

LA-210

EFM DSL Network Termination Unit



- EFM network termination unit with SHDSL.bis line interface, transporting up to 22 Mbps symmetric over SHDSL.bis.
- MEF-certified featuring Ethernet Private Line (EPL) and Ethernet Virtual Private Line (EVPL) services
- Support TDM services using pseudowire/circuit emulation standards CESoPSN and SAToP
- Robust bandwidth control mechanism and SLA monitoring per Ethernet flow assuring delivery of contracted Ethernet services
- Complete Ethernet OAM solution based on IEEE 802.3-2005 (formerly 802.3ah), IEEE 802.1ag and ITU-T Y.1731

The LA-210 EFM (Ethernet in the First Mile) DSL network termination unit operates at rates of up to 22 Mbps over bonded SHDSL.bis copper lines. As part of RAD's EtherAccess® portfolio, it offers Carrier Ethernet features, including Ethernet OAM for proactive SLA monitoring, quality of service (QoS) per Ethernet flow, and advanced traffic management capabilities – all starting at the service hand-off points.

In addition to advanced Ethernet capabilities, LA-210 features an E1 and serial interface to support leased line replacement or PBX connectivity using PWE technology.

This enables operators to reduce their operational expenses on expensive legacy TDM networks and migrate their E1 and serial data services to NG networks.

LA-210 is certified by the Metro Ethernet Forum to deliver Ethernet Private Line (EPL) and Ethernet Virtual Private Line (EVPL) services.

LA-210 is a Layer-2 device that transparently transfers both IPv4 and IPv6 traffic. The device is managed via IPv4 traffic only.

MARKET SEGMENTS AND APPLICATIONS

LA-210 is suitable for incumbent carriers employing a copper infrastructure to deliver data services using DSL technology, via extensive existing DSLAM deployments. The ability to serve both as a DSL modem and as an Ethernet demarcation point makes LA-210 suitable for carriers that want to deliver Ethernet services over different infrastructures, such as DSL. The 22 Mbps bandwidth achieved using LA-210 covers the customers that are not yet served via fiber, but want to receive Ethernet services at higher rates.

LA-210 is also suitable for Tier 2/alternative carriers. With more and more copper unbundling, this type of customer wants to deliver Ethernet services to their customer base. Once the copper is unbundled, the DSL becomes important for these operators as well.

Figure 1 and 2 illustrate typical applications.

Ethernet Private Line for Site-to-Site or LAN-to-LAN

Figure 1 illustrates an example of a typical application of Ethernet Private Line for site-to-site or LAN-to-LAN connectivity.



Ethernet Virtual Private Line

Figure 1 illustrates an example of Ethernet Virtual Private Line service where LA-210 supports several Ethernet Virtual Connections (EVCs). This application can be used to connect several branches to the corporate headquarters. The branches can be connected with LA-210 using a 2/4 SHDSL wire, while the headquarters is connected with 8 SHDSL wires (22.8 Mbps). The traffic from each branch is encapsulated into EVCs, which reaches the headquarter LA-210 and is handled according to the EVC SLA parameters.

INTEROPERABILITY

LA-210 interoperates with any device that operate according to Y.1731

ETHERNET

LA-210 offers the following Ethernet services:

- EPL – Site-to-site connectivity over dedicated bandwidth without service multiplexing
- EVPL – Site-to-site connectivity over shared bandwidth with service multiplexing (see Figure 2).



Flexible Traffic Mapping

Traffic is mapped to the Ethernet flows (EVCs) using the following classification criteria:

- Port-based (All-to-one bundling)
- CE-VLAN
- CE-VLAN priority
- CE-VLAN + CE-VLAN priority
- CE-VLAN + SP-VLAN
- CE-VLAN ID + IP precedence (user to network only)
- CE-VLAN + DSCP (user to network only).

More classification criteria and combinations can be found in the user manual.

