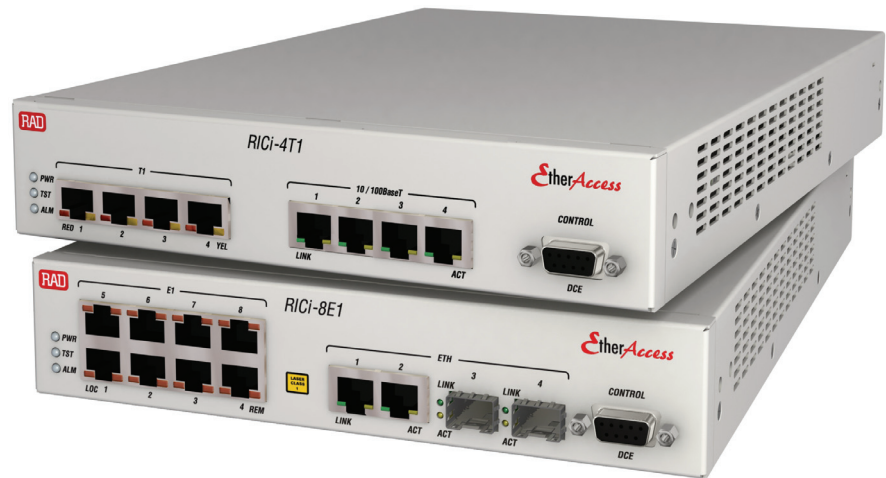


RICi-4/8 E1/T1

Fast Ethernet over Multiple E1/T1 Lines Network Termination Units



Connect Fast Ethernet LANs transparently to a TDM infrastructure

EtherAccess

- 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
- 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
- Bi-directional fault propagation of MLPPP link errors to the Ethernet port and Ethernet port errors to the MLPPP port

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

RICi-4E1/T1 and RICi-8E1/T1 comply with RAD's unique set of EtherAccess™ features. This feature set provides services and carrier backhaul applications over low and high-speed PDH and SDH/SONET circuits from fractional and full E1/T1, E3/T3 over STM-1/OC-3, STM-4/OC-12 to Ethernet networks.

The devices 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.

RAD

data communications
The Access Company

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BONDING

The bonding application creates 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.

TRAFFIC SEPARATION

VLAN tagging, stacking, and stripping at ingress and egress enable transporting user traffic transparently, keeping all the user VLAN settings intact. In addition, the management traffic can be tagged with a different VLAN, fully separating user traffic from management data.

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.

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.

INTERNAL 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.

MANAGEMENT

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 (RADview-Lite).

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.

Local management is performed via an ASCII terminal.

DELAY COMPENSATION

The devices compensate for a differential delay of up to 50 ms between traffic received on different circuits.

LOOP DETECTION

E1/T1 loops are immediately detected when they occur, avoiding the resulting Ethernet loops and Ethernet storms. The RICi-4E1/T1 and RICi-8E1/T1 units automatically recover when the TDM loop clears.

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 the 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. Depending on the user configuration, the mechanism may close the MLPPP port, thus blocking the management path to the remote device.

ENVIRONMENT

RICi-4E1/T1 and RICi-8E1/T1 are available as temperature-hardened devices, extending the permitted operating temperature range to -22 to 70°C (7.6 to 158°F).

