



Cisco uBR7100 Series and Cisco uBR7100E Series Universal Broadband Router Hardware Installation Guide

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You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side or the other of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

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Preface

This preface describes the purpose of the *Cisco uBR7100 Series and Cisco uBR7100E Series Universal Broadband Router Hardware Installation Guide*, its intended audience, its organization, and its document conventions. This preface also provides information on how to obtain related documentation and defines some technical terms you need to understand when using this guide.

Purpose

This installation guide explains the initial hardware installation and basic configuration procedures for Cisco uBR7100 series routers. It contains procedures for installing the router hardware, starting up the router, and troubleshooting any problems that might occur during the installation. After completing the installation and basic configuration procedures covered in this guide, you will then use the appropriate companion publications to more completely configure your system. For a list of the companion publications, see the [“Related Documentation” section on page viii](#).



Note

Unless otherwise indicated, the term *Cisco uBR7100 series* refers to all models of the Cisco uBR7100 series universal broadband router, including the Cisco uBR7111, Cisco uBR7111E, Cisco uBR7114, and Cisco uBR7114E routers.

Audience

To use this publication, you should be familiar not only with Cisco router hardware and cabling but also with electronic circuitry and wiring practices. You should also have experience as an electronic or electromechanical technician. Experience with RF cable plants is also highly desirable.



Warning

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

Organization

The major sections of this guide are as follows:

Chapter	Description
Chapter 1, “Product Overview”	Describes the Cisco uBR7100 series universal broadband router and its major features and interfaces.
Chapter 2, “Preparing for Installation”	Describes the steps required to prepare a site before installing the Cisco uBR7100 series router.
Chapter 3, “Installing Cisco uBR7100 Series Universal Broadband Routers”	Provides instructions to install the Cisco uBR7100 series router and to connect its network interface cables.
Chapter 4, “System Startup”	Describes the procedure for the initial startup of the system.
Chapter 5, “Troubleshooting the Installation”	Provides basic troubleshooting procedures for the hardware installation.
Chapter 6, “Maintenance”	Describes recommended maintenance procedures.
Appendix A, “System Specifications”	Contains the physical specifications and power requirements of the router.
Appendix B, “Manufacturers for Headend Provisioning Requirements”	Lists vendors for the auxiliary equipment that is normally required for a headend installation.
Appendix C, “Cable Specifications”	Provides cabling information and pinout information for the router.
Appendix D, “Frequency Allocation Tables”	Provides the standard frequency allocation channel plans.
Appendix E, “Site Log”	Provides a sample log sheet that can be used to track maintenance and other changes that are done to the equipment.

Related Documentation

Your Cisco uBR7100 series router and the Cisco IOS software running on it contain extensive features and functionality, which are documented in the following resources:

- For international agency compliance, safety, and statutory information for WAN interfaces for Cisco uBR7100 series routers, refer to the regulatory compliance and safety information document that shipped with your router.
- For information on installing and replacing field-replaceable units (FRUs), refer to the individual document for each FRU.
- For information about replacing SDRAM see *Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller* at the following URL:
<http://www.cisco.com/univercd/cc/td/doc/product/core/7206/fru/memory/index.htm>
- For information on using the flash disk, see the “Flash Memory Card Usage” section on page 6-5 and the *Using the Flash Disk* document at the following URL:
<http://www.cisco.com/univercd/cc/td/doc/product/core/7200vx/72vxfu/5819fdsk.htm>

- For information on the modular port adapter installed in your router (if present), refer to the individual documents for each port adapter at the following URL:
http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_rout/cfig_nts/index.htm
- For additional information on configuring Cisco uBR7100 series routers, refer to the *Cisco uBR7100 Series Software Configuration Guide* at the following URL:
<http://www.cisco.com/univercd/cc/td/doc/product/cable/ubr7100/scg7100/index.htm>
This guide contains configuration information and sample configuration files.
- *Cisco uBR7100 Series Software Features* at the following URL:
<http://www.cisco.com/univercd/cc/td/doc/product/cable/ubr7100/ub7100sw/index.htm>
- *Cisco CMTS System Messages* at the following URL:
http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_rout/ubrerrr.htm
- *Cisco CMTS Feature Guide* at the following URL:
http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_rout/cmtsfg/index.htm
- *Cisco Broadband Cable Command Reference Guide* at the following URL:
<http://www.cisco.com/univercd/cc/td/doc/product/cable/bbccmref/index.htm>
- Other sources of information:
 - Cisco IOS release notes for the version of software you are using on your router.
 - For information on setting up quality of service (QoS), refer to the *Quality of Service Solutions Configuration Guide* and *Quality of Service Solutions Command Reference* publications.
 - For information on encryption, refer to the *Security Configuration Guide* and the *Security Command Reference* publications.
 - For information on interfaces, refer to the *Cisco IOS Interface Configuration Guide* and the *Cisco IOS Interface Command Reference* publications.
 - For information on IP, refer to the *Network Protocols Configuration Guide, Part 1* and the *Network Protocols Command Reference, Part 1* publications.

Conventions

**Note**

Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this publication.

**Tip**

Means *the following information might help you solve a problem*.

**Caution**

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

Safety Warning



Warning

IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

Waarschuwing

BELANGRIJKE VEILIGHEIDSINSTRUCTIES

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

BEWAAR DEZE INSTRUCTIES

Varoitus

TÄRKEITÄ TURVALLISUUSOHJEITA

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelyyn liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

SÄILYTÄ NÄMÄ OHJEET

Attention

IMPORTANTES INFORMATIONS DE SÉCURITÉ

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

CONSERVEZ CES INFORMATIONS

Warnung WICHTIGE SICHERHEITSHINWEISE

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

BEWAHREN SIE DIESE HINWEISE GUT AUF.

Avvertenza IMPORTANTI ISTRUZIONI SULLA SICUREZZA

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

CONSERVARE QUESTE ISTRUZIONI

Advarsel VIKTIGE SIKKERHETSINSTRUKSJONER

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.

TA VARE PÅ DISSE INSTRUKSJONENE

Aviso INSTRUÇÕES IMPORTANTES DE SEGURANÇA

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

GUARDE ESTAS INSTRUÇÕES

¡Advertencia! INSTRUCCIONES IMPORTANTES DE SEGURIDAD

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

GUARDE ESTAS INSTRUCCIONES

Varning! VIKTIGA SÄKERHETSANVISNINGAR

Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

SPARA DESSA ANVISNINGAR**Figyelem FONTOS BIZTONSÁGI ELOÍRÁSOK**

Ez a figyelmeztető jel veszélyre utal. Sérülésveszélyt rejtő helyzetben van. Mielőtt bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplő figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján kereshető meg.

ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!**Предупреждение ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ**

Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.

СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ**警告 重要的安全性说明**

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明

警告 安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

주의 **중요 안전 지침**

이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

Aviso **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você se encontra em uma situação em que há risco de lesões corporais. Antes de trabalhar com qualquer equipamento, esteja ciente dos riscos que envolvem os circuitos elétricos e familiarize-se com as práticas padrão de prevenção de acidentes. Use o número da declaração fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham o dispositivo.

GUARDE ESTAS INSTRUÇÕES**Advarsel** **VIGTIGE SIKKERHEDSANVISNINGER**

Dette advarselssymbol betyder fare. Du befinder dig i en situation med risiko for legemeskadedigelse. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.

GEM DISSE ANVISNINGER**تحذير****إرشادات الأمان الهامة**

يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض للإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمات الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في آخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز. قم بحفظ هذه الإرشادات

Upozorenje **VAŽNE SIGURNOSNE NAPOMENE**

Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se nalazi uz pojedino upozorenje pronaći i njegov prijevod.

SAČUVAJTE OVE UPUTE

Upozornění DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY

Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.

USCHOVEJTE TYTO POKYNY**Προειδοποίηση ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ**

Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθειες πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.

ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ**אזהרה****הוראות בטיחות חשובות**

סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כדי לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

שמור הוראות אלה**Opomena VAŽNI BEZBEDNOSNI NAPATSTVIJA**

Симболот за предупредување значи опасност. Се наоѓате во ситуација што може да предизвика телесни повреди. Пред да работите со опремата, бидете свесни за ризикот што постои кај електричните кола и треба да ги познавате стандардните постапки за спречување на несреќни случаи. Искористете го бројот на изјавата што се наоѓа на крајот на секое предупредување за да го најдете неговиот период во преведените безбедносни предупредувања што се испорачани со уредот.

ЧУВАЈТЕ ГИ ОБИЕ НАПАТСТВИЈА**Ostrzeżenie WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA**

Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.

NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ

Upozornenie DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY

Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.

USCHOVAJTE SI TENTO NÁVOD

Terms and Acronyms

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

**Note**

A complete list of terms and acronyms is available in the *Internetworking Terms and Acronyms* guide, at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/cisintwk/ita/index.htm>

- ABR—available bit rate
- AAL5—ATM adaptation layer 5
- ATM-DXI—Asynchronous Transfer Mode-Data Exchange Interface
- AWG—american wire gauge
- CoS—class of service
- CPE—customer premises equipment
- CRC—cyclic redundancy check
- CSU—channel service unit
- CTS—Clear To Send
- DCD—data carrier detect
- DCE—data communications equipment
- DIMM—dual in-line memory module
- 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 service provider certified by Cisco)
- FTP—foil twisted-pair
- HDLC—High-Level Data Link Control
- IGRP—Interior Gateway Routing Protocol
- ILMI—Integrated Local Management Interface
- IPSec—IP Security Protocol
- ISM—Integrated Service Module
- L2F/L2TP—Layer 2 Forwarding Protocol and Layer 2 Tunneling Protocol
- LANE—LAN Emulation
- MAC—Media Access Control
- MB—megabyte
- MM—multimode
- nrt-VBR—nonreal-time variable bit rate
- NVRAM—nonvolatile random-access memory
- OAM AIS—Operation, Administration, and Maintenance alarm indication signal
- OIR—online insertion and removal
- PCI—Peripheral Component Interconnect
- PCMCIA—Personal Computer Memory Card International Association
- PPP—Point-to-Point Protocol
- QoS—quality of service
- rcp—remote copy protocol
- RFI—radio frequency interference
- RIP—Routing Information Protocol
- RISC—Reduced Instruction Set Computer
- RTS—Request To Send
- SAR—segmentation and reassembly
- SDRAM—synchronous dynamic random-access memory
- SIMM—single in-line memory module
- SMDS—Switched Multimegabit Data Service
- 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
- UBR—unspecified bit rate
- UDP—User Datagram Protocol

- UNI—User-Network Interface
- UTP—unshielded twisted-pair
- VC—virtual circuit
- VPN—Virtual Private Network

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation at this URL:

<http://www.cisco.com/univercd/home/home.htm>

You can access the Cisco website at this URL:

<http://www.cisco.com>

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

Ordering Documentation

You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Ordering tool:
<http://www.cisco.com/en/US/partner/ordering/index.shtml>
- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

Documentation Feedback

You can send comments about technical documentation to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

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

We appreciate your comments.

Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, Cisco Technical Support provides 24-hour-a-day, award-winning technical assistance. The Cisco Technical Support Website on Cisco.com features extensive online support resources. In addition, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not hold a valid Cisco service contract, contact your reseller.

Cisco Technical Support Website

The Cisco Technical Support Website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, 365 days a year at this URL:

<http://www.cisco.com/techsupport>

Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

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

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool automatically provides recommended solutions. If your issue is not resolved using the recommended resources, your service request will be assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

<http://www.cisco.com/techsupport/servicerequest>

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)

EMEA: +32 2 704 55 55

USA: 1 800 553 2447

For a complete list of Cisco TAC contacts, go to this URL:

<http://www.cisco.com/techsupport/contacts>

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—Your network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

<http://www.cisco.com/go/marketplace/>

- The Cisco *Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the Cisco Product Catalog at this URL:

<http://cisco.com/univercd/cc/td/doc/pcat/>

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

<http://www.ciscopress.com>

- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

<http://www.cisco.com/packet>

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

<http://www.cisco.com/go/iqmagazine>

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

<http://www.cisco.com/ipj>

- World-class networking training is available from Cisco. You can view current offerings at this URL:

<http://www.cisco.com/en/US/learning/index.html>



Product Overview

This chapter provides physical and functional overviews of Cisco uBR7100 series universal broadband routers and contains the following sections that describe router hardware, major components, and functions of hardware-related features:

- [Product Description, page 1-1](#)
- [Fixed Interface Units, page 1-6](#)
- [Field-Replaceable Units, page 1-7](#)
- [Functional Overview, page 1-11](#)



Note

Unless otherwise indicated, the term *Cisco uBR7100 series* in this manual refers to all models of the Cisco uBR7100 series universal broadband router, including the Cisco uBR7111, Cisco uBR7111E, Cisco uBR7114, and Cisco uBR7114E routers.

Product Description

The Cisco uBR7100 series universal broadband router is a cable modem termination system (CMTS) that provides Internet, local area network (LAN), and wide area network (WAN) access for cable modems and set-top boxes (STBs) over a coaxial cable connection. The router enables high-speed data services to be packaged similar to basic cable television service or video programming.

The Cisco uBR7100 series routers support two-way data and digitized voice connectivity over a bidirectional cable television and IP backbone network, using one of the following two standards:

- The Cisco uBR7111 and Cisco uBR7114 support the Data-over-Cable Service Interface Specifications (DOCSIS)—DOCSIS 1.0 and DOCSIS 1.1. DOCSIS supports the 6 MHz North American channel plans using the ITU J.83 Annex B RF standard. The downstream uses a 6 MHz channel width in the 85 to 860 MHz frequency range, and the upstream supports the 5 to 42 MHz frequency range.
- The Cisco uBR7111E and Cisco uBR7114E support the European Data-over-Cable Service Interface Specifications (EuroDOCSIS)—EuroDOCSIS 1.0 and EuroDOCSIS 1.1. EuroDOCSIS supports the 8 MHz Phase Alternating Line (PAL) and Systeme Electronique Couleur Avec Memoire (SECAM) channel plans using the ITU J.112 Annex A RF standard. The downstream uses an 8 MHz channel width in the 85 to 860 MHz frequency range, and the upstream supports multiple channel widths in the 5 to 65 MHz frequency range.

The Cisco uBR7100 series router is a cost-effective solution for cable operators, Internet service providers, multiple tenant units (MTUs), and multiple dwelling unit (MDU) operators such as hotels, hospitals, and dormitories. The router contains a combination of fixed and modular RF, LAN, and WAN interfaces, which simplifies operation while still providing a system that is flexible enough to meet different customers' needs. The Cisco uBR7100 series chassis includes an integrated upconverter and embedded dual 10/100BASE-T Ethernet interface.

Cisco uBR7100 Series Models

The Cisco uBR7100 series router has two models.

Cisco uBR7111 and Cisco uBR7111E

The Cisco uBR7111 and Cisco uBR7111E universal broadband routers provide the following fixed interfaces:

- A LAN interface with two Ethernet/FastEthernet ports
- A cable interface with one downstream port and one upstream port. The downstream port can be output either as an RF signal through the integrated upconverter or as an IF signal for processing by an external upconverter.
- A modular single-width port adapter for flexibility in WAN interface connections.

The Cisco uBR7111 router supports DOCSIS cable plants, and the Cisco uBR7111E supports EuroDOCSIS cable plants.

Cisco uBR7114 and Cisco uBR7114E

The Cisco uBR7114 and Cisco uBR7114E universal broadband routers provide the following fixed interfaces:

- A LAN interface with two Ethernet/FastEthernet ports
- A cable interface with one downstream port and four upstream ports. The downstream port can be output either as an RF signal through the integrated upconverter or as an IF signal for processing by an external upconverter.
- A modular single-width port adapter allows flexibility in WAN interface connections.

The Cisco uBR7114 router supports DOCSIS cable plants, and the Cisco uBR7114E supports EuroDOCSIS cable plants.

Cisco uBR7100 Series Router Operational Features

The Cisco uBR7100 series routers have the following operational features:

- Single-side serviceability—All cables and LEDs are available from the rear panel.
- Environmental monitoring and reporting functions—Allow you to maintain normal system operation by resolving adverse environmental conditions prior to loss of operation.
- Front to back airflow—Internal fans provide all necessary cooling. External fan assemblies are not required.

- Online insertion and removal (OIR)—Allows you to add, replace, or remove the modular port adapter without interrupting the system.
- Downloadable software—Allows you to load new images into flash memory remotely, without having to physically access the router, for fast, reliable upgrades.
- Network management using integrated SNMP agent—Allows you to remotely manage the router. Cisco uBR7100 series routers support CiscoWorks and CiscoView network management software.
 - CiscoWorks—Lets you monitor complex internetworks that use Cisco routing devices and helps you plan, troubleshoot, and analyze your network. CiscoWorks uses the Simple Network Management Protocol (SNMP) to monitor and control any SNMP device on the network.
 - CiscoView—A graphical SNMP-based device management tool that provides powerful real-time views of your networked Cisco devices. These views deliver a continuously updated physical picture of device configuration and performance conditions, with simultaneous views available for multiple device sessions. CiscoView runs from a centralized network management site from which you can review, reconfigure, and monitor essential device data from a simple GUI (that displays information such as dynamic status reports, performance statistics, and network inquiries) without having to physically check connections for each device, module, or port at every different or remote location.

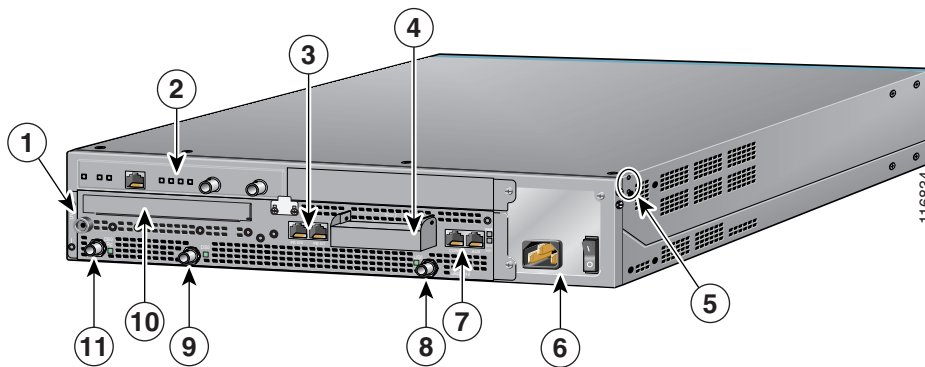
Cisco uBR7100 Series Routers Physical Description

Each model includes the following physical features:

- Cable interface—One downstream and either one or four upstreams, depending on the model of the router. The cable interface supports the DOCSIS 6 MHz, North American channel plan or the EuroDOCSIS 8 MHz PAL and SECAM channel plan, depending on the router model.
- Integrated upconverter—The downstream channel can be output using the router's integrated upconverter, producing an RF signal suitable for transmission over the coaxial cable network, saving both the money and rack space required by an external upconverter. However, for existing cable plants, the downstream can also be output to an external upconverter.
- Fixed LAN interface with two ports—10BASE-T/100BASE-TX autosensing Ethernet/Fast Ethernet (full and half duplex) equipped with an RJ-45 receptacle.
- Modular port adapter slot—Supports a single-width port adapter, including the Ethernet/FastEthernet, Serial, high-speed serial interface (HSSI), and ATM interfaces.
- One console port—Equipped with an RJ-45 receptacle.
- One auxiliary port—Equipped with an RJ-45 receptacle.
- Two PCMCIA card slots—Flash disk or flash memory cards contain the default Cisco IOS software image and can act as backup devices for CMTS and cable modem configuration files.
- LEDs—LEDs for system ready, power, PCMCIA card slots, for the fixed LAN and cable ports, and for the modular port adapter interfaces.
- Up to 256 MB of synchronous dynamic random-access memory (SDRAM) system memory with 64 MB of fixed SDRAM packet memory—Three dual in-line memory modules (DIMMs) on the network processor board.
- 2 rack-unit (2RU) chassis (front or rear rack-mountable)
- Single AC power supply, with the option of different power cords, depending on the country of operation.

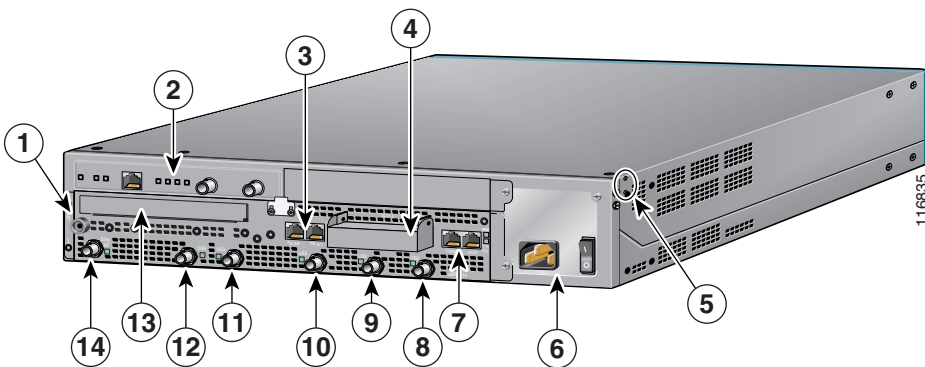
All interface connections and LEDs are located at the back of the router. [Figure 1-1](#) shows the rear panel of the Cisco uBR7111 and Cisco uBR7111E routers. [Figure 1-2](#) shows the rear panel of the Cisco uBR7114 and Cisco uBR7114E routers.

Figure 1-1 Cisco uBR7111 and Cisco uBR7111E Universal Broadband Router—Rear Panel View



1	ESD receptacle	5	Ground receptacles	9	DS0
2	Modular port adapter	6	Power supply	10	Module slot (not used)
3	Fixed Fast Ethernet LAN ports	7	Console and auxiliary ports	11	DS0 RF
4	PCMCIA card slots (covered)	8	US0		

Figure 1-2 Cisco uBR7114 and Cisco uBR7114E Universal Broadband Router—Rear Panel View



1	ESD receptacle	6	Power supply	11	US3
2	Modular port adapter	7	Console and auxiliary ports	12	DS0
3	Fixed Fast Ethernet LAN ports	8	US0	13	Module slot (not used)
4	PCMCIA card slots (covered)	9	US1	14	DS0 RF
5	Ground receptacle	10	US2		



Note

The grounding receptacles are shown in [Figure 1-1](#) and [Figure 1-2](#) are for the chassis grounding that is required by the Telcordia specifications for central office use. Power supply grounding is provided by the three-pronged grounded AC power supply outlet.

Figure 1-3 shows the front panel for all models of the Cisco uBR7100 series routers.

Figure 1-3 Cisco uBR7100 Series Front Panel



All Cisco uBR7100 series routers have one power supply with one AC-input power receptacle. A power cable connects the AC-input power supply to the site AC power source. The router's main power switch is located next to the AC-input power receptacle. Separate power cords are available, depending on the country of operation.

On the side of each chassis are two chassis ground receptacles—choose the most convenient set for a chassis ground connection for a two-hole grounding lug, and the other set can provide a mounting location for the cable management bracket. On the back of the chassis, there is a receptacle for electrostatic discharge (ESD) equipment.

Four internal fans draw cooling air into the chassis (back to front) and across internal components to maintain an acceptable operating temperature. There are four environmental sensors for monitoring the cooling air as it leaves the chassis. For more information on environmental monitoring, see the [“Environmental Monitoring and Reporting Functions”](#) section on page 6-2.



Caution

To ensure the proper flow of cooling air across the internal components, a port adapter must be installed in the port adapter slot. If no port adapter is installed, install a blank port adapter (the product number is MAS-7100-PABLANK=). Slot 5 has a blank face plate. For proper airflow, make sure that a blank faceplate is always installed in slot 5. (The product number is SM-BLANK=).

The modular port adapter slides into the chassis slot and connects directly to the router; there are no internal cables to connect.

The port adapter, fixed cable interface, and fixed LAN interface connect to two peripheral component interconnect (PCI) buses on the router's backplane that provide a path to packet I/O memory and the system processor. For more information, see the [“Peripheral Component Interconnect Buses”](#) section on page 1-14.

Cisco uBR7100 series routers can be installed on a tabletop or in an equipment rack. Rubber feet for tabletop installation are included in the accessory kit that shipped with your router.

A rack-mount and cable-management kit is also standard equipment included with all Cisco uBR7100 series routers when they are shipped from the factory. The kit provides the hardware needed to mount the router in a standard 19-inch, four-post or telco-type equipment rack. The rack-mount kit also provides the hardware necessary to manage the interface cables attached to the router.



Note

Hardware to install the Cisco uBR7100 series in a 23-inch or 24-inch rack can also be ordered separately (the order number is ACS-7100-RMK=).

Instructions for installing the router on a tabletop, installing the router in an equipment rack, and attaching the cable-management bracket are given in [Chapter 3, “Installing Cisco uBR7100 Series Universal Broadband Routers.”](#)

Fixed Interface Units

The Cisco uBR7100 series universal broadband router contains the following fixed interfaces:

- [Ethernet/Fast Ethernet LAN Interface, page 1-6](#)
- [RF Cable Interface, page 1-6](#)

Ethernet/Fast Ethernet LAN Interface

The Cisco uBR7100 series contains a fixed LAN Ethernet/Fast Ethernet autosensing interface with two separately routable 100BASE-TX ports. Both ports support full-duplex and half-duplex operation, and automatically determine whether the attached network is a 10-Mbps 10BASE-T Ethernet or a 100-Mbps, 100BASE-TX Fast Ethernet network. Each port uses an RJ-45 connector with Category 5 unshielded twisted-pair (UTP) wiring.

RF Cable Interface

The Cisco uBR7100 series router includes a fixed cable interface card that provides one downstream port and from one to four upstream ports, depending on the model.

On the Cisco uBR7111 and Cisco uBR7114 routers, the cable interface supports the North American DOCSIS channel plan, with a 6 MHz National Television Systems Committee (NTSC) channel width, with a 5 to 42 MHz upstream frequency range. The downstream supports the 54 to 858 MHz frequency range with 64 QAM and 256 QAM data rates, while the upstream supports QPSK and 16 QAM data rates.

On the Cisco uBR7111E and Cisco uBR7114E routers, the cable interface supports the EuroDOCSIS channel plan, with an 8 MHz pulse amplitude modulation (PAM) and SECAM channel width, with a 5 to 65 MHz upstream frequency range. The downstream supports the 54 to 858 MHz frequency range with 64 QAM and 256 QAM data rates, while the upstream supports QPSK and 16 QAM data rates.

Two downstream connectors are provided:

- DS0 RF—Outputs the downstream after it has been processed by the router’s integrated upconverter, thereby creating an RF signal suitable for connection to a combiner and transmission on the coaxial cable network.
- DS0—Outputs the downstream as an IF signal, requiring an external upconverter to process the signal for output on the coaxial cable network.

**Note**

On the Cisco uBR7111E and Cisco uBR7114E routers, the DS0 connector is automatically muted when the DS0 RF port is enabled.

**Note**

Only one downstream connector should be connected and used for data traffic on the network at any one time. On the Cisco uBR7111 and Cisco uBR7114 routers, the second downstream connector, however, can be used for local monitoring purposes.

The Cisco uBR7111 and Cisco uBR7111E routers support one upstream port, and the Cisco uBR7114 and Cisco uBR7114E routers support four upstream ports.

Field-Replaceable Units

Cisco uBR7100 series routers have the following field-replaceable units (FRUs):

- [Port Adapters, page 1-7](#)
- [Flash Disks, page 1-9](#)
- [SDRAM Memory, page 1-10](#)
- [Rack-Mount and Cable-Management Kit, page 1-11](#)

Port Adapters

The Cisco uBR7100 series routers support a wide range of port adapters. Supported port adapters include: Ethernet, Fast Ethernet, Synchronous Serial, HSSI, ATM, and SONET interfaces, see [Table 1-1](#).

**Note**

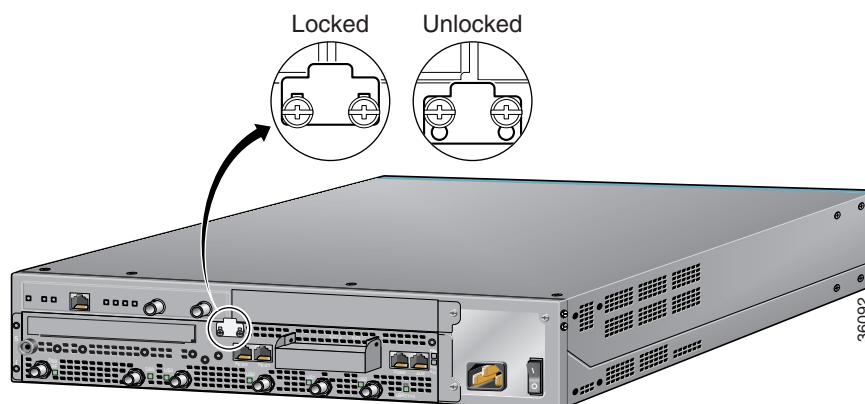
For the most current information on the supported port adapters in the Cisco uBR7100 series routers, see the Cisco IOS release notes or the *Cisco Product Catalog* at the following URL:

<http://cisco.com/univercd/cc/td/doc/pcat/>

All port adapters available for the Cisco uBR7100 series routers connect directly to the router and are locked into position by a locking tab and two screws (see [Figure 1-4](#)). Refer to the specific port adapter documentation at the following URL:

http://www.cisco.com/en/US/products/hw/modules/ps2033/prod_module_series_home.html

Figure 1-4 Port Adapter Locking Tabs



**Caution**

To ensure adequate airflow across the router port adapters, a port adapter or a blank port adapter must be installed in each port adapter slot. The product number for the blank port adapter is MAS-7100-PABLANK=.

