

RICi-155GE

Gigabit Ethernet over STM-1/OC-3c NTU



- Gigabit-to-STM-1/OC-3c bridge, offering up to 300 Mbps access rates
- MEF 9/MEF 14-certified products supporting EPL and EVPL services with flexible mapping of the user traffic into Ethernet flows
- SDH/SONET loopback detection and bidirectional fault propagation
- High-resiliency product offering redundancy for Gigabit Ethernet port, SDH/SONET port, and power supply
- Complete Ethernet OAM solution based on IEEE 802.3-2005 (formerly 802.3ah), IEEE 802.1ag and ITU-T Y.1731

Connects Gigabit
Ethernet LANs over up
to two STM-1/OC-3c
links

EtherAccess

RICi-155GE is a state-of-the-art network termination unit (NTU) that bridges between Gigabit Ethernet networks and STM-1/OC-3c networks, providing simple, efficient, and cost-effective Gigabit Ethernet connectivity over SDH/SONET networks. The device offers a migration path for connecting future-ready IP devices to existing SDH/SONET networks at up to 300 Mbps access rates.

RICi-155GE complies with RAD's unique set of EtherAccess™ features. This feature set provides carrier-grade Ethernet services and backhaul applications over low and high-speed SDH/SONET and PDH circuits, from fractional and full E1/T1 or E3/T3 over STM-1/OC-3c or STM-4/OC-12 to Gigabit Ethernet.

Typical applications include IP DSLAM backhauling (*Figure 1*), enterprise connectivity (*Figure 2*), and high-bandwidth private line services.

RICi-155GE is equipped with two STM-1/OC-3c ports with SFP-based optical interfaces, offering either 300 Mbps with link bonding using VCAT (G.707/Y.1322) and LCAS (G.7042), or 1+1 link protection mechanism (unidirectional MSP/APS) to increase service uptime. The unit has two Gigabit Ethernet ports that support Gigabit Ethernet link redundancy based on link aggregation protocol IEEE 802.3ad. The Gigabit Ethernet ports can be ordered with SFP-based optical interfaces or 10/100/1000BaseT interfaces.



data communications
The Access Company

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FLEXIBLE TRAFFIC MAPPING

The incoming customer traffic is mapped to the Ethernet flows (EVCs) using the following per-port criteria:

- Port-based (All-in-one bundling)
- User port + CE-VID
- User port + CE-VLAN priority.

Each Ethernet flow can either have a single service assigned to it or up to eight services that are differentiated by the CE-VLAN P-bits (EVC.CoS).

ENCAPSULATION

Traffic is encapsulated with:

- Generic Framing Procedure (ITU-T G.7041, ANSI T1-105.02), framed mode
- Link Access Procedure for SDH/SONET (LAPS) protocol following draft recommendation ITU-T X.86.

QUALITY OF SERVICE - QoS

Different service types require different levels of QoS to be provided end-to-end. QoS can be defined per subscriber as well as per service. QoS has two aspects: rate limitation and traffic prioritization.

Two policing mechanisms (upstream and downstream) are applied per service. The policing mechanisms operate according to the dual leaky bucket mechanism (CIR+CBS, EIR + EBS: two rates, three colors).

For prioritizing user traffic, RICi-155GE features up to four separate queues.

The queues handle traffic with different service demands, such as real-time traffic, premium data, or best-effort data.

The preceding capabilities allow service providers to offer different services and traffic types over the same link.

SDH/SONET TIMING OPTIONS

The user can define the following SDH/SONET clock sources:

- Internal
- Recovered from STM-1/OC-3c interface.

SDH/SONET LINK REDUNDANCY

The unit supports a 1+1 link protection mechanism (APS), according to the ITU-T G.841 requirements (unidirectional MSP). Additional protection is provided by the VCAT and LCAS protocols.

GIGABIT ETHERNET LINK REDUNDANCY

To allow reliable and uninterrupted service, the Gigabit Ethernet ports can be set to work in 1:1 or 1+1 automatic protection switching mode, according to link aggregation protocol (IEEE 802.3ad).

MEF COMPLIANCE

RICi-155GE is certified by the Metro Ethernet Forum (MEF) for the following services:

- MEF 9: EPL, EVPL
- MEF 14: EPL, EVPL

FAULT PROPAGATION

The unit features a user-configurable bidirectional fault propagation mechanism that notifies local and remote equipment of faulty conditions. This enables routers and switches on both ends of the link to reroute traffic.

SDH/SONET alarms can optionally propagate and cause the Gigabit Ethernet link to shut down. The Gigabit Ethernet alarms can also be propagated over the SDH/SONET link.

ETHERNET OAM

RICi-155GE provides two types of Ethernet OAM:

- OAM Connectivity Fault Management (CFM) based on IEEE 802.1ag and ITU T Y.1731 enables Ethernet service providers to monitor their services proactively, measure end-to-end performance, and guarantee that customers receive the contracted SLA.
- Single segment (link) OAM according to IEEE 802.3ah for remote management and fault indication.

