



## Need to test BER?

Complete solutions  
for high speed digital  
transmission testing.



**Agilent Technologies**  
Innovating the HP Way

# Flexible and Focused Solutions from Agilent Technologies

Bit error ratio (BER) testing is becoming the standard figure of merit in more and more industries. The demands in each are also increasing, with data rates soaring, new formats appearing every month, and less time allowed for the development cycle. In this new environment, you need test equipment that keeps pace and will grow with you. From general

purpose solutions that apply across wide ranges of applications, to focused instruments that are optimized for specific tasks with reduced cost per test.

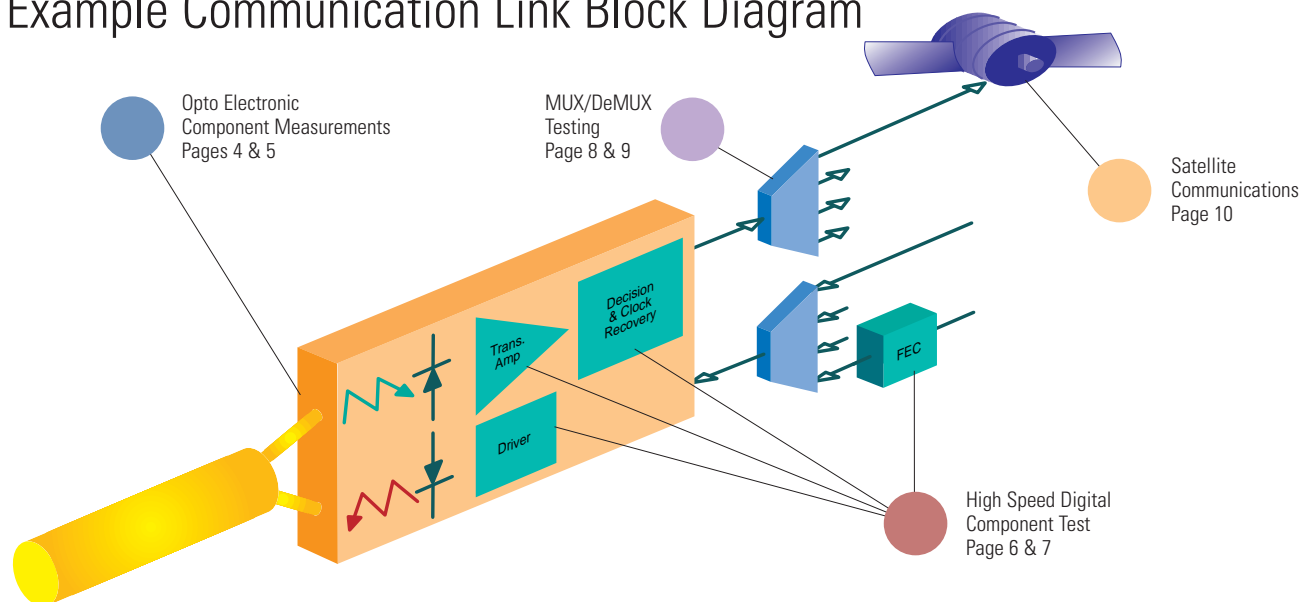
Here we show you the breadth of general purpose BER-related solutions from Agilent, and how they might fit into your testing toolbox.

In each case, more specific information on how they might be tailored to your needs is available by either contacting us, or ordering additional literature. (See back pages)

For every testing scenario, we have a solution to give you confidence that you are getting the complete picture, at the best value.

| Test Solution  |     | BERT Solutions |                    |                     |                    | Jitter | Eye Diagrams | Optical Convertors<br>e.g. 83430A |
|--|-----|----------------|--------------------|---------------------|--------------------|--------|--------------|-----------------------------------|
|  |     | ParBERT 81250  | 86130A BitAnalyzer | 71612B 12 Gb/s BERT | J422xA SpectralBER |        |              |                                   |
| Application Area   |     |                |                    |                     |                    |        |              |                                   |
| <b>Optoelectronic Components</b><br><i>e.g. Optical Transceivers</i><br><i>See pages 4 &amp; 5</i>                   | R&D |                | •                  | •                   |                    | •      | •            | •                                 |
|  | Mfg | •              | •                  | •                   | •                  | •      | •            | •                                 |
| <b>High Speed Digital Components</b><br><i>e.g. FEC chips, clock recovery circuits</i><br><i>See pages 6 &amp; 7</i> | R&D | •              | •                  | •                   |                    | •      | •            |                                   |
|  | Mfg | •              | •                  | •                   |                    |        | •            |                                   |
| <b>Mux/ Demux</b><br><i>e.g. OC-48, OC-192, OC-768 SERDES</i><br><i>See pages 8 &amp; 9</i>                          | R&D | •              | •                  | •                   |                    |        | •            |                                   |
|  | Mfg | •              | •                  | •                   |                    |        |              |                                   |
| <b>Satellite Communications</b><br><i>e.g. Link measurements</i><br><i>See page 10</i>                               | R&D |                | •                  | •                   |                    |        | •            |                                   |
|  | Mfg |                | •                  | •                   |                    |        |              |                                   |

