

**DATA SHEET**

## Cisco uBR7100 Series Universal Broadband Routers

Cisco® uBR7100 Series universal broadband routers deliver a feature-rich cable modem termination system (CMTS) for Tier 2 or Tier 3 cable networks evolving to an IP Next-Generation Network infrastructure that supports the deployment of revenue-generating services. These products offer cable operators, multiunit (MxU) businesses, and Internet service providers (ISPs) a cost-effective, high-speed data package that includes:

- A combined router and CMTS with routing, bridging, Point-to-Point Protocol over Ethernet (PPPoE), and Multilink PPP (MLPPP) termination modes supported
- Integrated upconverter on the cable interface
- Embedded dual 10/100BASE-T Ethernet interface with additional network interfaces orderable and configurable by customers

The Cisco uBR7100 Series is qualified to DOCSIS® 1.1 and 1.0 specifications. The product supports Euro-DOCSIS 1.1 and is qualified to Euro-DOCSIS 1.0 specifications. The product also supports the CableLabs® OpenCable™ DOCSIS Set-Top Gateway (DSG) specification. DSG enables cable operators to transport upstream and downstream video traffic directly through the CMTS instead of through a proprietary, standalone video infrastructure. Incorporating out-of-band (OOB) messaging in DOCSIS digitally modulated carriers, cable operators can consolidate cable modem and set-top box (STB) data traffic on a shared DOCSIS channel.

The Cisco uBR7100 Series (Figure 1) requires exceptionally low capital investment and minimal setup time to provide high-speed data services. The product supports up to 2000 subscribers.

**Figure 1**

Cisco uBR7100 Series Universal Broadband Router



## FEATURE-RICH, COST-EFFECTIVE, AND EASY-TO-USE

The Cisco uBR7100 Series provides a complete, easy-to-use product that allows cable operators, ISPs, and MxU businesses such as universities, hotels, convention centers, and apartment owners to offer high-speed data services including e-mail, Internet access, and digital video. For cable operators and ISPs, the product delivers a cost-effective solution that combines a router, supporting high-performance backbone technologies, with a CMTS that contains line cards with integrated upconverters. For MxU businesses, the product promotes quick and easy deployment of a cable headend—the central location that injects broadcast signals and enables data connectivity to and from subscribers. Subscriber devices supported include cable modems, STBs, and Cisco cable enterprise and customer premises equipment.

The Cisco uBR7100 Series offers hardware configurations optimized for the specific network topology and application:

- The Cisco uBR7111 and uBR7111E each contain one downstream (traffic from the headend to the subscriber) port and one upstream (traffic from the subscriber to the headend) port:
  - The Cisco uBR7111 and uBR7111E models support bidirectional cable traffic
  - The Cisco uBR7111 supports fast downstream access using the cable system with upstream connectivity using dial-up modems connected to the public switched telephone network (PSTN)
- The Cisco uBR7114 and uBR7114E each contain one downstream and four upstream ports:
  - The Cisco uBR7114 and uBR7114E support bidirectional cable traffic; four upstream ports increase capacity and offer greater flexibility when partitioning services
  - The Cisco uBR7114 supports fast downstream cable access with upstream PSTN connections; for cable companies planning to upgrade their one-way system, this model provides Internet-generating services immediately using telephone return, with easy conversion to two-way cable operations when ready

For cable plants using North American channel plans, the Cisco uBR7111 and uBR7114 support downstream and upstream traffic to and from two-way DOCSIS-based cable modems supporting 6-MHz National Television Systems Committee (NTSC) operations. For NTSC cable plants that have not been fully upgraded to two-way transmission, the Cisco uBR7111 and uBR7114 work with dialup access products to support upstream traffic from DOCSIS-based telco-return cable interfaces. For international cable plants using 8-MHz channel widths, the Cisco uBR7100 Series supports Phase Alternating Line (PAL) and Systeme Electronique Couleur Avec Memoire (SECAM) channel plans. The Cisco uBR7111E and uBR7114E operate with Euro-DOCSIS-based cable modems and STB units with integrated Euro-DOCSIS modems.

The Cisco uBR7100 Series is based on open standards and brings the power and proven reliability of the industry-leading Cisco uBR7246VXR Universal Broadband Router within reach of all cable operators. The Cisco uBR7100 Series offers feature-rich software. Cisco IOS® Software—the accepted standard networking software—provides end-to-end Internet connectivity and includes options to help ensure secure communications over the cable and IP network.

Cisco Systems® is a leader in CMTS lawful intercept enablement. Cisco IOS Software Release 12.3(13)BC introduces Service-Independent Intercept (SII) support on the Cisco uBR7100 Series.

Table 1 describes the Cisco uBR7100 Series features and benefits.

