Anritsu Advancing beyond

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.

Contents

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**
Module	
MU181000A 12.5GHz Synthesizer*1 MU181000B 12.5GHz 4 Port Synthesizer	✓
MU181500B Jitter Modulation Source	✓
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	✓
MU196060A 32G baud NRZ/PAM4 Re-Driver	✓
MU183020A 28G/32G bit/s PPG	✓
MU183040B 28G/32G bit/s High Sensitivity ED	✓
Software	
MX183000A High-Speed Serial Data Test Software	✓
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-PL023 USB 3.2 x 2 Link Training	✓
MX183000A-PL025 PCIe 5 Link Training	✓
MX183000A-PL026 PCIe 6 Link Training	✓
MX183000A-PL031 DUT Error Counts Import	✓

*1 Manufacturing discontinued.

Model and Name					MP1900A
Automation Software (Granite River Labs Corporation)					
(PCIe)	(Gen3/4)	GRL-PCIE4-RXA[*1]	(Base)	GRL-PCIE4-BASE-RXA	✓
			(CEM)	GRL-PCIE4-CEM-RXA	✓
	(Gen5)	GRL-PCIE5-RXA[*2]	(Base)	GRL-PCIE5-BASE-RXA	✓
			(CEM)	GRL-PCIE5-CEM-RXA	✓
	(Gen6)	GRL-PCIE6-RXA[*3]	(Base)	GRL-PCIE6-BASE-RXA	✓
			(CEM)	GRL-PCIE6-CEM-RXA	✓
GRL-PCIE-PLL (PCIe PLL)					✓
GRL-USB32-RXA (USB3.2)					✓
GRL-USB32-RXA (USB3.2 x2)					✓
GRL-USB4-RXA (USB4)					✓
GRL-TBT3-RXA (TBT3)					✓
GRL-SAS3-RXA (SAS-3)					✓
GRL-SAS4-RXA (SAS-4)					✓
GRL-SAS34-RXA (SAS-3/-4)					✓
GRL-DP14-SINKAN (DP1.4)					✓
Automation Software (Teledyne LeCroy)					
(PCIe)	(Gen3/4)	(Base&CEM&PLL)		QPHY-PCIE4-TX-RX	✓
	(Gen5)	(Base&CEM&PLL)		QPHY-PCIE5-TX-RX	✓
(PCIe Gen3/4/5) QPHY-PCIE-Tx-Rx					✓
(USB3.2) QPHY-USB3.2-Tx-Rx					✓
(USB4/TBT3) QPHY-USB4-Tx-Rx					✓
Automation Software (Tektronix)					
(PCIe)	(Gen4)	(Base&CEM)		RXSW-NLP-PCIE4C	✓
	(Gen5)	(Base&CEM)		RXSW-NLP-PCIE5	✓
(PCIe PLL) RXSW-NLP-PLLBW-PCEG5					✓
(USB4) RXSW-NLP-USB4					✓
(TBT3/4) RXSW-NLP-TBT34					✓

*1 The GRL-PCIE4-RXA automation software supports both PCIe Gen4 Base and CEM specifications.

*2 The GRL-PCIE5-RXA automation software supports both PCIe Gen5 Base and CEM specifications.

*3 The GRL-PCIE6-RXA automation software supports both PCIe Gen6 Base and CEM specifications.

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

Refer to the following table and select the PAM4 PPG (MU196020A)/ED (MU196040B) and SI PPG (MU195020A)/ED (MU195040A) according to usage.

PPG	ED	Application
MU196020A	MU196040B	PCIe6, IEEE 100G/200G/400G, USB4V2
MU195020A	MU195040A	PCIe1-5, USB3.1/3.2, USB4V1, DP, SAS, TBT

When requiring more detailed information, 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 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 MU196020A/MU196040B model for PAM4 measurement.
- Choose the MU196020A/MU196040B when using Link Training and LTSSM analysis required by PCIe Gen6.
- Choose the MU195020A/MU195040A when not expecting to require PCIe Gen6 support but requiring a solution supporting only SI PPG/SI ED measurement.
- Propose the minimum configuration meeting the customer's budget when expecting to require PCIe Gen6 support but also wanting a solution supporting only SI PPG/SI ED measurement. Contact our sales representative separately.
- PPG
  - Choose the MU196020A at PAM4 signal tests or when requiring high functions and high performance or for bit rates exceeding 32G.
  - When evaluating NRZ signals up to 32.1G, choose the MU195020A when requiring the Emphasis Generation function and a widely variable amplitude range.
  - When using an output amplitude of 1.3 Vp-p for NRZ signals up to 32.1G, choose the MU183020A when controlling the cross point.
- ED
  - When requiring high functions and high performance or for bit rates exceeding 32G at PAM4 signal tests, choose the MU196040B.
  - When evaluating NRZ signals up to 32.1G, choose the MU195040A when using the CTLE function and CDR supporting SSC.
  - When evaluating NRZ signals up to 32.1G and not using CTLE, choose the MU183040B either when evaluating an Eye Height of 15 mV and Eye Amplitude of 22 mVp-p (typ.), or small-amplitude signals of 31 mVp-p or less.

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

Measurement Application		MP1900A Series
Devices, backplanes, active cables BER measurement of devices and backplanes when using Emphasis, Jitter, Clock Recovery functions.	53G/58G (200/400 GbE)	MU196020A/40B
	to 28G/32G (10/40/100/200 GbE)	MU196020A/40B or MU195020A/40A
Optical modules, TOSA/ROSA, driver amplifiers BER measurement of optical modules and of high-amplitude applications other than those described below	53G/58G (200/400 GbE)	MU196020A/40B
	to 28G/32G (10/40/100/200 GbE)	MU196020A/40B or MU195020A/40A
EML-TOSA evaluations and tests using high-amplitude signals For EML-TOSA evaluation	53G/58G	MU196020A[*1]/40B
	to 28G/32G	MU196020A[*1] or MU195020A[*1]
InfiniBand AOC test	HDR[*2]	MU196020A/40B
	EDR FDR	MU195020A/40A[*3]
PON, optical circuit tests and burst signal tests BER measurements using burst signals and patterns with Mark ratio of 1/2 or more	100G PON	-
PCIe Gen1 to 5 Receiver Test (NRZ Only) Receiver sensitivity and JTOL measurements of PCIe Gen1 to 5 Root complex and End point when using Link Sequence, Dynamic Link Training, LTSSM analysis, SKP OS Insertion/Filtering function and SSC input support.		MU196020A[*4] or MU195020A[*4] MU195040A[*4] MU196060A[*5]
PCIe Gen4 to 6 Receiver Test (NRZ/PAM4) Receiver sensitivity and JTOL measurements of PCIe Gen 4 to 6 Root complex and End point when using Link Sequence, Dynamic Link Training, LTSSM analysis, SKP OS Insertion/Filtering function and SSC input support.		MU196020A MU196040B[*6] MU196060A
USB3.2 Receiver Test, USB4V1 Receiver sensitivity and JTOL measurements of USB3.2 Host and Device when using LFPS generation, Link Sequence, SKP OS Insertion/Filtering function and SSC input support.		MU195020A[*7] MU195040A[*7]
USB4 V2 Receiver Test Supports BER RX test by generating jitter and noise, as well as Signal Frequency Variation Training test.		MU196020A
Thunderbolt 3 Receiver Test Supports Thunderbolt 3 Host and Device Stressed Receiver Sensitivity measurement using Emphasis output and Jitter generation		MU195020A[*8]
SAS Receiver Test Supports Stressed Receiver Sensitivity measurements of Initiator and Expander Device storage products using Emphasis output and Jitter generation		MU195020A MU195040A
DisplayPort 1.4 Sink Test Supports Stressed Receiver Sensitivity measurements of Sink devices using Jitter and Noise generation		MU195020A

*1 Requires external amplifier
*2 Due to possible changes in the HDR standards, contact our sales representatives for more details.
*3 Measuring instrument recommended at IBTA Plugfest
*4 PCI-SIG certified test instrument
*5 Recommended for System test when Return Path ≥18 dB (for PCIe5 NRZ)
*6 Use MU195040A when testing PCIe1 to 5, and MU196040B when testing PCIe4 to 6.
However, the MU196060A is required when using the MU196040B.
*7 USB-IF certified test instrument. SI ED not required for USB4V1.
*8 Measuring instrument recommended at Thunderbolt Plugfest.

