

# MP1900A Selection Guide

Signal Quality Analyzer-R MP1900A

## Introduction

The Signal Quality Analyzer-R MP1900A is a modular design offering optional functions for easy customization to users' requirements. As a result, the configuration can be tailored to budget timing while the excellent expandability offers easy addition of new future functions.

This Selection Guide explains the modules and options, as well as their selection conditions and possible combinations. Please use it to check the best configuration meeting the measurement needs.

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# 1. MP1900A and MP1800A Series Supported Equipment and Software

The MP1900A and MP1800A main units support different modules and software. Select the modules, software, and parts extending the functionality based on the measurement application and bit rate.

| Model and Name                                    | MP1900A | MP1800A |
|---|---------|---------|
| <b>Module</b>                                     |         |         |
| MU181000A 12.5GHz Synthesizer *1                  | ✓       | ✓*4     |
| MU181000B 12.5GHz 4 Port Synthesizer              |         |         |
| MU181500B Jitter Modulation Source                | ✓       | ✓       |
| MU181800B 14GHz Clock Distributor                 |         | ✓       |
| MU195050A Noise Generator                         | ✓       |         |
| MU195020A 21G/32G bit/s SI PPG                    | ✓       |         |
| MU195040A 21G/32G bit/s SI ED                     | ✓       |         |
| MU196020A PAM4 PPG                                | ✓       |         |
| MU196040B PAM4 ED                                 | ✓       |         |
| MU196040A PAM4 ED                                 | ✓       |         |
| MU183020A 28G/32G bit/s PPG                       | ✓       | ✓       |
| MU183040B 28G/32G bit/s High Sensitivity ED       | ✓       | ✓       |
| MU183021A 28G/32G bit/s 4ch PPG                   | ✓       | ✓       |
| MU183041B 28G/32G bit/s 4ch High Sensitivity ED   | ✓       | ✓       |
| MU181020B 14Gbit/s PPG                            |         | ✓       |
| MU181040B 14Gbit/s ED                             |         | ✓       |
| <b>Extended box</b>                               |         |         |
| MP1825B 4Tap Emphasis                             |         | ✓       |
| MP1861A 56G/64G bit/s MUX                         |         | ✓       |
| MP1862A 56G/64G bit/s DEMUX                       |         | ✓       |
| G0373A USB Test Adapter                           |         | ✓       |
| G0361A 64Gbaud 2-bit DAC with MUX                 | ✓       | ✓       |
| G0374A 64Gbaud PAM4 DAC                           | ✓       | ✓       |
| G0375A 32Gbaud Power PAM4 Converter               | ✓       | ✓       |
| G0376A 32Gbaud PAM4 Decoder                       | ✓       | ✓       |
| MZ1834A/MZ1834B 4PAM Converter                    | ✓       | ✓       |
| <b>Software</b>                                   |         |         |
| MX183000A High-Speed Serial Data Test Software *6 | ✓       | ✓       |
| MX183000A-PL001 Jitter Tolerance Test             | ✓       | ✓       |
| MX183000A-PL011 PCIe Link Sequence                | ✓       | ✓       |
| MX183000A-PL012 USB Link Sequence                 |         | ✓       |
| MX183000A-PL021 PCIe Link Training                | ✓       |         |
| MX183000A-PL022 USB Link Training                 | ✓       |         |
| MX183000A-PL031 DUT Error Counts Import           | ✓       |         |
| MX180001A SDH/SONET Pattern Editor                |         | ✓       |
| MX180003A GbE/10GbE Pattern Editor                |         | ✓       |
| MX180004A PON Application Software                |         | ✓       |
| MX180005A Jitter Application Software             |         | ✓       |
| MX180014A 100G PON Application Software           |         | ✓       |
| MX181500A Jitter/Noise Tolerance Test Software    |         | ✓       |

\*1 Manufacturing discontinued.

\*2 2.4 Gbit/s and above supported by MU195020A/40A and MU196020A/40B.

\*3 Choose the MU195020A/MU196020A for Emphasis functions.

\*4 MU181000B-002 SSC extension supports MP1900A only

\*5 Use the MX183000A-PL001 for Jitter Tolerance and Sweep measurements.

\*6 Includes PAM4 control (standard function) of G0375A/G376A

## 1-a. Selection of PPG and ED Module According to Measurement Application

Choose the PPG and ED module according to the following measurement application examples. Refer to Table 1-2 for the differences in the functions and performance of each model. When several types models are described in Table 1-1, select according to the measurement conditions by referring to the following main functions and performance.

- We recommend the new MU1960xx model for PAM4 measurement, but adding the Expansion Unit to the current MU1950xx also supports PAM4 measurement.
- Choose the MU195020A/MU195040A when using Link Training and LTSSM analysis required by PCIe, USB application.
- PPG
  - Choose the MU196020A at new PAM4 purchase or when requiring high functions and high performance or for bit rates exceeding 32G.
  - Choose the MU195020A when wanting to implement PAM4 with existing modules, or when requiring Emphasis generation functions and a wide variable amplitude range (ratio).
  - Choose the MU183020A PPG when using at amplitudes greater than 1.3 Vp-p and when performing cross-point control.
- ED
  - Choose the MU196040B at new PAM4 purchase or when requiring high functions and high performance.
  - Choose the MU195040A when wanting to implement PAM4 with existing modules, or when wanting to use CTLE or CDR supporting SSC input.
  - Choose the MU183040B ED when CTLE function is not used and evaluating small amplitude signals lower than Eye Height 15 mV (typ.), Eye Amplitude 22 mVp-p (typ.),  $\leq 31$  mVp-p.

**Table 1-1 PPGs/EDs Supporting 21 Gbit/s by Measurement Application & Function**

| Measurement Application   |                                   | MP1900A Series                             | MP1800A Series                                  |
|---|-----------------------------------|--|---|
| <b>Devices, backplanes, Active cables</b><br>BER measurement of devices and backplanes when using Emphasis, Jitter, Clock Recovery functions.   | 53G/58G<br>(200/400 GbE)          | MU196020A/40B                              | -   |
|   | to 28G/32G<br>(10/40/100/200 GbE) | MU196020A/40B<br>or<br>MU195020A/40A       | MU183020A<br>MP1825B<br>MU183040B               |
| <b>Optical modules, TOSA/ROSA, driver amplifiers</b><br>BER measurement of optical modules and of high-amplitude applications other than those described below  | 53G/58G<br>(200/400 GbE)          | MU196020A/40B                              | -   |
|   | to 28G/32G<br>(10/40/100/200 GbE) | MU196020A/40B<br>or<br>MU195020A/40A       | MU18302xA<br>MU18304xB                          |
| <b>EML-TOSA evaluations and tests using high-amplitude signals</b><br>For EML-TOSA evaluation   | 53G/58G                           | MU196020A/40B                              | -   |
|   | to 28G/32G                        | MU196020A <sup>*5</sup><br>or<br>MU195020A | MU18302xA                                       |
| <b>InfiniBand AOC test</b>  | HDR <sup>*3</sup>                 | MU196020A/40B<br>or<br>MU195020A/40A       | -   |
|   | EDR<br>FDR                        |  | MU183020A<br>MP1825B<br>MU183040B <sup>*2</sup> |
| <b>PON, Optical circuit tests and burst signal tests</b><br>BER measurements using burst signals and patterns with Mark ratio of 1/2 or more  | <b>100G PON</b>                   | -  | MU183020A<br>MU183040B                          |
|   | <b>10G PON</b>                    | -  | MU181020B<br>MU181040B                          |
| <b>PCI Express Gen1 to 4 receiver Test</b><br>Receiver sensitivity and JTOL measurements of PCIe Gen1 to 4 Root complex and End point when using Link Sequence, Dynamic Link Training, LTSSM analysis, SKP OS Insertion/Filtering function and SSC input support. |                                   | MU195020A<br>MU195040A                     | -   |
| <b>USB3.1 receiver Test</b><br>Receiver sensitivity and JTOL measurements of USB3.1 Host and Device when using LFPS generation, Link Sequence, SKP OS Insertion/Filtering function and SSC input support.   |                                   | MU195020A<br>MU195040A                     | MU18302xA<br>MP1825B<br>G0373A <sup>*4</sup>    |
| <b>Thunderbolt 3 Receiver Test</b><br>Supports Thunderbolt 3 Host and Device Stressed Receiver Sensitivity measurement using Emphasis output and Jitter generation  |                                   | MU195020A                                  | MU183020A<br>MP1825B <sup>*1</sup>              |

\*1 Recommended measuring instrument at Thunderbolt Plugfest

\*2 Measuring instrument recommended at IBTA Plugfest

\*3 Due to possible changes in the HDR standards, contact our sales representatives for more details.

