



## Preface

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This preface explains the objectives, software options, intended audience, and organization of the *Cisco uBR10012 Universal Broadband Router Software Configuration Guide*, which describes the following release trains:

- Cisco IOS Release 12.1 BC, 12.2 BC, and 12.3 BC
- Cisco IOS Release 12.2 CY

This preface also defines this document's conventions for conveying instructions and information.

## Document Revision History

The Document Revision History table below records technical changes to this document.

*Table 1 Document Revision History*

Document Revision	Date	Change Summary
OL-1520-06	September 30, 2005	Incorporated new features and enhancements introduced in Cisco IOS Release 12.3(13a)BC. Added Document Revision History table.

## Purpose

This guide describes the procedures necessary to configure, maintain, and troubleshoot the initial software configuration for the Cisco uBR10012 universal broadband router. This guide also directs you to other closely related documentation for additional features and optimization.

The Cisco uBR10000 series CMTS solutions allow cable companies, Internet service providers (ISPs), and others to allocate channel capacity for Internet access services using a broadband radio frequency (RF) cable plant. The Cisco uBR10012 router sustains two-way downstream and upstream traffic over Data-over-Cable Service Interface Specifications (DOCSIS)-based cable modems (CMs) that support 6 MHz National Television Systems Committee (NTSC) operations.

# Audience

This guide is intended for system administrators and support engineers who configure and maintain the Cisco uBR10012 router. Many different delivery models exist for Cisco uBR10000 series equipment:

- In smaller networks, a single service provider manages all equipment and infrastructure.
- In larger networks, multiple service operators (MSOs) and ISPs share responsibility for provisioning and managing the cable plant and IP network.

How the MSO and ISP divide responsibilities depends on the service model. In some cases, the MSO maintains and operates the cable plant and attached CMs and set-top boxes (STBs), and the ISP owns, operates, and maintains the regional network and IP infrastructure beyond the cable distribution hub. In other cases, the Cable Modem Termination System (CMTS) and RF customer premises equipment (CPE) are viewed as part of the networking infrastructure, and the ISP maintains control for provisioning and managing DOCSIS functionality.



## Note

This guide considers the MSO and ISP as a single service principle with responsibility to provision and manage DOCSIS-based cable modems and STBs. This guide assumes that administrators are familiar with Cisco uBR10000 series hardware, DOCSIS requirements, and networking.

# Document Organization

This guide focuses on configuration of Cisco IOS software for the Cisco uBR10012 router. [Table 2](#) summarizes the chapters and procedures in this guide. These chapters are presented in the general sequence used in a router installation and configuration. However, this sequence is also affected by your network configuration and other factors.

**Table 2** *Guide Contents and Organization*

Title	Description
<a href="#">Chapter 1, “Overview of Cisco uBR10012 Universal Broadband Router Software”</a>	Acquaints you with the Cisco IOS releases, hardware, and software features supported on the Cisco uBR10000 series CMTS.
<a href="#">Chapter 2, “Configuring the Cable Modem Termination System for the First Time”</a>	Provides instructions to make basic configurations to the Cisco uBR10000 series Cable Modem Termination System (CMTS) using AutoInstall, the Setup facility, or manual configuration mode. Includes sample Cisco uBR10012 router software configurations.  <b>Note</b> Complete the configurations in this chapter prior to attempting additional configurations later in this guide.
<a href="#">Chapter 3, “Configuring Cable Interface Features for the Cisco uBR10012 Router”</a>	Provides instructions for required cable interface configurations for upstream and downstream interfaces.
<a href="#">Chapter 4, “Managing Cable Modems on the Hybrid Fiber-Coaxial Network”</a>	Provides a number of procedures that you can implement after you have completed upstream and downstream cable interface configurations to manage operations of your cable modems in the hybrid fiber-coaxial network.