## Example Communication Link Block Diagram



# Comparisons at a glance

| <b>Common Bit Rates</b>      | ParBERT<br>81250      | 86130A<br>BitAnalyzer | 71612B<br>12 Gb/s BERT | J422xA<br>SpectralBER |
|------------------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Frequency Agile Solution     | 1 Mb/s -<br>2.66 Gb/s | 50 Mb/s -<br>3.6 Gb/s | 100 Mb/s -<br>12 Gb/s  |                       |
| 155 Mb/s OC-3/STM-1          | •                     | •                     | •                      | •                     |
| 622 Mb/s OC-12/STM-4         | •                     | •                     | •                      | •                     |
| 1.25 Gb/s Gigabit Ethernet   | •                     | •                     | •                      | •                     |
| 2.48 Gb/s OC-48/STM-16       | •                     | •                     | •                      | •                     |
| 2.66 Gb/s OC-48 FEC          | •                     | •                     | •                      |                       |
| 3.125 Gb/s 10x Gbit Ethernet |                       | •                     | •                      |                       |
| 9.95 Gb/s OC-192/STM-64      |                       |                       | •                      |                       |
| 10.7 Gb/s OC-192 FEC         |                       |                       | •                      |                       |

| <b>Measurements</b>       | ParBERT<br>81250 | 86130A<br>BitAnalyzer | 71612B<br>12 Gb/s BERT | J422xA<br>SpectralBER |
|---------------------------|------------------|-----------------------|------------------------|-----------------------|
| BER                       | •                | •                     | •                      | •                     |
| Parallel BER              | •                |                       |                        |                       |
| Receiver sensitivity      | •                | •                     | •                      | •                     |
| SONET/SDH framed data     |                  | •                     | •                      | •                     |
| PRWS                      | •                |                       |                        |                       |
| Basic Error Location      |                  | •                     | •                      |                       |
| Advanced Error Analysis   |                  | •                     |                        |                       |
| FEC emulation             |                  | •                     |                        |                       |
| 'Q' factor                |                  | •                     | •                      |                       |
| Jitter (adding 71501C)    |                  | •                     | •                      |                       |
| Variable voltage          | •                | •                     | •                      |                       |
| Variable clock/data delay | •                | •                     | •                      |                       |
| Propagation delay         | •                |                       |                        |                       |
| Power dissipation         | •                |                       |                        |                       |
| Setup and hold times      | •                |                       |                        |                       |
| Device control signals    | •                |                       |                        |                       |

| <b>Form Factor</b> | ParBERT<br>81250 | 86130A<br>BitAnalyzer | 71612B<br>12 Gb/s BERT | J422xA<br>SpectralBER |
|--------------------|------------------|-----------------------|------------------------|-----------------------|
| Bench top          |                  | •                     | •                      |                       |
| VXI-based          | •                |                       |                        | •                     |

# Optoelectronic Component Measurements

- OC-12
- Fibre Channel
- Gigabit Ethernet
- OC-48
- OC-192
- 10x Gigabit Ethernet

