CHAPTER 2

Preparing for Installation

This chapter recommends general safety guidelines to follow and identifies requirements to meet before going to a subscriber site to install a Cisco uBR905 cable access router. It also lists the major agency approvals for the router. For additional safety and regulatory information, see Appendix C, "Regulatory Compliance and Safety Information."

Warning **Only trained and qualified personnel should be allowed to install or replace this equipment.**

The chapter includes the following sections:

- Safety, page 2-1—Describes general safety guidelines, as well as guidelines for electrical safety and for preventing damage from electrostatic discharge (ESD).
- Site Requirements, page 2-3—Describes the basic requirements for installing the Cisco uBR905 cable access router, as well as environment, power, and coaxial cable requirements.
- Required Tools and Equipment, page 2-8—Lists the tools and other equipment that is required for most installations.

Note For information on the governmental regulations and restrictions on this equipment, see Appendix C, "Regulatory Compliance and Safety Information."

Safety

This section describes the general, electrical, and electrostatic discharge guidelines that should be followed when installing the Cisco uBR905 cable access router.

Warnings and Cautions

Follow these guidelines to ensure general safety:

- Install the Cisco uBR905 cable access router 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, CC22.1.

  - In other countries: International Electro-technical Commission (IEC) 364, part 1 through part 7.

- Ensure that the shield of the coaxial cable is connected to the grounding system of the residence or building as close to the point of cable entry as practical. In the United States, the cable system must be in accordance with Article 820-40 of the National Electric Code.
- Keep the installation area clear and dust free during and after installation.
- Keep tools and all components away from walk areas.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught on the cable access router. Fasten your tie or scarf and roll up your sleeves.
- Use only the power supply provided by Cisco to power the Cisco uBR905 cable access router.
- Use only the power cord provided by Cisco or other grounding IEC 320 type power supply cord acceptable to the local electrical authorities to connect the power supply to the power outlet. The router ships with a three-wire electrical grounding-type plug which fits only into a grounding-type power outlet. This is a safety feature. Equipment grounding should be in accordance with local and national electrical codes.

Warning **Failure to properly ground the router—either by circumventing the three-wire grounding-type plug or by using a power outlet that is improperly grounded—can create a potentially hazardous electrical situation.**

- Operate the Cisco uBR905 cable access router in accordance with its marked electrical ratings and product usage instructions.
- Always unplug the power cable before installing or removing a cable access router.
- Do not work on the system or connect or disconnect cables during periods of lightning activity.

Electrical

Follow these guidelines when working with electrical equipment:

- Disconnect all power and external cables before installing or removing a cable access router.

Warning **Unplug the power cord before you work on a system that does not have an on/off switch.**

- Do not work alone when potentially hazardous conditions exist.
- 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, follow these guidelines when working with equipment that is disconnected from a power source, but still connected to cable wiring.

- Never install coaxial wiring during a lightning storm.
- Never install cable jacks in wet locations unless the jack is specifically designed for wet locations.

- Never touch uninsulated cable wires or terminals unless the line has been disconnected at the network interface.
- Use caution when installing or modifying cable lines.

If an electrical accident occurs, proceed as follows:

- Use caution; do not become a victim yourself.
- Turn off 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 victim needs rescue breathing or external cardiac compressions; then take appropriate action.

Electrostatic Discharge

Electrostatic discharge (ESD) damage, which occurs when electronic cards or components are improperly handled, can result in complete or intermittent system failures. The Cisco uBR905 cable access router consists of a printed circuit board that is housed in a metal enclosure. Electromagnetic interference (EMI) shielding and connectors are integral components of the enclosure. Although the enclosure helps protect the boards, use an antistatic strap whenever handling the Cisco uBR905 cable access router. This minimizes the possibility that ESD damage can occur to the internal boards by touching the external connectors.

Following are guidelines for preventing ESD damage:

- If you use an ESD wrist strap or ankle strap, ensure that it makes good skin contact and that the equipment end of the ESD strap is attached to an unfinished surface of the Cisco uBR905 cable access router.
- Always place the router 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.

Caution For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohm (Mohm).

Site Requirements

This section describes the following requirements that must be met before installing the Cisco uBR905 cable access router:

Prerequisites

Before going to a subscriber site to install the Cisco uBR905 cable access router, verify that the following have been done:

- Ensure that a coaxial cable connection is run from the cable TV trunk to the subscriber building or residence.

