ATM error performance testing

Product note

OmniBER
communications
performance
analayzer

It is vital to be able to detect and measure errors accurately, in high-speed ATM networks.

Errors arise routinely, during the installation and maintenance of ATM networks. Sources of error range from equipment failure to more specific ATM problems. These need to be found quickly and fixed. The reason for this is simple. In the highly competitive ATM market, Quality of Service (QoS) is a key contract element. Undetected or unmeasurable errors will ultimately detract from the QoS agreed between the user and the service provider.

ATM network equipment should be tested with ATM signals. The ability to detect and measure errors during such testing will go some way to replicate the real network situation.

This product note discusses possible ATM errors and describes a unique technique for providing simultaneous measurement of these errors. It also outlines a test setup to measure ATM errors at up to 2.5 Gb/s.

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Innovating the HP Way

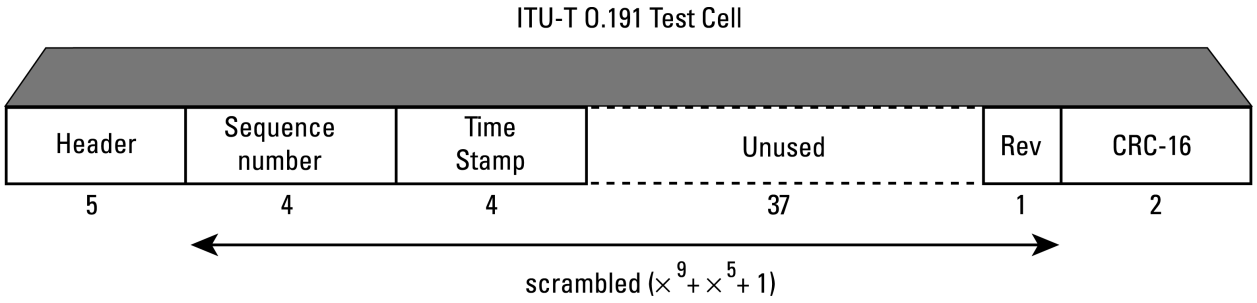


Figure 1.

Introduction

Error performance testing of ATM equipment is a necessary part of the verification of new equipment design, testing equipment in a production environment, installation of new equipment and maintenance of that equipment in an ATM network.

In some applications, it is important to know that no defects are present in the system under test and that data can be transferred without error through the system (transparency test). In other cases, a longer term test is required to establish that the expected Quality of Service is being met. In this situation, depending on the type of service and the traffic contract, a certain rate of error can be tolerated and needs to be checked against the required thresholds. Error performance results at different points in a network can be used to locate and assign responsibility for problems.

ATM error measurements

In traditional transmission systems, bit error ratio (BER) may have been sufficient to assess the effect of impairments on the service being carried. However, an ATM network may introduce additional impairments that have specific effects on the data being carried and so need to be measured also.

Cell loss may be caused by transmission errors on the ATM header or more importantly may arise due to congestion in ATM switches. *Cell Misinsertion* may also be caused by transmission errors on the ATM overhead. If errors cause the VP/VC to be changed to another valid value, this will cause a cell to be misinserted into another channel. Also, faults within the routing tables or management system of an ATM switch may cause cells to be routed to the wrong output port, appearing as misinserted cells. *Cell errors* caused by transmission impairments or faults within Network Equipment need to be measured in a different way from bit errors to ensure that lost or misinserted cells do not corrupt the measurement.

How are measurements made?

To make the necessary ATM measurements, we need to use a different kind of test signal from the PRBS traditionally used to measure BER. A special ATM test cell has been designed and endorsed by the ATM Forum and standardized the ITU-T in Recommendation O.191 (See Figure 1).

The test cell allows all of the ATM performance measurements to be made simultaneously. It comprises a 32-bit sequence number to detect if cells have been lost or misinserted, a timestamp to measure cell delay and a CRC to detect errored cells. ITU-T Recommendation O.191 contains a powerful algorithm to calculate the measurements of lost, misinserted and errored cells under a variety of realistic network conditions. Test equipment using the standardized test cell and measurement algorithm can therefore interoperate with each other and also give comparable results.

Service categories and policing

The ATM Forum has defined various Service Categories designed for transporting different types of data. These are:

- Constant Bit rate (CBR)
- Variable Bit Rate (VBR)
- Unspecified Bit Rate (UBR)
- Available Bit Rate (ABR)

Data carried within each of these Service Categories will be policed within the network to ensure that the traffic does not exceed the bandwidth negotiated. This ensures that the required QoS can be met and that other traffic in the network is not degraded.

For an error performance measurement, it is important to transmit a test signal that is representative of the data that will normally be carried and that will pass the policing function that is checking the signal bandwidth and distribution. Because UBR traffic is policed in a similar manner to CBR, a CBR signal can be used to represent UBR data. In ABR, dynamic control of the signal bandwidth is provided by resource management cells. However, a limited error performance test may be performed using a fixed bandwidth CBR signal.

Error performance measurements using the OmniBER

A wide range of interfaces

You can perform error performance measurements using the ATM features of the OmniBER communications performance analyzer from Agilent Technologies. The OmniBER has a wide range of interfaces and mappings available. Depending on the options ordered, ATM testing can be performed at the following interfaces:

- 2.5 Gb/s
- 622 Mb/s
- 155 Mb/s
- 51 Mb/s
- DS3
- 34 Mb/s
- 2 Mb/s
- DS1

ATM can be flexibly mapped into the SDH or SONET structure, allowing full rate ATM testing at all interfaces as well as multiplexing ATM into the test signal.

