



Preparing to Install the Router

This chapter describes site requirements and equipment needed to install your Cisco 3600 series router. It includes the following sections:

- [Safety Recommendations, page 2-1](#)
- [General Site Requirements, page 2-3](#)
- [Installation Checklist, page 2-6](#)
- [Creating a Site Log, page 2-7](#)
- [Inspecting the Router, page 2-7](#)
- [Tools and Equipment for Installation and Maintenance, page 2-8](#)
- [Console and Auxiliary Port Considerations, page 2-9](#)
- [Preparing to Connect to a Network, page 2-10](#)

After you have completed this chapter, proceed to [Chapter 3, “Installing the Router”](#) for installation instructions.

Safety Recommendations

Follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free during and after installation.
- If you remove the chassis cover, put it in a safe place.
- 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:



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

- Locate the emergency power-off switch in the room in which you are working. Then, 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.
- Never assume that power is disconnected from a circuit. Always check.
- 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.

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

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

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, ground yourself by touching a metal part of the chassis.



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.

Power Supply Considerations

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.



Warning

The device is designed for connection to TN and IT power systems. Statement 1007

The AC power supply includes the following features:

- Autoselects either 110-V or 220-V operation.
- All units include a 6-foot (1.8-meter) electrical power cord. (A label near the power cord indicates the correct voltage, frequency, current draw, and power dissipation for the unit.)

[Table 2-1](#) describes power requirements for Cisco 3600 series routers.

Table 2-1 Power Requirements for Cisco 3600 Series Routers

Router	Power Supply	Input Power	Input Voltage Tolerance Limits
Cisco 3620	AC	100 - 240 VAC, 1.0 A, 50 - 60 Hz	85 - 264 VAC
	DC, nominal 48 VDC	48 - 60 VDC, 3.0 A, positive or negative input	38 - 72 VDC
Cisco 3631	AC	100 - 240 VAC, 2.0 A, 50 - 60 Hz	85 - 264 VAC
	DC, nominal 24/48 VDC	24 - 36 VDC, 8 A, positive or negative input	18 - 72 VDC
		36 - 60 VDC, 4 A, positive or negative input	
DC, nominal 48 VDC	48 - 60 VDC, 4 A, positive or negative input	38 - 72 VDC	
Cisco 3640	AC	100 - 240 VAC, 2.0 A, 50 - 60 Hz	85 - 264 VAC
	DC, nominal 48 VDC	48 - 60 VDC, 5.0 A, positive or negative input	38 - 72 VDC
Cisco 3660	AC	100 - 240 VAC, 4.0 A, 50 - 60 Hz	85 - 264 VAC
	DC, nominal 24/48 VDC	24 - 36 VDC, 16 A, positive or negative input	18 - 72 VDC
		36 - 60 VDC, 7 A, positive or negative input	
DC, nominal 48 VDC	48 - 60 VDC, 8 A, positive or negative input	38 - 72 VDC	

Site Environment

All Cisco 3600 series routers can be placed on a desktop or mounted in a rack. The Cisco 3620 and Cisco 3640 routers can also be installed on a wall. The location of your router and the layout of your equipment rack or wiring room are extremely important for proper operation. Equipment placed too close together, inadequate ventilation, and inaccessible panels can cause malfunctions and shutdowns, and can make maintenance difficult. Plan for access to both front and rear panels of the router.

When planning your site layout and equipment locations, remember the precautions described in the next section, “[Site Configuration](#)” to help avoid equipment failures and reduce the possibility of environmentally caused shutdowns. If you are currently experiencing shutdowns or unusually high errors with your existing equipment, these precautions may help you isolate the cause of the failures and prevent future problems.

Site Configuration

The following precautions will help you plan an acceptable operating environment for your router and will help you avoid environmentally caused equipment failures:

- Ensure that the room where your router operates has adequate circulation. Electrical equipment generates heat. Without adequate circulation, ambient air temperature may not cool equipment to acceptable operating temperatures.
- Always follow ESD-prevention procedures described in the “[Preventing Electrostatic Discharge Damage](#)” section on page 2-2 to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.
- Ensure that the chassis cover or mainboard tray and module rear panels are secure. All empty network module slots, WAN interface card slots, and power supply bays (in the Cisco 3660 router) must have filler panels installed. The chassis is designed to allow cooling air to flow within it, through specially designed cooling slots. A chassis with uncovered openings will create air leaks, which may interrupt and reduce the flow of air across internal components.

