DIGITAL DATA ANALYZER
MP1632C
50 MHz to 3.2 GHz

CE GPIB OPTION

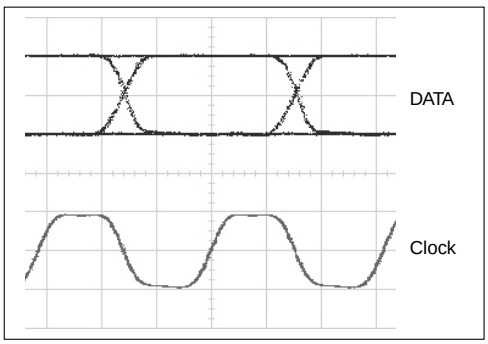
For Development, Manufacturing and Inspection of Transmission Systems, Optical Modules and Logic Devices

Core networks and computer networks are increasing rapidly as the volume of data transmitted in this multimedia data is growing. In addition to the STM-16/OC-48 (2.488 Gbit/s), Fibre channel, Giga-bit Ethernet, etc. are being commercialized. Compact and high performance digital data analyzer are required for inspecting products like digital transmission systems, optical modules, and logic devices.
The MP1632C realizes a compact solution that incorporates former measuring equipment (MP1652A Pulse Pattern Generator and MP1653A Error Detector) into a case.
MX163201A TEXT to MP1632A/C Pattern Conversion Software, MX163202A MP165X to MP1632A/C Pattern Conversion Software, MX163205A Q and Eye Analysis Software, and MX163206A SDH/SONET Pattern Editor are available as application software.

Features
- 3.2 Gb/s PPG and ED in a case
- Eye diagram measurement and burst signal measurement supported

Performance and functions
• Easy operation
The MP1632C has a large, color LCD with touch screen. Microsoft Windows® operating system version 3.1 displays measurement results graphically. Customized screens enable one-key and one-parameter operation.

• High-quality pulse pattern generator
Programmable patterns of 8 Mbit max, PRBS patterns [(2^7 – 1) to (2^{31} – 1) with variable mark ratio], and zero substitution patterns can be generated. Variable cross-point of data output waveform is also supported.



H: 100 ps/div, V: 1 V/div
MU163220C output waveform (3.2 GHz)

• Error detector with many functions
High input sensitivity (25 mVp-p*) and wide phase margin (250 ps*) performance is provided. The autosearch function enables PRBS pattern search with usual phase and threshold search. Insertion error and omission error can be measured simultaneously.
*Typical values at 3 Gb/s, PRBS 2^{23} – 1

• Internal synthesizer with high signal purity (Option)
Highly pure signals, SSB phase noise characteristics of –85 dBc/Hz or less (10 kHz offset), is generated.

• Support of various applications
The MP1632C supports testing of SDH/SONET (STM-0, 1, 4, 16/OC-1, 3, 12, 48) devices and modules, research and development on WDM components, Fibre channels, Giga-bit Ethernet, evaluation of E/O and O/E module, GaAs IC, and high-speed ASIC/FPGAs