MANAGEMENT

The unit can be managed with the following ports and applications:

- Out-of-band management via Fast Ethernet or RS-232 port
- Remote inband management via SDH/SONET or Gigabit Ethernet port. Remote management is performed using Telnet, Web browser, or an SNMP-based management system.

SECURITY

RICi-155GE supports the following security protocols, to provide a high level of client-server communication security:

- SNMPv3
- RADIUS authentication
- SSL for Web-based management
- SSH for Secure Shell communication.

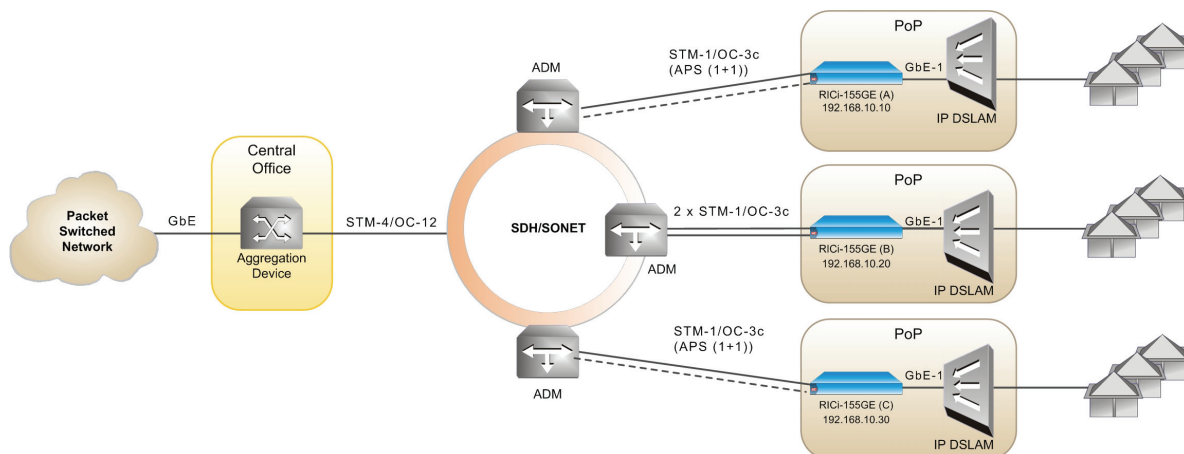


Figure 1. IP DSLAM Backhauling

Specifications

STM-1/OC-3C INTERFACE

Number of Ports

2

Data Rate

Up to 300 Mbps

Operation Mode

SDH/SONET

Interface Type

Optical SFP-based

Compliance

SDH: ITU-T G.957
SONET: GR-253-core

Framing

SDH: ITU-T G.707, G.708, G.709
SONET: ANSI T1.105-1995, GR-253-core
Both OC-3 and OC-3c are supported

Encapsulation

Generic Framing Procedure (ITU T G.7041, ANSI T1-105.02)
Link Access Procedure for SDH/SONET (LAPS) (ITU-T X.86)

Bonding

Link Capacity Adjustment Scheme (LCAS): compliant with G.7042
Virtual Concatenation (VCAT): compliant with G.707/Y.1322

Timing

Internal
Recovered from STM-1/OC-3c interface

SFP Transceivers

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

Connector

SFP slot (for transceivers, see *Ordering*)

GIGABIT ETHERNET INTERFACE

Number of Ports

2

Data Rate

1000BaseLx/1000BaseSx: 1000 Mbps
10/100/1000BaseT: 10/100/1000 Mbps

Port Combinations

2 fiber optic (SFP)
2 built-in electrical (RJ-45)

Type

1000BaseLx/1000BaseSx
10/100/1000BaseT

Compliance

Relevant sections of IEEE 802.3
MEF 9: EPL, EVPL
MEF 14: EPL, EVPL

Maximum Frame Size

9600 bytes

SFP Transceivers

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

Connector

SFP slot (for transceivers, see *Ordering*)
RJ-45

MANAGEMENT PORTS

Out-of-Band Ethernet Management Port

Type: 10/100BaseT
Connector: RJ-45

Control Port

Interface: V.24/RS-232 DCE
Connector: 9-pin D-type, female
Format: Asynchronous
Data rate: 9.6, 19.2, or 115.2 kbps
Selectable word format: 7 or 8 bits, no parity, 7-bit odd or even parity

INDICATORS

General

RDY (green) – Startup status
TST (yellow) – Test status
MAJ ALM (red) – Major alarm status
MIN ALM (red) – Minor alarm status
PWR (green, on power supply) – Power status

GbE, MNG ETH (per port)

LINK (green) – LAN link integrity status
ACT (yellow) – LAN data activity status

SDH/SONET

ON LINE (green) – STM-1/OC-3c link connection status
LOS (red) – STM-1/OC-3c loss of signal status

GENERAL

Power

AC: 100 to 240 VAC \pm 10%,
50 to 60 Hz
DC: -48 VDC (-40 to -72 VDC)

Power Consumption

AC: 40W
DC: 38W

Physical

Regular unit:
Height: 43.7 mm (1.7 in)
Width: 440 mm (17.3 in)
Depth: 240 mm (9.4 in)
Weight: 4 kg (8.8 lb)

