

MP1825B 4Tap Emphasis Operation Manual

20th Edition

- For safety and warning information, please read this manual before attempting to use the equipment.
- Additional safety and warning information is provided in the MP1800A Signal Quality Analyzer Installation Guide. Please also refer to it 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.

MP1825B
4Tap Emphasis
Operation Manual

15 April 2011 (First Edition)
6 April 2018 (20th Edition)

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The contents of this manual may be changed without prior notice.

Printed in Japan

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.
 - Overvoltage Category
This instrument complies with overvoltage category II defined in IEC 61010. DO NOT connect this instrument to the power supply of overvoltage category III or IV.
-

For Safety

WARNING

Electric Shock

- To ensure that the equipment is grounded, always use the supplied 3-pin power cord, and insert the plug into an outlet with a ground terminal. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock or causing damage to the internal components.

Repair



- Only qualified service personnel with a knowledge of electrical fire and shock hazards should service this equipment. This equipment cannot be repaired by the operator. DO NOT attempt to remove the equipment covers or unit covers or to disassemble internal components. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

Calibration



- The performance-guarantee seal verifies the integrity of the equipment. To ensure the continued integrity of the equipment, only Anritsu service personnel, or service personnel of an Anritsu sales representative, should break this seal to repair or calibrate the equipment. Be careful not to break the seal by opening the equipment or unit covers. If the performance-guarantee seal is broken by you or a third party, the performance of the equipment cannot be guaranteed.

Falling Over

- This equipment should always be positioned in the correct manner. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.
Always set up the equipment in a position where the power switch can be reached without difficulty.

For Safety

CAUTION

Cleaning

- Always remove the main power cable from the power outlet before cleaning dust around the power supply and fan.
 - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
 - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

Check Terminal



- Never input a signal of more than the indicated value between the measured terminal and ground. Input of an excessive signal may damage the equipment.

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 will repair this equipment free-of-charge if a malfunction occurs within one year after shipment due to a manufacturing fault. However, software fixes will be made in accordance with the separate Software End-User License Agreement. Moreover, Anritsu Corporation will deem this warranty void when:

- 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 of 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 PDF version.

Crossed-out Wheeled Bin Symbol

Equipment marked with the Crossed-out Wheeled Bin Symbol complies with council directive 2012/19/EU (the “WEEE Directive”) in European Union.



For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

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 - iii) Recovery of lost or damaged data.
 - iv) If this Software or the Equipment has been modified, repaired, or otherwise altered without Anritsu's prior approval.
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6. Reparations

If Anritsu suffers any loss, financial or otherwise, due to your violation of the terms of this EULA, Anritsu shall have the right to seek proportional damages from you.

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Upon termination of this EULA in accordance with item 5, you shall cease all use of this Software immediately and shall as directed by Anritsu either destroy or return this Software and any backup copies, full or partial, to Anritsu.

8. Dispute Resolution

If matters of dispute or items not covered by this EULA arise, they shall be resolved by negotiations in good faith between you and Anritsu.

9. Court of Jurisdiction

This EULA shall be interpreted in accordance with Japanese law and any disputes that cannot be resolved by negotiation described in Article 8 shall be settled by the Japanese courts.

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.

Cautions against computer virus infection

- Copying files and data
Only files that have been provided directly from Anritsu or generated using Anritsu equipment should be copied to the instrument.
All other required files should be transferred by means of USB or CompactFlash media after undergoing a thorough virus check.
- Adding software
Do not download or install software that has not been specifically recommended or licensed by Anritsu.
- Network connections
Ensure that the network has sufficient anti-virus security protection in place.

RCM Conformity Marking

Anritsu affixes the RCM marking on the following product(s) in accordance with the regulation to indicate that they conform to the EMC framework of Australia/New Zealand.

RCM marking



1. Product Model

Model: MP1825B 4Tap Emphasis

2. Applied Directive and Standards

EMC: Emission: EN 61326-1: 2013 (Class A equipment)

About This Manual

A testing system combining an MP1800A Signal Quality Analyzer or MT1810A 4-Slot Chassis mainframe, module(s), and control software is called a Signal Quality Analyzer Series. The operation manuals of the Signal Quality Analyzer Series consist of separate documents for the installation guide, the mainframe, remote control operation, module(s), and control software, as shown below.

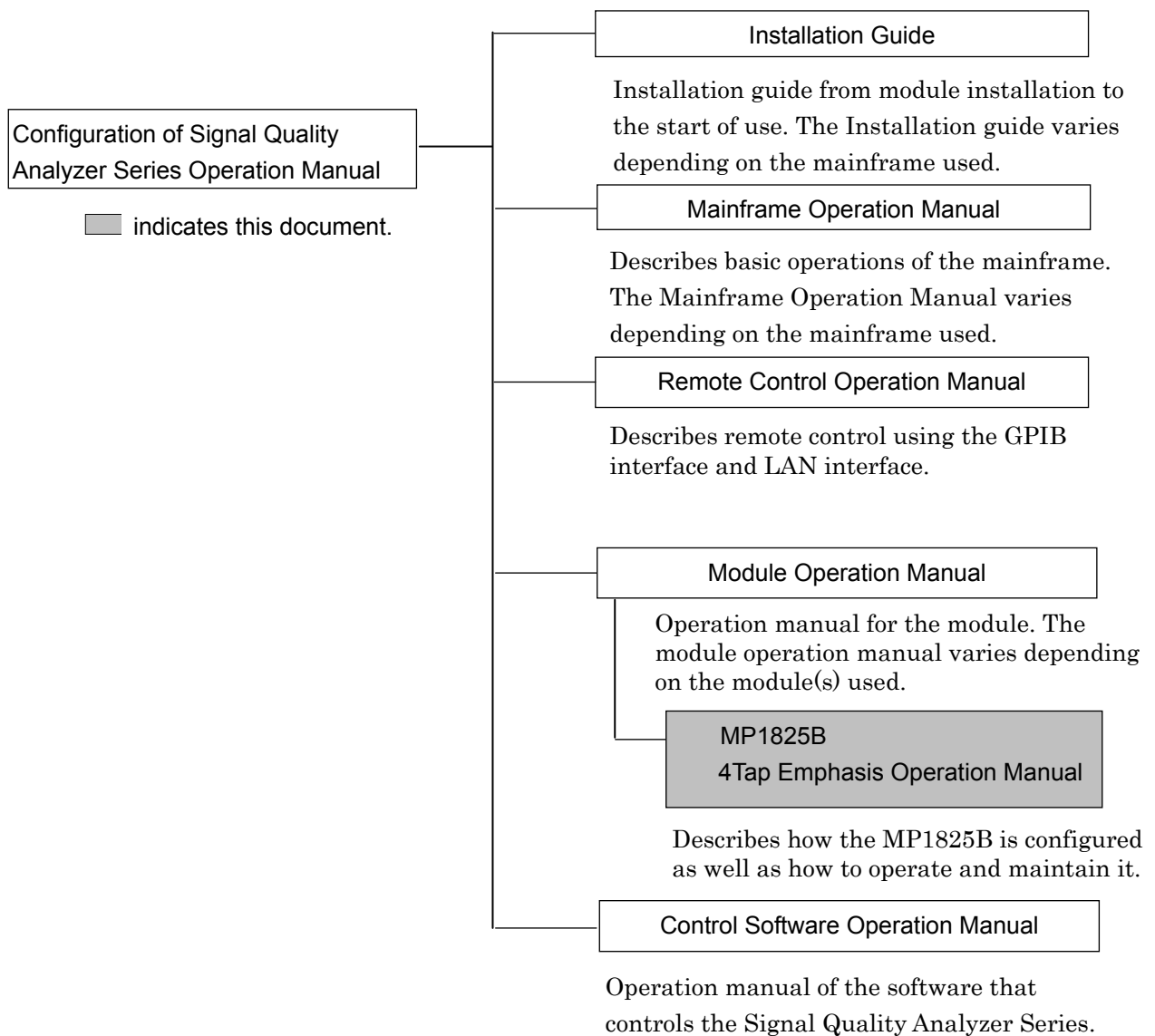


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Chapter 1 Overview

This chapter provides an overview of the MP1825B 4Tap Emphasis (MP1825B hereafter).

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1.1 Product Overview

MP1825B 4Tap Emphasis generates Emphasis waveform for input signal waveform. The generated waveform supports various standards. The MP1825B 4Tap Emphasis is used in combination with the Signal Quality Analyzer main frame and plug-in modules.

The waveform amplitude and form are easily edited using a simple graphical user interface (GUI).

Use

- For examining emphasis waveforms

In high-speed data communications, sometimes the waveform is degraded by the frequency characteristics of the transmission path. When this type of degradation occurs, normal communications are not possible if bit errors occur at the receive side or frame synchronization is lost.

Correction of the waveform at the send side to cancel out waveform distortions of the transmission path is called "emphasis".

A waveform with the appropriate emphasis can be transmitted normally via the transmission path despite the occurrence of distortion.

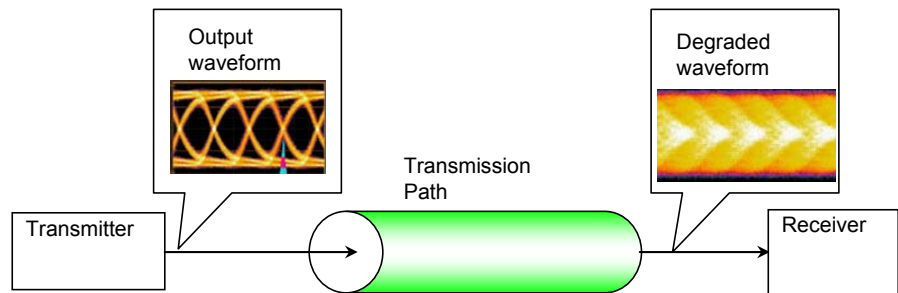


Figure 1.1-1 Degraded waveform caused by transmission path

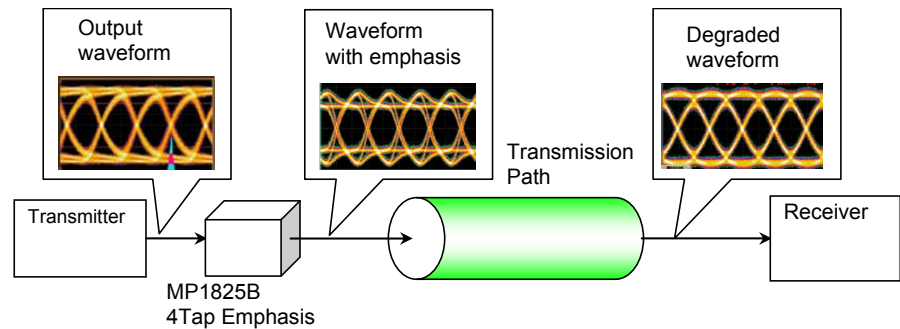


Figure 1.1-2 Waveform Corrected by MP1825B

Combining this instrument with a BERTS (Bit Error Rate Test Set) supports setting of emphasis to control the effect of intersymbol interference (ISI) caused by the transmission path frequency characteristics and to adjust emphasis settings that reduce bit error rates.

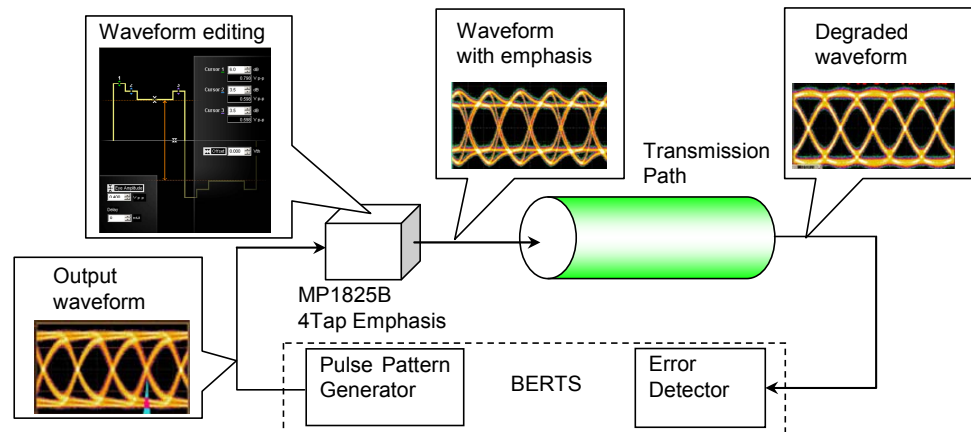


Figure 1.1-3 Evaluation of Waveform with Emphasis

- Evaluating receiver characteristics

The waveform amplitude is changed by the MP1825B to investigate how much waveform degradation the receiver can tolerate.

Using two instruments supports evaluation of crosstalk tolerance between receiver signals by changing the skew.

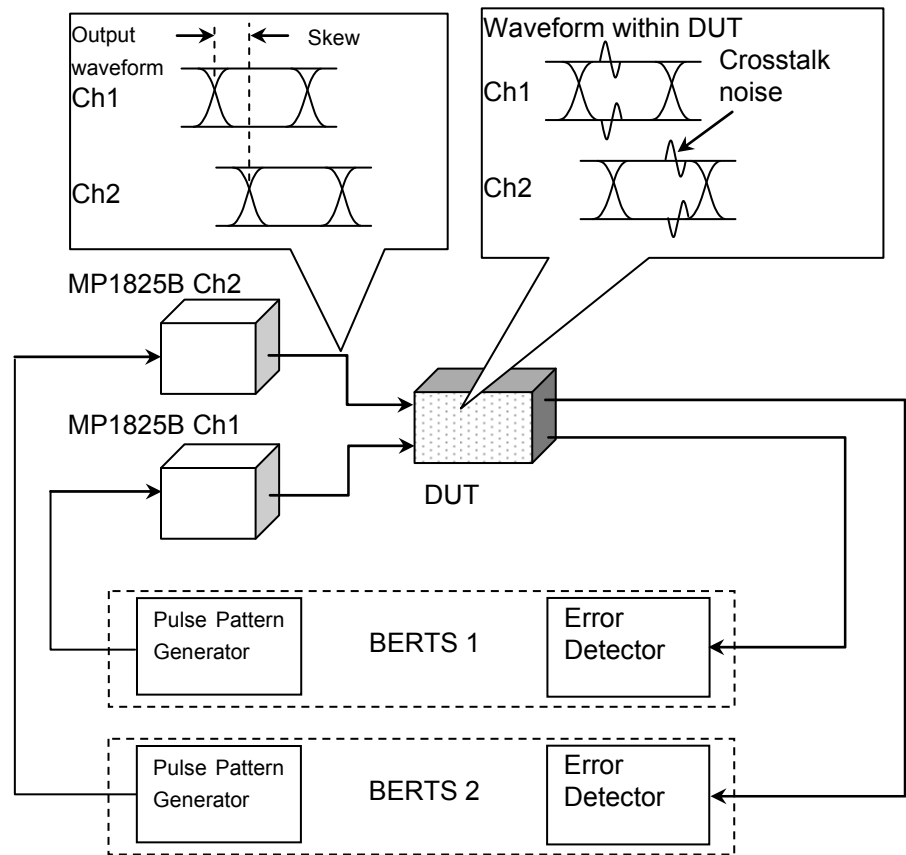


Figure 1.1-4 Crosstalk Tolerance Evaluation Method

Features

- Generates 4 tap emphasis signal for maximum operation bit rates of 14.05G (Opt-01) and 28.1G (Opt-02).
- Generates 4 tap emphasis signal for maximum operation bit rates of 32.1G (Opt-06).
- Easy setting as follows using simple GUI
 - Select emphasis waveform creation format
 - Tap amplitude (dB, Vp-p and % are switchable.)
 - Switching between Pre-Emphasis and De-Emphasis.
- Excellent jitter transfer characteristics by generating emphasis using jitter identification circuit
- Easy connection with DUT due to compact size
- Easy skew and differential skew variation between two channels of DUT by controlling two MP1825B units (requires Opt-x03 and Opt-x04)
- Emphasis generation by connecting MP1800A Signal Quality Analyzer built-in PPG and MUX, or other makers' PPG

1.2 Product Composition

1.2.1 Standard configuration

Table 1.2.1-1 shows the standard composition of the MP1825B.

