



Cisco 1120 Connected Grid Router Hardware Installation Guide

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Conventions

This document uses the following conventions.

| Conventions | Indication |
|---------------------------|---|
| bold font | Commands and keywords and user-entered text appear in bold font . |
| <i>italic font</i> | Document titles, new or emphasized terms, and arguments for which you supply values are in <i>italic font</i> . |
| [] | Elements in square brackets are optional. |
| {x y z} | Required alternative keywords are grouped in braces and separated by vertical bars. |
| [x y z] | Optional alternative keywords are grouped in brackets and separated by vertical bars. |
| string | A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks. |
| <code>courier font</code> | Terminal sessions and information the system displays appear in <code>courier font</code> . |
| < > | Nonprinting characters such as passwords are in angle brackets. |
| [] | Default responses to system prompts are in square brackets. |
| !, # | An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line. |

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Unpacking the Router

This section includes instructions about how to unpack the Cisco 1120 Connected Grid Router and describes the items that ship with the router.

These topics are discussed:

- [Unpacking the Router, page 3](#)
- [Router Package Contents, page 3](#)

Unpacking the Router

Note: When you unpack the router, do not remove the foam blocks attached to antennas and antenna connectors. The foam protects the antennas and connectors during installation.

Follow these steps to unpack the router:

1. Open the shipping container and carefully remove the contents.
2. Return all packing material to the shipping container, and save it.
3. Ensure that all items listed in the [Router Package Contents, page 3](#) are included in the shipment. If any item is damaged or missing, notify your authorized Cisco sales representative.

Router Package Contents

Your router kit contains the items listed in [Table 1 on page 4](#).

Table 1 Router Package Contents

| Qty. | Item | Description |
|------|----------------------------------|---|
| 1 | Cisco 1120 Connected Grid Router | Router enclosure with the following components installed: <ul style="list-style-type: none">■ Connected Grid Modules (1 to 2, depending on configuration ordered) with required antennas■ 2-GB SD Flash Memory Module■ AC power supply (integrated) |
| 1 | DIN Rail Mounting Kit | Includes: <ul style="list-style-type: none">■ DIN rail mounting bracket■ All required hardware to attach bracket to router |
| 2 | Power connectors adapters | Use these mating connectors for wiring the router power connectors |
| 1 | User Documentation Kit | Includes: <ul style="list-style-type: none">■ Read Me First card■ Regulatory Compliance and Safety Information document |



Installation Safety and Site Preparation

This document provides information you should be aware of before installing the Cisco 1120 Connected Grid Router, such as safety information, installation recommendations, and site requirements.

These topics are discussed:

- [Safety Recommendations, page 6](#)
- [General Site Requirements, page 7](#)
- [Rack Mounting, page 7](#)
- [Router Environmental Requirements, page 8](#)
- [Power Guidelines and Requirements, page 8](#)
- [Network Cabling Specifications, page 8](#)
- [Required Tools and Equipment for Installation and Maintenance, page 9](#)

Note: To see translated warnings that appear in this publication, see the Regulatory Compliance and Safety Information document that came with the router.

Warning: Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Warning: Ultimate disposal of this product should be handled according to all national laws and regulations. Statement 1040

Warning: This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. Statement 1028

Warning: This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: Maximum 15 A, 120 Vac or Maximum 10 A, 230 Vac Statement 1005

Warning: Take care when connecting units to the supply circuit so that wiring is not overloaded. Statement 1018

Warning: Installation of the equipment must comply with local and national electrical codes. Statement 1074

Warning: This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security. Statement 1017

Warning: Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. Statement 1029

Warning: Read the installation instructions before connecting the system to the power source. Statement 1004

Warning: IMPORTANT SAFETY INSTRUCTIONS. This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

Warning: Hot Surface

Note: Power Supply Heatsink may be hot to the touch



Safety Recommendations

Follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free during and after installation.
- Keep tools and chassis components away from walk areas.
- Do not wear loose clothing that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses when working under conditions that might be hazardous to your eyes.
- Do not perform any action that creates a hazard to people or makes the equipment unsafe.

Safety with Electricity

Follow these guidelines when working on equipment powered by electricity:

- Locate the emergency power-off switch in the room in which you are working. If an electrical accident occurs, you can quickly turn off the power.
- Disconnect all power before doing the following:
 - Installing or removing a chassis
 - Working near power supplies
- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, frayed power cords, and missing safety grounds.
- Do not work alone if hazardous conditions exist.

General Site Requirements

- Never assume that power is disconnected from a circuit. Always check.
- Never open the enclosure of the router's internal power supply.
- If an electrical accident occurs, proceed as follows:
 - Use caution; do not become a victim yourself.
 - Turn off power to the device.
 - If possible, send another person to get medical aid. Otherwise, assess the victim's condition and then call for help.
 - Determine if the person needs rescue breathing or external cardiac compressions; then take appropriate action.

Warning: Do not work on the system or connect or disconnect cables during periods of lightning activity. Statement 1001

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. It can occur if electronic printed circuit cards are improperly handled and can cause complete or intermittent failures. Always follow ESD prevention procedures when removing and replacing modules:

- Ensure that the router chassis is electrically connected to earth ground.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to channel unwanted ESD voltages safely to ground. To guard against ESD damage and shocks, the wrist strap and cord must operate effectively.
- If no wrist strap is available, touch a metal part of the chassis to discharge any electromagnetic build up.

Caution: For the safety of your equipment, periodically check the resistance value of the antistatic strap. It should be between 1 and 10 megohms (Mohm).

General Site Requirements

This section describes the requirements your site must meet for safe installation and operation of your router. Ensure that the site is properly prepared before beginning installation. If you are experiencing shutdowns or unusually high errors with your existing equipment, this section can also help you isolate the cause of failures and prevent future problems.

Rack Mounting

The router is designed for mounting on a DIN rail, or a wall. Cisco recommends that the router not be rack mounted. However, if you install the router in a rack, follow these guidelines:

- Allow clearance around the rack for maintenance.
- Allow at least one rack unit of vertical space between routers.
- Enclosed racks must have adequate ventilation. Ensure that the rack is not congested, because each router generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air. Heat generated by equipment near the bottom of the rack can be drawn upward into the intake ports of the equipment above.

Router Environmental Requirements

The location of your router and the layout of the substation environment are important considerations for proper router operation. Equipment placed too close together, inadequate ventilation, and inaccessible panels can cause malfunctions and shutdowns, and can make maintenance difficult.

Install the router so that you can access both the module-side and the cable-side panels.

When planning your site layout and equipment locations, refer to the [General Site Requirements, page 7](#). If you are currently experiencing shutdowns or an unusually high number of errors with your existing equipment, these precautions and recommendations may help you isolate the cause of failure and prevent future problems.

- Ensure that the room where your router operates has adequate air circulation. Electrical equipment generates heat. Without adequate air circulation, ambient air temperature may not cool equipment to acceptable operating temperatures.
- Always follow ESD-prevention procedures described in the [Preventing Electrostatic Discharge Damage, page 7](#), to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.
- Ensure that the chassis cover and module cable side panels are secure. All empty module slots and power supply bays must have filler panels installed.
- When equipment installed in a rack (particularly in an enclosed rack) fails, try operating the equipment by itself, if possible. Power off other equipment in the rack (and in adjacent racks) to allow the router under test a maximum of cooling air and clean power.

Power Guidelines and Requirements

Check the power at your site to ensure that you are receiving “clean” power (free of spikes and noise). Install a power conditioner if necessary.

The AC power supply includes the autoselect feature for either 110 V or 220 V operation.

Network Cabling Specifications

The following sections describe the cables needed to install the router:

- [Preparing for Network Connections, page 8](#)
- [Preparing for Network Connections, page 8](#)

Preparing for Network Connections

When setting up your router, consider distance limitations and potential electromagnetic interference (EMI) as defined by the applicable local and international regulations.

Network connection considerations are provided for several types of network interfaces and are described in the following sections:

- [Ethernet Connections, page 8](#)
- [Serial Connections, page 9](#)

Ethernet Connections

The IEEE has established Ethernet as standard IEEE 802.3. The router supports the following Ethernet implementations:

Required Tools and Equipment for Installation and Maintenance

- 1000BASE-X—1000 Mb/s full-duplex transmission over a Category 5 or better unshielded twisted-pair (UTP) cable (IEEE 802.3z). Supports the Ethernet maximum length of 328 feet (100 meters).
- 1000BASE-T—1000 Mb/s full-duplex transmission over a Category 5 or better unshielded twisted-pair (UTP) cable (IEEE 802.3ab). Supports the Ethernet maximum length of 328 feet (100 meters).
- 100BASE-TX—100 Mb/s full-duplex transmission over a Category 5 or better unshielded twisted-pair (UTP) cable (IEEE 802.3u). Supports the Ethernet maximum length of 328 feet (100 meters).

Serial Connections

Before you connect a device to a serial port, you need to know the following:

- Type of device, data terminal equipment (DTE) or data communications equipment (DCE)
- Type of connector, male or female, required to connect to the device
- Signaling standard required by the device

These are the most common devices connected to the router serial ports:

| Serial Devices | Network Options | Network Protocols | Network Topology |
|--|--|--|------------------|
| Devices such as RTU or IED with serial asynchronous interface Note: No synchronous serial protocol support | CGR 1120 serial interface can connect through DB9 connector devices with RS232 and RS485 asynchronous full-duplex or half-duplex support | <ul style="list-style-type: none"> ■ IP over SLIP or PPP asynchronous lines ■ Raw Socket and SCADA protocol translation (DNP3 to DNP3/IP and IEC 60870-5-101 to IEC 60870-5-104) | Point-to-Point |

Connecting

- You must provide or purchase separately the correct serial cable. The cable does not ship with the router. Contact your Cisco reseller to purchase the correct cable from Cisco.
- You can connect a device to this port while the router is operating normally.
- The serial ports are labeled **SER 1/1** and **SER 1/2**.

Related Information

For more information about this port, including supported standards and signaling, see [Router Hardware Description, page 11](#).

Asynchronous Module Baud Rates

Maximum baud rate for asynchronous interfaces is 115.2 kbps.

Required Tools and Equipment for Installation and Maintenance

You need the following tools and equipment to install and upgrade the router and its components:

- ESD-preventive cord and wrist strap

Required Tools and Equipment for Installation and Maintenance

- Number 2 Phillips screwdriver
- Phillips screwdrivers: small, 3/16-in. (4 to 5 mm) and medium, 1/4-in. (6 to 7 mm)
- Screws that fit your rack

In addition, depending on the type of modules you plan to use, you might need the following equipment to connect a port to an external network:

- Cables for connection to the WAN and LAN ports (dependent on configuration).
- Ethernet hub or PC with a network interface card for connection to an Ethernet (LAN) port.
- Console terminal (an ASCII terminal or a PC running HyperTerminal or similar terminal emulation software) configured for 9600 baud, 8 data bits, 1 stop bit, no flow control, and no parity.
- Modem for connection to the auxiliary port for remote administrative access (optional).



Router Hardware Description

This section describes the major hardware features of the Cisco 1120 Connected Grid Router and includes information about:

- The router chassis, internal components, connectors, ports, and hardware specifications
- How and when to use the router hardware features

This section does not describe how to install the router or make network connections.

- **Mounting**—For mounting instructions, see [Mounting the Router, page 33](#) chapter.
- **Installing**—For instructions on how to install the router, including making network and power connections, see [Connecting the Router to Power, page 43](#) and [Making Network Connections, page 53](#).

These topics are discussed:

- [Router Overview, page 11](#)
- [Hardware Features, page 14](#).

Router Overview

This section contains the following topics:

- [Applications Overview, page 11](#)
- [Hardware Compliance, page 12](#)
- [Router Hardware Overview, page 12](#)

Applications Overview

The Cisco 1120 Connected Grid Router is a ruggedized communication platform, designed for use inside substations or utility cabinets. This platform is built to meet the communication infrastructure needs of electric, gas, and water utilities.

The router provides an end-to-end communication network that enables increased power grid efficiency and reliability, reduced energy consumption, and reduced greenhouse gas emissions. The router also enables distributed intelligence for converged smart grid applications, including:

- Advanced Metering Infrastructure (AMI)
- Distribution Automation (DA)
- Integration of Distributed Energy Resources (DER)
- Remote workforce automation

The router provides reliable and secure real-time communication between network systems and the many devices that exist on the distribution grid, including meters, sensors, protection relays, Intelligent Electronic Devices (IEDs), plug-in electric vehicle (PEV) charging stations, and distributed solar farms. Network data is forwarded and processed over secure communication links between devices within the distribution grid for local decision processing.

Additionally, this data is sent to Supervisory Control and Data Acquisition (SCADA) systems and other management systems. The router supports physical connection to legacy distribution automation (DA) devices (over the serial port); the data from these devices can also be sent to central SCADA systems using protocol translation over the IP network.

Hardware Compliance

For a complete list of regulatory and compliance standards supported by the router, see the *Regulatory Compliance and Safety Information for the Cisco 1000 Series Routers* document on Cisco.com at: www.cisco.com/go/cgr1000-docs

Router Hardware Overview

The Cisco 1120 Connected Grid Router is a modular, ruggedized router that features:

| | |
|---|--|
| 2 - Connected Grid Module Slots, page 19 | Ruggedized Connected Grid modules provide connectivity to network endpoints, such as smart meters and DA devices. |
| 6 - Fast Ethernet Ports, page 23 2 - Gigabit Ethernet Ports, page 23 | Ethernet connections to the backhaul network and other IP network devices. |
| 2 - Integrated Serial Ports, page 25 | RS232/RS485 serial ports for optional connections to existing or legacy equipment. |
| Console Port, page 26 | A RJ-45 console port provides local access to the router for management and administration tasks. |
| SD Flash Memory Module, page 18 | An external, default 2 GB SD Flash Memory Module stores the router configuration and data provides ease of managing router configurations. |
| USB Port, page 17 | A Type A USB port for an optional connection to USB storage or other device, and provides power to the device. |
| Internal GPS Module, page 29 | An integrated GPS can provide accurate time and location information to the system when used with an optional GPS antenna (ordered separately from Cisco). |
| WiFi Short-Range Access Point, page 30 | An integrated 802.11b/g/n wireless access point provides short range wireless access to the router, when used with an optional WiFi antenna (ordered separately from Cisco). Wireless access enables local management over a WiFi connection to the router from outside the substation or utility box. |
| Mounting Features, page 15 | Support for wall and DIN rail mounting. |

Figure 1 Module Panel, Cisco 1120 Connected Grid Router

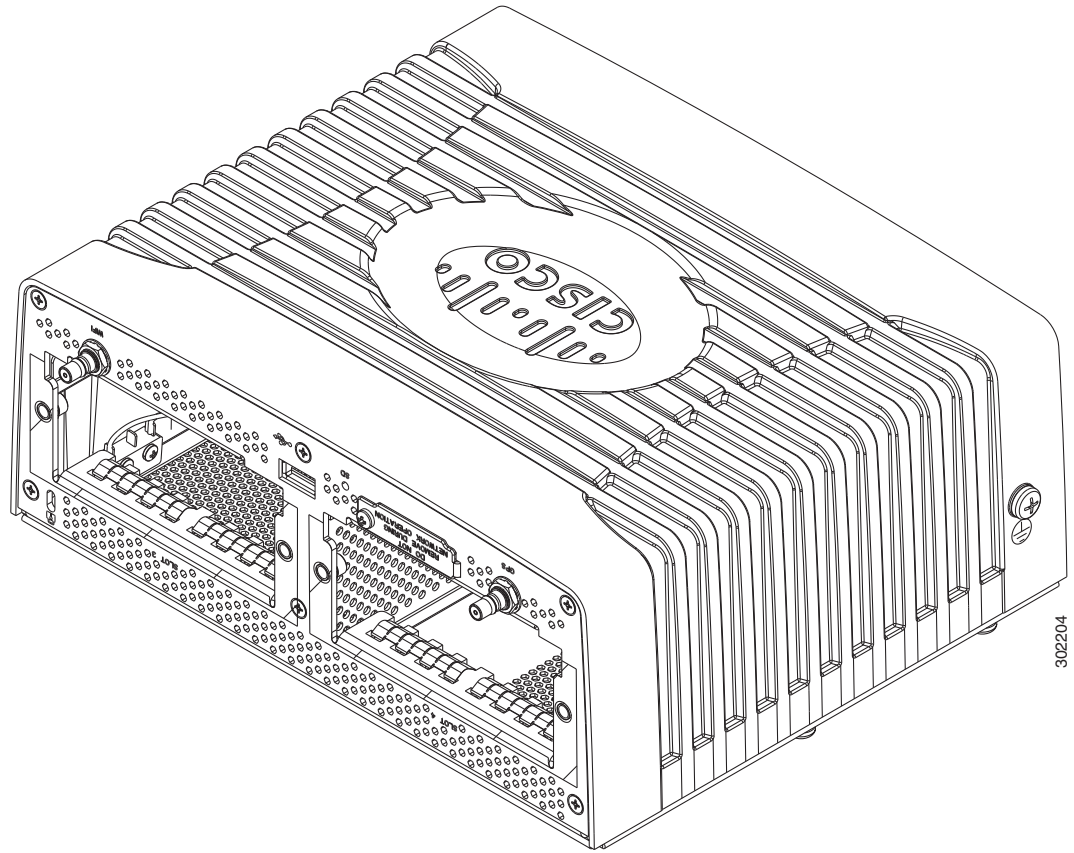
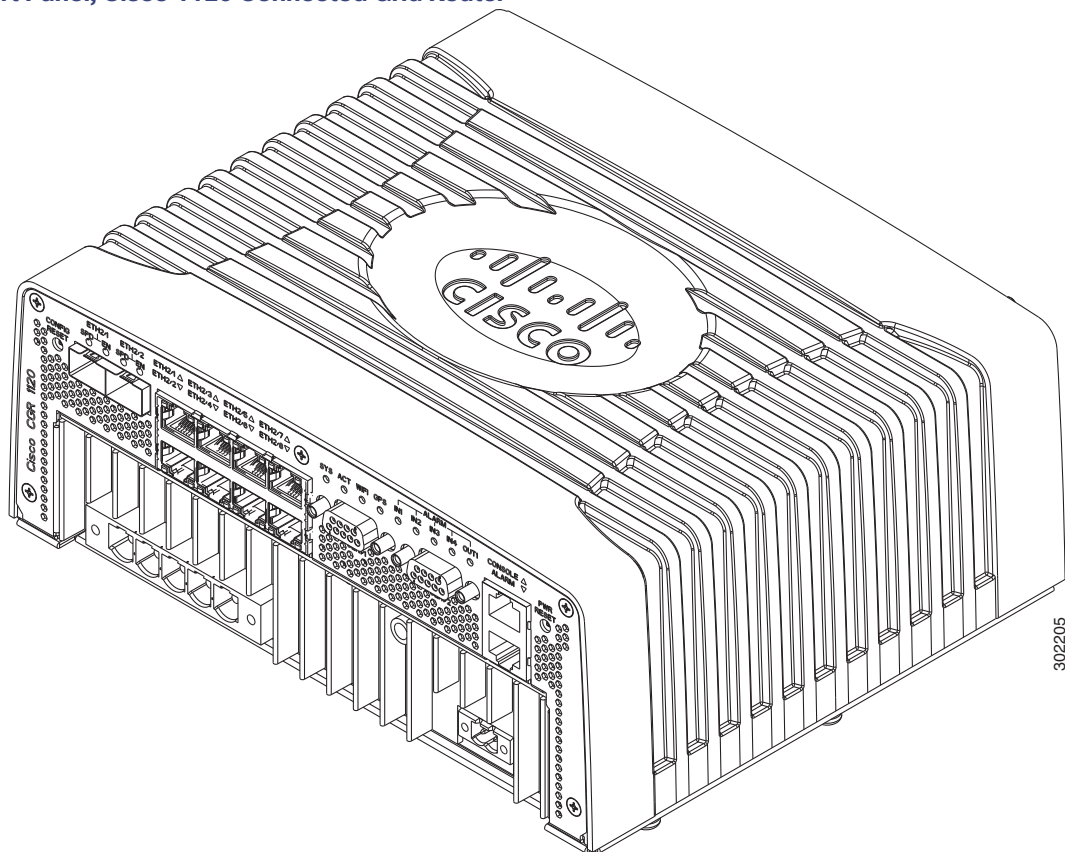


Figure 2 Port Panel, Cisco 1120 Connected Grid Router

Hardware Features

This section illustrates and describes in detail the router hardware features, including mounting brackets, network ports, device ports, and module slots.

Chassis

The router chassis is ruggedized to withstand harsh indoor operating environments, such as power substations and utility boxes.

UV testing has not been performed on the unit. The chassis has TGIC (triglycidyl isocyanurate) powder coating, so UV will not harm the device. The antennas are a polycarbonate blend and are UV stabilized. The exact life of the device is unknown. However, the device is designed for approximately 10-15 years of life, and there are devices in the field for 10 years already.

Note: For a complete list of regulatory and compliance standards supported by the router, see the *Regulatory Compliance and Safety Information for the Cisco 1000 Series Routers* document on Cisco.com at: www.cisco.com/go/cgr1000-docs

| Specification | Description |
|---------------|--|
| Dimensions | 9.25 cm x 22.9 cm x 20 cm (3.64 in. x 9.0 in. x 7.8 in.) |
| Weight | With 2 modules installed: 8 pounds (3.6 kg) |

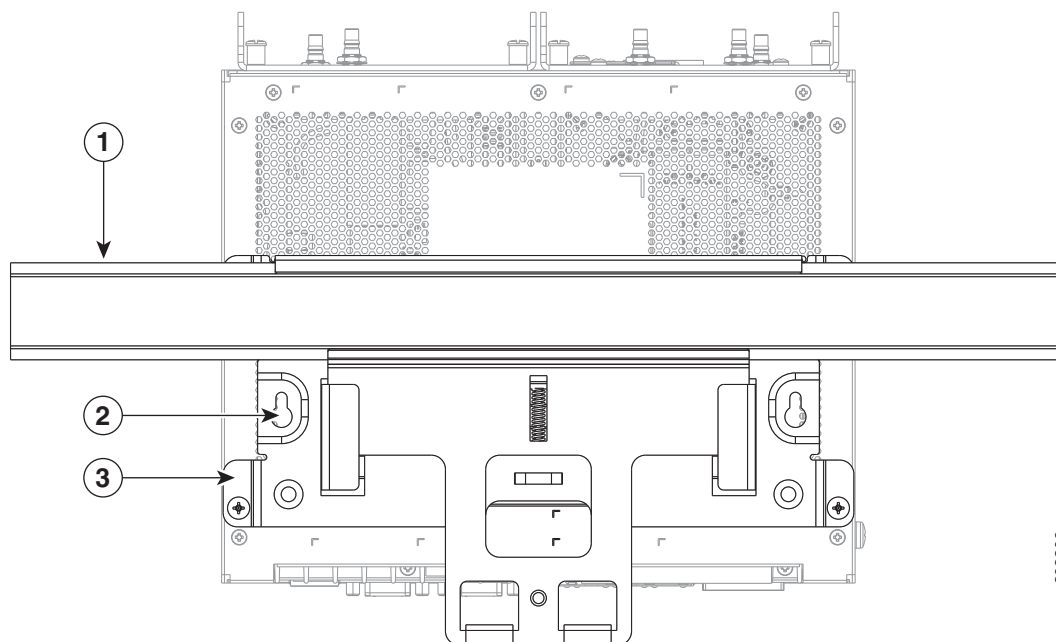
| Specification | Description |
|-----------------------|--|
| Operating temperature | -40° C to +60° C (-40° F to 140 °F) (IEEE 1613 Type test up to 85° C (185 °F) for 16 hours) |
| IP rating | IP30 |

Mounting Features

The router ships with a single mounting kit, which supports the following mounting options:

- Mounting on a DIN rail, which is a standard interior mounting option for substation devices and equipment. See [Figure 3 on page 15](#).
- Mounting on a wall, using the mounting keyholes on the mounting bracket.

