CHAPTER 2

# Preparing for Installation

This chapter provides specific information about preparing your site for the Cisco 12012. Included are safety guidelines, specific preparatory information, and tools and parts required to assure a successful installation of your Cisco 12012.

The shipping package for Cisco 12000 series routers is engineered to reduce the potential of product damage associated with routine material handling experienced during shipment. To minimize potential damage to the product, transport these products in their Cisco-specified packagings. Failure to do so may result in damage to the router or degradation of its performance. Also, do not remove the GSR or Internet Router from its shipping container until you are ready to install it. The router should always be transported or stored in an upright position. Keep the router in the shipping container until you have determined where you will install it.

Use the unpacking documentation included with the router when you unpack the Cisco 12012. Inspect all items for shipping damage. If anything is damaged, immediately contact a customer service representative.

Sections in this chapter include the following:

- Safety Recommendations
- Site Requirement Guidelines
- Tools for Installation
- Unpacking the Cisco 12012
- Site Log

Before installing your Cisco 12012, you should consider power and cabling requirements that must be in place at your installation site, the equipment you will need to install the router, and the environmental conditions your installation site must meet to maintain normal operation. This chapter guides you through the process of preparing for your router installation.

# Safety Recommendations

The following guidelines will help to ensure your safety and protect the equipment. This list is not inclusive of all potentially hazardous situations, so *be alert*.

- Never attempt to lift an object that might be too heavy for you to lift by yourself.
- Always disconnect the power source and unplug all power cables before working on the router.
- Keep the work area clear and dust free during and after installation.
- Keep tools and router components away from walk areas.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught in the router. Fasten your tie or scarf and sleeves.
- The Cisco 12012 operates safely when it is used in accordance with its marked electrical ratings and product usage instructions.
- Do not work alone if potentially hazardous conditions exist.
- The installation of your Cisco 12012 should be in compliance with national and local electrical codes: in the United States, National Fire Protection Association (NFPA) 70, United States National Electrical Code; in Canada, Canadian Electrical Code, part I, CSA C22.1; in other countries, International Electrotechnical Commission (IEC) 364, part 1 through part 7.
- Review the safety warnings listed in the document *Regulatory Compliance and Safety Information for the Cisco 12012 Gigabit Switch Router* (Document Number 78-4347-xx) that accompanied your Cisco 12012 before installing, configuring, or maintaining the router.

- Cisco 12012 routers with AC-input power supplies are shipped with a three-wire electrical grounding-type plug that will only fit into a grounding-type power outlet. This is a safety feature. The equipment grounding should be in accordance with local and national electrical codes.
- Cisco 12012 routers configured with DC-input power supplies require a 60-ampere DC circuit breaker for the input DC power source. This circuit breaker should protect against short-circuit and overcurrent faults in accordance with United States National Electrical Code NFPA 70 (United States), Canadian Electrical Code, part I, CSA C22.1 (Canada) and IEC 364 (other countries).
- Only a DC power source that complies with the safety extra-low voltage (SELV) requirements in UL950, CSA 950, EN 60950, and IEC950 can be connected to a Cisco 12012 DC-input power supply.
- A Cisco 12012 configured with DC-input power supplies is to be installed in a restricted access area in accordance with Articles 110-16, 110-17, and 110-18 of the National Electric Code, ANSI/NFPA 70.
- A Cisco 12012 configured with DC-input power supplies shall have a readily accessible disconnect device incorporated in the fixed wiring.

## Lifting Guidelines

A fully configured Cisco 12012 weighs approximately 380 lb (172 kg); it is not intended to be moved frequently. Before you install the router, ensure that your site is properly prepared so you can avoid having to move the Cisco 12012 later to accommodate power sources and network connections.

Whenever you lift any heavy assembly, follow these guidelines:

- Have a second person available to help lift the assembly; avoid lifting the assembly alone.
- Ensure that your footing is solid; balance the weight of the object between your feet.
- Lift the assembly slowly; never move suddenly or twist your body as you lift.

- Keep your back straight and lift with your legs, not your back. If you must bend down to lift the assembly, bend at the knees, not at the waist, to reduce the strain on your lower back muscles.
- Always disconnect all external cables before lifting or moving the Cisco 12012.