Table 2 Guide Contents and Organization (continued)

Title	Description
<a href="#">Chapter 5, “Configuring Basic Broadband Internet Access”</a>	Provides a recommended basic configuration for high-speed Internet access and a basic Internet access sample configuration file.
<a href="#">Chapter 6, “Troubleshooting the System”</a>	Provides troubleshooting instructions for the configuration of the Cisco uBR10000 series CMTS.
<a href="#">Appendix A, “DOCSIS and CMTS Architectural Overview”</a>	Provides a brief overview of general DOCSIS architecture and enhancements.
<a href="#">Appendix B, “Configuration Register Information for the Cisco uBR10012 Universal Broadband Router”</a>	Provides information about the functions and configuration of bits in the Cisco IOS Software Configuration Register.

## Conventions

This guide uses the following conventions for command syntax descriptions and textual emphasis:

Table 3 Command Syntax and Emphasis Conventions

Convention	Description
<b>boldface font</b>	Commands and keywords are in <b>boldface</b> .
<i>italic font</i>	Arguments for which you supply values are in <i>italics</i> .
[ ]	Elements in square brackets are optional.
{x y z}	Alternative, mutually exclusive, keywords are grouped in braces and separated by vertical bars.
[x y z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
screen font	Terminal sessions and information the system displays are in <i>screen font</i> .
<b>boldface screen font</b>	Information you must enter is in <b>boldface screen font</b> .
<i>italic screen font</i>	Arguments for which you supply values are in <i>italic screen font</i> .
^	The symbol ^ represents the key labeled Control—for example, the key combination ^D in a screen display means hold down the Control key while you press the D key.
< >	Nonprinting characters, such as passwords, are in angle brackets in contexts where italics are not available.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point ( ! ) or a pound sign ( # ) at the beginning of a line of code indicates a comment line.

**Note**

This symbol means *reader take note*. Notes contain helpful suggestions or references to material not covered in the publication.

**Tip**

This symbol means *the following are useful tips*.

**Timesaver**

This symbol means *the described action saves time*. You can save time by performing the action described in the paragraph.

**Caution**

This symbol means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

## Terms and Acronyms

**Note**

To fully understand the content of this guide, you should be familiar with the following terms and acronyms:

A complete list of terms and acronyms is available in the [Internetworking Terms and Acronyms](#) guide on Cisco.com and the Documentation CD-ROM.

- ABR—available bit rate
- ACL—access control list
- AGC—automatic gain control
- ASIC—application specific integrated circuit
- AWG—American wire gauge
- BGP—Border Gateway Protocol
- BPI—Baseline Privacy Interface
- CM—cable modem—CPE side device in a cable network
- CMTS—cable modem termination system
- CoS—class of service
- CPE—customer premises equipment
- CRC—cyclic redundancy check
- CSU—channel service unit
- CTS—Clear To Send
- D/A—Digital to Analog (Conversion)
- DCD—Data Carrier Detect
- DCE—data communications equipment
- DHCP—Dynamic Host Configuration Protocol
- DIMM—dual in-line memory module
- DOCSIS—Data-over-Cable Service Interface Specification
- DS—downstream—data flowing from the internet backbone towards the cable network is considered to be moving in the downstream direction. Also refers to data flowing from the CMTS towards the CM is moving in the downstream direction.
- DSP—digital signal processor

- DSR—data set ready
- DSU—data service unit
- DTE—data terminal equipment
- DTR—data terminal ready
- EMC—electromagnetic compliance
- EMI—electromagnetic interference
- ESD—electrostatic discharge
- FRU—field-replaceable unit (router components that do not require replacement by a Cisco certified service provider)
- FTP—foil twisted-pair
- HCCP—Hot Standby Connection-to-Connection Protocol
- HDLC—High-Level Data Link Control
- HFC—hybrid fiber coaxial
- HWIDB—hardware interface data block
- IPSec—IP Security Protocol
- Kbps—Kilo-bits Per Second
- LC—line card
- LCN—logical channel number
- LCP—line card processor
- LLC—Logical Link Control
- Logical Interface—A group of one or more upstream and one or more downstream cable ports
- MAC—Media Access Control
- MAP—upstream bandwidth allocation map
- MB—megabyte
- Mbps—Mega-bits per second
- MM—multimode
- Modem—modulator/demodulator
- MPLS—Multiprotocol label switching
- nrt-VBR—non-real-time variable bit rate
- NTSC—National Television Standards Committee
- NVRAM—nonvolatile random-access memory
- OAM AIS—Operation, Administration, and Maintenance alarm indication signal
- OIR—online insertion and removal
- PBR—policy-based routing
- PCI—peripheral component interconnect bus
- PCMCIA—Personal Computer Memory Card International Association
- PHS—payload header suppression
- PHY—Physical Interface Chip
- PPP—Point-to-Point Protocol
- PRE—Performance Routing Engine
- QAM—Quadrature Amplitude Modulation
- QoS—quality of service
- QPSK—Quadrature Phase Shift Keying
- rcp—remote copy protocol
- RF—radio frequency
- RFI—radio frequency interference
- RIP—Routing Information Protocol
- RISC—Reduced Instruction Set Computer
- ROM—read only memory

