

LA-110

Advanced ATM Integrated Access Device



Link
Access

FEATURES

- Advanced ATM Integrated Access Device for providing voice, data and LAN services over ATM networks
- Wide range of services over ATM:
 - Leased lines services
 - Voice services, such as ISDN BRI, PRI or FXS
 - E1 (CES, PRI, UNI)
 - High-speed data (serial and Frame Relay)
 - Ethernet with MAC bridge and IP router
- ADSL, SHDSL or E1 uplink
- Traffic shaping to ensure reliable service and optimal ATM uplink utilization
- AAL1, AAL2 and AAL5 adaptation layers
- Up to 16 connections on the ATM side
- LAN port providing bridge (VLAN-aware or VLAN-unaware) or IP router (DHCP server/relay, different address translation services, DNS relay and firewall) functionality
- Data port with V.35 or X.21 physical interface supporting transparent or Frame Relay services
- Voice ports with four FXS or ISDN S0 BRI interfaces employing toll-quality 64-kbps PCM modulation or 32-kbps ADPCM encoding
- E1 user port with balanced or unbalanced interfaces supporting AAL1 (CES, DB-CES, UNI) or AAL2 (LES, PRI) operation
- Flexible system timing:
 - NTR
 - Received from E1 uplink or user port
 - Adaptive
 - Internal
- Extended management capabilities:
 - Local out-of-band management via an ASCII terminal connected to the RS-232 port
 - Remote out-of-band management via the LAN port
 - Remote inband management via the ATM uplink
- Plug & Play installation
- Comprehensive diagnostics:
 - Collection of application layer performance statistics
 - ATM layer performance statistics and control (OAM support)
 - Physical layer diagnostics: loopback tests and performance statistics
- Compact 8.5-inch wide enclosure

LA-110

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DESCRIPTION

- LA-110 is an advanced ATM Integrated Access Device (IAD) that provides voice, data and LAN services over ATM networks for small and medium-sized businesses.
- The services supported by LA-110 include:
 - High-quality leased lines over E1 or serial data links
 - Voice, such as ISDN BRI, PRI or FXS
 - E1 (CES, PRI, UNI)
 - High-speed data (transparent and Frame Relay)
 - Ethernet with MAC bridge and IP router.

WAN INTERFACE

- LA-110 has one WAN (uplink) port, used to connect to the ATM network. The WAN port can be ordered with one of the following interfaces:
 - 2-wire or 4-wire SHDSL interface
 - ADSL interface (Annex A)
 - E1 interface.

- The UNI network interface supports the following ATM adaptation layers:
 - AAL1 – for transparent transport of serial data streams, and for circuit emulation services (CES)
 - AAL2 – for providing ATM Forum Loop Emulation Services (LES) that support PSTN and ISDN BRI and PRI access
 - AAL5 – for packet traffic (Frame Relay, Ethernet, IP).
- The network port supports the following classes of service: CBR, VBR, UBR and UBR+.
- Per-connection user-configurable traffic shaping and traffic contract enforcing ensure improved QoS and efficient utilization of the ATM uplink bandwidth.

LAN INTERFACE

- The LAN port has an Ethernet 10/100BaseT interface with autonegotiation support.
- The LAN interface can be configured to operate as a MAC bridge or an IP router.
- In bridge mode the LA-110 LAN interface operates as a self-learning media access bridge. The MAC bridge is user-configurable to VLAN-aware and VLAN-unaware modes.

- When configured to operate as an IP router, LA-110 supports the following interfaces:
 - One or two LAN interfaces
 - 1–16 WAN interfaces, each using its own PVC
 - An optional host interface for router management.
- The router uses static routing entries or RIP I, RIP II for routing decisions.
- In the IP router mode, LA-110 can use encapsulation per RFC2684, or transfer the traffic using PPPoA (with PAP and CHAP authentication).
- LA-110 serves as a DNS relay, exchanging DNS requests and replies between its hosts and the DNS server.
- A firewall can be set on each one of the router interfaces (WAN, LAN) for filtering inbound or outbound traffic.
- LA-110 can be configured as a DHCP server or to DHCP relay mode.
- The IP router provides up to 20 NAT/NAPT translations. Each translation can be applied to a WAN or LAN port.