**Caution** To prevent damage, never attempt to lift or tilt the Cisco 12012 using the handles on the blower modules or on the power supplies. These handles are not designed to support the weight of the Cisco 12012.

## Safety with Electricity

The line cards, redundant clock and scheduler cards, switch fabric cards, alarm card, blower modules, and redundant power supplies can be removed and replaced while the system is operating without presenting an electrical hazard or damage to the system.

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the interior of the Cisco 12012, locate the emergency power-off switch for the room in which you are working.
- If an electrical accident occurs, proceed as follows:
  - Use caution; do not become a victim yourself. Disconnect power to the system.
  - If possible, send another person to get medical aid; otherwise, assess the condition of the victim and then call for help.
  - Determine if the person needs rescue breathing or external cardiac compressions, then take appropriate action.
- Disconnect all power and external cables before installing or removing a router.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Never install equipment that appears damaged.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

In addition, use the guidelines that follow when working with any equipment that is disconnected from a power source, but still connected to telephone or network wiring:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

## Preventing Electrostatic Discharge Damage

Many router components are sensitive to damage from static electricity. Some components can be degraded by voltages as low as 30V. Conversely, static voltages as high as 35,000V can be generated just by handling plastic or foam packing material, or by sliding assemblies across plastic and carpets. Not exercising the proper electrostatic discharge (ESD) precautions can result in intermittent or complete component failures. To minimize the potential for ESD damage, observe the following guidelines:

- Always use an ESD wrist strap or ankle strap and ensure that it makes good skin contact.
- When handling a removed line card, switch fabric card, or RP, make sure the equipment end of your ESD strap is attached to one of the two upper card cage ESD connection sockets or to bare metal on the frame. Avoid contact between the card and your clothing. The wrist strap only protects the card from ESD voltages on the body; EDS voltages on the clothing can still cause component damage.
- Always place a card component-side up on an antistatic surface, in an antistatic card rack, or in a static shielding bag. If you are returning the item to the factory, immediately place it in a static shielding bag.
- When installing a line card or RP, use the ejector levers to properly seat the card connectors in the backplane, then tighten both captive screws. These screws prevent accidental removal, provide proper grounding for the system, and help to ensure that the card connector is seated in the backplane.

- When removing line cards, clock and scheduler cards, switch fabric cards, or an RP, use the ejector levers to unseat the card connector from the backplane. Pull the metal card carrier out slowly, placing one hand along the bottom of the carrier to guide it straight out of the slot.
- Handle line cards, clock and scheduler cards, switch fabric cards or an RP by the metal card carrier edges only; avoid touching the board or any connector pins.

**Caution** For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms.

## Laser Safety

Single-mode style line cards for the Cisco 12012 are equipped with lasers, which emit invisible radiation. Do not stare into open line card ports. Observe the following warning to prevent eye injury.

**Warning** Because invisible laser radiation may be emitted from the aperture of the port when no cable is connected, avoid exposure to laser radiation and do not stare into open apertures.

# Site Requirement Guidelines

This section provides the following site requirement guidelines that you must consider before installing the Cisco 12012:

- Rack-mounting guidelines
- Airflow guidelines
- Temperature and humidity guidelines
- Power guidelines
- Site wiring guidelines

## Rack-Mounting Guidelines

Before installing the Cisco 12012 in telco-style or 19-inch equipment racks, consider the following general rack-mounting guidelines:

- Install the frame in an enclosed rack only if the rack has adequate ventilation or an exhaust fan; use an open rack when possible.
- A ventilation system that is too powerful in an enclosed rack can also prevent cooling by creating negative air pressure around the frame and redirecting the air away from the air intake vent. If necessary, operate the router with the rack door open or in an open rack.
- The correct use of baffles inside an enclosed rack can assist in cooling the router.
- Equipment located near the bottom of the rack can generate excessive heat that is drawn upward and into the intake ports of equipment above, leading to failures in the router. If the enclosed rack you are using does not have a ventilation fan, one should be installed.

The rack-mounting hardware included with the Cisco 12012 is suitable for most 19-inch equipment racks or telco-style racks. We strongly recommend a rack-mount installation for the Cisco 12012 because of size and weight considerations.

