Extreme Networks Site Planning Guide

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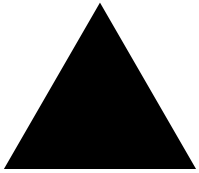

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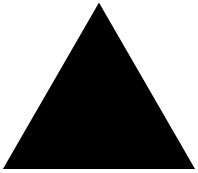

Introduction

This guide describes how to prepare your site for installing Extreme Networks equipment. It contains information on environmental and cabling requirements, power requirements, and information on contacting building and electrical code organizations, and includes these sections:

- Site Planning Process
- Meeting Site Requirements
- Evaluating and Meeting Cable Requirements
- Meeting Power Requirements
- Applicable Industry Standards

This guide is intended for the system administrator, network equipment technician, or network manager who is responsible for installing and managing the network hardware. It assumes a working knowledge of local area network (LAN) operations, and a familiarity with communications protocols that are used on interconnected LANs.

By carefully planning your site, you can maximize the performance of your existing network and ensure that it is ready to migrate to future networking technologies.

Site Planning Process

To install your equipment successfully, you should plan your site carefully. The site planning process has three major steps:

Step 1: Meeting Site Requirements

Your physical installation site must meet several requirements for a safe and successful installation:

- Building and electrical code requirements
- Environmental, safety, and thermal requirements for the equipment you plan to install
- Distribution rack requirements

Step 2: Evaluating and Meeting Cable Requirements

After examining your physical site and ensuring all environmental requirements are met, you should evaluate your existing cable plant and the requirements of the Extreme Networks equipment to determine when to use your existing cable and when to install new cable.

Step 3: Meeting Power Requirements

To run your equipment safely, you must meet the specific power requirements for the equipment you plan to install.

Review and follow the safety information located in the user guide for the equipment you are installing.

Meeting Site Requirements

This section addresses the various requirements to consider when preparing your installation site, including:

- Operating Environment Requirements
- Rack Specifications and Recommendations

Operating Environment Requirements

A preliminary step in planning your site is to verify that it meets all environmental and safety requirements.

Virtually all areas of the United States are regulated by building codes and standards, which are enforced by local jurisdictional agencies. During the early planning stages of installing or modifying your local area network (LAN), it is important that you develop a thorough understanding of the regulations imposed in your area.

Building and Electrical Codes

Building and electrical codes vary depending on your location. Comply with all code specifications when planning your site and installing cable. The following sections are provided as a resource to obtain additional information.

Three major building codes are:

- Uniform Building Code—produced by the International Conference of Building Officials (ICBO); 5360 South Workman Mill Road; Whittier, California 90601 USA. www.icbo.org
- BOCA Basic Building Code—produced by the Building Officials and Code Administrators (BOCA) International, Inc.; 4051 West Flossmoor Road; Country Club Hills, Illinois 60478 USA. www.bocai.org
- Standard Building Code (SBC)—produced by the Southern Building Code Congress International, Inc.; 900 Montclair Road; Birmingham, Alabama 35213 USA. www.sbcci.org

Five authorities on electrical codes are:

- National Electrical Code (NEC) Classification (USA only)—a recognized authority on safe electrical wiring. Federal, state, and local governments use NEC standards to establish their own laws, ordinances, and codes on wiring specifications. The NEC classification is published by the National Fire Protection Association (NFPA). The address is NFPA; 1 Batterymarch Park; Quincy, Massachusetts 02269 USA. www.nfpa.org
- Underwriters' Laboratory (UL) Listing (USA only)—an independent research and testing laboratory. UL evaluates the performance and capability of electrical wiring and equipment to determine whether they meet certain safety standards when properly used. Acceptance is usually indicated by the words "UL Approved" or "UL Listed." The address is UL; 333 Pfingsten Road; Northbrook, Illinois 60062-2096 USA. www.ul.com
- National Electrical Manufacturing Association (NEMA) (USA only)—an organization made up of electrical product manufacturers. Members develop consensus standards for cables, wiring, and electrical components. The address is NEMA; 2101 L Street N.W.; Washington, D.C. 20037 USA. www.nema.org
- Electronics Industry Association (EIA)—a trade association that develops technical standards, disseminates marketing data, and maintains contact with government agencies in matters relating to the electronics industry. The address is EIA; 2001 Eye Street N.W.; Washington, D.C. 20006 USA. www.eia.org
- Federal Communications Commission (FCC)—a commission that regulates all interstate and foreign electrical communication systems originating in the United States under the Communications Act of 1934. The FCC regulates all U.S. telephone and cable systems. The address is FCC; 1919 M Street N.W.; Washington, D.C. 20554 USA.