NEBS-compliant unit:
Height: 43.7 mm (1.7 in)
Width: 541 mm (21.3 in)
Depth: 240 mm (9.4 in)
Weight: 4.9 kg (10.8 lb)

Environment

Temperature:
Regular unit:
0 to 50°C (32 to 122°F)
NEBS-compliant unit:
0 to 55°C (32 to 131°F)
Humidity: Up to 90%, non-condensing

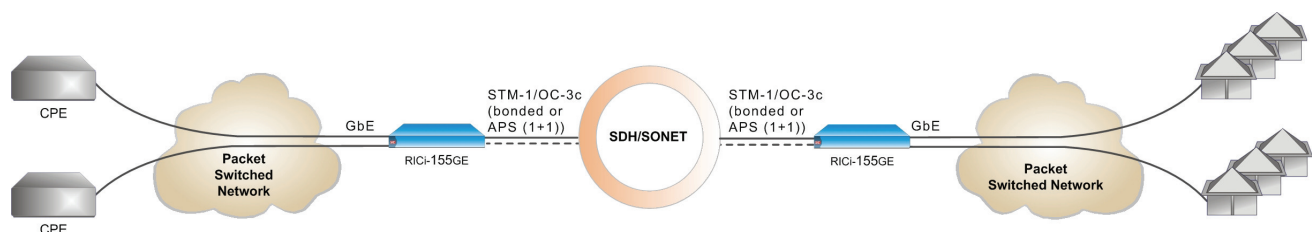


Figure 2. Point-to-Point Ethernet Private Line over SDH/SONET

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Ordering

RICi-155GE/*/%/&/S

Legend

* Power supply:

- AC 100 to 240 VAC
- 48 -48 VDC
- ACR Dual 100 to 240 VAC
- 48R Dual -48 VDC

% Gigabit Ethernet port interface:

- SFP5 Single SFP-5 transceiver: Gigabit Ethernet, 850 nm, multimode, VCSEL, 0.55 km (0.3 mi)
- SFP6 Single SFP-6 transceiver: Gigabit Ethernet, 1310 nm, single mode, laser, 10.0 km (6.2 mi)
- SFP6D Single SFP-6D transceiver: Gigabit Ethernet, DDM, internal calibration, 1310 nm, single mode, laser, 10.0 km (6.2 mi)

- 2XSFP5 Dual SFP-5 transceivers
- 2XSFP6D Dual SFP-6D transceivers
- 2XUTP Dual UTP ports
- NULL Two empty SFP slots

& SDH/SONET port interface:

- SFP1 Single SFP-1 transceiver: Fast Ethernet/STM-1, 1310 nm, multimode, LED, 2 km (1.2 mi)
- SFP2 Single SFP-2 transceiver: Fast Ethernet/STM-1, 1310 nm, single mode, laser, 15 km (9.3 mi)
- SFP2D Single SFP-2D transceiver: Fast Ethernet/STM-1, DDM, internal calibration, 1310 nm, single mode, laser, 15 km (9.3 mi)
- SFP11 Dual SFP 11 transceivers: Fast Ethernet/STM-1, coaxial, mini BNC, 135m
- 2XSFP1 Dual SFP-1 transceivers
- 2XSFP2 Dual SFP-2 transceivers
- 2XSFP2D Dual SFP-2D transceivers
- 2XSFP11 Dual SFP-11 transceivers
- NULL Two empty SFP slots

Note:

- If a single SFP is ordered, the second slot is empty.
- 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.

- S NEBS-3 compliancy (Default= Unit supplied is 19-inch, not NEBS-3 compliant):
- N3 NEBS-3 compliant

SUPPLIED ACCESSORIES



- AC power cord
- DC power connection kit (if DC power supply is ordered)

- CBL-DB9F-DB9M-STR Control port cable

OPTIONAL ACCESSORIES

- RICi-155GE-PS/AC 100-240 VAC power supply module
- RICi-155GE-PS/48 -48 VDC power supply module
- RM-34 Hardware kit for mounting one regular RICi-155GE unit in a 19-inch rack (if non-NEBS option is ordered)
- RM-34-23 Hardware kit for mounting one NEBS-compliant RICi-155GE unit in a 23-inch rack (if NEBS option is ordered)
- WM-34 Hardware kit for mounting one regular RICi-155GE unit on a wall (if the non-NEBS option is ordered)

Product Comparison Table

Feature	RICi-155GE (Ver. 2.0)	RIC-155GE (Ver. 2.0)
		
Frame Size (Bytes)	64-9600	64-1664
Ethernet Flows	Yes	No
QoS	802.1p Port-based	802.1p
MEF Certification	MEF 9, MEF 14:EPL, EVPL	No
Number of Queues	4 (strict)	4 (strict)
Encapsulation	GFP (G.7041), LAPS (X.86)	Packet-over-SDH/SONET (POS)
Traffic Mapping	Port-based (All-in-one bundling) User port + CE-VID User port + CE-VLAN priority	N/A
SDH/SONET Redundancy	APS 1+1	No
Gigabit Ethernet Redundancy	Yes	No
Hot-Swappable Power Supplies	Yes	Yes

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