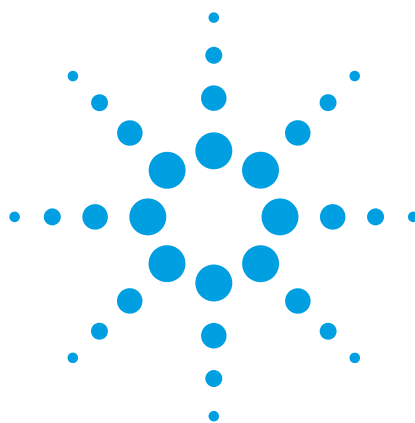


OmniBER OTN

Communications
Performance Analyzer
Family



Fast, accurate and future-proof
All telecom transport rates
up to 10 Gb/s, including
OTU-1, and OTU-2



Agilent Technologies

The test solution of the future, today

Get the capabilities you need to test next-generation transport devices, including OTU-1, OTU-2, jitter and Ethernet over SONET/SDH (EoS)

The OmniBER OTN family of communication performance analyzers is quite simply the industry's most comprehensive solution for testing ITU-T G.709 optical channel and SONET/SDH devices, modules and sub-systems.

Equipped with all standard telecom rates from 1.5 Mb/s to 10 Gb/s, 2.66 Gb/s (OTU-1) and 10.71 Gb/s (OTU-2) optical channel, the OmniBER OTN keeps you at the cutting-edge of next generation optical transport applications. And with the latest in all-channel testing, not only will you slash test times and cost, you'll get your products and

services to market fast.

The OmniBER OTN provides advanced test capability and unparalleled flexibility for validating device operation and conformance to Telcordia/ITU-T standards. It includes ITU-T G.709-compliant OTU testing with powerful forward error correction (FEC) analysis. It offers next generation SONET/SDH virtual concatenation, GFP/LAPS encapsulations and Gigabit Ethernet payload structures up to 2.5 Gb/s. And it delivers extensive jitter capabilities up to 10.71 Gb/s. As the total solution for next-generation transport devices, the OmniBER OTN family helps solve design and manufacturing challenges with measurement speed, accuracy and integrity.

The OmniBER OTN family includes:

- OmniBER 10G analyzer (to 10.71 Gb/s)
- OmniBER 10G jitter analyzer (to 10.71 Gb/s)

OmniBER family compatibility

When your designs move into manufacturing, the OmniBER OTN analyzer is optimized for easy integration into your test environment. For example, if you're already using SCPI command code for 2.5 Gb/s test applications, you'll find it easy to migrate to 10 Gb/s. The OmniBER OTN's SCPI command set is designed for maximum backwards compatibility with OmniBER 718/719/725 analyzers, allowing significant re-use of existing test code.



The cornerstone to getting to market fast is the equipment you use to test your devices. You need confidence in your testers to ensure your products meet both specified performance criteria, and international standards. I believe that Agilent's OmniBER OTN family can improve productivity, reduce test times, and cut costs without sacrificing test thoroughness and measurement accuracy. All the attributes needed to get your products in the marketplace before your competitors.

Nadia Kemer, Optical Transmission Engineer
Agilent Technologies

compromising quality.

Testing today's transport devices and those in the future

As telecom technology continues to evolve, there's every reason to choose the OmniBER OTN now. Not only can it solve today's high-speed SONET/SDH, optical channel, jitter and EoS challenges, it has been designed to evolve as transmission technology advances enabling you to keep pace with the changing communications environment.



- OmniBER 2.5G analyzer (to 2.5 Gb/s)

Detailed BER testing to 10.71 Gb/s

In every part of the product life cycle, from research and development, verification through to production test, the J7230A OmniBER OTN analyzer provides extensive test capability up to 10.71 Gb/s to ensure standards compliance and interoperability while reducing cost of test.

It is the industry's first ITU-T G.709 optical channel tester designed to help you meet the test challenges of this new standard. It lets you capture and display multiple optical channels frames, including overhead, payload and FEC blocks, to rigorously test your ITU-T G.709 devices. And when combined with versatile triggering, you get even greater analysis of

problem areas in your designs.