Specifications

• MU163220C 3.2G Pulse Pattern Generator

Operating frequency	10 MHz to 3.2 GHz (50 MHz to 3.2 GHz when using MP1632C-03 3.2G Internal Synthesizer)
External clock input	0.5 to 2 Vp-p (<0.5 GHz: square wave, ≥0.5 GHz: square wave or sine wave, 50% duty cycle)
Generation pattern	Pseudo random pattern (PRBS) Pattern length: $2^n - 1$ (n: 7, 9, 11, 15, 20, 23, 31) Mark ratio: 1/2, 1/4, 1/8, 0/8, $\overline{1/2}$, 3/4, 7/8, 8/8 AND bit shift upon mark ratio setting: 1, 3 bits Data pattern Data length: 2 to 8,338,608 bits Zero substitution pattern Continuous 0 bit length: 1 to (pattern length – 1) bits Pattern length: 2^n (n: 7, 9, 11, 15) Error insertion Error ratio: 10^{-n} (n: 3, 4, 5, 6, 7, 8, 9), single error External error input: Provided
Data output	Number of outputs: 2 (DATA/$\overline{\text{DATA}}$, independent) Amplitude: 0.5 to 2 Vp-p (10 mV steps, setting error: ±15% or ±0.1 V, whichever is greater) Offset voltage V_{OH}: –2 to +2 V (at 2 Vp-p amplitude), –3.5 to +2 V (at 0.5 Vp-p amplitude) (5 mV steps, setting error: ±15% of offset voltage, ±0.1 V or ±15% of amplitude, whichever is the greatest) Display: V_{OH}, V_{TH}, and V_{OL} selectable Rise/fall time: ≤80 ps (10% to 90% of amplitude) Pattern jitter: ≤30 psp-p Waveform distortion: 10% or 0.1 V of amplitude, whichever is greater Load impedance: 50 Ω (with back termination) Connector: SMA DATA/$\overline{\text{DATA}}$ tracking: $\overline{\text{DATA}}$ amplitude and offset voltage can be set to same value as DATA. Crosspoint adjustment function: Provided
Clock output	Number of output: 2 (CLOCK/$\overline{\text{CLOCK}}$, independent) Amplitude: 0.5 to 2 Vp-p (10 mV steps, setting error: ±15% or ±0.1 V, whichever is greater) Offset voltage V_{OH} : –2 to +2 V (at 2 Vp-p amplitude), –3.5 to +2 V (at 0.5 Vp-p amplitude) (5 mV steps, setting error: ±15% of offset voltage, ±0.1 V or ±15% of amplitude, whichever is the greatest) Display: V_{OH}, V_{TH}, and V_{OL} selectable Rise/fall time: ≤80 ps (10% to 90% of amplitude) Load impedance: 50 Ω (with back termination) Connector: SMA Clock delay: –1 to +1 ns (2 ps steps)
External burst trigger input	Input level: 0/–1 V, connector: SMA
Internal burst signal	Burst cycle: 2 µs to 50 ms (1 µs steps), Enable length: 1 µs to 49.999 ms (1 µs steps)
Burst trigger output	Output level: 0/–1 V, connector: SMA
Sync signal output	Number of outputs: 1 (1/8 clock, variable pattern synchronization output selectable), Output level: 0/–1 V, Connector: SMA
Operating temperature	+5 to +45°C
Power	≤200 VA
Dimensions and mass	232 (W) x 49 (H) x 449 (D) mm, ≤4.5 kg

• MU163240C 3.2G Error Detector

Operating frequency	10 MHz to 3.2 GHz (50 MHz to 3.2 GHz when using MP1632C-03 3.2G Internal Synthesizer)
Data input	Input waveform: NRZ Input voltage: 0.5 to 4 Vp-p Variable threshold voltage: –4 to +4 V (1 mV steps) Termination: Connected to GND, –2 V or +3 V via 50 Ω Connector: SMA
Clock input	Input waveform: Square wave (<0.5 GHz), square wave or sine wave (≥0.5 GHz), duty: 50% Input amplitude: 0.5 to 4 Vp-p Variable input delay: –1 to +1 ns (2 ps steps) Polarity inversion: POS/NEG inversion selectable Termination: Connected to GND, –2 V or +3 V via 50 Ω Connector: SMA
Auto search function	Phase, threshold, phase & threshold, PRBS pattern (allowed if the mark ratio is between 1/8 and 7/8)
Receive pattern	Pseudo random pattern (PRBS) Pattern length: $2^n - 1$ (n: 7, 9, 11, 15, 20, 23, 31) Marker ratio: 1/2, 1/4, 1/8, 0/8, $\overline{1/2}$, 3/4, 7/8, 8/8 AND bit shift upon mark ratio setting: 1, 3 bits Data pattern Data length: 2 to 8,338,608 bits Zero substitution pattern Continuous 0 bit length: 1 to (pattern length – 1) bits Pattern length: 2^n (n: 7, 9, 11, 15)
Sync mode	Normal, frame
Sync threshold	AUTO or 10^{-n} (n: 2, 3, 4, 5, 6, 7, 8)
Error detection mode	Omission, insertion, total

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Measurement items	Error rate: 0.0000 x 10^{-16} to 1.0000 x 10^{0} Number of errors: 0 to 9.9999 x 10^{16} Error interval (async): 0 to 9999999 (Interval: 100 ms, 1 s) Error free interval (EFI): 0.0000 to 100.0000% Clock frequency: 0.01 to 3.2 GHz (resolution: 1 Hz, accuracy: 10 ppm ±1 kHz)
Eye margin measurement function	Provided
Error performance calculation function	Provided
Measurement channel mask	1 to 8 channels, each channel settable independently
Error output	Number of output: 1 (1/32 bit rate OR error), Output level: 0/–1, Connector: SMA
Sync signal output	Number of outputs: 1 (switchable among 1/8 clock, fixed pattern sync, sync gain output) Output level: 0/–1 V, Connector: SMA
Burst trigger input	Input level: 0/–1 V, connector: SMA
Operating temperature	+5˚ to +45˚C
Power	≤250 VA
Dimensions and mass	232 (W) x 54 (H) x 449 (D) mm, ≤5 kg

• MP1632C (Main frame)

