DATA SHEET

Cisco Gigabit Ethernet Half-Height Line Card for the Cisco uBR10012 Universal Broadband Router

As competition among broadband service providers intensifies, cable operators face an ever-increasing demand to economically transport new and existing services over their hybrid fiber-coaxial (HFC) access and metro networks. IP, DOCSIS®, and Gigabit Ethernet have emerged as important technologies, enabling operators to move to a single, unified, switched intelligent network infrastructure. Cable operators have increasingly turned to the Ethernet protocol as a Layer 2 metro network solution. Ethernet-based technologies are a big driver behind the transformation of cable operators into successful providers of commercial services. Operators can use Gigabit Ethernet on their unidirectional systems to deliver video on demand (VoD) and broadcast digital video services to business customers. They can carry cable modem traffic and business data from secure virtual private network (VPN) connections over bidirectional Ethernet facilities using optics directly integrated into edge switches and routers.

Cable operators are uniquely positioned to challenge telecommunications companies and satellite video providers. Gigabit Ethernet provides the traffic engineering and distance capabilities of traditional network technologies, but at a fraction of the cost. The benefits of cable's HFC presence, coupled with modern, easy-to-deploy Gigabit Ethernet technology, position cable operators to address emerging capabilities using wholly owned modern HFC networks that not only provide superior performance, but also offer equipment diversity and alternative routing over competitive solutions.

To meet cable operator demands to deploy Gigabit Ethernet technology, as well as address increasing needs for modularity and density, Cisco Systems® offers the Cisco® Gigabit Ethernet Half-Height Line Card for the Cisco uBR10012 Universal Broadband Router. The line card (Figure 1) offers an IEEE 802.3z-compliant Ethernet interface that can run up to 1 Gbps in full-duplex mode. The card uses a Small Form-Factor Pluggable (SFP) gigabit interface converter (GBIC) module that supports a variety of Gigabit Ethernet interface types (SX, LX/LH, and ZX) which operators can change or upgrade at any time.

Figure 1
Cisco Gigabit Ethernet Half-Height Line Card for the Cisco uBR10012

Benefits of the new line card include the following:

- It provides maximum modularity for flexible deployment options.
- It doubles the Gigabit Ethernet density of the Cisco uBR10012 to maximize slot utilization and decrease system cost per port.
- It supports modular Gigabit Ethernet optics for deployment flexibility.
- It supports standards-based Gigabit Ethernet implementation for compatibility and interoperability.

Table 1 elaborates on these benefits.

Table 1. Features and Benefits of the Cisco Gigabit Ethernet Half-Height Line Card for the Cisco uBR10012

Features	Benefits
Maximum modularity	The implementation of a half-height line card allows Cisco uBR10012 customers to optimize earlier investments, deploy Gigabit Ethernet, double LAN interface density, and reduce capital and operational expenditures.
Increased Gigabit Ethernet density	Doubling Gigabit Ethernet density enables customers to insert dual Gigabit Ethernet uplinks without taking up an additional line card slot. This helps to maximize slot utilization and decrease system cost per port.
Support for modular Gigabit Ethernet optics	The Cisco uBR10012 Gigabit Ethernet Half-Height Line Card supports modular small form-factor pluggable (SFP) transceivers to ensure that customers have maximum flexibility in configuring physical network interfaces. The 1000BASE-SX, 1000BASE-LX/LH, and 1000BASE-ZX SFP transceivers available in these modules are hot-swappable, providing a quick and easy method of changing physical interfaces.
Standards-based Gigabit Ethernet	The Cisco uBR10012 Gigabit Ethernet Half-Height Line Card is based on the IEEE 802.3z industry standard—helping ensure interoperability and compatibility with other standards-based Gigabit Ethernet products in the customer's network. Gigabit Ethernet standards compliance, along with Cisco manageability and standard Cisco IOS® Software, help ensure high-speed interoperability with existing Gigabit Ethernet products in the Cisco uBR10012, Cisco 10000 Series routers, and Cisco Catalyst® switches.

HARDWARE FEATURES

- Single-port Gigabit Ethernet line card running at 1 Gbps, full duplex
- Support for jumbo frames (up to 9180 bytes in size)
- Support for online insertion and removal (OIR)
- Functionality in Cisco uBR10012 interface card slot 3 and 4 with one Cisco uBR10012 Series Half-Height Line Card Carrier per slot (product number ESR-HH-CARRIER)
- Hot-swappable SFP optical modules (SFP transceivers); only SFP modules supplied by Cisco work with the Cisco Gigabit Ethernet Half-Height Line Card
- 16-MB receive packet memory
- Error-correcting code (ECC) protection for the processor local memory and packet memory
- Support for the following SFP transceivers:
  - 1000BASE-SX (SFP-GE-S) multimode, compliant with IEEE 802.3z specifications
  - 1000BASE-LX/LH (SFP-GE-L), compliant with IEEE 802.3z specifications
  - 1000BASE-ZX (GLC-ZX-SM), compliant with IEEE 802.3z specifications

- 256 pairs of packet and byte performance counters based on the source address of received frames
- 256 pairs of packet and byte performance counters based on the destination address of transmitted frames

ETHERNET FEATURES

- MAC with full-duplex operation
- Hardware address filtering on received frames of up to 4096 address entries
- 802.3x-standard-based flow control
- Ethernet encapsulation formats:
  - Ethernet V2
  - 802.2 Service Advertising Protocol (SAP)
  - 802.2 Subnetwork Access Protocol (SNAP)

SOFTWARE FEATURES

- Autonegotiation
- 64-bit counters
- 802.1Q virtual LANs (VLANs)
- Hot Standby Router Protocol (HSRP)

Table 2 describes the SFP transceiver specifications.

