

# Preparing for Installation

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This chapter describes the equipment and site requirements for installing the Cisco uBR904 cable modem. The chapter contains the following sections:

- Safety Recommendations
- Site Requirements
- Tools for Installation
- Configuration Information
- Cisco uBR904 Cable Modem Installation Checklist
- Site Log

Before installing the Cisco uBR904 cable modem, you should consider the power and cabling requirements that must be in place at the installation site, the equipment you will need to install the Cisco uBR904 cable modem, and the environmental conditions the installation site must meet to maintain normal operation. This chapter guides you through the process of preparing for the Cisco uBR904 cable modem installation.

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**Note** The Cisco uBR7246 universal broadband router installed at the cable headend must be properly configured to successfully install the Cisco uBR904 cable modem. Additional configuration information is downloaded from the Cisco uBR7246 to the Cisco uBR904 cable modem.

We highly recommend that a cable headend technician be available, or on-call, to assist you with troubleshooting Cisco uBR904 cable modem installations; especially during the early field installations. Contact your cable service provider for more information.

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# Safety Recommendations

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

- The installation of your Cisco uBR904 cable modem should be in compliance with national and local electrical codes. In the United States, National Fire Protection Association (NFPA) 70, United States National Electrical Code. In Canada, Canadian Electrical Code, part I, CC22.1. In other countries, International Electrotechnical Commission (IEC) 364, part 1 through part 7.
- The cable system must be in accordance with Article 820-40 of the National Electric Code. This code specifies that the shield of the coaxial cable must be connected to the grounding system of the building where it is installed, as close to the point of cable entry as practical.
- Always unplug the power cable before installing or removing a Cisco uBR904 cable modem.
- Keep the Cisco uBR904 cable modem area clear and dust free during and after installation.
- Keep tools and Cisco uBR904 cable modem components away from walk areas.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught on the Cisco uBR904 cable modem. Fasten your tie or scarf and roll up your sleeves.
- The Cisco uBR904 cable modem ships with a three-wire electrical grounding-type plug, which will only fit into a grounding-type power outlet. This is a safety feature. The equipment grounding should be in accordance with local and national electrical codes.
- The Cisco uBR904 cable modem operates safely when it is used in accordance with its marked electrical ratings and product usage instructions.

## Safety with Electricity

Follow these basic guidelines when working with any electrical equipment:

- Disconnect all power and external cables before installing or removing a Cisco uBR904 cable modem.
- 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, use the guidelines that follow when working with any 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.

## 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 Cisco uBR904 cable modem 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 (if one is available) whenever handling the Cisco uBR904 cable modem.

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 uBR904 cable modem.
- Always place the Cisco uBR904 cable modem 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.

## FCC Requirements

### For Class A Equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### For Class B Equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a

particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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**Note** If the system contains several subsystems/cards then the warning notice has only to appear in the main control systems user manual/guide.

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## CISPR 22 Requirements

Specifications covered:

- EN55022:1994 - EU requirements
- AS/NZS 3548:1995 - Australia

## Site Requirements

To assure normal operation and avoid unnecessary maintenance, plan your site configuration and prepare your site *before* installation. After installation, make sure the site maintains an ambient temperature of 23° to 113°F (-5° to 45°C), and keep the area around the chassis as free from dust as is practical.

The following sections address the site environment requirements for the Cisco uBR904 cable modem.

### AC Power

The AC-input power supply in the Cisco uBR904 cable modem uses a power factor corrector that allows the Cisco uBR904 cable modem to operate on input voltage and frequency within the ranges of 100 to 240 VAC and 50/60 Hz.

Refer to Table 1-1 in the chapter “Product Overview” for system power specifications, including input voltage and operating frequency ranges.

### Wiring and Cabling

Following are guidelines for setting up the wiring and cabling at the installation site. When planning the location of the Cisco uBR904 cable modem, 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 uBR904 cable modem, and can even create an electrical hazard by conducting power surges through lines and into equipment. (Review the safety warnings in the section “Safety with Electricity” earlier in this chapter.)

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

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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 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 Cisco uBR904 cable modem 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.

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**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 small reduction in signal quality for digital data might completely disrupt service to a Cisco uBR904 cable modem user.

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Check the cables for general quality level, tears or cuts in the insulation, insulation that is at least 80% 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.

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

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We recommend that you replace any cable that is in question to 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.



**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.

### Distance Limitations

The size of your networks and the distances between connections on the CATV network can affect the successful installation of a Cisco uBR904 cable modem.