Note Cisco recommends that a dedicated (new) CATV coaxial cable drop be run from the grounding block directly to the Cisco uBR905 cable access router. If such a drop is not available, careful qualification of existing cable is often necessary. Cable ground should be connected to the grounding system of the building or residence as close to the point of cable entry as practical. For the United States, refer to the National Electrical Code Section 820-40 guidelines for proper grounding.

- Verify that each subscriber site is characterized at the headend to support upstream transmission and meets DOCSIS upstream and downstream RF requirements. Observe procedures in the *NCTA Recommended Practises for Measurements on Cable Television Systems*. Also see the "CATV Coaxial Cabling" section on page 2-5.
- Some sites specify that high pass filters must be installed on every tap drop that does not carry upstream data, voice, or IPPV services.

Note Installing a high pass filter between the Cisco uBR905 router and the headend prevents the router from connecting to the headend—in this situation, the provisioning process fails and the router's US LED never comes on.

- Ensure that all required headend routing and network interface equipment is installed, configured, and operational. Ensure that DHCP, Cisco IOS images, and configuration files have been created and pushed to appropriate servers such that each Cisco uBR905 router, when initialized, can transmit a DHCP request, receive an IP address, obtain TFTP and ToD server addresses, and download a configuration file (and updated software image) in compliance with DOCSIS and the procedures in place for your network.
- Verify that all PCs at all subscriber locations meet the minimum computing requirements. See the "PC Subsystem" section on page 4-8 for procedures to verify TCP/IP and DHCP PC settings when onsite.

  Each service provider will have its own recommendations and requirements for the CPE devices connected to its network. However, at the very minimum a PC should have a 33 MHz 486 processor (a 75-MHz Pentium or greater processor is recommended); 16 MB of RAM; Windows for Workgroups for 486-based PCs and Windows 95 (or higher) for Pentiums; an Internet browser.

  The PC must also have an installed Ethernet Network Interface Card (NIC). TCP/IP networking software must also be installed and DHCP must be enabled. In addition, Internet connectivity must be set for the Ethernet interface.

Note This recommendation is for Internet access in general and is not specific to the Cisco uBR905 cable access router. Other operating systems and hardware platforms of comparable capability may be supported by your service provider.

- Ensure that you bring sufficient cables to connect all devices at all subscriber locations. For simultaneous TV and computer usage at a subscriber site, obtain cable splitters and directional couplers as appropriate to install when you install the router.
- As applicable for testing or reconfiguration based on your network practices, obtain IP addresses pertinent to your network from your system administrator if you are statically configuring the subscriber site. (For most networks, IP addresses are supplied automatically.)

Environmental

Appendix A, "Technical Specifications," lists the operating and nonoperating environmental site requirements for operation of the Cisco uBR905 router. The ranges indicate the minimum and maximum values allowed for the router's operation, but if a measurement approaches the minimum or maximum of a range, it could indicate a potential problem. You can maintain normal operation by anticipating and correcting environmental anomalies before they approach a maximum operating range.

Caution For proper airflow, keep the back, sides, and bottom of the cable access router clear of obstructions and away from the exhaust of other equipment. To prevent the unit from overheating, never install the Cisco uBR905 router in an enclosed rack or room that is not properly ventilated or air conditioned.

Power

The Cisco uBR905 router does not contain a power switch. After the cable system technician installs, connects, powers on, and initializes the unit, it is intended to remain connected to the broadband network when operating normally.

Before plugging in and applying power to the Cisco uBR905 router, verify that the power source is within the values given in Appendix A, "Technical Specifications."

Note The same power supply supports both domestic (U.S.) and international operation. Different power cords are required, however, depending on the country of operation.

Caution Use only a power supply and cord that is provided by Cisco and that is applicable to the country of operation. Using any other vendor's power supply and cord can cause loss of data or permanent damage.

CATV Coaxial Cabling

When running the coaxial line from the cable TV trunk connection to the subscriber site, consider the issues of electromagnetic interference (EMI), coaxial cable quality, and distance limitations for signaling, 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 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 uBR905 router, and can even create an electrical hazard by conducting power surges through lines and into equipment. (Review the safety warnings in the *"Electrical"* section on page 2-2.)

Note Category 5 data wiring and telco wiring is much more susceptible to EMI than high-grade well-shielded CATV coaxial cable.

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 unsaddled conductors to destroy electronic devices. If you have had problems of this sort in the past, you might want to consult experts in electrical surge suppression and shielding.

Coaxial Cable Quality

CATV coaxial cable quality can vary dramatically at each installation site. Poor insulation, improperly installed additional outlets, the condition and length of the cable's center conductor, and the quality of the cable can negatively affect the connectivity and performance of the cable access router for digital data transmission. Coaxial cable tolerances for the transmission of two-way digital data are much lower than the tolerances for the transmission of downstream-only video. Coaxial cable used to carry two-way digital data must be of very high quality.