- RP—route processor
- RPR(+)—Route Processor Redundancy (plus)
- RTS—Request To Send
- SA—spectrum analyzer
- SDRAM—synchronous dynamic random-access memory
- SFID—Service Flow Identifier
- SID—Service ID
- SIMM—single in-line memory module
- SM—subscriber modem or spectrum manager
- SMI—single-mode intermediate reach
- SNMP—Simple Network Management Protocol
- TCP/IP—Transmission Control Protocol/Internet Protocol
- TDM—time-division multiplexing
- TFTP—Trivial File Transfer Protocol
- ToD—time-of-day
- ToS—Type of Service
- UBR—unspecified bit rate
- UDP—User Datagram Protocol
- UNI—User-Network Interface
- US—upstream—Data flowing from the cable network towards the internet backbone is considered to be moving in the upstream direction. Also, data flowing from the CM towards the CMTS is moving in the upstream direction.
- UTP—unshielded twisted-pair
- VC—virtual circuit
- VPN—Virtual Private Network

## Additional References

The following references provide additional information related to the Cisco uBR10012 router.

Related Topic	Document Title
Documentation Roadmap	<ul style="list-style-type: none"> <li>• <i>Cisco uBR7200 Series Routers and Cisco uBR10012 Universal Broadband Router Documentation Roadmap</i>  <a href="http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/roadmap/u10krdmp.html">http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/roadmap/u10krdmp.html</a></li> </ul>
Cisco uBR10012 Hardware Installation	<ul style="list-style-type: none"> <li>• <i>Cisco uBR10012 Universal Broadband Router Hardware Installation Guide</i>  <a href="http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/installation/guide/hig.html">http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/installation/guide/hig.html</a></li> </ul>
Cisco uBR10012 Field Replaceable Units (FRUs)	See the Cisco uBR10012 Universal Broadband Router Software Configuration Guide
Cisco uBR10012 Software, Configuration and Features	<ul style="list-style-type: none"> <li>• <i>Cisco uBR10012 Universal Broadband Router Release Notes</i>  <a href="http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/release/notes/12_3bc/ubr10k_123bc_rn.html">http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/release/notes/12_3bc/ubr10k_123bc_rn.html</a></li> <li>• <i>Cisco uBR10012 Universal Broadband Router Software Configuration Guide</i>  <a href="http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/configuration/guide/scg.html">http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/configuration/guide/scg.html</a></li> <li>• <i>Cisco uBR10012 Router Software Features</i>  <a href="http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/release/notes/12_3bc/ubr10k_123bc_rn.html#wp514515">http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/release/notes/12_3bc/ubr10k_123bc_rn.html#wp514515</a></li> <li>• <i>Cisco Cable Modem Termination System Feature Guide</i>  <a href="http://www.cisco.com/en/US/docs/cable/cmts/feature/guide/cmtsfg.html">http://www.cisco.com/en/US/docs/cable/cmts/feature/guide/cmtsfg.html</a></li> </ul>

