OpenWay® Riva CAM3
Installation Guide

Technical
Communications

knowledge to shape your future

Identification

OpenWay® Riva CAM3 Installation Guide

7 November 2018

TDC-7086-000

Copyright

© 2018 Itron, Inc. All rights reserved.

Confidentiality Notice

The information contained herein is proprietary and confidential and is being provided subject to the condition that (i) it be held in confidence except to the extent required otherwise by law and (ii) it will be used only for the purposes described herein. Any third party that is given access to this information shall be similarly bound in writing.

Trademark Notice

Itron is a registered trademark of Itron, Inc.

All other product names and logos in this documentation are used for identification purposes only and may be trademarks or registered trademarks of their respective companies.

Suggestions

For more information about Itron or Itron products, see www.itron.com.

If you have questions or comments about the software or hardware product, contact Itron Technical Support Services.

Contact

- Email: support@itron.com
- Itron Access: https://support.itron.com
- Telephone Itron Technical Support North America: 1-877-487-6602

For technical support contact information by region, go to www.itron.com and select your country and language.

Contents

Chapter 1 Overview....1
Regulatory Compliance.... 1

Chapter 2 Installation Kits....5
CAM3 Installation Kit.... 5
RF Filter Kit.... 5
External Antennas....5
915 MHz 5.5 dBi External Antenna Kit....5
915 MHz 8.15 dBi External Antenna Kit....6
Remote-Mount High-Gain (8.15 dBi) 915 MHz Antenna for CGR/CAM3.... 6
915 MHz Antenna Specifications....7

Chapter 3 CAM3 Installation for RF-Only Applications.... 9
Disconnecting CGR Power.... 9
Installing the CAM3 for RF-Only Applications.... 12

Chapter 4 ACTD Application Installation.... 15

Chapter 5 External Antenna Installation.... 17
External Antenna Only.... 17
Disconnecting the CGR Cables.... 18
Unmounting the CGR....21
Removing the CGR Mounting Bracket....21
Installing the CGR Mounting Bracket....22
Installing the CGR.... 23
Reconnecting the CGR Cables....24
Assembling the Antenna.... 26
External Antenna with RF Filter....28
Disconnecting the CGR Cables.... 30
Unmounting the CGR....33
Removing the CGR Mounting Bracket....33
Installing the RF Filter Mounting Bracket....34
Installing the CGR Mounting Bracket....35
Installing the CGR.... 36
Connecting the RF Filter Cables....37
Reconnecting the CGR Cables....38
Assembling the Antenna.... 40
Lightning Arrestor.... 42
Weatherproofing the RF Connections....43

Chapter 6 Field Replacement....46
Requirements....46
Uninstalling the Existing CAM....46
Opening the CGR....47

Door Sensor..... 47
Connecting to the CGR..... 48
Confirming the CAM Slot Location..... 50
Powering Down the CAM..... 51
Verifying the CAM Location..... 51
Removing the CAM..... 52
Installing the New CAM3..... 53
Powering Up the CAM3..... 53
Confirming the CAM3 Status..... 54
Ending the CGR PuTTY Connection..... 55
Closing the CGR..... 55

Chapter 1 Overview

This document provides the procedure necessary to install the CGR ACT Module 3 (CAM3) in the 1000 Series Cisco® Connected Grid Router (CGR). In addition to the physical installation of the Adaptive Communications Technology (ACT) module, a procedure for loading the ACTD application into the CGR Guest Operating System (GOS) is also provided. The ACTD application serves as a communication gateway between the CGR operating system (IOS) and the CAM3. A procedure for the installation of an external antenna is also included. An external antenna is required to ensure optimal radio performance when the CGR is deployed in a star configuration for battery-powered-device (BPD) deployments.

This document is intended for field installers who are familiar with the CGR, its function, and operation. The information in this document is complementary to the base CGR installation procedures and addresses the addition of the CAM3/ACTD and the external star network antenna.

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

Regulatory Compliance

Labeling

The following information appears on labels on the exterior of the CGR.

- FCC ID: LDKALTMT0556
- IC: 2461B-ALTMT0556
- Model: CGR1240

Contains:

- FCC ID: EO9OW3
- IC: 864A-OW3
- Model: OW3
- Model Name: CAM3
- FCC ID: N7NMC7355
- IC: 2417C-MC7355
- Model: MC7354

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.
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.*
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 an 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 previously 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.

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.

DANGER: 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 will void 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.

Chapter 2 Installation Kits

This section lists the installation kits available to aid installation.

Notice: 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. Only authorized Itron personnel may open the ERT Gateway. Unauthorized access or modifications to the ERT Gateway will void the warranty.

CAM3 Installation Kit

The following items are included in the CAM3 installation kit:

- 1 CGR ACT module
- 1 Regulatory label

RF Filter Kit

The following items are included in the RF Filter installation kit:

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

External Antennas

This equipment has been designed and approved per FCC rules to operate with these CAM antennas. The required antenna impedance is 50Ω. To reduce potential radio interference to other users, the antenna type and its gain were chosen so that the equivalent isotropically radiated power (EIRP) is not more than that permitted for successful communication.

⚠ **Caution**: Antennas not approved by Itron are strictly prohibited for use with this device. Installing the CAM with an unapproved antenna will void the product warranty and can void the user's authority to operate this equipment.

915 MHz 5.5 dBi External Antenna Kit

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

- 915 MHz 5.5 dBi 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 5.5 dBi antenna directly on the CGR/CAM3. Antenna installation directly on the CGR/CAM3 will compromise mechanical integrity and will not meet the compliance requirements.

915 MHz 8.15 dBi External Antenna Kit

The following items are included in the External Antenna installation kit (KIT-0018-007):

- 915 MHz 8.15 dBi gain antenna
- Antenna mounting kit:
  - Thermal ring
  - Lightning Arrestor
  - Mounting bracket (BAM1005)

⚠ **Caution**: Do not install an 8.15 dBi antenna directly on the CGR/CAM3. Antenna installation directly on the CGR/CAM3 will compromise mechanical integrity and will not meet the compliance requirement for a loss of 3.0 dB between the CAM3 and the 8.15 dBi antenna.

Remote-Mount High-Gain (8.15 dBi) 915 MHz Antenna for CGR/CAM3

The following coax specification table lists several options for coaxial cable that can be used with the remote-mount high-gain 915 MHz antenna. When a high-gain antenna is installed for the CAM3, follow the FCC set limits for the maximum transmit power of the CAM3. To meet these limits, CAM3 with FCC ID number EO9OW3 must have a minimum of 3.0 dB of loss between the CGR and the antenna. Allow 0.1 dB loss for each connector. If required, you may use a 1 dB attenuator (similar to the Pasternack PE7002-1) to attain the desired power at the antenna.

⚠ **Caution**: Do not install an 8.15 dBi antenna directly on the CGR with a CAM3. Antenna installation directly on the CGR will compromise mechanical integrity and will not meet the compliance requirement for a loss of 3 dB between the CGR and the 8.15 dBi antenna.

	Total Coaxial Length		
Coax Specification	**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.

915 MHz Antenna Specifications

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

Specification	**915 MHz Antenna**			
Itron part number	**KIT-0049-001**	**KIT-0073-001**	**KIT-0018-007**	**Cisco ANT-MP2-I-OUT-M**
Frequency range	902-928 MHz	902–928 MHz	902–928 MHz	698–960 MHz
Maximum gain	5.15 dBi	5.5 dBi	8.15 dBi	2.8 dBi
Horizontal beamwidth	Omnidirectional	Omnidirectional	Omnidirectional	Omnidirectional
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

Specification	915 MHz Antenna			
Itron part number	**KIT-0049-001**	**KIT-0073-001**	**KIT-0018-007**	**Cisco ANT-MP2-I-OUT-M**
Wind load @ rated wind speed	n/a	n/a	57 lbs.	n/a

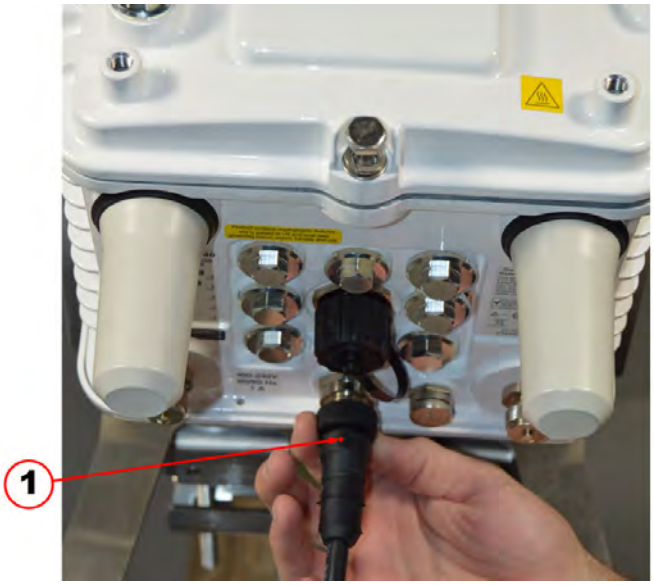
Note: To reduce potential radio interference to other users, select an antenna type with gain such that the equivalent isotropically radiated power (EIRP) is not more than permitted for successful communication.

Chapter 3 CAM3 Installation for RF-Only Applications

The following procedures apply to CAM3 installations for RF mesh applications only.

Disconnecting CGR Power

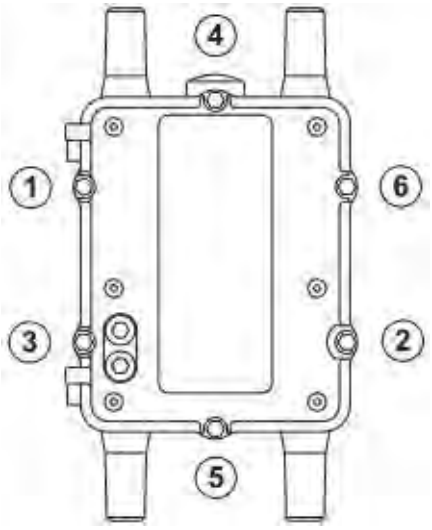
1. Disable the power at the circuit or power supply to which the router AC power cable is connected.
2. Disconnect the router AC power cable from the AC power connector on the base of the router enclosure.



Callout Number	Description
1	CGR power cable

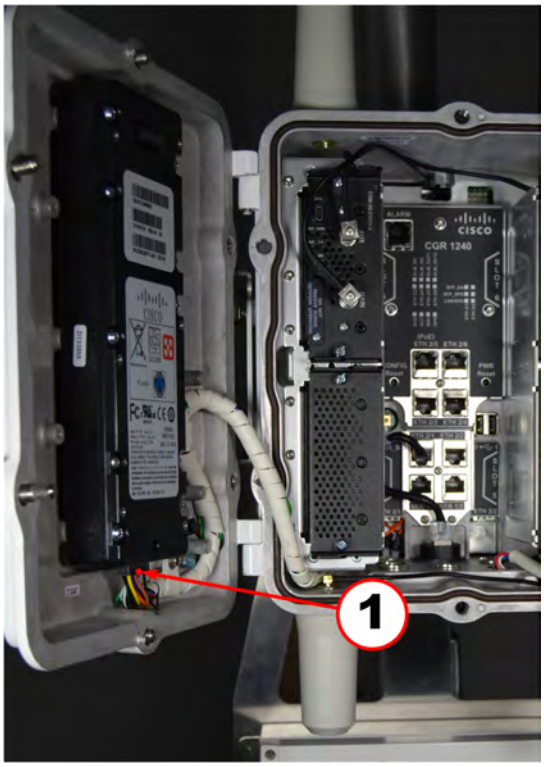
3. Loosen the six captive bolts that secure the hinged CGR door using the sequence shown below and swing the door fully open.

