Preparing the Cisco uBR7225VXR Router for Installation

This chapter describes the site requirements for installing the Cisco uBR7225VXR universal broadband router and contains the following sections:

- Safety Recommendations, page 2-1
- Site Requirements, page 2-5
- Required Network Information, page 2-7
- Installation Tools, page 2-8
- Rack-Mount and Cable-Management Kit, page 2-8
- Equipment Required to Verify Your Plant’s RF Setup, page 2-9
- Shipping Container Contents, page 2-9
- Provisioning the Cable Headend, page 2-10
- Site Preparation Checklist, page 2-17
- Component Checklists, page 2-18

Safety Recommendations

The following safety guidelines will help to ensure your safety and protect the equipment. This list does not cover all potentially hazardous situations, so be alert. Before installing, configuring, or maintaining the Cisco uBR7225VXR router, review the safety warnings listed in the Regulatory Compliance and Safety Information for Cisco uBR7200 Series Universal Broadband Routers at the following URL:


The installation of your Cisco uBR7225VXR universal broadband router should be in compliance with national and local electrical codes.

Other safety issues to be aware of:

- Never attempt to lift an object that might be too heavy for you to lift by yourself.
- Always turn all power supplies off and unplug all power cables before opening the chassis.
- Always unplug the power cable before installing or removing a chassis.
- Keep the chassis area clear and dust-free during and after installation.
- Keep tools and chassis components away from walk areas.
Safety Recommendations

- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught in the chassis.
- For systems with installed AC-input power supplies, the Cisco uBR7225VXR router ships with a 3-wire electrical grounding-type plug, which only fits into a grounding-type power outlet. This is a safety feature. The equipment grounding should be in accordance with local and national electrical codes.
- The Cisco uBR7225VXR router operates safely when it is used in accordance with its marked electrical ratings and product usage instructions.

Warning

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

Note

For Australia and New Zealand, equipment is to be installed and maintained by service personnel only as defined by AS/NZS 3260 Clause 1.2.14.3 Service Personnel.

Warning

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

Lifting the Cisco uBR7225VXR Router Safely

Before you install the router, ensure that your site configuration is properly designed and prepared so that you can avoid having to move the router later to accommodate power sources and network connections.

A fully-configured Cisco uBR7225VXR router (with two 300W power supplies) weighs approximately 48 pounds (21.8 kilograms).

Whenever you lift a chassis or any heavy object, follow these guidelines:

- Always disconnect all external cables before lifting or moving the chassis.
- Do not attempt to lift the chassis by yourself; have someone assist you (see Figure 2-1 on page 2-3).
- Ensure that your footing is solid, and balance the weight of the object between your feet.
- Lift the chassis 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 chassis, bend at the knees, not at the waist, to reduce the strain on your lower back muscles.
- Lift the chassis from the bottom; grasp the undersize of the chassis exterior with both hands.
Warning

Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the chassis and components, never attempt to lift the chassis with the handles on the power supplies or on the interface processors, or by the plastic panels on the front of the chassis. These handles were not designed to support the weight of the chassis. Statement 5

Safety with Electricity

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.
- Disconnect all power and external cables before installing or removing a chassis.
- 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.
- Do not work alone if potentially hazardous conditions exist.
- Never install equipment that appears damaged.

Caution

You must power down the system before removing or replacing the network processing engine. The cable interface line cards and redundant power supplies are designed to be removed and replaced while the system is operating, without presenting an electrical hazard or damage to the system.
Safety Recommendations

Warning The telecommunications lines must be disconnected 1) before unplugging the main power connector and/or 2) while the housing is open. Statement 89

Warning Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units. Statement 246

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

In addition, use the guidelines that follow 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 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

Electrostatic discharge (ESD) damage, which occurs when electronic cards or components are improperly handled, can result in complete or intermittent system failures. The network processing engine and cable interface line cards consist of a printed circuit board that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding, connectors, and a handle are integral components of the carrier. Although the carrier helps protect the boards, use an antistatic strap whenever handling the network processing engine and cable interface cards. Handle the carriers by the handles and the carrier edges only; never touch the boards or connector pins.