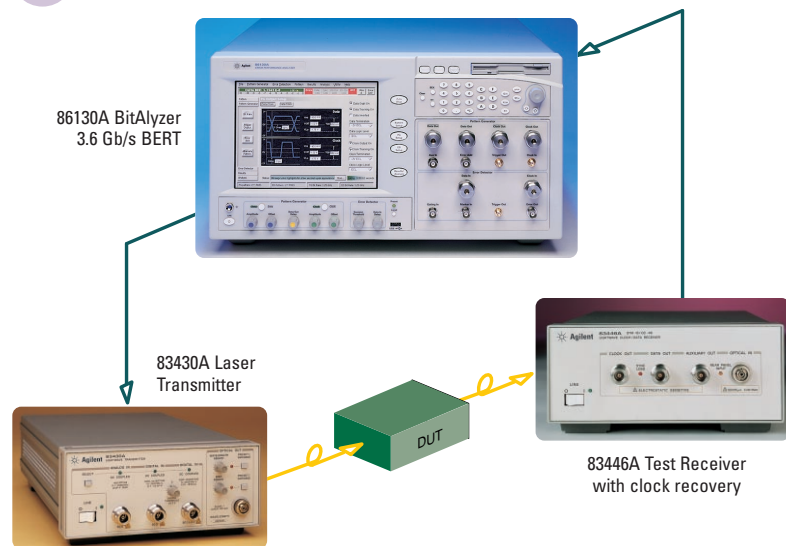
Designing competitive optical components for LAN and WAN applications requires faster time-to-market than ever before. Whether you are at the design, manufacturing or QA stages, we have focused our energies on saving you time. This becomes apparent from the first

time you use one of these instruments, with easy access to features and the minimum of relearning if you have been away from one for a while. However, it doesn't end there. We have worked to provide measurements that you can be confident in the first time.

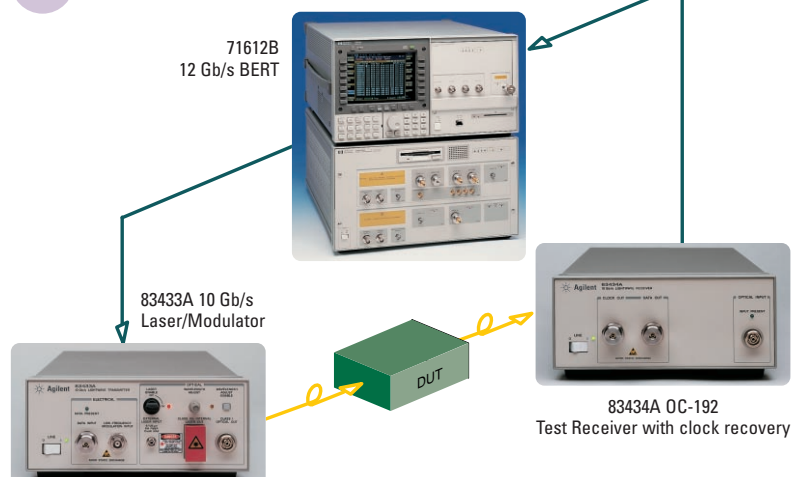
## Design

In the design environment, you quickly need to verify component performance and focus in on problems. Intuitive instrument setup, immediate visibility of settings, and an excellent waveform are only part of the solution. The Agilent 86130A BitAnalyzer® includes SyntheSys Research error analysis capabilities. These powerful and innovative features provide insight into the underlying causes behind the error conditions that you may encounter.

