

# 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.

### ETHERNET

#### 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.



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### 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

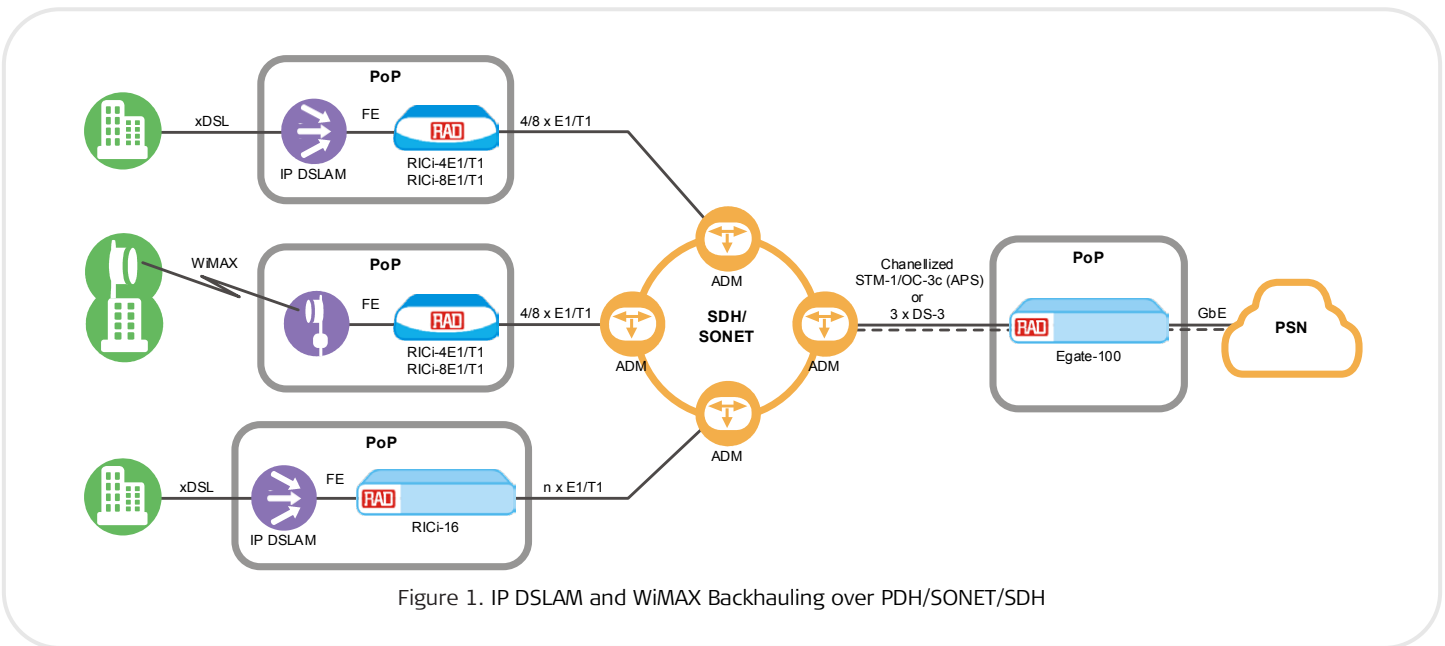


Figure 1. IP DSLAM and WiMAX Backhauling over PDH/SONET/SDH

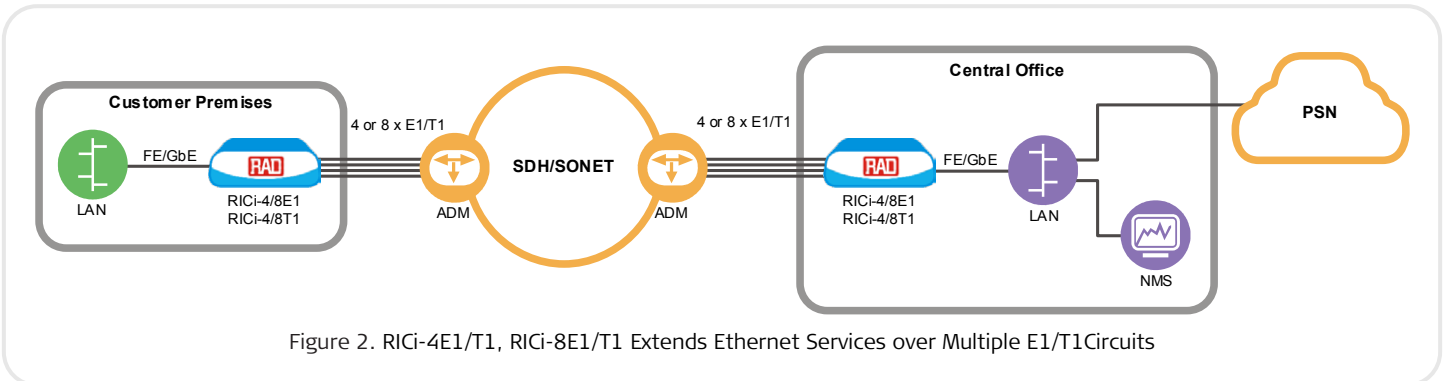


Figure 2. RICi-4E1/T1, RICi-8E1/T1 Extends Ethernet Services over Multiple E1/T1 Circuits

## 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](http://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

## RICi-4/8 E1/T1

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## 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

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