System environment	OS: Microsoft Windows® operating system Version 3.1 Display: 10.4 inch, color LCD (touch screen), 640 x 480 dots, 256 colors Printer: Parallel port for external printer (D-sub, 25-pins) Keyboard: 101 type (English), PS/2 (mini DIN 6-pin connector) Mouse: Serial, PS/2 (mini DIN, 6-pin connector) FDD: 2 modes (1.44 MB, 740 KB) HDD C drive: ≥474 MB (used for system: measurement data, pattern), D drive: ≥30 MB (not accessible to users, interface: IDE)
Remote control	RS-232C (standard), GPIB (option): IEEE488.2, Ethernet (option): 10 Base-T
EMC	EN61326: 1997/A1: 1998 (Class A) EN61000-3-2: 1995/A2: 1998 (Class A) EN61326: 1997/A1: 1998 (Annex A)
LVD	EN61010-1: 1993/A2: 1995 (Installation Category Ⅱ, Pollution degree 2)
Power supply	100 to 120 Vac/200 to 240 Vac, 47.5 to 63 Hz, ≤150 VA
Operating temperature	+5˚ to +45˚C
Dimensions and mass	426 (W) x 221.5 (H) x 451(D) mm, ≤20 kg

• 3.2G internal synthesizer (Option 03)

Frequency range	50 MHz to 3.2 GHz (1 kHz steps)
Frequency accuracy	±2 ppm
SSB phase noise	≤–85 dBc/Hz (10 kHz offset, 1 kHz bandwidth)
Non-harmonic spurious	≤–60 dBc (limited to spurious 10 kHz or more distant from carrier frequency)
Reference lock range	10 MHz ±10 ppm
Power	≤50 VA
Mass	≤5 kg

• MX163201A TEXT to MP1632A/C Pattern Conversion Software

Required system	Computer: IBM-PC/AT or full compatible, OS: Windows 3.1/95/98, CPU: Pentium 133 MHz or higher, Memory: 32 MB or more, Hard disk space: 25 MB or more Display Resolution: 640 x 480 or more, Display colors: 256 or more FDD: 3.5-inch (1.44 MB)
Text file	A text file describing the program pattern in hex format (maximum number of characters in a line: 32696 bits including spaces and return characters)
MP1632A/C pattern data file (PTN)	All the MP1632A/C set data and patterns (file format for reading/writing on the MP1632A/C main screen)
MP1632A/C pattern clip file (PCP)	Only patterns (a file format that can be read or written in the MP1632A/C Pattern Editor)

• MX163202A MP165X to MP1632A/C Pattern Conversion Software

Required system	Computer: IBM-PC/AT or full compatible, OS: Windows 3.1/95/98, CPU: Pentium 133 MHz or higher, Memory: 32 MB or more, Hard disk space: 25 MB or more Display Resolution: 640 x 480 or more, Display colors: 256 or more FDD: 3.5-inch (1.2/1.44 MB)
Input file	MP165X program pattern files: MP165X's reading/writing and edit File name: T**.PTN (for pulse pattern generator), R**.PTN (for error detector)
Output file	MP1632A/C pattern data file (PTN): All the MP1632A/C set data and patterns (file format for reading/writing on the MP1632A/C main screen) MP1632A/C pattern clip file (PCP): Only patterns (File format that can be read or written in the MP1632A/C's pattern editor.)

Note: Since the FD format of MP165X is 1.2 MB, the PC must read 1.2 MB format FD.

• MX163205A Q and Eye Analysis Software

Required system	Computer: IBM-PC/AT or full compatible, OS: Windows 95/98/NT, CPU: Pentium 166 MHz or higher, Memory: 64 MB or more, Hard disk space: 100 MB or more, GPIB: National Instruments made GPIB interface (PCMCIA-GPIB or AT- GPIB/TNT series boards are recommended.) Display Resolution: 800 x 600 or more, Display colors: 256 or more ∗If two or more applications are running simultaneously, operation cannot be guaranteed.
Function	Measurement frequency: 1 to 3.2 GHz Measurement patterns: PRGM, PRBS 7, 9, 11, 15, 20, 23, 31 Pattern format: Continuous/burst (To be synchronized within 1 s) Eye margin measurement Measurement resolution (threshold): 1 to 10 mV (1 mV steps), Measurement resolution (phase): 2 to 10 ps (2 ps steps), Measurement rate: E-2 to E-15 Eye diagram measurement Measurement resolution (phase): 2 to 10 ps (2 ps steps) Measurement rate: E-2 to E-15 (actual measurement), E-3 to E-12 (estimate measurement) Display rate: E-2 to E-15 (actual measurement), E-2 to E-4915 (estimate measurement) Mask test judgment rate: E-2 to E-15 Q factor measurement Measurement style: Multiple measurements at fixed phase/phase vs. Q factor measurements Bit error rate range: Upper limit at E-3 to E-5, lower limit at E-7 to E-12 Minimum error count (measurement accuracy): 1, 10, 100, 1000 Vth shift width: Automatic, fixed (1 to 10 mV/1 mV steps)