Table 1-1 lists and describes the port adapters supported by Cisco uBR7100 series routers. For information about specific Cisco IOS release compatibility, refer to the Cisco IOS release notes at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/cable/ubr7100/ub7100rn/index.htm>

Table 1-1 Port Adapters Used with the Cisco uBR7100 Series Universal Broadband Router

WAN Technology	Product Description	End of Life
Ethernet		
	PA-4E—4-port Ethernet 10BASE-T port adapter	No
	PA-8E—8-port Ethernet 10BASE-T port adapter	Yes
Fast Ethernet		
	PA-FE-TX—1-port 100BASE-TX Fast Ethernet port adapter	No
	PA-FE-FX—1-port 100BASE-TX Fast Ethernet port adapter	No
	PA-2FE-TX—2-port 100BASE-TX Fast Ethernet port adapter	No
	PA-2FE-FX—2-port 100BASE-TX Fast Ethernet port adapter	No
Serial		
	PA-E3—1-port high-speed serial E3 interface port adapter	No
	PA-T3—1-port serial T3 interface port adapter	No
	PA-T3+—1-port serial T3 interface port adapter	No
	PA-2E3—2-port high-speed serial E3 interface port adapter	No
	PA-2T3—2-port serial T3 interface port adapter	No
	PA-2T3+—2-port serial T3 interface port adapter	No
	PA-4T+—4-port synchronous serial port adapter	No
	PA-4E1G-75—4-port unbalanced (75-ohm) E1-G.703/G.704 synchronous serial port adapter	No
	PA-4E1G-120—4-port balanced (120-ohm) E1-G.703/G.704 synchronous serial port adapter	No
	PA-8T-232—8-port EIA/TIA-232 synchronous serial port adapter	Yes
	PA-8T-V35—8-port V.35 synchronous serial port adapter	No
	PA-8T-X21—8-port X.21 synchronous serial port adapter	Yes
	PA-MC-2T1—2-port multichannel DS1 Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) single-wide port adapter	Yes
	PA-MC-4T1—4-port multichannel DS1 ISDN PRI single-wide port adapter	No
HSSI		
	PA-H—1-port HSSI port adapter	Yes
	PA-2H—2-port HSSI port adapter	No

Table 1-1 Port Adapters Used with the Cisco uBR7100 Series Universal Broadband Router (continued)

WAN Technology	Product Description	End of Life
ATM		
	PA-A3-E3—1-port E3 ATM, PCI-based, single-width port adapter, that uses an E3 interface with a coaxial cable BNC connector.	No
	PA-A3-OC3MM—1-port OC-3c ATM, PCI-based multimode port adapter	No
	PA-A3-OC3SMI—1-port OC-3c ATM, PCI-based single-mode intermediate reach port adapter	Yes
	PA-A3-OC3SML—1-port OC-3c ATM, PCI-based single-mode long reach port adapter	No
	PA-A3-8T1/IMA—ATM inverse multiplexer over ATM port adapter with 8 T1 ports	No
Packet-over-SONET		
	PA-POS-OC3SMI—1-port OC3 single-mode, intermediate reach port adapter	No

Flash Disks

The flash disk is the default memory device that ships with your Cisco uBR7100 series router. Cisco uBR7100 series routers support two installed PCMCIA flash disks that contain the default Cisco IOS software image. Flash disks can be installed in slot 0 and slot 1 of the PCMCIA card slots located at the back of the router. Slot 0 is the top slot and slot 1 is the bottom slot.

To ensure proper electromagnetic compatibility (EMC), the PCMCIA card slot has a cover that is secured with a captive screw.



Tip

The flash disk slots are physically identified as slot 0 and slot 1, but they are addressed as **disk0** and **disk1**, respectively, when accessing the flash disks with Cisco IOS commands.

For procedures that explain the installation and use of the flash disk, see the [“Flash Memory Card Usage” section on page 6-5](#). Also see the *Using the Flash Disk* document that accompanies every flash disk shipped from the factory.

[Table 1-2](#) lists the flash disk memory options and their product numbers.

Table 1-2 Flash Disk Memory Options

Memory Size	Product Number	Spare Product Number
48 MB	MEM-7100-FLD48M	MEM-7100-FLD48M=
64 MB	MEM-7100-FLD64M	MEM-7100-FLD64M=
128 MB	MEM-7100-FLD128M	MEM-7100-FLD128M=

SDRAM Memory



Warning

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

SDRAM memory consists of three DIMMs (on the network processor card) that contain the packet and system memory. By default, each chassis comes with 64 MB of fixed packet memory and 128 MB of upgradable system memory. SDRAM system memory is upgradable to 256 MB; packet memory is fixed at 64 MB.

For more information on the network processor, see the “[Network Processor Card](#)” section on page 1-15. For information about replacing the SDRAM, see the “[Upgrading the SDRAM Memory Modules](#)” section on page 6-11.



Note

For information on how to replace the SDRAM memory, refer to the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/core/7206/fru/memory/index.htm>

Table 1-3 lists the SDRAM product numbers for both packet memory and system memory. Where applicable, product numbers are for spares (to replace existing memory configurations) and for upgrades (to upgrade the existing memory configuration to a larger value).

Table 1-3 SDRAM DIMM Configurations

Total SDRAM	Memory Configuration	Product Number
Packet Memory SDRAM		
64 MB ¹	1 64 MB DIMM in slot DIMM 0	MEM-7120/40-64P=
System Memory SDRAM		
128 MB ²	1 128 MB DIMM in slot DIMM 1	MEM-7120/40-128S=
192 MB	1 128 MB DIMM in slot DIMM 1 and 1 64 MB DIMM in slot DIMM 2	MEM-7120/40-192S (when ordering the original configuration) MEM-7120/40-64S= (to upgrade the default configuration)
256 MB	2 128 MB DIMMs; 1 in each slot (DIMM 1 and DIMM 2)	MEM-7120/40-256S (when ordering the original configuration) MEM-7120/40-128S= (to upgrade the default configuration)

1. Packet memory is fixed at 64 MB on the Cisco uBR7100 series routers.
2. This is the default memory configuration for all Cisco uBR7100 series routers.



Note

The amount of memory installed in slot DIMM 1 must be greater than or equal to the amount of memory installed in slot DIMM 2. If desired, slot DIMM 2 can be zero.

Slot DIMM 0 is used exclusively for packet memory and is fixed at 64 MB in the factory.

Rack-Mount and Cable-Management Kit

The rack-mount and cable-management kit for Cisco uBR7100 series routers consists of rack-mount brackets and a cable-management bracket that are designed for mounting your router in 19-inch, four-post or telco-type equipment racks. The kit is shipped with each Cisco uBR7100 series router and is also available as a single FRU.

**Note**

Rubber feet for tabletop installation are included in the accessory kit that shipped with your router. Hardware for mounting the router in a 23- or 24-inch rack is available separately. The product number for this kit is ACS-7100-RMK=.

For detailed instructions about how to install the rack-mount and cable-management brackets on your Cisco uBR7100 series router, see the [“Attaching the Cable-Management Bracket”](#) section on page 3-7.

Functional Overview

The following sections provide a functional overview of Cisco uBR7100 series routers to help you become familiar with the capabilities of the router:

- [Chassis Slot and Logical Interface Numbering, page 1-11](#)
- [Online Insertion and Removal, page 1-14](#)
- [Peripheral Component Interconnect Buses, page 1-14](#)
- [Network Processor Card, page 1-15](#)
- [System LEDs and Reset Button, page 1-18](#)

Chassis Slot and Logical Interface Numbering

In Cisco uBR7100 series routers, the *slot number* is the location in the chassis where the interface resides and the *port number* is the physical port associated with that slot. Cisco uBR7100 series router slots are numbered 0 through 5. Interfaces in the Cisco IOS software are identified by a type, slot number, and port number. The number of physical ports depends on the type of modular port adapter or fixed interface. For example, Fast Ethernet 0/1 indicates port 1 on the fixed LAN interface in slot 0.

Slots in the Cisco uBR7100 series are numbered as follows:

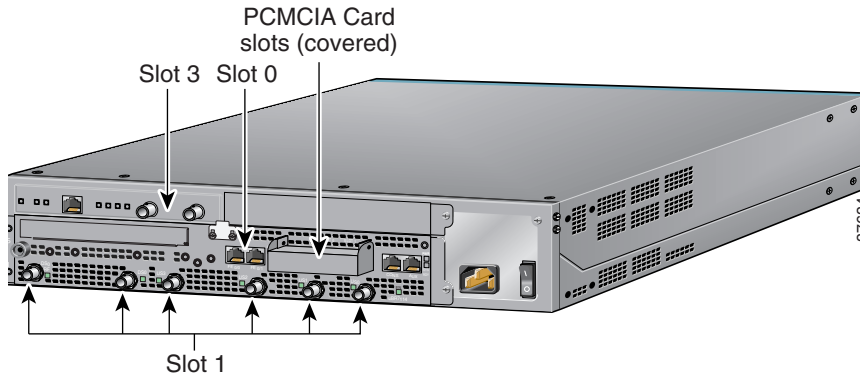
- Slot 0—Fixed LAN (Fast Ethernet) interface
- Slot 1—Fixed RF interface
- Slot 3—Modular port adapter

**Note**

Slots 2, 4, and 5 are not used on the Cisco uBR7100 series router.

[Figure 1-5](#) illustrates the slot placement on Cisco uBR7114 and Cisco uBR7114E routers. The placement on the Cisco uBR7111 and Cisco uBR7111E routers is identical.

Figure 1-5 Slot Numbering—Cisco uBR7100 Series



Note

The slots for the PCMCIA flash disk memory cards are identified as slot 0 and slot 1 on the chassis, but they are referenced as **disk0** and **disk1** when using Cisco IOS commands.

Identifying Interface Information in the Software

You can identify interfaces by using software commands. To display information about all interfaces, use the **show interfaces** command. To display information about a specific interface, use the **show interfaces** command with the interface type, slot number, and port number in the format **show interfaces type slot/port**.

The following example shows how the **show interfaces** command, used without arguments, displays status information (including the slot and port number) for each interface in a Cisco uBR7100 series router. In the following example, most of the status information for each interface is omitted:

```
Router# show interfaces
```

```
FastEthernet0/0 is up, line protocol is up
  Hardware is DEC21140A, address is 0002.b9ff.7c00 (bia 0002.b9ff.7c00)
  Internet address is 10.7.35.1/16
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    (statistical information omitted)
FastEthernet0/1 is administratively down, line protocol is down
  Hardware is DEC21140A, address is 0002.b9ff.7c01 (bia 0002.b9ff.7c01)
  Internet address is 10.1.1.2/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    (statistical information omitted)
Cable1/0 is up, line protocol is up
  Hardware is BCM3210 ASIC, address is 0002.b9ff.7c1c (bia 0002.b9ff.7c1c)
  Internet address is 20.35.1.1/16
  MTU 1500 bytes, BW 27000 Kbit, DLY 1000 usec,
    (statistical information omitted)
Interface Cable1/0
Hardware is IMC11
BCM3210 revision=0x56B2
Upconverter info: Config status 0x4E, Dynamic Status 0x0
Upconverter output is Enabled
  (statistical information omitted)

Cable1/0 Downstream is up
Frequency 669.0000 MHz, Channel Width 6 MHz, 256-QAM, Symbol Rate 5.360537 Msps
FEC ITU-T J.83 Annex B, R/S Interleave I=32, J=4
Downstream channel ID: 0
```



```
Cable1/0 Upstream 0 is up
  Frequency 38.000 MHz, Channel Width 3.200 MHz, 16-QAM Symbol Rate 2.560 Msps
  Spectrum Group is overridden
  SNR 30.8820 dB
    (statistical information omitted)
```

```
FastEthernet3/0 is up, line protocol is up
  Hardware is DEC21140A, address is 0002.b9ff.7c28 (bia 0002.b9ff.7c28)
  Internet address is 10.100.68.100/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    (statistical information omitted)
```

You can also use arguments such as the interface type (Ethernet, Token Ring, ATM, and so forth) and the slot/port number to display information about a specific interface only. The following example shows the display for the fixed LAN (Fast Ethernet interface) port 0 in slot 0:

```
Router# show interfaces fastethernet 0/0
FastEthernet0/0 is up, line protocol is up
  Hardware is DEC21140A, address is 0050.73ff.6300 (bia 0050.73ff.6300)
  Internet address is 10.0.0.0/1
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Half-duplex, 10Mb/s, 100BaseTX/FX
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 00:00:04, output 00:00:03, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy:fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 2000 bits/sec, 1 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    134 packets input, 41451 bytes
      Received 134 broadcasts, 0 runts, 0 giants, 0 throttles
      0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
      0 watchdog, 0 multicast
      0 input packets with dribble condition detected
    26 packets output, 5281 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out
```

For information on the other commands used to configure the router, refer to the Cisco IOS configuration guides and command references. See the [“Related Documentation”](#) section on page viii.

MAC Addresses

The *Media Access Control (MAC)* or *hardware* address is a standardized data-link layer address that is required for certain network interface types. These addresses are not used by other devices in the network; they are specific and unique to each port. The router uses a specific method to assign and control the MAC addresses of its port adapter.

All LAN interfaces (ports) require unique MAC addresses. Typically, the MAC address of an interface is stored on a memory component that resides directly on the interface circuitry; however, the online insertion and removal (OIR) feature requires a different method. For a description of OIR, see the [“Online Insertion and Removal”](#) section on page 1-14.

The OIR feature allows you to remove a port adapter and replace it with another identically configured one. If the new port adapter matches the port adapter you removed, the system immediately brings it online.

To allow OIR, an address allocator with unique MAC addresses is stored in an EEPROM on the router. Each address is reserved for a specific port and slot in the router regardless of whether a port adapter resides in that slot.

The MAC addresses for port adapters are assigned to slot 3 in Cisco uBR7100 series routers, not to a particular port adapter. Assigning MAC addresses to the slot and not to the port adapter allows you to remove a port adapter and insert the port adapter into other routers without causing the MAC addresses to move around the network or to be assigned to multiple devices.

**Note**

Storing the MAC addresses for every slot in one central location means the addresses stay with the memory device on which they are stored.

Online Insertion and Removal

The modular port adapter installed in Cisco uBR7100 series routers supports OIR. This function allows you to install and replace a port adapter while the router is operating; you do not need to notify the software or shut down the system power. This provides a method that is seamless to end users on the network, maintains all routing information, and preserves sessions.

The following is a functional description of OIR for background information only; for specific procedures for installing and replacing a port adapter in a Cisco uBR7100 series router, see the configuration note that ships with each port adapter.

Each port adapter has a bus connector that connects it to the router. Each connector has a set of tiered pins in three lengths that send specific signals to the system as they make contact with the port adapter. The system assesses the signals it receives and the order in which it receives them to determine if a port adapter is being removed or inserted into the router. From these signals, the system determines whether to reinitialize a new interface or shut down a removed interface. For example, when you insert a port adapter, the longest pins make contact with the port adapter first, and the shortest pins make contact last. The system recognizes the signals and the sequence in which it receives them.

When you remove or insert a port adapter in a Cisco uBR7100 series router, the port adapter pins send signals to notify the system, which then performs as follows:

1. Rapidly scans the system for configuration changes.
2. Initializes all newly inserted port adapters, noting any removed interfaces and placing them in the administratively shutdown state.
3. Brings all previously configured interfaces on the port adapter back to the state they were in when they were removed. Any newly inserted interfaces are put in the administratively shutdown state, as if they were present (but not configured) at boot time. If a similar port adapter type is reinserted into a slot, its ports are configured and brought online up to the port count of the original port adapter.

Peripheral Component Interconnect Buses

All interfaces connect to two Peripheral Component Interconnect (PCI) buses on the router that provide a path to packet I/O memory and the network processor. Slots 1 and 3 use PCI bus 0, and slot 0 uses PCI bus 1. The maximum recommended bandwidth points on each PCI bus is 600 points.

**Note**

Slots 2, 4, and 5 are not used in the Cisco uBR7100 series routers.

Network Processor Card

The network processor card resides inside the chassis and is shown in [Figure 1-6 on page 1-16](#). The network processor card provides the following features:

- Senses OIR of the port adapter
- Bridges the PCI buses from the interfaces to packet memory
- Arbitrates traffic across the PCI buses
- Generates the clock signals for the interfaces on each PCI bus

The network processor card also performs the following system management functions:

- Sending and receiving routing protocol updates
- Managing tables, caches, and buffers
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management and the console or Telnet interface
- Accounting and switching of data traffic
- Booting and reloading images
- Managing port adapters (recognition and initialization during OIR)

**Note**

For instructions for removing and replacing memory components on the network processor card, such as the SDRAM DIMMs, refer to *Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller* at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/core/7206/fru/memory/index.htm>

The network processor card consists of the following components:

- Reduced Instruction Set Computing (RISC) microprocessor running at 175 MHz
- Two system controllers—Provide processor access to two separate banks of SDRAM and permit devices on both PCI buses to access either SDRAM bank. This means that devices on different PCI buses can access different SDRAM banks simultaneously.
- Upgradable memory modules—SDRAM system memory defaults to 128 MB and can be upgraded to either 192 MB or 256 MB. (SDRAM packet memory is fixed at 64 MB.) SDRAM memory stores packets received or sent from network interfaces, routing tables, and network accounting applications. The two independent SDRAM memory arrays allow concurrent access by interfaces and the processor. For information about accessing the SDRAM memory modules, refer to the [“Upgrading the SDRAM Memory Modules” section on page 6-11](#).

**Note**

The network processor card contains two SDRAM slots for user-configurable system memory, DIMM 1 and DIMM 2. The amount of memory installed in slot DIMM 1 must be greater than or equal to the memory installed in slot DIMM 2. Slot DIMM 2 is zero for the default memory configuration of 128 MB. Slot DIMM 0 is used only for packet memory and is fixed at 64 MB in the factory.

- Cache memory—Cisco uBR7100 series routers have two levels of cache: a primary cache that is internal to the microprocessor and a secondary, 2-MB (fixed) external cache that provides additional high-speed storage for data and instructions.

- Four environmental sensors—Monitor the cooling air as it leaves the chassis.
- Boot ROM—Stores sufficient code for booting the Cisco IOS software.
- Flash memory single in-line memory module (SIMM)—Stores the boot image used to boot the router.
- NVRAM onboard flash memory—Stores the system configuration and environmental monitoring logs. (The NVRAM uses lithium batteries to maintain its contents when disconnected from power.)

Figure 1-6 Network Processor Card

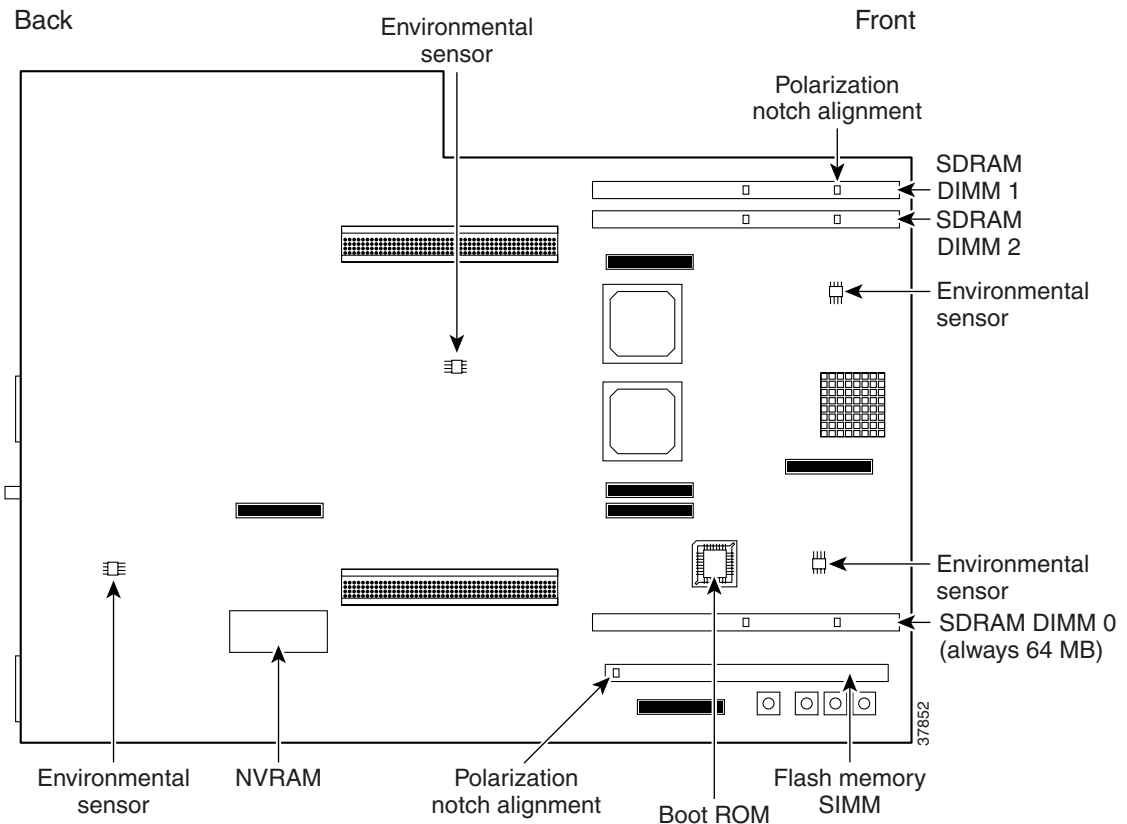


Table 1-4 describes the memory types.

Table 1-4 Network Processor Memory, Cache, and Flash Disk Information

Memory Type	Size	Quantity	Description	Location
SDRAM packet memory	64 MB	1 fixed SDRAM slot	Fixed at 64 MB DIMM at the factory	DIMM 0 = U16
SDRAM system memory	128 to 256 MB	2 configurable SDRAM slots	64 or 128-MB DIMMs (based on maximum SDRAM required)	DIMM 1 = U13 DIMM 2 = U14
Boot ROM	512 KB	1	OTP ¹ ROM for the ROM monitor program	Socket U21
Flash memory SIMM	8 MB	1	Contains the default boot helper image	Flash SIMM socket P2
NVRAM	128 KB	1	Nonvolatile EPROM for the system configuration file	U69

Table 1-4 Network Processor Memory, Cache, and Flash Disk Information (continued)

Memory Type	Size	Quantity	Description	Location
Primary cache	32 KB (instruction), 32 KB (data)	–	Processor's primary internal cache	Internal to processor
External cache	2 MB (fixed)	–	Secondary external cache for Cisco uBR7100 series processors	–
Flash disk	48 MB and 128 MB	Up to 2	Contains the default Cisco IOS image	PC Card slot 0 and slot 1 ²

1. One-time programmable.
2. The flash disk card slots are physically identified as slot 0 and slot 1, but are addressed as **disk0** and **disk1** when using Cisco IOS commands.

Identifying the Network Processor and the Cisco IOS Release Software Version

To identify the processor and software version installed in your Cisco uBR7100 series router, use the **show version** command. The following example using a Cisco uBR7100 series router shows sample output from the **show version** command:

```
Router# show version
```

```
Cisco Internetwork Operating System Software
IOS (tm) EGR Software (UBR7100-P-M), Released Version 12.1(5)EC
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Thu 10-Aug-01 00:56 by
Image text-base: 0x60008968, data-base: 0x60F84000

ROM: System Bootstrap, Version 12.1(5r)EC, RELEASE SOFTWARE (fc1e)
BOOTFLASH: EGR Software (UBR7100-BOOT-M), Released Version 12.1(5)EC

RACK7522_uBR7114 uptime is 21 hours, 45 minutes
System returned to ROM by reload at 05:53:22 PST Wed Aug 17 2001
System image file is "ubr7100-p-mz"

cisco uBR7114 (EGR) processor (revision A) with 57344K/73728K bytes of memory.
Processor board ID 15495273
R527x CPU at 225Mhz, Implementation 40, Rev 10.0, 2048KB L2 Cache
Last reset from power-on
X.25 software, Version 3.0.0.
National clock card with T1 controller
2 FastEthernet/IEEE 802.3 interface(s)
1 Cable Modem network interface(s)
125K bytes of non-volatile configuration memory.

46976K bytes of ATA PCMCIA card at slot 0 (Sector size 512 bytes).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0
```

Other Interfaces

Console port—Provides access for a local terminal and is equipped with an RJ-45 receptacle.

Auxiliary port—Provides access for a modem for remote access and is equipped with an RJ-45 receptacle.

Two PCMCIA card slots—Contain flash disks or flash memory cards that provide the default Cisco IOS software image.

System LEDs and Reset Button

The LEDs indicate the status of the router. The CPU reset button allows you to reset the entire system. The LEDs are shown in [Figure 1-7](#) and [Figure 1-8](#), and are described in [Table 1-5](#).

Caution

To prevent system errors and problems, use the CPU reset button only at the direction of your service representative.

Figure 1-7 Cisco uBR7111 System LEDs

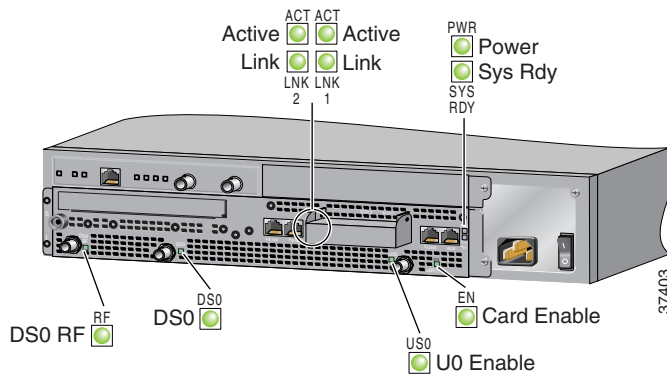


Figure 1-8 Cisco uBR7114 System LEDs

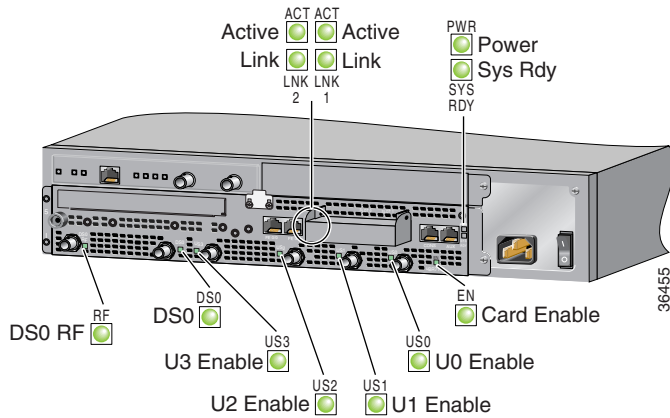


Table 1-5 Cisco uBR7100 Series System LED Descriptions

LED Label	Color	State	Function
ACT 0 ACT 1	Green	On	10BASE-T/100BASE-TX Ethernet ports are transmitting or receiving packets (activity).
LNK 0 LNK 1	Green	On	10BASE-T/100BASE-TX Ethernet ports have established a valid link with the network. This LED remains off during normal operation of the router, unless there is an incoming carrier signal.
SLOT 0 SLOT 1	Green	On	The PCMCIA card slot (0 or 1) is in use and is being accessed by the system. These LEDs remain off during normal operation of the router.
PWR	Green	On	The power supply is delivering AC-input power to the router.
SYS RDY	Green	On	The system is operational and has passed its initial power-on diagnostics.
EN	Green	On	The cable interface card is on, receiving power from the router midplane, and enabled for operation. This LED remains on during normal operation of the router.
DS0 RF	Green	On	The RF downstream interface and the integrated upconverter are active.
DS0	Green	On	The IF downstream interface is active.
US0–US3	Green	On	The associated upstream interface is active.



Preparing for Installation

This chapter describes the tasks you must perform before you begin to install a Cisco uBR7100 series router and includes the following sections:

- [Tools and Parts Required, page 2-1](#)
- [Shipping Container Contents, page 2-2](#)
- [Safety Guidelines, page 2-3](#)
- [Site Requirement Guidelines, page 2-6](#)



Warning

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



Warning

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

Tools and Parts Required

Cisco uBR7100 series routers are fully assembled at the factory; no additional assembly is required prior to installing the router. The following tools and parts are shipped with Cisco uBR7100 series routers (unless noted otherwise) and are required for installation:

- Electrostatic discharge (ESD)-preventive wrist strap (not included with the router)
- Number 2 Phillips screwdriver (not included with the router)
- Flat-head screwdriver (not included with the router)
- Rack-mount and cable-management kit for 19-inch, four-post or telco-type rack installation (mounting brackets for a 23- or 24-inch rack are available separately)
- Rubber feet for desktop installation
- One double ground lug and two 3.5 x 8-mm screws for grounding the chassis. This optional procedure also requires a 6-AWG grounding wire, a crimping tool suitable for the wire, and a knife or wire stripper.

Shipping Container Contents

Ensure that the correct Cisco uBR7100 series router is in the shipping container. The shipping container includes the following items:

- Cisco uBR7100 series router with appropriate port adapter card installed. If the port adapter is not installed, it should be installed, using the instructions that accompany the card, before the router is installed.
- A rack-mount and cable-management kit that includes the following items:
 - Two rack-mount brackets for 19-inch rack installations
 - One cable-management bracket
 - Sixteen 3.5 x 8-mm Phillips flathead screws for securing the rack-mount brackets to the chassis
 - Two 3.5 x 7-mm slotted hexhead screws for securing the cable-management bracket to the chassis



Note Four 10-32 x 3/8-inch slotted binderhead screws are required to secure the chassis to the rack rails; the binderhead screws are not included in the rack-mount and cable-management kit.

