Product Brochure

MP2100A Series

BERTWave

Slim All-in-One Instrument for BER and Eye-pattern Analysis

Cuts Measurement Times and Raises Productivity

The rapid spread of the Internet and increases in network transmission capacity are driving development and manufacturing of FTTx and 10-Gbit Ethernet devices. As a result, R&D into high-speed transmission technologies and manufacturing of high-speed devices are both progressing at a fast pace. To assure the integrity of signals passing via these high-speed devices, the Bit Error Rate (BER) and Eye-pattern are measured using a BERT and sampling scope. The all-in-one MP2100A series BERTWave supporting simultaneous BER and Eye-pattern measurements is ideal for both R&D and manufacturing tests because it increases efficiency and cuts measurement costs by eliminating time-consuming setup.

MP2100A series BERTWave

The MP2100A series BERTWave cuts measurement times and assures signal integrity. Customers can tailor the configuration according to usage.

MP2100A BERTWave

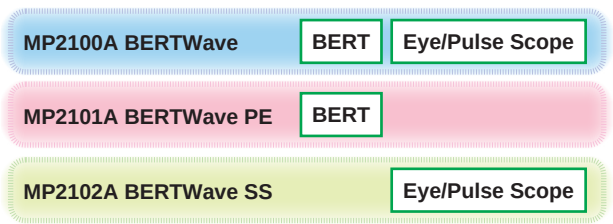
All-in-one instrument supporting simultaneous BER measurements and Eye-pattern analysis

MP2101A BERTWave PE

BER tester supporting 125 Mbit/s to 12.5 Gbit/s

MP2102A BERTWave SS

Eye/Pulse pattern tester supporting high-speed mask tests



Cuts Measurement Times

- All-in-one BER and Eye-pattern Measurements
- High-speed Remote Tests
- High-speed Mask Tests

Various Analysis Functions

- Wide Operation Frequency Range
- Supports Electrical and Optical Interfaces
- Simultaneous 2-channel BER Measurements
- Clock Recovery
- Signal Integrity Analysis

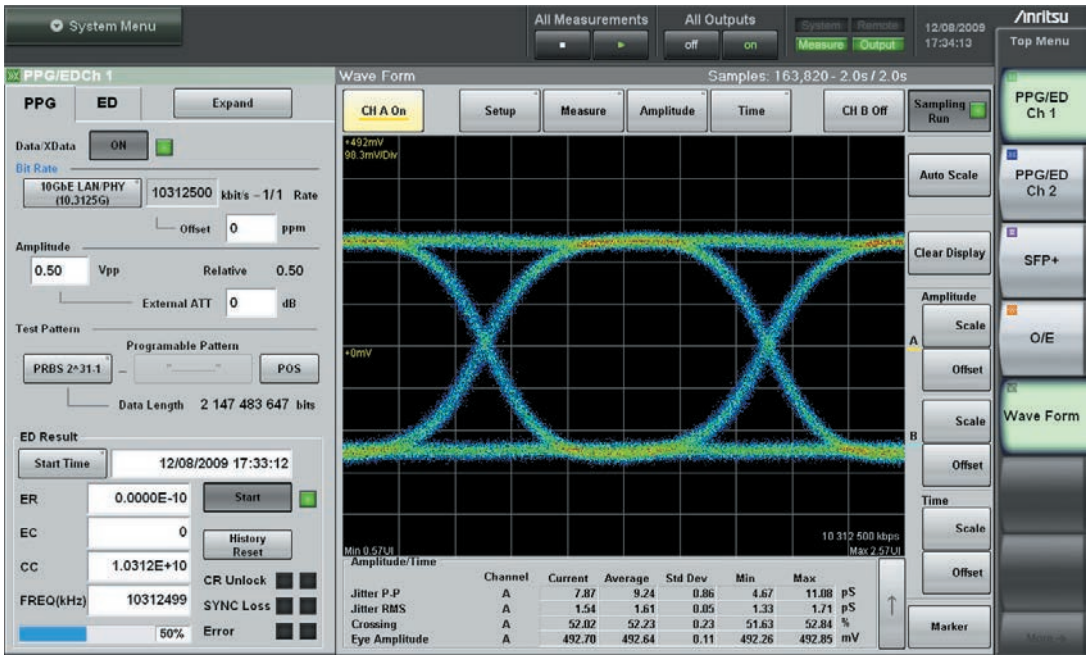
Low Equipment and Running Costs

- Flexible Measurement
- Easy Operability, Flash Disk Drive, and Eco-friendly

Cuts Measurement Times

All-in-one BER and Eye-pattern Measurements

Simultaneous BER and Eye/Pulse Scope measurements using an all-in-one tester halve investment costs and cut measurement times.
The tracking function supports easy BERT and Eye/Pulse Scope settings.

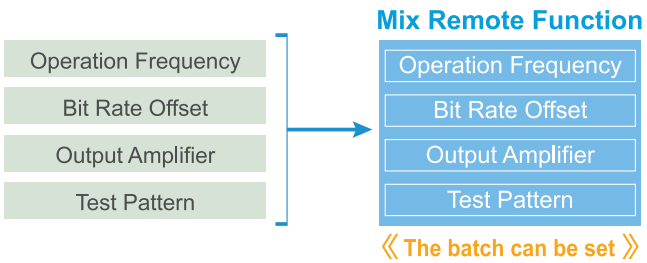


High-speed Remote Tests

The built-in remote high-speed mode supports mix remote functions for batch processing multiple commands and cuts BER measurement times by 30%* to 10 ms.

*: Compared to MP1761C/62C

- **Mix Remote Function:**
The mix remote function supports batch sending of the four commands required to set the operation frequency, bit rate, output amplifier, and test pattern, cutting setting times by 75%.



High-speed Mask Tests

High-speed sampling enabled the acquisition of 100,000 samples in about 1 s. And, it support Automatic Mask Margin test within 1 s. As a result, cutting measurement times.

Various Analysis Functions

Supports Electrical and Optical Interfaces

One MP2100A supports both electrical and optical interfaces for performing simultaneous TRx evaluations of optical modules, cutting measurement times.

Wide Operation Frequency Range

The BERT function supports bit rate from 125 Mbit/s to 12.5 Gbit/s (with Option-090) for evaluating devices and application supporting STM-1, 10 GFC and etc…

Support Bit Rate and Application samples (With Option 090)

PPG/ED Operation Bit Rate	Application samples
8 Gbit/s to 12.5 Gbit/s	• 8GFC • 10GbE • 10GFC • 10GbE FEC • 10GFC FEC • OC-192/STM-64 • OTU-2 • OC-192/STM-64 FEC • OTU-2e • OTU-1e
4 Gbit/s to 6.25 Gbit/s	• CPRI/OBSAI • 4GFC
2 Gbit/s to 3.125 Gbit/s	• CPRI/OBSAI • 2GbE • 2GFC • OC-48/STM-16 • Infiniband • OTU-1
1 Gbit/s to 1.5625 Gbit/s	• 1GbE • 1GFC
0.5 Gbit/s to 0.78125 Gbit/s	• OC-12/STM-4
0.25 Gbit/s to 0.39625 Gbit/s	
0.125 Gbit/s to 0.195312 Gbit/s	• OC-3/STM-1

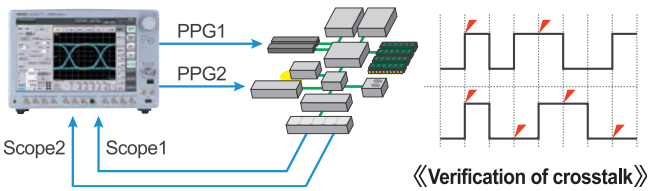
Support Bit Rate and Application samples (Without Option 090)

PPG Operation Bit Rate	Application samples
8.5 Gbit/s to 11.32 Gbit/s	• 8GFC • 10GbE • 10GFC • 10GbE FEC • 10GFC FEC • OC-192/STM-64 • OTU-2 • OC-192/STM-64 FEC • OTU-2e • OTU-1e
4.25 Gbit/s to 5.66 Gbit/s	• 4GFC
2.125 Gbit/s to 2.83 Gbit/s	• 2GFC • 2GbE • Infiniband • OC-48/STM-16 • OTU-1
1.0625 Gbit/s to 1.415 Gbit/s	• 1GbE • 1GFC
0.53125 Gbit/s to 0.7075 Gbit/s	• OC-12/STM-4
0.265625 Gbit/s to 0.35375 Gbit/s	
0.132812 Gbit/s to 0.176875 Gbit/s	• OC-3/STM-1

ED Operation Bit Rate	Application samples
8.5 Gbit/s to 11.32 Gbit/s	• 8GFC • 10GbE • 10GFC • OC-192/STM-64 • 10GFC FEC • OC-192/STM-64 FEC
4.25 Gbit/s to 5.66 Gbit/s	• 4GFC

Simultaneous 2-channel BER Measurements

Expansion of the BERT to 2 channels supports easy simultaneous TRx measurements, crosstalk tests and confirmation of adjacent lane interference.



《Verification of crosstalk》

Insertion / Omission

This can check how signal is involved.

Insertion: Change of 0→1
Omission: Change of 1→0

Clock Recovery

ED Clock Recovery Function (Standard):
This is for inputting data signals and performing BER analysis without an external clock.

- 4 Gbit/s to 6.25 Gbit/s, 8 Gbit/s to 12.5 Gbit/s

This have been using the trigger of Scope.

Eye/Pulse Pattern Clock Recovery Function (Option-055):

- 8.5 GHz to 12.5 GHz, 0.1 GHz to 2.7 GHz

This supports evaluation of characteristics of long-distance transmissions and equipment without clock output.

Signal Integrity Analysis

The Eye/Pulse Scope supporting DC to 25 GHz offers signal integrity analysis using a variety of applications.

Time and Amplifier Tests

These tests supports measurement of 0 and 1 levels, SNR, Eye crosspoint ratio, Eye amplification, Eye height, Eye width, Jitter p-p values, Jitter RMS, Extinction ratio, Rise and Fall times, Duty cycle distortion, and Average power and OMA.
In addition, the high-accuracy extinction ratio measurements close to ideal values are perfect for confirming the characteristics of optical modules.