Wiring Closet Considerations

You should consider the following recommendations for your wiring closet:

- Ensure that your system is easily accessible for installation and service. See “Rack Specifications and Recommendations” on page 12 for specific recommendations.
- Use AC power, 15-amp service receptacles, type N5/15 or NEMA 5-15R for 120 VAC.
- Use a vinyl floor covering in your wiring closet. (Concrete floors accumulate dust, and carpets can cause static electricity.)
- Prevent unauthorized access to wiring closets by providing door locks.
- Provide adequate overhead lighting for easy maintenance.
- Ensure that each wiring closet has a suitable ground. All distribution racks and equipment installed in the closet should be grounded.
- Ensure that all system environmental requirements are met, such as ambient temperature and humidity.

It is recommended that you consult an electrical contractor for commercial building and wiring specifications.

Temperature. As with any installation, Extreme Networks equipment generates a significant amount of heat. It is essential that you provide a temperature controlled environment for both performance and safety.

The following are some general thermal recommendations for your wiring closet:

- Ensure that the ventilation in the wiring closet is adequate to maintain a temperature below 104° F (40° C).
- Install a reliable air conditioning and ventilation system.
- Keep the ventilation in the wiring closet running during nonbusiness hours; otherwise, the equipment can overheat.

- Ambient operating temperature: 32° to 104° F (0° to 40° C)
- Storage Temperature: -14° to 158° F (-10° to 70° C)

Like all electrical equipment, product lifetimes degrade with increased temperature. If possible, temperatures should be kept at approximately 78° F (25° C) or lower.

Airflow Requirements. A minimum of 3 inches around the unit is required (5 inches recommended) for proper airflow.

Humidity. Operating humidity should be kept between 10 and 95% relative humidity (noncondensing)

Electrostatic Discharge (ESD)

Your system must be protected from static electricity. Take the following measures to ensure optimum system performance:

- Keep relative humidity at 50 to 70%.
- Remove materials likely to cause electrostatic generation (such as synthetic resins) from the wiring closet. Check appropriateness of floor mats and flooring.

- Use electrostatically safe equipment and the ESD straps provided with your equipment. All Alpine and BlackDiamond equipment come with ESD wrist strap connectors on the front of their chassis as shown in Figure 1.