Table 1-2 Selection by Difference in Functions and Performance

Function/Performance	MU1960xx series (MU196020A/ MU196040B)	MU1950xx series (MU195020A/ MU195040A)	MU1830xx series (MU183020A/ MU183040B)
PPG/ED Common Items			
Coding	NRZ, PAM4	NRZ	
Operating rate	2.4 to 32.1/58.2/64.2 Gbaud (option selection)*1	2.4 to 21/32.1 Gbit/s (option selection)	2.4 to 28.1/32.1 Gbit/s (option selection)
Link Training and LTSSM Analysis*2	Supported	Supported	—
Sequence Editor function *3	—	Supported	—
PPG			
Output amplitude (Single-end)	0.07 to 0.8 Vp-p	0.1 to 1.3 Vp-p	0.5 to 2.0 or 3.5 Vp-p
Output setting control	Data/Xdata common		Data/Xdata independent
Emphasis tap	4 Taps (option)	10 Taps (option)	— *4
Emphasis gain control	–20 to +20 dB		— *4
ISI additional function	Supported (option)	Supported (option)	—
Cross-point	50% fixed		20% to 80%
Tr/Tf (NRZ, 20% to 80%) (typ.)	9 ps @ 32.1G 8.5 ps @ 58.2G at J1749A 40 cm cable	12 ps @32.1G	
Intrinsic Jitter RJ(typ.)	170 fs rms	115 fs rms	200 fs rms
Offset function	–2.0 to +3.3 VOH		
FEC Pattern Generation	Supported (option)	—	—
ED			
Input amplitude (Single-end)	NRZ: 0.05 to 1.0 Vp-p PAM4: 0.3 to 1.0 Vp-p	0.05 to 1.0 Vp-p	
Input sensitivity (PAM4) (Eye height) (typ.)	23 mV @ 32.1 Gbaud 49 mV @ 58.2 Gbaud	—	—
Input sensitivity (NRZ) (Eye height) (Eye amplitude) (typ.)	19 mV 25 mVp-p ≤50 mVp-p @ 32.1 Gbit/s	15 mV 22 mVp-p ≤31 mVp-p @ 28 Gbit/s, at CTLE off	10 mV 15 mVp-p ≤25 mVp-p @ 28 Gbit/s
CTLE function	Supported (with MU196060A)	0 to –12 dB (option) 0 to –30 dB (with MU196060A)	—
LFE function	–2.0 to 0.0 dB (option)	-	-
DFE function(typ.)	–1.4 dB @ 53.1G (option)	-	-
Clock recovery	2.4 to 32.1 Gbit/s, 51.0 to 58.2 Gbit/s (option)	2.4 to 32.1 Gbit/s (option), SSC input support	2.4 to 28.1 Gbit/s (option) or 25.5 to 32.1 Gbit/s (option) , no SSC 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 MX183000A-PL021/PL022/PL023/PL025/PL026

*3 MU195020A-050/051

*4 Manufacturing of the MP1825B is discontinued. Use either the MU195020A or MU196020A to use the Emphasis function.

2. Functions and Features of Main Unit, each Module, and each Option

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

Table 2-1 Main Unit Functions and Features

MP1900A 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 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 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 SSC Extension	When PCIe Host is DUT, supports input of Refclk signal from Host and output of synchronized clock. Option for use with MP1900A.
MU181500B 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)

Table 2-3 Noise Module Functions and Features

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

Table 2-4 PPG Module Functions and Features

MU195020A 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 configuration as option. Supports PCIe Link Training.
MU195020A-001 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 1ch Data Output	Option supporting 1ch differential data output and output amplitude from 0.1 Vp-p to 1.3 Vp-p.
MU195020A-020 2ch Data Output	Option supporting 2ch differential data output and output amplitude from 0.1 Vp-p to 1.3 Vp-p.
MU195020A-011 1ch 10Tap Emphasis	Option adding built-in 10Tap Emphasis function to 1ch differential data output. Can be selected when Opt-010 installed.
MU195020A-021 2ch 10Tap Emphasis	Option adding built-in 10Tap Emphasis function to 2ch differential data output. Can be selected when Opt-020 installed.
MU195020A-030 1ch Data Delay	Option for varying phase. Can vary Data phase versus Clock. Can be selected when Opt-010 installed.
MU195020A-031 2ch Data Delay	Option for varying phase. Can vary Data phase versus Clock. Can be selected when Opt-020 installed.
MU195020A-040 1ch Variable ISI	Generates signal emulating ISI using Emphasis control. Requires Opt-011.

MU195020A-041 2ch Variable ISI	Generates signal emulating ISI using Emphasis control. Requires Opt-021.
MU195020A-050 Sequence Editor Function	Sends and saves any edited Link Training sequence with support for PCIe Gen1 to 4, and USB3.2.
MU195020A-051 Sequence Editor Function PCIe 5 Extension	Can send and save any edited Link Training sequence. Supports PCIe Gen 5. Requires MU195020A-050.

MU196020A PAM4 PPG	PPG module supporting PAM4 and NRZ with differential I/F for outputting signals up to 32.1 Gbaud, 58.2 Gbaud, or 64.2 Gbaud. Can generate various patterns for PAM4 and NRZ.
MU196020A-001 32 Gbaud *1	Can be used in operating rate range from 2.4 Gbaud to 32.1 Gbaud.
MU196020A-002 58 Gbaud *1	Can be used in operating rate range from 2.4 Gbaud to 58.2 Gbaud.
MU196020A-003 64 Gbaud *1	Can be used in operating rate range from 2.4 Gbaud to 64.2 Gbaud.
MU196020A-112 32G to 58G baud Extension Retrofit	Extends upper operation rate from Opt-001 to 58.2 Gbaud.
MU196020A-113 32G to 64G baud Extension Retrofit	Extends upper operation rate from Opt-001 to 64.2 Gbaud.
MU196020A-123 58G to 64G baud Extension Retrofit	Extends upper operation rate from Opt-002 to 64.2 Gbaud.
MU196020A-011 4Tap Emphasis	Option adding built-in 4Tap Emphasis function.
MU196020A-030 Data Delay	Option for varying phase. Can vary Data phase versus Clock.
MU196020A-040 Adjustable ISI	Generates signal emulating ISI using Emphasis control. Requires Opt-011.
MU196020A-042 FEC Pattern Generation	Generates FEC patterns.
MU196020A-043 FEC Error Insertion for PCIe6	Option for adding errors used for Flit FEC logic verification defined in PCIe 6.0.
MU196020A-050 Inter-Module Synchronization	Multi-channel operation is possible. Opt-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 Gbaud is the same.
MU196020A-060 PCIe6 LEQ	Option supporting PCIe 6.0 4Tap Emphasis Dynamic Link EQ and required option for Link Training with MX183000A-PL026. Requires Opt-011.

*1 Select either one.

MU183020A 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 configuration according to the option.
MU183020A-001 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 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 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 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 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 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 MU183020A-012 or 013 is installed.
MU183020A-031 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 MU183020A-022 or 023 is installed.

Table 2-5 ED Module Functions and Features

MU195040A 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 configuration as option. Supports PCIe Link Training.
MU195040A-001 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 1ch ED	1ch differential Data input option
MU195040A-020 2ch ED	2ch differential Data input option
MU195040A-011 1ch CTLE	Option adding built-in CTLE function to 1ch differential Data input. Can be selected with Opt-010.
MU195020A-021 2ch CTLE	Option adding built-in CTLE function to 2ch differential Data input. Can be selected with Opt-020.
MU195040A-022 Clock Recovery	Option for recovering for recovering Clock from Data input. Supports SSC input.

MU196040B PAM4 ED	ED module supporting PAM4 and NRZ with differential interface for signal analysis up to PAM4 58.2 Gbaud (NRZ 64.2 Gbit/s). Operates with half-rate clock input from PPG, or clock recovered from data input.
MU196040B-001 32G baud *1	Option for decoding PAM4/NRZ 2.4G to 32.1G signals.
MU196040B-002 58G baud *1	Option for decoding PAM4 signals from 2.4G to 58.2G, and NRZ signals from 2.4G to 64.2G.
MU196040B-011 Equalizer	Option for building Low Frequency Equalizer and Decision Feedback Equalizer functions into differential data input.
MU196040B-112 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 29G Clock Recovery	Option for recovering clock from 2.4G to 29G data input.
MU196040B-022 32G Clock Recovery	Option for recovering clock from 2.4G to 32.1G data input.
MU196040B-023 58G Clock Recovery Extension	Option for recovering clock from 51G to 58.2G data input; requires Opt-021 or Opt-022.

MU196040B-124 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 SER Measurement	Option for analyzing PAM4 signal symbol errors.
MU196040B-042 FEC Analysis	Supports real-time FEC symbol error measurements.
MU196040B-043 FEC Analysis for PCIe6	Supports real-time FEC symbol error measurements (PCIe6).

*1 Select either one.

MU196040A 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 32.1 Gbaud Decoder (mandatory option)	Option for decoding PAM4 signals.
MU196040A-022 25.5G to 32.1G Clock Recovery	Option for recovering for recovering Clock from Data input.
MU196040A-041 SER Measurement	Option for analyzing PAM4 signal symbol errors.

MU183040B 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 configuration according to the option. To operate at a half-rate clock, input a half-rate clock either from the PPG module or the customer's DUT.
MU183040B-001 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 1ch ED	This option supports 1ch differential data input. A function for phase adjustment between incoming data and clock is included.
MU183040B-020 2ch ED	This option supports 2ch differential data input. A function for phase adjustment between incoming data and clock is included.
MU183040B-022 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 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.