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 bolt is loosened.



The chassis hardware features a pressure-sensitive alarm switch that detects the opening and closing of the router door and alerts the CGNMS/FND operator to a potential security breach. When the switch detects that the door has been opened or closed, it sends an event message to the router, which is stored in the router log file.

4. Disable the Backup-Battery Unit (BBU) by disconnecting the BBU Harness Cable.



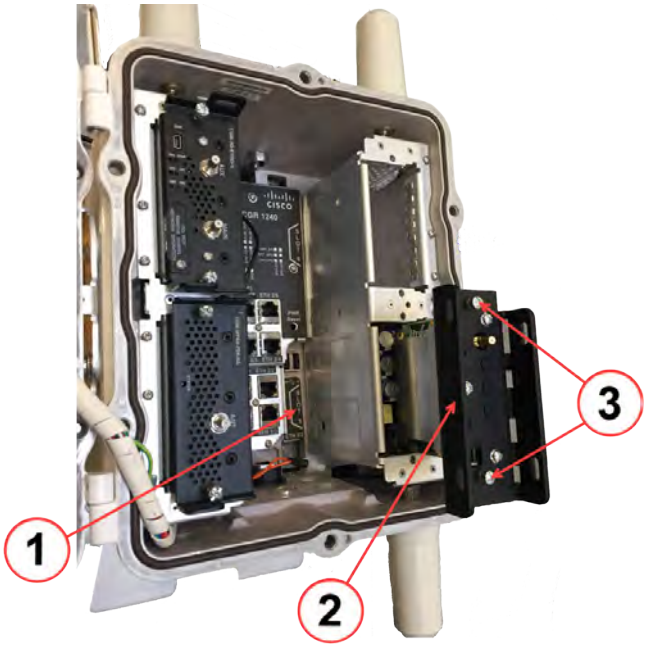
Callout Number	Description
1	Backup-Battery Connector

Note: For routers using Cisco IOS, you must disable the BBU by using the IOS CLI and then disconnecting the BBU harness cable. You can only disable the BBU by terminal or console access on routers using Cisco CG-OS.

5. Check the SYS LED. To confirm that the router is powered off, verify that the SYS LED is off. The SYS LED is on the bottom exterior of the router enclosure.

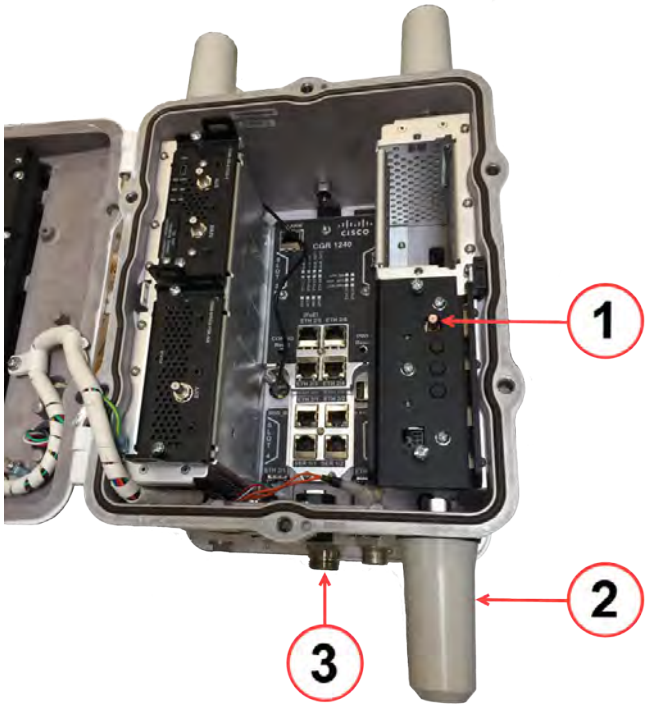
Callout Number	Description
1	System LED

Installing the CAM3 for RF-Only Applications



Callout Number	Description
1	Slot #5 identifier label
2	CAM3
3	CAM3 retaining screws

1. Locate slot #5 by the slot identifier label 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 CAM3 into slot #5 of the CGR. Ensure that the CAM3 is oriented so that the connectors on the rear of the CAM3 are aligned with those in the slot #5. Gently press the CAM3 until its card-edge connector is firmly seated into the connector in the CGR.
4. Tighten the retaining screws on the front of the CAM3, securing the module in place. Use either a #2 Phillips or a 9/32" flat-blade screwdriver.

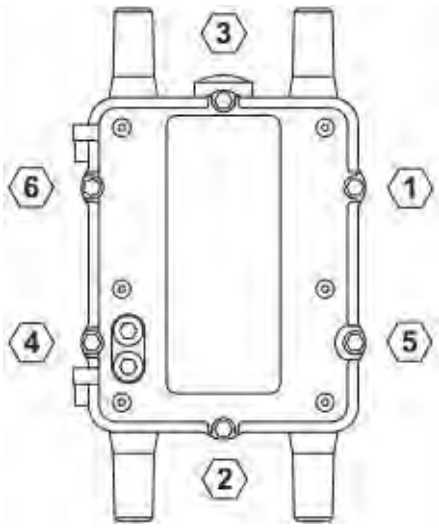


Callout Number	Description
1	Antenna cable connection
2	WPAN antenna
3	External antenna connector

5. Secure the black antenna wire from the appropriate antenna to the bottom antenna connector on the front of the CAM3.

   Note: The CGR is shipped with two antenna connection options: the WPAN antenna and an external mounted antenna. Internal antenna cables are provided for both options. You must select the internal antenna cable that connects to the antenna (WPAN or external remote mounted) being used for this installation and connect it to the antenna connection on the CAM3.

6. Ensure that the antenna cable is routed so that it does not interfere with door closure. Use a single plastic cable tie to secure the antenna cable to the tie loop on the front of the CAM3.
7. Close the door and secure it by tightening the six captive bolts using the sequence shown below. Use a torque of 6–7 foot-pounds when tightening the bolts.



8. Affix the regulatory label (included in the CAM3 installation kit) to the door of the CGR, as shown in the following image.

Chapter 4 ACTD Application Installation

This procedure assumes that the CGR is properly installed and configured. The ACTD application serves as a communication gateway between the CGR and the IOS and the CAM3. This procedure also assumes that the user has a basic understanding of networking such as setup and use of SCP servers and how to find IP addresses.

For further information about setting up the CGR refer to *Cisco CGR1000 IOx Application Development Cook Book .*

1. Log on to the CGR.
2. Enable GOS within CGR.

```
#Enable access to GOS
conf t
line 1/4
transport input all
end
copy r s
```

3. Log on to the GOS via the console using the same IP address that you use to create an SSH connection to the IOS. Telnet into port 2070 to access the GOS.

   Note: At this point you will have two sessions open: one from the IOS and one from the GOS.

4. Get hostname, IPv4, and IPv6 addresses from the IOS session.

```
(OK)
OW2-FAR### show iox host list
Host Name    IPV4 Address    IPV6 Address
    IOX Client Version
-----------------------------------------------
<gos-hostname>,<gos-ipv4>,gos-ipv6>
    0.1
-----------------------------------------------
```

5. Enable the SSH on the GOS from the IOS.

   `OW2-FAR### IOX host exec enablessh <gos-hostname>`

6. Reset the password.

   `iox host exec "resetpw itron" OW2-FAR###-GOS-1`

7. Set up an SCP server on the same network as the CGR.
8. Ensure that your computer has access to the SCP server.
9. Get the current IPv4 address.
10. Ping your IP address to ensure network connectivity.

    `OW2-FAR###` ping <IPv4 address>

11. Transfer the ACTD image to CGR flash.

```
copy flash:<filename> scp://root@<GOS-IPv4>//software/downloads/
<filename>
```

12. Get the IPv4 address of the GOS.

```
show iox host list
```

13. Transfer the ACTD image from flash to the GOS.

```
copy flash: <filename>
OW2-FAR### scp://<root ip address>/<pathname>/<gos-hostname> flash:
```

14. Install ACTD.

```
iox application install <filename> <ipv6 address>
```

15. Start ACTD.

```
OW2-FAR### iox application start actd
```

16. Verify that the application is running.

```
show iox application list
```

Chapter 5 External Antenna Installation

An external antenna is required to ensure optimal radio performance when the CGR is deployed in a Star configuration for battery powered device (BPD) deployments. Standard height external antennas are mounted directly above the CGR (3–5 feet above the CGR). External antennas can be mounted at an extended height above the CGR.

This chapter describes two processes for external antenna installation:

- External Antenna Only
- External Antenna with RF Filter

Note: The requirement for the RF Filter is dependent on the geographic territory where the CGR is installed and used. The RF Filter is not required for North American deployments.

External Antenna Only

This section describes the installation of an external antenna in territories where an RF Filter is not required.

Placement

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 external antenna:

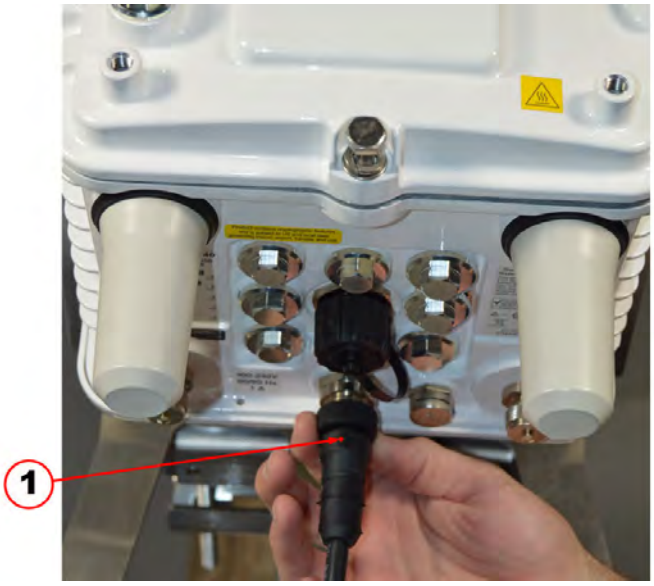
- Mount the antenna vertically.
- Mount the antenna in a location where there is a clear, unobstructed, 360-degree view of the horizon. The antenna receives and transmits in all directions. Objects such as building walls, nearby metal surfaces, or other obstructions might interfere with the proper operation 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 recommends installing the antenna no higher than 30 meters.

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).

