Anritsu envision : ensure

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	MP1800A
Module		
MU181000A 12.5GHz Synthesizer [*1] MU181000B 12.5GHz 4 Port Synthesizer	✓	✓[*4]
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	[*2]	✓
MU181040B 14Gbit/s ED	[*2]	✓
Extended box		
MP1825B 4Tap Emphasis	[*3]	✓
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	✓	✓
Software		
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	[*5]	✓
MX180014A 100G PON Application Software		✓
MX181500A Jitter/Noise Tolerance Test Software	[*5]	✓

*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

Model and Name	MP1900A	MP1800A
Software (continued)		
GRL-PCIE5-BASE-RXA (PCIe Gen5 Base) *7	✓	
GRL-PCIE4-CEM-RXA (PCIe Gen3/4 CEM) *7	✓	
GRL-PCIE4-BASE-RXA (PCIe Gen3/4 Base) *7	✓	
GRL-PCIE4-RXA (PCIe Gen3/4 Base and CEM) *7	✓	
GRL-TBT3-RXA (TBT3) *7	✓	
GRL-USB31-RXA (USB3.2) *7	✓	
QPHY-PCIE-Tx-Rx PCIe Gen4 Base and CEM, Gen5 Base) *8	✓	

*7 Granite River Labs (GRL) Corporation software

*8 Teledyne LeCroy software

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.), ≤31 mVp-p.

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

<table>
<tr><th colspan="2">Measurement Application</th><th>MP1900A Series</th><th>MP1800A Series</th></tr>
<tr><td rowspan="2">Devices, backplanes, Active cables
BER measurement of devices and backplanes when using Emphasis, Jitter, Clock Recovery functions.</td><td>53G/58G
(200/400 GbE)</td><td>MU196020A/40B</td><td>-</td></tr>
<tr><td>to 28G/32G
(10/40/100/200 GbE)</td><td>MU196020A/40B
or
MU195020A/40A</td><td>MU183020A
MP1825B
MU183040B</td></tr>
<tr><td rowspan="2">Optical modules, TOSA/ROSA, driver amplifiers
BER measurement of optical modules and of high-amplitude applications other than those described below</td><td>53G/58G
(200/400 GbE)</td><td>MU196020A/40B</td><td>-</td></tr>
<tr><td>to 28G/32G
(10/40/100/200 GbE)</td><td>MU196020A/40B
or
MU195020A/40A</td><td>MU18302xA
MU18304xB</td></tr>
<tr><td rowspan="2">EML-TOSA evaluations and tests using high-amplitude signals
For EML-TOSA evaluation</td><td>53G/58G</td><td>MU196020A/40B</td><td>-</td></tr>
<tr><td>to 28G/32G</td><td>MU196020A *5
or
MU195020A</td><td>MU18302xA</td></tr>
<tr><td rowspan="2">InfiniBand AOC test</td><td>HDR *3</td><td rowspan="2">MU196020A/40B
or
MU195020A/40A</td><td>-</td></tr>
<tr><td>EDR
FDR</td><td>MU183020A
MP1825B
MU183040B*2</td></tr>
<tr><td rowspan="2">PON, Optical circuit tests and burst signal tests
BER measurements using burst signals and patterns with Mark ratio of 1/2 or more</td><td>100G PON</td><td>-</td><td>MU183020A
MU183040B</td></tr>
<tr><td>10G PON</td><td>-</td><td>MU181020B
MU181040B</td></tr>
<tr><td colspan="2">PCI Express Gen1 to 4 receiver Test
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.</td><td>MU195020A
MU195040A</td><td>-</td></tr>
<tr><td colspan="2">USB3.2 receiver Test
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.</td><td>MU195020A
MU195040A</td><td>MU18302xA
MP1825B
G0373A *4</td></tr>
<tr><td colspan="2">Thunderbolt 3 Receiver Test
Supports Thunderbolt 3 Host and Device Stressed Receiver Sensitivity measurement using Emphasis output and Jitter generation</td><td>MU195020A</td><td>MU183020A
MP1825B *1</td></tr>
</table>