High accuracy jitter testing to 10.71 Gb/s

The J7231B OmniBER OTN jitter analyzer offers high-accuracy jitter testing of your SONET/SDH and ITU-T G.709 devices up to 10.71 Gb/s. It has the industry's lowest jitter intrinsic, significantly exceeding the test equipment specification ITU-T 0.172, giving you greater headroom for your designs. With wider test margins, the need to re-test marginal cases is reduced, resulting in less cost and faster time to market. Whether you are testing SONET, SDH or ITU-T G.709 network equipment, this analyzer has the measurement accuracy you need to reliably demonstrate compliance to ITU-T and Telcordia standards. Further, your jitter test results will be up to five times faster with the analyzer's unique parallel measurement filters.

Next-generation SONET/SDH to 2.5 Gb/s

For the first time, you can be confident of identifying next generation mapping and concatenation defects and ensure vendor interoperability when encapsulating Ethernet payloads into SONET/SDH up to 2.5 Gb/s. The J7232A OmniBER OTN's Ethernet payloads, GFP/LAPS encapsulation, and new (high order and low order) virtual concatenation support allow you to verify products fully before release. And like the OmniBER OTN 10 Gb/s analyzer, its ability to generate and identify mixed mappings ensures that tests are carried out with realistic traffic signals allowing you to bring data-aware SONET/SDH products to market early without

For in-depth testing at all line rates, the OmniBER OTN family of analyzers offer both framed and unframed operation.

The OmniBER OTN 10 Gb/s analyzer provides SONET/SDH test capabilities up to OC-192/STM-64/OTU-2.

The OmniBER OTN 2.5 Gb/s analyzer provides SONET/SDH-only test capabilities up to OC-48/STM-16.

Optical Channel	OTU-1 (2.66 Gb/s), OTU-2 (10.71 Gb/s),
SONET	STS-1, STS-3, OC-1, OC-3, OC-12, OC-48, OC-192
SDH	STM-0, STM-0e, STM-1, STM-1e, STM-4, STM-16, STM-64
Other	DS1, DS3, E1, E2, E3, E4
Unframed	10.71 Gb/s, 9.9 Gb/s, 2.66 Gb/s, 2.488 Gb/s, 622 Mb/s, 155 Mb/s, 140 Mb/s, 52 Mb/s, 45 Mb/s, 34 Mb/s, 8 Mb/s, 2 Mb/s, 1.5 Mb/s

Bridge the gap between comprehensive testing and faster time to market

Unique measurement techniques and ease-of-use features—all designed to help you bring new products to market faster without sacrificing quality

Detailed BER testing to 10.71 Gb/s

For all standard telecom rates up to 10 Gb/s, plus 2.66 Gb/s (OTU-1) and 10.71 Gb/s (OTU-2) optical channel, the J7230A OmniBER OTN 10 Gb/s analyzer is the total solution to testing both metro and long-haul devices.

Whether your applications are in SONET, SDH or ITU-T G.709 OTN network equipment, the analyzer has the capabilities you need to ensure all your designs are fault-free, reliable and meet relevant Telcordia, ITU-T, ANSI and ETSI recommendations.

Monitor up to 192 STS/AU channels simultaneously

To dramatically speed testing and increase your confidence in the performance of your devices, the OmniBER OTN analyzer's SignalWizard facility lets you monitor all channels simultaneously.

Once the signal structure is detected, the analyzer can measure errors and alarms in all STS/AU channels. For 10 Gb/s signals, that means all 192 STS-1/AU-3 channels.

In addition, SignalWizard automatically detects signal and payload/signal structures, eliminating the need to configure the test set. And you can navigate to any channel for full error and alarm status.

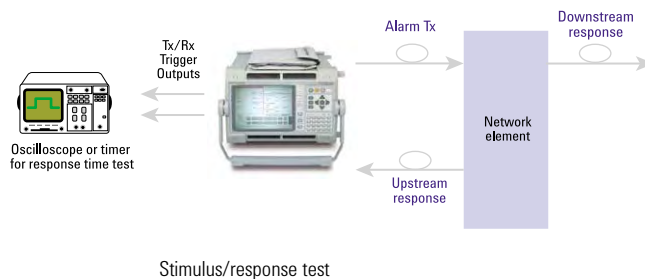
Confirm your network subsystems are

functioning correctly

Automatic protection switching helps keep networks alive and maintains customer quality of service. The OmniBER OTN analyzer's service disruption test lets you quickly and accurately determine the impact of a protection switch on customer traffic. What's more, the analyzer performs measurements of service disruption time—not only with channelized payloads but concatenated payloads too—so you can check your devices against the recommendations.