### Solutions to OC-48



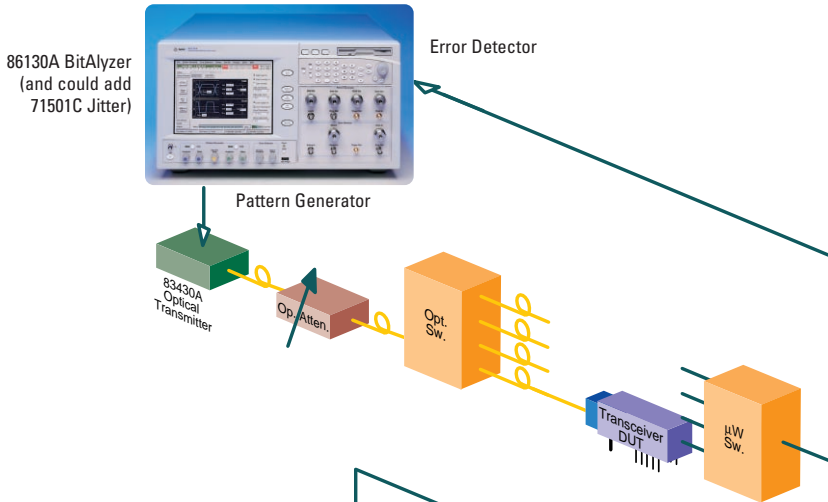
### Solutions to OC-192



# Manufacturing and QA Test

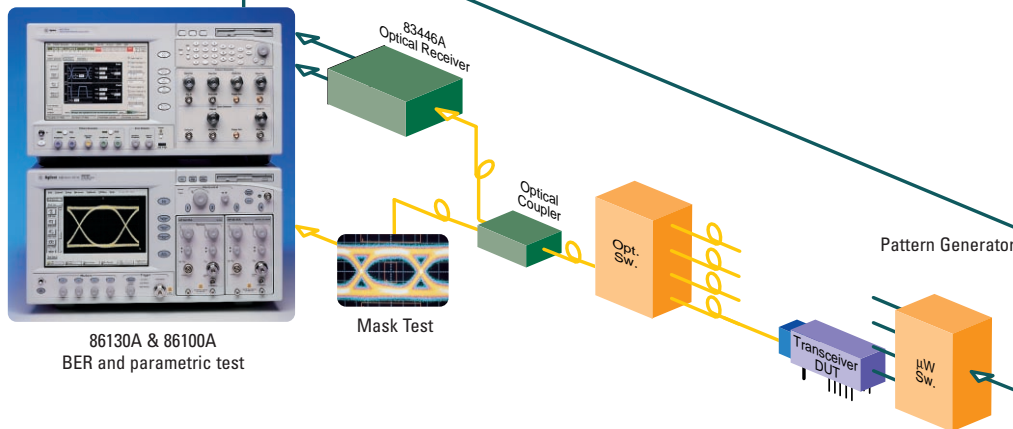
## Test Compliance to International Standards

### Receiver test



In optical transceiver testing we aim to save you test time. Harness the 86130A (for measurements up to 3.6 Gb/s) or the 71612B (up to 12 Gb/s) with the Agilent 86100A Infiniium DCA. Easy setup BER measurement, and fast go/no-go mask testing combine for fast throughput. Measure receiver sensitivities, and add the Agilent 71501C to characterize jitter.

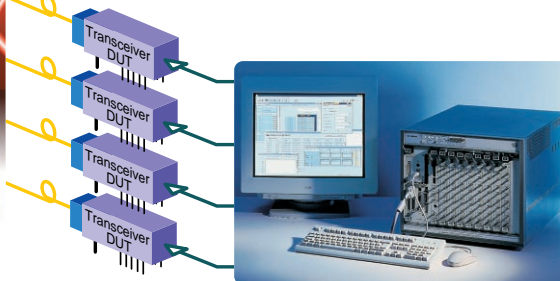
### Transmitter test



## Lower Cost, Quick Testing

In the manufacturing environment devices and modules need to be tested in seconds. Whether you are testing multiple transmitters or multiple receivers, reducing cost per test is crucial. These solutions offer you:

- Scalability to many channels on a VXI platform
- Flexibility to upgrade your manufacturing line between bit rates up to OC-48
- Reduced test time
- Cost effectiveness
- Space effectiveness



ParBERT 81250 electrical channels

# High Speed Digital Component Test

- **FEC circuits**
- **Clock recovery circuits**
- **Decision circuits**
- **Trans-impedance amplifiers**

To have confidence that your components will keep your customers satisfied under every condition, you need to know how they will perform to their limits. Here, flexibility in bit rate, pattern, voltage and timing allow you to stress your designs to the maximum.

## What are the errors telling you about your component design?

Understanding how errors occur is a major step towards fixing them. Advanced error analysis helps to reveal the underlying causes.

- Are your errors really random?
- Are you observing sensitivity to particular patterns?
- If so, which patterns?
- Are there interference effects occurring?

The 86130A error analysis features are designed to make answering these questions a lot easier.



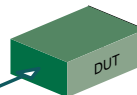
## Clock Recovery Circuits

The 71501C jitter analysis system provides advanced jitter analysis of high-speed digital communication waveforms and the components which generate them.

- Use with 71612B 12 Gb/s BERT or 86130A BitAnalyzer 3.6 Gb/s BERT
- Frequency agile
- Automatic SDH/SONET compliance tests



71501C  
Jitter Analysis System

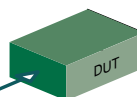


## OC-192 Testing

OC-192? No Problem!