\*4 Link Training, LTSSM analysis is not possible.

\*5 Requires external amplifier

**Table 1-2 Selection by Difference in Functions and Performance**

| Function/Performance                                       | MU1960xx series<br>(MU196020A/<br>MU196040B)                        | MU1950xx series<br>(MU195020A/<br>MU195040A)                              | MU1830xx series<br>(MU183020A/<br>MU183040B)  |
|--|---|---|---|
| PPG/ED   |   |   |   |
| Coding   | NRZ, PAM4   | NRZ   |   |
| Operating rate   | 2.4 to 32.1/58.2/64.2 Gbaud<br>(option selection) <sup>*1</sup>     | 2.4 to 21/32.1 Gbits<br>(option selection)                                | 2.4 to 28.1/32.1 Gbits<br>(option selection)  |
| Link Training and<br>LTSSM Analysis <sup>*3</sup>          | —   | Supported   | —   |
| PPG  |   |   |   |
| Output amplitude<br>(Single-end)                           | 0.07 Vp-p to 0.8 Vp-p   | 0.1 Vp-p to 1.3 Vp-p<br>0.3 Vp-p to 1.95 Vp-p <sup>*4</sup>               | 0.5 to 2.0 or 3.5 Vp-p<br>1.5 Vp-p to 2.25 Vp-p <sup>*4</sup>   |
| Output setting control                                     | Data/Xdata common   |   | Data/Xdata independent  |
| Emphasis tap   | 4 Taps (option)   | 10 Taps (option)  | — <sup>*2</sup>   |
| Emphasis gain control                                      | -20 to +20 dB   |   | — <sup>*2</sup>   |
| ISI additional function                                    | Supported (option)  | Supported (option)  | —   |
| Cross-point  | 50% fixed   |   | 20% to 80%  |
| Tr/Tf (NRZ, 20% to 80%)                                    | 9 ps (typ.) @32.1G<br>8.5 ps (typ.) @58.2G<br>at J1749A 40 cm cable | 12 ps (typ.) @32.1G   |   |
| Intrinsic Jitter RJ  | 170 fs rms (typ.)   | 115 fs rms (typ.)   | 200 fs rms (typ.)   |
| Offset function  | -2.0 to +3.3 VOH  |   |   |
| FEC Pattern Generation                                     | Supported (option)  | —   | —   |
| ED   |   |   |   |
| Input amplitude<br>(Single-end)                            | NRZ: 0.05 Vp-p to 1.0 Vp-p<br>PAM4: 0.3 Vp-p to 1.0 Vp-p            | NRZ: 0.05 Vp-p to 1.0 Vp-p  |   |
| Input sensitivity (PAM4)<br>(Eye height)                   | @32.1 Gbaud 23 mV (typ.)<br>@58.2 Gbaud 49 mV (typ.)                | —   | —   |
| Input sensitivity (NRZ)<br>(Eye height)<br>(Eye amplitude) | @32.1 Gbit/s<br>19 mV (typ.)<br>25 mVp-p (typ.),<br>≤50 mVp-p       | @28 Gbit/s , at CTLE off<br>15 mV (typ.)<br>22 mVp-p (typ.),<br>≤31 mVp-p | @28 Gbit/s<br>10 mV (typ.)<br>15 mVp-p (typ.),<br>≤25 mVp-p   |
| CTLE function  | —   | 0 to -12 dB (option)  | —   |
| LFE function<br>DFE function                               | -2.0 to 0.0 dB (option)<br>@53.1G -1.4 dB (typ.)<br>(option)        |   |   |
| Clock recovery   | 2.4G to 32.1G, 51.0G to<br>58.2G (option)                           | 2.4 Gbit/s to 32.1 Gbit/s<br>(option),<br>SSC input support               | 2.4 Gbit/s to 28.1 Gbit/s<br>(option) or 25.5 Gbit/s to<br>32.1 Gbit/s (option) , no SSC<br>input support |
| PAM4 counter   | MSB/LSB, Symbol 0 to 3  | —   |   |

\*1 The MU196040B upper limits are 64.2G for NRZ, and 58.2G for PAM4.

\*2 4Tap and -20 to +20 dB control when using MP1825B

\*3 MX183000A-PL021, PL022

\*4 PAM4 output amplitude in combination with G0375A (Single-end)

## 2. Functions and Features of Each Main Unit, Module, and Option

This section explains the functions and features of each main unit module and option. Refer to the catalog for details of functions and features.

**Table 2-1 Main Unit Functions and Features**

|                                      |   |
|--------------------------------------|---|
| MP1900A<br>Signal Quality Analyzer-R | Main unit with touch panel operation screen. Up to 8 expansion modules can be inserted in slots. The MX190000A Signal Quality Analyzer Control software is installed. Functions for remote control over LAN and GPIB are supported. |
|--------------------------------------|---|

**Table 2-2 Functions and Characteristics of Clock Module**

|   |   |
|---|---|
| MU181000B<br>12.5 GHz 4Port Synthesizer | This 2-slot wide module supports output of clocks of 0.1 to 12.5 GHz. There are four output ports that can be used as clock sources for the PPG and module.   |
| MU181000B-001<br>Jitter Modulation      | This option outputs a jittered clock. Inputting the jittered clock to either the PPG or MUX module can be used to output jittered data. The internal sinusoidal jitter source can impress jitter of up to 80 MHz. |
| MU181000B-002<br>SSC Extension          | When PCIe Host is DUT, supports input of Refclk signal from Host and output of synchronized clock.<br>Option for use with MP1900A.  |
| MU181500B<br>Jitter Modulation Source   | This 2-slot wide module adds any jitters such as SJ, RJ, BUJ and SSC to the incoming clock. Two kinds of SJ are available by combination with a jittered synthesizer (MU181000B-001)                              |
| MU181800B<br>14 GHz Clock Distributor   | This module divides the 0.1 GHz to 14 GHz clock into five branches for distribution of the clock to up to five PPG modules.   |
| MU181800B-005<br>14.1 GHz Extension     | This module extends the frequency range to support input/output of signals up to 14.1 GHz.  |

**Table 2-3 Noise Module Functions and Features**

|                              |  |
|------------------------------|--|
| MU195050A<br>Noise Generator | Noise generation module for adding common mode, differential mode, and White (option) noise to MU195020A 2ch PPG Data input for output |
| MU195050A-001<br>White Noise | Option for adding White noise.   |