Disconnecting the CGR Cables

1. Disconnect the power source from the CGR and remove the power cable.



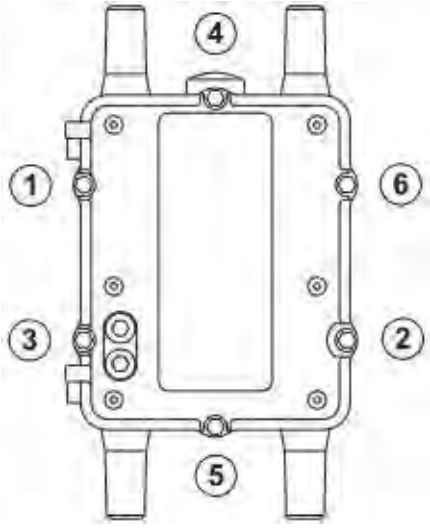
Callout Number	Description
1	CGR power cable

2. Check the SYS LED. To confirm that the router is powered off, verify that the SYS LED is off. The SYS LED is on the bottom exterior of the router enclosure. If the SYS LED is still on, the BBU must be disconnected after the CGR door is opened.

Callout Number	Description
1	System LED

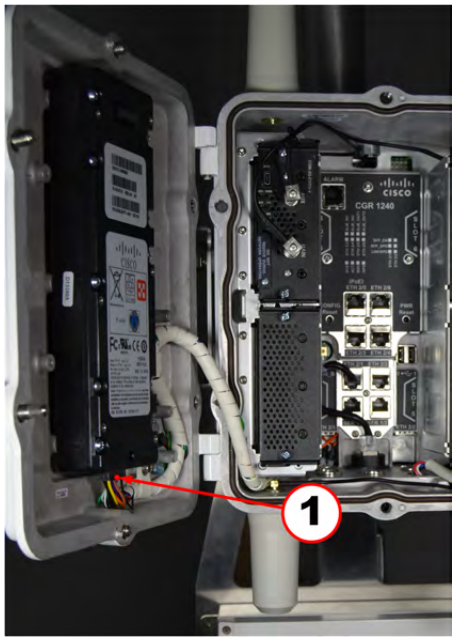
3. Loosen the six captive bolts that secure the hinged CGR door using the sequence shown below and swing the door fully open.

   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 bolt is loosened.



   The chassis hardware features a pressure-sensitive alarm switch that detects the opening and closing of the router door and alerts the CGNMS/FND operator to a potential security breach. When the switch detects that the door has been opened or closed, it sends an event message to the router, which is stored in the router log file.

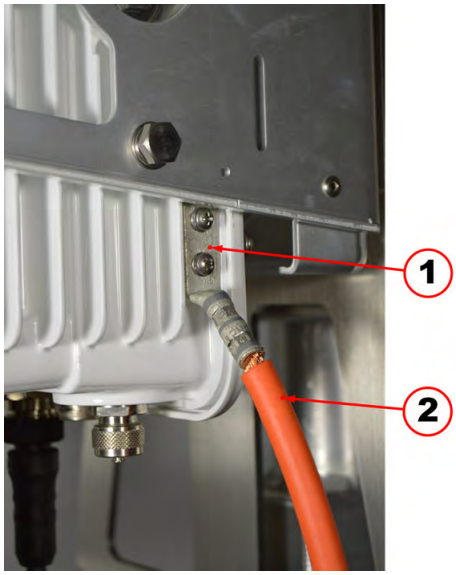
4. Disable the Backup-Battery Unit (BBU) by disconnecting the BBU Harness Cable.



Callout Number	Description
1	Backup-Battery Connector

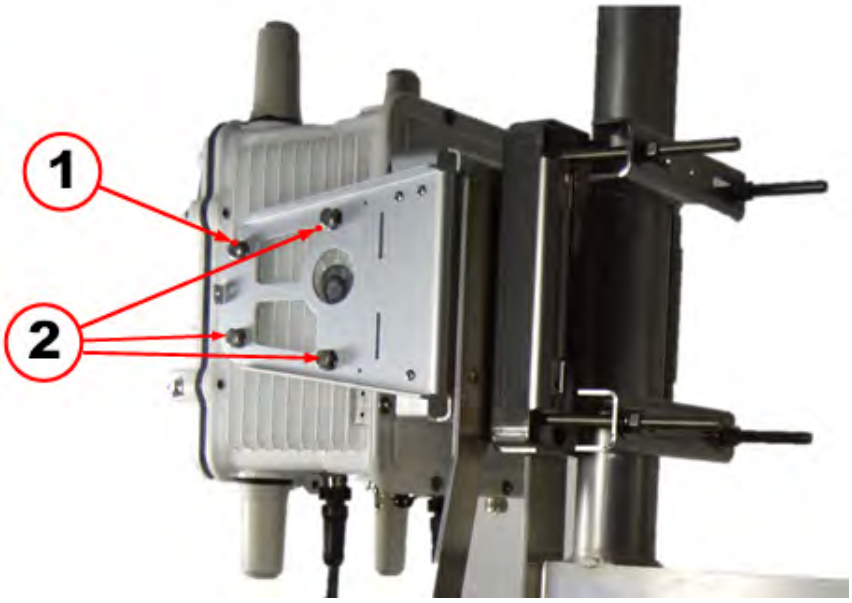
Note: For routers using Cisco IOS, you must disable the BBU by using the IOS CLI and then disconnecting the BBU harness cable. You can only disable the BBU by terminal or console access on routers using Cisco CG-OS.

5. Remove the two screws from the ground lug and disconnect the ground cable from the CGR.



Callout Number	Description
1	Ground lug
2	CGR 6 AWG ground cable

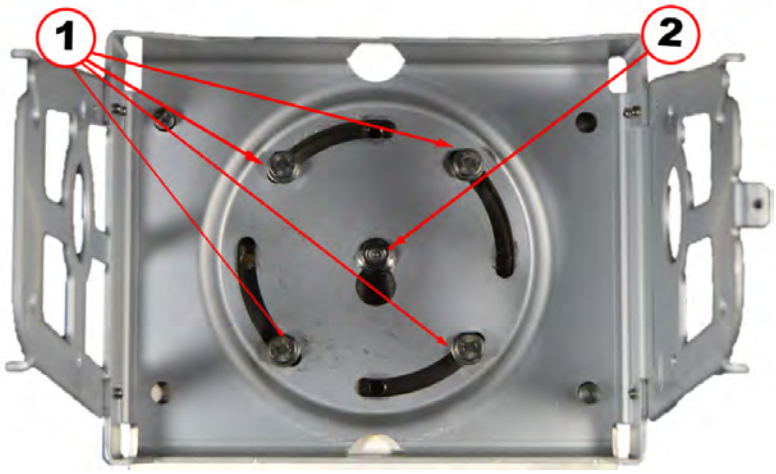
Unmounting the CGR



Callout Number	Description
1	Mounting bolt to be loosened
2	Mounting bolts to be completely removed

1. Loosen the top front hex head bolt on each side, but do not completely remove.
2. Remove the two rear and lower front hex head bolts on each side of the CGR mounting bracket.

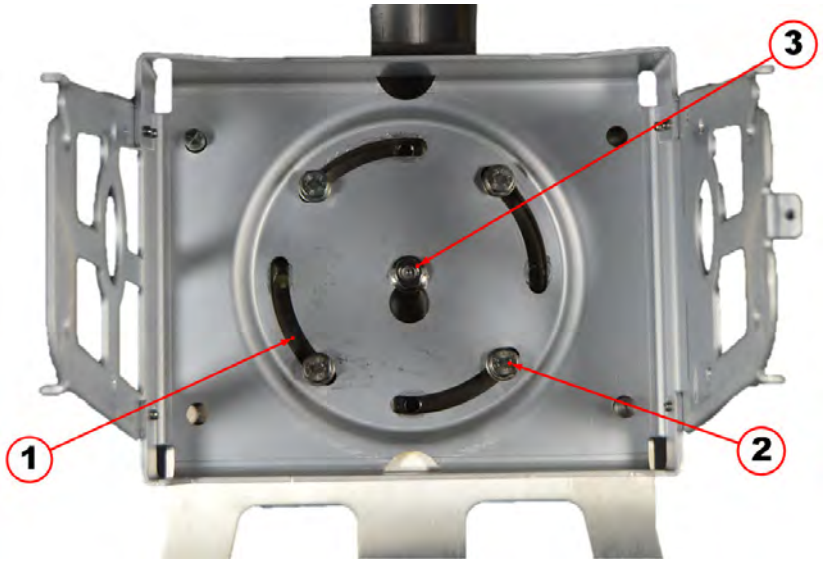
Removing the CGR Mounting Bracket



Callout Number	Description
1	Hex head mounting bolts
2	Center stud with self-locking hex nut

1. Remove the four hex head bolts and set aside. Longer bolts are required to accommodate the coupler unit bracket and are provided in the ACT Coupler unit installation kit.
2. Loosen the center self-locking hex nut to allow the bracket to slide upward and off the center stud.

Installing the CGR Mounting Bracket



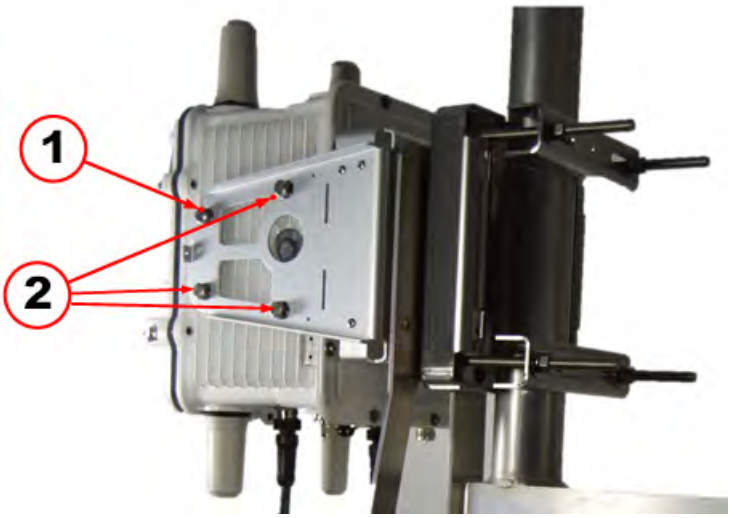
Callout Number	Description
1	Alignment slots
2	4 Hex head mounting bolts (8mm x 25mm) supplied with the installation kit
3	Center stud with self-locking hex nut

1. 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 unit to be rotated either clockwise or counterclockwise for alignment purposes. Inserting the mounting bolts as shown allow the unit to rotate counterclockwise. Inserting all four bolts in the holes at the other end of the slot allows the unit to be rotated clockwise.
2. Adjust the alignment of the CGR to the desired orientation and tighten the four mounting bolts and the hex nut on the center stud. Use a torque of 6–7 foot-pounds when tightening the bolts and nut.

Installing the CGR

1. Mount the CGR to the mounting bracket by sliding the mounting bolt in the top front position on each side of the CGR into the corresponding slot on the mounting bracket.