- Four Rubber feet for mounting the router on a tabletop
- Nylon cable tie
- Cable tie holder
- Ground lug kit that includes two M3.5 x 7-mm screws
- Rollover RJ-45 to RJ-45 cable for connecting the console or auxiliary port
- Female RJ-45-to-DB-9 adapter for connecting a PC running terminal emulation software to the console port
- Male RJ-45-to-DB-25 adapter for connecting a modem to the auxiliary port for remote access
- Documentation roadmap
- *Regulatory Compliance and Safety Information for the Cisco uBR7100 and Cisco uBR7100E Series Universal Broadband Router*

**Note**

Depending on the exact model and bundle ordered, other materials, such as an evaluation copy of Cisco Network Registrar (CNR), might also be included with the Cisco uBR7100 series router.

Keep the shipping container in case you must return the router to the factory.

Safety Guidelines

Any device that uses electricity must be handled carefully; follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free during and after installation.
- If removing the chassis cover, put the removed chassis cover in a safe place.
- Keep tools away from walk areas where you and others could fall over them.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses if you are working under any conditions that might be hazardous to your eyes.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- The installation of the router 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.
- Never attempt to lift an object that might be too heavy for you to lift by yourself.
- Always turn all power supplies off (O) and unplug all power cables before opening the chassis.
- Always unplug the power cable before installing or removing a chassis.
- The AC-powered routers ship with a three-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.



Warning

This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024



Warning

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

Electrical Equipment Guidelines



Warning

Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected. Statement 4



Warning

Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals. Statement 43

Follow these guidelines when you work on equipment powered by electricity.

- Locate the emergency power-off switch for the room in which you are working. Then, if an electrical accident occurs, you can act quickly to turn off the power.
- Before working on the system, unplug the power cord.
- Disconnect all power before doing the following:
 - Installing or removing a chassis
 - Working near power supplies



Warning

Before working on a system that has an on/off switch, turn OFF the power and unplug the power cord. Statement 1



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 12



Warning

When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit. Always check.
- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, frayed power cords, and missing safety grounds.
- 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 person needs rescue breathing or external cardiac compressions; then take appropriate action.

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.

Electrostatic Discharge Prevention

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD damage occurs when electronic components are improperly handled and can result in complete or intermittent failures. [Figure 2-1](#) illustrates how to attach an electrostatic discharge wrist strap.

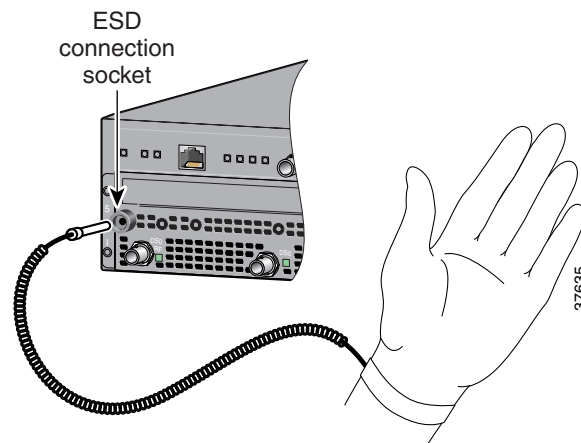
Always follow ESD-prevention procedures when you remove and replace components. Ensure that the chassis is electrically connected to earth ground. Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the grounding clip to an unpainted surface of the chassis frame to safely ground unwanted ESD voltages. To guard against ESD damage and shocks, the wrist strap and cord must operate properly. If no wrist strap is available, ground yourself by touching the metal part of the chassis.



Caution

For safety, periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms (Mohm).

Figure 2-1 Attaching an Electrostatic Discharge Wrist Strap



Chassis Lifting Guidelines

A fully configured Cisco uBR7100 series router weighs approximately 32 pounds (14.5 kg). The chassis is not intended to be moved frequently. Before you install the router, ensure that your site is properly prepared so you can avoid having to move the chassis later to accommodate power sources and network connections.

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

- Always disconnect all external cables before lifting or moving the chassis.
- 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 underside of the chassis exterior with both hands.

Site Requirement Guidelines



Warning

This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.

Statement 1017

The environmental monitoring functionality in the router protects the system and components from potential damage from overvoltage and overtemperature conditions. To ensure that 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 32°F through 104°F (0°C through 40°C), and keep the area around the chassis as free from dust as is practical.

Planning a proper location for the router and the layout of your equipment rack or wiring closet is 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.

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

- Plan for access to both front and rear panels of the chassis.
- Ensure that the room where the chassis operates has adequate ventilation. Remember that electrical equipment generates heat. Ambient air temperature may not cool equipment to acceptable operating temperatures without adequate ventilation.
- 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 router 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.
- Ensure that the port adapter (or the blank port adapter) is in place and secure for proper cooling. The fans direct cooling air throughout the chassis interior; a loose component or empty slot can redirect the air flow away from active components.

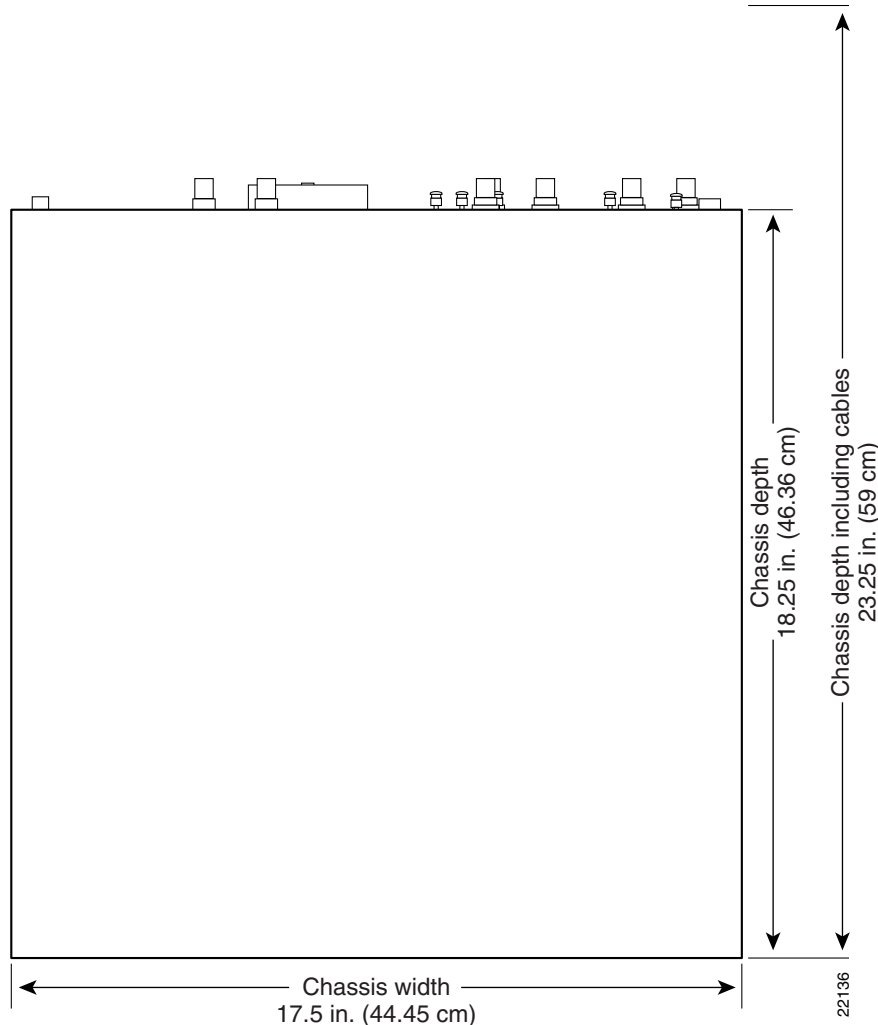
Rack-Mounting Guidelines

The rack-mounting hardware included with router is suitable for standard 19-inch equipment racks and telco-type racks; brackets for 23- and 24-inch racks are available separately. To easily access the interface cables while the router is installed in a rack make certain that you have access to the 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 does impair a rear rack-mount installation, remove the power strip before installing the router in the rack, and then replace it after the chassis is installed. As an alternative, you can mount the router on an equipment shelf, provided that 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 router.

Figure 2-2 shows the chassis outer dimensions and required footprint for the Cisco uBR7114 universal broadband router. The dimensions for the other models of Cisco uBR7100 series routers are identical.

Figure 2-2 Cisco uBR7114 Router Footprint and Outer Dimensions



To use the rack-mounting hardware provided with the router, consider the following guidelines:

- 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 inches (43.18 cm).
- The height of the 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.
- If you plan to use an equipment shelf, ensure that the shelf is constructed to support the weight and dimensions of the chassis. Figure 2-2 shows the chassis footprint, which you need if you are designing a customized shelf. We recommend that you use the rack-mount kit designed for Cisco uBR7100 series routers.

When planning your rack installation, consider the following guidelines:

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

An enclosed rack should have louvered sides and a fan to provide cooling air, because heat generated by equipment near the bottom of the rack can be drawn upward into the intake ports of the equipment above.



Caution

To prevent chassis overheating, never install the router in an enclosed rack or room that is not properly ventilated or air conditioned.

- Ensure that the rack is not congested, because each unit generates heat. Maintain a minimum clearance of 3 inches (7.62 cm) on the back and front of the chassis for the cooling air inlet and exhaust ports, respectively.
- Baffles can isolate exhaust air from intake air, which also helps to draw cooling air through the chassis. The best placement of the baffles depends on the airflow patterns in the rack, which can be found by experimenting with different configurations.
- When equipment installed in a rack (particularly in an enclosed rack) fails, try operating the equipment by itself, if possible. Power off other equipment in the rack to allow the unit under test a maximum of cooling air and clean power.
- 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 (installing or removing a port adapter or connecting cables). Otherwise, allow 19 inches (48.3 cm) of clearance to remove the port adapter.
- Install the chassis and external devices to which it will connect in a contiguous stack.
- Always install heavier equipment in the lower half of a rack to maintain a low center of gravity and prevent the rack from falling over.
- 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.
- Provide an adequate chassis ground (earth) connection for your router chassis.



Note

We strongly recommend that you provide a chassis ground connection. (See [“Attaching the System Ground Connection”](#) section on page 3-5 for instructions.)

In addition to the preceding guidelines, review the precautions for avoiding overtemperature conditions in the following section, [“Temperature and Humidity Requirements.”](#) To properly install a Cisco uBR7100 series chassis in a rack, see the instructions given in [“Rack-Mounting the Chassis”](#) section on page 3-3.

Temperature and Humidity Requirements

[Table 2-1](#) lists the operating and nonoperating environmental site requirements. The ranges listed are those within which Cisco uBR7100 series routers 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.

Table 2-1 Specifications for Operating and Nonoperating Environments

Specification	Minimum	Maximum
Temperature, ambient operating	32°F (0°C)	104°F (40°C)
Temperature, ambient nonoperating and storage	-4°F (-20°C)	149°F (65°C)
Humidity, ambient (noncondensing) operating	10%	90%
Humidity, ambient (noncondensing) nonoperating and storage	5%	95%
Altitude, operating and nonoperating	Sea level	10,000 ft. (3050 m)
Vibration, operating	5–200 Hz, 0.5 g (1 octave/min.)	–
Vibration, nonoperating	5–200 Hz, 1 g (1 octave/min.) 200–500 Hz, 2 g (1 octave/min.)	–

Power Connection Guidelines

Follow these precautions and recommendations when planning power connections to a Cisco uBR7100 series 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 if necessary.
- The AC power supply includes the following features:
 - Autoselects either 110V or 220V operation.
 - All units include a 6-foot (1.8-meter) electrical power cord that is appropriate for the country of operation.



Warning

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 15A minimum, 60VDC. Statement 1005



Warning

This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

- Use a grounded AC power outlet and install proper grounding to avoid damage from lightning and power surges.
- The AC-input power supply operates on input voltage and frequency within the ranges of 100 to 240 VRMS and 50/60 Hz without the need for operator adjustments. This power supply also incorporates an active power factor corrector that minimizes the unwanted generation of line current harmonics that can cause overload of site electrical distribution systems.



Note

We recommend an uninterruptible power source to protect against power failures at your site. We recommend powering a Cisco uBR7100 series router from a 15A receptacle at the power source.

**Note**

The Cisco uBR7100 series router installation must comply with all applicable codes and is approved for use with copper conductors only. If installing the router in a central office environment that requires Telcordia grounding, the ground bond fastening hardware should be of compatible material and preclude loosening, deterioration, and electrochemical corrosion of hardware and joined material. Attachment of the chassis ground to a central office or other interior ground system should be made with a minimum 6-AWG, copper ground conductor.

To satisfy Telcordia grounding requirements, the chassis provides two threaded chassis grounding receptacles, located on the sides near the rear of the chassis, which are intended to be bonded directly to the central offices or other interior ground system. The chassis ground requires 3.5 mm screws, which are included. See [“Attaching the System Ground Connection” section on page 3-5](#) for instructions on attaching the system ground.

Plant Wiring Guidelines

Following are guidelines for setting up the plant wiring and cabling at your site. When planning the location of the new system, consider the distance limitations for signaling, EMC, 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 plant wiring:

- Bad wiring practice can result in radio interference emanating from the plant wiring.
- Strong electromagnetic interference (EMI), especially when it is caused by lightning or radio transmitters, can destroy the signal drivers and receivers in the router, and can even create an electrical hazard by conducting power surges through lines and into equipment. (Review the safety warnings in the [“Electrical Equipment Guidelines” section on page 2-3](#).)

**Note**

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

If you use twisted-pair cable in your plant wiring with a good distribution of grounding conductors, the plant 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 problems of this sort in the past, you may 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 in the following descriptions 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, but 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 shown here; 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 a Cisco uBR7100 series router, you must consider a number of factors related to each type of interface:

- The type of cabling required for each type (fiber, thick or thin coaxial, foil-twisted pair [FTP], or unshielded twisted-pair [UTP] cabling)
- Distance limitations for each signal type
- The specific cables you need to connect each interface
- Any additional interface equipment you need, such as transceivers, hubs, switches, modems, channel service units (CSUs), or data service units (DSUs)
- Cable pinouts if you plan to build your cables

**Note**

The specific interface information you need is contained in the documentation that is shipped with each port adapter.

Also see [Appendix C, “Cable Specifications,”](#) for cabling information.

Before installing a Cisco uBR7100 series router, have all additional external equipment and cables on hand. For ordering information, contact a customer service representative.

Ethernet Connections

There are two 10BASE-T/100BASE-TX Fast Ethernet ports on the rear panel of the router. Both ports use unshielded twisted-pair (UTP) cable. We recommend Category 5 UTP cable. The maximum segment distance is 328 feet (100 meters). UTP cables look like the cables used for ordinary telephones; however, UTP cables meet certain electrical standards that telephone cables do not. Cables are not included.

Port Adapter WAN Connections

Cisco uBR7100 series routers support a number of port adapters that provide different WAN connection ports on the rear panel of the router. For more information on the cables used with the WAN ports, see the documentation that accompanies the port adapter, as well as [Appendix C, “Cable Specifications,”](#)

**Warning**

This equipment must be installed and maintained by service personnel as defined by AS/NZS 3260. Incorrectly connecting this equipment to a general-purpose outlet could be hazardous. The telecommunications lines must be disconnected 1) before unplugging the main power connector or 2) while the housing is open, or both. Statement 1043

**Warning**

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

Console and Auxiliary Port Considerations

Cisco uBR7100 series routers include an asynchronous serial console port and an auxiliary port. The console and auxiliary ports provide access to the access server either locally (with a console terminal) or remotely (with a modem). This section discusses important cabling information to consider before connecting a console terminal (such as PC running terminal emulation software) to the console port or connecting a modem to the auxiliary port.

The main difference between the console and auxiliary ports is that the auxiliary port supports hardware flow control using RTS/CTS (Request To Send/Clear To Send) signaling, and the console port does not. Flow control paces the transmission of data between a sending device and a receiving device, ensuring that the receiving device can absorb the data sent to it before the sending device sends more.

When the buffers on the receiving device are full, a message is sent to the sending device to suspend transmission until the data in the buffers has been processed. Because the auxiliary port supports flow control, it is ideally suited for use with the high-speed transmissions of a modem. Console terminals transmit at slower speeds than modems; therefore, the console port is ideally suited for use with console terminals.

For detailed information about installing a console terminal and connecting devices to the auxiliary port, see the [“Connecting the Console Port and Auxiliary Port”](#) section on page 3-10. For cable and port pinouts, see [Appendix C, “Cable Specifications,”](#)

Console Port Connections

Cisco uBR7100 series routers include an EIA/TIA-232 asynchronous serial console port (RJ-45). Depending on the cable and the adapter used, this port will appear as a data terminal equipment (DTE) or data communications equipment (DCE) device at the end of the cable. Your router arrives with cables and adapters to connect a console terminal (an ASCII terminal or PC running terminal emulation software) to the console port.

To connect a PC running terminal emulation software to the console port, use the RJ-45 rollover cable with the female RJ-45-to-DB-9 adapter (labeled TERMINAL). The default parameters for the console port are 9600 baud, 8 data bits, no parity, and 2 stop bits. The console port does not support hardware flow control.

Auxiliary Port Connections

Cisco uBR7100 series routers include an EIA/TIA-232 asynchronous serial auxiliary port (RJ-45) that supports RTS/CTS flow control. Depending on the cable and the adapter used, this port will appear as a DTE or DCE device at the end of the cable. Your router arrives with a cable and an adapter to connect a modem to the auxiliary port. To connect a modem to the auxiliary port, use the RJ-45 rollover cable with the male RJ-45-to-DB-25 adapter (labeled MODEM).



Installing Cisco uBR7100 Series Universal Broadband Routers

This chapter explains how to mount and physically install a Cisco uBR7100 series router. Before performing any of the procedures in this chapter, review [Chapter 2, “Preparing for Installation,”](#) to ensure that you understand all the tools required and the safety guidelines. This chapter includes the following sections:

- [Physical Placement, page 3-1](#)
- [Attaching the System Ground Connection, page 3-5](#)
- [Attaching the Cable-Management Bracket, page 3-7](#)
- [Connecting to the Network, page 3-8](#)
- [Connecting the Console Port and Auxiliary Port, page 3-10](#)
- [Connecting the Power, page 3-12](#)



Warning

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



Warning

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

Physical Placement

The Cisco uBR7100 series router can be installed either on a tabletop or in a standard 19- or 23-inch mounting rack. See the following sections for more information:

- [Mounting the Chassis on a Tabletop](#)
- [Rack-Mounting the Chassis](#)

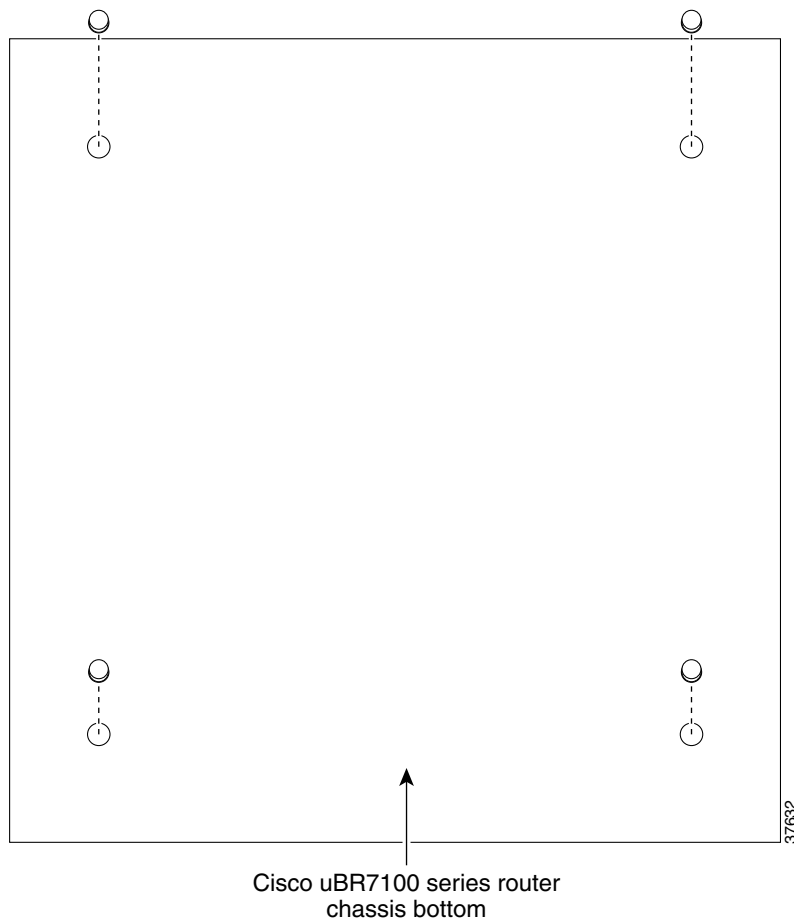
Mounting the Chassis on a Tabletop

The Cisco uBR7100 series router can be mounted on a flat, hard, and stable surface, such as a tabletop. Ensure that the mounting area has a sufficient footprint to accommodate the router, as given in the “[Site Requirement Guidelines](#)” section on page 2-6.

Equipment not located correctly on a tabletop is susceptible to malfunctions and shutdowns, and can make maintenance difficult. Make sure that the equipment is not placed too close together, that the equipment has adequate ventilation, and that all panels are easily accessible.

Before placing the router on the tabletop, attach the rubber feet as shown in [Figure 3-1](#). Rubber feet are included in the accessory kit that shipped with your router.

Figure 3-1 Attaching the Rubber Feet



Warning

Do not stack the chassis on any other equipment. If the chassis falls, it can cause severe bodily injury and equipment damage. Statement 48

Rack-Mounting the Chassis



Tip

If you rack-mount the router with the back panel forward, attach the system ground connection before you rack-mount the router. For instructions on how to connect the system ground, see the next section, “[Attaching the System Ground Connection](#).”



Warning

To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack. Statement 1006



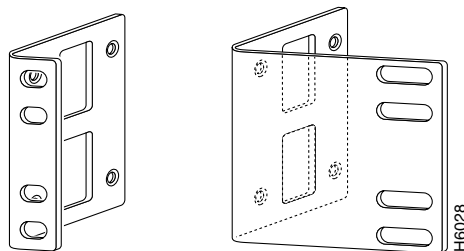
Tip

If using an external upconverter, it should be mounted either above or below the Cisco uBR7100 series router to minimize the length of cable connecting the downstream port to the upconverter.

This section describes how to rack-mount the chassis in a standard four-post equipment rack. The router is shipped with 19-inch rack-mount brackets; larger brackets for use with a 23- or 24-inch rack are available separately (the product number is ACS-7100-RMK=).

See [Figure 3-2](#) illustrates the rack-mount brackets that are used with the Cisco uBR7100 series routers:

Figure 3-2 Standard Rack-Mount Brackets



Bracket for 19-inch rack Bracket for 23- or 24-inch rack

Attaching the Brackets

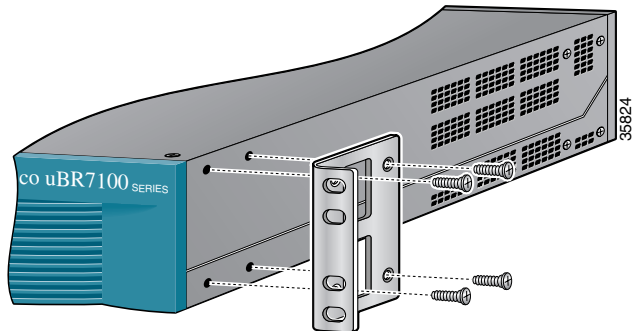
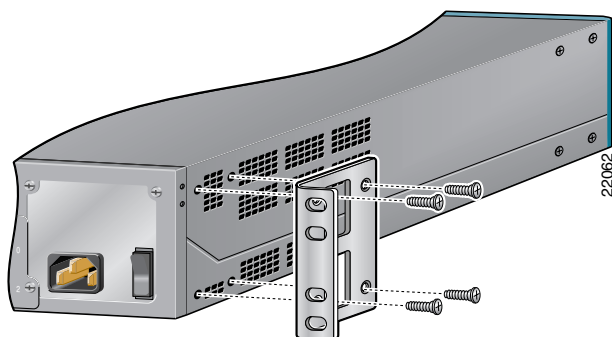
To install the chassis in a rack, attach the brackets in one of the following ways:

- Front panel forward (see [Figure 3-3](#))
- Back panel forward (see [Figure 3-4](#))



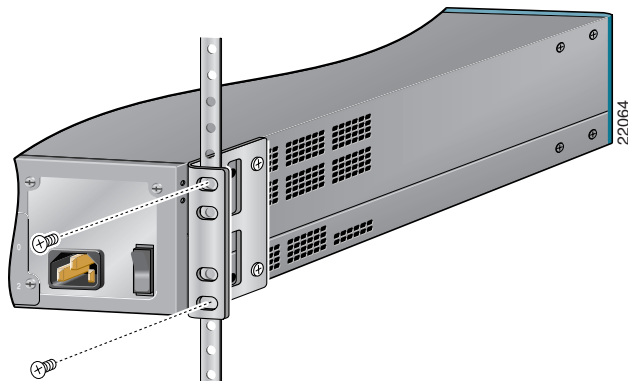
Note

Although the installations show the 19-inch brackets, the procedure is the same for the 23- and 24-inch brackets.

Figure 3-3 Standard Bracket Installation—Front Panel Forward**Figure 3-4 Standard Bracket Installation—Back Panel Forward**

Installing the Chassis in a Rack

After the brackets are secured to the chassis, you can rack-mount the router. Using the screws that you provide, attach the chassis to the rack as shown in [Figure 3-5](#). You need two people to install the chassis in the rack—one person to hold the router and one person to secure it to the rack.

Figure 3-5 Attaching the Chassis to the Rack—Back Panel Forward

Note: The second bracket attaches to the other side of the chassis.
The brackets can also be installed with the front panel forward.

Attaching the System Ground Connection

**Warning**

When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

Before you connect power or turn on power to your router, we strongly recommend that you provide an adequate chassis ground (earth) connection for your router's chassis. This connection is required for a central office that must comply with Telcordia bonding requirements; it is optional but highly recommended for other installations.

**Note**

The Telcordia bonding connections are in addition to the grounding that is required for the AC power connection.

Chassis grounding receptacles for Telcordia bonding connections are provided on each side of the router, near the rear of the chassis.

**Note**

One set of grounding receptacles should be used for the Telcordia bonding ground connection, and the other set can be used for attaching the cable management bracket (see [Attaching the Ground Wire](#)).

To ensure that the chassis grounding connection that you provide is adequate, you need the following parts and tools:

- One grounding lug—Must have two 3.5-mm screw holes that have a 0.63-inch (16.002-mm) spacing between them, and a wire receptacle large enough to accept a 6-American Wire Gauge (AWG) multistrand, copper wire. This grounding lug is provided in the accessory kit.
- Two slotted hexhead 3.5 x 7-mm thread-forming machine screws. These screws are provided in the accessory kit.
- One grounding wire—6-AWG, 0.162-inch (4.115-mm) diameter, with approximately 0.108 inch (2.743 mm) of insulation, for a total wire diameter of approximately 0.27 inch (6.858 mm). The wire's length is dependent on your router location and site environment. This wire is not available from Cisco Systems; it is available from any commercial cable vendor.
- Flat-blade screwdriver
- Crimping tool large enough to accommodate the diameter of the wire receptacle on your grounding lug
- Wire stripper

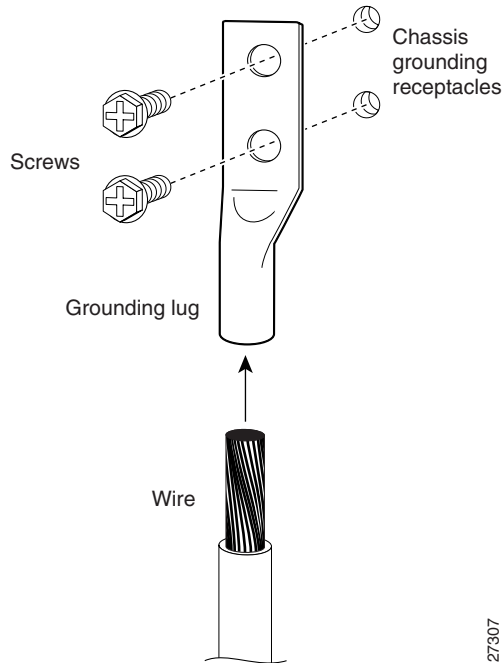
Attaching the Ground Wire

To attach the grounding lug to the chassis grounding receptacles on the router, use the following procedure:

- Step 1** Use the wire stripper to strip one end of the 6-AWG wire approximately 0.75 inch (19.05 mm).
- Step 2** Insert the 6-AWG wire into the wire receptacle on the grounding lug.
- Step 3** Use the crimping tool to carefully crimp the wire receptacle around the wire; this step is required to ensure that a proper mechanical connection.