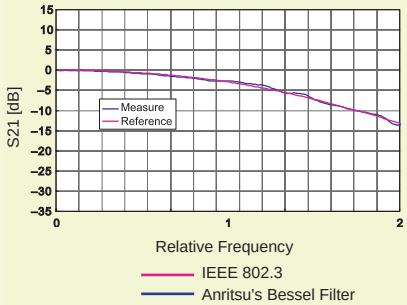
Amplitude/Time

	Channel	Current	Average	Std Dev	Min	Max	
Jitter P-P	A	44.94	44.52	0.48	43.87	45.29	pS
Jitter RMS	A	5.97	5.98	0.01	5.97	6.01	pS
Crossing	A	53.42	53.20	0.19	53.03	53.42	%
Eye Amplitude	A	101.51	101.44	0.04	101.30	101.51	mV

Ideal Extinction Ratio Measurements

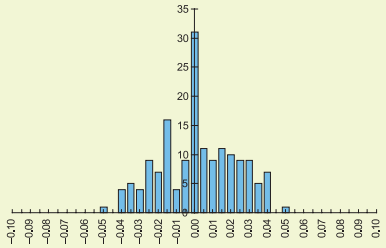
High-accuracy Extinction Ratio Measurements Close to Ideal Values

1. Ideal Bessel filters
Bessel filters with the ideal frequency characteristics support high-accuracy extinction ratio measurement results.

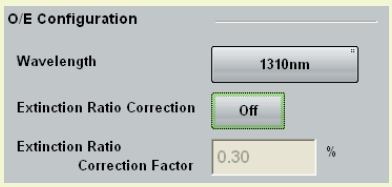


Frequency Characteristics (typ.)

2. High-accuracy results close to true value
Calibration using the reference light source holds error to less than ±0.05 dB (typ.).



3. Correction function
Correction of the measured extinction ratio assures correlation with other instruments.

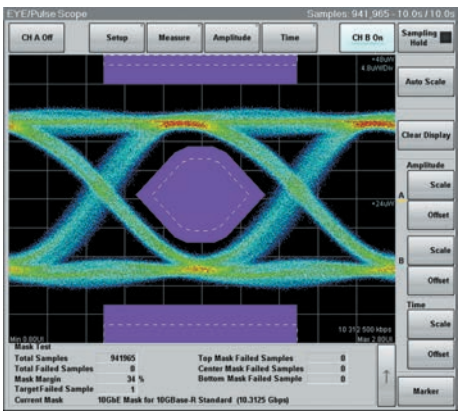


Correction Value Input Display

Eye Mask/Mask Margin Tests

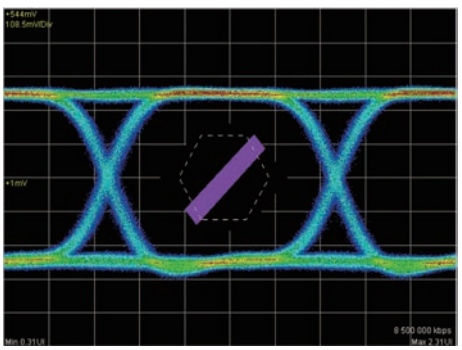
Eye Mask and Mask Margin tests confirm product margin against standards to improve yield.

- Automatic measurement within 1 s
- Supporting real time Mask Margin test



Change Specified Mask Area

The specified mask area for the target application or user mask can be changed. Consequently, positions in the open Eye where the mask margin is maximum and minimum can be evaluated.



Mask Area Restriction On
(45 degrees, 0.1 UI)

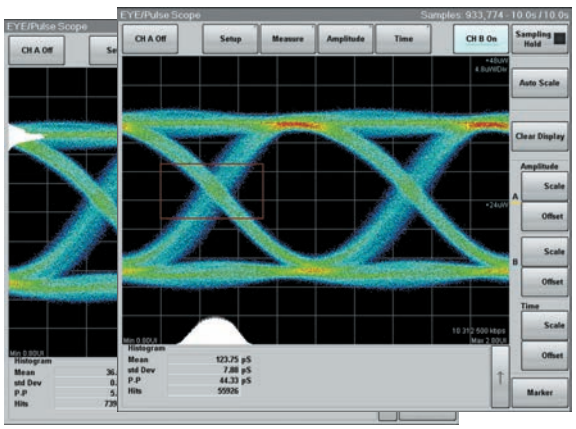
Mask Adjust

The Eye mask area can be adjusted either automatically or manually. As a result, the waveform mask can be measured without restrictions on the time axis.
∗: Can set when Align Method is User Defined.

Low Cost and Eco-friendly Design

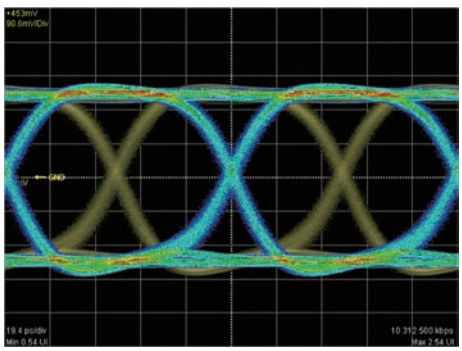
Histogram

Measuring averages, standard deviation and scatter of data in a specified area supports waveform data component analysis and troubleshooting.



Reference Trace Function

This function saves measured waveforms to compare saved data with waveforms being measured.



Skew Function

The built-in skew function moves the waveform on the time axis to adjust the waveform position.
Therefore, this function can adjust the phase between channels of differential signal.

Flexible Measurements

Equipment costs are cut by choosing a custom configuration from the BERTWave, BERTWave PE, and BERTWave SS range of tailored measurement solutions.

- BERTWave : BER and Eye/Pulse measurements
- BERTWave PE : BER measurement
- BERTWave SS : Eye/Pulse measurement

Easy Operability, Flash Disk Drive, and Eco-design

Improved Operability

- PPG/ED simple design
- 12.1-inch display
- Intuitive GUI with touch panel

High Reliability

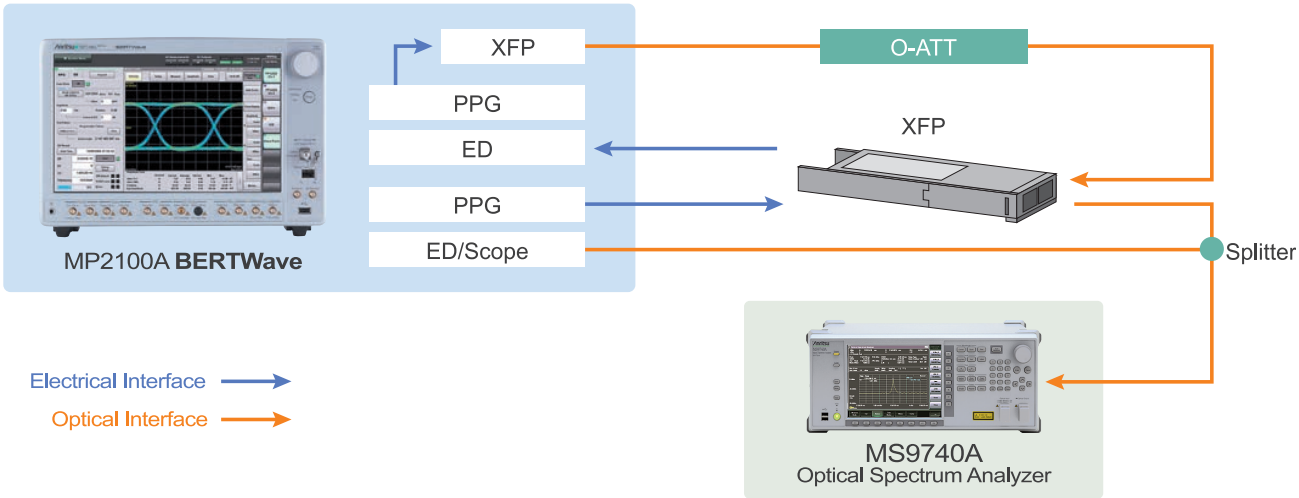
- The flash drive makes hard-disk crashes a thing of the past.

Eco-design

- 18-cm deep compact design
- Dimensions: 341 (W) × 221 (H) × 180 (D) mm
- Lightweight (7 kg Max.)
- Low power consumption (300 VA Max.)

MP2100A BERTWave

Optical Module Evaluations



Cuts Measurement Times

Simultaneous BER and Eye/Pulse Scope measurements using the all-in-one tester halve investment costs and cut measurement times.
Use with the MP2100A BERTWave and MS9740A Optical Spectrum Analyzer cuts optical module measurement times.

- **Simultaneous TRx Measurements**
One MP2100A supports both electrical and optical interfaces for performing simultaneous TRx evaluations of optical modules, cutting measurement times.

- **High-speed Remote Tests**
The built-in remote high-speed mode supports mixed remote functions for batch processing multiple commands and cuts BER measurement times by 30% to 10 ms.

- **High-speed Mask Tests**
High-speed sampling supports fast mask tests in about 12 s*, cutting measurement times.

*: Typical value when capturing 1 x 10^6 samples at bit rate of 10.3125 Gbit/s with PRBS31 test pattern, back-to-back

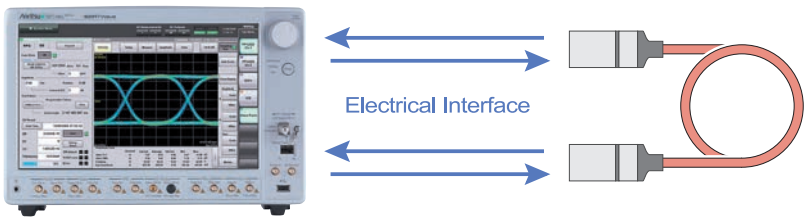
Optical Transceiver Measurement Items

Measurement Items		MP2100A BERTWave	MS9740A Optical Spectrum Analyzer
Tx	Data Rate Tolerance	✓	
	Center Wavelength		✓
	Side Mode Suppression Ratio		✓
	Average Optical Output Power (Min./Max.)	✓	✓
	Extinction Ratio	✓	
	Mask Test	✓	
Rx	Input Sensitivity (10^{-12})	✓*	

*: Programmable optical attenuator is needed.

MP2100A BERTWave/MP2101A BERTWave PE

Active Optical Cable Evaluation



Simultaneous TRx Measurements and Crosstalk Tests

Expansion of the MP2101A BERTWave PE to a 2-channel BERT supports simultaneous TRx measurements and crosstalk tests for high-speed, multilane active optical cables to help reduce crosstalk. Moreover, selecting the MP2100A BERTWave supports simultaneous Eye-pattern analysis to further improve manufacturing yields.

- **Simultaneous 2-channel BER Measurements**
Expansion of the BERT to 2 channels supports easy simultaneous TRx measurements and confirms crosstalk tests.

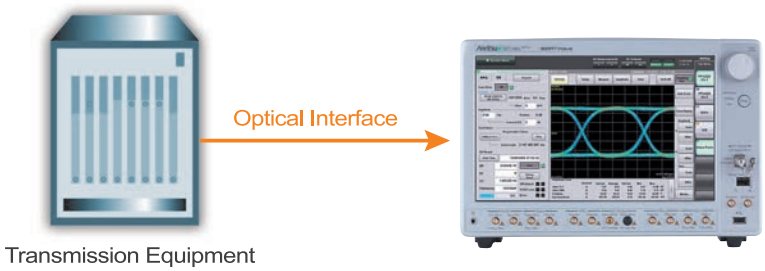
- **All-in-one BER and Eye-pattern***
Simultaneous BER measurements and Eye-pattern analysis using an all-in-one tester does not require a separate BERT and sampling scope, halving equipment costs.