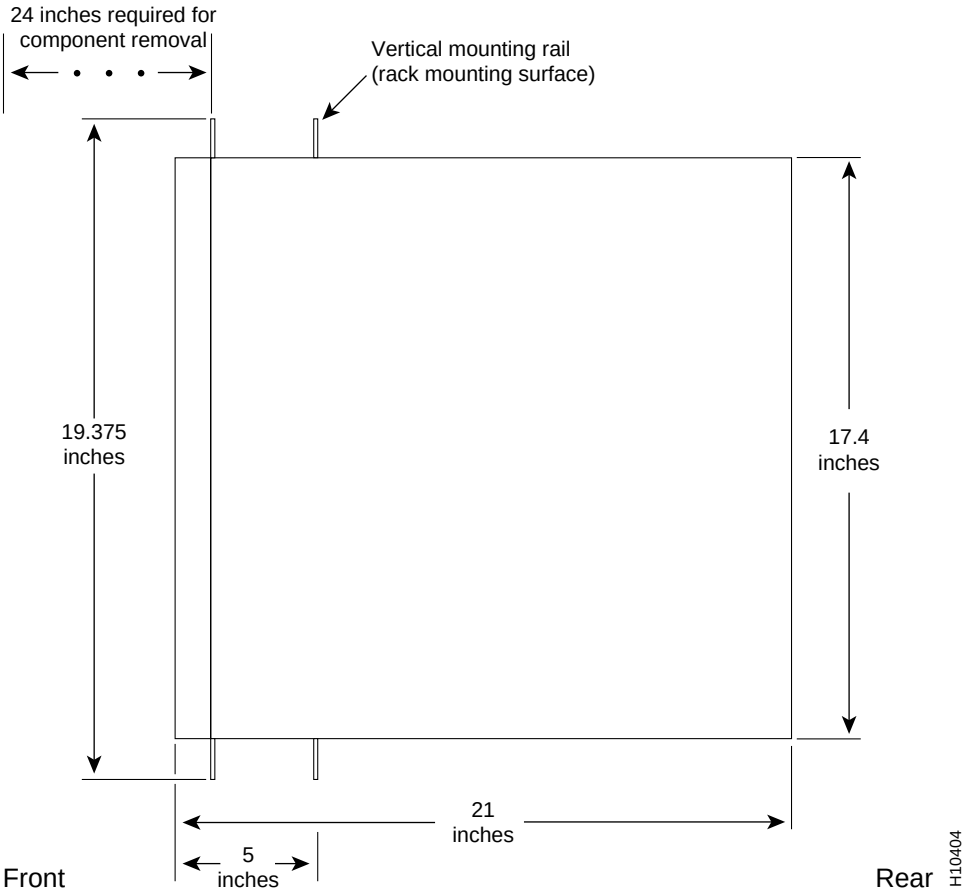
Following are specific rack-mounting guidelines for the Cisco 12012:

- The Cisco 12012 weighs approximately 380 lb (172 kg) fully configured. To keep the equipment rack center of gravity as low as possible, mount the router so that the bottom of the router frame is no higher than 10-inches (25.4-cm) from the floor.
- If you use telco-style racks, be sure that the rack is bolted to floor. The frame mounts to the two rack posts, and the rest of the frame is cantilevered off of the posts. Ensure that the weight of the Cisco 12012 does not make the rack unstable. Some telco-style racks are also secured to ceiling brackets, if necessary, because of the weight of the equipment in the rack. Make sure that the rack you are installing the Cisco 12012 in is secured to the building structure.
- The height of the Cisco 12012 frame is 57-inches (144.8-cm). Allow sufficient space in the rack for the frame.
- To mount the router between two posts or rails, the inner clearance (the width between the *inner* sides of the two posts or rails) must be at least 17.5-inches (44.5-cm).

- Maintain at least a 6-inch (15.25-cm) clearance at the front and back of the router frame for cooling air intake and warm air exhaust. Avoid placing the router in an overly congested rack because the heated exhaust air from other equipment can enter the inlet air vents and cause an overtemperature condition inside the router.
- Allow at least 19 inches (48-cm) of clearance at the front of the rack for maintenance.
- Install and use the cable-management bracket included with the router to keep cables organized and out of the way of line cards, power supplies, and the blower modules. Consider the equipment and cabling that is already installed in the rack. Ensure that cables from other equipment will not impair access to the upper or lower card cage, or require you to disconnect cables unnecessarily to perform equipment maintenance or upgrades.
- When mounting the router in a four-post or telco-style rack, be sure to use all of the screws provided to secure the frame to the rack posts.

