

## Cisco Channelized T1/E1 and ISDN PRI Modules for the Integrated Services Routers

The Cisco® Channelized T1/E1 and ISDN PRI High-Speed WAN Modules combine multiple T1/E1 WAN connectivity-Channelized T1/E1 and ISDN Primary Rate Interface (PRI), in the same card. Applications include fractional or full T1/E1 WAN connectivity, ISDN PRI for primary WAN link or WAN backup, and dial access aggregation. With flexible WAN connectivity options, together with integrated routing, security, voice, and wireless capabilities, the Cisco Integrated Services Routers can meet every need of enterprise-class branch offices today and in the future. Three versions are available, 1- and 2-port cards (Figure 1) in a single-wide high-speed WAN interface card (HWIC), and a 8-port cards (Figure 2) in a single-wide network module. The different versions help enable customers to deploy different port densities according to the needs of individual offices.

The modules can be used in T1 or E1 networks, selectable by software configuration. The integrated channel service unit/data service unit (CSU/DSU) function allows customers to consolidate customer premises equipment (CPE). The modules support balanced and unbalanced E1 connectivity and conform to the G.703 and G.704 standards for unframed and framed E1 modes. The Channelized T1/E1 and ISDN PRI modules work with the digital modem module in the Cisco 2800, 2900, 3800, and 3900 Series Integrated Services Routers to provide V.90- and V.92-compliant digital dial access aggregation.

The 1- and 2-port Channelized T1/E1 and ISDN PRI HWICs are updated versions of the E1/T1 ISDN PRI network modules, with the same functions and performance in a compact form factor of HWIC. You can save the network module slots for other LAN/WAN connectivity, and your deployment flexibility is greatly enhanced.

**Figure 1.** 1- and 2-Port Channelized T1/E1 and ISDN PRI High-Speed WAN Interface Card



**Figure 2.** 8-Port Channelized T1/E1 and ISDN PRI Network Module



## Features and Benefits

- 1, 2, or 8 ports of RJ-48
- Cisco IOS® Software configurable for T1 or E1 operation
- Integrated CSU/DSU per port
- Fractional T1/E1 (n x DS-0) or full T1/E1
- Balanced or unbalanced E1 termination in the same module
- E1 unframed and framed modes (G.703 or G.704)
- Interoperable with Cisco digital modem modules PVDMM2-12DM, PVDMM2-24DM, and PVDMM2-36DM (HWIC-1CE1T1-PRI and HWIC-2CE1T1-PRI modules only)
- Support for Multilink Point-to-Point Protocol (PPP) and Multilink Frame Relay (FRF.16)
- PRI for data

## Key Benefits

### Enhanced Flexibility

The Cisco E1/T1 ISDN PRI HWICs are software-configurable between E1 or T1 operation, balanced or unbalanced E1 termination, and CSU/DSU. Customers no longer need to buy a specific module for T1 support and then another card for E1 connectivity. In addition, the same modules provide for balanced (120-ohm) and unbalanced (75-ohm) E1 termination. Table 1 lists available cable adaptors.

### Support for G.703 Unstructured E1 Signaling

ITU signaling standard G.703 was previously available only on Cisco midrange routers through the voice/WAN interface card (VWIC-xFT-G703), which did not support data PRI. Framed E1 (G.704) is also supported for international customers without G.703 service.

### Increased Manageability and Troubleshooting

Critical loopback support makes the Cisco Channelized T1/E1 and ISDN PRI Modules easy to manage. Both models can internally loop back the onboard framer chip toward the interface, thus eliminating the need for an external loopback plug. Local, remote, line, and payload loopbacks, complement the management features of the Cisco Channelized T1/E1 and ISDN PRI Module.

### Reliability

Integrating the external E1/T1 terminating device (CSU/DSU) increases the overall system reliability. Possible points of failure are reduced by eliminating the second power supply, additional fans, extra cabling, and other equipment that accompany a “two-box” solution. This increase in reliability allows service providers to more easily and cost-effectively meet the requirements of their customers’ service-level agreements (SLAs) and provides enterprises with maximum equipment uptime.