Equipment Racks

You can mount the Cisco 3620 and Cisco 3640 routers in a 19-inch rack (with a 17.5- or 17.75-inch opening), a 23-inch rack, or a 24-inch rack.

The Cisco 3631 and Cisco 3660 routers can be mounted in a 19-inch rack (with a 17.5- or 17.75-inch opening), or a 23-inch rack.

The following information will help you plan your equipment rack configuration:

- Allow clearance around the rack for maintenance.
- 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.
- When mounting a chassis in an open rack, ensure that the rack frame does not block the intake ports or exhaust ports. If the chassis is installed on slides, check the position of the chassis when it is seated into the rack.
- Baffles can help to isolate exhaust air from intake air, which also helps to draw cooling air through the chassis. The best placement of the baffles depends on the airflow patterns in the rack, which can be found by experimenting with different configurations.
- 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.

Installation Checklist

The sample Installation Checklist lists items and procedures for installing a new router. Make a copy of this checklist and mark the entries when completed. Include a copy of the checklist for each router in your Site Log (described in the next section, “[Creating a Site Log](#)”).

Installation checklist for site _____

Router name _____

Task	Verified by	Date
Installation Checklist copied		
Background information placed in Site Log		
Site power voltages verified		
Installation site power check completed		
Required tools available		
Additional equipment available		
Router received		
The appropriate quick start guide for your router received		
<i>Cisco 2600 Series, Cisco 3600 Series, and Cisco 3700 Series Regulatory Compliance and Safety Information</i> document received		
Product registration card received		
Cisco.com contact information label received		
Chassis components verified		
Initial electrical connections established		
ASCII terminal (for local configuration) or modem (for remote configuration)		
Signal distance limits verified		
Startup sequence steps completed		
Initial operation verified		
Software image verified		

Creating a Site Log

The Site Log provides a record of all actions related to the router. Keep it in an accessible place near the chassis where anyone who performs tasks has access to it. Use the Installation Checklist to verify steps in the installation and maintenance of the router. Site Log entries might include the following:

- Installation progress—Make a copy of the Installation Checklist and insert it into the Site Log. Make entries as each procedure is completed.
- Upgrade and maintenance procedures—Use the Site Log as a record of ongoing router maintenance and expansion history. A Site Log might include the following events:
 - Installation of network modules
 - Removal or replacement of network modules and other upgrades
 - Configuration changes
 - Maintenance schedules and requirements
 - Maintenance procedures performed
 - Intermittent problems
 - Comments and notes

Inspecting the Router

Do not unpack the router until you are ready to install it. If the final installation site will not be ready for some time, keep the chassis in its shipping container to prevent accidental damage. When you are ready to install the router, proceed with unpacking it.

The router, cables, publications, and any optional equipment you ordered may be shipped in more than one container. When you unpack the containers, check the packing list to ensure that you received all the following items:

- Router
- 6-foot (1.8-meter) power cord
- Rubber feet for desktop mounting (with Cisco 3620 routers only)
- Rack-mount brackets for 19-inch rack
- Grounding lug and bracket
- RJ-45-to-DB-9 adapter cable
- RJ-45-to-DB-25 adapter cable
- Ethernet cables: one with Cisco 3631 and Cisco 3640; two with Cisco 3660
- Optional equipment (such as network connection cables or additional rack-mount brackets)
- *Cisco 3620 and Cisco 3640 Modular Access Routers Quick Start Guide*, if applicable
- *Cisco 3631 Router Quick Start Guide*, if applicable
- *Cisco 3660 Modular Access Router Quick Start Guide*, if applicable
- *Cisco 2600 Series, Cisco 3600 Series, and Cisco 3700 Series Regulatory Compliance and Safety Information* document

Inspect all items for shipping damage. If anything appears to be damaged, or if you encounter problems installing or configuring your router, contact customer service. Warranty, service, and support information is in the quick start guide that shipped with your router.