Table 1.2.1-1 Standard Configuration (MP1825B)

Item	Model/Symbol	Name	Quantity	Remarks
Main frame	MP1825B	4Tap Emphasis	1	
Accessories	J1137	Terminator	3	SMA connector Data Output, Data Output, Clock Buffer Output
	J1341A	Open	2	Data Input, Clock Input
	J1359A	Coaxial Adaptor (K-P, K-J, SMA)	2	Data Output, Data Output
	J1475A	USB Cable	1	
	J1507A*	Semi-rigid coaxial cable	1	For connection between Doubler Output-Clock Input
	J1359A*	Coaxial Adaptor (K-P, K-J, SMA)	1	Data Input
	J1615A	Coaxial Cable set (Jitter-PPG-Emphasis)	1	Cable set for jitter tolerance measurement
	Z1312A	AC Adapter	1	
		Power cord, 2.5 M	1	
	Z0897A	MP1800A Manual CD	1	CD-ROM
	Z0918A	MX180000A Software CD	1	CD-ROM

*: Only supplied to Option x02.

Connecting the J1507A installs the J1341A for Doubler Input.

1.2.2 Options

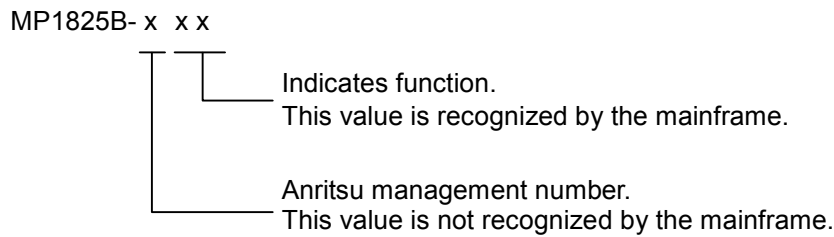
Table 1.2.2-1 shows the options for the MP1825B. They are sold separately.

Table 1.2.2-1 MP1825B Options

Model Name	Name	Remarks
MP1825B-x01	14 Gbit/s Operation	Select either x01 or x02.
MP1825B-x02	28 Gbit/s Operation	
MP1825B-x03	14 Gbit/s Variable Data Delay	This can be added when x01 is selected.
MP1825B-x04	28 Gbit/s Variable Data Delay	This can be added when x02 is selected.
MP1825B-x05*	14.1 Gbit/s Extension	This can be added when x01 is selected.
MP1825B-x06	32.1 Gbit/s Extension	This can be added when x02 is selected.

Note:

Option name format is as follows:



*: Notes on MP1825B-005 Option Model Display

The model number and name of the MP1825B-005 option are located on the top panel of the module. Although the Option screen of the software shows “MP1825B-01 (14Gbit/s Operation)”, the operation is guaranteed at a bit rate between 1.0 and 14.1 Gbit/s.

1.2.3 Applicable parts

Table 1.2.3-1 shows the application parts for the MP1825B. They are sold separately.

Table 1.2.3-1 Applicable Parts

Model/Symbol	Name	Remarks
J1342A	Coaxial Cable 0.8 m	APC 3.5 mm connector
J1625A	Coaxial Cable 1.0 m	SMA connector
J1349A	Coaxial Cable 0.3 m	SMA connector
J1439A	Coaxial cable, (0.8 m, K connector)	K connector
J1359A	Coaxial Adaptor (K-P, K-J, SMA)	K connector
J1550A	Coaxial skew match cable (0.8m, APC3.5 connector)	APC 3.5 mm connector, Pair cable
J1551A	Coaxial skew match cable (0.8m, K connector)	K connector, Pair cable
J1611A	Coaxial cable (1.3m, K connector)	K connector
J1741A	Fixed Electrical Length Coaxial Cable (0.8 m, K Connector)	K connector
J1615A*	Coaxial Cable set (Jitter-PPG-Emphasis)	Cable set for jitter tolerance measurement
J1618A*	Coaxial Cable set (Jitter-2chPPG-Emphasis)	Cable set for jitter tolerance measurement
J1620A	Coaxial Cable (0.9 m K Connector)	K connector
W3482AE	Operation Manual	Printed version
Z0306A	Wrist Strap	
J1678A	ESD Protection Adapter-K	K connector

*: For examples of how to connect instruments with coaxial cables, refer to Appendix B.

1.3 Specifications

Table 1.3-1 MP1825B Specifications

Item		Specifications
Operating bit rate		Opt-x01: 1 to 14.05 Gbit/s Opt-x02: 1 to 28.1 Gbit/s* ¹ 8 to 28.1 Gbit/s* ² Opt-x05: 1 to 14.1 Gbit/s Opt-x06: 1 to 32.1 Gbit/s* ¹
Data Output* ³	Number of Output	2 (Data, $\overline{\text{Data}}$)
	Emphasis Settings	When set to Pre-Emphasis: a) 2Post-cursor, 1Pre-cursor b) 3Post-cursor c) 1Post-cursor, 1Pre-cursor d) 2Post-cursor e) 1Post-cursor f) Rev. 3Post-cursor g) 2Pre-cursor h) 1Post-cursor, 2Pre-cursor When set to De-Emphasis: a) 1Post-cursor, 1Pre-cursor
	Emphasis Settings Peak Voltage	0.10 to 1.5 V _{p-p} (single end)
	Eye Amplitude Step Accuracy	0.10 to 1.0 V _{p-p} (single end) 2 mV _{p-p} ±50 mV ±17%* ⁴
	Offset* ⁵ Step Accuracy	-1.0 to +1.0 V 1 mV ±65 mV ±10% of Offset voltage ±EYE Amplitude accuracy/2
	Cursor 1 emphasis	-20 to +20 dB* ⁶ , 0.1 dB step
	Cursor 2 emphasis	-20 to +20 dB* ⁶
	Cursor 3 emphasis	-20 to +20 dB* ⁶

*1: When Full Rate Clock is set at Clock Input Band without using Doubler

*2: When Half Rate Clock is set at Clock Input Band with using Doubler

*3: As specified at PRBS 2³¹-1, Mark Ratio 1/2
Observed value when using 50-GHz band sampling scope with J1439A connected by coaxial cable (0.8 m, K connector)

*4: Emphasis setting: 2Post-cursor, 1Pre-cursor waveform standard
For 14.05 Gbit/s (Opt-01/x05), or 28.1 Gbit/s (Opt-02)

*5: Threshold voltage (V_{th})

$$*6: 20 \log \left(\frac{\text{Voltage_at_Cursor}}{\text{Eye_Amplitude}} \right)$$

Table 1.3-1 MP1825B Specifications (Cont'd)

Item	Specifications	
Data Output *3 (Cont'd)	Rising/falling time	Option x01: ≤ 25 ps*7, *8, *11, 20 ps (Typical) Option x05: ≤ 25 ps*7, *11, *15, 20 ps (Typical) Option x02: ≤ 16 ps*7, *9, *11, 12 ps (Typical) Option x06: ≤ 16 ps*7, *11, *16, 12 ps (Typical)
	Jitter (Peak – Peak)	8 ps p-p *4, *10 (Typical)
	Waveform Distortion (0-peak)	Option x01: ≤ 25 mV + 20% of EYE Amplitude*8, *11, *13, 25 mV +15% of EYE Amplitude (Typical) Option x05: ≤ 25 mV + 20% of EYE Amplitude*11, *13, *15, 25 mV +15% of EYE Amplitude (Typical) Option x02: ≤ 25 mV + 19% of EYE Amplitude*9, *11, *13, 25 mV +14% of EYE Amplitude (Typical) Option x06: ≤ 25 mV + 19% of EYE Amplitude*11, *13, *16, 25 mV +14% of EYE Amplitude (Typical)
	Output Control	On/Off switching
	Variable Data Delay*12	Opt-x01 + x03: 1 to 14.05 Gbit/s Opt-x01 + x03 + x05: 1 to 14.1 Gbit/s Opt-x02 + x04: 8 to 28.1 Gbit/s
	Setting Range	-1000 to +1000 mUI When synchronized with MU181020A/B: 1 mUI Step When synchronized with MU182020A/MU182021A/MU183020A/MU183021A: 2 mUI Step
	Accuracy	50 mUIp-p (Typical)
Display unit	mUI, ps	
Calibration	Calibration by instructions from screen	
Relative 0	Sets relative phase error display to 0 by instructions from screen	
Termination	50 Ω /AC coupling AC ON/OFF switching	
Connector	K (f.)	

*7: Amplitude ≥ 0.5 Vp-p, 20% to 80% level

*8: At 14.05 GHz

*9: At 28.1 GHz

*10: At initial setting, Using oscilloscope with residual jitter of less than 0.2 ps (rms)

*11: Emphasis Function setting: OFF

*12: With addition of Opt-x03 or Opt-x04

*13: Temperature +20 to +30°C

*14: Bit rate ≥ 1 Gbit/s, PRBS2²³-1 pattern

*15: At 14.1 GHz

*16: At 32.1 GHz

Table 1.3-1 MP1825B Specifications (Cont'd)

Item		Specifications
Data Input	Input Amplitude	0.4 to 1.2 Vp-p
	Peak Input Voltage	High level (max.) 0.8 V Low level (min.) -1.2 V
	Termination*14	50 Ω/GND, AC coupling
	Connector	SMA (f.)*17 K (f.)*18
Clock Input	Frequency	Opt-x01: 1 to 14.05 GHz Opt-x02: 1 to 28.1 GHz Opt-x05: 1 to 14.1 GHz Opt-x06: 1 to 32.1 GHz
	Input Amplitude	Opt-x01/ x02/ x05: 0.25 to 1.0 Vp-p Opt-x06: 0.3 to 1.0 Vp-p
	Data/Clock Adjustment*19, *20	Auto/Manual/Auto (Low Amp.) Manual phase adjustment range: -1 to + 1UI
	Termination	50 Ω/AC coupling
	Connector	SMA(f.)*17 K (f.)*18
Data Clock Phase Margin		550 mUI or more*21
Clock Buffer Output	Frequency	Opt-x01: 1 to 14.05 GHz (Buffer output for Clock input) Opt-x02: 4 to 14.05 GHz (Buffer output for Doubler input) Opt-x05: 1 to 14.1 GHz (Buffer output for Clock input)
	Output Amplitude*22	0.4 to 1.0 Vp-p
	Termination	50 Ω/AC coupling
	Connector	SMA (f.)

*17: Option x01 only

*18: Option x02 only

*19: At input of waveform with PRBS pattern; 1/2 mark ratio and 50% crosspoint from MU181020A/B, MU182020A, MU182021A, MU183020A, or MU183021A

*20: If both of the following conditions are met, this value can be adjusted in the range of 28.1G to 32.1Gbit/s:

- MP1825B is interworking with MU183020A or MU183021A.
- MU183020A/21A is installed together with its option x30/31.

*21: Without Opt-x03 or Opt-x04

Auto-adjust function added by Opt-x03 or Opt-x04

*22: The output amplitude cannot be changed.

Table 1.3-1 MP1825B Specifications (Cont'd)

Item		Specifications
Doubler Input*18	Frequency	4 to 14.05 GHz
	Input Amplitude	0.25 to 1.2 Vp-p
	Termination	50 Ω/AC coupling
	Connector	SMA (f.)
Doubler Input*18	Output Amplitude*22	0.4 to 1.0 Vp-p
	Termination	50 Ω/AC coupling
	Connector	K(f.)
Channel Setting Switch		CH1/CH2*23
Bit Rate Monitor*24		±100 ppm
USB Interface		USB 2.0 or 1.1 Type B×1
Power Supply	Voltage	AC 100 to 240 V*25
	Frequency	50 to 60 Hz
	Power Consumption	≤100 W
Dimensions		90.9 mm (H) × 120 mm (W) × 140 mm (D) (Excluding protrusions)
Mass		≤ 5 kg
Operating Environment	Operating Temperature	+15 to +35°C
	Storage Temperature	-20 to +60°C

*23: Setting at rear-panel switch

*24: Displayed at Main Application screen

*25: Operating voltage: within the range of +10% to -15% from the rated voltage

Chapter 2 Before Use

This chapter describes preparations required before using the MP1825B.

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2.1 Preparation

This section explains the installation position of the main frame and how to turn on the power.

2.1.1 Installation Environment

 **CAUTION**

The MP1825B operates in the temperature range from 15 to 35°C. Avoid using it under any of the following environment conditions that may cause failure.

- In places of direct sunlight
- In dusty places
- Outdoors
- In liquids, such as water, oil, 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 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

Condensation may form inside the MP1825B if it is moved to a warm location after operating for a long time in a cold location. In such a case, always wait until the MP1825B becomes completely dry before turning on the power. If the MP1825B is switched on while there is condensation inside it, damage may be caused by a short circuit.

2.1.2 Distance from surrounding objects

A cooling fan is provided on the sides of the MP1825B. Install the MP1825B at least 10 cm away from walls, peripheral devices, or the like to prevent blockage of ventilation. Insufficient ventilation may cause the internal temperature to rise, resulting in failure.