APPLICATIONS

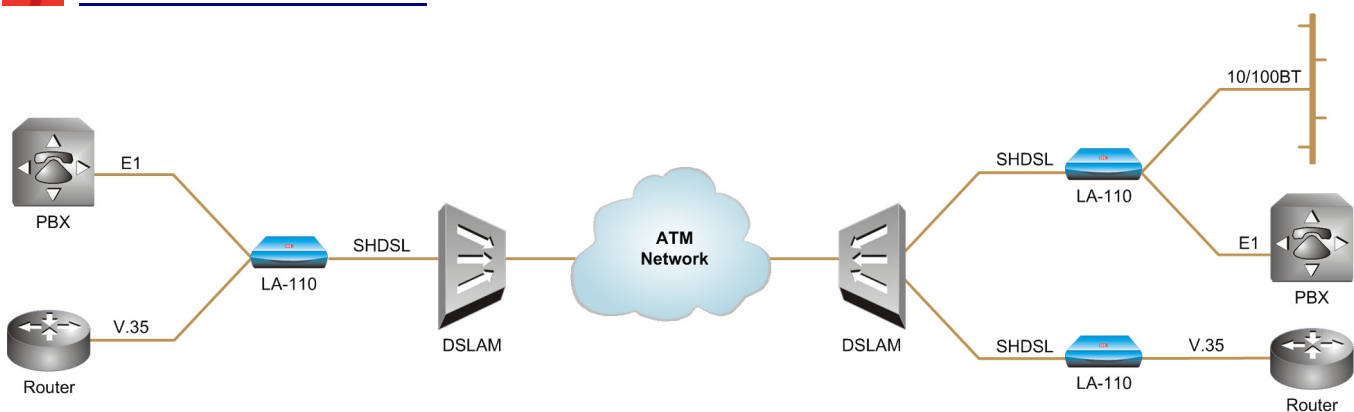


Figure 1. Providing Leased Line Services

DATA INTERFACE

- The LA-110 data port is a synchronous serial DCE port, supporting V.35 and X.21 interfaces. The data port operates at the rates of $N \times 64$ kbps in the range of 64 to 2048 kbps.
- The data payload is processed in accordance with the user-selectable application mode: AAL1 or Frame Relay.
- In AAL1 mode, the data stream is transferred transparently at the CBR service category. The AAL1 stream mode supports any Layer 2 protocol.
- When the LA-110 data port operates in Frame Relay mode, the traffic is carried over AAL5, at the user-configurable ATM service category.
- LA-110 supports up to 16 DLCIs.
- The Frame Relay interworking mode can be configured to:
 - Service interworking per FRF.8
 - Network interworking per FRF.5.

FXS INTERFACE

- LA-110 can be ordered with four independent FXS analog voice interfaces, for direct connection to subscriber POTS phone, fax or voiceband modem equipment. Each port provides power feed and ringing to the subscriber equipment.

- The input and output audio levels of each channel are user-selectable. The signals are encoded by a PCM codec, using 64 kbps PCM encoding per ITU-T Rec. G.711, enabling transparent transfer of DTMF signaling, Group III fax signals and voiceband modems.
- Each channel includes a near-end echo canceller. The echo canceller can be disabled when processing fax or modem signals.
- For compatibility with national implementations, the PSTN signaling characteristics are user-selectable.
- The transport of analog voice requires LES over AAL2, which allows several voice connections to share the same VC. The ELCP protocol can also be used.

ISDN INTERFACE

- Four independent ISDN BRI S0 interfaces comply with ETSI 300012 and ITU-T Rec. I.430. The interface characteristics are compatible with many types of ISDN switches, including NTT, 5ESS, DMS-100 and NI1.
- The ISDN interface operates in NT (Network Termination) mode, enabling direct connection of ISDN terminal equipment to "S" ports.
- The ISDN ports require use of LES over AAL2, allowing several connections to share the same VC. The ELCP protocol can also be used. The signaling information carried by the multiplexed 64-kbps D channel is transported transparently to the voice gateway.