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
- Number 2 Phillips screwdriver
- Flat-blade screwdrivers: small, 3/16-inch (0.476 cm) and medium, 1/4-inch (0.625 cm)
 - To install or remove modules
 - To remove the cover or mainboard tray, if you are upgrading memory or other components
- Number 15 Torx screwdriver
 - For replacing components in the Cisco 3660 router
- Rack-mount screws
- ROM 32-pin PLCC extractor tool
- Needlenose pliers
 - For straightening any pins bent when you install the ROM
- Cable ties, if required, for organizing cables

To install a Cisco 3620 router on a wall, you need suitable screws or wall anchors.

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).



Note For more information on cable specifications, refer to the [Cisco Modular Access Router Cable Specifications](#) document online or on the Documentation CD-ROM.

- Ethernet hub or PC with a network interface card for connection to Ethernet (LAN) ports.
- Console terminal (an ASCII terminal or a PC running terminal emulation software) configured for 9600 baud, 8 data bits, no parity, and 2 stop bits.
- Modem for connection to the auxiliary port for remote administrative access (optional).
- Token Ring interfaces require a Token Ring media attachment unit (MAU).
- Serial interfaces may require a data service unit (DSU) or channel service unit/data service unit (CSU/DSU).
- CT1/PRI modules without the built-in CSU require an external CSU.
- ISDN BRI S/T interfaces require an NT1 device if one is not supplied by your service provider.

Console and Auxiliary Port Considerations

The router includes an asynchronous serial console port and an auxiliary port. The console and auxiliary ports provide access to the router either locally using a console terminal, or remotely using a modem connected to the auxiliary port. This section discusses important cabling information to consider before connecting a console terminal, which can be either an ASCII terminal or a PC running terminal emulation software, to the console port or modem to the auxiliary port.

The main difference between the console and auxiliary ports is that the auxiliary port supports hardware flow control and the console port does not. Flow control paces the transmission of data between a sending device and a receiving device. Flow control ensures that the receiving device can absorb the data sent to it before the sending device sends more. When the buffers on the receiving device are full, a message is sent to the sending device to suspend transmission until the data in the buffers has been processed. Because the auxiliary port supports flow control, it is ideally suited for use with the high-speed transmissions of a modem. Console terminals transmit at slower speeds than modems; therefore, the console port is ideally suited for use with console terminals.

Console Port Connections

The router has an EIA/TIA-232 asynchronous serial console port (RJ-45). Depending on the cable and the adapter used, this port appears as a DTE or DCE device at the end of the cable.

For connection to a PC running terminal emulation software, your router is provided with an RJ-45 to DB-9 adapter cable.

To connect the router to an ASCII terminal, use an RJ-45 rollover cable and an RJ-45-to-DB-25 female adapter (not provided).

The default parameters for the console port are 9600 baud, 8 data bits, no parity, and 2 stop bits. The console port does not support hardware flow control. For detailed information about installing a console terminal, refer to the [“Connecting to a Console Terminal or Modem”](#) section on page 3-43.

For cable and port pinouts, refer to the [Cisco Modular Access Router Cable Specifications](#) document online or on the Documentation CD-ROM.

Auxiliary Port Connections

The router has an EIA/TIA-232 asynchronous serial auxiliary port (RJ-45) that supports flow control. Depending on the cable and the adapter used, this port appears as a DTE or DCE device at the end of the cable.

For connection to a modem, your router is provided with an RJ-45-to-DB-25 adapter cable.

For detailed information about connecting devices to the auxiliary port, refer to the [“Connecting to a Console Terminal or Modem”](#) section on page 3-43.

For cable and port pinouts, refer to the [Cisco Modular Access Router Cable Specifications](#) document online or on the Documentation CD-ROM.