Check ITU-T G.709 FEC performance easily

More devices are using forward error correction (FEC) to enable longer optical spans or to improve error performance. Use the OmniBER OTN analyzer to generate valid FEC blocks, add correctable and uncorrectable errors, and measure FEC performance. This capability is essential to ensure integrity of your designs.



The OmniBER OTN family combines cutting-edge technology with OmniBER's renowned test integrity and reliability.

- Simultaneous monitoring of all STS/AUs
- Frame, overhead and sequence capture
- Framed and unframed testing
- Alarm stress testing
- Event triggering



OmniBER OTN 10 Gb/s communications performance analyzer

Versatile receive and transmit triggers

How quickly your devices respond in a crisis is a critical design goal. The analyzer's event triggers let you check the speed network elements respond to events, anomalies or defects—giving you greater confidence of their real-life performance. Furthermore, when creating new designs or debugging intermittent problems, sequence generation and capture capability along with flexible triggering help you resolve tricky problems with ease.

Direct overhead access

The OmniBER OTN analyzer gives you direct access to overhead bytes. This means you can verify that the device-under-test (for example, mux/demux) is performing termination and pass-through operations accurately, giving you confidence in your design.

Capture the overhead to solve intermittent problems fast

By capturing the complete overhead (SONET, SDH or optical channel) the analyzer lets you quickly pin-point error, alarm or pointer problems without wasting time waiting to see them happen.

Detect every bit error with unframed testing

To guarantee detection of any bit error, unframed PRBS signals can be used to test devices such as optical transceivers. The OmniBER OTN provides unframed operation at all optical rates from 52 Mb/s to 10.71 Gb/s, plus electrical rates 1.5, 2, 8, 34, 45, 52, 140 and 155 Mb/s.

Stress test to the limit

When you're designing to comply with recommendations, stress your circuits to the limit and beyond. The OmniBER OTN analyzer's alarm stress test capability lets you verify that alarms work under extreme network conditions.

An active response from OmniBER OTN

With active APS, the OmniBER OTN analyzer can simulate a network element—responding intelligently to any received K1/K2 messages for independent verification of your device-under-test.

Cost effective solutions

Four OmniBER OTN 10 Gb/s options are available to help you tailor your test equipment to your specific test applications:

- multi-rate to 10 Gb/s
- multi-rate to 10.71 Gb/s
- 10 Gb/s only
- 10 Gb/s and 10.71 Gb/s only

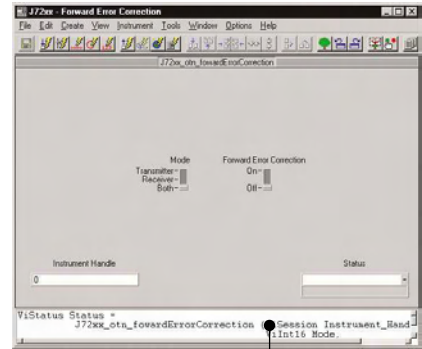
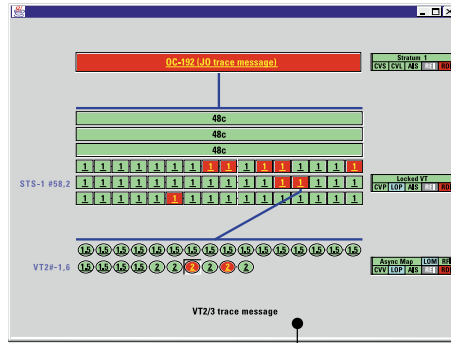
Performance summary

- Optical interfaces
Transmitter and receiver cover all rates from 1.5 Mb/s through 10 Gb/s (DS1 to OC-192/STM-64). In addition, the transmit and receive interfaces support optical channel functionality at 2.66 Gb/s (OTU-1) and 10.71 Gb/s (OTU-2) to ITU-T G.709
- Flexible signal levels
Structured SONET/SDH up to 10 Gb/s (OC-192/STM-64). Unframed PRBS capability at all rates. Optional optical channel at 2.66 Gb/s (OTU-1) and 10.71 Gb/s (OTU-2) to ITU-T G.709
- Output triggers for transmitter and receiver alarms and errors
- Simultaneous monitoring of all STS/AU signals
- Generation of mixed mappings
- Error and alarm generation
- Alarm stress test
- OTU-1 and OTU-2 frame capture
- Overhead sequence generation and capture
- Text set-up and monitoring of optical channel and SONET/SDH overhead labels
- Service disruption measurements and active APS
- Built-in power meter and frequency counter
- Graphical results
- Extensive, user-expandable on-line help
- Mouse operation