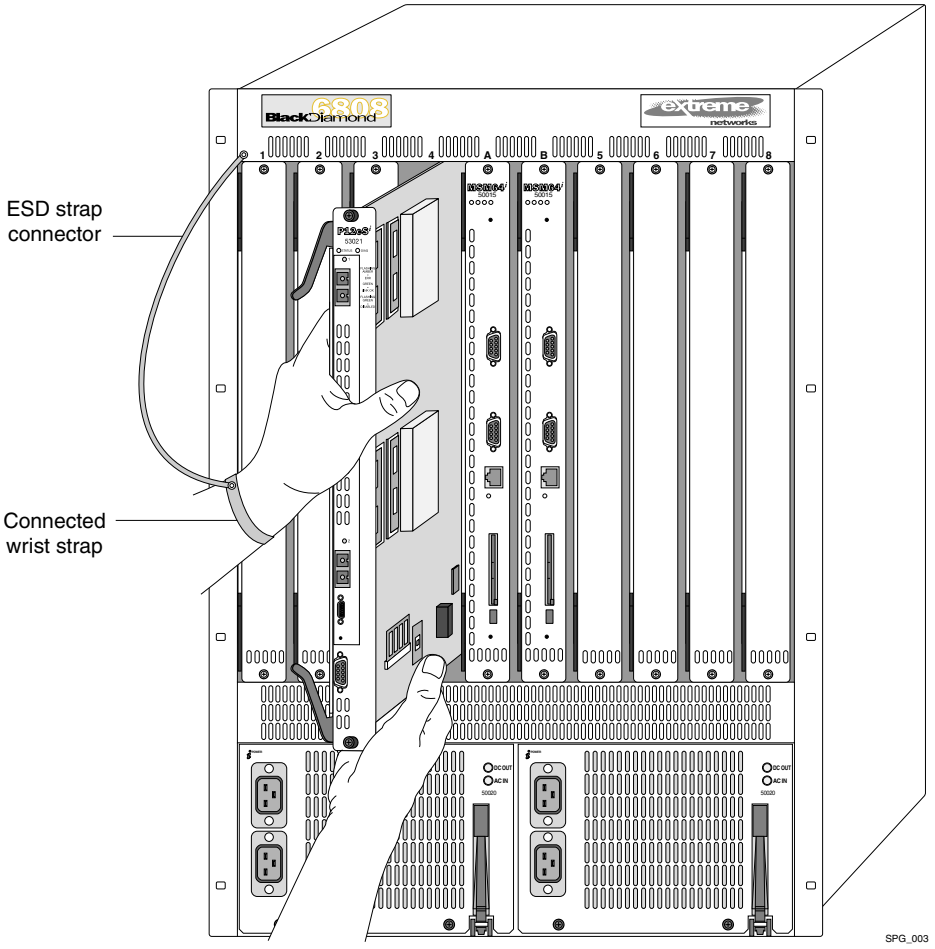

Figure 1: ESD wrist strap connectors

- Connect conductors (metals, etc.) to ground, using dedicated grounding lines.

Rack Specifications and Recommendations

Racks should conform to conventional standards. In the United States, use EIA Standard RS-310C: Racks, Panels, and Associated Equipment. In countries other than the United States, use IEC Standard 297. In addition, verify that your rack meets the basic mechanical and space requirements described in this section.

Mechanical Recommendations for the Rack

Use distribution racks that meet the following mechanical recommendations:

- Use an open style, 19-inch rack to facilitate easy maintenance and to provide proper ventilation.
- The rack should use the universal mounting rail hole pattern identified in IEC Standard 297.
- The mounting holes should be flush with the rails to accommodate the chassis.
- Use a rack made of steel or aluminum.
- Install equipment into the lower half of the rack first to avoid making the rack top-heavy.
- The rack should support approximately 600 pounds (272 kilograms).

Protective Grounding for the Rack

Use a rack grounding kit and a ground conductor that is carried back to earth or to another suitable building ground.

All Extreme Networks products are designed with mounting brackets that provide solid metal-to-metal connection to the rack. If equipment racks are not used, wiring terminals can be attached directly to the mounting brackets for appropriate grounding. Alpine products have grounding terminals mounted on the back of the chassis.

At minimum, follow these guidelines:

- Ground equipment racks to earth ground.
  - — CAD weld appropriate wire terminals to building I-beams or earth ground rods.
  - — Use #4 copper wire.
  - — Drill and tap wire terminals to equipment racks.
  - — Position the earth ground as close to the equipment rack as possible to maintain the shortest wiring distance possible.
  - — Properly test the quality of the earth ground.

  Because building codes vary world-wide, Extreme Networks strongly recommends that you consult an electrical contractor to ensure proper equipment grounding is in place for your specific installation.
- Ground DC power supplies to earth ground using the grounding terminals provided.

Space Requirements for the Rack

Provide enough space in front of and behind the system so that you can service it easily. Allow a minimum of 4 feet in front of the rack and 2 feet behind the rack. When using a relay rack, provide a minimum of two feet of space behind the mounted equipment.

Extra room on each side is optional. Figure 2 illustrates the recommended distances for service access.

