

LA-130

DSL Cell-Site Gateway



Reduces cellular
backhaul OPEX by
efficiently
transporting 2G, 3G
and HSDPA services
over IP or ATM-based
DSLAM infrastructure



- Equipped with 4 E1 ports towards the cell site, individually software configurable as TDM, ATM UNI or ATM IMA
- Supports IMA or physical-layer bonding of SHDSL.bis up to 20 Mbps
- Ideal solution for HSDPA offload over ADSL2+
- Standard pseudowire encapsulation techniques: ATMoPSN, CESoPSN and SAToP
- High precision clock recovery via ACR (Adaptive Clock Recovery) or NTR (Network Time Reference)

LA-130 delivers TDM and ATM services over ATM and packet-switched networks. It aggregates and optimizes TDM and ATM traffic over DSL link in 2G and 3G cellular backhaul applications.

PSEUDOWIRE CAPABILITIES

LA-130 converts the data stream from its ATM UNI, ATM IMA or TDM ports into packets with an MPLS frame format. These packets are transmitted over the PSN network via LA-130's DSL port. A remote pseudowire device converts the packets back to their native format.

PSEUDOWIRE FUNCTIONALITY

A proper balance between PSN throughput and delay is achieved via a configurable packet size.

A jitter buffer compensates for packet delay variation (jitter) of up to 60 milliseconds in the network.

ATM OVER PSN CAPABILITIES

LA-130 utilizes up to four pseudowire (PW) connections to emulate 3G ATM services over packet-switched networks.

The following encapsulation methods are supported according to draft-ietf-pwe3-atm-encap:

- 1:1 VP – Each VP is mapped to a single PW connection
- N:1 VP – Several VPs are mapped to a single PW connection.

LA-130 allows single or multiple cells to be encapsulated per frame.



LA-130

DSL Cell-Site Gateway

TDM OVER PSN CAPABILITIES

LA-130 allows 2G cellular traffic to be carried over packet switched networks.

To compensate for the jitter caused by the packet-switched network, each TDM stream has a jitter buffer of up to 60 milliseconds.

The following encapsulation techniques are employed:

- CESoPSN
- SAToP
- TDMoIP

TIMEOUT MECHANISM

A built-in timer determines the time to forward a PW frame regardless whether the max number of cells per frame has been reached or not.

PACKET REORDERING

LA-130 features a mechanism that reorders packets when they arrive in an incorrect order.

PSEUDOWIRE QoS/CoS

Ethernet networks – outgoing pseudowire packets are assigned a dedicated VLAN ID according to 802.1Q and marked for priority using 802.1p bits. Pseudowire traffic can be classified into 3 different classes (queues), which are then transmitted towards the network based

on the WFQ (weighted fair queuing) algorithm MPLS networks – outgoing pseudowire packets are assigned to a specific MPLS tunnel and marked for priority using EXP bits MPLS networks – outgoing pseudowire packets are assigned to a specific MPLS tunnel and marked for priority using EXP bits.

PSEUDOWIRE OAM

Pseudowire connectivity is verified using the Virtual Circuit Connection Verification BFD (VCCV-BFD) mechanism. It provides low-overhead, low-latency detection of faults even on physical media that do not support failure detection of any kind.

ATM CAPABILITIES

Four ATM cross-connections link the user interfaces to the network.

Using LA-130, operators can assign each virtual connection (VC) or virtual path (VP) to a service class, define the QoS parameters and shape the ATM egress traffic accordingly.

LA-130 performs traffic scheduling according to CBR, VBR, UBR and UBR+.

ATM OAM

OAM is provided according to ITU I.610 requirements:

- F4 and F5 OAM
- AIS and RDI cell detection and

generation upon physical layer and ATM layer failures

- CC cell generation and LOC state detection per VP/VC
- Periodic loopbacks.

NETWORK INTERFACE

The network port uses the IMA or multipair bonding technologies. The data is sent over 4 x 2-wire SHDSL/SHDSL.bis lines at a combined data rate of up to 9.2 Mbps (Annex A, B) or 20 Mbps (Annex F, G). Table 1 and Table 2 detail typical SHDSL ranges.

LA-130 is also available with the ADSL interface (Annex A/B, ADSL2 or ADSL2+). Table 3 and Table 4 detail typical ADSL ranges.

E1 INTERFACE

LA-130 features four E1 ports with balanced or unbalanced (via an adapter cable) interfaces.