Figure 2-1 shows the outer dimensions of the Cisco 12012 frame.

**Figure 2-1 Cisco 12012 Frame Outer Dimensions (Top View)**



## Airflow Guidelines

The Cisco 12012 air circulation system consists of two blower modules: one mounted at the top of the frame (above the upper card cage) and the other mounted at the bottom of the frame (below the power supply bay). The blower modules maintain acceptable operating temperatures for the internal components by drawing cooling air in through a replaceable air filter and circulating the air through both card cages and the power supply bays.

Observe the following guidelines when selecting a site to install the Cisco 12012:

- The site should be as dust-free as possible. Dusty environments can clog the air filter, reducing the cooling airflow through the system. This can cause an overtemperature condition in the system.
- Allow sufficient airflow by maintaining a minimum of 6 inches (15.2-cm) of clearance at both the inlet and exhaust openings on the frame. If the airflow is blocked or restricted, or if the inlet air is too warm, an overtemperature condition within the router can occur. Under extreme conditions, the environmental monitoring system will shut down the power to protect the system components.

## Temperature and Humidity Guidelines

Table 2-1 lists the operating and nonoperating environmental site requirements. The ranges listed are those within which the Cisco 12012 will continue to operate; however, a temperature measurement that is approaching a minimum or maximum indicates a potential problem. You can maintain normal operation by anticipating and correcting environmental anomalies before they approach critical values.

The environmental monitoring functionality built into the Cisco 12012 protects the system and components from potential damage from overvoltage and overtemperature conditions. To assure normal operation and avoid unplanned maintenance, plan and prepare your site before you install the router.

**Table 2-1 Site Environment Requirements**

| Specifications | Minimum | Maximum |
|---|---|---|
| Ambient temperature, operating | 32°F (0°C) | 104°F (40°C) |
| Ambient, temperature, nonoperating and storage | –40°F (–40°C) | 149°F (65°C) |
| Ambient humidity, (noncondensing) operating | 10% relative | 90% relative |
| Ambient humidity, (noncondensing) nonoperating and storage | 5% relative | 95% relative |
| Altitude, operating and nonoperating | Sea level | 10,000 ft (3,050 m) |
| Thermal output | – | 10,640 Btu/hour (maximum) |
| Vibration, operating | 5 to 200 Hz, 0.5 g[1] (1 oct/min)[2] | – |
| Vibration, nonoperating | 5 to 200 Hz, 1 g (1 oct/min) 200 to 500 Hz, 2 g (1 oct/min) | – |

1. g = gravity.
2. oct/min. = octave per minute.

## Power Guidelines

The Cisco 12012 can be configured with either AC-input or DC-input power supplies. The Cisco 12012 requires two AC-input power supplies or one DC-input power supply to operate. Site requirements differ depending on the type of source voltage. We recommend you follow these precautions and recommendations when planning power connections to the Cisco 12012:

- Check the power at your site before installation and periodically after installation to ensure that you are receiving clean power. Install a power conditioner if necessary.
- Install proper grounding to avoid damage from lightening and power surges.

**Warning** AC operation requires a minimum configuration of two AC-input power supplies.

## AC-Powered Systems

In sites where the Cisco 12012 operates with AC-input power supplies, observe the following guidelines:

- The AC-input power supply operating between 185–264 VAC requires a minimum of 20-amp service, North America; 10-amp or 16-amp, International.
- There are five styles of AC-input power supply power cords available (differing in plug type); make sure you have the correct style for your site. (See Figure 2-2 and Table 2-3.) All AC-input power supply power cords measure 14 feet (4.3 m).
- Provide dedicated power sources for each power supply installed in the router.
- Install an uninterruptible power source where possible.
- Install proper grounding to avoid damage from lightening and power surges.

Table 2-2 lists the nominal and acceptable value ranges for source AC power.

