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Anritsu

MP1630B

Digital Data Analyzer

10 kHz to 200 MHz



16-Channel PPG and ED in One Cabinet
Eye Diagram Measurement Based on BER

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Seamless Testing of Digital Equipment in Communications, Computing and Broadcasting Fields

The MP1630B is general-purpose bit error measuring instrument that can simultaneously measure multi-channel signals and burst signals at up to 200 MHz. The analyzer runs under the Microsoft® Windows® operating system version 3.1 and has a bright 10.4" TFT color LCD with touch screen and 1 GB HDD for easy-to-use operation.

The MP1630B is not only for continuous signals —— it can measure burst-signal bit error rates as well. Consequently, it is easily able to handle burst signals used by TDMA (Time Domain Multiplex Access) methods and packet/cell transmissions, etc. Both a Pulse Pattern Generator Unit and Error Detector Unit can be installed in the MP1630B, to measure simultaneously parallel data for 16 channels using just one unit. In addition, the eye margin measurement function can be used to measure the threshold margin and the phase margin at a specific error rate. This data can be displayed graphically in an eye margin diagram. This function cannot be measured with an oscilloscope. The eye margin measurement is very useful for analysis of all the margins of the data signal.

The MP1630B is for a wide range of applications from R&D to manufacturing next-generation multimedia devices and digital equipment.

Main Functions

Built-in 16-Channel Pulse Pattern Generator and Error Detector Units

- 16-Channel Data, Clock and Trigger I/O
- 8-Channel AUX Output (Reset/Envelope Signal)

Continuous/Burst Signal Bit Error Measurement

- Variable Burst Cycle, Guard Time (Bit Units)
- Variable Bit Length for Preamble, Overhead, and Information Bit for Each Channel

Full Lineup of Patterns for Each Transmission Method

- PRBS (2^n – 1, n = 7 to 31, variable mark ratio)
- PRGM (Programmable 64 kb/ch)
- Zero Substitution Pattern
- Mixed Pattern (Any PRGM and PRBS selectable)
- PON Pattern (for Testing Passive Optical Network Modules)

High-Performance Synthesizer

- 1 to 200 MHz (1 kHz Steps), 10 kHz to 1 MHz (100 Hz Steps), ±2 ppm Accuracy
- Optional Built-in Jitter Modulation Function

Auto Search Function

- PRBS Identification
- Clock Phase and Data Threshold

Error Analysis Functions

- Error Performance Measurement (ITU-T Rec. G.821)
- Eye Margin Measurement
- Delay Measurement

Excellent Operability

- Large, Clear Color LCD with Touch Screen
- Windows 3.1 OS

Applications

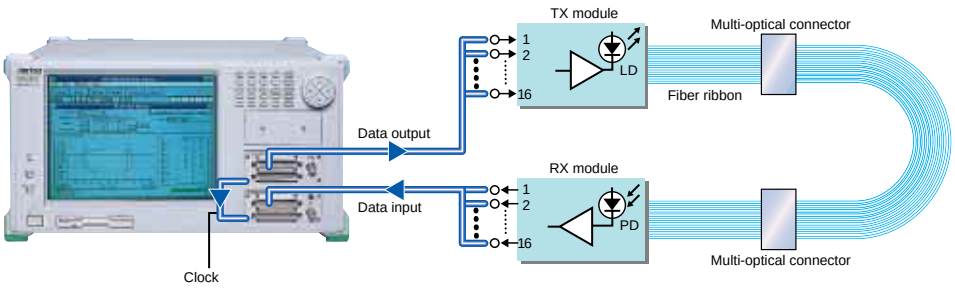
- Testing Multi-channel Modules for Optical Interconnection
- E/O, O/E Evaluation for Optical Networks (PON/PDS)
- Testing SDH/ATM Equipment and Modules
- Testing Cable Modems for Digital CATV
- R&D on TDMA
- R&D on Wireless LAN Peripherals
- Evaluating Next-Generation PC Interfaces (Fiber Channel, IEEE 1394, SSA, ATM-25)
- Evaluating Digital Demodulators including QPSK/QAM, etc.
- Evaluating IrDA Communications Equipment
- Evaluating Communications LSIs, ASICs/FPGAs and CCDs, etc

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Essential Tool for Multimedia Era

●Simultaneous Bit Error Measurement of 16 Channels

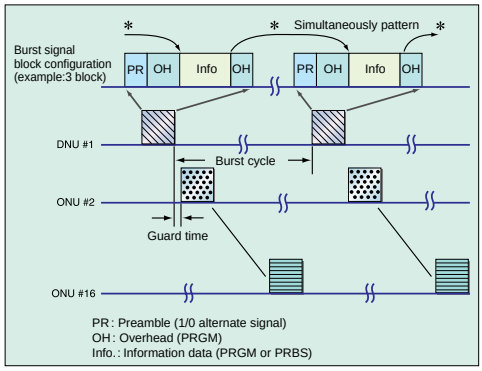
The MP1630B has 16-channel Pulse Pattern Generator and Error Detector Units, and can measure bit errors in parallel and simultaneously. Conventional measurement method was not economical for continuous evaluation of the performance of each route of devices with N:N input/output ports by switching inputs and outputs using a selector. Using the MP1630B shortens the time required to measure each device to 1/N, thereby greatly improving production efficiency.