E1 INTERFACE

- LA-110 can be ordered with one user E1 port with balanced or unbalanced (via an adapter cable) interfaces.
- The E1 interface supports the following framing modes:
 - G732S
 - G732N
 - Unframed
 - ISDN PRI (AAL2 only)
 - E1 ATM UNI.
- In AAL1 mode LA-110 uses the following transmission methods:
 - Structured CES, transmitting each E1 bundle over separate PVC
 - Dynamic bandwidth allocation (DB-CES) for detecting voice channel activity and allocating uplink bandwidth accordingly.
- In AAL2 mode, LES is used for voice support, with or without ELCP. Application identifiers determine the signaling methods:
 - CAS
 - PSTN signaling
 - DSS1 for ISDN BRI and PRI
 - ISDN PRI remote access with ELCP.
- LA-110 transparently transfers the ATM-based E1 UNI services at the rate of 1984 kbps.

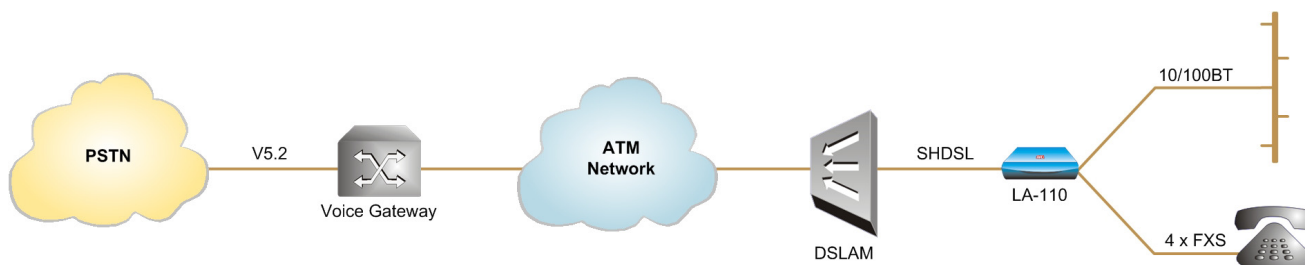


Figure 2. Providing VoDSL Using LES over AAL2

TIMING MODES

- LA-110 supports flexible timing modes to enable hierarchical timing distribution in the network.
- The LA-110 system timing can be locked to the following sources:
 - NTR – LA-110 locks its timing reference to the DSLAM clock
 - Received – LA-110 receives the clock from the E1 equipment
 - Adaptive – the LA-110 clock is locked to an average arrival rate of the ATM cells carrying voice channels
 - Internal – LA-110 uses the clock generated by its internal oscillator.

MANAGEMENT CAPABILITIES

- The unit can be managed using different ports and applications:
 - Local out-of-band management via an ASCII terminal connected to the RS-232 port
 - Remote out-of-band management via the LAN port
 - Remote inband management via the ATM uplink. Remote management is performed using Telnet, Web browser or RADview-EMS, RAD's SNMP-based element management system.
- Different stations can manage LA-110 simultaneously, enabling monitoring the network status from different locations.

PLUG & PLAY

- LA-110 supports automatic configuration from a remote location. Once the unit is installed it needs only to be powered up. It then automatically receives its management IP address, and all the configuration procedures can be performed from the remote location.

DIAGNOSTICS

- LA-110 collects performance monitoring statistics at the physical and ATM layers for 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-110 stores alarms detected during its operation in a buffer holding up to 200 alarms.

SPECIFICATIONS

NETWORK INTERFACE

ATM SERVICE

- **Interface Type**
UNI per ATM User-Network Interface (UNI) Specification (Version 3.1) for PVCs only
- **AAL Support**
 - AAL1 (CES and DB-CES)
 - AAL2 (LES and ELCP)
 - 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 VCs**
16

SHDSL INTERFACE

- **Type**
2-wire or 2/4-wire per ITU-T Rec. G.991.2, Annex A, B
- **Line Code**
TC-PAM
- **Range**
See Table 1
- **Data Rate**
N × 64 kbps (N ≥ 3):
 - 200–2312 kbps (2-wire)
 - 200–4608 kbps (4-wire)
- **Handshake Protocol**
ITU-T Rec. G994.1
- **EOC Support**
Mandatory
- **Connector**
RJ-45