Table 2-6 Re-Driver Module Functions and Features

MU196060A 32G baud NRZ/PAM4 Re-Driver	Supports loss-attenuated NRZ/PAM4 signal up to 32.1 Gbaud to correct signal loss by equalizing with CTLE.
MU196060A-001 Clock Recovery for SSC	This option regenerates clocks up to 32.1 Gbaud from SSC-modulated input data.

Table 2-7 Software Functions and Features

MX190000A Signal Quality Analyzer Control Software	Software for controlling modules installed in MP1900A. Installed at MP1900A shipment.
MX183000A 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 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 PCIe Link Sequence	Software using Link Sequence Pattern generation function for transitioning PCIe Gen1 to 4 Devices to Loopback mode.
MX183000A-PL021 PCIe Link Training	Software using Link Training function with negotiation process for transitioning PCIe Gen1 to 4 Devices to Loopback mode.
MX183000A-PL025 PCIe 5 Link Training	Software using Link Training function with negotiation process for transitioning PCIe Gen5 Devices to Loopback mode. The MX183000A-PL021 is required.
MX183000A-PL026 PCIe 6 Link Training	Software using Link Training function with negotiation process for transitioning PCIe Gen6 Devices to Loopback mode. The MX183000A-PL021 and PL025 are required.
MX183000A-PL022 USB Link Training	Software for transitioning USB3.2 devices to Loopback mode using Link Training function for performing negotiation.
MX183000A-PL023 USB 3.2 x 2 Link Training	Software for transitioning USB 3.2 x2 device to Loopback mode using Link Training function for performing negotiation. Requires MX183000A-PL022.
MX183000A-PL031 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.

High-speed bus (HSB) Automation Software	Automation software for compliance testing for various HSB standards. Controls MP1900A and oscilloscopes to perform compliance tests.
(GRL Corporation)	Controls MP1900A and Keysight/Tektronix oscilloscope to perform PCIe, USB, and TBT3 compliance tests. This software is a product of GRL Corporation, but is sold and supported by Anritsu.
GRL-PCIE4-BASE-RXA GRL-PCIE4-CEM-RXA GRL-PCIE4-RXA	Automation software supporting PCIe Gen3/4 measurements. GRL-PCIE4-BASE-RXA supports the Base Spec measurements. GRL-PCIE4-CEM-RXA supports the CEM Spec measurements. GRL-PCIE4-RXA supports both the Base and CEM Spec measurements.
GRL-PCIE5-BASE-RXA GRL-PCIE5-CEM-RXA GRL-PCIE5-RXA	Automation software supporting PCIe Gen5 Base Spec measurements. GRL-PCIE5-BASE-RXA supports the Base Spec measurements. GRL-PCIE5-CEM-RXA supports the CEM Spec measurements. GRL-PCIE5-RXA supports both the Base and CEM Spec measurements.
GRL-PCIE6-BASE-RXA GRL-PCIE6-CEM-RXA GRL-PCIE6-RXA	Automation software supporting PCIe Gen6 Base Spec measurements. GRL-PCIE6-BASE-RXA supports the Base Spec measurements. GRL-PCIE6-CEM-RXA supports the CEM Spec measurements. GRL-PCIE6-RXA supports both the Base and CEM Spec measurements.
GRL-TBT3-RXA	Automation software supporting TBT3 measurements
GRL-USB32-RXA	Automation software supporting USB3.2/USB3.2x2 measurements
GRL-USB4-RXA	Automation software supporting USB4 measurements

	GRL-SAS3-RXA	Automation software supporting SAS-3 measurements
	GRL-SAS4-RXA	Automation software supporting SAS-4 measurements
	GRL-SAS34-RXA	Automation software supporting SAS-3/4 measurements
	GRL-DP14-SINKAN	Automation software supporting DisplayPort1.4 measurements
(Teledyne LeCroy)		Controls MP1900A and Teledyne LeCroy oscilloscopes LabMaster 10Zi-A series to perform PCIe compliance tests. This software is sold and supported by Teledyne LeCroy.
	QPHY-PCIE-Tx-Rx	Automation software supporting PCIe Gen3/4/5 measurements.
	QPHY-USB3.2-Tx-Rx	Automation software supporting USB3.2 measurements.
	QPHY-USB4-Tx-Rx	Automation software supporting USB4 and TBT3 measurements.
(Tektronix)		Controls MP1900A and Tektronix oscilloscopes MSO/DPO/DSA series to perform PCIe compliance tests. This software is sold and supported by Tektronix.
	Tek Rx Test Application Software	Automation software supporting PCIe Gen3/4/5, USB4 and TBT3/4 measurements.

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 (Select one or other)	10Tap Emphasis	Variable ISI	Data Phase Tuning
1	21 Gbit/s (Without Opt-001) or 32 Gbit/s Opt-001	1ch Opt-010 1ch Data Output	-	-	-
2					Opt-030 1ch Data Delay
3			Opt-011 1ch 10 Tap Emphasis	-	-
4					Opt-030 1ch Data Delay
				Opt-040 1ch Variable ISI	-
					Opt-030 1ch Data Delay
5		2ch Opt-020 2ch Data Output	-	-	-
6					Opt-031 2ch Data Delay
7			Opt-021 2ch 10 Tap Emphasis	-	-
8					Opt-031 2ch Data Delay
				Opt-041 2ch Variable ISI	-
					Opt-031 2ch Data Delay

Table 3-2 PAM4 PPG MU196020A

No.	Upper Operating Rate (Select either)	FEC Error Insertion for PCIe6	PCIe6 LEQ	4Tap Emphasis	Adjustable ISI	FEC Pattern Generation	Data Phase Tuning Data Delay	Multi-Channel Inter-Module Synchronization
1	32.1 Gbaud Opt-001 or 58.2 Gbaud Opt-002 or 64.2 Gbaud Opt-003	Opt-043	Opt-060	-	-	-	-	-
2							Opt-030	-
3								Opt-050
4						Opt-042	-	-
5							Opt-030	-
6								Opt-050
7				Opt-011	-	-	-	-
8							Opt-030	-
9								Opt-050
10						Opt-042	-	-
11							Opt-030	-
12								Opt-050
13					Opt-040	-	-	-
14							Opt-030	-
15								Opt-050
16						Opt-042	-	-
17							Opt-030	-
18								Opt-050
19	32.1 Gbaud Opt-001 or 58.2 Gbaud Opt-002	Opt-043	-	-	-	-	-	-
20							Opt-030	-
21								Opt-050
22						Opt-042	-	-
23							Opt-030	-

24	or							Opt-050
25	64.2 Gbaud			Opt-011	-	-	-	-
26	Opt-003					-	Opt-030	-
27								Opt-050
28						Opt-042	-	-
29							Opt-030	-
30								Opt-050
31					Opt-040	-	-	-
32							Opt-030	-
33								Opt-050
34						Opt-042	-	-
35							Opt-030	-
36								Opt-050
37	32.1 Gbaud	-	Opt-060	-	-	-	-	-
38	Opt-001						Opt-030	-
39	or							Opt-050
40	58.2 Gbaud					Opt-042	-	-
41	Opt-002						Opt-030	-
42	or							Opt-050
43	64.2 Gbaud			Opt-011	-	-	-	-
44	Opt-003						Opt-030	-
45								Opt-050
46						Opt-042	-	-
47							Opt-030	-
48								Opt-050
49					Opt-040	-	-	-
50							Opt-030	-
51								Opt-050
52						Opt-042	-	-
53							Opt-030	-
54								Opt-050
55	32.1 Gbaud	-	-	-	-	-	-	-
56	Opt-001						Opt-030	-
57	or							Opt-050
58	58.2 Gbaud					Opt-042	-	-
59	Opt-002						Opt-030	-
60	or							Opt-050
61	64.2 Gbaud			Opt-011	-	-	-	-
62	Opt-003						Opt-030	-
63								Opt-050
64						Opt-042	-	-
65							Opt-030	-
66								Opt-050
67					Opt-040	-	-	-
68							Opt-030	-
69								Opt-050
70						Opt-042	-	-
71							Opt-030	-
72								Opt-050

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

No.	Upper Bit Rate	Data ch No.	Data Amplitude (Select one or other)	Data Phase Tuning
1	28.1 Gbit/s (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 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 21G/32G bit/s SI ED MU195040A

