MP1800A Series

56G/64G bit/s MUX
MP1861A

56G/64G bit/s DEMUX
MP1862A
Traffic volumes at data centers are exploding due to the rapid spread of cloud computing services. To increase transmission speeds, standards for new high-speed interfaces like 400 GbE and CEI-56G are being investigated. Assuring signal integrity of PHY devices like SERDES used by these high-speed interfaces is a key requirement in speed increases.

Linking the MUX MP1861A and DEMUX MP1862A with the MP1800A with installed 32G PPG/ED and Jitter Modulation Source option supports generation of NRZ Data signals at up to 64.2 Gbit/s, BER measurements and Jitter Tolerance measurements. New standards such as CEI-56G are also supported by Jitter Tolerance measurements of jitter components such as Dual Tone SJ (two different frequencies), RJ, BUJ, SSC, and Half Period Jitter (Even/Odd jitter) as well as Bathtub jitter measurements. With its built-in Jitter Tolerance Software for Emphasis and PAM signal generation and Equalizer for correcting the Eye opening, Anritsu’s MP1800A is the ideal total solution for signal integrity evaluation.
Anritsu High-Speed Solutions for Every Measurement Need

Wide 56G/64G bit/s bandwidth: Supports CEI-56G, 400 GbE and FEC bit rates
2:1 MUX, 1:2 DEMUX: Expand 28G/32G 2ch BERT to 56G/64G
Compact Remote Head: Cuts losses in DUT connection cable

### Key Features

- **64.2 Gbit/s** Wideband Bit Rate Up to 64.2 Gbit/s
- **2:1 MUX** Expand 28G/32G 2ch BERT to 56G/64G
- **Compact Remote Head** Reduces DUT Connection Cable Losses
- **3.5 Vp-p MUX max.** x7 Output Variable Range 25 mV DEMUX Sensitivity
- **Jitter** Jitter Tolerance Tests Bathub Measurements
- **Emphasis and PAM4 Signal Generation using 2ch Sync and Combiner with Rx Passive Equalizer**

### Technical Specifications

- **Low Intrinsic Jitter**
  
  \( R_J = 200 \text{ fs rms (typ.)} \)

- **Variable Amplitude**
  
  3.5 Vp-p Output max.

- **High Input Sensitivity**
  
  25 mV (typ., Single-ended, Eye Height, 56.2 Gbit/s)

- **Excellent Signal Quality and Rx Sensitivity:**
  High-Accuracy Measurement of Semiconductor Chip Characteristics

- **Versatile Signal Integrity Measurements:**
  Support CEI-56G and 400 GbE Test Requirements

  - TJ/DJ/RJ/Bathub, Eye Diagram, Eye Margin Automatic Measurement
  - Jitter Tolerance Test (using MU181500B)
  - Dual Tone SJ (two different frequencies), RJ, BUJ, SSC, and Half Period jitter (Even/Odd jitter)
  - Max. SJ Amplitude: 0.55 UI @ fm 250 MHz
  - Crosstalk Test using Independently Variable Data skew for Each Channel

- **High Expandability:**
  Assured Future-proof Investment

  - Expandable from 32G to 56G/64G BERT For 100G/400G R&D
  - Sync Operation for up to 4ch Multichannel Sync Pattern Generation and Simultaneous BER Analysis
  - Emphasis Signal Generation (using MZ1854A at 2ch Sync with MP1861A and 57.8 Gbit/s)
  - PAM4 Signal Generation (using MZ1854A at 2ch Sync with MP1861A and 56.2 GbAud)

**MP1861/62A**

Traffic volumes at data centers are exploding due to the rapid spread of cloud computing services. To increase transmission speeds, standards for new high-speed interfaces like 400 GbE and CEI-56G are being investigated. Assuring signal integrity of PHY devices like SERDES used by these high-speed interfaces is a key requirement in speed increases.

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Multichannel BER and Jitter Measurements using Modular Configuration

The modular configuration is easily customized for 32G multichannel, PAM, Emphasis and 56G/64G serial/multichannel signal analyses and measurements supporting 100G/400G R&D required by new IEEE and OIF standards, helping cut future equipment investment costs.

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Synchronous operation of up to four MP1800A units generates 64ch x 16G signals.

Supports 64G signal quality evaluations using one MP1800A and MUX
**56G/64G bit/s MUX MP1861A, 56G/64G bit/s DEMUX MP1862A Features**

**Low-jitter and High-Quality Waveform MUX**
The MUX MP1861A outputs low-jitter, high-quality waveforms. Various output amplitude options can be selected to match the application.