Figure 3 Mounting Features (Router Shown Mounted on a DIN Rail)



302206

| Item | Feature | Description |
|------|----------------------|--|
| 1 | DIN rail | Standard rail type used for mounting industrial control equipment on an equipment rack. |
| 2 | Mounting keyhole (2) | Use the mounting keyholes on the mounting bracket to mount the router on a wall. |
| 3 | Mounting bracket | Included as part of the mounting kit. Use this bracket when mounting the router on a wall or DIN rail. |

Mounting Procedures

For instructions on how to mount the router using the mounting bracket kit, see [Mounting the Router, page 33](#).

Module Panel (Front Panel) Features

The module panel labels appear inverted when the router rests on its base (see [on page 16](#)). The label orientation is designed to be read when the router is installed on a DIN rail.

Figure 4 Module Panel (Front Panel) Features

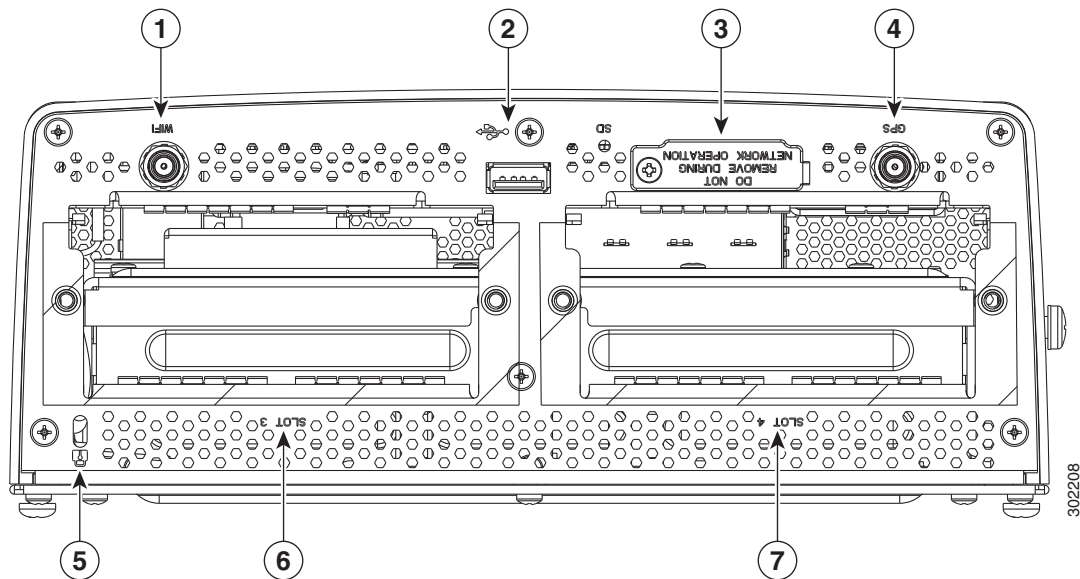


Table 1 Module Panel (Front Panel) Features

| Item | Feature | Description |
|------|-------------------------------------|---|
| 1 | WiFi antenna port | Install a WiFi antenna (ordered separately) in this port to support the router integrated WiFi Short-Range Access Point , page 30 . For more information, see the WiFi Antenna Port , page 17 . |
| 2 | USB port | Connect this USB port to a supported, external USB device. For more information, see the USB Port , page 17 . |
| 3 | SD Flash Memory module slot | Contains an external flash memory card that stores the operating system software image. For more information, see the SD Flash Memory Module , page 18 . |
| 4 | GPS antenna port | Install a GPS antenna (ordered separately) in this port for connectivity to the router GPS system. For more information, see the GPS Antenna Port , page 18 . |
| 5 | Kensington-compatible security slot | Provides security for the router by supporting Kensington or Kensington-compatible locking security cables. For more information, see the Kensington-Compatible Security Slot , page 19 . |
| 6 | CG Module slot 3 | Install Cisco Connected Grid modules in the module slots. For more information, see the Connected Grid Module Slots , page 19 . |
| 7 | CG Module slot 4 | |

This sections discusses:

- [Front Panel LEDs](#), [page 17](#)
- [WiFi Antenna Port](#), [page 17](#)
- [USB Port](#), [page 17](#)
- [SD Flash Memory Module](#), [page 18](#)

Hardware Features

- [GPS Antenna Port, page 18](#)
- [Kensington-Compatible Security Slot, page 19](#)
- [Connected Grid Module Slots, page 19](#)

Front Panel LEDs

For detailed descriptions of the LEDs that appear on the front panel, see [Router LED Locations and States, page 83](#).

WiFi Antenna Port

A single WiFi antenna is installed directly in this port to support the router. For more information, see the [WiFi Short-Range Access Point, page 30](#). You must order this antenna separately from the router. [on page 16](#) displays the WiFi antenna port location.

Antennas

For more detailed information about supported antennas, including specifications and installation instructions, see these documents:

- [About Connected Grid Antennas, page 71](#)
- [Connected Grid Antennas Installation Guide](#) on Cisco.com

Specifications

| Specification | Description |
|-------------------|--|
| Connector type | Female QMA |
| Supported antenna | <p>Cisco Product ID (PID): ANT-4G-DP-IN-TNC</p> <p>Form factor: Swivel-mount indoor dipole</p> <p>Bands supported: Cellular/PCS/AWS/MDS, WiMAX 2100/2300/2500/2600 and global GSM900/GSM1800/UMTS/LTE2600</p> |

USB Port

See [on page 16](#) for the USB port location.

The router features one standard USB 2.0 port for connecting and powering an optional USB peripheral device.

The USB port operates at the following speeds:

- 1 Mbps
- 12 Mbps
- 480 Mbps

USB Connections

- Depending on the USB devices you connect to this port, you might require a USB extension cable to connect devices.
- To prevent a connected USB device accidental or unauthorized removal from the port, secure any connected USB device with a locking mechanism designed for this purpose. You must provide any locking device or mechanism.

Specifications

| Specification | Description |
|----------------------------|-----------------------------------|
| USB Port Type | Type A |
| USB Device Types Supported | USB 1.1, USB 2.0 |
| Power Output | 2.5W (+5V +/-5% @ 500mA) per port |

SD Flash Memory Module

The router supports one Cisco Secure Digital (SD) flash memory module (SD card), which stores router software, configurations, and network data. For detailed information about the SD card, see the [Using the SD Flash Memory Module](#) chapter.

Supported SD Cards

These are the supported SD cards:

Size

2-GB flash memory module

Caution: You must use a supported Cisco SD card with the router. Using an unsupported card could impact SD card reliability and therefore router performance.

Caution: Do not remove the SD card from the router; removing the SD card will cause the router to stop operating.

Specifications

| Specification | Description |
|-------------------------|----------------|
| Socket type | 14 pin |
| Power (from router) | +3.3 V |
| Voltage ramp rate range | 1 mS to 100 mS |

GPS Antenna Port

See [on page 16](#) for the GPS antenna port location.

You can connect a single Connected Grid GPS antenna using the 15-foot cable that is integrated into the antenna. Mount the GPS antenna is mounted on the exterior of the substation or utility cabinet to enable connectivity between the router and the GPS system.

Supported Antennas

For more detailed information about supported antennas, including specifications and installation instructions, see these documents:

- [About Connected Grid Antennas, page 71](#)
- [Connected Grid Antennas Installation Guide](#) on Cisco.com

Specifications

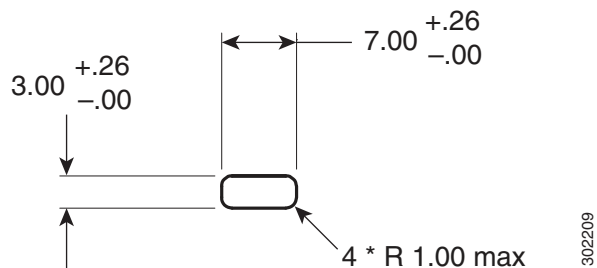
| Specification | Description |
|--|--|
| Connector type | Female QMA |
| Power consumption (from router) | 3V (when GPS connectivity is active) |
| Supported antenna | Cisco Product ID (PID): ANT-GPS-OUT-TNC |

Kensington-Compatible Security Slot

See [on page 16](#) for the Kensington-compatible security slot location.

The front panel features one Kensington-compatible security slot. Use this slot to secure the router at the installation location with a Kensington (or compatible) security cable.

Dimensions



Connected Grid Module Slots

The router has two module slots to support up to two compatible Cisco Connected Grid modules that add NAN and LAN interfaces to the router.

- For more information about the Connected Grid modules for this router, see [About Connected Grid Modules, page 65](#).
- For detailed installation instructions for installing Cisco Connected Grid modules in the router, see the corresponding installation and configuration guide for each module at: www.cisco.com/go/cg-modules

Module Numbering

The router uses module numbering to identify the integrated and modular router components. Some system software commands refer to the following module numbers.

- **Module 1** is the integrated router supervisor engine (located on the CPU motherboard)
- **Module 2** is the router integrated Ethernet switch module, which has six Fast Ethernet ports and two Gigabit Ethernet ports.
- **Module 3** and **Module 4** are external, Connected Grid modules installed in the router module slots with the corresponding numbers (see [on page 16](#)).

Cable Panel (Back Panel) Features

Figure 5 Cable Panel (Back Panel) Features

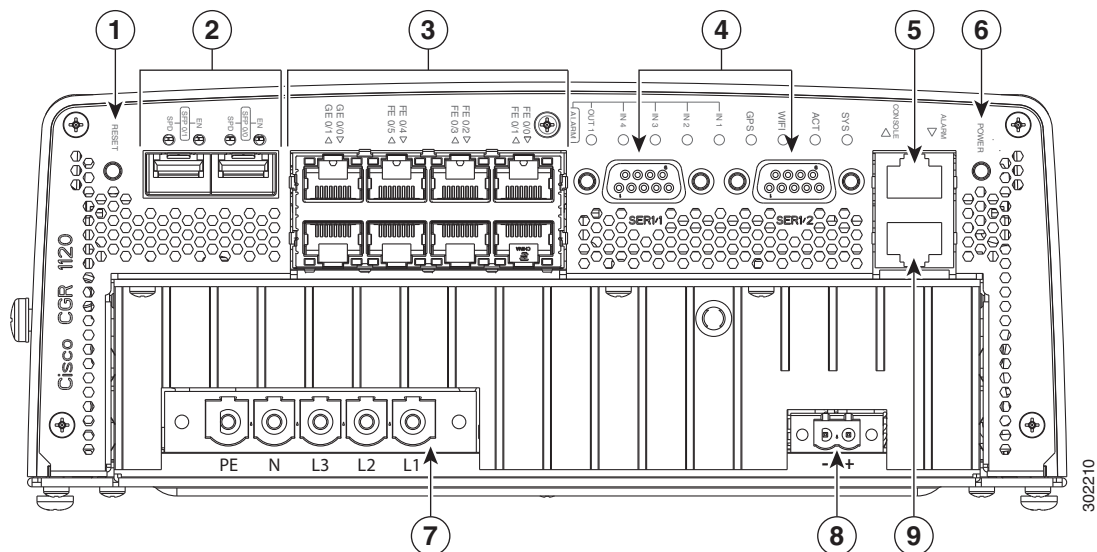


Table 2 Cable Panel (Back Panel) Features

| Item | Feature | Description |
|------|--|--|
| 1 | CONFIG Reset button | Press for at least 5 seconds to return the router software configuration to the factory default, and power cycle the router. For information on how to use this feature, including a Caution statement, see the CONFIG Reset Button, page 21 . |
| 2 | SFP ports | Install supported small-form-factor pluggable (SFP) modules in these two SFP ports, labeled ETH 2/1 and ETH 2/2. For more information and supported SFPs, see the Small Form-Factor Pluggable (SFP) Ports, page 22 . |
| 3 | Ethernet ports: <ul style="list-style-type: none"> ■ 2-Gigabit Ethernet (10/100/1000 Mbps) ■ 6-Fast Ethernet (10/100 Mbps) | <p>Make network connections using the Ethernet ports. For more information, see the Ethernet Ports, page 23.</p> <ul style="list-style-type: none"> ■ Gigabit Ethernet (GE) ports—GE ports ETH 2/1 and ETH 2/2 are WAN ports for connectivity to a primary substation or a control center. ■ Fast Ethernet (FE) ports —FE ports ETH 2/3 to ETH2/8 are LAN ports for local network devices. |
| 4 | Serial ports | Connect the router to legacy devices using these two serial ports. For more information on these ports and supported devices, see the Serial Ports, page 25 . |
| 5 | Console port | Connect a console or PC to the asynchronous console port to manage the router with a local connection. |
| 6 | PWR RESET button | Press the PWR RESET button for at least 5 seconds to power cycle the router. For more information on how to use this feature, see the PWR RESET Button, page 22 . |

Table 2 Cable Panel (Back Panel) Features

| | | |
|---|--------------------|---|
| 7 | AC power connector | Connect the router to the AC power supply (included). For more information, see the AC Power Connector, page 27 . Note: The mating connector shipped with the router is a 5-way screw terminal printed circuit board plug connector manufactured by Phoenix Contact (part number 1913604). |
| 8 | DC power connector | Connect an external backup battery unit (not included) to the router to serve as either the primary power source for the router or to serve as a backup source to the router when AC power, serving as primary source, fails. For more information, see the DC Power Connector–DC Input for External Batteries Connection, page 27 . Note: The mating connector shipped with the router is a 2-way screw terminal printed circuit board plug connector manufactured by Phoenix Contact (part number 1912184). |
| 9 | Alarm port | Connect this alarm port to an alarm system to monitor external events and trigger alarms for external events. For more information, see the Alarm Port, page 28 . |

This section discusses:

- [Back Panel LEDs, page 21](#)
- [CONFIG Reset Button, page 21](#)
- [PWR RESET Button, page 22](#)
- [Small Form-Factor Pluggable \(SFP\) Ports, page 22](#)
- [Ethernet Ports, page 23](#)
- [Combo Ports, page 24](#)
- [Serial Ports, page 25](#)
- [Console Port, page 26](#)
- [Power Connections, page 26](#)
- [Alarm Port, page 28](#)

Back Panel LEDs

For detailed descriptions of the LEDs that appear on the back panel, see [Router LED Locations and States, page 83](#).

CONFIG Reset Button

See [Figure 5 on page 20](#) for the CONFIG Reset button location.

Caution: When you use the CONFIG Reset button to restore the router to the factory default software configuration, the current software configuration is permanently deleted from the router.

Press the CONFIG Reset button for at least 5 seconds to return the router software configuration to the factory default, and power cycle the router. Power cycling the router turns the router off, then immediately back on. The router will temporarily stop operating on the network during the power cycle, then resume operating when the power cycle process is complete.

PWR RESET Button

See [Figure 5 on page 20](#) for the PWR RESET button location.

Press the PWR RESET button for at least 5 seconds to power cycle the router. Power cycling the router turns the router off, then immediately back on. The router will temporarily stop operating on the network during the power cycle, then resume operating when power cycle process is complete.

Small Form-Factor Pluggable (SFP) Ports

The router features two fiber optical SFP ports that support optional Cisco rugged SFP modules for Gigabit Ethernet connections. The ports are labeled as follows (see [Figure 5 on page 20](#)):

- ETH 2/1
- ETH 2/2

Note: Interfaces ETH 2/1 and ETH 2/2 are also used by the Gigabit Ethernet ports. For more information about how these ports are used together, see the [Combo Ports, page 24](#).

Hot Swapping SFP Modules

The SFP modules can be installed or removed while the router is on and operating normally.

Supported SFPs

Note: See the *Cisco 1000 Series Connected Grid Routers Release Notes* for the most recent information about supported hardware and software.

These are the supported SFP modules:

| Cisco Product ID | Description |
|------------------|---|
| GLC-BX-D | 1000BASE-BX10-D downstream bidirectional single fiber; with DOM |
| GLC-BX-U | 1000BASE-BX10-U upstream bidirectional single fiber; with DOM |
| GLC-SX-MM-RGD | 1000BASE-SX short wavelength; rugged |
| GLC-LX-SM-RGD | 1000BASE-LX/LH long wavelength; rugged |
| GLC-FE-100LX-RGD | 100BASE-LX10 SFP |
| GLC-FE-100FX-RGD | 100BASE-FX SFP |
| GLC-ZX-SM-RGD | 1000BASE-ZX extended distance; rugged |

Specifications

| Specification | Description |
|-------------------------|---|
| Connector type | RJ-45 |
| Copper Interface | Full-duplex 10BASE-T, 100BASE-TX, 1000BASE-T |
| Fiber | SFP modules: <ul style="list-style-type: none">■ 1000 Mbps 8B/10B coding■ 100 Mbps 4B/5B coding. |
| Pinouts | See Connector and Cable Specifications, page 93 . |

Ethernet Ports

See [Figure 5 on page 20](#) for Ethernet port locations

Ethernet Connections

The router supports the following Ethernet connection types:

- 1000BASE-T—1000 Mbps full-duplex transmission over a Category 5 or higher shielded twisted-pair (UTP) cable. Supports the Ethernet maximum length of 328 feet (100 meters).
- 100BASE-T—100 Mbps full-duplex transmission over a Category 5 or higher shielded twisted-pair (UTP) cable. Supports the Ethernet maximum length of 328 feet (100 meters).
- 10BASE-T—10 Mbps full-duplex transmission over a Category 5 or higher shielded twisted-pair (UTP) cable. Supports the Ethernet maximum length of 328 feet (100 meters).

Fast Ethernet (FE) Ports

The router features six Fast Ethernet (FE) ports that can be connected to local network devices, such as IEDs, sensors, and reclosers. The ports are labeled as follows:

- ETH 2/3
- ETH 2/4
- ETH 2/5
- ETH 2/6
- ETH 2/7
- ETH 2/8

Specifications

| Specification | Description |
|-----------------------|---|
| Connector type | RJ-45 |
| Cables | Category 5 or higher |
| Interface speed | 10BASE-T and 100BASE-TX |
| IEEE standard | IEEE 802.3 |
| Pinouts | See Connector and Cable Specifications, page 93 |

Gigabit Ethernet (GE) Ports

The router features two Gigabit Ethernet (GE) ports for a WAN connection to a primary substation or control center. The ports are labeled as follows:

- ETH 2/1
- ETH 2/2

Note: Interfaces ETH 2/1 and ETH 2/2 are also used by the SFP ports. For more information about how these ports are used together, see the [Combo Ports, page 24](#).

The GE ports automatically detect the type of any connected cable (fiber or copper) and then switch to the corresponding mode (fiber or copper). When both cables types are connected to the router, the first cable that establishes a link is enabled.

Specifications

| Specification | Description |
|-----------------------|---|
| Connector type | RJ-45 (Copper mode) |
| Cables | Optical fiber Category 5, 5e, 6 shielded twisted pair (STP) |
| Interface speed | 10BASE-TX, 100BASE-TX, 1000BASE-T |
| Pinouts | See Connector and Cable Specifications, page 93 . |

Combo Ports

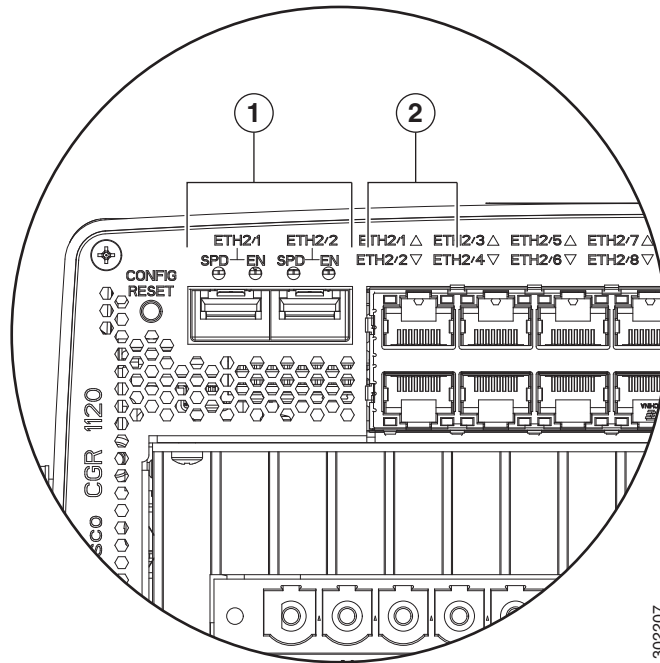
The two Gigabit Ethernet ports and the two SFP ports are labeled identically (ETH 2/1 and ETH 2/2) because the SFP and GE interfaces share physical ports on the router. Only one instance of each interface (ETH 2/1 and ETH 2/2) can be in use at any time.

- **GE ports:** Copper GE connections
- **SFP modules:** Fiber optic GE connections

These ports automatically detect the type of any connected cable (fiber or copper) and then switch to the corresponding mode (fiber or copper).

Note: If connections are made to both interfaces of the same name (ETH 2/1 or ETH 2/2), the first connection that establishes a link is the only connection enabled.

Figure 6 GE Ports and SFP Ports Share Interfaces ETH 2/1 and ETH 2/2



| Items | Description | Gigabit Ethernet Connection Type |
|-------|------------------------|----------------------------------|
| 1 | SFP module ports | Fiber optic |
| 2 | Gigabit Ethernet ports | Copper |

Serial Ports

See [Figure 5 on page 20](#) for serial port locations.

The router has two serial ports that support the following modes (selected with system software commands):

- RS232
- RS485

The ports are labeled as follows:

- SER 1/1
- SER 1/2

Specifications

| Specification | RS232 | RS485 |
|-------------------------------|--|----------------------------|
| Connector type | DB-9 | |
| Cable | You must order a serial transition cable for the signaling protocol. | |
| Signaling | Single-ended | Differential |
| Max. drivers | 1 | 32 |
| Max. receivers | 1 | 256 |
| Operating mode | Full duplex | Half duplex Full duplex |
| Network topology | Point-to-point | Multipoint |
| Max. distance (standard) | 15 m | 1200 m |
| Max speed (at 12 m/1200 m) | 20 Kbps/1 Kbps | 35 Mbms/100 Kbps |
| Pinouts | See Connector and Cable Specifications, page 93 | |

Console Port

See [Figure 5 on page 20](#) for the console port location.

The router features a single asynchronous console port for connecting a console or PC directly to the router. To configure the router locally, using the command-line interface (CLI), you must establish a connection to the router with a terminal session.

Note: The router also supports wireless console connections with an internal WiFi short-range access point. For more information, see [WiFi Short-Range Access Point, page 30](#).

Console Port Default Settings

The console port does not support hardware flow control. The default settings for the port are: 9600 baud, 8 data bits, no parity, and 1 stop bit.

Connecting to the Console Port

Detailed information about connecting to the console port is in [Making Network Connections, page 53](#).

Specifications

| Specification | Description |
|----------------|---|
| Connector type | RJ-45 |
| Transceiver | RS-232 |
| Cable type | EIA RJ-45 |
| Pinout | See Connector and Cable Specifications, page 93 . |

Power Connections

- [AC Power Connector, page 27](#)
- [DC Power Connector—DC Input for External Batteries Connection, page 27](#)
- [Power Specifications, page 27](#)

Hardware Features

AC Power Connector

See [Figure 5 on page 20](#) for the AC power connection location.