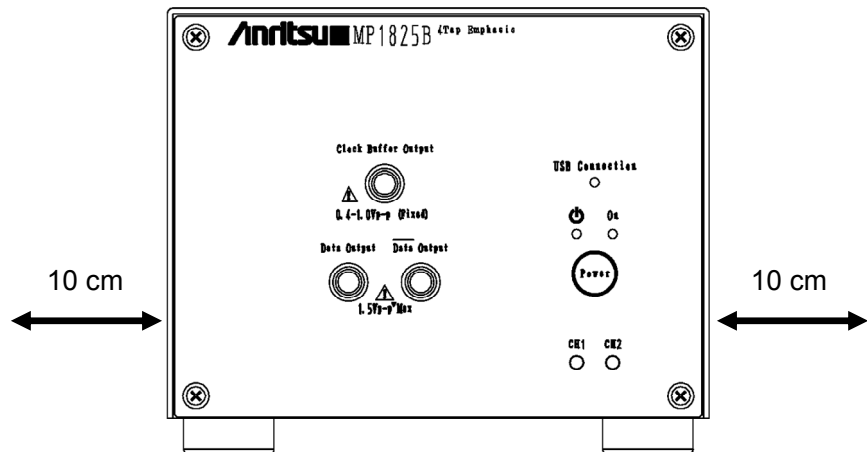


Figure 2.1.2-1 Distance from surrounding objects

2.2 Explanation of Panels

2.2.1 Front panel

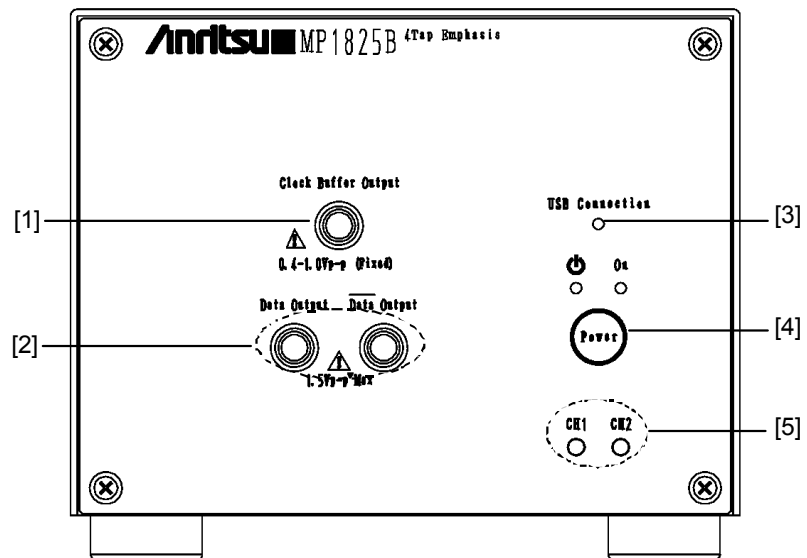


Figure 2.2.1-1 MP1825B front panel

Table 2.2.1-1 Name and Function of MP1825B Front Panel Parts

No.	Name	Explanation
[1]	Clock Buffer Output	Option x01: Outputs same clock frequency as clock input to Clock Input connector on back panel. Option x02: Outputs same clock frequency as clock input to Doubler Input connector on back panel.
[2]	Data Output Data Output	Outputs emphasized differential data signal.
[3]	USB Connection	Indicate status of connection between MP1825B and MP1800A or PC controller. The LED flashes when the MP1825B is connected.
[4]	Power Switch	Switches power between ON and Standby. When the AC adapter and power cable are connected, the LED is lit orange to indicate the Standby status, and green to indicate ON.
[5]	Channel display	Lights main-frame channel number lamp.

Note:

The channel number identifies the MX180000A Signal Quality Analyzer control software (MX180000A hereafter) when the main frame and MP1800A or PC are connected by USB.

During control from the MX180000A, the channel number displayed at the MX180000A does not change even when the back-panel channel setting switch is changed.

2.2.2 Rear panel

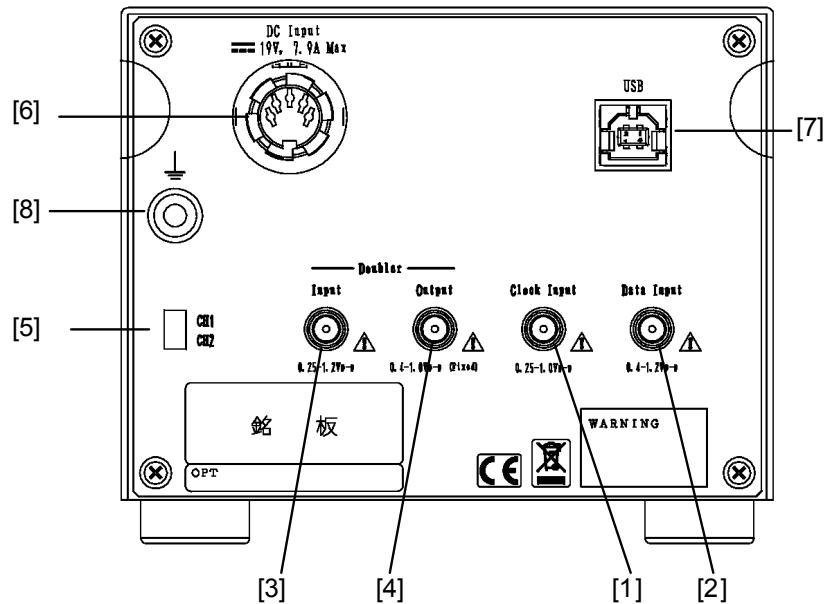


Figure 2.2.2-1 MP1825B rear panel

Table 2.2.2-1 Name and Function of MP1825B Rear Panel Parts

No.	Name	Description
[1]	Clock Input	Connector for inputting clock at same rate as data signal
[2]	Data Input	Connector for inputting data signal for generating emphasis
[3]	Doubler Input	For input of clock frequency Used when Opt-x02 installed
[4]	Doubler Output	For outputting clock frequency input to Doubler Input as 1/1 or 2/1 clock The clock multiplier is set at Clock Input Band of software. Used when Opt-x02 installed
[5]	Channel Setting Switch	Switch for setting channel number when two main frames controlled either from one MP1800A or PC controller. The channel number set by this switch is indicated by the channel lamps on the front panel.
[6]	DC Input connector	For power input Connect the AC adapter supplied as an accessory with the MP1825B. If another AC adapter is used, there is a risk of damaging the MP1825B.
[7]	USB Port	For connecting either MP1800A or PC control to MP1825B Do not connect devices other than the MP1800A or PC controller.
[8]	Frame ground	Connect a wrist strap to prevent risk of static electric charges when handling plug-in modules, etc.

2.2.3 Internal Clock Diagrams

This section explains the internal Diagram of this instrument.

This instrument has an internal delay circuit for four clock pulses. The sum of these outputs is output.

Option x02 installs a doubler for doubling the clock frequency and outputting the clock.

Adding Options x03 and x04 supports phase adjustment of the data and clock outputs.

If Option x06 is added, the operation ranges of the signal input from Data Input/Clock Input and of the emphasis signal output from Data Output in Figure 2.2.3-2 are expanded to 32.1 Gbit/s. The operation ranges of Doubler Input and Doubler Output are not expanded.

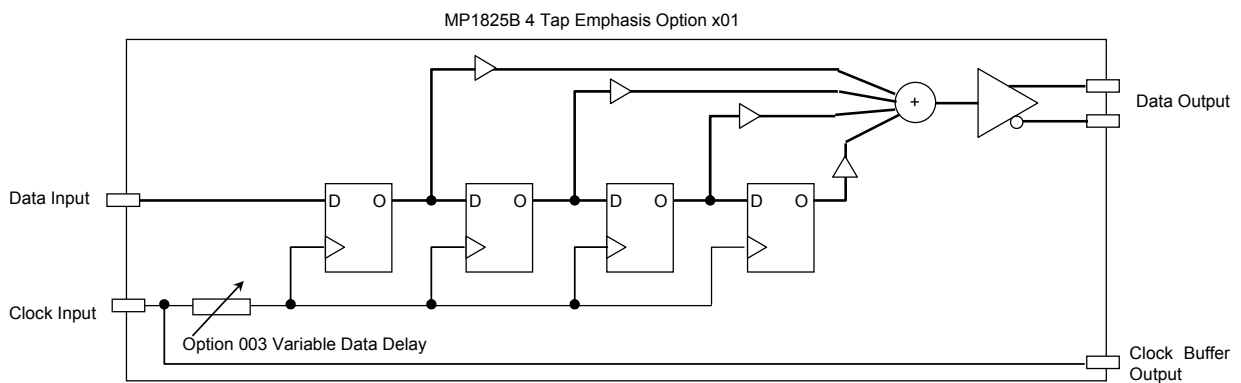


Figure 2.2.3-1 MP1825B-x01 14Gbit/s Operation Clock Diagram

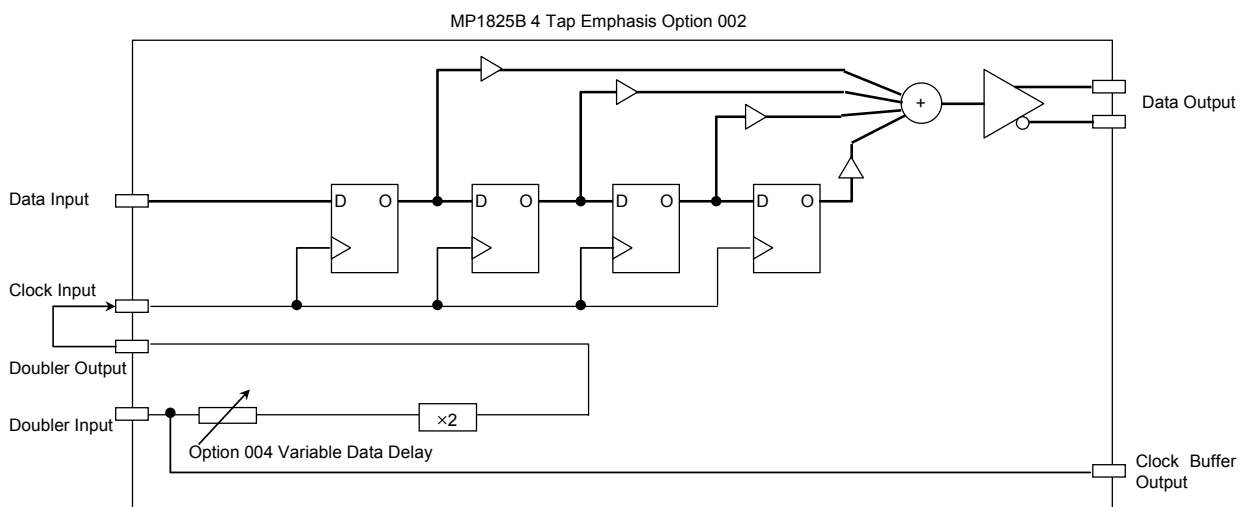


Figure 2.2.3-2 MP1825B-x02 28Gbit/s Operation Clock Diagram

2.3 Installing Software

2.3.1 Installation procedure

To use the MP1825B, it is necessary to install the accessory software in the controller.

This section explains installation in the MP1800A.

For the general software installation procedures, refer to “MP1800A Installation Guide” (W2747AE) and “MT1810A Installation Guide” (W2748AE).

- (1) When the general procedures are followed by the installer, the confirmation dialog box is displayed. Press **Yes** to start installation.

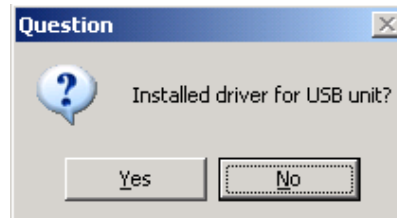


Figure 2.3.1-1 Confirmation Dialog Box of USB Driver Installation (1)

- (2) For Windows 7, a confirmation dialog box is displayed to ask if you want to install Anritsu Corporation Universal Serial BUS Controller. Click **Yes** to continue installation.
- (3) For Windows XP, Figure 2.3.1-2 is displayed when the installation is in progress. Press **Continue Anyway** to continue the installation procedures.

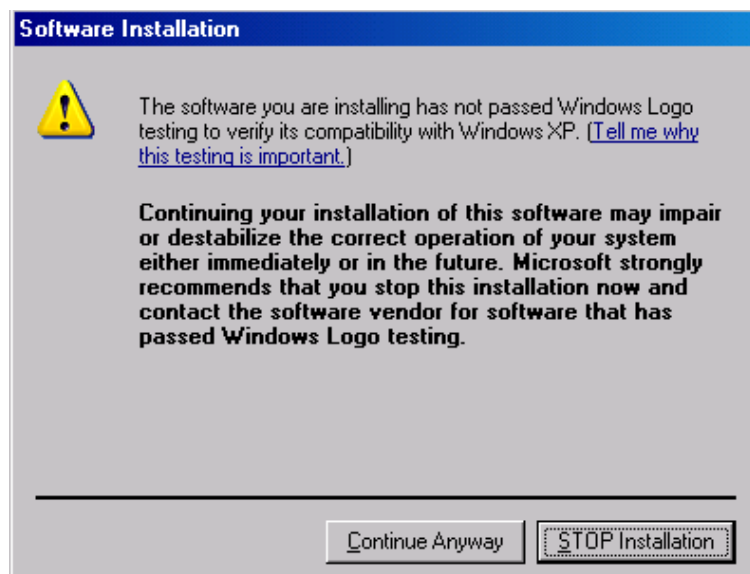


Figure 2.3.1-2 Confirmation Dialog Box of USB Driver Installation (2)

Note:

The screen as shown in Figure 2.3.1-2 may not be displayed on the front page. If software installations take a long time, check that the screen as shown in Figure 2.3.1-2 is hidden at the back of the other screen.

- (4) The following window is displayed when the installation completes normally.

Click **Finish** to end the installation procedure.

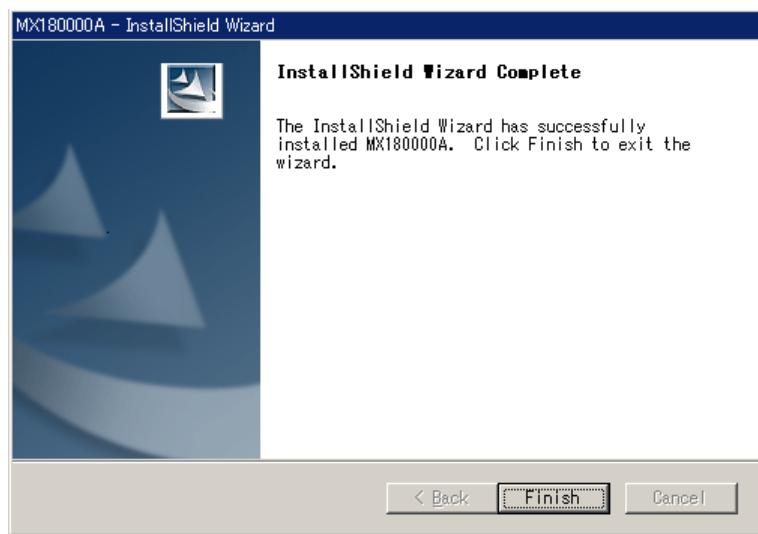


Figure 2.3.1-3 Screen when Installation Finished

When the MP1825B is connected to the MP1800A or remote PC after software installation, install the driver using the following procedures. The following example show when the MP1825B is connected to the MP1800A.

- (1) Connect the MP1800A and MP1825B using an USB cable.
For Windows 7, the driver is installed automatically.
For Windows XP, perform the step 2 to 5 to install the driver.
- (2) The Found New Hardware Wizard screen is displayed to confirm windows update. Select **No, not this time** and press **Next**.

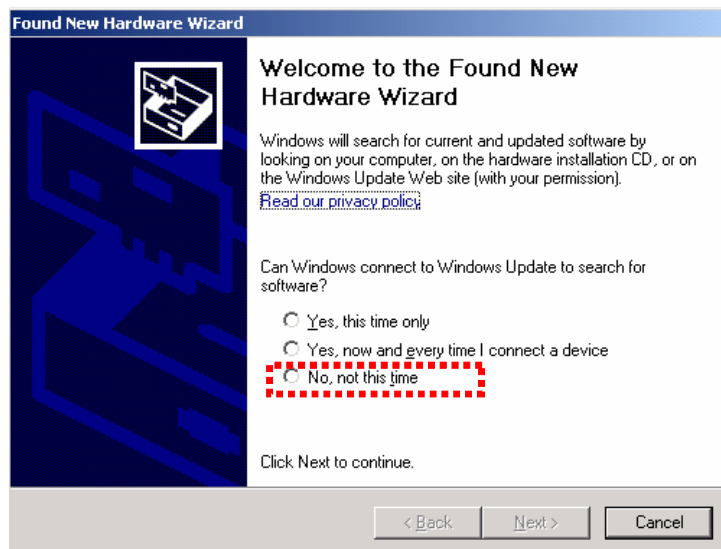


Figure 2.3.1-4 Confirmation of Windows Update

- (3) Select **Install the software automatically** and press **Next**.

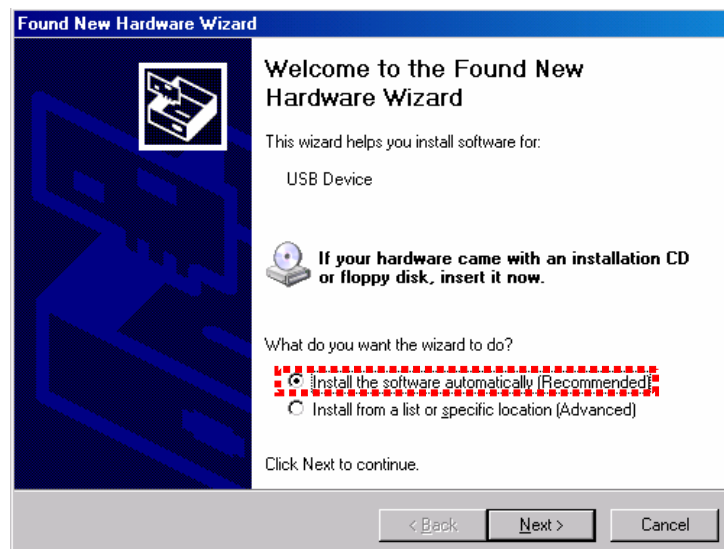


Figure 2.3.1-5 Installing software

- (4) The following screen is displayed when the hardware is found. Press **Continue Anyway** to continue the installation procedures.

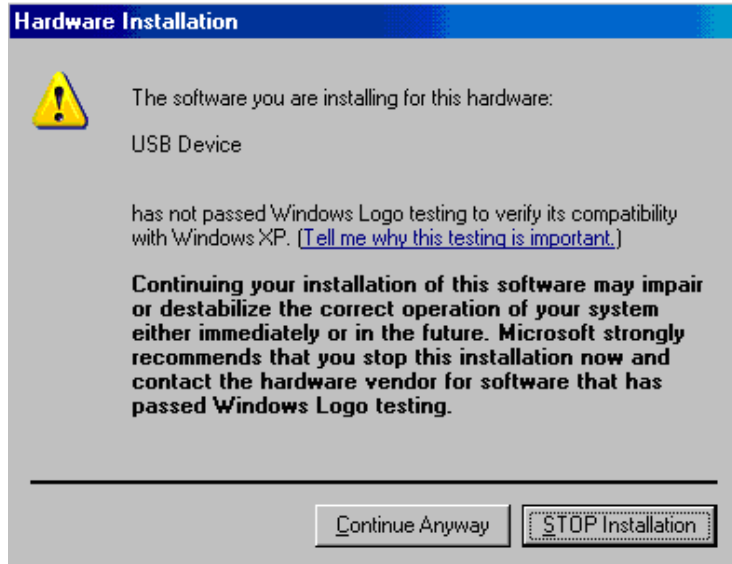


Figure 2.3.1-6 Installing hardware

- (5) Click **Finish** to end the installation procedure.



Figure 2.3.1-7 Completion of Installation

If the installed driver is no longer needed, uninstall it as follows.

- (1) Select **Start** menu → **Control Panel**, and then open the Control Panel.
- (2) Double-click **Add/Remove Programs** in the Control Panel.
- (3) Select **Anritsu USB Device Driver** from the list and click **Remove** to start the uninstallation.

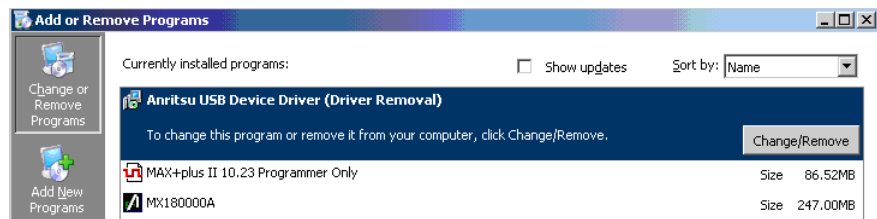


Figure 2.3.1-8 Removing USB Driver

2.3.2 Checking Software Version

Check the software version after completing installation.

Check the installed software version using the **Help** item at the Main Application menu bar or the Setup utility.

Confirming version at menu bar

1. Click **Help** at the Main Application menu bar.
2. Select **Version**. The screen shown below opens.
3. Set **Unit Information** to **USB5** or **USB6**.

MP1825B is displayed at Model Number and the software version is displayed.

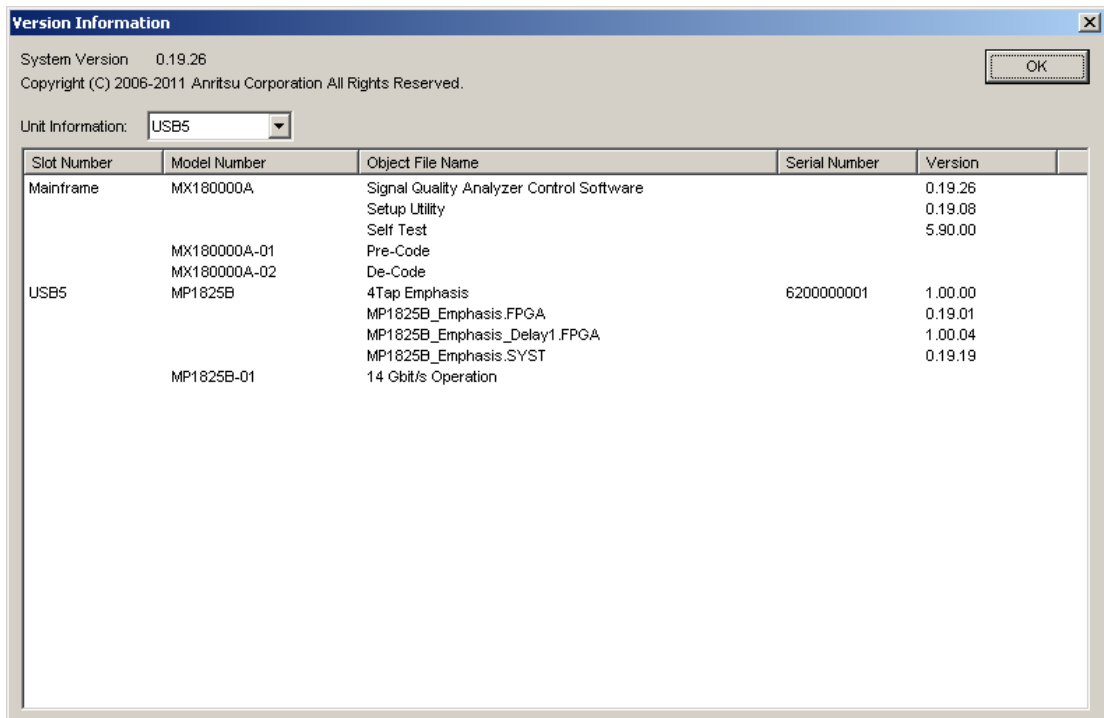


Figure 2.3.2-1 Version Information screen

Objects displayed against a yellow background at the Version Information screen indicates a version other than the installed version. In this case, update the installed software as described in section 6.2. “Software Update”.

If there is a mismatch with the built-in software version, operation may be abnormal.

Confirming version using setup utility

1. Choose **Setup utility** at the Selector screen displayed after the MX180000A is started.
2. Choose **Login – User**.
3. Click the **Version** tab to display the software version. The following screen is displayed.
4. Select **USB5** or **USB6** at the pull down menu. **MP1825B** is displayed at Model Number and the software version is displayed.

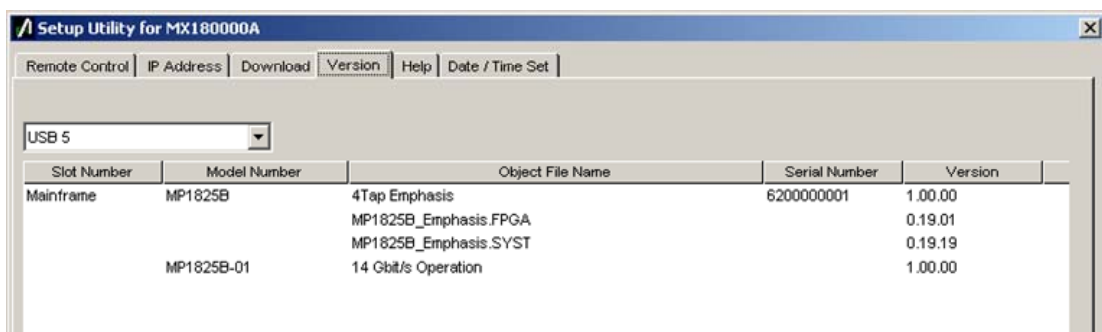


Figure 2.3.2-2 Version Information screen

Objects displayed against a yellow background on the Version Information screen indicates a version other than the installed version. In this case, update the installed software as described in section 6.2. “Software Update”.

If there is a mismatch with the built-in software version, operation may be abnormal.

2.4 Supplying Power

This section describes the procedures for supplying power.

Plug the power cord of the AC adapter into a grounded wall power socket. To ensure that the instrument is earthed, always use the supplied 3-pin power cord, and insert the plug into an outlet with a ground terminal.

 **WARNING**

If the power cord is connected without grounding the system, there is a risk of receiving a fatal electric shock. In addition, peripheral devices connected to the instrument may be damaged.

Also, avoid using electrical equipment such as an extension cord or a transformer.

2.5 Connecting Controller

The MP1825B is controlled by the controller via USB.
 Either the MP1800A or a PC can be used as the controller.
 Use the accessory USB cable to connect the controller.

2.5.1 Control PC specifications

The PC used as the controller must satisfy the following performance specifications.

Table 2.5.1-1 When OS is Windows XP

Item	Specifications
Compatibility	IBM-PC or compatible PC
CPU	Pentium4 @ ≥ 1.6 GHz
OS	Windows XP Version 2002 Service Pack 2
Memory	≥ 512 MB
Monitor Resolution	800 × 600 dots or greater resolution
Display color	≥ 256 colors
CD-ROM drive	Required when installing MX180000A
Hard Disk Capacity	≥ 200 MB of free space
USB Interface	USB 1.1 or 2.0

Table 2.5.1-2 When OS is Windows 7

Item	Specifications
Compatibility	IBM-PC or compatible PC
CPU	32-bit (x86) processor or 64-bit (x64) processor ≥ 1 GHz
OS	Windows 7 Professional/Enterprise/Ultimate
Memory	32 bit:1 GB RAM 64 bit:2 GB RAM
Monitor Resolution	800 × 600 dots or greater resolution
Display color	≥ 256 colors
CD-ROM drive	Required when installing MX180000A
Hard Disk Capacity	≥ 200 MB of free space
Remote Interface	10 BASE-T or 100 BASE-TX

The MP1825B will not operate normally when performing the following operations and functions on the PC while the MX180000A is operating.

- (1) Running another application at the same time
- (2) With lid of laptop PC closed
- (3) Screen Saver
- (4) When laptop running in save battery mode

Read the PC instruction manual to resolve items (3) and (4).

Note:

Operation of the MP1825B is not guaranteed unless the PC meets all the specifications in Table 2.5.1-1.

2.5.2 Connection Method

MX180000A can control up to two units of MP1825B.

To detect MP1825B, set the CH1/CH2 rear panel switch.

You cannot assign the two MP1825s to the same channel.

If CH1 is selected, MX180000A regards MP1825B as **USB5**.

If CH2 is selected, MX180000A regards MP1825B as **USB6**.

If controlling MP1825B by remote commands, specify the target MP1825B by using the :USB:ID command.

 Chapter 5 “Remote Commands”

(1) Connecting MP1800A:

Connect the USB connector (type A) to the front panel or rear panel of the MP1800A, and then connect the USB connector (type B) to the MP1825B.