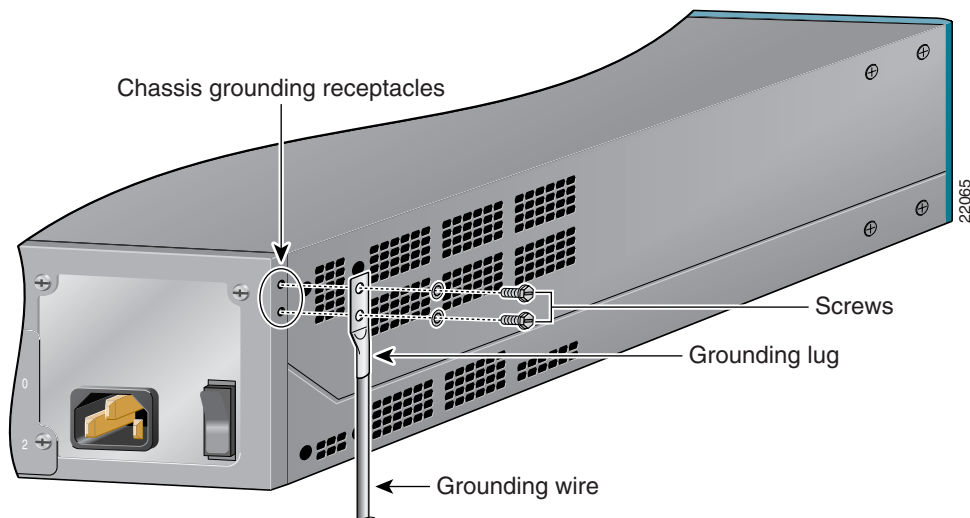
- Step 4** Insert the two screws through the holes in the grounding lug. (See [Figure 3-6](#).) Ensure that the grounding lug does not interfere with other router hardware.

Figure 3-6 Attaching the Ground Wire to the Grounding Lug



- Step 5** Locate the chassis grounding receptacles that are on either side on your router chassis. Choose the side that is most convenient for attaching the grounding wire. (See [Figure 3-7](#).)

Figure 3-7 Attaching the Grounding Lug to the Telcordia Bonding Grounding Receptacles



- Step 6** Use the flat-blade screwdriver to carefully tighten the screws until the grounding lug is held firmly to the chassis. Do not overtighten the screws.

- Step 7** Connect the opposite end of the grounding wire to the appropriate grounding point at your site to ensure an adequate chassis ground.

Attaching the Cable-Management Bracket

To install the cable-management bracket on the router, complete the following steps:

- Step 1** Locate the chassis grounding receptacles on the rear sides of the chassis. (See [Figure 3-8](#).)

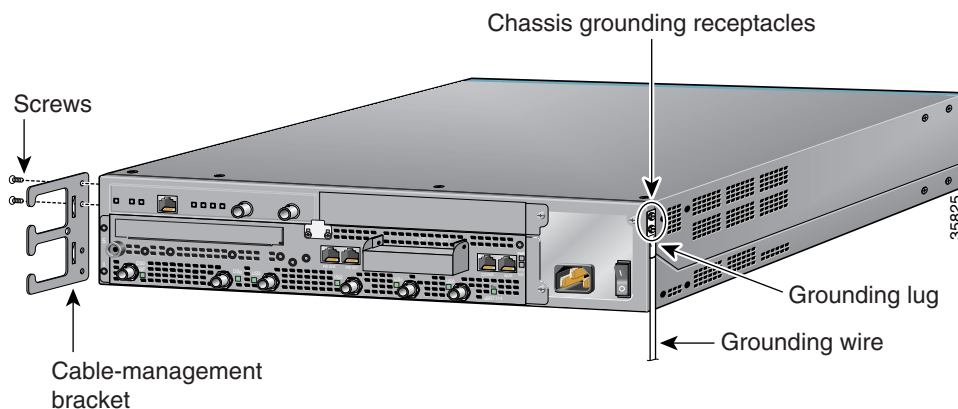


Note Both rear sides of Cisco uBR7100 series chassis have two grounding receptacles. Attach the cable-management bracket to the two grounding receptacles that were not used to ground the chassis in the “[Attaching the System Ground Connection](#)” section on page 3-5.

- Step 2** Align the cable-management bracket to the vacant receptacles. Ensure that the two flanges on the bracket are facing away from the chassis.
- Step 3** Thread two 3.5 x 7-mm slotted hexhead screws through the bracket and into the chassis. Use a flat-head screwdriver to tighten the screws. Use tie wraps to secure interface cables to the bracket flanges.

[Figure 3-8](#) shows how to attach the cable-management brackets to the Cisco uBR7114 or Cisco uBR7114E chassis; the Cisco uBR7111 or Cisco uBR7111E chassis is identical.

Figure 3-8 Attaching the Cable-Management Bracket to the Chassis (Cisco uBR7114 chassis)



- Step 4** As you connect the interface cables, carefully lace each cable through the cable-management bracket as needed.

This completes the steps for installing the cable-management bracket on a Cisco uBR7100 series router.

Connecting to the Network

This section describes how to connect the router to your network. The cables required to connect the router to a network are not provided. For ordering information, contact customer service. For cable product numbers and port pinouts, see [Appendix C, “Cable Specifications”](#).

The router has integrated LAN Fast Ethernet ports and arrives with the modular port adapter already installed, unless you order a port adapter separately as a spare. For information on installing port adapters, see the installation and configuration notes for your port adapter.



Warning

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



Warning

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

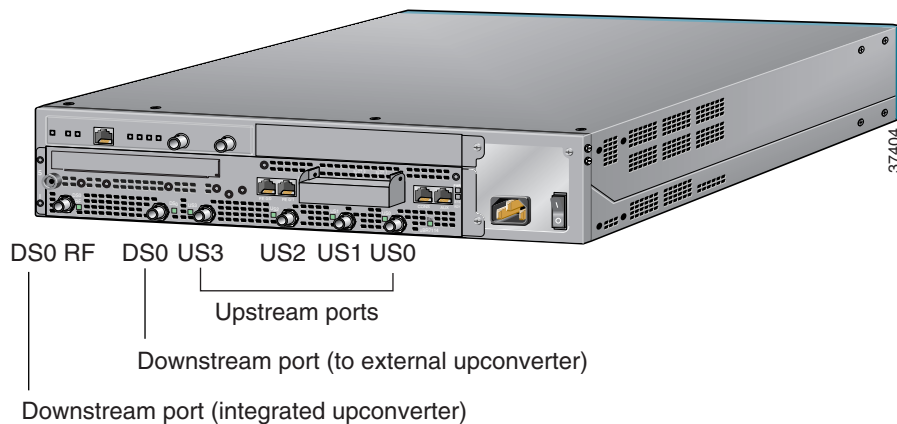
Connecting Upstream and Downstream Ports

The upstream and downstream ports are connected as follows:

- DS0 RF outputs the downstream after it has been processed by the Cisco uBR7100 series integrated upconverter. This is an RF signal suitable for output to a combiner.
- DS0 outputs the downstream as an IF signal. This signal must be output into an external waveconverter before sending it to a combiner.
- US connects the upstream cables to the upstream ports. If an upstream port is not being used, it should remain unconnected.

Use high-quality RG-59 cabling for both the upstream and downstream ports. RG-6 cable is not recommended for headend use.

Figure 3-9 Connecting Upstream and Downstream Ports



Connecting the Fast Ethernet Ports

The 10BASE-T/100BASE-TX Fast Ethernet ports support IEEE 802.3 and IEEE 802.3u specifications for 10-Mbps and 100-Mbps transmission over unshielded twisted-pair (UTP) cables. These ports also support autosensing and autonegotiation of the proper transmission mode (half duplex or full duplex) with an attached device.

Each Fast Ethernet port has an RJ-45 connector that supports standard straight-through and crossover Category 3 or Category 5 UTP cable:

- Use Category 3 UTP straight-through cables when connecting a 10BASE-T port to a hub.
- Use Category 3 UTP crossover cables when connecting to a PC or other Ethernet device.
- Use Category 5 UTP straight-through cables when connecting 100BASE-TX to a hub.
- Use Category 5 UTP crossover cables when connecting to a PC or other Ethernet device.



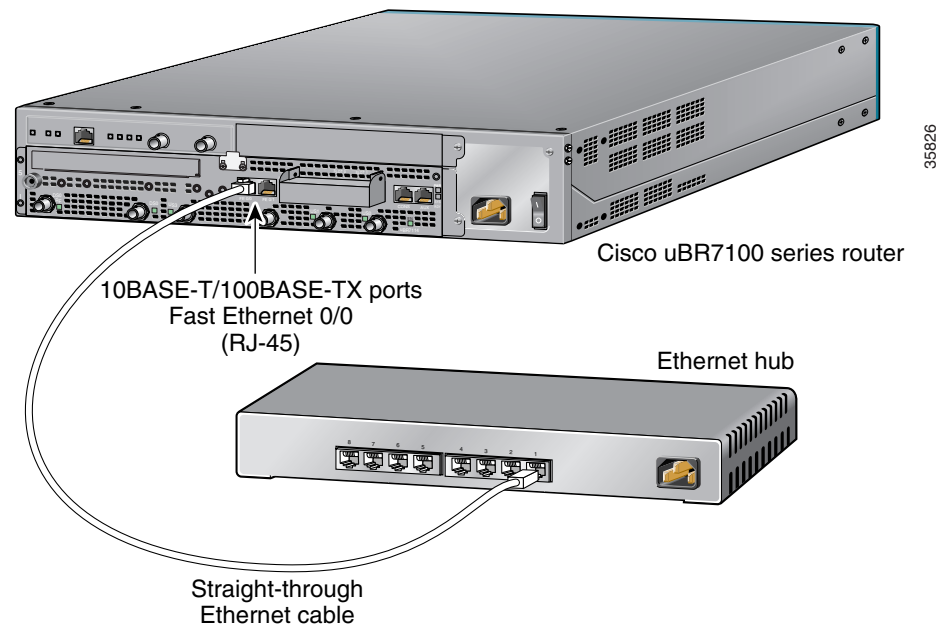
Note

Cisco Systems does not supply Category 3 or Category 5 UTP RJ-45 cables; these cables are available commercially. For more information, see the [“Fast Ethernet Port Cables and Pinouts”](#) section on page C-4.

To connect the Fast Ethernet port to an Ethernet hub, use the following procedure:

- Step 1** Verify that the Ethernet hub is properly connected to the rest of the LAN.
- Step 2** Attach the appropriate cable directly to the receptacle on the router. (See [Figure 3-10](#).)
- Step 3** Attach the network end of the cable to the Ethernet hub or end station. (See [Figure 3-10](#).)

Figure 3-10 Connecting the LAN Port to an Ethernet Hub



Connecting the Console Port and Auxiliary Port

The router arrives with a console and auxiliary cable kit, which contains the cable and adapters you need to connect a console (an ASCII terminal or PC running terminal emulation software) or modem to the router. The console and auxiliary cable kit includes:

- RJ-45-to-RJ-45 rollover cable
- RJ-45-to-DB-9 female DTE adapter (labeled TERMINAL)
- RJ-45-to-DB-25 male DCE adapter (labeled MODEM)


Note

For more information, see the “[Console and Auxiliary Port Cables and Pinouts](#)” section on page C-2.

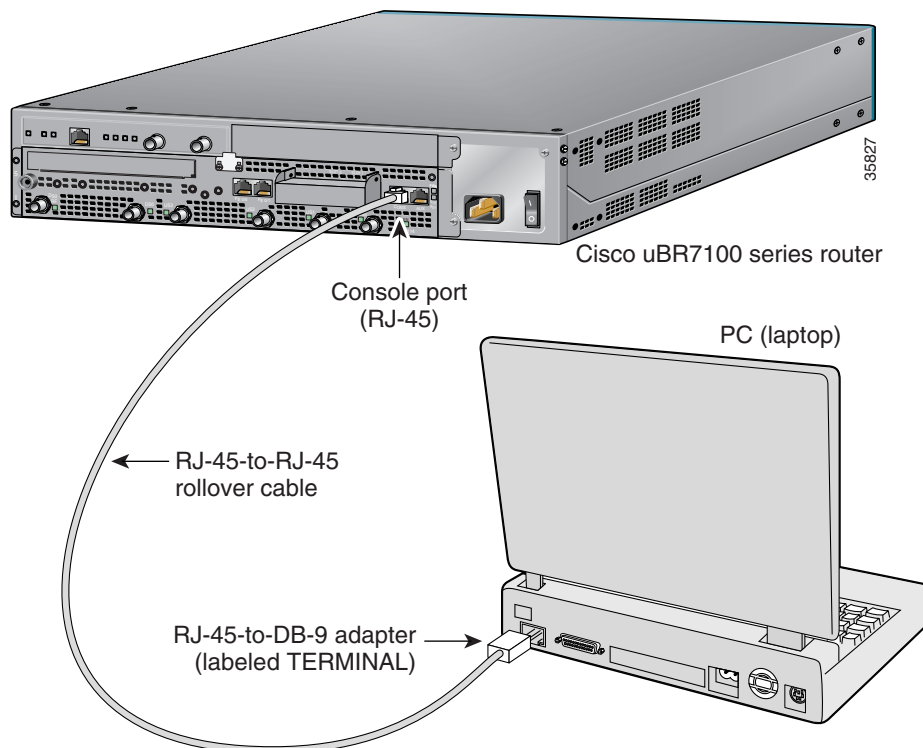
Connecting to the Console Port

Use the console terminal for local administrative access to the router. You can connect a terminal to the console port only.

To connect the console port to a terminal (an ASCII terminal or a PC running terminal emulation software), use the following procedure:

- Step 1** Connect one end of the RJ-45 rollover cable to the RJ-45-to-DB-9 adapter (labeled TERMINAL).
- Step 2** Connect the other end of the rollover cable directly to the console port on the router. (See [Figure 3-11](#).)

Figure 3-11 Connecting the Console Terminal



- Step 3** Attach the DB-9 connector to the appropriate serial connector on the PC or terminal. (See [Figure 3-11](#).)
- Step 4** Configure the terminal or PC terminal emulation software for 9600 baud, 8 data bits, no parity, 2 stop bits, and no flow control.



Note Do not set the terminal emulation software for either hardware or software flow control. Doing so will prevent communications with the router.

Connecting a Modem to the Auxiliary Port

You can use the auxiliary port to connect a terminal or a modem for remote access to the router.

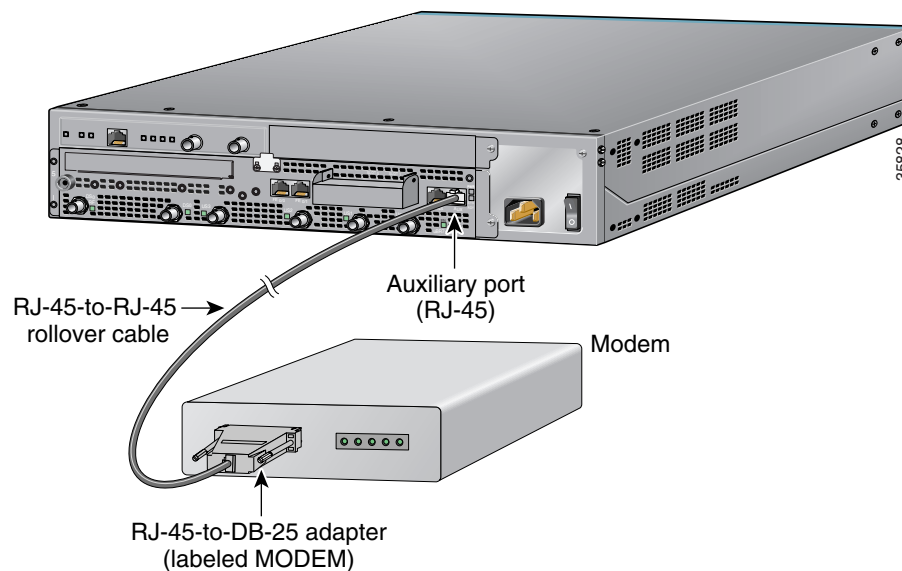


Note For more information about the console port and auxiliary port connectors, see the “[Console and Auxiliary Port Cables and Pinouts](#)” section on page C-2.

To connect the auxiliary port to a modem, use the following procedure:

- Step 1** Connect one end of the RJ-45 rollover cable to the RJ-45-to-DB-25 adapter (labeled MODEM).
- Step 2** Connect the other end of the rollover cable directly to the auxiliary port on the router. (See [Figure 3-12](#).)

Figure 3-12 Connecting a Modem to the Auxiliary Port



- Step 3** Attach the DB-25 connector to the modem. (See [Figure 3-12](#).)
- Step 4** Make sure that the modem and the auxiliary port on the router are configured for the same transmission speed (38.4 Kbps and 56 Kbps are typical). Configure the modem for auto-answer, and for hardware flow control using the Data Carrier Detect (DCD) and Data Terminal Ready (DTR) signals.

Connecting the Power

Cisco uBR7100 series routers feature four-output switching AC power supplies that provide power factor correction and regulated outputs. Cisco uBR7100 series routers have one AC-input power supply.



Note

For information on the power supply specifications, see [Appendix A, “System Specifications”](#).



Warning

Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected. Statement 4

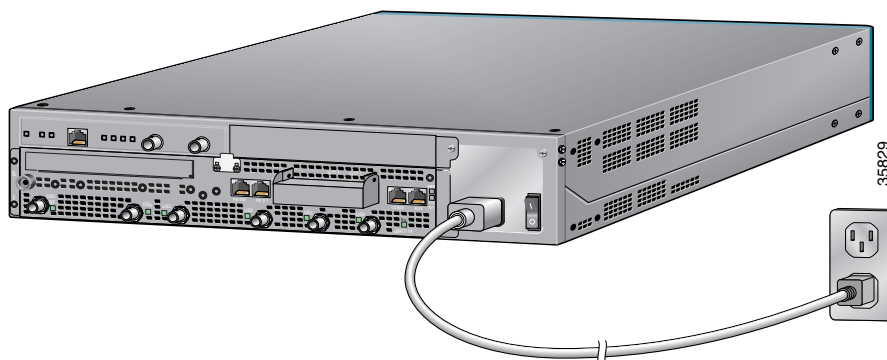
Check the following conditions before you start the router:

- The port adapter is securely inserted in its slot.
- All network interface cables are connected.
- A flash disk or flash memory card is installed in its PC Card slot.
- The console terminal is connected and powered on.

To connect the AC power on Cisco uBR7100 series routers, use the following procedure:

- Step 1** At the back of the router, check that the power switch is in the OFF (O) position.
- Step 2** Connect one end of the power cord to the power connector on the back of the router. (See [Figure 3-13.](#))
- Step 3** Connect the other end of the power cord to the power outlet.

Figure 3-13 Connecting the AC Power Cord



Note

For information on system startup and software configuration, see [Chapter 4, “System Startup.”](#)



System Startup

This chapter describes how to start the system and initially configure your Cisco uBR7100 series router. The chapter contains the following sections:

- [Checking Conditions Prior to System Startup, page 4-1](#)
- [Starting the System, page 4-2](#)

This chapter guides you through system startup. Complex configuration procedures are beyond the scope of this publication and can be found in the following publications:

- *Cisco uBR7100 Series Universal Broadband Router Software Configuration Guide*, at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/cable/ubr7100/scg7100/index.htm>

This document contains sample configurations and procedures for configuring a Cisco uBR7100 series router.

- Modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software release installed on your Cisco hardware.



Note

For information on other publications, see the [“Related Documentation” section on page viii](#).

To configure a router from a console, you must connect a terminal to the router’s console port.

Checking Conditions Prior to System Startup

Check the following conditions before you start your router:

- The port adapter is securely inserted in its slot.
- All network interface cables are connected.
- A flash disk or flash memory card is installed in the PCMCIA card slot.
- The power cable is connected and secured.
- The console terminal is connected and powered on.

Starting the System

After installing the router and connecting cables, start the router as follows:

-
- Step 1** At the back of the router, place the power switch on the power supply in the ON (I) position. The green power (PWR) LED on the router comes on.
 - Step 2** Listen for the fans; you should immediately hear them operating.
 - Step 3** During the boot process, observe the system LEDs. The LEDs on the fixed interfaces and the modular port adapter go on and off in irregular sequence. Some may go on, go out, and go on again for a short time.
 - Step 4** Observe the initialization process. When the system boot is complete (a few seconds), the network processor begins to initialize the interfaces. During this initialization, the LEDs on each port behave differently (most flash on and off).

The enabled LED on each interface goes on when initialization is completed, and the console screen displays a system banner similar to the following:

Restricted Rights Legend

Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subparagraph (c) of the Commercial Computer Software - Restricted Rights clause at FAR sec. 52.227-19 and subparagraph (c) (1) (ii) of the Rights in Technical Data and Computer Software clause at DFARS sec. 252.227-7013.

cisco Systems, Inc.
170 West Tasman Drive
San Jose, California 95134-1706

- Step 5** When you start up the router for the first time, the system automatically enters the setup command facility, which determines which interfaces are installed and prompts you for configuration information for each one. On the console terminal, after the system displays the system banner and hardware configuration, you see the following System Configuration Dialog prompt:

```
--- System Configuration Dialog ---
```

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

You have the following options:

- Enter **yes** to proceed with the setup facility to configure the router's interfaces
- Enter **no** to exit the setup procedure, and instead proceed to use command line interface (CLI) configuration commands to configure the global (system-wide) and interface-specific parameters.



Note You do not have to configure the interfaces immediately; however, you cannot enable the interfaces or connect them to any networks until you have configured them.

If the system does not complete each of the steps in the startup procedure, proceed to [Chapter 5, "Troubleshooting the Installation,"](#) for troubleshooting recommendations and procedures.

System LEDs

Many of the interface LEDs do not go on until you have configured them. To verify correct operation of each interface, complete the first-time startup procedures and configuration, and then use the LEDs to check the status of the interfaces.

The LEDs indicate the status of the router. The CPU reset button that you to reset the entire system. The LEDs are shown in [Figure 4-1](#) and [Figure 4-2](#), and are described in [Table 4-1](#).



Caution

To prevent system errors and problems, use the CPU reset button only at the direction of your service representative.

Figure 4-1 Cisco uBR7111 System LEDs

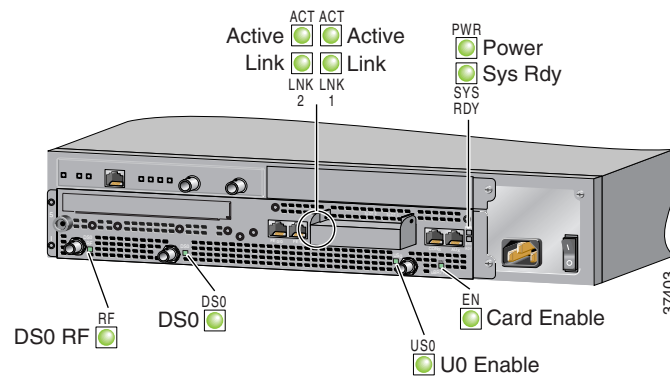


Figure 4-2 Cisco uBR7114 System LEDs

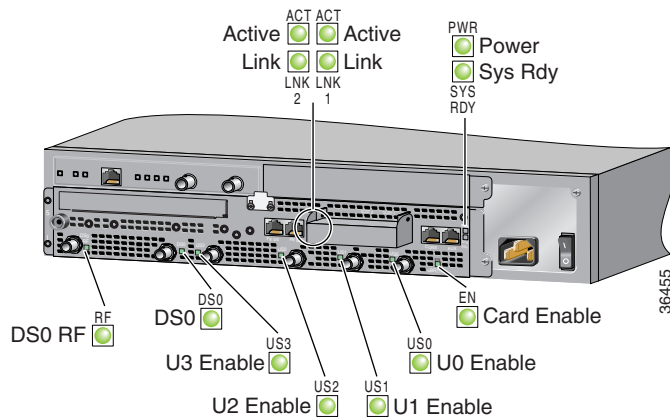


Table 4-1 Cisco uBR7100 Series System LED Descriptions

LED Label	Color	State	Function
ACT 0 ACT 1	Green	On	10BASE-T/100BASE-TX Ethernet ports are transmitting or receiving packets (activity).
LNK 0 LNK 1	Green	On	10BASE-T/100BASE-TX Ethernet ports have established a valid link with the network. This LED remains off during normal operation of the router, unless there is an incoming carrier signal.
SLOT 0 SLOT 1	Green	On	A particular PCMCIA card slot is in use (0 or 1) and is being accessed by the system. These LEDs remain off during normal operation of the router.
PWR	Green	On	The power supply is delivering AC-input power to the router.
SYS RDY	Green	On	The system is operational and has passed its initial power-on diagnostics.
EN	Green	On	The cable interface card is on, receiving power from the router midplane, and enabled for operation. This LED remains on during normal operation of the router.
DS0 RF	Green	On	The RF downstream interface and the integrated upconverter are active.
DS0	Green	On	The IF downstream interface is active.
US0–US3	Green	On	The associated upstream interface is active.

**Note**

For information on the port adapter LEDs, see the configuration and installation notes that shipped with the port adapter.



Troubleshooting the Installation

Your Cisco uBR7100 series router went through extensive testing before leaving the factory. However, if you encounter problems starting the router, use the information in this chapter to help isolate the cause of the problems. This chapter contains the following sections:

- [Troubleshooting Overview, page 5-1](#)
- [Troubleshooting the Power Subsystem, page 5-4](#)
- [Troubleshooting the Processor Subsystem, page 5-4](#)
- [Troubleshooting the Cooling Subsystem, page 5-6](#)

The procedures in this chapter assume that you are troubleshooting the initial system startup, and that your router is in the original factory configuration. If you have removed or replaced components or changed any default settings, the recommendations in this chapter might not apply. Make sure to review the safety warnings listed in the publication that accompanied your Cisco uBR7100 series router before using the troubleshooting procedures in this chapter.

Troubleshooting Overview

This section describes the troubleshooting methods used in this chapter and describes how Cisco uBR7100 series routers are divided into subsystems for more efficient problem solving.

[Figure 5-2](#) shows the general troubleshooting strategy described in this chapter. Refer to this chart, as necessary, to follow the steps to isolate problems to a specific subsystem; then resolve the problem if possible.

Before You Call for Technical Assistance

If you are unable to easily solve the problem, contact a customer service representative for assistance and further instructions. Provide the representative with the following information:

- Date you received the router
- Chassis serial number
- Type of software and release number
- Brief description of the problem you are having
- Brief explanation of the steps you have taken to isolate and resolve the problem
- Maintenance agreement or warranty information

Locating the Serial Number on Your Router

The serial number label is located on the input/output (I/O) side, lower-right corner of the chassis. The serial number format is: 3 letters, 4 numbers, and 4 characters (combination of letters and numbers). See [Figure 5-1](#) for the location.

Figure 5-1 Serial Number Location



Problem Solving Using a Subsystems Approach

The key to solving problems with the system is isolating the problem to a specific subsystem. The first step in solving startup problems is to compare what the system *is doing* to what it *should be doing*. Because a startup problem is usually caused by a single component, it is more efficient to first isolate the problem to a subsystem rather than to troubleshoot each component in the system. For these troubleshooting procedures, consider the following subsystems:

- Power subsystem—Includes the power supply and the external power cable.
- Processor subsystem—Includes the network processing card, the modular port adapter, the service module, and the fixed RF ports. The system memory and management functions reside on the network processing card, and the enabled LED on each port indicates if the port is initialized. A port adapter that is partially installed in the router can cause the system to hang and crash.
- Cooling subsystem—Includes the fans.

The following sections help you isolate a problem to one of these subsystems and direct you to the appropriate troubleshooting section.

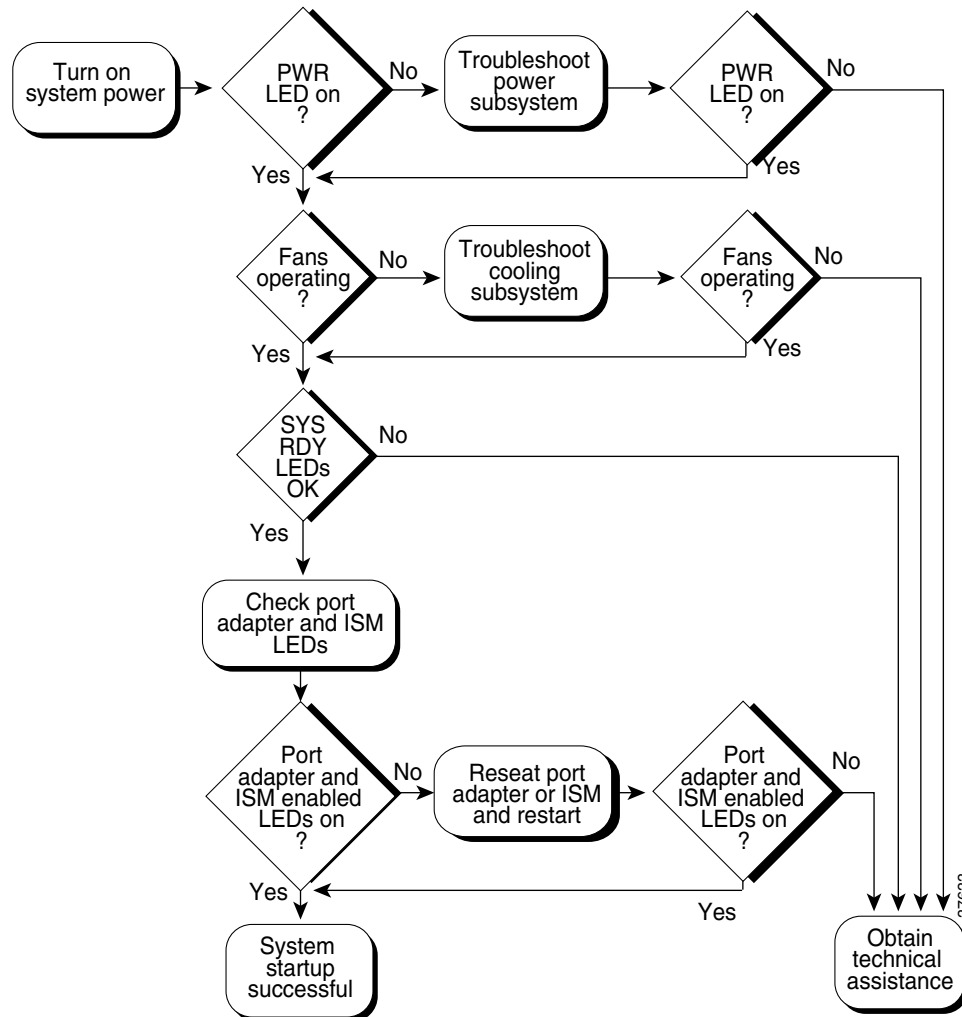
Identifying Startup Problems

Startup problems are commonly due to the source power or to a port adapter that is dislodged from the router. Although an overtemperature condition is unlikely at initial startup, the environmental monitoring functions are included in this chapter because they also monitor internal voltages.