Low Jitter: RJ = 200 fs rms (typ.)
Amplitude:
- 0.5 Vp-p to 2.5 Vp-p (≤56.2 Gbit/s, MP1861A-011)
- 1.0 Vp-p to 2.5 Vp-p (>56.2 Gbit/s, MP1861A-011)
- 0.5 Vp-p to 3.5 Vp-p (≤56.2 Gbit/s, MP1861A-013)
- 1.0 Vp-p to 3.5 Vp-p (>56.2 Gbit/s, MP1861A-013)

![Output Waveform at 50 Gbit/s and 3.5 Vp-p (MP1861A-013)](image)

**High-Sensitivity DEMUX**
The DEMUX MP1862A has high sensitivity to support various applications up to 64 Gbit/s.

Sensitivity: 25 mV (typ.)
≤40 mV (Eye Height, PRBS31, Single-ended, 56.2 Gbit/s)

**SJ, RJ, BUJ, SSC and Half Period Jitter (F/2 Jitter) Generation**
The Jitter Modulator MU181500B generates wide-amplitude SJ up to 0.55 UI at a Jitter Frequency of 250 MHz and a maximum 2000 UI, ensuring sufficient margin for receiver Jitter Tolerance tests. Additionally, the Intrinsic Jitter of 275 fs rms (nominal)* is extremely low, not only when Jitter modulation is OFF but also when 0 UI is set at Jitter modulation ON, ensuring accurate measurements even at low Jitter amplitudes.

The combination of low intrinsic jitter waveform with excellent jitter transparency supports high-accuracy Jitter Tolerance tests. Moreover, simultaneous injection of RJ, BUJ and SSC as well as dual SJ for two-tone supports various Jitter Tolerance tests. Additionally, the Jitter/Noise Tolerance Test Software MX181500A supports multi-mask tables as well as easy mask editing to support next-generation standards.

*: Phase noise measurement with using Spectrum Analyzer and 1010… repetition signal.

![Jitter Modulation Source MU181500B Setting Screen](image)

![Jitter/Noise Tolerance Test Software MX181500A Setting Screen](image)

![Sinusoidal Jitter (SJ)](image) ![Random Jitter (RJ)](image) ![Bounded Uncorrelated Jitter (BUJ)](image) ![Half Period Jitter (F/2 Jitter)](image)
Emphasis Signal Generation

Linking two MUXes MP1861A using the Data Signal Combiner MZ1854A supports generation of a 2Tap Emphasis signal at up to 57.8 Gbit/s. Since the MP1800A external Remote Head can get close to the DUT, the effect of cable losses is minimized to assure high signal quality is maintained. Accurate Jitter Tolerance tests are possible using the pre-Emphasis signal supporting transmission path loss required by CEI-56G.

PAM4 Signal Generation

Linking two MUXes MP1861A using the Data Signal Combiner MZ1854A supports generation of PAM4 signals up to 56.2 Gbaud. Using the MP1861A high-quality NRZ waveform with a wideband passive combiner supports generation of the PAM signals required for R&D into high-speed backplanes and high-speed optical modulation.

Passive Equalizer

High-speed serial transmissions such as 56 Gbit/s suffer from a closed Eye opening due to losses in the transmission path. Inserting the Passive Equalizer J1646A upstream of the DEMUX MP1862A compensates for transmission path losses and restores the Eye opening. Combination with the high-sensitivity DEMUX MP1862A supports BER measurements and Jitter Tolerance tests of PHY devices with a closed Eye opening.
Bathtub Jitter
Measures optimum bit rate based on changes in bit error rate relative to phase margin and performs jitter analysis (TJ, DJ, RJ).

Eye Diagram
Captures bit error rate contours linking specified bit error rate points.

Eye Margin
Confirms Data threshold and phase margins.

Crosstalk Tests
Independently controls phase for each channel using built-in PPG Data Delay option to examine DUT crosstalk characteristics with excellent accuracy in 4-mUI steps.

Up to 4ch Sync
Using an external MUX and DEMUX supports syncing for up to 4ch by connecting to the PPG and ED modules installed in the MP1800A. D/A converter, crosstalk and skew tolerance tests are all supported.

Versatile Pattern Generation
• Pseudorandom Patterns (PRBS)
  All PRBS patterns required by standards are supported up to PRBS $2^{31} - 1$.
  $2^n - 1$ (n = 7, 9, 10, 11, 15, 20, 23, 31)

• Zero Substitution Pattern
  Consecutive 0 s and 1 s patterns can be added to PRBS patterns for Clock Data Recovery (CDR) tolerance tests.
  $2^n, 2^n - 1$ (n = 7, 9, 10, 11, 15, 20, 23)

• Data Pattern
  Patterns required by each application, such as CJTPAT, CJPAT, K28.5 and PAM4 PRBS can be created flexibly.
  512 Mbits/ch max. (Steps: 2 bit)

• Mixed Pattern
  A mixed data and PRBS pattern can be output. At creation of SONET/SDH frames, adding a PRBS $2^{31} - 1$, etc., pattern to the payload supports setting of a continuous pattern across frames.