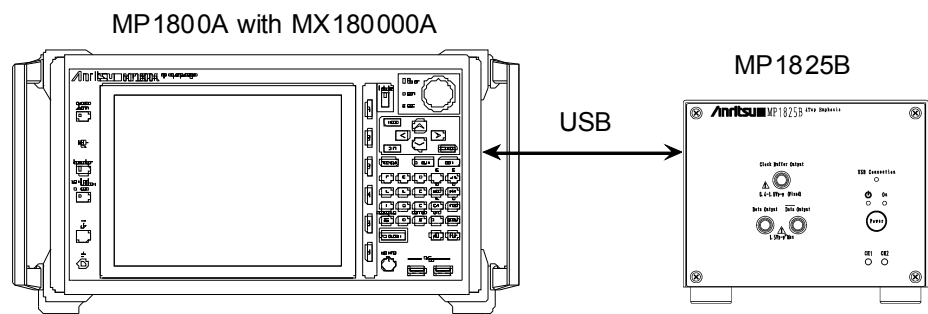


Figure 2.5.2-1 Connecting MP1800A

If connecting two units of MP1825B to MP1800A, connect to the USB connector (type B) on the front panel of MP1800A.

Do not connect MP1825B to the USB connector on the back panel of MP1800A; it may not function properly.

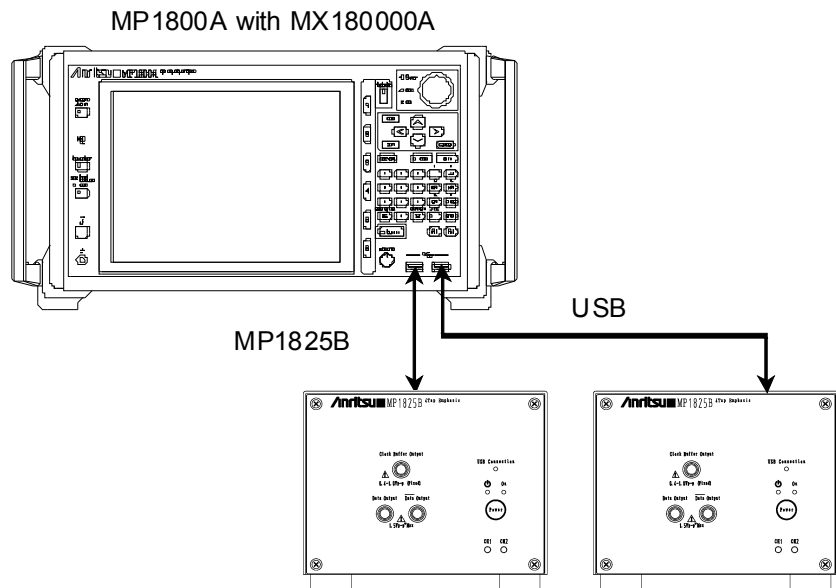


Figure 2.5.2-2 Connecting MP1800A with Two Units of MP1825B

(2) Connecting control PC:

Connect the USB connector (type A) to control PC, and then connect the USB connector (type B) to the MP1825B.

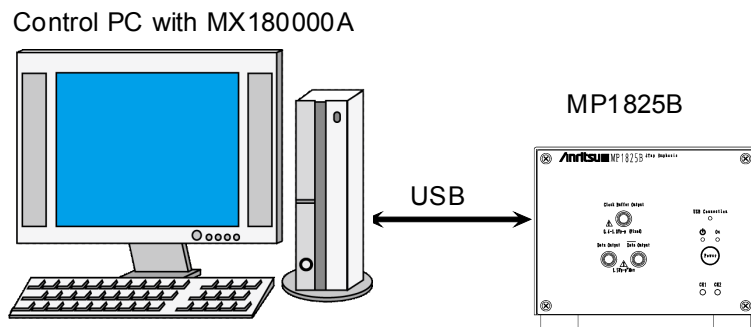


Figure 2.5.2-3 Connecting Control PC

Note the following when connecting the two units of MP1825B to control PC:

- For PC with multiple USB connectors, connect to the USB connector with the same USB controller, as shown below. It may not function normally if connecting to the connector with different USB controller.
- For PC with single USB connector, use USB hub to connect two units of MP1825B.

Note:

Anritsu is not responsible for the proper functioning of all USB hubs.

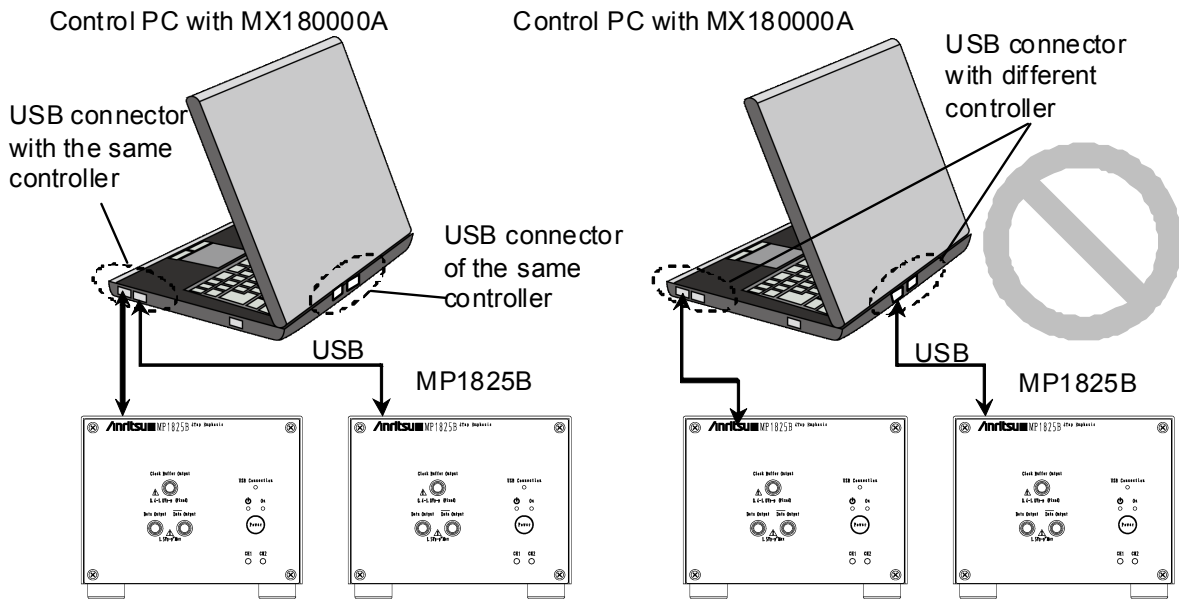


Figure 2.5.2-4 Connecting Control PC with Two MP1825Bs

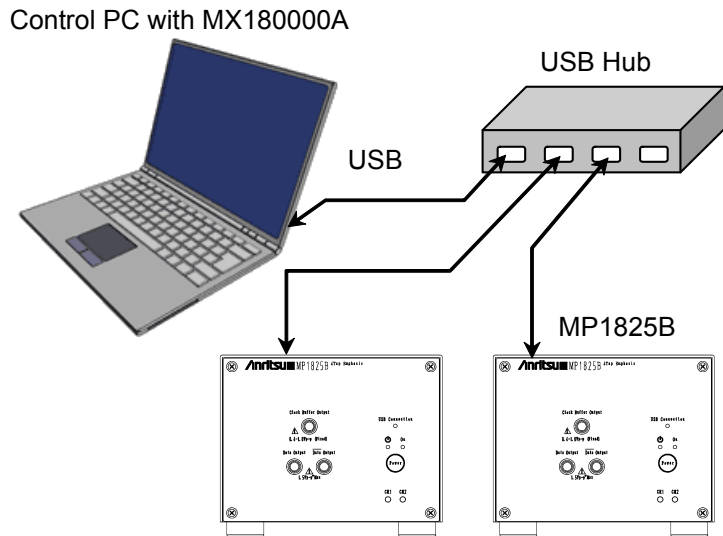


Figure 2.5.2-5 Connecting Control PC with USB Hub

Using USB devices

This section explains use of general-purpose USB devices with the MP1825B .

Connect the USB device before starting the MP1800A; do not connect or disconnect USB devices while using the MX180000A Control Software. In addition, only read measurement data using a USB device after quitting the MX180000A Control Software (closing selector screen).

2.5.3 USB Connection/Disconnection Messages

This section explains the screens when connecting and disconnecting the USB connection.

Hot Plugging

When disconnecting a USB connection to this equipment, proceed as follows to minimize the risk of affecting running applications.

However, this operation is not assured for every USB disconnection. For normal usage, connect and disconnect the USB cable after cutting the power as described in section 2.6.2 "Exiting".

When USB disconnected while application running

- (1) The following message is displayed when the MP1825B connection is cut.

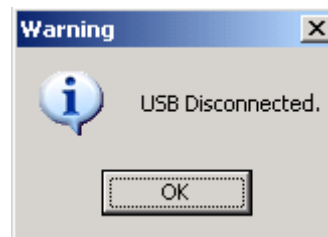


Figure 2.5.3-1 USB Disconnection Message

- (2) If the Call Screen button is disabled, this screen is not displayed too. The Data Output and Clock Output are set forcibly to OFF.
- (3) All MP1800A modules that are connected to MP1825B will be set to off.

When USB connected while application running

- (1) The following USB connection dialog box is displayed.

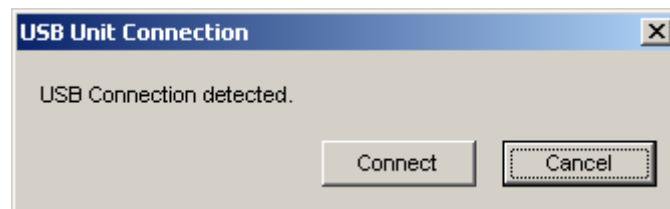


Figure 2.5.3-2 USB Connection Message

- (2) If there is a backup file (when MP1825B connected when previous application terminated), the MP1825B settings can be recovered. When the MP1825B is reconnected immediately after disconnection, the settings are recovered.

- (3) If the MP1825B Call Screen button is enabled, the screen is displayed and can be used.
At this time, the MP1825B Data Output and Clock Output are set to OFF.

When USB connection disconnected while using setup utility

- (1) No warning is displayed when the USB connection is disconnected.
(2) When executing processing for the MP1825B with the USB connection disconnected, the following message indicating that the device is not connected is displayed.

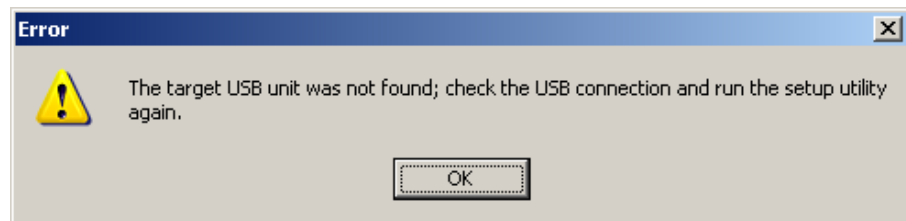


Figure 2.5.3-3 Setup Utility USB Disconnection Message

- (3) Even with this message, the MP1800A module connected to this equipment can still be used.

When connecting USB while using setup utility

- (1) The MP1825B is not recognized when the USB cable is connected while the setup utility is running.
(2) Use the following procedure to recognize the MP1825B.
1. Toggle the power off and on again.
 2. Quit the setup utility.
 3. Restart the setup utility from the Selector screen.

CAUTION

If the connection between the MP1825B and the MP1800A or the PC controller is disconnected during download by the setup utility, operation may be abnormal. NEVER disconnect during downloading.

2.6 Starting and Exiting

This section explains how to install the software and how to start and stop the applications.

2.6.1 Starting

Connecting MP1800A:

- (1) Connect the MP1825B and MP1800A as explained in Figure 2.5.2-1.
- (2) Connect the AC adapter to the MP1825B and set the power switch to ON.
The LED lights green while power is on.
- (3) When the MP1800A is turned on, Windows boots and the MX180000A starts automatically. Select **Main application** on the selector screen.
- (4) The MP1825B control screen is displayed.

When connecting to control PC

- (1) Connect the MP1825B and control PC as explained in Figure 2.5.2-3.
- (2) Connect the AC adapter to the MP1825B and set the power switch to ON.
The LED lights green while power is on.
- (3) Start the MX180000A controller PC and select **Main application** on the selector screen.
- (4) The MP1825B control screen is displayed.

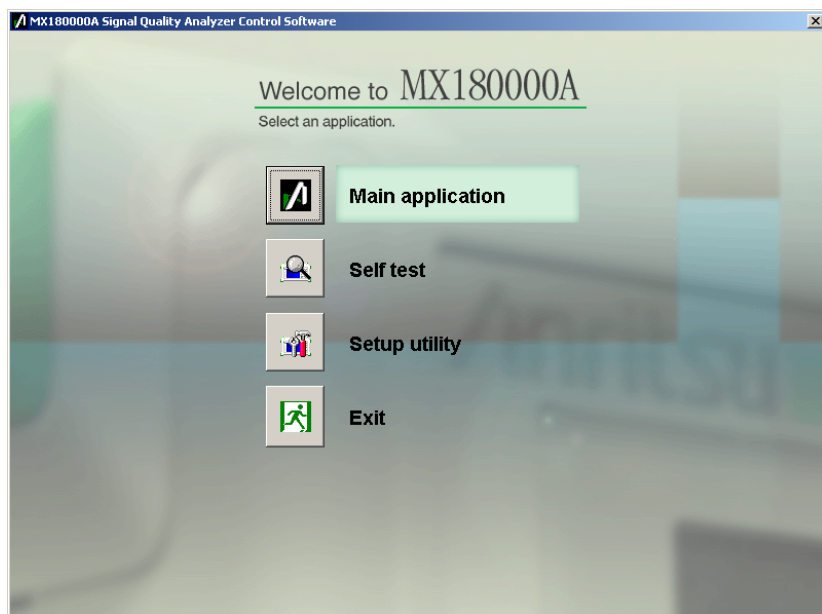


Figure 2.6.1-1 Selector Screen

2.6.2 Exiting

When connected MP1800A:

- (1) Press and hold the power switch on the MP1800A front panel or click the **Shut down** button on the selector screen. After the applications are shut down, the MP1800A Power lamp goes off, and then the Standby LED lights up.
- (2) Set the MP1825B power switch to OFF.
The LED lights orange, indicating the standby status.

When connected to control PC

- (1) Close **Main application** to display the selector screen.
- (2) Press **Exit** on the selector screen to close the window.
- (3) Set the MP1825B power switch to OFF.
The LED lights orange, indicating the standby status.

Notes:

- To cut the power without following the above procedure, press the MP1825B power switch for more than 10 seconds to enter the standby status.
- Do not disconnect the power cord and AC adapter without first turning off the MP1825B as described above, otherwise the MP1825B may be damaged.

