MZ1834A/MZ1834B
4PAM Converter
MZ1838A
8PAM Converter
MZ1854A
Data Signal Combiner
Operation Manual

Third Edition

- **For safety and warning information, please read this manual before attempting to use the equipment.**
- **Additional safety and warning information is provided within the MP1800A Signal Quality Analyzer Installation Guide, the MT1810A 4 Slot Chassis Installation Guide and MU183020A 28G/32G bit/s PPG MU183021A 28G/32G bit/s 4ch PPG Operation Manual and MP1861A Operation Manual. Please also refer to this document before using the equipment.**
- **Keep this manual with the equipment.**

ANRITSU CORPORATION

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Ensure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following symbols may be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

Symbols used in manual

⚠ **DANGER** This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

⚠ **WARNING** This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

⚠ **CAUTION** This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

⊘ This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

◯ This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

△ This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.

▢ This indicates a note. The contents are described in the box.

♺ 🗑 These indicate that the marked part should be recycled.

MZ1834A/MZ1834B   4PAM Converter
MZ1838A   8PAM Converter
MZ1854A   Data Signal Combiner
Operation Manual
18   October   2013 (First Edition)
5   February   2016 (Third Edition)

For Safety

⚠ WARNING

ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the advice in the operation manual is not followed there is a risk of personal injury or reduced equipment performance. The alert mark shown on the left may also be used with other marks and descriptions to indicate other dangers.

⚠ CAUTION

Use in a residential environment

This instrument is designed for an industrial environment.
In a residential environment this instrument may cause radio interference in which case the user may be required to take adequate measures.

Use in Corrosive Atmospheres

Exposure to corrosive gases such as hydrogen sulfide, sulfurous acid, and hydrogen chloride will cause faults and failures.
Note that some organic solvents release corrosive gases.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories, including the National Institute of Advanced Industrial Science and Technology, and the National Institute of Information and Communications Technology, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation provides the following warranty against stoppages arising due to manufacturing error, and against problems with operation occurring even though the procedures outlines in the operation manual were followed.

Hardware:
Problems occurring within a period of one year from the date of delivery will be corrected by Anritsu Corporation at no cost to the user.

Software:
Software reported as faulty within a period of 6 months from the date of delivery will be corrected or replaced by Anritsu Corporation at no cost to the user.
Following correction or replacement the software will remain under warranty for either the remainder of 6 months from the date of initial delivery, or for a period of 30 days, whichever is shorter.
The hardware and software warranties are not valid under any of the following conditions:

- The fault is outside the scope of the warranty conditions separately described in the operation manual.
- The fault is due to mishandling, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster, including fire, wind, flooding, earthquake, lightning strike, or volcanic ash, etc.
- The fault is due to damage caused by acts of destruction, including civil disturbance, riot, or war, etc.
- The fault is due to explosion, accident, or breakdown of any other machinery, facility, or plant, etc.
- The fault is due to use of non-specified peripheral or applied equipment or parts, or consumables, etc.

- The fault is due to use of a non-specified power supply or in a non-specified installation location.
- The fault is due to use in unusual environments[Note].
- The fault is due to activities or ingress of living organisms, such as insects, spiders, fungus, pollen, or seeds.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation shall assume no liability for injury or financial loss of the customer due to the use of or a failure to be able to use this equipment.

Note:
For the purpose of this Warranty, "unusual environment" means use:
- In places of direct sunlight
- In dusty places
- Outdoors
- In liquids, such as water, oil, or organic solvents, and medical fluids, or places where these liquids may adhere
- In salty air or in place chemically active gases (sulfur dioxide, hydrogen sulfide, chlorine, ammonia, nitrogen dioxide, or hydrogen chloride etc.) are present
- In places where high-intensity static electric charges or electromagnetic fields are present
- In places where abnormal power voltages (high or low) or instantaneous power failures occur
- In places where condensation occurs
- In the presence of lubricating oil mists
- In places at an altitude of more than 2,000 m
- In the presence of frequent vibration or mechanical shock, such as in cars, ships, or airplanes

Anritsu Corporation Contact

In the event that this equipment malfunctions, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.

Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.

When you dispose of export-controlled items, the products/manuals need to be broken/shredded so as not to be unlawfully used for military purpose.

About This Manual

The operation manual for the MZ1834A 4PAM Converter (hereafter, MZ1834A), MZ1834B 4PAM Converter (hereafter, MZ1834B), MZ1838A 8PAM Converter (hereafter, MZ1838A) and MZ1854A Data Signal Combiner (hereafter, MZ1854A) covers the usage precautions, product outline and installation method.

1 Outline
This section explains the purpose of this product usage.

2 Before Use
This section explains the standard configuration, applicable parts and connector assignment.

3 How to Use
This section explains how to use this product.

4 Storage Precautions
This section explains the procedures and precautions when storing this product.

5 Transportation and Disposal
This section explains the precautions when transporting and disposing this product.

This operation manual assumes the reader has the following basic knowledge and experiences of:
・ Handling optical transmission, data transmission, and high-frequency signal

Table of Contents

1   Outline

The MZ1834A, MZ1834B, MZ1838A or MZ1854A is used by connecting to the data output connectors of the MU183020A 28G/32G bit/s PPG or MU183021A 28G/32G bit/s 4ch PPG (hereafter collectively, 32G PPG) or MP1861A 54G/64G bit/s MUX (hereafter, 64G MUX).

The MZ1834A and MZ1834B can synthesize the data signals from the 32G PPG output connector and output 4PAM (Pulse Amplitude Modulation) waveform.

The MZ1838A can synthesize the data signals from the 32G PPG output connector and output 4PAM (Pulse Amplitude Modulation) or 8PAM waveform.

The MZ1854A can synthesize the data signals from the 64G MUX output connector and output 4PAM (Pulse Amplitude Modulation) or Emphasis waveform.

Figure 1-1   MZ1834A 4PAM Converter External View

Figure 1-2　MZ1838A 8PAM Converter External View

Figure 1-3　MZ1854A Data Signal Combiner External View

2   Before Use

2.1   Standard configuration

Table 2.1-1 through Table 2.1-4 list the standard configuration of the MZ1834A, MZ1834B, MZ1838A and MZ1854A. At unpacking, check that all items are included. Contact your Anritsu Service and Sales Office or agent if any parts are missing or damaged.

Table 2.1-1   Standard configuration for MZ1834A

Item	Product name	Q'ty	Remarks
Mainframe	MZ1834A 4PAM Converter	1	
Accessory	Z0897A MP1800A Manual CD	1	
	J1359A Coaxial Adaptor (K-P.K-J,SMA)	2	Data Output × 2

Table 2.1-2   Standard configuration for MZ1834B

Item	Product name	Q'ty	Remarks
Mainframe	MZ1834B 4PAM Converter	1	
Accessory	Z0897A MP1800A Manual CD	1	
	J1359A Coaxial Adaptor (K-P.K-J,SMA)	2	Data Output × 2

Table 2.1-3   Standard configuration for MZ1838A

Item	Product name	Q'ty	Remarks
Mainframe	MZ1838A 8PAM Converter	1	
Accessory	Z0897A MP1800A Manual CD	1	
	J1359A Coaxial Adaptor (K-P.K-J,SMA)	2	Data Output × 2

Table 2.1-4   Standard configuration for MZ1854A

Item	Product name	Q'ty	Remarks
Mainframe	MZ1854A Data Signal Combiner	1	
Accessory	Z0897A MP1800A Manual CD	1	

2.2   Applicable parts

Table 2.2-1   Applicable parts

Model name	Product name	Remarks
J1343A	Coaxial cable 1m	SMA connector
J1342A	Coaxial cable 0.8m	APC3.5 connector
J1439A	Coaxial cable (0.8m, K connector)	K connector
J1359A	Coaxial Adaptor (K-P.K-J,SMA)	K, SMA connector
J1708A	Coaxial Adaptor	V connector
W3687AE	MZ1834A/MZ1834B 4PAM Converter MZ1838A 8PAM Converter MZ1854A Data Signal Combiner Operation Manual	Printed version

2.3   External Appearance

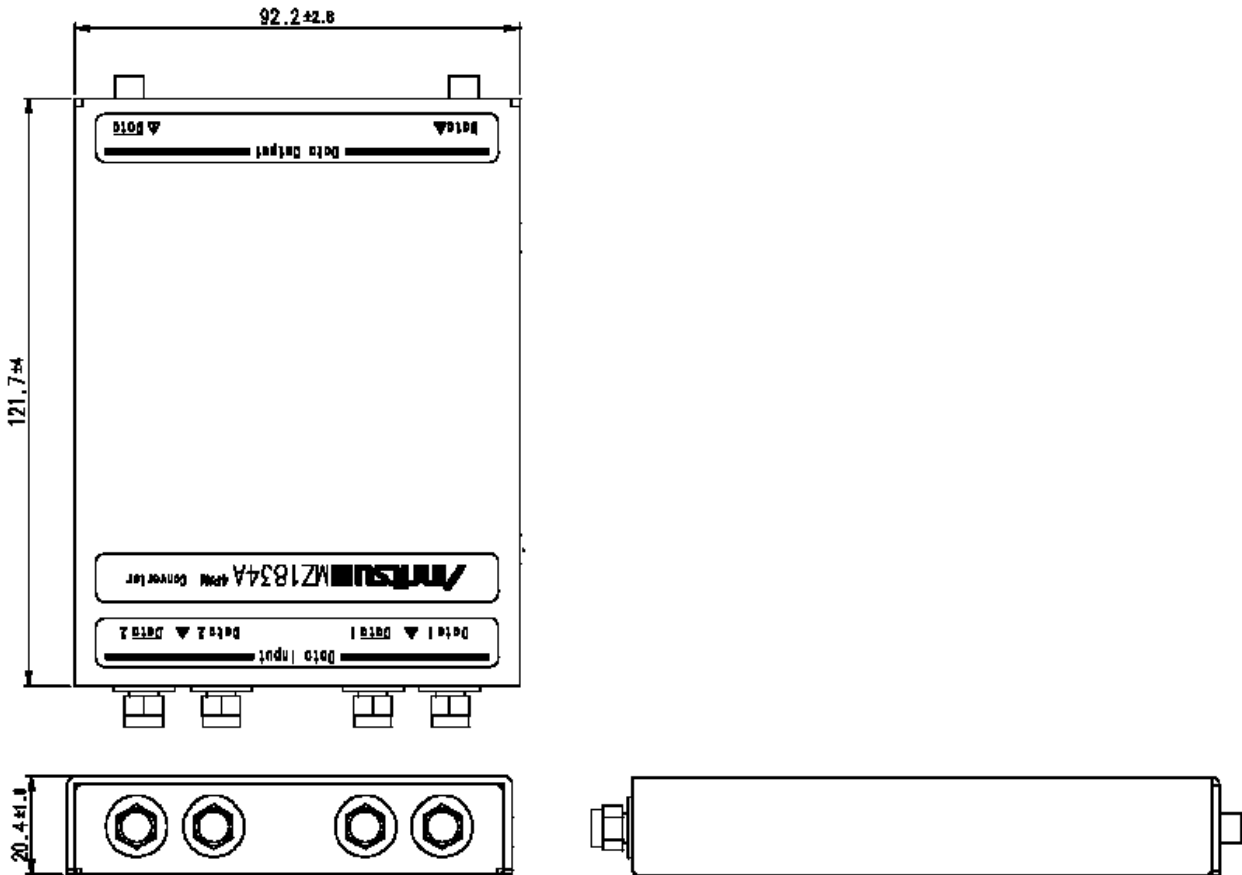Figure 2.3-1 through 2.3-4 show the external appearance of the MZ1834A, MZ1834B, MZ1838A, and MZ1854A. Units are mm.
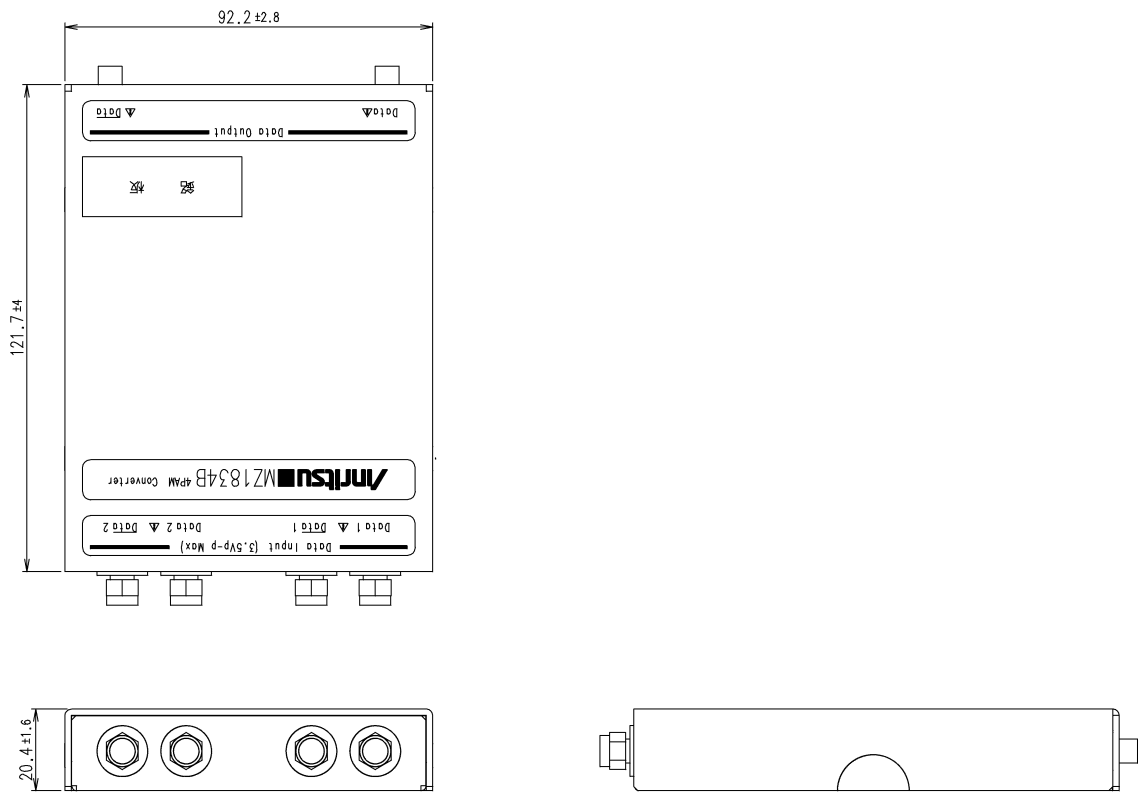