More measurements, more access,
more coverage, more versatility



Test smarter, not harder
 SmartTest is the gateway to fast, productive testing. Simply press the front-panel SMART TEST button to automatically configure the analyzer and access a full range of essential tests. Select SignalWizard to automatically identify the signal structure and payload right down to VT/TU sub-channels for fast fault finding.



Convenient features to increase your productivity:

- Floppy disk drive to store/recall graphic results, log results, store bitmaps of screen shots and install firmware upgrades.
- Clear connector layout with separate transmit and receive sections for simple test connection.
- GPIB, RS-232-C and LAN connections for remote control, USB for printer.

Faster testing with simultaneous all-channel test technology. Monitor up to 192 STS/AU channels simultaneously with the OmniBER OTN analyzer. Within any selected STS/AU channel, you can also explore the VT/TU sub-channels. This gives you an accurate picture of activity in the channel. For testing the latest next-generation devices, check out errors and alarms in real time, resolving problems and catching all intermittent faults as quickly as they

Click and point using UIDs and generate test programs in minutes. Reduce the time taken to generate test code using universal instrument drivers (UIDs). From your PC or workstation, you can quickly write test code without having to learn complicated set-up and measurement commands. Additionally, the UIDs let you create test programs from your preferred programming environment using platform-independent code.

	OmnibER OTN 10 Gb/s analyzer	OmnibER OTN 10 Gb/s analyzer with jitter	OmnibER OTN 2.5 Gb/s analyzer
SONET/SDH framing structures	•	•	•
OCh including FEC (G.709 compliant)	•	•	•
Mixed mappings generation	•	•	•
Alarm stress testing	•	•	•
Ethernet payload analysis			•
GFP and LAPS encapsulation			•
Virtual concatenation			•
Jitter/wander generation and analysis		•	
Structured and unstructured payloads	•	•	•
Bulk mapping and concatenated payloads	•	•	•
Service disruption measurement (during APS)	•	•	•
Optical power measurement	•	•	•
Overhead manipulation	•	•	•
Intrusive thru-mode	•	•	•
SignalWizard auto-setup facility	•	•	•
Contiguous concatenation	•	•	•
SONET: 3c/6c/9c/12c/24c/48c/192c	•	•	(192c excepted)
SDH: AU-4/2c/3c/4c/8c/16c/64c	•	•	(64c excepted)
1310 nm and 1550 nm optics	•	•	•
Rear mounted connectors (option)	•	•	•

Leading-edge jitter performance for testing SONET/SDH and optical channel devices

While jitter can't be eliminated from designs, it can be tested and minimized

High accuracy jitter testing to 10.71 Gb/s

Eliminate inconsistent jitter test results

When making jitter measurements, you need to have confidence in your test results. Agilent's J7231B OmniBER OTN jitter analyzer now provides high-accuracy jitter testing up to 10 Gb/s for both SONET/SDH and ITU-T G.709 optical channel line-rates, including OTU-2 at 10.71 Gb/s. Combining ultra-low and stable intrinsic jitter characteristics, it significantly exceeds the test equipment specification ITU-T O.172, giving you sufficient margin to develop and test components, line cards, and systems to the Telcordia GR-253 and ITU-T G.783 standards.

Reduce jitter test times by up to a factor of five

For rapid jitter measurements, the OmniBER OTN jitter analyzer has five digital filters, each with their own peak detector, for parallel measurement processing. Each filter generates results, and all filters can be used during gating. This leads to better correlation of events, and more consistent results. And it's available at all optical rates.