**Table 2-4 PPG Module Functions and Features**

|                                       |   |
|---------------------------------------|---|
| MU195020A<br>21G/32G bit/s SI PPG     | PPG module supporting differential interfaces outputting signals from 21Gbit/s to 32.1Gbit/s. Can generate various patterns such as PRBS. Select 1ch or 2ch Data output as option. Supports PCIe Link Training. |
| MU195020A-001<br>32.1Gbit/s Expansion | Option extending upper operation frequency from 21 Gbit/s to 32.1 Gbit/s. Can be used in bit rate range from 2.4 Gbit/s to 32.1 Gbit/s. Without this option, the bit rate is from 2.4 Gbit/s to 21 Gbit/s.      |
| MU195020A-010<br>1ch Data Output      | Option supporting 1ch differential data output and output amplitude from 0.1 Vp-p to 1.3 Vp-p.  |
| MU195020A-020<br>2ch Data Output      | Option supporting 2ch differential data output and output amplitude from 0.1 Vp-p to 1.3 Vp-p.  |
| MU195020A-011<br>1ch 10Tap Emphasis   | Option adding built-in 10Tap Emphasis function to 1ch differential data output. Can be selected with Opt-010.   |
| MU195020A-021<br>2ch 10Tap Emphasis   | Option adding built-in 10Tap Emphasis function to 2ch differential data output. Can be selected with Opt-020.   |
| MU195020A-030<br>1ch Data Delay       | Option for varying phase. Can vary Data phase versus Clock. Can be selected with Opt-010.   |
| MU195020A-031<br>2ch Data Delay       | Option for varying phase. Can vary Data phase versus Clock. Can be selected with Opt-020.   |

|                                   |  |
|-----------------------------------|--|
| MU195020A-040<br>1ch Variable ISI | Generates signal emulating ISI using Emphasis control. Requires Opt-011. |
| MU195020A-041<br>2ch Variable ISI | Generates signal emulating ISI using Emphasis control. Requires Opt-021. |

|   |  |
|---|--|
| MU196020A<br>PAM4 PPG                               | PPG module supporting PAM4 and NRZ with differential I/F for outputting signals up to 32.1G, 58.2G, or 64.2G. Can generate various patterns for PAM4 and NRZ.                                    |
| MU196020A-001<br>32 Gbaud *1                        | Can be used in operating rate range from 2.4 Gbaud to 32.1 Gbaud.  |
| MU196020A-002<br>58 Gbaud *1                        | Can be used in operating rate range from 2.4 Gbaud to 58.2 Gbaud.  |
| MU196020A-003<br>64 Gbaud *1                        | Can be used in operating rate range from 2.4 Gbaud to 64.2 Gbaud.  |
| MU196020A-112<br>32G to 58G baud Extension Retrofit | Extends upper operation rate from Opt-001 to 58.2 Gbaud.   |
| MU196020A-113<br>32G to 64G baud Extension Retrofit | Extends upper operation rate from Opt-001 to 64.2 Gbaud.   |
| MU196020A-123<br>58G to 64G baud Extension Retrofit | Extends upper operation rate from Opt-002 to 64.2 Gbaud.   |
| MU196020A-011<br>4Tap Emphasis                      | Option adding built-in 4Tap Emphasis function.   |
| MU196020A-030<br>Data Delay                         | Option for varying phase. Can vary Data phase versus Clock.  |
| MU196020A-040<br>Adjustable ISI                     | Generates signal emulating ISI using Emphasis control. Requires Opt-011.   |
| MU196020A-032<br>FEC Pattern Generation             | Generates FEC patterns.  |
| MU196020A-050<br>Inter-Module Synchronization       | Multi-channel operation is possible.<br>Option 030 is required. It is necessary to add this option to all the modules to be synchronized, and the operation rate option of 32/58/64 is the same. |

\*1 Select either

|  |   |
|--|---|
| MU183020A<br>28G/32 Gbit/s PPG         | This PPG module supports differential interfaces outputting signals up to 28.1 Gbit/s or 32.1 Gbit/s. It can be used to generate various patterns such as PRBS. The number of channels can be selected from 1ch or 2ch according to the option. |
| MU183020A-001<br>32.1 Gbit/s Extension | This option extends the operation bit-rate up to 32.1 Gbit/s. The bit-rate range is 2.4 Gbit/s to 32.1 Gbit/s with this option. Without this option, the bit-rate range is 2.4 to 28.1 Gbit/s.  |
| MU183020A-012<br>1ch 2 V Data Output   | This option supports 1ch differential data output. The variable amplitude range is from 0.5 Vp-p to 2.0 Vp-p. The offset and cross-point can also be varied.  |
| MU183020A-013<br>1ch 3.5 V Data Output | This option supports 1ch differential data output. The variable amplitude range is from 0.5 Vp-p to 3.5 Vp-p. The offset and cross-point can also be varied.  |
| MU183020A-022<br>2ch 2 V Data Output   | This option supports 2ch differential data output. The variable amplitude range is from 0.5 Vp-p to 2.0 Vp-p. The offset and cross-point can also be varied.  |
| MU183020A-023<br>2ch 3.5 V Data Output | This option supports 2ch differential data output. The variable amplitude range is from 0.5 Vp-p to 3.5 Vp-p. The offset and cross-point can also be varied.  |

|  |   |
|--|---|
| MU183020A-030<br>1ch Data Delay        | This option enables phase adjustment of data relative to the clock and enables pattern-synchronized data signals among the other PPGs. This option can be selected when 1ch Data output (MU183020A-012/013) is installed. |
| MU183020A-031<br>2ch Data Delay        | This option enables phase adjustment of data relative to the clock and enables pattern-synchronized data signals among the other PPGs. This option can be selected when 2ch Data output (MU183020A-022/023) is installed. |
| MU183021A<br>28G/32 Gbit/s 4ch PPG     | This PPG module supports differential interfaces outputting signals up to 28.1 Gbit/s or 32.1 Gbit/s. It can be used to generate various patterns such as PRBS. The number of channels is 4.                              |
| MU183021A-001<br>32.1 Gbit/s Extension | This option extends the operation bit-rate up to 32.1 Gbit/s. The bit-rate range is 2.4 Gbit/s to 32.1 Gbit/s with this option. Without this option, the bit-rate range is 2.4 Gbit/s to 28.1 Gbit/s.                     |
| MU183021A-012<br>4ch 2 V Data Output   | This option supports variable amplitude. The amplitude range is from 0.5 Vp-p to 2.0 Vp-p. The offset and cross-point can also be varied.   |
| MU183021A-013<br>4ch 3.5 V Data Output | This option supports 4ch differential data output. The variable amplitude range is from 0.5 Vp-p to 3.5 Vp-p. The offset and cross-point can also be varied.  |
| MU183021A-030<br>4ch Data Delay        | This option enables phase adjustment of data relative to the clock and enables pattern-synchronized data signals among the other PPGs.  |

**Table 2-5 ED Module Functions and Features**

|                                       |   |
|---------------------------------------|---|
| MU195040A<br>21G/32G bit/s SI ED      | ED module for differential interfaces supporting analysis of signals from 21 Gbit/s to 32.1Gbit/s. Operates with half-rate Clock input from PPG or with Clock recovered from Data input. Select 1ch or 2ch Data input as option. Supports PCIe Link Training. |
| MU195040A-001<br>32.1Gbit/s Expansion | Option extending upper operation frequency from 21 Gbit/s to 32.1 Gbit/s. Can be used in bit rate range from 2.4 Gbit/s to 32.1 Gbit/s. Without this option, the bit rate is from 2.4 Gbit/s to 21 Gbit/s.  |
| MU195040A-010<br>1ch ED               | 1ch differential Data input option  |
| MU195040A-020<br>2ch ED               | 2ch differential Data input option  |
| MU195040A-011<br>1ch CTLE             | Option adding built-in CTLE function to 1ch differential Data input. Can be selected with Opt-010.  |
| MU195020A-021<br>2ch CTLE             | Option adding built-in CTLE function to 2ch differential Data input. Can be selected with Opt-020.  |
| MU195040A-022<br>Clock Recovery       | Option for recovering for recovering Clock from Data input. Supports SSC input.   |