Figure 2.3-1   External Appearance of MZ1834A
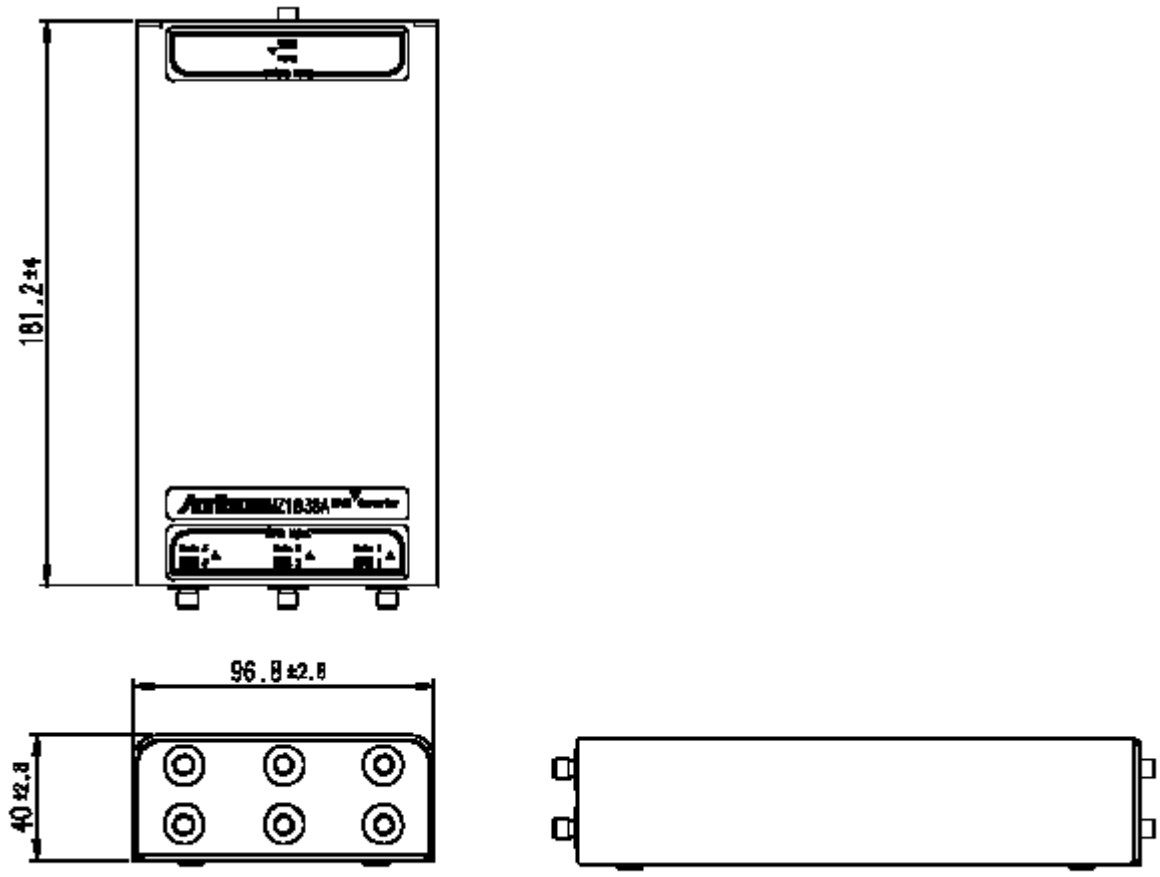
Figure 2.3-2   External Appearance of MZ1834B

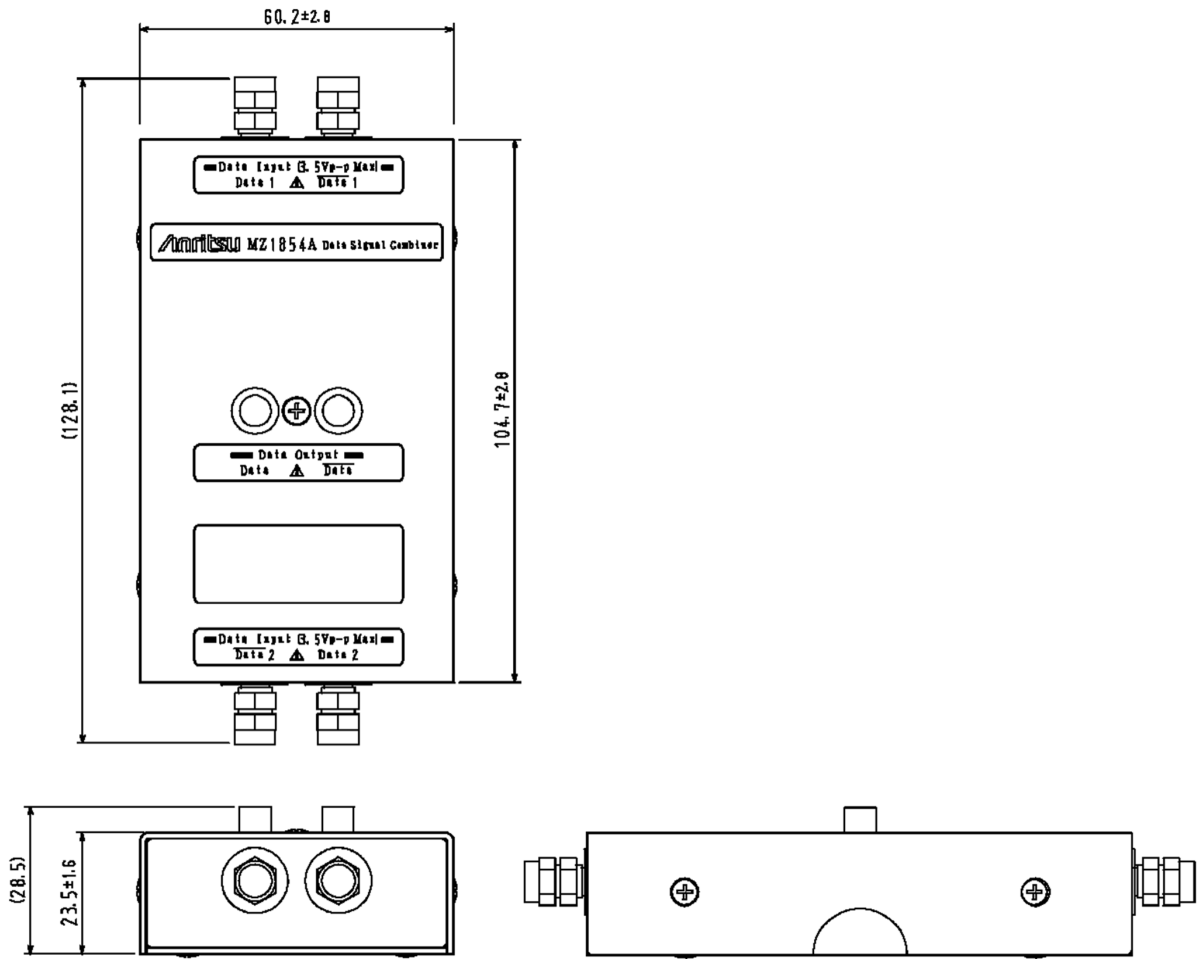**Figure 2.3-3   External Appearance of MZ1838A**

Figure 2.3-4   External Appearance of MZ1854A

2.4   Connector Layout

Figure 2.4-1 and Table 2.4-1 show the connector layout of the MZ1834A
and MZ1834B. Figure 2.4-2 and Table 2.4-2 show the Connector layout of
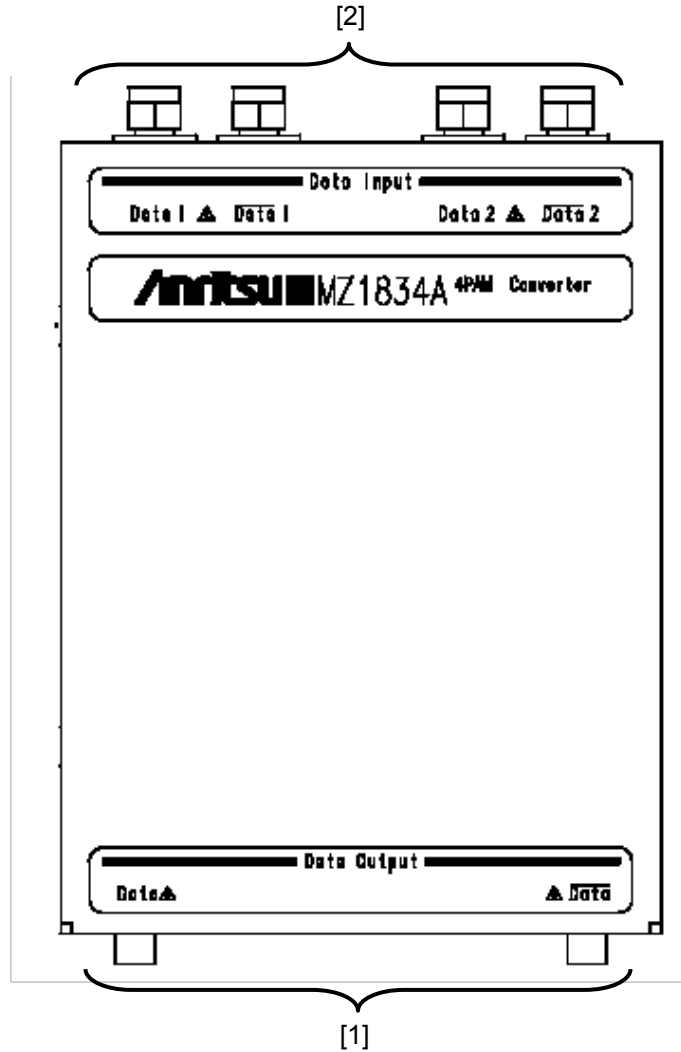MZ1838A. Figure 2.4-3 and Table 2.4-3 show the Connector layout of
MZ1854A.

Figure 2.4-1   MZ1834A and MZ1834B Connector Layout

Table 2.4-1   Connector Name and Function of MZ1834A and MZ1834B

No.	Name	Function
[1]	Data, $\overline{\text{Data}}$ Output	Outputs differential signals of Data, $\overline{\text{Data}}$ (hereafter XData). Outputs 4PAM signals.
[2]	Data, $\overline{\text{Data}}$ Input*	Inputs Data, XData signals from 32G PPG. Inputs differential signals to Data 1 and 2.