## Product Specifications

Table 1 lists the product numbers of the Cisco Channelized T1/E1 ISDN PRI Modules and the cables for balanced and unbalanced E1.

**Table 1.** Product Numbers of the Cisco Channelized T1/E1 and ISDN PRI Modules and Cables

Product Number	Description
<b>HWIC-1CE1T1-PRI</b>	1 Port Channelized T1/E1 and ISDN PRI High Speed WAN Interface Card
<b>HWIC-2CE1T1-PRI</b>	2 Port Channelized T1/E1 and ISDN PRI High Speed WAN Interface Card
<b>NM-8CE1T1-PRI</b>	8 Port Channelized T1/E1 and ISDN PRI Network Module

Product Number	Description
<b>SM-NM-ADPTR</b>	Network Module Adapter for SM Slot on Cisco 2900 and 3900 Series ISR
<b>CAB-E1-RJ45BNC</b>	E1 Cable RJ-45 to Dual BNC (Unbalanced)

## Platform Support

Refer to the software release notes or the Cisco IOS Software Upgrade Planner, or ask your local Cisco representative for information about supported platforms and minimum software and memory requirements. Table 2 shows the minimum Cisco IOS Software requirements for each platform.

**Table 2.** Minimum Cisco IOS Software Requirements

	2800, and 3800 Series	2900, and 3925, 3945	Cisco 3925E, 3945E
<b>Minimum IOS Release</b>	12.4(20)T	15.0(1)M	15.1(1)T
<b>Minimum IOS Technology Package</b>	IP Base	IP Base	IP Base

Table 3 shows the platform support and maximum number of Cisco Channelized T1/E1 and ISDN PRI Modules supported in each platform.

**Table 3.** Number of Cisco Channelized T1/E1 and ISDN PRI Modules per Platform

Type of Module	Cisco 1841 and 2801	Cisco 2811, 2821, and 2851	Cisco 1941 and 2901	Cisco 2911, 2921, 2951	Cisco 3825, 3845	Cisco 3925, 3945	Cisco 3925E, 3945E
<b>HWIC-1CE1T1-PRI</b>	N/A	4	N/A	4	4	4	3
<b>HWIC-2CE1T1-PRI</b>	N/A	4	N/A	4	4	4	3
<b>NM-8CE1T1-PRI</b>	N/A	N/A	N/A	N/A	1	1 <sup>1</sup>	1

<sup>1</sup> Support for NM-8CE1T1-PRI in the 3925 and 3945 will be via the network module adapter card (SM-NM-ADPTR).

## Software and Management Features

Table 4 shows the number of DS-0 channels supported by Cisco Channelized T1/E1 and ISDN PRI HWICs and Network Module. Each port can support up to 24 channels for T1 and 31 channels for E1.

**Table 4.** Number of DS-0 Channels Supported per Module

Type of Module	Cisco 1841 thru 3945E
<b>HWIC-1CE1T1-PRI</b>	Up to 32 channels on each card
<b>HWIC-2CE1T1-PRI</b>	Up to 64 channels on each card
<b>NM-8CE1T1-PRI</b>	Up to 128 channels on each card (1841 thru 3845, up to 256 channels on the 3945E, 3925E, 3945, 3925)

Table 5 shows the management features for the Cisco Channelized T1/E1 and ISDN PRI HWICs and Network Module.

**Table 5.** Management Features

Feature	Description
<b>Diagnostic Loopback Support</b>	<ul style="list-style-type: none"> <li>E1 loopback modes: <ul style="list-style-type: none"> <li>Controller local loopback</li> <li>Interface local loopback</li> </ul> </li> <li>T1 loopback modes: <ul style="list-style-type: none"> <li>Interface local loopback</li> <li>Interface remote loopback</li> <li>Controller local loopback</li> <li>Controller remote loopback</li> </ul> </li> </ul>

