RICi-4/8 E1/T1

Fast Ethernet over Four or Eight E1 or T1 NTUs

- Connecting Fast Ethernet LANs over up to four or eight bonded E1 or T1 circuits utilizing Multilink PPP, bridging the bandwidth gap between E1/T1 and E3/T3
- Certified by the Metro Ethernet Forum (MEF) for MEF 9 EPL
- VLAN tagging, stacking, and stripping fully separates Ethernet user traffic from management data
- Monitoring diagnostic tools for quick fault isolation on TDM and Ethernet ports
- Bidirectional fault propagation of MLPPP link errors to the Ethernet port and Ethernet port errors to the MLPPP port

RICi-4/8 E1/T1 is a state-of-the-art Network Termination Unit (NTU) connecting Fast Ethernet LANs over four or eight bonded E1 or T1 circuits. The device enables service providers to supply high-capacity Ethernet services to remote locations, and transparent connection of corporate LANs over existing E1 or T1 lines.

MARKET SEGMENTS AND APPLICATIONS

The device can be used in a point-to-point application or in a hub-and-spoke topology, operating opposite RAD's Egate-100 and third-party gateways. Typical applications include:

- Ethernet private Line/LAN services
- IP DSLAM, cellular IP, and WiMAX base station backhauling
- Interoffice or enterprise LAN connection.

RICi-4/8 E1/T1 uses bonding to create a scalable, large virtual pipe comprised of up to four or eight E1 or T1 lines using Multilink PPP (MLPPP). The bonding is performed at the E1/T1 level, providing flexible bandwidth for different applications.

EHTERNET

Quality of Service (QoS)
The VLAN priority (802.1p), DSCP, and per port priority schemes enable users to define four QoS levels according to application requirements. This concept provides high priority to real-time applications such as voice and video.

Ethernet OAM
The unit provides Ethernet OAM based on 802.1ag and Y.1731 to enable Ethernet service providers to monitor their services proactively, measure end-to-end performance, and guarantee that the customers receive the contracted SLA. Fault monitoring and performance measurement include Frame Delay, Frame Delay Variation, Frame Loss, and Frame Availability

Bridge
The internal bridge can be configured to filter or transparent mode. In filter mode, the bridge learns MAC addresses and filters local traffic accordingly. In transparent mode, it forwards the received packets, ignoring the MAC addresses.

Traffic Separation
VLAN tagging, stacking, and stripping at ingress and egress enable transporting user traffic transparently, keeping all the user VLAN settings intact. Management traffic and user Ethernet traffic are transported together on the same Ethernet flow and can be separated by different VLANs, thus ensuring high traffic security.

Adjustable Transmit Queues
The size of the transmit queues is adjustable to achieve optimal throughput versus delay combination, according to the application requirements.

Frame Fragmentation
Frame fragmentation is enabled by controlling the size of the Maximum Transmit Unit (MTU) to achieve optimal throughput versus delay combination, according to the application requirements.

Delay Compensation
The device compensates for a differential delay of up to 50 ms between traffic received on different circuits.

RESILIENCY

Fault Propagation
If a failure is detected on the MLPPP port, the fault propagation mechanism deactivates the Fast Ethernet links. This enables routers and switches on both ends of the link to reroute the traffic.

If a failure occurs on an Ethernet port, the fault propagation mechanism reports it to the remote device using OAM 802.3-2005 (formerly 802.3ah) notification. According to your configuration, the mechanism may close the MLPPP port, thus blocking the management path to the remote device.

CARRIER ETHERNET
MEF
Certified Compliant

RAD
Your Network's Edge

MANAGEMENT AND SECURITY

The devices can be managed inband from the Fast Ethernet user ports or the E1/T1 ports (via the MLPPP link). Access is available using Telnet, Web browser, and SNMP. Local management is performed via an ASCII terminal.

The following security mechanisms are provided:

- Access control for SNMP, Telnet, and Web-based management interfaces
- SSL/SSH for secure Telnet and Web access
- RADIUS protocol for password management and user authentication.

