



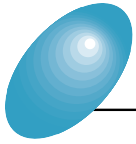
# MP1632C

## Digital Data Analyzer

50 MHz to 3.2 GHz



*3.2 Gb/s PPG and ED in One Cabinet*  
*Eye Diagram Measurement and Burst Signal Measurement Supported*



# Sophisticated Low-Cost 3.2 GHz Digital Data

Core networks and computer networks are becoming increasingly rapid 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 production inspections of all kinds of digital transmission systems, optical modules, and logic devices.

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.

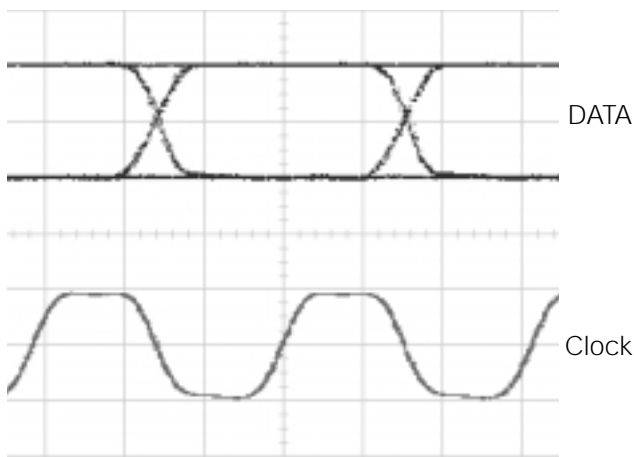
# Analyzer

## ■ Easy to View, Superb Operability

The MP1632C comes with a large color LCD with touch screen. Moreover, it employs Microsoft® Windows® operating system Version 3.1. In addition to the graphic display of measurement results, 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 ( $2^{31}-1$ ), variable mark ratio], and zero substitution patterns can be generated. Moreover, 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)

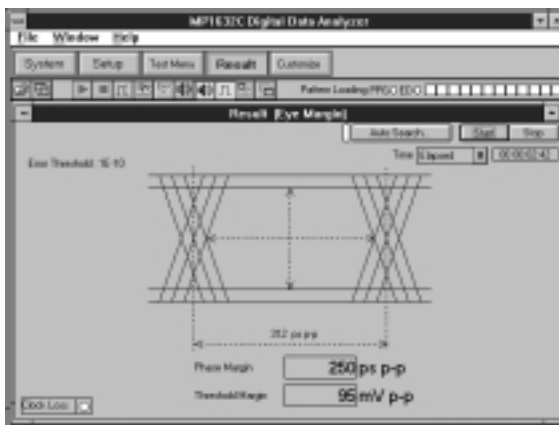
Generates highly pure signals with SSB phase noise characteristics of  $-85$  dBc/Hz or less (10 kHz offset).

## ■ Support of Various Applications

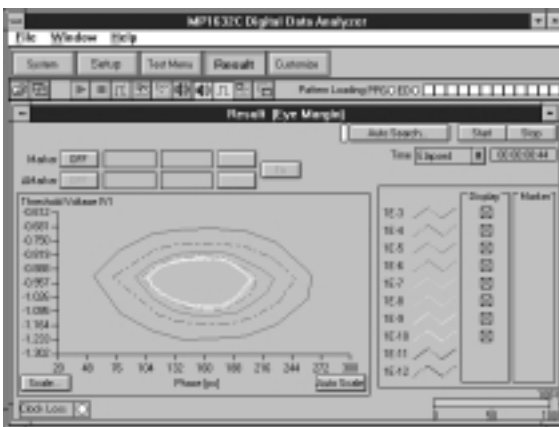
- Testing of SDH/SONET (STM-0, 1, 4, 16/OC-1, 3, 12, 48) devices and modules
- Research and development on WDM components, Fibre channels, Giga-bit Ethernet
- Evaluation of E/O and O/E module, GaAs IC and high-speed ASIC/FPGAs

## ■ Eye margin measurement for evaluating waveform quality

Phase margin and threshold margin can be measured using various error rate. Eye diagram display is also supported.