*:   To prevent damage to these connectors, it is recommended that
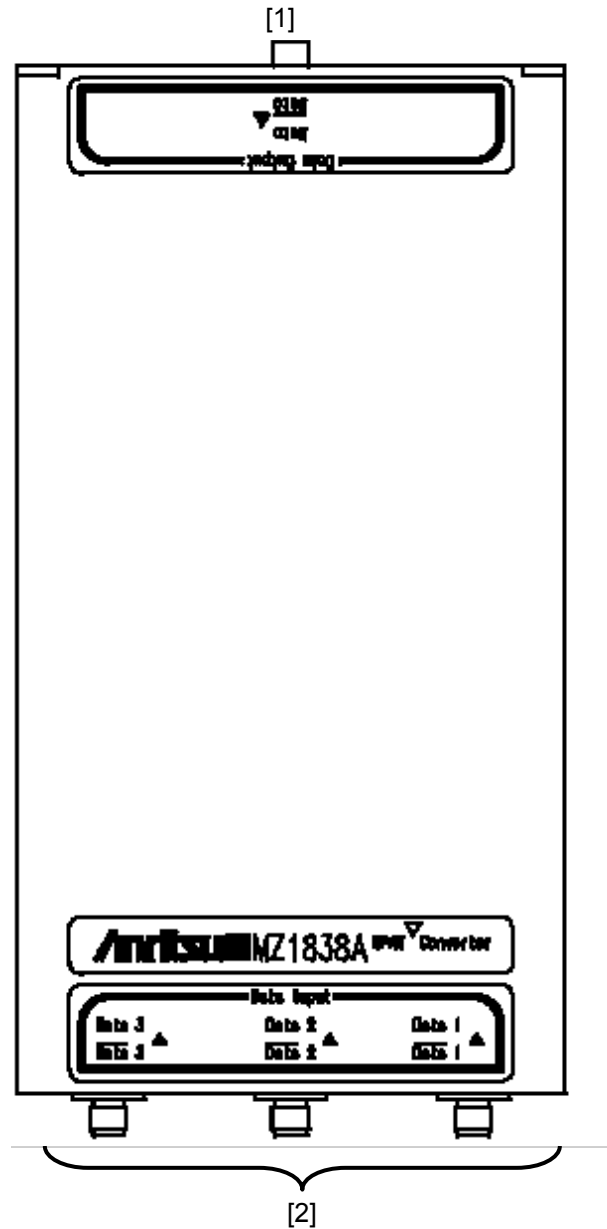J1359A coaxial adaptors be connected.

Figure 2.4-2   MZ1838A Connector Layout

Table 2.4-2   Connector Name and Function of MZ1838A

No.	Name	Function
[1]	Data, $\overline{\text{Data}}$ Output	Outputs differential signals of Data, XData. Outputs 4PAM or 8PAM signals.
[2]	Data, $\overline{\text{Data}}$ Input*	Inputs Data, XData signals from 32G PPG. Inputs differential signals to Data 1 to 3.

*:   To prevent damage to these connectors, it is recommended that J1359A coaxial adaptors be connected.
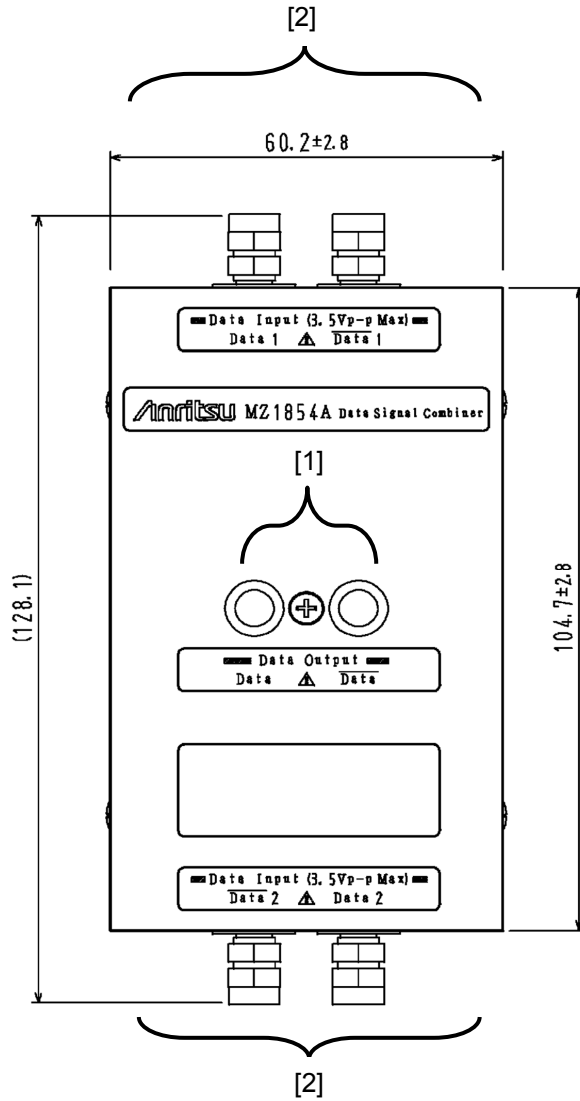
[2]

Figure 2.4-3   MZ1854A Connector Layout

Table 2.4-3   Connector Name and Function of MZ1854A

No.	Name	Function
[1]	Data, $\overline{\text{Data}}$ Output	Outputs differential signals of Data, XData. Outputs 4PAM or Emphasis signals.
[2]	Data, $\overline{\text{Data}}$ Input*	Inputs Data, XData signals from 64G MUX. Inputs differential signals to Data 1 and 2.

*:   To prevent damage to these connectors, it is recommended that J1708A coaxial adaptors be connected.

3 How to Use

This section explains how to use the MZ1834A, MZ1834B, MZ1838A and MZ1854A.

3.1 Connecting with 32G PPG and 64 MUX

Avoid static electricity when handling the MZ1834A, MZ1834B, MZ1838A and MZ1854A.

⚠ CAUTION

● **When signals are input to the MZ1834A, MZ1834B, MZ1838A or MZ1854A, avoid excessive voltage beyond the rating. Otherwise, the circuit may be damaged.**

● **As a countermeasure against static electricity, ground other devices to be connected (including experimental circuits) with ground wires before connecting the I/O connector.**

● **The outer conductor and core of the coaxial cable may become charged as a capacitor. Use any metal to discharge the outer conductor and core before use.**

● **To prevent the risk of damage to the MZ1834A, MZ1834B, MZ1838A or MZ1854A from static electric charges, always use an antistatic mat on the workbench and ensure that the operator wears a grounded wrist strap. Always ground the wrist strap to the workbench antistatic mat or the frame ground of the MP1800A or MT1810A.**

● **When removing a cable from a connector on the front panel of the MZ1834A, MZ1834B, MZ1838A or MZ1854A, be careful not to add excessive stress to the connector.**

● **Addition of excessive stress to a connector may result in characteristic degradation or a failure. Use a torque wrench (recommended torque: 0.9 N-M) when attaching or removing a cable.**

3.1.1   Connecting MZ1834A, MZ1834B,

This section describes a connection example of the MZ1834A and 32G PPG. MZ1834B and 32G PPG can be also connected in same manner.
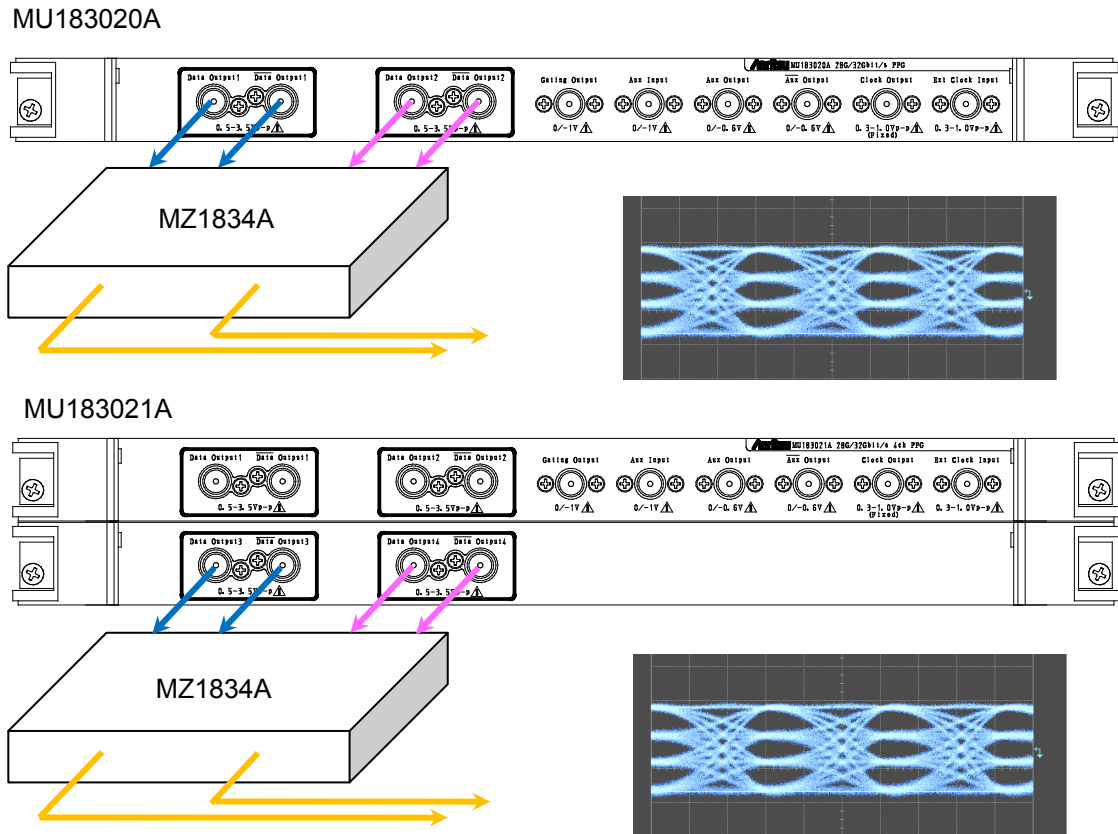
MU183020A

MU183021A

Figure 3.1.1-1   Connection example of MZ1834A and 32G PPG

- The MZ1834A is designed to be easily connected to Data Output1, XData Output1, Data Output2, and XData Output2 connectors of the MU183020A.
  Connect the connectors and tighten them equally as in Figure 3.1.1-1.
- To connect the MZ1834A with the MU183021A, connect it to Data1 and 2 or Data3 and 4.

3.1.2   Connecting MZ1838A

This section describes a connection example of the MZ1838A and 32G PPG.

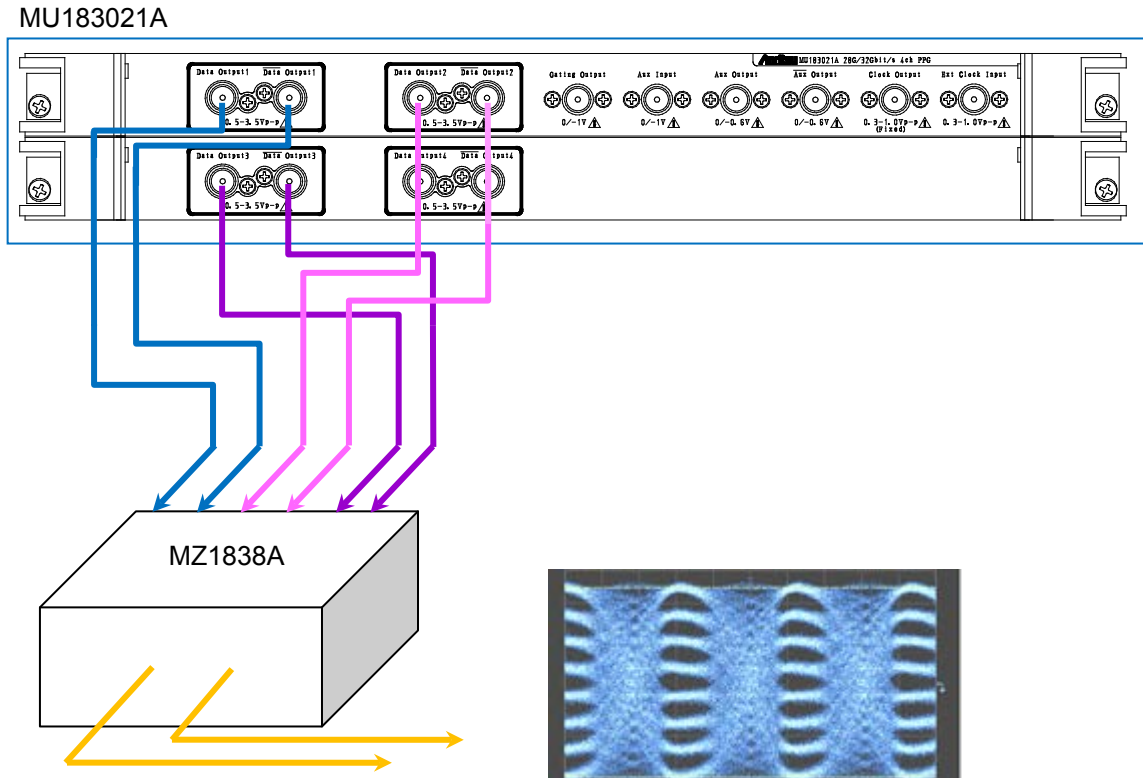(1) Connection example of MZ1838A and 32G PPG (8PAM)

MU183021A

Figure 3.1.2-1   Connection example of MZ1838A and 32G PPG (8PAM)

Connect the Data Output 1 to 3 and XData Output 1 to 3 connectors of the MU183021A to the Data Input 1 to 3 and XData Input 1 to 3 connectors of the MZ1838A as in Figure 3.1.2-1.