Related Topic	Document Title
Cisco IOS Command Reference	<ul style="list-style-type: none"> <li>• <i>Cisco Broadband Cable Command Reference Guide</i> <a href="http://www.cisco.com/en/US/docs/ios/cable/command/reference/cbl_book.html">http://www.cisco.com/en/US/docs/ios/cable/command/reference/cbl_book.html</a></li> <li>• <i>Cisco CMTS Error Messages</i> <a href="http://www.cisco.com/en/US/docs/cable/cmts/system/message/uberrchap3.html">http://www.cisco.com/en/US/docs/cable/cmts/system/message/uberrchap3.html</a></li> <li>• <i>Cisco IOS Release 12.2 Web Page</i> <a href="http://www.ciscosystems.ch/en/US/products/hw/voiceapp/ps967/prod_bulletin09186a0080091f63.html">http://www.ciscosystems.ch/en/US/products/hw/voiceapp/ps967/prod_bulletin09186a0080091f63.html</a></li> </ul>
Additional Cable/Broadband Information Resources	<ul style="list-style-type: none"> <li>• <i>Cisco Cable/Broadband Software Center Web page</i> <a href="http://www.cisco.com/en/US/products/sw/netmgts/ps529/prod_software_versions_comparison.html">http://www.cisco.com/en/US/products/sw/netmgts/ps529/prod_software_versions_comparison.html</a></li> <li>• Cisco Cable/Broadband Technical Support Web page <a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></li> <li>• Cisco Multiservice Broadband Cable Guide <a href="http://www.cisco.com/en/US/prod/collateral/video/ps8806/ps5684/ps2209/prod_brochure09186a008014eeb0.pdf">http://www.cisco.com/en/US/prod/collateral/video/ps8806/ps5684/ps2209/prod_brochure09186a008014eeb0.pdf</a></li> </ul>

## Standards

Standards <sup>1</sup>	Title
ITU X.509 V3	<i>International Telecommunications Union (ITU) X.509 Version 3.0 standard</i>
PKT-EM-I03-011221	<i>PacketCable™ Event Message Specification</i>
PKT-SP-DQOS-I03-020116	<i>PacketCable™ Dynamic Quality-of-Service Specification</i>
PKT-SP-EC-MGCP-I04-011221	<i>PacketCable™ Network-Based Call Signaling Protocol Specification</i>
PKT-SP-ESP-I01-991229	<i>PacketCable™ Electronic Surveillance Specification</i>
PKT-SP-ISTP-I02-011221	<i>PacketCable™ Internet Signaling Transport Protocol (ISTP) Specification</i>
PKT-SP-PROV-I03-011221	<i>PacketCable™ MTA Device Provisioning Specification</i>
PKT-SP-SEC-I05-020116	<i>PacketCable™ Security Specification</i>
PKT-TR-ARCH-V01-991201	<i>PacketCable™ 1.0 Architecture Framework Technical Report</i>
<p><b>Note</b> The PacketCable 1.0 specifications are available on the Packetcable website at <a href="http://www.cablelabs.com/packetcable/specifications/multimedia.html">http://www.cablelabs.com/packetcable/specifications/multimedia.html</a></p>	
<a href="#">SP-BPI+-I08-020301</a>	<i>Baseline Privacy Interface Plus Specification</i>
<a href="#">SP-RFIV1.1-I09-020830</a>	<i>Data-over-Cable Service Interface Specifications Radio Frequency Interface Specification, version 1.1</i>

1. Not all supported standards are listed.

## MIBs

The Cisco uBR10012 router supports the following categories of Management Information Bases (MIBs):

- **Cable-specific MIBs**—Provide information about the cable interfaces and related information on the Cisco uBR10012 router. They include both Data-over-Cable Service Interface Specifications (DOCSIS)-specific MIBs and enterprise MIBs specific to Cisco. If your network management applications have not already been configured for the Cisco uBR10012 router, these MIBs must be loaded. The Cisco uBR10012 router and CMTS supports DOCSIS 1.1 MIBs.