• Burst Signals
  Application evaluation using burst signals, such as optical loop test and transmission test using quantum noise technology are supported.
Measuring 56-Gbit/s Band High-Speed Semiconductor Chips

56 Gbit/s BER Measurements
The bit rates of high-performance servers, switch backplanes, etc., are becoming increasingly faster while consuming less power. Evaluation of signal integrity is important for evaluating dropping input/output amplitudes of semiconductor chips such as SERDES and CDR to reduce power consumption. The signal output of these low-amplitude devices can be received securely using the high-sensitivity performance 25 mV (typ.) of the DEMUX MP1862A.

Input Sensitivity Tests
With a wide tuning range of 0.5 Vp-p to 3.5 Vp-p max., the MUX MP1861A supports device input sensitivity tests (when 56 Gbit MP1861A-013 installed.) The MP1861A incorporates a 6-dB ATT as standard for use over a range of 0.25 Vp-p to 1.75 Vp-p. Anritsu recommends using a 6-dB ATT to prevent risk of damage from EOS (Electric Over Stress).

56 Gbit/s BER Measurements
The bit rates of high-performance servers, switch backplanes, etc., are becoming increasingly faster while consuming less power. Evaluation of signal integrity is important for evaluating dropping input/output amplitudes of semiconductor chips such as SERDES and CDR to reduce power consumption. The signal output of these low-amplitude devices can be received securely using the high-sensitivity performance 25 mV (typ.) of the DEMUX MP1862A.

Jitter Tolerance Tests
Installing the Jitter Modulation Source MU181500B in the MP1800A supports independent and simultaneous injection of Dual SJ (two types), Rj, BUJ, and SSC jitter components for Jitter Tolerance tests meeting various standards, such as CEI-56G, etc.

Bathtub Jitter Measurement
Standards such as CEI-56G specify device output Jitter Tolerance values. Bathtub Jitter measurement analyzes the device Total Jitter (TJ) and Rj and DJ components from changes in the bit error rate with phase. It also calculates the optimum bit error rate. A clean Clock reference signal is required by the DEMUX and ED at Bathtub Jitter measurement. The MP1862A supports Bathtub Jitter measurement using a clean Clock with jitter addition.
Evaluating 400 GbE Transmitters

By using a MUX/DEMUX supporting bit rates up to 56 Gbit/s, it is possible to evaluate 400 GbE EML and optical modules using 4ch synchronous operation now being investigated by IEEE 802.3 bs.

Ideal Signal Quality for EML Evaluations
With a tunable output function of up to 3.5 Vp-p, EMLs can be driven directly. The amplitude and crosspoint can be adjusted easily on the screen to shorten evaluation times and offer high-reliability evaluations.

Confirming Skew and Crosstalk Effects
Applications using 56-Gbit/s class signals require both theoretical and practical verifications. Since the MP1800A supports pattern synchronization and has a phase tuning function, it is the ideal instrument for easy examination of Rx device skew tolerance, crosstalk effects, etc.

Built-in High-Sensitivity Auto-Search Function
The built-in DEMUX MP1862A Auto Search function supports autotuning of the Data and Clock phase difference as well as optimization of the voltage threshold value. It is possible to easy operation for optical receiver sensitivity tests.
AOC/Backplane Device Stress Jitter Tolerance Test

Generating Emphasis
Emphasis signals can be generated using the MP1861A 2ch synchronization function and Data Signal Combiner MZ1854A to compensate for transmission path losses at the electrical interface of Active Optical Cables (AOC) and Backplane devices and recover the Eye opening.

Jitter Tolerance Tests
The Jitter Modulation Source MU181500B injects SJ (two types), RJ, BUJ, and SSC simultaneously or independently for Jitter Tolerance tests meeting various standards.

Bathtub and Eye Diagram Analyses
Bathtub Jitter analysis (TJ, RJ, DJ components) is performed using the Clock Delay function of the built-in ED. Even low bit-error rates, such as 1E-12 and 1E-15, can be estimated quickly from changes in the bit error rate with phase.

Test Requirements
- Emphasis Signal Generation
- Crosstalk Test
- Jitter Tolerance Test
- Bathtub Jitter and Eye Diagram Analyses

Confirming Crosstalk Effects
Processing of 56-Gbit/s class signals requires both theoretical and practical verification. With its pattern synchronization and independent phase tuning function for each channel, the MP1800A makes it easy to examine AOC and Backplane crosstalk effects, etc.
56G/64G bit/s MUX MP1861A, 56G/64G bit/s DEMUX MP1862A Panel Layout