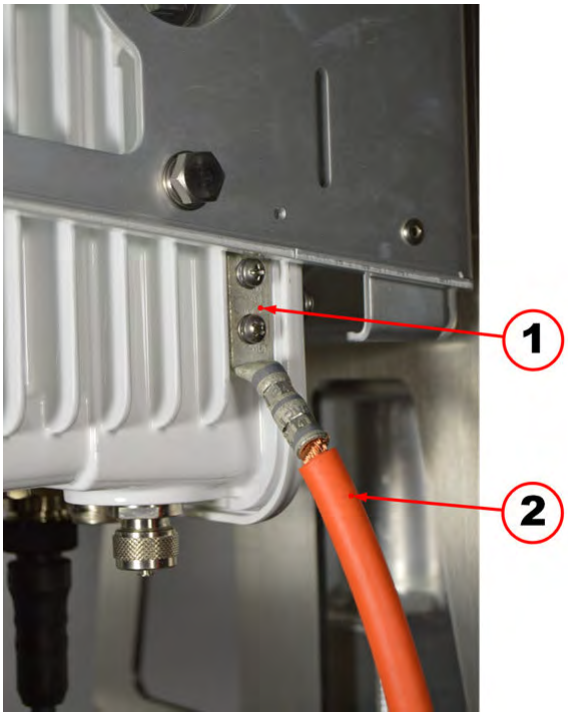
Callout Number	Description
1	Mounting bolt not completely removed
2	Mounting bolts to be completely removed

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

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

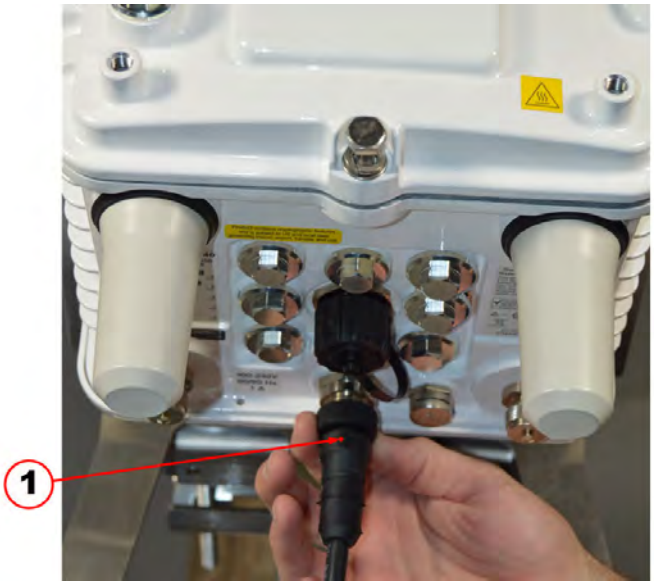
3. Tighten all mounting bolts. Use a torque of 6–7 foot-pounds when tightening the bolts.

Reconnecting the CGR Cables



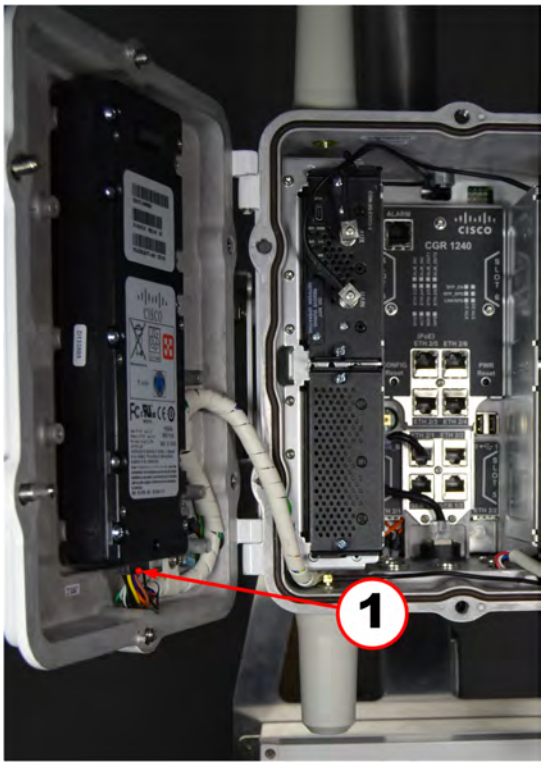
Callout Number	Description
1	Ground Lug
2	CGR 6 AWG ground cable

1. Re-insert the two screws to the ground lug and re-connect the ground cable to the CGR.



Callout Number	Description
1	CGR power cable

2. Re-connect the power source to the CGR and connect the power cable.



Callout Number	Description
1	Backup-Battery Connector

3. Reconnect the Backup-Battery Unit (BBU) by connecting the BBU Harness Cable.

   Note: For routers using Cisco IOS, you must disable the BBU by using the IOS CLI and then disconnecting the BBU harness cable. You can only disable the BBU by terminal or console access on routers using Cisco CG-OS.

4. Check the SYS LED. To confirm that the router is powered on, verify that the SYS LED is on. The SYS LED is on the bottom exterior of the router enclosure.

Assembling the Antenna

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

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

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

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

5. Slide the antenna holder over the silicone seal.

6. Make sure the antenna holder and the adapter plate are flush on all sides. See the following illustrations.

7. Attach the antenna to the mounting bracket.
   a) Push the 1¾-inch bolt through the antenna holder, the remote mount adapter plate, and the mounting bracket.
   b) Place the flat washer on the bolt.
   c) Place the split washer on the bolt.
   d) Add a drop of anti-seize lubricant to the nut and attach the nut to the bolt.

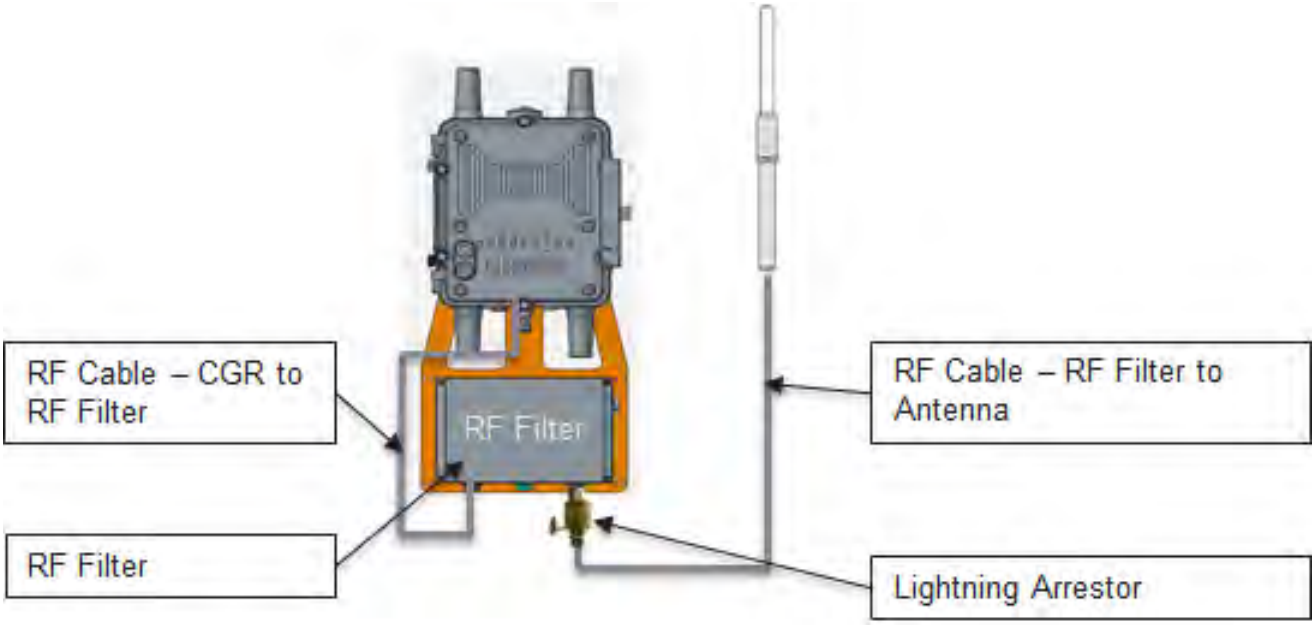
8. Replace the black rubber bumper on the end of the antenna.

External Antenna with RF Filter

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

An external antenna is required to ensure optimal radio performance when the CGR is deployed in a Star configuration for battery powered device (BPD) deployments. Standard height external antennas are mounted directly above the CGR (3–5 feet above the CGR) and connected to the RF Filter with an external RF cable. External antennas can be mounted at an extended height above the CGR. The coax RF cable from the RF Filter to the antenna will be locally sourced to the required length needed for specific antenna mounting locations (½" superflex is recommended for runs less than 35 feet).

The following illustration indicates how the external antenna and RF filter are connected to a CGR.



Placement

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 external 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 dBi antenna directly on the CGR/CAM3. Antenna installation directly on the CGR/CAM3 will compromise mechanical integrity and will not meet the compliance requirements.

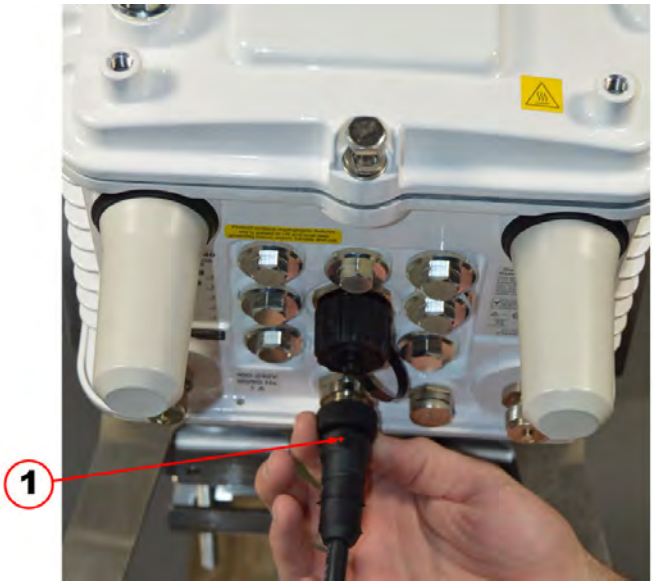
⚠ **Caution**: Do not install an 8.15 dBi antenna directly on the CGR/CAM3. Antenna installation directly on the CGR/CAM3 will compromise mechanical integrity and will not meet the compliance requirement for a loss of 3.0 dB between the CAM3 and the 8.15 dBi antenna.

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.)

Disconnecting the CGR Cables

1. Disconnect the power source from the CGR and remove the power cable.



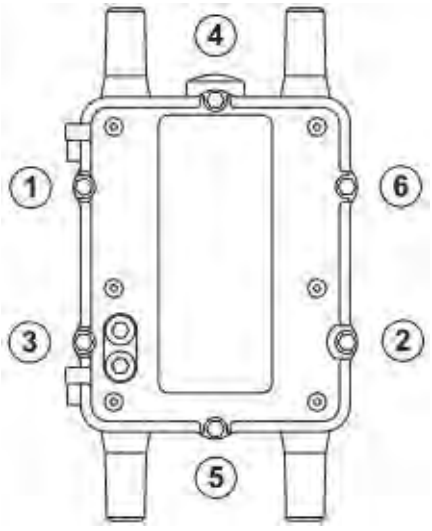
Callout Number	Description
1	CGR power cable

2. Check the SYS LED. To confirm that the router is powered off, verify that the SYS LED is off. The SYS LED is on the bottom exterior of the router enclosure. If the SYS LED is still on, the BBU must be disconnected after the CGR door is opened.