Whether you are testing optical, electrical, telecom or 10x Gigabit Ethernet line cards, you will need test flexibility as well as superb waveform integrity. The 71612B offers these, and may be combined with 71501C for jitter measurement, and the 86100A Infiniium DCA for eye diagram analysis.

71612B  
12 Gb/s error  
performance  
analyzer





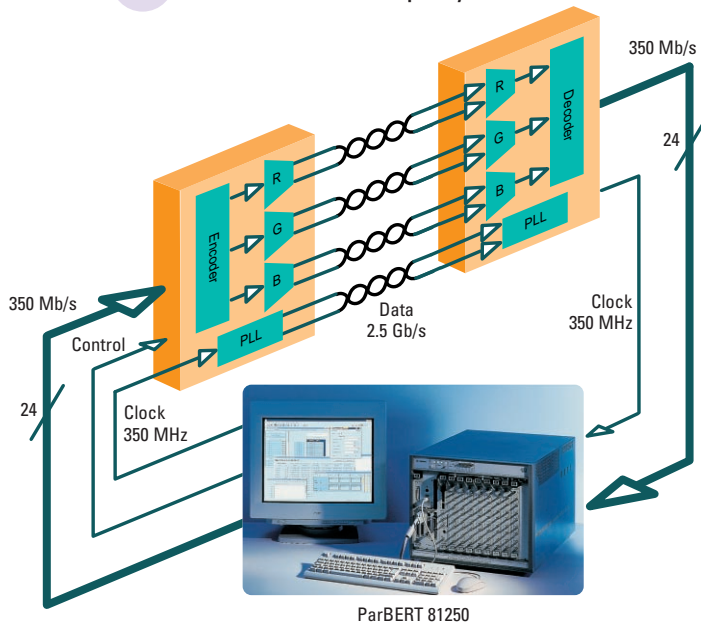
# Complete Solutions for MUX/DeMUX Testing

- Up to OC-768 MUX/DeMUX
- Fibre Channel
- Gigabit Ethernet
- Flat panel display link
- System I/O

More and more standards are emerging for moving data from one location to another – whether that journey is between cities, computers, or even within the equipment itself. As these new technologies evolve from proprietary to mainstream, you need test equipment that is flexible in bit rate and flexible in format. Before committing designs to production, be sure that you have exercised your circuits thoroughly to avoid problems later.

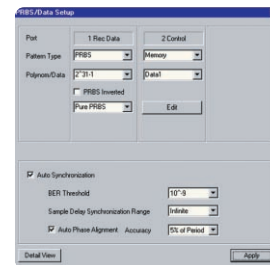
If you are working on 40 Gb/s OC-768 mux/demux devices, take a closer look at the Agilent ParBERT 81250. Measure back-to-back with a golden device and identify the cause of errors as early in the design phase as possible. Decrease time-to-market without waiting for 40 Gb/s BERT solutions.

## Flat Panel Display Link Measurement

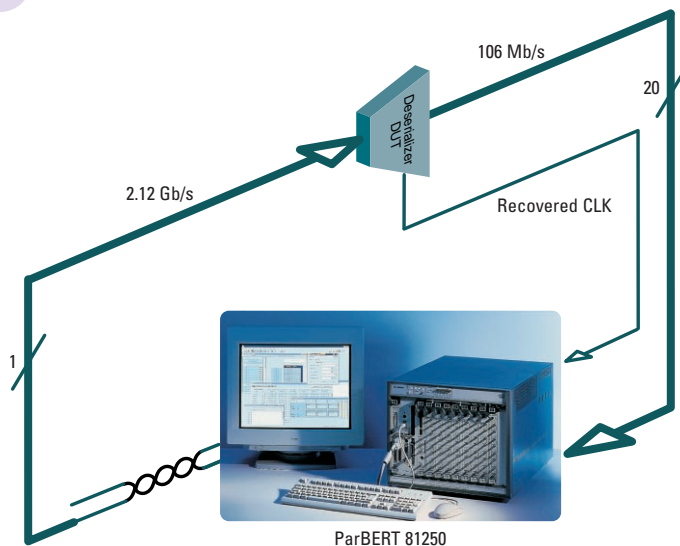


Test devices more quickly with the auto-synchronization function. Synchronization time is typically 100 ms.