Note:

Use coaxial cables in the same length to connect the MU183021A and MZ1838A.

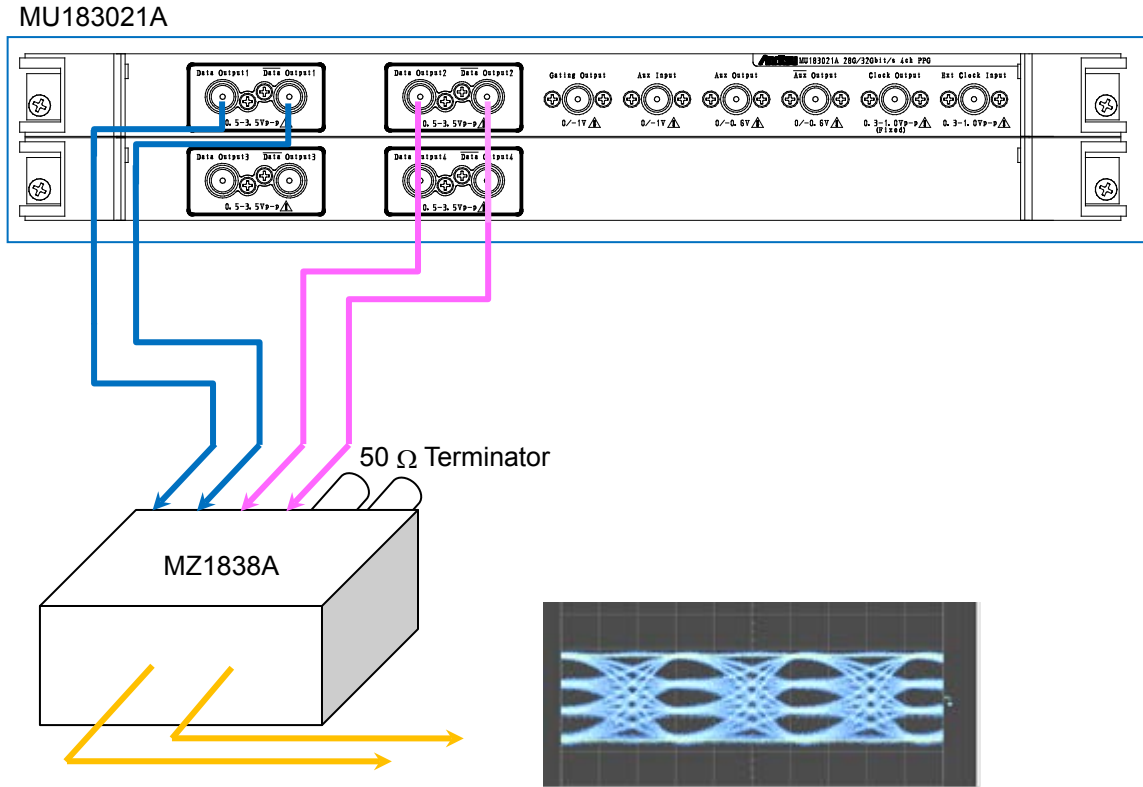(2) Connection example of MZ1838A and 32G PPG (4PAM)

MU183021A

Figure 3.1.2-2 Connection example of MZ1838A and 32G PPG (4PAM)

Connect the Data Output1 to 2 and XData Output1 to 2 connectors of the MU183021A to the Data Input1 to 2 and XData Input1 to 2 connectors of the MZ1838A as in Figure 3.1.2-2. Connect 50 Ω terminators to Data Input 3.

Notes:

- Use coaxial cables in the same length to connect the MU183021A and MZ1838A.

- The MZ1834A and MZ1838A output 4PAM waveforms different from each other because of their different inner structures.

3.1.3 Connecting MZ1854A (PAM and Emphasis signals generated using MU183020A)

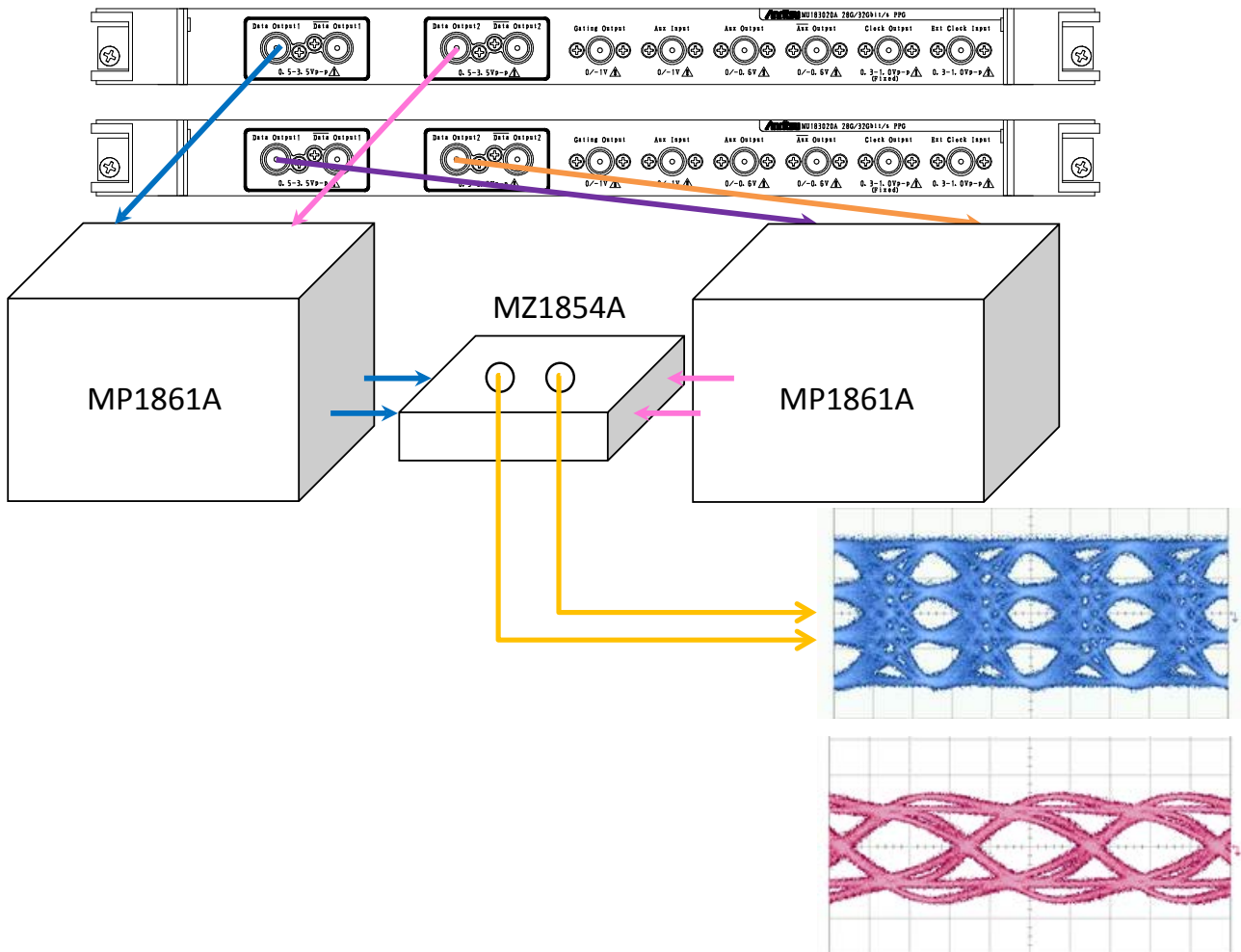This section describes a connection example using the MZ1854A, 64G MUX and MU183020A.

Figure 3.1.3-3 Connection example of MZ1854A , 64G MUX and MU183020A

- Connect CH1 of the MP1861A to the Data Output1 and Data Output2 connectors of the MU183020A in slot 1, and connect CH2 of the MP1861A to the Data Output1 and Data Output2 connectors of the MU183020A in slot 2.
  The MP1861A CH settings are switched using the switch on the rear.
- The MZ1854A is designed to be connected to the CH1/2 Data Output and XData Output connectors of the MP1861A.
  Connect the MZ1854A connectors and tighten them equally.

3.1.4 Connecting MZ1854A (PAM signal generated using MU183021A)

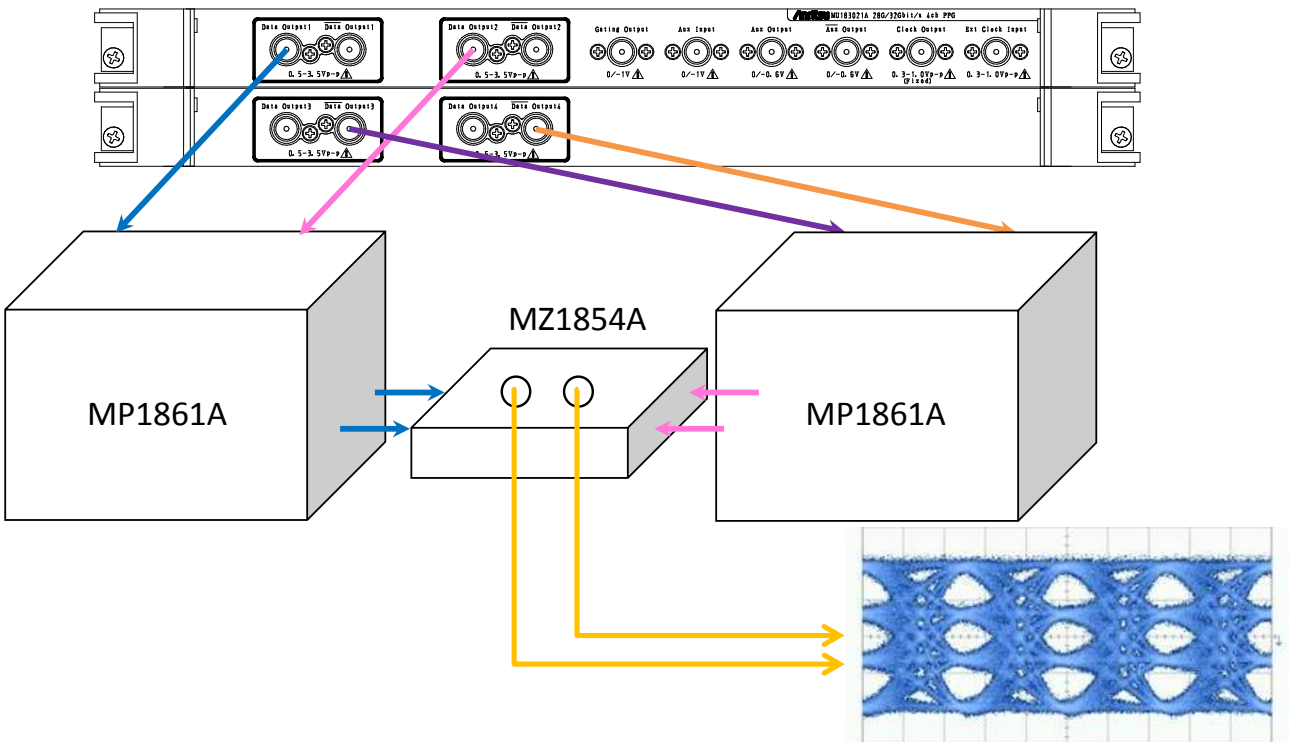This section describes a connection example using the MZ1854A, 64G MUX and MU183021A.

Figure 3.1.4-1   Connection example of MZ1854A ,64G MUX and MU183021A

- Connect CH1 of the MP1861A to the Data Output1 and Data Output2 connectors of the MU183021A, and connect CH2 of the MP1861A to the XData Output3 and XData Output4 connectors of the MU183021A. The MP1861A CH settings are switched using the switch on the rear.
- The MZ1854A is designed to be connected to the CH1/2 Data Output and XData Output connectors of the MP1861A.
  Connect the MZ1854A connectors and tighten them equally.

3.1.5   Connecting MZ1854A (Emphasis signal generated using MU183021A)

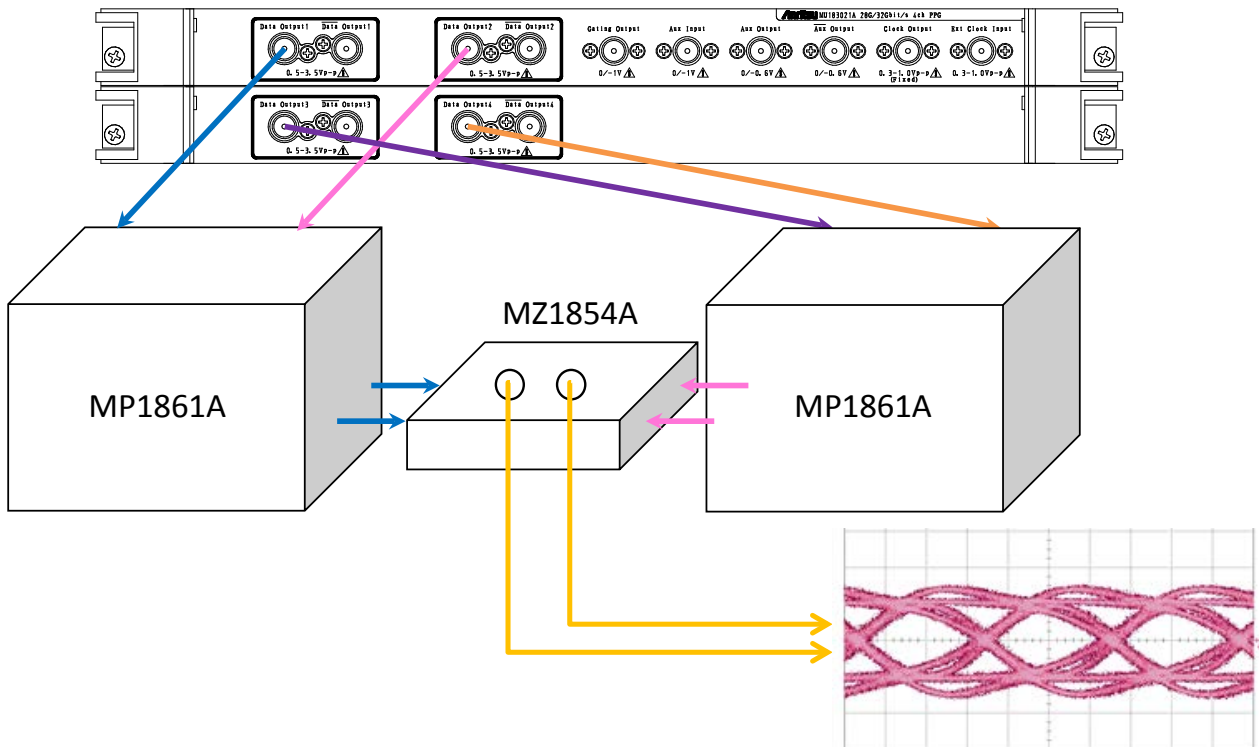This section describes a connection example using the MZ1854A, 64G MUX and MU183021A.

Figure 3.1.5-1   Connection example of MZ1854A ,64G MUX and MU183021A

- Connect CH1 of the MP1861A to the Data Output1 and Data Output2 connectors of the MU183021A, and connect CH2 of the MP1861A to the Data Output3 and Data Output4 connectors of the MU183021A. The MP1861A CH settings are switched using the switch on the rear.
- The MZ1854A is designed to be connected to the CH1/2 Data Output and XData Output connectors of the MP1861A. Connect the MZ1854A connectors and tighten them equally.

3.2 Setting Amplitude of PAM signal

The following sections explain how to set PAM signal amplitude when the MZ1834A, MZ1834B, MZ1838A and MZ1854A and 32G PPG or 64G MUX are combined.

3.2.1 Setting Amplitude of 4PAM signal

This subsection explains how to vary 4PAM signal amplitude by using the MU183020A and MZ1834A. MZ1834B can be used as same as MZ1834A.

The setting is explained in the configuration where the MU183020A is installed in the MP1800A. The option compositions and device in the configuration are shown below.

- MP1800A-014
- MU181000A
- MU183020A-x23 + x31
- Sampling oscilloscope

Connecting Devices
For connection of the MU183020A and MZ1834A, refer to Section 3.1.1 "Connecting MZ1834A".

Setting 32G PPG
Set combination, bit rate, and pattern of the MU183020A. Refer to the *MU183020A28G/32G bit/s PPG MU183021A 28G/32G bit/s 4ch PPG Operation Manual* for details.

1. Set **Combination** to **2ch** by **Combination Setting** in **Misc2** tab.

2. Set operation bit rate in **Bit Rate Setting** in **Output** tab.

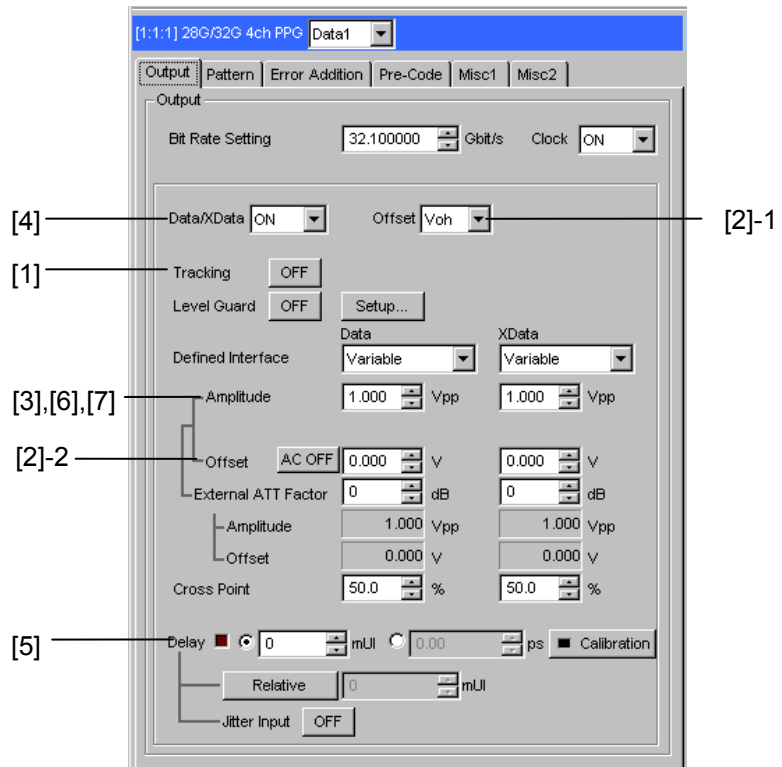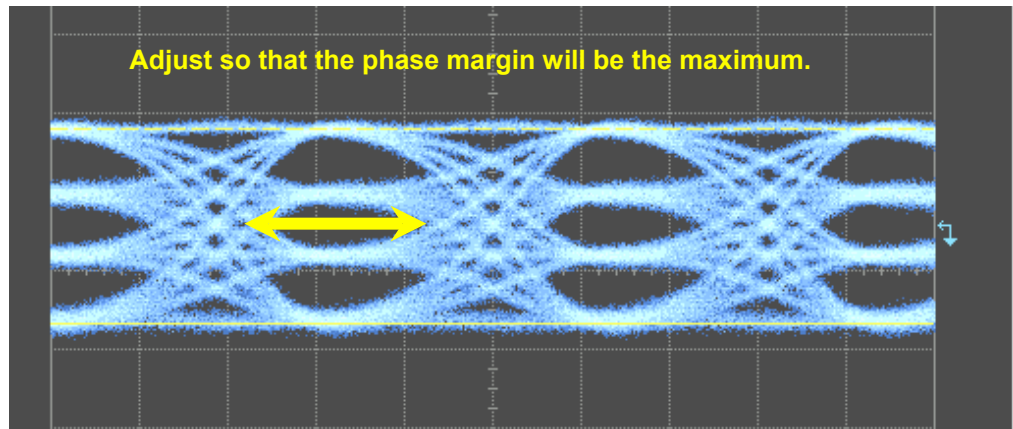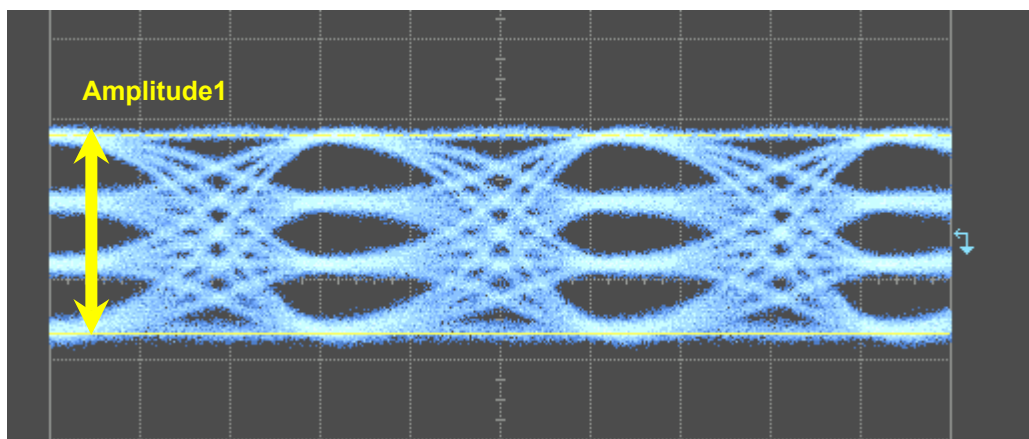3. Set test pattern in **Pattern** tab.

Figure 3.2.1-1   Setting dialog box for MU183020A

Setting Amplitude (by MU183020A)

[1]   Select **Output** tab of Data1, and set **Tracking** to **ON**. Set Data2 in the same manner.

[2]   Set **Offset** to **Vth**.
Set **Offset** value to 0.000 V. Set Data 2 in the same manner.

[3]   Set **Amplitude** of Data1 to 1.680 Vp-p. Set **Amplitude** of Data2 to 0.840 Vp-p.

[4]   Set **Data/XData** in Output tab to **ON**. Then set **Output** of module function to **ON**.

[5]   By checking the waveform on the sampling oscilloscope, adjust **Delay** value in **Output** tab of Data1 so that the phase margin will be the maximum.

Adjust so that the phase margin will be the maximum.

[6]   After setting [5], Amplitude1 of 4PAM signal (figure below) is 0.4 Vp-p. Amplitude1 can be enlarged by increasing **Amplitude** of Data1 and Data2 in the same amount. On the contrary, by decreasing **Amplitude** of Data1 and Data2 in the same amount, **Amplitude1** can be diminished.

Amplitude1

[7]   Amplitude2 of 4PAM signal (figure below) can be enlarged by increasing **Amplitude** of Data1 and decreasing **Amplitude** of Data2 in the same amount. On the contrary, Amplitude2 can be diminished by increasing **Amplitude** of Data2 and decreasing **Amplitude** of Data1 in the same amount.

Amplitude2

3.2.2   Setting Amplitude of 8PAM signal

This subsection explains how to vary 8PAM signal amplitude by using the MU183021A and MZ1838A.

The setting is explained in the configuration where the MU183021A is installed in the MP1800A. The option compositions and device in the configuration are shown below.

- MP1800A-015
- MU181000A
- MU183021A-x13 + x30
- Sampling oscilloscope

Connecting Devices

For connection of the MU183021A and MZ1838A, refer to Section 3.1.2 "Connecting MZ1838A".

Setting 32G PPG

Set combination, bit rate, and pattern of the MU183021A. Refer to the *MU183020A28G/32G bit/s PPG MU183021A 28G/32G bit/s 4ch PPG Operation Manual* for details.