**Table 2-2 Source AC Power Specifications**

| Specifications | Nominal Value | Acceptable Value Ranges |
|---|---|---|
| AC input voltage | 200 to 240 VAC[1] | 180 to 264 VAC, single phase |
| AC input line frequency | 50/60 Hz | 47 to 63 Hz |
| AC input current | 9.5 amps (@ 200 VAC) | – |

1. VAC = volts alternating current.

**Figure 2-2 AC Power Cords**

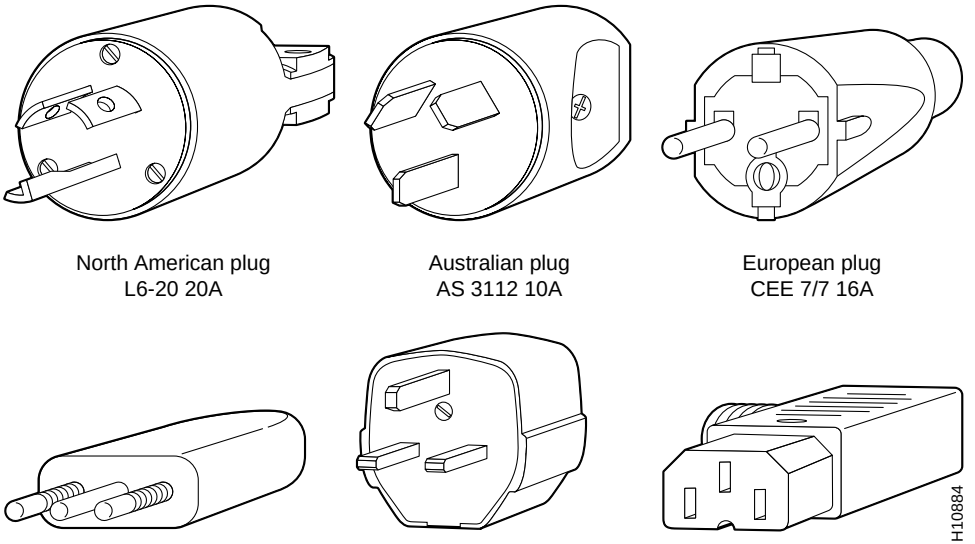



**Table 2-3 AC Power Cord International Options**

| Label | Description | Product Number |
|---|---|---|
| North American | 208 VAC, 60 Hz AC power cord | CAB-GSR12-US= |
| Australian | 240 VAC, 50 Hz AC power cord | CAB-GSR12-AU= |
| European | 230 VAC, 50 Hz AC power cord | CAB-GSR12-EU= |
| Italian | 220 VAC, 50 Hz AC power cord | CAB-GSR12-IT= |
| United Kingdom | 240 VAC, 50 Hz AC power cord | CAB-GSR12-UK= |

## DC-Powered Systems

In sites where the Cisco 12012 operates with DC-input power supplies, observe the following guidelines:

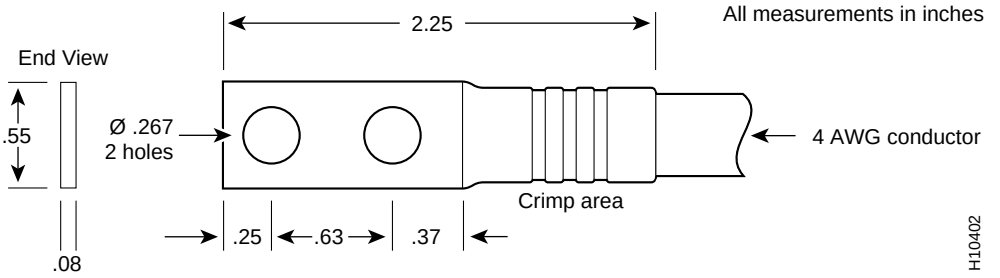
- Each DC-input power supply requires a dedicated 60-amp service. Table 2-4 lists the nominal and acceptable value ranges for source DC power.
- For DC power cables, we recommend that you use 4-AWG, high strand count wire cable (three leads).
- Lugs should be dual hole and able to fit over M6 terminal studs at .625-inch (15.86-mm) centers. Figure 2-3 shows the type of lug required for the DC-input cable connections.