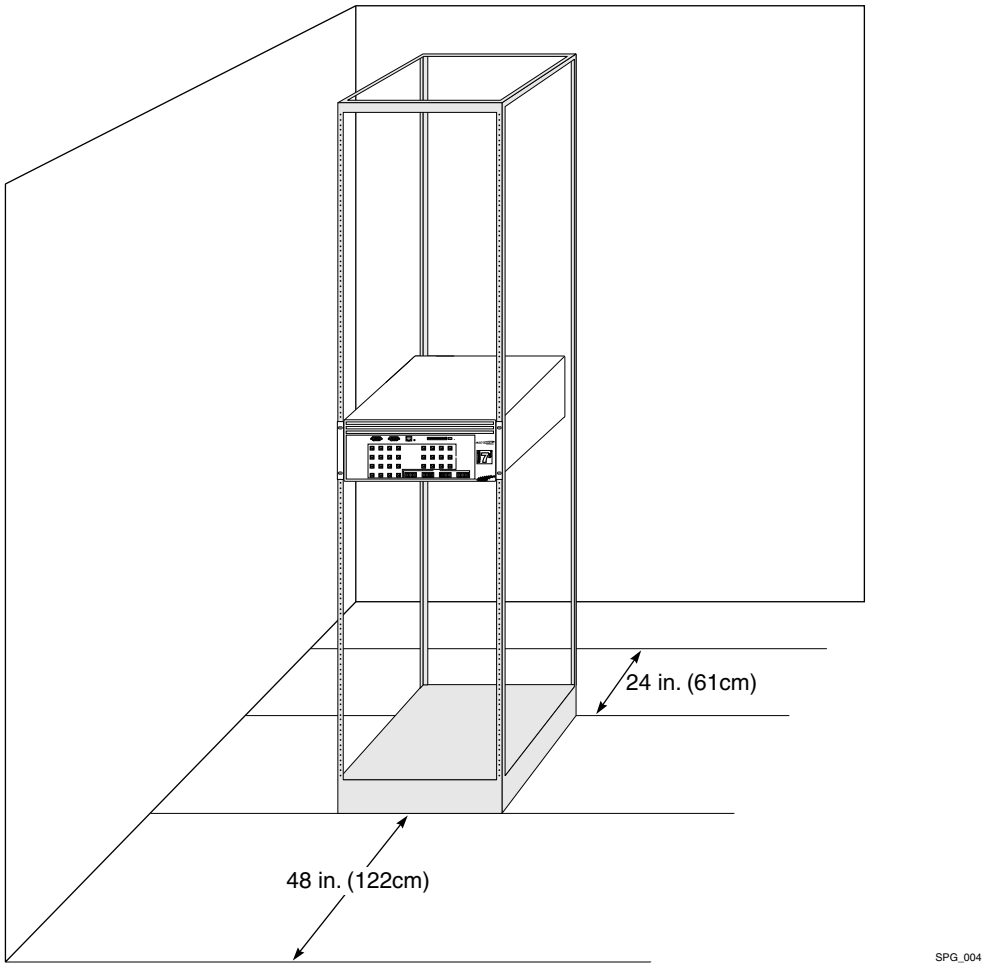

Figure 2: Recommended service access

Install your equipment rack near an easily accessible power outlet. You should power down your equipment only by removing the power cord from the power source.

Securing the Rack

The rack should be attached to the wiring closet floor with 9.5 millimeters (3/8 inch) lag screws or equivalent hardware. The floor under the rack should be level within 5 millimeters (3/16 inch). Use a floor-leveling cement compound if necessary or bolt the racks to the floor as shown in Figure 3.

