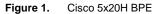# Cisco 5x20H Broadband Processing Engine for the Cisco uBR10012 Universal Broadband Router

The Cisco® 5x20H Broadband Processing Engine (BPE) for the Cisco uBR10012 Universal Broadband Router combines industry-leading port density, an advanced RF feature set, next-generation advanced time division multiple access (A-TDMA) capabilities, and DOCSIS® and European DOCSIS (Euro-DOCSIS) support—on a single line card (Figure 1). The Cisco 5x20H BPE is a performance-enhanced update of the Cisco 5x20U Broadband Processing Engine with incremental memory and processor capacity. The line card also supports an extended DOCSIS upstream frequency range of 5 to 55 MHz and downstream support of 70 to 860 MHz for DOCSIS operations in Japan.

The Cisco 5x20H BPE (Figure 1) addresses the expanding service and operational needs of cable operators. A set of advanced features and a scalable architecture make the Cisco 5x20H BPE an ideal choice for cable operators facing the challenge of delivering carrier-class IP-based data, voice, and video services to a growing number of subscribers. The Cisco 5x20H BPE works with the Cisco 1-Gbps Wideband Shared Port Adapter (SPA) for the Cisco uBR10012 and Cisco SPA Interface Processor for the 1-Gbps Wideband Shared Port Adapter.

Figure 1.   Cisco 5x20H BPE

Product Overview

The Cisco 5x20H BPE is a cable interface line card for the Cisco uBR10012 that performs cable modem termination system (CMTS) functions, such as:

- Physical layer (PHY) RF interface (upstream burst demodulation, downstream modulation, RF upconversion)
- MAC processing (modem registration, transmission opportunity scheduling, Layer 2 quality of service [QoS])
- Onboard packet processing

Featuring a highly integrated and robust RF front end and an advanced processing engine for DOCSIS-based and Euro-DOCSIS-based networks, the Cisco 5x20H BPE enables high-performance, reliable, and secure bidirectional transmission of IP packets over the cable plant for data, voice, and video services. The card supports:

- DOCSIS: 6 MHz National Television Systems Committee (NTSC) channel operation, using standard (STD), Harmonic Related Carrier (HRC), or Incremental Related Carrier (IRC) frequency plans conforming to EIA-S542 and ITU J.83 Annex B. The card supports downstream channels in the 88 to 860 MHz range, and upstream channels in the 5 to 42 MHz range.
- Euro-DOCSIS: 8 MHz Phase Alternating Line (PAL) and Systemme Electronique Couleur Avec Memoire (SECAM) channel plans conforming to the ITU J.83 Annex A standard. The card supports a greater upstream spectrum range of 5 to 65 MHz and an increased downstream channel width of 8 MHz.
- DOCSIS with extensions for Japan: 6 MHz Annex B extension support with a downstream extended frequency range of 70 to 860 MHz and an upstream extended frequency range of 5 to 55 MHz.

Advanced RF Front End

The Cisco 5x20H BPE presents an advanced RF front-end design, combining a very high level of integration with enhanced RF robustness and performance. The innovative design, which uses leading PHY chips from multiple vendors, features five downstream modulators, five upconverters, and 20 upstream burst receivers on a single line card. It embeds advanced RF capabilities, such as direct sampling of the upstream channels and ingress noise cancelation and advanced equalization.

Superior MAC

The Cisco 5x20H BPE features dedicated MAC layer hardware for superior performance in large-scale deployments. The Cisco 5x20H BPE MAC layer hardware enables scalability to thousands of cable modems, simultaneously providing hardware acceleration for sophisticated security features, such as DOCSIS 1.1 extensions to baseline privacy interface (BPI). It also provides hardware acceleration for functions such as concatenation, fragmentation, and payload header suppression (PHS) necessary to deploy advanced data and voice services.

Table 1 lists Cisco 5x20H BPE features and benefits, and Table 2 lists specifications.