Preparing to Connect to a Network

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 2-10](#)
- [Token Ring Connections, page 2-11](#)
- [Serial Connections, page 2-11](#)
- [ISDN BRI Connections, page 2-13](#)
- [56-K/Switched-56-kbps DSU/CSU Connections, page 2-14](#)

Refer to the following online documents for more information about network connections and interfaces:

- [Cisco Network Modules Hardware Installation Guide](#)
- [Cisco Interface Cards Installation Guide](#)
- [Cisco Modular Access Router Cable Specifications](#)



Warning

To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Statement 1021

Ethernet Connections

The IEEE has established Ethernet as standard IEEE 802.3. The most common Ethernet implementations are as follows:

- 100BASE-T—2-pair Category 5 or unshielded twisted-pair (UTP) straight-through RJ-45 cable.
- 10BASE-2—Ethernet on thin coaxial cable, also known as thin Ethernet. The maximum segment distance is 607 feet (186 meters).
- 10BASE-5—Ethernet on thick coaxial cable, also known as thick Ethernet. The maximum segment distance is 1,640 feet (500 meters).
- 10BASE-T—Ethernet on unshielded twisted-pair (UTP) cable. The maximum segment distance is 328 feet (100 meters). UTP cables look like the wiring used for ordinary telephones; however, UTP cables meet certain electrical standards that telephone cables do not meet.

Refer to the [Cisco Modular Access Router Cable Specifications](#) online document for information about Ethernet cables, connectors, and pinouts. This document is available online and on the Cisco Documentation CD-ROM.

Token Ring Connections

The IEEE has established Token Ring as standard IEEE 802.5. Specifications indicate a maximum segment distance of 328 feet (100 meters) for UTP cabling.

**Note**

To ensure agency compliance with FCC Class B electromagnetic emissions requirements (EMI), make sure that you use a shielded RJ-45 Token Ring cable when connecting your router to a Token Ring network.

Token Ring can operate at two different ring speeds: 4 and 16 Mbps. All devices on the Token Ring must use the same operating speed.

Use a Token Ring cable to connect the router to a switch. Refer to the section “Token Ring Port Pinouts” in the [Cisco Modular Access Router Cable Specifications](#) online document for the Token Ring port pinouts. This document is available online and on the Cisco Documentation CD-ROM.

Serial Connections

Serial connections are provided by WAN interface cards and network modules. For more information on WAN interface cards, refer to the [Cisco Interface Cards Installation Guide](#). For more information on network modules, refer to the [Cisco Network Modules Hardware Installation Guide](#). These documents are accessible online and on the Cisco Documentation CD-ROM.

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), you are connecting to the synchronous serial interface
- Type of connector, male or female, required to connect to the device
- Signaling standard required by the device

Configuring Serial Connections

The serial ports on the asynchronous/synchronous serial network modules and the serial WAN interface card use DB-60 connectors. Serial ports can be configured as DTE or DCE, depending on the serial cable used.

Serial DTE or DCE Devices

A device that communicates over a synchronous serial interface is either a DTE or DCE device. A DCE device provides a clock signal that paces the communications between the device and the router. A DTE device does not provide a clock signal. DTE devices usually connect to DCE devices. The documentation that accompanied the device should indicate whether it is a DTE or DCE device. (Some devices have a jumper to select either DTE or DCE mode.) [Table 2-2](#) lists typical DTW and DCE devices.

Table 2-2 Typical DTE and DCE Devices

Device Type	Gender	Typical Devices
DTE	Male ¹	Terminal PC
DCE	Female ²	Modem CSU/DSU Multiplexer

1. If pins protrude from the base of the connector, the connector is male.
2. If the connector has holes to accept pins, the connector is female.

Signaling Standards Supported

The synchronous serial ports available for the router support the following signaling standards: EIA/TIA-232, EIA/TIA-449, V.35, X.21, and EIA-530. You can order a Cisco DB-60 shielded serial transition cable that has the appropriate connector for the standard you specify. The documentation for the device you want to connect should indicate the standard used for that device. The router end of the shielded serial transition cable has a DB-60 connector, which connects to the DB-60 port on a serial WAN interface card. The other end of the serial transition cable is available with a connector appropriate for the standard you specify.