Caution Always tighten the captive installation screws on the network processing engine and cable interface line cards. These screws prevent accidental removal, provide proper grounding for the system, and help ensure that the bus connectors are properly seated in the midplane.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist strap or ankle strap and ensure that it makes good skin contact.
- When handling a removed network processing engine or cable interface line card, make sure that the equipment end of your ESD strap is attached to an unfinished chassis surface of the router; do not touch the printed circuit board, and avoid contact between the printed circuit board and your clothing. Always place the network processing engine or cable interface line card component side up on an antistatic surface or in a static shielding bag. If you are returning the item to the factory, immediately place it in a static shielding bag.
Site Requirements

To ensure normal operation and avoid unnecessary maintenance, plan your site configuration and prepare your site before installation. Take into account the following criteria:

- Verify that your cable network meets system requirements and DOCSIS or EuroDOCSIS downstream and upstream specifications.
- Select forward and reverse channel frequencies from the range specified in your channel plan.
- Make sure that the site maintains an ambient temperature of 32 to 104°F (0 to 40°C), and keep the area around the chassis as free from dust as is practical.

Caution

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

AC Power

The AC-input power supply uses a power factor corrector that allows the Cisco uBR7225VXR router to operate on input voltage and frequency within the ranges of 100 to 240 V AC and 50/60 Hz.

Note

We recommend an uninterruptable power source to protect against power failures at your site. For the Cisco uBR7225VXR router, the 300W AC-input power supply has an electrical input current rating of 4A with 100Vac input and the 540W AC-input power supply has an electrical input current rating of 6.5A with 100Vac input.

See Appendix A, “Cisco uBR7225VXR Router Specifications,” for system power specifications, including input voltage and operating frequency ranges.

Site Environment

Table 2-1 lists the operating and nonoperating environmental site requirements. The following ranges are those within which the Cisco uBR7225VXR router continues to operate; however, a measurement that is approaching the minimum or maximum of a range indicates a potential problem. You can maintain normal operation by anticipating and correcting environmental anomalies before they approach the minimum or maximum of an operating range.
To provide airflow through the Cisco uBR7225VXR router, cooling air is drawn in through the air intake vent on the right side of the chassis (when viewing the router from the front) and is exhausted through the left side of the chassis. Keep the right and left sides of the chassis clear of obstructions and away from the exhaust of other equipment.

**Note**

The Cisco uBR7225VXR router is suitable for installation in Network Telecommunication Facilities and locations where the National Electrical Code (NEC) applies. The Cisco uBR7225VXR router is not intended for installation in outside plant (OSP) locations.

<table>
<thead>
<tr>
<th>Table 2-1 Specifications for Operating and Nonoperating Environments</th>
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<tr>
<td><strong>Specification</strong></td>
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<td>Temperature, ambient operating</td>
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<tr>
<td>Temperature, ambient nonoperating and storage</td>
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<tr>
<td>Humidity, ambient (noncondensing) operating</td>
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<td>Humidity, ambient (noncondensing) nonoperating and storage</td>
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<td>Altitude, operating and nonoperating</td>
</tr>
<tr>
<td>Vibration, operating</td>
</tr>
<tr>
<td>Vibration, nonoperating</td>
</tr>
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</table>

**Site Configuration: Maintaining Normal Operation**

Planning a proper location for the Cisco uBR7225VXR universal broadband router and the layout of your equipment rack or wiring closet are essential for successful system operation. Equipment placed too close together or inadequately ventilated can cause system overtemperature conditions. In addition, chassis panels made inaccessible by poor equipment placement can make system maintenance difficult. Following are precautions that can help avoid problems during installation and ongoing operation.

**General Precautions**

Follow these general precautions when planning your equipment locations and connections:

- Use the `show environment` command regularly to check the internal system status. The environmental monitor continually checks the interior chassis environment; it provides warnings for high temperature and maximum and minimum voltages and creates reports on any occurrences. If warning messages are displayed, take immediate action to identify the cause and correct the problem.

- We recommend keeping the Cisco uBR7225VXR router off the floor and out of any area that tends to collect dust, excessive condensation, or water.