When you start up the router for the first time, you should observe the startup sequence described in the [“Starting the System” section on page 4-2](#), which contains a more detailed description of the normal startup sequence.

LEDs indicate all system states in the startup sequence. By checking the state of the LEDs, you can determine when and where the system failed in the startup sequence. Use the following descriptions to isolate the problem to a subsystem, and then proceed to the appropriate sections to try to resolve the problem. See [Figure 5-2](#).

Figure 5-2 Troubleshooting Strategy for Startup Problems



When you start up the system by turning the power supply switch to the ON (I) position, the following should occur:

- You should immediately hear the fans operating.
 - If not, proceed to the [“Troubleshooting the Cooling Subsystem”](#) section on page 5-6. If you determine that the power supply is functioning normally and that a fan is faulty, contact a customer service representative. If a fan does not function properly at initial startup, there are no installation adjustments that you should make.
- The LEDs on the router should come on as follows:
 - The power LED (PWR) comes on immediately and indicates that the router is receiving power. This LED comes on during a successful router boot and remains on during normal operation of the router.
 - If this LED remains off when you start the router, either there is a problem with the power supply (it is damaged or not connected correctly), or the network processing card is not connected properly. Proceed to the [“Troubleshooting the Power Subsystem”](#) section on page 5-4.

- The system ready LED (SYS RDY) comes on after the power LED and indicates that the network processor card is enabled for operation by the system; however, it does not mean that the Fast Ethernet port is functional or enabled. This LED comes on during a successful router boot and remains on during normal operation of the router.

If this LED remains off when you start the router, it is probably a problem with the main processor card. Contact your service representative for technical assistance.

- Each enabled LED for the cable interface (EN, DS0 RF, DS0, U0, U1, U2, and U3) comes on initially at power-on and then turns off. The LED then comes on again and remains on when the corresponding port is enabled and configured for operations.

If an enabled LED fails to come on at initial power-on, or if the LED fails to come on and remain on after the port is enabled and configured, proceed to the [“Troubleshooting the Port Adapter and Fixed RF Ports”](#) section on page 5-5.

- The slot 0 and slot 1 LEDs only come on when the PCMCIA card slot is being accessed by the system. These LEDs remain off during normal operation of the router and do not indicate startup problems.
- The initial system banner should be displayed on the console screen.

If it is not displayed, see the [“Connecting the Console Port and Auxiliary Port”](#) section on page 3-10 to verify that the terminal is set up correctly and that it is properly connected to the router’s console port.

Troubleshooting the Power Subsystem

Check the following to help isolate a problem with the power subsystem:

- Is the power LED (PWR) on?
 - If yes, the power source is good, and the power supply is functional.
 - If no, make sure that the power cable is connected at both ends.
 - If the power LED remains off, and the power switch is set correctly, suspect the power source or the power cable. Turn the switch off, connect the power cable to another power source, if available, and turn the switch back on. If the LED comes on, the problem is the first power source.
 - If the power LED fails to come on after you connect the power supply to a new power source, replace the power cord, and turn the switch back on. If the LED comes on, return the first power cable for replacement.
 - If the LED still fails to come on when the power supply is connected to a different power source with a new power cable, the power supply is probably faulty. Contact a service representative for further instructions.

Troubleshooting the Processor Subsystem

The processor subsystem comprises the network processing card and the ports. The system can operate without a port adapter installed as long as none are in *partial* contact with the connector pins. A port adapter that is partially connected to the router sends incomplete signals to the processor, which faults the Peripheral Component Interconnect (PCI) bus and causes the system to hang. Therefore, first ensure

that the system software has initialized successfully. If not, remove the port adapter and restart the system. If the system then boots, reinsert the port adapter card and, if necessary, troubleshoot the port adapter.

Troubleshooting the Network Processor Card

The procedures in this section assume that the router is in the original factory configuration, and that you have not made changes to your configuration file.

If the system ready LED (SYS RDY) does not come on as expected (see the [“When you start up the system by turning the power supply switch to the ON \(I\) position, the following should occur:”](#) section on page 5-3), check the following items to help isolate the problem:

- Do all of the LEDs remain off when the system power switch is turned on?
 - If the LEDs stay off, first see the [“Troubleshooting the Power Subsystem”](#) section on page 5-4 and the [“Troubleshooting the Cooling Subsystem”](#) section on page 5-6 to ensure that both the fans and the power supply are functioning properly.
 - If the power supply and fans appear operational but the system ready or enable LEDs are off, suspect that an improperly connected port adapter has hung the system. Reinsert the port adapter, tighten all captive installation screws, and then restart the system.
- Is the system ready LED on?
 - If yes, the system software has initialized successfully, and the system is operational.
 - If the system ready LED remains off, the system detected a processor hardware failure. (This LED should be on in normal operation.) Contact a service representative for instructions.

Troubleshooting the Port Adapter and Fixed RF Ports

Check the following to help isolate a problem with a port adapter or fixed RF port:

- Are *all* enabled LEDs on?
 - If yes, the system is operational.
- Are *any* enabled LEDs off?
 - If the enabled LED on a port adapter is off, first verify that the port adapter has been enabled and configured for operations. The enabled LED remains off when a port adapter has not been configured and enabled.
 - If the port has been enabled but its corresponding enabled LED is still off, suspect that the adapter has pulled away from the router. Reseat the adapter in its slot. (You do not have to turn off the system power when removing or replacing port adapters.) After the system reinitializes the interfaces, the enabled LED on the adapter should come on.
 - If the enabled LED remains off after the above checks, it is likely that the system has detected a processor hardware failure. Contact a service representative for instructions.

Troubleshooting the Cooling Subsystem

Check the following to help isolate a problem with the cooling system:

- When you start up the system, do the fans start operating?

To determine if the fans are operating, listen for them. In noisy environments, place your hand on the front of the chassis to feel for air being pushed out of the vents. If necessary, pop off the front bezel to expose the fans and verify that they are operating correctly.

- If yes, the power to the fans is good.
- If no, there is a problem with the fan or power. (See the [“Troubleshooting the Power Subsystem” section on page 5-4.](#))

- The following messages, if displayed, indicate that the system has detected a critical overtemperature condition or out-of-tolerance power inside the chassis:

Queued messages:

```
00:01:19:%ENVM-4-ENVWARN:+2.5 V measured at +2.59
00:01:19:%ENVM-4-ENVWARN:+5.15 V measured at +5.31

00:00:19:%ENVM-2-ENVCRIT:chassis core measured at 31C/87F
00:00:19:%ENVM-2-ENVCRIT:chassis inlet measured at 27C/80F
00:00:19:%ENVM-2-ENVCRIT:chassis outlet 1 measured at 30C/86F
00:00:19:%ENVM-2-ENVCRIT:chassis outlet 2 measured at 30C/86F
```

Although an overtemperature condition is unlikely at initial startup, ensure that heated exhaust air from other equipment is not entering the router's inlet vent and that there is sufficient clearance around the sides of the chassis to allow cooling air to flow.

The above message could also indicate a faulty component or temperature sensor. Use the **show environment** or **show environment table** command to display the internal chassis environment.

If you experience trouble with the startup that is not resolved with these procedures, manually power off the router and contact a service representative for assistance and further instructions.



Maintenance

This chapter describes basic maintenance for the Cisco uBR7100 series router. The chapter contains the following sections:

- [Online Insertion and Removal, page 6-1](#)
- [Environmental Monitoring and Reporting Functions, page 6-2](#)
- [Flash Memory Card Usage, page 6-5](#)
- [Upgrading the SDRAM Memory Modules, page 6-11](#)

Online Insertion and Removal

The port adapter in the Cisco uBR7100 series router supports online insertion and removal (OIR). This function allows you to install and replace the port adapter while the universal broadband router is operating. In most instances, you do not need to shut down system power.

The following is a functional description of OIR; for specific procedures to install, configure, or replace a port adapter, refer to the appropriate port adapter documentation at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/core/12939paf.htm>

The port adapter has a bus connector that connects it to the universal broadband router's midplane. Each midplane connector has a set of tiered pins in three lengths. The pins send specific signals to the system as they make contact with the port adapter. The system assesses the signals it receives and the order in which it receives them to determine if a board is being removed or inserted into the midplane. From these signals, the system determines whether to reinitialize a new interface or shut down a removed interface.

For example, when inserting a port adapter, the longest pins make contact with the port adapter first, and the shortest pins make contact last. The system recognizes the signals and the sequence in which it receives them.

When you remove or insert a port adapter in a Cisco uBR7100 series router, the midplane pins send signals to notify the system, which then performs as follows:

1. Rapidly scans the midplane for configuration changes.
2. Initializes the newly inserted port adapter, noting any removed interfaces and placing them in the administratively shutdown state.
3. Brings all previously configured interfaces on the port adapter back to the state they were in when they were removed. Any newly inserted interfaces are put in the administratively shutdown state, as if they were present (but not configured) at boot time. If a similar port adapter is reinserted into a slot, its ports are configured and brought online up to the port count of the original port adapter.

You can remove and replace a port adapter with the same type of component without interrupting the system. To replace a port adapter with a different type of port adapter (for example, replacing a HSSI adapter with an ATM adapter), you must copy your startup configuration to your running configuration on the Cisco uBR7100 series router to enable the interfaces on the port adapter.

Environmental Monitoring and Reporting Functions

Environmental monitoring and reporting functions are controlled by the network processor and allow you to maintain normal system operation by identifying and resolving adverse conditions that might disrupt operation.

The environmental monitoring functions constantly monitor the internal chassis air temperature and power supply voltages and currents. The power supply monitors its own voltage and temperature and shuts itself down if it detects a critical condition within the power supply. The reporting functions periodically log the values of measured parameters so that you can retrieve them for analysis later, and the reporting functions display warnings on the console if any of the monitored parameters exceed defined thresholds.

The front and back of the chassis must remain unobstructed to ensure adequate airflow and prevent overheating inside the chassis; we recommend at least 3 inches (7.6 cm) of clearance. Temperature sensors in the router monitor the internal air temperature and send warning messages when the internal air temperature exceeds the specified threshold.

Environmental Monitoring

The environmental monitoring functions use four sensors to monitor the temperature of the cooling air as it moves through the chassis.

If the air temperature exceeds a defined threshold, the router displays warning messages on the console terminal. The system stores the present parameter measurements for both temperature and power voltage in NVRAM so you can retrieve them later.

In addition, the power supply monitors the internal power supply temperature and voltages. A power supply is either within tolerance (normal) or out of tolerance (critical). If the internal power supply temperature or voltage reaches a critical level, the power supply shuts down without any interaction with the system processor.

The environmental monitoring functions use the following levels of status conditions to monitor the system:

- Normal—All monitored parameters are within normal tolerances.
- Warning—The system has exceeded a specified threshold. The system continues to operate, but operator action is recommended to bring the system back to a normal state.
- Critical—An out-of-tolerance temperature or voltage condition exists. The system continues to operate; however, immediate operator action is required.

[Table 6-1](#) lists the typical temperature thresholds for each network processor type, and [Table 6-2](#) lists the power thresholds for the normal, warning, and critical (power supply-monitored) levels.

Table 6-1 Typical Processor-Monitored Temperature Thresholds

Parameter	High Warning	High Critical
Core	120°F (49°C)	129°F (54°C)
Chassis inlet	109°F (43°C)	118°F (48°C)
Chassis outlet 1	114°F (46°C)	123°F (51°C)
Chassis outlet 2	116°F (47°C)	125°F (52°C)

**Note**

If the system reports temperatures in the critical range, you must manually shut down the router. The processor does not shut down the router automatically.

Table 6-2 Typical Power Supply-Monitored Voltage Thresholds

Parameter	Low Critical	Low Warning	High Warning	High Critical
+2.5 V	+2.35 V	+2.39 V	+2.69 V	+2.72 V
+3.3 V	+3.11 V	+3.19 V	+3.39 V	+3.47 V
+5.15 V	+4.88 V	+5.00 V	+5.23 V	+5.39 V
+12.3 V	+11.53 V	+11.77 V	+12.76 V	+13.05 V
+12.3 V	+11.53 V	+11.77 V	+12.76 V	+13.05 V
-12.5 V	-10.20 V	-11.24 V	-13.71 V	-14.33 V

Displaying Environmental Status Reports

Cisco uBR7100 series routers display warning messages on the console if chassis interface-monitored parameters exceed a desired threshold. You can also retrieve and display environmental status reports with the **show environment**, **show environment all**, **show environment last**, and **show environment table** commands. Parameters are measured and reporting functions are updated every 60 seconds. A brief description of each of these commands follows.

**Caution**

To prevent overheating the chassis, ensure that your system is drawing cool inlet air. Overtemperature conditions can occur if the system is drawing in the exhaust air of other equipment. Ensure adequate clearance around the sides of the chassis so that cooling air can flow through the chassis interior unimpeded and exhaust air exits the chassis and is not drawn into the inlet vent of other device.

The **show environment** command displays the current environmental status of the system. The report displays parameters that are out of the normal values. No parameters are displayed if the system status is normal. The example that follows shows the display for a system in which all monitored parameters are within normal range:

```
Router# show environment
All measured values are normal
```

If the environmental status is *not* normal, the system reports the worst-case status level. Following is a sample overvoltage warning:

```
Router# show environment
Warning: +3.3 V measured at +3.41 V
```

The **show environment last** command retrieves and displays the NVRAM log, which provides a record of environmental status readings. Air temperature is measured and displayed, and the voltage supplied by the power supply is also displayed.

Following is sample output of the **show environment last** command:

```
Router# show environment last

chassis core           previously measured at 34C/93F
chassis inlet          previously measured at 28C/82F
chassis outlet 1      previously measured at 31C/87F
chassis outlet 2      previously measured at 33C/91F
+2.5 V                 previously measured at +2.59
+3.3 V                 previously measured at +3.32
+5.15 V                previously measured at +5.13
+12.3 V                previously measured at +12.99
+12.3 V                previously measured at +12.33
-12.5 V                previously measured at -12.43
```

The **show environment table** command displays the temperature and voltage thresholds for each temperature sensor and for each monitored status level, which are related to those thresholds listed in [Table 6-1](#) and [Table 6-2](#).

Following is sample output of the **show environment table** command:

```
Router# show environment table

Sample Point      LowCritical  LowWarning  HighWarning  HighCritical
chassis core      49C/120F    54C/129F
chassis inlet     43C/109F    48C/118F
chassis outlet 1  46C/114F    51C/123F
chassis outlet 2  47C/116F    52C/125F

+2.5 V            +2.35       +2.39       +2.69       +2.72
+3.3 V            +3.11       +3.19       +3.39       +3.47
+5.15 V           +4.88       +5.00       +5.23       +5.39
+12.3 V           +11.53      +11.77      +12.76      +13.05
+12.3 V           +11.53      +11.77      +12.76      +13.05
-12.5 V           -10.20      -11.24      -13.71      -14.33
```


Note

Temperature ranges and values are subject to change.

The **show environment all** command displays an extended report that includes temperature readings and voltage readings.

Following is sample output of the **show environment all** command:

```
Router# show environment all

Power Supply:
  Power supply is standard power supply. Unit is on.
Temperature readings:
  chassis core      measured at 33C/91F
  chassis inlet     measured at 27C/80F
  chassis outlet 1  measured at 30C/86F
  chassis outlet 2  measured at 32C/89F
```



```
Voltage readings:
+2.5 V measured at +2.59 V
+3.3 V measured at +3.32 V
+5.15 V measured at +5.13 V
+12.3 V measured at +12.29 V
+12.3 V measured at +12.33 V
-12.5 V measured at -12.43 V

Envm stats saved 2 time(s) since reload
```

Fan Failures

When the system power is on, all four fans should be operational. The system continues to operate if a fan fails; however, if the air temperature exceeds a defined threshold, the router displays warning messages on the console terminal.

For complete descriptions and instructions of the environmental monitor commands, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide* at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/ffun_c/

and the *Cisco IOS Configuration Fundamentals Command Reference* at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/ffun_r/

Flash Memory Card Usage

The Cisco uBR7100 series router has two Personal Computer Memory Card International Association (PCMCIA) slots for Type II flash memory cards. Slot 0 is the lower PCMCIA card slot and slot 1 is the upper PCMCIA card slot.

The following sections describe how to insert, remove, and format a flash memory card

Inserting a Flash Memory Card

To insert a flash memory card in either PCMCIA slot of the Cisco uBR7100 series router, use the following procedure. You do not need to power off the system to insert a flash memory card.



Note

To avoid potential problems when inserting spare flash memory cards in your Cisco uBR7100 series universal broadband router, we recommend that you reformat all of your flash memory cards during your regularly scheduled service times. The “[Formatting a Flash Memory Card](#)” section on page 6-8 contains instructions that explain how to reformat a flash memory card.

Step 1

Locate the PCMCIA card slots. For proper electromagnetic compliance (EMC), the slots have a cover that is secured with a captive screw. (See [Figure 6-1](#).)

Step 2

Use a flat-head screwdriver to loosen the captive screw that secures the protective cover, and lift the protective cover. (See [Figure 6-2](#).)



Tip

The flash disk memory card slots are labelled slot 0 and slot 1 on the chassis, but the flash disk memory cards themselves are addressed as disk0 and disk1, respectively, when using Cisco IOS commands.

- Step 3** Orient the flash memory card so that its connector end faces the appropriate slot. Make sure that the back label is facing up. (See [Figure 6-3](#).)

Figure 6-1 Location of the PCMCIA Card Slot

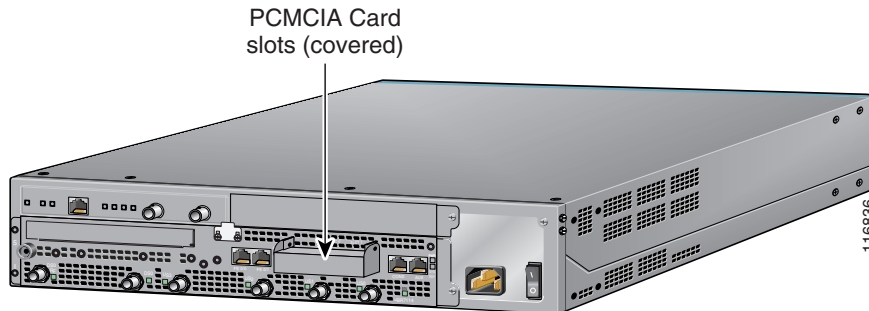


Figure 6-2 Removing the PCMCIA Card Slot Cover

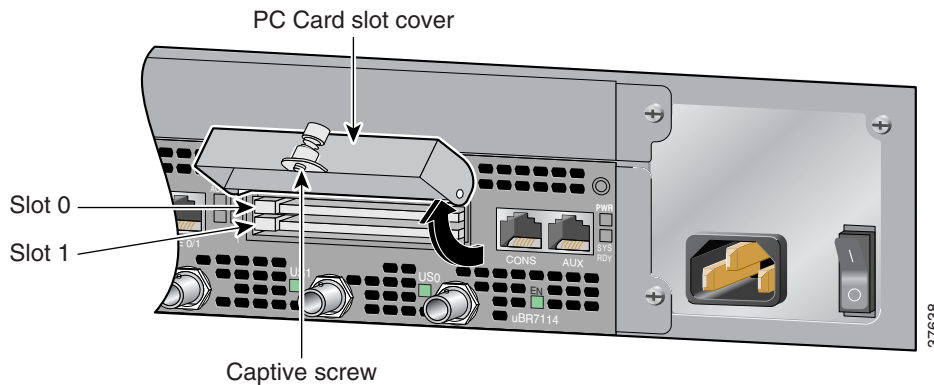
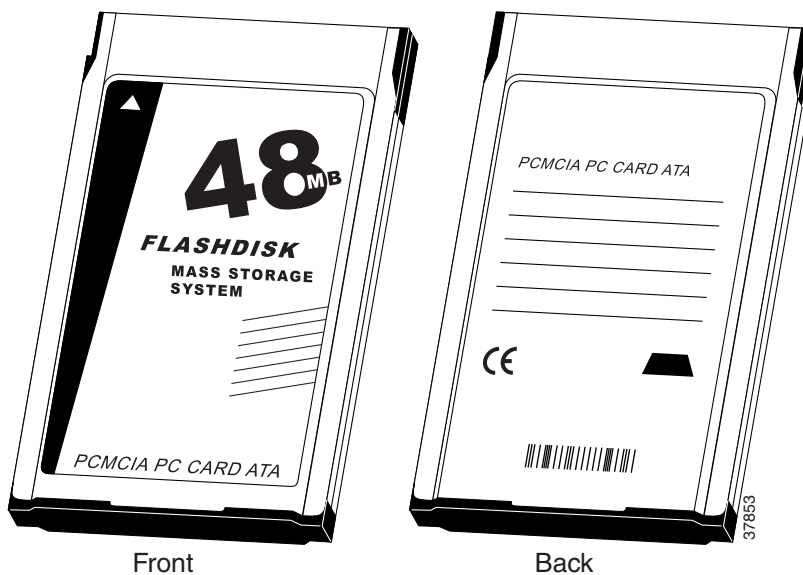


Figure 6-3 Flash Disk Card



Front

Back

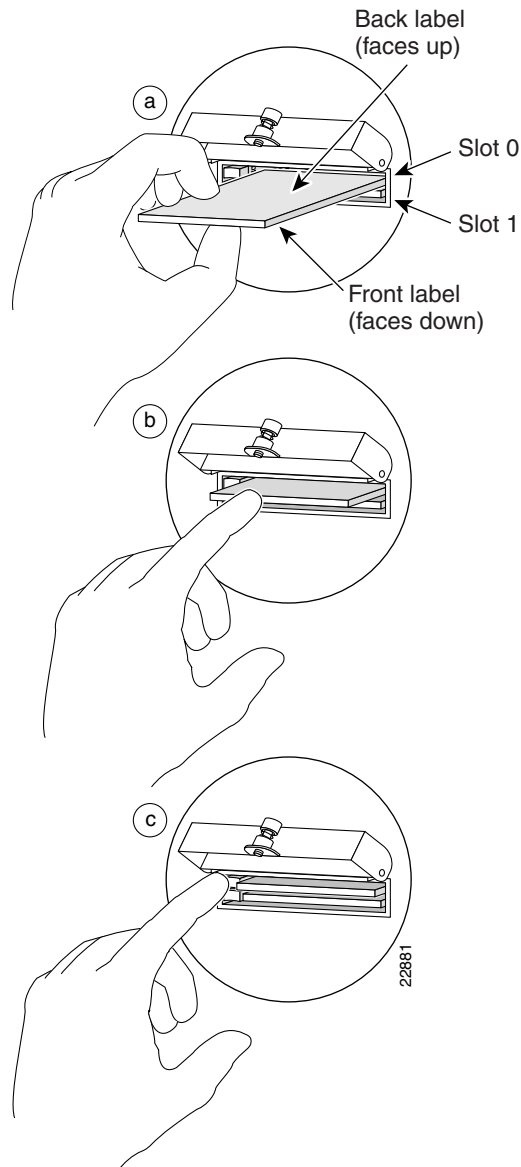
**Note**

The flash disk PC card must be installed with the back label facing up. The card is keyed and cannot be seated the wrong way.

Step 4

Carefully guide the card into the slot until it mates with the slot's connector and the eject button for the slot pops out toward you. (See [Figure 6-4](#).)

Figure 6-4 Inserting and Ejecting a Flash Disk Memory Card

**Note**

Flash memory cards do not insert all the way into the PCMCIA slots; the end of the card protrudes from the slot. Do *not* attempt to force the card past this point.

Removing a Flash Memory Card

To remove a flash memory card from either PCMCIA slot:

-
- Step 1** Use a flat-head screwdriver to loosen the captive screw that secures the protective cover, and lift the protective cover.
 - Step 2** Press the ejector button on the slot. (See [Figure 6-4c](#).)
 - Step 3** Grasp the card and pull it from the slot and place the card in an antistatic bag.
-

Formatting a Flash Memory Card

The flash memory card that shipped with your router contains the Cisco IOS software image you need to boot your router. In some cases, you might need to insert a new flash memory card and copy images or backup configuration files onto it. Before you can use a new flash memory card, you must format it. (Use only Type II PCMCIA flash memory cards provided by Cisco.)

**Tip**

To avoid potential problems when inserting spare flash memory cards in your Cisco uBR7100 series router, we recommend that you reformat all your flash memory cards during your regularly scheduled service times.

**Caution**

The following formatting procedure erases all information on the flash memory card. To prevent the loss of important data that might be stored on a flash memory card, proceed carefully. If you want to save the data on a flash memory card, copy the data to a server before you format the card.

**Note**

The following procedure assumes that you have already booted your router.

To format a new flash memory card:

-
- Step 1** Using the procedure described in the [“Inserting a Flash Memory Card”](#) section on page 6-5, insert the flash memory card into slot 0. (If slot 0 is not available, use slot 1.)
 - Step 2** To format the flash memory card, use the **format disk0:** (or **format disk1:**) command as follows:

```
Router# format disk0:
All sectors will be erased, proceed? [confirm]
Enter volume id (up to 30 characters): MyNewCard
Formatting sector 1
Format device disk0 completed
Router#
```

The system counts down the sectors as they are formatted. For example, a 48-MB flash memory card contains 384 sectors, and the display counts backwards from 384 to 1.

When the format routine reaches sector 1, the new flash memory card is formatted and ready to use.

```
Router(config)# boot system flash disk0:new.image
Router(config)# ^z
Router# copy running-config startup-config
Router# reload
```



Note In this example, the exclamation points (!!!) appear as the file is downloaded, and the “C” characters signify calculation of the checksum, which is a verification that the file has been correctly downloaded to the flash memory card.

When the system reloads, it boots the new.image file from the flash memory card.

Copying Bootable Images Between Flash Memory Cards

As future releases of Cisco IOS images become available, you will receive these images either as a file booted from a network server, a file on floppy disk, or a file on a flash memory card.

The following scenario describes how to use a newly released image on a flash memory card in a system that has an older image on a flash memory card in slot 0 and a default boot image in the onboard flash memory SIMM.

For this scenario, the filenames are as follows:

- The new image on the new flash memory card is new.image.
- The old image on the flash memory card in slot 0 (which is addressed as **disk0:**) is old.image.
- The bootable image in onboard flash memory is boot.image.

You will copy the new image from the new flash memory card onto the flash memory card that contains the old image.



Note

The scenario assumes that the new image will fit on the flash memory card in slot 0, alongside the old image. If there is not enough available space, use the **delete** command to delete files from the flash memory card to make sufficient room for the new image; however, do *not* delete the image.old file. Then use the **squeeze** command to remove these deleted files from the flash memory card. If, after you have deleted files and used the **squeeze** command, the two files cannot coexist on the flash memory card in slot 0, remove this card (place it in an antistatic bag and store it in a safe place), then insert the new flash memory card (with the file new.image) in slot 0. Proceed to [Step 5](#) and use the **boot system flash slot0:new.image** command to designate the file new.image as the default boot image.

Step 1 Boot the Cisco uBR7100 series universal broadband router. By default, the file boot.image is used.

Step 2 Enable the router as follows:

```
Router> enable
Password: <password>
Router#
```

Step 3 Insert the new flash memory card into slot 1.

- Step 4** Use the following command to copy the file `new.image` in slot 1 to the flash memory card in slot 0, *only if* there is enough memory space for the two images to coexist. If there is not enough memory space, proceed to [Step 5](#).

```
Router# copy disk1:new.image disk0:new.image
```



Note You can also enter the preceding command as `copy disk1:new.image disk0:`.

- Step 5** Use the following series of commands to designate the file `new.image` (which is on the flash memory card in slot 0) as the default boot image:

```
Router# configure terminal
Router(config)# no boot system
Router(config)# boot system flash disk0:new.image
Router(config)# ^z
Router# copy running-config startup-config
Router# reload
```

When the system reloads, it boots the file `new.image` from the flash memory card in slot 0.

Upgrading the SDRAM Memory Modules

The Cisco uBR7100 series router has upgradable memory modules on the network processing card located *inside* the router. To access these modules, you must remove the top cover of the chassis. Review the safety information before starting this procedure.



Note

SDRAM system memory defaults to 128 MB and can be upgraded to either 192 MB or 256 MB. (SDRAM packet memory is fixed at 64 MB.)