|   |   |
|---|---|
| MU196040B<br>PAM4 ED                    | ED module supporting PAM4 and NRZ with differential interface for signal analysis up to PAM4 58.2G (NRZ 64.2G). Operates with half-rate clock input from PPG, or clock recovered from data input. |
| MU196040B-001<br>32G baud <sup>*1</sup> | Option for decoding PAM4/NRZ 2.4G to 32.1G signals.   |
| MU196040B-002<br>58G baud <sup>*1</sup> | Option for decoding PAM4 signals from 2.4G to 58.2G, and NRZ signals from 2.4G to 64.2G.  |
| MU196040B-011<br>Equalizer              | Option for building Low Frequency Equalizer and Decision Feedback Equalizer functions into differential data input.   |



|   |   |
|---|---|
| MU196040B-112<br>32G to 58G baud Extension    | Option for extending upper frequency limit from 32.1G to 58.2G for Opt-001; adding this option supports range of 2.4G to 58.2G for PAM4 and range of 2.4G to 64.2G for NRZ. |
| MU196040B-021<br>29G Clock Recovery           | Option for recovering clock from 2.4G to 29G data input.  |
| MU196040B-022<br>32G Clock Recovery           | Option for recovering clock from 2.4G to 32.1G data input.  |
| MU196040B-023<br>58G Clock Recovery Extension | Option for recovering clock from 51G to 58.2G data input; requires Opt-021 or Opt-022.  |
| MU196040B-124<br>32G Clock Recovery Extension | Option for extending clock recovery upper rate from 29G to 32.1G for Opt-021; adding this option supports range of 2.4G to 32.1G.   |
| MU196040B-041<br>SER Measurement              | Option for analyzing PAM4 signal symbol errors.   |

\*1 Select any one.

|   |   |
|---|---|
| MU196040A<br>PAM4 ED                                      | ED module supporting PAM4 and NRZ with differential I/F for analyzing signals up to 32.1G. Operates with half-rate clock input from PPG or clock recovered from Data input. |
| MU196040A-001<br>32.1 Gbaud Decoder<br>(mandatory option) | Option for decoding PAM4 signals.   |
| MU196040A-022<br>25.5G to 32.1G Clock Recovery            | Option for recovering for recovering Clock from Data input.   |
| MU196040A-041<br>SER Measurement                          | Option for analyzing PAM4 signal symbol errors.   |

|  |   |
|--|---|
| MU183040B<br>28G/32 Gbit/s ED                        | This ED module supports differential interfaces for analyzing signals up to 28.1 Gbit/s or 32.1 Gbit/s. Its main function is for BER measurement, etc. The number of channels can be selected from 1ch or 2ch according to the option.  |
| MU183040B-001<br>32.1 Gbit/s Extension               | This option extends the operation bit-rate up to 32.1 Gbit/s. The bit-rate range is 2.4 Gbit/s to 32.1 Gbit/s with this option. Without this option, the bit-rate range is 2.4 to 28.1 Gbit/s.  |
| MU183040B-010<br>1ch ED                              | This option supports 1ch differential data input. A function for phase adjustment between incoming data and clock is included.  |
| MU183040B-020<br>2ch ED                              | This option supports 2ch differential data input. A function for phase adjustment between incoming data and clock is included.  |
| MU183040B-022<br>2.4G to 28.1 Gbit/s Clock Recovery  | This is the clock recovery option. This option enables recovering clock from incoming data, so input of an external clock (from PPG Module) is not necessary. The clock signal is recovered from the Data signal input to CH-1 and is distributed internally to each channel. This option supports bit rates of 2.4 Gbit/s to 28.1 Gbit/s. The Loop band can be selected from Bit-rate/1667, Bit-rate/2578, and Variable (1 MHz to 17 MHz, 1-MHz steps). This option and the MU183040B-023 cannot be installed simultaneously.                      |
| MU183040B-023<br>25.5G to 32.1 Gbit/s Clock Recovery | This is the clock recovery option. This option enables recovering clock from incoming data, so input of an external clock (from PPG Module) is not necessary. The clock signal is regenerated from the Data signal input to CH-1 and is distributed internally to each channel. This option supports bit rates of 25.5 Gbit/s to 32.1 Gbit/s. The Loop band can be selected from Bit-rate/1667, and Bit-rate/2578. This option and the MU183040B-022 cannot be installed simultaneously. The MU183040B-001 must be installed to select this option. |

|  |   |
|--|---|
| MU183041B<br>28G/32 Gbit/s 4ch ED                    | This ED module supports differential interfaces for analyzing signals up to 28.1 Gbit/s or 32.1 Gbit/s. Its main function is for BER measurement, etc. The number of channels is 4.   |
| MU183041B-001<br>32.1 Gbit/s Extension               | This option extends the operation bit-rate up to 32.1 Gbit/s. The bit-rate range is 2.4 Gbit/s to 32.1 Gbit/s with this option. Without this option, the bit-rate range is 2.4 to 28.1 Gbit/s.  |
| MU183041B-022<br>2.4G to 28.1 Gbit/s Clock Recovery  | This is the clock recovery option. This option enables recovering clock from incoming data, so input of an external clock (from PPG Module) is not necessary. The clock signal is regenerated from the Data signal input to CH-1 and is distributed internally to each channel. This option supports bit rates of 24 Gbit/s to 28.1 Gbit/s. The Loop band can be selected from Bit-rate/1667, Bit-rate/2578, and Variable (1MHz to 17 MHz, 1-MHz steps). This option and the MU183041B-023 cannot be installed simultaneously.  |
| MU183041B-023<br>25.5G to 32.1 Gbit/s Clock Recovery | This is the clock recovery option. This option enables recovering clock from incoming data, so input of an external clock (from PPG Module) is not necessary. The clock signal is regenerated from the Data signal input to CH-1 and is distributed internally to 1ch and 2ch. Moreover, similarly, the clock regenerated from the Data input to 3ch is distributed to 3ch and 4ch. This option supports bit rates of 25.5 Gbit/s to 32.1 Gbit/s. The Loop band can be selected from Bit-rate/1667, and Bit-rate/2578. This option and the MU183041B-022 cannot be installed simultaneously. The MU183041B-001 must be installed to select this option. |

**Table 2-6 Software Functions and Features**

|   |  |
|---|--|
| MX190000A<br>Signal Quality Analyzer Control Software | Software for controlling modules installed in MP1900A. Installed at MP1900A shipment.  |
| MX183000A<br>High Speed Serial Data Software          | Adding this software option supports Jitter Tolerance measurements as well as PCIe and USB receiver measurements. It is installed at MP1900A shipment. |
| MX183000A-PL001<br>Jitter Tolerance Test              | This software supports the jitter tolerance and jitter sweep tests when used in combination with the jitter modulation source (MU181500B).             |
| MX183000A-PL011<br>PCIe Link Sequence                 | Software using Link Sequence Pattern generation function for transitioning PCI Express Gen1 to 4 Devices to Loopback mode.                             |
| MX183000A-PL021<br>PCIe Link Training                 | Software using Link Training function with negotiation process for transitioning PCI Express Gen1 to 4 Devices to Loopback mode.                       |
| MX183000A-PL022<br>USB Link Training                  | Software for transitioning USB3.1 devices to Loopback mode using Link Training function for performing negotiation.                                    |
| MX183000A-PL031<br>DUT Error Counts Import            | Capture DUT bit error count vis USB or Ethernet connection. To measure jitter tolerance using this count value, MX183000A - PL001 is required.         |

### 3. Option Combinations

The following tables list the combinations of the main units, modules and options. Refer to each table when deciding option combinations.