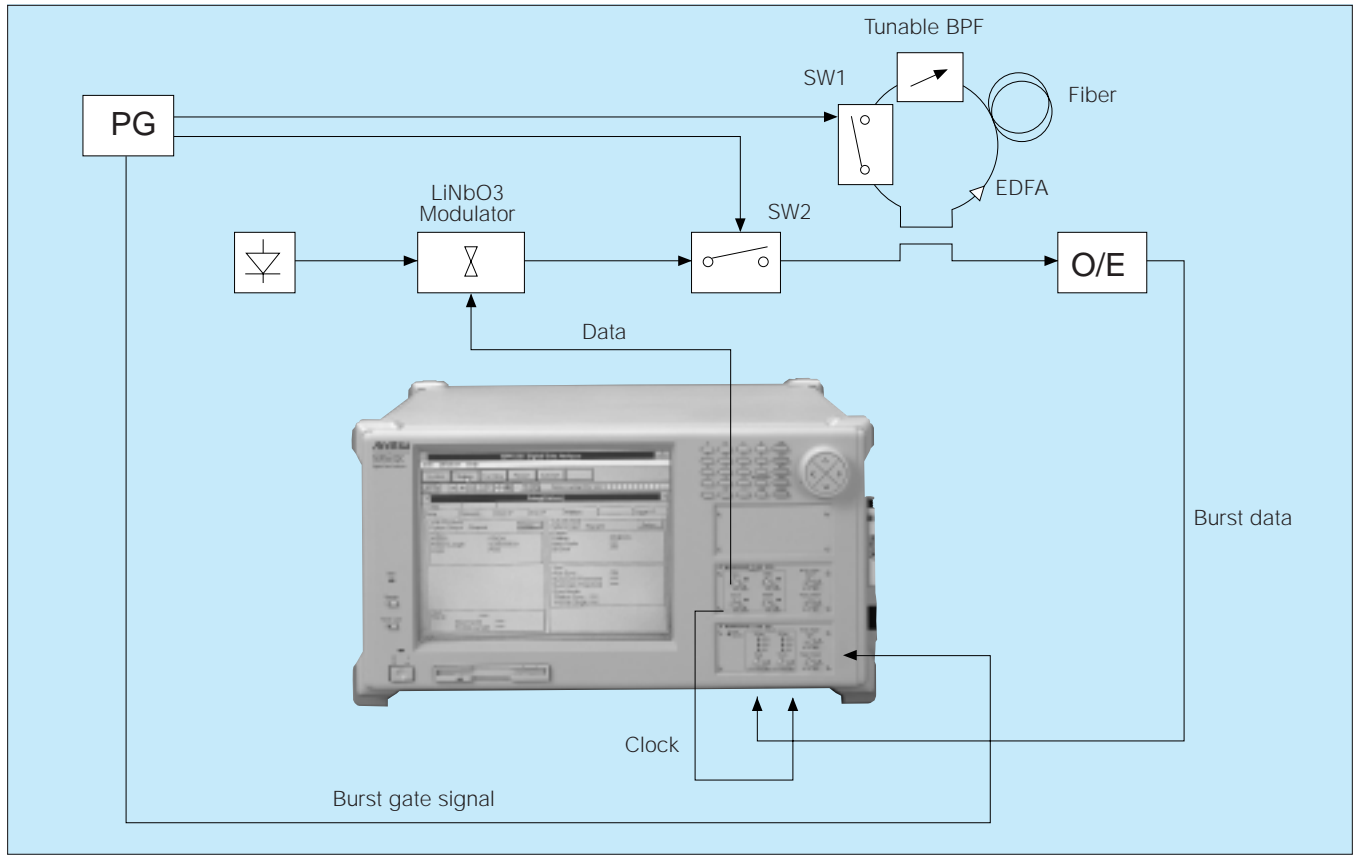
Eye margin



Eye diagram

## Burst Signal Measurement

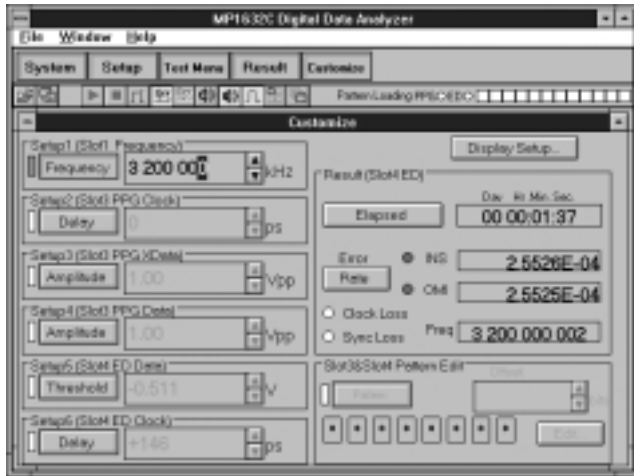
It is popular to use optical fiber circulating loop for testing long distance transmission. In this case, data signal is burst signal. Pulse Pattern Generator unit can generate burst signals and Error Detector unit can measure BER of input burst signal.



Burst signal measurement for fiber loop test

### ■ One-Key/One-Parameter Operation using Customized Screens

To make measurement settings simpler, the MP1632C has the convenient one-key/one parameter operation used previously in the Anritsu bit error rate test sets, as well as customized screens.



Customized screen

### ■ Easy-to-Use Interface

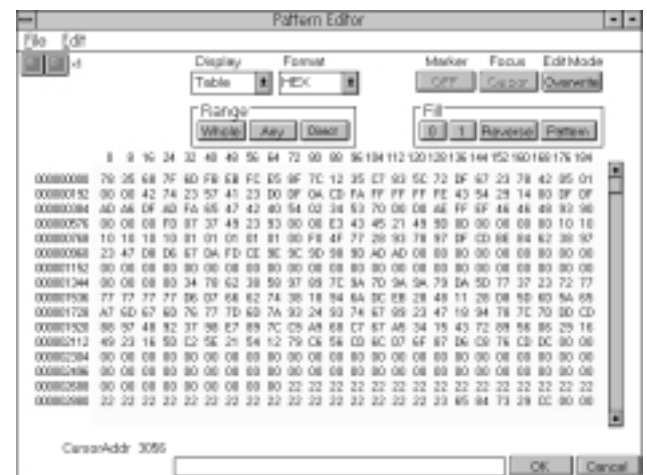
Useful setting and pattern data can be saved as a file to either 3.5" FD or the large-capacity internal hard disk. In addition, video-out and printer interfaces for displaying screens and measurement results are provided as standard. Moreover, the standard RS-232C I/F, optional GPIB I/F and Ethernet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

### ■ Powerful Pattern Editor Function

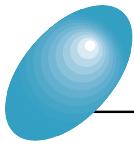
The MP1632C pulse pattern generator and error detector PRGM patterns can be edited easily using the keyboard, mouse, or cursor keys. There are two editing modes matching the various applications: Time and table. The Time mode puts time on the horizontal axis and displays the pattern as a horizontal line. The table mode displays the pattern as a memory table image using either binary or hexadecimal code.



Pattern editor (time mode)



Pattern editor (table mode)



# Easy-to-use Large LCD with Touch Panel

The MP1632C can be operated using touch keys, a mouse, a ten-key/rotary encoder, and a

### Large Color LCD with Touch Screen

The analyzer uses the Microsoft® Windows® operating system version 3.1; the hierarchy of measurement parameter levels has been decreased for better usability.

### 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 ^, v, <, and > functions, and as the cursor key for selecting measurement parameters.

### Data Input Keys

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



### 3.5" FDD

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

### 3.2G Error Detector

This unit has a burst trigger input.