Table 2. Gigabit Ethernet SFP Transceiver Specifications

SFP Transceiver	Wavelength (mm)	Fiber Type	Core Size (Microns)	Modal Bandwidth (MHz/km)	Cable Distance
1000BASE-SX SFP-GE-S	850	Multimode fiber (MMF)	62.5 62.5 50.0 50.0	160 200 400 500	722 ft (220m) 902 ft (275m) 1640 ft (500m) 1804 ft (550m)
1000BASE-LX/LH SFP-GE-L	1300	MMF[1] Single-mode fiber (SMF)	62.5 50.0 50.0 8 to 10	500 400 500 –	1804 ft (550m) 1804 ft (550m) 1804 ft (550m) 32,808 ft (10 km)
1000BASE-ZX GLC-ZX-SM	1550	SMF	9 to 10	–	43.4 to 62 miles (70 to 100 km) [2]

[1] A mode-conditioning patch cord (part number CAB-GELX-625 or equivalent) is required. If you use an ordinary patch cord with MMF, 1000BASE-LX/LH SFPs, and a short link distance (tens of meters), this can cause transceiver saturation, resulting in an elevated bit error rate (BER). In addition, when you use the long-reach SFP with 62.5-micron-diameter MMF, you must install a mode-conditioning patch cord between the SFP and the MMF cable on both the transmit and receive ends of the link. The mode-conditioning patch cord is required for link distances greater than 984 ft (300m).

[2] 1000BASE-ZX SFP can reach up to 100 km by using dispersion-shifted SMF or low attenuation SMF; the distance depends on fiber quality, number of splices, and connectors.

ENVIRONMENTAL CONDITIONS

- Storage temperature: –38 to 150°F (–40 to 70°C)
- Operating temperature, nominal: 41 to 104°F (5 to 40°C)
- Operating temperature, short term: 23 to 131°F (–5 to 55°C)
- Storage relative humidity: 5 to 95 percent relative humidity (RH)
- Operating humidity, nominal: 5 to 85 percent RH
- Operating humidity, short term: 5 to 90 percent RH
- Operating altitude: –60 to 4000m

PHYSICAL SPECIFICATIONS

- Height: 7.8 in. (19.8 cm)
- Width: 1.3 in. (3.3 cm)
- Depth: 11 in. (27.9 cm)
- Weight: 2 lb (0.9 kg)

LEDs

- Link status (green, one per port)
- Transmit activity (green, one per port)
- Receive activity (green, one per port)
- Fail (yellow, one per card)

NETWORK MANAGEMENT

- Network management using:
  - Telnet (command-line interface [CLI])
  - Console port (CLI)
  - Simple Network Management Protocol (SNMP)
- MIB-II
- RFC 1213
- RFC 1573

HALF-HEIGHT LINE CARD POWER BUDGET

- Unit power: 15.98W

SFP TRANSCEIVER SPECIFICATIONS

- 1000BASE-SX (SFP-GE-S) transceiver
  - Wavelength: 850 nm
  - Power budget: 7.5 dB
  - Transmit power: –9.5 to 0 dBm
  - Receive power: –17 to 0 dBm
  - Connector: LC
- 1000BASE-LX/LH (SFP-GE-L) transceiver
  - Wavelength: 1310 nm
  - Power budget: 7.5 dB (multimode fiber), 8 dB (single mode)
  - Transmit power: –11.5 to –3 dBm (multimode fiber), –11 to –3 dBm (single mode)
  - Receive power: –19 to –3 dBm (multimode and single-mode fiber)
  - Connector: LC
- 1000BASE-ZX (GLC-ZX-SM) transceiver
  - Power budget: 23 dB
  - Transmit power: 0 to 4.77 dBm
  - Receive power: –23 to 0 dBm
  - Connector: LC

PRODUCT REGULATORY APPROVALS

- UL60950/CAN/CSA-C22.2 No. 60950-00, third edition, dated December 1, 2000, with no deviation considered to be less stringent than IEC 60950
- EN60950 with Amendments 1 to 4, for CE Marking to the LVD directive
- IEC 60950 third edition with Amendments 1 to 4, including all national/group deviations
- AS/NZS 60950:2000
- AS/NZS 3260-1993 with Amendments 1 to 4
- ACA TS001-1997