- Follow ESD prevention procedures to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.
- Ensure that the network processing engine, cable interface line cards, any blank cable interface line cards, power supplies, and any power supply filler plates are in place and secure. The fans direct cooling air throughout the chassis interior; a loose component or empty slot can redirect the airflow away from active components and cause overheating.

**Power Considerations**

Follow these precautions and recommendations when planning power connections to the Cisco uBR7225VXR router:

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

**Required Network Information**

After you install the chassis, your system administrator must configure the individual and system interfaces before you connect your system to external networks. Refer to the following documentation for configuration information.

*Cisco uBR7200 Series Software Configuration Guide* at the following URL:

*Cisco IOS CMTS Cable Software Configuration Guide* at the following URL:
http://www.cisco.com/web/techdoc/cable/Config/Sw_conf.html

*Cisco IOS CMTS Cable Command Reference Guide* at the following URL:

**Before You Begin**

Be prepared with global (system-wide) parameters such as:

- Hostnames
- Passwords
- Routing protocols
- Configuration information for each interface, such as:
  - Addresses
  - Rates or speeds of operation
  - Routing protocol specifics

Following is the information you might need, depending on the services you plan to offer:

- Hostname for the router.
- Passwords to prevent unauthorized privileged-level access to the EXEC command interpreter and for individual virtual terminal lines.
- Protocols you plan to route.
Chapter 2      Preparing the Cisco uBR7225VXR Router for Installation

Installation Tools

Your Cisco uBR7225VXR universal broadband router chassis is fully assembled at the factory; no assembly is required. However you will need the following tools and equipment to install the chassis and the rack-mount and cable-management kit:

- Number 2 Phillips screwdriver
- 3/16-inch flat-blade screwdriver
- 7/16-inch flat-blade screwdriver
- 7/16-inch torque wrench for connecting coaxial cables to the cable F-connectors on the cable interface line cards—Recommended torque is 20 inch-pounds (optional)
- Tape measure (optional)
- Level (optional)

Rack-Mount and Cable-Management Kit

The rack-mount and cable-management kit includes the following parts:

- Two rack-mount brackets for mounting the chassis in the rack.
- Cable-management bracket to relieve the strain on installed cable interface line card interface cables.
- Eight M4 x 6-mm Phillips flathead screws to secure the rack-mount brackets to the chassis.
- Four M3 x 6-mm Phillips panhead screws to secure the cable-management bracket to the chassis.
- Four 10/32 x 3/8-inch slotted binderhead screws to secure the rack-mount brackets to the rack rails.

For more information on the rack-mount brackets and cable-management bracket, refer to the “Cisco uBR7225VXR Router Chassis Rack-Mounting Options” section on page 3-2.
Equipment Required to Verify Your Plant’s RF Setup

To verify your plant’s RF setup, you need the following:

- RF spectrum analyzer
- For coaxial cabling:
  - Diplex filters/splitters
  - Coaxial cable crimping tool
  - New coaxial cable
  - Coaxial jumpers that are at least 2 to 3 feet long (maximum of 5 feet)
- For fiber networks, optical receivers for each upstream optical path
- Assorted RF attenuators (with at least two 20-dB attenuators)

**Note**
For headend RF and data setups, refer to Chapter 4, “Connecting the Cisco uBR7225VXR Router to the Cable Headend.” Refer to Appendix F, “Manufacturers for Headend Provisioning Requirements,” for a list of manufacturers. Refer to Appendix C, “Cable Specifications,” for coaxial cabling specifications.

In addition, you might need the following:

- Crossover Ethernet cable with RJ-45 connectors—If you plan to connect a computer directly to an Ethernet port in the Cisco uBR7225VXR router, you need this type of cable.
- Fast Ethernet transceiver.
- DOCSIS cable modem or DOCSIS-based STB and CPE devices to test full system functionality.

**Note**
When the Cisco uBR7225VXR router starts running, IF downstream output is generated. For more information, see the “Powering On the Cisco uBR7225VXR Router” section on page 3-18.

Shipping Container Contents

When you receive your Cisco uBR7225VXR universal broadband router, use the following procedure to check the contents of the shipping container. Use the Cisco uBR7225VXR Router Installation Checklist or the “Component Checklists” section on page 2-18 to ensure you received all the components that you ordered.