The AC power supply connector on the router cable-side (back) panel is the connection to the to AC power terminal block. The router supports single-phase and three-phase AC power input.

Note: The mating connector shipped with the router is a 5-way screw terminal printed circuit board plug connector manufactured by Phoenix Contact (part number 1913604).

For detailed information about the AC power supply, including how to connect the router to AC power, see [Connecting the Router to Power, page 43](#).

DC Power Connector—DC Input for External Batteries Connection

See [Figure 5 on page 20](#) for the external DC power input connector.

The router supports an external battery DC power connection. You must provide the battery connection or unit. The batteries can also serve as the primary power source for the router, if no AC source is used.

Note: The mating connector shipped with the router is a 2-way screw terminal printed circuit board plug connector manufactured by Phoenix Contact (part number 1912184).

For detailed information about the DC power input, including how to connect the router to a DC power input source, see [Connecting the Router to Power, page 43](#).

Power Specifications

| Specification | Description |
|-----------------------|---|
| DC Input Voltage | Nominal operating range: 10.6 to 52VDC Maximum operating range: 9 to 60VDC |
| AC Input Voltage | Three-phase <ul style="list-style-type: none"> ■ 208 to 415VAC 4W+ PE WYE Single-phase <ul style="list-style-type: none"> ■ 100 to 240VAC @ 50/60Hz |
| Circuit Breaker | AC <ul style="list-style-type: none"> ■ Single Phase: Single 10A circuit breaker ■ Three-phase: Three 10A ganged circuit breaker ■ AC voltage rating: 250VAC L-N (minimum) <p>Note: We recommend that the circuit breaker be installed in close proximity to the router by a licensed electrician in accordance with local electrical standards.</p> DC <ul style="list-style-type: none"> ■ DC rating: 60VDC minimum, 10A maximum |
| Output Power | 40W |
| Cooling Type | Natural convection |
| Operating Temperature | -40 F to 140 C (-40 C to 60 C) |
| Lifetime | 20 years, at 104 F (40 C) |

Alarm Port

See [Figure 5 on page 20](#) for the alarm port location.

Attach the alarm port to an alarm system to monitor and trigger external alarm events. The router supports two alarm inputs and two alarm outputs.

The alarm-trigger setting determines when an alarm is sent to the attached alarm system.

The alarm port has a rating of 30V DC, 1A.

Input Alarm Trigger Settings

- **Open**—The **open** setting indicates that the normal router operating condition has an electrical current passing through the alarm circuits (DRY contact closed). If this electrical current is no longer detected (DRY contact open), an alarm is generated.
- **Closed**—The **closed** setting indicates that the normal router operating condition is that no electrical current is passing through the alarm circuits (DRY contact open). If an electrical current is detected (DRY contact closed), an alarm is generated.

Output Alarm Trigger Settings

- **Normally Open (NO)**—This setting depends on the pinout of the cable that is connected to the alarm port. See [Connector and Cable Specifications, page 93](#).
- **Normally Closed (NC)**—This setting depends on the pinout of the cable that is connected to the alarm port. See [Connector and Cable Specifications, page 93](#).

If interfaces fail or other non-fatal errors occur, the alarm port does not respond. Continue to use SNMP to manage these types of errors.

Note: Due to the RJ-45 pin spacing, the alarm port does not support AC signaling.

Specifications

| Specification | Description |
|----------------|----------------|
| Connector type | RJ-45 |
| Alarm input | 8 volts @ 1 mA |
| Alarm output | 30 volts @ 1 A |

Internal Hardware Features

This section describes router hardware features that are integrated into the router and which are not visible from the router exterior. This section describes the following features:

- [Memory, page 29](#)
- [Internal GPS Module, page 29](#)
- [WiFi Short-Range Access Point, page 30](#)
- [Real-Time Clock \(RTC\), page 31](#)
- [Temperature Sensor, page 31](#)

Memory

This router supports the three types of memory described in this section.

- **SD Flash Memory Module**—See [Using the SD Flash Memory Module, page 77](#) for information about the router SD card, which stores the router configuration and system data.
- **DDR2 SDRAM**—The router features 1 GB of double data rate (DDR2) SDRAM.
- **Boot Flash**—The router features 16 MB of boot flash memory, consisting of two 8 MB Serial Peripheral Interface (SPI) flash devices. The boot flash supports the Common Flash Interface (CFI) standard.

Internal GPS Module

The router has an internal Global Positioning System (GPS), which provides precise time and location information to the system.

GPS LED

You can view the GPS LED to determine the GPS state and whether or not it is successfully connected to a GPS satellite. For information on the GPS LED, see [Router LED Locations and States, page 83](#).

Specifications

| Specification | Description |
|-------------------------|---|
| Channels | 12 |
| Tracking sensitivity | -160 dBm |
| Acquisition sensitivity | -148 dBm |
| Fast TTFF (Cold start) | 38 seconds |
| Error correction | Space Based Augmentation Systems (SBAS) |

Related Commands

- [Displaying GPS Current Time and Location for a Cisco CG-OS Router, page 29](#)
- [Displaying GPS Current Time and Location for a Cisco IOS Router, page 29](#)

Displaying GPS Current Time and Location for a Cisco CG-OS Router

Use the commands in this section to see the GPS current time and location.

Use the **show gps time** command to display the current GPS time:

```
CGR1120# show gps time
8:46:9.923 UTC Fri Sep 11 2011
```

Use the **show gps location** command to display the GPS latitude and longitude:

```
CGR1120# show gps location
Latitude: 37.4090637
Longitude -121.9523598
```

Displaying GPS Current Time and Location for a Cisco IOS Router

Use the commands in this section to see the GPS current time and location.

Use the **show platform gps time** command to display the current GPS time:

Hardware Features

```
CGR1120# show platform gps time
0:55:26.588 UTC Tue May 14 2013
```

Use the **show platform gps location** command to display the GPS latitude and longitude:

```
CGR1120# show platform gps location
Latitude: 37.4184227
Longitude -121.9190216
```

WiFi Short-Range Access Point

The router features an integrated, short-range WiFi access point to support a wireless connection to the router, over which you can administer the router. The router can be installed in a utility box or substation; the wireless connection enables you to manage the router from outside these enclosures.

The WiFi connection is available only when the system software is operating. If the system software is not operating, you cannot use the WiFi connection to connect to or administer the router.

- [WiFi Default Settings, page 30](#)
- [Related Commands, page 30](#)

WiFi Default Settings

These are the default WiFi interface identity settings for the Cisco CG-OS and Cisco IOS operating systems:

| Cisco Operating System | Interface Identity |
|------------------------|--------------------|
| Cisco CG-OS | wifi 2/1 |
| Cisco IOS | dot11Radio 2/1 |

Note: The CGR 1120 router WiFi interface is assigned to module 2 and cannot be changed.

For more information on the WiFi configuration and setting it, see the *Cisco 1000 Series Connected Grid Routers WiFi Software Configuration Guide* on Cisco.com, at: www.cisco.com/go/cgr1000-docs.

Related Commands

- [Displaying WiFi Configuration Information for a Cisco CG-OS Router, page 30](#)
- [Displaying WiFi Configuration Information for a Cisco IOS Router, page 31](#)

Displaying WiFi Configuration Information for a Cisco CG-OS Router

Note: For a CGR 1120 router using the Cisco CG-OS operating system, the WiFi interface is identified as 'wifi 2/1'.

To display WiFi configuration information, enter any or all of the following commands in privileged EXEC or user EXEC mode:

- **show interface wifi slot/port [associations | brief | description | statistics]**—Displays the status of the interface as up or down, the five second input and output rate and the number of input and output packets. Additionally, the Cisco CG-OS router displays hardware details such as radio type (802.11N, 2.4 GHz radio), MAC address and MTU setting.
- **show controller wifi slot/port**—Displays serial number, software version, and configured frequency and power settings.

For detailed information about these commands, see the chapter “Configuring the WiFi Interface” in the *Cisco 1000 Series Connected Grid Routers WiFi Software Configuration Guide*, at www.cisco.com/go/cgr1000-docs.

Displaying WiFi Configuration Information for a Cisco IOS Router

Note: For a CGR 1120 router using the Cisco IOS operating system, the WiFi interface is identified as ‘Dot11Radio 2/1’.

To display WiFi configuration information, enter any or all of the following commands in privileged EXEC or user EXEC mode:

- **show interface dot11Radio 2/1**—Displays the status of the interface as up or down, the five second input and output rate and the number of input and output packets. Also displays hardware details such as radio type (802.11N, 2.4 GHz radio), MAC address and MTU setting.
- **show controller dot11Radio 2/1**—Displays the serial number, software version, and configured frequency and power settings.

For detailed information on how to use these commands, see the *Cisco 1000 Series Connected Grid Routers WiFi Software Configuration Guide* on Cisco.com, at: www.cisco.com/go/cgr1000-docs.

Real-Time Clock (RTC)

The router features an integrated real-time clock (RTC) with battery backup that supplies the system software with accurate date and time information. The integrated router GPS compares the current RTC time with the time at which it last received a valid signal to ensure accurate timekeeping on the router.

When the router is powered on using the CONFIG Reset button, the RTC sets the router memory controller and clock frequency. For more information, see the [CONFIG Reset Button, page 21](#).

RTC Battery

The RTC includes battery backup for the date and time when the router is not receiving any power.

Specifications

| Specification | Description |
|----------------------|--|
| Battery type | High-capacity lithium (550 mAh) |
| Battery life span | 10 years |
| Supported interrupts | Time-of-day alarms (Range: 1/second - 1/month) |
| | Periodic rates (Range: 122 us - 500 ms) |
| | End-of-update-cycle notifications |

Temperature Sensor

The router hardware features an internal temperature sensor used by the router software to monitor the system operating temperature. The router can be configured to generate alerts when the temperature falls outside of a user-defined temperature range. The router can also be configured to store historical temperature data.

For more information about monitoring and storing router temperature data, see the *Cisco 1000 Series Connected Grid Routers Software Configuration Guide Set*.



Mounting the Router

This section describes the safety information, equipment, and procedures required to mount the Cisco 1120 Connected Grid Router on a vertical pole or streetlight.

These topics are discussed:

- [Router Mounting Kit, page 33](#)
- [Prepare to Mount the Router, page 34](#)
- [Mounting Instructions, page 35](#)
- [Ground the Router, page 40](#)

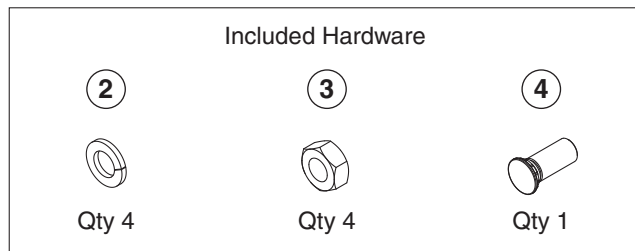
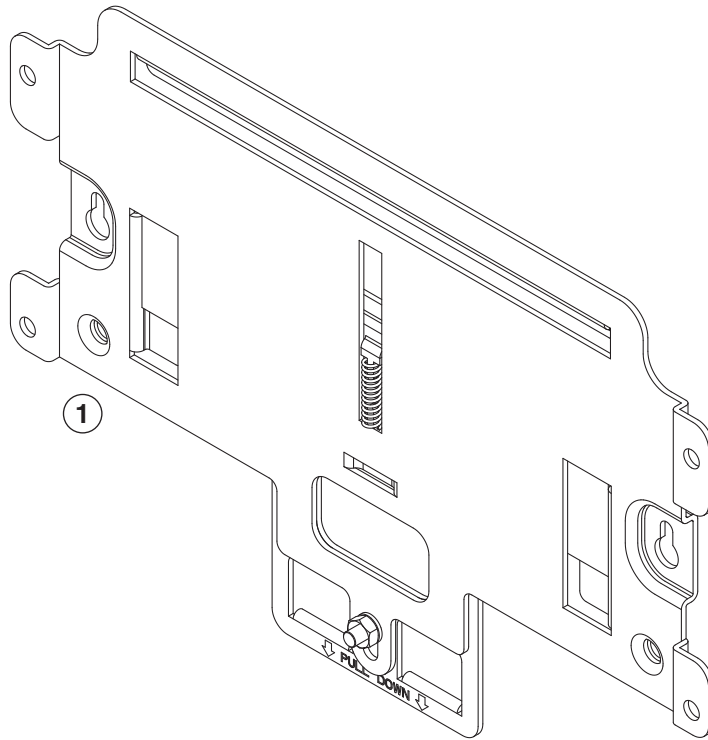
Router Mounting Kit

The router ships with a mounting kit that contains all the parts required to mount the router on a DIN rail or on a wall. A detailed description of the mounting parts shipped with your router is included in the [Mounting Kit Contents, page 33](#).

Mounting Kit Contents

The mounting bracket attaches to the router. The router is then installed on a wall using the mounting bracket, or on a DIN rail, using the DIN rail adapter.

Figure 1 Mounting Kit Contents



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| Item | Description | Qty. |
|------|------------------------|------|
| 1 | Mounting bracket | 1 |
| 2 | Split lock washer (M8) | 4 |
| 3 | Nut (M8) | 4 |
| 4 | Mounting stud (M8) | 1 |

Prepare to Mount the Router

Read these topics before mounting the router:

- [Materials and Tools You Supply, page 35](#)
- [Router Orientation When Mounting, page 35](#)
- [General Safety Information for Mounting, page 35](#)

Materials and Tools You Supply

You must supply some or all of these items to mount the router on a pole. The items you supply depend on the installation procedure that you use.

| Item | Required for These Procedures |
|-------------------------|---|
| #2 Phillips screwdriver | <ul style="list-style-type: none">■ See Attach the Mounting Bracket to the Router, page 35.■ See Ground the Router, page 40. |
| Crimping tool or pliers | <ul style="list-style-type: none">■ See Ground the Router, page 40. |

Router Orientation When Mounting

When mounting the router on a DIN rail or wall, ensure that the router is oriented with the chassis cabling openings pointing down so the router cable hangs down.

Caution: Mounting the router with the cable panel at the top (facing up) can cause stress on the cables and potentially impact network and other connections. We discourage mounting the router with the cable panel at the top.

General Safety Information for Mounting

Before performing any of the tasks in this chapter, read the safety warnings in this section and in [Connecting the Router to Power, page 43](#).

One person is required to properly and safely mount the router.

Caution: All mounting methods at any location are subject to the acceptance of local jurisdiction.

Caution: Personnel mounting the router must understand grounding methods.

Warning: Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, as they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (for example, U.S.:NFPA 70, National Electrical Code, Article 810, Canada: Canadian Electrical Code, Section 54). Statement 1052

Mounting Instructions

This section includes all the steps required to mount the router on a wall or DIN rail. There are two main procedures for mounting the router:

- [Attach the Mounting Bracket to the Router, page 35](#)
- [Mount the Router on a DIN Rail, page 38](#)

In some environments, you might want to mount the router on a wall instead of DIN rail. The wall mounting procedure is described in the [Mount the Router on a Wall, page 39](#).

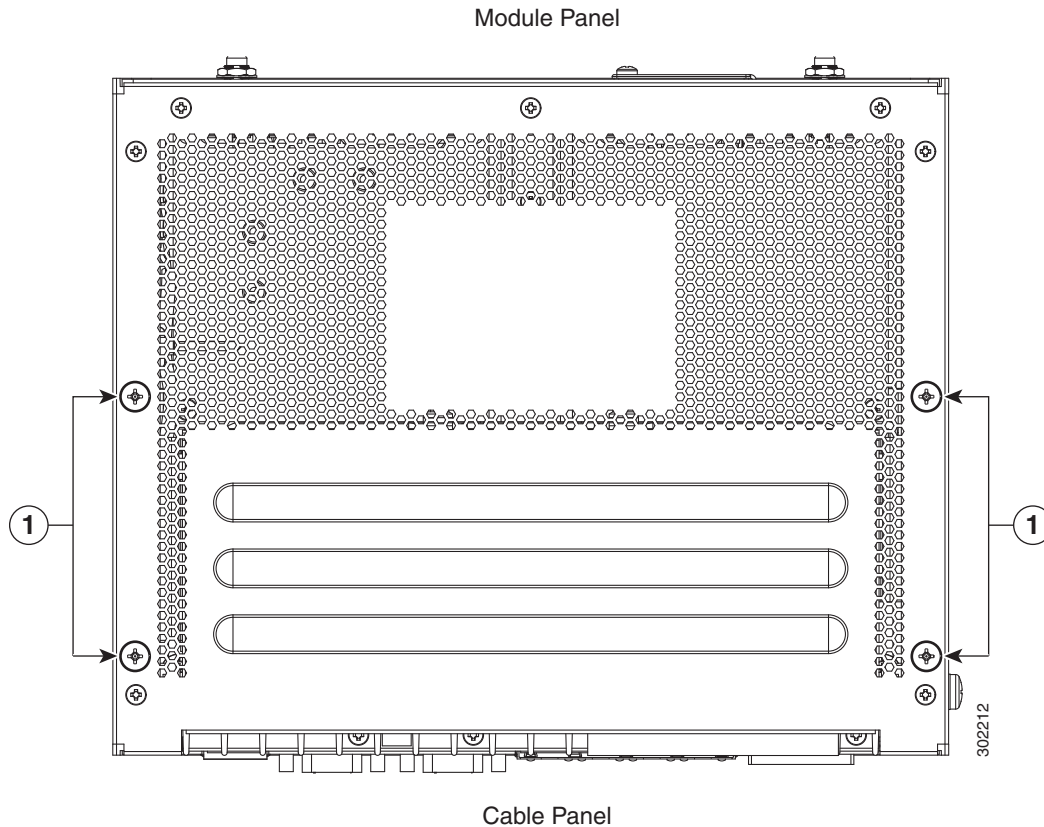
Attach the Mounting Bracket to the Router

Before you begin, disconnect the router from power and any network connections.

1. Place the router on a stable surface, with the base of the router facing up and the module panel at the top, as shown in [Figure 2 on page 36](#).

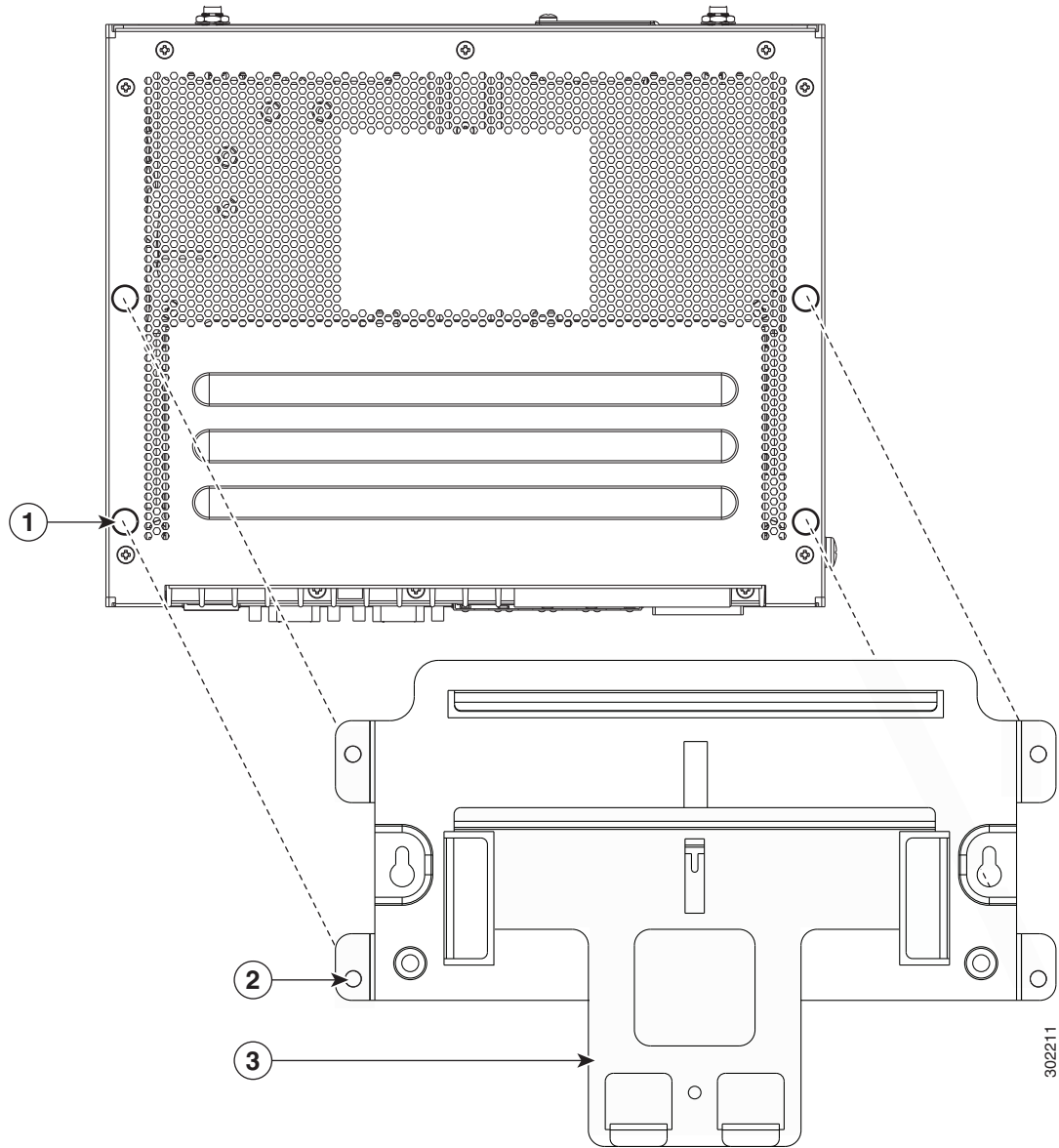
2. Use the #2 Phillips screwdriver to remove the four large screws (Item 1, [Figure 2 on page 36](#)) from the chassis base. Keep the screws. You will replace them at the end of this procedure to mount the bracket on the chassis.
3. Remove only the screws indicated in [Figure 2 on page 36](#). Do not remove the smaller screws, which secure the router bottom panel to the chassis.

Figure 2 Remove the Four Large Screws (1) from the Router Base



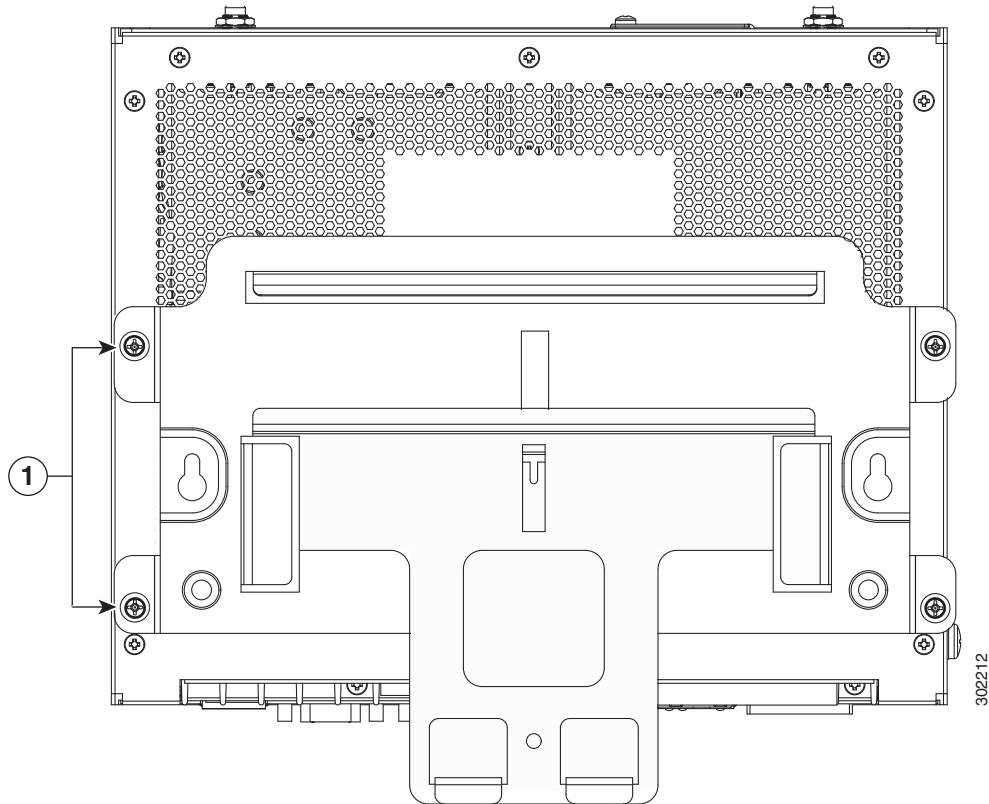
4. Place the mounting bracket onto the back of the router, following these guidelines ([Figure 3 on page 37](#)):
 - The **bracket handle** (Item 3, [Figure 3 on page 37](#)) should be facing the router cable panel.
 - Align the **bracket mounting holes** (Item 2, [Figure 3 on page 37](#)) with the router **bracket connectors** (Item 1, [Figure 3 on page 37](#)). (The screws were removed from the bracket connectors in Step 2.)