2.7 Initializing Settings

Click **Initialize** in the File menu of the MX180000A SQA control software to initialize the equipment to the factory defaults.

In addition, the equipment settings can be returned to the factory defaults using the Setup utility; start the utility and click the **Help** tab.

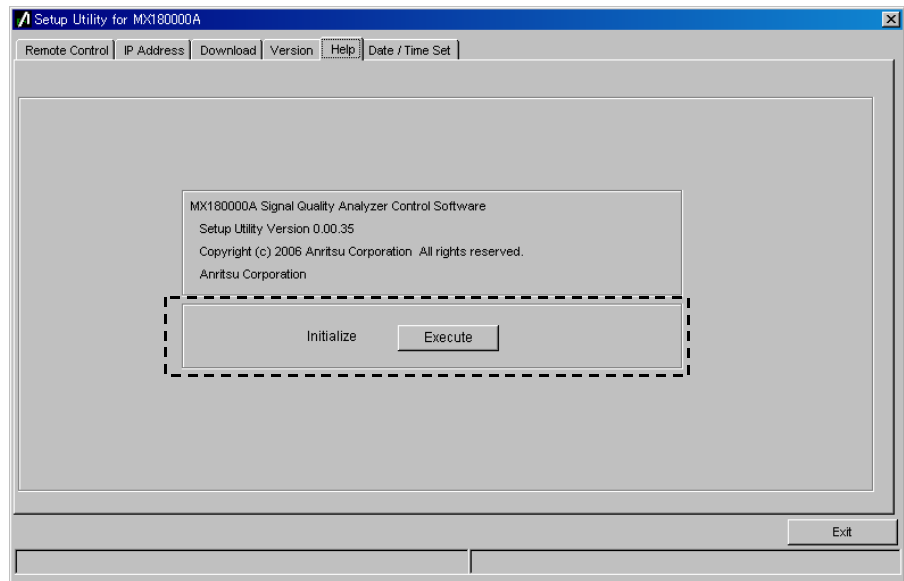


Figure 2.7-1 Initialize Setting

When **Execute** in the Initialize group box is clicked, the equipment is initialized to the factory default settings.

2.8 Preventing Damage

Before connecting signals to the input and output connectors of the MP1825B, always check that the signals are within the specified voltage range.

If an out-of-range signal is input, the MP1825B may be damaged.



CAUTION

- When signals are input to the MP1825B, avoid excessive voltage beyond the rating. Otherwise, the circuit may be damaged.
- When output is used at the 50 Ω /GND terminator, never feed any current or input signals to the output.
- 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.
- Never open the MP1825B.
If you open it and the MP1825B has failed or sufficient performance cannot be obtained, we may decline to repair the MP1825B.
- The MP1825B has many important circuits and parts including hybrid ICs.
These parts are extremely sensitive to static electric charges, so never open the case of the MP1825B.
- The hybrid ICs used in the MP1825B are sealed in airtight containers; never open them.
If you open the MP1825B and it has failed or sufficient performance cannot be obtained, we may decline to repair the MP1825B.

 **CAUTION**

- To prevent the risk of damage to the MP1825B 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 MP1825B.
- When connecting an external device such as a Bias-T to the output connectors of this equipment, if the output signal includes any DC voltage, variations in the output of the DC power supply or load may change the level of the output signal, risking damage to the internal circuits.

Note the following precautions when using this equipment:

- Do not connect or disconnect any external devices while DC voltage is impressed.
- Only switch DC power sources ON and OFF when all equipment connections have been completed.

<Recommended procedure>

Measurement Preparation 1:

1. Connect all equipment.
2. Set the DC power supply output to ON.
3. Set the equipment output to ON and complete measurement.

Measurement Preparation 2:

1. Set the equipment output to OFF.
 2. Set the DC power supply output to ON.
 3. Disconnect the equipment, or change the DUT connections.
-

⚠ CAUTION

- Since even unforeseen fluctuations in DC voltage and load (open or short circuits at the equipment output side and changes caused by using a high-frequency probe, etc.,) can damage the DUT and equipment, we recommend connecting a 50-ohm resistance in series with the DC terminal of the Bias-T to prevent risk of damage.

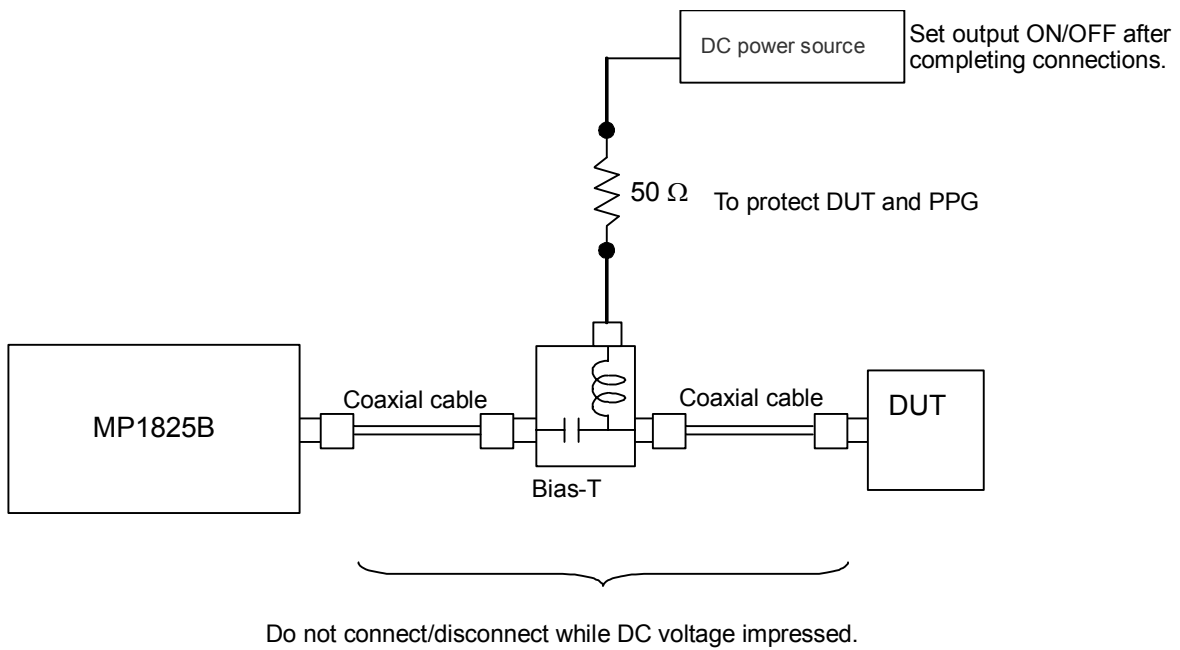


Figure 2.8-1 Bias-T Connection Example

Chapter 3 Screen Operation

This chapter explains the following items:

- Composition of Screens
- Waveform editing procedure
- File operations
- Alarm information display

3.1	Composition of Screens.....	3-2
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3.1 Composition of Screens

3.1.1 Overall Composition of Screen

MP1825B screens have the following overall composition.

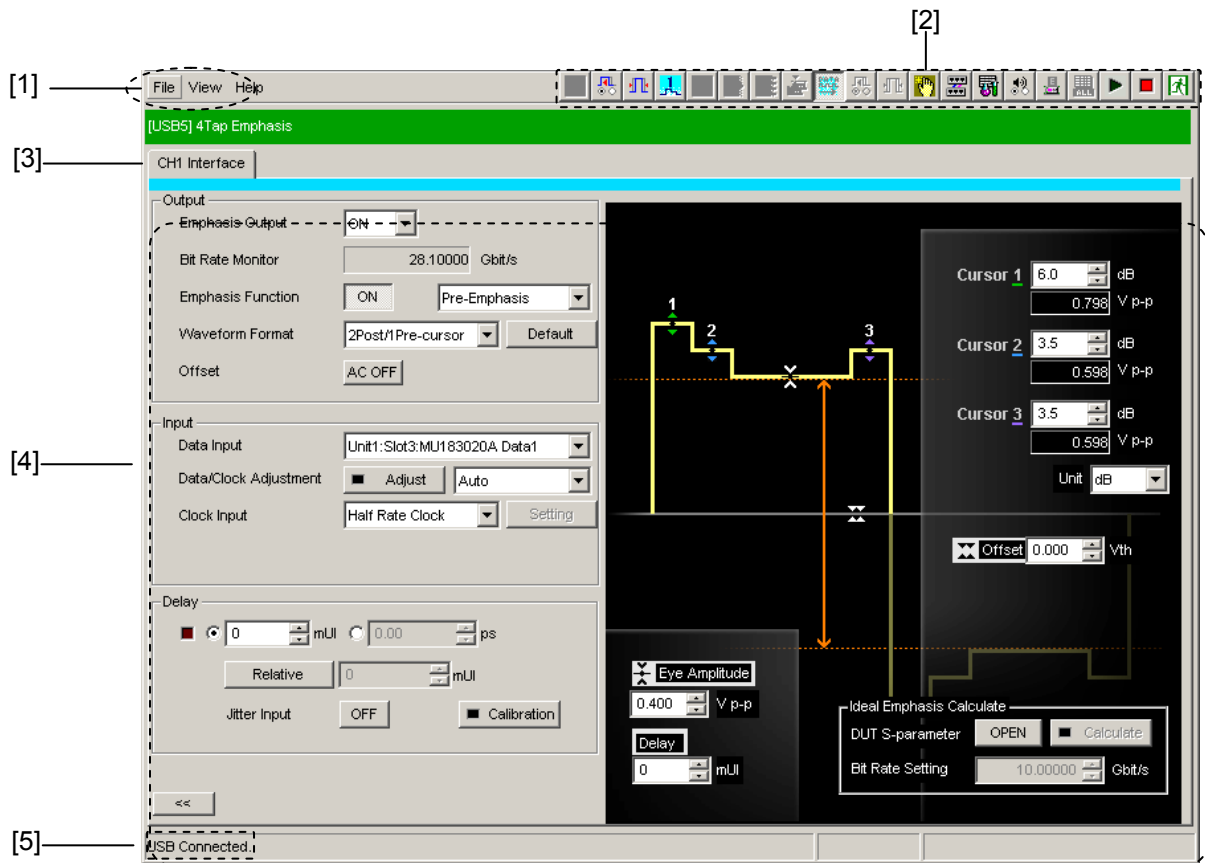


Figure 3.1.1-1 Overall Screen Composition

The MP1825B screens are composed of the five basic blocks shown in Figure 3.1.1-1.

Table 3.1.1-1 explains each block.

Table 3.1.1-1 Screen Block Functions

No.	Block Name	Function
[1]	Menu bar	For selecting settings related to overall MP1825B
[2]	Module function buttons	Shortcut buttons to displayed unit functions Up to 17 functions can be selected by user customization of predefined function buttons. Pressing the 4Tap Emphasis function button displays the MP1825B Operation screen.
[3]	Function setting selection tab	Switches operation setting screen to each function item
[4]	Operation screen	For making settings
[5]	USB connection status	Indicates status of USB connection
	Tree view call area	Calls the Tree View screen by moving the cursor over this area.

3.1.2 Function Buttons

The MX180000A Control Software for the MP1825B 4Tap Emphasis displays a **4Tap Emphasis** button.



4Tap Emphasis Button

Figure 3.1.2-1 Function Buttons



- Displays CH1 Interface tab.
- Displays CH2 Interface tab.
- Displays alarm information list.

3.7 “Alarm Information Display”

The **4Tap Emphasis** button is disabled in the following circumstances.



- When MP1825B is not connected by USB cable.
- When MP1825B power is OFF.

To display the MP1825B Control screen, click the **4Tap Emphasis** button of the module function buttons.

3.1.3 MP1825B Control Screens

The MP1825B Control screens are shown in Figure 3.1.3-1 to Figure 3.1.3-5.

If the screen for another module is displayed, perform one of the following actions to bring the MP1825B screen to the foreground:

- Click the module function button ( / ).
- Press the Tree View key on the MP1800A's front panel.

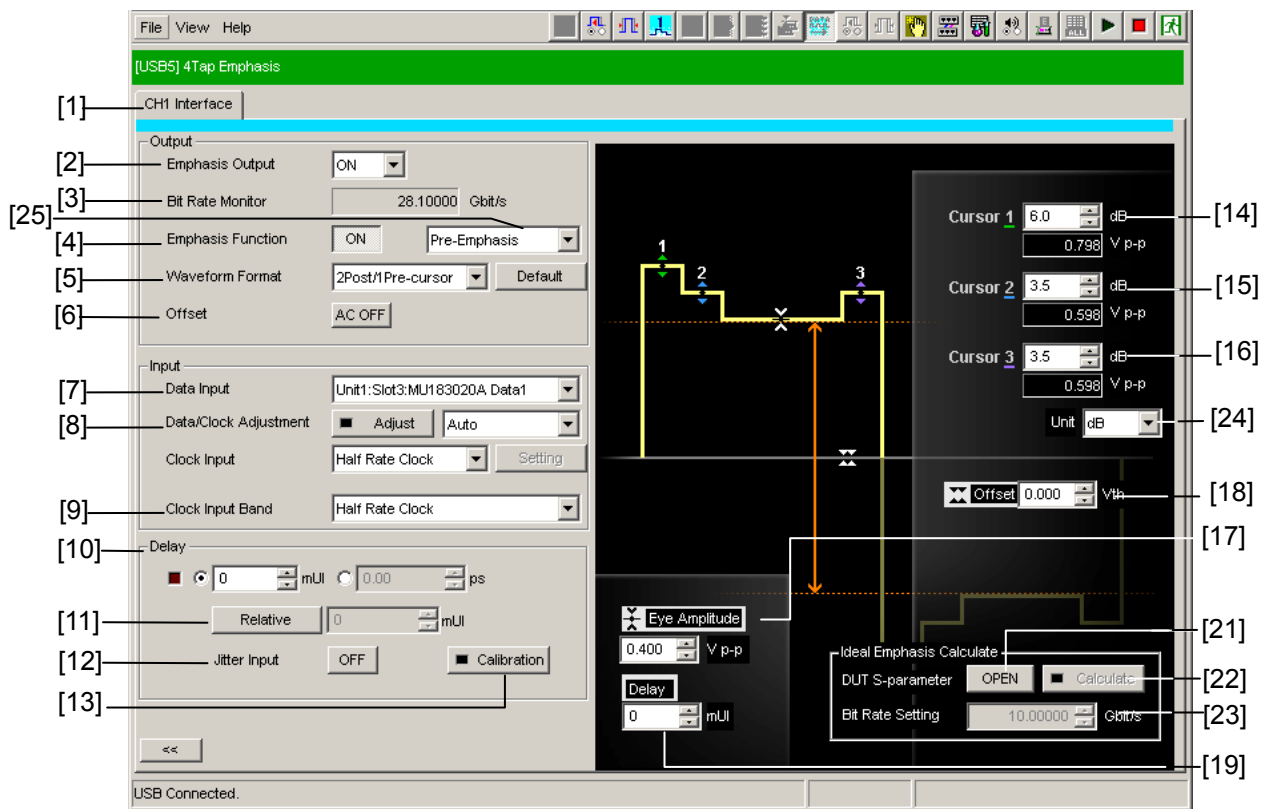


Figure 3.1.3-1 MP1825B Control Screen (Full Screen)