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

Table 3-5 PAM4 ED MU196040B

No.	Upper Bit Rate	Equalizer	FEC Analysis	SER Measurement	FEC Analysis for PCIe6	Clock Recovery 32G	Clock Recovery 58G
1	Opt-001 32G baud	-	-	-	-	-	-
2						Opt-021 29G CR	-
3						Opt-022 32G CR	-
4				Opt-041 SER Measurement	-	-	-
5						Opt-021 29G CR	-
6						Opt-022 32G CR	-
7					Opt-043 FEC Analysis for PCIe6	-	-
8						Opt-021 29G CR	-
9						Opt-022 32G CR	-
10			Opt-042 FEC Analysis	Opt-041 SER Measurement	-	-	-
11						Opt-021 29G CR	-
12						Opt-022 32G CR	-
13					Opt-043 FEC Analysis for PCIe6	-	-
14						Opt-021 29G CR	-
15						Opt-022 32G CR	-
16		Opt-011 Equalizer	-	-	-	-	-
17						Opt-021 29G CR	-
18						Opt-022 32G CR	-
19				Opt-041 SER Measurement	-	-	-
20						Opt-021 29G CR	-
21						Opt-022 32G CR	-
22					Opt-043 FEC Analysis for PCIe6	-	-
23						Opt-021 29G CR	-
24						Opt-022 32G CR	-
25			Opt-042 FEC Analysis	Opt-041 SER Measurement	-	-	-
26						Opt-021 29G CR	-
27						Opt-022 32G CR	-
28					Opt-043 FEC Analysis for PCIe6	-	-
29						Opt-021 29G CR	-
30						Opt-022 32G CR	-
31	Opt-002 58G baud	-	-	-	-	-	-
32						Opt-021 29G CR	-
33							Opt-023 58G CR
34						Opt-022 32G CR	-
35							Opt-023 58G CR
36				Opt-041 SER Measurement	-	-	-
37						Opt-021 29G CR	-
38							Opt-023 58G CR
39						Opt-022 32G CR	-
40							Opt-023 58G CR
41					Opt-043 FEC Analysis for PCIe6	-	-
42						Opt-021 29G CR	-
43							Opt-023 58G CR
44						Opt-022 32G CR	-
45							Opt-023 58G CR

46			Opt-042 FEC Analysis	Opt-041 SER Measurement	-	-	-
47						Opt-021 29G CR	-
48						-	Opt-023 58G CR
49						Opt-022 32G CR	-
50						-	Opt-023 58G CR
51					Opt-043 FEC Analysis for PCIe6	-	-
52						Opt-021 29G CR	-
53						-	Opt-023 58G CR
54						Opt-022 32G CR	-
55						-	Opt-023 58G CR
56		Opt-011 Equalizer	-	-	-	-	-
57						Opt-021 29G CR	-
58							Opt-023 58G CR
59						Opt-022 32G CR	-
60							Opt-023 58G CR
61				Opt-041 SER Measurement	-	-	-
62						Opt-021 29G CR	-
63							Opt-023 58G CR
64						Opt-022 32G CR	-
65							Opt-023 58G CR
66					Opt-043 FEC Analysis for PCIe6	-	-
67						Opt-021 29G CR	-
68							Opt-023 58G CR
69						Opt-022 32G CR	-
70							Opt-023 58G CR
71			Opt-042 FEC Analysis	Opt-041 SER Measurement	-	-	-
72						Opt-021 29G CR	-
73							Opt-023 58G CR
74						Opt-022 32G CR	-
75							Opt-023 58G CR
76					Opt-043 FEC Analysis for PCIe	-	-
77						Opt-021 29G CR	-
78						-	Opt-023 58G CR
79						Opt-022 32G CR	-
80						-	Opt-023 58G CR

Table 3-6 PAM4 ED MU196040A

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

Table 3-7 28G/32G bit/s High Sensitivity ED MU183040B

No.	Upper Bit Rate	Number of Data Channels (Select one or other)	Clock Recovery	Clock Phase Tuning
1	28.1 Gbit/s (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 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 3-8 32G baud NRZ/PAM4 Re-Driver

No.	Clock Recovery for SSC
1	-
2	Opt-001 Clock Recovery for SSC

Table 3-9 Signal Quality Analyzer-R MP1900A (Main frame)

No.	Mainframe OS	
1	Without Opt-110 or -210 Retrofit	Units ordered prior to this date have Windows Embedded Standard 7 installed
2	Opt-110 or -210 Retrofit	These options upgrade main units with Windows Embedded Standard 7 installed to Windows 10 by remodeling hardware. In addition, after hardware remodeling, Anritsu physically destroys all unnecessary parts used previously by Windows Embedded Standard 7. Contact our business representative for more details.

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
MU196060A	Re-Driver	MU195040A	SI ED	MU183041B	32G ED 4CH

*1 MU183021A and MU183041B are discontinued models.

4.1 Restrictions

4.1.1 Restrictions on Module Combination

<table>
<tr><th></th><th colspan="2">Restrictions</th></tr>
<tr><td rowspan="2">Synthesizer Module
Jitter Module</td><td colspan="2">There are no restrictions on the slot positions.</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td rowspan="6">SI PPG/ED Module</td><td colspan="2">Use either the standard BERT module configuration described in section 4.2.1, or the module configuration described in sections 4.2.2 to 4.2.4. *</td></tr>
<tr><td colspan="2">A maximum of four PPG or ED modules can be installed. When using multiple PPG modules, install the PPG modules sequentially from slot 1</td></tr>
<tr><td colspan="2">The following option are required to use the 2ch Combination function.
MU195020A-x20 2ch Data Output2ch
MU195040A-x20 2ch ED</td></tr>
<tr><td colspan="2">Channel Synchronization and Combination functions between modules.</td></tr>
<tr><td></td><td>The following option is required for all modules.
MU195020A-x31 2ch Data Delay</td></tr>
<tr><td></td><td>The following option configurations must be the same for all modules.
MU195020A-x01 32G bit/s Extension
MU195020A-x20 2-channel Data Output</td></tr>
<tr><td rowspan="6">PAM4 PPG/ED Module</td><td colspan="2">Use either the standard BERT module configuration described in section 4.2.1, or the module configuration described in sections 4.2.2 to 4.2.4. *</td></tr>
<tr><td colspan="2">A maximum of four PPG or ED modules can be installed. When using multiple PPG modules, install the PPG modules sequentially from slot 1</td></tr>
<tr><td colspan="2">Channel Synchronization and Combination functions between modules.</td></tr>
<tr><td></td><td>The following option configurations must be the same for all modules.
MU196020A-x30 Data Delay
MU196020A-x50 Inter-Module Synchronization</td></tr>
<tr><td></td><td>The following Option configurations must be the same for all modules.
MU196020A-x01 32G baud
MU196020A-x02 58G baud, MU196020A-x12 32G to 58G baud Extension one of them
MU196020A-x03 64G baud, MU196020A-x13 32G to 64G baud Extension, MU196020A-x23 58G to 64G baud Extension one of them

Example
<table>
<tr><th>No.</th><th>Module 1</th><th>Module 2</th><th>Module 3</th><th>Combination Possible/Impossible</th></tr>
<tr><td>1</td><td>MU196020A-x01</td><td>MU196020A-x01</td><td>MU196020A-x01</td><td>Possible</td></tr>
<tr><td>2</td><td>MU196020A-x02</td><td>MU196020A-x02</td><td>MU196020A-x12</td><td>Possible</td></tr>
<tr><td>3</td><td>MU196020A-x03</td><td>MU196020A-x13</td><td>MU196020A-x23</td><td>Possible</td></tr>
<tr><td>4</td><td>MU196020A-x01</td><td>MU196020A-x12</td><td>MU196020A-x23</td><td>Impossible</td></tr>
</table></td></tr>
<tr><td rowspan="3">PAM4 PPG/ED Module
SI PPG/ED Module</td><td colspan="2">Use either the standard BERT module configuration described in section 4.2.1, or the module configuration described in sections 4.2.2 to 4.2.4. *</td></tr>
<tr><td colspan="2">A maximum of four PPG or ED modules can be installed. When using multiple PPG modules, install the PPG modules sequentially from slot 1</td></tr>
<tr><td colspan="2">The Channel Synchronization and Combination functions between modules can only be set when the two target modules are the same model and have the same configuration.
(About SI PPG/ED) The 2ch Combination function across two modules is not supported. The 2ch</td></tr>
</table>

	Combination function requires the 2ch PPG/ED option. Use of two 1ch PPG/ED modules does not support 2ch Combination setting.
32G PPG/ED Module	Use the module configuration described in sections 4.2.2 to 4.2.4
	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. Install in the slot above or below the PPG to connect the PPG using the standard accessory cable.
Re-Driver Module	There are no restriction on the slot positions. Install in the slot above or below the ED to connect the ED using the standard accessory cable.

* Note the restrictions for this item; use is possible after removing some modules from the configuration as described in “Expert BERT.”

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/B	MU195040A MU183040B/41B
PPG Module	MU196020A	✔	-
	MU195020A MU183020A	-	✔*

* G0375A is required on the PPG side. Please use PAM4 Control screen of MX183000A. （Production of the G0375A is being discontinued. In future, use the MU196020A.）

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

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

Slot No.	**Standard BERT for PAM4** 1ch NRZ/PAM4 BER Measurement Or PCIe Gen4 to 6 Measurement Applications	**Standard BERT for SI** 1 to 2ch NRZ or 1ch PAM4 BER Measurement PCIe/USB Applications	**Standard BERT for SI and PAM4** 1ch NRZ or 1ch PAM4 BER Measurement PCIe/Ether Applications
Slot1	Synthesizer	Synthesizer	Synthesizer
Slot2			
Slot3	Jitter	Jitter	Jitter
Slot4			
Slot5	Re-Driver *1	- *2	PAM4 ED or Re-Driver
Slot6	PAM4 ED	SI ED	SI ED
Slot7	PAM4 PPG	SI PPG	PAM4 PPG
Slot8	Noise	Noise	Noise

*1 It can be used with SI ED. The Re-Driver is required for PCIe.
*2 It can be used with PAM4 PPG, PAM4 ED, 32G ED or Re-Driver

Please start with "Expert BERT" instead of "Standard BERT".