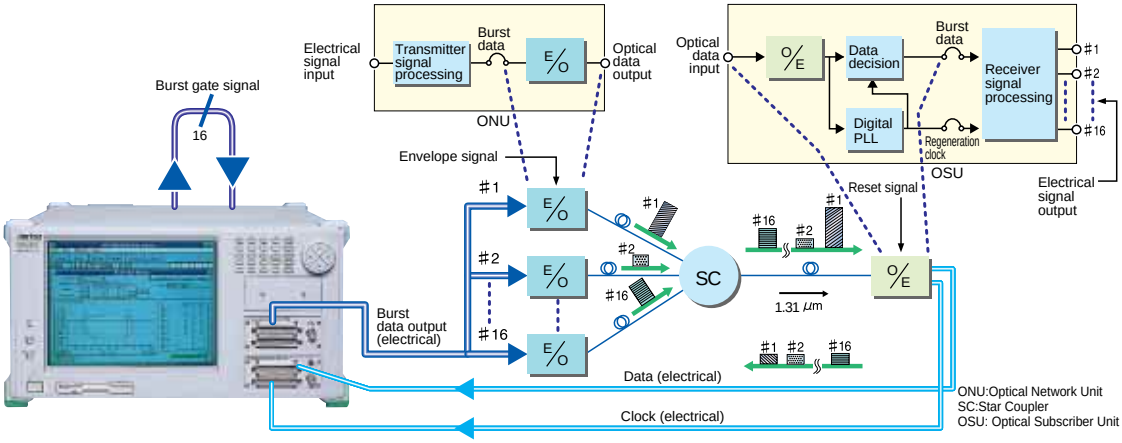
Testing example for optical multi-channelmodule

●For Both Continuous and Burst Data

For example, continuous data is used in the PDH/SDH transmission system, burst data is used in the PON (Passive Optical Network) subscriber TDMA transmission system, as well as in the burst cell unit ATM-PON transmission system. The MP1630B can handle bit error measurement of both continuous and burst data. It can output burst data for up to 16 channels. And the burst cycle, guard time, preamble length and data length can all be varied. Moreover, the data section of each burst data can be split into a maximum of 7 blocks and any pattern type (PRGM or PRBS) and length can be set for each block. Furthermore, the error detector receives a serial data combined by star coupler, then specify the each burst area and measure the bit error rate for each channel simultaneously.



Example of burst data output for PON module test



Testing TDMA PON subscriber system (upside)

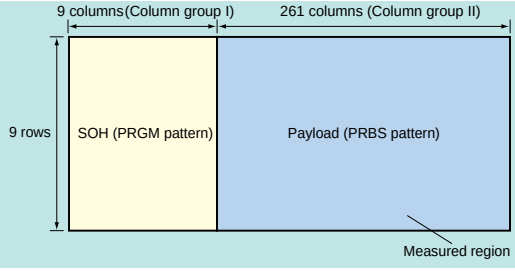
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●Mixed Pattern Generation, Selective BER Measurement

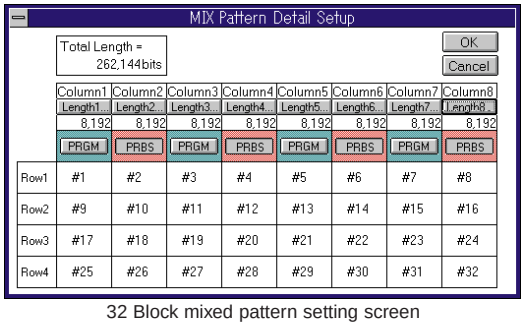
With the MP1630B, a test pattern can be selected and set for each channel. Not only can both PRGM and PRBS patterns be used, but a mixed pattern composed of both PRGM and PRBS patterns can be generated too. The packet type and cell type data can be configured smoothly from the overhead and payload parts.

Moreover, the pattern field can split into 2 to 32 blocks and a PRGM or PRBS pattern can be allocated to each column individually. As a result, it is possible to create pseudo-test signals for SDH/ATM, etc., as well as signals for evaluating complex communication protocols.

On the other hand, just the required blocks can be measured by masking the specified blocks, even at the Error Detector side. Measurement is even possible by selecting and combining the overhead and information parts. This flexibility of the pattern generation and error detection functions makes the MP1630B a powerful general-purpose digital analyzer.



Example of pseudo SDH signal
(2 column groups x 9 rows = 18 blocks)



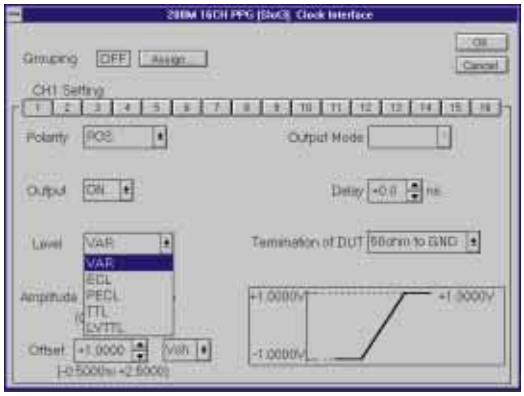
32 Block mixed pattern setting screen

●Superior Basic Functions

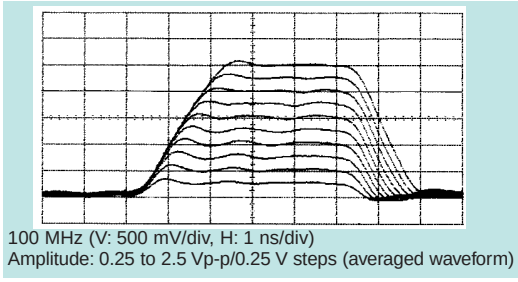
A high-performance frequency synthesizer is built into the MP1630B. It generates stable, accurate signals with high resolution in the 10 kHz to 200 MHz band. In addition, when the optional digital modulator function is used, the jitter tolerance of communications equipment and devices can also be measured.