**Table 3-1 21G/32G bit/s SI PPG MU195020A**

| No. | Upper Bit Rate  | Number of Data Channels<br>(Select one or other) | 10Tap Emphasis                 | Variable ISI           | Data Phase Tuning      |
|-----|---|--|--------------------------------|------------------------|------------------------|
| 1   | 21 Gbit/s<br>(Without<br>Opt-001)<br>or<br>32 Gbit/s<br>Opt-001 | 1 ch<br>Opt-010<br>1ch Data Output               | -                              | -                      | -                      |
| 2   |   |  |                                |                        | Opt-030 1ch Data Delay |
| 3   |   |  | Opt-011<br>1ch 10 Tap Emphasis | -                      | -                      |
| 4   |   |  |                                |                        | Opt-030 1ch Data Delay |
| 5   |   | 2 ch<br>Opt-020<br>2ch Data Output               | -                              | -                      | -                      |
| 6   |   |  |                                |                        | Opt-031 2ch Data Delay |
| 7   |   |  | Opt-021<br>2ch 10 Tap Emphasis | -                      | -                      |
| 8   |   |  |                                |                        | Opt-031 2ch Data Delay |
|     |   |  | Opt-041<br>2ch Variable ISI    | -                      |                        |
|     |   |  |                                | Opt-031 2ch Data Delay |                        |

**Table 3-2 PAM4 PPG MU196020A**

| No. | Upper Operating Rate<br>(Select either)   | 4Tap Emphasis | Adjustable ISI | FEC Pattern Generation | Data Phase Tuning<br>Data Delay | Multi Channel<br>Inter-Module<br>Synchronization |         |
|-----|---|---------------|----------------|------------------------|---------------------------------|--|---------|
| 1   | 32.1 Gbaud<br>Opt-001<br>or<br>58.2 Gbaud<br>Opt-002<br>or<br>64.2 Gbaud<br>Opt-003 | -             | -              | -                      | -                               | -  |         |
| 2   |   |               |                |                        | Opt-030                         | -  |         |
| 3   |   |               |                |                        |                                 | Opt-050  |         |
| 4   |   |               |                | -                      |                                 |  |         |
| 5   |   |               |                | Opt-042                | -                               | -  | -       |
| 6   |   |               |                |                        |                                 |  | Opt-030 |
| 7   |   | Opt-050       |                |                        |                                 |  |         |
| 8   |   | Opt-011       | -              | -                      | -                               | -  |         |
| 9   |   |               |                |                        |                                 | Opt-030  |         |
| 10  |   |               |                |                        |                                 | Opt-050  |         |
| 11  |   |               |                | Opt-042                | -                               | -  | -       |
| 12  |   |               |                |                        |                                 |  | Opt-030 |
| 13  |   |               |                |                        |                                 |  | Opt-050 |
| 14  |   | Opt-040       | -              | -                      | -                               |  |         |
| 15  |   |               |                |                        | Opt-030                         |  |         |
| 16  |   |               |                |                        | Opt-050                         |  |         |
| 17  |   | Opt-042       | -              | -                      | -                               |  |         |
| 18  |   |               |                |                        | Opt-030                         |  |         |
|     |   |               |                |                        | Opt-050                         |  |         |

**Table 3-3 28G/32G bit/s PPG MU183020A**

| No. | Upper Bit Rate                             | Data ch No. | Data Amplitude<br>(Select one or other) | Data Phase Tuning      |
|-----|--|-------------|---|------------------------|
| 1   | 28.1 Gbit/s<br>(Without Opt-001)           | 1ch         | Opt-012 0.5 Vp-p to 2.0 Vp-p            | -                      |
| 2   |  |             |   | Opt-030 1ch Data Delay |
| 3   |  |             | Opt-013 0.5 Vp-p to 3.5 Vp-p            | -                      |
| 4   |  |             |   | Opt-030 1ch Data Delay |
| 5   |  | 2ch         | Opt-022 0.5 Vp-p to 2.0 Vp-p            | -                      |
| 6   |  |             |   | Opt-031 2ch Data Delay |
| 7   |  |             | Opt-023 0.5 Vp-p to 3.5 Vp-p            | -                      |
| 8   |  |             |   | Opt-031 2ch Data Delay |
| 9   | 32.1 Gbit/s<br>Opt-001 32 Gbit/s Expansion | 1ch         | Opt-012 0.5 Vp-p to 2.0 Vp-p            | -                      |
| 10  |  |             |   | Opt-030 1ch Data Delay |
| 11  |  |             | Opt-013 0.5 Vp-p to 3.5 Vp-p            | -                      |
| 12  |  |             |   | Opt-030 1ch Data Delay |
| 13  |  | 2ch         | Opt-022 0.5 Vp-p to 2.0 Vp-p            | -                      |
| 14  |  |             |   | Opt-031 2ch Data Delay |
| 15  |  |             | Opt-023 0.5 Vp-p to 3.5 Vp-p            | -                      |
| 16  |  |             |   | Opt-031 2ch Data Delay |

**Table 3-4 28G/32G bit/s 4ch PPG MU183021A**

| No. | Upper Bit Rate                             | Data ch No. | Data Amplitude<br>(Select one or other) | Data Phase Tuning      |
|-----|--|-------------|---|------------------------|
| 1   | 28.1 Gbit/s<br>(Without Opt-001)           | 4ch         | Opt-012 0.5 Vp-p to 2.0 Vp-p            | -                      |
| 2   |  |             |   | Opt-030 4ch Data Delay |
| 3   |  |             | Opt-013 0.5 Vp-p to 3.5 Vp-p            | -                      |
| 4   |  |             |   | Opt-030 4ch Data Delay |
| 5   | 32.1 Gbit/s<br>Opt-001 32 Gbit/s Expansion |             | Opt-012 0.5 Vp-p to 2.0 Vp-p            | -                      |
| 6   |  |             |   | Opt-030 4ch Data Delay |
| 7   |  |             | Opt-013 0.5 Vp-p to 3.5 Vp-p            | -                      |
| 8   |  |             |   | Opt-030 4ch Data Delay |

**Table 3-5 21G/32G bit/s SI ED MU195040A**

| No. | Upper Bit Rate                             | Number of Data Channels<br>(Select one or other) | CTLE                | Clock Recovery (SSC supported) |
|-----|--|--|---------------------|--------------------------------|
| 1   | 21 Gbit/s<br>(Without Opt-001)             | 1ch<br>Opt-010<br>1ch ED                         | -                   | -                              |
| 2   |  |  |                     | Opt-022 Clock Recovery         |
| 3   |  |  | Opt-011<br>1ch CTLE | -                              |
| 4   |  |  |                     | Opt-022 Clock Recovery         |
| 5   |  | 2ch<br>Opt-020<br>2ch ED                         | -                   | -                              |
| 6   |  |  |                     | Opt-022 Clock Recovery         |
| 7   |  |  | Opt-021<br>2ch CTLE | -                              |
| 8   |  |  |                     | Opt-022 Clock Recovery         |
| 9   | 32.1 Gbit/s<br>Opt-001 32 Gbit/s Expansion | 1ch<br>Opt-010<br>1ch ED                         | -                   | -                              |
| 10  |  |  |                     | Opt-022 Clock Recovery         |
| 11  |  |  | Opt-011<br>1ch CTLE | -                              |
| 12  |  |  |                     | Opt-022 Clock Recovery         |
| 13  |  | 2ch<br>Opt-020<br>2ch ED                         | -                   | -                              |
| 14  |  |  |                     | Opt-022 Clock Recovery         |
| 15  |  |  | Opt-021<br>2ch CTLE | -                              |
| 16  |  |  |                     | Opt-022 Clock Recovery         |

