Cisco Channelized T1/E1 and ISDN PRI Modules for the Cisco 2010 Connected Grid Router

The Cisco® Connected Grid portfolio of solutions is designed specifically for the harsh, rugged environments often found in the energy and utility industries. These solutions include the Cisco 2010 Connected Grid Router (CGR 2010) and the Cisco 2520 Connected Grid Switch (CGS 2520), which have been designed to support the communications infrastructure needs of the energy delivery infrastructure across the generation, transmission, and distribution sectors. This infrastructure includes the utility- and customer-owned energy infrastructure, such as substation applications supporting electrical transmission and distribution, renewable generation, oil and gas, water, distributed generation, co-generation, and trackside operations. The infrastructure also includes the communications infrastructure for delivery applications such as transmission pipelines, distribution mains, and service lines for oil and gas and water. Designed for highly secure, reliable, and scalable infrastructure, the CGR 2010 and CGS 2520 are an ideal platform to support Smart Grid and other energy delivery infrastructure needs of customers. These ruggedized products have been extensively tested and are KEMA certified to meet the challenging substation compliance standards including IEEE 1613 and IEC 61850-3.

The Cisco Channelized T1/E1 and ISDN PRI Rugged WAN interface card (GRWIC) modules are designed for use with the Cisco 2010 Connected Grid Router (CGR 2010). This rugged router platform is optimized for the harsh conditions common in connected energy applications worldwide. The Cisco Channelized T1/E1 and ISDN PRI Grid Router WAN Interface Cards (GRWICs) 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. The Cisco CGR 2010 supports a one- and a two-port version of the T1/E1 module (Figure 1) in a single-wide GRWIC. The different versions help enable customers to deploy different port densities, depending on wide area network needs in connected energy network locations.

The modules can be used in T1 or E1 networks and are selectable by software configuration. The integrated channel service unit/data service unit (CSU/DSU) function allows customers to consolidate customer premise 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.

Figure 1. 1- and 2-Port Channelized T1/E1 and ISDN PRI Rugged WAN Interface Cards (GRWICs)

Features and Benefits

- One or two 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)
- 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 GRWICs 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.

Support for G.703 Unstructured E1 Signaling

The one- and two-port T1/E1 GRWIC supports G.703 unstructured signaling. 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 utilities with maximum equipment uptime.

Platform Support

Refer to the software release notes or the Cisco IOS Software Upgrade Planner, or ask your local Cisco representative for information about minimum software and memory requirements. Table 1 shows the minimum Cisco IOS Software requirements for each platform.

Table 1. Minimum Cisco IOS Software Requirements

	Cisco CGR 2010
Minimum IOS Release	15.1(1)T
Minimum IOS Technology Package	IPBase

Table 2 shows the platform support and maximum number of Cisco Channelized T1/E1 and ISDN PRI Modules supported in each platform.

Table 2. Number of Cisco Channelized T1/E1 and ISDN PRI Modules per Platform

Type of Module	Cisco CGR 2010
1 port T1/E1 GRWIC	4
2 port T1/E1 GRWIC	4

Software and Management Features

Table 3 shows the number of DS-0 channels supported by Cisco Channelized T1/E1 and ISDN PRI GRWICs and Network Module. Each port can support up to 24 channels for T1 and 31 channels for E1.

Table 3. Number of DS-0 Channels Supported per Module

Type of Module	Number of DS-0 Channels per Module
1 port T1/E1 GRWIC	T1: up to 24 channels on each card. E1: up to 31 channels on each card
2 port T1/E1 GRWIC	T1: up to 48 channels on each card. E1: up to 62 channels on each card

Table 4 shows the management features for the Cisco Channelized T1/E1 and ISDN PRI GRWICs and Network Module.

Table 4. Management Features

Feature	Description
Diagnostic Loopback Support	• E1 loopback modes: • Controller local loopback • Interface local loopback • T1 loopback modes: • Interface local loopback • Interface remote loopback • Controller local loopback • Controller remote loopback • CSU loopback modes for T1 CSU: • Data terminal equipment (DTE) loopback • Network loopback • Payload loopback
Alarm Detection	• Yellow Alarm-Receive/Send from/to network • Blue Alarm-Receive alarm indication signal (AIS) from network • Red Alarm-Loss of network signal
Relevant MIB Support	• T1 MIB (RFC1406-MIB) • Cisco Integrated DSU/CSU MIB (CISCO-ICSUDSU-MIB)
Remote Management	• Cisco CNS 2100 Series Intelligence Engine (IE2100) • CiscoWorks LAN Management Solution
Signaling Debugging	• ISDN Q.921 and Q.931 decode • All other previously existing applicable Cisco IOS Software debugs

Hardware Specifications

Table 5 shows the hardware specifications for the Cisco Channelized T1/E1 and ISDN PRI GRWICs.