Feature	Description
	<ul style="list-style-type: none"> <li>CSU loopback modes for T1 CSU:</li> <li>Data terminal equipment (DTE) loopback</li> <li>Network loopback</li> <li>Payload loopback</li> </ul>
<b>Alarm Detection</b>	<ul style="list-style-type: none"> <li>Yellow Alarm-Receive/Send from/to network</li> <li>Blue Alarm-Receive alarm indication signal (AIS) from network</li> <li>Red Alarm-Loss of network signal</li> </ul>
<b>Relevant MIB Support</b>	<ul style="list-style-type: none"> <li>T1 MIB (RFC1406-MIB)</li> <li>Cisco Integrated DSU/CSU MIB (CISCO-ICSUDSU-MIB)</li> </ul>
<b>Remote Management</b>	<ul style="list-style-type: none"> <li>Cisco CNS 2100 Series Intelligence Engine (IE2100)</li> <li>CiscoWorks</li> </ul>
<b>Signaling Debugging</b>	<ul style="list-style-type: none"> <li>ISDN Q.921 and Q.931 decode</li> <li>All other previously existing applicable Cisco IOS Software debugs</li> </ul>

## Hardware Specifications

Table 6 shows the hardware specifications for the Cisco Channelized T1/E1 and ISDN PRI HWICs and Network Module.

**Table 6.** Hardware Specifications for the Cisco Channelized T1/E1 and ISDN PRI Modules

Feature	Description
<b>Dimensions (H x W x D)</b>	<ul style="list-style-type: none"> <li>HWIC-1CE1T1-PRI: 0.75 x 3.08 x 4.74 in.</li> <li>(1.91 x 7.82 x 12.04 cm)</li> <li>HWIC-2CE1T1-PRI: 0.75 x 3.08 X 4.74 in.</li> <li>(1.91 x 7.82 x 12.04 cm)</li> <li>NM-8CE1T1-PRI: 1.59 x 7.10 x 7.29 in. (4.0 x 18.0 x 18.5 cm)</li> </ul>
<b>Weight</b>	<ul style="list-style-type: none"> <li>HWIC-1CE1T1-PRI: 0.18 lb (0.08 kg)</li> <li>HWIC-2CE1T1-PRI: 0.19 lb (0.09 kg)</li> <li>NM-8CE1T1-PRI: 1.4 lb (0.63 kg)</li> </ul>
<b>Operating Temperature</b>	<ul style="list-style-type: none"> <li>32 to 104°F (0 to 40°C)</li> </ul>
<b>Nonoperating Temperature</b>	<ul style="list-style-type: none"> <li>-40 to 158°F (-40 to 70°C)</li> </ul>
<b>Relative Humidity</b>	<ul style="list-style-type: none"> <li>5-95% noncondensing</li> </ul>
<b>LEDs</b>	<p>LEDs per port</p> <ul style="list-style-type: none"> <li>Carrier Detect/Loopback (CD/LP):</li> <li>Off = No carrier detect</li> <li>Green On = Carrier detect</li> <li>Yellow On = Port in loopback mode</li> <li>Alarm (AL):</li> <li>Off = No alarms</li> <li>Yellow On = Port in alarm mode</li> </ul> <p>LEDs per module (on NM-8CE1T1-PRI only):</p> <ul style="list-style-type: none"> <li>EN:</li> <li>Off = Card not available</li> <li>On = Card enabled</li> </ul>
<b>Ports</b>	<ul style="list-style-type: none"> <li>1, 2, or 8 T1/E1 ports on RJ-48C connectors</li> </ul>
<b>Line Bit Rate (per Port)</b>	<ul style="list-style-type: none"> <li>E1: (2.048 Mbps)</li> <li>T1: (1.544 Mbps)</li> </ul>
<b>Line Coding</b>	<ul style="list-style-type: none"> <li>E1: High-density bipolar three (HDB3)</li> <li>T1: Alternate mark inversion (AMI) and binary 8-zero substitution (B8ZS)</li> </ul>
<b>Framing Formats</b>	<ul style="list-style-type: none"> <li>E1: CRC4</li> <li>T1: Super Frame (SF) and Extended Super Frame (ESF)</li> </ul>
<b>Output Levels</b>	<ul style="list-style-type: none"> <li>E1: short-haul/long-haul</li> <li>T1 (line build-out [LBO]): 0, -7.5, or -15 dB</li> </ul>

## Regulatory Compliance, Safety, Emissions, and EMC/Immunity

Table 7 shows a partial listing of regulatory compliance and safety data.