Slot No.	Only PAM4 PPG or ED		SI PPG/ED and 32G PPG/ED Mixed Configurations			SI PPG x2 (For DDR5)
Slot1	Synthesizer					
Slot2						
Slot3	Jitter					
Slot4						
Slot5	-					SI PPG*1
Slot6	-	PAM4 ED	32G ED		SI ED	
Slot7	PAM4 PPG	-	SI PPG	32G PPG		SI PPG
Slot8	Noise	Noise	Noise	-	-	Noise

*1 Slot 5 requires the MU195020A-020 for DDR5 measurements. See "Option Configuration Examples" for details.

4.2.2 2ch PAM4 BERT, 4ch NRZ SI BERT, 4ch 32G BERT Configurations

Install the PPG modules sequentially from slot 1
Start after selecting [Expert BERT] at the MX190000A control software.

Slot No.	PAM4 PPG/ED	PAM4 PPG/ED (with Noise)	SI PPG/ED
Slot1	PAM4 PPG x 2	PAM4 PPG x 2	SI PPG x 2
Slot2			
Slot3	Jitter*1	Noise	Jitter
Slot4		PAM4 ED	
Slot5	Synthesizer	Jitter	Synthesizer
Slot6			
Slot7	PAM4 ED x 2 *1	Synthesizer	SI ED x 2 *1
Slot8			

*1 Load the ED in Slot 8 when using a configuration with two PPGs and one ED.

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 *1	SI ED x2 or 32G ED x2 or 32G ED 4CH*1
Slot8		

*1 Load the ED in Slot 8 when using a configuration with two PPGs and one ED.

4.2.3 PAM4 PPG/SI PPG 2 Module + Noise Configuration

Start after selecting “Expert BERT” at the MX190000A control software.

Slot No.	PAM4 PPG/ED		SI PPG/ED *2	
	Unit No.1	Unit No.2	Unit No.1	Unit No.2
Slot1	Jitter	Synthesizer	SI PPG x2	Synthesizer
Slot2				
Slot3	Noise	-	Jitter	-
Slot4	PAM4 PPG			
Slot5	PAM4 ED*1		Noise x2	
Slot6	PAM4 ED*1			
Slot7	PAM4 PPG		SI ED x2*1	
Slot8	Noise			

*1 Load the ED in Slot 5 when using a configuration with two PPGs and one ED. It can be used either without this module or with the synthesizer module loaded.
*2 Use eight pieces of the Electrical Length Specified Coaxial Cable J1728A to input data from the PPG module to the Noise module.

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 PAM4 PPG/SI PPG 4 Module Configuration

Install the PPG modules sequentially from slot 1. Start after selecting [Expert BERT] at the MX190000A control software.
Use the two J1748A Power Splitter units and six J1728A Electrical Length Specified Coaxial Cables to supply clocks from the Jitter module to the four PPG modules.

Slot No.	PAM4 PPG/ED		SI PPG/ED	
	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	SI PPG x2	32G ED x4
Slot2				
Slot3		32G PPG x2	32G PPG 4CH	
Slot4				
Slot5	Jitter			-
Slot6				
Slot7	Synthesizer			
Slot8				

4.3 Option Configuration Examples

4.3.1 Typical Option Configurations for High-Speed Bus Interface Evaluations

Category	Module/Option	Name	PCIe Gen1 to 5 Receiver Compliance Test[*1]	PCIe Gen1 to 5 Receiver Base Spec Crosstalk Test	PCIe Gen4 to 6 Receiver Compliance Test [*1]
Main Frame	MP1900A	Signal Quality Analyzer-R	1	1	1
Synthesizer	MU181000B	12.5GHz 4port Synthesizer	1	1	1
	MU181000B-001	Jitter Modulation			
	MU181000B-002	SSC Extension	1	1	1
Jitter Modulation	MU181500B	Jitter Modulation Source	1	1	1
SI PPG	MU195020A	21G/32G bit/s SI PPG	1	1	
	MU195020A-001	32G bit/s Extension	1[*2]	1[*2]	
	MU195020A-010	1ch Data Output	1		
	MU195020A-020	2ch Data Output		1	
	MU195020A-011	1ch 10Tap Emphasis	1		
	MU195020A-021	2ch 10Tap Emphasis		1	
	MU195020A-030	1ch Data Delay			
	MU195020A-031	2ch Data Delay		1	
	MU195020A-040	1ch Variable ISI			
	MU195020A-041	2ch Variable ISI		1[*3]	
	MU195020A-050	Sequence Editor Function	1[*4]	1[*4]	
	MU195020A-051	Sequence Editor Function PCIe 5 Extension	1[*4]	1[*4]	
PAM4 PPG	MU196020A	PAM4 PPG			1
	MU196020A-001	32G baud			1
	MU196020A-002	58G baud			
	MU196020A-003	64G baud			
	MU196020A-011	4Tap Emphasis			1
	MU196020A-030	Data Delay			
	MU196020A-040	Adjustable ISI			
	MU196020A-042	FEC Pattern Generation			
	MU196020A-043	FEC Error Insertion for PCIe6			1[*7]
	MU196020A-050	Inter-Module Synchronization			
	MU196020A-060	PCIe6 LEQ			1
SI ED	MU195040A	21G/32G bit/s SI ED	1	1	
	MU195040A-001	32G bit/s Extension	1[*2]	1[*2]	
	MU195040A-010	1ch ED	1		
	MU195040A-020	2ch ED		1	
	MU195040A-011	1ch CTLE	1		
	MU195040A-021	2ch CTLE		1	
	MU195040A-022	Clock Recovery	1	1	
PAM4 ED	MU196040B	PAM4 ED			1
	MU196040B-001	32G baud（2.4G to 32.1G）			1
	MU196040B-002	58G baud（NRZ：2.4G to 64.2G, PAM4：2.4G to 58.2G）			
	MU196040B-011	Equalizer			1
	MU196040B-021	29G baud Clock Recovery (2.4G to 29G)			
	MU196040B-022	32G baud Clock Recovery (2.4G to 32.1G)			
	MU196040B-023	58G baud Clock Recovery Extension（51G to 58.2G）			
	MU196040B-041	SER Measurement			1
	MU196040B-042	FEC Analysis			
	MU196040B-043	FEC Analysis for PCIe6			1[*7]
Voltage Noise	MU195050A	Noise Generator	1	1	1
	MU195050A-001	White Noise			
Re-Driver	MU196060A	32G baud NRZ/PAM4 Re-Driver	1[*5]	1[*5]	1
	MU196060A-001	Clock Recovery for SSC	1[*5]	1[*5]	1
Software	MX183000A-PL001	Jitter Tolerance Test	1	1	1
	MX183000A-PL021	PCIe Link Training	1[*6]	-	1[*6]
	MX183000A-PL025	PCIe 5 Link Training	1[*6]	-	1[*6]
	MX183000A-PL026	PCIe 6 Link Training	-	-	1[*6]

Typical Option Configurations for High-Speed Bus Interface Evaluations (continued 1)

Category	Module/Option	Name	USB3.2 x1 Receiver Test	USB3.2 x 2 Receiver Test	USB Type-C, DP Receiver Test
Main Frame	MP1900A	Signal Quality Analyzer-R	1	1	1
Synthesizer	MU181000B	12.5GHz 4port Synthesizer	1	1	1
	MU181000B-001	Jitter Modulation			
	MU181000B-002	SSC Extension			
Jitter Modulation	MU181500B	Jitter Modulation Source	1	1	1
SI PPG	MU195020A	21G/32G bit/s SI PPG	1	1	1
	MU195020A-001	32G bit/s Extension			
	MU195020A-010	1ch Data Output	1		1*8
	MU195020A-020	2ch Data Output		1	1*8
	MU195020A-011	1ch 10Tap Emphasis	1		1*8
	MU195020A-021	2ch 10Tap Emphasis		1	1*8
	MU195020A-030	1ch Data Delay			
	MU195020A-031	2ch Data Delay		1	
	MU195020A-040	1ch Variable ISI			
	MU195020A-041	2ch Variable ISI			
	MU195020A-050	Sequence Editor Function	1*9	1*9	
	MU195020A-051	Sequence Editor Function PCIe 5 Extension			
SI ED	MU195040A	21G/32G bit/s SI ED	1	1	
	MU195040A-001	32G bit/s Extension			
	MU195040A-010	1ch ED	1		
	MU195040A-020	2ch ED		1	
	MU195040A-011	1ch CTLE	1		
	MU195040A-021	2ch CTLE		1	
	MU195040A-022	Clock Recovery	1	1	
Voltage Noise	MU195050A	Noise Generator	1	1	1
	MU195050A-001	White Noise			
Software	MX183000A-PL001	Jitter Tolerance Test	1	1	
	MX183000A-PL021	PCIe Link Training			
	MX183000A-PL022	USB Link Training	1	1*10	
	MX183000A-PL023	USB 3.2 x 2 Link Training		1*10	
	MX183000A-PL025	PCIe 5 Link Training			
	MX183000A-PL026	PCIe 6 Link Training			