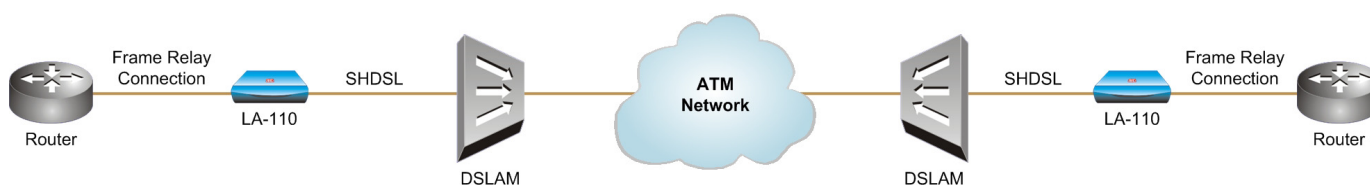


Figure 3. Providing Frame Relay Conenctivity (Network Interworking Mode)

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Table 1. Typical SHDSL Ranges

| Data Rate [kbps] | 2-wire | | 4-wire | |
|---------------------|--------|---------|--------|---------|
| | [km] | [miles] | [km] | [miles] |
| 384–512 | 5.5 | 3.4 | 6.3 | 3.9 |
| 576–832 | 5.0 | 3.1 | 5.4 | 3.3 |
| 896–1152 | 4.5 | 2.7 | 5.1 | 3.1 |
| 1216–1344 | 4.2 | 2.6 | 5.1 | 3.1 |
| 1408–1856 | 3.9 | 2.4 | 4.5 | 2.7 |
| 1920–2176 | 3.5 | 2.1 | 4.5 | 2.7 |
| 2304 | 3.3 | 2.0 | 4.5 | 2.7 |
| 2432–3072 | – | – | 3.9 | 2.4 |
| 3200–4624 | – | – | 3.3 | 2.0 |

ADSL INTERFACE

- **Type**
Per ITU-T Rec. G.992.1 Annex A
- **Line Code**
Full DMT
- **Data Rate**
 - Downstream: up to 8 Mbps
 - Upstream: 1 Mbps

E1 INTERFACE

- **Payload Rate**
 $N \times 64$ kbps ($N = 1-26$)
- **Compliance**
ITU-T Rec. G.704, G.706, G.732, G.823
- **Framing**
G732N or G732S, with or without CRC-4
- **Line Rate**
 $2.048 \text{ Mbps} \pm 32 \text{ ppm}$
- **Line Code**
HDB3
- **Line Interface**
 - 120Ω , balanced
 - 75Ω , unbalanced
- **Receive Input Level**
0 to -43 dB or 0 to -12 dB, user-configurable
- **Transmit Output Level**
 - $\pm 3V \pm 10\%$, balanced
 - $\pm 2.37V \pm 10\%$, unbalanced
- **Jitter**
ITU-T Rec. G.823
- **Connectors**
 - RJ-45, balanced
 - Two BNC, unbalanced (via adapter cable)

USER INTERFACE

SERIAL DATA PORT

- **Data Link Protocol**
 - Frame Relay using AAL5
 - Transparent using AAL1
- **Data Rate**
 $N \times 64$ kbps in the range of 64 to 2048 kbps
- **Frame Relay Interworking**
 - Network interworking per FRF.5
 - Service interworking per FRF.8
- **Frame Relay Connections**
Up to 16 DLCIs
- **Timing**
DCE
- **Type**
 - V.35 via 34-pin VAPL female connector
 - X.21 15-pin D-type female connector

LAN PORT

- **Interface**
10/100BaseT Ethernet
- **Functionality**
 - Ethernet MAC bridge
 - IP router
- **Connector**
RJ-45
- **MAC Bridge**
 - Number of ports: 1 LAN, 1–16 WAN
 - VLAN: aware or unaware mode
- **IP Router**
 - Routing: static, RIP I, RIP II, RIPv1 and RIPv2
 - Number of ports: 1–2 LAN, 1–16 WAN, host (optional)
 - DHCP services: DHCP server (up to 10 address pools), DHCP relay
 - NAT, PAT services

ISDN PORTS

- **Number of Ports**
4
- **Type**
“S”
- **Compliance**
ETS 300012, ITU-T Rec. I.430, compatible with NTT, 5ESS, DMS-100 and NI1 switches