LA-210 performs several per-flow VLAN tagging actions, including adding and removing VLAN tags.

Bridge Mode

The internal bridge operates in VLAN-aware or VLAN-unaware mode. VLAN stacking separates traffic between different users or services. The traffic is separated by assigning different VLAN IDs to different services or users.

QoS and Traffic Prioritization

LA-210 prioritizes traffic and offers QoS to ensure service level agreements (SLA) that comply with business customers' high demands.

Traffic policing is applied per flow and operates according to the dual token bucket mechanism based on user-configurable CIR + CBS and EIR + EBS.

User traffic is mapped into up to four separate queues, which can be configured to work as strict priority or weighted fair queue (WFQ). The queues handle traffic with different service demands, such as real-time traffic, premium data, or best-effort data.

Shaping can be performed at the network queue and network port egress level.

Color-Aware P-Bit Re-Marking

The VLAN priority bit in Ethernet frames can be modified at network ingress according to the 'color' of the frame. This allows service consistency and QoS

continuity across color-aware as well as color-unaware networks.

OAM

End-to-end OAM based on IEEE 802.1ag and ITU-T Y.1731 enables Ethernet service providers to monitor their services proactively, measure end-to-end performance including Ethernet delay & loss measurements (ETH-LM & ETH-DM), and guarantee that the customers receive the contracted SLA. Fault monitoring and performance measurement include frame delay, frame delay variation, frame loss and availability.

Single segment (link) OAM according to IEEE 802.3-2005 (formerly 802.3ah) provides fault indication, including remote loopback.

Layer-2 Control Processing

LA-210 can be configured to pass through Layer-2 control frames across the network, to peer-supported protocols (802.3ah), or to discard the L2CP frames.

TDM PSEUDOWIRE

LA-210 provides E1 or serial data (V.35, X.21) connectivity over SHDSL using PWE technology that supports MPLS and UDP/IP encapsulation.

The following TDM emulation methods are supported:

- CESoPSN per RFC 5086
- SAToP per RFC 4553.

LA-210 uses high-performance ASIC-based buffering and forwarding techniques to minimize end-to-end processing delay.

RESILIENCY

LA-210 provides a fault propagation mechanism according to IEEE 802.1ag and ITU-T Y.1731 in both directions (user to network and network to user).

If a link fails for which fault propagation has been enabled, the corresponding port shuts down or triggers an OAM CFM failure message to cause the connected CPE to stop forwarding frames through that link.

TIMING AND SYNCHRONIZATION

LA-210 supports the following in order to synchronize TDM devices:

- NTR (network timing reference) – The clock is transmitted over SHDSL lines and recovered by LA-210
- ACR (adaptive clock recovery) – The clock is recovered automatically from incoming Ethernet frames (per G.823 and G.824, traffic interface with 100 ppb clock accuracy)
- DCR (differential clock recovery) – The clock is recovered from real-time transport protocol (RTP) timestamps in the transmitted packets. This method requires common reference clock at both server and client sides, and improves the recovered clock performance. DCR mode allows use of a TDM clock that is different from the common clock for leased line applications.

MANAGEMENT AND SECURITY

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

- Remote inband management via the network ports using Telnet or RADview, RAD's SNMP-based management system
- Out-of-band management via one of the user ports configured as a management port
- Local management via an ASCII terminal.

Management traffic can be separated from user traffic by creating dedicated flows for management.

Databases and scripts of commonly used commands can be easily created and applied to multiple units using RAD's command line interface.

LA-210 ensures client-server communication security and correct user authentication using the following protocols:

- SNMPv3
- RADIUS (client authentication only)
- SSH for Secure Shell communication session

Password-protected Telnet and local terminal access.

MONITORING AND DIAGNOSTICS

Connectivity Tests

Ping test – Checking IP connectivity by pinging an IP address

Trace route – Tracing the route and hops from LA-210 to an IP address.