- Generate and analyze real LVDS loads
- Run control gives you the flexibility to stimulate and measure with independent clocks and bit rates



## Fibre Channel DeMUX Measurement Example

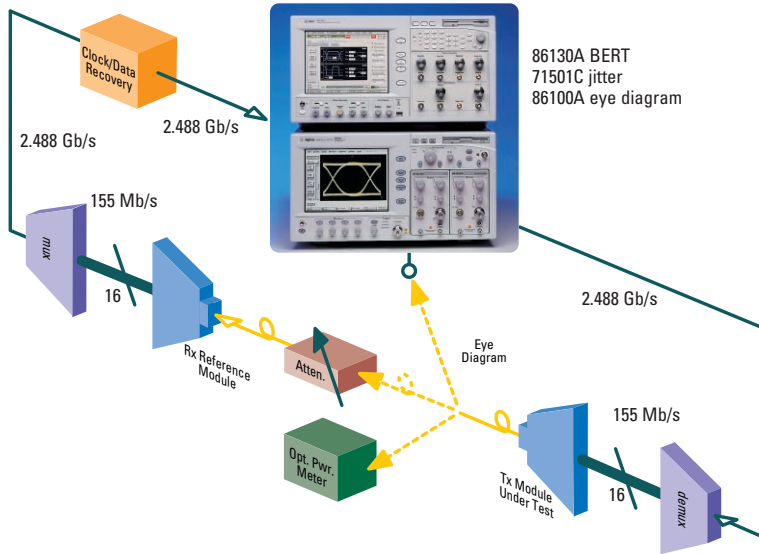


Synchronous parallel measurements mean there is no longer a need for a golden device.

- Fast memory-based data testing
- Reduced risk of undetermined errors
- Flexible testing that can be conditional upon DUT control signals

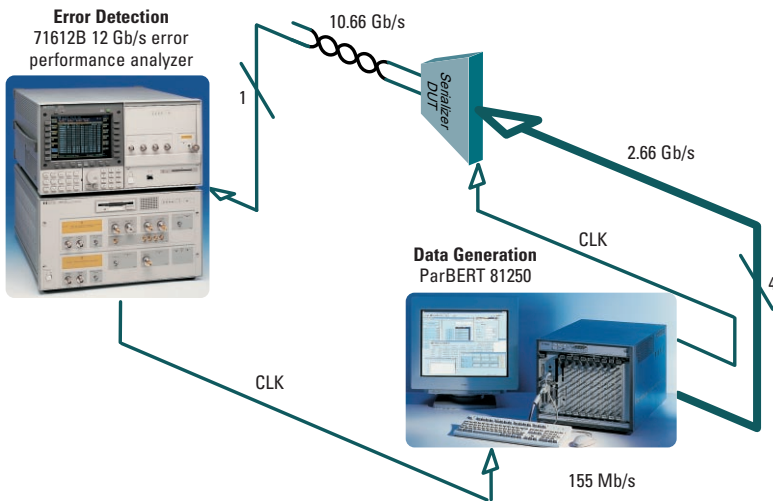


## Integrated Transmit/Multiplexer Module Test



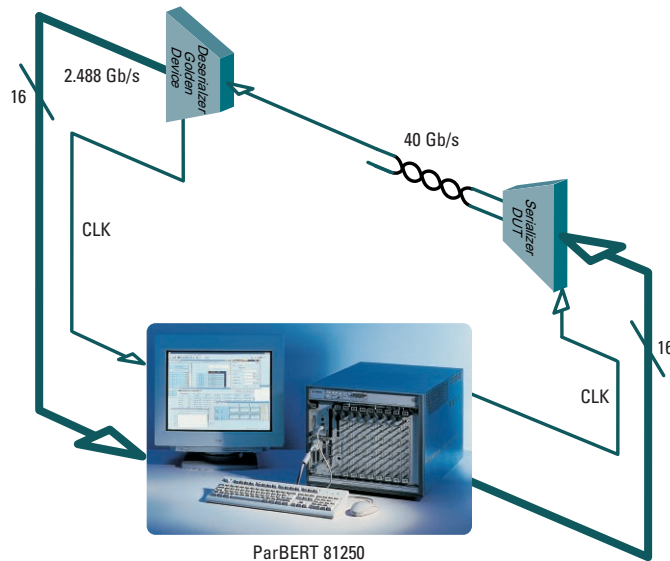
Here is a characterization method used in a manufacturing environment for parametric measurements, such as optical power, extinction ratio, optical jitter, and BER. The 86130A BitAlyzer analysis will also identify digital logic issues on each side of muxes and demuxes.