**Table 3-6 PAM4 ED MU196040B**

| No. | Upper Bit Rate      | Equalizer                  | SER Measurement            | Clock Recovery 32G | Clock Recovery 58G |   |
|-----|---------------------|----------------------------|----------------------------|--------------------|--------------------|---|
| 1   | Opt-001<br>32G baud | -                          | -                          | -                  | -                  |   |
| 2   |                     |                            |                            | Opt-021 29G CR     | -                  |   |
| 3   |                     |                            |                            | Opt-022 32G CR     | -                  |   |
| 4   |                     |                            | Opt-041<br>SER Measurement | -                  | -                  |   |
| 5   |                     |                            |                            | Opt-021 29G CR     | -                  |   |
| 6   |                     |                            |                            | Opt-022 32G CR     | -                  |   |
| 7   |                     | Opt-011<br>Equalizer       | -                          | -                  | -                  |   |
| 8   |                     |                            |                            | Opt-021 29G CR     | -                  |   |
| 9   |                     |                            |                            | Opt-022 32G CR     | -                  |   |
| 10  |                     |                            | Opt-041<br>SER Measurement | -                  | -                  |   |
| 11  |                     |                            |                            | Opt-021 29G CR     | -                  |   |
| 12  |                     |                            |                            | Opt-022 32G CR     | -                  |   |
| 13  | Opt-002<br>58G baud | -                          | -                          | -                  | -                  |   |
| 14  |                     |                            |                            | Opt-021 29G CR     | -                  |   |
| 15  |                     |                            |                            | Opt-023 58G CR     | -                  |   |
| 16  |                     |                            | Opt-022 32G CR             | -                  | -                  |   |
| 17  |                     |                            |                            | Opt-023 58G CR     | -                  |   |
| 18  |                     |                            |                            | -                  | -                  |   |
| 19  |                     | Opt-041<br>SER Measurement | -                          | Opt-021 29G CR     | -                  |   |
| 20  |                     |                            |                            | Opt-023 58G CR     | -                  |   |
| 21  |                     |                            |                            | -                  | -                  |   |
| 22  |                     |                            | Opt-022 32G CR             | Opt-023 58G CR     |                    |   |
| 23  |                     |                            | Opt-011<br>Equalizer       | -                  | -                  | - |
| 24  |                     |                            |                            |                    | Opt-021 29G CR     | - |
| 25  | Opt-023 58G CR      | -                          |                            |                    |                    |   |

|    |  |  |                            |                |                |
|----|--|--|----------------------------|----------------|----------------|
| 26 |  |  |                            | Opt-022 32G CR | -              |
| 27 |  |  |                            |                | Opt-023 58G CR |
| 28 |  |  | Opt-041<br>SER Measurement | -              | -              |
| 29 |  |  |                            | Opt-021 29G CR | -              |
| 30 |  |  |                            |                | Opt-023 58G CR |
| 31 |  |  |                            |                | -              |
| 32 |  |  |                            | Opt-022 32G CR | Opt-023 58G CR |

**Table 3-7 PAM4 ED MU196040A**

| No. | Upper Bit Rate                                | Clock Recovery         | SER Measurement         |
|-----|---|------------------------|-------------------------|
| 1   | 32.1 Gbaud<br>(Opt-001)<br>(mandatory option) | -                      | -                       |
| 2   |   |                        | Opt-041 SER Measurement |
| 3   |   | Opt-022 Clock Recovery | -                       |
| 4   |   |                        | Opt-041 SER Measurement |

**Table 3-8 28G/32G bit/s High Sensitivity ED MU183040B**

| No. | Upper Bit Rate                             | Number of Data Channels<br>(Select one or other) | Clock Recovery         | Clock Phase Tuning   |
|-----|--|--|------------------------|----------------------|
| 1   | 28.1 Gbit/s<br>(Without Opt-001)           | Opt-010 1ch ED                                   | -                      | Built-in as standard |
| 2   |  |  | Opt-022 Clock Recovery |                      |
| 3   |  | Opt-020 2ch ED                                   | -                      |                      |
| 4   |  |  | Opt-022 Clock Recovery |                      |
| 5   | 32.1 Gbit/s<br>Opt-001 32 Gbit/s Expansion | Opt-010 1ch ED                                   | -                      |                      |
| 6   |  |  | Opt-022 Clock Recovery |                      |
| 7   |  |  | Opt-023 Clock Recovery |                      |
| 8   |  | Opt-020 2ch ED                                   | -                      |                      |
| 9   |  |  | Opt-022 Clock Recovery |                      |
| 10  |  |  | Opt-023 Clock Recovery |                      |

**Table 3-9 28G/32G bit/s 4ch High Sensitivity ED MU183041B**

| No. | Upper Bit Rate                   | Data ch<br>No. | Clock Recovery         | Clock Phase Tuning   |
|-----|----------------------------------|----------------|------------------------|----------------------|
| 1   | 28.1 Gbit/s<br>(Without Opt-001) | 4ch            | -                      | Built-in as standard |
| 2   |                                  |                | Opt-022 Clock Recovery |                      |
| 3   | -                                |                |                        |                      |
| 4   | Opt-022 Clock Recovery           |                |                        |                      |
| 5   | Opt-023 Clock Recovery           |                |                        |                      |

## 4. Module Combinations

This chapter explains the following supported module configurations.

| Model     | Description | Model       | Description | Model     | Description |
|-----------|-------------|-------------|-------------|-----------|-------------|
| MU181000B | Synthesizer | MU196020A   | PAM4 PPG    | MU183020A | 32G PPG     |
| MU181500B | Jitter      | MU196040A/B | PAM4 ED     | MU183021A | 32G PPG 4CH |
| MU195050A | Noise       | MU195020A   | SI PPG      | MU183040B | 32G ED      |
|           |             | MU195040A   | SI ED       | MU183041B | 32G ED 4CH  |

### 4.1 Restrictions

#### 4.1.1 Restrictions on Module Combination

|  | Restrictions  |
|--|---|
| Synthesizer Module<br>Jitter Module    | There are no restrictions on the slot positions.  |
|  | The SJ2 Jitter generation function can be used when Opt-001 is installed in the Synthesizer MU181000A/B module and the Jitter Modulation Source MU181500B module is installed in same unit. To achieve the best SJ2 accuracy and reliability, the synthesizer module and jitter modulation source module combination is tuned at shipment. Consequently, the performance cannot be guaranteed if the shipped module configuration is changed. When adding a new jitter modulation source module to a customer's existing synthesizer configuration (with Opt-001), since the SJ2 Jitter generation accuracy described in the catalog will not be met, the customer's synthesizer module must be returned to Anritsu for readjustment. |
| PAM4 PPG/ED Module<br>SI PPG/ED Module | A maximum of four PPG or ED modules can be installed. When using Channel Synchronization function to synchronize multiple PPG modules, install the PPG modules sequentially from slot 1 (the reference clock of the PPG module installed in slot 1 is used).  |
|  | The Channel Synchronization and 64G x 2 Combination functions between modules can only be set when the two target modules are the same model and have the same configuration. The 2ch Combination function across two modules is not supported. The 2ch Combination function requires the 2ch PPG/ED option. Use of two 1ch PPG/ED modules does not support 2ch Combination setting.  |
| Noise Module                           | There are no restrictions on the slot positions.<br>When connecting PPG to the Noise module using the standard and accessory cable, install the Noise module in the slot immediately above or below PPG.  |

#### 4.1.2 Restrictions on Jitter Tolerance Test

Restrictions of Jitter Tolerance Test (MX183000A-PL001) in combination of PPG / ED modules are as follows.