1. Set **Combination** to **4ch** by **Combination Setting** in **Misc2** tab.

2. Set operation bit rate in **Bit Rate Setting** in **Output** tab.

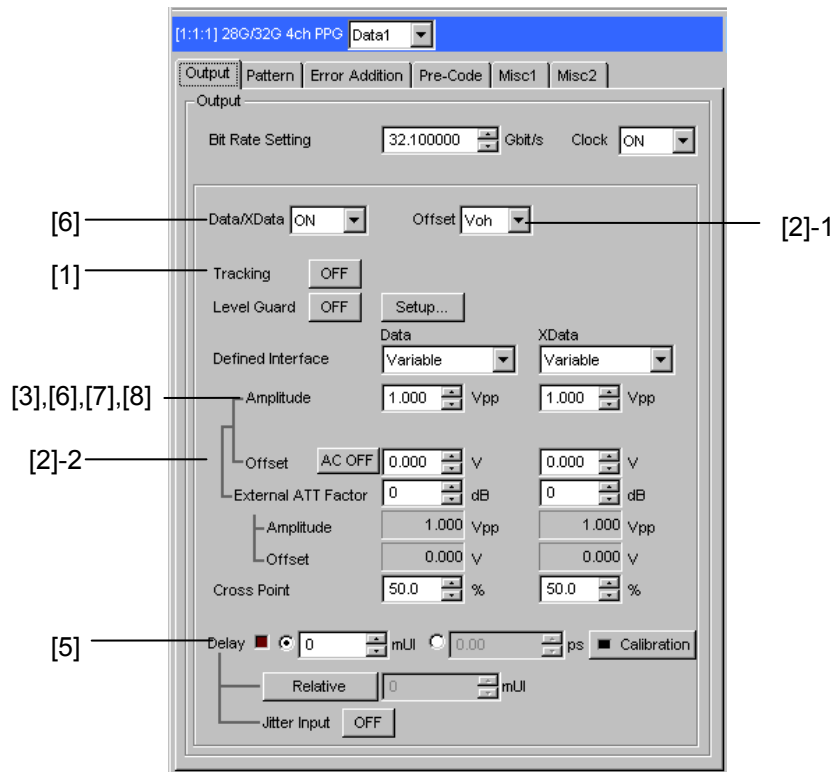3. Set test pattern in **Pattern** tab.

Figure 3.2.2-1   Setting dialog box for MU183021A

Setting Amplitude (by MU183021A)

[1]   Select **Output** tab of Data1, and set **Tracking** to **ON**. Set Data2 and Data3 in the same manner.

[2]   Set **Offset** to **Vth**.
      Set **Offset** value to 0.000 V. Set Data2 and Data3 in the same manner.

[3]   Set **Amplitude** of Data1 to 1.442 Vp-p.
      Set Data2 to 1.810 Vp-p and Data3 to 1.434 Vp-p in the same manner.

[4]   Set **Data/XData** in **Output** tab to **ON**. Then set **Output** of module function to **ON**.

[5]　By checking waveform on the sampling oscilloscope, adjust **Delay** value in **Output** tab of Data1 and Data2 so that the phase margin will be the maximum.
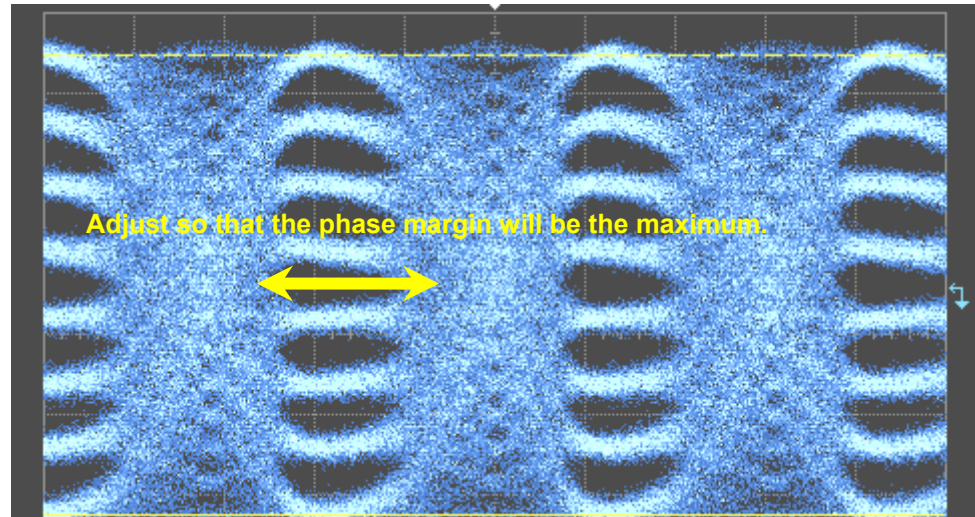
[6]　After setting [5], Amplitude1 of 8PAM signal (figure below) is 0.4 Vp-p. **Amplitude1** can be enlarged by increasing **Amplitude** of Data1, Data2, and Data3 in the same amount. On the contrary, **Amplitude1** can be diminished by decreasing **Amplitude** of Data1, Data2, and Data3 in the same amount.
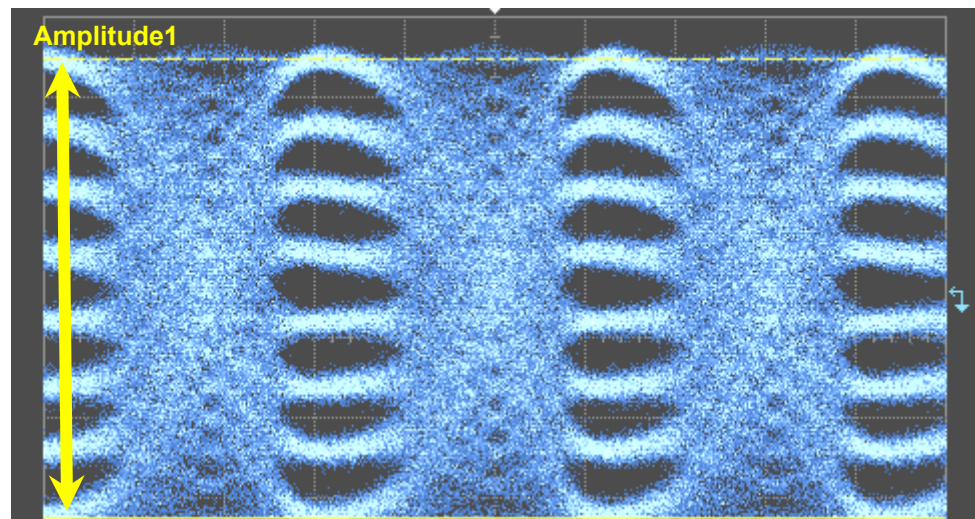
[7] To increase or decrease **Amplitude2** (figure below) of 8PAM signal, set **Amplitude** of Data1, Data2, and Data3 according to Table 3.2.2-1.
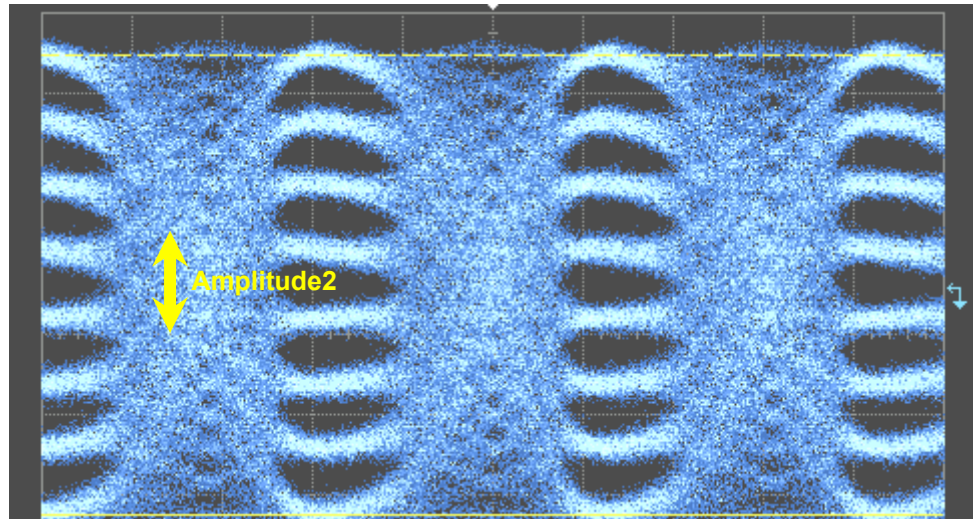
Table 3.2.2-1   Setting Increase and Decrease in Amplitude2

	Increase in Amplitude2	Decrease in Amplitude2
Data1 Amplitude	$+x$	$-x$
Data2 Amplitude	$-\dfrac{2}{3}x$	$+\dfrac{2}{3}x$
Data3 Amplitude	$-\dfrac{1}{3}x$	$+\dfrac{1}{3}x$

[8] To increase or decrease Amplitude3 of 8PAM signal (figure below), set **Amplitude** of Data2 and Data3 according to Table 3.2.2-2.

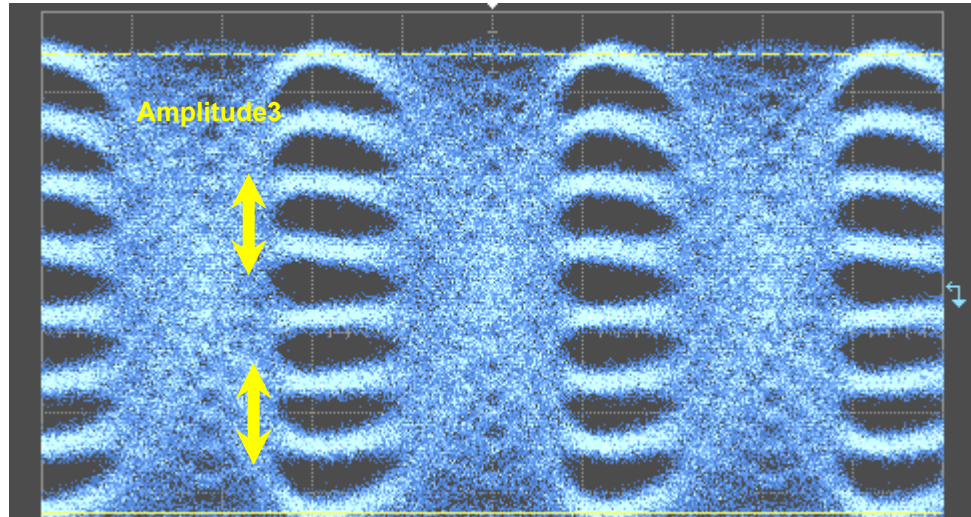**Table 3.2.2-2   Setting Increase and Decrease in Amplitude3**

	Increase in Amplitude3	Decrease in Amplitude3
Data2 Amplitude	$+x$	$-x$
Data3 Amplitude	$-x$	$+x$

3.2.3   Setting Amplitude of 4PAM signal (Using MZ1838A)

This subsection explains how to vary 4PAM signal amplitude by using the MU183021A and MZ1838A.

The setting is explained in the configuration where the MU183021A is installed in the MP1800A. The option compositions and device in the configuration are shown below.

- MP1800A-015
- MU181000A
- MU183021A-x13 + x30
- Sampling oscilloscope

Connecting Devices

For connection of the MU183021A and MZ1838A, refer to Section 3.1.2 "Connecting MZ1838A".

Setting 32G PPG

Set combination, bit rate, and pattern of the MU183021A. Refer to the *MU183020A28G/32G bit/s PPG MU183021A 28G/32G bit/s 4ch PPG Operation Manual* for details.

1. Set **Combination** to **2ch** by **Combination Setting** in **Misc2** tab.

2. Set operation bit rate in **Bit Rate Setting** in **Output** tab.

3. Set test pattern in **Pattern** tab.

Figure 3.2.3-1   Setting dialog box for MU183021A

Setting Amplitude (by MU183021A)

[1]   Select **Output** tab of Data1, and set **Tracking** to **ON**. Set Data2 in the same manner.

[2]   Set **Offset** to **Vth**.
Set **Offset** value to 0.000 V. Set Data2 in the same manner.

[3]   Set **Amplitude** of Data1 to 1.680 Vp-p. Set **Amplitude** of Data2 to 2.114 Vp-p.

[4]   Set **Data/XData** in **Output** tab to **ON**. Then set **Output** of module function to **ON**.