The synchronous serial port can be configured as DTE or DCE, depending on the attached cable (except EIA-530, which is DTE only). To order a shielded cable, contact customer service. See the “[Obtaining Technical Assistance](#)” section on page xviii.



Note

All serial ports configured as DTE require external clocking from a CSU/DSU or other DCE device.

Although manufacturing your own serial cables is not recommended (because of the small size of the pins on the DB-60 serial connector), cable pinouts are provided in the [Cisco Modular Access Router Cable Specifications](#) document.

Distance Limitations

Serial signals can travel a limited distance at any given bit rate; generally, the slower the data rate, the greater the distance. All serial signals are subject to distance limits, beyond which a signal significantly degrades or is completely lost.



Note

Only the serial WAN interface card supports bit rates above 128 Kbps.

[Table 2-3](#) lists the recommended maximum speeds and distances for each serial interface type; however, you might get good results at speeds and distances greater than those listed, if you understand the electrical problems that might arise and can compensate for them. For instance, the recommended maximum rate for V.35 is 2 Mbps, but 4 Mbps is commonly used.

Table 2-3 Serial Signal Transmission Speeds and Distances

Rate (bps)	EIA/TIA-232 Distance		EIA/TIA-449, X.21, V.35, EIA-530 Distance	
	Feet	Meters	Feet	Meters
2400	200	60	4100	1250
4800	100	30	2050	625
9600	50	15	1025	312
19200	25	7.6	513	156
38400	12	3.7	256	78
56000	8.6	2.6	102	31
1544000 (T1)	—	—	50	15

Balanced drivers allow EIA/TIA-449 signals to travel greater distances than EIA/TIA-232 signals. The recommended distance limits for EIA/TIA-449 shown in [Table 2-3](#) are also valid for V.35, X.21, and EIA-530. Typically, EIA/TIA-449 and EIA-530 can support 2-Mbps rates, and V.35 can support 4-Mbps rates.

Asynchronous/Synchronous Serial Module Baud Rates

The following baud-rate limitations apply to the slow-speed serial interfaces found in the asynchronous/synchronous serial modules:

- Asynchronous interface—Maximum baud rate is 115.2 kbps.
- Synchronous interface—Maximum baud rate is 128-kbps full duplex.

ISDN BRI Connections

The BRI WAN interface cards provide Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) connections. The BRI modules and BRI WAN interface cards are available with either an S/T interface that requires an external Network Terminator 1 (NT1), or a U interface that has a built-in NT1.

You can install the BRI modules in any available slot in the chassis.



Warning

Hazardous network voltages are present in WAN ports regardless of whether power to the unit is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the unit first. Statement 1026

Use a BRI cable (not included) to connect the BRI WAN interface card directly to an ISDN. [Table 2-4](#) lists the specifications for ISDN BRI cables. Also, refer to the [Cisco Modular Access Router Cable Specifications](#) online document for pinouts. This document is located on Cisco.com and the Documentation CD-ROM.

Table 2-4 ISDN BRI Cable Specifications

Specification	High-Capacitance Cable	Low-Capacitance Cable
Resistance (at 96 kHz)	160 ohms/km	160 ohms/km
Capacitance (at 1 kHz)	120 nF ¹ /km	30 nF/km
Impedance (at 96 kHz)	75 ohms	150 ohms
Wire diameter	0.024 in. (0.6 mm)	0.024 in. (0.6 mm)
Distance limitation	32.8 ft (10 m)	32.8 ft (10 m)

1. nF = nanoFarad

For more information on BRI WAN interface cards, refer to the [Cisco Interface Cards Installation Guide](#) online document. This document is located on Cisco.com and the Documentation CD-ROM.

56-K/Switched-56-kbps DSU/CSU Connections

Switched-56-kbps connections are provided by the 56-kbps DSU/CSU WAN interface card.

For more information on Switched-56-kbps WAN interface cards, refer to the [Cisco Interface Cards Installation Guide](#) online document. This document is located on Cisco.com and the Documentation CD-ROM.