Typical Option Configurations for High-Speed Bus Interface Evaluations (continued 2)

Category	Module/Option	Name	SAS Receiver Test	Thunderbolt3/ USB4 Receiver Test	DP1.4 Sink Test
Main Frame	MP1900A	Signal Quality Analyzer-R	1	1	1
Synthesizer	MU181000B	12.5GHz 4port Synthesizer	1	1	1
	MU181000B-001	Jitter Modulation			
	MU181000B-002	SSC Extension	1		
Jitter Modulation	MU181500B	Jitter Modulation Source	1	1	1
SI PPG	MU195020A	21G/32G bit/s SI PPG	1	1	1
	MU195020A-001	32G bit/s Extension	1[*2]		
	MU195020A-010	1ch Data Output	1	1	
	MU195020A-020	2ch Data Output			1
	MU195020A-011	1ch 10Tap Emphasis	1	1	
	MU195020A-021	2ch 10Tap Emphasis			1
	MU195020A-030	1ch Data Delay			
	MU195020A-031	2ch Data Delay			
	MU195020A-040	1ch Variable ISI	1		
	MU195020A-041	2ch Variable ISI			
	MU195020A-050	Sequence Editor Function			
	MU195020A-051	Sequence Editor Function PCIe 5 Extension			
SI ED	MU195040A	21G/32G bit/s SI ED	1		
	MU195040A-001	32G bit/s Extension	1[*2]		
	MU195040A-010	1ch ED	1		
	MU195040A-020	2ch ED			
	MU195040A-011	1ch CTLE	1		
	MU195040A-021	2ch CTLE			
	MU195040A-022	Clock Recovery	1		
Voltage Noise	MU195050A	Noise Generator	1[*11]	1[*11]	1
	MU195050A-001	White Noise			
Re-Driver	MU196060A	32G baud NRZ/PAM4 Re-Driver			
	MU196060A-001	Clock Recovery for SSC			
Software	MX183000A-PL001	Jitter Tolerance Test			
	MX183000A-PL021	PCIe Link Training			
	MX183000A-PL022	USB Link Training			
	MX183000A-PL023	USB 3.2 x 2 Link Training			
	MX183000A-PL025	PCIe 5 Link Training			
	MX183000A-PL026	PCIe 6 Link Training			

Typical Option Configurations for High-Speed Bus Interface Evaluations (continued 3)

Category	Module/Option	Name	DDR5 Receiver Test
Main Frame	MP1900A	Signal Quality Analyzer-R	1
Synthesizer	MU181000B	12.5GHz 4port Synthesizer	1
	MU181000B-001	Jitter Modulation	-
	MU181000B-002	SSC Extension	-
Jitter Modulation	MU181500B	Jitter Modulation Source	1
SI PPG#1	MU195020A	21G/32G bit/s SI PPG	1
	MU195020A-001	32G bit/s Extension	-
	MU195020A-010	1ch Data Output	1
	MU195020A-020	2ch Data Output	-
	MU195020A-011	1ch 10Tap Emphasis	1
	MU195020A-021	2ch 10Tap Emphasis	-
	MU195020A-030	1ch Data Delay	1
	MU195020A-031	2ch Data Delay	-
	MU195020A-040	1ch Variable ISI	1
	MU195020A-041	2ch Variable ISI	-
	MU195020A-050	Sequence Editor Function	-
	MU195020A-051	Sequence Editor Function PCIe 5 Extension	-
SI PPG#1	MU195020A	21G/32G bit/s SI PPG	1
	MU195020A-001	32G bit/s Extension	-
	MU195020A-010	1ch Data Output	-
	MU195020A-020	2ch Data Output	1
	MU195020A-011	1ch 10Tap Emphasis	-
	MU195020A-021	2ch 10Tap Emphasis	1
	MU195020A-030	1ch Data Delay	-
	MU195020A-031	2ch Data Delay	1
	MU195020A-040	1ch Variable ISI	-
	MU195020A-041	2ch Variable ISI	-
	MU195020A-050	Sequence Editor Function	-
	MU195020A-051	Sequence Editor Function PCIe 5 Extension	-
SI ED	MU195040A	21G/32G bit/s SI ED	1
	MU195040A-001	32G bit/s Extension	-
	MU195040A-010	1ch ED	1
	MU195040A-020	2ch ED	-
	MU195040A-011	1ch CTLE	1
	MU195040A-021	2ch CTLE	-
	MU195040A-022	Clock Recovery	-
Voltage Noise	MU195050A	Noise Generator	1
	MU195050A-001	White Noise	-
Re-Driver	MU196060A	32G baud NRZ/PAM4 Re-Driver	-
	MU196060A-001	Clock Recovery for SSC	-
Software	MX183000A-PL001	Jitter Tolerance Test	-
	MX183000A-PL021	PCIe Link Training	-
	MX183000A-PL022	USB Link Training	-
	MX183000A-PL023	USB 3.2 x 2 Link Training	-
	MX183000A-PL025	PCIe 5 Link Training	-
	MX183000A-PL026	PCIe 6 Link Training	-

*1 Anritsu contributes as a PCI-SIG member to PCI Express standards.

*2 Required for PCIe Gen5 and SAS-4 support

*3 Supports PCIe Gen5 Base Spec receive test

*4 Used for debugging PCIe Link training. PCIe Gen1-4 requires MU195020A-050 while PCIe Gen5 requires both MU195020A-050 and -051.

*5 Required when NRZ Channel LOSS ≥18 dB
*6 PCIe Gen1-4 requires MX183000A-PL021 while PCIe Gen5 requires both MX183000A-PL021 and -PL025. Support for PCIe Gen6 requires all the MX183000A-PL021, -PL025, and -PL026 options.
*7 Supports PCIe FEC evaluation. Not required for compliance testing.
*8 Select either 1ch or 2ch. Either 1ch or 2ch can be selected for USB Type-C. DP receiver test requires 2ch.
*9 Used for debugging USB3.2 Link training.
*10 USB3.2x2 Link training requires both MX183000A-PL022 and -PL023.
*11 Requires Pickoff Tee when not using MU195050A.

4.3.2 Option Configuration Examples when using PAM4 BERT

Category	Module/Option	Name	1ch PAM4 BERT	1ch PAM4 PPG	2ch PAM4 BERT	4ch PAM4 BERT
Main Frame	MP1900A	Signal Quality Analyzer-R	1	1	2	2
Synthesizer	MU181000B	12.5GHz 4port Synthesizer	1	1	1	1
	MU181000B-001	Jitter Modulation				
	MU181000B-002	SSC Extension				
Jitter Modulation	MU181500B	Jitter Modulation Source	1	1	1	1
PAM4 PPG	MU196020A	PAM4 PPG	1	1	2	4
	MU196020A-001	32G baud	1*1	1*1	2*1	4*1
	MU196020A-002	58G baud				
	MU196020A-003	64G baud				
	MU196020A-011	4Tap Emphasis	1	1	2	4
	MU196020A-030	Data Delay			2	4
	MU196020A-040	Adjustable ISI	1	1	2	4
	MU196020A-042	FEC Pattern Generation	1	1	2	4
	MU196020A-050	Inter-Module Synchronization			2	4
PAM4 ED	MU196040B	PAM4 ED	1		2	4
	MU196040B-001	32G baud (2.4G to 32.1G)	1*1		2*1	4*1
	MU196040B-002	58G baud (NRZ: 2.4G to 64.2G, PAM4, 2.4G to 58.2G)				
	MU196040B-011	Equalizer	1		2	4
	MU196040B-021	29G baud Clock Recovery (2.4G to 29G)	1*1,*2		2*1,*2	4*1, *2
	MU196040B-022	32G baud Clock Recovery (2.4G to 32.1G)				
	MU196040B-023	58G baud Clock Recovery Extension (51G to 58.2G)	1*2		2*2	4*2
	MU196040B-041	SER Measurement	1		2	4
	MU196040B-042	FEC Analysis	1		2	4
Voltage Noise	MU195050A	Noise Generator				
	MU195050A-001	White Noise				
Re-Driver	MU196060A	32G baud NRZ/PAM4 Re-Driver				
	MU196060A-001	Clock Recovery for SSC				
Software	MX183000A-PL001	Jitter Tolerance Test	1	1	1	1
	MX183000A-PL031	DUT Error Counts Import		1		
	MX183000A-PL021	PCIe Link Training				
	MX183000A-PL025	PCIe 5 Link Training				
	MX183000A-PL026	PCIe 6 Link Training				

*1 Select each one.