**Table 1** Cisco uBR7100 Series Features and Benefits

Feature	Description
Complete package	Includes integrated upconverters, network interfaces, and default configuration files to fully provision hosts and cable modems in simple high-speed data configurations Allows customers to quickly build a service-enabled broadband cable network that delivers Internet-billable services
Standards-based	Supports DOCSIS and Euro-DOCSIS standards to protect investment and promote interoperability Supports DSG, enabling cable operators to migrate from proprietary to open set-top technology and benefit from technical advantages and continued innovation of DOCSIS
Reliable operation and spectrum management	Enables cable operators to capture the full potential of their cable spectrum and DOCSIS hybrid fiber-coaxial (HFC) networks Alerts operators to fluctuations before critical conditions occur Supports proactive resolution while the system remains online Offers spectrum management features that include the ability to specify configurable frequency hop parameters, assign frequency subbands and input power levels in a spectrum group, reassign frequency based on day/time patterns, and reassign frequency based on the number of lost station messages from subscriber devices that exceed a threshold
Easy upgrades and management	Enables fast, reliable software and microcode upgrades Supports single, centralized point of administration for remote device that includes the capability to download files to remote subscriber devices
Choice of models	Supports deployment of two-way cable and telephone return on same downstream channel based on model ordered Meets diverse needs and simplifies hardware configuration
Cisco IOS Software	Offers best-of-breed networking software for increased interoperability among networking devices Includes diverse routing protocols, quality of service (QoS), and policy-routing features to support differentiated services configuration features such as Dynamic Host Configuration Protocol (DHCP) and Trivial File Transfer Protocol (TFTP); DOCSIS Baseline Privacy Interface (BPI) security

## ROUTING AND BRIDGING OPERATING MODE SUPPORT

The Cisco uBR7100 Series supports the following modes of operation:

- Routing mode—This is the default mode for the Cisco uBR7100 Series. This mode offers a wide spectrum of advanced Cisco IOS Software routing features.
- Transparent bridging mode supported using Cisco IOS Software Release 12.1(7)EC or greater—This mode supports bridging between cable and network interfaces. This mode is effective in MxU environments where the CMTS is replacing an existing bridging network or in CMTS environments with a limited number of customer premises equipment devices. Bridging is not typically used in DOCSIS CMTS installations because of potential performance and security problems.
- Integrated routing and bridging (IRB) supported using Cisco IOS Software Release 12.1(7)EC or greater—IRB operation allows bridging within a specific segment of networks or hosts, yet also allows these hosts to connect to devices on other routed networks without having to use a separate router to interconnect the two networks.
- MLPPP support using Cisco IOS Software Release 12.3(13)BC or greater—MLPPP gives network managers the power to deliver WAN bandwidth on demand using an array of services.

## DOCSIS SET-TOP GATEWAY SUPPORT

Traditionally, physical transport of OOB messaging is carried over dedicated channels as defined by the Society of Cable Telecommunication Engineers Digital Video Subcommittee (SCTE DVS) 167 and SCTE DVS 178. DSG allows the Cisco uBR7100 Series to deliver OOB messages with just a software upgrade using Cisco IOS Software Release 12.2(15)BC2. DSG is a technology that bridges the traditional video environment with what can be considered next-generation OOB. DSG moves away from traditional OOB transport, incorporating it into DOCSIS digitally modulated carriers now used for cable modem service. The CMTS transports digital video OOB messaging/signaling between the video headend and subscriber digital STBs.

Consolidating cable modem and STB traffic over a common DOCSIS network enables cable operators to support new features and technology with minimal hardware change and offers an intelligent and more lasting network infrastructure that increases return on investment and reduces operating expenses. DSG adds the power of DOCSIS technology for new services, accelerating deployment of bandwidth-intensive, interactive video services such as online gaming, t-commerce, and targeted advertising. Migration of OOB messaging traffic to an operationally superior and higher-bandwidth DOCSIS channel is critical to adoption of interactive services. For these services, the traditional OOB mechanism (DVS 167 and DVS 178) is inefficient and provides insufficient bandwidth at a higher cost point.

## SPECIFICATIONS

Table 2 shows hardware specifications for the Cisco uBR7100 Series.