The E1 interfaces operate in ATM UNI, IMA, or TDM modes:

- Using structured CES in TDM mode, LA-130 transmits each E1 bundle over a separate PVC or PW. Up to 4 E1 TDM ports are supported.
- LA-130 transparently transfers the ATM-based E1 UNI services at the rate of 1984 kbps.

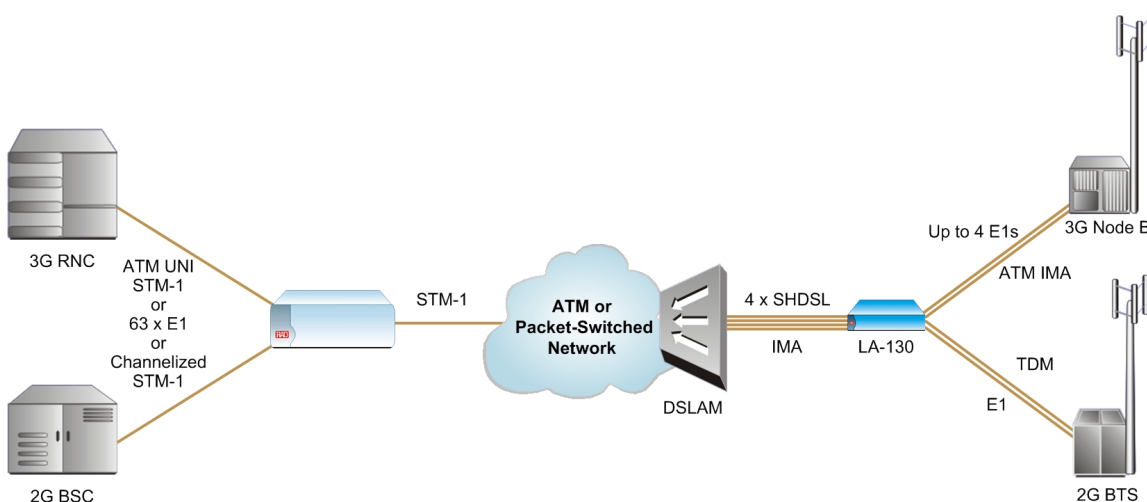


Figure 1. Backhauling 2G/3G Cellular Traffic over an ATM or Packet-Switched Network

- Up to 4 E1 UNI links can be bonded using IMA technology.

ETHERNET INTERFACE

LA-130 includes one or four Ethernet 10/100BaseT interface with autonegotiation support.

The LA-130 Ethernet interface operates as a self-learning media access bridge.

The Ethernet traffic can be classified according 802.1p, IP precedence, ToS or DSCP. The traffic classes are mapped, using the ATM CoS or WFQ mechanism. LA-130 supports up to 8 QoS rules.

ENVIRONMENT

LA-130/H is a temperature-hardened version intended for industrial installations.

SYSTEM TIMING

LA-130 supports flexible timing modes for hierarchical timing distribution in the network.

The LA-130 master clock can be locked to the following sources:

- Internal – Provided by the internal oscillator
- Received – Locked to the Rx clock of an E1 CES port or an IMA group. The IMA group, providing clock reference consists of the user E1 UNI links or network SHDSL link (NTR clock).
- Recovered – Derived from the network via a bundle (MS over ATM mode) or a PW (MS over PSN mode).

MANAGEMENT

LA-130 can be configured and monitored locally via an ASCII terminal, or remotely via Telnet, Web browser or RADview.

Management traffic can run over a dedicated VLAN or dedicated ATM VCC.

Software download is performed via the local terminal, using XMODEM, or remotely, using TFTP.

Different stations can manage LA-130 simultaneously, enabling monitoring of the network status from different locations.

OAM AND DIAGNOSTICS

LA-130 collects performance monitoring statistics at the physical and ATM layers of the network and user interfaces. It also provides statistics for individual connections (AAL1, AAL5).

Comprehensive diagnostic capabilities include:

- Physical loopbacks on the network and user interfaces
- OAM loopback on a VCC
- Ping for IP connectivity checks.

LA-130 stores up to 200 alarms detected during its operation in a buffer.