56G/64G bit/s MUX MP1861A

Front Panel

1 Clock Output 1 Connector
Clock Output 2 Connector

2 Data Output Connector
Data Output Connector

3 Ground Jack

4 USB Connection LED

5 Power Switch

6 Channel LEDs

Rear Panel

1 DC Input Connector

2 Ext. Clock Input Connector

3 Ground Jack

4 Data Input 1 Connector
Data Input 2 Connector

5 1/2 Clock Output Connector

6 USB Port

7 Buffered Clock Output Connector

8 Channel Setting Switch

9 Mux Clock Input Connector

10 Delayed Clock Output Connector

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1 Clock Output 1 Connector
Clock Output 2 Connector |
Outputs Clock reference for DUT and MP1862A

2 Data Output Connector
Data Output Connector |
Output 2:1 MUXed differential Data signals

3 Ground Jack

4 USB Connection LED |
Indicates connection status with MP1800A or PC controller

5 Power Switch |
Switches power between on and standby

6 Channel LEDs |
Indicate channel numbers

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1 DC Input Connector |
Connects to AC adapter

2 Ext. Clock Input Connector |
Inputs Clock reference signal for this instrument

3 Ground Jack |
Grounds connected wrist strap and Ground on a DUT to discharge static charges

4 Data Input 1 Connector
Data Input 2 Connector |
Inputs Data signal from MU18302xA

5 1/2 Clock Output Connector |
Outputs 1/2 frequency divided Clock of Clock input to Ext. Clock Input connector

6 USB Port |
Connects MP1800A or PC to this instrument

7 Buffered Clock Output Connector |
Outputs same Clock frequency as Clock input to Ext. Clock Input connector

8 Channel Setting Switch |
Sets instrument channel number

9 Mux Clock Input Connector |
For input of Clock with same frequency as Clock input to Ext. Clock input connector

10 Delayed Clock Output Connector |
Outputs Clock with same frequency as Clock input to Ext. Clock input connector
56G/64G bit/s DEMUX MP1862A Panel Layout

Front Panel

1. Clock Output Connector: Outputs same Clock frequency as Clock input to Ext. Clock Input connector
2. Ext. Clock Input Connector: Inputs Clock reference signal for this instrument
3. Data Input Connector: Inputs differential data signal
4. Ground Jack: Grounds connected wrist strap and Ground on a DUT to discharge static charges
5. USB Connection LED: Indicates connection status with MP1800A or PC controller
6. Power Switch: Switches power between on and standby
7. Channel LEDs: Indicate channel numbers

Rear Panel

1. DC Input Connector: Connects to AC adapter
2. Ground Jack: Grounds connected wrist strap and Ground on a DUT to discharge static charges
3. Data Output 1 Connector: Outputs 1:2 divided Data/Input signal. Outputs Data signal to MU18304xA/B
4. 1/2 Clock Output Connector: Outputs 1/2 frequency divided Clock of Clock input to Ext. Clock Input connector. Outputs Clock signal to MU18304xA/B
5. USB Port: Connects MP1800A or PC to this instrument
6. Buffered Clock Output Connector: Outputs same Clock frequency as Clock input to Ext. Clock Input connector
7. Channel Setting Switch: Sets instrument channel number
8. Demux Clock Input Connector: For input of same frequency as Clock input to Ext. Clock input connector when necessary
9. Delayed Clock Output Connector: Outputs Clock with same frequency as Clock input to Ext. Clock input connector
## 56G/64G bit/s MUX MP1861A, 56G/64G bit/s DEMUX MP1862A Selection Guide

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*1: Select any one
*2: Required when using 56G/64G bit/s MUX MP1861A
### 56G/64G bit/s MUX MP1861A, 56G/64G bit/s DEMUX MP1862A Specifications