*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 (MU196020A/ MU196040B)	MU1950xx series (MU195020A/ MU195040A)	MU1830xx series (MU183020A/ MU183040B)
PPG/ED			
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 Gbits (option selection)	2.4 to 28.1/32.1 Gbits (option selection)
Link Training and LTSSM Analysis*3	—	Supported	—
PPG			
Output amplitude (Single-end)	0.07 Vp-p to 0.8 Vp-p	0.1 Vp-p to 1.3 Vp-p 0.3 Vp-p to 1.95 Vp-p*4	0.5 to 2.0 or 3.5 Vp-p 1.5 Vp-p to 2.25 Vp-p*4
Output setting control	Data/Xdata common		Data/Xdata independent
Emphasis tap	4 Taps (option)	10 Taps (option)	—*2
Emphasis gain control	–20 to +20 dB		—*2
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 8.5 ps (typ.) @58.2G 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 (Single-end)	NRZ: 0.05 Vp-p to 1.0 Vp-p PAM4: 0.3 Vp-p to 1.0 Vp-p	NRZ: 0.05 Vp-p to 1.0 Vp-p	
Input sensitivity (PAM4) (Eye height)	@32.1 Gbaud 23 mV (typ.) @58.2 Gbaud 49 mV (typ.)	—	—
Input sensitivity (NRZ) (Eye height) (Eye amplitude)	@32.1 Gbit/s 19 mV (typ.) 25 mVp-p (typ.), ≤50 mVp-p	@28 Gbit/s , at CTLE off 15 mV (typ.) 22 mVp-p (typ.), ≤31 mVp-p	@28 Gbit/s 10 mV (typ.) 15 mVp-p (typ.), ≤25 mVp-p
CTLE function	—	0 to –12 dB (option)	—
LFE function DFE function	–2.0 to 0.0 dB (option) @53.1G –1.4 dB (typ.) (option)		
Clock recovery	2.4G to 32.1G, 51.0G to 58.2G (option)	2.4 Gbit/s to 32.1 Gbit/s (option), SSC input support	2.4 Gbit/s to 28.1 Gbit/s (option) or 25.5 Gbit/s 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 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 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)
MU181800B 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 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 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 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 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 with Opt-010.
MU195020A-021 2ch 10Tap Emphasis	Option adding built-in 10Tap Emphasis function to 2ch differential data output. Can be selected with Opt-020.
MU195020A-030 1ch Data Delay	Option for varying phase. Can vary Data phase versus Clock. Can be selected with Opt-010.
MU195020A-031 2ch Data Delay	Option for varying phase. Can vary Data phase versus Clock. Can be selected with Opt-020.

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.

MU196020A 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 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-032 FEC Pattern Generation	Generates FEC patterns.
MU196020A-050 Inter-Module Synchronization	Multi-channel operation is possible. 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 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 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 1ch Data output (MU183020A-012/013) 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 2ch Data output (MU183020A-022/023) is installed.
MU183021A 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 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 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 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 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 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 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 58.2G (NRZ 64.2G). 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.

*1 Select any 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 according to the option.
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.

MU183041B 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 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 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 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 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 PCI Express Gen1 to 4 Devices to Loopback mode.
MX183000A-PL021 PCIe Link Training	Software using Link Training function with negotiation process for transitioning PCI Express Gen1 to 4 Devices to Loopback mode.
MX183000A-PL022 USB Link Training	Software for transitioning USB3.2 devices to Loopback mode using Link Training function for performing negotiation.
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.

HSB Automation Software (GRL Corporation)	Automation software for compliance testing for various high-speed bus (HSB) standards. Controls MP1900A and oscilloscope to perform PCIe, USB, and TBT3 compliance tests. Supports control of various oscilloscopes from various makers (Keysight/Tektronix). This software from GRL Corporation is sold and supported by Anritsu.
GRL-PCIE5-BASE-RXA	Automation software supporting PCIe Gen5 Base Spec measurements released November 2019
GRL-PCIE4-CEM-RXA	Automation software supporting PCIe Gen3/4 CEM Spec measurements
GRL-PCIE4-BASE-RXA	Automation software supporting PCIe Gen3/4 Base Spec measurements
GRL-PCIE4-RXA	Automation software supporting PCIe Gen3/4 Base and CEM Spec measurements
GRL-TBT3-RXA	Automation software supporting TBT3 measurements
GRL-USB31-RXA	Automation software supporting USB3.2 Gen1/2 measurements

HSB Automation Software (Teledyne LeCroy)	Automation software for compliance testing for various high-speed bus (HSB) standards. Controls MP1900A and Teledyne LeCroy oscilloscopes to perform PCIe Gen5 and Gen 3/4 compliance tests. This Teledyne LeCroy software is sold and supported by Teledyne LeCroy.
QPHY-PCIE-Tx-Rx	Automation software supporting PCIe Gen5 and Gen3/4 measurements. Supported realtime oscilloscopes are the Teledyne LeCroy LabMaster 10Zi-A series.

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	1 ch 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		2 ch 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)	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	-	-	-	-	-
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

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 28G/32G bit/s 4ch PPG MU183021A

No.	Upper Bit Rate	Data ch No.	Data Amplitude (Select one or other)	Data Phase Tuning
1	28.1 Gbit/s (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 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 (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 3-6 PAM4 ED MU196040B

No.	Upper Bit Rate	Equalizer	SER Measurement	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-011 Equalizer	-	-	-
8				Opt-021 29G CR	-
9				Opt-022 32G CR	-
10			Opt-041 SER Measurement	-	-
11				Opt-021 29G CR	-
12				Opt-022 32G CR	-
13	Opt-002 58G baud	-	-	-	-
14				Opt-021 29G CR	-
15					Opt-023 58G CR
16				Opt-022 32G CR	-
17					Opt-023 58G CR
18			Opt-041 SER Measurement	-	-
19				Opt-021 29G CR	-
20					Opt-023 58G CR
21				Opt-022 32G CR	-
22					Opt-023 58G CR