In addition to TTL, LVTTL, ECL, and PECL, the pulse pattern generator clock and data output levels can be set to any output (0.25 to 2.5 V at 50 Ω termination; 0.5 to 5.0 V at high) for a variety of interfaces. The data and clock output delay can be varied at high resolution for each channel and there is no necessity to adjust the cable length for each signal. The clock input of the Error Detector can also be varied for each channel.

Furthermore, by using the Auto Search function, the phase relationship of the input data and clock can be adjusted automatically to the best position, eliminating the need for troublesome adjustments.

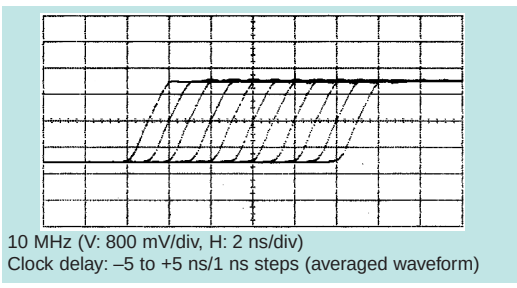


Pulse pattern generator clock interface screen



100 MHz (V: 500 mV/div, H: 1 ns/div)
Amplitude: 0.25 to 2.5 Vp-p/0.25 V steps (averaged waveform)

Variable level (amplitude) characteristics



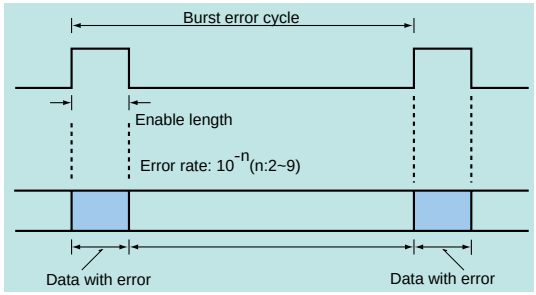
10 MHz (V: 800 mV/div, H: 2 ns/div)
Clock delay: –5 to +5 ns/1 ns steps (averaged waveform)

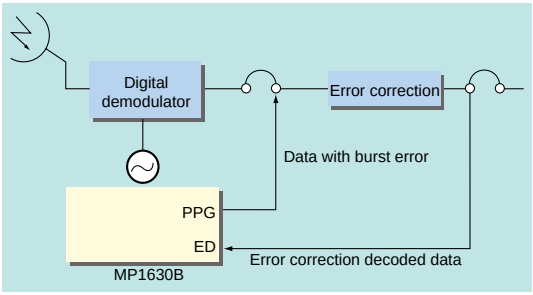
Variable delay characteristics

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●Evaluating Error Correction Function using Burst Error Insertion

In addition to having the earlier cyclic and single error-mode insertion functions, the MP1630B also has burst-mode insertion functions, making it ideal for evaluating the efficiency of error-correction codes used by each type of communication protocol. In particular, it is especially effective for testing digital transmission methods used by broadcast satellites and mobile phones, etc.

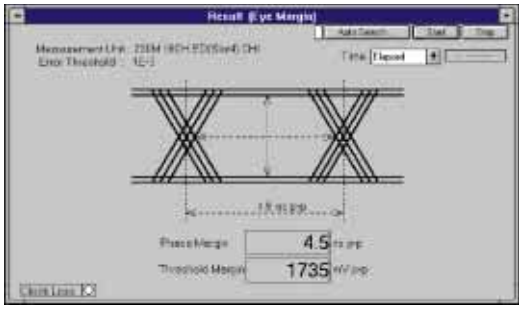




Evaluating error correction using burst error insertion function

●Evaluating Data Waveform Quality using Eye Margin Measurement

Sometimes there are bit errors even if the eye pattern on oscilloscope looks good. The MP1630B eye margin measurement function shows its usefulness in this circumstance; if necessary, it automatically measures the threshold voltage and phase range below the specified error rate. It has two measurement modes: the Margin mode, which measures the margin range as numeric values, and the Diagram mode, which plots the margin range as a graph on 2-dimensional axes (x: threshold margin, y: phase margin). These modes can be selected according to the application.



Margin mode

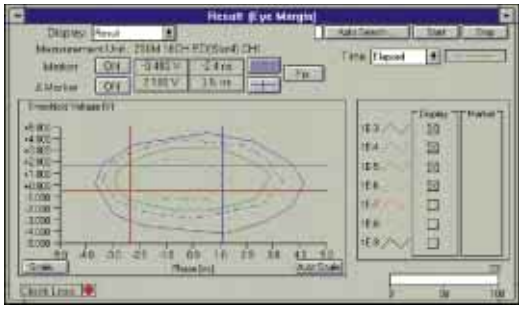


Diagram mode

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Large, Clear Color LCD with Touch Screen

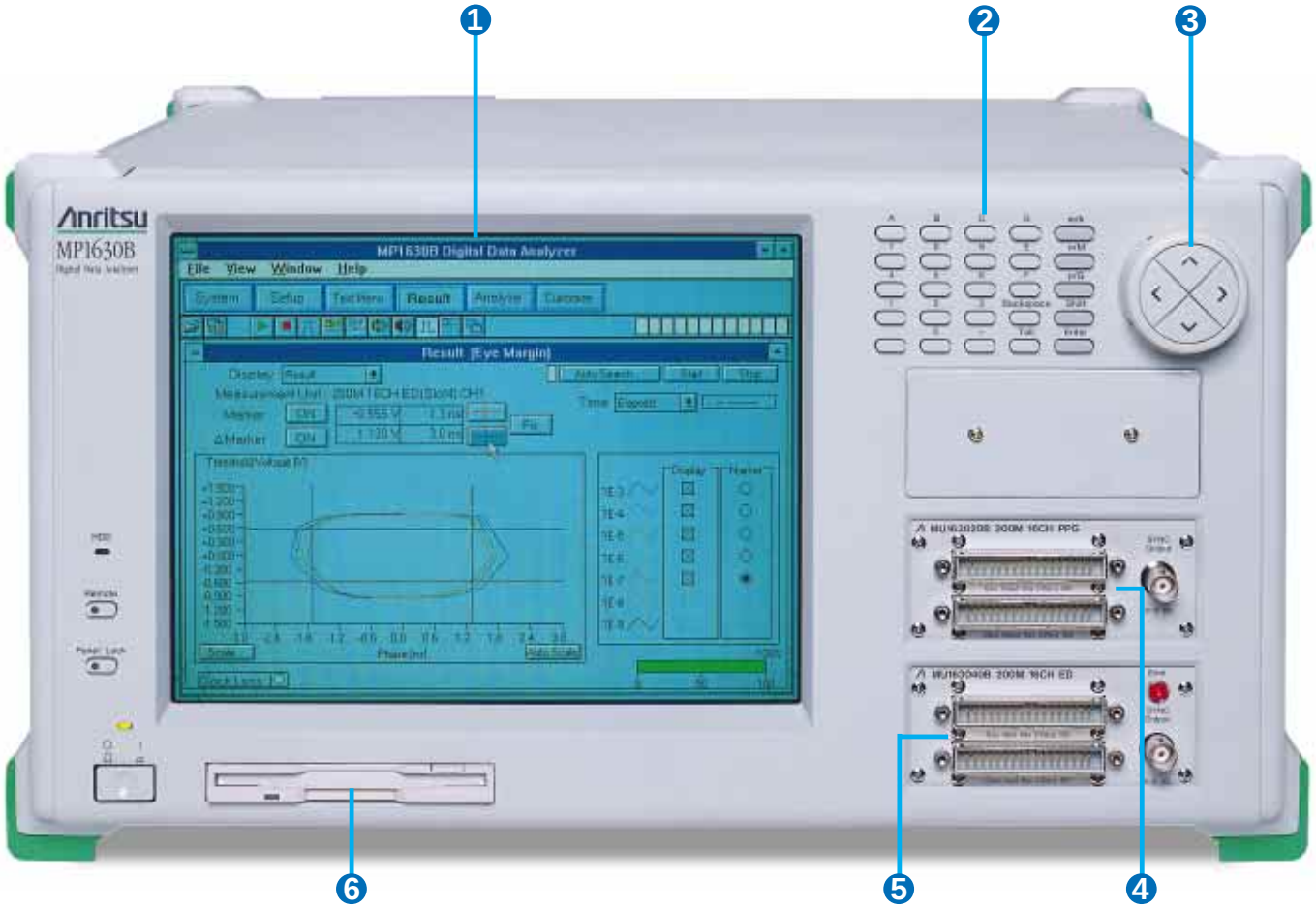
Which input method do you prefer?

1. *Touch screen*
2. *Mouse (standard accessory)*
3. *Ten keys and rotary encoder*
4. *Keyboard (sold separately)*

1 Large Color LCD with Touch Screen
The analyzer uses the Windows 3.1 OS; the hierarchy of measurement parameter levels has been decreased for better usability.

2 Data Input Keys
These keys are used to input numeric values, alphabetic characters and units. Alphabetic input uses pattern data editing in HEX code.

3 Rotary Encoder Knob
The outer ring of the knob is used to input continuously-variable numeric values for the frequency and output level, etc. The inner part is used as the ∧ ,∨ , <, and > functions, and as the cursor key for selecting measurement parameters.



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4 Pulse Pattern Generator Unit (200 Mb/s, 16 channels)

5 Error Detector Unit (200 Mb/s,16 channels)

6 3.5" FDD

This is an MS-DOS format 1.44 MB/740 KB mode disk drive.

7 Clock Generator Unit

This unit can also accept input of an external clock. The option 01(jitter addition) is included in the below photograph.

8 Pulse Pattern Generator Unit (200 Mb/s 16 channels)

This unit has a burst trigger output (16 channels) and an AUX output (8 channels).

9 Error Detector Unit (200 Mb/s,16 channels)

This unit has a burst trigger input (16 channels), etc.

10 RS-232C (COM1)

This port is used to connect an external controller.

11 Keyboard Connector

12 Mouse Connector

13 CRT (VGA)

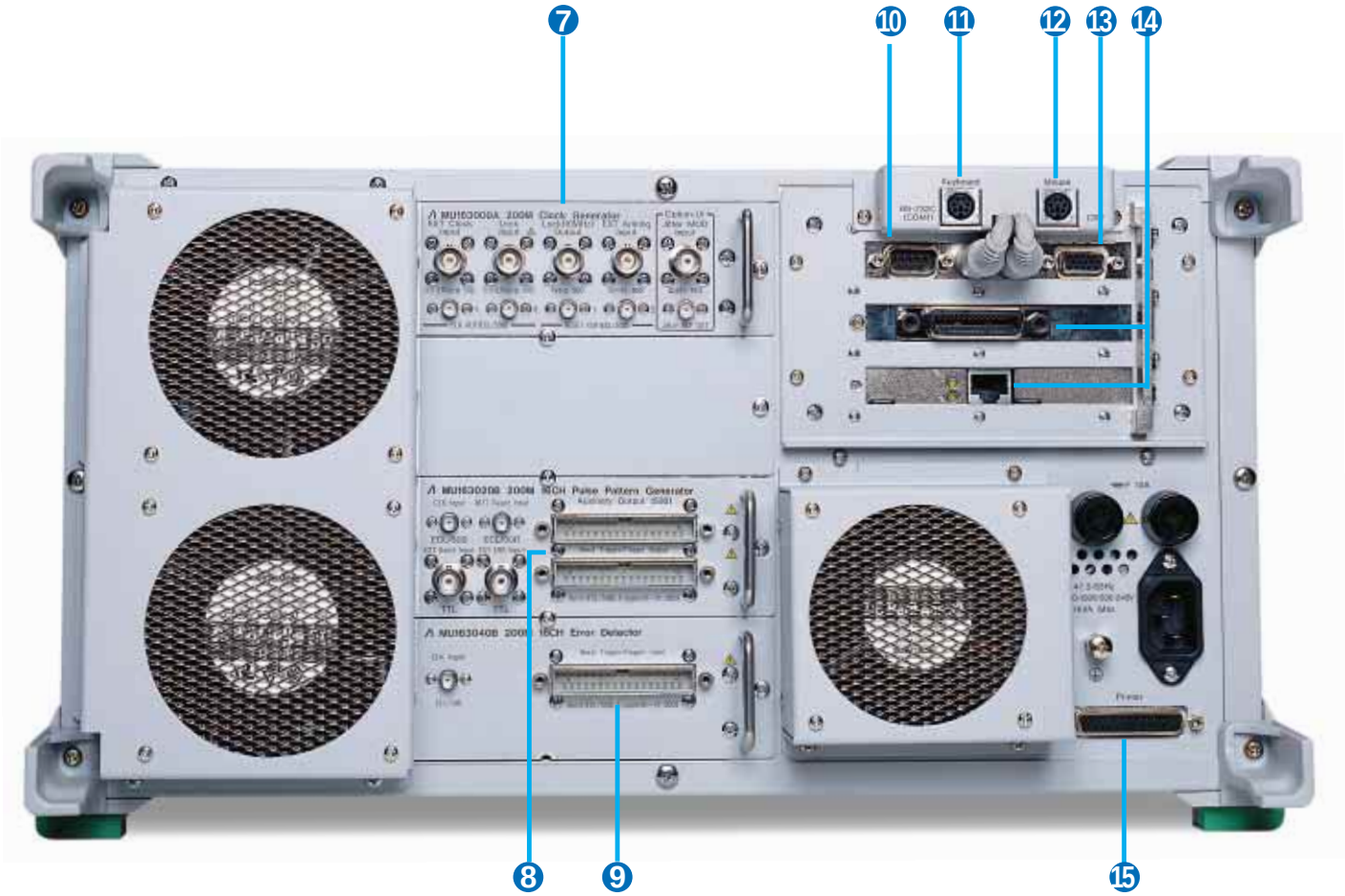
This connector is used to connect an external monitor.

14 GPIB (Option 01) or Eathernet (Option 02)

This connector is used to connect an external controller.

15 Printer

This connector is used to connect an external printer.

