

## Cisco 10000 Series 4-Port Channelized T3 Half-Height Line Card

The Cisco® 10000 Series 4-Port Half-Height Channelized T3 Line Card sets a new standard for high availability, scalability, and performance in the T1 and T3 aggregation market. This half-height line card supports four T3 physical connections (eight per Cisco 10000 line-card slot) with each T3 capable of supporting a full “clear-channel” DS-3 or DS-3 Channelized down to DS-1 or N x DS-0.

### Product Overview

Coupled with native edge-aggregation services such as high availability, Multiprotocol Label Switching (MPLS), and quality of service (QoS), the Cisco 10000 Series 4-Port Half-Height Channelized T3 Module provides a comprehensive set of enhanced aggregation services, including higher port density per Cisco 10000 line-card slot, 1:1 line-card failover protection through Y-cables, and enhanced bit error rate testing (BERT) and loopback testing capabilities.

Using channelized interfaces to receive multiplexed T1 circuits on a single pair of coaxial cables, service providers can save dramatically on power, floor space, local-loop charges, and equipment costs. The Cisco 4-port half-height CT3 module can accept both clear-channel T3 traffic and multiplexed circuits from T1 and N x DS-0.

With this combination of features and performance, Cisco Systems® provides a versatile interface for an upgrade to the advanced network architectures provided by Cisco 10000 Series routers. Service provider points of presence (POPs) can use the 4-port half-height CT3 line card to enable rapid, efficient addition of circuits where density, performance, and high availability are required.

**Figure 1.** Cisco 10000 Series 4-Port Half-Height Channelized T3 Line Card



## Applications

The Cisco 10000 Series 4-Port Half-Height Channelized T3 Line Card is ideal for several applications, including:

- Service provider edge offices or data centers aggregating circuits from multiple customer sites and locations to provide direct Internet access and other T1-related services
- Cell site aggregation for mobile wireless providers offering high-speed wireless data connections as an alternative to DSL or cable broadband access
- Cisco Broadband Local Integrated Services Solutions for T1 (BLISS)—The Cisco BLISS framework provides the network foundation and call control and application intelligence to deliver integrated data and voice services over a single connection for small and medium-sized businesses (SMBs). It can support Metro Ethernet, DSL, cable, and T1 access. The Cisco 10000 Series has been tested and approved for the T1 aggregation portion of the Cisco BLISS solution and enables several providers to offer the services that SMBs require.

## Key Features and Benefits

The 4-port half-height CT3 line card delivers numerous new features to the ESR 10000 Series Router:

- 4-port half-height form factor—The line card adds 2 ports per Cisco 10000 line-card slot, while providing the ability to add new ports in lower increments, reducing costs and saving valuable POP real estate.
- 1:1 line-card redundancy—Failover protection is provided within a single Cisco 10000 line-card slot in case a CT3 line card fails. Two line cards and 8 BNC Y-cables are required to support 1:1 redundancy: one as the working or active module, the other as the protect or standby module.
- Enhanced testing capabilities—These capabilities include the following:
  - New BERT patterns (3-in-24, 1-in-8, and 2-in-8)
  - Support for up to 12 simultaneous T1 BERTs (limited to six under the first two T3s and six under the second two)
  - Addition of “show BERT” command
  - Support for transmission of 2-in-5 and 3-in-5 inband remote loopback commands in Extended Super Frame (ESF) and SF modes (module will not respond to these in-band commands)
  - A wide range of troubleshooting tools to ensure that customer connections are configured and operating per service provider specifications
- 256 channels per port—The 4-port half-height CT3 module doubles the number of available channels per port when compared with the 128 channels per port available on the 6-port CT3. Ports 0, 1, and 2 support 256 channels, and port 3 supports 255, giving service providers additional flexibility when adding new customers and services to their existing network. Note that the last port supports only 255 channels, for a line-card total of 1023 channels.
- T1 status LEDs—The addition of T1-level Alarm and Loopback LEDs provides fast, local fault indication when an alarm condition exists on any one of the 28 T1s contained in the DS-3 signal.