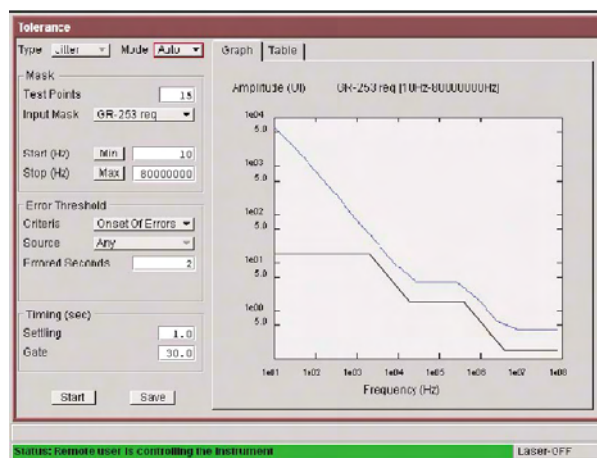
A single-box solution for all your jitter testing

The OmniBER OTN jitter analyzer offers jitter/wander generation, jitter/wander measurement, plus jitter tolerance to check the ability of your device's clock circuits to recover incoming bit sequences correctly in the presence of jitter. The analyzer also provides jitter transfer measurements to assess jitter amplification. This is vital in line systems where systematic jitter gain can accumulate to cause transmission errors.

Furthermore, the analyzer's jitter masks are more flexible than ever, and are ideal for design applications through to production where tailor-

made masks can be applied. For example, you can select specific frequency ranges and zoom in for closer scrutiny. And for margin testing, you can adjust the masks up or down by percentage increments to make testing more stressful.

This single-box solution delivers the speed and accuracy you demand, while giving you the confidence you need to ensure your SONET/SDH and ITU-T G.709 devices conform to international standards. And ensure that your devices avoid introducing noise or timing defects that could significantly compromise the error-free transmission performance of the transport network.



For convenience, graphical results are shown on the same display as the user-programmable parameters.

- SONET/SDH/OTN
- All optical jitter test: 52 Mb/s to 10.71 Gb/s
- Unframed
- Programmable tolerance/transfer
- Jitter vs time graph
- Parallel measurements
- External modulation
- Demodulated output
- Wander test: 52 Mb/s to 10.71 Gb/s
- MTIE/TDEV analysis
- Single rate option



OmniBER OTN 10 Gb/s communications performance analyzer with jitter

Reduce measurement uncertainty

The jitter contribution from test equipment needs careful consideration when designing devices and during production test. Optics, clock recovery and other components of a tester's design all contribute to its intrinsic jitter. And combined with stringent jitter standards, for example the 100 mUI jitter limit as specified in Telcordia GR-253 and ITU-T G.783, high intrinsic jitter in test equipment will prevent you making reliable jitter measurements.

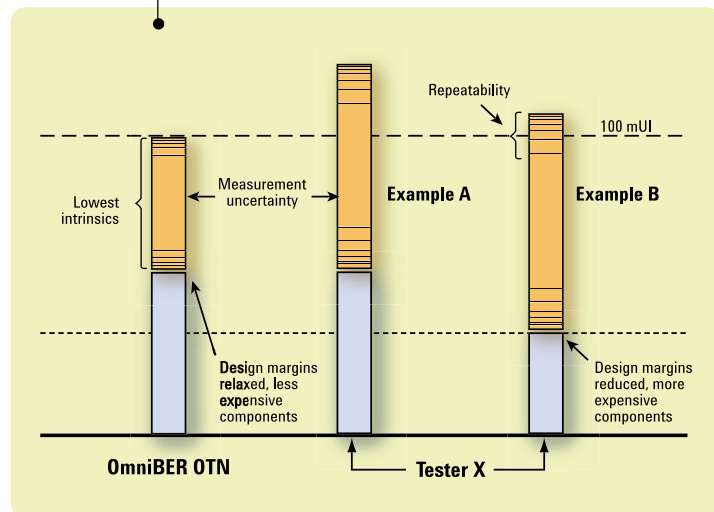
Of course, decision-making based on inaccurate measurements can lead to costly re-work, redesign or, worse, poor quality products entering the market place. But how do you know if your test set is measuring correctly? The answer is accuracy and repeatability.

The OmniBER OTN jitter analyzer's accuracy based on low intrinsics leads the industry, letting you see problems other testers won't let you see. And because you won't miss defects that are masked by limitations in the test equipment, you get faster test times, faster throughput, and higher quality. What's more, you can be confident of reliable measurements first time round so you don't have to keep re-testing marginal results.

Accuracy, driven by low intrinsics, and repeatability are key when making jitter measurements. Below, the grey bars indicate the design margin, that is, the jitter contribution from the device-under-test (DUT). The orange bars represent the jitter contribution from the test equipment.

