

# RIC-LC

## Ethernet Converter for Bonded PDH Circuits



- Delivery of Ethernet traffic over up to 16 bonded E1 ports using Ethernet over NG-PDH protocols
- VLAN tagging and stacking for full separation of Ethernet user traffic from management data
- Monitoring and diagnostic tools for quick fault isolation on TDM and Ethernet ports
- TDM-to-Ethernet fault propagation
- Extensive management capabilities including local and remote (inband and out-of-band) options

RIC-LC is a Fast Ethernet over E1 converter that provides simple, efficient and cost-effective Fast Ethernet connectivity over one, four, eight or sixteen bonded E1 circuits. The device enables service providers to supply high-capacity Ethernet services to remote locations and transparently connect corporate LANs over existing E1 links.

RIC-LC supports standard Next Generation Ethernet over PDH protocols including GFP ITU-T G.8040, VCAT ITU-T G.7043 and LCAS ITU-T G.7042. These protocols allow service providers to dynamically allocate bandwidth to their customers by mere changing the number of links bonded to the virtual group, without stopping the service.

### MARKET SEGMENTS AND APPLICATIONS

RIC-LC targets cost-sensitive applications for carriers, mobile operators and service providers, such as transparent inter-LAN connectivity, Ethernet private lines, as well as IP DSLAM, WiMAX base station and cellular backhaul.

### ETHERNET

#### VLAN tagging and stacking

VLAN tagging and stacking at ingress and egress enable transporting user traffic transparently, keeping all the user VLAN settings intact. Management traffic and user Ethernet traffic are sent together on the same Ethernet flow and can be

separated by different VLANs, thus ensuring high traffic security.

#### Quality of Service (QoS)

RIC-LC supports VLAN-aware and VLAN unaware bridging, as well as VLAN stacking (Q-in-Q). It maps Ethernet frames into four priority queues based on user port, VLAN priority (802.1p) or DSCP marking, to enable differentiation between various user applications. It uses both strict priority and WFQ (weighted fair queuing), as well as per port rate limitation.

#### 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.

### RESILIENCY

#### Fault Propagation

If a failure is detected on the E1 port, the fault propagation mechanism deactivates the Fast Ethernet links, enabling routers and switches on both ends of the link to reroute the traffic.

### MANAGEMENT AND SECURITY

RIC-LC can be managed locally via an ASCII terminal connected to RS-232.

Remote inband management is performed via the E1 ports using Telnet, Web browser or RADview, RAD's SNMP-based management system that ensure safe and secure access control.

Out-of-band management is performed via one of the user Ethernet ports.

### ARCHITECTURE

RIC-LC is provided with two hardware options:

- **Blue/white enclosure** – Internal wide-range AC/DC power supply, 1-16 E1 ports
  - Extended temperature range option
  - Extended temperature range option for outdoor installation with front-panel ground
- **Red enclosure** – External AC or DC power supply (single E1 port only).

### MONITORING AND DIAGNOSTICS

RIC-LC diagnostic capabilities include:

- Ping test for checking IP connectivity
- User-activated diagnostic loopback tests on VCG or individual E1 generated using management software or rear-panel DIP switch.