**Note**
Do not discard the shipping container. You will need the container if you move or ship your Cisco uBR7225VXR router in the future.

Verifying the Shipping Container Contents

**Step 1**
Verify that the following are included in the shipping container (the accessories box might be separate):

- One Cisco uBR7225VXR universal broadband router chassis containing all of the components you ordered for your system (except the rack-mount and cable-management kit)
• One or more accessories boxes (some or all might be shipped separately)

Step 2 Check the contents of the accessories box against the “Component Checklist” and the packing slip to verify that you received all listed equipment, which should include the following:
• One modular power cable for an AC-input power supply. (If you purchased a Cisco uBR7225VXR router with a redundant power supply, you should receive two power cables.)
• One rack-mount and cable-management kit (3 brackets and 14 mounting screws).
• Optional equipment that you ordered, such as network interface cables, transceivers, or special connectors.
• CNR or CSRC provisioning documentation, or both.
• Cisco IOS software documentation, if ordered.

Step 3 Verify that the number of cable interface line cards installed in your Cisco uBR7225VXR router matches the number of cable interface line cards that you ordered.

Step 4 Refer to Appendix G, “Site Log,” then to the “Cisco uBR7225VXR Router Chassis Rack-Mounting Options” section on page 3-2 to begin the installation.

---

Provisioning the Cable Headend

This section describes the necessary preparations to make at the cable headend before you install the Cisco uBR7225VXR universal broadband router.

Two-Way Data and VoIP

To prepare for two-way data operation, including digitized voice and fax, ensure that the following conditions are met:
• The cable headend equipment is properly aligned and certified for two-way transmission based on procedures provided by the manufacturers of the equipment and in accordance with DOCSIS or EuroDOCSIS RF Interface Specifications.
• The cable headend is wired for narrowcast downstream data transmission.
• The cable headend is wired to supply an RF feed from the upstream fiber-optic receivers to the Cisco uBR7225VXR router.
• Upstream frequencies are allocated for data transmission.
• Upstream impairments are measured and understood, and comply with recommendations in DOCSIS or EuroDOCSIS RF interface specifications.
• Upstream ports are configured as appropriate to support frequency agility.
• Downstream frequencies are assigned.
• Internet connectivity is established.
• Internet addresses are obtained and allocated.
• All RF connectivity is verified.
For a VoIP system using H.323, ensure that the CMTS has been properly provisioned with equipment such as VoIP gateways and gatekeepers. For SGCP-based VoIP systems, ensure that the CMTS has been properly provisioned with equipment such as VoIP gateways and call-agents.

### Headend Certification

The cable headend plant must pass both analog and digital certification:

- In the United States, the Federal Communications Commission (FCC) mandates minimum technical performance requirements for cable systems.
- For international requirements, consult with local agencies for certification requirements.

The digital certification process is described in Chapter 4, “Connecting the Cisco uBR7225VXR Router to the Cable Headend.”

### Diplex Filters

For coaxial cabling, diplex filters must be installed in the RF path between the cable interface cards in the Cisco uBR7225VXR universal broadband router and cable interfaces and STBs. Diplex filters separate the downstream signals from the upstream signals.

For fiber optics, laser transmitters and optical receivers handle the frequency separation of upstream and downstream. Refer to the “Receivers” section on page 2-11.

High-frequency signals flow in the downstream direction from the Cisco uBR7225VXR router to cable interfaces and STBs. Low-frequency signals flow in the upstream direction from the cable interfaces to the Cisco uBR7225VXR router.

A diplex filter has three ports: low, high, and common. The downstream attaches to the high port because it runs at high frequency. The upstream attaches to the low port because it runs at a low frequency. The common port attaches to a splitter attached to one or more cable interfaces and STBs.

In two-way cable networks, the diplex filter takes the upstream and downstream and combines them on one cable for the cable interface. The downstream output signal from the Cisco uBR7225VXR router runs through the upconverter and then enters the high filter port of the diplex filter. The signal exits the common port of the filter and is distributed to the cable interfaces. The upstream signal from the cable modem enters the common port of the diplex filter and flows to the upstream receive ports of the Cisco uBR7225VXR cable interface line cards through the diplex filters’ low port.