**Table 2-4 Source DC Power Specifications**

| Specifications | Nominal Value | Acceptable Value Ranges |
|---|---|---|
| DC input voltage | –48 VDC[1] (United States) | –40.5 to –56 VDC (United States) |
| | –60 VDC (International) | –58 to –75 VDC (International) |
| DC input current | 50 amps (@ 50 VDC) | – |

1. VDC = volts direct current.

**Figure 2-3 DC Power Cable Lug**



## System Grounding Connection Guidelines

Before you connect power or turn on your Cisco 12012, we strongly recommend that you provide adequate system ground for your router. System grounding (earth) receptacles are provided on the Cisco 12012. The grounding receptacles are located between the air filter tray and the power supply bays, on the card cage assembly mounting flange. To ensure the system grounding connection that you provide is adequate, you will need the following parts:

- Two grounding lugs—Must have two M6 screw holes that have 0.625–0.75-inch (15.86–19.05-mm) spacing between them. The lug is similar to the type used for the DC-input power supply leads. (See Figure 2-3.) This grounding lug is not available from Cisco Systems; electrical-connector vendors, such as Panduit, provide this type of lug.
- Four hex-head screws with locking washers—M6 (metric). These screws are not available from Cisco Systems; they are available from any commercial hardware vendor.
- Two grounding wires—4 AWG recommended. The length of the wire depends on your router location and site environment. This wire is not available from Cisco Systems; it is available from any commercial cable vendor.

## Site Wiring Guidelines

Following are guidelines for setting up the plant wiring and cabling at your site. When planning the location of the new system, consider the distance limitations for signaling, electromagnetic interference (EMI), and connector compatibility, as described in the following sections.

When wires are run for any significant distance in an electromagnetic field, interference can occur between the field and the signals on the wires. This fact has two implications for the construction of plant wiring:

- Bad wiring practice can result in radio interference emanating from the plant wiring.
- Strong EMI, especially when it is caused by lightning or radio transmitters, can destroy the signal drivers and receivers in the Cisco 12012, and can even create an electrical hazard by conducting power surges through lines and into equipment.

**Note** To predict and remedy strong EMI, you might also need to consult experts in radio frequency interference (RFI).

If you use twisted-pair cable in your plant wiring with a good distribution of grounding conductors, the plant wiring is unlikely to emit radio interference. If you exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.

If wires exceed recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse (EMP) caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices. If you have had problems of this sort in the past, you may want to consult experts in electrical surge suppression and shielding.

Most data centers cannot resolve the infrequent but potentially catastrophic problems just described without pulse meters and other special equipment. These problems can cost a great deal of time to identify and resolve, so take precautions by providing a properly grounded and shielded environment, with special attention to issues of electrical surge suppression.

## SONET Connection Guidelines

The SONET specification for fiber-optic transmission defines two types of fiber: single-mode and multimode. Modes can be thought of as bundles of light rays entering the fiber at a particular angle. Single-mode fiber allows only one mode of light to propagate through the fiber, while multimode fiber allows multiple modes of light to propagate through the fiber. Because multiple modes of light propagating through the fiber travel different distances depending on the entry angles, causing them to arrive at the destination at different times (a phenomenon called modal dispersion), single-mode fiber is capable of higher bandwidth and greater cable run distances than multimode fiber. The maximum distances for single-mode and multimode transmissions, as defined by SONET, are listed in Table 2-5. If the distance between two connected stations is greater than these maximum distances, significant signal loss can result, making transmission unreliable.

**Table 2-5 SONET Maximum Fiber-Optic Transmission Distances**

| Transceiver Type | Maximum Distance between Stations[1] |
|---|---|
| Single-mode | Up to 9 miles (14.8 kilometers) |
| Multimode | Up to 1.5 miles (2.4 kilometers) |

1. Table 2-5 gives typical results. You should use the power budget calculations to determine the actual distances.

## Power Budget

To design an efficient optical data link, evaluate the power budget. The power budget is the amount of light available to overcome attenuation in the optical link and to exceed the minimum power that the receiver requires to operate within its specifications. Proper operation of an optical data link depends on modulated light reaching the receiver with enough power to be correctly demodulated.