• MX163206A SDH/SONET Pattern Editor

Required system	Computer: IBM-PC/AT or full compatible, CPU: Pentium 200 MHz or higher, OS: Windows 95/98/NT, Memory: 64 MB or more Display Resolution: 800 x 600 or more; Display colors: 256 or more FDD: 3.5-inch (1.44 MB), Hard disk space: 100 MB or more, GPIB: National Instruments made GPIB interface (PCMCIA-GPIB or AT-GPIB/TNT series boards are recommended.)
Functions	SDH/SONET pattern editor Mapping: STM-N (N = 1, 4c, 12c, 16c), STS-N SPE (N = 1, 3c, 12c, 48c) Pattern edit: Arbitrary editing of program patterns (PRBS pattern can be inserted in the payload.), time indication, table indication/edit Payload: Free format, ALL 0, ALL 1, PRBS $2^n - 1$ (n = 7, 9, 11, 15, 20, 20z, 23, 31) ∗Pattern repetition up to the length of all frames CID pattern: Available Frame repetition : Maximum 26 frames Alarm addition: Alarm addition conforming to SDH/SONET Standard ∗items: OOF/LOF, MS-AIS (L-AIS), MS-RDI (L-RDI), MS-REI (L-REI), HP-AIS (P-AIS), HP-REI (P-REI), HP-RDI (P-RDI) BIP error addition: Generates parity errors of B1, B2, and B3 B1, B2, and B3 calculation: Available Scramble: Available BIP correction: Available OH editor: Available

Ordering information

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

Model/Order No.	Name	
	Main frame	
MP1632C	Digital Data Analyzer	
	Standard accessories	
	Power cord (shielded):	1 pc
F0090	Fuse, 8 A:	2 pcs
Z0319A	PS/2 mouse:	1 pc
Z0320	Input pen:	1 pc
Z0527	Recovery disk*1:	1 set
Z0528	Application disk*1:	1 set
Z0529	Remote sample disk*1:	1 set
Z0396A	Pen holder:	1 pc
W1859AE	MP1632C operation manual:	1 copy
W1860AE	MP1632C remote control operation manual:	1 copy
B0447B	Dummy unit for EXTENSION:	1 pc
B0329D	Front cover:	1 pc
	Options	
MP1632C-01	GPIB	
MP1632C-02	Ethernet	
MP1632C-03	3.2G internal synthesizer	
	Application software	
MX163201A	TEXT to MP1632A/C Pattern Conversion Software	
MX163202A	MP165X to MP1632A/C Pattern Conversion Software	
MX163205A	Q and Eye Analysis Software	
MX163206A	SDH/SONET Pattern Editor	

∗1: Only for MP1632C customer
∗2: Units are factory options (not user replaceable)
∗3: Not supplied when 3.2G pulse pattern generator purchased as same time

Model/Order No.	Name	
	Peripherals	
Z0321A	Keyboard (PS/2)	
J0008	GPIB cable, 2 m	
B0447A	Dummy unit for CG	
B0447C	Dummy unit for PPG	
B0447D	Dummy unit for ED	
Z0416	3.5 inch head cleaning disk	
MB24B	Portable Test Rack (specified current: 20 A)	
B0348	Soft case	
B0329D	Front cover	
B0333D	Rack mount kit	
J0905A	Semi-rigid cable (for Option 03)	
Z0398	Ethernet installation disk (for Option 02)	
W1529AE	Ethernet operation manual (for Option 02)	
MU163220C	3.2G Pulse Pattern Generator*2	
	Standard accessories	
J0693A	Coaxial cord (HRM202B · 3D2W · HRM202B), 1 m:	1 pc
J0696A	Coaxial cord (AA-165-500), 0.5 m:	2 pcs
W1857AE	MU163220C/163240C operation manual:	1 copy
Z0306A	Wrist strap:	1 pc
MU163240C	3.2G Error Detector*2	
	Standard accessories	
J0693A	Coaxial cord (HRM202B · 3D2W · HRM202B), 1 m:	1 pc
J0696A	Coaxial cord (AA-165-500), 0.5 m:	2 pcs
W1857AE	MU163220C/163240C operation manual*3:	1 copy

For product ordering information, see pages 3 – 6