Flexible traffic generator

Test traffic can be generated to simulate CBR and VBR ATM Service categories. The transmit cell rate can be set accurately and precisely tuned to the rate required with 1 cell per second resolution all the way up to the highest rate. Up to 7 background cell streams can be generated to ensure realistic traffic conditions.

The traffic parameters used in the traffic contract can be entered directly into OmniBER and the necessary test traffic is generated automatically from the traffic parameters according to the ITU-T O.191 standardized algorithm. Therefore you don't need to spend time working out how to generate test traffic; OmniBER does it for you.

Performing the analysis

1. Configure the equipment (see Figure 2).
2. Set up a VP/VC connection through the system under test (SUT).
3. Configure OmniBER to generate test cells on the VC already set up on the SUT.
4. Set the appropriate service category and distributions.
5. Configure the OmniBER analyser to analyse the test cells received from the SUT (the VP/VC may be different). The required service category and distributions should be set.
6. Run a test for a fixed time and check for errors on the ATM results page.

Conclusion

In order to fully characterize and test your ATM network equipment, flexible ATM signals with cell based error generation and detection are required. With OmniBER you have the possibility to do simultaneous mesurement on ATM signals up to 2.5 Gb/s.

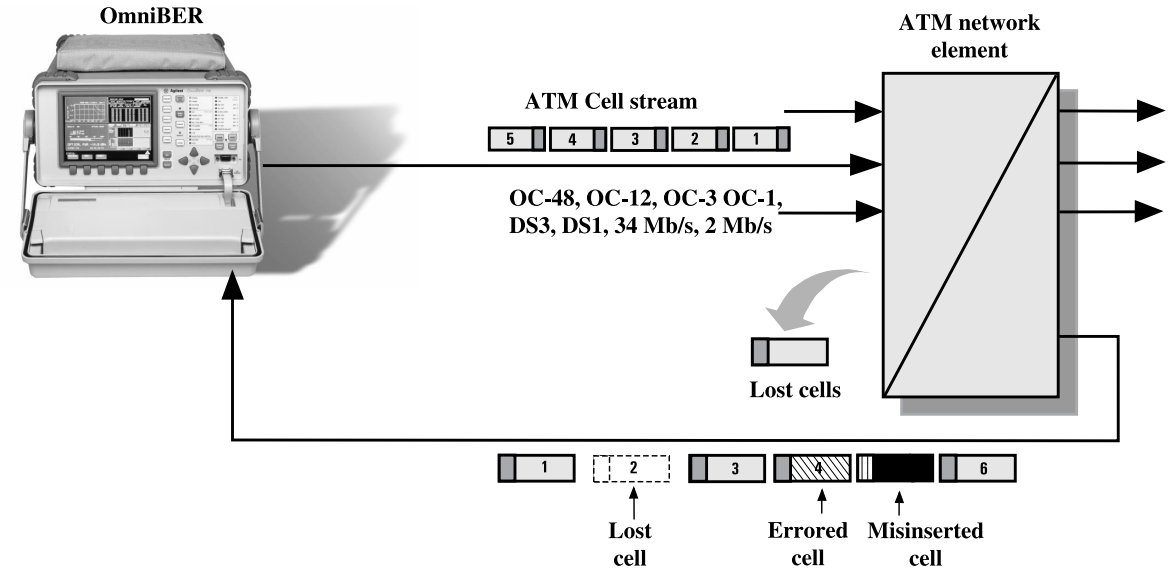
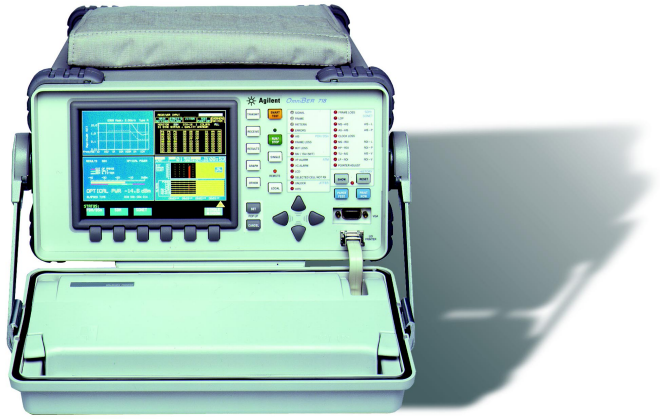


Figure 2.



OmniBER communications performance analyzer

Offers a modular, upgradeable one-box solution for installation, commissioning, and field maintenance. This rugged, portable tester allows comprehensive functional testing of SDH, PDH and ATM equipment including jitter generation and test. A 3.5-inch disk drive eases results retrieval, test firmware upgrades, and analysis.

Related Literature

The complete global tester to 2.5 Gb/s (OmniBER 718) 5968-8740E

OmniBER 718 technical specification 5968-8335E

OmniBER 718 configuration guide 5968-8012E

OmniBER product note:
Measuring service disruption times in high-speed ATM networks
5968-9137E

OmniBER product note:
Physical layer jitter testing in an ATM environment
5968-9883E

OmniBER product note:
Verifying the policing functions in the ATM network
5968-9884E

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Technical data is subject to change

Printed in the USA
5968-9885E 03/00

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