### 3.2G Pulse Pattern Generator

Burst trigger output is enabled.

keyboard, thus meeting the needs and preferences of all users.

Touch Panel Input Pen

3.2G Internal Synthesizer (option)

RS-232C (COM1)

This port is used to connect an external controller.

Keyboard Connector

Mouse Connector

CRT (VGA)

This connector is used to connect an external monitor.

GPIB (Option 01) or Ethernet (Option 02)

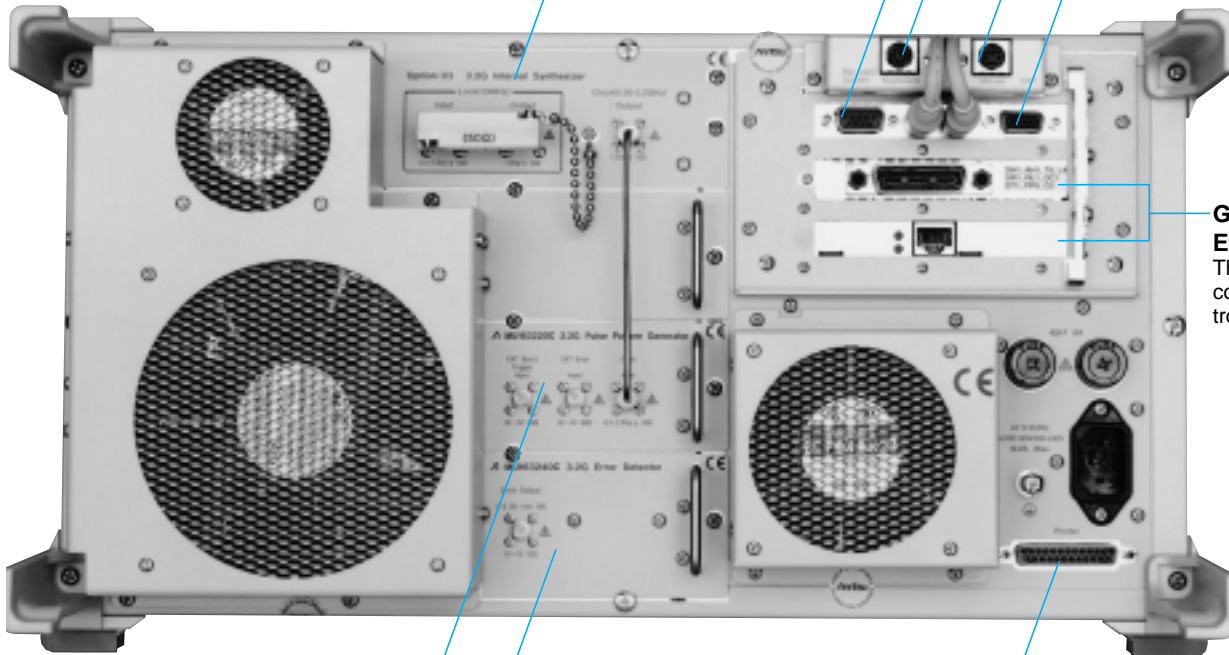
This connector is used to connect an external controller.

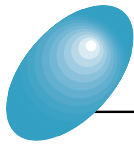
Printer

This connector is used to connect an external printer.