## OC-192 MUX Measurement with FEC



This combined solution for OC-192 mux/demux testing has a focused parallel solution on the stimulus side and excellent error detection capabilities on the output side. This solution allows you to comprehensively characterize multiplexer components.

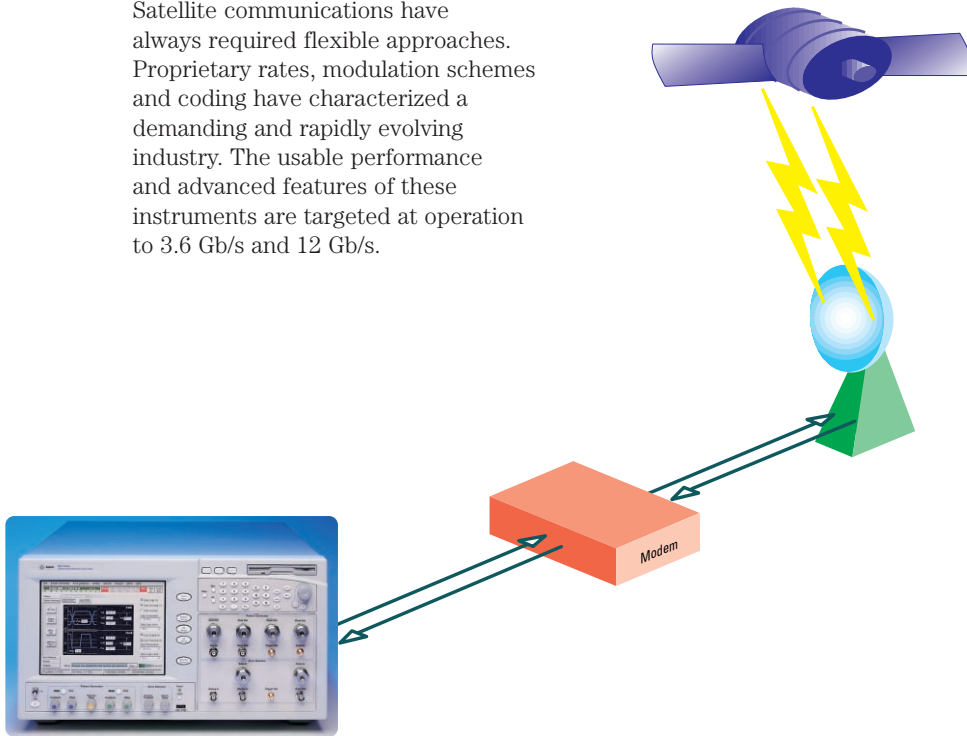
## OC-768 MUX Back to Back Measurement



When testing parallel to parallel, you can provide up to 32 parallel stimulus and 32 parallel error detection channels at speeds up to 2.66 Gb/s. This allows you to identify the cause of errors as early in the design phase as possible.

# Satellite Communications

Satellite communications have always required flexible approaches. Proprietary rates, modulation schemes and coding have characterized a demanding and rapidly evolving industry. The usable performance and advanced features of these instruments are targeted at operation to 3.6 Gb/s and 12 Gb/s.



Satellite communication applications that use I/Q or QAM modulation can suffer from bit errors derived from any of the following:

- Pattern sensitivities
- Coding error propagation
- Transmission burst errors
- Interference
- SNR

Each have unique error location signatures. The 86130A BitAlyzer highlights these and helps lead you to the underlying causes.

By studying exact bit error locations, BitAlyzer analysis can uncover relationships between errors allowing you to carry out repair or redesign activities. Or you can characterize coding performance completely, including impact upon bit and burst error statistics.

## 86130A BitAlyzer:

- 3.6 Gb/s operation with external clock
- Excellent waveform
- Advanced Error Location Analysis
- ECC emulation
- Intuitive Operation
- Easy channel coding development for channel optimization



## 71612B Error Performance Analyzer:

- 12 Gb/s operation
- 4 sub-rate outputs
- Flexible RAM patterns
- Excellent waveforms

# Product Descriptions



## 86130A BitAlyzer 3.6 Gb/s Error Performance Analyzer

The latest serial BER tester from Agilent Technologies, incorporating patented error analysis. This integrated Pattern Generator and Error Detector is designed to quickly solve your design and manufacturing problems. Complementing the new 86100A Infiniium DCA, the 86130A brings a new level of insight into your testing toolbox. Powerful analysis, easy setting and use, together in a small, expandable package makes digital testing easy.