Warning

Before performing any of the following procedures, ensure that power is removed from the DC circuit. Statement 1003



Warning

Hazardous voltage or energy is present on the backplane when the system is operating. Use caution when servicing. Statement 1034



Warning

Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected. Statement 4



Warning

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



Warning

When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

Removing the Chassis Cover

To remove the top cover, use the following procedure:

- Step 1** Make sure that you are properly grounded.
- Step 2** Remove *all* power from the chassis.
- Step 3** Remove all the network connections.
- Step 4** Remove the chassis from the rack (if necessary) and place the it on a tabletop or workbench.

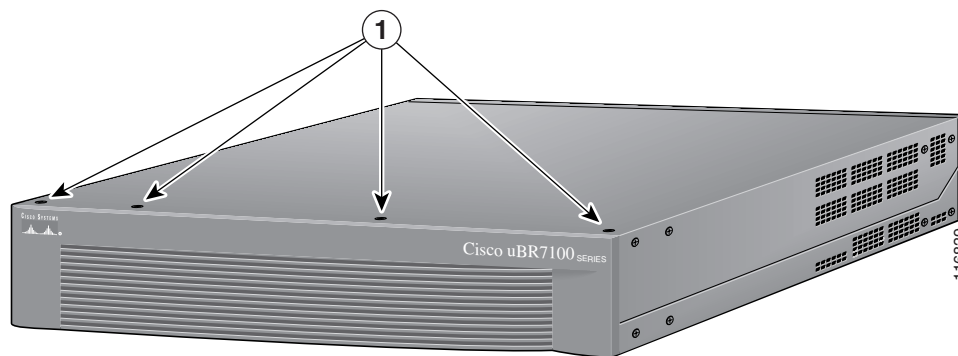


Caution

If you are moving the chassis to a workbench or other work area, it is a good idea to reconnect the chassis ground to help prevent ESD damage to the chassis components.

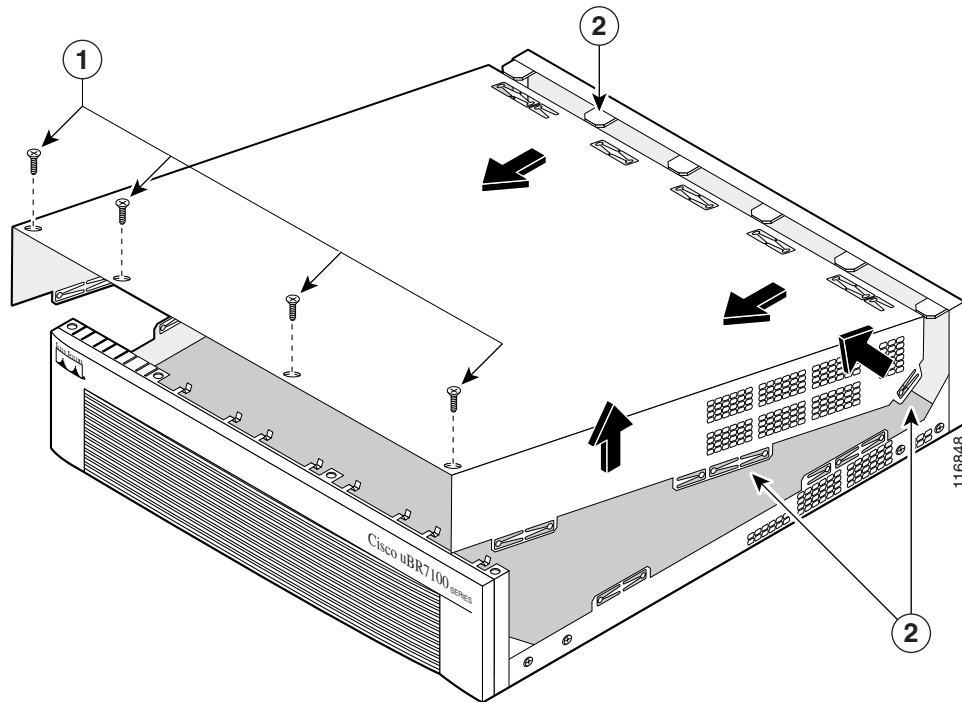
- Step 5** Unscrew the four cover screws at the front of the chassis and place the screws in a safe, easily accessible location. See [Figure 6-5](#).
- Step 6** Using both hands (one on either side of the cover), lift up the front of the cover and pull it towards you until it is clear of the bezel at the rear of the chassis. See [Figure 6-7](#).
- Step 7** Place the cover in a safe location.

Figure 6-5 Locating the Screw



1	Cover screws		
----------	--------------	--	--

Figure 6-6 Removing the Cover



1	Cover screws
2	Tabs

Removing the SDRAM DIMM

To remove the existing DIMM, use the following procedure:

-
- Step 1** Make sure that you are properly grounded.
 - Step 2** Locate the DIMM and position the chassis so that you are facing the DIMM module you want to remove.
 - Step 3** Open the DIMM latches on the DIMM to release the DIMM from the socket. (See [Figure 6-8](#)) The DIMM is under tension in the socket; therefore, the DIMM might be released from the socket with some force.

Figure 6-7 Locating the SDRAM DIMM 1 and SDRAM DIMM 2

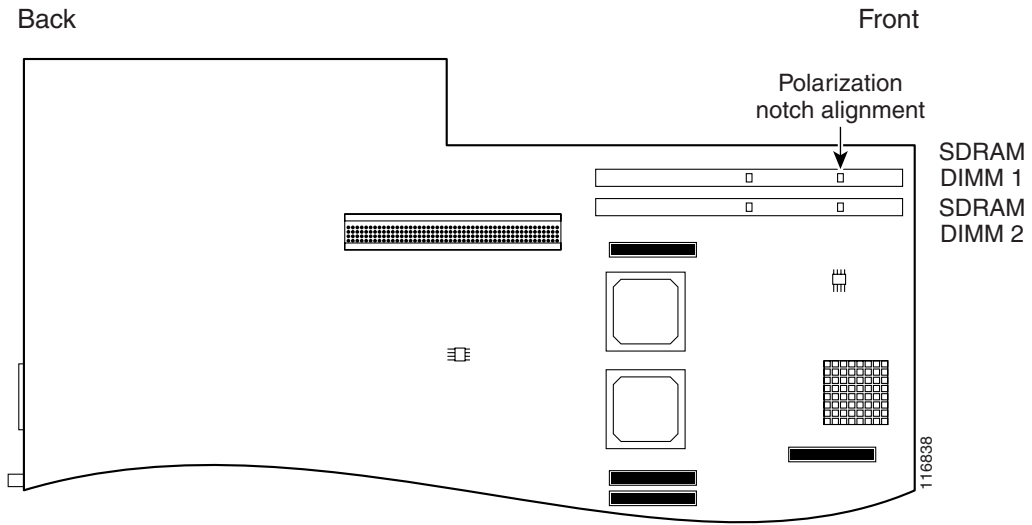
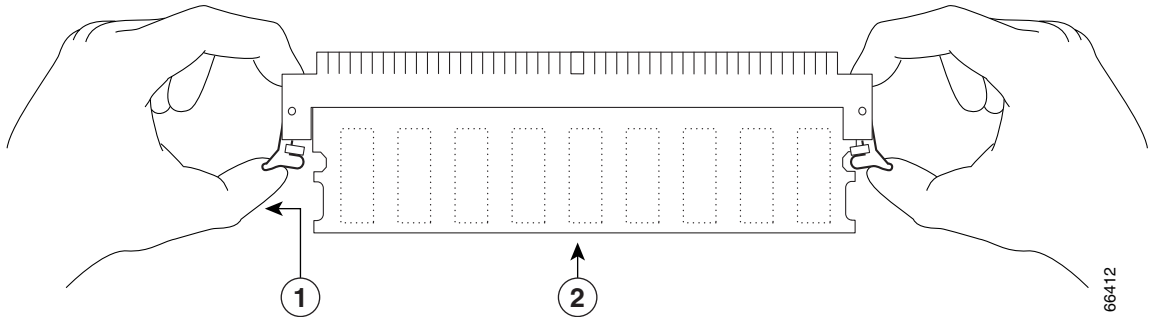


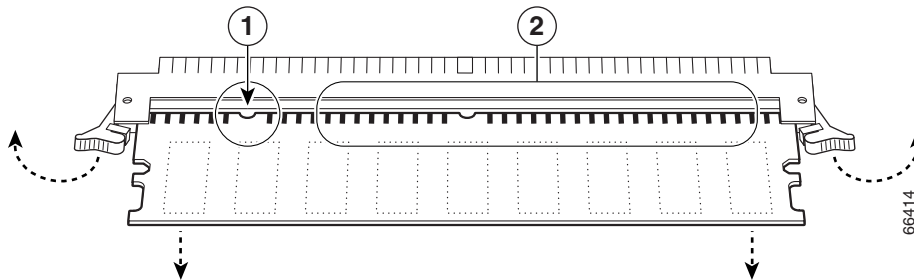
Figure 6-8 Opening DIMM Latches



1	Release latches	2	SDRAM DIMM
----------	-----------------	----------	------------

Step 4 With the DIMM latches open, grasp the ends of the DIMM between your thumbs and forefingers and pull the DIMM completely out of the socket.

Figure 6-9 Removing the DIMM

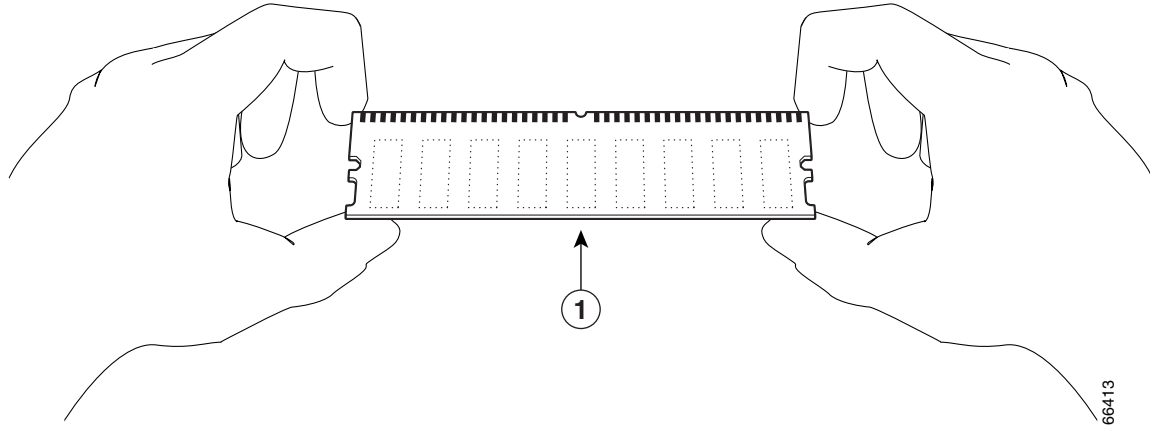


1	Notch	2	Metal fingers
----------	-------	----------	---------------

**Caution**

Handle the edges of the DIMM only; avoid touching the memory module, pins, or traces (the metal fingers along the connector edge of the DIMM).

Figure 6-10 Handling the DIMM



1	SDRAM DIMM		
----------	------------	--	--

**Caution**

To prevent ESD damage when working with DIMMs: handle the DIMM by the card edges only, place a removed DIMM on an antistatic mat, and store it in an antistatic container.

Step 5

Place the DIMM in an antistatic container to protect it from ESD damage.

Replacing the SDRAM DIMM

**Note**

The network processor card contains two SDRAM slots for user-configurable system memory, DIMM 1 and DIMM 2.

- The amount of memory installed in slot DIMM 1 must be greater than or equal to the memory installed in slot DIMM 2.
- Slot DIMM 2 is zero for the default memory configuration of 128 MB.
- Slot DIMM 0 is used only for packet memory and is fixed at 64 MB in the factory.

To replace the SRAM DIMM, do the following:

Step 1

Make sure that you are properly grounded.

Step 2

Remove the new DIMM from its antistatic container.

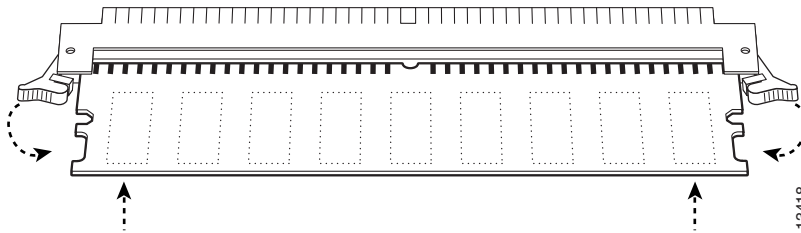
- Step 3** Hold the DIMM between your thumbs and forefingers and insert the connector edge of the DIMM straight into the socket. See [Figure 6-10](#).

**Caution**

When inserting the DIMM, use firm but not excessive pressure. If the socket is damaged, the chassis must be returned to the factory for repair.

- Step 4** Gently push the DIMM into the socket until the socket latches close over the ends of the DIMM. (See [Figure 6-11](#).) If necessary, rock the DIMM gently back and forth to seat it properly.

Figure 6-11 Inserting the DIMM



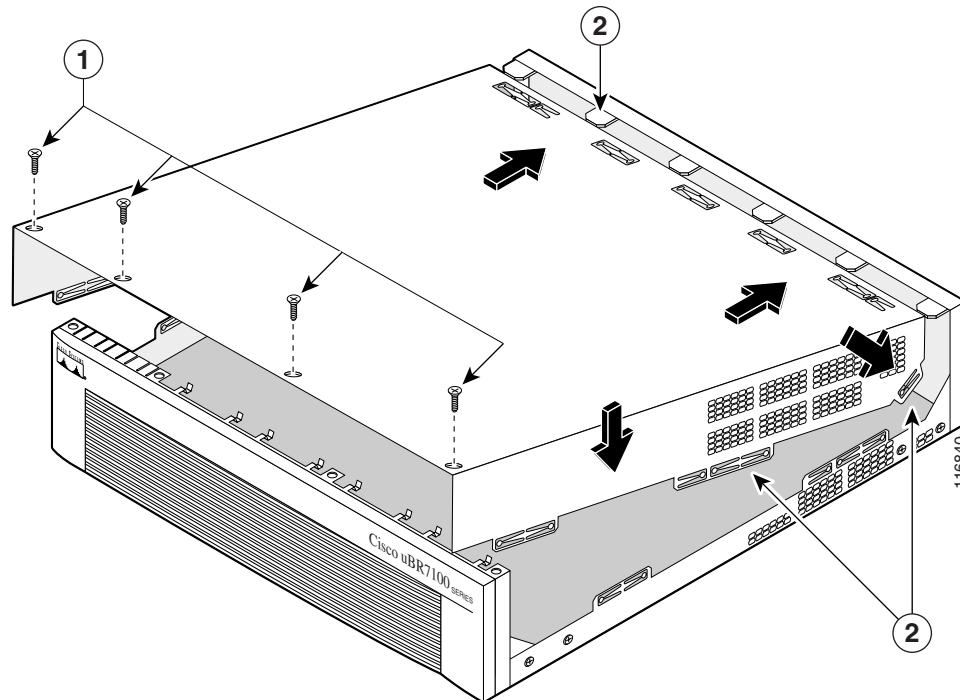
- Step 5** When the DIMM is installed, check to see if it is seated properly. If the DIMM appears misaligned, carefully remove it and reseat it in the socket. Push the DIMM firmly back into the socket until first one and then the other latch moves into place.
- Step 6** Repeat Step 2 through Step 5 to replace the second DIMM.

Replacing the Chassis Cover

To replace the cover on the Cisco uBR7100 series router, do the following:

- Step 1** Using both hands, carefully hold the cover at an angle and insert it back into the cover tab slots at the rear of the chassis. See [Figure 6-12](#).
- Step 2** Settle the cover in place making sure that the side tabs are correctly inserted into the side slots.
- Step 3** Gently push the cover down until you hear it snap into place.
- Step 4** Replace the screws in chassis cover (at the front). Do not overtighten the screws. (The recommended torque is 5 to 7 in. lbs [0.564 to 0.790 nm].)
- Step 5** Replace the chassis in the rack (if necessary). See the [“Rack-Mounting the Chassis”](#) section on [page 3-3](#).)

Figure 6-12 Replacing the Chassis Cover



1 Cover screws

2 Tabs

Powering On the Router

To return power to the router, do the following:

-
- Step 1** Verify that the chassis is properly grounded. Replace the ground connection, if necessary. See the “Attaching the Ground Wire” section on page 3-5.
 - Step 2** Reconnect the network connections. See the “Connecting to the Network” section on page 3-8 and the “Connecting the Console Port and Auxiliary Port” section on page 3-10.
 - Step 3** Connect the power cord to the chassis. See the “Connecting the Power” section on page 3-12.
 - Step 4** Connect the power cord to the AC outlet or other power source.
-



Note

For more information, also see *Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller* at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/core/7206/fru/memory/index.htm>



System Specifications

This appendix provides the following specifications for the Cisco uBR7100 series universal broadband routers:

- [Physical Specifications, page A-1](#)
- [RF Specifications, page A-3](#)
- [DOCSIS Upstream and Downstream Specifications, page A-3](#)
- [EuroDOCSIS Upstream and Downstream Specifications, page A-5](#)

Physical Specifications

Table A-1 Physical Specifications and Power Requirements

Description	Specification
Dimensions (H x W x D)	3.5 x 17.5 x 18.25 in. (8.89 x 44.45 x 46.36 cm)
Weight	~ 32 lb (14.5 kg)
Heat dissipation	370 W (1262 Btu ¹)
Input voltage, AC power supply	100 to 240 VAC
Current	5 to 2.5 A ²
Frequency	50/60 Hz
Power factor	0.80 to 0.95
Input AC power	525 W ³ (maximum)
AC-input cables	18-QEG4 3-wire cable, with a 3-lead IEC-320 receptacle on the power supply end, and a country-dependent plug on the power source end
Airflow	~120 cfm ⁴
Temperature	32 to 104°F (0 to 40°C) operating; –4 to 149°F (–20 to 65°C) nonoperating
Humidity	10 to 90% noncondensing
LAN interfaces	2 Ethernet 10BASE-T/100BASE-TX autosensing (RJ-45)
Console port	Asynchronous serial (RJ-45)
Auxiliary port	Asynchronous serial (RJ-45) with hardware flow-control

Table A-1 Physical Specifications and Power Requirements (continued)

Description	Specification
WAN interface options	For a list of supported port adapters, refer to the “Port Adapters” section on page 1-7 and Table 1-1 on page 1-8. Note Additional port adapters may be added in future Cisco IOS software releases. See the Cisco IOS software release notes for your software release for the most recent list of supported port adapters.
Recommended minimum software requirements	Cisco IOS Release 12.1(5)EC or later release for DOCSIS operations Cisco IOS Release 12.1(7)EC or later release for EuroDOCSIS operations
Compliance marking	CE, CSA, TUV, FCC, ICES, VCCI, AS/NZS, BSMI
Safety	UL 1950, CSA 22.2 No. 950, EN60950, ACA TS001, AS/NZS 3260, IEC 60950
EMC Emissions ⁵	CFR 47 part 15:1998 Class B; EN55022:1994 [incl AMD1+AMD2] Class B; AS/NZS 3548:1995; CISP22:1997 Class B; VCCI:1997 ClassB; ICES-003:1994; CNS13438:1997 Class B
EMC Immunity	EN61000-3-2:1995; EN61000-3-2:1995 ⁶

1. Btu = British thermal units.
2. A = amperes.
3. W = watts.
4. cfm = cubic feet per minute.
5. EMC = electromagnetic compatibility.
6. Refer to *Regulatory Compliance and Safety Information for the Cisco uBR7100 and Cisco uBR7100E Series Universal Broadband Routers* for more information.

Table A-2 Cisco uBR7100 Series Cable Interface Specifications

Router Model	Downstream Modulation	Upstream Modulation	IF Output ¹
uBR7111	64 QAM	QPSK	+35 to +43 dBmV
uBR7114	64 QAM	QPSK	+35 to +43 dBmV
uBR7111E	64 QAM	QPSK	+33 to +38 dBmV
uBR7114E	64 QAM	QPSK	+33 to +38 dBmV

1. This table shows the output from the DS0 downstream port, which does not use the integrated upconverter.

RF Specifications

Table A-3 Typical RF Upstream Bandwidth and Modulation

Upstream Bandwidth	QPSK Data Throughput	16 QAM Data Throughput
200 kHz	0.3 Mbs	0.6 Mbs
400 kHz	0.6 Mbs	1.2 Mbs
800 kHz	1.2 Mbs	2.3 Mbs
1600 kHz	2.3 Mbs	4.5 Mbs
3200 kHz	4.6 Mbs	9.0 Mbs

Table A-4 Typical RF Downstream Modulation

Downstream Bandwidth	64 QAM Data Throughput	256 QAM Data Throughput
6 MHz	27.0 Mbs	38.0 Mbs
8 MHz	38.0 Mbs	56.0 Mbs

DOCSIS Upstream and Downstream Specifications

The recommended settings listed in the following tables are based on a hybrid fiber-coaxial cable (HFC) network in which the digital signal is carried 10 dB below the adjacent analog video channel. If the digital signal on your network is carried 6 dB below the adjacent analog video channel, add 4 dB to the recommended settings in [Table A-5](#) and [Table A-6](#).

Table A-5 DOCSIS Cable Upstream RF Specifications

Specification	DOCSIS Specifications ¹	Minimum Settings ²	Your Headend Settings
System/Channel			
Frequency range	5 to 42 MHz	5 to 42 MHz	
Transit delay, CMTS to furthest customer	< 0.800 μsec	< 0.800 μsec	
Carrier to noise ratio	> 25 dB (QPSK ³) ⁴ > 25 dB (16 QAM ⁵) ⁴	> 21 dB (QPSK) ⁴ > 24 dB (16 QAM) ⁴	
Carrier to ingress power ratio	> 25 dB	> 25 dB	
Carrier to interference ratio	> 25 dB (QPSK) ⁴ > 25 dB (16 QAM) ⁴	> 21 dB (QPSK) ⁴ > 24 dB (16 QAM) ⁴	
Carrier hum modulation	< -23 dBc ⁶ (7%)	< -23 dBc (7%)	
Burst noise	< 10 μsec	< 10 μsec	
Amplitude ripple	0.5 dB/MHz	0.5 dB/MHz	
Group delay ripple	200 ns/MHz	200 ns/MHz	
Micro reflections (single echo)	-10 dBc @ < 0.5 μsec -20 dBc @ < 1.0 μsec	-10 dBc @ < 0.5 μsec -20 dBc @ < 1.0 μsec	

Table A-5 DOCSIS Cable Upstream RF Specifications (continued)

Specification	DOCSIS Specifications ¹	Minimum Settings ²	Your Headend Settings
Seasonal/diurnal signal level variation	< 8 dB	< 8 dB	
Carrier to second order	< -50 dBc	< -50 dBc	
Digital Signal Levels			
From cable modem (upstream)	+8 to +58 dBmV (QPSK) +8 to +55 dBmV (16 QAM)	+8 to +58 dBmV (QPSK) +8 to +55 dBmV (16 QAM)	
Input amplitude to modem card (upstream)	-16 to +26 dBmV	-10 to +25 dBmV	
Signal as relative to adjacent video signal	-6 to -10 dBc	-6 to -10 dBc	

- DOCSIS specifications are baseline settings for a DOCSIS-compliant, two-way data-over-cable system.
- Minimum settings are slightly different than the DOCSIS settings to account for cable system variations over time and temperature. Using these settings should increase the reliability of DOCSIS-compliant, two-way data-over-cable systems.
- QPSK = Quadrature Phase-Shift Keying: a method of modulating digital signals onto a radio-frequency carrier signal using four phase states to code two digital bits.
- These settings are measured relative to the digital carrier. Add 6 or 10 dB, as determined by your company's policy and derived from the initial cable network setup, relative to the analog video signal.
- QAM = Quadrature Amplitude Modulation: a method of modulating digital signals onto a radio-frequency carrier signal involving both amplitude and phase coding.
- dBc = decibels relative to carrier.

Table A-6 DOCSIS Cable Downstream RF Specifications

Specification	DOCSIS Specifications ¹	Minimum Settings ²	Your Headend Settings
System/Channel			
RF channel spacing (bandwidth)	6 MHz	6 MHz	
Transit delay ³	0.800 µsec	0.800 µsec	
Carrier to noise ratio	> 30 dB (64 QAM ⁴) ⁵ > 35 dB (256 QAM) ⁵	>30 dB (64 QAM) ⁵ > 33 dB (256 QAM) ⁵	
Carrier to ingress power ratio	> 35 dB	> 35 dB	
Composite triple beat distortion	< -50 dBc ⁶	< -50 dBc	
Carrier to second order	< -50 dBc	< -50 dBc	
Cross-modulation level	< -40 dBc	< -40 dBc	
Amplitude ripple	0.5 dB in 6 MHz	0.5 dB in 6 MHz	
Group delay	75 ns ⁷ in 6 MHz	75 ns in 6 MHz	
Micro reflections bound for dominant echo	-10 dBc @ < 0.5 µsec -15 dBc @ < 1.0 µsec -20 dBc @ < 1.5 µsec -30 dBc @ < 1.5 µsec	-10 dBc @ < 0.5 µsec -15 dBc @ < 1.0 µsec -20 dBc @ < 1.5 µsec -30 dBc @ < 1.5 µsec	
Carrier hum modulation	< -26 dBc (5%)	< -26 dBc (5%)	
Burst noise	< 25 µsec	< 25 µsec	
Seasonal/diurnal signal level variation	8 dB	8 dB	

Table A-6 DOCSIS Cable Downstream RF Specifications (continued)

Specification	DOCSIS Specifications ¹	Minimum Settings ²	Your Headend Settings
Signal level slope (50 to 750 MHz)	16 dB	16 dB	
Maximum analog video carrier level (at CM)	+17 dBmV	+17 dBmV	
Minimum analog video carrier level (at CM)	-5 dBmV	-5 dBmV	
Digital Signal Levels			
From headend	-15 to +15 dBmV	-15 to +15 dBmV	
Signal as relative to adjacent video signal	-6 or -10 dBc	-6 or -10 dBc	

- DOCSIS specifications are baseline settings for an DOCSIS-compliant, two-way data-over-cable system.
- Minimum settings are slightly different than the DOCSIS settings to account for cable system variations over time and temperature. Using these settings should increase the reliability of DOCSIS-compliant, two-way data-over-cable systems.
- Transit delay is defined as the “round trip” from the cable headend to the furthest customer and back.
- QAM = Quadrature Amplitude Modulation: a method of modulating digital signals onto a radio-frequency carrier signal involving both amplitude and phase coding.
- These settings are measured relative to the digital carrier. Add 6 or 10 dB, as determined by your company’s policy and derived from the initial cable network setup, relative to the analog video signal.
- dBc = decibels relative to carrier.
- ns = nanoseconds.

EuroDOCSIS Upstream and Downstream Specifications

The recommended settings listed in the following tables are based on a hybrid fiber-coaxial cable (HFC) network in which the digital signal is carried 10 dB below the adjacent analog video channel. If the digital signal on your network is carried 6 dB below the adjacent analog video channel, add 4 dB to the recommended settings in [Table A-7](#) and [Table A-8](#).

Table A-7 EuroDOCSIS Cable Upstream RF Specifications

Specification	EuroDOCSIS Specifications ¹	Minimum Settings ²	Your Headend Settings
System/Channel			
Frequency range	5 to 65 MHz	5 to 65 MHz	
Transit delay, CMTS to furthest customer	< 0.800 ms	< 0.800 ms	
Carrier to noise ratio	> 25 dB (QPSK ³) ⁴ > 25 dB (16 QAM ⁵) ⁴	> 21 dB (QPSK) ⁴ > 24 dB (16 QAM) ⁴	
Carrier to ingress power ratio	> 25 dB	> 25 dB	
Carrier to interference ratio	> 25 dB (QPSK) ⁴ > 25 dB (16 QAM) ⁴	> 21 dB (QPSK) ⁴ > 24 dB (16 QAM) ⁴	
Carrier hum modulation	< -23 dBc ⁶ (7%)	< -23 dBc (7%)	
Burst noise	< 10 ms	< 10 ms	
Amplitude ripple	0.5 dB/MHz	0.5 dB/MHz	
Group delay ripple	200 ns/MHz	200 ns/MHz	

Table A-7 EuroDOCSIS Cable Upstream RF Specifications (continued)

Specification	EuroDOCSIS Specifications ¹	Minimum Settings ²	Your Headend Settings
Micro reflections (single echo)	-10 dBc @ < 0.5 ms -20 dBc @ < 1.0 ms	-10 dBc @ < 0.5 ms -20 dBc @ < 1.0 ms	
Seasonal/diurnal signal level variation	< 8 dB	< 8 dB	
Carrier to second order	< -50 dBc	< -50 dBc	
Digital Signal Levels			
From cable modem (upstream)	+8 to +58 dBmV (QPSK) +8 to +55 dBmV (16 QAM)	+8 to +58 dBmV (QPSK) +8 to +55 dBmV (16 QAM)	
Input amplitude to modem card (upstream)	-10 to +25 dBmV	-10 to +25 dBmV	
Signal as relative to adjacent video signal	-6 to -10 dBc	-6 to -10 dBc	

1. EuroDOCSIS specifications are baseline settings for a EuroDOCSIS-compliant, two-way cable system.
2. Minimum settings are slightly different than the EuroDOCSIS settings to account for cable system variations over time and temperature. Using these settings should increase the reliability of EuroDOCSIS-based, two-way cable systems.
3. QPSK = Quadrature Phase-Shift Keying: a method of modulating digital signals onto a radio-frequency carrier signal using four phase states to code two digital bits.
4. These settings are measured relative to the digital carrier. Add 6 or 10 dB, as determined by your company's policy and derived from the initial cable network setup, relative to the analog video signal.
5. QAM = Quadrature Amplitude Modulation: a method of modulating digital signals onto a radio-frequency carrier signal involving both amplitude and phase coding.
6. dBc = decibels relative to carrier.