- **Wide Operating Frequency Range***
The BERT function supports bit rate from 125 Mbit/s to 12.5 Gbit/s (with Option-090) for evaluating devices and application supporting STM-1, 10 GFC and etc…

*: The MP2100A BERTWave supports Eye-pattern analysis and Eye mask tests.

MP2102A BERTWave SS

Evaluation of Transmission Equipment Physical Layer



Physical Layer Evaluation

The MP2102A BERTWave SS clock recovery function eliminates the need for a trigger source when evaluating optical output characteristics, and the full range of mask patterns makes the MP2102A ideal for both evaluating the physical layer of equipment supporting various 2G, 4G, and 8GFC applications, and for testing optical transceivers at acceptance inspection.

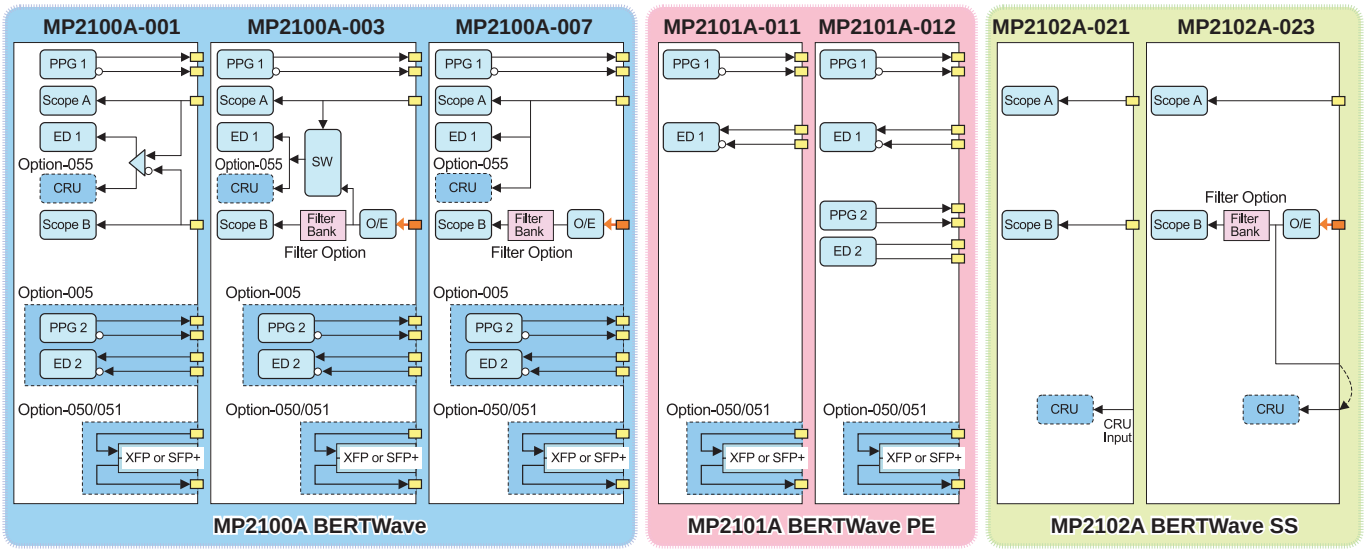
- **Clock Recovery**
The Eye/Pulse pattern Clock recovery (Option-055) function supports rates of 8.5 GHz to 12.5 GHz and 0.1 GHz to 2.7 GHz to perform mask tests for most applications.

- **High-speed Mask Tests**
High-speed sampling supports fast mask tests in about 12 s*, cutting measurement times.

*: Typical value when capturing 1×10^6 samples at bit rate of 10.3125 Gbit/s with PRBS31 test pattern, back-to-back

MP2100A Series BERTWave Composition

Block Diagram



Interface List

Interface		MP2100A BERTWave		MP2101A BERTWave PE		MP2102A BERTWave SS	
		MP2100A-001	MP2100A-003/007	MP2101A-011	MP2101A-012	MP2102A-021	MP2102A-023
2 Output (Electrical Data1, xData1)		✓	✓	✓	✓		
2 Input (Electrical Data1/Scope1, Electrical xData1/Scope2)		✓				✓	
2 Input (Electrical Data1/Scope1, Optical Data2/Scope2)			✓				
2 Input (Electrical Data1, xData1)				✓	✓		
2 Input (Electrical Scope1, Scope2)						✓	
2 Input (Electrical Scope1, Optical Scope2)							✓
Additional Interface	2 Output (Electrical Data1, xData1)	✓*1	✓*1		✓		
	2 Input (Electrical Data1, xData1)	✓*1	✓*1		✓		
	XFP Slot	✓*2	✓*2	✓*2	✓*2		
	SFP+ Slot	✓*3	✓*3	✓*3	✓*3		

Function List

Interface	MP2100A BERTWave		MP2101A BERTWave PE		MP2102A BERTWave SS	
	MP2100A-001	MP2100A-003/007	MP2101A-011	MP2101A-012	MP2102A-021	MP2102A-023
Crosstalk tests	✓*1	✓*1		✓		
Optical Module Simultaneous TRx measurements (XFP)		✓*1, *4				
1ch BER measurement	✓	✓	✓	✓		
2ch BER measurement	✓*1	✓*1		✓		
Electrical integrity of signals tests - Time and Amplitude Tests - Histogram Test - Eye Mask/Mask Margin Tests	✓	✓			✓	✓
Optical integrity of signals tests - Time and Amplitude Tests - Histogram Test - Eye Mask/Mask Margin Tests		✓				✓

∗1: Option-005 Selected
∗2: Option-050 Selected
∗3: Option-051 Selected
∗4: Option-050 or Option-051 Selected

Selection Guide

Selection Guide

BERTWave

Model Number	Model Name	Note
MP2100A	BERTWave	BERT + Eye/Pulse Scope
MP2100A -001	Dual Electrical Receiver	Must select one of those
MP2100A -003	Optical/Single-ended Electrical Receiver	
MP2100A -007	1ch Electrical BERT and Optical/Single-ended Electrical Scope	
MP2100A -005	Extended PPG/ED Channel	
MP2100A -030	GPIB	
MP2100A -037	FC Connector	Either Option-003 or 007 is required. Must select one of those
MP2100A -040	SC Connector	
MP2100A -050	XFP Slot	Select no option or one of these
MP2100A -051	SFP+ Slot	
MP2100A -052	Full Rate Clock Output	
MP2100A -055	Clock Recovery for Eye/Pulse Scope	
MP2100A -061	1 High Bit Rate Filter	Either Option-003 or 007 is required. About of Filter Bank and Filter, refer to “Filter Bank Configuration” Option-084 and 086 support to 8GFC measurement
MP2100A -062	2 High Bit Rate Filter Bank	
MP2100A -063	3 to 4 High Bit Rate Filter Bank	
MP2100A -064	1 to 2 Low Bit Rate Filter Bank	
MP2100A -065	3 to 4 Low Bit Rate Filter Bank	
MP2100A -066	1 High Bit Rate/1 to 2 Low Bit Rate Filter Bank	
MP2100A -067	1 to 2 High Bit Rate/3 to 4 Low Bit Rate Filter Bank	
MP2100A -068	2 to 3 High Bit Rate/1 to 2 Low Bit Rate Filter Bank	
MP2100A -069	3 High Bit Rate/3 Low Bit Rate Filter Bank	
MP2100A -070	LPF for 156M (L)	
MP2100A -071	LPF for 622M (L)	
MP2100A -072	LPF for 1.0G (L)	
MP2100A -073	LPF for 1.2G (L)	
MP2100A -076	LPF for 2.1G (H)	
MP2100A -077	LPF for 2.5G (H)	
MP2100A -078	LPF for 2.6G (H)	
MP2100A -079	LPF for 3.1G (H)	
MP2100A -080	LPF for 4.2G (H)	
MP2100A -081	LPF for 5.0G (H)	
MP2100A -082	LPF for 6.2G (H)	
MP2100A -084	LPF for 9.9G to 10.3G (H)	
MP2100A -085	LPF for 10.5G to 11.3G (H)	
MP2100A -086	LPF for Multi 10G (H)	
MP2100A -090	Bit rate Extension for PPG/ED	
MP2100A -091	ED High Sensitivity	
MP2100A -130	GPIB Retrofit	
MP2100A -152	Full Rate Clock Output Retrofit	
MP2100A -191	ED High Sensitivity Retrofit	

BERTWave PE

Model Number	Model Name	Note
MP2101A	BERTWave PE	BERT
MP2101A -011	1CH PGG/ED	Must select one of those
MP2101A -012	2CH PGG/ED	
MP2101A -030	GPIB	Select one of these
MP2101A -050	XFP Slot	Select no option or one of these
MP2101A -051	SFP+ Slot	
MP2101A -052	Full Rate Clock Output	
MP2101A -090	Bit rate Extension for PPG/ED	
MP2101A -091	ED High Sensitivity	
MP2101A -130	GPIB Retrofit	
MP2101A -152	Full Rate Clock Output Retrofit	
MP2101A -191	ED High Sensitivity Retrofit	

BERTWave SS

Model Number	Model Name	Note
MP2102A	BERTWave SS	Eye/Pulse Scope
MP2102A -021	Dual Electrical Receiver	Must select one of those
MP2102A -023	Optical/Single-ended Electrical Receiver	
MP2102A -030	GPIB	
MP2102A -037	FC Connector	Option-023 is required Must select one of those
MP2102A -040	SC Connector	
MP2102A -055	Clock Recovery	
MP2102A -061	1 High Bit Rate Filter	
MP2102A -062	2 High Bit Rate Filter Bank	
MP2102A -063	3 to 4 High Bit Rate Filter Bank	
MP2102A -064	1 to 2 Low Bit Rate Filter Bank	
MP2102A -065	3 to 4 Low Bit Rate Filter Bank	
MP2102A -066	1 High Bit Rate/1 to 2 Low Bit Rate Filter Bank	
MP2102A -067	1 to 2 High Bit Rate/3 to 4 Low Bit Rate Filter Bank	
MP2102A -068	2 to 3 High Bit Rate/1 to 2 Low Bit Rate Filter Bank	
MP2102A -069	3 High Bit Rate/3 Low Bit Rate Filter Bank	
MP2102A -070	LPF for 156M (L)	Option-023 is required About of Filter Bank and Filter, refer to "Filter Bank Configuration"
MP2102A -071	LPF for 622M (L)	
MP2102A -072	LPF for 1.0G (L)	
MP2102A -073	LPF for 1.2G (L)	
MP2102A -076	LPF for 2.1G (H)	
MP2102A -077	LPF for 2.5G (H)	
MP2102A -078	LPF for 2.6G (H)	
MP2102A -079	LPF for 3.1G (H)	
MP2102A -080	LPF for 4.2G (H)	
MP2102A -081	LPF for 5.0G (H)	
MP2102A -082	LPF for 6.2G (H)	
MP2102A -084	LPF for 9.9G to 10.3G (H)	
MP2102A -085	LPF for 10.5G to 11.3G (H)	Option-084 and 086 support to 8GFC measurement
MP2102A -086	LPF for Multi 10G (H)	
MP2102A -130	GPIB Retrofit	