### Receivers

If the upstream channels of your cable plant terminate at the headend over fiber-optic lines, ensure that you have a receiver allocated for each upstream in your network.
DHCP, DNS, TFTP, and TD Servers

A DHCP server must be installed at the headend. The DHCP server must also offer a time-of-day (TD) server option that is compliant with RFC 868.

In conjunction with the DHCP server, a Domain Name System (DNS) server must be installed to translate names of network nodes into IP addresses. A TFTP server must be installed to facilitate the transfer of DOCSIS configuration files over the broadband network.

Cisco provides a configuration tool with every Cisco uBR7225VXR universal broadband router—Cisco Network Registrar (CNR)—to automate dynamic IP address allocation to cable interfaces, PCs, and other devices on the broadband network. CNR provides integrated DHCP and DNS services for your network configuration.

Telco Return

To support telco return, ensure that:

- Your downstream plant meets DOCSIS or EuroDOCSIS specifications.
- Your headend is wired for narrowcast downstream data transmission.
- You have assigned downstream frequencies.
- All equipment needed to support upstream traffic over the PSTN, as well as to monitor telco return service features is installed. Key components include:
  - Dial-up access server (for example, the Cisco AS5300 or Cisco AS5800)
  - RADIUS dial security server
- All third-party, telco return cable interfaces are DOCSIS-compliant.
- Your Cisco IOS software image supports telco return functionality.

The following sections describe CMTS equipment necessary to support telco return service.

Dial-Up/Remote Access Servers

Because a telco return cable network relies on the local telephone system to complete the upstream data path to the Cisco uBR7225VXR router, you need to be sure that you provision your network with a dial-up access server and other required equipment through which remote cable interfaces will gain access to your headend.

RADIUS Dial Security Servers

After remote telco return cable interfaces have initiated dial-up to the CMST via the network access server, a RADIUS dial security server typically authenticates their respective usernames and passwords or MAC address and passwords and then determines whether or not to allow the connection.

In addition to the dial-up numbers provided in telephony channel descriptor (TCD) messages originating from the Cisco uBR7225VXR router, username and password information is included in TCD messages to validate the cable interface’s upstream connection. After dialing in to the network access server, the username and password portions of the TCD messages are passed through a RADIUS dial access server for authentication before the upstream data path can be completed. (See Figure 2-2.)
Chapter 2 Preparing the Cisco uBR7225VXR Router for Installation

Authentication, Authorization, and Accounting Servers

Authentication, authorization, and accounting (AAA) servers are essential to the network, because they typically monitor usage for subscriber billing and record keeping. AAA features call upon a RADIUS security server to help authenticate and monitor users’ access.

VoIP Gateways and Gatekeepers

To support digitized voice transmission on uBR7225VXR router using Cisco IOS Release 12.2(33)SCA CMTS images, be sure to include VoIP gateways and gatekeepers in your configuration. Cisco IOS Release 12.2(33)SCA supports VoIP by using the H.323 protocol. VoIP gateways convert IP-based voice packets into standard PSTN voice traffic, making the process of placing calls over the IP network transparent to users.

VoIP gatekeepers manage H.323-compliant gateways throughout the network. Gatekeepers also manage traffic between their local cable system networks, as well as the networks of other VoIP gatekeepers.

VoIP SGCP Pass-Through

To support digitized voice transmission using Simple Gateway Control Protocol (SGCP), be sure to include VoIP gateways and external call control elements (often referred to as call-agents) in your configuration. Cisco IOS Release 12.2(33)SCA and later versions support VoIP communication using the SGCP 1.1 protocol on uBR7225VXR. Just as with H.323 systems, VoIP gateways in an SGCP environment convert IP-based voice packets into standard PSTN voice traffic, making the process of placing calls over the IP network transparent to users.

Call-agents manage SGCP-compliant gateways throughout the network, allowing them to engage in common channel signaling (CCS) over a 64-kbps circuit emulation service (CES) circuit.
Headend Wiring

This section provides guidelines for setting up the headend wiring and cabling at your site. When planning the location of the new system, consider the distance limitations for signaling, EMI, and connector compatibility, as described in the following sections.