When preparing a site for network connections to the Cisco uBR904 cable modem, you must consider several factors related to the cabling:

- The number of amplifiers from the installation site to the nearest node
- The 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:

- A correct, linear unity gain two-way sweep procedure is in place
- Industry-standard configuration practices are used at the headend
- The downstream frequency is known at the time of installation
- The absolute downstream signal level can be measured where it enters the Cisco uBR904 cable modem



## Personal Computer Hardware and Software

The Cisco uBR904 cable modem must be connected to a personal computer at the installation site. We recommend a personal computer with the following configuration:

- A Pentium or 486 processor-based personal computer running the Windows 95 operating system.
- Ethernet 10BaseT network interface card and applicable drivers installed in the computer.
- Web browsing software, such as Microsoft Internet Explorer or Netscape Navigator installed in the computer.
- Internet Protocol (IP) set as the networking protocol; as opposed to Point-to-Point Protocol (PPP), which is commonly used in dial-up Internet connection. See the user guides that accompanied your computer and your network interface card for more information on how to set this option.
- Network settings configured to enable DHCP service for dynamic IP address assignment; as opposed to manual IP address assignment. See the user guides that accompanied your computer and your network interface card for more information on how to set this option.

## Installing the Cisco uBR904 Cable Modem at the Headend

You can mount the Cisco uBR904 cable modem on an equipment shelf at the headend provided that the rack dimensions allow you to secure the router to the shelf, and the overall configuration permits safe installation and access.

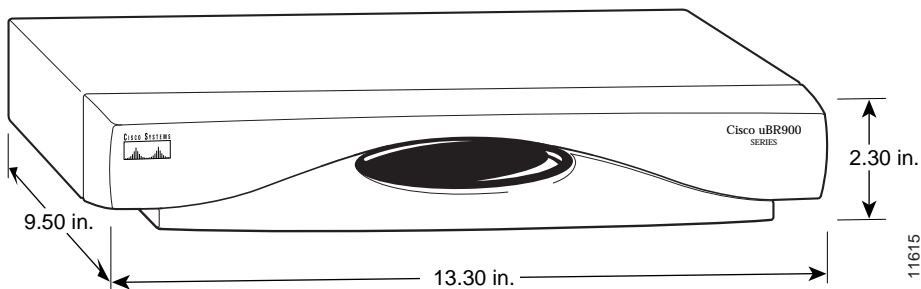
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**Note** We recommend that you install at least one cable modem at each headend site to assist field troubleshooting and to detect potential problems at subscriber installation sites.

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Figure 2-1 shows the Cisco uBR904 cable modem footprint and outer dimensions.

**Figure 2-1 Cisco uBR904 Cable Modem Footprint and Outer Dimensions**



## Site Environment

Table 2-1 lists the operating and nonoperating environmental site requirements. The following ranges are those within which the Cisco uBR904 cable modem will continue 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 a maximum operating range.

- Operating temperature range: 32° through 114°F (0° through 40°C).
- Operating humidity range: 5 to 95%, noncondensing.
- Airflow: Keep the back, sides, and bottom of the Cisco uBR904 cable modem clear of obstructions and away from the exhaust of other equipment.



**Caution** To prevent chassis overheating, never install the Cisco uBR904 cable modem in an enclosed rack or room that is not properly ventilated or air conditioned.

**Table 2-1 Specifications for Operating and Nonoperating Environments**

<b>Specification</b>	<b>Minimum</b>	<b>Maximum</b>
Temperature, ambient operating	32°F (0°C)	114°F (40°C)
Temperature, ambient nonoperating and storage	-13°F (-25°C)	95°F (70°C)
Humidity, ambient (noncondensing) operating	5%	95%
Humidity, ambient (noncondensing) nonoperating and storage	5%	95%
Altitude, operating and nonoperating	Sea level	10,000 ft (3,050 m)
Vibration, operating	10 to 200 Hz, 0.0005 g (1 oct./min.)	–
Vibration, nonoperating	10 to 100 Hz, 0.0065 g (1 oct./min.)	–

## Preventive Site Configuration: Maintaining Normal Operation

Planning a proper location for the Cisco uBR904 cable modem is essential for successful system operation. Equipment placed too close together or inadequately ventilated can cause system overtemperature conditions. In addition, 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:

- We recommend keeping the Cisco uBR904 cable modem off the floor and out of any area that tends to collect dust.
- Follow ESD prevention procedures to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.

### Power Considerations

Follow these precautions and recommendations when planning power connections to the Cisco uBR904 cable modem:

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

## Tools for Installation

Each Cisco uBR904 cable modem chassis is fully assembled at the factory; no assembly is required. However, you will need the following tools and equipment to install the cable modem:

- High-quality coaxial cable with at least 80% braid with foil
- Coaxial cable crimping tool
- Replacement coaxial cable connector ends
- Ethernet straight-through cable with RJ-45 connectors (one included)
- Console cable with RJ-45 connectors (light blue) (one included)
- Tape measure (optional)

In addition, you might need the following external equipment:

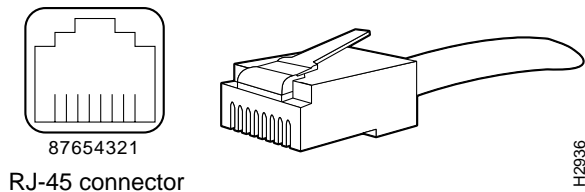
- CATV field strength meter (power meter)
- CATV house amplifier
- Portable, hand-held console terminal
- Ethernet transceiver
- Ethernet crossover cable with RJ-45 connectors (only if connecting the Cisco uBR904 cable modem to a hub)
- Network interface card (if the computer at the installation site does not have one installed)

## Making a Crossover Ethernet Cable Connection

The RJ-45 receptacle supports standard straight-through and crossover Category 5 UTP (RJ-45) cables. Cisco Systems does not supply Category 5 UTP cables; these cables are available commercially.