Table 1.   Product Features and Benefits

Feature	Benefits
High port density	• Reduces per-port cost • Maximizes plant capacity (frequency reuse)
Advanced RF front end	• Optimizes RF performance and robustness
Integrated upconverter	• Reduces operational cost and complexity
Dense connector	• Reduces installation time • Reduces mean time to repair (MTTR)
Onboard spectrum analyzer hardware	• Reduces return-path monitoring costs • Enhances remote troubleshooting capabilities
Dedicated MAC layer hardware	• Provides hardware acceleration of DOCSIS 1.1 features • Enables scalability of data and voice deployment • Optimizes cable modem registration time • Provides hardware-based Layer 2 QoS • Allows use of best-of-class PHY
DOCSIS, Euro-DOCSIS, and extensions to support DOCSIS operations in Japan	• Provides operational savings • Lowers capital expenditures (CapEx) • Increases flexibility
DOCSIS and Euro-DOCSIS 2.0 capable	• DOCSIS 1.x and 2.0 deployments • Maximizes return on investment • Provides advanced PHY robustness for DOCSIS 1.x and 2.0 deployments
Compatible with the Cisco uBR 3x10 RF Switch	• Preserves investment, independent of CMTS chassis or line-card technology choice

Table 2.   Specifications

Description	Specifications
Physical	• Occupies a single slot in the Cisco uBR10012 chassis • Interface: line card single mode, with intermediate reach connector • Hot-swappable; no slot dependency • Weight: 16 lb (7.26 kg) • Dimensions (H x W x D): 20 x 1.36 x 16 in. • (50.80 x 3.55 x 10.64 cm)
Power	• Unit power: 185W
Reliability and Availability	• Mean time between failure (MTBF): 75,610 hr
Environmental	• Operating altitude: -197 to 13,123 ft (-60 to 4000 m) • Storage temperature: -4 to 149℉ (-20 to 65℃) • Operating temperature, nominal: 41 to 104℉ (5 to 4 0℃) • Storage relative humidity: 5 to 95% • Operating relative humidity: 10 to 90%
Software Release	• Cisco IOS® Software Release 12.3(17)BC2 or higher
Regulatory Compliance	
Safety	• UL 1950, Third Edition (Safety of Information Technology Equipment, Including Electrical Business Equipment), with no D3 deviations • CSA 950 1995 Third Edition (Safety of Information Equipment Technology, Including Electrical Business Equipment) • EN 60950 (Safety of Information Equipment Technology, Including Electrical Business Equipment) • IEC 60950 • ACA TS001, 1997 Test Report and Statement of Compliance AS/NZS3260

Electromagnetic Emissions	- EN55022: 1998 Class B - CISPR 22: 1997 Class B - CFR 47 Part 15 Class B - ICES -003, Issue 2, Class B, April 1995 - VCCIV-3/2000.04 - AS/NZS 3548: 1995 Class B - CNS-13438 Class B—BSMI (BCIQ) in Taiwan
Electromagnetic Immunity	- EN50082-1: 1992 - EN50082-1: 1997 - EN55024: 1998 - EN61000-3-2: 1995 - EN61000-3-3: 1995 - EN61000-4-2: 1995 (including AMD1 + AMD2) ESD immunity - EN61000-4-3: 1997 Radiated RF field immunity - EN61000-4-4: 1995 Immunity to electrical fast transients - EN61000-4-5: 1995 Surge immunity - EN61000-4-6: 1996 (including AMD1) RF conducted immunity
Network Equipment Building Systems (NEBS): Level 3	- Designed and tested to meet requirements of GR-1089-CORE - Issue 2, December 1997 - Revision 1, February 1999
Mechanical	- IEC 68-2-1, IEC 68-2-2, IEC 68-2-56: Operational temperature and humidity - IEC 68-2-27: Operating shock - IEC 68-2-64, IEC 68-2-6, IEC 68-2-47: Operating and nonoperating vibration - IEC 68-2-32: Nonoperating freefall drop - IEC 68-2-40: Nonoperating altitude - IEC 68-2-27, IEC 68-2-32: Nonoperating mechanical shock - IEC 68-2-3: Nonoperating humidity - IEC 68-2-14, IEC 68-2-33: Nonoperating temperature shock - LEDs - One power LED (green) - One status LED (green/yellow): solid green indicates the processor has booted and passed its diagnostics; LED blinks green on a protect card, yellow when in one of the booting states - Maintenance (yellow): indicates the line card can be removed - One upstream-enabled LED on each upstream port (green): upstream path is configured and able to pass traffic - One downstream-enabled LED on each downstream port (green): downstream path is configured and able to pass traffic through the upconverter at the radio frequencies
Network Management Information	
Standard MIBs	- IF-MIB (RFC-2233) - ENTITY-MIB (RFC-2737) - MIBII (RFC1213) - EtherLike-MIB (RFC-2665) - IGMP-MIB (RFC-2993) - RMON-MIB (RFC-1757)
Expression MIBs	- SNMPv2-SMI - SNMPv2-TC - SNMPv2-MIB - IANAifType-MIB
Simple Network Management Protocol Version 3 (SNMPv3) MIBs	- SNMP-FRAMEWORK-MIB (RFC-2571) - SNMP-MPD-MIB (RFC-2572) - SNMP-NOTIFICATION-MIB (RFC-2573) - SNMP-TARGET-MIB (RFC-2573) - SNMP-USM-MIB (RFC-2574) - SNMP-VACM-MIB (RFC-2575)