Interference Considerations

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 headend wiring:

- Bad wiring practice can result in radio interference emanating from the wiring, ingress noise, co-channel interference, and degraded or erratic universal broadband router performance.
- Strong EMI, especially when caused by lightning or radio transmitters, can destroy the signal drivers and receivers in the Cisco uBR7225VXR router, and can even create an electrical hazard by conducting power surges through lines and into equipment. (Review the safety warnings in the “Safety with Electricity” section on page 2-3.)

If you use twisted-pair cable in your headend wiring with a good distribution of grounding conductors, the 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 caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices. If you have had EMI problems in the past, you might want to consult experts in electrical surge suppression and shielding.

Distance Limitations and Interface Specifications

The size of your networks and the distances between connections depend on the type of signal, the signal speed, and the transmission media (the type of cabling used to transmit the signals). For example, standard coaxial cable has a greater channel capacity than twisted-pair cabling. The distance and rate limits are the IEEE-recommended maximum speeds and distances for signaling; however, you can usually get good results at speeds and distances far greater than these. For example, the recommended maximum rate for V.35 is 2 Mbps, and it is commonly used at 4 Mbps without any problems. If you understand the electrical problems that might arise and can compensate for them, you should get good results with rates and distances greater than those recommended by IEEE; however, do so at your own risk.

Note

We recommend that you do not exceed specified transmission rate and distance limits.

When preparing your site for network connections to the Cisco uBR7225VXR router, you must consider a number of factors related to each type of interface:

- The type of cabling required for each type of interface (fiber, thick or thin coaxial, shielded twisted-pair, or unshielded twisted-pair cabling)
- Distance limitations for each signal type
- The specific cables you need to connect each interface
Preparing the Cisco uBR7225VXR Router for Installation

Provisioning the Cable Headend

Before installing the Cisco uBR7225VXR router, have all additional external equipment and cables available. The information listed above is available at Cisco.com. For ordering information, contact a customer service representative.

Equipment Racks

The rack-mounting hardware included with the Cisco uBR7225VXR universal broadband router is suitable for most 19-inch equipment racks and telco-type racks. To easily access field-replaceable units (FRUs) while the router is installed in a rack, ensure that you have access to the front and rear of the router.

Before using a particular rack, check for obstructions (such as a power strip) that could impair rack-mount installation. If a power strip impairs a rear rack-mount installation, remove the power strip before installing the Cisco uBR7225VXR router in the rack, then replace it after the chassis is installed. As an alternative, you can mount the Cisco uBR7225VXR router on an equipment shelf if the rack dimensions allow you to secure the router to the shelf, and the overall configuration permits safe installation and access. However, we recommend rack-mounting the Cisco uBR7225VXR router.

Figure 2-3 on page 2-16 shows the Cisco uBR7225VXR router footprint and outer dimensions.

When rack-mounting the Cisco uBR7225VXR router, consider the following information:

- To mount the router between two posts or rails using the brackets, the inner clearance (the width between the inner sides of the two posts or rails) must be at least 17.5 inches (44.45 cm).
- The height of the Cisco uBR7225VXR chassis is 3.5 inches (8.89 cm).
- When mounting the router in four-post or telco-type racks, be sure to use all the screws and the brackets provided to secure the chassis to the rack posts.
Figure 2-3  Cisco uBR7225VXR Router Footprint and Outer Dimensions (View from Top Looking Down)

Note

We recommend the rear bracket mounting system for four-post racks because this method enables you to keep cables from protruding too far out in front of the Cisco uBR7225VXR router, and simultaneously manage the cables at the front of the chassis with the cable-management bracket.

When planning your rack installation, consider the following information:

- Install the Cisco uBR7225VXR router in an open rack whenever possible. If installation in an enclosed rack is unavoidable, ensure that the rack has adequate ventilation.

- If you plan to use an equipment shelf, ensure that the shelf is constructed to support the weight and dimensions of the chassis. Figure 2-3 shows the chassis footprint, which you will need if you are designing a customized shelf. We recommend that you use the rack-mount kit for the Cisco uBR7225VXR router (product number ACS-uBR7225-RMK=).