OPERATION AND MAINTENANCE

SYSLOG

System logs are forwarded to the network according to predefined criteria.
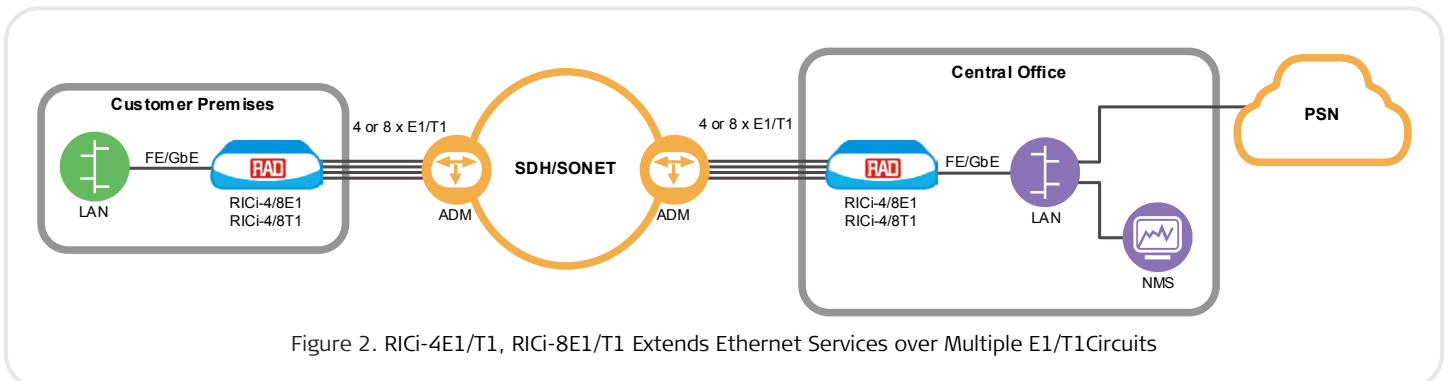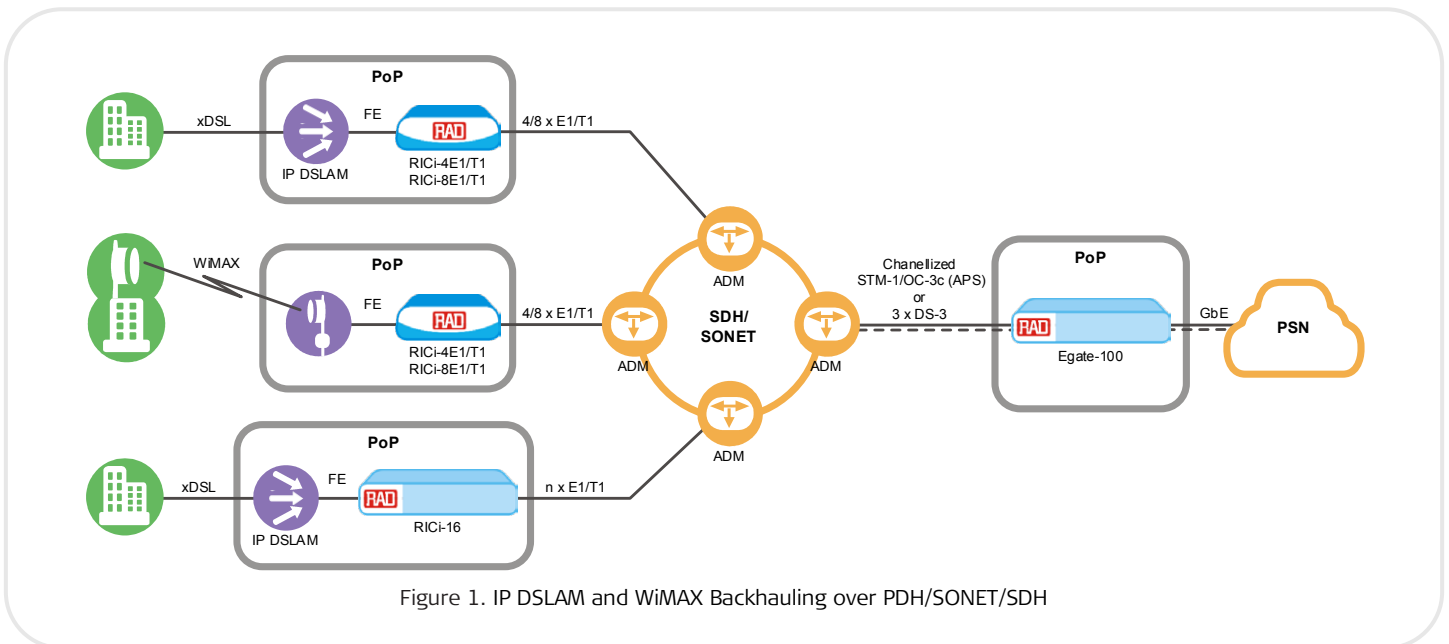
MONITORING AND DIAGNOSTICS

Comprehensive diagnostic capabilities:

- Ping test and route trace for checking IP connectivity
- BERT and remote loopback on E1/T1.