#### 56G/64G bit/s MUX MP1861A

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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</table>
| **Operational Bit-rate Range** | 8 Gbit/s to 56.2 Gbit/s  
8 Gbit/s to 64.2 Gbit/s (with Option 01 installed) |
| **External Clock Input** | **Number of Input:** 1  
**Frequency:** 4 GHz to 28.1 GHz  
4 GHz to 32.1 GHz (with Option 01 installed)  
**Amplitude:** 0.3 Vp-p to 1.0 Vp-p  
**Termination:** 50Ω/AC Coupling  
**Connector:** K (f) |
| **Data Input** | **Number of Input:** 2 (Data Input1, Data Input2)  
**Input level:** 0V/–0.7 V (H: –0.15 to +0.05, L: –0.85 to –0.55)  
**Termination:** 50Ω/GND  
**Connector:** K (f) |
| **1/2 Clock Output** | **Number of Output:** 1  
**Frequency:** 2 GHz to 14.05 GHz  
2 GHz to 16.05 GHz (with Option 01 installed)  
**Output amplitude:** 0.3 Vp-p to 1.0 Vp-p  
**Termination:** 50Ω/AC Coupling  
**Connector:** SMA (f) |
| **Clock Output 1, 2** | **Number of Output:** 2 (Clock Output1, Clock Output2)  
**Frequency:** 4 GHz to 28.1 GHz  
4 GHz to 32.1 GHz (with Option 01 installed)  
**Output amplitude:** 0.4 Vp-p to 1.0 Vp-p  
**Termination:** 50Ω/AC Coupling  
**Connector:** K (f) |
| **Buffered Clock Output** | **Number of Output:** 1  
**Frequency:** 4 GHz to 28.1 GHz  
4 GHz to 32.1 GHz (with Option 01 installed)  
**Output amplitude:** 0.2 Vp-p to 1.0 Vp-p  
**Termination:** 50Ω/AC Coupling  
**Connector:** K (f) |
| **Delayed Clock Output** | **Number of Output:** 1  
**Frequency:** 4 GHz to 28.1 GHz  
4 GHz to 32.1 GHz (with Option 01 installed)  
**Output amplitude:** 0.2 Vp-p to 1.0 Vp-p  
**Termination:** 50Ω/AC Coupling  
**Connector:** K (f) |
| **MUX Clock Input** | **Number of Input:** 1  
**Frequency:** 4 GHz to 28.1 GHz  
4 GHz to 32.1 GHz (with Option 01 installed)  
**Amplitude:** 0.2 Vp-p to 1.0 Vp-p  
**Termination:** 50Ω/AC Coupling  
**Connector:** K (f) |
| **Data Output** |  
|  
| **Option x11** |  
**Number of Output:** 2 (Data Output1, Data Output2)  
**Amplitude:** 0.5 Vp-p to 2.5 Vp-p/2 mV Step (@≤56.2 Gbit/s)  
1.0 Vp-p to 2.5 Vp-p/2 mV Step (@>56.2 Gbit/s)  
**Setting Error:** ±50 mV ±17% of Amplitude  
**Offset:** –2.0 to +3.3 Voh/1-mV Step, min.: –4.0 Vol  
**Current Limit:** Source 100 mA/Sink 100 mA  
**Crosspoint:** 45 to 55%/0.1% Step (≤56.2 Gbit/s)  
>56.2 Gbit/s, with MP1861A-x 01 installed: Since >50% is not assured, displays Overload  
**Tr/Tf:** Typ. 8 ps (20 to 80%)  
**Half Period Jitter:** –20 to 20/1 Step  
**Jitter (rms):** 450 fs typ., ≤550 fs  
**Random Jitter (rms):** 200 fs typ.  
**Waveform Distortion (0-peak):** ±25 mV ±10% of Amplitude  
**ON/OFF Output Switch Function:** AC/DC switchable, 50Ω/GND, –2 V, +1.3 V (at DC selection)  
**Connector:** V (f) |
| **Option x13** |  
**Number of Output:** 2 (Data Output1, Data Output2)  
**Amplitude:** 0.5 Vp-p to 3.5 Vp-p/2 mV Step (@≤56.2 Gbit/s)  
1.0 Vp-p to 3.5 Vp-p/2 mV Step (@>56.2 Gbit/s)  
**Setting Error:** ±50 mV ±17% of Amplitude  
**Offset:** –2.0 to +3.3 Voh/1-mV Step, min.: –4.0 Vol  
**Current Limit:** Source 100 mA/Sink 100 mA  
**Crosspoint:** 45 to 55%/0.1% Step (≤56.2 Gbit/s)  
>56.2 Gbit/s, with MP1861A-x 01 installed: Since >50% is not assured, displays Overload  
**Tr/Tf:** Typ. 8 ps (20 to 80%)  
**Half Period Jitter:** –20 to 20/1 Step  
**Jitter (rms):** 450 fs typ., ≤550 fs  
**Random Jitter (rms):** 200 fs typ.  
**Waveform Distortion (0-peak):** ±25 mV ±10% of Amplitude  
**ON/OFF Output Switch Function:** AC/DC switchable, 50Ω/GND, –2 V, +1.3 V (at DC selection)  
**Connector:** V (f) |
### Jitter Tolerance

![Jitter Tolerance Graph](image)

- **56.2 Gbit/s, 64.2 Gbit/s (with Option 01 installed), at PRBS 2\(^{31} - 1\), Mark ratio 1/2, Crosspoint 50%, MP1861A – MP1862A Loopback, Temperature: +20° to +30°C**
- **56.2 Gbit/s up to 250 MHz modulation frequency; 64.2 Gbit/s up to 150 MHz modulation frequency**