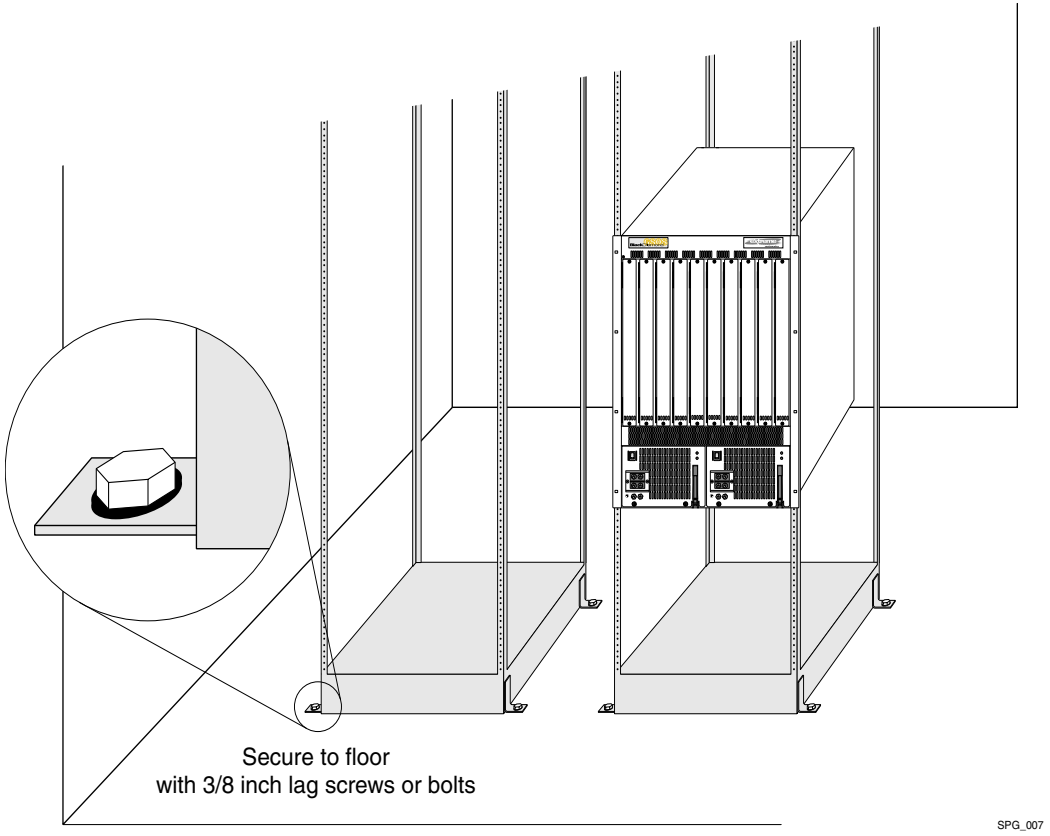

Figure 3: Properly secured rack

- Brace open distribution racks if the channel thickness is less than 6.4 millimeters (1/4 inch).

Evaluating and Meeting Cable Requirements

This section addresses requirements for the cable you should use when installing your equipment. It includes:

- Cabling Standards
- Cable Labeling and Record Keeping
- Installing Cable
- RJ-45 Connector Jackets
- Radio Frequency Interference

Cabling Standards

We recommend using the BICSI (Building Industry Consulting Service International) RCDD (Registered Communications Distribution Designer), which is globally recognized as a standard in site planning and cabling. For information, go to http://www.bicsi.org/.

Cable Labeling and Record Keeping

A reliable cable labeling system is essential when planning any installation. A good cable labeling system provides enough information for you to locate the opposite end of any cable. Maintaining accurate records helps you to:

- relocate devices easily.
- make changes quickly.
- isolate faults in the distribution system.

Consider the following recommendations when setting up a cable labeling system suitable for your installation:

- Identify cables by securely attaching a label to all cable ends.
- Assign a unique block of sequential numbers to the group of cables that run between each pair of wiring closets.
- Assign a unique identification number to each distribution rack.
- Identify all wiring closets by labeling the front panel of your Extreme Networks equipment and other hardware.
- Keep accurate and up-to-date cable identification records.
- Post records near each distribution rack. Record the following cable drop information: the cable source, destination, jumper location, and any additional information.

Installing Cable

Consider the following when running cable to your equipment:

- Examine cable for cuts, bends, and nicks.
- Support cable using a cable manager mounted above connectors to avoid unnecessary weight on the cable bundles.
- Use cable managers to route cable bundles to the left and right of the equipment to maximize accessibility to the connectors.

- Provide enough slack (approximately 2”-3”) to provide proper strain relief as indicated in Figure 4.