Loop Detection

E1/T1 loops are immediately detected when they occur, avoiding the resulting Ethernet loops and Ethernet storms. The unit automatically recovers when the TDM loop clears.

Applications

Figure 1. IP DSLAM and WiMAX Backhauling over PDH/SONET/SDH

Figure 2. RICi-4E1/T1, RICi-8E1/T1 Extends Ethernet Services over Multiple E1/T1Circuits

Specifications

E1 INTERFACES

Number of Ports
4 or 8

Compliance
G.703

Data Rate
2.048 Mbps, unframed

Line Code
HDB3, AMI

Line Impedance
120Ω, balanced
75Ω, unbalanced

System Clock
Internal or loopback timing

Connector
RJ-45, balanced
Two BNC, unbalanced (via adapter cable)

T1 INTERFACES

Number of Ports
4 or 8

Compliance
T1.403

Data Rate
1.544 Mbps

Line Code
B8ZS, AMI

Framing
Framed (ESF)

Line Impedance
100Ω, balanced

System Clock
Internal or loopback timing

Connector
RJ-45

WAN PROTOCOL

Type
PPP, MLPPP (BCP)

MTU Size
80 to 1900 bytes, user-configurable

Delay Compensation
Up to 50 ms

ETHERNET INTERFACES

Number of Ports
4

Port Combinations
4 built-in electrical
2 built-in electrical + 2 fiber optic (SFP)

SFPs
For full details, see the SFP Transceivers
data sheet at www.rad.com

*Note: It is strongly recommended to order this device with **original** RAD SFPs **installed**. This will ensure that prior to shipping, RAD has performed comprehensive functional quality tests on the entire assembled unit, including the SFP devices. RAD cannot guarantee full compliance to product specifications for units using non-RAD SFPs.*

Type
10/100 Mbps, autonegotiation, full/half
duplex, flow control, MDI/MDX crossover

Connector
RJ-45 for electrical (100BaseTx)
LC (SFP-based) for optical (100BaseFx)

Max Frame Size
1900 Bytes

Compliance
IEEE 802.3 and 802.3u, relevant sections

BRIDGE

LAN Table
Up to 2,048 MAC addresses (learned)

Operation Mode
VLAN-aware, VLAN-unaware

Filtering and Forwarding
Transparent or filtered

MANAGEMENT

Terminal Control Port
Type: RS-232/V.24 (DCE asynchronous)
Data rate: 9.6, 19.2, 115.2 kbps
Connector: 9-pin, D-type, female

DIAGNOSTICS

Loopback Tests
E1/T1 remote loopbacks

BERT
E1/T1 Bit Error Rate Test

GENERAL

Indicators
PWR (green) – Power status
TST (green) – Self test status
ALM (red) – Alarm status

Physical
Height: 43.7 mm (1.7 in) (1U)
Width: 21.5 cm (8.5 in)
Depth: 30.0 cm (11.8 in)
Weight: 2.2 kg (4.7 lb)

Power
AC/DC: 100–240 VAC, 50/60 Hz or
48/60 VDC nominal (40–72 VDC)

Power Consumption
9W max

Environment
Temperature:

Standard enclosure:
    0 to 50°C (32 to 122°F)

Temperature-hardened enclosure:
    -22 to 70°C (7.6 to 158°F)

Humidity: Up to 90%, non–condensing

Ordering

RECOMMENDED CONFIGURATIONS

RICI-4E1

Fast Ethernet Network Termination Unit, 4 E1 ports

RICI-4E1/U

Fast Ethernet Network Termination Unit, 4 unbalanced E1 ports

RICI-4T1

Fast Ethernet Network Termination Unit, 4 T1 ports

RICI-8E1

Fast Ethernet Network Termination Unit, 8 E1 ports

RICI-8E1/U

Fast Ethernet Network Termination Unit, 8 unbalanced E1 ports

RICI-8T1

Fast Ethernet Network Termination Unit, 8 T1 ports

SPECIAL CONFIGURATIONS

Please contact your local RAD partner for additional configuration options

SUPPLIED ACCESSORIES

AC power cord (when AC power supply is ordered)

DC connection kit (when DC power supply is ordered)

CBL-RJ45/2BNC/E1
Adapter cable (if unbalanced E1 interface is ordered)

OPTIONAL ACCESSORIES

RM-35/@
Hardware kit for mounting one or two units in a 19-inch rack

@   Specify rack-mounting kit type
    P1   For mounting one unit
    P2   For mounting two units

WM-35
Hardware kit for mounting one RICi-4 or RICi-8 unit on a wall

CBL-DB9F-DB9M-STR
Control port cable

RAD
Your Network's Edge