Table 5. Hardware Specifications for the Cisco Channelized T1/E1 and ISDN PRI Modules

Feature	Description
Form Factor	• Single-wide GRWIC, no slot restrictions
Dimensions (H x W x D)	• 1 port T1/E1 PRI GRWIC: 2.52 x 3.0 x 7.81 in. • (6.4 x 7.6 x 19.8cm) • 2 port T1/E1 PRI GRWIC: 2.52 x 3.0 x 7.81 in. • (6.4 x 7.6 x 19.8cm)
Weight	• 1 port T1/E1 PRI GRWIC: 0.84 lb (0.38kg) • 2 port T1/E1 PRI GRWIC: 0.84 lb (0.38kg)
LEDs	LEDs per port • Carrier Detect/Loopback (CD/LP): • Off = No carrier detect • Green On = Carrier detect • Yellow On = Port in loopback mode • Alarm (AL): • Off = No alarms • Yellow On = Port in alarm mode
Ports	• 1 or 2 T1/E1 ports on RJ-48C connectors
Line Bit Rate (per Port)	• E1: (2.048 Mbps) • T1: (1.544 Mbps)
Line Coding	• E1: High-density bipolar three (HDB3) • T1: Alternate mark inversion (AMI) and binary 8-zero substitution (B8ZS)
Framing Formats	• E1: CRC4 • T1: Super Frame (SF) and Extended Super Frame (ESF)
Output Levels	• E1: short-haul/long-haul • T1 (line build-out [LBO]): 0, -7.5, or -15 dB

Regulatory Compliance, Safety, Emissions, and EMC/Immunity

Table 6 shows a partial listing of regulatory compliance and safety data.

Table 6. Common Specifications*

Feature	Description
Environmental Specifications	
Operating Conditions	
Environmental Substation Compliance	IEC 61850-3 IEEE1613
Operating Temperature	-40 ºF to 140ºF (-40 to +60ºC) continuous operating temperature range -40 ºF to 185ºF (-40 to +85ºC) type test for 100 hours at 85ºC
Shock/Vib	30G @11ms
Altitude	10,000 ft (3,048 m) Max operating temp is de-rated with increasing altitude per IEEE1613a-2008
Relative humidity	5 to 95% non-condensing
Non-operating Conditions	
Temperature	–40ºF to 185ºF (–40ºC to 85ºC)
Relative humidity	5 to 95% non-condensing

Feature	Description
Altitude	16,000 ft (4,876 m) Max operating temp is de-rated with increasing altitude per IEEE1613a-2008
Non-Op Free Fall Drop	4 in. (100 mm) per ENG-339611
Operating Seismic/Earthquake	NEBS GR-63 (5.4.1)
Non-Op Shock/Vib	40-50G (3.26 m/s minimum)
Immunity	• EN61000-6-2 • EN61000-4-2 (ESD) • EN61000-4-3 (RF) • EN61000-4-4 (EFT) • EN61000-4-5 (SURGE) • EN61000-4-6 (CRF) • EN61000-4-11 (VDI) • EN 55024, CISPR 24 • EN50082-1
Telecom compliance	• US: TIA-968-A • CA: CS-03 • EU: TBR1, 2, 4, 12, 13 • RTTE Directive • Australia: AS/ASIF S016, S038 • Japan: JATE
Telecommunication Interface Industry Standards	• ITU-T G.703, G.704, G.706, G.823, ANSI T1.403
Safety	• USA: UL 60950-1 • Canada: CAN/CSA C22.2 No. 60950-1 • Europe: EN 60950-1 • China: GB 60950-1 • Australia/New Zealand: AS/NZS 60950-1 • Rest of World: IEC 60950-1 • CSA certified to UL/CSA 60950-1, 2nd Ed. • CB report to IEC60950-1, 2nd Ed., covering all group differences and national deviations.
EMC Emissions	• 47 CFR, Part 15 • ICES-003 Class A • EN55022 Class A • CISPR22 Class A • AS/NZS 3548 Class A • VCCI V-3 • CNS 13438 • EN 300-386

* For more information, consult the Product Approval Database http://www.ciscofax.com or consult your local Cisco representative (Cisco.com login required).

Product Part Numbers

Connected Grid Router WICs	
GRWIC-1CE1T1-PRI	1 port channelized T1/E1 and PRI GRWIC (data only)
GRWIC-1CE1T1-PRI=	1 port channelized T1/E1 and PRI GRWIC (data only), spare
GRWIC-2CE1T1-PRI	2 port channelized T1/E1 and PRI GRWIC (data only)
GRWIC-2CE1T1-PRI=	2 port channelized T1/E1 and PRI GRWIC (data only), spare

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

When installed in a Cisco CGR 2010, the one- and two-port Channelized T1/E1 and ISDN PRI GRWICs do not change the standards (safety, EMC, telecom, network homologation, power, environmental requirements, and regulatory approvals) of the router itself. Refer to the Cisco CGR 2010 data sheet for additional information about mechanical, environmental, and agency certifications.

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