**Table 2** Hardware Specifications

Description	Specification
Embedded processor	MIPS RISC5271/RM7000, 75-MHz bus
Throughput of services	50 Mbps
System memory	64-MB packet/64-MB system memory default Memory expandable to 256 MB
Line cards with integrated upconverters/modulators (cable plant interfaces)	Fixed based on product/option ordered  DOCSIS Annex B, 6-MHz operation: Cisco uBR7111 with 1 downstream and 1 upstream Cisco uBR7114 with 1 downstream and 4 upstreams The downstream uses a 6-MHz channel width in the 85 to 860-MHz frequency range. The upstream supports the 5 to 42-MHz frequency range.  DOCSIS Annex A, 8-MHz operation: Cisco uBR7111E with 1 downstream and 1 upstream Cisco uBR7114E with 1 downstream and 4 upstreams The downstream uses an 8-MHz channel width in the 85 to 860-MHz frequency range. The upstream supports multiple channel widths in the 5 to 65-MHz frequency range.  Integrated upconverter specifications: High-level output: +61 dBmV, 53 to 857 MHz Optimized for 64 and 256 quadrature amplitude modulation (QAM) Software configurable from 45 to 61 dBmV output power in units of dBmV Calibration accuracy range: 50 to 60 dBmV Software selectable output frequency in 12.5-kHz step size

Description	Specification
	<p>Out-of-band noise performance: &lt; -12 dBmV/-30 dBmV/6 MHz and 8 MHz</p> <p>Digital slope compensation to achieve &lt; ±0.3 dB slope over any channel</p> <p>Excellent in-band noise performance</p> <p>RF output mutes when changing output configuration</p> <p>High-reliability, state-of-the-art design using monolithic microwave integrated circuit (MMIC) and surface mount technology</p> <p>Conservative component derating and 100% burn-in to help ensure reliable operation</p> <p>Low power consumption</p> <p>All local oscillators are frequency synthesized and locked to a common internal high-stability reference</p> <p>Note: Also see "Downstream Cable Physical Layer" and "Upstream Cable Physical Layer" specification sections</p>
Port adapters (WAN or backbone interfaces)	<p>Embedded dual 10/100BASE-T Ethernet (TX FE) provided</p> <p>Supports one additional port adapter; options include:</p> <p>Ethernet—PA-FE-TX, PA-FE-TX, PA-FE-FX, PA-4E</p> <p>Serial—PA-4T, PA-4T+</p>
Included AC power supply	<p>Single; 100 to 240 VAC input voltage</p> <p>Output 20W</p> <p>50 to 60 Hz frequency</p> <p>0.80 to 0.95 power factor</p> <p>525W (maximum) input AC power</p> <p>AC-input cable: 18-QEG4 3-wire cable with a 3-lead IEC-320 receptacle on the power supply end and country-dependent plug on power source end</p>
<p>Compact design:</p> <p>Suitable for rack-mount (2-rack unit) or desktop installation</p>	<p>Dimensions of 17.5 x 18.25 x 3.5 in. (44.45 x 46.36 x 8.89 cm) (H x W x D)</p> <p>32 lb (14.5 kg)</p>

Table 3 lists physical and environmental specifications for the Cisco uBR7100 Series.

**Table 3** Physical and Environmental Specifications

Description	Specification
Operating temperature	32 to 104°F (0 to 40°C) operating; -4 to 149°F (20 to 65°C) nonoperating
Airflow	~120 cfm5
Humidity	10 to 90% noncondensing
Heat dissipation	370W (1262 Btu1)
Safety approvals	Compliance: CE Marking, FCC Part 68 Safety: UL 1950, CSA 22.2 No.950, EN60950, AUSTEL TS001, AS/NZS 3260, IEC 950
Emissions	FCC Class A (47 CFR, Part 15), ICES-003 Class A, EN55022 Class B, CISPR22 Class B, AS/NRZ 3548 Class B, VCCI Class B Immunity: IEC-1000-4-2, IEC-1000-4-3, IEC-1000-4-4, IEC-1000-4-5, IEC-1000-4-6, IEC-1000-4-11, IEC 1000-3-2

- Downstream physical layer enhanced ITU J.83, Annex B, with convolutional and Reed-Solomon Forward Error Correction (FEC)
- Variable depth interleaving, (I, J) = (8, 16), (32, 4), (64, 2), (128, 1)
- DOCSIS physical layer parameters in a 6-MHz channel
- Output impedance: 75 ohms nominal
- Cable fixed-line card connector: F-connector

Table 4 describes the downstream cable physical layer for the Cisco uBR7111 and uBR7114.

**Table 4** Downstream Cable Physical Layer, Cisco uBR7111 and uBR7114

Modulation	Baud Rate	Nyquist Filter (Square Root–Raised Cosine)
64 QAM	5.056941 Mbps	12%
256 QAM	5.36057 Mbps	18%

Cisco uBR7100 Series upstream cable interfaces support the following values from cable modems or STBs:

- Symbol rates of 160, 320, 640, 1280, and 2560 ksym/sec
- Modulation: quaternary phase shift keying (QPSK) and 16 QAM
- Upstream frequency range: 5 to 42-MHz edge-to-edge with FEC length (T = 0 to 10)
- Calibrated and widely adjustable upstream voltage level
- Total input power: less than 35 dBmV
- Operating power range: bursts within 6 dB of commanded level
- RF performance stable to 1.5 dB across -5 to 50°C
- RF spurs less than 5V on all inputs and outputs
- Cable fixed-line card connector: F-connector

Table 5 describes the upstream cable physical layer for the Cisco uBR7111 and uBR7114.