## Product Specifications

Table 1 gives specifications of the 4-port half-height CT3 line card.

**Table 1.** Product Specifications

<b>Product compatibility</b>	Compatible with the Cisco 10008 8-Slot Chassis with Cisco 10000 Series Performance Routing Engine 2 (PRE2) and later engines
<b>Software compatibility</b>	Compatible with Cisco 10000-supported Cisco IOS <sup>®</sup> Software Release 12.2(28)SB and later Cisco IOS 12.2 images
<b>Cards, ports, and slots</b>	Offers 4 ports per line card; the line card occupies one subslot (half-height); Y-cable redundancy feature ID limited to line cards installed in vertically adjacent line-card subslots
<b>Connectivity</b>	Uses BNC connectors on rear of Cisco 10008 chassis; T3-level physical interface is compliant with ANSI T1.102 and Bellcore TR-TSY-000499, 16 (BNC) 75-ohm coaxial connectors
<b>Channelization</b>	<p>Supports full-rate DS-3, Channelized DS-3, DS-1, and fractional DS-1 on every port; up to 256 usable N x DS-0 channels (where N is 1 to 24; port 3 supports 255 channels) that can be allocated among the 28 DS-1 ports on each DS-3. For each port, the 256 serial data channels are configurable up to:</p> <ul style="list-style-type: none"> <li>• 1 DS-3 line (44.736 Mbps)</li> <li>• 28 DS-1 lines</li> <li>• 256 (255) N x DS-0 channels</li> <li>• Asynchronous bit serial Point-to-Point Protocol (PPP) and High-Level Data Link Control (HDLC) delineation per RFC 1662 on all channels</li> <li>• Ability to distribute the channel assignments across the port in any proportion, up to the full bandwidth of the port itself</li> <li>• Bipolar three zero substitution (B3ZS) line coding</li> <li>• Compliant with DS-3 pulse mask per ANSI T1.102-1993</li> </ul>
<b>High availability</b>	<p>Supports:</p> <ul style="list-style-type: none"> <li>• Y-cable redundancy (provided 2 line cards are installed in the same slot)</li> <li>• Online insertion and removal (OIR)</li> <li>• Provision for Error Correcting Code (ECC)-protected synchronous dynamic RAM (SDRAM) in CPU section</li> </ul>
<b>Encapsulations</b>	Supports PPP, Frame Relay, and Cisco HDLC; compatible with Multilink Point-to-Point Protocol (MLPPP) feature on PRE
<b>Testing and monitoring features</b>	<ul style="list-style-type: none"> <li>• Local, line, and remote loopback capabilities at DS-3 and DS-1 levels</li> <li>• Response to embedded loopback commands</li> <li>• Insertion of loopback commands into transmitted signal</li> <li>• Full BERT capabilities on any T1 or T3</li> <li>• Detection of test patterns with bit error rates up to 10<sup>-2</sup></li> <li>• Onboard processor for real-time Facilities Data Link (FDL) messaging; in-band-code detection; and insertion, alarm integration, and performance monitoring</li> <li>• Refer to DS-3 and DS-1 specific features</li> </ul>
<b>DS-1 specific features</b>	<ul style="list-style-type: none"> <li>• SF and ESF support</li> <li>• ANSI T1.403 FDL support</li> <li>• Alarm detection: alarm indication signal (AIS), remote alarm indication (RAI), and out of frame (OOF)</li> <li>• Performance reporting: 24-hour history maintained, with 15-minute interval counts of path code violations, frame loss seconds, line errored seconds, degraded minutes, errored seconds, bursty errored seconds, severely errored seconds, and unavailable seconds</li> <li>• Internal and loop (recovered from network) clocking selectable per DS-1</li> <li>• Programmable pseudorandom BERT patterns up to 32 bits long, including 211-1, 215-1, 220-1 0153, 220-1 QRSS, and 223-1</li> <li>• Fixed BERT patterns of 0s, 1s, alt-0-1, 3-in-24, 1-in-8, and 2-in-8</li> <li>• Loopback features: Local and line loopback; response to SF inband loopback codes, or ESF ANSI loopback commands; sends SF in-band loopback codes, new 2-in-5 and 3-in-5 SF or ESR inband loopback codes, and ESF ANSI and Bellcore (SmartJack) loopback commands</li> </ul>