- Allow sufficient clearance around the rack for maintenance. If the rack is mobile, you can push it back near a wall or cabinet for normal operation and pull it out for maintenance (connecting cables, or replacing or upgrading components). Otherwise, allow at least 23.25 inches (59.06 cm) of clearance at the front, and 19 inches (48.3 cm) at the back to remove any of the field-replaceable units.

- Maintain a minimum clearance of 3 inches (7.72 cm) on the right and left of the chassis for the cooling air inlet and exhaust ports, respectively. Avoid placing the Cisco uBR7225VXR router in an overly congested rack or directly next to another equipment rack; otherwise, the heated exhaust air from other equipment can enter the inlet air vents and cause an overtemperature condition inside the router.

- Always install heavier equipment in the lower half of a rack to maintain a low center of gravity and prevent the rack from falling.

- If you use telco-type racks, be sure that the rack is bolted to the floor and secured, because in these types of installations, only one end of the chassis mounts to the two rack posts with the brackets. Ensure that the weight of the chassis does not make the rack unstable.
• Install and use the cable-management bracket included with the Cisco uBR7225VXR rack-mount kit to keep cables organized. Consider the equipment and cabling that is already installed in the rack. Ensure that cables from other equipment will not impair access to the interface slots, or require you to disconnect cables unnecessarily to perform equipment maintenance or upgrades.

In addition to the preceding guidelines, review the precautions for avoiding overtemperature conditions in the “Site Environment” section on page 2-5. To properly install the Cisco uBR7225VXR router chassis in a rack, refer to the instructions in the “Cisco uBR7225VXR Router Chassis Rack-Mounting Options” section on page 3-2.

⚠️ Caution ⚠️

Do not install the Cisco uBR7225VXR chassis in an enclosed rack or room that is not properly ventilated or air-conditioned. The Cisco uBR7225VXR chassis overheats if the input air temperature reaches 105°F (41°C).

---

### Site Preparation Checklist

Before installing the Cisco uBR7225VXR router, assemble the equipment needed to support your network configuration and subscriber service offering. Ensure all power and cabling requirements are met based on the equipment to be installed. Also ensure that environmental conditions are met to maintain proper equipment operation.

Table 2-2 is a checklist that identifies the key tasks to complete.

<table>
<thead>
<tr>
<th>Task</th>
<th>Verified By</th>
<th>Date</th>
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<td></td>
</tr>
<tr>
<td>Site power voltages verified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site environmental specifications verified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downstream and upstream channel plans created.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable plant balanced, swept and verified to comply with DOCSIS or EuroDOCSIS recommendations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optical receivers adjusted for proper upstream RF output levels.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required passwords, IP addresses, device names available.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All additional CMTS equipment to support Internet access services, RF-related equipment, servers and other host computers, a Cisco uBR900 series cable access router, and console accessory kit to test operation of your network available.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required tools and cables available.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Telco Return Configurations:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telco return dial-up plan created.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network access server installed and configured.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone circuits, connections, and all equipment to support telco return available.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IP Telephony Configurations:</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Table 2-3 Cisco uBR7225VXR Router Component List

<table>
<thead>
<tr>
<th>Description</th>
<th>Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cisco uBR7225VXR chassis</td>
<td></td>
</tr>
<tr>
<td>• Network processing engine</td>
<td></td>
</tr>
<tr>
<td>• Up to two AC-input power supplies and power cords (blank power supply filler plate should be installed in empty power supply slot)</td>
<td></td>
</tr>
<tr>
<td>• Up to two cable interface line cards (blank cable interface line cards should be installed in empty cable interface line card slots)</td>
<td></td>
</tr>
<tr>
<td>• CompactFlash Disk</td>
<td></td>
</tr>
</tbody>
</table>

The following accessories might arrive in separate shipping containers:

• Rack-mount and cable-management kit—Two rack-mount brackets, cable-management bracket, eight M4 x 6-mm Phillips flathead screws, four M3 x 6-mm Phillips panhead screws, and four 10/32 x 3/8-inch slotted binderhead screws

• AC-input power cables—Up to two AC-input power cables (if separate AC-input power supply ordered)

• Documentation, including the following:
  – Cisco Information Packet
  – Cisco Network Registrar documentation—if ordered
  – Cisco IOS software documentation set—if ordered

**Note** All hardware and software documentation is also found at the following URL: