Agilent 86130A BitAlyzer®
Error Performance
Analyzer
Technical Specifications

General Features

Internal Hard Disk
For local storage of user patterns and data

Removable Storage
MS-DOS® compatible 3.5” Superdrive (accepts 1.4 Mbyte HD disks & 120 Mbyte SuperDisks™)

Data Entry
Touch-sensitive display, numeric keypad with up/down arrows, analogue feel position controls, or provided USB keyboard and mouse if desired.

Display
Internal 8” (diagonal) backlit LCD touch-screen

Interfaces
GPIB (IEEE 488), LAN (“10 Base T” Ethernet) for printing and file transfer, Parallel/Centronics printer port, external VGA output.

On-line Help
Context-sensitive On-Line help is included. Operation, programming and quick-start guides are also included and supplied on MS-Windows® compatible CD-ROM.

Accessories Supplied
USB compatible keyboard; mouse; stylus; Quick Start Manual on paper; Quick Start Card.
MS-Windows® compatible CD-ROM containing “PDF” files of Operating, Quick-Start, and Programming guides.
Power Cord; 6x APC-3.5 connector savers (female to female); 6x 50Ω APC-3.5 (male) terminations, 3x 1 metre SMA (male to male) cables.
Pattern Generator

Pattern Generator Parameters

**Operating Frequency**
- **Internal Clock Source**
  - Frequency Range: 50 MHz to 3.0 GHz
  - Frequency Accuracy: ±20 ppm

**Test Patterns**
- 2\(^N\)-1 PRBS: 2\(^{231}\)-1, 2\(^{23}\)-1, 2\(^{15}\)-1, 2\(^{10}\)-1, 2\(^7\)-1
- 2\(^N\) PRBS: 2\(^{23}\), 2\(^{15}\), 2\(^{10}\), 2\(^7\)

- **Variable Mark Density**
  - 1/8, 1/4, 1/2, 3/4, 7/8

**User Defined Patterns**
- Variable length patterns from 1 to 8 Mbits

**Alternating Patterns**
- Change between two equal length user patterns, each up to 4 Mbits long. Changeover is synchronous with the end of a pattern, under the control of the front panel or the Auxiliary Input.

**Error Add**
- Single, continuously variable between 1x10\(^{-2}\) and 1x10\(^{-9}\), and user specified bursts of errors.

**Pattern Editor**
- Fully flexible pattern editor included with “cut”, “copy” and “paste” functions.
Pattern Generator
Input/Output Specifications

Data and Data Outputs
Data and Data outputs are independently settable
- **Format:** NRZ
- **Polarity:** Normal or Inverted
- **Amplitude:** 0.5 to 2 V in 10 mV steps
- **Offset:** See figure below. 10mV resolution.
- **Data Outputs On/Off:** 'Off' goes to high impedance state

Supported Terminations:
- 0 V (LVTTL, SCFL, etc.), –2 V (ECL), +1.3 V (3.3 V PECL), AC-coupled
- **Jitter (pk-pk):** <20 ps, <12 ps typical
- **Transition Time (10–90%):** <45 ps typical
- **Variable Crossover:** Supported
- **Clock/ Data Delay Range:** 0–1 bit period or 10 ns, whichever is less. 1 ps resolution.
- **Interface:** DC-coupled 50Ω reverse terminated, APC-3.5 connector

Clock and Clock Outputs
Clock and Clock outputs are independently settable
- **Amplitude:** 0.5 to 2 V in 10 mV steps
- **Offset:** See figure below. 10mV resolution.
- **Clock Outputs On/Off:** 'Off' goes to high impedance state
- **Supported Terminations:**
  - 0 V (LVTTL, SCFL, etc.), –2 V (ECL), +1.3 V (3.3 V PECL), AC-coupled
  - **Transition Time (10–90%):** <45 ps typical
- **Interface:** DC-coupled 50Ω reverse terminated, APC-3.5 connector

Intrinsic Clock to data delay is constant at all frequencies.

Auxiliary Input
This has two functions.
1. Blanks the data outputs to allow the user to create bursts of data
2. If in Alternating Pattern mode, used to change between 'A' and 'B' patterns
- **Minimum pulse width:** 64 clock periods
- **Interface:** TTL compatible, 50Ω BNC female connector

Error Add Input
This allows injection of single errors by an external pulse generator into the transmitted test pattern synchronous with the rising edge of the pulse
- **Minimum pulse width:** 64 clock periods
- **Interface:** TTL compatible, 50Ω BNC female connector

Clock Input
Allows connection of an external clock source in order to extend the operating range of the instrument. Recommended clock sources Agilent 8648D and 83752A.
- **Frequency Range:** 50 MHz to 3.6 GHz
- **Amplitude Range:** +3 dBm to –3 dBm
- **Interface:** SMA female 50Ω, DC coupled to 0 V

Trigger Output
Provides a pulse to trigger a communication analyzer etc. It has two modes:
1. Divided Clock mode: pulses at 1/8th of the clock rate.
2. Pattern mode: pulse at a settable bit position within the pattern.
- **Minimum pulse width:** (Pattern mode) 64 bits
- **Output levels:** High –0.2 V, Low –0.9 V
- **Interface:** 50Ω SMA female
Error Detector Parameters

Operating Frequency
50 MHz to 3.6 GHz.

Test Patterns
As specified for Pattern Generator

Auto-Align
Includes synchronizing, data polarity, clock/data align, clock invert, 0/1 threshold center.

Data In Delay
Manual Data In Delay/Auto Clock-Data Align

Threshold Setting
Manual set, Average DC level set, Auto 0/1 center

Synchronization

Results
Accumulated measurements may be run once, repetitively or manual start/stop.
Delta (instantaneous) BER always available.

