

Wideband Satellite • Wireless Point-To-Point • Adaptive Reed-Solomon Based Forward Error Correction

The CLA-2000/ATM™ is a networking device that enables interconnection of ATM networks over satellite or terrestrial point-to-point WAN links operating at fractional T1 to 8.448 Mb/s data rates.

The CLA-2000/ATM provides efficient bandwidth utilization, improves link quality and increases application throughput over noisy WAN links. It is ideally suited for use over wideband satellite (fixed or mobile) or terrestrial wireless ATM links.

Fiber-like quality with improved bandwidth utilization is achieved through use of adaptive Reed-Solomon based forward error correction (FEC) and interleaving mechanisms. The bursty bit errors on such links are corrected by the CLA-2000/ATM to provide cell error plus cell loss-ratios of 10^{-10} and better.

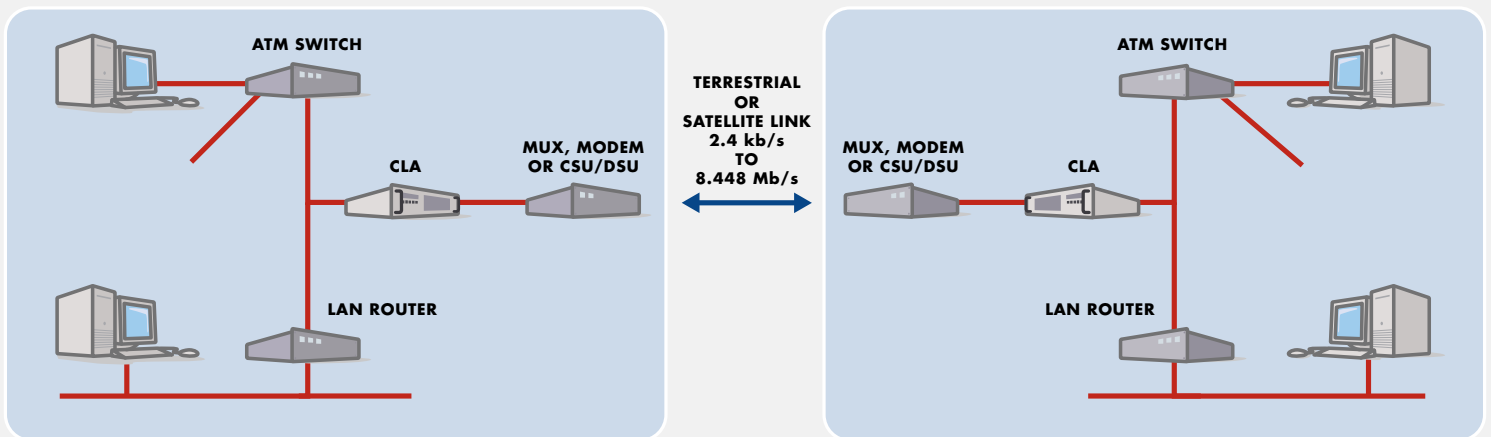
The adaptive coding mechanism of the CLA-2000/ATM eliminates the need to over-design the links to function under adverse link conditions. The device can dynamically modify its Reed-Solomon coding rates depending on the quality of the link. For example, on “clear” days, it uses less overhead for FEC coding, thereby providing up to 7% additional bandwidth for higher throughput.

The CLA-2000/ATM performs loss-less header compression of ATM cells to provide an additional 4% bandwidth. Further, through loss-less data compression of selected virtual circuits, the CLA-2000/ATM improves the effective link rate for ATM traffic, providing savings in cost toward additional satellite or wireless bandwidth that may otherwise be required.



CLA-2000/ATM™ BENEFITS

- Improved application throughput and quality, especially over high error rate links.
- Application throughput and quality remain high over a wide variety of link types—terrestrial, mobile, radio and satellite.
- Improved link availability even under severe link conditions.
- Reduced WAN link cost due to data compression and adaptive FEC.
- Reduced WAN link capital investment with use of smaller antenna sizes and reduced transmission power.
- Meets new industry standard TIA/EIA/IS-787.



EXAMPLE CLA APPLICATION

The CLA-2000/ATM is easily installed into existing customer networks between the user ATM switch and the WAN transmission device (modem, multiplexer, or CSU/DSU). It functions transparently to the network and does not require any changes to end-user equipment or protocols.