Figure 2-2 shows the RJ-45 receptacle and plug. Table 2-2 lists the pinouts and signals for the RJ-45 receptacle.

**Figure 2-2 RJ-45 Receptacle and Plug**



**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. Use caution when connecting cables.

**Table 2-2 RJ-45 Receptacle Pinouts**

Pin	Description
1	Receive Data + (RxD+)
2	RxD-
3	Transmit Data + (TxD+)
6	TxD-

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**Note** Referring to the RJ-45 pinout in Table 2-2, proper common-mode line terminations should be used for the unused Category 5 UTP cable pairs 4/5 and 7/8. Common-mode termination reduces electromagnetic interference (EMI).

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To identify the RJ-45 cable type, hold the two ends of the cable next to each other so you can see the colored wires inside the ends, as shown in Figure 2-3.

### Figure 2-3 RJ-45 Cable Identification

Examine the sequence of colored wires to determine the type of RJ-45 cable:

- Straight-through—The colored wires are in the same sequence at both ends of the cable.
- Crossover—The first (far left) colored wire at one end of the cable is the third colored wire at the other end of the cable.

## Configuration Information

After you install the Cisco uBR904 cable modem, verify that all the hardware is operating properly, verify that the computer is configured for IP and DHCP services, and establish a connection to the headend, the Cisco uBR904 cable modem will be configured by software downloaded from the Cisco uBR7246 universal broadband router installed at the headend. You do not need to perform any manual configuration on the Cisco uBR904 cable modem unit itself.

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**Note** If an error message is displayed on the uBR904, you can find its explanation in the *Cisco Cable CPE Error Messages* book, viewable online at [www.cisco.com/univercd/cc/td/doc/product/cable/cab\\_modm/ubcmerrs.pdf](http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_modm/ubcmerrs.pdf).

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## Cisco uBR904 Cable Modem Installation Checklist

To assist you with your installation and to provide a historical record of what was done and by whom, use the Cisco uBR904 Cable Modem Installation Checklists in Table 2-3 and Table 2-4. Make a copy of this checklist and indicate when each procedure or verification is completed. When the checklist is completed, place it in your site log (described at the end of this chapter) along with the other records for your new Cisco uBR904 cable modem.

**Table 2-3 Cisco uBR904 Cable Modem Installation Site Checklist**

<b>Installation Site Information</b>
Subscriber's Name:
Address:
Service account number:
Serial number and MAC address of Cisco uBR904 cable modem:
Personal computer make and model number:
Network interface card type:

**Table 2-4 Cisco uBR904 Cable Modem Installation Task Checklist**

<b>Task</b>	<b>Verified by</b>	<b>Date</b>
Date Cisco uBR904 cable modem delivered to installation site		
Cable modem and all accessories unpacked		
Safety recommendations and guidelines reviewed		
Installation Checklist copied		
Site log established and background information entered		
Site power voltages verified		
Existing coaxial cable at the installation site inspected and replaced, if necessary		
Personal computer hardware, software, and configuration meet site requirements		
Site environmental specifications verified		
Required passwords, IP addresses, and so on, available		
Required tools available		
Power cable connected to AC source		

## Site Log

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Task	Verified by	Date
Ethernet cable connected (straight-through for single computer, crossover for hub)		
Console port set for 9600 baud, 8 data bits, no parity, and 2 stop bits (9600 8N2)		
System power turned on (power LED is on)		
System configuration complete (cable and Ethernet LEDs are on)		
Internet browser running and a test web page can be accessed on the computer		
Console screen displays correct hardware configuration (displayed after system banner)		

## Site Log

A site log provides a historical record of all actions relevant to the Cisco uBR904 cable modem operation and maintenance. Keep the site log in a common place where anyone who performs tasks has access to it. Site log entries might include the following:

- Installation progress—Make a copy of the Cisco uBR904 cable modem Installation Checklist and insert it into the site log. Make entries on the Installation Checklist as each procedure is completed.
- Upgrades and removal/replacement procedures—Use the site log as a record of system maintenance and expansion history. Each time a procedure is performed on the system, update the site log to reflect the following:
  - Corrective maintenance procedures performed
  - Intermittent problems
  - Related comments

Table 2-5 shows a sample site log page. Make copies of the sample or design your own site log to meet the needs of your installation site and equipment.



Table 2-5 Site Log Example

Date	Description of Action Performed or Symptom Observed	Initials