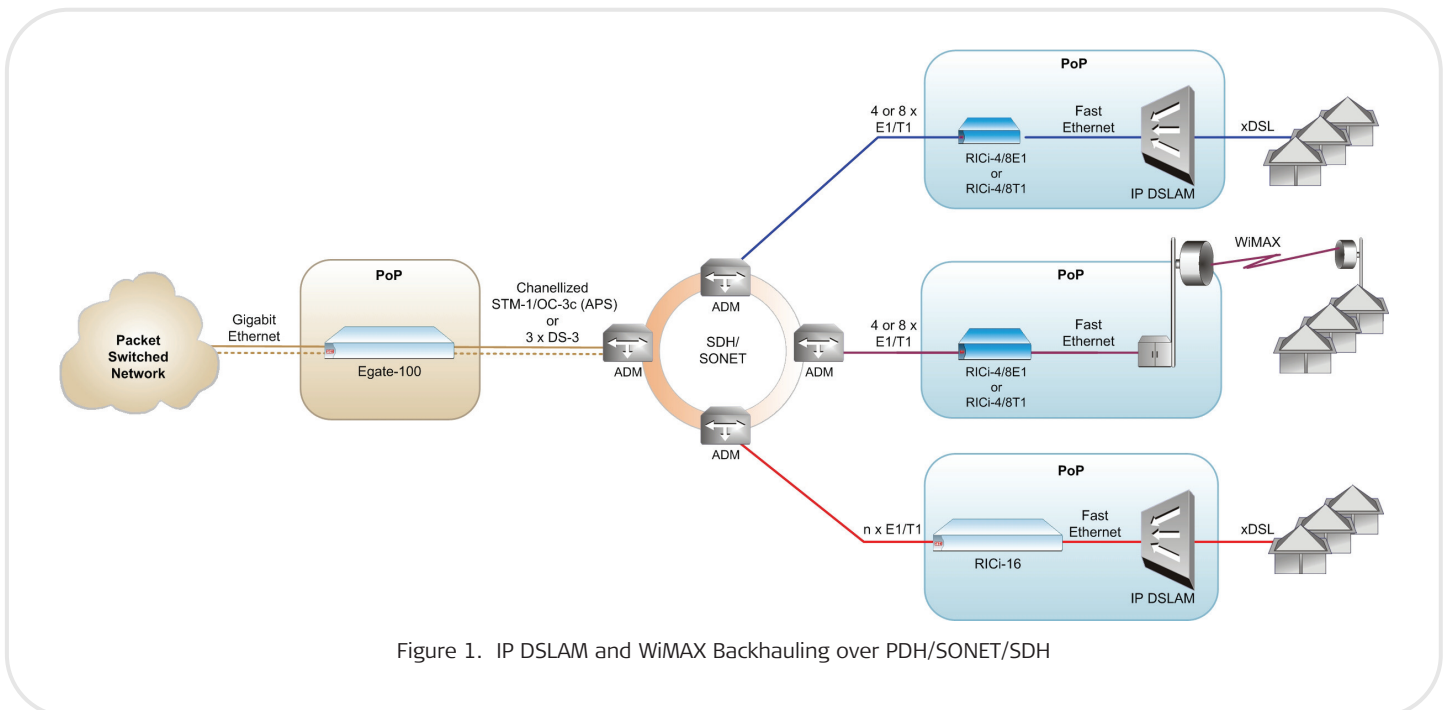


Figure 1. IP DSLAM and WiMAX Backhauling over PDH/SONET/SDH

Specifications

E1 INTERFACE

Number of Ports

4 or 8

Compliance

G.703

Data Rate

2.048 Mbps

Line Code

HDB3, AMI

Framing

Unframed

Line Impedance

120Ω, balanced
75Ω, unbalanced

System Clock

Internal or loopback timing

Connector

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

T1 INTERFACE

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 INTERFACE

Number of Ports

4

Port Combinations

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

SFPs

SFP-1: 1310 nm multimode, 2 km (1.2 miles)

SFP-2: 1310 nm single mode,
15 km (9.3 miles)

SFP-3: 1310 nm single mode,
40 km (24.8 miles)

SFP-4: 1550 nm single mode,
80 km (49.7 miles)

SFP-10A: 1310 nm (Tx), 1550 nm (Rx),
single mode (single fiber),
20 km (12.4 miles)

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

INTERNAL BRIDGE

LAN Table

Up to 2,048 MAC addresses (learned)

Operation Mode

VLAN-aware, VLAN-unaware

Filtering and Forwarding

Transparent or filtered

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

GENERAL

Diagnostics

Remote loopbacks on E1 and T1 interfaces

Indicators

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

Power

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

Power Consumption

9W max

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)

Environment

Standard: 0 to 50°C (32 to 122°F)
Temperature-hardened: -22 to 0°C
(-7.6 to 158°F)
Humidity: Up to 90%, non-condensing

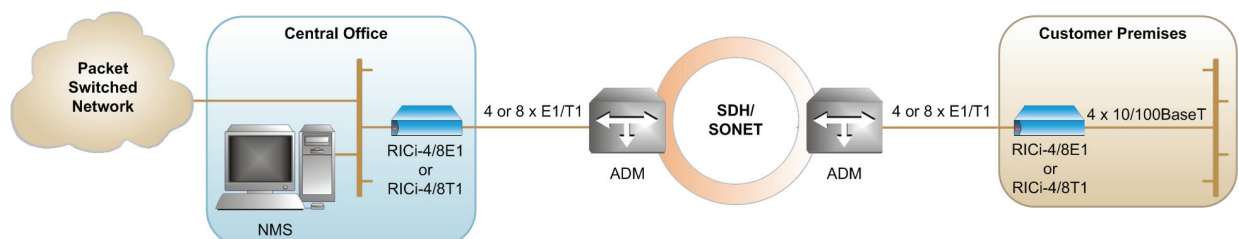


Figure 2. RICI-4E1/T1 or RICI-8E1/T1 Extend Ethernet Services over Multiple E1/T1 Circuits

RICi-4/8 E1/T1

Fast Ethernet over Multiple E1/T1 Lines Network Termination Units

Ordering

RICi-8E1/1/\$/+/?

RICi-8T1/1/+/?

RICi-4E1/1/\$/+/?

RICi-4T1/1/+/?

Legend

! Power supply type:

24 24 VDC
(for temperature-hardened version only)

Note: If no power supply is specified, the unit is supplied with AC/DC power supply.

\$ E1 interface type

U Unbalanced E1 interface (via RJ-45 to BNC adapter cable)

+ SFP type for Ethernet port 3 and 4:

SFP-1 SFP-1 transceiver

SFP-2 SFP-2 transceiver

SFP-3 SFP-3 transceiver

SFP-4 SFP-4 transceiver

SFP-10A SFP-10A transceiver

NULL Empty SFP slot

Notes:

- If Ethernet SFP type is left empty, the unit is supplied with four UTP ports.
- It is strongly recommended to order this device with original RAD SFPs installed. This ensures 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.

? Temperature range:

H Temperature-hardened version

Note: If **H** is not specified, the unit is supplied for operation within the standard temperature range.

SUPPLIED ACCESSORIES

AC power cord

DC connection kit

CBL-RJ45/2BNC/E1

RJ-45 to BNC adapter cable (if an 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

RICi Family Product Comparison Table

Feature	RICi-E1/T1 (Ver. 2.1)	RICi-E3/T3 (Ver. 1.1)	RICi-4/8 E1/T1 (Ver. 1.3)	RICi-16 (Ver. 2.1)
Protocol Type	RAD HDLC HDLC IS GFP (G.8040, G.7041/Y.1303)	RAD HDLC X.86 (LAPS)	MLPPP	GFP (G.8040, G.7041/Y.1303) VCAT (G.7043) LCAS (G.7042)
Fault Propagation	Yes	Yes	Yes	Yes
MAC Address Table	512	512	2048	1024
QoS	802.1p IP Precedence	802.1p	802.1p DSCP Per port	802.1p DSCP Per port
QoS Mechanism	Strict	Strict	Strict	Strict
Host VLAN	Yes	Yes	Yes	Yes

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