DOCSIS and Euro-DOCSIS MIB	• DOCS-IF-MIB (v2 Rev04) • DOCS-CABLE-DEVICE-MIB (RFC-2669) • DOCS-BPI-PLUS-MIB (Rev 5) • DOCS-QOS-MIB (Rev 4) • DOCS-CABLE-DEVICE-TRAP-MIB • DOCS-SUBMGT-MIB (Rev 2)
Cisco DOCSIS MIBs	• CISCO-DOCS-EXT-MIB • CISCO-DOCS-REMOTE-QUERY-MIB • CISCO-DOCS-QOS-EXT-MIB • CISCO-CABLE-SPECTRUM-MIB • CISCO-CABLE-AVAILABILITY-MIB • CISCO-DOCS-EXT-CAPABILITY-MIB
Cisco Generic MIBs	• CISCO-SYSLOG-MIB • CISCO-SMI-MIB • CISCO-TC-MIB • CISCO-PRODUCTS-MIB • CISCO-FLASH-MIB • CISCO-CONFIG-MAN-MIB • CISCO-CONFIG-COPY-MIB • CISCO-MEMORY-POOL-MIB • CISCO-BULK-FILE-MIB • CISCO-SONET-MIB • CISCO-TCP-MIB • CISCO-RTTMON-MIB • CISCO-FTP-CLENT-MIB • CISCO-IPMROUTE-MIB • CISCO-QUEUE-MIB • CISCO-IMAGE-MIB • CISCO-ENVMON-MIB • CISCO-ENTITY-VENDORTYPE-OID-MIB • CISCO-PRODUCTS-MIB

Ordering Information

Part Number and Product Description

UBR10-5x20H-D

The new Cisco uBR10012 BPE offers 5 downstreams with upconverter, 20 upstreams, spectrum analyzer, and a dense connector. The dense connector is designed to simplify installation and maximize serviceability. Please make sure you procure a correctly terminated cable to connect to this connector by ordering one of the cable kits from Cisco or by purchasing an equivalent set from White Sands Engineering (www.whitesandsengineering.com). Table 3 lists part numbers and descriptions.

Table 3. Cable Kits Part Numbers and Descriptions

	Cisco Cable Kit	White Sands
UBR10-5x20H-D	CAB-RFSW520QTIMM cable bundle, 5x20-Dense to RF switch, 1 m, term CAB-RFSW520QTPMF cable bundle, 5x20-Dense to cable operator plant, 3 m	2x WS943 (10-pack) and 1x WS942 (5-pack) Mini RG59 95% TC Braid 100% foil shield

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