- **Bit Rate**
192 kbps
- **Line Coding**
Pseudo-ternary
- **Mode**
NT with phantom feed
- **Line Impedance**
100 Ω
- **Connector**
RJ-45

ANALOG FXS VOICE PORTS

- **Number of Ports**
4
- **Interface Type**
FXS, for direct connection to a 2-wire telephone, RS-464 loop start
- **Nominal Impedance**
600 Ω
- **Return Loss (ERL)**
Better than 20 dB
- **Encoding**
 - 64 kbps PCM per ITU-T Rec. G.711 and AT&T PUB-43801, μ -Law or A-Law
 - 32 kbps ADPCM per ITU-T Rec. G.726 (see *Ordering*)
- **Frequency Response (Ref: 1020 Hz)**
 $\pm 0.5 \text{ dB}$: 300 to 3000 Hz
 $\pm 1.1 \text{ dB}$: 250 to 3400 Hz
- **Signal/Total Distortion (ITU-T Rec. G.712, G.713 Method 2)**
0 to -30 dBm0: better than 33 dB
+3 to -45 dBm0: better than 22 dB
- **Idle Channel Noise**
Better than -70 dBm0 (+20 dBnc)
- **Transformer Isolation**
1500 VRMS
- **Echo Cancellation**
In accordance with ITU-T Rec. G.168, tail end, maximum 4 msec
- **Connector**
RJ-11

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E1 PORT

- **Compliance**
ITU-T Rec. G.703, G.704, G.706, G.732, G.823
- **Framing**
 - Unframed
 - G732N with or without CRC-4
 - G732S with or without CRC-4
 - ISDN PRI
 - UNI (multiframe or non-multiframe)
- **Line Rate**
2.048 Mbps \pm 32 ppm
- **Line Code**
HDB3, AMI
- **Line Impedance**
 - 120 Ω , balanced
 - 75 Ω , unbalanced
- **Receive Input Level**
0 to -43 dB or 0 to -12 dB, user-configurable
- **Transmit Output Level**
 - \pm 3V \pm 10%, balanced
 - \pm 2.37V \pm 10%, unbalanced
- **Jitter**
ITU-T Rec. G.823
- **Connectors**
 - RJ-45, balanced
 - Two BNC, unbalanced (via adapter cable)

GENERAL

- **Timing**
 - Recovered from xDSL interface (NTR)
 - Recovered from E1 interface
 - Adaptive
 - Internal
- **Management**
 - Inband: SNMP, Telnet, Web
 - Out-of-band: LAN port, serial V.24 (RS-232) port
- **Terminal Control Port**
 - Interface: V.24 (RS-232) async DCE
 - Baud rate: 0.3–115.2 kbps
 - Connector: 9-pin D-type female

- **Power**
AC: 100–240 VAC
DC: -40 to -72 VDC

Note: The DC option is not available for the units with ISDN, FXS user interfaces or E1 uplink.

- **Power Consumption**
7.5W max
- **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
- **Environment**
Temperature: 0–50°C/32–122°F
Humidity: Up to 90%, non-condensing



ORDERING

LA-110/~/\$/*/#/@

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~ Specify **DC** for a DC power supply
Default is an AC power supply

\$ Specify WAN interface type:
SHDSL for 2-wire SHDSL
SHDSL/4W for 4-wire SHDSL
ADSLA for ADSL Annex A
E1 for balanced E1

* Specify optional ADPCM compression type:
VC4 for ADPCM FXS, 4 TS
VC8 for ADPCM ISDN, 8 TS
VC30 for ADPCM E1, 30 TS
NULL for LA-110 without voice compression

Specify voice interface type:
E1 for E1
FXS for 4-port FXS (units with SHDSL or ADSL uplink only)
ISDN for 4-port ISDN (units with SHDSL or ADSL uplink only)

@ Specify serial data interface type:
V35 for V.35
X21 for X.21

Note: V.35 and X.21 serial data ports are not available for units with ISDN and FXS user interfaces.

SUPPLIED ACCESSORIES

- Power cord
- AC/DC adapter plug (if a DC option is ordered)

OPTIONAL ACCESSORIES

- RM-33-2
Hardware kit for mounting one or two LA-110 units into a 19-inch rack
- CBL-RJ45/2BNC/E1 adapter cable for unbalanced E1 interface



data communications

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