#### Loop Detection

E1 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

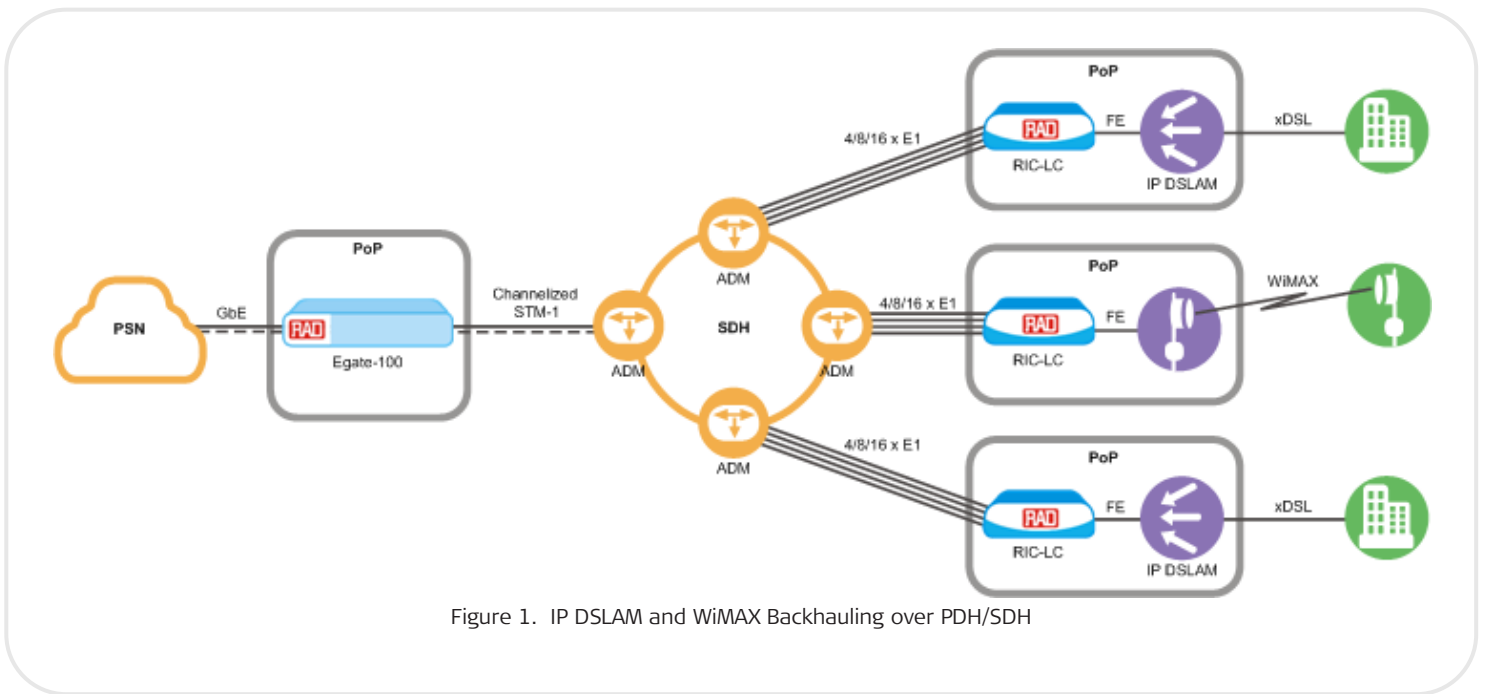


Figure 1. IP DSLAM and WiMAX Backhauling over PDH/SDH

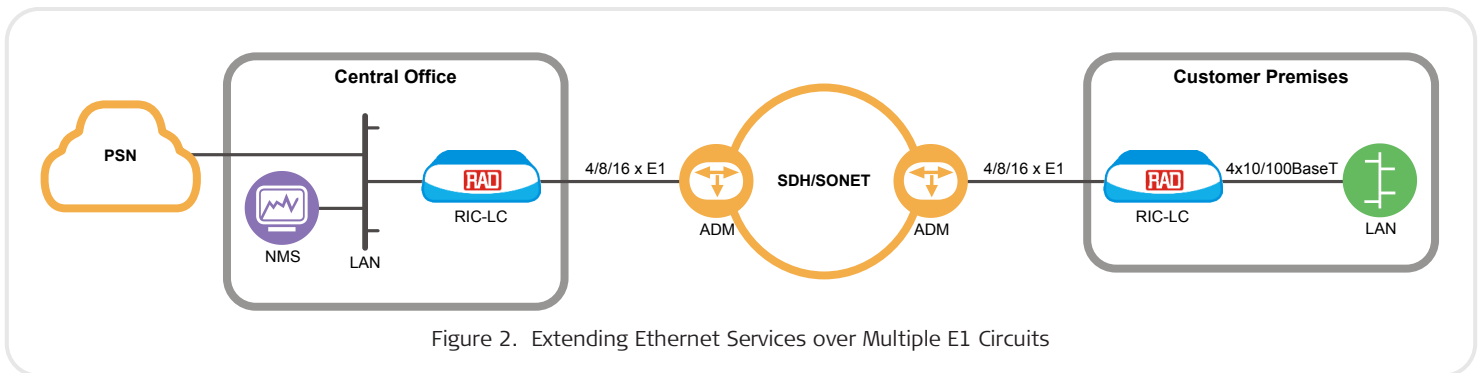


Figure 2. Extending Ethernet Services over Multiple E1 Circuits

## Specifications

### CAPACITY

#### Number of VCGs

1

### E1 INTERFACE

#### Number of Ports

1, 4, 8 or 16

#### Compliance

ITU-T Rec. G.703, G.706, G.732, G.823

#### Data Rate

2.048 Mbps, framed

#### Line Code

HDB3

#### Line Impedance

120Ω, balanced

75Ω, unbalanced

#### System Clock

Internal or loopback timing

#### Connector

RJ-45, balanced

BNC, unbalanced (1-, 4- or 8-port options;  
16-port units are supplied with RJ-45  
to BNC adapter cable)