Manual start/stop

Time
Accumulate for periods from 1 second to 100 days

Errors
Until at least 10/100/1000 errors

Bits
107 to 1015 bits

Results are logged periodically to the hard disk for later export (in ‘CSV’ format) and analysis in a PC spreadsheet program.

Result Displays
Results are displayed under the following headings.

Delta BER Results
Delta Error Ratio, Delta Error Count, Graph of BER vs Time

Accumulated Results
Bit Count, Error Ratio, Error Count, Errored One Count, Errored Zero Count, Error Free Seconds, Errored Seconds, Elapsed Accumulation Time, Sync Loss Seconds, Power Loss Seconds, Graph vs Time

Eye Results
Eye Width, Eye Height, Eye Voltage Center value, Eye Time Center value, Delta Error Ratio at Eye Center on completion of Autoalign

Error Analysis*
Graphs of Burst Lengths, Error Free Intervals, Correlation Analysis, Pattern Sensitivity Analysis, Block Analysis, Strip Chart

Audible Error Indicator
Selectable to indicate Isolated Errors, Delta Error Ratio, Errors above user-defined threshold. On/Off Volume Control. Audible pitch changes, with higher pitch corresponding to higher BER.

* Burst Mode, Capture Synch and Error Analysis coming later.
## Error Detector
### Input/Output Specifications

#### Data Input
- **Polarity:** Normal or Inverted
- **Input Amplitude:** 0.1 to 2 V
- **Threshold Range:** +3 to –3 V
- **Threshold Resolution:** 0.5 mV
- **Terminations:** Via 50Ω to –2 V, 0 V, +1.3 V
- **Data Input Delay Range:** 0–1 bit period, or 10 ns whichever is less. 1 ps resolution
- **Interface:** DC-coupled 50Ω, APC-3.5 female connector

#### Clock Input
- Clock Input functions—switchable termination voltages, input frequency measurement, clock invert.
- **Bit Rate:** 50 MHz to 3.6 GHz
- **Data Sampling Clock Edge:** Selectable Rising or Falling
- **Amplitude:** 0.5 to 2 V
- **Terminations:** Via 50Ω to –2 V, 0 V, +1.3 V
- **Interface:** DC-coupled 50Ω, APC-3.5 female connector

#### Gating Input
- This is used to inhibit error counting
- **Minimum pulse width:** 64 clock periods
- **Interface:** TTL compatible, 50Ω BNC female connector

#### Marker Input
- Takes in reference marker signal to provide reference for Error Correlation Analysis
- **Pulse width:** 64 clock periods
- **Interface:** TTL compatible, 50Ω BNC female connector

#### Error Output
- Provides a pulse if one or more errors have been detected within the preceding 128 bit block.
- **Pulse Width:** 64 bits
- **Output Levels:** High +2.4 V, Low +0.4 V
- **Interface:** DC-coupled, reverse terminated 50Ω BNC female connector

#### Trigger Output
- Provides a pulse to trigger a communication analyzer etc.
- It has two modes:
  1. Divided Clock mode: pulses at 1/8th of the clock rate.
  2. Pattern mode: pulse at a fixed bit position within the pattern.
- **Pulse width** (Pattern mode): 64 bits
- **Output levels:** High –0.2 V, Low –0.9 V
- **Interface:** 50Ω SMA female
**External Parameters**

*Environmental*
- **Warm-up time**
  30 minutes
- **Operating Temperature Range to specification**
  10 to 45°C
- **Humidity**
  15 to 95% at 45°C non-condensing

*Electrical*
- **Supply Voltage Parameters**
  90 V–250V AC, 50–60Hz
- **Power Consumption**
  <500W
- **EMC**
  EU EMC Directive (CE-Marked)

*Support*
- **Warranty**
  1 year
- **Calibration**
  2 year cycle, return to Agilent Technologies

**Physical**

*Dimensions*
426 W x 215 H x 527 D mm approx (16.8” W x 8.5” H x 20.7” D approx)

*Weight*
20 kg (44 lbs)
# Ordering Information

- **86130A BitAlyzer** 3 Gbit/s BitAlyzer with basic error analysis features
  (for 3.0 Gbit/s BER measurement and analysis with internal clock source, 3.6 Gbit/s with external clock source)
- **Option 100** 2-D error mapping*
- **Option 200** Error correction coding analysis*
- **Option 300** Add 8648D 4.0 GHz external synthesized signal source
- **Option 0B1** Hard copy programming manuals
- **Option AX4** Mounting kit for 19" rack, without handles
- **Option AXE** Mounting kit for 19" rack, including front handles

## Recommended Product Accessories

**Torque Wrench:**
- **8710-1765** For APC 3.5 connectors

**Cable:**
- **8120-4948** 1m SMA cable

**Blocking Capacitor:**
- **11742A** 45 MHz to 26.5 GHz, APC-3.5 mm

**Bias Network:**
- **11612A** 45 MHz to 26.5 GHz, APC-3.5 mm

**Attenuators:**
- **8493C option 003** 3 dB APC 3.5 pad
- **8493C option 006** 6 dB APC 3.5 pad
- **8493C option 010** 10 dB APC 3.5 pad
- **8493C option 020** 20 dB APC 3.5 pad

**Transition Time Convertors:**
Used to slow the output waveform rise/fall times if desired. SMA male to SMA female connectors.
- **15435A** 150 ps output transition time
- **15432B** 250 ps output transition time
- **15433B** 500 ps output transition time
- **15434B** 1000 ps output transition time
- **15438A** 2000 ps output transition time

* Contact factory for availability

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

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Mississauga, Ontario
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