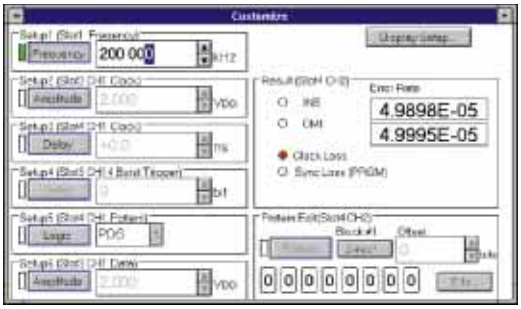


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Easy-to-Use GUI

●One-Key/One-Parameter Operation using Customized Screens

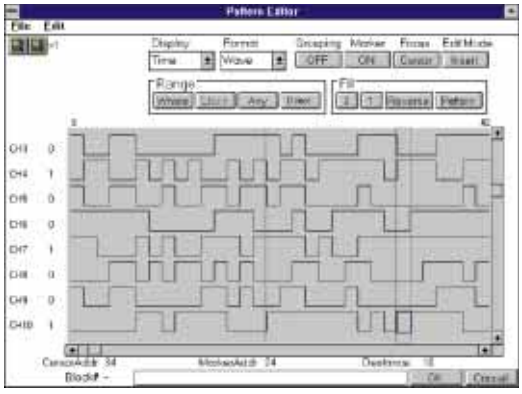
Measurement of general multi-channel data requires complex operations to manage the large numbers of measurement parameters. To make measurement settings simpler, the MP1630B has the convenient one one-key/one parameter operation used previously in the Anritsu BERTS, as well as customized screens. It also has a Grouping function which groups together the same measurement items used for each channel. Common settings (all or pattern-only) are saved as files on the large internal hard disk. The user can freely select the measurement parameters to create customized screens with the required measurement items and results. These file and customized screen functions (or Grouping function) for multi-channels are used in the same way as the earlier single-channel BERTS.



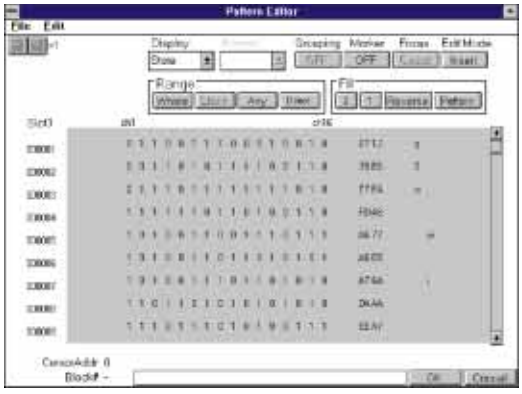
Customized screen

●Powerful Pattern Editor Function

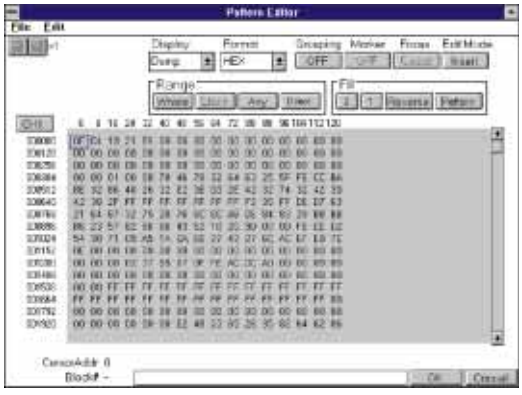
The MP1630B pulse pattern generator and error detector PRGM patterns can be edited easily using the keyboard, mouse, or cursor keys. There are three editing modes matching the various applications: Time, State, and Dump.
The Time mode puts time on the horizontal axis and displays the pattern for each channel as a horizontal line.
The State mode displays the data of channel 1 as the MSB and parallel 16 bits (corrected 1 bit from each channel at a time) as one data item.
The Dump mode displays the pattern for the specified channel as a memory dump image using either binary or hexadecimal code.



Pattern editor (time mode, input waveform)



Pattern editor (state mode)



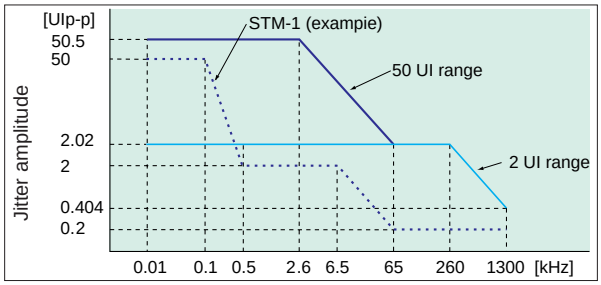
Pattern editor (dump mode)

●Easy-to-Use Interface

Useful setting and pattern data can be saved as a file to either 3.5" FD or the large-capacity internal hard disk. In addition, video-out and printer interfaces for displaying screens and measurement results are provided as standard. Moreover, the standard RS-232C I/F, optional GPIB I/F and Ethernet I/F (option) permit the analyzer to be either controlled by a host or to control other equipment, allowing configuration of advanced measurement systems.