3.2G Pulse Pattern Generator

3.2G Error Detector





# Application Software

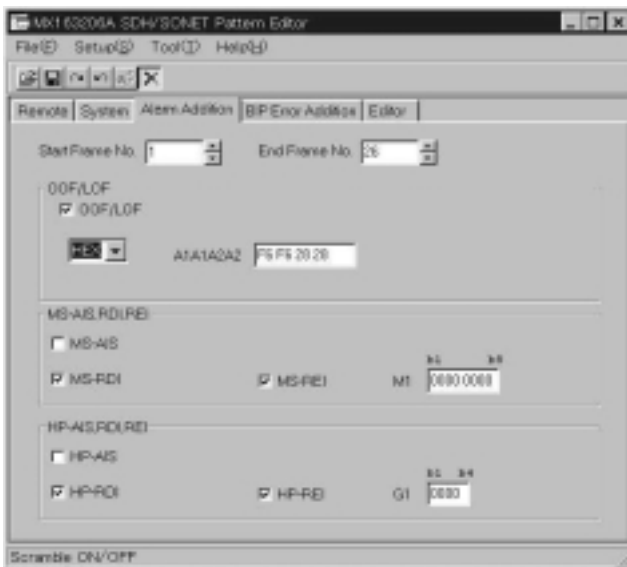
## ■ MX163205A Q/Eye Analysis Software

- Eye diagram and eye margin automatic measurement
- Displays a mask figure for the evaluation on the screen
- Q-factor (ITU-T G.976) automatic measurement

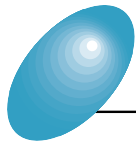


## ■ MX163206A SDH/SONET Pattern Editor

- Support OC-1 (STM-0) to OC-48c (STM-16c) mapping
- Alarm addition (OOF, LOF, MS-AIS, REI, RDI)
- BIP error addition (B1, B2, B3)
- Support "no frame" pattern







# Specifications

## ●MU163220C 3.2G Pulse Pattern Generator

<b>Operating frequency</b>	10 MHz to 3.2 GHz (50 MHz to 3.2 GHz when using MP1632C-03 3.2G Internal Synthesizer)
<b>External clock input</b>	0.5 to 2 Vp-p (<0.5 GHz: square wave, ≥0.5 GHz: square wave or sine wave, 50% duty cycle)
<b>Generation pattern</b>	<p>Pseudo random pattern (PRBS)            Pattern length: <math>2^n - 1</math> (n: 7, 9, 11, 15, 20, 23, 31)            Mark ratio: 1/2, 1/4, 1/8, 0/8, <math>1/2</math>, 3/4, 7/8, 8/8            AND bit shift upon mark ratio setting: 1, 3 bits</p> <p>Data pattern            Data length: 2 to 8,388,608 bits</p> <p>Zero substitution pattern            Continuous 0 bit length: 1 to (pattern length - 1) bits            Pattern length: <math>2^n</math> (n: 7, 9, 11, 15)</p> <p>Error insertion            Error ratio: <math>10^{-n}</math> (n: 3, 4, 5, 6, 7, 8, 9), single error            External error input: Provided</p>
<b>Data output</b>	<p>Number of outputs: 2 (DATA/<math>\overline{\text{DATA}}</math>, independent)            Amplitude: 0.5 to 2 Vp-p (10 mV steps)            Offset voltage  <math>V_{OH}</math>: -2 to +2 V (5 mV steps)            Display: <math>V_{OH}</math>, <math>V_{TH}</math>, and <math>V_{OL}</math> 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/<math>\overline{\text{DATA}}</math> tracking:            DATA amplitude and offset voltage can be set to same value as DATA.            Crosspoint adjustment function: Provided</p>
<b>Clock output</b>	<p>Number of output: 2 (CLOCK/<math>\overline{\text{CLOCK}}</math>, independent)            Amplitude: 0.5 to 2 Vp-p (10 mV steps)            Offset voltage  <math>V_{OH}</math>: -2 to +2 V (5 mV steps)            Display: <math>V_{OH}</math>, <math>V_{TH}</math>, and <math>V_{OL}</math> 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)</p>
<b>External burst trigger input</b>	Input level: 0/-1 V, connector: SMA
<b>Internal burst signal</b>	<p>Burst cycle: 2 μs to 50 ms (1 μs steps)            Enable length: 1 μs to 49.999 ms (1 μs steps)</p>
<b>Burst trigger output</b>	Output level: 0/-1 V, connector: SMA
<b>Sync signal output</b>	<p>Number of outputs: 1 (1/8 clock, variable pattern synchronization output selectable)            Output level: 0/-1 V            Connector: SMA</p>
<b>Operating temperature</b>	+5 to +45°C
<b>Power</b>	≤200 VA
<b>Dimensions and mass</b>	232 (W) x 49 (H) x 449 (D) mm, ≤4.5 kg