Note A 5 dB reduction in signal quality for analog downstream video might cause a slight degradation of picture clarity, which might or might not be noticeable to a subscriber.

A 1 dB reduction in signal quality for digital data might completely disrupt service to a Cisco uBR905 router user.

Check the cables for general quality level, tears or cuts in the insulation, insulation that is at least 80 percent braid with foil, a broken or bent center conductor at the conductor ends, the length of the center conductor, and splitters or amplifiers that have been added to extend video connectivity at the installation site.

Note The center conductor should extend 1/8 inch (3.2 mm) beyond the end of the conductor.

Tips Cisco recommends that you replace any cable that is in question and begin the installation with clean, two-way digital data transmission media. If the cable is of high-quality and was recently installed, replacing the connectors with high-quality connectors can also improve performance and eliminate future service calls.

Caution If you replace a connector, be careful not to score the center conductor. A scored conductor can reduce or impair performance for channels broadcast between 550 and 860 MHz. If the center conductor is too short, signals between 5 and 42 MHz might be affected.

Distance Limitations

The size of your networks and the distances between connections on the CATV network can affect the successful installation of a Cisco uBR905 router, which must be within 100 miles of the CMTS. This distance can also be defined in relation to the speed of light through the transmission network as being less than 2 msec from the CMTS to the Cisco uBR905 router and back again.

Note Exceeding this distance is a violation of the DOCSIS RFI specification.

When preparing a site for network connections to the Cisco uBR905 router, consider the following:

- Number of amplifiers from the installation site to the nearest node
- Number of outlets and amplifiers at the installation site
- Cable pinouts if you plan to build your cables

Potential distance limitation problems in the CATV network can be reduced by ensuring the following factors:

- Correct, linear unity gain two-way sweep procedure is in place
- Industry-standard configuration practices are used at the headend
- Downstream frequency is known at the time of installation
- Absolute downstream signal level can be measured where it enters the cable access router

Required Tools and Equipment

Assemble the tools and equipment needed to install the Cisco uBR905 router at subscriber sites. Table 2-1 lists the recommended items that Cisco does not provide.

Table 2-1 Recommended Tools, Cabling, and Equipment List

Checked Off	Item
	Installation toolkit including a flathead screwdriver (small to medium size); Phillips screwdriver (small to medium size); 7/16-inch open-end wrench; ESD-preventive wrist strap
	Signal level meter capable of reading a 64 QAM signal or a spectrum analyzer (HP8594Q or equivalent) as appropriate. An alternative is a clear understanding of the digital-to-analog channel amplitude offset and a calibrated analog signal level meter to measure a nearby adjacent analog carrier.
	Mixed set of attenuators (pads), cable adapters, splitters, High Pass Filters (HPF), directional couplers as appropriate
	10BaseT Ethernet cable tester
	Portable, hand-held console terminal such as a laptop computer with RS-232 serial port communications software, and a setting of 9600 baud, 8 data bits, no parity, and 1 stop bit (9600 8N1); reserved for technicians in networks supporting remote configuration and troubleshooting.
	Applicable cables based on the subscriber site configuration: • High-quality, shielded RF coaxial cable (with at least 80% braid) to connect the Cisco uBR905 to the cable system • Category 5 UTP (10BaseT Ethernet) straight-through cables to connect computers directly to the Cisco uBR905 • Category 5 UTP (10BaseT Ethernet) crossover cables to connect the Cisco uBR905 to an Ethernet hub (RJ-45 connectors) • All other cables to connect the Ethernet hub to the supported devices • Cable to connect the console port to the portable, hand-held console device (RJ-45 connectors)

Caution Use only the power supply and cord provided for Cisco and suitable to the country of operation. Using any other vendor's power supply and cord can cause loss of data or permanent damage.

Note A cable console kit and console cable, used to locally reconfigure the router, can be purchased separately.

The subscriber in-box documentation set includes:

- *Quick Start, Cisco uBR905 Cable Access Router Subscriber Setup* publication

The service provider in-box documentation set includes:

- Warranty card
- Licensing information

The following additional documents are available via CCO:

- *Cisco uBR905 Cable Access Router Hardware Installation Guide*—this document
- *Cisco uBR905 Cable Access Router Software Configuration Guide*
- Release notes are available for all Cisco IOS Release images

After you have completed installation, give each subscriber a copy of the *Quick Start, Cisco uBR905 Cable Access Router Subscriber Setup* publication, along with any documentation your company provides.