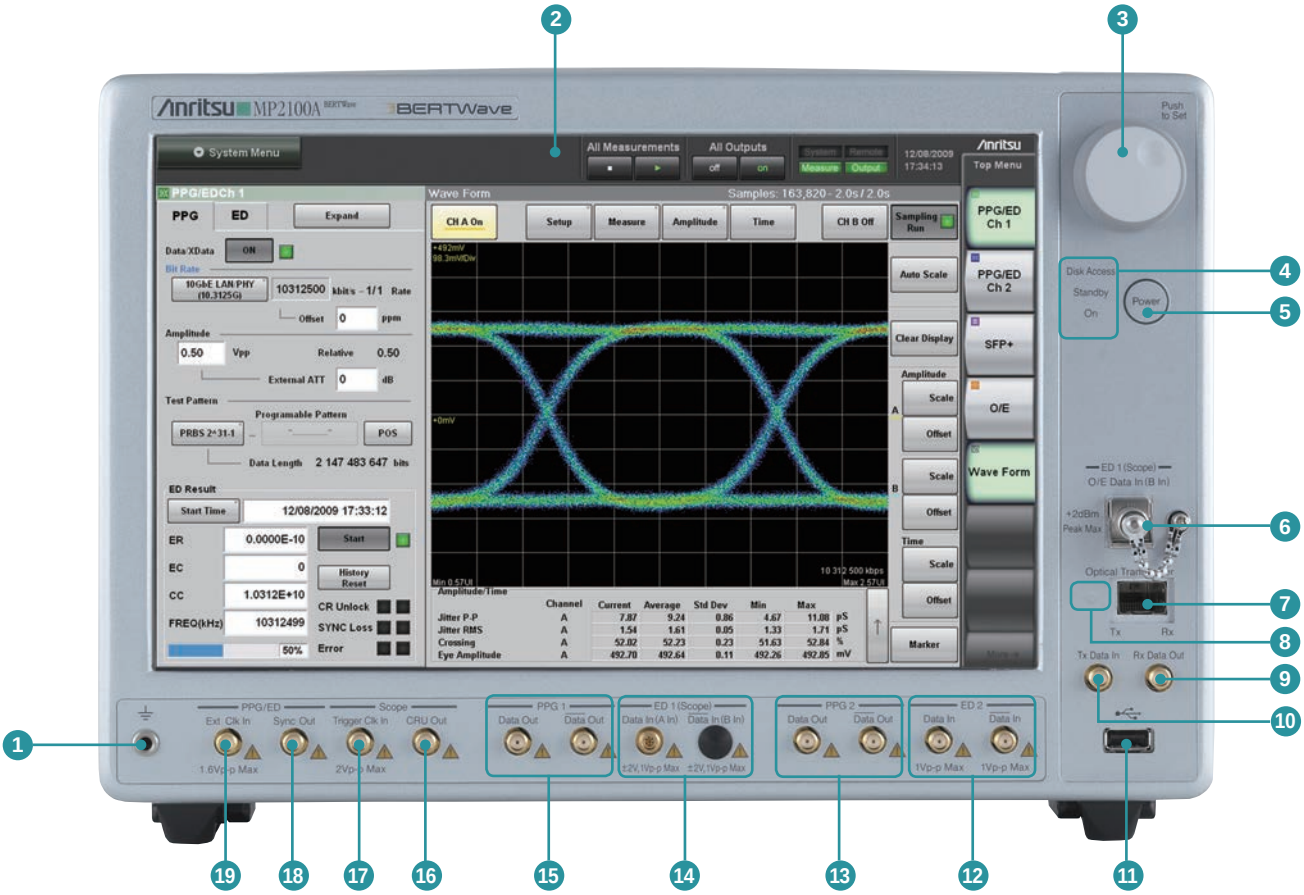
Software for BERTWave series

Model Number	Model Name	Note
MX210001A	Jitter Analysis Software	
MX210002A	Transmission Analysis Software	

Filter Bank Configuration

Filter Bank		Low Bit Rate LPF				High Bit Rate LPF									
		Option-070	Option-071	Option-072	Option-073	Option-076	Option-077	Option-078	Option-079	Option-080	Option-081	Option-082	Option-084	Option-085	Option-086
		156M (L)	622M (L)	1.0G (L)	1.2G (L)	2.1G (H)	2.5G (H)	2.6G (H)	3.1G (H)	4.2G (H)	5.0G (H)	6.2G (H)	9.9G to 10.3G (H)	10.5G to 11.3G (H)	9.9G to 10.7G (H)
Option-061	1 High Bit Rate Filter	—	—	—	—	Select 1 LPF									
Option-062	2 High Bit Rate Filter Bank	—	—	—	—	Select 2 LPFs									
Option-063	3 to 4 High Bit Rate Filter Bank	—	—	—	—	Select 3 to 4 LPFs									
Option-064	1 to 2 Low Bit Rate Filter Bank	Select 1 to 2 LPFs				—	—	—	—	—	—	—	—	—	—
Option-065	3 to 4 Low Bit Rate Filter Bank	Select 3 to 4 LPFs				—	—	—	—	—	—	—	—	—	—
Option-066	1 High Bit Rate/1 to 2 Low Bit Rate Filter Bank	Select 1 to 2 LPFs				Select 1 LPF									
Option-067	1 to 2 High Bit Rate/3 to 4 Low Bit Rate Filter Bank	Select 3 to 4 LPFs				Select 1 to 2 LPFs									
Option-068	2 to 3 High Bit Rate/1 to 2 Low Bit Rate Filter Bank	Select 1 to 2 LPFs				Select 2 to 3 LPFs									
Option-069	3 High Bit Rate/3 Low Bit Rate Filter Bank	Select 3 LPFs				Select 3 LPFs									

Key Layout



1 **Ground Terminal**
Connects antistatic wrist strap

2 **Display**
12.1-inch touch panel

3 **Rotary Knob**
Changes set value

4 **Disk Access, Standby and Power Lamps**

5 **Power Switch**

6 **Optical Input Connector**
Supported by MP2100A-003 and MP2102A-023

7 **Optical Transceiver Slot**
Supports XFP modules when MP2100A/MP2101A-050 selected as well as SFP + module when MP2100A/MP2101A-051 selected

8 **Optical Output Display Lamp**
When MP2100A/MP2101A-050 or MP2100A/MP2101A-051 selected

9 **Optical Transceiver Received Signal Output Terminal**
When MP2100A/MP2101A-050 or MP2100A/MP2101A-051 selected

10 **Optical Transceiver Transmitted Signal Input Terminal**
When MP2100A/MP2101A-050 or MP2100A/MP2101A-051 selected

11 **USB Connector**

12 **Error Detector CH2 Input Terminal**
When MP2100A-005 or MP2101A-012 selected

13 **Pulse Pattern Generator CH2 Output Terminal**
When MP2100A-005 or MP2101A-012 selected

14 **Error Detector CH1/Eye/Pulse Scope Input Terminal**
A (in) and B (in) supported when MP2100A-001, MP2101A-011/012, or MP2102A-021 selected.
A (in) supported when MP2100A-003 or MP2102A-023 selected

15 **Pulse Pattern Generator CH1 Output Terminal**
When MP2100A or MP2101A selected

16 **Clock Recovery Unit Output Terminal**
When MP2100A-055 or MP2102A-055 selected

17 **Eye/Pulse Scope Trigger Input Terminal**
When MP2100A or MP2102A selected

18 **Synchronized Pulse Output Terminal**
When MP2100A or MP2101A selected

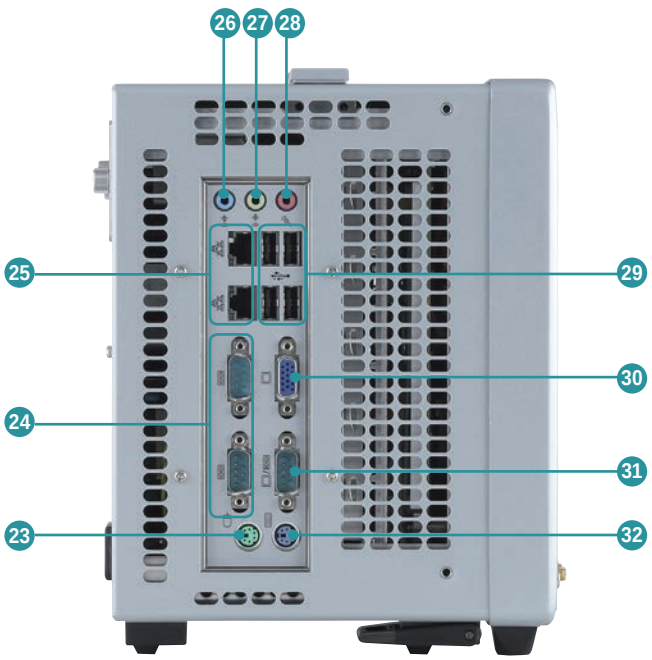
19 **Clock Input Terminal**
When MP2100A or MP2101A selected

Rear

20 **10 MHz Clock Input**
When MP2100A or MP2101A selected

21 **GPIB Connector**
When MP2100A/MP2101A/MP2102A-030 selected

22 **Inlet**



Left side

23 **PS2 Mouse Port**
24 **Serial Interface**
25 **Ethernet Port**
26 **Line Input**
27 **Line Output**
28 **Microphone Input**
29 **USB Port**
30 **Monitor Output (15 pins)**
31 **Monitor Output (9 pins)/Serial Interface**
32 **PS2 Keyboard Port**

Specifications

MP2100A, MP2101A, MP2102A Common

Input Device	Rotary Encoder, Touch Panel, Power Switch
Liquid-crystal Display	12.1-inch WXGA (1280 × 800)
LED	Disk access, Standby, Power
Functions	Measurement buzzer, Panel lock
Remote Interface	Ethernet, GPIB (Option-030)
Circumjacent Connection	VGA Output (SVGA), USB (5ports, Revision 2.0), Ethernet (2ports, 10/100/1000 BASE-T)
OS	Windows embedded standard 2009 (based on Windows XP SP3)
Internal Memory	Flash memory 8 GB (min.)
Power Supply	100 V(ac) to 120 V(ac)/200 V(ac) to 240 V(ac) (100 V/200 V is unnecessary change.), 50 Hz/60 Hz
Power Consumption	300 VA (max.)
Temperature Range	Operating: +5˚ to +40˚C Storage: –20˚ to +60˚C
Dimensions	341 (W) × 221.5 (H) × 180 (D) mm (Exclusive of surface projection)
Mass	7 kg (max.) (With MP2100A-003 installing, Not contain other options)
EMC	EN61326-1, EN61000-3-2
LVD	EN61010-1

