cable, item 1, that connects between the RF Filter and the Antenna, the Lightning Arrestor, item 2, the RF Filter, item 3 and the RF Cable, item 4, that connects between the CGR's N Connector and the RF Filter.

Figure 92 RF Filter Installation Configuration



Placement Guidelines for Remote Antenna

Antenna placement is one of the most important factors in determining overall system performance. Careful consideration must be given to proper antenna placement. Follow these general guidelines when determining the ideal location for a remote-mounted remote antenna:

- Mount the antenna vertically.
- Mount the antenna in a location where there is a clear, unobstructed, 360-degree view of the horizon. The antenna receives and transmits in all directions. Objects like building walls, nearby metal surfaces, or other obstructions might interfere with the proper operation of the antenna.
- Do not mount the antenna on a rooftop where nearby buildings are higher than the installation location.
- Do not mount the antenna near existing RF radiating antennas. If existing RF radiators are nearby, the horizontal separation distance to the radiator must be a minimum of 30 meters and/or three meters of vertical separation. In instances where nearby RF radiators are present, conduct an inter-modulation interference study to evaluate the potential for

interference and any effects it may have on system performance. Consult your Itron systems engineer for more information.

- Height is preferred for optimal performance. Itron recommends installing the antenna no higher than 30 meters.

> **Caution:** Do not install a 5.5/5.15 dBi antenna directly on the CGR. Antenna installation directly on the CGR will compromise mechanical integrity and will not meet the compliance requirements. See **915MHz 5.5dBi Remote Antenna Kit** and **915MHz 5.15dBi Remote Antenna Kit**.

> **Caution:** Do not install a 8.15 dBi antenna directly on the CGR. Antenna installation directly on the CGR will compromise mechanical integrity and will not meet the compliance requirement for a loss of 2.2dB (for any exceptions, ensure you read this entire section), between the RF filter and the 8.15 dBi antenna. See **915MHz 8.15dBi High Gain Remote Antenna Kit 915MHz 8.15dBi High Gain Remote Antenna Kit** .

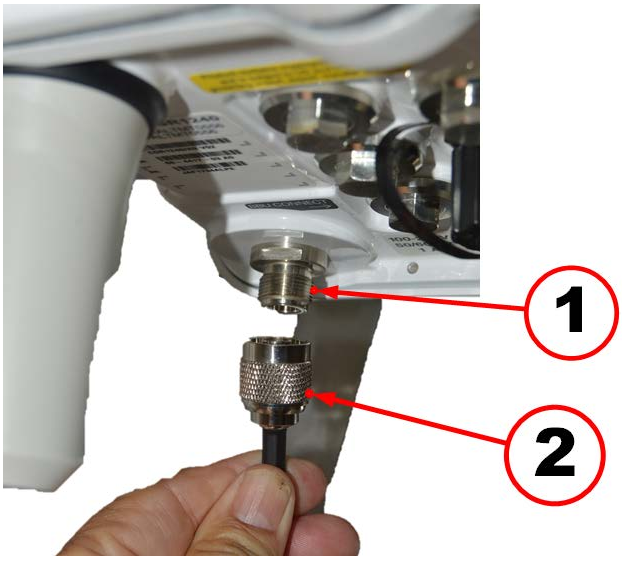
A side arm antenna installation must be done if the antenna is mounted where it does not have an unobstructed 360-degree view. Refer to the following guidelines for a side arm antenna installation:

- The minimum standoff distance is 60 centimeters, where the interfering structural members are 10 centimeters or less in diameter and spaced more than two meters apart.
- For structural members between 10 and 25 centimeters in diameter, use a sliding scale of 0.6 to 1.5 meters. (For example, a 60-centimeter standoff at 10-centimeter diameter to a 150-centimeter standoff at 25-centimeter member diameter.)

Connecting a RF Filter

1. Connect one end of the RF Cable, see item 2, coming from the RF Filter to the N Connector, see item 1, located on the bottom of the CGR enclosure.

Figure 93 RF Filer to CGR Connection



2. Connect the other end of the RF Cable, see item 1, to the N Connector on the bottom of the RF Filter.

Figure 94 RF Filer to CGR Connection

Australia Applications

To meet regulator requirements in Australia for the CAM3S or CAM3M in either a Star or Mesh deployment, ensure you comply with either of the following configurations:

1. Use the 915MHz 2.8dBi WPAN antenna on the CGR for CAM3M.
2. Use the 915MHz 5.5dBi or 915MHz 8.15dBi remote antenna with the RF Filter for CAM3S.