**Table 7.** Regulatory Compliance and Safety (partial listing\*)

Feature	Description
<b>Telecom compliance</b>	<ul style="list-style-type: none"> <li>• USA: FCC Part 68, TIA-968A</li> <li>• Canada: Industry Canada CS-03</li> <li>• European Union: TBR 4, TBR 12, TBR 13</li> <li>• Australia: AS/ACIF S038, AS/ACIF S016</li> <li>• Japan: JATE Gray Book</li> <li>• Hong Kong: HKTA 2027, HKTA 2015</li> <li>• Taiwan: IS6100</li> <li>• Singapore: IDA TS ISDN PRA</li> <li>• Korea: MIC No.2004-15</li> </ul>
<b>Telecommunication Interface Industry Standards</b>	<ul style="list-style-type: none"> <li>• ITU-T G.703, G.704, G.706, G.823, and ANSI T1.403</li> </ul>
<b>Safety</b>	<ul style="list-style-type: none"> <li>• United States: UL60950</li> <li>• Canada: C22.2 No.60950</li> <li>• Europe: EN60950</li> <li>• Australia and New Zealand: AS/NZS3260 and TS001</li> <li>• Other countries: IEC60950</li> </ul>
<b>Network Equipment Building Standards (NEBS)</b>	<ul style="list-style-type: none"> <li>• GR-63, GR-78, and GR-1089-CORE Type 1/3</li> </ul>
<b>EMC Emissions and Immunity</b>	<ul style="list-style-type: none"> <li>• 47 CFR Part 15: 2005</li> <li>• CISPR22: 2005</li> <li>• EN300386: V1.3.3: 2005</li> <li>• EN55022: 1994 [+ amd 1 &amp; 2]</li> <li>• EN55022: 1998</li> <li>• EN61000-3-2: 2000 [Inc amd 1 &amp; 2]</li> <li>• EN61000-3-3: 1995 [+ amd 1: 2001]</li> <li>• ICES-003 Issue 4: 2004</li> <li>• KN 22: 2005</li> <li>• VCCI: V-3/2006.04</li> <li>• CISPR24: 1997 [+ amd 1 &amp; 2]</li> <li>• EN300386: V1.3.3: 2005</li> <li>• EN50082-1: 1992</li> <li>• EN50082-1: 1997</li> <li>• EN55024: 1998 [+ amd 1 &amp; 2]</li> <li>• EN61000-6-1: 2001</li> </ul>

For more information, visit the Cisco Compliance home page (listed later in this document in the section “Country Support”) or consult your local Cisco representative.

## Safety, EMC, Telecom, Network Homologation, Power, Environmental Requirements, and Regulatory Approvals

When installed in a Cisco 1900, 2800, 2900, 3800 or 3900 Series Router, the 1- and 2-port Channelized T1/E1 and ISDN PRI HWICs and 8-port Channelized T1/E1 and ISDN PRI network module do not change the standards (safety, EMC, telecom, network homologation, power, environmental requirements, and regulatory approvals) of the router itself. Refer to the Cisco 1900, 2800, 2900, 3800 and 3900 Series data sheets for additional information about mechanical, environmental, and agency certifications.

- Cisco 2800 Series: <http://www.cisco.com/en/US/partner/products/ps5854/index.html>
- Cisco 3800 Series: <http://www.cisco.com/en/US/partner/products/ps5855/index.html>
- 3900 Series: <http://www.cisco.com/en/US/products/ps10536/index.html>

- 2900 Series: <http://www.cisco.com/en/US/products/ps10537/index.html>
- 1900 Series: <http://www.cisco.com/en/US/products/ps10538/index.html>

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### Country Support

Visit the following URL or contact your local Cisco representative for country-specific approval status (Cisco.com login required): <http://www.ciscofax.com>.



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