- The Cisco uBR10012 router supports objects related to QoS support for scheduler of DOCSIS-compliant RF interfaces in the CMTS.
- **Cisco platform and network-layer enterprise MIBs**—Common across most Cisco router platforms. If your network management applications are already configured to support other Cisco routers, such as the Cisco 2600 series router, no further configuration is needed unless the version of Cisco IOS software being used has updated these MIBs.
- **Simple Network Management Protocol (SNMP) standard MIBs**—These MIBs are required by any agent supporting SNMPv1 or SNMPv2 network management. The SNMP MIBs improve object support for SNMP traps. This aids in network management. Traps are the mechanisms used to automatically send alarms for certain network events.
- **Deprecated MIBs**—Supported in earlier releases of Cisco IOS software but have been replaced by more standardized, scalable MIBs. Network Management applications and scripts should convert to the replacement MIBs as soon as possible.

MIBs	MIBs Link
<ul style="list-style-type: none"> <li>• Cisco uBR10012 MIBs supporting specific releases</li> </ul>	<ul style="list-style-type: none"> <li>• Cisco uBR10012 Release Notes Web page  <a href="http://www.cisco.com/en/US/products/hw/cable/ps2209/prod_release_notes_list.html">http://www.cisco.com/en/US/products/hw/cable/ps2209/prod_release_notes_list.html</a></li> </ul>
<ul style="list-style-type: none"> <li>• Selected Platforms and Feature Sets</li> </ul>	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

## Obtaining Documentation

The following sections explain how to obtain documentation from Cisco Systems.

### World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following URL:

<http://www.cisco.com>

Translated documentation is available at the following URL:

<http://www.cisco.com/web/siteassets/locator/index.html>

### Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package, which is shipped with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription.

## Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Networking Products Marketplace:  
<http://www.cisco.com/pcgi-bin/marketplace/welcome.pl>
- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:  
<http://www.cisco.com/web/ordering/root/index.html>
- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco corporate headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

## Documentation Feedback

If you are reading Cisco product documentation on Cisco.com, you can submit technical comments electronically. Click the **Fax** or **Email** option under the “Leave Feedback” at the bottom of the Cisco Documentation home page.

You can e-mail your comments to [bug-doc@cisco.com](mailto:bug-doc@cisco.com).

To submit your comments by mail, use the response card behind the front cover of your document, or write to the following address:

Cisco Systems  
Attn: Document Resource Connection  
170 West Tasman Drive  
San Jose, CA 95134-9883

We appreciate your comments.

## Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools by using the Cisco Technical Assistance Center (TAC) Web site. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC Web site.

## Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

Cisco.com is a highly integrated Internet application and a powerful, easy-to-use tool that provides a broad range of features and services to help you to

- Streamline business processes and improve productivity
- Resolve technical issues with online support
- Download and test software packages

- Order Cisco learning materials and merchandise
- Register for online skill assessment, training, and certification programs

You can self-register on Cisco.com to obtain customized information and service. To access Cisco.com, go to the following URL:

<http://www.cisco.com>

## Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available through the Cisco TAC:

- the Cisco TAC Web site



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**Note** In addition, be sure to familiarize yourself with TAC's *Cisco uBR10012 Product Support Page* at <http://www.cisco.com/cisco/web/support/index.html>.

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- the Cisco TAC Escalation Center

Inquiries to Cisco TAC are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Which Cisco TAC resource you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

## Cisco TAC Web Site

The Cisco TAC Web site allows you to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web site, go to the following URL:

<http://tools.cisco.com/ServiceRequestTool/create/launch.do>

All customers, partners, and resellers who have a valid Cisco services contract have complete access to the technical support resources on the Cisco TAC Web site. The Cisco TAC Web site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to the following URL to register:

<https://tools.cisco.com/RPF/register/register.do>

If you cannot resolve your technical issues by using the Cisco TAC Web site, and you are a Cisco.com registered user, you can open a case online by using the TAC Case Open tool at the following URL:

<http://tools.cisco.com/ServiceRequestTool/create/launch.do>

If you have Internet access, it is recommended that you open P3 and P4 cases through the Cisco TAC Web site.

## Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses issues that are classified as priority level 1 or priority level 2; these classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer will automatically open a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to the following URL:

[http://www.cisco.com/en/US/support/tsd\\_cisco\\_worldwide\\_contacts.html](http://www.cisco.com/en/US/support/tsd_cisco_worldwide_contacts.html)

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled; for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). In addition, please have available your service agreement number and your product serial number.