If the 100 mUI limit, indicated by the upper dotted line, is crossed, then the DUT fails. The OmniBER OTN analyzer (left) exhibits the lowest intrinsics, in other words, the shortest orange bar. Typical testers such as Tester X (center and right) exhibit higher intrinsics.

In example A, the 100 mUI limit is crossed. This results in a failure despite the DUT having the same design characteristic as that tested by the OmniBER OTN jitter analyzer. In example B, a DUT exhibiting a lower jitter contribution has also been failed by Tester X through poor test repeatability, arbitrarily passing and failing the DUT.



The OmniBER OTN analyzer's lowest intrinsics reduces measurement uncertainty.

Get to market first with next-generation SONET/SDH and Gigabit Ethernet devices

The OmniBER OTN 2.5 Gb/s analyzer gives you everything you need to test devices and systems to OC-48/STM-16 —and more besides

Next-generation SONET/SDH testing

Ensure standards compliance for your next-generation SONET/SDH products

As telecom and datacom networks merge, next-generation, bandwidth-efficient devices need to be created for the network. This, of course, presents new test challenges to ensure standards compliance and Ethernet over SONET/SDH interoperability.

A range of tests are also needed to verify the basic operation of the network element such as error free transmission, basic error and alarm handling, and the correct configuration of specific operating characteristics such as individual payload mapping/de-mapping, path provisioning and protection switching. This job is made more difficult by the need to track and correctly interpret the new and evolving standards such as the ITU-T G.7041 standard for Generic Framing Procedure (GFP), the ITU-T X.86 standard for Link Access Protocol over SDH (LAPS), and the ITU-T G.707 revised standard for

next generation Virtual Concatenation.

Industry's first compliant test capability for GFP/LAPS and Virtual Concatenation (ITU-T G.7041, X.86 and G.707)

The J7232A OmniBER OTN 2.5 Gb/s analyzer is the industry's first analyzer to test the mapping of Ethernet into SONET/SDH (EoS) according to ITU-T G.7041 GFP and ITU-T G.707 (high and low order) virtual concatenation. The analyzer also offers an integrated test solution for ITU-T X.86 LAPS encapsulation, and includes support for the arbitrary contiguous concatenations of STS-6c/AU-4-2c, STS-9c/AU-4-3c and STS-24c/AU-4-8c.

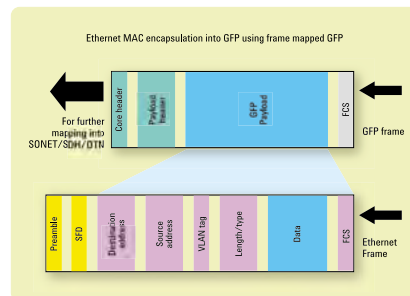
This unique combination of EoS encapsulations and virtual concatenation means you can comprehensively test next-generation SONET/SDH devices against these new standards for greater confidence in EoS interoperability with

other vendors network equipment.

Using the OmniBER OTN analyzer's in-depth test capability, you can test device integrity and pinpoint problems in fully structured, mixed payload signals. You can identify and analyze defective signals in the SONET/SDH concatenation layer, encapsulation layer, even the Ethernet payload layer. Indeed, the OmniBER OTN analyzer is the only tester in the multi-service environment that allows access to the payload on the SONET/SDH line side, allowing you to test and confirm the integrity of each layer.

Not only does this ensure that you can identify and eliminate defects before your devices are deployed in the network. But quality products can be brought to market faster, with more defects being caught in the early design stages rather than in production where it's an expensive fix.

The analyzer also provides complete programming flexibility for your concatenation, GFP/LAPS and Ethernet MAC framing structures, enabling you to stress your device capabilities to the maximum.



- Multi-rate up to OC-48/STM-16
- High and low order SONET/SDH virtual concatenation
- GFP and LAPS encapsulations
- Gigabit Ethernet payload analysis
- SONET arbitrary concatenations: STS-3c, STS-6c, STS-9c, STS-12c, STS-24c and STS-48c
- SDH arbitrary concatenations: AU-4, AU-4-2c, AU-4-3c, AU-4-4c, AU-4-8c and AU-4-16c
- Mixed mappings