*2 The 58G baud Clock Recovery Extension (51G to 58.2G) requires either MU196040B-021 and -023, or MU196040B-022 and -023.

5. Combinations of Automation Software and Real-time Oscilloscopes for Compliance Tests

Refer to the following table for the combinations of automation software used for each type of compliance test and supported real-time oscilloscope.
Legend: ✔ = Can be used

Module	Solution	MP1900A	GRL Automation SW		LeCroy	Tektronix
			Keysight Scope	Tektronix Scope		
SI PPG ＋SI ED	PCIe Gen3 Rx	✔	✔	✔	✔ (CEM Only)	-
	PCIe Gen4 Rx	✔	✔	✔	✔(CEM Only)	✔
	PCIe Gen5 Rx	✔	✔	✔	✔	✔
	PCIe PLL Test	✔	✔	✔	✔	✔
	USB3.2 1 lane Rx	✔	✔	✔	✔	-
	USB3.2 2 lanes Rx	✔	✔	✔	-	-
	USB3.2 Ping LFPS	✔	✔	✔	✔	-
	USB3.2 Retimer (Embedded&Component&Active Cable)	✔[*1]	-	-	-	-
	USB4 V1Rx	✔	✔	✔	✔	✔
	SAS3/4 Rx(12G 22.5G Only PRBS Ber Test)	✔	✔	✔	-	-
	DP1.4	✔	✔	✔	-	-
	DP2.0	✔	✔	✔	✔	-
	TBT3 Rx	✔	✔	-	✔	-

PPG Module	Solution	MP1900A	GRL Automation SW		LeCroy	Tektronix
			Keysight Scope	Tektronix Scope		
PAM4 PPG ＋SI ED	PCIe Gen3 Rx	✔	✔	✔	✔(CEM Only)	-
	PCIe Gen4 Rx	✔	✔	✔	✔(CEM Only)	✔
	PCIe Gen5 Rx	✔	✔	✔	✔	✔
	PCIe PLL Test	✔	-			
PAM4 PPG ＋PAM4 ED	PCIe Gen3 Rx	✔	-			
	PCIe Gen4 Rx	✔	*2	*2	*2	*2
	PCIe Gen5 Rx	✔	*2	*2	*2	*2
	PCIe Gen6 Rx Base	✔	✔	✔	*2	✔
	PCIe Gen6 Rx CEM	-	✔	✔	*2	*2
	PCIe PLL Test	✔	-			

*1 Active Cable supports up to USB 3.2 Gen1.
*2 Enquire about support status.

6. Compliance Test Measurement Kit

The following table lists the peripheral equipment for performing each compliance test.

Compliance Test Item	Model	Name	Qty	Remarks
PCIe Gen6 (When using Gen5 CEM Test Fixture when DUT TYPE = K-connector)	J1815A	MP1900A PCIe Measurement Component Set	1	
	Z2025A	PCIe CBB Controller	1	For add-in-card test; supports GRL automation software
	Z2029A	PCIe 100 MHz Reference Clock Buffer	1	For add-in-card test
	34VKF50A	Fixed Adapter (V-M, K-F)	2	MU196060A Data Input V->K
PCIe Gen6 (When not using Gen5 CEM Test Fixture when DUT TYPE = V-connector)	Z2029A	PCIe 100 MHz Reference Clock Buffer	1	For add-in-card test
	34VFK50A	Fixed Adapter (V-F, K-M)	2	MU195050A Data Output K->V
	J1790A	Electrical Length Specified Coaxial Cable (0.8 m, V connector)	4	
	J1625A	Coaxial Cable 1 m (SMA connector)	3	
	J1892A	Coaxial Adaptor(BNC-P, SMA-J)	2	
PCIe Gen1-5 (When using MU195040A)	J1815A	MP1900A PCIe Measurement Component Set	1	
	Z2025A	PCIe CBB Controller	1	For add-in-card test; supports GRL automation software
	Z2029A	PCIe 100 MHz Reference Clock Buffer	1	For add-in-card test
	~~G0430A~~	~~PCIe5 Re-Driver Set~~	1	~~For PCIe Gen5 SystemTest~~ Use MU196060A.
	34VKF50A	Fixed Adapter (V-M, K-F)	2	MU196060A Data Input V->K (When using MU196060A)
	34VFK50A	Fixed Adapter (V-F, K-M)	2	MU195040A Data Input K->V (When using MU196060A)
USB3.2/USB3.2x2	J1551A	Coaxial Skew Matched Cable (0.8 m)	2 (4)[*1]	K-connector
	USB31CET	USB3.1 Type-C Test Fixture[*2]	1	Purchase from Wilder Technology Corporation
USB4, Thunderbolt 3	J1551A	Coaxial Skew Matched Cable (0.8 m)	3	K-connector
	K261	DC Block	2	
	-	K-SMP Adapter	4	Equivalent to Rosenberger Corporation 02K119-K00E3
	ISI-USB4	ISI Channel	1	Purchase from Wild River Technology Corporation
	USB4-TPA-UC-K	USB4/TBT 3 Test Fixture	1	Purchase from Wilder Technology Corporation
SAS-3	K261	DC Block	4	
	J1550A	Coaxial skew match cable (0.8 m)	3	APC3.5 Connector
	J1758A	ISI Board	1	
	-	SAS Test Fixture	1	
SAS-4	K261	DC Block	4	
	J1551A	Coaxial skew match cable (0.8 m)	4	K-connector
	MG3692C	2 GHz to 20 GHz Signal Generator	1	
	K241C	Power Splitter	1	
	J1758A	ISI Board	1	
	-	SAS Test Fixture	1	
DisplayPort1.4	DSG815	RF Signal Generator, 9 kHz to 1.5 GHz	1	Regol Corporation
	CLE1000-A2	Variable ISI Channel	1	Artek Corporation
	DPT-200	DisplayPort Reference Source	1	Unigraf Corporation
	-	DP Test Fixture	1	
	J1625A	Coaxial Cable 1 m (SMA connector)	1	
	41KB-6	Precision Fixed Attenuator (6 dB)	1	
	J1398A	N-SMA Adapter	1	
	J1550A	Matched Skew Coaxial Cables (0.8 m)	1	
	HL9450-60	Low-Pass Rise-time Filter	2	HYPERLABS Corporation
	K261	DC Block	2	
	AN44182	4-WAY POWER DIVIDER	2	
	HL9450-150	Low Pass Rise Time Filter	2	HYPERLABS Corporation
	-	SMA-f to BNC Adapter	1	
	-	SMA-m to SMA-m Adapter	10	

Compliance Test Item	Model	Name	Qty	Remarks
DDR5	41KC-6	Precision Fixed Attenuator (6 dB)	3	
	J1551A	Coaxial skew match cable(0.8 m, K connector)	3 Pairs	
	J1439A	Coaxial cable (0.8 m, K connector)	2	
	J1624A	COAXIAL CABLE 0.3 m (SMA connector)	(4)	Use MU181000B standard accessory cables (4 pcs).
	J1746A	Skew match pair semirigid cable (K connector, Data Input 1)	(1 Pair)	Use MU195050A standard accessory.
		SMP to SMA adapter cable	7	Wilder Technologies p/n 415-0080-002 (reference product)
		Power Supply (2 outputs , +12 V,+3.3V)		Keithley 2220 or 2230 (reference product)
		Red Banana-Plug Jumper Cable, Power Supply -> Fixture connection. 3.3 V, 12 V. 8"	1 Pair	Keithley CA-560-2 (reference product)
		Black Banana-Plug Jumper Cable, Power Supply -> Fixture connection, ground. 8".	1	Keithley CA-560-0 (reference product)
		Real Time Oscilloscope with BW >=21 GHz	1	DPO7000DX MSO7000DX DPO7000SX Contact Tektronix.
		Lan Hab (3 or more ports)	1	Commercial product for automation
	A9-AUTO-01	Reset Automation Kit	1	Contact ASTEK. https://www.astekcorp.com/
	A9-CTC2-01	DDR5 CTC2 Test Fixture	1	
	A9-DIMM5	DDR5 Parametric Test Card	1	
		USB Type A-MicroUSB Type B	1	Commercial product ASTEK A9-CTC2-01 for control

*1 Used for USB4 and Thunderbolt 3 Compliance Test; not required for USB3.2.
*2 Used for USB3.2 Compliance Test; not required for USB4 and Thunderbolt 3 Receiver Test.

7. Supported Software Versions

The MP1900A main unit and each application model support the following software versions. Use the latest upgrade of each software version. However, refer to the GRL software release notes published on the company webpage for the MX190000A and MX183000A software versions supported by the GRL software.