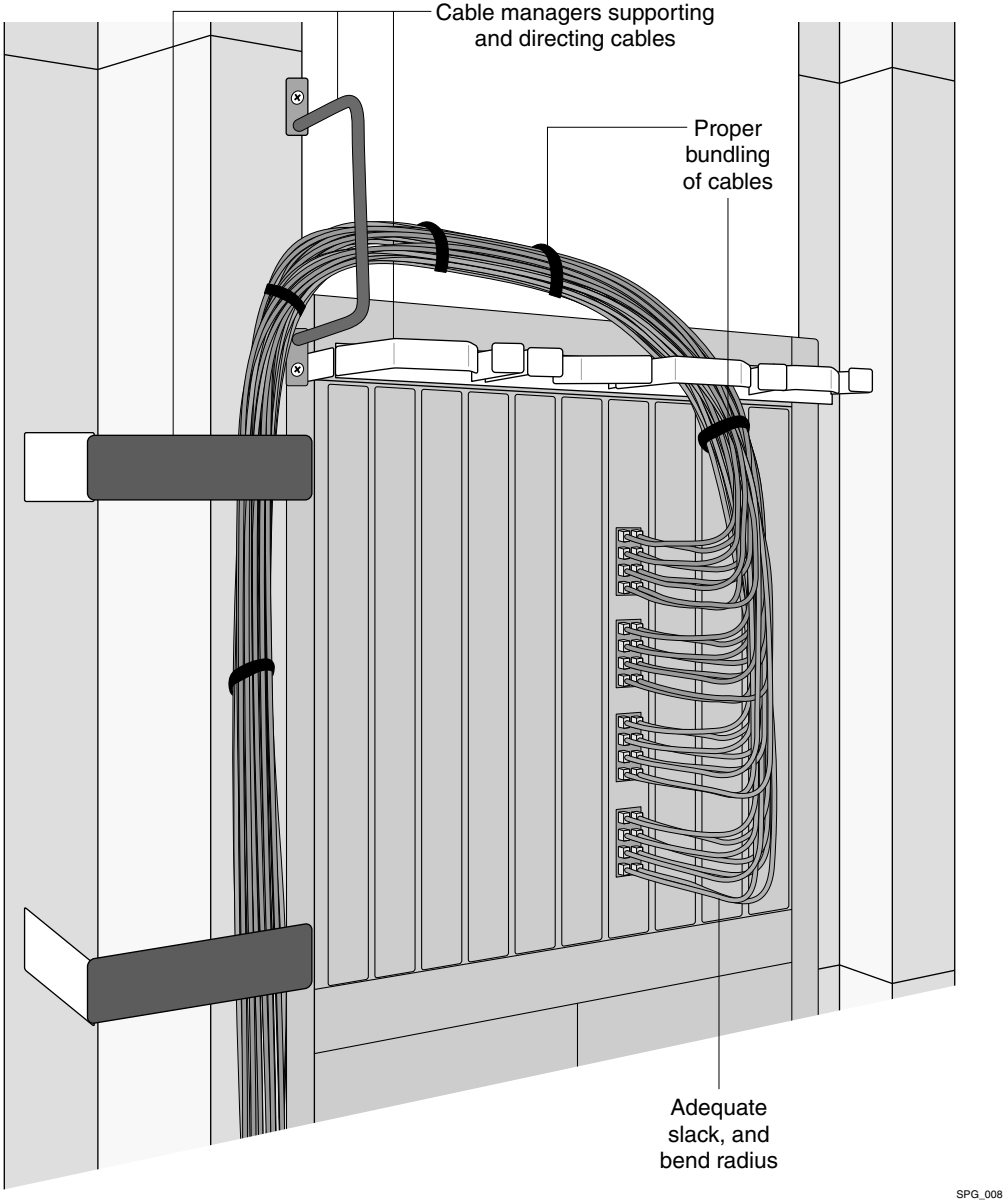

Figure 4: Properly installed and bundled cable

- Bundle cable using velcro straps to avoid injuring cables.
- If you build your own cable, ensure that cable is properly crimped.
- When installing a patch panel using twisted pair wiring, untwist no more than 1” of the cable to avoid RF interference.
- When required for safety and fire rating requirements, plenum-rated cable can be used. See your local building codes for determining when it is appropriate to use plenum-rated cable, or refer to IEC standard 850.
- Keep all ports and connectors free of dust.

UTP cable can build up ESD charges when being pulled into a new installation. Before installing category 5 UTP cables, discharge ESD from the cable by plugging it into a port on a system that is not powered on.

Fiber Optic Cable

Fiber optic cable must be treated fairly gently during installation. Every cable has a minimum bend radius, for example, and fibers are damaged if the cables are bent too sharply. It is important not to stretch the cable during installation. It is recommended that the bend radius for fiber optic cable equals 2” minimum for each 90 degree turn as shown in Figure 5.

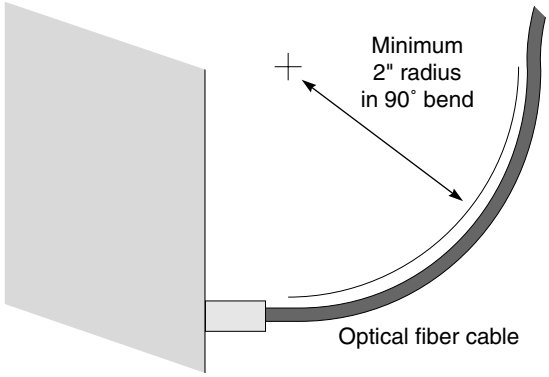

Figure 5: Bend radius for fiber optic cable

Cable Distances

Table 1 shows cable media types and maximum distances supported.