LASER SAFETY

- 21 CRF 1040, Subchapter J:
  - EN60825-1
  - EN60825-2

PRODUCT REGULATORY COMPLIANCE

Electromagnetic Emissions Certification

- AS/NZ 3548:1995 (including Amd I + II) Class B
- EN55022:1998 Class B
- CISPR 22:1997
- EN55022:1994 (including Amd I + II)
- 47 CFR Part 15:2000 (FCC) Class B
- VCCI V-3/01.4 Class 2
- CNS-13438:1997 Class B
- GR1089:1997 (including Rev1: 1999)

Immunity

- EN300386:2000-TNE EMC requirements; product family standard; high priority of service; headend and distribution hub locations
- EN50082-1:1992/1997
- EN50082-2:1995-Generic Immunity Standard, Heavy Industrial
- CISPR24:1997
- EN55024:1998-Generic ITE Immunity Standard
- EN61000-4-2:1995+AMD I + II-ESD, Level 4, 8-kV contact, 15-kV air
- IEC-1000-4-3:1995+AMD 1-Radiated Immunity, 10V/m
- IEC-1000-4-4:1995-Electrical Fast Transients, Level 4, 4 kV/B
- IEC-1000-4-5:1995+AMD 1-DC Surge Class 3; AC Surge Class 4
- EN61000-4-6:1996+AMD 1-RF Conducted Immunity, 10V rms
- EN61000-4-11:1995-Voltage Dips and Sags
- ETS300 132-2:1996+corregendum, Dec. 1996
- GR1089:1997 (including Rev1: 1999)

Network Equipment Building Systems

- Level 3 compliant
- Bellcore SR-3580 Criteria Levels, issued November 1995
- GR1089-Core: Electromagnetic Compatibility and Electrical Safety, issued December 1997
- GR63-Core: Physical Protection Requirements, issued October 1995
- SBC equipment requirements: TP76200 MP and TP76400 MP
- Verizon equipment requirements: SIT.NEBS.TE.NPI.2000.004 Rev.

PRODUCT SYSTEM REQUIREMENTS AND COMPATIBILITY

Hardware Requirements

- **Chassis**—The Cisco Gigabit Ethernet Half-Height Line Card is supported in the Cisco uBR10012 Universal Broadband Router.
- **Performance routing engines (PREs)—**The line card is supported with the Cisco uBR10012 Performance Routing Engine 2.
- **Line cards**—The line card is supported with Cisco broadband processing engines on the Cisco uBR10012.
- **Carrier**—The Cisco uBR10012 Gigabit Ethernet Half-Height Line Card requires a carrier (part number ESR-HH-CARRIER) for compatibility with the Cisco uBR10012. For more information about the carrier, refer to that component's data sheet.

Software Requirements

- **Initial Cisco IOS Software Release**—The Cisco Gigabit Ethernet Half-Height Line Card is supported on the Cisco uBR10012 beginning with Cisco IOS® Software Release 12.3(13)BC.

ORDERING INFORMATION

Visit http://www.cisco.com/en/US/ordering/ to place an order.

Table 3 lists product part numbers for the Cisco uBR10012 Gigabit Ethernet Half-Height Line Card.

Table 3. Part Numbers for Cisco Gigabit Ethernet Half-Height Line Card for the Cisco uBR10012

Part Number	Product Description
ESR-HH-1GE	1-port Gigabit Ethernet half-height line card
ESR-HH-1GE=	1-port Gigabit Ethernet half-height line card, spare
ESR-HH-CARRIER	Full-length base carrier for half-height line card
ESR-HH-CARRIER=	Full-length base carrier for half-height line card, spare
ESR-HH-COVER	Blank filler for half-height line card
ESR-HH-COVER=	Blank filler for half-height line card, spare
SFP-GE-S	1000BASE-SX pluggable transceiver
SFP-GE-S=	1000BASE-SX pluggable transceiver, spare
SFP-GE-L	1000BASE-LH/LX pluggable transceiver
SFP-GE-L=	1000BASE-LH/LX pluggable transceiver, spare
GLC-ZX-SM	1000BASE-ZX pluggable transceiver
GLC-ZX-SM=	1000BASE-ZX pluggable transceiver, spare

All Cisco uBR10012 half-height line cards require a carrier (product number ESR-HH-CARRIER). Because each carrier holds two half-height line cards, a blank (product number ESR-HH-COVER) is shipped with any carrier with open half-height line card slots.

Cisco recommends that customers who order spare carrier or half-height line cards also order enough blanks to help ensure that the configured system has no empty slots.

MIGRATION PROGRAM

A Cisco Technology Migration Plan (TMP) has been established for this product. The Cisco TMP is a sales program that allows customers to trade in Cisco service and support products to receive a trade-in credit toward the purchase of any new Cisco product. The program underscores the Cisco commitment to customer success. Providing end-to-end networking solutions and effective product migration options provides flexibility in an environment of ever-changing technology and network requirements. More details about this program are located at: http://www.cisco.com/go/tradein.

SERVICE AND SUPPORT

Cisco Systems offers a wide range of service and support options for its customers. More information about Cisco service and support programs and benefits is located at: http://www.cisco.com/en/US/support/index.html.

FOR MORE INFORMATION

For more information about the Cisco uBR10012, visit http://www.cisco.com/en/US/products/hw/cable/ps2209/index.html or contact your local account representative.

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JR/LW8741 07/05

Printed in USA