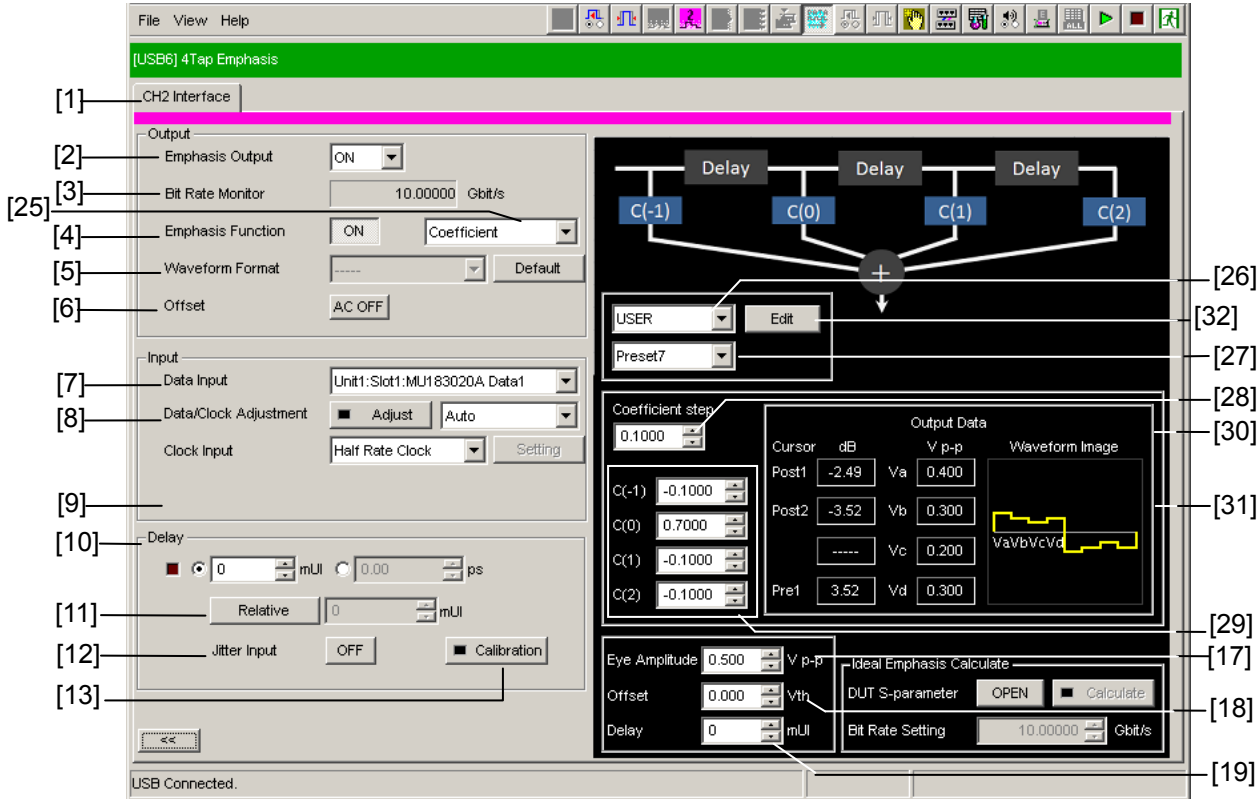


Figure 3.1.3-2 MP1825B Control Screen (Full Screen, Coefficient setting)

3

Screen Operation

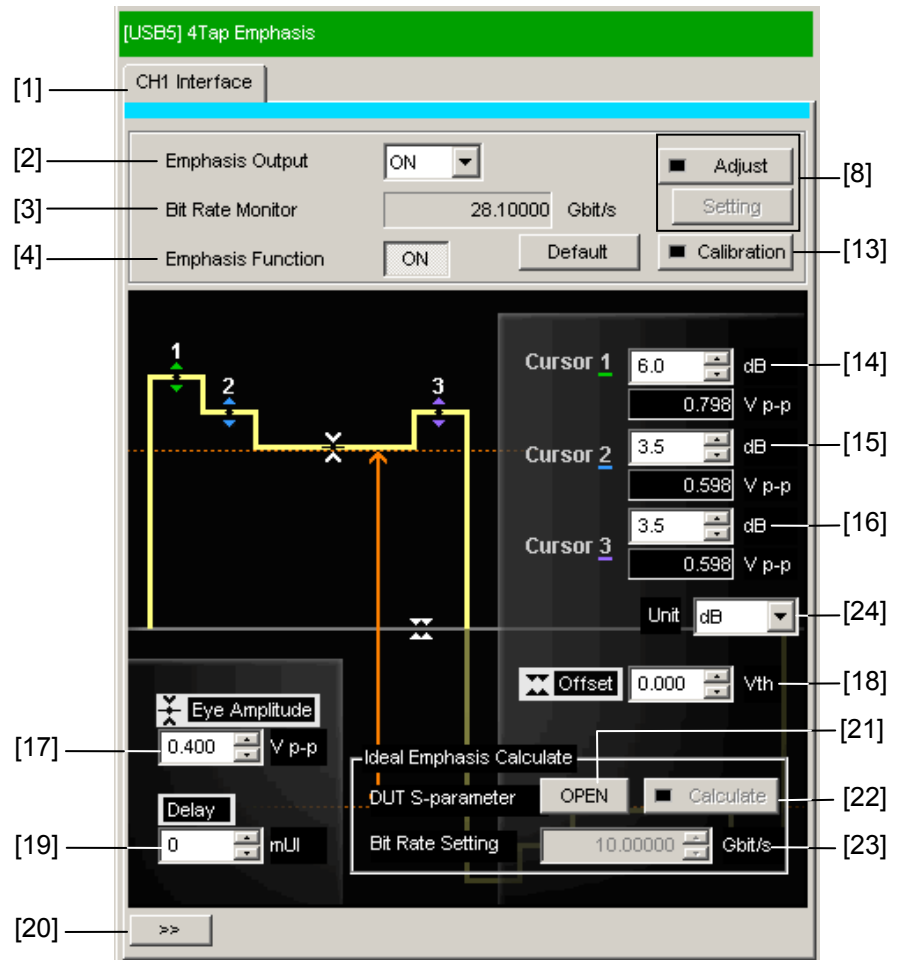


Figure 3.1.3-3 MP1825B Control Screen (Half Screen)

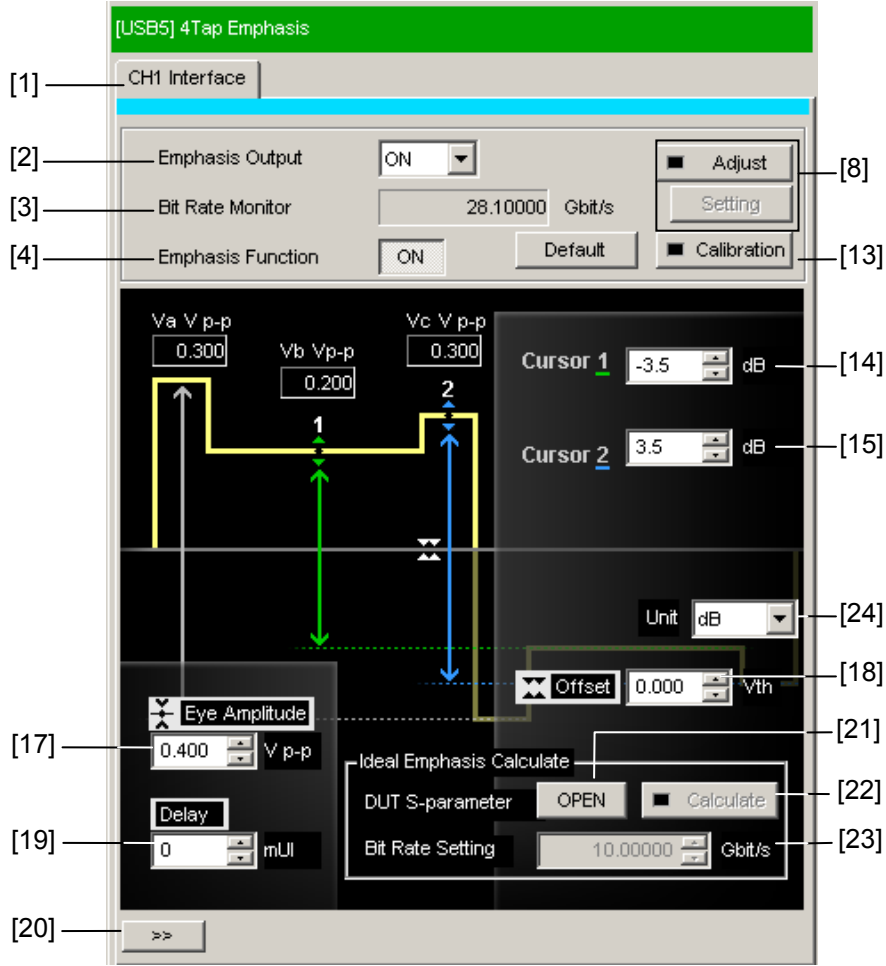


Figure 3.1.3-4 MP1825B Control Screen (Half Screen, De-Emphasis Setting)

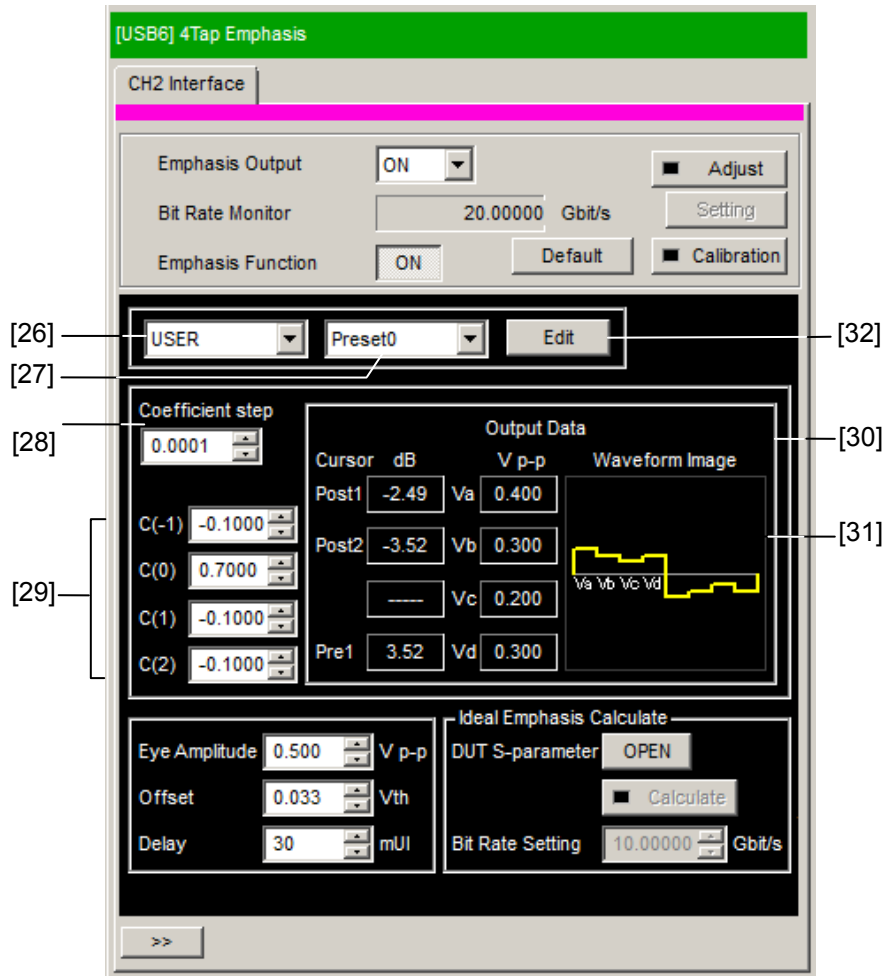


Figure 3.1.3-5 MP1825B Control Screen (Half Screen, Coefficient Setting)

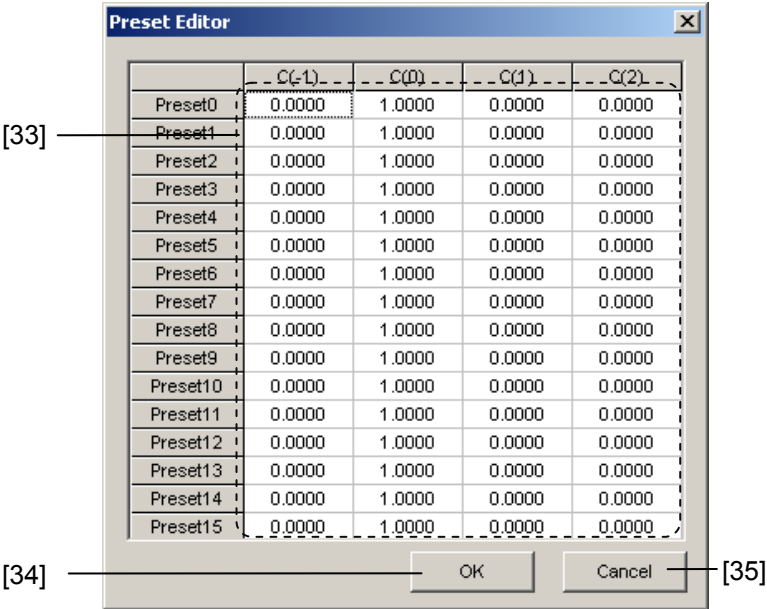


Figure 3.1.3-6 Preset Editor Dialog Box

Table 3.1.3-1 Composition of MP1825B Screen

No.	Name	Function
[1]	Tab	Switches controlled MP1825B screen when controlling two MP1825B units. The screen for channel 1 is displayed with a light blue line and the screen for channel 2 is displayed with a red line.
[2]	Emphasis Output	Sets signal output for front-panel Data Output, and $\overline{\text{Data}}$ Output connectors. If On is selected, Adjust is automatically selected, and then phase adjustment is performed by using the Data/Clock Adjustment function.
[3]	Bit Rate Monitor	Displays output data bit rate*1
[4]	Emphasis Function	Sets Emphasis ON/OFF OFF : Although the emphasis waveform can be edited, the signal output from the front panel has no emphasis applied. ON : The signal output from the front panel has emphasis applied.
[5]	Waveform Format	Selects waveform format*2 Clicking Default sets the voltage of the edited waveform to the default.
[6]	Offset	Enables/disables Offset voltage setting AC OFF: Offset voltage enabled AC ON: Offset voltage disabled Outputs data with 0 V offset
[7]	Data Input	Selects signal input to Data Input from PPG, MUX, 32G PPG or External.