- 50 Mb/s to 3.6 Gb/s with external clock
- 50 Mb/s to 3.0 Gb/s with internal clock source
- Excellent waveform performance
- Easy setup

For more information order the following literature:  
5968-8547E Product Brochure  
5968-8545E Technical Specifications



## 71612B 12 Gb/s Error Performance Analyzer

Ideal for OC-192/STM-64 testing of systems and components. The HP 71612B error performance analyzer addresses applications for high speed digital testing up to 12 Gb/s, including R&D and manufacturing test of lightwave components and sub-assemblies, advanced computer technology and high-capacity communication systems.

- 100 Mb/s to 12 Gb/s
- Excellent waveform performance
- Flexible architecture
- 'Q' and eye contour software available
- SONET pattern construction software available
- STM-64 and STS-192 samples supplied on disk

For more information order the following literature:  
5968-2810E Product Brochure



## ParBERT 81250 2.6 Gb/s Parallel Bit Error Ratio

ParBERT 81250 generates pseudo random word sequences (PRWS) and standard PRBS on parallel lines up to 2.6 Gb/s. Analyze bit error ratios with user-defined data, PRBS or mixed data.

- Scalable up to 64 channels
- Intuitive Windows®NT based user software
- Automatic synchronization
- Programmable single-ended differential analyzer
- Data generation and analysis with sequencing and looping
- Interface with DUT control signals

For more information order the following literature:  
5968-9188E Product Overview

# Product Descriptions



## J422XA SpectralBER

- 155 Mb/s, 622 Mb/s, 1.25 Gb/s, 2.488 Gb/s
- Framed and unframed PRBS
- ITU grid wavelength transmit options
- Optical transmit and receive
- Expandable from 4 to 64 channels

For more information:  
5968-4022E  
Product Brochure  
5968-5444E  
Technical Specifications



83433A Tx & 83434A Rx

## Instrument grade optical front-ends

### Transmitters

- 83430A Optical transmitter to 2.5 Gb/s with internal laser
- 83433A Optical transmitter for 2.5 Gb/s and 9.952 Gb/s with internal or external laser

### Clock/Data Recovery Receivers

- 83446A - 2.488 Gb/s
- 83434A - 9.958 Gb/s

For more information:  
83430A: 5965-5074E Product Overview  
83433A & 83434A: 5968-9251E  
83446A: 5964-1682E Product Overview

Agilent Lightwave Catalog  
5968-8000E  
Digital Design & Test Catalog  
5968-9327E



(Pictured here with 86130A above)

## 86100A Infiniium DCA

The ideal BERT companion – add eye diagram analysis with the 86100A Infiniium DCA.

- Designed to make complex tasks simple.
- Fast measurement throughput
- Modular platform, compatible with 83480A modules.

For more information order the following literature:  
5968-8548E Product Brochure  
5968-8546E Technical Specifications



## 71501C Jitter Analyzer

- Frequency agile
- Jitter transfer, tolerance, generation
- 50 Mb/s to >12 Gb/s
- Test clock-recovery chips to complete systems
- High accuracy

For more information:  
5965-0801E  
Product Overview  
5963-5353E  
Application Note

For more information about Agilent Technologies test and measurement products, applications, services, and for a current sales office listing, visit our web site,

[www.agilent.com/find/BERT](http://www.agilent.com/find/BERT)

You can also contact one of the following centers and ask for a test and measurement sales representative.

### United States:

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Test and Measurement Call Center  
P.O. Box 4026  
Englewood, CO 80155-4026  
(tel) 1 800 452 4844

### Canada:

Agilent Technologies Canada Inc.  
5150 Spectrum Way  
Mississauga, Ontario, L4W 5G1  
(tel) 1 877 894 4414

### Europe:

Agilent Technologies  
Test & Measurement  
European Marketing Organization  
P.O. Box 999  
1180 AZ Amstelveen  
The Netherlands  
(tel) (31 20) 547 9999

### Japan:

Agilent Technologies Japan Ltd.  
Measurement Assistance Center  
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