

RIC-LC

Ethernet Converter for Bonded PDH Circuits



Connects Fast
Ethernet LANs
transparently over
TDM infrastructure

- Delivery of Ethernet traffic 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.

The device can be used in a point-to-point application or in a hub-and-spoke topology, operating with RAD's Egate-100, Egate-2000 and RICi-16 or 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.

Using interface bonding, RIC-LC creates a scalable, large virtual pipe comprised of up to four, eight or sixteen E1 lines. The bonding is performed at the E1 level, providing flexible bandwidth for different applications.



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TRAFFIC SEPARATION

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.

MANAGEMENT

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.

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.

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.

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.

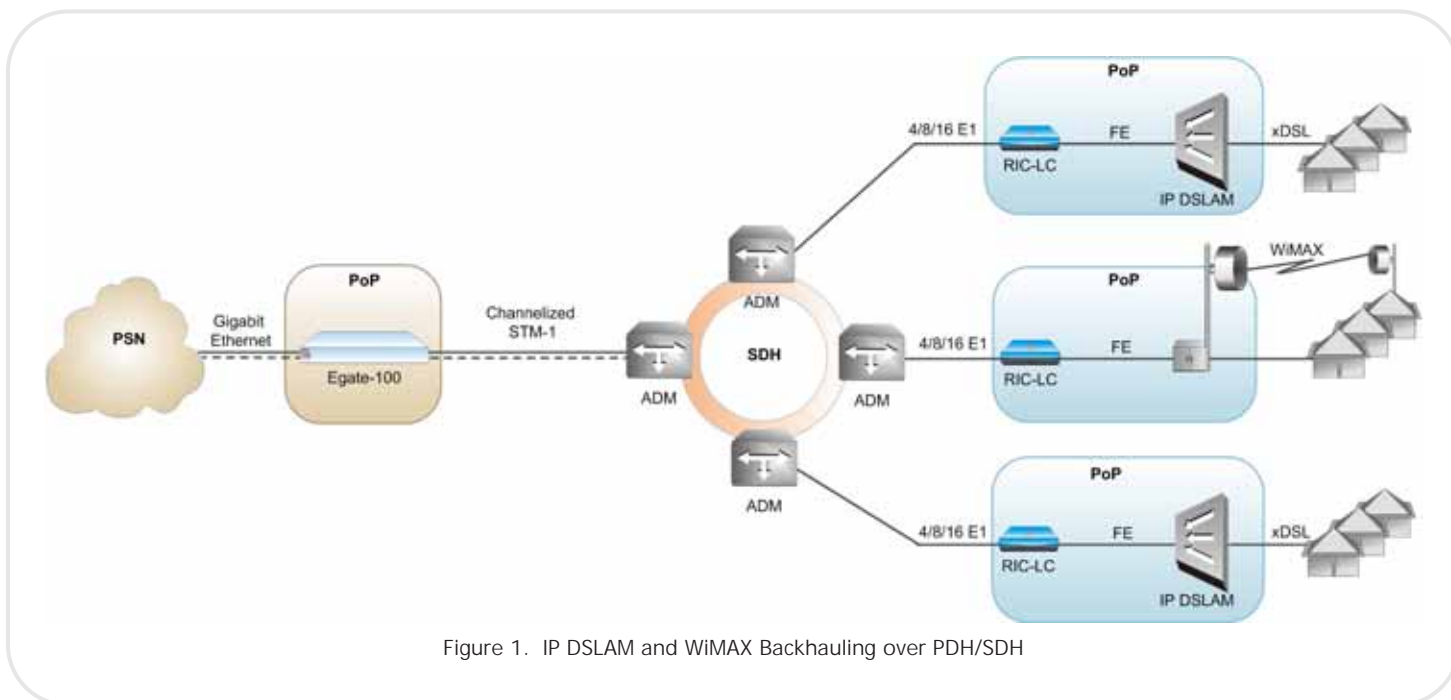


Figure 1. IP DSLAM and WiMAX Backhauling over PDH/SDH

Specifications

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 only; 16-port units are supplied with RJ-45 to BNC adapter cable)

VIRTUAL CONCATENATION GROUP

Number of VCGs

1

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 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, 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