Figure 3 Align the Bracket Mounting Holes (2) over the Router Bracket Connectors (3)



5. Replace the screws you removed in Step 2 to secure the mounting bracket to the chassis.
6. Evenly hand-tighten the screws (Item 1 in [Figure 4 on page 38](#)), then tighten with the Phillips #2 screwdriver.

Figure 4 Replace and Tighten Screws to Secure Bracket to Router



Mount the Router on a DIN Rail

The steps in this section assume that your substation or utility box already has a DIN rail installed and ready to support equipment. If your environment does not use DIN rails, you can mount the router on a wall. For more information, see [Mount the Router on a Wall, page 39](#).

To mount the router on a DIN rail:

1. Tilt the chassis-bracket assembly about 10 to 30 degrees and the bracket handle facing down. Do not mount the router with the bracket handle facing up.

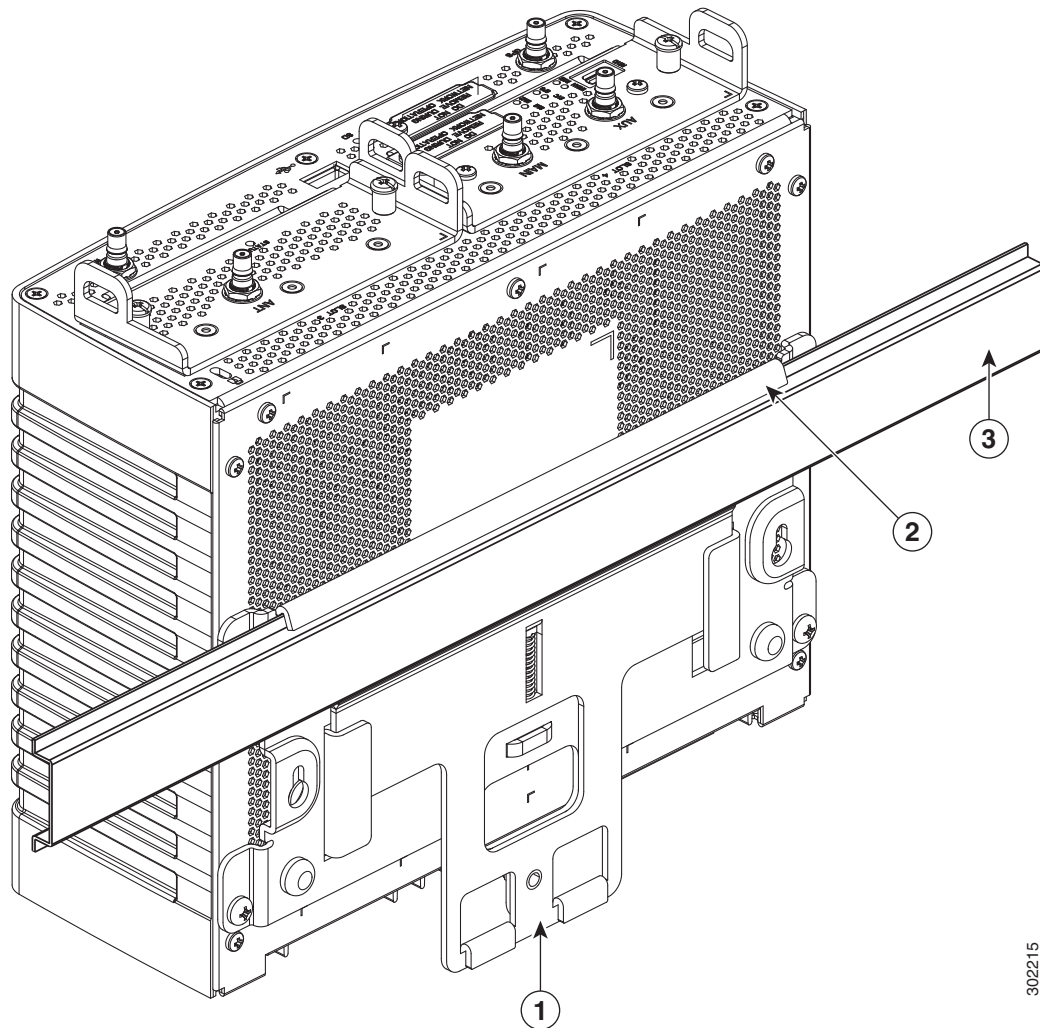
For the following steps, reference [Figure 5 on page 39](#).

2. Place the **top lip of the bracket** (Item 2) over the top of the **DIN rail** (Item 3).
3. Firmly pull the **bracket handle** (Item 1) down and rotate the unit until it is parallel to the wall or DIN rail.

Caution: Use caution when pulling the bracket handle: The handle is spring-loaded and will snap shut when released quickly.

4. Slowly release the bracket handle so that the bottom lip of bracket is secured over the top of the DIN rail.

Figure 5 Router Mounted on DIN Rail (3)



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Mount the Router on a Wall

The mounting bracket has wall-mount holes that you can use to mount the router directly on a wall.

To mount the router on a wall, you must provide the hardware that can be used with the wall material in the installation environment.

Caution: The wall material and hardware that you use to mount the router must be able to support the weight of the router with two modules installed: **8.0 pounds (3.6 Kg)**.

Wall-Mount Orientation

See the [Router Orientation When Mounting](#), page 35.

Wall-Mount Location

Identify an area on a wall that meets the safety, space, and environmental requirements described in [Installation Safety and Site Preparation](#), page 5.

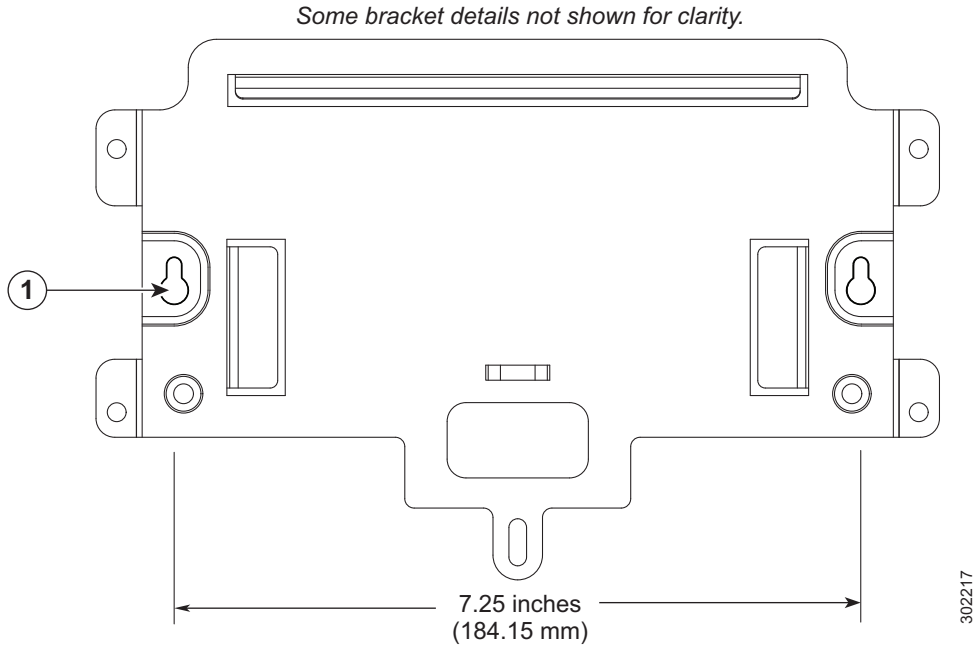
Wall-Mount Height

The router should be mounted at a height at which you are able to view the top of the module-side panel and at which the cables are able to be managed without adding stress to the router ports.

Wall-Mount Hardware Distance

The hardware you provide should be mounted the correct distance apart so that the router wall mount holes (Item 1, [Figure 6 on page 40](#)) can be hung on the hardware **7.25 in. (184.15 mm)**.

Figure 6 Distance for Wall-Mounting Hardware

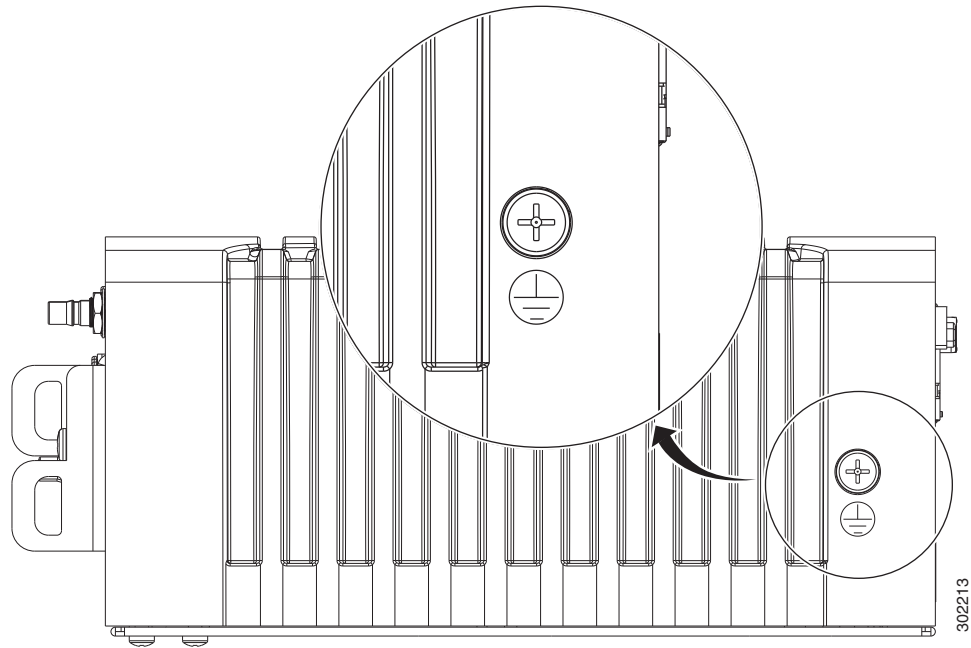


Ground the Router

You must ground the router with the grounding lug on the chassis exterior as described in this section.

Warning: This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

Figure 7 Router Grounding Lug Location



To ground the router:

1. Use the appropriate crimping tool or pliers to crimp a 6-gauge ground that will attach to the grounding lug on the router exterior. You must provide the wire.
- [Figure 6 on page 40](#) shows the grounding lug location.
2. Connect the other end of the wire to the router grounding connectors, using the supplied grounding screws. Tighten the grounding screws to 10 to 12 foot-pounds of torque. Do not over tighten!
 3. If necessary, strip the other end of the ground wire and connect it to a reliable earth ground, such as a grounding rod or an appropriate grounding point on substation equipment that is grounded.



Connecting the Router to Power

This section describes how to connect the Cisco 1120 Connected Grid Router to AC and DC power source

These topics are discussed:

- [Before You Begin, page 43](#)
- [AC Power Connection Information, page 45](#)
- [Connect to AC Power, page 49](#)
- [Connect to DC Power, page 50](#)
- [Power Cycling the Router, page 51](#)

Before You Begin

Before you connect power to the router, read these topics:

- [Verify Router Hardware Readiness, page 43](#)
- [Tools and Materials You Supply, page 43](#)
- [EMC Class A Notices and Warnings \(US and Canada\), page 44](#)
- [Safety Information, page 44](#)

Verify Router Hardware Readiness

Before connecting the router to power, verify the following:

- The unit is grounded as described in [Mounting the Router, page 33](#).
- The SD flash memory module is installed correctly as described in [Using the SD Flash Memory Module, page 77](#).

Tools and Materials You Supply

You must provide the following tools and materials to connect the router to AC power or optional DC power:

Note: For the AC power connector, a 5-way screw terminal printed circuit board plug connector manufactured by Phoenix Contact (part number 1913604) is supplied.

Note: For the DC power connector, a 2-way screw terminal printed circuit board plug connector manufactured by Phoenix Contact (part number 1912184) is supplied.

- Wire-stripping tool
- Flat-blade screwdriver

-
- AC power cable that meets the following requirements:
 - Wiring compatible with the power supply used at your site: single-phase or three-phase, rated 10A minimum
 - Plug that is compatible with the power source used at your site: single-phase or three-phase.
 - Correct length for your installation
 - DC power cable that meets the following requirements:
 - The length and gauge of the DC power cable must be selected such that the voltage supplied to the terminals of the router does not drop below 10.6VDC, which is the minimum recommended operating voltage. See the Power Specifications section in the Router Hardware Description chapter.
 - The maximum input current at 9VDC input will be less than 7A and the wire size must be selected by considering the installation DC operating voltage. DC input on the router accommodates a 12AWG to 18AWG wire size.
 - Please consult your Cisco reseller, partner, or sales representative for unusual installation requirements of greater than 30 feet of cabling.

EMC Class A Notices and Warnings (US and Canada)

Tip: For a complete listing of all EMC Class A Notices and Warnings, refer to following document:

[Regulatory Compliance and Safety Information for the Cisco 1000 Series Connected Grid Routers](#)

- [Class A Notice for FCC, page 44](#)
- [Class A Notice for Canada, page 44](#)

Class A Notice for FCC

Modifying the equipment without Cisco's authorization may result in the equipment no longer complying with FCC requirements for Class A digital devices. In that event, your right to use the equipment may be limited by FCC regulations, and you may be required to correct any interference to radio or television communications at your own expense.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case users will be required to correct the interference at their own expense.

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

Class A Notice for Canada

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

This device complies with Industry Canada (IC) license-exempt RSS standard(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.

Safety Information

When connecting the router to AC power, you must ensure that the following conditions are met:

-
- AC power is available at the installation location.
 - AC power can be readily and conveniently removed from the router. The power should not be removed by disconnecting the AC power connector on the unit.

Warning: The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device. Statement 1019

Warning: Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Warning: Installation of the equipment must comply with local and national electrical codes. Statement 1074

Warning: Before connecting or disconnecting the power cord, you must remove AC power from the power cord using a suitable service disconnect.

- When you install the unit outdoors, or in a wet or damp location, the AC branch circuit that powers the unit should have ground fault protection (GFCI), as required by Article 210 of the NEC.
- Ensure that the user-supplied AC power plug is certified for outdoor use and has a minimum rating, such as Interpower 84131251 or Hubbell HBL316P6W (IEC/EN60309 pin-and-sleeve type connectors).
- If the power cord goes through a metal cover, a bushing should be installed to prevent fraying of the cord. When using a strain relief bushing, follow these recommendations:
 - Use properly sized parts that are suitable for outdoor installation
 - Use bushings that are safety certified

AC Power Connection Information

This section provides information you need to connect the router to AC power and includes the following topics:

- [Router Power Source Input Terminals, page 45](#)
- [Electrical Wire Color Codes, page 46](#)
- [Terminal Blocks and Mating Connectors for Power Input Wiring, page 47](#)

Router Power Source Input Terminals

The Cisco CGR 1120 Router has two sets of terminals for power input (see [Figure 1 on page 46](#)):

- A set of five terminals for AC-input power source wires
- A set of two terminals for DC-input power source wires

Figure 1 Router Power Source Input Terminals

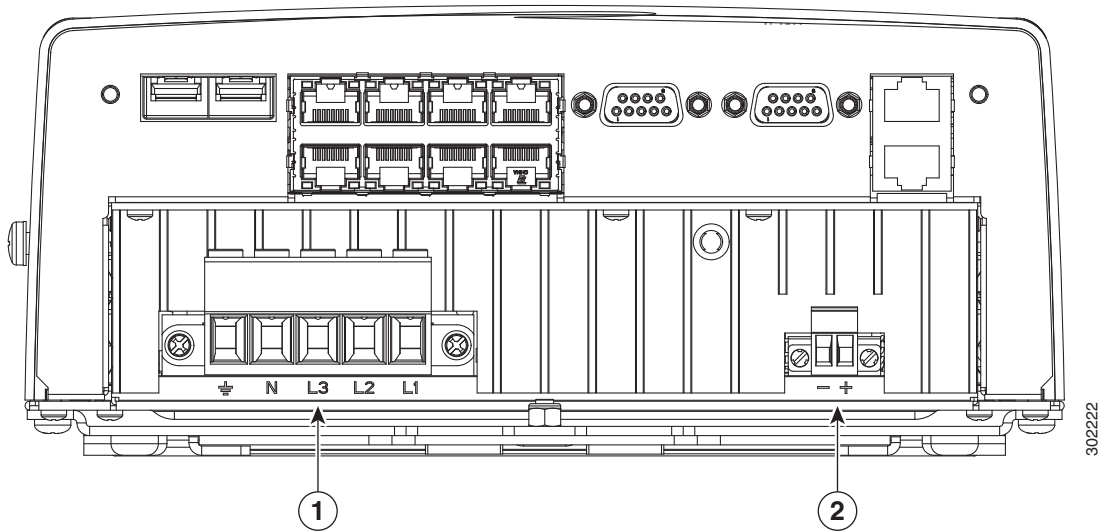


Figure 1 on page 46 shows the label for each terminal.

Table 1 Power Input Terminals

| Item | Terminal Type | Description |
|------|---------------------------------|--|
| 1 | AC-Input Power Source Terminals | |
| | ⊕ | Ground terminal To provide a protected earth ground, terminate either a green/yellow or green wire (region-specific) from the AC power cable on the external screw on the left side of the router. See Table 2 on page 47 for details on wiring colors by region |
| | N | Neutral wire terminal |
| | L3 | Line terminal |
| | L2 | Line terminal |
| 2 | DC-Input Power Source Terminals | |
| | - | Negative |
| | + | Positive |

Electrical Wire Color Codes

This section provides general information about the standard wire coloring used for AC and DC power connections. Use these colors as a guide when wiring the terminal block as part of the AC power and DC power connection procedure.

Caution: Verify power wire color information for your installation site with a qualified electrician before making any power connections to the router.

Table 2 AC Power Electrical Wiring Colors by Region

| Region or Country | Standard | Ground (Protective Earth) | Neutral | Line (Phases) |
|-------------------|-----------|---------------------------|---------|--|
| European Union | IEC 60446 | Green-and-yellow | Blue | Black, brown, gray |
| United States | - | Green | White | 120/208/240V: Black, red, blue 277/480V: Brown, orange, yellow |
| Canada | - | Green | White | 120/208/240V: Red, black Single-phase isolated systems: orange, brown Three-phase isolated systems: orange, brown, yellow |

Table 3 DC Power Electrical Wiring Colors

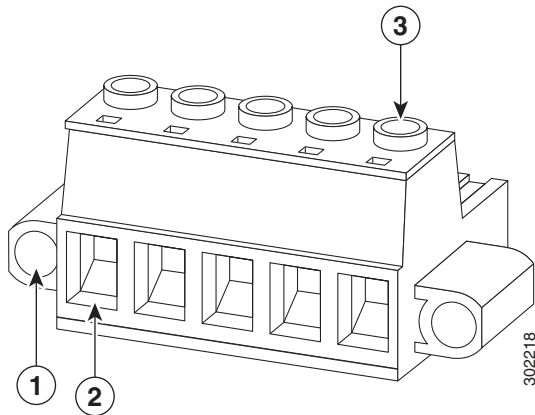
| Color | Description |
|-------|-------------|
| Black | Negative |
| Red | Positive |

Terminal Blocks and Mating Connectors for Power Input Wiring

The router ships with two connectors used to connect power to the AC and DC power connectors on the router.

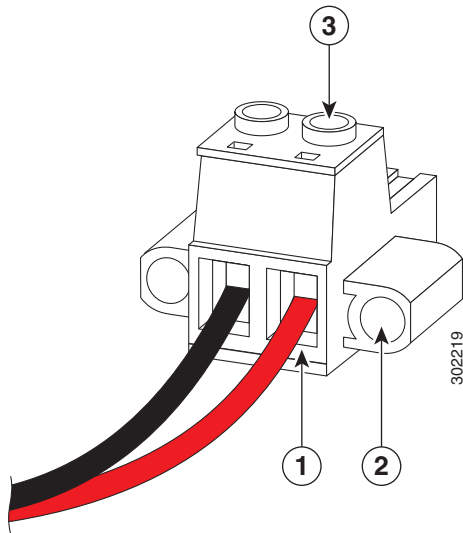
- The AC power connection mating connector is a 5-way screw terminal printed circuit board plug connector manufactured by Phoenix Contact (part number 1913604). [Figure 2 on page 48](#) shows the connector.
- The DC power connection mating connector is a 2-way screw terminal printed circuit board plug connector manufactured by Phoenix Contact (part number 1912184). [Figure 3 on page 48](#) shows the connector.

Figure 2 AC Power Connector



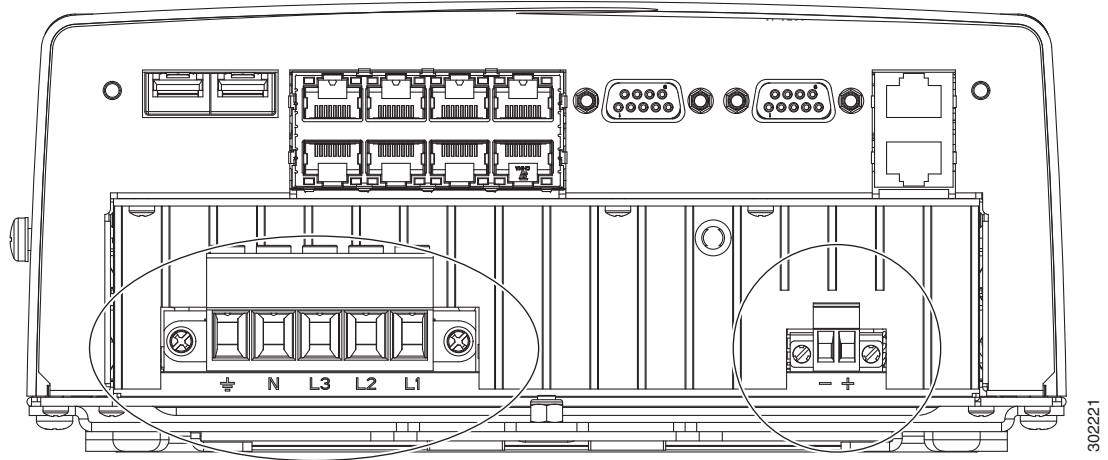
| Item | Description | Quantity |
|------|---|----------|
| 1 | Captive screws, for connecting terminal block to mating connector on the router | 2 |
| 2 | Terminal openings for inserting AC-input source wires | 5 |
| 3 | Screws for tightening wires into terminal openings | 5 |

Figure 3 DC Power Connector



| Item | Description | Quantity |
|------|---|----------|
| 1 | Terminal openings for inserting DC-input source wires | 2 |
| 2 | Captive screws, for connecting terminal block to mating connector on the router | 2 |
| 3 | Screws for tightening wires into terminal openings | 2 |

Figure 4 Terminal Block Mating Connectors Connected to Router Chassis



Connect to AC Power

This section describes how to make two the following types of AC power connections to the router:

- Single-phase AC
- Three-phase AC

Note: The AC power connection mating connector shipped with the router is a 5-way screw terminal printed circuit board plug connector manufactured by Phoenix Contact (part number 1913604).