<b>DS-3 specific features</b>	<ul style="list-style-type: none"> <li>• Channelized DS-3 with 28 DS-1 lines multiplexed into a signal DS-3</li> <li>• Unchannelized DS-3 supporting subrate and scrambling formats for: <ul style="list-style-type: none"> <li>◦ Digital link</li> <li>◦ ADC/Kentrox</li> <li>◦ Larscom</li> <li>◦ Adtran</li> <li>◦ Verilink data service units (DSUs)</li> </ul> </li> <li>• C-bit parity and M23 framing</li> <li>• B3ZS line coding</li> <li>• Performance reporting: 24-hour history maintained, with 15-minute interval counts of line-code violations, P-bit coding violations, C-bit coding violations, P-bit errored seconds, P-bit severely errored seconds, severely errored framing seconds, unavailable seconds, line errored seconds, C-bit errored seconds, and C-bit severely errored seconds</li> <li>• Alarm detection: AIS, loss of signal (LOS), far end bit errors (FEBE), RAI, and OOF</li> <li>• Internal or network clock selectable per DS-3</li> <li>• Programmable pseudorandom BERT patterns up to 32 bits long, including 215-1, 220-1 0153, 220-1 QRSS, and 223-1</li> <li>• Fixed BERT patterns of 0s, 1s, and alt-0-1</li> <li>• Generation and termination of DS-3 maintenance data link (MDL) in C-bit framing</li> <li>• Far end alarm control (FEAC) support in C-bit framing</li> <li>• Diagnostic, line, and remote loopback support at the DS-3 level</li> </ul>
<b>HDLC-specific features</b>	<ul style="list-style-type: none"> <li>• Support for 16- and 32-bit cyclic redundancy check (CRC)</li> <li>• Detection and maintenance of statistics of CRC errors, framing errors, and aborts</li> </ul>
<b>Performance</b>	<ul style="list-style-type: none"> <li>• Support for full line-rate transfers of packets sizes from 64 to 8000 bytes</li> <li>• 16-MB ingress and 16-MB egress packet buffer memory per port (4 x DS-3)</li> </ul>
<b>LEDs</b>	<ul style="list-style-type: none"> <li>• Line-card fail (1 per card)</li> <li>• Alarm (Off/DS-3/DS-1 LEDs x 4 ports)</li> <li>• Loopback active (Off/DS-3/DS-1 LEDs x 4 ports)</li> <li>• Carrier signal (1 per DS-3, 4 per card)</li> </ul>
<b>Network management</b>	<ul style="list-style-type: none"> <li>• Telnet (command-line interface [CLI])</li> <li>• Console port (CLI)</li> <li>• Simple Network Management Protocol (SNMP)</li> <li>• MIB-II <ul style="list-style-type: none"> <li>◦ RFC 2495</li> <li>◦ RFC 2496</li> </ul> </li> </ul>
<b>Physical specifications</b>	Dimensions (H x D x W): 7.8 x 11 x 1.3 in. (19.8 x 27.9 x 3.3 cm) Weight: 2.0 lb (0.9 kg)
<b>Environmental conditions</b>	<p><b>Operating temperature:</b> 41 to 104°F (5 to 40°C) Short-term operating temperature is limited to 131°F (55°C)</p> <p><b>Relative humidity:</b> Operating—Nominal: 5 to 85% Operating—Short-term: 5 to 90% Storage: 5 to 95%</p> <p><b>Storage temperature:</b> –40 to 158°F (–40 to 70°C)</p>
<b>Power consumption</b>	19.3W
<b>Product regulatory approvals</b>	<ul style="list-style-type: none"> <li>• 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</li> <li>• EN60950 with Amendments 1–4, for CE Marking to the LVD directive</li> <li>• IEC 60950 third edition with Amendments 1–4, including all national and group deviations</li> <li>• AS/NZS 60950:2000</li> <li>• AS/NZS 3260-1993 with Amendments 1–4</li> <li>• ACA TS001-1997</li> <li>• NOM-019-SCFI-1998</li> </ul>

