

Testing the physical layer performance of PDH based ATM networks

This application note describes how AuroraForte can be used for testing the correct operation of an ATM network that is using E1, E3, DS1/T1 or DS3 interface speeds. Collectively these are known as Pleiosynchronous Digital Hierarchy (PDH) because their clocking source is not necessarily synchronised at all points in the network, though the clock rate is nominally the same.

Application Note ANFORTE 01



Testing the World's Digital Networks

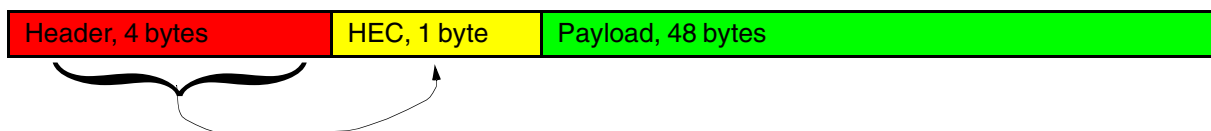
TrendCommunications

DETERMINING NETWORK PERFORMANCE

These systems use electrical cabling for transmission of the data, either unbalanced coaxial cable or balanced twisted pair.

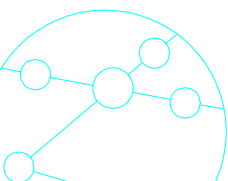
Interface Type	E1	E3	DS1/T1	DS3
Connector type	BNC RJ45	BNC	Bantam RJ45	BNC
Transmission rate	2.048Mbps	34.368 Mbps	1.544 Mbps	44.736 Mbps
ATM data rate	1.920Mbps	G.751 PLCP 27.648 Mbps G.832 ADM 33.920 Mbps	PLCP 1.280 Mbps ADM 1.391 Mbps	PLCP 40.704 Mbps ADM 44.209 Mbps
ATM payload data rate	1.738Mbps	PLCP 25.040 Mbps ADM 30.720 Mbps	PLCP 1.159 Mbps ADM 1.260 Mbps	PLCP 36.864 Mbps ADM 40.038 Mbps

Electrical cable systems used for data transmission are well known for being susceptible to performance degradation. This loss of performance can be due to interference from adjacent signal lines or high voltage systems, poor cable joints, cable damage etc. All of which could lead to data errors. The demand for more broadband connections is requiring that either new lines are installed, or that existing cable infrastructure is reused for higher speed services. In both cases it is necessary to test the cable performance to ensure that it can reliably provide the intended service. The ATM protocol provides for error detection or correction of the header bytes but not the payload information.



ATM is intended for use over highly reliable transmission systems where bit errors should be at a very low rate. The protocol has made a trade between fast data transfer at the expense of error handling. If errors do occur these will result in:

- Header error correction if only one bit error occurs in the header bytes
- Cell loss if more than one bit error in the header bytes occurs
- Payload data corruption if bit errors occur in the user data.



Errors that are not corrected are the responsibility of the ATM Adaptation Layer protocol or the user application to detect and compensate for.

What needs to be tested?

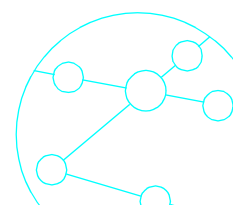
The purpose of this testing is to check that the network connection is operating correctly and will be reliable for use with an ATM equipment. The aspects of operation that will be tested are:

- Framing synchronisation
- Network physical alarms
- Physical Bit Errors
- ATM cell flow
- ATM circuit routing
- ATM circuit performances in the header bytes

How is the testing done?

With Aurora Forte you can select from the available interface modules installed and connect the tester to the network or ATM equipment and prove that the connection is reliable. The first step will be to check the status of the physical layer alarms reported by Aurora Forte. The alarms displayed range from Loss of Signal through to Out of Cell Delineation and should all be shown as OK, otherwise there is either mis-configuration or a real network error. AuroraForte allows you to view all the alarms and see a count of indicated errors. At the same time you can change the port configuration and see if the alarms can be cleared. Once you have finished the investigation you will know if there are real faults being reported by the network.

SECTION	Alarm Name	Status	Count	Unit	Inject
SECTION	LOS	OK	0	[secs]	<input type="checkbox"/>
	LOF	OK	0	[secs]	<input type="checkbox"/>
	ODF	OK	0	[secs]	<input type="checkbox"/>
	B1	OK	0	[errs]	<input type="checkbox"/>
LINE	LAIS	OK	0	[secs]	<input type="checkbox"/>
	LRDI	OK	0	[secs]	<input type="checkbox"/>
	LFEBE	OK	0	[errs]	<input type="checkbox"/>
	B2	OK	0	[errs]	<input type="checkbox"/>
PATH	PAIS	OK	0	[secs]	<input type="checkbox"/>
	PRDI	OK	0	[secs]	<input type="checkbox"/>
	PFEBE	OK	0	[errs]	<input type="checkbox"/>
	B3	OK	0	[errs]	<input type="checkbox"/>
ATM	OCD	OK	0	[secs]	<input type="checkbox"/>
	HEC	OK	0	[errs]	<input type="checkbox"/>



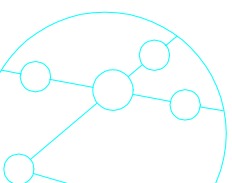
Typical Faults

If an alarm is displayed indicating a fault there are some simple steps that you can take to rectify this:

- Does framing type match the network?
Selection of ADM or PLCP for instance will change the alarms that are reported.
- Is the clock selection correct?
Use line recovered where the network is providing the clock source
Use internal where AuroraForte is to provide the master clock signal
- All Alarms Red?
Make sure you have the Rx and Tx cables connected to the correct port. On an interface module with a choice of connectors or signal rates, make sure that the Port Config matches your requirement.

What Next?

This application note has described configuring Aurora Forte, connecting to the network and testing the PDH physical layer operation. Once all the physical layer alarms are showing correct operation, you can test the performance of the network operation. For example, physical Bit Error Rate Testing, and ATM layer operation these are explained in other Notes in this series.



Aurora Forte

Aurora Forte is an ATM handheld tester with the key features of being multi-interface with a graphical user interface and providing physical, ATM and IP layer test routines. File Management System allows test results and configurations to be copied to/from a PC using the testers Ethernet port.

- Portable, battery powered, handheld unit, rugged design
- Large high resolution colour display
- Graphical ICON based window applications for easy operation of tests
- Interfaces - combined E1 + E3, combined DS1 + DS3, ATM25,
- OC3/STM1 (Single mode, Multi mode, G703, CAT5)
- Bi-directional monitoring
- Pass / Fail parameters for fast analysis of test results
- Physical Frame and Alarm monitoring & Injection
- Physical BERT for E1, E3, DS1, DS3
- ATM VCC real time Traffic Scanning - up to 1024 VCC
- ATM cellstream transmission - up to 256 VCC
- ATM BERT
- Quality of Service (O.191) measurement
- Traffic Policing - to monitor and enforce a committed service level agreement
- F4 and F5 OAM testing of ATM fault management layer (AIS, RDI, CC, Loopback), real time and trace history OAM cell capture with English language decode
- IP ping over ATM - transmit and respond tests
- SVC UNI 3.0, 3.1, 4.0 support with comprehensive Information Element editing
- Management of results and configuration files via PC on Ethernet interface for simple operation

Software upgrades available from Trend Communications website, with download to tester via Ethernet port



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