BERT

• Common

External 10 MHz Input Connector	Amplitude: 0.7 Vp-p to 2 Vp-p, AC coupled Connector: BNC connector, 50 Ω Waveform: Square or Sine wave
External Reference Clock Input	External 1/16 Clock Input Amplitude: 0.2 Vp-p to 1.5 Vp-p, AC coupled Connector: SMA connector, 50 Ω Waveform: Square or Sine wave
Sync. Output	Output Level: V_{OL}: –0.5 V to –0.3 V, V_{OH}: –0.1 V to 0 V, 0.4 Vp-p (typ.) Connector: SMA connector, 50 Ω

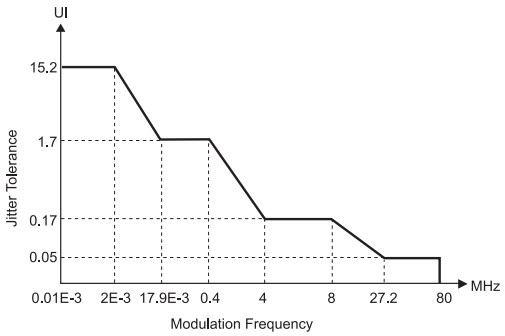
Bit Rate	Frequency Dividing Rate
8.5G to 11.32G	1/8 PPG Clock, 1/16 PPG Clock, 1/64 PPG Clock, PPG Pattern Sync., 1/16 ED Clock
1/2 Rate	1/4 PPG Clock, 1/16 PPG Clock, 1/64 PPG Clock, PPG Pattern Sync., 1/4 ED Clock, 1/16 ED Clock
1/4 Rate	1/2 PPG Clock, 1/16 PPG Clock, PPG Pattern Sync.
1/8 Rate	1/1 PPG Clock, PPG Pattern Sync.
1/16 Rate	1/1 PPG Clock, PPG Pattern Sync.
1/64 Rate	1/1 PPG Clock, PPG Pattern Sync.

• PPG

<table>
<tr><td>Operation Bit Rate</td><td>
<table>
<tr><th>With MP2100A/MP2101A-090</th><th>Without MP2100A/MP2101A-090</th></tr>
<tr><td>Variable bit-rate range (1 kbit/s step)
8 Gbit/s to 12.5 Gbit/s
1/N bit-rate operation range
N=2: 4 Gbit/s to 6.25 Gbit/s
N=4: 2 Gbit/s to 3.125 Gbit/s
N=8: 1 Gbit/s to 1.5625 Gbit/s
N=16: 500 Mbit/s to 781.25 Mbit/s
N=32: 250 Mbit/s to 390.625 Mbit/s
N=64: 125 Mbit/s to 195.312 Mbit/s</td><td>Variable bit-rate range (1 kbit/s step)
8.5 Gbit/s to 11.32 Gbit/s
1/N bit-rate operation range
N=2: 4.25 Gbit/s to 5.66 Gbit/s
N=4: 2.125 Gbit/s to 2.83 Gbit/s
N=8: 1.0625 Gbit/s to 1.415 Gbit/s
N=16: 531.25 Mbit/s to 707.5 Mbit/s
N=32: 265.625 Mbit/s to 353.75 Mbit/s
N=64: 132.813 Mbit/s to 176.875 Mbit/s</td></tr>
</table>
</td></tr>
<tr><td>Internal Reference Clock Accuracy</td><td>±10 ppm
Offset Variability: ±100 ppm, 1 ppm step</td></tr>
<tr><td>Data Output</td><td>Data, xData
Amplitude: Variable 0.1 Vp-p to 0.8 Vp-p, 10 mV step, AC coupled
Amplitude Accuracy: ±20 mV ±20% for settings
Tr/Tf: 25 ps (20 to 80%, typ.)
Output Jitter: 3 ps rms (typ.)
Skew: ±15 ps
Connector: SMA connector, 50 Ω</td></tr>
<tr><td>Test Pattern</td><td>PRBS: $2^7 – 1$, $2^9 – 1$, $2^{15} – 1$, $2^{23} – 1$, $2^{31} – 1$ (Invert ON/OFF)
User Data: 1.3 Mbits (Editable Text File, Presence Sample File)</td></tr>
<tr><td>Error Insertion</td><td>Repeat, Single
Error rate: 1E – n (n: 2 to 12)</td></tr>
</table>

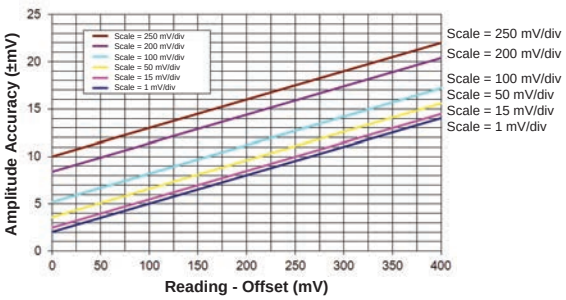
• ED

<table>
<tr><td>Operation Bit Rate</td><td>
<table>
<tr><th>With MP2100A/MP2101A-090</th><th>Without MP2100A/MP2101A-090</th></tr>
<tr><td>Variable bit-rate range (1 kbit/s step)
8 Gbit/s to 12.5 Gbit/s
1/N bit-rate operation range*
N=2: 4 Gbit/s to 6.25 Gbit/s
N=4: 2 Gbit/s to 3.125 Gbit/s
N=8: 1 Gbit/s to 1.5625 Gbit/s
N=16: 500 Mbit/s to 781.25 Mbit/s
N=32: 250 Mbit/s to 390.625 Mbit/s
N=64: 125 Mbit/s to 195.312 Mbit/s</td><td>Variable bit-rate range (1 kbit/s step)
8.5 Gbit/s to 11.32 Gbit/s
4.25 Gbit/s to 5.66 Gbit/s</td></tr>
</table>
</td></tr>
<tr><td>Offset Capacity</td><td>±100 ppm</td></tr>
<tr><td>Electrical Data Input</td><td>Input Number: Data, xData, Single-ended or Differential (With MP2100A-001, MP2101A-011, MP2101A-012)
Data, Single (With MP2100A-003)
Input Format: NRZ, Mark Ratio 50%
Threshold: –0.085 V to +0.085 V, 1 mV step (Termination: Single, at 0 dB external attenuation factor)
Consecutive Identical Digit Immunity:
72 bits (min.)
Bit rate: 9.95328 Gbit/s, Pattern: Frame format equal to STM-64, Mark ratio: 1/2, Termination: Single end,
At 20° to 30°C
External Attenuation Factor: 0 to 30 dB, 1 dB resolution
Connector
MP2100A: K connector
MP2101A: SMA connector
<table>
<tr><th>With MP2100A/MP2101A-090</th><th>Without MP2100A/MP2101A-090</th></tr>
<tr><td>0.1 Vp-p to 0.8 Vp-p, DC coupled:
8.5 Gbit/s to 11.32 Gbit/s and 1/N bit rate above
(10.3125 Gbit/s, single-ended 0.1 Vp-p, loopback,
PRBS31, mark ratio 1/2, 20° to 30°C, BER <1E–12)
0.25 Vp-p to 0.8 Vp-p, DC coupled:
8.0 Gbit/s to 8.5 Gbit/s, 11.320001 Gbit/s to 12.5 Gbit/s
and 1/N bit rate above
(12.288 Gbit/s, single-ended 0.25 Vp-p, loopback,
PRBS31, mark ratio 1/2, 20° to 30°C, BER <1E–12)</td><td>0.1 Vp-p to 0.8 Vp-p, DC coupled:
8.5 Gbit/s to 11.32 Gbit/s and 1/N bit rate above
(10.3125 Gbit/s, single-ended 0.1 Vp-p, loopback,
PRBS31, mark ratio 1/2, 20° to 30°C, BER <1E–12)</td></tr>
</table>
</td></tr>
</table>

Optical Data Input (O/E Input)	Input Number: 1 (With MP2100A-003/007) Input Format: NRZ, Mark Ratio 50% Optical Sensitivity: –9 dBm (typ.) Another Specification is same Optical Data Input of Eye/Pulse Scope (O/E Input) specification.
Measurement Function	Regenerating Clock Detection Clock count: 0 to 9999999,1.0000E07 to 9.9999E17 Frequency: Bit rate setting ±100 ppm Measurement accuracy depends on Internal Reference clock. Measurement Method Measurement time: 1 seconds to 9 days 23 hours 59 minutes 59 seconds Measurement frequency: Single, Repeat, Untimed Display update interval On: 0.1 seconds, Off: Set time at measurement time Auto sync control: On, Off Threshold value at bit error rate: INT/1E-2 to 1E-8 Sync control: Frame detection On, Off ∗This can be set when test pattern is Programmable Pattern and data length is 128 bits or more. Frame length: 64 bits ∗Sync Control = Frame On Frame position: 1 to (Pattern Length – Frame Length + 1), 1 bit resolution Jitter Tolerance: When inputting 9.95328 Gbit/s, pattern is set to PRBS 2^{31} – 1, and single-end and amplitude are set to 0.1 Vp-p.  15.2 UI (Modulation Frequency: 10 Hz to 2 kHz) 15.2 UI to 1.7 UI, (Modulation Frequency: 2 kHz to 17.9 kHz) 1.7 UI (Modulation Frequency:17.9 kHz to 400 kHz) 1.7 UI to 0.17 UI (Modulation Frequency: 400 kHz to 4 MHz) 0.17 UI (Modulation Frequency: 4 MHz to 8 MHz) 0.17 UI to 0.05 UI (Modulation Frequency: 8 MHz to 27.2 MHz) 0.05 UI (Modulation Frequency: 27.2 MHz to 80 MHz)
Test Pattern	PRBS: 2^7 – 1, 2^9 – 1, 2^{15} – 1, 2^{23} – 1, 2^{31} – 1 (Invert On/Off) USER Data: 1.3 Mbit/s (Editable Text File, Presence Sample File)
Measurement	Error Rate: 0.0001E-18 to 1.0000E-00 Error Count: 1.0000E07 to 9.9999E17
Alarm Indicator	Pattern asynchronous (Sync. loss), Frequency asynchronous (CR Unlock)

∗: When N is 4 or higher, asynchronous data recovery is used for the ED.
In this case, the ED sync. clock cannot be used.