GENERAL

Diagnostics

Loopbacks on VCG or E1, ping

Indicators

PWR (green) – Power status

TST (green) – Self test status

ALM (red) – Alarm status

Power

Wide-range power supply:

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

Power Consumption

AC: 6W

DC: 5W

Physical

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)

Environment

Temperature: 0 to 50°C (32 to 122°F)

Humidity: Up to 90%, non-condensing

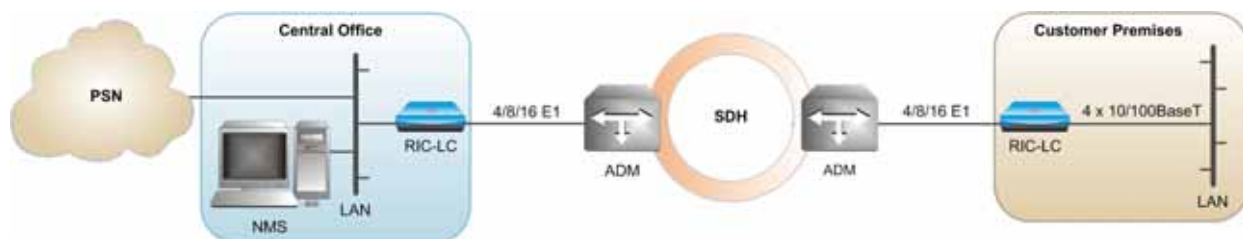


Figure 2. Extending Ethernet Services over Multiple E1 Circuits

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Ordering

STANDARD CONFIGURATIONS

- RIC-LC/E1/4UTP
- RIC-LC/4E1/4UTP
- RIC-LC/8E1/4UTP
- RIC-LC/16E1/4UTP

SPECIAL CONFIGURATIONS

RIC-LC/I/\$/@

Legend

- ! PDH ports:
- E1** 1×E1 port
- 4E1** 4×E1 ports
- 8E1** 8×E1 ports
- 16E1** 16×E1 ports

\$ E1 interface (Default=balanced):

U Unbalanced

Note: 1-, 4- or 8-port options are supplied with BNC ports; 16-port units have RJ-45 ports and are shipped with RJ-45 to BNC cable adapter.

@ Ethernet ports:

4UTP 4×10/100BaseT Ethernet ports

2NULL2UTP 2×10/100BaseT and 2×SFP (100Fx) ports

OPTIONAL ACCESSORIES

RM-33-2

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

CBL-RJ45/2BNC/E1

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


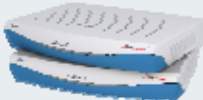
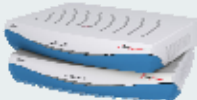


SUPPLIED ACCESSORIES

- AC power cord
- DC connection kit

CBL-MUSB-DB9F

Mini USB control port cable

Table 1. RICi Family Product Comparison Table

Feature	 RIC-LC (Ver. 1.0)	 RICi-E1, RICi-T1 (Ver. 2.1)	 RICi-E3, RICi-T3 (Ver. 1.1)	 RICi-4/8 E1/T1 (Ver. 2.0)	 RICi-16 (Ver. 2.5)
Protocol Type	GFP (G.7041), GFPPoPDH (G.8040) VCAT (G.7043) LCAS (G.7042)	RAD HDLC HDLC IS GFP (G.7041) GFPPoPDH (G.8040)	RAD HDLC X.86 (LAPS)	MLPPP (BCP)	GFP (G.7041), GFPPoPDH (G.8040) VCAT (G.7043) LCAS (G.7042)
Fault Propagation	Yes	Yes	Yes	Yes	Yes
MAC Address Table	1024	512	512	2048	1024
QoS	Per port DSCP VLAN Priority (802.1p)	VLAN Priority (802.1p) IP Precedence	VLAN Priority (802.1p)	VLAN Priority (802.1p) DSCP Per port	VLAN Priority (802.1p) DSCP Per port
QoS Mechanism	Strict/WFQ	Strict	Strict	Strict	Strict/WFQ
Host VLAN	Yes	Yes	Yes	Yes	Yes
VLAN Stacking	Yes	Yes	Yes	Yes	Yes

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