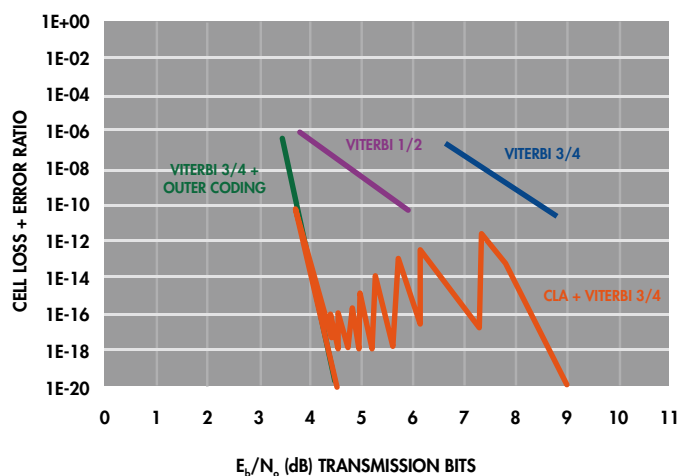
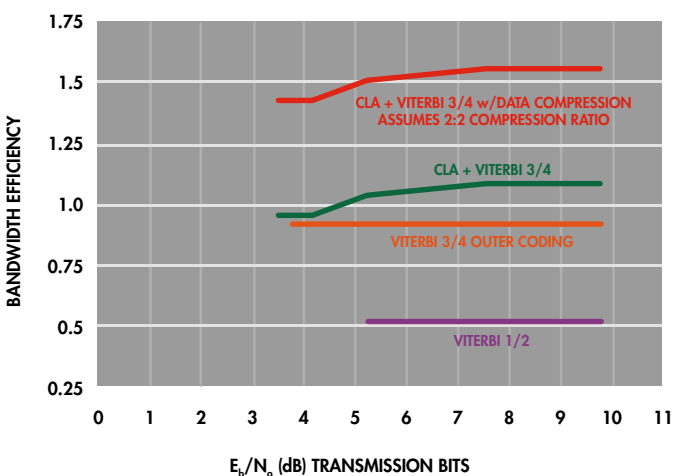
The CLA-2000/ATM supports DS-3, E-3, RS-449 interfaces to the ATM switch (V.35 and RS-530 interfaces are options). The WAN equipment is connected using a programmable rate RS-449 (optional V.35 or RS-530) interface. The CLA-2000/ATM thereby permits interconnection of standard ATM equipment over nonstandard-rate WAN links. For example, customers can connect their ATM switches, with DS-3 interfaces over an 8.448 Mb/s satellite link using the CLA-2000/ATM. Under adverse link conditions, the CLA-2000/ATM supports throughput of ATM cells at a sustained rate, up to 93% of 8.448 Mb/s.

FEATURES

- Cell-based Reed-Solomon coding and byte interleaving. Automatically adapts coding rate to measured link quality.
- Cell error plus cell loss ratio of 10^{-10} or better. Coding overhead of 0 to 7%. Errored cells not delivered.
- Byte interleaving to combat burst errors. Convolutional interleaving scheme reduces interleaver delay.
- Cell buffering to perform rate adaptation.
- Priority scheduling for CBR, VBR, ABR and UBR traffic.
- Adaptive, loss-less ATM header compression. 4% bandwidth savings.
- Adaptive, loss-less data compression for selectable PVCs. Capable of compressing 2.5 Mb/s down to 1.4 Mb/s.
- WAN link: 2.4 Kb/s to 8.448 Mb/s. symmetric or asymmetric data rates. Terrestrial, single-hop, or double-hop satellite link. RS-449 external clocking.
- WAN link raw bit error rate range: $0-10^{-3}$.
- ATM access ports: DS-3 E3, or RS-449. Independently selectable for each CLA-2000/ATM on each end of a WAN link.
- Novel synchronization scheme to achieve rapid bit, byte, and frame synchronization between the CLA-2000/ATM units over the WAN link.
- For test and measurement, WAN link can be configured for transparent ATM mode with Reed-Solomon coding and interleaving disabled.
- Compatible with all major ATM switches, modems, multiplexers, and CSU/DSU equipment.
- Plug-and-play ease of use. Preconfigured to meet most common configurations.
- Customer-configurable parameters.
- Flash memory for software upgrades.
- Management via console port, Ethernet/IP or SNMP.
- Redundancy option (1:1) available.

CLA-2000/ATM Performance

The charts below illustrate the bandwidth efficiency and cell-loss-plus-error ratio for various E_b/N_0 values when using the CLA-2000/ATM. Header compression is assumed to be enabled, with a satellite modem operating with rate 3/4 Viterbi FEC coding. For comparison, performance curves for the link without the CLA-2000/ATM are also shown. One curve shows the performance using a satellite modem that employs rate 1/2 Viterbi FEC coding; the other shows performance with a satellite modem employing rate 3/4 Viterbi FEC coding and INTELSAT-standard Reed-Solomon outer coding.



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