Attenuation, caused by the passive media components (cables, cable splices, and connectors), is common to both multimode and single-mode transmission.

The following variables reduce the power of the signal (light) transmitted to the receiver in multimode transmission:

- Chromatic dispersion (spreading of the signal in time because of the different speeds of light wavelengths)
- Modal dispersion (spreading of the signal in time because of the different propagation modes in the fiber)

Attenuation is significantly lower for optical fiber than for other media. For multimode transmission, chromatic and modal dispersion reduce the available power of the system by the combined dispersion penalty (in decibels [dB]). The power lost over the data link is the sum of the component, dispersion, and modal losses. Table 2-6 lists the factors of attenuation and dispersion limit for typical fiber-optic cable.

**Table 2-6 Typical Fiber-Optic Link Attenuation and Dispersion Limits**

| | Single-Mode | Multimode |
|---|---|---|
| Attenuation | 0.5 dB | 1.0 dB/km |
| Dispersion Limit | No limit | 500 MHz/km[1] |

1. The product of bandwidth and distance must be less than 500 MHzkm.

## Approximating the Line Card Power Margin

The LED used for a multimode transmission light source creates multiple propagation paths of light, each with a different path length and time requirement to cross the optical fiber, causing signal dispersion (smear). Higher order mode loss (HOL) results from light from the LED entering the fiber and being radiated into the fiber cladding. A worst-case estimate of power margin (PM) for multimode transmissions assumes minimum transmitter power (PT), maximum link loss (LL), and minimum receiver sensitivity (PR). The worst-case analysis provides a margin of error, although not all of the parts of an actual system will operate at the worst-case levels.

The power budget (PB) is the maximum possible amount of power transmitted. The following equation lists the calculation of the power budget:

PB = PT – PR

PB = –18.5 dBm –(– 30 dBm)

PB = 11.5 dB

The power margin calculation is derived from the power budget and subtracts the link loss, as follows:

PM = PB – LL

If the power margin is positive, as a rule, the link will work.

Table 2-7 lists the factors that contribute to link loss and the estimate of the link loss value attributable to those factors.

**Table 2-7 Estimating Link Loss**

| Link Loss Factor | Estimate of Link Loss Value |
|---|---|
| Higher order mode losses | 0.5 dB |
| Clock recovery module | 1 dB |
| Modal and chromatic dispersion | Dependent on fiber and wavelength used |
| Connector | 0.5 dB |
| Splice | 0.5 dB |
| Fiber attenuation | 1 dB/km |

After calculating the power budget minus the data link loss, the result should be greater than zero. Results less than zero may have insufficient power to operate the receiver.

For SONET versions of a line card, the signal must meet the worst case parameters listed in Table 2-8.

**Table 2-8 Line Card SONET Signal Requirements**

| | Single-Mode | Multimode |
|---|---|---|
| PT | –18.5 | –15 |
| PR | –30 | –28 |
| PB | 11.5 | 13 |

## Multimode Power Budget Example with Sufficient Power for Transmission

The following is an example calculation for a multimode power budget based on the following variables:

Length of multimode link = 3 kilometers (km)

4 connectors

3 splices

Higher order loss (HOL)

Clock recovery module (CRM)

Estimate the power budget as follows:

PB = 13 dB – 3 km (1.0 dB/km) – 4 (0.5 dB) – 3 (0.5 dB) – 0.5 dB (HOL) – 1 dB (CRM)

PB = 13 dB – 3 dB – 2 dB – 1.5 dB – 0.5 dB – 1 dB

PB = 5 dB

The value of 5 dB indicates that this link would have sufficient power for transmission.

## Multimode Power Budget Example of Dispersion Limit

Following is an example with the same parameters as the previous example, but with a multimode link distance of 4 km:

PB = 13 dB – 4 km (1.0 dB/km) – 4 (0.5 dB) – 3 (0.5 dB) – 0.5 dB (HOL) – 1 dB (CRM)

PB = 13 dB – 4 dB – 2 dB – 1.5 dB – 0.5 dB – 1 dB

PB = 4 dB

The value of 4 dB indicates that this link would have sufficient power for transmission; however, due to the dispersion limit on the link (4 km x 155.52 MHz > 500 MHzkm), this link would not work with multimode fiber. In this case, single-mode fiber would be the better choice.