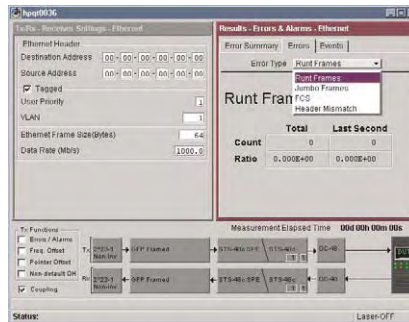
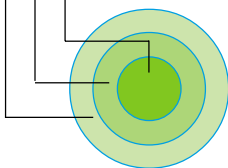


OmniBER OTN 2.5 Gb/s communications performance analyzer with Ethernet over SONET/SDH support

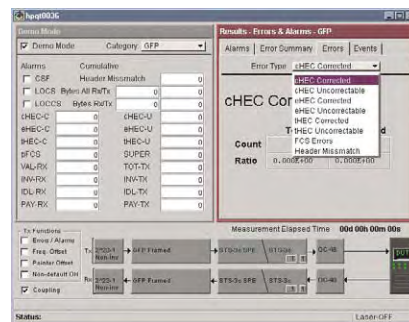
Performance summary

The OmniBER OTN 2.5 Gb/s analyzer offers compliance testing for:

- SONET/SDH concatenations (Telcordia GR-253, ITU-T G. 707 and ITU-T G. 7041)
 - GFP Transparent/Framed (ITU-T G. 7041)
 - LAPS (ITU-T X.86)
 - Ethernet MAC (IEEE 802.3)



Flexible Ethernet payload construction capability allows you to configure Ethernet frames easily



Flexible GFP configuration along with ease of handling error and alarm handling

Test capability

- Transmitter and receiver cover all rates from 1.5 Mb/s through 2.5 Gb/s (52 Mb/s to 2.5 Gb/s optical interfaces)
- Structured SONET/SDH up to 2.5 Gb/s
- Stress test capabilities for ITU-T G. 707 (high and low order) virtual concatenation, including differential delay generation and analysis of virtual group containers.
- Stress test capabilities for ITU-T G. 7041 and ITU-T X.86, including access to all relevant GFP/LAPS bytes
- Complete test coverage for contiguous and arbitrary concatenation of STS-3c/AU-4, STS-6c/AU-4-2c, STS-9c/AU-4-3c, STS-12c/AU-4-4c, STS-24c/AU-4-8c and STS-48c/AU-4-16c
- Event triggering for transmitter and receiver alarms and errors
- Simultaneous monitoring of all STS/AU signals
- Error and alarm generation
- Overhead sequence generation and capture

Product literature

You'll find further details of the OmniBER OTN platform's capability in the product specifications:

- publication no. 5988-3653EN (10 Gb/s)
- publication no. 5988-6708EN (10 Gb/s jitter)
- publication no. 5988-6836EN (2.5 Gb/s)

and configuration guide:

- publication no. 5988-3654EN (10 Gb/s)
- publication no. 5988-6834EN (10 Gb/s jitter)
- publication no. 5988-6835EN (2.5 Gb/s)

or at www.agilent.com/comms/otn

Related Products

OmniBER XM Network Simulator

The Agilent OmniBER XM network simulator offers fast and thorough system verification test (SVT) to accelerate the time to market of next-generation SONET/SDH and metro network equipment. With multi-channel, multi-port, multi-rate and multi-user capability, the OmniBER XM can generate (in terminate or intrusive-thru mode) realistic network signals using mixed payloads, with errors and alarms, on up to 192 channels simultaneously. This replicates real network conditions to truly stress-test network elements, and increases the effectiveness of verification test. The OmniBER XM also simultaneously measures each channel for errors, alarms, APS switching durations, and correct connectivity, reducing test times and uncovering all performance issues.



For more information on the OmniBER XM Network Simulator, refer to publication number 5988-6647EN.



Agilent Technologies manufactures the OmniBER OTN family under a quality system approved to the international standard ISO 9001 plus TickIT (BSI Registration Certificate No FM 10987).

Agilent Technologies' Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.



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(fax) (305) 269 7599

China:
(tel) 800 810 0189
(fax) 1 0800 650 0121

Taiwan:
(tel) 080 004 7866
(fax) (886 2) 2545 6723

Europe:
(tel) (31 20) 547 2323
(fax) (31 20) 547 2390

Other Asia Pacific Countries:
(tel) (65) 375 8100
(fax) (65) 836 0252
Email: tm_asia@agilent.com

Japan:
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

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