To connect the router to AC power, follow these steps:

Note: The router will power on as soon as it is connected to an AC power source. You are not required to press a power button to power on the router.

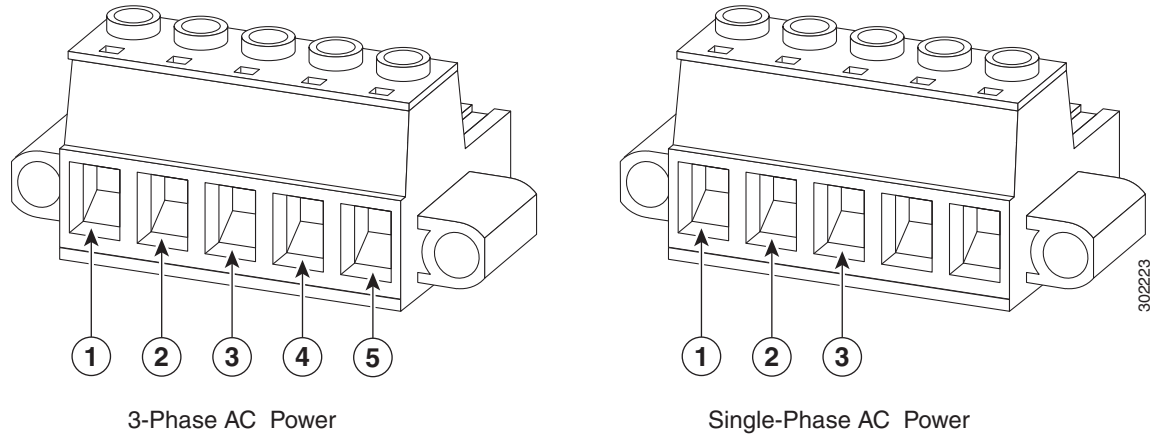
接続ケーブル、電源コード、ACアダプタ、バッテリーなどの部品は、必ず添付品または指定品をご使用ください。添付品・指定品以外の部品をご使用になると故障や動作不良、火災の原因となります。また、電気用品安全法により、当該法の認定（PSEとコードに表記）でなくUL認定（ULまたはCSAマークがコードに表記）の電源ケーブルは弊社が指定する製品以外の電気機器には使用できないためご注意ください。

Caution: When connecting the router AC power connector, always connect the router end of the cable first. When removing the AC power connector, always disconnect the router end of the cable last.

1. Turn off power to the AC power source at the designated circuits.
2. Use a wire-stripping tool to strip each of the wires from the AC-input power source. Expose the wire to the appropriate length for the terminal block, about 0.25 inches.
3. Insert the wires into the AC power connector terminals described in [Figure 1 on page 46](#) and [Table 1 on page 46](#).

Insert wires that correspond to your installation (three-phase or single-phase), as shown in [Figure 5 on page 50](#).

Figure 5 AC Power Connector Wiring



4. After the wires are inserted into the connector terminals, use the screwdriver to tighten the connector screw terminals. The screw terminals are shown in [Figure 2 on page 48](#).
5. Connect the AC power connector to the AC power connection on the router as shown in [Figure 4 on page 49](#).
6. Use the screwdriver to tighten the two captive screws on the connector. The terminal screws are shown in [Figure 2 on page 48](#). Torque the terminal block screws to 1.243 N-m (11 lbf-in).
7. Turn on AC power by plugging in an AC power cord to the power source, or enabling power at the designated circuit. The router will power on and run a series of bootup tests, indicated by blinking LEDs.

Verify AC Power Connection

After you connect the router to AC power, verify that the power is being supplied to the router by checking the status of the SYS (System) LED. As the router starts up, the SYS LEDs show these states:

| Sequence | State | Description |
|----------|----------------|---|
| 1 | Yellow | System is receiving power. |
| 2 | Green blinking | The system is starting up or power cycling, and loading system software, including BIOS and operating system. |
| 3 | Green solid | The system is functioning normally. |

For the SYS LED location, see [Figure 1 on page 84](#) in [Router LED Locations and States, page 83](#).

Connect to DC Power

You can connect the router to a DC power source as a primary source.

Note: If you are using AC power as the primary source of power to the router, you can also configure DC power as an alternate power source in the event that the AC power source fails or is disrupted.

Note: The AC power connection mating connector shipped with the router is a 2-way screw terminal printed circuit board plug connector manufactured by Phoenix Contact (part number 1912184).

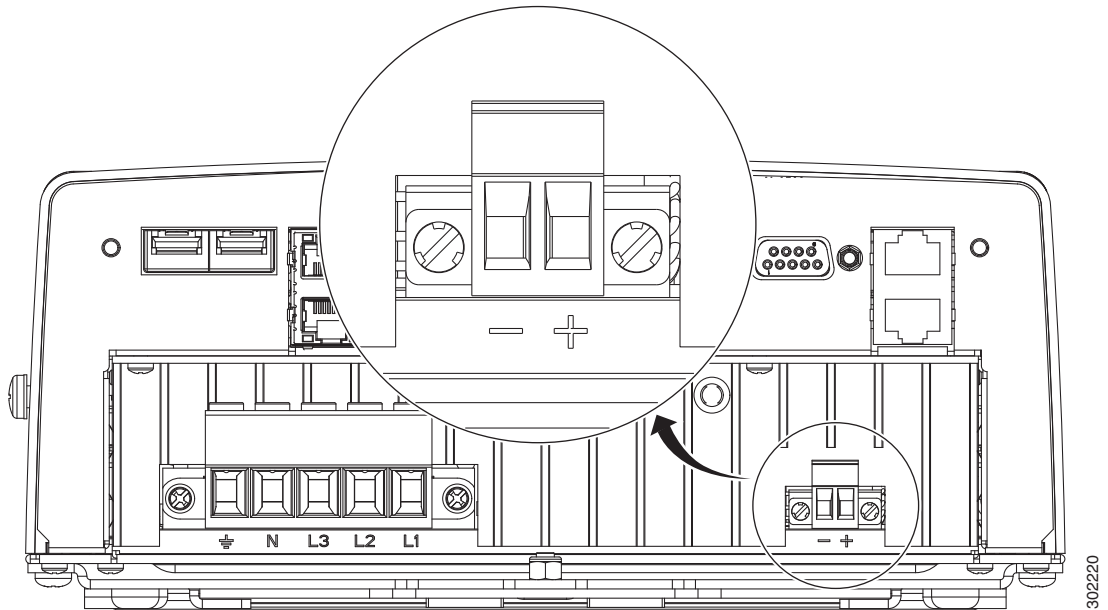
To connect a DC-input power source to the router, follow these steps:

1. Turn off power to the DC power source at the designated circuits.

2. Using a wire-stripping tool to strip both of the wires from the DC-input power source. Expose the wire to the appropriate length for the DC power connector, about 0.25 inches.
3. Insert the wires into the DC power connector terminals described in [Figure 1 on page 46](#) and [Table 1 on page 46](#).

Note: When you insert the wires in the terminals as shown in [Figure 6 on page 51](#), ensure that the polarity matches: negative-to-negative and positive-to-positive).

Figure 6 DC Power Connector Terminals



4. Use the screwdriver to tighten the two captive screws on the connector. The terminal screws are shown in [Figure 6 on page 51](#). Torque the terminal block screws to 1.243 N-m (11 lbf-in).
5. Connect the DC power connector to the DC power connection on the router as shown in [Figure 4 on page 49](#).
6. Use the screwdriver to tighten the two captive screws on the terminal block to the mating connector. The terminal screws are shown in [Figure 2 on page 48](#). Torque the terminal block screws to 1.243 N-m (11 lbf-in).
7. Enable DC power by plugging in the DC power supply cord to the power source, or by enabling power at the designated circuit.

Power Cycling the Router

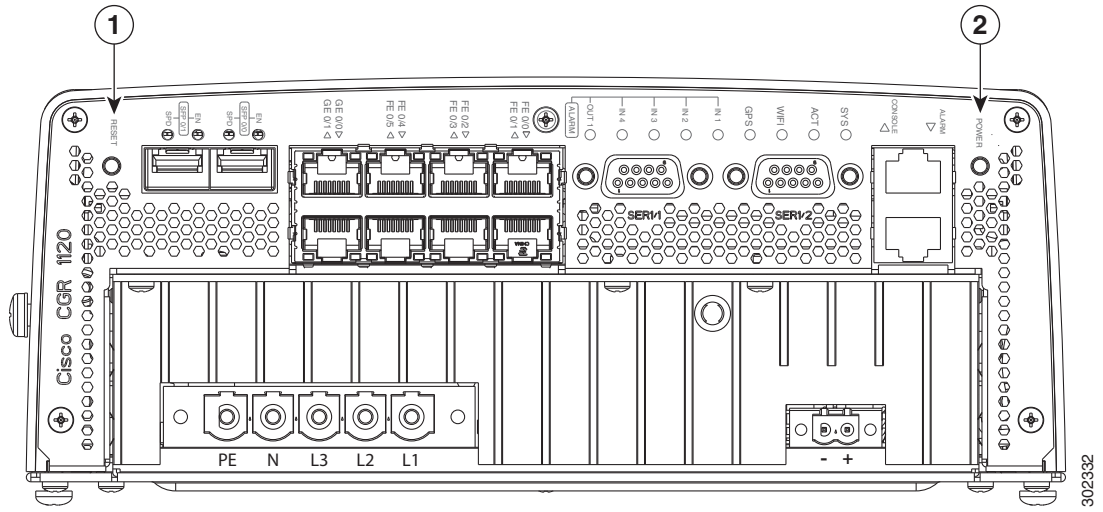
There are two reset buttons on the router cable panel, which can be used to power cycle the router and to reset the router system software to the default configuration. Use the reset buttons as described in this section.

Caution: When you use the CONFIG Reset button to restore the router to the factory default software configuration, the current software configuration is permanently deleted from the router.

Accessing the Buttons

You must provide a pin, paper clip, or other thin metal tool to access and press these buttons.

Figure 7 Router Power and Reset Buttons



| Item | Button | Description |
|------|---------------------|---|
| 1 | CONFIG Reset | Press the CONFIG Reset button for at least 5 seconds to return the router software configuration to the factory default, and power cycle the router. Power cycling the router turns the router off, then immediately back on. The router will temporarily stop operating on the network during the power cycle, then resume operating when the power cycle process is complete. |
| 2 | PWR RESET | Press the PWR RESET button for at least 5 seconds to power cycle the router. Power cycling the router turns the router off, then immediately back on. The router will temporarily stop operating on the network during the power cycle, then resume operating when power cycle process is complete. |



Making Network Connections

This section describes how to connect network and other connections when installing the Cisco 1120 Connected Grid Router, and includes the procedures for basic router network connections and for optional installation steps. The procedures you follow depend on your network environment and requirements.

These topics are discussed:

- [Before Installing, page 53](#)
- [Basic Network Connections, page 54](#)
- [Additional Router Connections, page 58](#)
- [Installing Modules and Antennas, page 63](#)

Note: This chapter describes router installation procedures. For detailed, technical information about the router hardware, including hardware specifications and connector and cable descriptions, see [Router Hardware Description, page 11](#) and [Connector and Cable Specifications, page 93](#).

Before Installing

Before following any installation procedures in this section, read these topics:

- [Installation Site Preparation, page 53](#)
- [Installation Safety Information, page 53](#)
- [Connecting the Router to Power, page 53](#)
- [Preventing Electrostatic Discharge Damage, page 54](#)
- [Cabling Guidelines, page 54](#)

Installation Site Preparation

The procedures in this section assume that you prepared the installation site according to the information in [Installation Safety and Site Preparation, page 5](#).

Installation Safety Information

Before performing any of the tasks in this section, read the safety warnings in this section and in [Installation Safety and Site Preparation, page 5](#).

Connecting the Router to Power

Before you make network connections, your router should be connected to the AC power source and powered on as described in [Connecting the Router to Power, page 43](#).

Preventing Electrostatic Discharge Damage

Many of the components discussed in this chapter are sensitive to electrostatic discharge (ESD) damage, which can occur when electronic cards or components are handled improperly, which can result in complete or intermittent failures.

To prevent ESD damage, follow these guidelines:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- Place a removed memory card on an antistatic surface or in a static shielding bag. If the card will be returned to the factory, immediately place it in a static shielding bag.
- Avoid contact between the card and clothing. The wrist strap protects the card from ESD voltages on the body only; ESD voltages on clothing can still cause damage.
- Do not remove the wrist strap until the installation is complete.

Cabling Guidelines

Follow these guidelines for using cables with the router:

- Follow the recommended router orientation when mounting it to prevent cable strain. For more information, see the [Router Orientation When Mounting, page 35](#).
- Position cables so that they do not place strain on the router connectors.
- Organize cables into bundles when necessary to avoid intertwining.
- Inspect cables to ensure adequate routing and bend radius.
- Install cable ties that comply with your site requirements.

Basic Network Connections

This section describes basic router installation steps. These are the minimum installation steps required for the router to begin operating within the field area network.

Connect to the Ethernet Network

The steps in this section require that an Ethernet network connection is available at the installation location. There are two options for connecting to the Ethernet network:

- [Connecting the Ethernet Ports, page 54](#)
- [Connecting the SFP Ports, page 55](#)

Connecting the Ethernet Ports

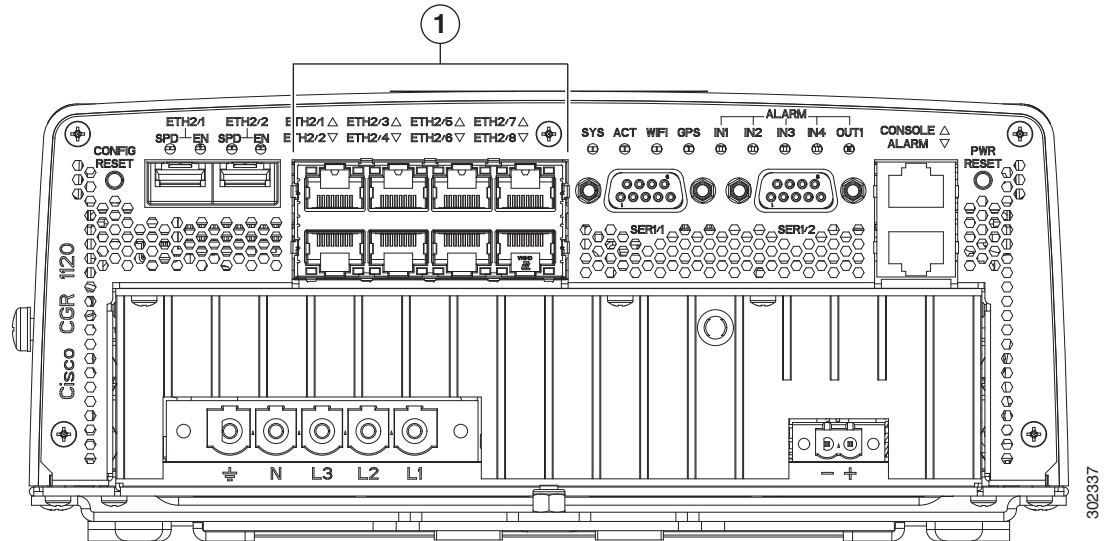
The router features four Fast Ethernet (FE) ports and two Gigabit Ethernet (GE) ports for connecting the router to an Ethernet network through a hub or switch.

- See [Figure 1 on page 55](#) for the Ethernet port locations.
- One or two Ethernet cables are typically provided with the router. Additional cables and transceivers can be ordered from Cisco. For ordering information, contact your reseller or Cisco customer service.

- The GE ports (ETH 2/1 and ETH 2/2) have identical labels to the SFP ports because the SFP ports share physical ports with the GE ports. For detailed information about how to use these ports (called combo ports), see [Combo Ports, page 24](#).

Warning: Do not work on the system or connect or disconnect cables during periods of lightning activity.
Statement 1001

Figure 1 Ethernet Ports



1 Ethernet ports

| Item | Description |
|------|--|
| 1 | 4-Fast Ethernet ports <ul style="list-style-type: none"> ■ ETH 2/3 ■ ETH 2/4 ■ ETH 2/5 ■ ETH 2/6 |
| 2 | 2-Gigabit Ethernet port (combo ports) <ul style="list-style-type: none"> ■ ETH 2/1 ■ ETH 2/2 |

Connecting the SFP Ports

Small Form-Factor Pluggable (SFP) modules are devices that plug into the router SFP connectors shown in [Figure 2 on page 57](#). The transceiver connects the electrical circuitry of the module with the optical or copper network.

The SFP module used on each port must match the wavelength specifications on the other end of the cable, and the cable must not exceed the stipulated cable length for reliable communications.

Use only Cisco SFP transceiver modules with the router. Each SFP transceiver module supports the Cisco Quality Identification (ID) feature which allows a Cisco switch or router to identify and validate that the transceiver module is certified and tested by Cisco.

Warning: Class 1 laser product. Statement 1008

Caution: Do not remove the dust plugs from the fiber-optic SFP module port or the rubber caps from the fiber-optic cable until you are ready to connect the cable. The plugs and caps protect the SFP module ports and cables from contamination and ambient light.

Caution: Cisco recommends that you not install or remove the SFP module while the fiber-optic cable is attached to it because of the potential damage to the cables, to the cable connector, or to the optical interfaces in the SFP module. Disconnect the cable before you remove or install an SFP module.

Materials and Tools You Supply

You must provide these tools and materials to install the SFP transceiver module:

- Wrist strap or other personal grounding device to prevent ESD occurrences.
- Antistatic mat or antistatic foam to set the transceiver on.
- Fiber-optic end-face cleaning tools and inspection equipment. For complete information on inspecting and cleaning fiber-optic connections, see the white-paper document at this URL:

http://www.cisco.com/en/US/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml

Connecting

This section describes how to install SFP modules. SFP modules are inserted into the SFP ports shown in [Figure 2 on page 57](#).

You can connect SFP modules to these ports while the router is operating normally. The SFP ports are labeled **ETH 1/2** and **ETH 2/2**.

When installing or removing SFP modules, observe these guidelines:

- Removing and installing an SFP module can shorten its useful life. Do not remove and insert any module more often than is absolutely necessary.
- To prevent ESD damage, follow your normal board and component handling procedures when connecting cables to the switch and other devices.

To install SFP modules:

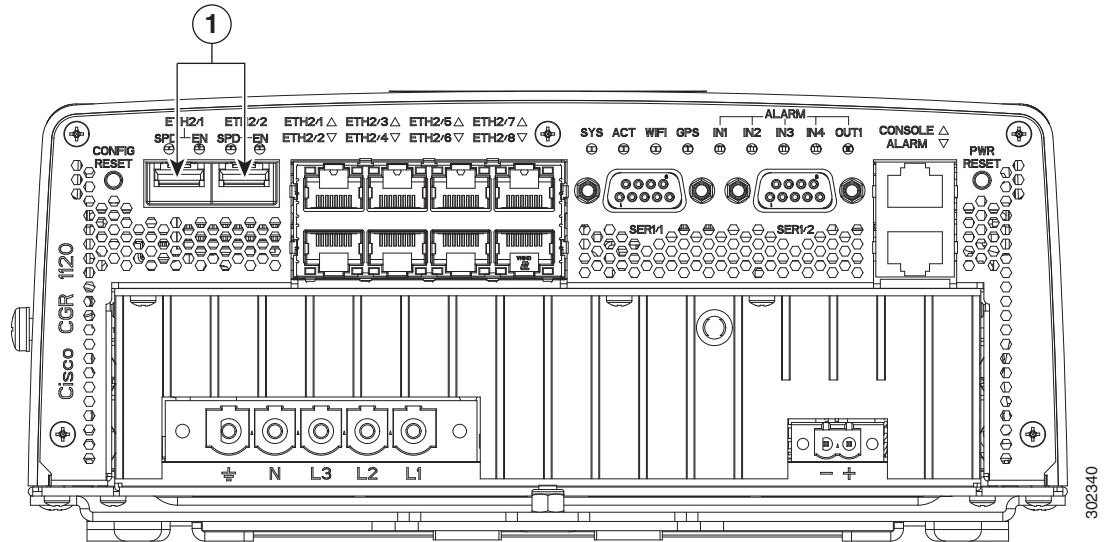
1. Attach an ESD-preventive wrist strap to your wrist and to a bare metal surface.
2. For fiber-optic SFP modules, remove the dust plugs and store them in a clean location for reuse.
3. Position the SFP transceiver module in front of the socket opening, and insert the SFP into the socket until you feel the connector latch into place.
4. Remove the dust plugs from the network interface cable LC connectors.
5. Inspect and clean the LC connector's fiber-optic end-faces.
6. Remove the dust plugs from the SFP transceiver module optical bores.
7. Attach the network interface cable connector to the SFP transceiver module.

Related Information

- For supported SFP modules, see [Router Hardware Description, page 11](#).

- For detailed information on connecting the SFP module cables to the network, see Cisco.com for the documentation for your SFP module.

Figure 2 SFP Ports



1 SFP ports

Verify Ethernet Connection with System Software CLI

Note: The **show interface** command works on routers using the Cisco CG-OS or Cisco IOS operating systems. The example shown is for a router using a CG-OS operating system.

To verify that the router has been successfully installed and connected to the network, use the **show interface** command to confirm that the router Ethernet interface is up.

```
CGR1120> show interface
Ethernet0 is up, line protocol is up
  Hardware is Cisco, address is 0019.076c.1a78 (bia 0019.076c.1a78)
  Internet address is 192.0.2.111/23
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 5/75, 32 drops
  5 minute input rate 10000 bits/sec, 27 packets/sec
  5 minute output rate 10000 bits/sec, 26 packets/sec
    16076431 packets input, 1280716531 bytes, 27 no buffer
    Received 1809290 broadcasts, 0 runts, 0 giants
    1105 input errors, 0 CRC, 0 frame, 0 overrun, 1105 ignored, 0 abort
    0 input packets with dribble condition detected
    16196175 packets output, 1011044938 bytes, 0 underruns
    19 output errors, 184 collisions, 3 interface resets
    0 babbles, 0 late collision, 1474 deferred
    19 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out
  Serial0 is administratively down, line protocol is down
  Hardware is HD64570
```

```
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation HDLC, loopback not set, keepalive set (10 sec)
Last input never, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/64/0 (size/threshold/drops)
  Conversations 0/0 (active/max active)
  Reserved Conversations 0/0 (allocated/max allocated)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  0 packets output, 0 bytes, 0 underruns
  0 output errors, 0 collisions, 1 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
DCD=down DSR=down DTR=down RTS=down CTS=down
```

For more information about using the **show interface** command, see the *Cisco 1000 Series Connected Grid Routers Software Configuration Guide*.