[5] By checking the waveform on the sampling oscilloscope, adjust **Delay** value in **Output** tab of Data1 so that the phase margin will be the maximum.
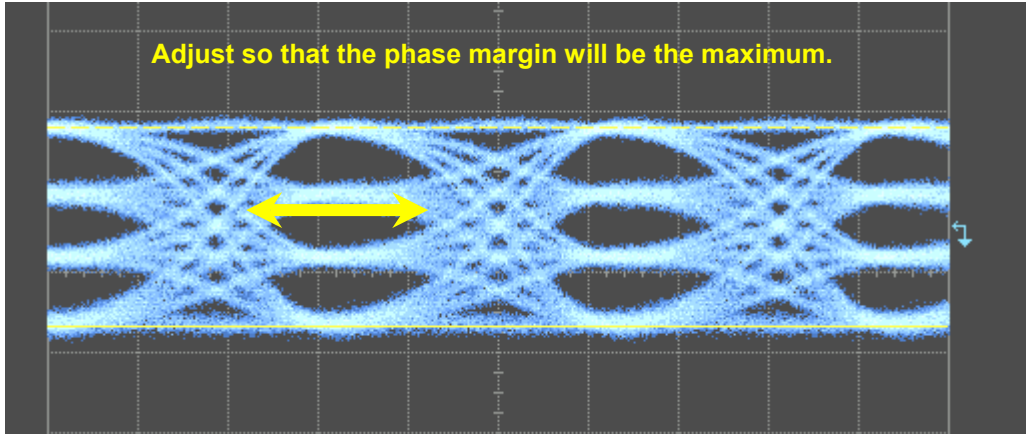
[6] After setting [5], Amplitude1 of 4PAM signal (figure below) is 0.4 Vp-p. Amplitude1 can be enlarged by increasing **Amplitude** of Data1 and Data2 in the same amount. On the contrary, by decreasing **Amplitude** of Data1 and Data2 in the same amount, Amplitude1 can be diminished.

[7]   Amplitude2 of 4PAM signal (figure below) can be enlarged by
increasing **Amplitude** of Data1 and decreasing **Amplitude** of Data2
in the same amount. On the contrary, Amplitude2 can be diminished
by increasing **Amplitude** of Data2 and decreasing **Amplitude** of
Data1 in the same amount.
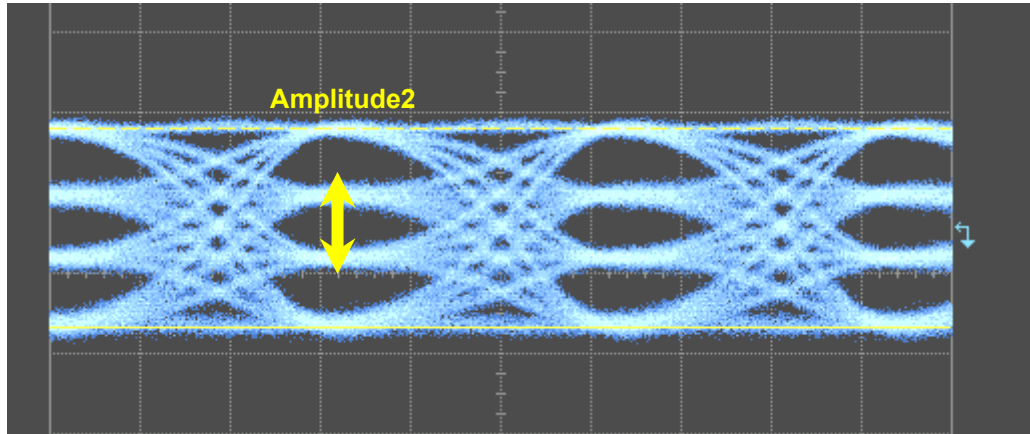
3.2.4   Setting Amplitude of 56G 4PAM signal

This subsection explains how to vary 4PAM signal amplitude by using the MP1861A and MZ1854A.

The setting is explained for a configuration with two MU183020As installed in the MP1800A, and two MP1861As connected. The option compositions and device in the configuration are shown below.

- MP1800A-015
- MU181000A
- MU183020A-x23 + x31 (2 units)
- MP1861A-x13 + x30 (2 units)
- Sampling oscilloscope

Connecting Devices

For connection of the MP1861A and MZ1854A, refer to Section 3.1.3 "Connecting MZ1854A (PAM and Emphasis signals generated using MU183020A)" or Section 3.1.4 "Connecting MZ1854A (PAM signal generated using MU183021A)".

Setting 32G PPG and 64G MUX

Set combination, bit rate, and pattern of the MU183021A and MP1861A. Refer to the *MU183020A28G/32G bit/s PPG MU183021A 28G/32G bit/s 4ch PPG Operation Manual* and *MP1861A56G/64G bit/s MUX Operation Manual* for details.

1. Set the CH for the second MP1861A to 2.
2. Click the Combination module function button and select "2 ch Combination". If using MU183021A for 32G PPG, click Combination in Combination Setting in the 32G PPG tab, and select "2ch CH Sync".
3. Set operation bit rate in **Bit Rate Setting** in **Output** tab of 32G PPG.
4. Click the MP1861A MUX/PPG Link button to link the two modules.
5. Set test pattern in **Pattern** tab.

    Set the pattern logic to "NEG" for the 32G PPG connected to the CH2 MP1861A here. This operation is not required if using MU183021A for 32G PPG.
6. Set **Clock Output Rate** in 32PPG **Misc2** tab to **Full Rate**.
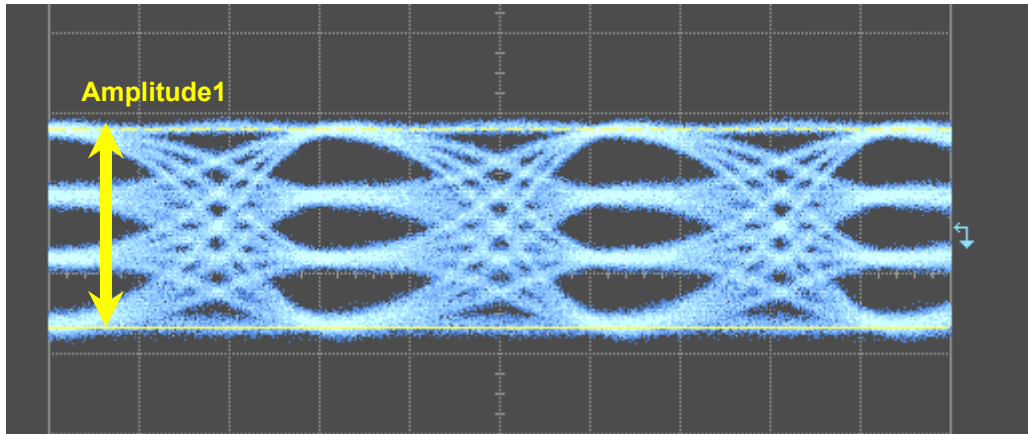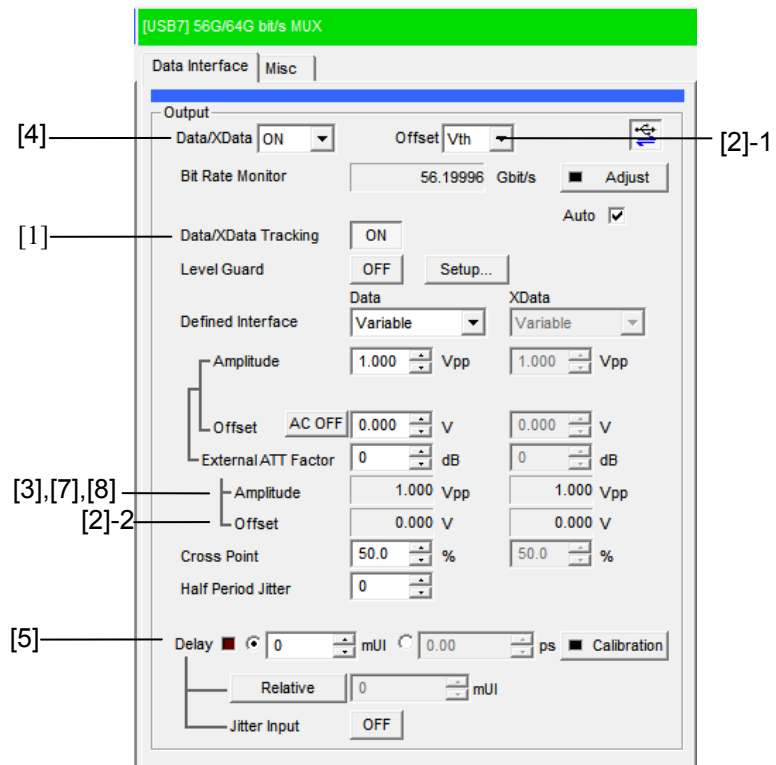
Figure 3.2.4-1   Setting dialog box for MP1861A

Setting Amplitude (MP1861A)

[1] Select **Data Input** tab of CH1, and set **Tracking** to **ON**. Set CH2 in the same manner.

[2] Set **Offset** to **Vth**.
Set **Offset** value to 0.000 V. Set CH 2 in the same manner.

[3] Set **Amplitude** of CH1 to 2.0 Vp-p. Set **Amplitude** of CH2 to 1.0 Vp-p.

[4] Set **Data/XData** in Data Interface tab to **ON**. Then set **Output** of module function to **ON**. Verify that the MP1861A Adjust is operating here.

[5] Combine the bit phase between the two MP1861As.

By checking the waveform on the sampling oscilloscope, adjust the Delay value in the Data Interface tab of CH2 so that the waveform is at a NRZ not covered by the emphasis. The adjustment range here is approximately ±5000 mUI.

[6] Click the Combination module function button and select "64 G x 2ch Combination". If using MU183021A for 32G PPG, click Combination in Combination Setting in the 32G PPG tab, and select "64G x 2ch Combination".

[7] After setting [5], Amplitude1 of 4PAM signal (figure below) is 0.475 Vp-p. Amplitude1 can be enlarged by increasing **Amplitude** of CH1 and CH2 in the same amount. On the contrary, by decreasing **Amplitude** of CH1 and CH2 in the same amount, **Amplitude1** can be diminished.
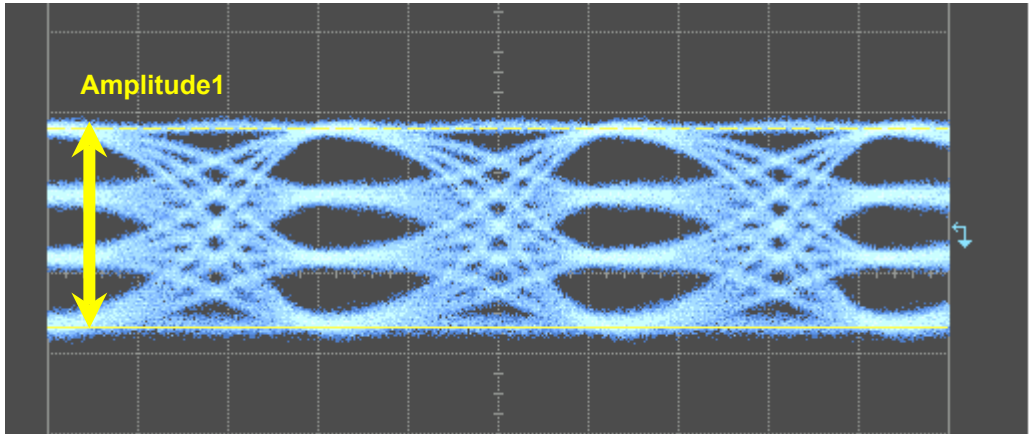
[8] Amplitude2 of 4PAM signal (figure below) can be enlarged by increasing **Amplitude** of CH1 and decreasing **Amplitude** of CH2 in the same amount. On the contrary, Amplitude2 can be diminished by increasing **Amplitude** of CH2 and decreasing **Amplitude** of CH1 in the same amount.
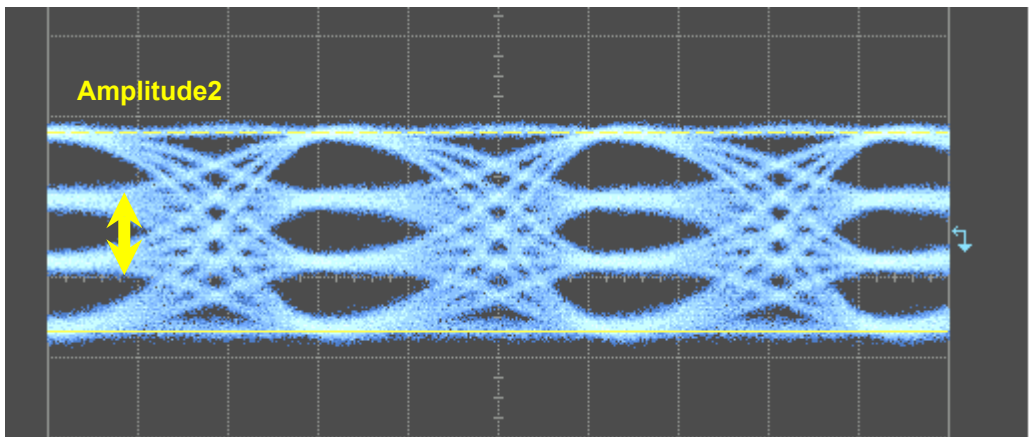
3.2.5   Setting 64G Emphasis signal

This subsection explains how to generate the Emphasis signal using the MP1861A and MZ1854A.

