Smart testing with the OmniBER 719 communications performance analyzer

Testing today’s SONET networks can be a complex task. However, with Smart test and the OmniBER 719, testing network performance has never been easier.

Smart test is an addition we’ve made to simplify the process of network testing. Smart test provides a shortcut to running the most frequently needed tests while Smart Setup automatically configures OmniBER to the connected link whether it be DS1 or OC-48.

The aim of this product note is to show how OmniBER users can save time by using Smart test to analyze Virtual Tributaries within an OC-n SONET signal or a mix of DS1 and E1 (2 Mb/s) channels within a DS3.
The OmniBER 719 makes light work of testing today's optical SONET networks, thanks to Smart test. This is a feature ensuring that you spend your time testing the network rather than setting up your analyzer.

Smart test is a short-cut to instrument configuration and to getting the test results that really matter. All the testing capability required on today's optical links is offered to the user, with test results a mere couple of clicks away. Find error summary results, optical power or APS switching time easily and quickly under the Smart test banner.

With Smart test there's no need to send installation crews on long training courses. Setup and configuration is simply a double click of the prominent Smart test button. Finding the results you need for your particular testing application is easy, with the minimum number of keystrokes giving the maximum testing possibility.

(Of course, using Smart test is entirely optional as it compliments the standard easy-to-use OmniBER interface).

What do you want to test today?

As you would expect from the OmniBER family of analyzers, all the features for network test are there. However, getting to them quickly and easily has never been simpler. Smart test has been divided into four main areas.

Smart Setup
Smart Setup is your auto-configuration utility. By connecting the analyser to the test link and running Smart Setup, the instrument will automatically discover the channel structure of the received signal and identify the status of all the channels.

Signal Quality
Smart test's Signal Quality menu gives you fast access to parametric measurement results, including:
- Optical power
- Frequency (line rate)

Functional Tests
The typical results needed during network test can be found under the Functional Tests banner:
- Trouble scan
- Error summary
- Alarm seconds
- Auto tributary scan
- Trace messages (J0 and J1)
- Labels (S1 and C2)
- Error Analysis (G.821, G.826, M.2101 and M.21x0)
- APS switching time
- Pointer graph

Settings Control
This takes you direct to the most commonly needed instruments settings pages - stored settings, logging setup, triggering and Tx/Rx coupling.
Analyzing a virtual tributary structured SONET signal

Smart test can automatically configure to Virtual Tributary mapped payloads. OmniBER 719 can analyze and generate VT1.5, VT2 and VT6 mapped SONET signals including multiplexing (insert/drop) a DS1 or E1 signal into the appropriate VT structured signal.

This example describes the easy process of detecting and configuring to a VT-mapped signal.

1. **Press the Smart Test button twice to invoke Smart Setup**

   The analyzer will now search through the signal to discover STS-n channels and display the J1 trace message.

2. **Press Explore Further to look at the VT mapping.**

   Select the VT structured STS-1 to be analyzed then press Explore Further.

   Here we have found 28 VT1.5 channels in the selected STS-1. Using its color coded graphical display, Smart Setup shows us that there are no alarms on any of the virtual tributaries.

3. **Select an individual VT channel using the cursor keys and press Explore Further to look at the service mapping.**

   Smart test has now discovered a PRBS signal in the selected Virtual Tributary’s mapped DS1 signal.

### Virtual tributaries

The easy transport of lower rate signals through SONET networks is provided for by using Virtual Tributaries. The major benefit from using signals structured with a VT-mapping is being able to switch DS1, E1 and DS2 tributaries over the high speed SONET network with the end result of better capacity usage.

This is because signals such as DS1s and E1s remain visible to SONET network elements through the VT mappings, without having to demultiplex a DS3 signal, making transport quicker and easier.

The different VT types (listed below) are suited to transporting different tributary rates. For instance, a VT1.5 is designed for transporting DS1s (1.544 Mb/s). The extra overhead bits perform the same function for the VT as the Path Overhead for an STS frame.

<table>
<thead>
<tr>
<th>VT Type</th>
<th>Bit Rate</th>
</tr>
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<tbody>
<tr>
<td>VT1.5</td>
<td>1.728 Mb/s</td>
</tr>
<tr>
<td>VT2</td>
<td>2.304 Mb/s</td>
</tr>
<tr>
<td>VT3</td>
<td>3.456 Mb/s</td>
</tr>
<tr>
<td>VT6</td>
<td>6.912 Mb/s</td>
</tr>
</tbody>
</table>

An STS frame is divided into 7 VT groups. Within each group, the STS frame can support 4 x VT1.5, 3 x VT2, 2 x VT3 or 1 x VT6. Mixed VT types are not permitted within the group, but the STS frame can be composed of different types of group.
Analyzing mixed E1 and DS1 channels within a mapped DS3 signal

Smart test allows analysis down to DS1 tributaries. However, it is unique in being able to identify and analyze mixed DS1 and E1 tributaries within a DS-3 signal.

Finding these mixed payloads couldn’t be easier with Smart Test. Smart Setup will find and display graphically DS1 and E1 tributaries including framing, contents and status.

1. Press ‘Smart Test’ on the OmniBER front panel
2. Select ‘Smart Setup’ and ‘Run Test’

The analyzer will now automatically identify all STS-n channels within the received SONET signal.

We have detected numerous STS-1s, one of which is structured with DS3 payload within an OC-48 SONET signal. You will note that the trace message is displayed to allow easy identification of path origins.

3. To analyze the signal further, highlight the required STS-n channel then press ‘Explore Further’

Now the analyzer automatically identifies structure of the mapped payload, in this example identifying a DS3 signal.

Here we see that the DS3 signal is carrying a mix of DS1 and E1 channels.

4. Use the cursor keys to select an individual channel to discover its details.

Information on the framing, content and status of each channel is displayed when you browse through the channels using the cursor. Alarmed channels are easily identified via the color coding on the graphical display.

E1 into DS-3?

E1 (2 Mb/s) signals can be carried within a DS-3 structure instead of the typical DS1 sub-rate. Examples of this may exist on international paths where the ETSI and ANSI worlds can often collide. Or, this may also occur where an operator uses ETSI PDH signals, such as E1s, multiplexed into higher speed SONET signals. Mixing network channels together will inevitably lead to a mixture of lower rate tributaries.

Alternatively, E1 tributaries can be carried within a VT2 Virtual Tributary, which the SONET signal structure allows. The OmniBER 719 can analyze or multiplex E1 sub-rates within structured SONET signals at rates up to 2.5 Gb/s.