\* The following are restrictions on PAM4. There is no restriction on NRZ.

|            |           | ED Module |                            |
|------------|-----------|-----------|----------------------------|
|            |           | MU196040A | MU195040A<br>MU183040B/41B |
| PPG Module | MU196020A | ✓         | -                          |
|            | MU195020A | -         | ✓*                         |
|            | MU183020A |           |                            |

\*: G0375A is required on the PPG side. Please use PAM4 Control screen of MX183000A.

## 4.2 Verified module configuration

The verified module configuration is shown below. If you want to use the configuration not listed here, please contact our sales representative.

### 4.2.1 Standard BERT Module Configurations

Recommended configuration:

This configuration can be started as "Standard BERT" with MX190000A control software.

| Slot No. | Standard BERT for PAM4<br>1ch NRZ/PAM4 BER Measurement | Standard BERT for SI<br>1 to 2ch NRZ or 1ch PAM4 BER Measurement<br>PCIe/USB Applications |
|----------|--|---|
| Slot1    | Synthesizer  | Synthesizer   |
| Slot2    |  |   |
| Slot3    | Jitter   | Jitter  |
| Slot4    |  |   |
| Slot5    | - *2   | - *3  |
| Slot6    | PAM4 ED  | SI ED   |
| Slot7    | PAM4 PPG   | SI PPG  |
| Slot8    | Noise *1   | Noise *1  |

\*1 It can be used without this module

\*2 It can be used with SI ED

\*3 It can be used with PAM4 PPG, PAM4 ED or 32G ED

Other configuration: \* Please start with "Expert BERT" instead of "Standard BERT".

| Slot No. | Only PAM4 PPG or ED |          | SI PPG/ED and 32G PPG/ED configurations |         |   |
|----------|---------------------|----------|---|---------|---|
| Slot1    | Synthesizer         |          |   |         |   |
| Slot2    |                     |          |   |         |   |
| Slot3    | Jitter              |          |   |         |   |
| Slot4    |                     |          |   |         |   |
| Slot5    | -                   |          |   |         |   |
| Slot6    |                     |          |   |         |   |
| Slot7    | PAM4 PPG            | -        | SI PPG                                  | 32G PPG |   |
| Slot8    | Noise *1            | Noise *1 | -                                       | -       | - |

### 4.2.2 2ch PAM4, 4ch NRZ BER Configurations

When using Channel Synchronization function to synchronize multiple PPG modules, install the PPG modules sequentially from slot 1

Recommended configuration:

| Slot No. | PAM4 PPG/ED Configuration | SI PPG/ED Configuration |
|----------|---------------------------|-------------------------|
| Slot1    | PAM4 PPG x 2              | SI PPG x 2              |
| Slot2    |                           |                         |
| Slot3    | Jitter                    | Jitter                  |
| Slot4    |                           |                         |
| Slot5    | Synthesizer               | Synthesizer             |
| Slot6    |                           |                         |
| Slot7    | PAM4 ED x 2               | SI ED x 2               |
| Slot8    |                           |                         |

Other configuration:

| Slot No. | SI PPG and PAM4 ED | SI PPG/ED and 32G PPG/ED               |
|----------|--------------------|--|
| Slot1    | SI PPG x2          | SI PPG x2 or 32G PPG x2 or 32G PPG 4CH |
| Slot2    |                    |  |
| Slot3    | Jitter             | Jitter                                 |
| Slot4    |                    |  |
| Slot5    | Synthesizer        | Synthesizer                            |
| Slot6    |                    |  |
| Slot7    | PAM4 ED x2         | SI ED x2 or 32G ED x2 or 32G ED 4CH    |
| Slot8    |                    |  |



### 4.2.3 2ch PAM4 BERT + Noise Configurations

Recommended configuration:

| Slot No. | PAM4 PPG/ED Configuration |             | SI PPG/ED Configuration |             |
|----------|---------------------------|-------------|-------------------------|-------------|
|          | Unit No.1                 | Unit No.2   | Unit No.1               | Unit No.2   |
| Slot1    | Jitter                    | Synthesizer | Jitter                  | Synthesizer |
| Slot2    |                           |             |                         |             |
| Slot3    | Noise                     | -           | Noise                   | -           |
| Slot4    | PAM4 PPG                  |             | SI PPG                  |             |
| Slot5    | PAM4 ED                   |             | SI ED                   |             |
| Slot6    | PAM4 ED                   |             | SI ED                   |             |
| Slot7    | PAM4 PPG                  |             | SI PPG                  |             |
| Slot8    | Noise                     |             | Noise                   |             |

Other configuration:

| Slot No. | Unit No.1 | Unit No.2   |
|----------|-----------|-------------|
| Slot1    | Jitter    | Synthesizer |
| Slot2    |           |             |
| Slot3    | Noise     | -           |
| Slot4    | PAM4 PPG  |             |
| Slot5    | PAM4 ED   |             |
| Slot6    | SI ED     |             |
| Slot7    | SI PPG    |             |
| Slot8    | Noise     |             |

### 4.2.4 4ch PAM4 BERT Configurations

When using Channel Synchronization function to synchronize multiple PPG modules, install the PPG modules sequentially from slot 1. Use the two J1748A Power Splitter units to supply clocks from the Jitter module to the four PPG modules.

Recommended configuration:

| Slot No. | PAM4 PPG/ED Configuration |             | SI PPG/ED Configuration |           |
|----------|---------------------------|-------------|-------------------------|-----------|
|          | Tx                        | Rx          | Tx                      | Rx        |
| Slot1    | PAM4 PPG x 4              | PAM4 ED x 4 | SI PPG x 4              | SI ED x 4 |
| Slot2    |                           |             |                         |           |
| Slot3    |                           |             |                         |           |
| Slot4    |                           |             |                         |           |
| Slot5    | Jitter                    | -           | Jitter                  | -         |
| Slot6    |                           |             |                         |           |
| Slot7    | Synthesizer               | -           | Synthesizer             | -         |
| Slot8    |                           |             |                         |           |

Other configuration:

| Slot No. | Tx          |            | Rx        |             |
|----------|-------------|------------|-----------|-------------|
| Slot1    | 32G PPG x4  | SI PPG x2  | 32G ED x4 |             |
| Slot2    |             | SI PPG x2  |           |             |
| Slot3    |             | 32G PPG x2 |           | 32G PPG 4CH |
| Slot4    |             | 32G PPG x2 |           | 32G PPG 4CH |
| Slot5    | Jitter      |            | -         |             |
| Slot6    | -           |            |           |             |
| Slot7    | -           |            |           |             |
| Slot8    | Synthesizer |            |           |             |