<table>
<thead>
<tr>
<th>Variable Data Delay</th>
<th>Variable Phase Range: –64000 mUI to +64000 mUI/4 mUI Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Interface</td>
<td>USB 2.0 or 1.1 Type B × 1</td>
</tr>
<tr>
<td>Channel Setting</td>
<td>1ch to 4ch Selectable</td>
</tr>
<tr>
<td>Power Supply (AC adapter)</td>
<td>Input Voltage: 100 V(ac) to 240 V(ac)*7</td>
</tr>
<tr>
<td></td>
<td>Input Frequency: 50 Hz to 60 Hz</td>
</tr>
<tr>
<td></td>
<td>Output power: 19 V(dc), 7.9 A (max.)</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>19 V(dc), 4 A</td>
</tr>
<tr>
<td>Dimensions and Mass</td>
<td>120 (W) × 90.9 (H) × 140 (D) mm (Excluding protrusions), ≤5 kg</td>
</tr>
<tr>
<td>Temperature</td>
<td>Operation: +15° to +35°C (with options installed)</td>
</tr>
<tr>
<td></td>
<td>Storage: –20° to +60°C</td>
</tr>
</tbody>
</table>

*1: Unless otherwise described, at PRBS 2\(^{31} - 1\), Mark Ratio 1/2. Values observed using Coaxial Cable J1656A and 70-GHz band sampling oscilloscope
*2: At 56.2 Gbit/s
*3: 64.2 Gbit/s (with MP1861A Option x01 installed)
*4: Crosspoint: 50%
*5: Jitter Standard values when oscilloscope intrinsic jitter ≤200 fs
*6: Output Amplitude: 2.5 Vp-p
*7: Operation voltage: +10% and –15% of specified voltage
**56G/64G bit/s DEMUX MP1862A Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Operational Bit-rate Range**              | 8 Gbit/s to 56.2 Gbit/s  
8 Gbit/s to 64.2 Gbit/s (with Option 01 installed)                                                                                                                                                |
| **External Clock Input**                    | Number of Input: 1  
Frequency: 4 GHz to 28.1 GHz  
4 GHz to 32.1 GHz (with Option 01 installed)  
Amplitude: 0.3 Vp-p to 1.0 Vp-p  
Termination: 50Ω/AC Coupling  
Connector: K (f)                                                                                                                        |
| **Data Output**                             | Number of Output: 2 (Data Output1, Data Output2)  
Output Level: 0−0.4 V (H: –0.1 to +0.1, L: –0.6 to –0.3)  
Termination: 50Ω/GND  
Connector: K (f)                                                                                                                        |
| **1/2 Clock Output**                        | Number of Output: 1  
Frequency: 2 GHz to 14.05 GHz  
2 GHz to 16.05 GHz (with Option 01 installed)  
Output amplitude: 0.3 Vp-p to 1.0 Vp-p  
Termination: 50Ω/AC Coupling  
Connector: SMA (f)                                                                                                                        |
| **Clock Output**                            | Number of Output: 1  
Frequency: 4 GHz to 28.1 GHz  
4 GHz to 32.1 GHz (with Option 01 installed)  
Output amplitude: 0.4 Vp-p to 1.0 Vp-p  
Termination: 50Ω/AC Coupling  
Connector: K (f)                                                                                                                        |
| **Buffered Clock Output**                   | Number of Output: 1  
Frequency: 4 GHz to 28.1 GHz  
4 GHz to 32.1 GHz (with Option 01 installed)  
Output amplitude: 0.2 Vp-p to 1.0 Vp-p  
Termination: 50Ω/AC Coupling  
Connector: K (f)                                                                                                                        |
| **Delayed Clock Output**                    | Number of Output: 1  
Frequency: 4 GHz to 28.1 GHz  
4 GHz to 32.1 GHz (with Option 01 installed)  
Output amplitude: 0.2 Vp-p to 1.0 Vp-p  
Termination: 50Ω/AC Coupling  
Connector: K (f)                                                                                                                        |
| **DEMUX Clock Input**                       | Number of Input: 1  
Frequency: 4 GHz to 28.1 GHz  
4 GHz to 32.1 GHz (with Option 01 installed)  
Amplitude: 0.2 Vp-p to 1.0 Vp-p  
Termination: 50Ω/AC Coupling  
Connector: K (f)                                                                                                                        |
| **Data Input**                              | Number of Input: 2 (Data Input/ Data Input), Differential  
Amplifier: Single-ended, 50Ω, Differential 50Ω, Differential 100Ω selectable  
Data, XData selectable  
Tracking, Independent, Alternate selectable  
At Alternate setting: Data-XData, XData-XData selectable (Absolute value of Data, XData Threshold Difference: 3.0 V max.)  
Input Data Format: NRZ  
Amplitude: 0.125 Vp-p to 1.0 Vp-p  
Threshold Voltage: –3.5 V to +3.3 V/1-mV step  
(independently settable Data, selectable. Absolute value of Data, XData Threshold Difference: 3.0 V max.)  
Input Sensitivity: 25 mV typ., ≤40 mV  
30 mV typ.  
Phase Margin: 200° typ.  
Termination: 50Ω/GND, Variable  
Termination Voltage: –2.5 V to +3.5 V/0.01-V step at Variable setting  
Connector: V (f) |
56G/64G bit/s MUX MP1861A, 56G/64G bit/s DEMUX MP1862A Specifications