Callout Number	Description
1	System LED

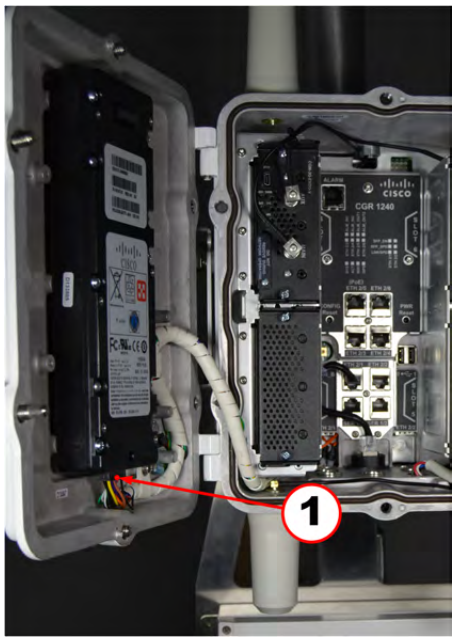
3. Loosen the six captive bolts that secure the hinged CGR door using the sequence shown below and swing the door fully open.

   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 bolt is loosened.



   The chassis hardware features a pressure-sensitive alarm switch that detects the opening and closing of the router door and alerts the CGNMS/FND operator to a potential security breach. When the switch detects that the door has been opened or closed, it sends an event message to the router, which is stored in the router log file.

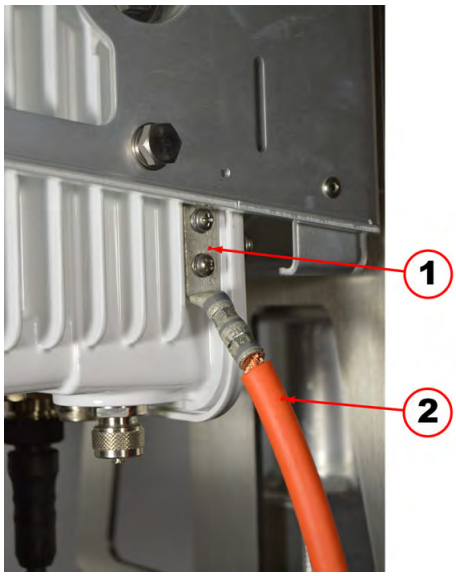
4. Disable the Backup-Battery Unit (BBU) by disconnecting the BBU Harness Cable.



Callout Number	Description
1	Backup-Battery Connector

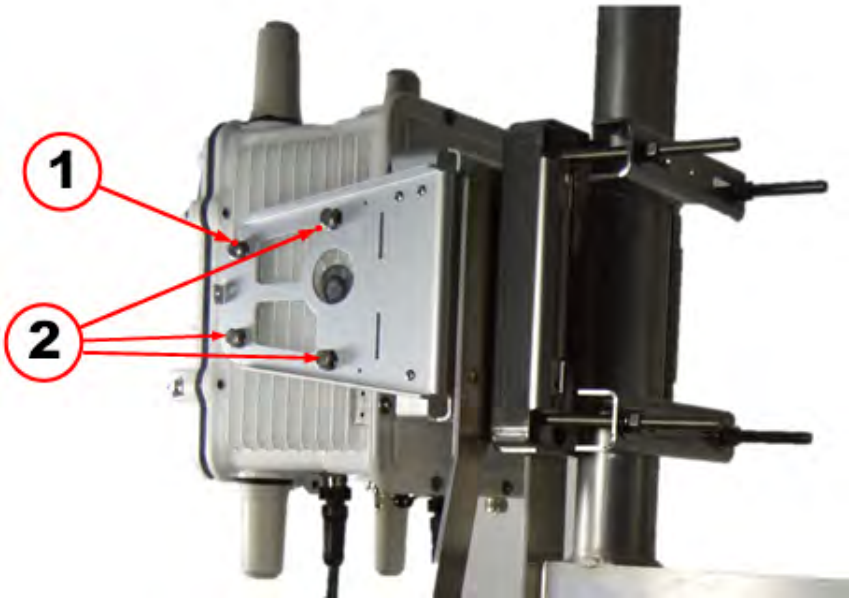
Note: For routers using Cisco IOS, you must disable the BBU by using the IOS CLI and then disconnecting the BBU harness cable. You can only disable the BBU by terminal or console access on routers using Cisco CG-OS.

5. Remove the two screws from the ground lug and disconnect the ground cable from the CGR.



Callout Number	Description
1	Ground lug
2	CGR 6 AWG ground cable

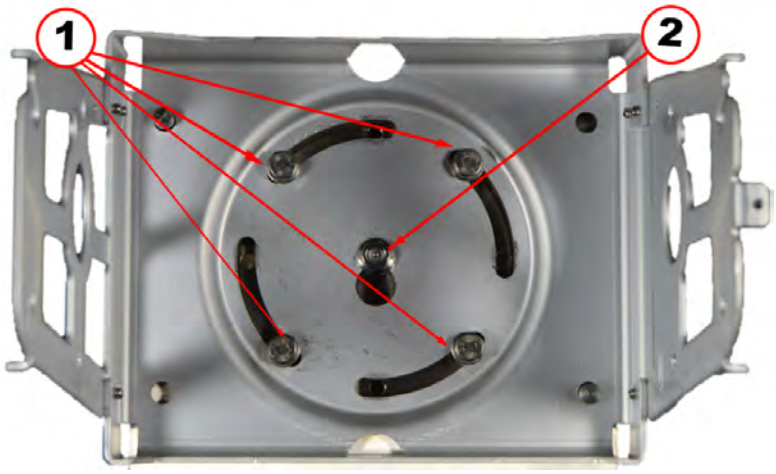
Unmounting the CGR



Callout Number	Description
1	Mounting bolt to be loosened
2	Mounting bolts to be completely removed

1. Loosen the top front hex head bolt on each side, but do not completely remove.
2. Remove the two rear and lower front hex head bolts on each side of the CGR mounting bracket.

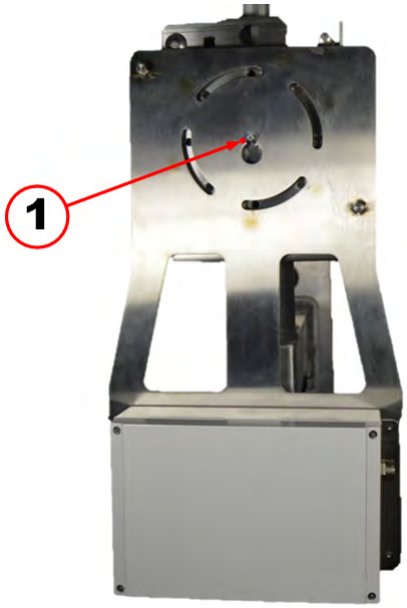
Removing the CGR Mounting Bracket



Callout Number	Description
1	Hex head mounting bolts
2	Center stud with self-locking hex nut

1. Remove the four hex head bolts and set aside. Longer bolts are required to accommodate the coupler unit bracket and are provided in the ACT Coupler unit installation kit.
2. Loosen the center self-locking hex nut to allow the bracket to slide upward and off the center stud.

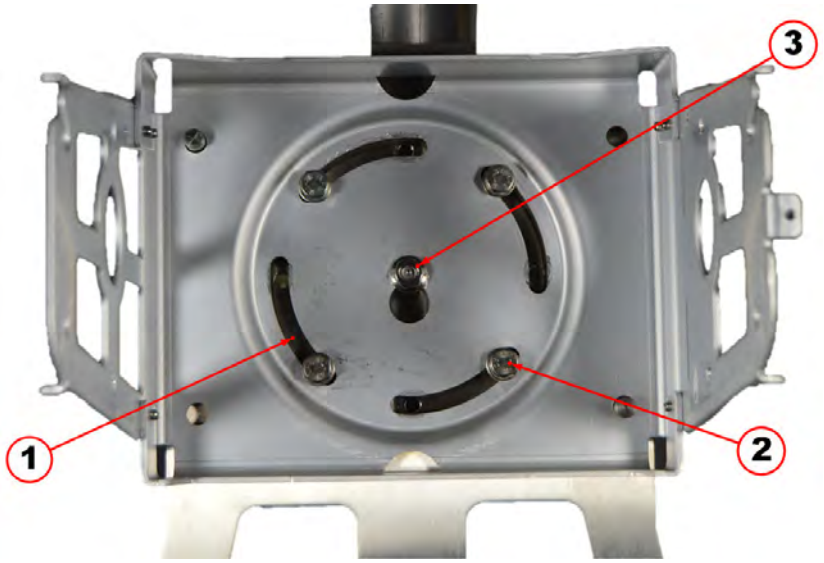
Installing the RF Filter Mounting Bracket



Callout Number	Description
1	Center stud with self-locking hex nut

- Slide the RF filter mounting bracket keyhole slot over the center stud on the pole mount base plate.

Installing the CGR Mounting Bracket



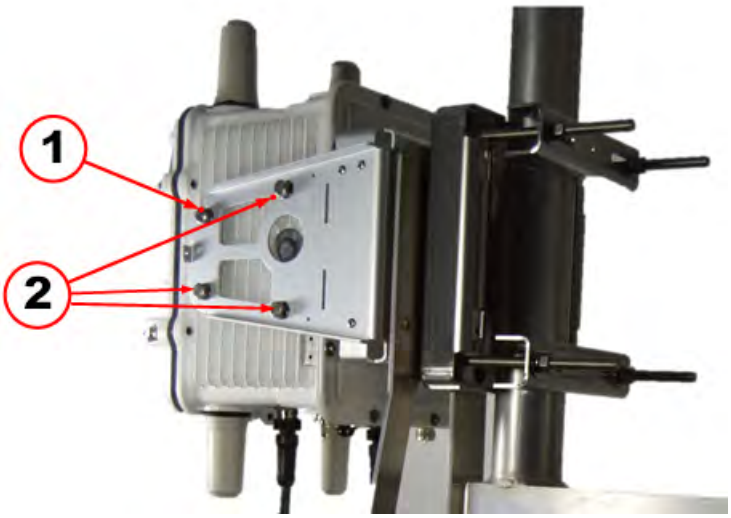
Callout Number	Description
1	Alignment slots
2	4 Hex head mounting bolts (8mm x 25mm) supplied with the installation kit
3	Center stud with self-locking hex nut

1. Position the RF Filter mounting bracket over the center stud and slide down behind hex nut.
2. 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 filter unit to be rotated either clockwise or counterclockwise for alignment purposes. Inserting the mounting bolts as shown allow the unit to rotate counterclockwise. Inserting all four bolts in the holes at the other end of the slot allows the unit to be rotated clockwise.
3. Adjust the alignment of the CGR and RF Filter to the desired orientation and tighten the four mounting bolts and the hex nut on the center stud. Use a torque of 6–7 foot-pounds when tightening the bolts and nut.