<b>Electromagnetic emissions certification</b>	<ul style="list-style-type: none"> <li>AS/NZ 3548:1995 (including Amendment I + II) Class B</li> <li>EN55022:1998 Class B</li> <li>CISPR 22:1997</li> <li>EN55022:1994 (including Amendment I+ II)</li> <li>47 CFR Part 15:2000 (FCC) Class B</li> <li>VCCI V-3/01.4 Class 2</li> <li>CNS-13438:1997 Class B</li> <li>GR1089:1997 (including Rev1: 1999)</li> </ul>
<b>Immunity</b>	<ul style="list-style-type: none"> <li>EN300386:2000—TNE EMC requirements; product family standard; high priority of service; central-office and noncentral office locations</li> <li>EN50082-1:1992/1997</li> <li>EN50082-2:1995—Generic Immunity Standard, Heavy Industrial</li> <li>CISPR24:1997</li> <li>EN55024:1998—Generic ITE Immunity Standard</li> <li>EN61000-4-2:1995+AMD I + II-ESD, Level 4, 8-kV contact, 15-kV air</li> <li>IEC-1000-4-3:1995+AMD 1—Radiated Immunity, 10 V/m</li> <li>IEC-1000-4-4:1995—Electrical Fast Transients, Level 4, 4 kV/B</li> <li>IEC-1000-4-5:1995+AMD 1—DC Surge Class 3; AC Surge Class 4</li> <li>EN61000-4-6:1996+AMD 1—RF Conducted Immunity, 10V rms</li> <li>EN61000-4-11:1995—Voltage Dips and Sags</li> <li>ETS300 132-2:1996+corregendum, Dec. 1996</li> <li>GR1089:1997 (including Rev1: 1999)</li> </ul>
<b>Network Equipment Building Standards (NEBS)</b>	<ul style="list-style-type: none"> <li>NEBS Level 3-compliant</li> <li>Telcordia SR-3580 Criteria Levels, issued November 1995</li> <li>GR1089-Core: Electromagnetic Compatibility &amp; Electrical Safety, issued February 1999</li> <li>GR63-Core: Physical Protection Requirements, issued April 2002</li> <li>SBC equipment requirements: TP76200 MP and TP76400 MP</li> <li>Verizon equipment requirements: SIT.NEBS.TE.NPI.2002.010</li> </ul>

## System Capacity

Table 2 gives Cisco 10000 Series CT3 line-card port densities.

**Table 2.** Cisco 10000 Series CT3 Line-Card Port Densities (assumes 1 slot dedicated to uplinks)

	Ports per Line Card	Ports per Chassis	Ports per Chassis with Y-Cable Redundancy
<b>DS-1</b>	112	1792	896
<b>DS-3</b>	4	64	32

## Ordering Information

To place an order, visit the [Cisco Ordering Home Page](#) or refer to Table 3.

**Table 3.** Ordering Information

Product Description	Part Number
<b>Cisco 10000 Series 4-Port Channelized T3 Half-Height Line Card</b>	ESR-HH-4CT3
<b>Three of ESR-HH-4CT3 cards</b>	ESR-HH-4CT3-3PACK
<b>Pair of ESR-HH-4CT3= and 8 Y-cables</b>	ESR-4CT3-2PACK=
<b>7-inch BNC Y-Cable (eight cables required for each pair of redundant cards)</b>	CAB-BNC-7INY=
<b>Cisco 10000 Half-Height Carrier (divides full slot into two half slots)</b>	ESR-HH-CARRIER

## Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco services help you protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business. For more information about Cisco services, see [Cisco Technical Support Services](#) or [Cisco Advanced Services](#).

## For More Information

For more information about the Cisco 10000 Series routers, visit <http://www.cisco.com/en/US/products/hw/routers/ps133/index.html> or contact your local Cisco account representative.



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