Loopback Tests

Layer-2 loopback testing with MAC address swapping, in Flow mode. In this scenario, LA-210 exchanges source and destination MAC addresses of the incoming packets. This type of loopback is performed per flow and does not disrupt traffic flows that are not being tested.

External and internal loopbacks can be used to check TDM link connectivity.

BER Tests

Continuous connectivity check by inserting errors in pre-defined time increments, supported for E1 and PCS interfaces.

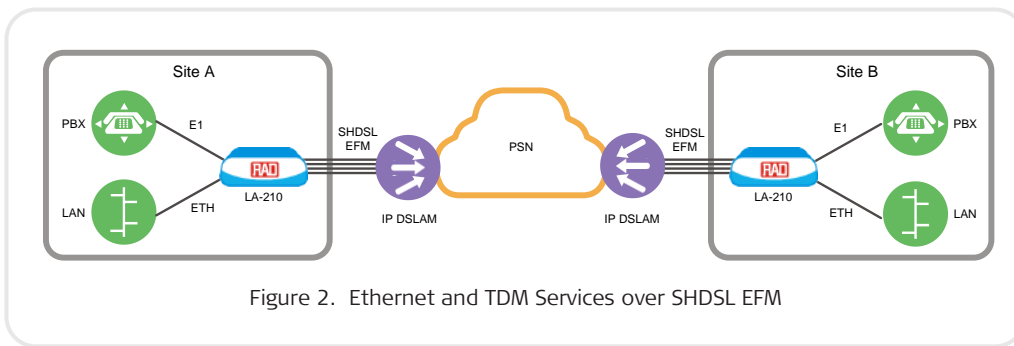


Figure 2. Ethernet and TDM Services over SHDSL EFM

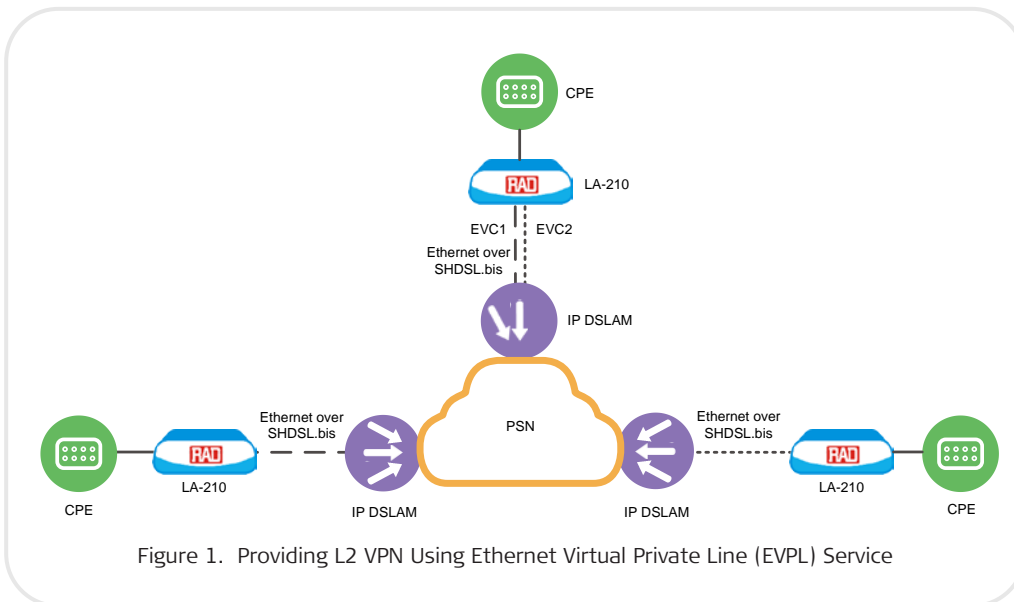


Figure 1. Providing L2 VPN Using Ethernet Virtual Private Line (EVPL) Service

Specifications

CAPACITY

Compliance

IEEE 802.3, 802.3u, 802.1D, 802.1Q, 802.1p, 802.3ah, MEF 9 and MEF 14

Max. Frame Size

2000 bytes

MAC Address Table Size

2,048 entries

Management

Local terminal port (V.24/RS-232 DCE; 9.6, 19.2, 115.2 kbps; DB-9 female connector)