Table 1: Media Types and Distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
1000BASE-SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
1000BASE-LX (1300 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
1000BASE-LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000
100BASE-FX (1300 nm optical window)	50/125 µm multimode fiber	400	2000
	50/125 µm multimode fiber	500	2000
	62.5/125 µm multimode fiber	400	2000
	62.5/125 µm multimode fiber	500	2000
1000BASE-T	Category 5 and higher UTP cable	–	100
100BASE-TX	Category 5 and higher UTP cable	–	100
10BASE-T	Category 3 and higher UTP cable	–	100

* Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

RJ-45 Connector Jackets

Use RJ-45 cable with connector jackets that are flush with the connector or that have connectors with a no-snag feature built in.

Using cable with jackets wider than the connectors can cause:

- connectors that are not properly aligned with the port.
- crowded cable installation, which can cause connectors to pop out of the port and lose the connection.

Figure 6 shows examples of connector jacket types that are not recommended as well as recommended RJ-45 connector jacket types.

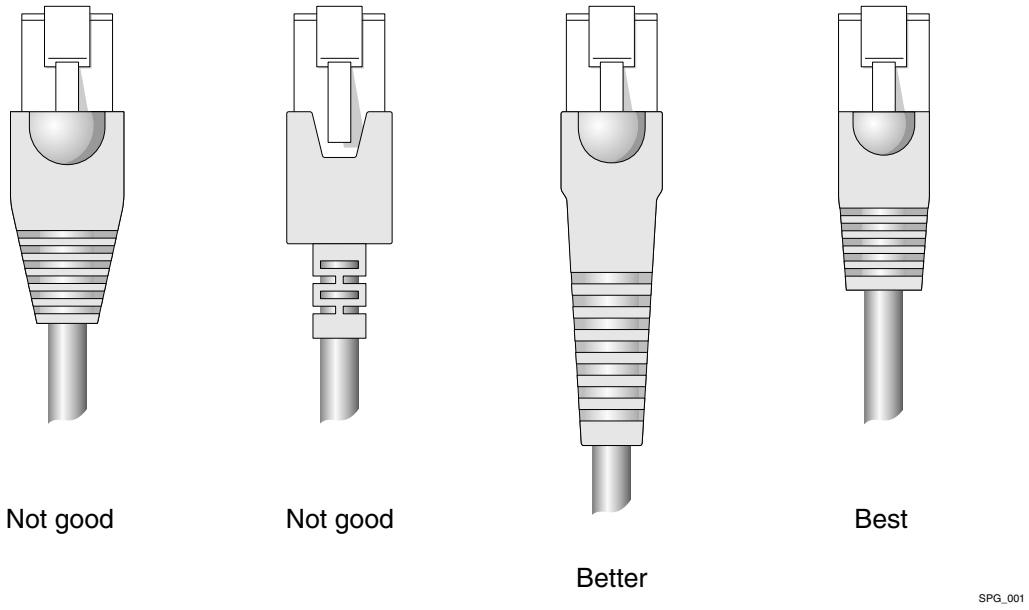

Figure 6: RJ-45 connector jacket types

Radio Frequency Interference

In installations where unshielded twisted pair (UTP) cabling is used, precautions should be taken to avoid radio frequency (RF) interference. RF interference can cause degradation of signal quality, and, in an Ethernet network environment, can cause excessive collisions, loss of link status, or other physical layer problems that can lead to poor performance or loss of communication.

The following devices or situations can cause RF interference and should be avoided:

- Attaching UTP cable to AC power cords
- Routing UTP cable near antennas, such as a Ham radio antenna
- Routing UTP cable near equipment that could exhibit RF interference, such as:
  - ARC welding equipment
  - Electrical motors that contain coils
  - Air conditioner units
  - Electrical transformers

In areas or applications where these situations cannot be avoided, use fiber optic cabling or shielded twisted pair wiring.

Because harmonics can appear on the neutral line of a typical three phase power circuit, Extreme Networks recommends that a harmonics meter is used in new installations.