Caution: For Australia the required minimum loss between the CGR/CAM3 and 8.15dBi antenna is 2.2dB in addition to the required RF Filter and the supplied cable between the CGR and the RF Filter.

Additionally, Itron recommends, you select a backhaul cellular provider that does not operate in the passband of the CAM3S/CAM3M, as this results in desensing the CAM's receiver as the two antennas are so close together.

Glossary

A

Adaptive Communications Technology (ACT)

A technology that incorporates both radio frequency (RF) and power line communication (PLC) onto one chip set. Adaptive Communications Technology (ACT) allows an endpoint to dynamically change its communication media and modulation to the fastest and most reliable available, based on its location, network operating conditions, and the criticality of the application data.

Advanced Meter

An electric meter that is capable of measuring and recording usage data in time differentiated registers, including hourly or such interval as is specified by regulatory authorities. The meter allows electric consumers, suppliers and service providers to participate in all types of price-base demand response programs. Also, the meter provides other data and functionality that address power quality and other electricity service issues.

B

Battery Backup Unit (BBU)

The battery provides power to the CGR if AC power is lost or not available. The CGR supports up to three units.

Battery Powered Device (BPD)

Devices powered by long-lasting batteries, as opposed to mains powered devices (MPDs), which receive power from a wired electrical connection.

C

Connected Grid Router (CGR)

A Cisco® field area router (FAR) used as a network router in OpenWay systems. The CGR is a network router that serves as a data collection point for meters participating in the Cisco® radio frequency (RF) Mesh.

Connected Grid Router (CGR) Adaptive Communication Technology (ACT) Module (CAM)

A module that enables meters and grid devices equipped with Adaptive Communications Technology (ACT) to communicate with each other while dynamically switching between radio frequency (RF) and power line communication (PLC).

F

Field Deployment Manager (FDM)

A meter/endpoint installation and workforce management software solution. FDM supports safe, efficient deployment and maintenance of meters, endpoints, and metering network equipment; automates endpoint programming; electronically captures and validates installation data, reducing errors and site revisits; ensures network connectivity; captures field images and GPS coordinates; and creates work orders for service and quality audit work orders. It includes optional invoicing and inventory management modules.

Firmware

The computer program stored in a read-only memory (ROM) or an erasable programmable read-only memory (EPROM) integrated circuit.

I

Internet Protocol (IP)

Refers to the core protocol that defines the basic packet structure for transport over the internet.

Internetwork Operating System (IOS)

Cisco IOS (Internetwork Operating System) is a software made by Cisco for use on various hardware devices such as networking routers and switches. A command-line interface governs a series of “trains” defined as tools for delivering Cisco software to specific platforms.

L

Lighting Arrestor

A device used to protect the insulation and conductors of the system from damaging effects of lightning.

M

Mesh Network

A network topology in which there are nodes that participate in the relaying of information from other nodes, generally in a peer-to-peer environment. This would include protocols that support self-organizing, self-discovery networks. It provides the greatest amount of redundancy, so in the event that one node fails, network traffic can be redirected to any other node.

O

OpenWay Operation Center - Collection Manager (OWOC-CM)

An OpenWay Operations Center (OWOC) application. Collection Manager (CM) manages high-volume, secure communications to support the configuration and firmware management of electric, gas, and water devices, data collection, and remote service connect and disconnects. It provides the ability to manage recurring job scheduling and optional data storage for operational reporting. It incorporates integrated mapping support to provide geospatial context of devices and key performance indicator reporting (KPIs) for read rates and non-communicating meters.

P

Power Line Communications (PLC)

A communication system that translates data, voice, and video over electric power lines.

R

Radio Frequency (RF)

Refers to a wireless electromagnetic signal used as a form of communication. Radio waves are a form of electromagnetic radiation with identified radio frequencies.

S

Smart Meter

A term used to refer to an advanced meter. See Advanced Meter.

Star Network

A star network is an implementation of a spoke–hub distribution paradigm in computer networks. In a star network, every host is connected to a central hub. In its simplest form, one central hub acts as a conduit to transmit messages.

System LED

The System Light-Emitting Diode (LED) signals AC power is applied when the green LED is lite.

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