Specifications

ATM INTERFACE

Type

UNI per ATM User-Network Interface (UNI) Specification (Version 3.1) for PVCs only

AAL Support

- AAL1 (CES)
- AAL5

Traffic Shaping

Per VC

ATM Service Categories

CBR, VBR, UBR+, UBR

F5 OAM Cells

Per ITU-T Rec. I.610

VPI Range

0–31

VCI Range

0–255

Maximum Number of XCs

4

ATMoPSN FUNCTIONALITY

Standard Compliance

RFC 4717

PW Types

1:1 VP, N:1 VP

Number of PW Connections

4

Jitter Buffer Size

1–60 msec with 1 msec granularity

TDMoPSN FUNCTIONALITY

Standard Compliance

- IETF: RFC 4553 (SAToP), RFC 5086 (CESoPSN), RFC 5087 (TDMoIP)
- MFA: IA 4.0

PW Types

CESoPSN, SAToP, TDMoIP

Number of PW Connections

4

SHDSL INTERFACE

Standard

G. 991.2 (SHDSL, SHDSL.bis)

Line Code

TC-PAM

Line Rate per Link

Up to 2312 kbps (Annex A, Annex B)
Up to 5696 kbps (Annex F, Annex G)

Handshake Protocol

ITU-T Rec. G994.1

EOC Support

Mandatory

Connector

RJ-45

Table 1. Typical Ranges for SHDSL Annex A, B (4-Wire 26 AWG, per Port)

Data Rate	Range	
	[km]	[mi]
[kbps]		
384–512	5.2	3.2
576–832	4.9	3.0
896–1152	4.6	2.8
1216–1344	4.5	2.7
1408–1856	4.0	2.4
1920–2176	3.7	2.2
2304	3.5	2.1
2312	3.8	2.3

Table 2. Typical Ranges for SHDSL Annex F, G (2-Wire 26 AWG)

Data Rate [kbps]	Range	
	[km]	[mi]
768-1024	5.5	3.4
2048	5.0	3.1
2560	4.7	2.9
3072	4.4	2.7
2584	4.1	2.5
3818	4.0	2.4
4096	3.9	2.4
4608	3.5	2.1
5120	3.4	2.1
5696	3.1	1.9

Note: The values in Table 1 and Table 2 represent the data rates of a single pair.

IMA BONDING

Type

IMA over 4 × 2-wire, per ATM Forum 1.0 (AF-PHY-0086.000) or ATM Forum 1.1 (AF-PHY-0086.001)

Data Rate

Up to 9.2 Mbps (Annex A, B)
Up to 20 Mbps (Annex F, G)

M-PAIR BONDING (PHYSICAL)

Number of Pairs

2, 3 or 4

Data Rate

Up to 9.2 Mbps (Annex A, B)
Up to 20 Mbps (Annex F, G)

ADSL INTERFACE

Type

- ADSL: ITU-T Rec. G.992.1 Annex A and B
- ADSL2: ITU-T Rec. G.992.3 Annex A and B
- ADSL2+: ITU-T Rec. G.992.5 Annex A and B

Line Code

DMT

Data Rate

ADSL:

- Downstream: up to 8 Mbps

- Upstream: 1 Mbps

ADSL2:

- Downstream: 12 Mbps

- Upstream: 1 Mbps

ADSL2+:

- Downstream: 24 Mbps

- Upstream: 1 Mbps

Connector

RJ-45

Table 3. Typical Ranges for ADSL2+ Annex A (2-Wire 26 AWG)

Data Rate [kbps]		Range	
Upstream	Downstream	[km]	[mi]
1140	24720	0.2	0.1
1145	20500	1.2	0.7
1130	16565	1.7	1.0
1110	10595	2.5	1.5
970	5935	3.2	2.0
765	4070	3.7	2.3

Table 4. Typical Ranges for ADSL2+ Annex B (2-Wire 26 AWG)

Data Rate [kbps]		Range	
Upstream	Downstream	[km]	[mi]
1160	24240	0.05	0.03
1160	22770	0.5	0.3
1045	21050	1.0	0.6
915	17605	1.5	0.9
900	13560	2.0	1.2
745	9230	2.5	1.5
585	5990	3.0	1.8
395	3795	3.5	2.1

E1 INTERFACE

Number of Ports

4

Data Rate

2.048 Mbps ±32 ppm

Compliance

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

Operation Mode

CES, ATM UNI, ATM IMA

Receive Input Level

0 to -43 dB
0 to -12 dB

Transmit Output Level

±3V ±10%, balanced
±2.37V ±10%, unbalanced

Line Code

HDB3, AMI

Framing

Unframed
G732N with or without CRC-4
G732S with or without CRC-4
UNI (multiframe or non-multiframe)

Line Impedance

120Ω, balanced
75Ω, unbalanced

Receive Input Level

0 to -43 dB
0 to -12 dB

Transmit Output Level

±3V ±10%, balanced
±2.37V ±10%, unbalanced

Jitter

ITU-T Rec. G.823

Connectors

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

GENERAL

Timing

Locked to the Rx clock of an E1 port or an IMA group TRL

Recovered from the network
(ordering option)