## 4.3 Option Configuration Examples

### 4.3.1 Option Configuration Examples when using SI PPG/ED

| Module,<br>Option Model | 1ch                      |                         |            |             |                           | 2ch        |                 | 4ch                    |                 |
|-------------------------|--------------------------|-------------------------|------------|-------------|---------------------------|------------|-----------------|------------------------|-----------------|
|                         | PCIe<br>Receiver<br>test | USB<br>Receiver<br>Test | 32G<br>NRZ | 32G<br>PAM4 | 64G<br>PAM4 <sup>*1</sup> | 32G<br>NRZ | 32G<br>PAM4     | 32G<br>NRZ,<br>KR4/CR4 | 32G<br>PAM4     |
| MP1900A                 | 1                        | 1                       | 1          | 1           | 1                         | 1          | 1               | 2                      | 2               |
| MU181000B               | 1                        | 1                       | 1          | 1           | 1                         | 1          | 1               | 1                      | 1               |
| MU181000B-001           | 1                        |                         |            |             |                           |            |                 |                        |                 |
| MU181000B-002           | 1                        |                         |            |             |                           |            |                 |                        |                 |
| MU181500B               | 1                        | 1                       | 1          | 1           | 1                         | 1          | 1               | 1                      | 1               |
| MU195020A               | 1                        | 1                       | 1          | 1           | 2                         | 1          | 2               | 2                      | 4               |
| MU195020A-001           |                          |                         | 1          | 1           | 2                         | 1          | 2               | 2                      | 4               |
| MU195020A-010           | 1                        | 1                       | 1          |             |                           |            |                 |                        |                 |
| MU195020A-020           |                          |                         |            | 1           | 2                         | 1          | 2               | 2                      | 4               |
| MU195020A-011           | 1                        | 1                       | 1          |             |                           |            |                 |                        |                 |
| MU195020A-021           |                          |                         |            | 1           |                           | 1          | 2               | 2                      | 4               |
| MU195020A-030           |                          |                         |            |             |                           |            |                 |                        |                 |
| MU195020A-031           |                          |                         |            | 1           | 2                         | 1          | 2               | 2                      | 4               |
| MU195020A-040           |                          |                         | (1)        |             |                           |            |                 |                        |                 |
| MU195020A-041           |                          |                         |            |             |                           | (1)        |                 | 2                      |                 |
| MU195040A               | 1                        | 1                       | 1          | 1           |                           | 1          | 2               | 2                      | 4               |
| MU195040A-001           |                          |                         | 1          | 1           |                           | 1          | 2               | 2                      | 4               |
| MU195040A-010           | 1                        | 1                       | 1          |             |                           |            |                 |                        |                 |
| MU195040A-020           |                          |                         |            | 1           |                           | 1          | 2               | 2                      | 4               |
| MU195040A-011           | 1                        | 1                       | 1          |             |                           |            |                 |                        |                 |
| MU195040A-021           |                          |                         |            |             |                           | 1          |                 | 2                      |                 |
| MU195040A-022           | 1                        | 1                       | 1          | 1           |                           | 1          | 2               | 2                      | 4               |
| MU195050A               | 1                        | 1 <sup>*2</sup>         |            |             |                           |            |                 | 2                      |                 |
| MU195050A-001           |                          |                         |            |             |                           |            |                 | 2                      |                 |
| MX183000A-PL001         | 1                        | 1                       | 1          | 1           |                           | 1          | 1               | 1                      |                 |
| MX183000A-PL011         | (1)                      |                         |            |             |                           |            |                 |                        |                 |
| MX183000A-PL021         | 1                        |                         |            |             |                           |            |                 |                        |                 |
| MX183000A-PL022         |                          | 1                       |            |             |                           |            |                 |                        |                 |
| G0374A                  |                          |                         |            |             | 1                         |            |                 |                        |                 |
| G0375A                  |                          |                         |            | 1           |                           |            | 2               |                        | 4               |
| G0376A                  |                          |                         |            | 1           |                           |            | 2 <sup>*3</sup> |                        | 4 <sup>*3</sup> |

\*1 Contact our sales representative about expected future ED support.

\*2 Not required when using Pick Off Tee J1510A (2 pcs).

\*3 The MX183000A software can control one G0376A.

### 4.3.2 Option Configuration Examples when using PAM4 PPG/ED

| Module<br>Option Model | 1ch        |             |             |                | 2ch | 4ch |
|------------------------|------------|-------------|-------------|----------------|-----|-----|
|                        | 32G<br>NRZ | 32G<br>PAM4 | 58G<br>PAM4 | 64G<br>PAM4 *1 |     |     |
| MP1900A                | 1          | 1           | 1           | 1              | 2   | 2   |
| MU181000B              | 1          | 1           | 1           | 1              | 1   | 1   |
| MU181500B              | 1          | 1           | 1           | 1              | 1   | 1   |
| MU196020A              | 1          | 1           | 1           | 1              | 2   | 4   |
| MU196020A-001          | 1          | 1           |             |                | 2   | 4   |
| MU196020A-002          |            |             | 1           |                |     |     |
| MU196020A-003          |            |             |             | 1              |     |     |
| MU196020A-011          | 1          | 1           | 1           | 1              | 2   | 4   |
| MU196020A-030          | 1          | 1           | 1           | 1              | 2   | 4   |
| MU196020A-040          | 1          | 1           | 1           | 1              | 2   | 4   |
| MU196020A-042          | 1          | 1           | 1           | 1              | 2   | 4   |
| MU196020A-050          |            |             |             |                | 2   | 4   |
| MU196040B              | 1          | 1           | 1           |                | 2   | 4   |
| MU196040B-001          | 1          | 1           |             |                | 2   | 4   |
| MU196040B-002          | 1          | 1           | 1           |                | 2   | 4   |
| MU196040B-011          | 1          | 1           | 1           |                | 2   | 4   |
| MU196040B-022          | 1          | 1           |             |                | 2   | 4   |
| MU196040B-023          |            |             | 1           |                | 2   | 4   |
| MU196040B-041          |            | 1           | 1           |                | 2   | 4   |
| MU196040A              | 1          | 1           |             |                | 2   | 4   |
| MU196040A-001          | 1          | 1           |             |                | 2   | 4   |
| MU196040A-022          | 1          | 1           |             |                | 2   | 4   |
| MU196040A-041          |            | 1           |             |                | 2   | 4   |
| MU195050A              | 1          | 1           |             |                | 2   |     |
| MX183000A-PL001        | 1          | 1           | 1           | 1              | 1   | 1   |
| MX183000A-PL031        | 1          | 1           | 1           | 1              | 1   | 1   |

\*1 Contact our sales representative about expected future ED support.

## 5. Supported Software Versions

The MP1900A main unit and each application model support the following software versions. Use the latest upgrade of each software version.

**Table 5-1 MX190000A Supported Versions**

| Model   | Supported version |
|---|-------------------|
| MU181000B 12.5GHz 4 Port Synthesizer<br>MU181500B Jitter Modulation Source<br>MU195050A Noise Generator<br>MU183040B 28G/32G bit/s High Sensitivity ED<br>MU195020A 21G/32G bit/s SI PPG<br>MU195040A 21G/32G bit/s SI ED | Ver. 1.00         |
| MU181000B-002 SSC Extension   | Ver. 2.00         |
| MU196020A PAM4 PPG<br>MU196040A PAM4 ED   | Ver. 3.00         |
| MU196020A-040 Adjustable ISI<br>MU196020A-042 FEC Pattern Generation<br>MU196020A-050 Inter-Module Synchronization  | Ver. 3.01         |
| MU196040B PAM4 ED   | Ver. 4.01         |

**Table 5-2 MX183000A Supported Versions**

| Model   | Supported version |
|---|-------------------|
| MX183000A-PL001 Jitter Tolerance Test<br>MX183000A-PL011 PCIe Link Sequence<br>MX183000A-PL021 PCIe Link Training | Ver. 2.00         |
| MX183000A-PL022 USB Link Training   | Ver. 3.00         |
| MX183000A-PL031 DUT Error Counts Import   | Ver. 3.07         |

## 6. Document History

| Date       | Modifications  |
|------------|--|
| 2018.07.31 | <ul style="list-style-type: none"><li>● Added module configuration details to Table 4-2 describing operation functions added by multi-modules for modules other than MU195020A and MU195040A</li><li>● Added postscript to Table 4-4 (The MX183000A software can control one G0376A)</li></ul> |
| 2018.11.21 | Added MU196020A and MU196040A.   |
| 2019.3.6   | Added Options <ul style="list-style-type: none"><li>● MU196020A -040 Adjustable ISI, -042 FEC Pattern Generation, -050 Inter-Module Synchronization</li><li>● MX183000A-PL031 DUT Error Counts Import</li></ul>  |
| 2019.4.10  | Updated "Module Combinations"  |
| 2019.5.30  | Correction of errors   |
| 2019.10.25 | Added MU196040B.   |

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