Installing the CGR

1. Mount the CGR to the mounting bracket by sliding the mounting bolt in the top front position on each side of the CGR into the corresponding slot on the mounting bracket.



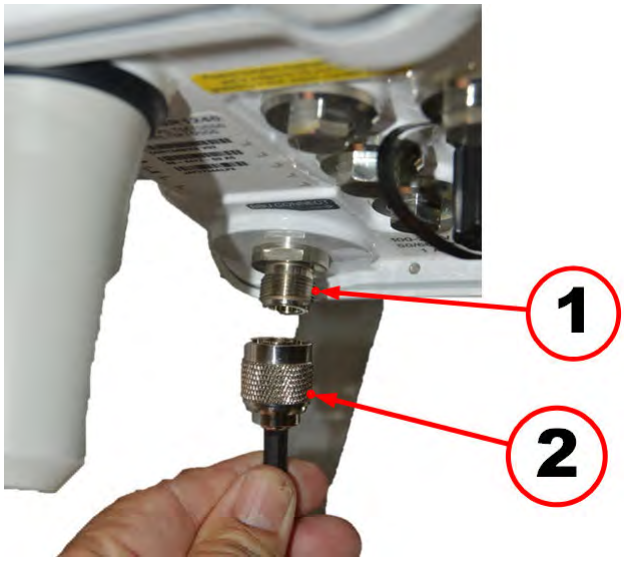
Callout Number	Description
1	Mounting bolt not completely removed
2	Mounting bolts to be completely removed

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

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

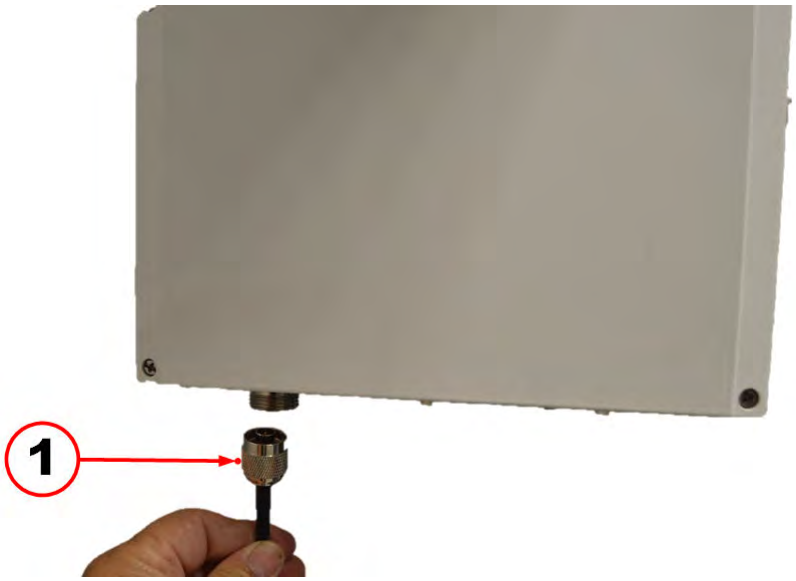
3. Tighten all mounting bolts. Use a torque of 6–7 foot-pounds when tightening the bolts.

Connecting the RF Filter Cables



Callout Number	Description
1	Pre-installed N connector
2	CGR to RF Filter cable

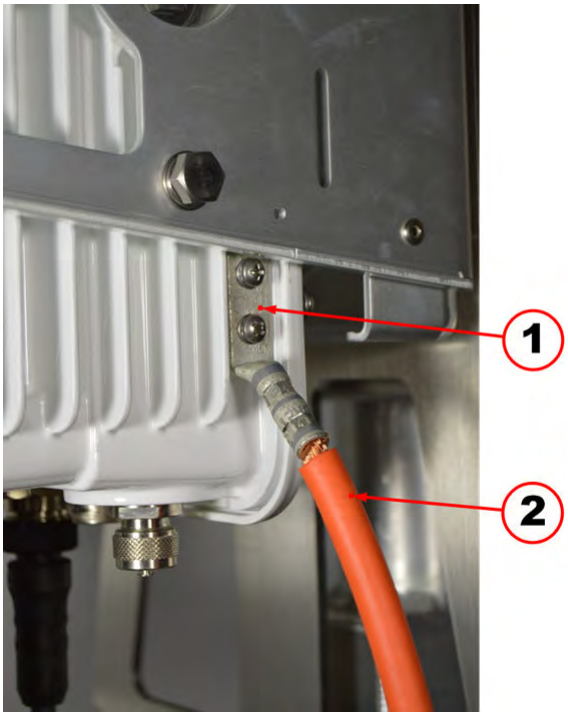
1. Connect the CGR-RF Filter cable to the pre-installed N connector on the bottom of the CGR.



Callout Number	Description
1	CGR to RF Filter cable

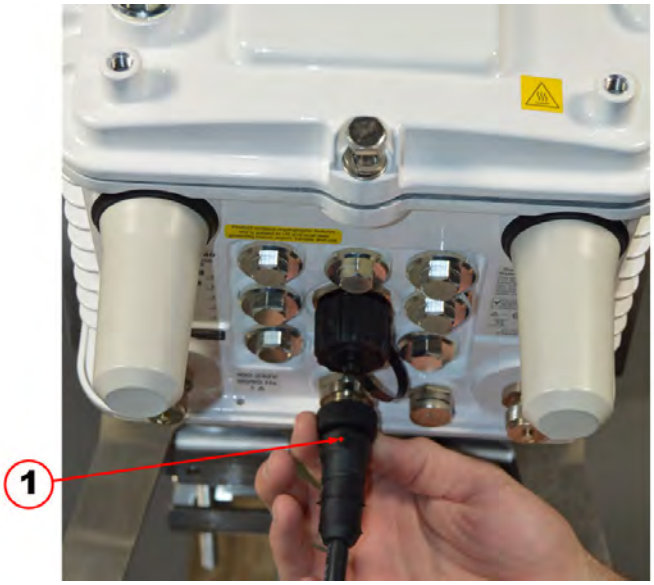
2. Connect the CGR-RF Filter cable to the pre-installed N connector on the bottom of the RF Filter.

Reconnecting the CGR Cables



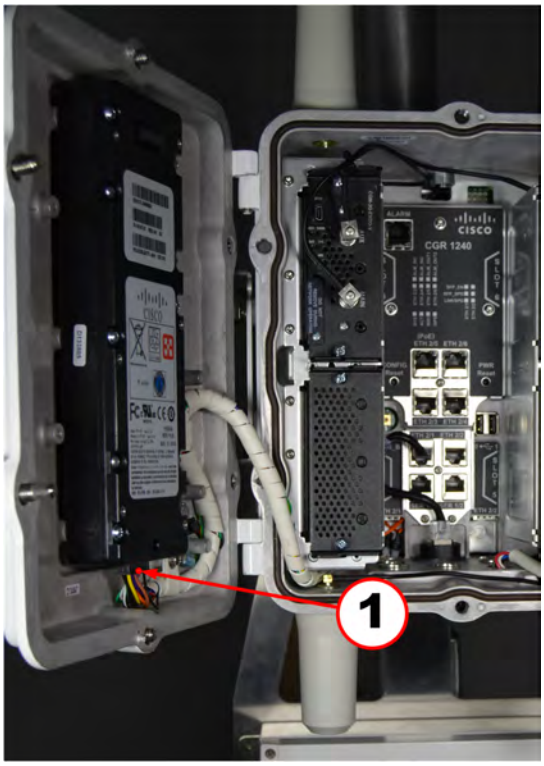
Callout Number	Description
1	Ground Lug
2	CGR 6 AWG ground cable

1. Re-insert the two screws to the ground lug and re-connect the ground cable to the CGR.



Callout Number	Description
1	CGR power cable

2. Re-connect the power source to the CGR and connect the power cable.



Callout Number	Description
1	Backup-Battery Connector

3. Reconnect the Backup-Battery Unit (BBU) by connecting the BBU Harness Cable.

   Note: For routers using Cisco IOS, you must disable the BBU by using the IOS CLI and then disconnecting the BBU harness cable. You can only disable the BBU by terminal or console access on routers using Cisco CG-OS.

4. Check the SYS LED. To confirm that the router is powered on, verify that the SYS LED is on. The SYS LED is on the bottom exterior of the router enclosure.

Assembling the Antenna

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

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

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

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

5. Slide the antenna holder over the silicone seal.

6. Make sure the antenna holder and the adapter plate are flush on all sides. See the following illustrations.

7. Attach the antenna to the mounting bracket.
   a) Push the 1¾-inch bolt through the antenna holder, the remote mount adapter plate, and the mounting bracket.
   b) Place the flat washer on the bolt.
   c) Place the split washer on the bolt.
   d) Add a drop of anti-seize lubricant to the nut and attach the nut to the bolt.

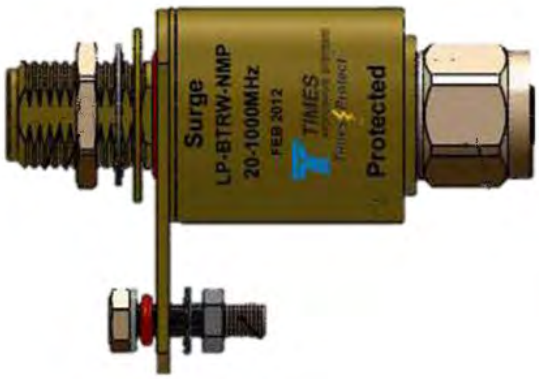
8. Replace the black rubber bumper on the end of the antenna.

Lightning Arrestor

When using an external remote antenna, install a lightning arrestor to protect the equipment 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.



Weatherproofing the RF Connections

1. Wrap vinyl electrical tape around the connection, starting at the filter and moving up the cable as shown in the following illustration.

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 following illustration.

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

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 will self-vulcanize over time and the seam will disappear.
7. Wrap vinyl electrical tape around the butyl rubber, starting at the filter and moving up as you did in step 1.

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.

Chapter 6 Field Replacement

This chapter covers the procedures necessary for successfully replacing an existing CAM module with a new CAM3 module:

- Using PuTTY to access the CGR console command line
- Identifying the current CAM slot location and status
- Powering down the CAM
- Removing the CAM
- Installing the new CAM3
- Powering up the new CAM3
- Checking the new CAM3 status
- Saving the current CGR CAM configuration

Important: In some geographic territories, such as North America (NAM), the RF Filter is not needed with a CAM3 module and may be removed if it is already installed for an earlier CAM module. In this case, the external antenna can be installed without the filter, but it should NOT be connected directly to the CGR.