## ●MU163240C 3.2G Error Detector

<b>Operating frequency</b>	10 MHz to 3.2 GHz
<b>Data input</b>	<p>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</p>
<b>Clock input</b>	<p>Input waveform: Square wave (&lt;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</p>
<b>Auto search function</b>	Phase, threshold, PRBS pattern (allowed if the mark ratio is between 1/8 and 7/8)

<b>Receive pattern</b>	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, 1/2, 3/4, 7/8, 8/8 AND bit shift upon marker ratio setting: 1, 3 bits Data pattern Data length: 2 to 8,388,608 bits Zero substitution pattern Continuous 0 bit length: 1 to (pattern length - 1) bits Pattern length: $2^n$ (n: 7, 9, 11, 15)
<b>Sync mode</b>	Normal, frame
<b>Sync threshold</b>	AUTO or $10^{-n}$ (n: 2, 3, 4, 5, 6, 7, 8)
<b>Error detection mode</b>	Omission, insertion, total
<b>Measurement items</b>	Error rate: $0.0000 \times 10^{-16}$ to $1.0000 \times 10^0$ Number of errors: 0 to $9.9999 \times 10^{16}$ 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 $\pm$ 1 kHz)
<b>Eye margin measurement function</b>	Provided
<b>Error performance calculation function</b>	Provided
<b>Measurement channel mask</b>	1 to 8 channels, each channel settable independently
<b>Error output</b>	Number of output: 1 (1/32 bit rate OR error) Output level: 0/-1 V Connector: SMA
<b>Sync signal output</b>	Number of outputs: 1 (switchable among 1/8 clock, fixed pattern sync, sync gain output) Output level: 0/-1 V Connector: SMA
<b>Burst trigger input</b>	Input level: 0/-1 V, connector: SMA
<b>Operating temperature</b>	+5° to +45°C
<b>Power</b>	$\leq 250$ VA
<b>Dimensions and mass</b>	232 (W) x 54 (H) x 449 (D) mm, $\leq 5$ kg

### ●MP1632C (Main frame)

<b>System environment</b>	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: $\geq 474$ MB (used for system: measurement data, pattern) D drive: $\geq 30$ MB (Not accessible to users, interface: IDE)
<b>Remote control</b>	RS-232C (standard), GPIB (option): IEEE488.2, Ethernet (option): 10 Base-T
<b>EMC</b>	EN61326: 1997/A1: 1998(ClassA), EN6100-3-2: 1995/A2: 1998(ClassA), EN61326: 1997/A1: 1998(Annex A)
<b>LVD</b>	EN61010: 1993/A2: 1995(Installation Category II, Pollution degree2)
<b>Power supply</b>	100 to 120 Vac/200 to 240 Vac, 47.5 to 63 Hz, $\leq 150$ VA
<b>Operating temperature</b>	+5° to +45°C
<b>Dimensions and mass</b>	426 (W) x 221.5 (H) x 451(D) mm, $\leq 20$ kg

### ●3.2G Internal Synthesizer (Option 03)

<b>Frequency range</b>	50 MHz to 3.2 GHz (1 kHz steps)
<b>Frequency accuracy</b>	$\pm 2$ ppm
<b>SSB phase noise</b>	$\leq -85$ dBc/Hz (10 kHz offset, 1 kHz bandwidth)
<b>Non-harmonic spurious</b>	$\leq -60$ dBc (limited to spurious 10 kHz or more distant from carrier frequency)
<b>Power</b>	$\leq 50$ VA
<b>Mass</b>	$\leq 5$ kg

Microsoft Windows is a registered trademark of Microsoft Corporation in USA and other countries.