Additional Router Connections

This section provides information about making other router cable connections. Follow the procedures in this section based on your network configuration and requirements. This section contains these procedures:

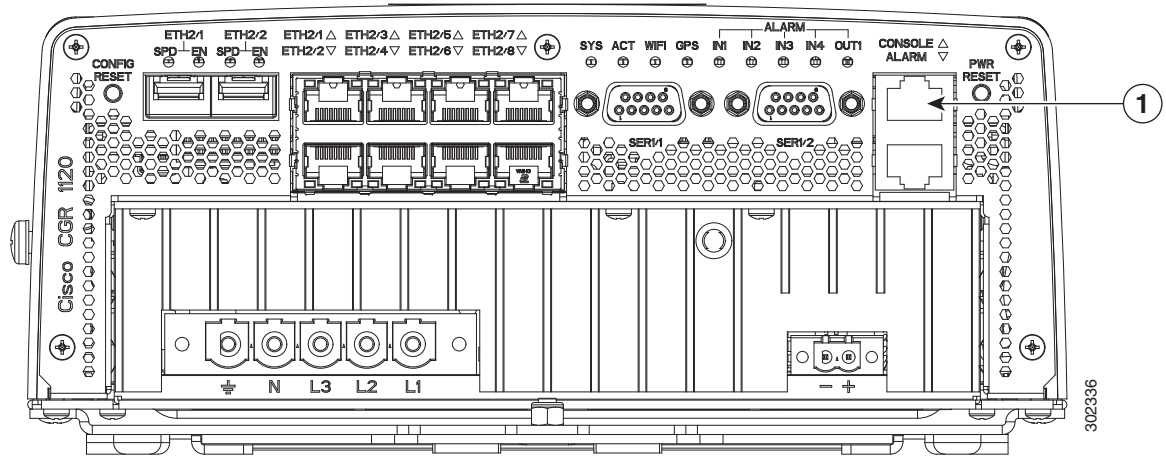
- [Connecting the Console Port, page 58](#)
- [Connecting the Serial Port, page 59](#)
- [Connecting the USB Port, page 60](#)
- [Connecting the Alarm Port, page 61](#)
- [Installing Modules and Antennas, page 63](#)

Connecting the Console Port

To configure the router through the Cisco IOS command-line interface (CLI), you must establish a connection between the router console port and either a terminal or a PC. The console port is located on the router exterior ([Figure 3 on page 59](#)) and is labeled **CON**.

Use this port to connect a PC terminal, enabling you to log directly into the router system software to perform configuration or other commands.

Figure 3 Console Port (Item 1)



- 1 Console port

Connecting

This section describes how to connect a PC terminal to the console port.

When a terminal is connected to the console port, you can connect directly to the router and configure it. You can connect a PC terminal to this port while the router is operating normally.

To connect a PC terminal to the router, you must provide:

- RJ-45-to-RJ-45 rollover cable
- One of the following adapters, depending on the port type of the terminal device: RJ-45-to-DB-25 female DTE adapter or RJ-45-to-DB-9 female DTE adapter (labeled TERMINAL).

To connect a PC or PC terminal to the console port:

1. Connect one end of the RJ-45-to-RJ-45 rollover cable to the console port on the router.
2. Connect the adapter you provide to the other end of the RJ-45 cable.
3. Connect the adapter end of the cable to the router.

Related Information

- For information about starting a terminal session over the console port with Microsoft Windows, Mac OS X, or Linux, see [Starting a Router Terminal Session, page 91](#).
- For more information about this port, see [Router Hardware Description, page 11](#).

Connecting the Serial Port

Before you connect a device to the router serial port ([Figure 4 on page 60](#)), you need to know the following:

- Type of device, data terminal equipment (DTE) or data communications equipment (DCE)
- Type of connector, male or female, required to connect to the device

- Signaling standard required by the device

These are the most common devices connected to the router serial ports:

| Serial Devices | Network Options | Network Protocols | Network Topology |
|--|--|--|------------------|
| Devices such as RTU or IED with serial asynchronous interface Note: No synchronous serial protocol support | CGR 1120 serial interface can connect through DB9 connector devices with RS232 and RS485 asynchronous full-duplex or half-duplex support | <ul style="list-style-type: none"> ■ IP over SLIP or PPP asynchronous lines ■ Raw Socket and SCADA protocol translation (DNP3 to DNP3/IP and IEC 60870-5-101 to IEC 60870-5-104) | Point-to-Point |

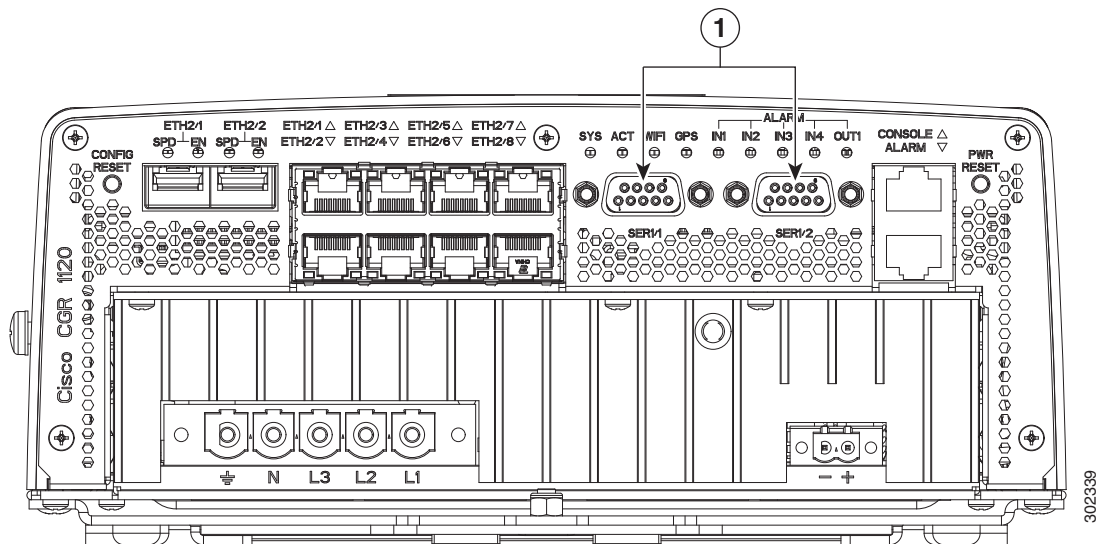
Connecting

- You must provide or purchase separately the correct serial cable. The cable does not ship with the router. Contact your Cisco reseller to purchase the correct cable from Cisco.
- You can connect a device to this port while the router is operating normally.
- The serial ports are labeled **SER 1/1** and **SER 1/2**.

Related Information

For more information about this port, including supported standards and signaling, see [Router Hardware Description, page 11](#).

Figure 4 Serial Ports (Item 1)



- 1 Serial ports

Connecting the USB Port

You can connect an optional USB device to the router USB port ([Figure 5 on page 61](#)), which will provide power to the USB device. You can also connect USB devices that are powered by an external source, such as an AC adapter or batteries.

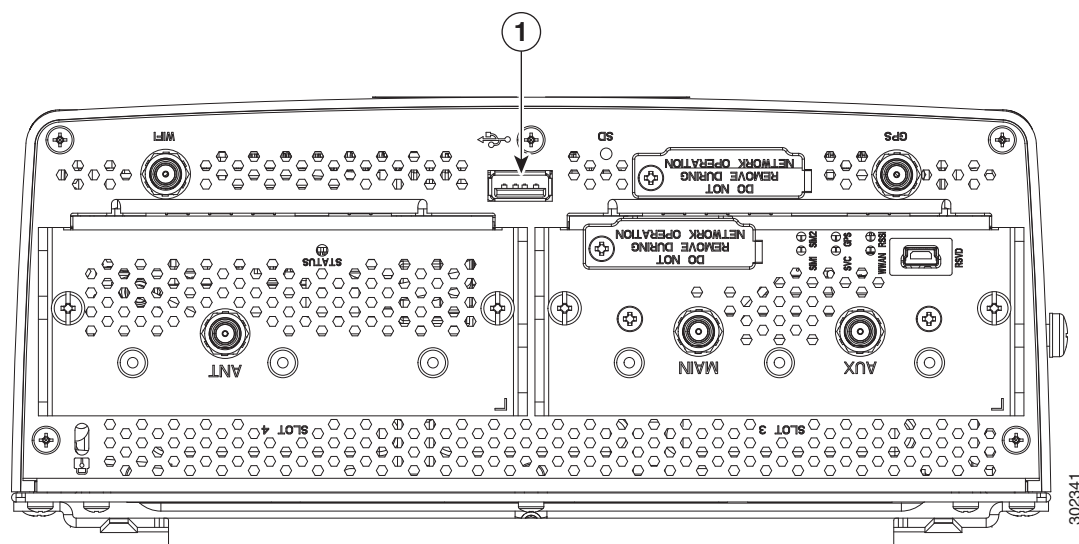
Connecting

- You can connect devices to the USB port while the router is operating normally.
- The USB port is labeled with universal USB icon.
- Depending on the USB devices you connect to these ports, you might require a USB extension cable to connect devices to these ports.
- To prevent connected USB devices from being stolen or accidentally removed, secure any connected USB device with a locking mechanism designed for this purpose.

Related Information

For detailed information about these ports, including supported USB standards and power output, see [Router Hardware Description, page 11](#).

Figure 5 USB Port



- 1 USB port

Connecting the Alarm Port

The alarm port provides data about fatal or severe errors that can cause the system software to crash.

The alarm port is connected to a normally closed solid state relay. Cisco CG-OS writes to a hardware port and the relay contact opens. If the system enters into a ROM monitor (ROMmon) or watchdog reset state, the relay contacts close. The closing contacts alert the alarm annunciator or monitor that a Cisco CG-OS crash has occurred.

If interfaces fail or other non-fatal errors occur, the alarm port does not respond. Continue to use SNMP to manage these types of errors.

Connecting

- You can connect this port while the router is operating normally.

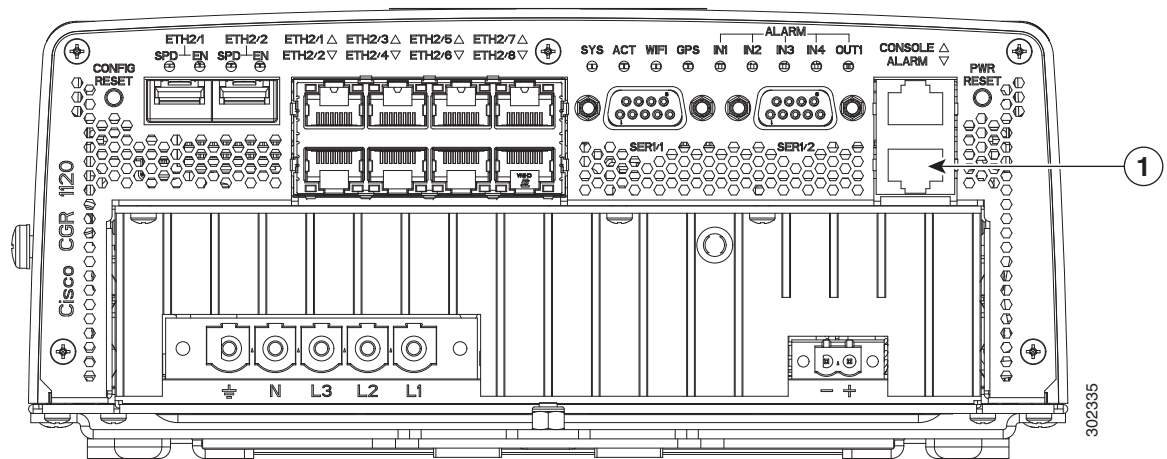
- If you use an alarm system on your network, connect the alarm port to an alarm system with an alarm cable that you provide.

Related Information

[Router Hardware Description, page 11](#) includes detailed information about this port, including:

- Alarm input and output
- Location on the router
- Link to pinout information

Figure 6 Alarm Port

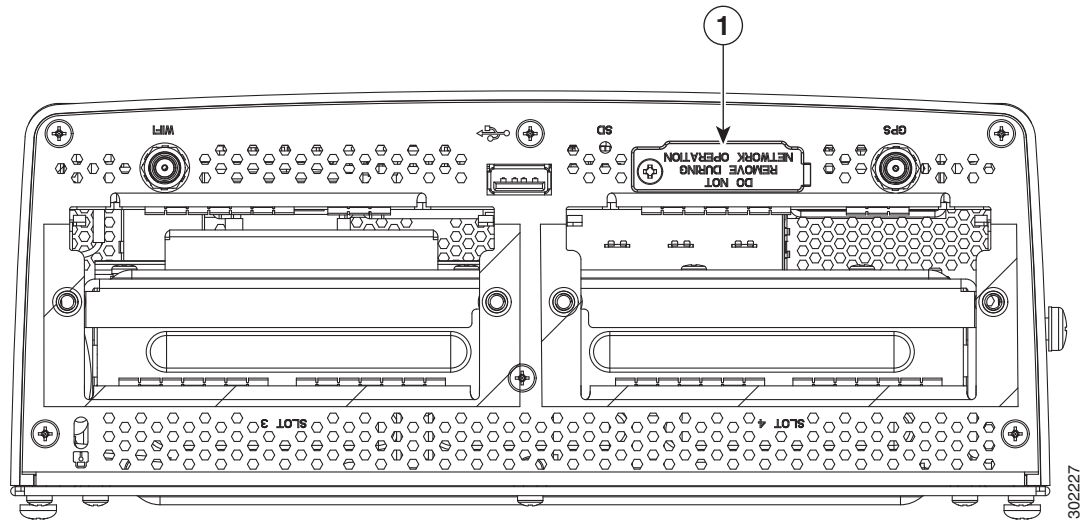


- 1 Alarm port

SD Flash Memory Module Card

For detailed information about the router SD Flash Memory Module card, including specifications, supported SD cards, and installation procedures, see [Using the SD Flash Memory Module, page 77](#). For information about the antennas that ship with the router, see [Using the SD Flash Memory Module, page 77](#).

Figure 7 SD Card Slot



- 1 SD card slot

Installing Modules and Antennas

The router supports up to two Cisco Connected Grid modules. Each module requires one or two antennas, which are installed on the module or near the router.

Related Information

- For information about supported router antennas, see [About Connected Grid Antennas, page 71](#).
- For information about supported modules, see [About Connected Grid Modules, page 65](#).
- For detailed installation instructions for all Connected Grid modules and antennas, see the documentation on Cisco.com at: www.cisco.com/go/cg-modules



About Connected Grid Modules

This section describes the installation information for the Cisco Connected Grid modules supported by the Cisco 1120 Connected Grid Router.

The router supports up to two Cisco Connected Grid modules to enable network connections from the router to field devices, such as smart meters, and from the router to the utility or data management center.

Depending on the configuration, your router could arrive in the shipping container with all required modules already installed. However, you might need to:

- Add a module to your current installation.
- Replace a faulty module.

These topics are discussed:

- [Installing and Removing Modules, page 65](#)
- [Where to Find Additional Module Information, page 70](#)

Installing and Removing Modules

This section provides general instructions for installing modules in the router. For information specific to a particular module, refer to the module installation and configuration guides on Cisco.com, at: www.cisco.com/go/cg-modules.

This section contains the following topics:

- [Preparing to Install Modules, page 65](#)
- [Installation Warning Statements, page 66](#)
- [Module Installation Locations, page 66](#)
- [Installing a Module, page 66](#)
- [Removing a Module, page 68](#)

Preparing to Install Modules

Before installing modules in the router, verify the following guidelines have been met:

Note: The CGR 1120 router supports online insertion and removal (OIR) of modules. For more information see [Installing a Module, page 66](#) and [Removing a Module, page 68](#).

- Verify that there is adequate airflow around the module slots and through the router vents. For more information, see [Installation Safety and Site Preparation, page 5](#).
- The ambient installation environment temperature must not exceed 140° F (60° C). If the module is installed in a closed or multi-rack assembly, the temperature around it might be higher than normal room temperature.
- The installation environment humidity must not exceed 95% (non-condensing).

-
- The installation site altitude must be no higher than 10,000 feet.
 - After replacing or installing a module in the router, you must update the label (on the router exterior) that lists the module types contained in the router. The label must list the FCC ID number and the IC Certification number for each module installed in the router.

Installation Warning Statements

This section includes the installation warning statements. Translations of these warning statements appear in the *Regulatory Compliance and Safety Information for Cisco Connected Grid Router 1000 Series Routers* documents on Cisco.com, at: www.cisco.com/go/cgr1000-docs.

Warning Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Warning To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of: 140°F (60°C) Statement 1047

Warning To prevent airflow restriction, allow clearance around the ventilation openings to be at least: 1.75 in. (4.4 cm) Statement 1076

Module Installation Locations

There are two module slots and these are numbered 3 and 4. Connected Grid modules can be installed in either module slot, regardless of module type. Empty module slots must be covered with a blank faceplate.

Installing a Module

A module can be installed in a router in an offline or online state. Installing a module in an online router involves using the CLI or CG-DM application. The instructions for removing a module can vary based on the router operating system—Connected Grid operating system (CG-OS) or Cisco IOS operating system.

Note: The CGR 1120 router supports online insertion and removal (OIR) of modules. To install a module by OIR, there are two options:

- Power down the module slot using the command line interface (CLI) prior to installing the module.
- Use the CG-DM application to remove the module.

Tip: This section provides general module installation steps. For detailed steps for the module type that you are installing, see the installation and configuration guide for your module at: www.cisco.com/go/cgr1000-docs.

To install a module, choose from the following options:

- [Installing a Module in an Offline Router, page 66](#)
- [Installing a Module in an Online Router using the CLI, page 67](#)
- [Installing a Module using Connected Grid Device Manager, page 68](#)

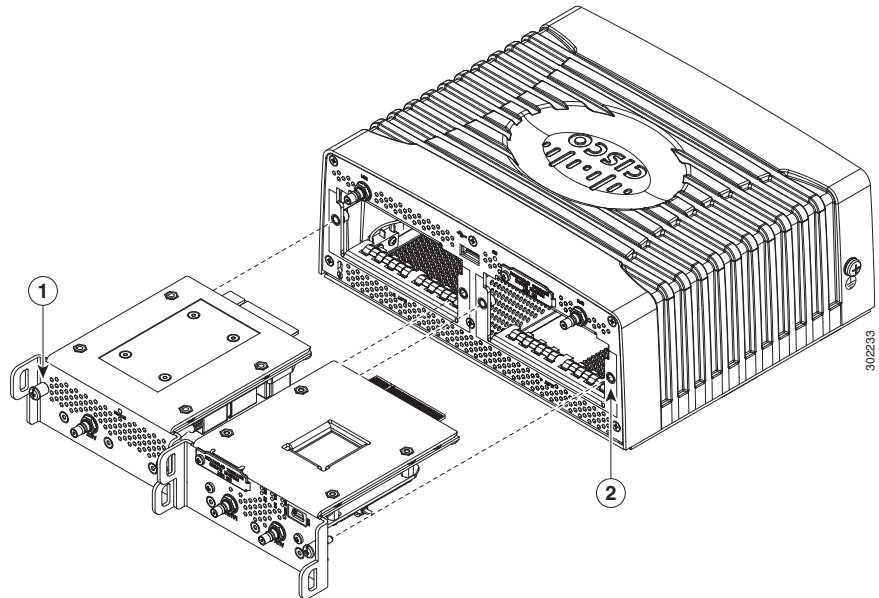
Installing a Module in an Offline Router

To install a module in an offline router:

1. Identify the slot the module is to be installed in (3 or 4).
2. Disconnect the router from AC power.

3. Insert the module in the slot as shown in [Figure 1 on page 67](#).

Figure 1 Inserting a Module in to the Router



- 1 Module captive screws, 2 per module
- 2 Router captive screw connectors (4)

4. Use a screwdriver to tighten the module captive screws (two per module) into the connectors on the router front panel to 10–12 in-lb (1.13–1.36 N-m).
5. Attach any required cables to the module. This step is specific to the module type.

Installing a Module in an Online Router using the CLI

To install a module in an online router using the CLI:

1. Identify the slot where the module is to be installed (3 or 4).
2. Start a terminal session to access the command line interface (CLI) by following the instructions in [Starting a Router Terminal Session, page 91](#).
3. Power down the slot (number 3 or 4) by issuing the appropriate command at the (CLI):

- For a router using Cisco CG-OS, use the following command:

```
router(config)# poweroff module slot
```

Note: To power down a module slot use the **poweroff module slot** command in global configuration mode. The *slot* is the slot number of the module (3 or 4). To power the slot again, use the **no** form of the command.

- For a router using Cisco IOS, use the following command:

```
router(config)# hw-module poweroff slot
```

Note: To power down a module slot use the **hw-module poweroff slot** command in global configuration mode. The *slot* is the slot number of the module (3 or 4). To power the slot again, use the **no** form of the command.

4. Insert the module in the slot as shown in [Figure 1 on page 67](#).
5. Use a screwdriver to tighten the module captive screws (two per module) into the connectors on the router front panel to 10–12 in-lb (1.13–1.36 N-m).

Installing a Module using Connected Grid Device Manager

Note: There are different versions of the CG-DM application for routers using the Cisco CG-OS and Cisco IOS operating systems. Verify that you have the correct version installed before proceeding.

To install a module using CG-DM:

1. Identify the slot the module is to be installed in (3 or 4).
2. For CG-DM instructions on how to install a module:
 - If the router is using Cisco CG-OS, see the “Add a Module” section of the “Using the Device Manager” chapter of the *Cisco Connected Grid Device Manager Installation and User Guide* on Cisco.com.
 - If the router is using Cisco IOS, see the “Inserting a Module” section of the “Using the Device Manager” chapter of the *Cisco Connected Grid Device Manager Installation and User Guide (Cisco IOS)* on Cisco.com.
3. Use a screwdriver to tighten the module captive screws (two per module) into the connectors on the router front panel to 10–12 in-lb (1.13–1.36 N-m).

Removing a Module

A module can be removed from a router in an offline or online state. Removing a module from an online router involves using the CLI or CG-DM application. The instructions for removing a module can vary based on the router operating system—Connected Grid operating system (CG-OS) or Cisco IOS operating system.

Note: The CGR 1120 router supports online insertion and removal (OIR) of modules. To remove a module by OIR, there are two options:

- Power down the module slot using the command line interface (CLI) prior to removing the module.
- Use the CG-DM application to remove the module.

The options for removing a module are:

- [Removing a Module from an Offline Router, page 68](#)
- [Removing a Module from an Online Router using the CLI, page 69](#)
- [Removing a Module using Connected Grid Device Manager, page 69](#)

Removing a Module from an Offline Router

To remove a module from an offline router:

1. Identify the slot from where the module is to be removed (3 or 4).
2. Disconnect the router from AC power.
3. Use a screwdriver to unscrew the module captive screws (two per module) from the connectors on the router front panel.

4. Pull the module gently from the router.
5. If the module slot is being left empty, cover the slot with a blank faceplate.

Removing a Module from an Online Router using the CLI

To remove a module from an online router using the CLI:

1. Identify the slot from where the module is to be removed (3 or 4).
2. Start a terminal session to access the command line interface (CLI) by following the instructions in [Starting a Router Terminal Session, page 91](#).
3. Power down the slot (number 3 or 4) by issuing the appropriate command at the (CLI):
 - For a router using Cisco CG-OS, use the following command:

```
router(config)# poweroff module slot
```

Note: To power down a module slot use the **poweroff module slot** command in global configuration mode. The *slot* is the slot number of the module (3 or 4). To power the slot again, use the **no** form of the command.