## Single-Mode Transmission

The single-mode signal source is an injection laser diode. Single-mode transmission is useful for longer distances because there is a single transmission path within the fiber and smear does not occur. In addition, chromatic dispersion is also reduced because laser light is essentially monochromatic.

The maximum overload specification on the single-mode receiver is –14 dBm. The single-mode receiver can be overloaded when using short lengths of fiber because the transmitter can transmit up to –8 dB. The receiver could be overloaded at –14 dB, but no damage will result. To prevent overloading the receiver connecting short fiber links, insert a 5 to 10 dB attenuator on the link between any single-mode SONET transmitter and the receiver.

## SONET Single-Mode Power Budget Example

The following example of a single-mode power budget is of a two buildings, 11 kilometers apart, connected through a patch panel in an intervening building with a total of 10 connectors.

Length of single-mode link = 11 km

10 connectors

Estimate the power budget as follows:

PB = 11.5 dB – 11 km (0.5 dB/km) – 10 (0.5 dB)

PB = 11.5 dB – 5.5 dB – 5 dB

PB = 1 dB

The value of 1 dB indicates that this link would have sufficient power for transmission and is not in excess of the maximum receiver input power.

### Using Statistics to Estimate the Power Budget

Statistical models more accurately determine the power budget than the worst-case method. Determining the link loss with statistical methods requires accurate knowledge of variations in the data link components. Statistical power budget analysis is beyond the scope of this document. For further information, refer to UNI Forum specifications, ITU-T standards, and your equipment specifications.

## Tools for Installation

The Cisco 12012 is designed to be installed with a minimum number of tools. The following are required tools:

- 1/4-inch flat-blade screwdriver
- 3/16-inch flat-blade screwdriver
- ESD-preventive wrist strap
- Antistatic mat
- Tape measure
- 10-mm wrench (either open-end or socket) for DC-input power supplies
- 9/16-inch or 15-mm wrench (either open-end or socket) to remove lag bolts from pallet
- Wire cutters
- Pliers

# Unpacking the Cisco 12012

To unpack your Cisco 12012, use the unpacking instructions in the document *Cisco 12012 Unpacking Instructions* posted on the outside of the shipping container.

**Note** Do not discard the shipping packaging. You will need this packaging if you move or ship the router in the future.

If packing material is lost or damaged, the Cisco 12012 packing materials are available as an orderable item; use Product Number PKG-GSR12=.

# Checking the Shipping Packaging Contents

Check the contents of the shipping packaging and verify that the following are included with your shipment:

- One Cisco 12012, fully assembled (except for redundant AC-input power supplies)
- One to four power supplies. Systems configured for source DC operation are shipped with one or two DC-input power supplies installed in the power supply bay. Systems configured for source AC operation are shipped with two AC-input power supplies installed in the power supply bay. If your system is configured with redundant AC-input power supplies (one or two additional AC-input power supplies), the additional power supplies are shipped packaged in a large cardboard box on the front of the pallet.
- One or more accessories boxes (one accessories box is shipped in the large cardboard box on the front of the pallet. Additional accessories boxes are shipped separately.)

If you do not receive everything you ordered, contact a customer service representative for assistance.

# Site Log

A site log provides a historical record of all actions relevant to the Cisco 12012 operation and maintenance. Keep your site log in a common place near the router where anyone who performs tasks has access to it.

Site log entries might include the following:

- Installation progress—make entries in the site log to record installation progress. Note any difficulties encountered and remedies during the installation process.
- Upgrades and removal/replacement procedures—use the site log as a record of system maintenance and expansion history.

  Each time a procedure is performed on the system, update the site log to reflect the following:

  — Any FRU installed, removed, or replaced

  — Any Cisco 12012 configuration changes

  — Software upgraded

  — Corrective or preventive maintenance procedures performed

  — Intermittent problems

  — Related comments

Table 2-9 shows a sample site log page. Make copies of the sample or design your own site log to meet the needs of your site and equipment.

**Table 2-9 Site Log Example**

| Date | Description of Action Performed or Symptom Observed | Initials |
|---|---|---|
| | | |
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