Internal

Management

SNMPv1
Telnet
RADview
ASCII terminal via V.24 (RS-232) DCE port

Terminal Control Port

Type: V.24 (RS-232) async DCE

Baud rate: 0.3- 115.2 kbps

Connector: 9-pin D-type female

LA-130

DSL Cell-Site Gateway

LED Indicators

- PWR (green) – Power status
- ALM (red) – Alarm status
- SYNC SHDSL 1, 2, 3, 4 (red/green) – SHDSL interface synchronization status
- E1 1, 2, 3, 4 LOC (red) – Local loss of E1 synchronization
- E1 1, 2, 3, 4 REM (red) – Remote loss of E1 synchronization
- ETH LINK (green) – Ethernet link status
- ETH ACT (yellow) – Ethernet activity status

Power

Wide range power supply:
100–240 VAC, 48/60 VDC nominal (40 to 72 VDC)

Power Consumption

8W max

Physical

Height: 47 mm (1.8 in)
Width: 215 mm (8.4 in)
Depth: 300 mm (11.8 in)
Weight: 2.4 kg (5.3 lb)

Environment

Temperature:
LA-130: 0 to 50°C (32 to 122°F)
LA-130/H: -20 to 65°C (-4 to 149°F)
Humidity: Up to 90%, non-condensing

Cell-Site Gateway Comparison Table

	LA-130 (Ver. 4.5)	ACE-3100 (Ver. 5.0)	ACE-3200 (Ver. 5.0)
STM-1/OC-3c traffic aggregation	–	✓	✓
E1 ports	4	0 or 4, built-in	8 or 16, built-in
T1 ports	–	0 or 4, built-in	8 or 16, built-in
ATM-155 ports	–	1 or 2, built-in	0 or 2, built-in
SFPs for ATM-155 ports	–	✓	✓
DSL ports	SHDSL/SHDSL.bis, ADSL/ADSL2/ADSL2+	–	–
NTR clock recovery	✓		
Fast Ethernet ports	1 or 4	2 for PSN traffic and/or inband management	2 for PSN traffic and/or inband management
SFPs for FE ports	–	✓ (optional)	✓ (optional)
PSN clock distribution	–	✓	✓
PSN clock recovery	✓	✓	✓
APS on ATM-155 ports	–	✓	✓
Max. ATM VCCs	4	128	128
Max. remote PSN peers	4	32	32
Power supply	Single, fixed	Single, fixed	Single/dual, fixed
Physical width	8.5"	8.5"	17.3"
Physical height	1U	1U	1U

LA-130

DSL Cell-Site Gateway

Ordering

LA-130/\$/E1/#/@/*/!

Legend

\$ Network interface type:

SHDSL SHDSL**1+A** One ADSL2+ Annex A port**1+B** One ADSL2+ Annex B port

Number of Ethernet ports:

ETH One 10/100BaseT**4ETH** Four 10/100BaseT

@ Functionality type:

BASIC Non-upgradeable to PW functionality unit with 4 UNI/IMA E1 ports**PACK1** Software upgrade for enabling pseudowire functionality

Note: If no functionality type is specified, LA-130 is supplied as an ATM-only unit. It can be upgraded to the pseudowire functionality by ordering the PACK1 software package.

* Recovered clock capability:

A Advanced adaptive clock for the PACK1-type units

Note: Adaptive clock functionality is not available for units with ADSL2+ interface.

! Unit type:

H Temperature-hardened unit

SUPPLIED ACCESSORIES

Power cord

DC adapter plug

OPTIONAL ACCESSORIES

CBL-RJ45/2BNC/E1

RJ-45 to BNC adapter cable

CBL-DB9F-DB9M-STR

Control port cable

WM-35

Hardware kit for mounting one LA-130 unit on a wall

RM-35/@

Hardware kit for mounting one or two LA-130 units into a 19-inch rack

@ Rack mounting kit type:

P1 Mounting one unit**P2** Mounting two units**LA-130-SW/PACK1**

Software upgrade pack for enabling pseudowire functionality

International Headquarters
24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
Tel. 972-3-6458181
Fax 972-3-6498250, 6474436
E-mail market@rad.com

North America Headquarters
900 Corporate Drive
Mahwah, NJ 07430, USA
Tel. 201-5291100
Toll free 1-800-4447234
Fax 201-5295777
E-mail market@radusa.com

www.rad.com



data communications

The Access Company