Requirements

The following items are required for successful CAM3 field replacement as described in this chapter:

- ½-inch (13-mm) socket wrench to loosen the router chassis door bolts
- Laptop with USB port running PuTTY or similar terminal application

  Note: Go to the PuTTY website to download the latest version of the application: https://www.putty.org/.
- Credentials for CGR access
- New CAM3

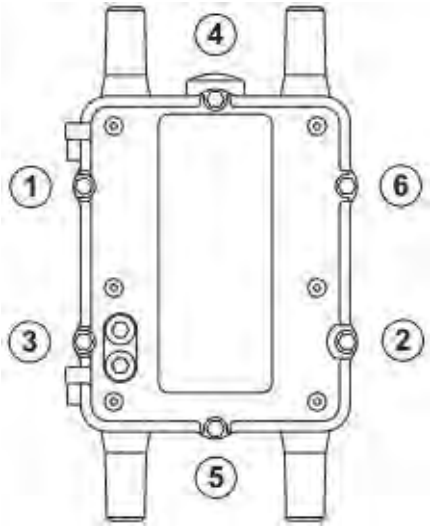
  Note: The CAM3 ships in an anti-static shipping bag. Do not remove the CAM3 from the anti-static shipping bag until it is ready to be placed into the CGR. Save the anti-static shipping bag for the removed CAM.
- Available CGNMS/FND operator (utility office or Itron Managed Services) to verify CAM3 operation
- CGR communications port access
- Cisco DB9–RJ45 serial cable and USB-to-serial adapter cable

Uninstalling the Existing CAM

This section covers the procedures necessary uninstalling and removing an existing CAM module prior to installing a new CAM3 module.

Opening the CGR

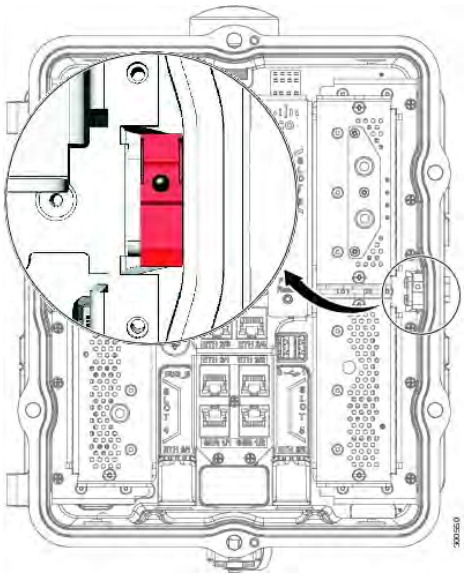
Use a ½-inch (13-mm) socket wrench to loosen all six captive bolts that secure the hinged CGR door using the sequence shown below. Use a torque of 3–4 foot-pounds when loosening the bolts. The captive bolts cannot be removed from the door.



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 bolt is loosened.

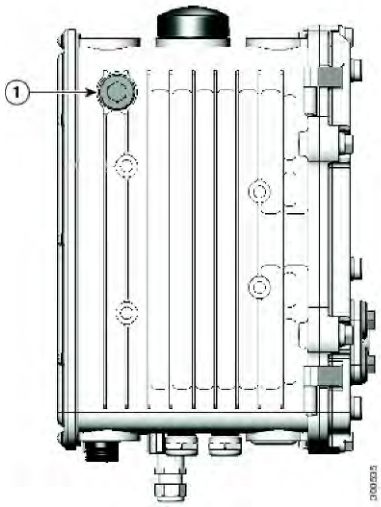
Door Sensor

The chassis hardware features a pressure-sensitive alarm switch that detects the opening and closing of the router door and alerts the CGNMS/FND operator to a potential security breach. When the switch detects that the door has been opened or closed, it sends an event message to the router. The event message is stored in the router log file.



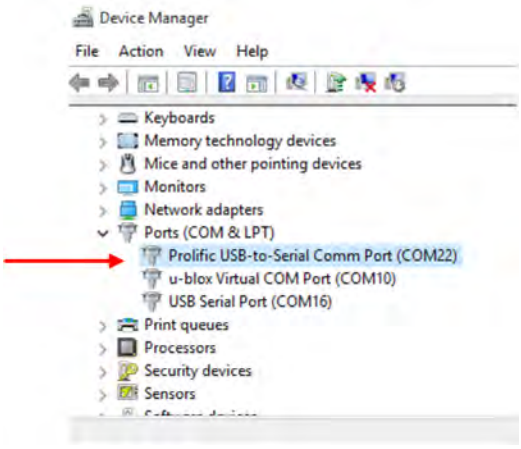
Connecting to the CGR

1. Remove the ½-inch (13mm) console port access plug. The console port access plug (1) is located on the back of the CGR as shown.

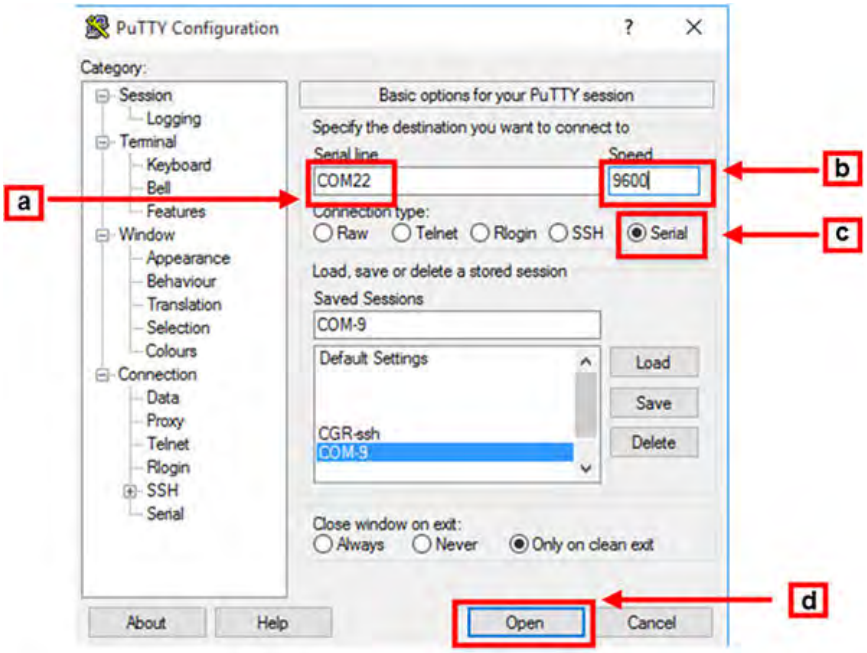


2. Connect the USB to serial adapter to the laptop.
3. Plug the blue Cisco cable end into the CGR's RJ45 port, located behind the ½-inch (13mm) access plug.

4. Open Windows Device Manager and locate the Prolific USB to Serial adapter and assigned com port.



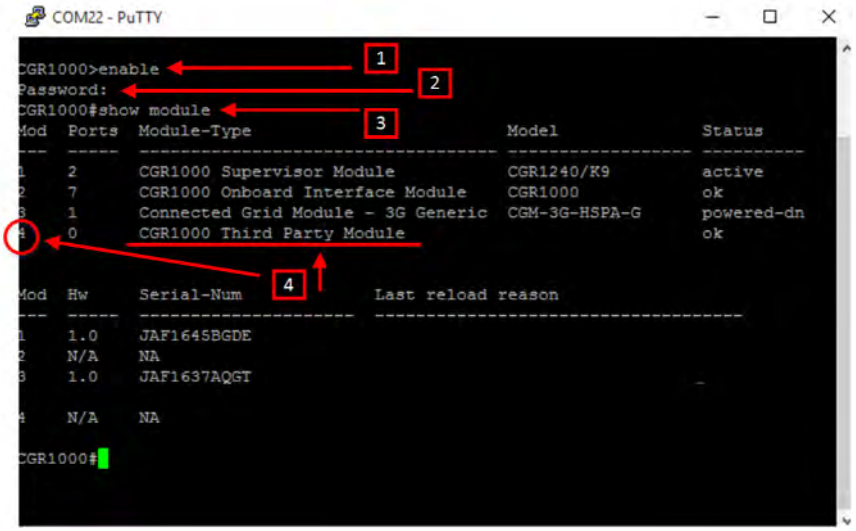
5. Open a new PuTTY session and perform the following steps:
   a) In the **Serial line** field, enter the comm port (for example, `COM22`).
   b) Set the port **Speed** to `9600`.
   c) For **Connection type**, select **Serial**.
   d) Click **Open**.



Confirming the CAM Slot Location

After PuTTY connects to the CGR, a console terminal appears. If you don't see a terminal prompt, press Enter until the terminal prompt appears. If you still do not get a prompt, exit PuTTY and switch to a new baud rate. Make sure that the cable is attached and undamaged.

Note: In the example described here, the CAM is located in Slot #4. If your CAM is located in Slot #5, the same procedure applies. In this case, use Slot #5.



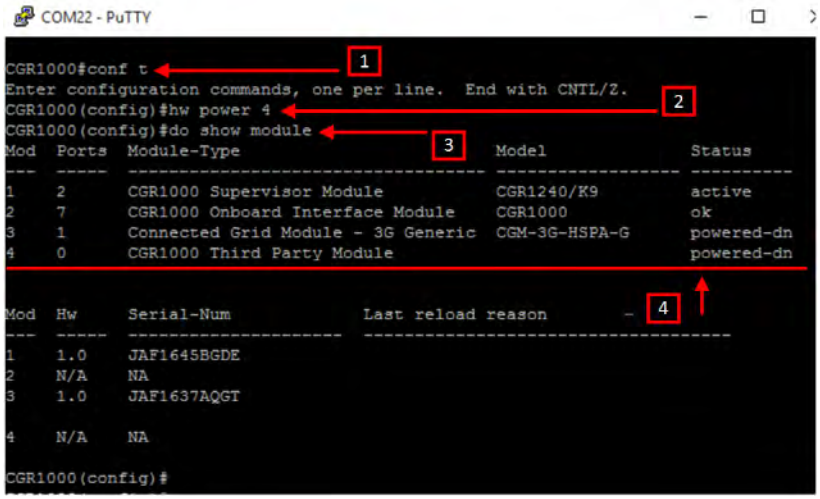
1. Type `enable` at the prompt.
2. Type the console password and press Enter.

Note: The password for every CGR is different. The password does not appear on the screen as you enter it.

3. Type `show module`.
4. Confirm that the Itron CAM module location is shown (for example, `CGR1000 Third Party Module`). In the example above, Mod 4 is Slot #4. Under **Status**, `ok` indicates that the device is powered and active.

Powering Down the CAM

Note: In the example described here, the CAM is located in Slot #4. If your CAM is located in Slot #5, the same procedure applies. In this case, use Slot #5.



1. Type `conf t` (configuration terminal). The prompt changes to `(config)`.
2. Type `hw power 4` (in this example, the CAM is located in Slot #4).
3. Type `do show module`.
4. If successful, the **Status** indicates `powered-dn` (powered down).