- For a router using Cisco IOS, use the following command:

```
router(config)# hw-module poweroff slot
```

Note: To power down a module slot use the **hw-module poweroff slot** command in global configuration mode. The *slot* is the slot number of the module (3 or 4). To power the slot again, use the **no** form of the command.

4. Use a screwdriver to unscrew the module captive screws (two per module) from the connectors on the router front panel.
5. Pull the module gently from the router.
6. If the module slot is being left empty, cover the slot with a blank faceplate.

Removing a Module using Connected Grid Device Manager

Note: The CG-DM application for routers using Cisco CG-OS and Cisco IOS is different. Verify that you have the correct version installed before proceeding.

To remove a module using CG-DM:

1. Identify the slot the module is to be installed in (3 or 4).
2. For CG-DM instructions on how to remove a module:
 - If the router is using Cisco CG-OS, see the “Remove a Module” section of the “Using the Device Manager” chapter of the *Cisco Connected Grid Device Manager Installation and User Guide* on Cisco.com.
 - If the router is using Cisco IOS, see the “Removing a Module” section of the “Using the Device Manager” chapter of the *Cisco Connected Grid Device Manager Installation and User Guide (Cisco IOS)* on Cisco.com.
3. If the module slot is being left empty, cover the slot with a blank faceplate.

Where to Find Additional Module Information

For instructions on how to install, replace, and configure the modules, see these installation and configuration guides on Cisco.com, at: www.cisco.com/go/cg-modules

Table 1 Connected Grid Modules for CGR 1000 Series Routers Documentation

| Connected Grid Module | Related Documentation |
|---|--|
| Cisco Connected Grid Modules for CGR 1000 Series - Cellular 3G CDMA (Cisco IOS) | Connected Grid 3G CDMA Module for CGR 1000 Series Installation and Configuration Guide (Cisco IOS) |
| Cisco Connected Grid Modules for CGR 1000 Series - Cellular 3G GSM (Cisco IOS) | Cisco Connected Grid 3G GSM Module for CGR 1000 Series Installation and Configuration Guide (Cisco IOS) |
| Cisco Connected Grid Modules for CGR 1000 Series - Cellular 3G CDMA/GSM | Cisco Connected Grid Cellular 3G Module for CGR 1000 Series Installation and Configuration Guide |
| Cisco Connected Grid Modules for CGR 1000 Series - Cellular 4G LTE (Cisco IOS) | Cisco Connected Grid 4G LTE Module Installation and Configuration Guide |
| Cisco Connected Grid Modules for CGR 1000 Series -WiFi | Cisco Connected Grid Routers WiFi Software Configuration Guide |
| Cisco Connected Grid Modules for CGR 1000 Series - WiMAX | Cisco Connected Grid WiMAX Module for CGR 1000 Series Installation and Configuration Guide |
| Cisco Connected Grid Modules for CGR 1000 Series - WPAN/CG-Mesh | Cisco Connected Grid WPAN Module for CGR1000 Series Installation and CG-Mesh Configuration Guide (Cisco IOS) |
| Cisco Connected Grid Modules for CGR 1000 Series - WPAN/RFLAN | Cisco Connected Grid Cellular WPAN Module for CGR 1000 Series Installation and RFLAN Configuration Guide |



About Connected Grid Antennas

This section describes the Cisco 1120 Connected Grid Router antennas, and describes how to find product and installation information for all Cisco Connected Grid antennas. This chapter includes these sections:

- [Router Antennas Overview, page 71](#)
- [Installing or Replacing Module Antennas, page 74](#)
- [Antenna Specifications, page 75](#)

Router Antennas Overview

This section describes the antennas used with the router.

Router Antennas

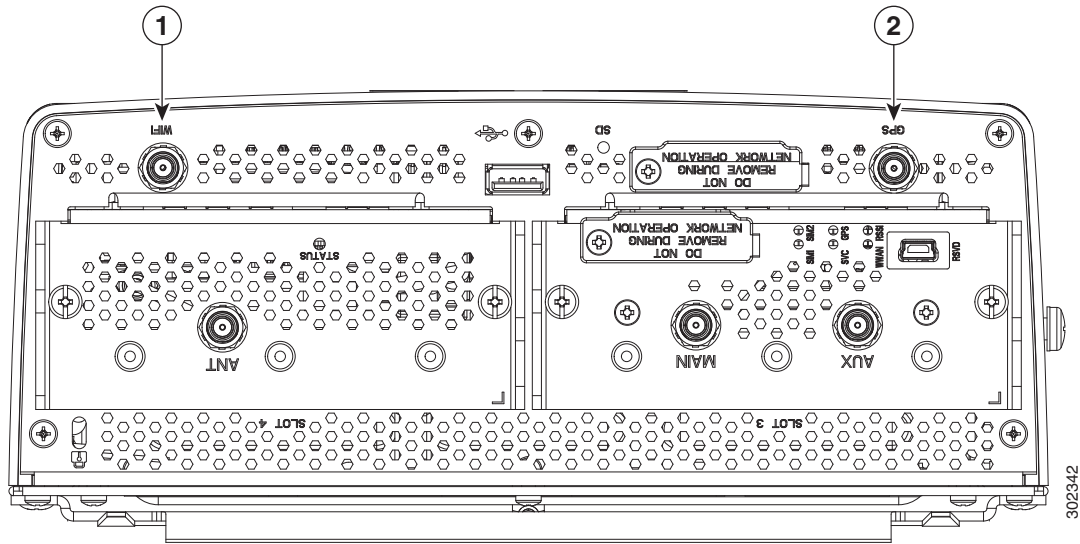
The router ships with two antennas that support router functionality:

- [GPS Antenna, page 72](#)
- [WiFi Antenna, page 73](#)

Module Antennas

The router also supports Connected Grid module antennas. For more information, see [Connected Grid Module Antennas, page 74](#).

Figure 1 Router WiFi and GPS Antenna Locations



- 1 WiFi antenna port
- 2 GPS antenna port

GPS Antenna

The Connected Grid GPS Antenna kit (optional) includes the following items:

- GPS antenna with integrated 15-foot coaxial cable (see [Figure 2 on page 73](#))
- Male QMA connector adapter, to connect the cable to the router GPS antenna port
- Hardware required to mount the antenna, for example on the substation or utility cabinet exterior

This antenna provides connectivity to the GPS system, from which the router derives precise time and location information while operating on the network.

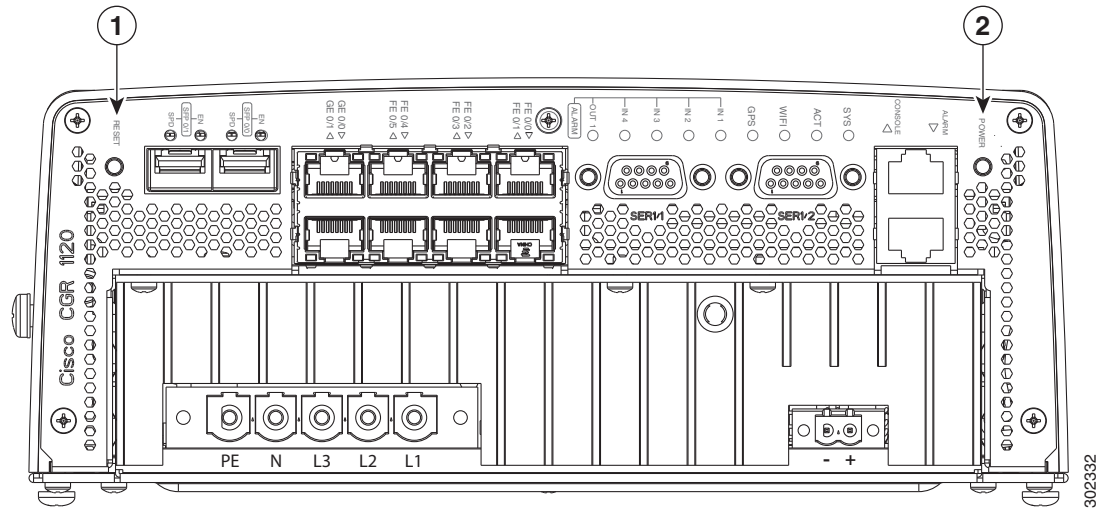
GPS Antenna Information

Caution: If the antenna is mounted outside, the antenna assembly must be grounded either at the bracket or at the external building point where the cabling enters the building. This is critical because if it's not grounded, the CGR 1120 chassis would be isolated on the antenna card very close to AC isolation requirements. Also see Statement 1052 below.

Warning: Do not locate the outdoor antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, as they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (for example, U.S.:NFPA 70, National Electrical Code, Article 810, Canada:Canadian Electrical Code, Section 54). Statement 1052

- The GPS antenna is a field-replaceable component.
- For detailed technical information about the GPS antenna, see [GPS Antenna Specifications, page 75](#).
- For information about the GPS status LED, see [Router LED Locations and States, page 83](#).
- For more information about the internal GPS module, see the [Internal GPS Module, page 29](#).

Figure 2 GPS Antenna with Mounting Hardware and Male QMA Adapter



WiFi Antenna

The Connected Grid 4GE LTE WiFi antenna kit (optional) includes the following items:

- 4G LTE indoor swivel-mount antenna (see [Figure 3 on page 74](#))
- Male QMA connector adapter, to connect the antenna to the router WiFi antenna port

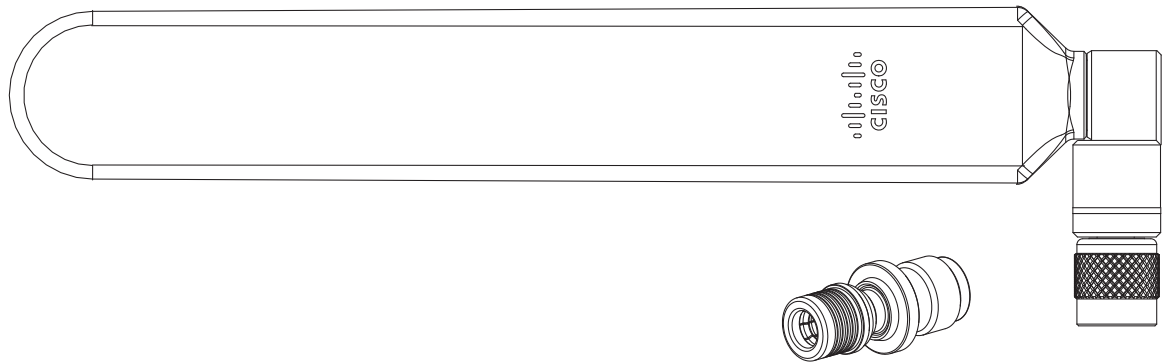
The WiFi antenna provides connectivity to the router internal short-range access point.

The short-range access point enables a WiFi link so users can connect to the router from anywhere within WiFi range. For example, a technician can check the status of the router from outside the substation or utility cabinet by connecting to the router over the WiFi link.

WiFi Antenna Information

- The Cisco order number of the WiFi antenna kit is: ANT-4G-DP-IN-TNC.
- The WiFi antenna is a field-replaceable component.
- For detailed technical information about the WiFi antenna, see [WiFi Antenna Specifications, page 76](#).
- For information about the WiFi status LED, see [Router LED Locations and States, page 83](#).
- For more information about the WiFi short-range access point that provides the WiFi connection to the router, see [WiFi Short-Range Access Point, page 30](#).

Figure 3 4G LTE WiFi Antenna and Male QMA Adapter



Connected Grid Module Antennas

In addition to the two fixed antennas (GPS and WiFi), the router supports additional antennas that provide connectivity to the Connected Grid modules installed in the router.

The router supports up to two Cisco Connected Grid modules. Each module requires one antenna or two antennas (one main antenna and one diversity antenna). The total number of antennas installed with the router depends on:

- Number of modules installed in the router.
- Module types that are installed in the router

For detailed information about the Connected Grid module antennas, see the Connected Grid antennas documentation, at: www.cisco.com/go/cg-modules

Installing or Replacing Module Antennas

Depending on the configuration you specified, the router could arrive in the shipping container with all required antennas already installed and connected to the corresponding Cisco Connected Grid modules, also installed in the router.

However, you might need to install an antenna when:

- You purchase a module separately from the router. The antenna is included with the module, and must be installed on the router to complete the module installation.
- You purchase an antenna separately to replace a faulty or damaged antenna.
- The antenna form factor prevents requires that it be installed after the router has shipped.

Where to Find Antenna Installation Information

For instructions on how to install or replace antennas on the router, see the Cisco Connected Grid antenna documentation on Cisco.com, at: www.cisco.com/go/cg-modules

Table 1 Connected Grid Modules for CGR 1000 Series Routers Documentation

| Title | Description |
|--|--|
| Cisco Connected Grid Antennas Installation Guide | Installation procedures and safety information for all models of Cisco Connected Grid antennas. |
| Cisco Connected Grid Antennas Overview | An overview of antenna technology, antenna types, and Cisco Connected Grid antennas and accessories. |

Table 1 Connected Grid Modules for CGR 1000 Series Routers Documentation (continued)

| Title | Description |
|--|---|
| Choosing Your Cisco Connected Grid Antenna | A decision tree to help you choose the correct antennas for your platform and physical environment. |

Antenna Specifications

This section contains specifications for the fixed antennas that ship with the router.

For all technical details and specification for these and other Cisco Connected Grid antennas, see the Cisco Connected Grid antenna documentation on Cisco.com at: www.cisco.com/go/cg-modules

GPS Antenna Specifications

| Specification | Value |
|-----------------------------|---|
| Dimensions | Cable length: 15 feet (460.8 cm) Diameter of antenna rodome: 1.97 inches (50 cm) |
| Connector (cable to router) | TNC male |
| Frequency | 1575.42 MHz +/-5MHz |
| Nominal Impedance | 50 Ohms nominal |
| VSWR | 2.0 Max. in band |
| Peak Gain | 4.0 dBi min. @ zenith |
| Minimum Gain | 1 dBi @ 10 degrees elevation |
| Pattern Type | Hemispherical |
| Polarization | Circular RHCP |
| LNA Gain | 26 dB +/-2 dB DC Voltage: 3-5VDC |
| Out of Band Attenuation | 20 dB min. at 1575+ / -50MHz |
| Max. Input Power | 20 mA max @ 3.3VDC +/- .3VDC |
| Operating Temperature | -40° C to +85° C |
| IP Code Rating | IP67 (Outdoor use) |
| Wind Speed Rating | 165 MPH |
| Compliance | RoHS |

WiFi Antenna Specifications

| Specification | Value |
|-----------------------|---|
| Dimensions | 9.0 x 1.2 x 0.6 inches (229 x 30.5 x 15 mm) |
| Weight | 1.73 ounces (49 grams) |
| Connector | TNC male |
| Frequency | 698 to 806 MHz 824 to 894 MHz 880 to 960 MHz 1710 to 1880 MHz 1850 to 1990 MHz 1920 to 2170MHz 2100 to 2500 MHz 2500 to 2690 MHz |
| Nominal Impedance | 50 ohms |
| VSWR | < 2.5:1 |
| Peak Gain | 0.5 dBi (698-960 MHz) 2.2 dBi (1710-2700 MHz) |
| Average Efficiency | 55% (698-960 MHz) 73% (1710- 2700 MHz) |
| Polarization | Linear |
| Max. Input Power | 3W |
| Operating Temperature | -35° C to +70° C |
| Compliance | RoHS |



Using the SD Flash Memory Module

This section describes the Secure Digital (SD) flash memory module (or SD card) that is used with the Cisco 1120 Connected Grid Router, and includes instructions for installing and removing the SD card.

These topics are discussed:

- [SD Card Overview, page 77](#)
- [SD Card Status, page 78](#)
- [Accessing the SD Card, page 79](#)
- [SD Card Insertion and Removal, page 79](#)
- [Securing the SD Card with a Password, page 81](#)
- [Related Commands, page 82](#)

SD Card Overview

The router features an SD card connector, which supports a single Cisco SD card. The SD card stores router data and software, including:

- Router operating software
- Running configurations
- Network management software configuration
- Network registration data
- Router firmware
- Billing data
- Outage data
- Event data

The topics in this section include:

- [SD Card File System, page 77](#)
- [Sharing SD Cards Across Systems, page 78](#)
- [Supported SD Cards, page 78](#)

SD Card File System

The SD card uses a Linux-based EXT2/3 file system. The router configuration is stored in a binary file in an invisible partition on the card.

Sharing SD Cards Across Systems

The card cannot be used to configure or operate any system other than the system with which it is shipped.

Supported SD Cards

Table 1 on page 78 lists the SD cards that can be used with the router.

Table 1 Supported SD Flash Memory Modules

| |
|------|
| Size |
| 2-GB |

Note: For detailed specifications about the SD flash memory module, refer to [SD Flash Memory Module, page 18](#).

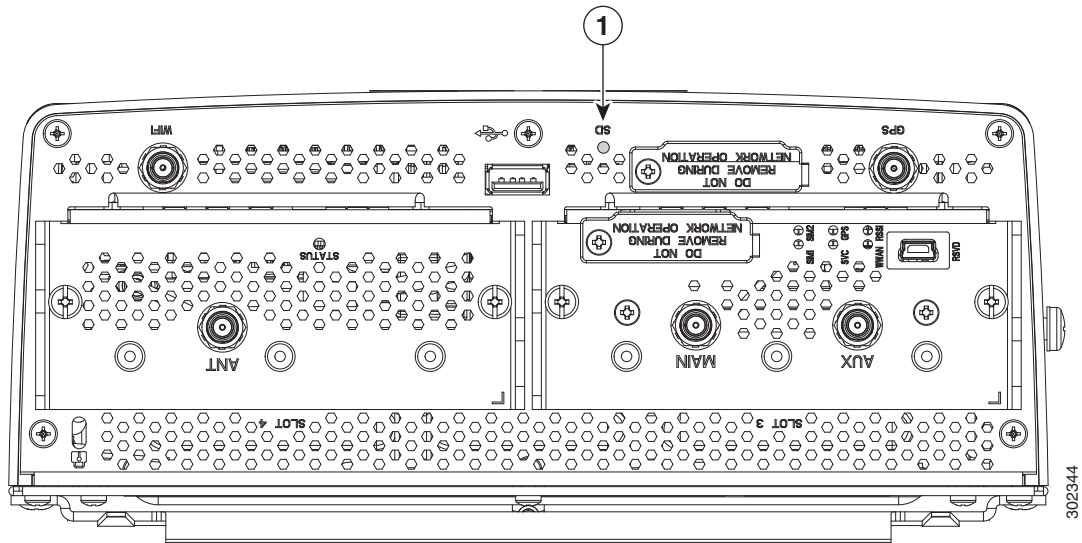
SD Card Status

You can check the SD card status by viewing the SD Card LED.

SD Card LED

The SD card LED is located next to the SD card slot (see [Figure 1 on page 78](#)).

Figure 1 SD Card LED (Item 1)



302344

Figure 2 SD LED - SD Flash Memory Module LED States

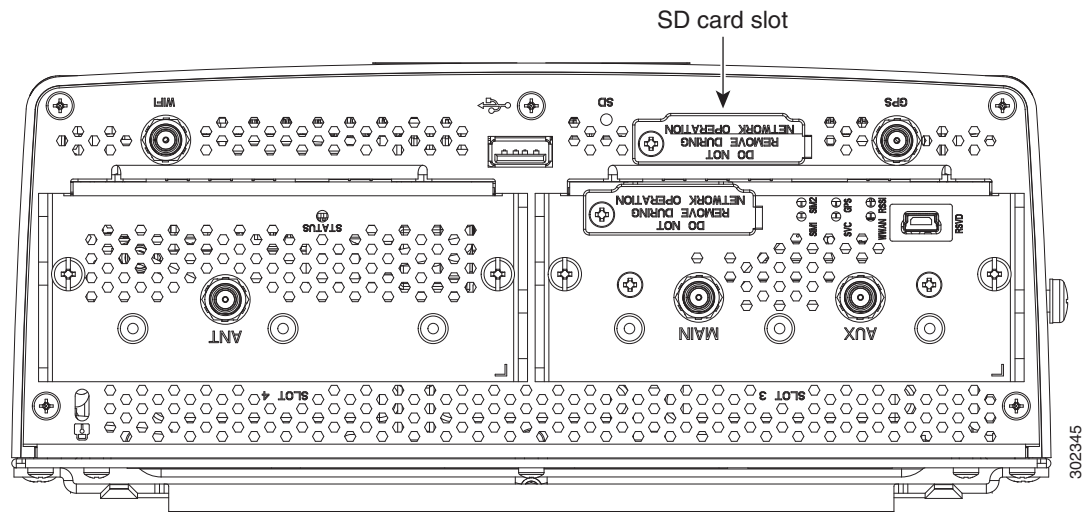
| Label Description | Color and State | Description |
|------------------------------------|-----------------|--|
| SD0 SD flash card status | Green solid | SD flash card is installed and operating normally. Note: If the SD Card is removed, the SD flash memory module LED remains green solid until the router is rebooted. |
| | Green blinking | A data transfer between the router and the SD card is in progress. |
| | Amber solid | <ul style="list-style-type: none"> ■ An error occurred when the router accessed the SD flash card. ■ The router could not find a system software image. |
| | Amber blinking | An unsupported SD card is installed in the slot. |

Accessing the SD Card

The SD card is accessed from the router exterior, through the router SD card port, shown in [Figure 3 on page 79](#).

Caution: Removing the SD card during normal router operation will cause the router to stop operating. Do not remove the SD card while the router is operating.

Figure 3 SD Card Slot (with Cover) on Router Exterior



SD Card Insertion and Removal

Depending on the configuration, the router could arrive in the shipping container with the SD card already installed.

However, you might need to install or remove an SD card in the router when:

- You are upgrading the router with software or firmware stored on the SD card.
- The router requires an SD card with greater memory capacity.

-
- You must replace a faulty or damaged SD card.

The topics in this section include:

- [Safety Warnings, page 80](#)
- [Preventing Electrostatic Discharge Damage, page 80](#)
- [Tools You Supply, page 80](#)
- [Inserting and Removing the SD Card, page 80](#)

Safety Warnings

Before performing any of the tasks in this section, read the safety warnings in [Installation Safety and Site Preparation, page 5](#).

Preventing Electrostatic Discharge Damage

SD flash memory modules are sensitive to electrostatic discharge (ESD) damage, which can occur when electronic cards or components are handled improperly, results in complete or intermittent failures.

To prevent ESD damage, follow these guidelines:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- Place a removed the memory card on an antistatic surface or in a static shielding bag. If the card will be returned to the factory, immediately place it in a static shielding bag.
- Avoid contact between the card and clothing. The wrist strap protects the card from ESD voltages on the body only; ESD voltages on clothing can still cause damage.
- Do not remove the wrist strap until the installation is complete.

Tools You Supply

You must provide a #2 Phillips screwdriver to remove the cover over the SD card slot.

Inserting and Removing the SD Card

Caution: Removing the SD card during normal router operation will cause the router to stop operating. Do not remove the SD card while the router is operating.

To install or remove a SD card:

1. Power down the router.
2. Use a Phillips screwdriver to remove the cover over the SD card slot (See [Figure 3 on page 79](#)).
3. To remove an SD card from the router:
 - a. Press the SD card in slightly. The card moves outward so that it projects from the slot.
 - b. Pull the SD card out of the slot.
 - c. Place the SD card in an antistatic bag to protect it from static discharge.

-
4. To install an SD card in the router:
 - a. Insert the SD card by sliding it into the SD card slot, with the connector first and the notched corner facing up. The card is keyed so that you cannot insert it the wrong way.
 - b. Ensure that the card is seated in the slot connector and the edge of the card is flush with the edge of the slot.
 5. Rotate the cover back in place and secure it by tightening the screw to 3.5 in-pounds.