●MX163201A TEXT to MP1632A/C Pattern Conversion Software

<b>Required system</b>	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)
<b>Text file</b>	A text file describing the program pattern in hex format (maximum number of characters in a line: 32696 bits including spaces and return characters)
<b>MP1632A/ pattern datafile (PTN)</b>	All the MP1632A/C set data and patterns (file format for reading/writing on the MP1632A/C main screen)
<b>MP1632A/C pattern clipfile (PCP)</b>	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

<b>Required system</b>	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)
<b>Input file</b>	MP165X program pattern files: MP165X's reading/writing and edit File name: T.PTN (for pulse pattern generator), R.PTN (for error detector)
<b>Output file</b>	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.

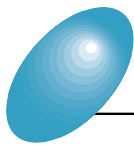
●MX163205A Q and Eye Analysis Software

<b>Required system</b>	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.
<b>Function</b>	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

<b>Required system</b>	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.)
<b>Functions</b>	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

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# Ordering Information

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

Model/Order No.	Name
<b>MP1632C</b>	<b>Main frame</b> Digital Data Analyzer
	<b>Standard accessories</b>
	Power cord (shielded): 1 pc
<b>F0090</b>	Fuse, 8 A: 2 pcs
<b>Z0319A</b>	PS/2 mouse: 1 pc
<b>Z0320</b>	Input pen: 1 pc
<b>Z0396A</b>	Pen holder: 1 pc
<b>Z0393</b>	Application disk*1: 1 set
<b>Z0395</b>	Remote sample disk*1: 1 set
<b>W1859AE</b>	MP1632C operation manual: 1 copy
<b>W1860AE</b>	MP1632C remote control operation manual: 1 copy
<b>B0447B</b>	Dummy unit to shut EXT unit space: 1 pc
	<b>Options</b>
<b>MP1632C-01</b>	GPIB
<b>MP1632C-02</b>	Ethernet
<b>MP1632C-03</b>	3.2G internal synthesizer (50 MHz to 3.2 GHz)
	<b>Application software</b>
<b>MX163201A</b>	TEXT to MP1632A/C Pattern Conversion Software
<b>MX163202A</b>	MP165X to MP1632A/C Pattern Conversion Software
<b>MX163205A</b>	Q and Eye Analysis Software
<b>MX163206A</b>	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
	<b>Peripherals</b>
<b>Z0321A</b>	Keyboard (PS/2)
<b>Z0416</b>	3.5 inch head cleaning disk
<b>J0008</b>	GPIB cable, 2 m
<b>MB24B</b>	Portable test Rack (specified current: 10 A)
<b>B0348</b>	Soft case
<b>B0329D</b>	Front cover(1 MW 5U)
<b>B0333D</b>	Rack mount kit
<b>B0447A</b>	Dummy unit to shut CG unit space
<b>B0447C</b>	Dummy unit to shut PPG unit space
<b>B0447D</b>	Dummy unit to shut ED unit space
<b>Z0398</b>	Ethernet installation disk (for Option 02)
<b>W1529AE</b>	Ethernet operation manual (for Option 02)
<b>J0905A</b>	Semi-rigid cable (for Option 03)
<b>MU163220C</b>	3.2G Pulse Pattern Generator*2
	<b>Standard accessories</b>
<b>J0693A</b>	Coaxial cord (HRM202B · 3D2W · HRM202B), 1 m: 1 pc
<b>J0696A</b>	Coaxial cord (AA-165-500), 0.5 m: 2 pcs
<b>W1857AE</b>	MU163220C/163240C operation manual: 1 copy
<b>Z0306A</b>	Wrist strap: 1 pc
<b>MU163240C</b>	3.2G Error Detector*2
	<b>Standard accessories</b>
<b>J0693A</b>	Coaxial cord (HRM202B · 3D2W · HRM202B), 1 m: 1 pc
<b>J0696A</b>	Coaxial cord (AA-165-500), 0.5 m: 2 pcs
<b>W1857AE</b>	MU163220C/163240C operation manual*3: 1 copy



Specifications are subject to change without notice.

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