23		Opt-011 Equalizer	-	-	-
24				Opt-021 29G CR	-
25					Opt-023 58G CR
26				Opt-022 32G CR	-
27					Opt-023 58G CR
28			Opt-041 SER Measurement	-	-
29				Opt-021 29G CR	-
30					Opt-023 58G CR
31				Opt-022 32G CR	-
32					Opt-023 58G CR

Table 3-7 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 3-8 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 3-9 28G/32G bit/s 4ch High Sensitivity ED MU183041B

No.	Upper Bit Rate	Data ch No.	Clock Recovery	Clock Phase Tuning
1	28.1 Gbit/s (Without Opt-001)	4ch	-	Built-in as standard
2			Opt-022 Clock Recovery	
3	32.1 Gbit/s Opt-001 32 Gbit/s Expansion		-	
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 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 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. 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 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** 1ch NRZ/PAM4 BER Measurement	**Standard BERT for SI** 1 to 2ch NRZ or 1ch PAM4 BER Measurement 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	-	PAM4 ED	32G ED		SI ED
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	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 Option Configuration Examples when using SI PPG/ED

Module, Option Model	1ch					2ch		4ch	
	PCIe Receiver test	USB Receiver Test	32G NRZ	32G PAM4	64G PAM4 *1	32G NRZ	32G PAM4	32G NRZ, KR4/CR4	32G 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 *4		1	1	2	1	2	2	4
MU195020A-010	1	1	1						
MU195020A-020	1 *5			1	2	1	2	2	4
MU195020A-011	1	1	1						
MU195020A-021	1 *5			1		1	2	2	4
MU195020A-030									
MU195020A-031	1 *5			1	2	1	2	2	4
MU195020A-040	1 *6		(1)						
MU195020A-041	1 *6					(1)		2	
MU195040A	1	1	1	1		1	2	2	4
MU195040A-001	1 *4		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 *2						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 *3		4 *3

*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 Required to support PCIe Gen5
*5 Required for Crosstalk test
*6 Supports Gen5 Base Rx test

4.3.2 Option Configuration Examples when using PAM4 PPG/ED

Module Option Model	1ch				2ch	4ch
	32G NRZ	32G PAM4	58G PAM4	64G 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. 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.

Table 5-1 MX190000A Supported Versions

Model	Supported version
MU181000B 12.5GHz 4 Port 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 Extension	Ver. 2.00
MU196020A PAM4 PPG MU196040A PAM4 ED	Ver. 3.00
MU196020A-040 Adjustable ISI MU196020A-042 FEC Pattern Generation 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 MX183000A-PL011 PCIe Link Sequence 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	● 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	Correction of errors
2019.10.25	Added MU196040B.
2019.11.25	Describes PCIe Gen5 support Adds GRL and Teledyne LeCroy automation software to sections 1 and 2 Describes PCIe Gen5 option configurations in section 4

Anritsu envision : ensure

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.
700 Silver Seven Road, Suite 120, Kanata,
Ontario K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

• **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, Bâtiment Iris 1- Silic 612,
91140 VILLEBON SUR YVETTE, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

• **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.
Via Elio Vittorini 129, 00144 Roma, Italy
Phone: +39-6-509-9711
Fax: +39-6-502-2425

• **Sweden**
Anritsu AB
Isafjordsgatan 32C, 164 40 KISTA, Sweden
Phone: +46-8-534-707-00

• **Finland**
Anritsu AB
Teknobulevardi 3-5, FI-01530 VANTAA, Finland
Phone: +358-20-741-8100
Fax: +358-20-741-8111

• **Denmark**
Anritsu A/S
Torveporten 2, 2500 Valby, Denmark
Phone: +45-7211-2200
Fax: +45-7211-2210

• **Russia**
Anritsu EMEA Ltd.
Representation Office in Russia
Tverskaya str. 16/2, bld. 1, 7th floor.
Moscow, 125009, Russia
Phone: +7-495-363-1694
Fax: +7-495-935-8962

• **Spain**
Anritsu EMEA Ltd.
Representation Office in Spain
Edificio Cuzco IV, Po. de la Castellana, 141, Pta. 5
28046, Madrid, Spain
Phone: +34-915-726-761
Fax: +34-915-726-621

• **United Arab Emirates**
Anritsu EMEA Ltd.
Dubai Liaison Office
902, Aurora Tower,
P O Box: 500311- Dubai Internet City
Dubai, United Arab Emirates
Phone: +971-4-3758479
Fax: +971-4-4249036

• **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.
11 Chang Charn Road, #04-01, Shriro House
Singapore 159640
Phone: +65-6282-2400
Fax: +65-6282-2533

• **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.
5FL, 235 Pangyoyeok-ro, Bundang-gu, Seongnam-si,
Gyeonggi-do, 13494 Korea
Phone: +82-31-696-7750
Fax: +82-31-696-7751

• **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

1811

Printed on Recycled Paper

Printed in Japan 2019-11 MJM No. MP1900A-E-Z-1-(9.00)