Power

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

Power Consumption

2-wires: 7W
4-wires: 8W
8-wires: 8.5W

Physical

Height: 43.7 mm (1.7 in)
Width: 217 mm (8.5 in)
Depth: 170 mm (6.7 in)
Weight: 0.5 kg (1.1 lb)

SHDSL NETWORK INTERFACE

Type

SHDSL.bis

Line Coding

16 or 32 TC-PAM

Line Rate

192–5696 kbps

Impedance

135Ω

Compliance

ITU-T G.991.2, ETSI TS 101524

Bonding

Compliance: IEEE 802.3ah, ITU-T G.998.2

USER ETHERNET INTERFACE

Number of Ports

1 or 4

Type

10/100BaseT

Connector

RJ-45

E1 INTERFACE

Number of Ports

1, 2 or 4

Compliance

ITU-T Rec. G.703, G.704, G.706, G.732, G.823

Data Rate

2.048 Mbps

Line Code

HDB3

Framing

Framed or unframed

Line Impedance

120Ω, balanced
75Ω, unbalanced

Connector

Balanced: RJ-45

Unbalanced: BNC (RJ-45 to BNC adapter cable is supplied)

SERIAL INTERFACE

Number of ports: 1

Data rate: $n \times 64$ kbps ($N = 1, 2, \dots, 32$)

Timing DCE: Rx and Tx clock is supplied by the data port

Connector: X.21: 15-pin, D-type female;
V.35: 34-pin, female

GENERAL

Physical

Height: 43.7 mm (1.7 in)
Width: 217 mm (8.5 in)
Depth: 170 mm (6.7 in)
Weight: 0.5 kg (1.1 lb)

Power

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

Power Consumption

2-wires: 7W
4-wires: 8W
8-wires: 8.5W

LA-210

EFM DSL Network Termination Unit

Ordering

STANDARD CONFIGURATIONS

LA-210/ESHDSL/2W/4ETH

LA-210/ESHDSL/4W/4ETH

LA-210/ESHDSL/8W/4ETH

LA-210/ESHDSL/4W/4ETH/E1

LA-210/ESHDSL/8W/4ETH/E1

SPECIAL CONFIGURATIONS

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Legend

- & DSL technology:
ESHDSL SHDSL.bis
- ! SHDSL interface:
2W 2-wire SHDSL interface
4W 4-wire SHDSL interface
8W 8-wire SHDSL interface
- \$ Operation mode (Default=bridge mode):
EVPL EVPL services using ETH flows
- * Number of Ethernet ports:
ETH One Ethernet port
4ETH Four Ethernet ports
- @ TDM port:
E1 One E1 port
- { Serial data port:
V35 V.35
X21 X.21
- ~ Timing:
DR Differential Clock Recovery

LICENSE PACKAGES

Software packages to activate EVPL services using Ethernet flows

LA-210-2W-EVPL

Software license to activate EVPL for 2-wire SHDSL interface

LA-210-4W-EVPL

Software license to activate EVPL for

4-wire SHDSL interface

LA-210-8W-EVPL

Software license to activate EVPL for 8-wire SHDSL interface

SUPPLIED ACCESSORIES

AC power cord
DC connection kit (upon request)

CBL-RJ45/2BNC/E1/X

RJ-45 to BNC adapter cable (if unbalanced E1 interface is ordered)

OPTIONAL ACCESSORIES

RM-33-2

Hardware kit for mounting one or two LA-210 units in a 19-inch rack

CBL-DB9F-DB9M-STR

Control port cable

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