### ETHERNET INTERFACE

#### 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 [SFP/XFP Compatibility](#).

**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, full/half duplex

#### Connector

RJ-45 for electrical (100BaseTx)

LC (SFP-based) for optical (100BaseFx)

#### Max Frame Size

2036 bytes

#### Compliance

Relevant sections of IEEE 802.3, 802.3u  
and 802.1p&q

### INTERNAL BRIDGE

#### Operation Mode

VLAN-aware, VLAN-unaware

#### MAC Table Size

1024

#### Filtering and Forwarding

Transparent or filtered

#### Port-Based VLAN

Untagged, tagged

#### Number of VLANs

64

#### VLAN Range

1-4094

#### L2CP Handling

Transparent

### TERMINAL CONTROL PORT

#### Type

RS-232C/V.24 (DCE asynchronous)

#### Data Rate

115.2 kbps

#### Connector

Mini USB, female

### DIAGNOSTICS

#### Loopbacks

VCG, E1

#### Connectivity Test

Ping

### GENERAL

#### Indicators

PWR (green) – Power status

TST (orange) - Self-test status

ALM (red) – Alarm status

*Note: TST and ALM LEDs are available only in the enclosure with internal power supply*

#### Power

Internal wide-range power supply:

AC/DC: 100 to 240 VAC or 48 to 60 VDC

External power supply:

AC: 100 to 240 VAC

DC: 48 to 60 VDC

#### Power Consumption

AC: 6W

DC: 5W

#### Physical

Enclosure with internal power supply:

Height: 43.7 mm (1.7 in)

Width: 220 mm (8.6 in)

Depth: 170 mm (6.7 in)

Weight: 0.5 kg (1.1 lb)

Enclosure with external power supply:

Height: 43.5 mm (1.71 in)

Width: 210.3 mm (8.28 in)

Depth: 136 mm (5.35 in)

Weight: 0.6 kg (1.2 lb)

#### Environment

Temperature: 0 to 50°C (32 to 122°F)

Humidity: Up to 90%, non-condensing

# RIC-LC

## Ethernet Converter for Bonded PDH Circuits

### Ordering

#### RECOMMENDED CONFIGURATIONS

##### RIC-LC\_IND/4E1/4UTP

4×E1 ports and 4×10/100BaseT UTP ports, outdoor installation

##### RIC-LC\_IND/8E1/4UTP

8×E1 ports and 4×10/100BaseT UTP ports, outdoor installation

##### RIC-LC\_IND/16E1/4UTP

16×E1 ports and 4×10/100BaseT UTP ports, outdoor installation

##### RIC-LC/4E1/4UTP/ETR

4×E1 ports and 4×10/100BaseT UTP ports, extended temperature range

##### RIC-LC/8E1/4UTP/ETR

8×E1 ports and 4×10/100BaseT UTP ports, extended temperature range

##### RIC-LC/E1/4UTP

Single E1 and 4×10/100BaseT UTP ports

##### RIC-LC/4E1/4UTP

4×E1 ports and 4×10/100BaseT UTP ports

##### RIC-LC/8E1/4UTP

8×E1 ports and 4×10/100BaseT UTP ports

##### RIC-LC/16E1/4UTP

16×E1 ports and 4×10/100BaseT UTP ports

##### RIC-LC/ACEX/E1/1UTP

Single E1 and 1×10/100BaseT UTP port, external AC power supply

##### RIC-LC/ACEX/E1/4UTP

Single E1 and 4×10/100BaseT UTP port, external AC power supply

##### RIC-LC/DCEX/E1/4UTP

Single E1 and 4×10/100BaseT UTP port, external DC power supply

#### SPECIAL CONFIGURATIONS

Please contact your local RAD partner for additional configuration options

#### SUPPLIED ACCESSORIES

AC power cord

#### OPTIONAL ACCESSORIES

DC connection kit

##### RM-33-2

Hardware kit for mounting one or two units in a 19-inch rack

##### RM-47

Hardware kit for mounting one or two units of RIC-LC/E1 in a 19-inch rack

##### ST-35

Stacking tray for up to three plastic RIC-LC internal power supply units

##### CBL-RJ45/2BNC/E1

RJ-45 to BNC adapter cable (if a 16-E1 port unit with unbalanced interfaces is ordered)

##### CBL-K21-EURO

DC surge protection cable (required for outdoor installation)

##### CBL-K21-OPEN

AC surge protection cable, 2m, open end (required for outdoor installation)

##### CBL-MUSB-DB9F

Mini USB control port cable