**Table 5** Upstream Cable Physical Layer, Cisco uBR7111 and uBR7114

Symbol Rate	Channel Bandwidth	Bit Rate (QPSK)	Bit Rate (16 QAM)	Input Power Range
160 ksym/sec	200 kHz	290 kbps	580 kbps	-6 to 14 dBmV
320 ksym/sec	400 kHz	580 kbps	1160 kbps	-13 to 117 dBmV
640 ksym/sec	800 kHz	1150 kbps	2300 kbps	-10 to 20 dBmV
1280 ksym/sec	1600 kHz	2300 kbps	4600 kbps	-7 to 23 dBmV
2560 ksym/sec	3200 kHz	4600 kbps	9200 kbps	-4 to 26 dBmV

- Downstream physical layer enhanced ITU J.83, Annex A, with convolutional and Reed-Solomon FEC
- Variable-depth interleaving, (I, J) = (8, 16), (16, 8), (32, 4), (64, 2), (128, 1)
- DOCSIS physical layer parameters in a 6-MHz channel
- Output impedance: 75 ohms nominal
- Cable fixed-line card connector: F-connector

Table 6 describes the downstream cable physical layer for the Cisco uBR7111E and uBR7114E.

**Table 6** Downstream Cable Physical Layer, Cisco uBR7111E and uBR7114E

Modulation	Symbol Rate	Frequency	Bit Rate
64 QAM	(6 bits/sym)	40.44 MHz	36 Mbps
256 QAM	(8 bits/sym)	57.2 MHz	57 Mbps

Cisco uBR7100 Series upstream cable interfaces support the following values from cable modems or STBs:

- Symbol rates of 160, 320, 640, 1280, and 2560 ksym/sec
- Modulation: QPSK and 16 QAM
- Upstream frequency range: 5 to 65 MHz, edge-to-edge
- FEC length (T = 0 to 10)
- Calibrated and widely adjustable upstream voltage level
- Total input power: less than 35 dBmV
- Operating power range: bursts within  $\pm 6$  dB of commanded level
- RF performance stable to  $\pm 1.5$  dB across -5 to 50°C
- RF spurs less than 5 mV on all inputs and outputs

Table 7 describes the upstream cable physical layer for the Cisco uBR7111E and uBR7114E.

**Table 7** Upstream Cable Physical Layer, Cisco uBR7111E and uBR7114E

Symbol Rate	Channel Bandwidth	QPSK Bit Rate	16 QAM Bit Rate	Input Power Range
160 ksym/sec	200 kHz	290 kbps	580 kbps	-6 to 14 dBmV
320 ksym/sec	400 kHz	580 kbps	1160 kbps	-13 to 17 dBmV
640 ksym/sec	800 kHz	1150 kbps	2300 kbps	-10 to 20 dBmV
1280 ksym/sec	1600 kHz	2300 kbps	4600 kbps	-7 to 23 dBmV
2560 ksym/sec	3200 kHz	4600 kbps	9200 kbps	-4 to 26 dBmV

### DOCSIS SET-TOP GATEWAY SPECIFICATIONS

Cisco IOS Software Release 12.2(15)BC2—the first release that supports DSG—supports the following:

- Up to four separate conditional access vendors per router; vendor names must be unique and limited to a maximum of seven characters.
- A maximum of eight DSG tunnels (as identified by the well-known MAC address) per conditional access vendor, for a maximum possible total of 32 DSG tunnels per router.
- Multiple conditional access vendors cannot use the same DSG tunnel (that is, two vendors cannot use a tunnel with the same IP Multicast address).
- Each vendor must use a unique set of IP Multicast addresses, and after an IP Multicast address is assigned to a DSG tunnel, that same address cannot be used for any other purpose. However, all other Multicast addresses and groups can still be used on the interface for other Multicast applications.
- DSG-related IP Unicast traffic is supported only by configuring Network Address Translation (NAT) on the cable and WAN interfaces, as described in the “DOCSIS Set-Top Gateway for the Cisco CMTS” feature module.
- DSG traffic should be less than 2.048 Mbps per vendor, to conform to the DSG specifications.
- If using bundled interfaces, operators must configure DSG configurations on the master interface only. When DSG is configured properly on the master interface, DSG traffic can flow across both master and slave interfaces.

### FOR MORE INFORMATION

For more information about the Cisco uBR7100 Series, visit <http://www.cisco.com/en/US/products/hw/cable/ps2211/index.html> or contact your local account representative.

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JR/LW8741 07/05