The setting is explained for a configuration with two MU183020As installed in the MP1800A, and two MP1861As connected. The option compositions and device in the configuration are shown below.

- MP1800A-015
- MU181000A
- MU183020A-x23 + x31 (2 units)
- MP1861A-x13 + x30 (2 units)
- Sampling oscilloscope

Connecting Devices

For connection of the MP1861A and MZ1854A, refer to Section 3.1.3 "Connecting MZ1854A (PAM and Emphasis signals generated using MU183020A)" or Section 3.1.5 "Connecting MZ1854A (Emphasis signal generated using MU183021A)".

Setting 32G PPG and 64G MUX

Set combination, bit rate, and pattern of the MU183021A and MP1861A. Refer to the *MU183020A28G/32G bit/s PPG MU183021A 28G/32G bit/s 4ch PPG Operation Manual* and *MP1861A56G/64G bit/s MUX Operation Manual* for details.

1.   Set the CH for the second MP1861A to 2.
2.   Click the Combination module function button and select "2 ch Combination". If using MU183021A for 32G PPG, click Combination in Combination Setting in the 32G PPG tab, and select "2ch CH Sync".
3.   Set operation bit rate in **Bit Rate Setting** in **Output** tab of 32G PPG.
4.   Click the MP1861A MUX/PPG Link button to link the two modules.
5.   Set test pattern in **Pattern** tab.
6.   Set **Clock Output Rate** in 32PPG **Misc2** tab to **Full Rate**.
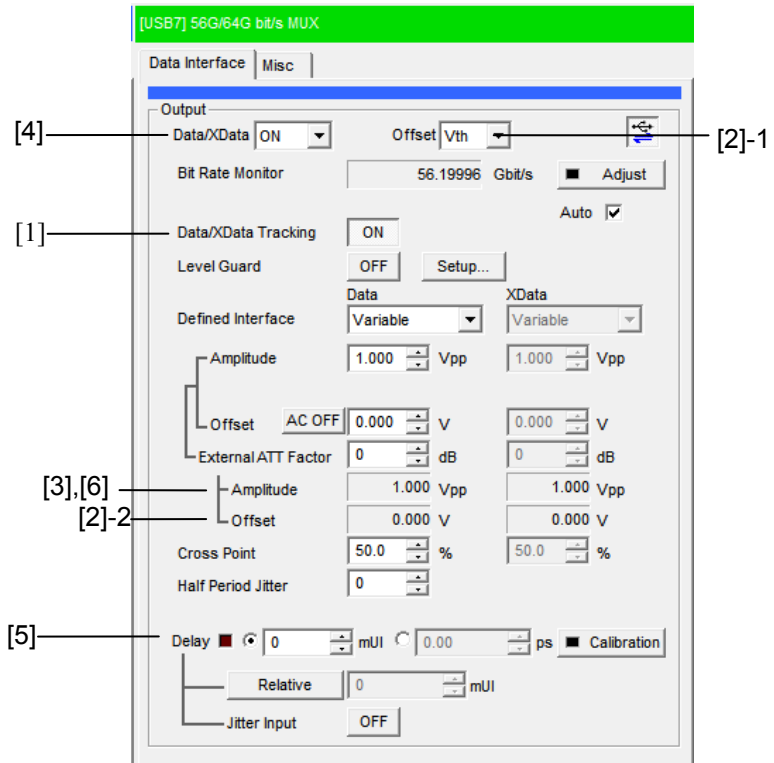
**Figure 3.2.5-1   Setting dialog box for MP1861A**

Setting Amplitude and Gain (MP1861A)

[1]   Select **Data Input** tab of CH1, and set **Tracking** to **ON**. Set CH2 in the same manner.

[2]   Set **Offset** to **Vth**.
Set **Offset** value to 0.000 V. Set CH 2 in the same manner.

[3]   Set **Amplitude** of CH1 to 2.0 Vp-p. Set **Amplitude** of CH2 to 1.0 Vp-p.

[4]   Set **Data/XData** in Data Interface tab to **ON**. Then set **Output** of module function to **ON**. Verify that the MP1861A Adjust is operating here.

[5]   Combine the bit phase between the two MP1861As.

By checking the waveform on the sampling oscilloscope, adjust the Delay value in the Data Interface tab of CH2 so that the waveform is at a NRZ not covered by the emphasis. The adjustment range here is approximately ±5000 mUI. Shift the phase by 1000 mUI from this state to create a waveform covered by Emphasis.

[6]   Set Emphasis Gain and Eye Amplitude. Emphasis Gain and Eye Amplitude are calculated using the following equation.

Eye Amplitude = (CH1 Amplitude − CH2 Amplitude)×$10^{-16/20}$

$$\text{Emphasis Gain} = 20\log_{10}\left(\frac{\text{CH1 Amplitude}+\text{CH2 Amplitude}}{\text{CH1 Amplitude}-\text{CH2 Amplitude}}\right)$$

3.3   Control Software

For using the MZ1834A, MZ1834B, MZ1838A or MZ1854A in connection with the 32G PPG or 64G MUX, we provide control software to facilitate setting of PAM signal amplitude. For details, go to Anritsu homepage (http://www.anritsu.com), select your region, and access the software download service in the library of the Signal Quality Analyzer MP1800A.

4   Storage Precautions

Wipe dust, fingerprints, stains, spots, etc., from the surface of the
MZ1834A, MZ1834B, MZ1838A and MZ1854A before storing it.

Avoid storing the MZ1834A, MZ1834B, MZ1838A and MZ1854A:

- In direct sunlight for extended periods
- Outdoors
- In excessively dusty locations
- Where condensation may occur
- In liquids, such as water, oil, or organic solvents, and medical fluids,
  or places where these liquids may adhere
- In salty air or in place chemically active gases (sulfur dioxide,
  hydrogen sulfide, chlorine, ammonia, nitrogen dioxide, or hydrogen
  chloride etc.) are present
- Where toppling over may occur
- In the presence of lubricating oil mists
- In places at an altitude of more than 2,000 m
- In the presence of frequent vibration or mechanical shock, such as in
  cars, ships, or airplanes
- Where temperature range and relative humidity exceed –20° to 60°C
  and 90%, respectively

Recommended storage conditions
The MZ1834A, MZ1834B, MZ1838A and MZ1854A should be stored in a
place that meets the ambient conditions above, plus the following
conditions if it is not to be used for a long time:

- Temperature   15 to 35°C
- Humidity   40 to 80%
- Slight daily fluctuation in temperature and humidity

5   Transport and Disposal

The following describes precautions for transport and disposal of the MZ1834A, MZ1834B, MZ1838A and MZ1854A.

Repackaging

Repack the MZ1834A, MZ1838A or MZ1854A in the original packing material (box) in which it was delivered.

If the packing material has been thrown away or damaged, repack the MZ1834A, MZ1834B, MZ1838A and MZ1854A as follows:

1.   Obtain a corrugated cardboard, wooden, or aluminum box large enough to pack shock-absorbing cushioning material around the MZ1834A, MZ1834B, MZ1838A or MZ1854A.

2.   Cover the connectors with protective materials such as foamed polystyrene to avoid damaging the connector pins.

3.   Wrap the MZ1834A, MZ1834B, MZ1838A or MZ1854A in plastic or a similar material to protect against water droplets, rain, and dust.

4.   Put the MZ1834A, MZ1834B, MZ1838A or MZ1854A in the box.

5.   Pack the cushioning material around the MZ1834A, MZ1838A or MZ1854A so it cannot move in the box.

6.   Close and secure the outside of the box with packing cord, adhesive tape, bands, or other similar materials.

Transport

Avoiding vibrations as much as possible and meet the recommended storage conditions during transport.

Disposal

When disposing the MZ1834A, MZ1834B, MZ1838A or MZ1854A, check with your local solid waste officials for details in your area for recycling options or proper disposal.

Appendix A   Specifications

Table A-1   Specifications for MZ1834A 4PAM Converter

Items	Specification	Comment
Data Output		
Number of outputs	2 (Data, XData)	Differential
Modulation	PAM4	PAM 0-3 level
Amplitude	0.238 to 0.475 Vp-p (MU18302xA-012) 0.238 to 0.832 Vp-p (MU18302xA-013)	0-3 level
Connector	K (female)	
Data Input*		
Number of inputs	4 (Data1, XData1, Data2, XData2)	Differential It is recommend to use J1359A coaxial adaptors to protect the connectors.
Amplitude	0.5 to 3.5 Vp-p	
Connector	K (male)	
Insertion Loss	–16 dB (nominal)	Data input to Data output
Environmental performance		
Operating Temperature	15 to 35°C	MU18302xA ambient temperature
Storage Temperature	–20 to 60°C	
Mass	2 kg max.	
Dimensions	20.4 (H) × 92.2 (W) × 121.7 (D) mm	Excluding protrusions

*:   When connecting MZ1834A to 32 PPG, tighten the 4 connectors using a torque wrench, evenly in small increments. If the connectors are tightened unevenly, the connectors may be damaged due to stress.

Table A-2　Specifications for MZ1834B 4PAM Converter

Items	Specification	Comment
Data Output		
Number of outputs	2 (Data, XData)	Differential
Modulation	PAM4	PAM 0-3 level
Amplitude	0.376 to 0.753 Vp-p (MU18302xA-012) 0.376 to 1.318 Vp-p (MU18302xA-013)	0-3 level
Waveform Distortion	≤ 10%	0-3 level A repeating pattern of "1" and "0" for 8 bits each.
Connector	K (female)	
Data Input		
Number of inputs	4 (Data1, XData1, Data2, XData2)	Differential It is recommend to use J1359A coaxial adaptors to protect the connectors.
Amplitude	0.5 to 3.5 Vp-p	
Connector	K (male)	
Insertion Loss	−12 dB (nominal)	Data input to Data output
Environmental performance		
Operating Temperature	15 to 35°C	MU18302xA ambient temperature
Storage Temperature	−20 to 60°C	
Mass	2 kg max.	
Dimensions	20.4 (H) × 92.2 (W) × 121.7 (D) mm	Excluding protrusions

*:　When connecting MZ1834B to 32 PPG, tighten the 4 connectors using a torque wrench, evenly in small increments. If the connectors are tightened unevenly, the connectors may be damaged due to stress.

Table A-3   Specifications for MZ1838A 8PAM Converter

Items	Specification	Comment
Data Output		
Number of outputs	2 (Data,XData)	Differential
Modulation	PAM8	PAM8 0-7 level
Amplitude	0.139 to 0.441 Vp-p (MU18302xA-012) 0.139 to 0.772 Vp-p (MU18302xA-013)	0-7 level
Connector	K (female)	
Data Input*		
Number of inputs	6 (Data1, XData1, Data2, XData2, Data3, XData3)	Differential It is recommend to use J1359A coaxial adaptors to protect the connectors.
Amplitude	0.5 to 3.5 Vp-p	
Connector	K (female)	
Insertion Loss	Data1: –16 dB Data2: –24 dB Data3: –28 dB (nominal)	Data input to Data output
Environmental performance		
Operating Temperature	15 to 35°C	MU18302xA ambient temperature
Storage Temperature	–20 to 60°C	
Mass	3 kg max.	
Dimensions	40 (H) × 96.8 (W) × 181.2 (D) mm	Excluding protrusions

*:   When connecting MZ1838A to 32 PPG, tighten the 6 connectors using a torque wrench, evenly in small increments. If the connectors are tightened unevenly, the connectors may be damaged due to stress.

Table A-4   Specifications for MZ1854A Data Signal Combiner

Items	Specification	Comment
Data Output		
Number of outputs	2 (Data, XData)	Differential
Modulation	PAM4	PAM4 0-3 level
Amplitude	0.238 to 0.594 Vp-p (MP1861A-011) 0.238 to 0.832 Vp-p (MP1861A-013)	0-3 level
Connector	V (female)	
Data Input*		
Number of inputs	4 (Data1, XData1, Data2, XData2)	Differential It is recommend to use J1708A coaxial adaptors to protect the connectors.
Amplitude	0.5 to 3.5 Vp-p	
Connector	V (male)	
Insertion Loss	–16 dB (nominal)	Data input to Data output
Environmental performance		
Operating Temperature	15 to 35°C	MP1861A ambient temperature
Storage Temperature	–20 to 60°C	
Mass	2 kg max.	
Dimensions	104.7(H) × 60.2(W) × 23.5 (D) mm	Excluding protrusions

*:   When connecting MZ1854A to 64G MUX, tighten the 4 connectors using a torque wrench, evenly in small increments. If the connectors are tightened unevenly, the connectors may be damaged due to stress.