Eye/Pulse Scope

<table>
<tr><td>Function</td><td>Wave Display: Eye Pattern, Pulse Pattern
Measurement Function: Time and Amplitude tests, Histogram, Eye Mask/Mask Margin Tests</td></tr>
<tr><td>Digital System</td><td>100 k sample/s (typ.)</td></tr>
<tr><td>Horizontal System</td><td>Clock Trigger Input
Frequency Range: 0.1 GHz to 12.5 GHz
Sensitivity: 100 mVp-p (typ.)
Maximum Amplitude: 2 Vp-p
Jitter
5 GHz to 12.5 GHz: 1.35 ps (max.), 0.85 ps rms (typ.)
1 GHz to 5 GHz: 1 ps rms (typ.)
0.1 GHz to 1 GHz: 2 ps rms (typ.)
Connector: SMA connector, 50 Ω
Pattern Display: 1 UI or more at full scale (Eye), 1 bit or more at full scale (Pulse)</td></tr>
<tr><td>Vertical System (Electrical Input)</td><td>Input Number: 2 (A in is Data of BERT is use the common port, B in is xData of BERT is use the common port)
(With MP2100A-001, MP2102A-021)
Input Number: 1 (A in is Data of BERT is use the common port)
(With MP2100A-003, MP2102A-023)
Bandwidth (–3 dB): DC to 20 GHz (min.), DC to 25 GHz (typ.)
Flatness: ±1 dB (typ.)
RMS Noise: 3.5 mV or less, 2 mV (typ.)
Maximum Input: ±2 V
Input Range: ±500 mV offset (min.)
±400 mV dynamic range (min.)
Amplitude Accuracy: Amplitude accuracy ±2% for reading value
 
The above figure shows the amplitude accuracy after calibration.</td></tr>
<tr><td>Vertical System (Optical Input)</td><td>Input Number: 1 (B in)
Fiber: 62.5 µm, Multimode, accepts single mode
Wavelength: 750 nm to 1650 nm
Bandwidth: DC to 9 GHz (typ., Unfiltered, –3 dB electrical)
Responsively: 0.25 A/W (850 nm, typ.), 0.475 A/W (1310 nm, typ.), 0.45 A/W (1550 nm, typ.)
Conversion Gain: 112.5 V/W (850 nm, typ.), 210 V/W (1310 nm, typ.), 200 V/W (1550 nm, typ.)
Optical Noise (typ.):
With MP2100A-007 and without MP2102A-055
<table>
<tr><th rowspan="2">Filter Option</th><th colspan="2">Wavelength (nm)</th></tr>
<tr><th>1310/1550</th><th>850</th></tr>
<tr><td>Option-070 to 073</td><td>1.8 µW rms</td><td>3.1 µW rms</td></tr>
<tr><td>Option-076 to 080</td><td>1.5 µW rms</td><td>2.7 µW rms</td></tr>
<tr><td>Option-081/082</td><td>2.2 µW rms</td><td>3.9 µW rms</td></tr>
<tr><td>Option-084/085</td><td>2.8 µW rms</td><td>4.8 µW rms</td></tr>
<tr><td>Option-086</td><td>1.4 µW rms</td><td>2.5 µW rms</td></tr>
</table>
With MP2100A-003 and with MP2102A-055
<table>
<tr><th rowspan="2">Filter Option</th><th colspan="2">Wavelength (nm)</th></tr>
<tr><th>1310/1550</th><th>850</th></tr>
<tr><td>Option-070 to 073</td><td>2.4 µW rms</td><td>4.2 µW rms</td></tr>
<tr><td>Option-076 to 080</td><td>2.0 µW rms</td><td>3.6 µW rms</td></tr>
<tr><td>Option-081/082</td><td>3.0 µW rms</td><td>5.2 µW rms</td></tr>
<tr><td>Option-084/085</td><td>3.7 µW rms</td><td>6.5 µW rms</td></tr>
<tr><td>Option-086</td><td>2.0 µW rms</td><td>3.4 µW rms</td></tr>
</table></td></tr>
</table>

<table>
<tr><td colspan="2">Optical Data Input (O/E Input)</td><td>Optical Sensitivity
MP2100A:<table><tr><td></td><td></td><td>Option-003</td><td>Option-007</td></tr><tr><td rowspan="3">Filter Option</td><td>Without Filter</td><td>–12 dBm</td><td>–15 dBm</td></tr><tr><td>With Option-086</td><td>–11 dBm</td><td>–14 dBm</td></tr><tr><td>With Filter (except Option-086)</td><td>–9 dBm</td><td>–12 dBm</td></tr></table>MP2102A:<table><tr><td></td><td></td><td>—</td><td>Option-055</td></tr><tr><td rowspan="3">Filter Option</td><td>Without Filter</td><td>–15 dBm</td><td>–12 dBm</td></tr><tr><td>With Option-086</td><td>–14 dBm</td><td>–11 dBm</td></tr><tr><td>With Filter (except Option-086)</td><td>–12 dBm</td><td>–9 dBm</td></tr></table>Maximum Input Power: –1 dBm or 794 µW (average)
+2 dBm or 1.58 mW (peak)
Absolute Maximum Ratings: +5 dBm or 3.16 mW (peak)
Optical Power Measurement
Measurement Range: –18 to 0 dBm
Measurement Accuracy: ±0.35 dB (–12 dBm or more, typ.)
±0.6 dB (Less than –12 dBm, typ.)
Optical Return Loss: –30 dB (typ.)
Connector: Select one of these Options
Option-037 FC connector
Option-040 SC connector</td></tr>
<tr><td rowspan="4">Clock Recovery (Option-055)</td><td>CRU Input</td><td>Connector: SMA connector (Jack), 50 Ω (AC coupled)
Amplitude: 100 mVp-p (typ.)
Maximum Amplitude: 2 Vp-p: input before damage</td></tr>
<tr><td>CRU Output</td><td>Connector: SMA connector (Jack), 50 Ω (AC coupled)
Amplitude: 0.27 Vp-p to 0.54 Vp-p (0.1 GHz to 2.7 GHz)
0.5 Vp-p to 1.5 Vp-p (8.5 GHz to 12.5 GHz)</td></tr>
<tr><td>Clock Rates</td><td>8.5 GHz to 12.5 GHz, 0.1 GHz to 2.7 GHz</td></tr>
<tr><td>Jitter RMS (additive)</td><td>8.5 GHz to 12.5 GHz band: 10 mUI (typ.), 20 mUI (4 MHz loop BW, max.)
0.1 GHz to 2.7 GHz band: 5 mUI (max.)</td></tr>
<tr><td>Loop Bandwidth (typ.)</td><td>8.5 GHz to 12.5 GHz band: 1, 2, 4, or 8 MHz (Possible to change, typ.)
0.1 GHz to 2.7 GHz band
2488.32 GHz: 200 kHz (typ.)
622 MHz: 50 kHz (typ.)
156 MHz: 20 kHz (typ.)</td></tr>
<tr><td colspan="2">Low Pass Filter (156M) (Option-070)</td><td>0.116 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (622M) (Option-071)</td><td>0.47 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (1.0G) (Option-072)</td><td>0.80 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (1.2G) (Option-073)</td><td>0.94 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (2.1G) (Option-076)</td><td>1.6 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (2.5G) (Option-077)</td><td>1.87 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (2.6G) (Option-078)</td><td>2.0 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (3.1G) (Option-079)</td><td>2.37 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (4.2G) (Option-080)</td><td>3.2 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (5.0G) (Option-081)</td><td>3.75 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (6.2G) (Option-082)</td><td>4.61 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (9.9G to 10.3G) (Option-084)</td><td>7.6 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (10.5G to 11.3G) (Option-085)</td><td>8.2 GHz (–3 dB cut off typical) LPF</td></tr>
<tr><td colspan="2">Low Pass Filter (9.9G to 10.7G) (Option-086)</td><td>7.5 GHz (–3 dB cut off typical) LPF</td></tr>
</table>

XFP Slot (Option-050)

Tx Data Input	Single-ended data input: 0.2 Vp-p to 0.4 Vp-p Input waveform: NRZ Connector: SMA connector, 50 Ω/GND
Rx Data Output	Single-end output level: 0.1 Vp-p (min.), 1.0 Vp-p (max.) Output waveform: NRZ Connector: SMA connector, 50 Ω/GND
Laser Safety	IEC60825-1: 2007: CLASS 1 21CFR1040.10*

SFP+ Slot (Option-051)

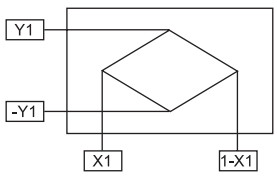
Tx Data Input	Single-end input level: 0.6 Vp-p to 0.8 Vp-p (G0238A) 0.25 Vp-p to 0.35 Vp-p (G0239A) Input waveform: NRZ Connector: SMA connector, 50 Ω/GND
Rx Data Output	Single-end output level: 0.10 Vp-p (min.), 1.0 Vp-p (max.) Output waveform: NRZ Connector: SMA connector, 50 Ω/GND
Laser Safety	IEC60825-1: 2007: CLASS 1 21CFR1040.10*

∗: All laser sources of this plug-in unit are classified as Class 1 according to IEC 60825-1 (2007). All laser sources comply with 21CFR 1040.10 except for deviations pursuant to Laser Notice No.50, dated 2007-June-24.
The following descriptive labels are affixed to the product.