Model	MX190000A/MX183000A Supported version
MU181000B 12.5GHz 4Port Synthesizer MU181500B Jitter Modulation Source MU195050A Noise Generator MU183040B 28G/32G bit/s High Sensitivity ED MU195020A 21G/32G bit/s SI PPG MU195040A 21G/32G bit/s SI ED	Ver. 1.00
MU181000B-002 SSC Expansion MX183000A-PL001 Jitter Tolerance Test MX183000A-PL011 PCIe Link Sequence MX183000A-PL021 PCIe Link Training	Ver. 2.00
MU196020A PAM4 PPG MU196040A PAM4 ED MX183000A-PL022 USB Link Training	Ver. 3.00
MU196020A-040 Adjustable ISI MU196020A-042 FEC Pattern Generation MU196020A-050 Inter-Module Synchronization	Ver. 3.01
MX183000A-PL031 DUT Error Counts Import	Ver. 3.07
MU196040B PAM4 ED	Ver. 4.01
MX183000A-PL025 PCIe 5 Link Training	Ver. 4.03
MU195020A-051 Sequence Editor Function PCIe 5 Extension MX183000A-PL023 USB 3.2 x 2 Link Training	Ver. 7.02.30
MU196020A-043 FEC Error Insertion for PCIe6 MU196040B-043 FEC Analysis for PCIe6 MU196020A-060 PCIe6 LEQ MU196060A 32G baud NRZ/PAM4 Re-Driver MU196060A-001 Clock Recovery for SSC MX183000A-PL026 PCIe 6 Link Training	Ver. 10.00.00

8. Document History

Date	Modifications
2018.7.31	● Added module configuration details to Table 4-2 describing operation functions added by multi-modules for modules other than MU195020A and MU195040A ● Added postscript to Table 4-4 (The MX183000A software can control one G0376A)
2018.11.21	Added MU196020A and MU196040A.
2019.3.6	Added Options ● MU196020A -040 Adjustable ISI, -042 FEC Pattern Generation, -050 Inter-Module Synchronization ● MX183000A-PL031 DUT Error Counts Import
2019.4.10	Updated "Module Combinations"
2019.5.30	Corrected errors
2019.10.25	Added MU196040B.
2019.11.25	Added PCIe Gen5 Base Spec support
2020.2.25	Added PCIe Gen5 CEM Spec support
2020.4.10	Updated "Module Combinations"
2020.7.6	Added Automation software for compliance tests
2020.10.21	Added support for SAS, DP and PCIe PAM4 configurations Added support for Compliance Test Kit
2020.11.20	Added Option MU195020A-050 Sequence Editor Function
2021.2.15	Added Option MU196040B-042 FEC Analysis
2021.10.25	Added Options MU195020A-051 Sequence Editor Function PCIe 5 Extension MX183000A-PL023 USB 3.2 x 2 Link Training
2022.3.9	Updated "Module Combinations"
2022.8.31	Updated following items 1. MP1900A and MP1800A Series Supported Equipment and Software Table 2-6 Software Functions and Features 4.2 Verified module configuration 4.3 Option Configuration Examples 5. Combinations of Automation Software and Real-time Oscilloscopes for Compliance Tests 6. Compliance Test Measurement Kit
2023.7.31	Updated MP1900A and MP1800A series Supported Equipment and Software Updated PPG/ED Module Selection using Measurement Application, and Table 1-1 PPGs/EDs Supporting 21 Gbit/s by Measurement Application & Function. Updated Module Combinations (added SI PPG 2 Module + Noise Configuration)
2023.10.25	Added following item 1. Re-Driver Module Functions and Features Updated following items 1. MP1900A and MP1800A Series Supported Equipment and Software 2. Selection of PPG and ED Module According to Measurement Application 3. PPGs/EDs Supporting 21 Gbit/s by Measurement Application & Function 4. Selection by Difference in Functions and Performance 5. Functions and Features of Main Unit, each Module, and each Option 6. Software Functions and Features 7. Option Combinations 8. Module Combinations 9. Verified module configuration 10. Option Configuration Examples 11. Combinations of Automation Software and Real-time Oscilloscopes for Compliance Tests 12. Compliance Test Measurement Kit
2024.3.1	Updated following items 1. Selection by Difference in Functions and Performance 2. Option Configuration Examples 3. Compliance Test Measurement Kit

Anritsu Advancing beyond

Specifications are subject to change without notice.

• **United States**
Anritsu Americas Sales Company
450 Century Parkway, Suite 190, Allen, TX 75013 U.S.A.
Phone: +1-800-Anritsu (1-800-267-4878)

• **Canada**
Anritsu Electronics Ltd.
Americas Sales and Support
450 Century Parkway, Suite 190, Allen, TX 75013 U.S.A.
Phone: +1-800-Anritsu (1-800-267-4878)

• **Brazil**
Anritsu Eletronica Ltda.
Praça Amadeu Amaral, 27 - 1 Andar
01327-010 - Bela Vista - Sao Paulo - SP, Brazil
Phone: +55-11-3283-2511
Fax: +55-11-3288-6940

• **Mexico**
Anritsu Company, S.A. de C.V.
Blvd Miguel de Cervantes Saavedra #169 Piso 1, Col. Granada
Mexico, Ciudad de Mexico, 11520, MEXICO
Phone: +52-55-4169-7104

• **United Kingdom**
Anritsu EMEA Ltd.
200 Capability Green, Luton, Bedfordshire, LU1 3LU, U.K.
Phone: +44-1582-433200
Fax: +44-1582-731303

• **France**
Anritsu S.A.
12 avenue du Québec, Immeuble Goyave,
91140 VILLEBON SUR YVETTE, France
Phone: +33-1-60-92-15-50

• **Germany**
Anritsu GmbH
Nemetschek Haus, Konrad-Zuse-Platz 1,
81829 München, Germany
Phone: +49-89-442308-0
Fax: +49-89-442308-55

• **Italy**
Anritsu S.r.l.
Spaces Eur Arte, Viale dell'Arte 25, 00144 Roma, Italy
Phone: +39-6-509-9711

• **Sweden**
Anritsu AB
Kistagången 20 B, 2 tr, 164 40 Kista, Sweden
Phone: +46-8-534-707-00

• **Finland**
Anritsu AB
Technopolis Aviapolis, Teknobulevardi 3-5 (D208.5.),
FI-01530 Vantaa, Finland
Phone: +358-20-741-8100

• **Denmark**
Anritsu A/S
c/o Regus Winghouse, Ørestads Boulevard 73, 4th floor,
2300 Copenhagen S, Denmark
Phone: +45-7211-2200

• **Spain**
Anritsu EMEA GmbH
Representation Office in Spain
Calle Manzanares 4, Primera planta, 28005 Madrid, Spain
Phone: +34-91-572-6761

• **Austria**
Anritsu EMEA GmbH
Am Belvedere 10, A-1100 Vienna, Austria
Phone: +43-(0)1-717-28-710

• **United Arab Emirates**
Anritsu A/S
Office No. 164, Building 17, Dubai Internet City
P. O. Box – 501901, Dubai, United Arab Emirates
Phone: +971-4-3758479

• **India**
Anritsu India Private Limited
6th Floor, Indiqube ETA, No.38/4, Adjacent to EMC2,
Doddanekundi, Outer Ring Road, Bengaluru – 560048, India
Phone: +91-80-6728-1300
Fax: +91-80-6728-1301

• **Singapore**
Anritsu Pte. Ltd.
1 Jalan Kilang Timor, #07-04/06 Pacific Tech Centre
Singapore 159303
Phone: +65-6282-2400
Fax: +65-6282-2533

• **Vietnam**
Anritsu Company Limited
16th Floor, Peakview Tower, 36 Hoang Cau Street, O Cho Dua Ward,
Dong Da District, Hanoi, Vietnam
Phone: +84-24-3201-2730

• **P.R. China (Shanghai)**
Anritsu (China) Co., Ltd.
Room 2701-2705, Tower A, New Caohejing International
Business Center No. 391 Gui Ping Road Shanghai, 200233, P.R. China
Phone: +86-21-6237-0898
Fax: +86-21-6237-0899

• **P.R. China (Hong Kong)**
Anritsu Company Ltd.
Unit 1006-7, 10/F., Greenfield Tower, Concordia Plaza,
No. 1 Science Museum Road, Tsim Sha Tsui East,
Kowloon, Hong Kong, P.R. China
Phone: +852-2301-4980
Fax: +852-2301-3545

• **Japan**
Anritsu Corporation
8-5, Tamura-cho, Atsugi-shi, Kanagawa, 243-0016 Japan
Phone: +81-46-296-6509
Fax: +81-46-225-8352

• **Korea**
Anritsu Corporation, Ltd.
8F, A TOWER, 20, Gwacheondaero 7-gil, Gwacheon-si,
Gyeonggi-do, 13840, Republic of Korea
Phone: +82-2-6259-7300
Fax: +82-2-6259-7301

• **Australia**
Anritsu Pty. Ltd.
Unit 20, 21-35 Ricketts Road, Mount Waverley, Victoria 3149, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

• **Taiwan**
Anritsu Company Inc.
7F, No. 316, Sec. 1, NeiHu Rd., Taipei 114, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817

2403

Printed in Japan 2024-4 MJM No. MP1900A-E-Z-1-(21.01)