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Specifications

Clock	Internal Operating frequency: 10 kHz to 200 MHz (accuracy: ±2 ppm) Resolution: 1 kHz steps (>1 to 200 MHz), 100 Hz steps (10 kHz to 1 MHz) External Input frequency range: 10 kHz to 200 MHz Input level: AC, 0.5 to 2.0 Vp-p (50 Ω), BNC connector External (at locked) Input frequency range: 10 MHz ±100 ppm, 64 kHz ±100 ppm Input level: AC, 0.5 to 2.0 Vp-p (50 Ω), BNC connector
Jitter modulation function (option)	External modulation input Modulation frequency range: 10 Hz to 1.3 MHz Input level range (sine wave): –1 to +1 V (75 Ω), BNC connector Reference output (jitter-free output): AC, 1 Vp-p (50 Ω), SMA Jitter: 0 to 50.5 UIp-p (clock frequency: >100 to 200 MHz) ✻Switchable to 50 UI/2 UI range 
Test pattern (pulse pattern generator, error detector)	PRBS Pattern: 2^n – 1 (n: 7, 9, 11, 15, 20, 23, 31), variable mark ratio, logic selectable Zero substitution pattern: 2^n (n: 7, 9, 11, 15); pattern length: n to 2^n – 1, logic selectable PRGM pattern: 2 to 65,536 bits/channel bit length, logic selectable Mixed pattern: Mixed PRGM and PRBS pattern, logic selectable ✻Block numbers: 2 to 32 [PRGM bit length/block: 8 to 8,192 bits; PRBS bit length/block: 8 to 131,072 bits (depend on block numbers)] PON pattern [TDMA test patterns with preamble inserted in ahead of Mixed patterns (PRGM and PRBS)] Preamble (1010...): 0 to 64 bits; guard time: –2,097,083 to 2,097,067 bits (1 bit resolution) Burst mode: Internal (burst cycle: 0.01 to 10 ms), external (enable length: 8 to 2,097,144 bits) Pattern edit function Edit mode: Dump, timing diagram, state table Edit results storage: Internal HDD, or FDD
Error insertion	Each channel, simultaneous or independently Error type: Normal, burst Normal mode (internal: cyclic or single, external) Error rate: 10^{-n} (n: 3 to 9) Insert area: Entire area, selected blocks (in Mixed pattern or PON pattern) Burst mode (internal/external) Error rate: 10^{-n} (n: 2 to 9) Internal enable length: 20 to 140 ms (resolution: 20 ms) Internal cycle: 1 to 10 s (resolution: 1 s) External mode: Error of specified rate inserted in external signal enable period
Data/clock output	Output No.: 16 (multipin connector), output on/off and logic selectable Output waveform: NRZ (data), RZ (clock) Output level: ECL, PECL, TTL, LVTTL, VAR VAR range Amplitude: 0.5 to 5 V (10 mV steps, high impedance), 0.25 to 2.5 V (5 mV steps, 50 Ω) Offset: –4.5 to + 5 V (5 mV steps, high impedance), –2.25 to + 2.5 V (2.5 mV steps, 50 Ω) Rise/fall times (typ.): 1.3 ns (1 Vp-p, 50 Ω termination) Clock delay: –5 to +5 ns (100 ps steps) Data skew: –5 to +5 ns (100 ps steps)
Data/clock input	Input No.: 16, logic selectable, multipin connector Input waveform: NRZ (data), RZ (clock) Input level: ECL, PECL, TTL, LVTTL, VAR VAR input range Amplitude: 0.5 to 5 V (50 Ω) Threshold level: –5 to + 5 V (5 mV steps, in 50 Ω to GND termination) Clock delay: –5 to +5 ns (100 ps steps)
Measurement data	Channel No.: 16 channels simultaneous measurement (selectable measurement channels) Signal format: Continuous or burst (internal/external)

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Bit error measurement		Error detection: All, insertion, omission Measurement region: All, PRGM, PRBS selectable, and each block selectable with block configuration Display Error rate: 0×10^{-16} to 1.0000×10^{0} Error count: 0 to 9999999, 1.0000×10^{7} to 9.9999×10^{16} Error interval: 0 to 9999999, 1.0000×10^{7} to 9.9999×10^{16} Error free interval: 0.0000 to 100.0000% Error performance: ITU-T Rec. G.821 Measurement mode: Single, repeat, untimed (1 second to 99 days 23 hours 59 minutes 59 seconds) Auto sync: ON/OFF switchable, [threshold value: 1×10^{-n} (n: 2 to 8)], with autosearch function
Alarm measurement		Detected items: Power loss, clock loss, pattern sync loss (PRGM, PRBS)
Frequency measurement		Measurement range: 10 kHz to 200 MHz Effective digits: 6 digits Resolution: 100 Hz Accuracy: ±(1 count ±10 ppm)
Eye margin measurement (based on BER)		Measures eye margin or eye diagram of specified data (1 channel) Eye margin: Displays threshold margin and phase margin as numeric value Eye diagram: Displays width of eye aperture as two-dimensional graph using bit-error measurement
Delay measurement		Mode: Single/repeat Unit: Time/bit numbers Range Time: 0 to 999 µs (1 µs steps), 1 to 999 ms (1 ms steps), 1 to 10 s (1 s steps) Bits: 2^{31} bit (max.) Time out: 0.5, 1, 2, 5, 10 s
I/O signal for burst BER measurement	Pulse pattern generator	External burst input Level: TTL (H: Enable, L: Disable), BNC connector Burst trigger output (index signal for each burst data) Output No.: 16 (for each data output), bit delay function Level: ECL, –2 V (50Ω), multipin connector Auxiliary output (PON system envelope, or AGC reset signal; usable as normal control signal) Output No.: 8 (selectable channel), 1 (OR output for each channel), bit delay function, logic selectable Level: ECL or TTL (≤100 Mb/s), multipin connector
	Error detector	Burst trigger input Input No.: 16 (for each data input) Level: ECL, –2 V (50 Ω), multipin connector
Other I/O signals		Sync signal output (pulse pattern generator, error detector) Sync source: 1/1 clock, 1/8 clock, PRGM pattern, PRBS pattern Level: 0/–1 V (50 Ω), BNC connector External error input (pulse pattern generator) Error mode: Normal, burst Level: TTL, BNC connector Trigger output (pulse pattern generator) Trigger source: Unique pattern index for delay measurement or pattern block index in MIX/PON pattern Level: 0/–1 V (50 Ω), multipin connector Trigger input (error detector) Trigger source: For delay measurement Level: 0/–1 V (50 Ω), multipin connector
System environment		Platform: Microsoft Windows operating system version 3.1 Display: Color LCD, touch screen, 640 × 480 dots, 256 colors Printer: Parallel port for printer, D-sub 25-pin connector Keyboard: 101 keys (English), PS/2 mini-DIN 6-pin connector Mouse: Serial, PS/2 mini-DIN 6-pin connector FDD: 2 mode (1.44 MB, 740 KB) HDD C drive: ≥1,380 MB (for measurement data, patterns) D drive: 30 MB (not released to user, interface: IDE)
Remote control		RS-232C (standard), GPIB (option): IEEE488.2, Ethernet (option): 10 Base-T
Other functions		Sound: When error or alarm detected, panel lock function, self check function
Power		100 to 120/200 to 240 Vac, 47.5 to 63 Hz, ≤1,000 VA
Dimensions and mass		426 (W) × 221.5 (H) × 451 (D) mm, ≤29 kg
Operating temperature		5˚ to 40˚C