Full Rate Clock Output (Option-052)

Operation Frequency	The MP2100A/01A-052 supports output at the following bit rates. With MP2100A/MP2101A-090 8.0 GHz to 12.5 GHz (1/1 rate) 4.0 GHz to 6.25 GHz (1/2 rate) 2.0 GHz to 3.125 GHz (1/4 rate) 1.0 GHz to 1.5625 GHz (1/8 rate) Without MP2100A/MP2101A-090 8.5 GHz to 11.32 GHz (1/1 rate) 4.25 GHz to 5.66 GHz (1/2 rate) 2.125 GHz to 2.83 GHz (1/4 rate) 1.0625 GHz to 1.415 GHz (1/8 rate) No clock is output when operating at the 1/16, 1/32, and 1/64 rates.
No. of Output Ports	1 (Single end)
Amplitude	300 mVp-p to 750 mVp-p
Duty	50±15%
Tr/Tf	30 ps (20 to 80%) (typ.)
Jitter (RMS)	2 ps rms (typ.) (10 GHz, Sync. Clock 1/8) 2 ps rms (typ.) (12.5 GHz, Sync. Clock 1/8, With MP2100A/MP2101A-090)
Connector	SMA connector
Termination	50 Ω/AC coupled
Reference Channel	Clock output synchronization target Ch1 PPG, ED: 1/1 rate, 1/2 rate operation selectable Ch2 PPG: With MP2100A-005 or MP2101A-012 ED: With MP2100A-005 or MP2101A-012 and 1/1 rate or 1/2 rate
Alarm	PLL Unlock Detect Function

ED High-sensitivity Input (Option-091)

Jitter Standard	Standardized jitter tolerance value per bit rate
Input sensitivity	MP2100A Ch1: 0.8 Vp-p to 0.1 Vp-p MP2100A Ch2 and MP2101A: 0.8 Vp-p to 0.05 Vp-p
Total Jitter: TJ [UI]	10.3125 Gbps: 0.65 4.25 Gbps: 0.325 2.125 Gbps: 0.325
Deterministic Jitter	10.3125 Gbps: 0.45 4.25 Gbps: 0.225 2.125 Gbps: 0.225
SJ (d-d) [UI] (4 MHz)	10.3125 Gbps: 0.22 4.25 Gbps: 0.11 2.125 Gbps: 0.11
Eye Mask Standard	Standardized input Eye mask per bit rate Y-axis voltage is Single-end input and BER ≤10^{-12} 
Y1: [mV]	MP2100A: Ch1 ED 10.3125 Gbps: 50 4.25 Gbps: 50 2.125 Gbps: 50 MP2100A: Ch2 ED 10.3125 Gbps: 25 4.25 Gbps: 25 2.125 Gbps: 25 MP2101A: Ch1 ED, Ch2 ED 10.3125 Gbps: 25 4.25 Gbps: 25 2.125 Gbps: 25
X1: [UI]	10.3125 Gbps: 0.325 4.25 Gbps: 0.1625 2.125 Gbps: 0.1625

Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

MP2100A BERTWave

Model/Order No.	Name	
	−Main frame−	
MP2100A	BERTWave	
	−Standard accessories−	
	Power Cord:	1
MX210000A	BERTWave Control Software (CD-ROM, Operation manual):	1
	−Option−	
MP2100A-001	Dual Electrical Receiver	
MP2100A-003	Optical/Single-ended Electrical Receiver*1	
MP2100A-005	Extended PPG/ED Channel	
MP2100A-007	1ch Electrical BERT and Optical/Single-ended Electrical Scope*2	
MP2100A-030	GPIB	
MP2100A-037	FC Connector	
MP2100A-040	SC Connector	
MP2100A-050	XFP Slot	
MP2100A-051	SFP+ Slot	
MP2100A-052	Full Rate Clock Output	
MP2100A-055	Clock Recovery for Eye/Pulse Scope	
MP2100A-061	1 High Bit Rate Filter	
MP2100A-062	2 High Bit Rate Filter Bank	
MP2100A-063	3 to 4 High Bit Rate Filter Bank	
MP2100A-064	1 to 2 Low Bit Rate Filter Bank	
MP2100A-065	3 to 4 Low Bit Rate Filter Bank	
MP2100A-066	1 High Bit Rate/1 to 2 Low Bit Rate Filter Bank	
MP2100A-067	1 to 2 High Bit Rate/3 to 4 Low Bit Rate Filter Bank	
MP2100A-068	2 to 3 High Bit Rate/1 to 2 Low Bit Rate Filter Bank	
MP2100A-069	3 High Bit Rate/3 Low Bit Rate Filter Bank	
MP2100A-070	LPF for 156M (L)	
MP2100A-071	LPF for 622M (L)	
MP2100A-072	LPF for 1.0G (L)	
MP2100A-073	LPF for 1.2G (L)	
MP2100A-076	LPF for 2.1G (H)	
MP2100A-077	LPF for 2.5G (H)	
MP2100A-078	LPF for 2.6G (H)	
MP2100A-079	LPF for 3.1G (H)	
MP2100A-080	LPF for 4.2G (H)	
MP2100A-081	LPF for 5.0G (H)	
MP2100A-082	LPF for 6.2G (H)	
MP2100A-084	LPF for 9.9G to 10.3G (H)*1, *3	
MP2100A-085	LPF for 10.5G to 11.3G (H)	
MP2100A-086	LPF for Multi 10G (H)*3, *4	
MP2100A-090	Bit Rate Extension for PPG/ED	
MP2100A-091	ED High Sensitivity	
MP2100A-107	1ch Electrical BERT and Optical/Single-ended Scope Retrofit*5, *6	
MP2100A-130	GPIB Retrofit (Upgrade option to original order)	
MP2100A-152	Full Rate Clock Output Retrofit	
MP2100A-176	LPF for 2.1G (H) Retrofit	
MP2100A-177	LPF for 2.5G (H) Retrofit	
MP2100A-178	LPF for 2.6G (H) Retrofit	
MP2100A-179	LPF for 3.1G (H) Retrofit	
MP2100A-180	LPF for 4.2G (H) Retrofit	
MP2100A-181	LPF for 5.0G (H) Retrofit	
MP2100A-182	LPF for 6.2G (H) Retrofit	
MP2100A-184	LPF for 9.9G to 10.3G (H) Retrofit	
MP2100A-185	LPF for 10.5G to 11.3G (H) Retrofit	
MP2100A-186	LPF for Multi 10G (H) Retrofit*7	
MP2100A-191	ED High Sensitivity Retrofit	

Model/Order No.	Name	
	−Standard accessories (MP2100A-001)−	
J1137	Terminator:	2
J1341A	Open (Coaxial connector cover):	5
J1359A	Coaxial Adaptor (K-P · K-J, SMA compatible):	2
	−Standard accessories (MP2100A-003)−	
J1137	Terminator:	2
J1341A	Open (Coaxial connector cover):	4
J1359A	Coaxial Adaptor (K-P · K-J, SMA compatible):	1
	−Standard accessories (MP2100A-005)−	
J1137	Terminator:	2
J1341A	Open (Coaxial connector cover):	2
	−Standard accessories (MP2100A-050)−	
J1341A	Open (Coaxial connector cover):	2
	−Standard accessories (MP2100A-051)−	
J1341A	Open (Coaxial connector cover):	2
	−Standard accessories (MP2100A-055)−	
J1341A	Open (Coaxial connector cover):	1
	−Maintenance service−	
MP2100A-ES310	Three Years Extended Warranty Service	
MP2100A-ES510	Five Years Extended Warranty Service	

MP2101A BERTWave PE

Model/Order No.	Name	
	−Main frame−	
MP2101A	BERTWave PE	
	−Standard accessories−	
	Power Cord:	1
MX210000A	BERTWave Control Software (CD-ROM, Operation manual):	1
	−Option−	
MP2101A-011	1CH PPG/ED	
MP2101A-012	2CH PPG/ED	
MP2101A-030	GPIB	
MP2101A-050	XFP Slot	
MP2101A-051	SFP+ Slot	
MP2101A-052	Full Rate Clock Output	
MP2101A-090	Bit Rate Extension for PPG/ED	
MP2101A-091	ED High Sensitivity	
MP2101A-130	GPIB Retrofit (Upgrade option to original order)	
MP2101A-152	Full Rate Clock Output Retrofit	
MP2101A-191	ED High Sensitivity Retrofit	
	−Standard accessories (MP2101A-011)−	
J1137	Terminator:	2
J1341A	Open (Coaxial connector cover):	4
	−Standard accessories (MP2101A-012)−	
J1137	Terminator:	4
J1341A	Open (Coaxial connector cover):	6
	−Standard accessories (MP2101A-050)−	
J1341A	Open (Coaxial connector cover):	2
	−Standard accessories (MP2101A-051)−	
J1341A	Open (Coaxial connector cover):	2
	−Maintenance service−	
MP2101A-ES310	Three Years Extended Warranty Service	
MP2101A-ES510	Five Years Extended Warranty Service	

MP2102A BERTWave SS

Model/Order No.	Name	
	−Main frame−	
MP2102A	BERTWave SS	
	−Standard accessories−	
	Power Cord:	1
MX210000A	BERTWave Control Software (CD-ROM, Operation manual):	1
	−Option−	
MP2102A-021	Dual Electrical Receiver	
MP2102A-023	Optical/Single-ended Electrical Receiver	
MP2102A-030	GPIB	
MP2102A-037	FC Connector	
MP2102A-040	SC Connector	
MP2102A-055	Clock Recovery	
MP2102A-061	1 High Bit Rate Filter	
MP2102A-062	2 High Bit Rate Filter Bank	
MP2102A-063	3 to 4 High Bit Rate Filter Bank	
MP2102A-064	1 to 2 Low Bit Rate Filter Bank	
MP2102A-065	3 to 4 Low Bit Rate Filter Bank	
MP2102A-066	1 High Bit Rate/1 to 2 Low Bit Rate Filter Bank	
MP2102A-067	1 to 2 High Bit Rate/3 to 4 Low Bit Rate Filter Bank	
MP2102A-068	2 to 3 High Bit Rate/1 to 2 Low Bit Rate Filter Bank	
MP2102A-069	3 High Bit Rate/3 Low Bit Rate Filter Bank	
MP2102A-070	LPF for 156M (L)	
MP2102A-071	LPF for 622M (L)	
MP2102A-072	LPF for 1.0G (L)	
MP2102A-073	LPF for 1.2G (L)	
MP2102A-076	LPF for 2.1G (H)	
MP2102A-077	LPF for 2.5G (H)	
MP2102A-078	LPF for 2.6G (H)	
MP2102A-079	LPF for 3.1G (H)	
MP2102A-080	LPF for 4.2G (H)	
MP2102A-081	LPF for 5.0G (H)	
MP2102A-082	LPF for 6.2G (H)	
MP2102A-084	LPF for 9.9G to 10.3G (H)*1, *3	
MP2102A-085	LPF for 10.5G to 11.3G (H)	
MP2102A-086	LPF for Multi 10G (H)*3, *4	
MP2102A-130	GPIB Retrofit (Upgrade option to original order)	
MP2102A-176	LPF for 2.1G (H) Retrofit	
MP2102A-177	LPF for 2.5G (H) Retrofit	
MP2102A-178	LPF for 2.6G (H) Retrofit	
MP2102A-179	LPF for 3.1G (H) Retrofit	
MP2102A-180	LPF for 4.2G (H) Retrofit	
MP2102A-181	LPF for 5.0G (H) Retrofit	
MP2102A-182	LPF for 6.2G (H) Retrofit	
MP2102A-184	LPF for 9.9G to 10.3G (H) Retrofit	
MP2102A-185	LPF for 10.5G to 11.3G (H) Retrofit	
MP2102A-186	LPF for Multi 10G (H) Retrofit*7	
	−Standard accessories (MP2102A-021)−	
J1341A	Open (Coaxial connector cover):	3
J1359A	Coaxial Adaptor (K-P · K-J, SMA compatible):	2
	−Standard accessories (MP2102A-023)−	
J1341A	Open (Coaxial connector cover):	2
J1359A	Coaxial Adaptor (K-P · K-J, SMA compatible):	1
	−Standard accessories (MP2102A-055)−	
J1341A	Open (Coaxial connector cover):	2
	−Maintenance service−	
MP2102A-ES310	Three Years Extended Warranty Service	
MP2102A-ES510	Five Years Extended Warranty Service	