Meeting Power Requirements

This section discusses power requirements, including:

- Power Supply Requirements
- AC Power Cord Requirements
- Uninterruptable Power Supply Requirements

Power Supply Requirements

The following requirements should be adhered to in order to operate your Extreme Networks equipment safely:

- Ensure that your equipment will be placed in an area that accommodates the power consumption and component heat dissipation factors required.
- Ensure that your power supply meets the site power, AC power, or DC power requirements.
- Ensure that DC connections are made by an on-site electrician.

For power specifications for Extreme Networks products, see the Extreme Networks website at http://www.extremenetworks.com.

- When routing power to installed equipment, avoid connecting through an extension cord or power strip.
- If your system includes an optional redundant (second) power supply, connect each of the two power supplies to different input power sources. Failure to do so makes the system susceptible to total power failure in the event that one of the power supplies fails.

AC Power Cord Requirements

The AC power cord must be approved for the country where it is used. Table 2 describes AC power cord requirements.

Table 2: AC Power Cord Requirements

Country	Requirements
USA and Canada	■ The cord set must be UL-approved and CSA-certified. ■ The minimum specification for the flexible cord is No. 16 AWG (1.5 mm 2), Type SV or SJ, 3-conductor. ■ The cord set must have a rated current capacity of at least 10 A. ■ The attachment plug must be an Earth-grounding type with a NEMA L6-20P (20 A, 250 V) configuration.
Denmark	The supply plug must comply with section 107-2-D1, standard DK2-1a or DK2-5a.
Switzerland	The supply plug must comply with SEV/ASE 1011.

When using dual power supplies, make sure that each AC power supply attaches to a different circuit.

Replacing the Power Cord

If the power cord plug is unsuitable and must be replaced, connect the power supply wires for the unit according to the following scheme:

- Brown wire to the Live (Line) plug terminal, which may be marked with the letter "L" or colored red.
- Blue wire to the Neutral plug terminal, which may be marked with the letter "N" or colored black.
- Yellow / Green wire to the Ground plug terminal, which may be marked with the letter "E" or the Earth symbol or colored yellow / green.

Uninterruptable Power Supply Requirements

An uninterruptible power supply (UPS) is a device that sits between a power supply (such as a wall outlet) and a device (such as a computer) to prevent outages, sags, surges, and bad harmonics from adversely affecting the performance of the device.

UPS Features

A UPS traditionally can perform the following functions:

- Absorb relatively small power surges.
- Smooth out noisy power sources.
- Continue to provide power to equipment during line sags.
- Provide power for some time after a blackout has occurred.

In addition, some UPS or UPS/software combinations provide the following functions:

- Automatic shutdown of equipment during long power outages.
- Monitoring and logging of power supply status.
- Display the voltage/current draw of the equipment.
- Restart equipment after a long power outage.
- Display the voltage currently on the line.
- Provide alarms on certain error conditions.
- Provide short circuit protection.

Selecting a UPS

To determine UPS requirements for your system, you should ask yourself these questions:

- What are your amperage requirements?
- What is the longest potential time period that your UPS would be required to supply backup power?
- Where will the UPS be installed?
- What is the maximum transition time your installation will allow?

Extreme Networks recommends using a UPS that provides online protection.

Calculating Amperage Requirements

To determine what size UPS you need, use the following procedure:

1. To find VA (Volt-Amps), locate the voltage and amperage requirements for each piece of equipment. These numbers are usually located on a sticker on the back or bottom of your equipment. Then multiply the numbers together to get VA:

   VA = Volts x Amperes

2. Add the VA from each piece of equipment together to find the total VA requirement.

   We recommend that you add 30% to determine the minimum amperage requirements for your UPS.

UPS Transition Time

Transition time is the time necessary for the UPS to transfer from utility power to full-load battery power. For Extreme Networks products, a transition time of less than 20 milliseconds is required for optimum performance.

Applicable Industry Standards

For more information, see the following ANSI/TIA/EIA standards:

- ANSI/TIA/EIA-568-A—discusses the six subsystems of a structured cabling system.
- ANSI/TIA/EIA-569-A—discusses design considerations.
- ANSI/TIA/EIA-606—discusses cabling system administration.
- ANSI/TIA/EIA-607—discusses commercial building grounding and bonding requirements.

You can access these standards at **http://www.ansi.org/** or **http://www.tiaonline.org/**.

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