Caution: You must replace the SD card slot cover when not using the card slot. If the card slot is not covered, the router interior could be exposed to environmental elements that can damage the router.

Securing the SD Card with a Password

Note: The CLI cited in this section work for both the CG-OS and Cisco IOS operating systems.

The SD card contents can be secured with a password. Once a password is set, the password must be supplied before data can be accessed on the SD card.

The SD card password must be set during system initialization, and you will be notified that the system must be rebooted for the new password to take effect. The password can be set at the CLI or through the CG-NMS.

To set and remove SD card passwords and display their status, see:

- [Setting and Removing an SD Card Password, page 81](#)
- [Displaying the SD Card Password Status, page 81](#)

Setting and Removing an SD Card Password

To set a password for the SD-card, use the **sd-card password** *password* command in global configuration mode to set the password. Use the **no sd-card password** command in global configuration mode to remove the password.

Displaying the SD Card Password Status

The SD Card password status can be:

- Unlocked
- Locked
- Password set/reset, reboot pending

To determine the status of the SD card password, you can use the **show sd-card password status** command in user EXEC mode.

```
cgr1120# show sd-card password status
```

```
SD-card lock status: [Locked, reboot required to apply.]
```

The command output indicates that the SD card is password secured but the router must be rebooted for the password to apply.

The status of an SD card fully secured by a password the status is [Locked], and an SD card unsecured by a password has [Unlocked] status.

Related Commands

Note: The commands in this section work on routers using the Cisco CG-OS or Cisco IOS operating systems.

- [copy running-config startup-config, page 82](#)
- [sd-card password, page 82](#)
- [no sd-card password, page 82](#)
- [show sd-card password status, page 82](#)

copy running-config startup-config

To save the router current software configuration to the SD card, use the **copy running-config startup-config** command in user EXEC mode:

```
cgr1120# copy running-config startup-config
[#####] 100%
Copy complete, now saving to disk (please wait)...
```

sd-card password

To set a password for the SD card, use the **sd-card password** *password* command in global configuration mode.

```
cgr1120(config)# sd-card password password
```

no sd-card password

To remove the SD card password, use the **no sd-card password** command in global configuration mode.

```
cgr1120(config)# no sd-card password
```

show sd-card password status

To determine the status of the SD card password, use the **show sd-card password status** command in user EXEC mode.

```
cgr1120# show sd-card password status
```



Router LED Locations and States

View the Cisco 1120 Connected Grid Router LEDs to determine the overall state of the system and to verify the status of specific connections, ports, and system components.

In addition to viewing the LEDs on the router hardware, you can use the router command line interface as described in [Related Commands, page 88](#) to check the system status LED state from remote locations.

These topics are discussed:

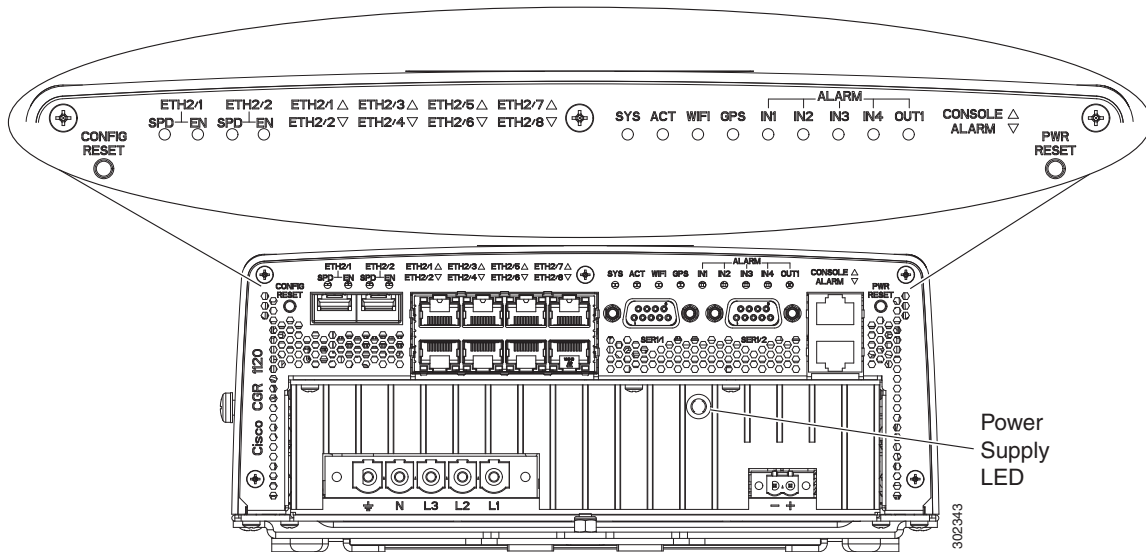
- [Rear Panel LED Locations, page 83](#)
- [Power Supply LED, page 84](#)
- [SYS LED—System Status, page 84](#)
- [ACT LED—System Activity, page 85](#)
- [WIFI LED—WiFi Link Status, page 85](#)
- [GPS LED—GPS Link Status, page 85](#)
- [CONSOLE LED—Console Port Status, page 86](#)
- [ALM LED—Alarm Port Status, page 86](#)
- [Ethernet LEDs—Network Links Status, page 86](#)
- [SD Card LED Location, page 87](#)
- [SD LED—SD Card Status, page 88](#)
- [Related Commands, page 88](#)

Rear Panel LED Locations

Most of the router LEDs are located on the router cable panel (rear panel) as shown in [Figure 1 on page 84](#).

The SD card status LED is located on the router module panel (front panel). For more information, see [SD Card LED Location, page 87](#).

Figure 1 Cable Panel (Rear Panel) LEDs



Power Supply LED

The power status LED indicates the power status of the router.

Table 1 Power Supply LED

| LED Label | Color | Description | Location | Drvr |
|---------------------------|-----------|---|---------------------|------|
| AC/DC Power Supply | Green/Red | Off: PSU no present Green: DC output is OK Red: DC output failed, but AC/DC input is good | PSU and wiring side | HW |

SYS LED—System Status

The system status (SYS) LED indicates the system or operating status of the router.

Table 2 SYS LED

| LED Label | Color and State | Description |
|-----------|-----------------|--|
| | Green | Normal system operating status |
| | Green blinking | The system is starting up or power cycling, and loading system software, including BIOS and operating system |
| | Amber | System receiving power but there is an error condition |
| | Off | System not receiving power |

ACT LED—System Activity

The system activity (ACT) LED indicates the state of the router CPU.

Table 3 ACT LED

| LED Label | Color and State | Description |
|-----------|-----------------|--|
| ACT | Green blinking | The router CPU is operating normally. |
| | Green solid | The router CPU is not operating, or is not operating normally. |
| | Off | The router CPU is not operating. |

WiFi LED—WiFi Link Status

The WiFi link status (WiFi) LED indicates the state of the router WiFi short-range access point link.

Table 4 WiFi LED

| LED Label | Color and State | Description |
|-----------|-----------------|---|
| WiFi | Green | WiFi link established |
| | Green blinking | WiFi link established and data transfer in progress |
| | Yellow | No WiFi link |

GPS LED—GPS Link Status

The GPS link status (GPS) LED indicates the state of the link between the router and the GPS satellite.

Table 5 GPS LED

| LED Label | Color and State | Description |
|-----------|-----------------|-------------------------------|
| GPS | Green | Locked but not receiving data |
| | Green blinking | Locked and receiving data |
| | Yellow blinking | Acquiring satellite |
| | Yellow solid | No GPS link |

CONSOLE LED—Console Port Status

Table 6 CONSOLE LED

| LED Label | Color and State | Description |
|-----------|-----------------|---|
| CONSOLE | Green | Active console connection to the router |
| | Off | No console connection |

ALM LEDS—Alarm Port Status

The router has five alarm port LEDs.

Table 7 ALM LEDS

| LED Label | Color and State | Description |
|---------------|-----------------|---|
| IN x (1 to 4) | Green/red | Alarm input status <ul style="list-style-type: none">■ Off: Alarm not configured■ Green: No alarm■ Red: Alarm is present |
| OUT 1 | Green/red | Alarm output status <ul style="list-style-type: none">■ Off: Alarm not configured■ Green: No alarm■ Red: Alarm is present |

Ethernet LEDs—Network Links Status

This section describes the router LEDs that indicate Ethernet network connection states and speeds, and includes these topics:

- [SFP LEDs—SFP Port States, page 86](#)
- [GE LEDs—Gigabit Ethernet Port States, page 87](#)
- [FE LEDs—Fast Ethernet Port States, page 87](#)

SFP LEDs—SFP Port States

The router has two SFP ports (labeled ETH 2/1 and ETH 2/2). Each SFP port has the following two LEDs:

- **SPD**—Indicates SFP port link speed
- **EN**—Indicates SFP port status

Table 8 SFP LEDs

| LED Label | Color and State | Description |
|-----------|--------------------------|---|
| SPD | Green, 2 blinks/pause | 100 MB/s link speed on the corresponding SFP port |
| | Green, 3 blink/pause | 1000 MB/s link speed |
| | Off | No link established |
| EN | Green | SFP is installed in the port and the link is active |
| | Amber | SFP is installed but there is an error condition |
| | Green blinking, then off | SFP module can be removed from the router |
| | Off | No SFP installed in the port |

GE LEDs—Gigabit Ethernet Port States

The router has two GE ports (labeled ETH 2/1 and ETH 2/2). Each GE port has a corresponding LED that indicates the GE link speed for the port.

Table 9 GE LEDs

| Color and State | Description |
|-----------------------|----------------------|
| Off | No link established |
| Green, 3 blinks/pause | 1000 MB/s link speed |
| Green, 2 blinks/pause | 100 MB/s link speed |
| Green, 1 blink/pause | 10 MB/s link speed |

FE LEDs—Fast Ethernet Port States

The router has six FE ports (labeled ETH 2/3 through ETH 2/8). Each FE port has a corresponding LED that indicates the FE link speed for the port.

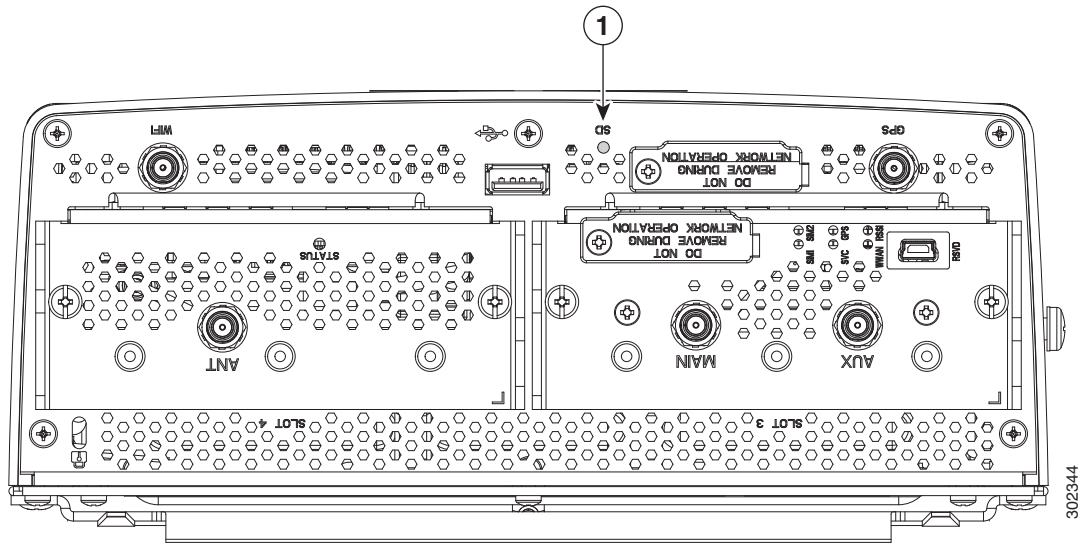
Table 10 FE LEDs

| Color and State | Description |
|-----------------------|---------------------|
| Off | No link established |
| Green, 2 blinks/pause | 10 MB/s link speed |
| Green, 1 blink/pause | 100 MB/s link speed |

SD Card LED Location

The SD card LED (Item 1 in [Figure 2 on page 88](#)) is located on the router module panel (front panel) and indicates the state of the router SD card.

Figure 2 SD Card LED (Item 1)



SD LED—SD Card Status

Table 11 SD LED

| Label | Color and State | Description |
|-------|-----------------|--|
| SD0 | Green | SD flash card installed and operating normally Note: If the SD Card is removed, the SD flash memory module LED remains green solid until the router is rebooted. |
| | Green blinking | SD flash card data transfer in process |
| | Amber solid | <ul style="list-style-type: none"> ■ Error when system accesses the SD flash card ■ Router cannot locate a system software image |
| | Amber blinking | Unsupported SD card installed in the slot |

Related Commands

- [show led, page 88](#)

show led

To view the status of the router SYS LED, use the **show led** command in privileged EXEC mode. The SYS LED is located on the router exterior (see [Figure 1 on page 84](#)),

During normal operation, the router can be installed in a substation, utility box, or other hard-to-access location, and you might not be able to view SYS LED. In this case, you can view the status of the LED from a remote location using the show LED command.

The values displayed in the **System LED** field are described in [SYS LED—System Status, page 84](#).

This example shows the command output:

```
CGR1120> show led
```

```
System LED: green, solid
```

```
Summary of LED status provider:
```

```
Client          | State
```

```
-----  
cellular 3/1   | Blinking
```

```
--- end of list ---
```

```
CGR-1120>
```




Starting a Router Terminal Session

This section describes how to start a terminal session with the Cisco 1120 Connected Grid Router using the console port. Start a terminal session with the router when you are at the router installation location and want to administer the router with a direct connection using the command-line interface (CLI) software.

Before You Begin

Before you start a terminal session with the router, you must connect a PC or PC terminal to the router console port following the instructions in [Connecting the Console Port, page 58](#).

About the Console Port

The console port is an asynchronous serial port that allows you to connect to the device for initial configuration through a standard RS-232 port with an RJ-45 connector. Any device connected to this port must be capable of asynchronous transmission.

Console Port Settings

Configure the console port settings as described in [Table 1 on page 91](#).

Table 1 Console Port Settings

| Parameter | Console Port Setting | Description |
|-----------|----------------------|--|
| Baud | 9600 | Specifies the transmission speed for the connection. |
| Data bits | 8 | Specifies the number of bits in an 8-bit byte that is used for data. |
| Parity | None | Specifies the odd or even parity for error detection. |
| Stop bits | 1 | Specifies the stop bits for an asynchronous line. |

Using the Ctrl-C Command

The router console port is located on the router exterior. For detailed information see [Console Port, page 26](#).

On many Cisco routers, you can enter **Ctrl-C** to interrupt the router startup process and then delete or change the admin password, or view or delete the router configuration.

Note: To prevent unauthorized access to the router configurations and passwords, the **Ctrl-C** command is disabled on the router while it is booting up and loading the system software.

Connecting to the Console Port with Microsoft Windows

To connect to the router console port using Microsoft Windows:

1. Start a terminal emulator application, such as Windows HyperTerminal (included with some versions of Windows OS) or PuTTY: www.putty.org
2. Configure the terminal emulation software with the parameters described in [About the Console Port, page 91](#).
3. Connect to the router.

Connecting to the Console Port with Mac OS X

This procedure describes how to connect a Mac OS X system USB port to the console using the built-in OS X Terminal utility.

1. Use the Finder to go to **Applications > Utilities > Terminal**.
2. Connect the OS X USB port to the router.
3. Enter the following commands to find the OS X USB port number:

```
macbook:user$ cd /dev
macbook:user$ ls -ltr /dev/*usb*
crw-rw-rw-  1 root  wheel          9,  66 Apr  1 16:46 tty.usbmodem1a21
DT-macbook:dev user$
```

4. Connect to the USB port with the following command followed by the router USB port speed:

```
macbook:user$ screen /dev/tty.usbmodem1a21 9600
```

To Disconnect the OS X USB Console from the Terminal Window

Enter **Ctrl+A** followed by **Ctrl+**

Connecting to the Console Port with Linux

To connect a Linux system USB port to the console using the built-in Linux Terminal utility:

1. Open the Linux Terminal window.
2. Connect the Linux USB port to the router.
3. Enter the following commands to find the Linux USB port number:

```
root@usb-suse# cd /dev
root@usb-suse /dev# ls -ltr *ACM*
crw-r--r--  1 root  root          188,  0 Jan 14 18:02 ttyACM0
root@usb-suse /dev#
```

4. Connect to the USB port with the following command followed by the router USB port speed:

```
root@usb-suse /dev# screen /dev/ttyACM0 9600
```

To Disconnect the Linux USB Console from the Terminal Window

Enter **Ctrl+A** followed by **;**, then type **quit**.



Connector and Cable Specifications

This appendix includes specifications for the Cisco 1120 Connected Grid Router connectors, adapters, and compatible cables, and is organized into the following sections:

- [Connector Specifications, page 93](#)
- [Cable and Adapter Specifications, page 96](#)

Connector Specifications

- [Alarm Port, page 93](#)
- [Console Port, page 94](#)
- [Combo Ports, page 94](#)
- [SFP Ports, page 94](#)
- [Serial Port, page 95](#)
- [Power Connectors, page 96](#)

Alarm Port

For detailed information about the alarm ports, see [Router Hardware Description, page 11](#). The alarm port is an 8-way RJ-45 alarm connector.

Table 1 Alarm Port Specification

| Pin (8-Way RJ-45 Alarm Connector) | Alarm Signal Description |
|-----------------------------------|--------------------------|
| 1 | Alarm1_IN |
| 2 | Alarm2_IN |
| 3 | Normally Closed (NC) |
| 4 | Alarm3_IN |
| 5 | Alarm4_IN |
| 6 | Normally Closed (NC) |
| 7 | Alarm_OUT_Common |
| 8 | Alarm_IN_Common |

Console Port

For detailed information about the console port, see [Router Hardware Description, page 11](#).

Table 2 Console/Auxiliary Port Specification

| Pin | Signal Name | Signal Description |
|-----|-------------|--------------------|
| 1 | RTS | Output |
| 2 | DTR | Output |
| 3 | TXD | Output |
| 4 | GND | - |
| 5 | GND | - |
| 6 | RXD | Input |
| 7 | DSR/DCD | Input |
| 8 | CTS | Input |

Combo Ports

For detailed information about the combination ports, see [Router Hardware Description, page 11](#).

Copper Interface–Combination Port (SFP and GE Ethernet)

Table 3 Combination Port Specification –Copper Interface

| Pin | 1000Base-T | 100Base-TX/10Base-T |
|-----|------------|---------------------|
| 1 | TX A+ | TX DATA+ |
| 2 | TX A- | TX DATA- |
| 3 | RX B+ | RX DATA+ |
| 4 | TX C+ | N/C |
| 5 | TX C- | N/C |
| 6 | RX B- | RX DATA- |
| 7 | RX D+ | N/C |
| 8 | RX D- | N/C |

SFP Ports

SFP Interface–Combination Port (SFP and GE Ethernet)

For detailed information about the combination ports, see [Router Hardware Description, page 11](#).

Table 4 SFP Port Specification

| Pin | Signal Name | Input/Output | Signal Description |
|-----|--------------------------|--------------|---|
| 1 | VeeT | - | GND |
| 2 | TxFault | Output | Connects to GPIO |
| 3 | TxDisable | Input | Driven from GPIO |
| 4 | MOD-DEF(2) | Bidir | Bidirectional. Connects to I2C data |
| 5 | MOD-DEF(1) | Input | Connects to I2C Clock |
| 6 | MOD-DEF(0) | Output | Grounded in SFP, indicates SFP is present |
| 7 | Rate Select ¹ | - | - |
| 8 | LOS | Output | Connects to GPIO |
| 9 | VeeR | - | GND |
| 10 | VeeR | - | GND |
| 11 | VeeR | - | GND |
| 12 | RD- | Output | Connects to PHY |
| 13 | RD+ | Output | Connects to PHY |
| 14 | VeeR | - | Gnd |
| 15 | VccR | - | 3.3V |
| 16 | VccT | - | 3.3V |
| 17 | VeeT | - | GND |
| 18 | TD+ | Input | Driven from PHY |
| 19 | TD- | Input | Driven from PHY |
| 20 | VeeT | - | GND |

¹ Rate Select is an optional SFP input that controls receiver bandwidth when used with Fibre Channel applications. This pin is unconnected.

Serial Port

For detailed information about the combination ports, see [Router Hardware Description, page 11](#).

Table 5 Serial Port Specification

| RS-232 ¹ | | | |
|---------------------|-------------------------------------|-----|-----|
| Pin | Signal Description (Abbreviation) | DTE | DCE |
| 1 | DCE ready, ring indicator (DSR/RI) | <- | -> |
| 2 | Received line signal detector (DCD) | <- | -> |
| 3 | DTE ready (DTR) | -> | <- |
| 4 | Signal ground (COM) | - | - |
| 5 | Received data (RxD) | <- | -> |
| 6 | Transmitted data (TxD) | -> | <- |

Table 5 Serial Port Specification (continued)

| RS-232 ¹ | | | |
|---------------------|-----------------------------------|-----|-----|
| Pin | Signal Description (Abbreviation) | DTE | DCE |
| 7 | Clear to send (CTS) | <- | -> |
| 8 | Request to send (RTS) | -> | <- |

¹ The RS232 pinouts use the EIA-561 standard.

Power Connectors

For detailed information about the router power supply terminal connectors (AC and DC input terminals), see [Router Hardware Description, page 11](#).

Cable and Adapter Specifications

SFP Cable

For detailed information about the SFP ports, see [Router Hardware Description, page 11](#).

Table 6 SFP Port Cabling Specification

| SFP Module | Wavelength (nm) | Cable Type | Core size/ Cladding Size (micron) | Modal Bandwidth (MHz/km) | Cable Distance |
|----------------|-----------------|------------------|-----------------------------------|--------------------------|---|
| 1000BASE-SX | 850 | MMF | 62.5/125 | 160 | 722 feet (220 m) |
| | | | 62.5/125 | 200 | 902 feet (275 m) |
| | | | 50/125 | 400 | 1640 feet (500 m) |
| | | | 50/125 | 500 | 1804 feet (550 m) 3281 ft (1000 m) |
| 1000BASE-LX/LH | 1310 | MMF ¹ | 62.5/125 | 500 | 1804 feet (550 m) |
| | | | 50/125 | 400 | 1804 feet (550 m) |
| | | | 50/125 | 500 | 1804 feet (550 m) |
| | | SMF | G.6522 | - | 32,808 feet (10,000 km) |
| 1000BASE-EX | 1310 | SMF | - | - | 131,234 feet (40,000 km) |
| 1000BASE-ZX | 1550 | SMF | G.652 ² | - | 43.4 to 62 miles (70 to 100 km) ² |
| 1000BASE-BX-U | 1310 | SMF | - | - | 32,808 ft (10,000 m) |
| 1000BASE-BX-D | 1490 | SMF | - | - | 32,808 ft (10,000 m) |

¹ A mode-conditioning patch cord is required. Using an ordinary patch cord with MMF or 1000BASE-LX/LH SFP modules and a short link distance can cause transceiver saturation and an elevated bit error rate (BER). When using the LX/LH SFP module with 62.5-micron diameter MMF, you must also install a mode-conditioning patch cord between the SFP module and the MMF cable on both the sending and receiving ends of the link. The mode-conditioning patch cord is required for link distances greater than 984 feet (300 m).

² 1000BASE-ZX SFP modules can send data up to 62 miles (100 km) by using dispersion-shifted SMF or low-attenuation SMF; the distance depends on the fiber quality, the number of splices, and the connectors.