Optional Accessories

Model/Order No.	Name
J1137	Terminator
J1341A	Open (Coaxial connector cover)
J1359A	Coaxial Adaptor (K-P · K-J, SMA compatible)
J1349A	Coaxial Cable 0.3 m
J1342A	Coaxial Cable 0.8 m
J1343A	Coaxial Cable 1 m
G0238A	SFP+ SR 850 nm
G0239A	SFP+ LR 1310 nm
G0174A	850 nm XFP Module (9.95 to 11.10 Gbit/s)
G0194A	1310 nm XFP Module
G0195A	1550 nm XFP Module
G0177A	850 nm SFP Module (1.062 to 4.25 Gbit/s)
G0178A	1310 nm SFP Module (0.155 to 2.67 Gbit/s)
G0179A	1550 nm SFP Module (0.155 to 2.67 Gbit/s)
J1344A	LC/PC-LC/PC-1M-SM
J1139A	FC · PC-LC · PC-1M-SM
J1345A	SC/PC-LC/PC-1M-SM
J1346A	LC/PC-LC/PC-1M-GI (62.5/125)
J1347A	FC/PC-LC/PC-1M-GI (62.5/125)
J1348A	SC/PC-LC/PC-1M-GI (62.5/125)
J1510A	Pick OFF Tee
J0617B	Replaceable Optical Connector (FC-PC)*8
J0618D	Replaceable Optical Connector (ST)*8
J0618E	Replaceable Optical Connector (DIN)*8
J0619B	Replaceable Optical Connector (SC)*8
B0639A	Carrying Case
W3349AE	MP2100A/MP2101A/MP2102A Operation Manual (Operation)
W3350AE	MP2100A/MP2101A/MP2102A Operation Manual (Remote Control, SCPI)
W3354AE	MP2100A/MP2101A/MP2102A Operation Manual (Remote Control, Native)
G0301A	External CDR Board (<2.667G)
J1512A	7.5G Passive Probe Set
B0650A	Rack Mount Kit

Software

Model/Order No.	Name
MX210001A	Jitter Analysis Software
MX210002A	Transmission Analysis Software

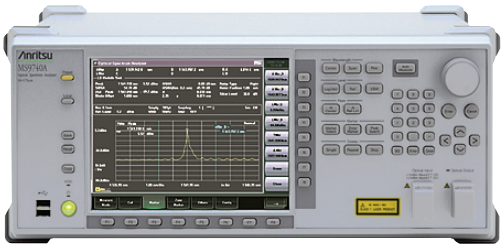
∗1: Build to Order.
∗2: Does not support optical BER measurements. Does not support Clock Recovery function of optical signal.
∗3: Option-084 and 086 supports to 8GFC measurement.
∗4: Cannot be used with Option-084.
∗5: Retrofitting is not supported the optical signal clock recovery function when the MP2100A-055 is installed.
∗6: Retrofitting is possible only for the MP2100A-003 configuration. It is not supported for the MP2100A-001 configuration.
∗7: When retrofitting to configurations including the Option-084, the Option-084 must be removed and replaced by either the Option-086.
∗8: Exchangeable-type optical connectors for optical input port.

Related Product

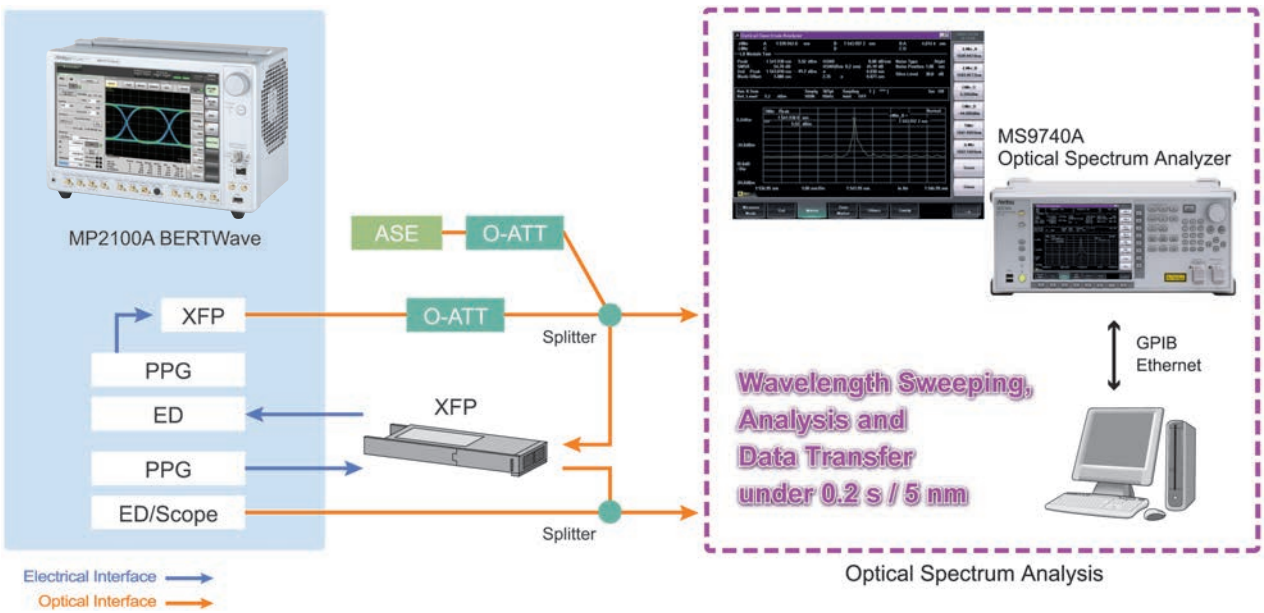
MS9740A Optical Spectrum Analyzer

600 nm to 1750 nm

- Measurement of passive optical devices in <0.2 s (5 nm) reduces total analysis time
- Dedicated applications for evaluating active optical devices
- Excellent cost performance
- Dynamic range performance ≤58 dB (0.4 nm from peak wavelength)
- 30 pm minimum resolution
- Lightweight, 50% less power consumption

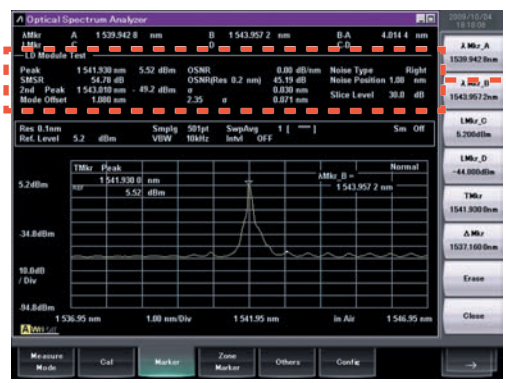


Example of Optical Transceiver Measurement



LD Module Test Analysis

This application measures test items such as center wavelength, optical level, OSNR, etc., required for LD module tests, and displays the results on one screen. The center wavelength, optical level, OSNR (per nm), side mode suppression ratio (SMSR) and 20 dB down spectrum width of LD modules can be measured. The center wavelength and spectrum half-width (FWHM) of FP-LDs or VCSELs are measured using the RMS method. Both SM and MM fibers are supported by one unit, helping cut equipment costs.



LD Module Test

LD Module Test Items

- Center wavelength, Level
- OSNR (actual measured value)
- OSNR (noise level per nm)
  * OSNR noise level specified from Higher, Left, Right, (L+R) / 2 or distance from peak wavelength
- SMSR
- Side mode peak wavelength, Level
- Spectrum width (n dB, RMS method, Standard deviation)

MP1800A series Signal Quality Analyzer

0.1 Gbit/s to 32 Gbit/s

This Compact, High-performance BER Test Equipment Supports Bit Rates from 0.1 Gbit/s to 32 Gbit/s

- Evaluate 100 GbE optical modules using 28 Gbit/s signals.
- Measure Jitter, crosstalk, skew, and emphasis effect required by multilane, high-speed interconnects market using PPG synchronization function.
- Evaluate EML by direct driving using 3.5 Vp-p high-amplitude waveforms and adjustable cross-point functions.

The MP1800A series offers the ideal solution for PHY layer evaluation of optical modules and high-speed devices at speeds from 0.1 Gbit/s to 32 Gbit/s. The modular slot design makes it easy to configure a flexible test system just by selecting modules and options matching the application. Moreover, combined use with a 56 Gbit/s MUX/DEMUX and synthesizer supports Bit Error Rate (BER) evaluations up to 56 Gbit/s.

Excellent Eco Product

MP1821A/MP1822A 50G/56Gbit/s MUX/DEMUX

8 Gbit/s to 56 Gbit/s

R&D into Fast 40 Gbit/s and Ultra-fast 56 Gbit/s Devices for Next-generation Communications

- Supports 56 Gbit/s Max. Operation Frequency
- Compact Remote Head
- Sophisticated Waveform
- Automatic Measurement Function
- Pre-code/De-code Functions
- Flexible Expandability

The MP1821A/MP1822A are MUX/DEMUX products supporting operating frequencies up to 56 Gbit/s. A full line of versatile functions and excellent performance for R&D into 40 Gbit/s fast next-generation devices, and ultra-fast 56 Gbit/s optical modules, supports customers with the perfect solution for bringing new products to market as early as possible.

MP1821A MP1822A

∗: Build-to-order product

MP1825B 4 Tap Emphasis

1 Gbit/s to 14.05 Gbit/s, 1 Gbit/s to 32.1 Gbit/s

Characteristics Evaluation for Serial Interface with Pre-emphasis Signals

- Pre-emphasis up to 4 taps
- Supports two bit rate ranges (14.1 Gbit/s and 32.1 Gbit/s)
- Jitter transparent
- Compact remote head

The MP1825B is a 4 taps pre-emphasis converter for bit rates up to 32.1 Gbit/s; it supports easy changes to the pre-emphasis waveform amplitude, offset, amplitude of each tap, etc., for effective evaluation of the characteristics of high-speed interfaces below 10 Gbit/s, such as PCIe, USB, and Backplane Ethernet requiring pre-emphasis signals, as well as InfiniBand 26G-IB-EDR, CEI-28G-VSR, 32G FC, etc., in the 30 Gbit/s band.
The passage of signals through printed-circuit board (PCB) wiring causes signal level attenuation and quality degradation, resulting in a closed Eye diagram. MP1825B enables emphasis with fast Tr/Tf and contribute precision measurement of high speed interconnect.

Anritsu

Specifications are subject to change without notice.

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