Table A-8 EuroDOCSIS Cable Downstream RF Specifications

Specification	EuroDOCSIS Specifications ¹	Minimum Settings ²	Your Headend Settings
System/Channel			
RF channel spacing (bandwidth)	8 MHz	8 MHz	
Transit delay ³	0.800 ms	0.800 ms	
Carrier to noise ratio	> 28 dB (64 QAM) ^{4,5} > 33.5 dB (256 QAM) ⁵	> 28 dB (64 QAM) ⁵ > 31.5 dB (256 QAM) ⁵	
Carrier to ingress power ratio	> 35 dB	> 35 dB	
Composite triple beat distortion	< -50 dBc ⁶	< -50 dBc	
Carrier to second order	< -50 dBc	< -50 dBc	
Cross-modulation level	< -40 dBc	< -40 dBc	
Amplitude ripple	0.5 dB in 8 MHz	0.5 dB in 8 MHz	
Group delay	75 ns ⁷ in 8 MHz	75 ns in 8 MHz	
Micro reflections bound for dominant echo	-10 dBc @ < 0.5 ms -15 dBc @ < 1.0 ms -20 dBc @ < 1.5 ms -30 dBc @ < 1.5 ms	-10 dBc @ < 0.5 ms -15 dBc @ < 1.0 ms -20 dBc @ < 1.5 ms -30 dBc @ < 1.5 ms	
Carrier hum modulation	< -26 dBc (5%)	< -26 dBc (5%)	

Table A-8 EuroDOCSIS Cable Downstream RF Specifications (continued)

Specification	EuroDOCSIS Specifications ¹	Minimum Settings ²	Your Headend Settings
Burst noise	< 25 ms	< 25 ms	
Seasonal/diurnal signal level variation	8 dB	8 dB	
Signal level slope (50 to 750 MHz)	16 dB	16 dB	
Maximum analog video carrier level	+17 dBmV	+17 dBmV	
Minimum analog video carrier level	-5 dBmV	-5 dBmV	
Digital Signal Levels			
From headend	-15 to +15 dBmV	-15 to +15 dBmV	
Signal as relative to adjacent video signal	-6 or -10 dBc	-6 or -10 dBc	

1. EuroDOCSIS specifications are baseline settings for an EuroDOCSIS-compliant, two-way cable system.
2. Minimum settings are slightly different than the EuroDOCSIS settings to account for cable system variations over time and temperature. Using these settings should increase the reliability of EuroDOCSIS-based, two-way cable systems.
3. Transit delay is defined as the “round trip” from the cable headend to the furthest customer and back.
4. QAM = Quadrature Amplitude Modulation: a method of modulating digital signals onto a radio-frequency carrier signal involving both amplitude and phase coding.
5. These settings are measured relative to the digital carrier. Add 6 or 10 dB, as determined by your company’s policy and derived from the initial cable network setup, relative to the analog video signal.
6. dBc = decibels relative to carrier.
7. ns = nanoseconds.

Integrated Upconverter Specifications

The integrated upconverter that is installed in the Cisco uBR7100 series chassis meets all DOCSIS and EuroDOCSIS specifications. The upconverter outputs an RF signal and operates in the frequency range of 55 to 858 MHz (band center). The output range is +50 to +63 dBmV at 64 and 256 QAM; the output can go down to +45 dBmV but with degraded power accuracy.



Note

The integrated upconverter output is available on the downstream port labeled DS0 RF. The downstream labeled DS0 outputs an IF signal that must be put through an external upconverter before use.



Note

On the Cisco uBR7111E and Cisco uBR7114E routers, the DS0 connector is automatically muted when the DS0 RF port is enabled.



Manufacturers for Headend Provisioning Requirements

Table B-1 and Table B-2 provide information on some of the manufacturers, websites, and product offerings required to prepare and provision a North American cable headend site for two-way data. Table B-3 and Table B-4 provide information on some of the manufacturers, websites, and product offerings required to prepare and provision a European cable headend site for two-way data.

North American Channel Plans

Table B-1 and Table B-2 provide information on some of the manufacturers, web sites, and product offerings required to prepare and provision a North American cable headend site for two-way data.

Table B-1 *Manufacturers for North American Headend Provisioning Requirements*

Manufacturer ¹	Website or Phone Number	Products/Model
Upconverters		
Barco ²	http://www.barco.com	Gemini
Motorola ³	http://www.gi.com	CDCM2000
Scientific Atlanta	http://www.sciatl.com	Continuum 9860, 9861
Vcom Electronics	http://www.vcom.com	HD4040, MA4040
Diplex Filters		
Eagle Comtronics	http://www.eaglecomtronics.com	Diplex filters
Microwave Filter Company, Inc.	http://www.microwavefilter.com	Diplex filters
PCI Technologies	http://www.pci.com	Diplex filters
Viewsonics	http://www.viewsonics.com	Diplex filters
Coaxial Jumpers, Attenuators, Splitters, and Taps		
Viewsonics	http://www.viewsonics.com	Variable attenuators, Comb generators, Cisco uBR kit (splitter, diplex filter, attenuators)
Vcom Electronics	http://www.vcom.com	Cisco uBR kit (splitter, diplex filter, attenuators)

Table B-1 Manufacturers for North American Headend Provisioning Requirements (continued)

Manufacturer ¹	Website or Phone Number	Products/Model
White Sands Engineering, Inc.	http://www.whitesandsengineering.com 1 800-jumpers or 602 581-0331	Coaxial jumpers
GPS Receivers		
Agilent ⁴	http://www.tm.agilent.com	Agilent 85960B, 85961B
Symmetricom	http://www.symmetricom.com	TS2500, TS2700, TS3000

1. The lead times for upconverters can run from 2 to 18 weeks. Contact the upconverter manufacturers listed above for current information on lead times.
2. The Barco Gemini model upconverter is no longer available or supported by Barco. Note that Barco currently supports the Gemini model stereoscopic projection package that is not related to the previous Gemini upconverter.
3. Formerly General Instrument
4. Formerly Hewlett-Packard Test and Measurement Division.

In addition, we recommend the following manufacturers, websites, and product offerings for various measurement devices you will need to prepare and provision a North American cable headend site for two-way data.

Table B-2 Manufacturers for North American Headend Measurement Devices

Manufacturer	Website or Phone Number	Products/Model
Digital Signal Level Meters/QAM Analyzers		
Acterna	http://www.acterna.com	SDA-5000, w/Option 4B
Agilent ¹	http://www.tm.agilent.com	Agilent 8594Q, N1776A
Telsey ²	http://www.telsey.it	DMA120, DMA122
Sencore	http://www.sencore.com	QAM-B970
Sunrise Telecom ³	http://www.sunrisetelecom.com/broadband	CR1200R, AT2000RQ
Trilithic	http://www.trilithic.com	860DSP w/Option QA1
Spectrum Analyzers		
Agilent	http://www.tm.agilent.com	Agilent 8591C, N1776A
Tektronics	http://www.tek.com	2715
Sunrise Telecom	http://www.sunrisetelecom.com/broadband	AT2000R
Vector Signal Analyzers		
Agilent	http://www.tm.agilent.com	Agilent 89411A

1. Formerly Hewlett-Packard Test and Measurement Division.
2. Formerly Tektronics DMA division
3. Formerly Hukk Engineering and Avantron.

European Channel Plans

Table B-3 and Table B-4 provides information on some of the manufacturers, Websites, and product offerings required to prepare and provision a European cable headend site for two-way data.

Table B-3 Manufacturers for European Headend Provisioning Requirements

Manufacturer ¹	Website or Phone Number	Products/Model
Upconverters		
Barco ²	http://www.barco.com	Gemini
Motorola ³	http://www.gi.com	CDCM2000
Scientific Atlanta	http://www.sciatl.com	Continuum
Vcom Electronics	http://www.vcom.com	HD4040, MA4040
Diplex Filters		
Eagle Comtronics	http://www.eaglecomtronics.com	Diplex filters
Microwave Filter Company, Inc.	http://www.microwavefilter.com	Diplex filters
PCI Technologies	http://www.pci.com	Diplex filters
Viewsonics	http://www.viewsonics.com	Diplex filters
Coaxial Jumpers, Attenuators, Splitters, and Taps		
Viewsonics	http://www.viewsonics.com	Variable attenuators, Comb generators, Cisco kit (splitter, diplex filter, attenuators, coaxial jumpers)
Vcom Electronics	http://www.vcom.com	Cisco uBR kit (splitter, diplex filter, attenuators)
White Sands Engineering, Inc.	http://www.whitesandsengineering.com 1 800-jumpers or 602 581-0331	Coaxial jumpers
GPS Receivers		
Agilent ⁴	http://www.tm.agilent.com	Agilent 85960B, 85961B
Symmetricom	http://www.symmetricom.com	TS2500, TS2700, TS3000

1. The lead times for upconverters can run from 2 to 18 weeks. Contact the upconverter manufacturers listed above for current information on lead times.
2. The Barco Gemini model upconverter is no longer available or supported by Barco. Note that Barco currently supports the Gemini model stereoscopic projection package that is not related to the previous Gemini upconverter.
3. Formerly General Instrument.
4. Formerly Hewlett-Packard Test and Measurement Division.

In addition, we recommend the following manufacturers, websites, and product offerings for various measurement devices you will need to prepare and provision a European cable headend site for two-way data.

Table B-4 Manufacturers for European Headend Measurement Devices

Manufacturer	Website or Phone Number	Products/Model
Digital Signal Level Meters/QAM Analyzer		
Acterna	http://www.acterna.com	SDA-5000 w/Option 4B
Agilent ¹	http://www.tm.agilent.com	Agilent 8594Q, N1776A
Sunrise Telecom ²	http://www.sunrisetelecom.com/broadband	AT2000RQ
Swires Research	http://www.swire.com	TVA 2000-Q
Telsey ³	http://www.telsey.it	DMA121, DMA122
Trilithic	http://www.trilithic.com	860DSP w/Option QA1
Spectrum Analyzers		
Agilent	http://www.tm.agilent.com	Agilent 8591C
Tektronix	http://www.tek.com	2715
Sunrise Telecom	http://www.sunrisetelecom.com/broadband	AT2000R
Vector Signal Analyzers		
Agilent	http://www.tm.agilent.com	Agilent 89411A

1. Formerly Hewlett-Packard Test and Measurement Division.
2. Formerly Hukk Engineering and Avantron.
3. Formerly Tektronics DMA division.



Cable Specifications

This appendix contains cable and cable pinout information for the Cisco uBR7100 series universal broadband routers.

- [Coaxial Cables, page C-1](#)
- [Console and Auxiliary Port Cables and Pinouts, page C-2](#)
- [Fast Ethernet Port Cables and Pinouts, page C-4](#)



Note

This appendix specifies pinouts only for the pins used. Pins not listed in the tables are not connected.

Coaxial Cables

The coaxial cable used to connect the Cisco uBR7100 series universal broadband routers at the headend should be very high-quality cable.

We recommend that you use a headend-grade coaxial cable or a quad-shield coaxial cable to connect the cable modem cards to the hybrid fiber-coaxial (HFC) network. The center conductor must be straight and extend 1/8 inch (3.2 mm) beyond the end of the connector, and the connector should be securely crimped to the cable. The following headend cables are recommended:

- 59-series cable (preferred)—20 AWG (0.032 inch/0.81 mm diameter) silver plated, copper-clad, steel center conductor; bonded foil inner shield; 95 percent braid second shield; nonbonded foil third shield; 95 percent braid fourth shield.
- 59-series quad shield—20 AWG (0.032 inch/0.81 mm diameter) copper-clad steel center conductor; bonded foil inner shield; 53 percent braid second shield; nonbonded foil third shield; 34–35 percent braid fourth shield.
- 6-series quad shield—18 AWG (0.0359 inch/0.91 mm diameter) copper-clad steel center conductor; bonded foil inner shield; 60 percent braid second shield; nonbonded foil third shield; 40–42 percent braid fourth shield.



Note

Any of the three of the coaxial cables listed can be used to connect a Cisco cable interface card to the HFC network; however, the consistent use of 59-series cable is preferred. If you connect a 59-series cable to a cable interface card that was previously connected using 6-series cable, the difference in the center connector diameter might cause intermittent connectivity loss.

If you use different types of coaxial cable, the following problems can appear:

- Damage to Cisco uBR7100 series cable interface card connectors—Cable interface card connectors are designed for 59-series or 6-series cable and connectors. Larger cables can damage the connectors.
- Poor return loss—High-quality cable and correct connectors help to ensure an optimal return loss of 16 dB or more.



Caution

Poorly shielded coaxial cable may result in undesired signal leakage (egress), interference from over-the-air signals (ingress), or crosstalk between cables in close physical proximity.

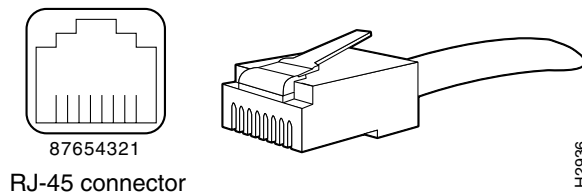
Console and Auxiliary Port Cables and Pinouts

The router arrives with a console and auxiliary cable kit, which contains the cable and adapters you need to connect a console (an ASCII terminal or PC running terminal emulation software) or modem to the router. The console and auxiliary cable kit includes:

- RJ-45-to-RJ-45 rollover cable
- RJ-45-to-DB-9 female data terminal equipment (DTE) adapter labeled **TERMINAL**
- RJ-45-to-DB-25 male data communications equipment (DCE) adapter labeled **MODEM**

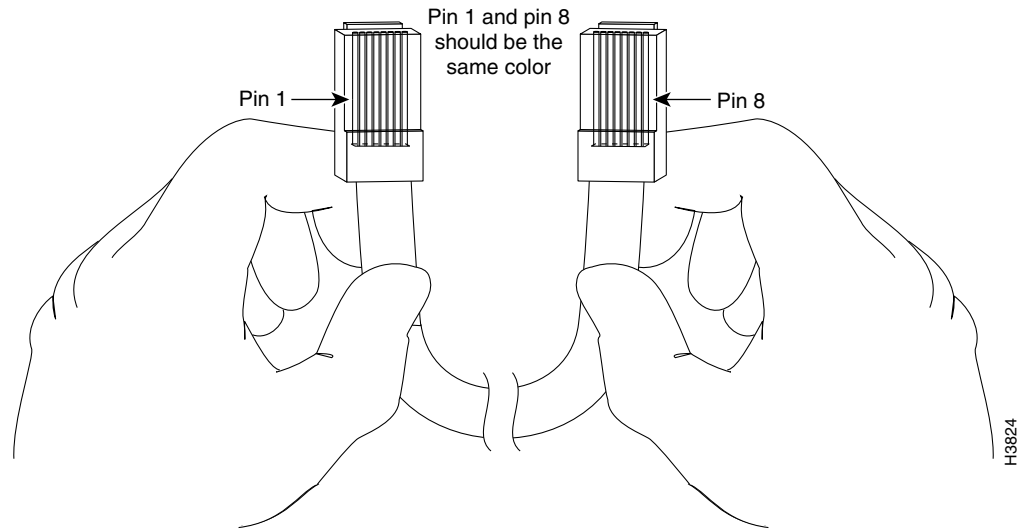
Figure C-1 shows the RJ-45 cable connector.

Figure C-1 RJ-45 Plug and Receptacle



Identifying an RJ-45 Rollover Cable

You can identify a rollover cable by holding the two ends of the cable next to each other, with the tab at the back. The wire connected to the pin on the outside of the lefthand plug should be the same color as the wire connected to the pin on the outside of the righthand plug, as shown in Figure C-2.

Figure C-2 RJ-45 Rollover Cable Identification

The colored wires at one connector are in the reverse order at the other connector (reverses pins 1 and 8, 2 and 7, 3 and 6, 4 and 5, 5 and 4, 6 and 3, 7 and 2, 8 and 1).

The wires of the straight-through cable are in the same sequence at both ends of the cable.

**Note**

If your cable was purchased from Cisco Systems, pin 8 is white.

Console Port Cables and Pinouts

Use the RJ-45-to-RJ-45 rollover cable and RJ-45-to-DB-9 female DTE adapter (labeled TERMINAL) to connect the console port to a PC running terminal emulation software. [Table C-1](#) lists the signals and pinouts for the asynchronous serial console port, the RJ-45-to-RJ-45 rollover cable, and the RJ-45-to-DB-9 female DTE adapter.

Table C-1 Console Port Signaling and Cabling Using a DB-9 Adapter

Console Port (DTE)	RJ-45-to-RJ-45 Rollover Cable		RJ-45-to-DB-9 Terminal Adapter	Console Device
	RJ-45 Pin	RJ-45 Pin	DB-9 Pin	
RTS	1 ¹	8	8	CTS
DTR	2	7	6	DSR
TxD	3	6	2	RxD
GND	4	5	5	GND
GND	5	4	5	GND
RxD	6	3	3	TxD
DSR	7	2	4	DTR
CTS	8 ¹	1	7	RTS

1. Pin 1 is connected internally to pin 8.

Auxiliary Port Cables and Pinouts

Use the RJ-45-to-RJ-45 rollover cable and RJ-45-to-DB-25 male DCE adapter (labeled MODEM) to connect the auxiliary port to a modem. Table C-2 lists the signals and pinouts for the asynchronous serial auxiliary port, the RJ-45-to-RJ-45 rollover cable, and the RJ-45-to-DB-25 male DCE adapter (labeled MODEM).

Table C-2 Auxiliary Port Signaling and Cabling Using a DB-25 Adapter

AUX Port (DTE)	RJ-45-to-RJ-45 Rollover Cable		RJ-45-to-DB-25 Modem Adapter	Modem (DCE)
Signal	RJ-45 Pin	RJ-45 Pin	DB-25 Pin	Signal
RTS	1	8	4	RTS
DTR	2	7	20	DTR
TxD	3	6	3	TxD
GND	4	5	7	GND
GND	5	4	7	GND
RxD	6	3	2	RxD
DSR	7	2	8	DCD
CTS	8	1	5	CTS

Fast Ethernet Port Cables and Pinouts

The 10BASE-T/100BASE-TX Fast Ethernet ports support IEEE 802.3 and IEEE 802.3u specifications for 10-Mbps and 100-Mbps transmission over unshielded twisted-pair (UTP) cables. Each Fast Ethernet port on the router has an RJ-45 connector to attach to Category 3 or Category 5 UTP cables.

- Use a Category 3 UTP crossover cable when connecting 10BASE-T port to a hub.
- Use a Category 3 UTP straight-through cable when connecting to a PC or other Ethernet device.
- Use a Category 5 UTP crossover cable when connecting 100BASE-TX to a hub.
- Use a Category 5 UTP straight-through cable when connecting to a PC or other Ethernet device.

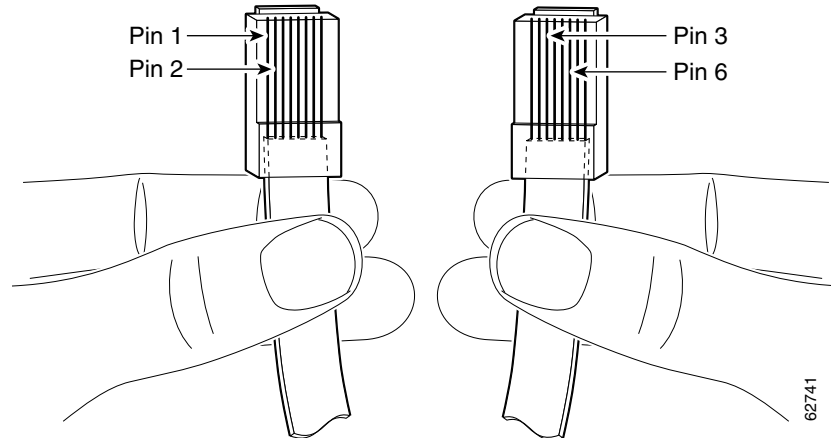


Note

Cisco Systems does not supply Category 3 or Category 5 UTP RJ-45 cables; these cables are available commercially.

Identifying an RJ-45 Crossover Cable

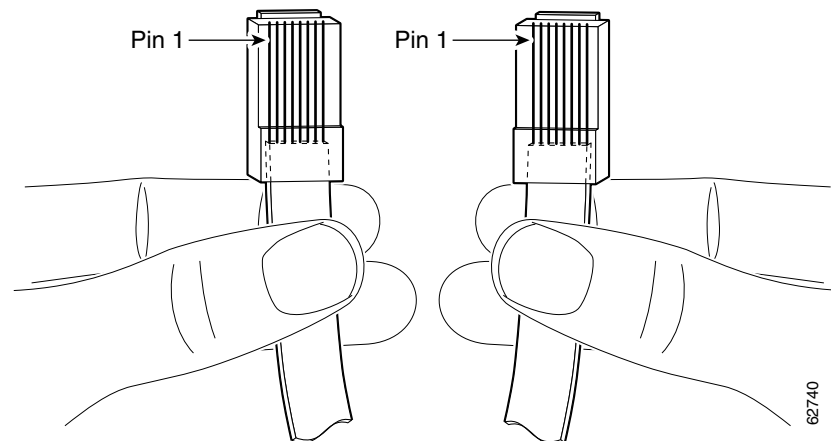
You can identify a crossover cable by comparing the two modular ends of the cable. Hold the cables side-by-side with the tab at the back. The first (far left) colored wire (pin 1) at one end of the cable is the third colored wire (pin 3) at the other end of the cable. The second colored wire (pin 2) at one end of the cable is the sixth colored wire (pin 6) at the other end of the cable. Pin 1 wire is white.

Figure C-3 RJ-45 Crossover Cable Identification

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Identifying an RJ-45 Straight-Through Cable

You can identify a straight-through cable by comparing the two modular ends of the cable. Hold the cables side-by-side with the tab at the back. The straight-through cable's wires are in the same sequence at both ends of the cable.

Figure C-4 RJ-45 Straight-Through Cable Identification

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**Note**

If your cable was purchased from Cisco Systems, pin 1 is white.

Table C-3 lists the pinouts for the two Fast Ethernet ports.

Table C-3 10BASE-T RJ-45 Connector Pinouts

RJ-45 Pin	Description	RJ-45 Pin	Description
1	Tx+	3	Rx+
2	Tx-	6	Rx-

Fiber-Optic Cables and Connectors



Warning

Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. Statement 1056



Warning

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

Use a single-mode or multimode fiber-optic interface cable to connect your Cisco uBR7100 series router to another router or switch. In general, multimode cables are gray or orange, and single-mode cables are yellow. For SONET or synchronous digital hierarchy (SDH) single-mode and multimode fiber-optic connections, use one duplex SC-type connector (Figure C-5) or two simplex SC-type connectors. (See Figure C-6.)

Figure C-5 Duplex SC Cable Connector

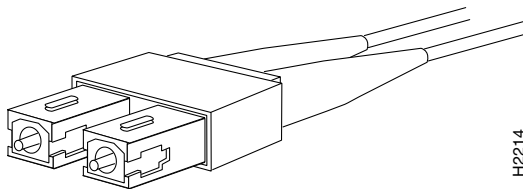


Figure C-6 Simplex SC Cable Connector

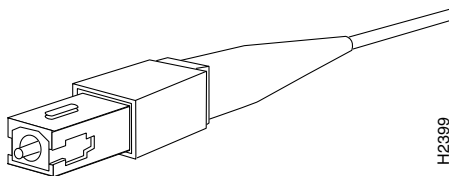
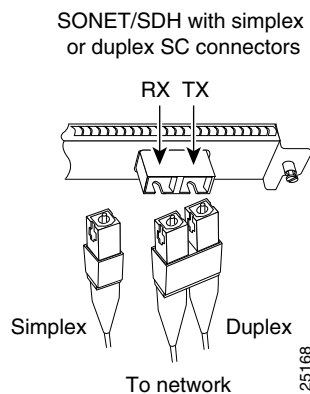


Figure C-7 Attaching Simplex or Duplex Fiber-Optic Cables

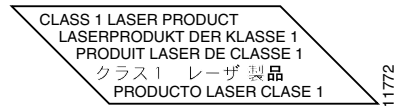


Attach either one duplex fiber cable or two simplex fiber cables between the digital pulse terminator (DPT) port adapter and the device to which the DPT port adapter is connected. Observe the receive (RX) and transmit (TX) cable relationship shown in [Figure C-7](#).

Laser Classification Labels

The following labels are found on port adapters that use fiber-optic connections.

Figure C-8 Laser Caution Label



Warning

Class 1 laser product. Statement 1008

Figure C-9 LED Caution Label



Warning

Class 1 LED product Statement 1027



Frequency Allocation Tables

This appendix provides information on broadcast and cable television NTSC and PAL/SECAM standards and frequencies used around the world.

There are three standards for transmitting video. They are defined by the method of encoding color onto a monochrome signal. The methods are defined as:

- **NTSC—National Television System Committee**

NTSC is the current standard used for analog television in the United States and elsewhere. NTSC supports color television transmission in a 6-MHz channel bandwidth and has 525 interlaced scan lines. Two fields are interlaced to make one frame with a frame rate of 29.97 frames per second and a field rate of 59.94 fields per second. A fraction (approximately 8 percent) of the available bandwidth is used for signal synchronization between the transmitter and the receiver, giving an effective resolution of 640x480. The aspect ratio, or ratio of picture width to picture height, is 4:3.
- **PAL—Phase Alternating Line**

PAL is a composite color system similar to NTSC. In PAL, however, the color difference signals alternate phase at the horizontal line rate. PAL video consists of a 625-line frame, a frame rate of 25 Hz, and a field rate of 50 Hz. As with NTSC, approximately 8 percent of the available bandwidth is used for synchronization yielding an effective resolution of 768x576. The aspect ratio is 4:3. The PAL standard and its variants are used primarily in Europe, Asia, Africa, Australia, Brazil, and Argentina.
- **SECAM—SEquential Couleur Avec Memoire**

SECAM is a color television broadcasting system using 625 picture lines and a 50-hertz (Hz) field rate, in which the two color-difference signals are transmitted sequentially instead of simultaneously.

NTSC information is covered in [Table D-4 on page D-3](#) and [Table D-5 on page D-8](#). General PAL/SECAM information is covered in [Table D-6 on page D-10](#). Use the information in [Table D-1](#), [Table D-2](#), and [Table D-3 on page D-2](#) to compare analog television standards used around the world.

Check these websites for more information:

http://www.blondertongue.com/WebPages/Reference/pdf/CATVref_Section_5_6_r.pdf

<http://www.geo-orbit.org/sizepgs/ntscp.html#anchor1016493>

http://www.acterna.com/downloads/posters/frequency_chart-acterna.pdf

<http://developer.apple.com/technotes/tn/tn1012.html#RTFToC4>

<http://www.c-cor.net/techdocs.cfm?product=Handbooks#files>

<http://www.qrf.com/ustvchan.htm>

<http://www.alkenmrs.com/video/standards.html>

Standards Comparisons

The following tables (Table D-1, Table D-2, and Table D-3) include data from Recommendation ITU-R BT.470.6, Conventional Television Systems (1998) and provide a comparison of the different standards.

Table D-1 Analog Television System Baseband Video Parameters

	M	N	B, B1, D1, G	H	I	D, K	K1	L
Lines per frame	525	625	625	625	625	625	625	625
Field rate (Hz)	Monochrome: 60 Color: 59.94	50	50	50	50	50	50	50
Horizontal rate (Hz)	Monochrome: 15,750 Color: 15,734.264	15,625	15,625	15,625	15,625	15,625	15,625	15,625
Video bandwidth (Mhz)	4.2	4.2	5	5	5.5	6	6	6

Table D-2 Analog Television Chrominance Sub Carrier Frequencies

	M/NTSC	M/PAL	B, B1, D, D1, G, H, K, N/PAL	I/PAL	N/PAL¹	B, D, G, H, K, K1, L/SECAM
Chrominance sub carrier frequency (Hz)	3,579,545 ± 10	3,575,611.49 ± 10	4,433,618.75 ± 5	4,433,618.75 ± 1	3,582,056.25 ± 5	$f_{OR} = 4,406,250 \pm 2,000$ $f_{OB} = 4,250,000 \pm 2,000$

1. This value applies to the combination N/PAL used in Argentina.

Table D-3 Analog Television System RF Parameters

	M	N	B, B1, G	H	I	D, D1, K	K1	L
Channel bandwidth at RF (MHz)	6	6	B=7 B1, G=8	8	8	8	8	8
Frequency separation between visual and aural carrier (MHz)	4.5	4.5	5.5	5.5	5.9996	6.5	6.5	6.5

NTSC Cable Television Channels and Relative Frequencies

Table D-4 provides information on the NTSC frequency map for standard 6-MHz channels in North, Central, and South America, as well as parts of Asia. Table D-5 on page D-8 lists NTSC assignments for Japan.