<table>
<thead>
<tr>
<th>Jitter Tolerance</th>
<th>56.2 Gbit/s, 64.2 Gbit/s (with Option 01 installed), PRBS 2³¹ – 1, Mark ratio 1/2, Crosspoint 50%, MP1861A – MP1862A Loopback, Temperature: +20° to +30°C 56.2 Gbit/s up to 250 MHz modulation frequency; 64.2 Gbit/s up to 150 MHz modulation frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>![Graph of Jitter Amplitude vs Modulation Frequency]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable Clock Phase</th>
<th>Variable Phase Range: -1000 mUI to +1000 mUI/4 mUI Step Phase Setting Error: ±50 mUI-p typ.*5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic Measurement</td>
<td>Auto Search, Eye Margin, Eye Diagram, Bathtub</td>
</tr>
<tr>
<td>BER Measurement Result Display</td>
<td>With indication screens</td>
</tr>
<tr>
<td>Control Interface</td>
<td>USB 2.0 or 1.1 Type B × 1</td>
</tr>
<tr>
<td>Channel Setting</td>
<td>1ch to 4ch Selectable</td>
</tr>
<tr>
<td>Power Supply (AC adapter)</td>
<td>Input Voltage: 100 V(ac) to 240 V(ac)*9 Input Frequency: 50 Hz to 60 Hz Output power: 19 V(dc), 7.9 A (max.)</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>19 V(dc), 4 A</td>
</tr>
<tr>
<td>Dimensions and Mass</td>
<td>120 (W) × 90.9 (H) × 140 (D) mm (Excluding protrusions), ≤5 kg</td>
</tr>
<tr>
<td>Temperature</td>
<td>Operation: +15° to +35°C (with options installed) Storage: -20° to +60°C</td>
</tr>
</tbody>
</table>

*1: At single-ended, 50Ω  
*2: Amplitude range using Auto Search and Auto Measurement functions. Sensitivity at minimum error-free input amplitude.  
*3: At 56.2 Gbit/s  
*4: At PRBS 2³¹ – 1, Mark Ratio 1/2, +20° to +30°C, using Coaxial Cable J1656A  
*5: Standard at Eye Height. Using the measurement system shown in the following diagram (output amplitude monitored using sampling oscilloscope with bandwidth of better than 70 GHz and intrinsic jitter of less than 200 fs), Eye Height (total measurement count of 30) is the value of the amplitude measured by the oscilloscope when the BER becomes 1E-9 when the amplitude is decreased using the MP1861A + ATT.  
*6: 64.2 Gbit/s (with MP1862A Option x01 installed)  
*7: Standard with Tx intrinsic jitter component deducted  
*8: Jitter standard value when oscilloscope intrinsic jitter ≤200 fs  
*9: Operation voltage: +10% and -15% of specified voltage
## 56G/64G bit/s MUX MP1861A, 56G/64G bit/s DEMUX MP1862A Specifications

### Data Signal Combiner MZ1854A

| **Data Output** | Number of Output: 2 (Data, XData)  
|                 | Output Amplitude*: 0.238 Vp-p to 0.594 Vp-p (with using MP1861A-011)  
|                 | 0.238 Vp-p to 0.832 Vp-p (with using MP1861A-013)  
|                 | Connector: V (f)  |
| **Data Input**  | Number of Input: 4 (Data1, XData1, Data2, XData2)  
|                 | Input Amplitude: 0.5 Vp-p to 3.5 Vp-p  
|                 | Connector: V (m)  |

**Insertion Loss**

-16 dBm (nominal)*2

**General**

- Temperature  
  - Operation: +15°C to +35°C  
  - Storage: -20°C to +60°C  
- Dimensions and Mass: 60.2 (W) × 104.7 (H) × 23.5 (D) mm (Excluding protrusions), ≤2 kg

*1: Level 0 to 3  
*2: Data_n input to Data output

### Passive Equalizer 6 dB (V connector) J1646A

<table>
<thead>
<tr>
<th><strong>Frequency Range</strong></th>
<th>DC to 28 GHz (56 Gbit/s band)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Slope</strong></td>
<td>6.0 dB ±1.0 dB</td>
</tr>
</tbody>
</table>
| **Insertion Loss**  | At 28 GHz  
|                     | ≤2.8 dB                         |
| **Return Loss**     | 11 dB (min.)                    |

**General**

- Connector: V  
- Impedance: 50Ω  
- Dimensions: 44 (W) × 12 (H) × 11 (D) mm
## Ordering Information