The specifications are with the MU163000A (200M Clock Generator Unit), MU163020B (200M 16CH Pulse Pattern Generator Unit) and MU163040B (200M 16CH Error Detector Unit) installed in the MP1630B main frame.

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Ordering Information

Please specify model/order number, name and quantity when ordering

Model/Order No.	Name		Remarks
	Main frame		
MP1630B	Digital Data Analyzer		
	Standard accessories		
J0491	Power cord (shielded):	1 pc	
F0087	Fuse, 10 A:	2 pcs	
Z0319A	PS/2 mouse:	1 pc	
Z0320	Input pen:	1 pc	
Z0388	MP1630B recovery disk:	11 pc	Only for MP1630B customer
Z0389	MP1630B application disk:	7 pc	Only for MP1630B customer
Z0390	MP1630B remote sample disk:	1 pc	Only for MP1630B customer
Z0396A	pen holder:	1 pc	
W1442AE	MP1630B operation manual:	1 copy	
W1443AE	MP1630B remote control operation manual:	1 copy	
W1450AE	MP1630B auto adjust operation manual:	1 copy	
	Options		
MP1630B-01*1	GPIB		GPIB interface board
MP1630B-02*1	Ethernet		Ethernet interface board
	Peripherals		
Z0321A	Keyboard (PS/2)		
J0008	GPIB cable		
MB24B	Portable Test Rack		Specified current: 10 A
B0348	Soft case		
B0329D	Front cover		
B0333D	Rack mount kit		
	Plug-in unit		
MU163000A*1	200M Clock Generator Unit		
	Standard accessories		
W1187AE	MU163000A operation manual		
	Option		
MU163000A-01*1	Jitter addition		
	Peripherals		
J0776D	Coaxial cord (BNC-P-3W · 3D-2W · BNC-P-3W), 2 m		Double shield
	Plug-in unit		
MU163020B*1,*2	200M 16CH Pulse Pattern Generator Unit		
	Standard accessories		
J0693B	SMA cable, 0.27 m:	2 pcs	
W1444AE	MU163020B/163040B operation manual:	1 copy	
	Peripherals		
J0776D	Coaxial cord (BNC-P-3W · 3D-2W · BNC-P-3W), 2 m		Double shield
J0824	BNC multi-core cable, (16 pins), 1 m		
J0825	BNC multi-core cable, (9 pins), 1 m		
J0826	SMA multi-core cable, (16 pins), 1 m		
J0827	SMA multi-core cable, (9 pins), 1 m		
J0858	SMA multi-core cable, (16 pins), 2 m		
J0859	SMA multi-core cable, (9 pins), 2 m		
J0860	BNC multi-core cable, (16 pins), 2 m		
J0861	BNC multi-core cable, (9 pins), 2 m		

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Model/Order No.	Name	Remarks
	Plug-in unit	
MU163040B*1,*2	200M 16CH Error Detector Unit	
	Standard accessories	
J0828	Multi-core cable, (16 pins), 0.5 m: 2 pcs	
J0829	Multi-core cable, (17 pins), 0.5 m: 1 pc	
J0693D	SMA cable, 0.27 m: 1 pc	
W1444AE	MU163020B/163040B operation manual: 1 copy	Not supplied when Pulse Pattern Generator Unit purchased as same time
	Peripherals	
J0776D	Coaxial cord (BNC-P-3W•3D-2W•BNC-P-3W), 2 m	Double shield
J0824	BNC multi-core cable, (16 pins), 1 m	
J0825	BNC multi-core cable, (9 pins), 1 m	
J0826	SMA multi-core cable, (16 pins), 1 m	
J0827	SAM multi-core cable, (9 pins), 1 m	
J0858	SMA multi-core cable, (16 pins), 2 m	
J0859	SMA multi-core cable, (9 pins), 2 m	
J0860	BNC multi-core cable, (16 pins), 2 m	
J0861	BNC multi-core cable, (9 pins), 2 m	

*1 : Factory option
*2 : Requires multi-core cable shown in peripherals (sold separately) for measurements

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