Table D-4 NCTA Cable Television Channels and Relative Frequencies

Channel No. ¹	Channel No., EIA	Bandwidth (MHz)	Visual Carrier (MHz)	Center Freq.	Aural Carrier (MHz)	Incrementally Related Carrier		Harmonically Related Carrier	
						Visual	Aural	Visual	Aural
T-7	none	5.75-11.75	7	8.75	11.5	N/A	N/A	N/A	N/A
T-8	none	11.75-17.75	13	14.75	17.5	N/A	N/A	N/A	N/A
T-9	none	17.75-23.75	19	10.75	23.5	N/A	N/A	N/A	N/A
T-10	none	23.75-29.75	25	26.75	29.5	N/A	N/A	N/A	N/A
T-11	none	29.75-35.75	31	32.75	35.5	N/A	N/A	N/A	N/A
T-12	none	35.75-41.75	37	38.75	41.5	N/A	N/A	N/A	N/A
T-13	none	41.75-47.75	43	44.75	47.5	N/A	N/A	N/A	N/A
TV-IF	none	40.0-46.0	45.75	44.0	41.25	N/A	N/A	N/A	N/A
2	2	54.0-60.0	55.25	57.0	59.75	55.2625	59.7625	54.0027	58.5027
3	3	60.0-66.0	61.25	63.0	65.75	61.2625	65.7625	60.0030	64.5030
4	4	66.0-72.0	67.25	69.0	71.75	67.2625	71.7625	66.0033	70.5030
5	5	76.0-82.0	77.25	79.0	81.75	79.2625	83.7625	78.0039	82.5039
6	6	82.0-88.0	83.25	85.0	87.75	85.2625	89.7625	84.0042	88.5042
	FM	88.0-108.0							
A-5	95	90.0-96.0	91.25	93.0	95.75	91.2625	95.7625	90.0045	94.5045
A-4	96	96.0-102.0	97.25	99.0	101.75	97.2625	101.7625	96.0048	100.5048
A-3	97	102.0-108.0	103.25	105.0	107.75	103.2625	107.7625	102.0051	106.5051
A-2	98 ²	108.0-114.0	109.25	111.0	113.75	109.2750	113.7750	Cannot lock to comb	
A-1	99 ²	114.0-120.0	115.25	117.0	119.75	115.2750	119.7750	ref: Refer to FCC regulations	
A	14 ²	120.0-126.0	121.25	123.0	125.75	121.2625	125.7625	120.0060	124.5060
B	15 ²	126.0-132.0	127.25	129.0	131.75	127.2625	131.7625	126.0063	130.5063
C	16 ²	132.0-138.0	133.25	135.0	137.75	133.2625	137.7625	132.0066	136.5066
D	17	138.0-144.0	139.25	141.0	143.75	139.2625	143.7625	138.0069	142.5069
E	18	144.0-150.0	145.25	147.0	149.75	145.2625	149.7625	144.0072	148.5072
F	19	150.0-156.0	151.25	153.0	155.75	151.2625	155.7625	150.0075	154.5075
G	20	156.0-162.0	157.25	159.0	161.75	157.2625	161.7625	156.0078	160.5078
H	21	162.0-168.0	163.25	165.0	167.75	163.2625	167.7625	162.0081	166.5081
I	22	168.0-174.0	169.25	171.0	173.75	169.2625	173.7625	168.0084	172.5084
7	7	174.0-180.0	175.25	177.0	179.75	175.2625	179.7625	174.0087	178.5087

Table D-4 NCTA Cable Television Channels and Relative Frequencies (continued)

Channel No. ¹	Channel No., EIA	Bandwidth (MHz)	Visual Carrier (MHz)	Center Freq.	Aural Carrier (MHz)	Incrementally Related Carrier		Harmonically Related Carrier	
						Visual	Aural	Visual	Aural
8	8	180.0-186.0	181.25	183.0	185.75	181.2625	185.7625	180.0090	184.5090
9	9	186.0-192.0	187.25	189.0	191.75	187.2625	191.7625	186.0093	190.5093
10	10	192.0-198.0	193.25	195.0	197.75	193.2625	197.7625	192.0096	196.5096
11	11	198.0-204.0	199.25	201.0	203.75	199.2625	203.7625	198.0099	202.5099
12	12	204.0-210.0	205.25	207.0	209.75	205.2625	209.7625	204.0102	208.5102
13	13	210.0-216.0	211.25	213.0	215.75	211.2625	215.7625	210.0105	214.5105
J	23	216.0-222.0	217.25	219.0	221.75	217.2625	211.7625	216.0108	220.5108
K	24 ²	222.0-228.0	223.25	225.0	227.75	223.2625	227.7625	222.0111	226.5111
L	25 ²	228.0-234.0	229.25	231.0	233.75	229.2625	233.7625	228.0114	232.5114
M	26 ²	234.0-240.0	235.25	237.0	239.75	235.2625	239.7625	234.0117	238.5117
N	27 ²	240.0-246.0	241.25	243.0	245.75	241.2625	245.7625	240.0120	244.5120
O	28 ²	246.0-252.0	247.25	249.0	251.75	247.2625	251.7625	246.0123	250.5123
P	29 ²	252.0-258.0	253.25	255.0	257.75	253.2625	257.7625	252.0126	256.5126
Q	30 ²	258.0-264.0	259.25	261.0	263.75	259.2625	263.7625	258.0129	262.5129
R	31 ²	264.0-270.0	265.25	267.0	269.75	265.2625	269.7625	264.0132	268.5132
S	32 ²	270.0-276.0	271.25	273.0	275.75	271.2625	275.7625	270.0135	274.5135
T	33 ²	276.0-282.0	277.25	279.0	281.75	277.2625	281.7625	276.0138	270.5138
U	34 ²	282.0-288.0	283.25	285.0	287.75	283.2625	287.7625	282.0141	286.5141
V	35 ²	288.0-294.0	289.25	291.0	293.75	289.2625	293.7625	288.0144	292.5144
W	36 ²	294.0-300.0	295.25	297.0	299.75	295.2625	299.7625	294.0147	298.5147
AA	37 ²	300.0-306.0	301.25	303.0	305.75	301.2625	305.7625	300.0150	304.5150
BB	38 ²	306.0-312.0	307.25	309.0	311.75	307.2625	311.7625	306.0153	310.5153
CC	39 ²	312.0-318.0	313.25	315.0	317.75	313.2625	317.7625	312.0156	316.5156
DD	40 ²	318.0-324.0	319.25	321.0	323.75	319.2625	323.7625	318.0159	322.5159
EE	41 ²	324.0-330.0	325.25	327.0	329.75	325.2625	329.7625	324.0162	328.5162
FF	42 ²	330.0-336.0	331.25	333.0	335.75	331.2625	335.7625	330.0165	334.5165
GG	43 ²	336.0-342.0	337.25	339.0	341.75	337.2625	341.7625	336.0168	340.5168
HH	44 ²	342.0-348.0	343.25	345.0	347.75	343.2625	347.7625	342.0171	346.5171
II	45 ²	348.0-354.0	349.25	351.0	353.75	349.2625	353.7625	348.0174	352.5174
JJ	46 ²	354.0-360.0	355.25	357.0	359.75	355.2625	359.7625	354.0177	358.5177
KK	47 ²	360.0-366.0	361.25	363.0	365.75	361.2625	365.7625	360.0180	364.5180
LL	48 ²	366.0-372.0	367.25	369.0	371.75	367.2625	371.7625	366.0183	370.5183
MM	49 ²	372.0-378.0	373.25	375.0	377.75	373.2625	377.7625	372.0186	376.5186
NN	50 ²	378.0-384.0	379.25	381.0	383.75	379.2625	383.7625	378.0189	382.5189
OO	51 ²	384.0-390.0	385.25	387.0	389.75	385.2625	389.7625	384.0192	388.5192

Table D-4 NCTA Cable Television Channels and Relative Frequencies (continued)

Channel No. ¹	Channel No., EIA	Bandwidth (MHz)	Visual Carrier (MHz)	Center Freq.	Aural Carrier (MHz)	Incrementally Related Carrier		Harmonically Related Carrier	
						Visual	Aural	Visual	Aural
PP	52 ²	390.0-396.0	391.25	393.0	395.75	391.2625	395.7625	390.0195	394.5195
QQ	53 ²	396.0-402.0	397.25	399.0	401.75	397.2625	401.7625	396.0198	400.5198
RR	54	402.0-408.0	403.25	405.0	407.75	403.2625	407.7625	402.0201	406.5201
SS	55	408.0-414.0	409.25	411.0	413.75	409.2625	413.7625	408.0204	412.5204
TT	56	414.0-420.0	415.25	417.0	419.75	415.2625	419.7625	414.0207	418.5207
UU	57	420.0-426.0	421.25	423.0	425.75	421.2625	425.7625	420.0210	424.5210
VV	58	426.0-432.0	427.25	429.0	431.75	427.2625	431.7625	426.0213	430.5213
WW	59	432.0-438.0	433.25	435.0	437.75	433.2625	437.7625	432.0216	436.5216
XX	60	438.0-444.0	439.25	441.0	443.75	439.2625	443.7625	438.0219	442.5219
YY	61	444.0-450.0	445.25	447.0	449.75	445.2625	449.7625	444.0222	448.5222
ZZ	62	450.0-456.0	451.25	453.0	455.75	451.2625	455.7625	450.0225	454.5225
	63	456.0-462.0	457.25	459.0	461.75	457.2625	461.7625	456.0228	460.5228
	64	462.0-468.0	463.25	465.0	467.75	463.2625	467.7625	462.0231	466.5231
	65	468.0-474.0	469.25	471.0	473.75	469.2625	473.7625	468.0234	472.5234
	66	474.0-480.0	475.25	477.0	479.75	475.2625	479.7625	474.0237	478.5237
	67	480.0-486.0	481.25	483.0	485.75	481.2625	485.7625	480.0240	484.5240
	68	486.0-492.0	487.25	489.0	491.75	487.2625	491.7625	486.0243	490.5243
	69	492.0-498.0	493.25	495.0	497.75	493.2625	497.7625	492.0246	496.5246
	70	498.0-504.0	499.25	501.0	503.75	499.2625	503.7625	498.0249	502.5249
	71	504.0-510.0	505.25	507.0	509.75	505.2625	509.7625	504.0252	508.5252
	72	510.0-516.0	511.25	513.0	515.75	511.2625	515.7625	510.0255	514.5255
	73	516.0-522.0	517.25	519.0	521.75	517.2625	521.7625	516.0258	520.5258
	74	522.0-528.0	523.25	525.0	527.75	523.2625	527.7625	522.0261	526.5261
	75	528.0-534.0	529.25	531.0	533.75	529.2625	533.7625	528.0264	532.5264
	76	534.0-540.0	535.25	537.0	539.75	535.2625	539.7625	534.0267	538.5267
	77	540.0-546.0	541.25	543.0	545.75	541.2625	545.7625	540.0270	544.5270
	78	546.0-552.0	547.25	549.0	551.75	547.2625	551.7625	556.0273	550.5273
	79	552.0-558.0	553.25	555.0	557.75	553.2625	557.7625	552.0276	556.5276
	80	558.0-564.0	559.25	561.0	563.75	559.2625	563.7625	558.0279	562.5279
	81	564.0-570.0	565.25	567.0	569.75	565.2625	569.7625	564.0282	568.5282
	82	570.0-576.0	571.25	573.0	575.75	571.2625	575.7625	570.0285	574.5285
	83	576.0-582.0	577.25	579.0	581.75	577.2625	581.7625	576.0288	580.5288
	84	582.0-588.0	583.25	585.0	587.75	583.2625	587.7625	582.0291	586.5291
	85	588.0-594.0	589.25	591.0	593.75	589.2625	593.7625	588.0294	592.5294
	86	594.0-600.0	595.25	597.0	599.75	595.2625	599.7625	594.0297	598.5297

Table D-4 NCTA Cable Television Channels and Relative Frequencies (continued)

Channel No. ¹	Channel No., EIA	Bandwidth (MHz)	Visual Carrier (MHz)	Center Freq.	Aural Carrier (MHz)	Incrementally Related Carrier		Harmonically Related Carrier	
						Visual	Aural	Visual	Aural
	87	600.0-606.0	601.25	603.0	605.75	601.2625	605.7625	600.0300	604.5300
	88	606.0-612.0	607.25	609.0	611.75	607.2625	611.7625	606.0303	610.5303
	89	612.0-618.0	613.25	615.0	617.75	613.2625	617.7625	612.0306	616.5306
	90	618.0-624.0	619.25	621.0	623.75	619.2625	623.7625	618.0309	622.5309
	91	624.0-630.0	625.25	627.0	629.75	625.2625	629.7625	624.0312	628.5312
	92	630.0-636.0	631.25	633.0	635.75	631.2625	635.7625	630.0315	634.5315
	93	636.0-642.0	637.25	639.0	641.75	637.2625	641.7625	636.0318	640.5318
	94	642.0-648.0	643.25	645.0	647.75	643.2625	647.7625	642.0321	646.5321
	100	648.0-654.0	649.25	651.0	653.75	649.2625	653.7625	648.0324	652.5324
	101	654.0-660.0	655.25	657.0	659.75	655.2625	659.7625	654.0327	658.5327
	102	660.0-666.0	661.25	663.0	665.75	661.2625	665.7625	660.0330	664.5330
	103	666.0-672.0	667.25	669.0	671.75	667.2625	671.7625	666.0333	670.5333
	104	672.0-678.0	673.25	675.0	677.75	673.2625	677.7625	672.0336	676.5336
	105	678.0-684.0	679.25	681.0	683.75	679.2625	683.7625	678.0339	682.5339
	106	684.0-690.0	685.25	687.0	689.75	685.2625	689.7625	684.0342	688.5342
	107	690.0-696.0	691.25	693.0	695.75	691.2625	695.7625	690.0345	694.5345
	108	696.0-702.0	697.25	699.0	701.75	697.2625	701.7625	696.0348	700.5348
	109	702.0-708.0	703.25	705.0	707.75	703.2625	707.7625	702.0351	706.5351
	110	708.0-714.0	709.25	711.0	713.75	709.2625	713.7625	708.0354	712.5354
	111	714.0-720.0	715.25	717.0	719.75	715.2625	719.7625	714.0357	718.5357
	112	720.0-726.0	721.25	723.0	725.75	721.2625	725.7625	720.0360	724.5360
	113	726.0-732.0	727.25	729.0	731.75	727.2625	731.7625	726.0363	730.5363
	114	732.0-738.0	733.25	735.0	737.75	733.2625	737.7625	732.0366	736.5366
	115	738.0-744.0	739.25	741.0	743.75	739.2625	743.7625	738.0369	742.5369
	116	744.0-750.0	745.25	747.0	749.75	745.2625	749.7625	744.0372	748.5372
	117	750.0-756.0	751.25	753.0	755.75	751.2625	755.7625	750.0375	754.5375
	118	756.0-762.0	757.25	759.0	761.75	757.2625	761.7625	756.0378	760.5378
	119	762.0-768.0	763.25	765.0	767.75	763.2625	767.7625	762.0381	766.5381
	120	768.0-774.0	769.25	771.0	773.75	769.2625	773.7625	768.0384	772.5384
	121	774.0-780.0	775.25	777.0	779.75	775.2625	779.7625	774.0387	778.5387
	122	780.0-786.0	781.25	783.0	785.75	781.2625	785.7625	780.0390	784.5390
	123	786.0-792.0	787.25	789.0	791.75	787.2625	791.7625	786.0393	790.5393
	124	792.0-798.0	793.25	795.0	797.75	793.2625	797.7625	792.0396	796.5396
	125	798.0-804.0	799.25	801.0	803.75	799.2625	803.7625	798.0399	802.5399
	126	804.0-810.0	805.25	807.0	809.75	805.2625	809.7625	804.0402	808.5402

Table D-4 NCTA Cable Television Channels and Relative Frequencies (continued)

Channel No. ¹	Channel No., EIA	Bandwidth (MHz)	Visual Carrier (MHz)	Center Freq.	Aural Carrier (MHz)	Incrementally Related Carrier		Harmonically Related Carrier	
						Visual	Aural	Visual	Aural
	127	810.0-816.0	811.25	813.0	815.75	811.2625	815.7625	810.0405	814.5405
	128	816.0-822.0	817.25	819.0	821.75	817.2625	821.7625	816.0408	820.5408
	129	822.0-828.0	823.25	825.0	827.75	823.2625	827.7625	822.0411	826.5411
	130	828.0-834.0	829.25	831.0	833.75	829.2625	833.7625	828.0414	832.5414
	131	834.0-840.0	835.25	837.0	839.75	835.2625	839.7625	834.0417	838.5417
	132	840.0-846.0	841.25	843.0	845.75	841.2625	845.7625	840.0420	844.5420
	133	846.0-852.0	847.25	849.0	851.75	847.2625	851.7625	846.0423	850.5423
	134	852.0-858.0	853.25	855.0	857.75	853.2625	857.7625	852.0426	856.5426
	135	858.0-864.0	859.25	861.0	863.75	859.2625	863.7625	858.0429	862.5429
	136	864.0-870.0	865.25	867.0	869.75	865.2625	869.7625	864.0432	868.5432
	137	870.0-876.0	871.25	873.0	875.75	871.2625	875.7625	870.0435	874.5435
	138	876.0-882.0	877.25	879.0	881.75	877.2625	881.7625	876.0438	880.5438
	139	882.0-888.0	883.25	885.0	887.75	883.2625	887.7625	882.0441	886.5441
	140	888.0-894.0	889.25	891.0	893.75	889.2625	893.7625	888.0444	892.5444
	141	894.0-900.0	895.25	897.0	899.75	895.2625	899.7625	894.0447	898.5447
	142	900.0-906.0	901.25	903.0	905.75	901.2625	905.7625	900.0450	904.5450
	143	906.0-912.0	907.25	909.0	911.75	907.2625	911.7625	906.0453	910.5453
	144	912.0-918.0	913.25	915.0	917.75	913.2625	917.7625	912.0456	916.5456
	145	918.0-924.0	919.25	921.0	923.75	919.2625	923.7625	918.0459	922.5459
	146	924.0-930.0	925.25	927.0	929.75	925.2625	929.7625	924.0462	928.5462
	147	930.0-936.0	931.25	933.0	935.75	931.2625	935.7625	930.0465	934.5465
	148	936.0-942.0	937.25	939.0	941.75	937.2625	941.7625	936.0468	940.5468
	149	942.0-948.0	943.25	945.0	947.75	943.2625	947.7625	942.0471	946.5471
	150	948.0-954.0	949.25	951.0	953.75	949.2625	953.7625	948.0474	952.5474
	151	954.0-960.0	955.25	957.0	959.75	955.2625	959.7625	954.0477	958.5477
	152	960.0-966.0	961.25	963.0	965.75	961.2625	965.7625	960.0480	964.5480
	153	966.0-972.0	967.25	969.0	971.75	967.2625	971.7625	966.0483	970.5483
	154	972.0-978.0	973.25	975.0	977.75	973.2625	977.7625	972.0486	976.5486
	155	978.0-984.0	979.25	981.0	983.75	979.2625	983.7625	978.0489	982.5489
	156	984.0-990.0	985.25	987.0	989.75	985.2625	989.7625	984.0492	988.5492
	157	990.0-996.0	991.25	993.0	995.75	991.2625	995.7625	990.0495	994.5495
	158	996.0-1002.0	997.25	999.0	1001.75	997.2625	1001.7625	996.0498	1000.5498

1. This column is for historical channel listings.

2. Aeronautical channels visual carrier frequency tolerance +/-5 kHz.

NTSC (M) Cable Television Frequencies for Japan

Japan uses NTSC (M) but has different channel assignments.

Table D-5 Japanese Channel Assignments

Channel Number	Bandwidth (MHz)	Visual Carrier (MHz)	Center Frequency	Aural Carrier (MHz)
1	90.0-96.0	91.25	93.00	95.75
2	96.0-102.0	97.25	99.00	101.75
3	102.0-108.0	103.25	105.00	107.75
4	170.0-176.0	171.25	173.00	175.75
5	176.0-182.0	177.25	179.00	181.75
6	182.0-188.0	183.25	185.00	187.75
7	188.0-194.0	189.25	191.00	193.75
8	192.0-198.0	193.25	195.00	197.75
9	198.0-204.0	199.25	201.00	203.75
10	204.0-210.0	205.25	207.00	209.75
11	210.0-216.0	211.25	213.00	215.75
12	216.0-222.0	217.25	219.00	221.75
C13	108.0-114.0	109.25	111.00	113.75
C14	114.0-120.0	115.25	117.00	119.75
C15	120.0-126.0	121.25	123.00	125.75
C16	126.0-132.0	125.25	129.00	131.75
C17	132.0-138.0	133.25	135.00	137.75
C18	138.0-144.0	139.25	141.00	143.75
C19	144.0-150.0	145.25	147.00	149.75
C20	150.0-156.0	151.25	153.00	155.75
C21	156.0-162.0	157.25	159.00	161.75
C22	164.0-170.0	165.25	167.00	169.75
C23	222.0-228.0	223.25	225.00	227.75
C24	230.0-236.0	231.25	233.00	235.75
C25	236.0-242.0	237.25	239.00	241.75
C26	242.0-248.0	243.25	245.00	247.75
C27	248.0-254.0	249.25	251.00	253.75
C28	254.0-258.0	253.25	257.00	257.75
C29	258.0-264.0	259.25	261.00	263.75
C30	264.0-270.0	265.25	267.00	269.75
C31	270.0-276.0	271.25	273.00	275.75
C32	276.0-282.0	277.25	279.00	281.75

Table D-5 Japanese Channel Assignments (continued)

Channel Number	Bandwidth (MHz)	Visual Carrier (MHz)	Center Frequency	Aural Carrier (MHz)
C33	282.0-288.0	283.25	285.00	287.75
C34	288.0-294.0	289.25	291.00	293.75
C35	294.0-300.0	295.25	297.00	299.75
C36	300.0-306.0	301.25	303.00	305.75
C37	306.0-312.0	307.25	309.00	311.75
C38	312.0-318.0	313.25	315.00	317.75
C39	318.0-324.0	319.25	321.00	323.75
C40	324.0-330.0	325.25	327.00	329.75
C41	330.0-336.0	331.25	333.00	335.75
C42	336.0-342.0	337.25	339.00	341.75
C43	342.0-348.0	343.25	345.00	347.75
C44	348.0-354.0	349.25	351.00	353.75
C45	354.0-360.0	355.25	357.00	359.75
C46	360.0-366.0	361.25	363.00	365.75
C47	366.0-372.0	367.25	369.00	371.75
C48	372.0-378.0	373.25	375.00	377.75
C49	378.0-384.0	379.25	381.00	383.75
C50	384.0-390.0	385.25	387.00	389.75
C51	390.0-396.0	391.25	393.00	395.75
C52	396.0-402.0	397.25	399.00	401.75
C53	402.0-408.0	403.25	405.00	407.75
C54	408.0-414.0	409.25	411.00	413.75
C55	414.0-420.0	415.25	417.00	419.75
C56	420.0-426.0	421.25	423.00	425.75
C57	426.0-432.0	427.25	429.00	431.75
C58	432.0-438.0	433.25	435.00	437.75
C59	438.0-444.0	439.25	441.00	443.75
C60	444.0-450.0	445.25	447.00	449.75
C61	450.0-456.0	451.25	453.00	455.75
C62	456.0-462.0	457.25	459.00	461.75
C63	462.0-468.0	463.25	465.00	467.75

PAL/SECAM Cable Television Channels and Relative Frequencies

Table D-6 provides information on the Phase Alternating Line (PAL) and SEquential Couleur Avec Memoire (SECAM) frequency map for standard 7- and 8-MHz channel bands in Europe.

The FCS (reference subaltern frequency) for color integration is different for different countries. Also, the channel and frequency designations are different for different countries. For a summary of the ITU designations for PAL and SECAM systems and Recommendation ITU-R BT.470.6 standards, refer to Table D-1, Table D-2, and Table D-3 on page D-2. These tables provide general information that may help determine frequency allocations for specific countries. Table D-6 is a frequency allocation table for PAL B and G locations. Also note that some countries use different schemes for VHF and UHF.

More information can be found at the websites listed on page E-1.



Note

The downstream frequency plan includes all center frequencies between 112 and 858 MHz on 250-kHz increments. It is up to the operator to decide which frequencies to use to meet national and network requirements

Table D-6 Cable Television Channels and Relative Frequencies, PAL B and G

Channel Number	Bandwidth (MHz)	Visual Carrier (MHz)	Aural Carrier (MHz)
E2	47.0-54.0	48.25	53.75
E3	54.0-61.0	55.25	60.75
E4	61.0-68.0	62.25	67.75
S3	118.0-125.0	119.25	124.75
S4	125.0-132.0	126.25	131.75
S5	132.0-139.0	133.25	138.75
S6	139.0-146.0	140.25	145.75
S7	146.0-153.0	147.25	152.75
S8	153.0-160.0	154.25	159.75
S9	160.0-167.0	161.25	166.75
S10	167.0-174.0	168.25	173.75
E5	174.0-181.0	175.25	180.75
E6	181.0-188.0	182.25	187.75
E7	188.0-195.0	189.25	194.5
E8	195.0-202.0	196.25	201.75
E9	202.0-209.0	203.25	208.75
E10	209.0-216.0	210.25	215.75
E11	216.0-223.0	217.25	222.75
E12	223.0-230.0	224.25	229.75
S11	230.0-237.0	231.25	236.75

Table D-6 Cable Television Channels and Relative Frequencies, PAL B and G (continued)

Channel Number	Bandwidth (MHz)	Visual Carrier (MHz)	Aural Carrier (MHz)
S12	237.0-244.0	238.25	243.75
S13	244.0-251.0	245.25	250.75
S14	251.0-258.0	252.25	257.75
S15	258.0-265.0	259.25	264.75
S16	265.0-272.0	266.25	271.75
S17	272.0-279.0	273.25	278.75
S18	279.0-286.0	280.25	285.75
S19	286.0-293.0	287.25	289.75
S20	293.0-300.0	294.25	299.75
S21	302.0-310.0	303.25	308.75
S22	310.0-318.0	311.25	316.75
S23	318.0-326.0	319.25	324.75
S24	326.0-334.0	327.25	332.75
S25	334.0-342.0	335.25	340.75
S26	342.0-350.0	343.25	348.75
S27	350.0-358.0	351.25	356.75
S28	358.0-366.0	359.25	364.75
S29	366.0-374.0	367.25	372.05
S30	374.0-382.0	375.25	380.75
S31	382.0-390.0	383.25	388.75
S32	390.0-398.0	391.25	396.75
S33	398.0-406.0	399.25	404.75
S34	406.0-414.0	407.25	412.75
S35	414.0-422.0	415.25	420.75
S36	422.0-430.0	423.25	428.75
S37	430.0-438.0	431.25	436.75
S38	438.0-446.0	439.25	444.75
S39	446.0-454.0	447.25	452.75
S40	454.0-462.0	455.25	460.75
S41	462.0-470.0	463.25	468.75
21	470.0-478.0	471.25	476.75
22	478.0-486.0	479.25	484.75
23	486.0-494.0	487.25	492.75
24	494.0-502.0	495.25	500.75
25	502.0-510.0	503.25	508.75

Table D-6 Cable Television Channels and Relative Frequencies, PAL B and G (continued)

Channel Number	Bandwidth (MHz)	Visual Carrier (MHz)	Aural Carrier (MHz)
26	510.0-518.0	511.25	516.75
27	518.0-526.0	519.25	524.75
28	526.0-534.0	527.25	532.75
29	534.0-542.0	535.25	540.75
30	542.0-550.0	543.25	548.75
31	550.0-558.0	551.25	556.75
32	558.0-566.0	559.25	564.75
33	566.0-574.0	567.25	572.75
34	574.0-582.0	575.25	580.725
35	582.0-590.0	583.25	588.75
36	590.0-598.0	591.25	596.75
37	598.0-606.0	599.25	604.75
38	606.0-614.0	607.25	612.75
39	614.0-622.0	615.25	620.75
40	622.0-630.0	623.25	628.75
41	630.0-638.0	631.25	636.75
42	638.0-646.0	639.25	644.75
43	646.0-654.0	647.25	652.75
44	654.0-662.0	655.25	660.75
45	662.0-670.0	663.25	668.75
46	670.0-678.0	671.25	676.75
47	678.0-686.0	679.25	684.75
48	686.0-694.0	687.25	692.75
49	694.0-702.0	695.25	700.75
50	702.0-710.0	703.25	708.75
51	710.0-718.0	711.25	716.75
52	718.0-726.0	719.25	724.75
53	726.0-734.0	727.25	732.75
54	734.0-742.0	735.25	740.75
55	742.0-750.0	743.25	748.75
56	750.0-758.0	751.25	756.75
57	758.0-766.0	759.25	764.75
58	766.0-774.0	767.25	772.75
59	774.0-782.0	775.25	780.75
60	782.0-790.0	783.25	788.75

Table D-6 Cable Television Channels and Relative Frequencies, PAL B and G (continued)

Channel Number	Bandwidth (MHz)	Visual Carrier (MHz)	Aural Carrier (MHz)
61	790.0-798.0	791.25	796.75
62	798.0-806.0	799.25	804.75
63	806.0-814.0	807.25	812.75
64	814.0-822.0	815.25	820.75
65	822.0-830.0	823.25	828.75
66	830.0-838.0	831.25	836.75
67	838.0-846.0	839.25	844.75
68	846.0-854.0	847.25	852.75
69	854.0-862.0	855.25	860.75



Site Log

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

- Installation progress—Make a copy of the Installation Checklist and insert it into the site log. Make entries 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:
 - Port adapters installed, removed, or replaced
 - Power supply removed or replaced
 - Chassis replaced
 - Configuration changed; port adapters or cable modem cards moved
 - Software upgraded
 - Corrective maintenance procedures performed
 - Intermittent problems
 - Related comments

[Table E-1](#) shows a sample site log page. Make copies of the sample or design your own site log to meet the needs of your site and equipment.



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