### 56G/64G bit/s MUX MP1861A, 56G/64G bit/s DEMUX MP1862A

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

### 56G/64G bit/s MUX MP1861A

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<tr>
<th>Model/Order No.</th>
<th>Name</th>
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</thead>
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<td><strong>Main Frame</strong></td>
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<tr>
<td>MP1861A</td>
<td>56G/64G bit/s MUX</td>
</tr>
<tr>
<td><strong>Standard Accessories</strong></td>
<td></td>
</tr>
<tr>
<td>J1658A</td>
<td>Coaxial Skew Match Pair Cable (1.3 m, K Connector):</td>
</tr>
<tr>
<td>J1652A</td>
<td>Coaxial Cable (0.5 m, K Connector):</td>
</tr>
<tr>
<td>J1654A</td>
<td>U Link Cable B:</td>
</tr>
<tr>
<td>J1363A</td>
<td>Protection Cap:</td>
</tr>
<tr>
<td>41V-6</td>
<td>Precision Fixed Attenuator 6 dB:</td>
</tr>
<tr>
<td>J1632A</td>
<td>Terminator:</td>
</tr>
<tr>
<td>J1341A</td>
<td>Open:</td>
</tr>
<tr>
<td>J1655A</td>
<td>Semi-rigid Cable (0.2 m, V):</td>
</tr>
<tr>
<td>J1475A</td>
<td>USB Cable:</td>
</tr>
<tr>
<td>Z1312A</td>
<td>AC Adapter:</td>
</tr>
<tr>
<td>G0342A</td>
<td>ESD Discharger:</td>
</tr>
<tr>
<td>J0017</td>
<td>Power Cord, 2.5 m:</td>
</tr>
<tr>
<td>Z0897A</td>
<td>MP1800A Manual CD:</td>
</tr>
<tr>
<td>Z0918A</td>
<td>MX180000A Software CD:</td>
</tr>
<tr>
<td><strong>Options</strong></td>
<td></td>
</tr>
<tr>
<td>MP1861A-001</td>
<td>64G bit/s Extension</td>
</tr>
<tr>
<td>MP1861A-011</td>
<td>Variable Data Output (0.5 to 2.5 Vp-p)</td>
</tr>
<tr>
<td>MP1861A-013</td>
<td>Variable Data Output (0.5 to 3.5 Vp-p)</td>
</tr>
<tr>
<td>MP1861A-030</td>
<td>Variable Data Delay</td>
</tr>
<tr>
<td><strong>Retrofit Options</strong></td>
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<tr>
<td>MP1861A-101</td>
<td>64G bit/s Extension Retrofit</td>
</tr>
<tr>
<td>MP1861A-111</td>
<td>Variable Data Output (0.5 to 2.5 Vp-p) Retrofit</td>
</tr>
<tr>
<td>MP1861A-113</td>
<td>Variable Data Output (0.5 to 3.5 Vp-p) Retrofit</td>
</tr>
<tr>
<td>MP1861A-130</td>
<td>Variable Data Delay Retrofit</td>
</tr>
<tr>
<td><strong>Optional Accessories</strong></td>
<td></td>
</tr>
<tr>
<td>J1600A</td>
<td>Skew Match Pair Cable (0.2 m, V connector)</td>
</tr>
<tr>
<td>J1656A</td>
<td>Coaxial Cable Set (MP1861A – MP1862A)</td>
</tr>
<tr>
<td>J1646A</td>
<td>Passive Equalizer 6 dB (V connector)</td>
</tr>
<tr>
<td><strong>Maintenance Service</strong></td>
<td></td>
</tr>
<tr>
<td>MP1861A-ES310</td>
<td>Three Years Extended Warranty Service</td>
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<tr>
<td>MP1861A-ES510</td>
<td>Five Years Extended Warranty Service</td>
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</tbody>
</table>

### 56G/64G bit/s DEMUX MP1862A

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<tr>
<td>MP1862A</td>
<td>56G/64G bit/s DEMUX</td>
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<tr>
<td><strong>Standard Accessories</strong></td>
<td></td>
</tr>
<tr>
<td>J1657A</td>
<td>Coaxial Cable (1 m, K Connector):</td>
</tr>
<tr>
<td>J1668A</td>
<td>Coaxial Cable (0.8 m, K connector):</td>
</tr>
<tr>
<td>J1654A</td>
<td>U Link Cable B:</td>
</tr>
<tr>
<td>J1363A</td>
<td>Protection Cap:</td>
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<tr>
<td><strong>Options</strong></td>
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<td>64G bit/s Extension</td>
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<td><strong>Retrofit Options</strong></td>
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<tr>
<td>J1600A</td>
<td>Skew Match Pair Cable (0.2 m, V connector)</td>
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</tbody>
</table>

### Data Signal Combiner MZ1854A

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<td>Data Signal Combiner</td>
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<tr>
<td><strong>Standard Accessories</strong></td>
<td></td>
</tr>
<tr>
<td>Z0897A</td>
<td>MP1800A Manual CD</td>
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</tbody>
</table>

### Software

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MX181500A</td>
<td>Jitter/Noise Tolerance Test Software</td>
</tr>
</tbody>
</table>