Note:

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

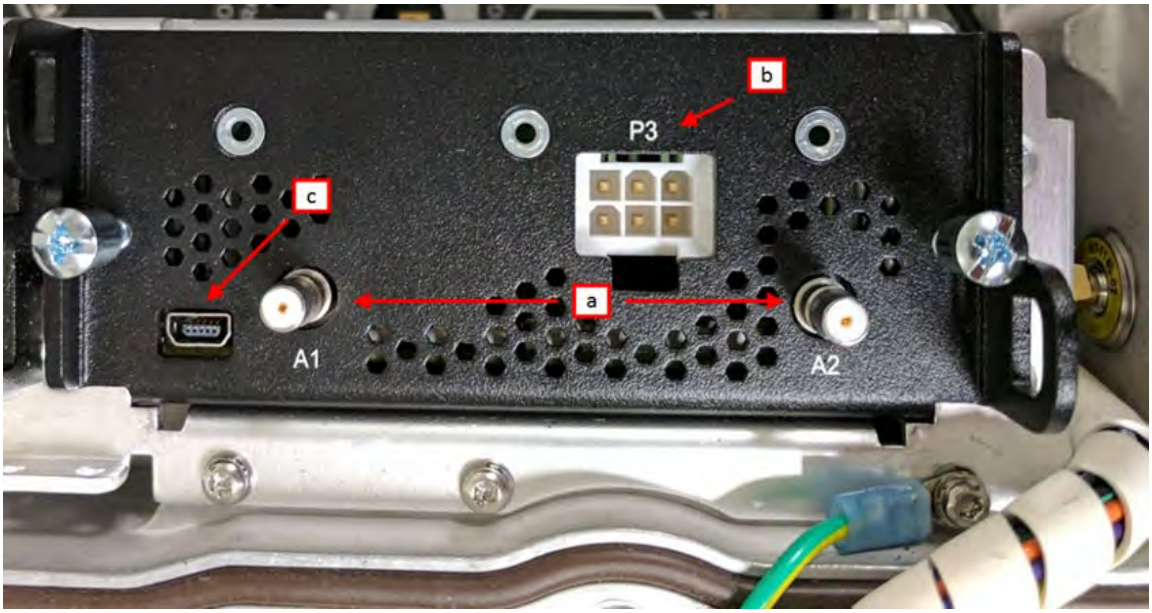
Verifying the CAM Location

After the CAM is powered down, use the following procedure to check the hardware components.

Note: In the example described here, the CAM is located in Slot #4. If your CAM is located in Slot #5, the same procedure applies. In this case, use Slot #5.

1. Locate the slot used for the CAM as found using PuTTY above.
2. Verify the slot is occupied by the Itron CAM. Visual identification cues are as follows:
    1. Has two small coaxial connectors labeled **A1** and **A2**.

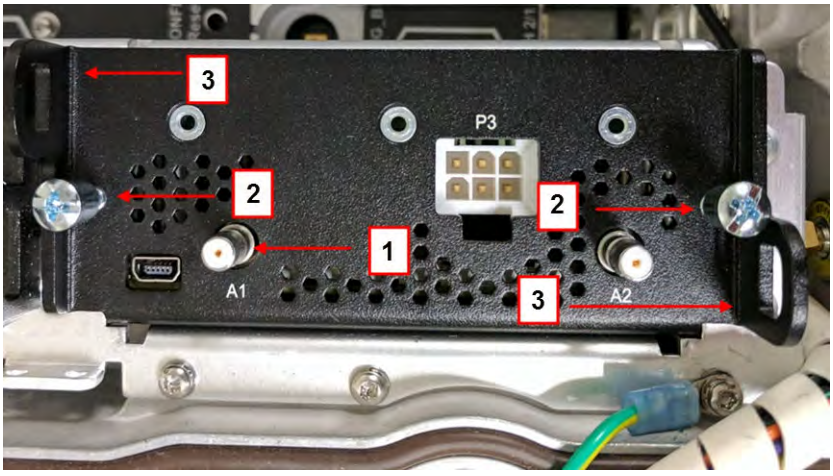
       Note: only one coaxial connector (**A1**) is used in North America.
    2. Has a PLC port labeled **P3**.
    3. Has a mini USB connector next to **A1**.



Removing the CAM

Note: In the example described here, the CAM is located in Slot #4. If your CAM is located in Slot #5, the same procedure applies. In this case, use Slot #5.

Once visually verified, the CAM may be removed from the CGR chassis.



1. Remove the new CAM3 from its anti-static bag and place the old CAM in the anti-static bag.
2. Remove the coaxial cable from port A1.
3. Remove the two Phillips screws securing the CAM module to the CGR chassis.
4. Pull up and out on the module handles to slide the module out of the CGR chassis on mounting rails.

Installing the New CAM3

1. Insert the new CAM3 into the same slot that the old CAM was removed from. Lightly push down on the CAM3 module's handles. You may need to vertically rock the module into place for it to fully seat.

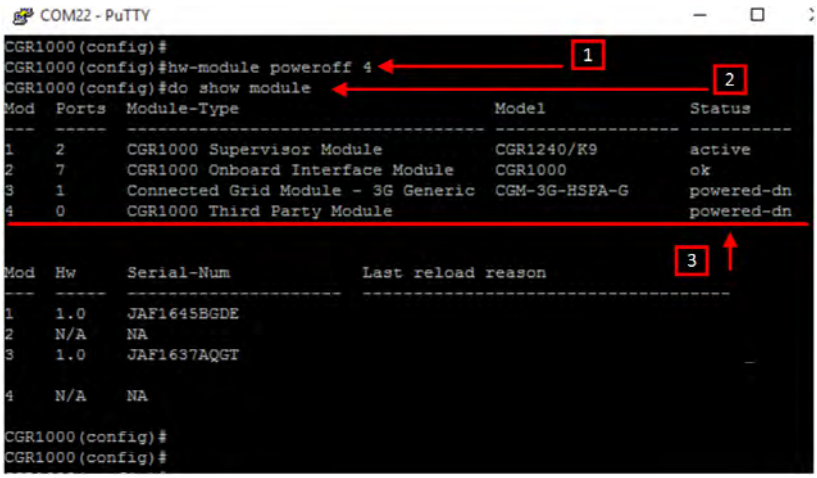
   ⚠ **Caution**: Do not force the CAM3 module into place.

2. Replace the two Phillips screws, securing the CAM3 module to the CGR chassis.
3. Replace the coaxial cable onto port A1.

Powering Up the CAM3

The CGR will automatically log out the user after 10–15 minutes of inactivity. While replacing the CAM, the CGR may have automatically logged you out. Log back on to the CGR and return to the `(config)` user prompt, as described in Confirming the CAM Slot Location on page 50.

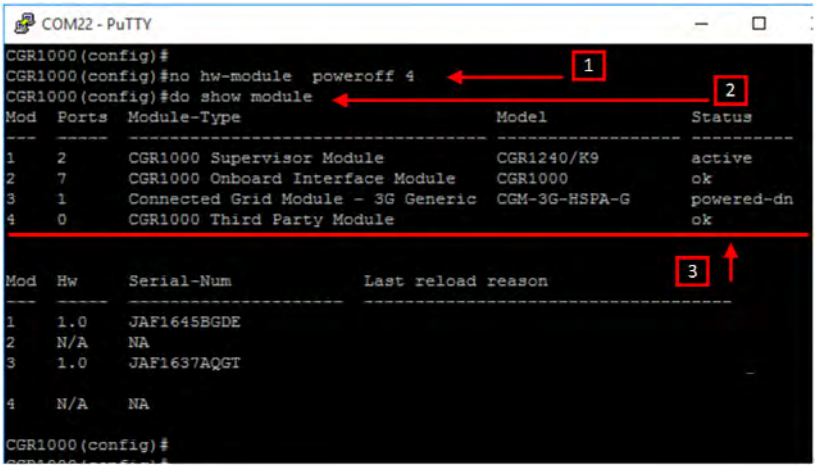
Note: In the example described here, the CAM is located in Slot #4. If your CAM is located in Slot #5, the same procedure applies. In this case, use Slot #5.



1. At the `config` prompt, enter `hw-module poweroff 4` (for Slot #4).

   Note: If the CAM3 is located in Slot #5, enter `hw-module poweroff 5`.
2. At the `config` prompt, enter `do show module`.
3. Verify that the new **Status** indicates `powered-dn`.

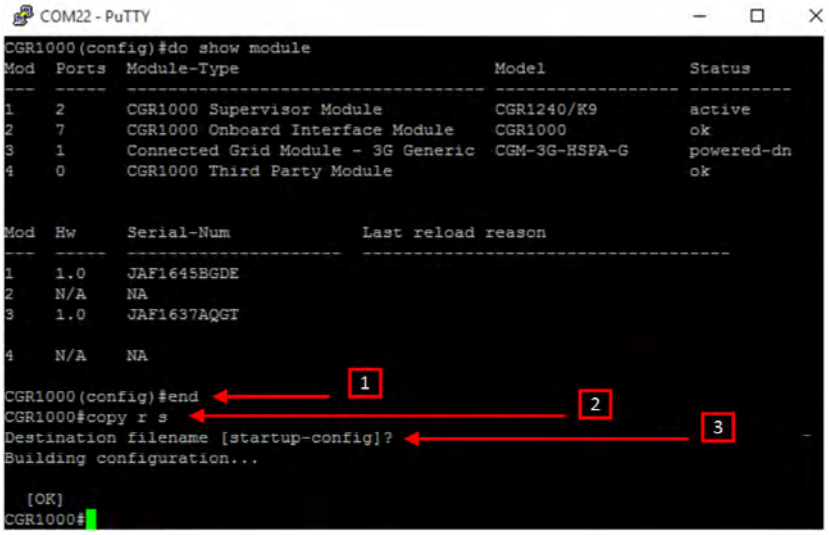
Confirming the CAM3 Status



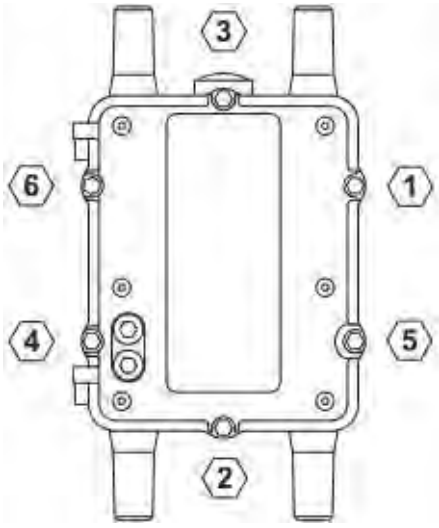
1. At the `config` prompt, enter `no hw-module poweroff 4` (for Slot #4).

   Note: If the CAM3 is located in Slot #5, enter `no hw-module poweroff 5`.
2. At the `config` prompt, enter `do show module`.
3. Verify that the new **Status** indicates `ok`.

Ending the CGR PuTTY Connection



1. At the `config` prompt, enter `end` to return to the original command prompt.
2. Enter `copy r s` at the prompt.
3. When prompted for `Destination filename [startup-config]`, press Enter.
4. Type `exit` at the prompt.
5. Call your local FND/CGNMS operator to confirm CAM3 operation. When operation is confirmed, you can unplug the console cable.

Closing the CGR

1. Replace the ½-inch (13mm) console port plug.
2. Close the door and secure it by tightening the six captive bolts using the sequence shown below. Use a torque of 6–7 foot-pounds when tightening the bolts.