*1: Not displayed in following cases:

- When Data Input set to MU181020A/B
- When Data Input setting is External and Clock Input Band set to Full rate Clock

*2: A waveform with emphasis applied to a repeating pattern of "1" and "0" for 6 bits each is displayed on the screen. At a random pattern, a different waveform from the screen display is output.

Table 3.1.3-1 Composition of MP1825B Screen (Cont'd)

No.	Name	Function
[8]	Data/Clock Adjustment* ³	Phase adjusts clock of Clock Input and signal of Data Input.
	Auto/Manual	Switches phase adjustment method between Auto and Manual.
	Adjust* ⁴	Auto-adjusts input data and clock phase. Green: Adjusting phase Red: Requesting phase adjustment
	Setting	Adjusts the input data clock phase. Use this button when phase cannot be adjusted by Adjust because jitter is added to data. Adjustment range: -1000 to +1000 mUI
	Clock Input* ⁵	When MP1825B is linked with MU183020A/21A, selects bit rate to execute data/clock phase adjustment. The connection method varies depending on whether MP1825B is used with half-rate clock (8 to 28.1 Gbit/s) or full-rate clock (8 to 32.1 Gbit/s). For details, refer to Figure 3.3-7 and Figure 3.3-8 in Section 3.3 "Input Signal Settings". Half Rate Clock: Sets when doubling standard clock using Doubler Input/Output in 8 to 28.1Gbit/s. Adjusts phase using clock delay of MP1825B. Full Rate Clock: Sets when inputting standard clock without using Doubler Input/Output in 2.4 to 32.1Gbit/s. Adjusts phase using data delay of MU183020A/21A.
[9]	Clock Input Band* ⁶	Half Rate Clock: Set when reference clock is multiple of 2 using Doubler Input/Output. Full Rate Clock: Set when inputting reference clock to Clock Input without using Doubler Input/Output.
[10]	Delay* ³	Sets delay time in mUI or ps units.

*3: This can be set when Option x03 or Option x04 is installed.

*4: The phase can be adjusted when the data signal crosspoint is 50%.
The phase may not be adjusted in the following conditions.

- The phase of the input data or clock is not stable.
- Jitter is added to the input data or clock.
- When the Eye Amplitude is setting less than 400 mV.

*5: This is displayed if both of the following conditions are met:

- Data Input is set to MU183020A/21A.
- MU183020A/21A is installed together with its option x30/31.

*6: This is displayed when Option x02 is installed, and when Data Input set to External.

Table 3.1.3-1 Composition of MP1825B Screen (Cont'd)

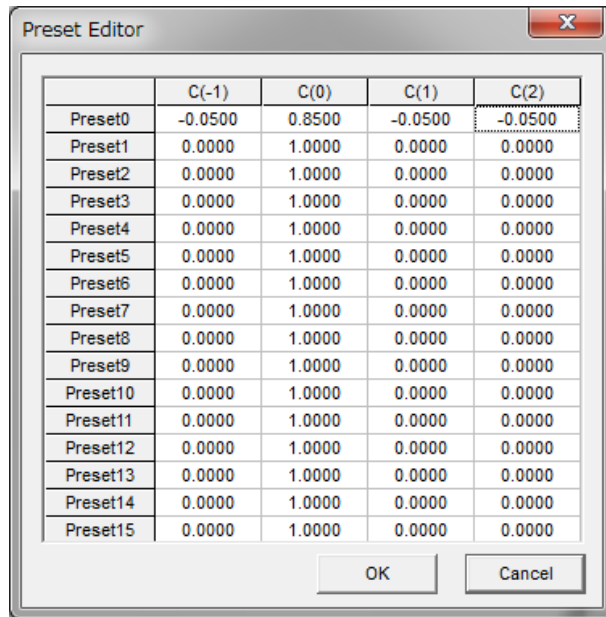
No.	Name	Function
[11]	Relative* ³	Sets value as phase difference from currently set phase. Clicking Relative sets the phase difference to "0".
[12]	Jitter Input* ³	Set to On when inputting a jittered clock to MP1825B and creating a jittered emphasis signal.
[13]	Calibration* ³	Click the Calibration button when the lamp is red. Calibrates the setting error of the delay time and assures the setting accuracy of the data phase adjustment function of MP1825B. Calibration is completed in less than 1 second.
[14]	Cursor1	Sets waveform amplitude
[15]	Cursor2	The displayed number of cursors varies according to the Waveform Format setting.
[16]	Cursor3	
[17]	Eye Amplitude	
[18]	Offset	
[19]	Delay* ³	Sets the delay time. Same setting as [10] and [11].
[20]	Screen size switching button	Changes screen size.
[21]	DUT S-parameter Open button	Used for the optimum value setting function Displays the dialog to open the DUT optimum waveform S-parameter file. After the file is opened, Ideal Emphasis Setting screen is displayed.
[22]	Ideal Emphasis Calculate button	Used for the optimum value setting function Clicking the Calculate button displays Ideal Emphasis Setting screen. When the S-parameter file optimum setting has been reflected, the lamp lights in green, and when it has not been reflected, the lamp turns off.
[23]	Bit Rate Setting	Bit rate input window to calculate the optimum values of Taps used with the optimum value setting function When External has been selected for Data Input, input the bit rate of the data input to Data Input. Note: If an error between the actual bit rate and input value is 1000 ppm or more, the optimum value calculation result is not displayed correctly.
[24]	Unit	Changes cursor units. Select from dB/Vp-p/%.
[25]	Emphasis Function Box	Select one of the following Emphasis functions: Pre-Emphasis, De-Emphasis, Coefficient

Table 3.1.3-1 Composition of MP1825B Screen (Cont'd)

No.	Name	Function
[26]	Standard	Select which of the following you want to use as coefficients. USER: Uses the coefficients (C(-1) to C(2)) preset in the Preset Editor dialog box. PCIe 3: Uses the coefficients defined in the PCIe Rev3 specification.
[27]	Preset	Select the preset data number. The values saved as the preset data are loaded as coefficients (C(-1) to C(2)). For details of the preset data, refer to Section 3.1.4 "Using Preset".
[28]	Coefficient step	Specify the step size for coefficients.. This value affects the minimum resolution of the coefficients.
[29]	Coefficient (C(-1) to C(2))	Set the coefficients that determine the signal amplitude. The range of each of these values varies depending on the coefficient and the Eye Amplitude value. The coefficients saved as Preset0 to Preset15 are displayed and can be edited.
[30]	Output Data dB, V _{p-p}	Displays the amplitude values of the output signal.
[31]	Waveform Image	Displays the image of the output signal.
[32]	Edit	Displays the Preset Editor dialog box to edit the defaults of Preset0 to Preset15. This button is available when USER is clicked in the Standard box. For how to edit the defaults, refer to Section 3.1.4 "Using Preset".
[33]	Preset view	Area to edit and display the defaults of Preset0 to Preset15. The data can be edited when the Set key is pressed on the front panel of MP1800A or ENTER is pressed.
[34]	OK	Closes the Preset Editor dialog box saving the data edited in the Preset view as the defaults for Preset0 to Preset15. Additionally, the edited values are displayed as coefficients (C(-1) to C(2)).
[35]	Cancel	Closes the Preset Editor dialog box without saving the data edited in the Preset view.

3.1.4 Using Preset

For setting Coefficient, the emphasis coefficients C(-1) to C(2) can be saved in Presets. There are 16 Presets from 0 to 15. If edit C(-1) to C(2), the change is saved in the corresponding Preset(s).



Preset Defaults

	C(-1)	C(0)	C(1)	C(2)
Preset0	-0.05	0.85	-0.05	-0.05
Preset1				
:				
Preset14				
Preset15				

When one of the following is performed, the defaults edited in the **Preset Editor** dialog box will be set as Presets.

- Clicking **Default**
- Performing initialization
- Clicking **OK** in the **Preset Editor** dialog box.

Preset Data

	C(-1)	C(0)	C(1)	C(2)
Preset0	-0.1	0.7	-0.1	-0.1
Preset1				
:				
Preset14				
Preset15				

Preset0

C(-1)	-0.1000
C(0)	0.7000
C(1)	-0.1000
C(2)	-0.1000

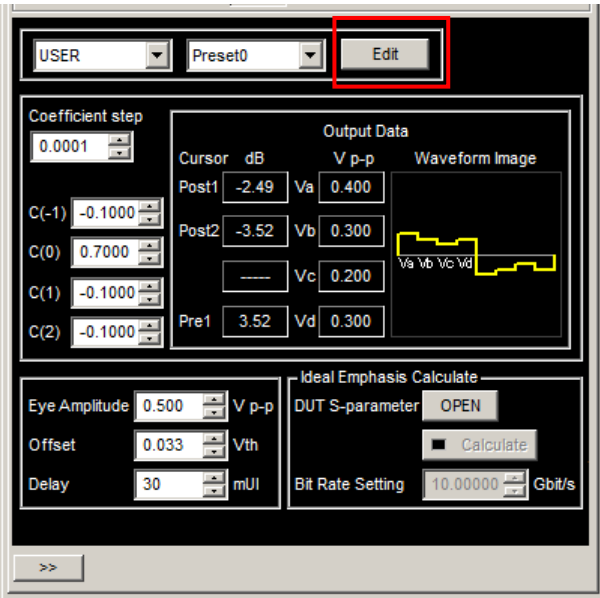
Figure 3.1.4-1 Preset Data Configuration

If you are using MX180000A installed on the control PC, set coefficients C(-1) to C(2) in the **Preset Editor** dialog box according to the following procedure. If you are using the MP1800A, press the **Set** key on the front panel instead of the **Enter** key.

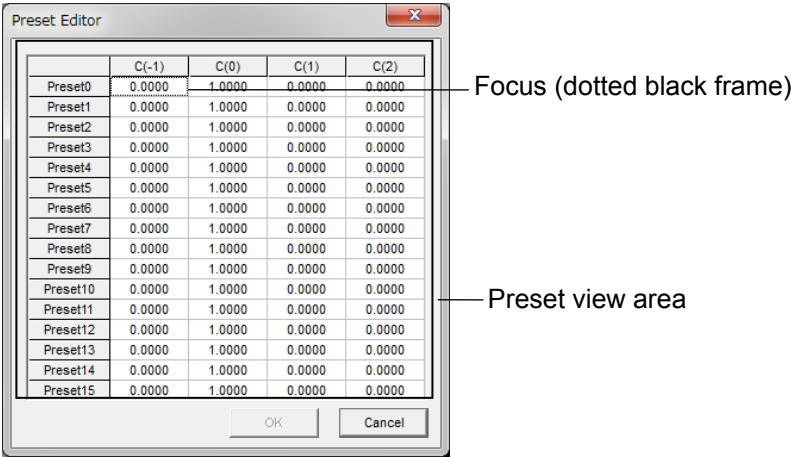
1. In full-screen view, turn on the Emphasis Function, and then click **Coefficient** in the list box.



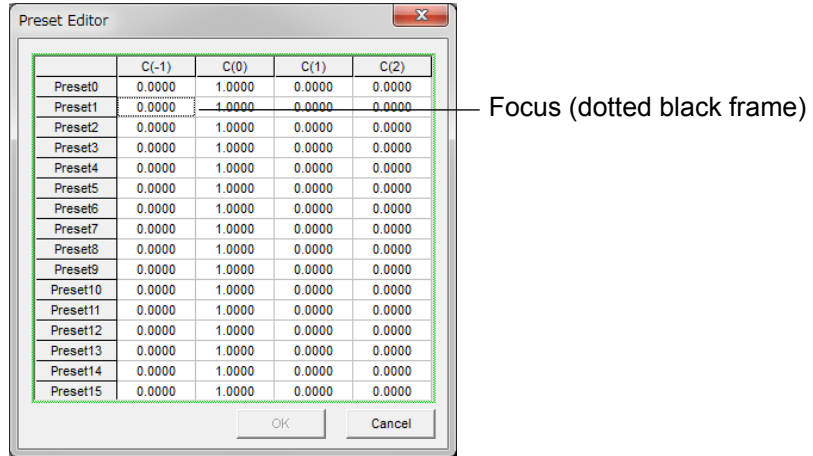
2. Click **Edit**.



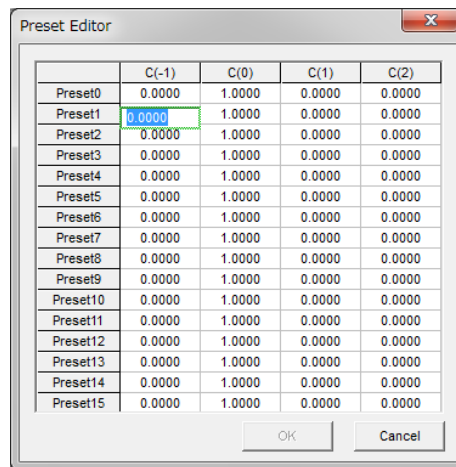
3. Move the focus to the Preset view area by using the Up and Down Arrow keys or mouse. The Preset defaults cannot be edited in this state.



- Press the **Enter** key to display a green frame around the Preset view area.



- Move the focus to the cell you want to edit using the arrow keys.
- Press the **Enter** key. A green frame appears around the selected cell that allows editing.



- Edit the value using the numeric keys or arrow keys, and press the **Enter** key. The green frame disappears and **OK** is enabled.
- Go back to Step 5 if you want to continue editing the Preset defaults.
- Press the **ESC** key to quit editing the Preset defaults. If you are using the MP1800A, press the **Cancel** key on the front panel.
- To save the edited value(s), click **OK**. The edited value(s) of Preset0 to 15 are saved collectively.
Click **Cancel** to discard the editing.

Note:

The Preset data value set by clicking **OK** may be outside the Coefficient setting range, depending on the Eye Amplitude setting. In this case, an alert message is displayed and an allowable value closest to Preset will be set for Coefficient.

Check the actual setting values for C(-1) to C(2) on the screen at Step 2.

3.2 Setting Procedure

The basic setting procedure is shown below.

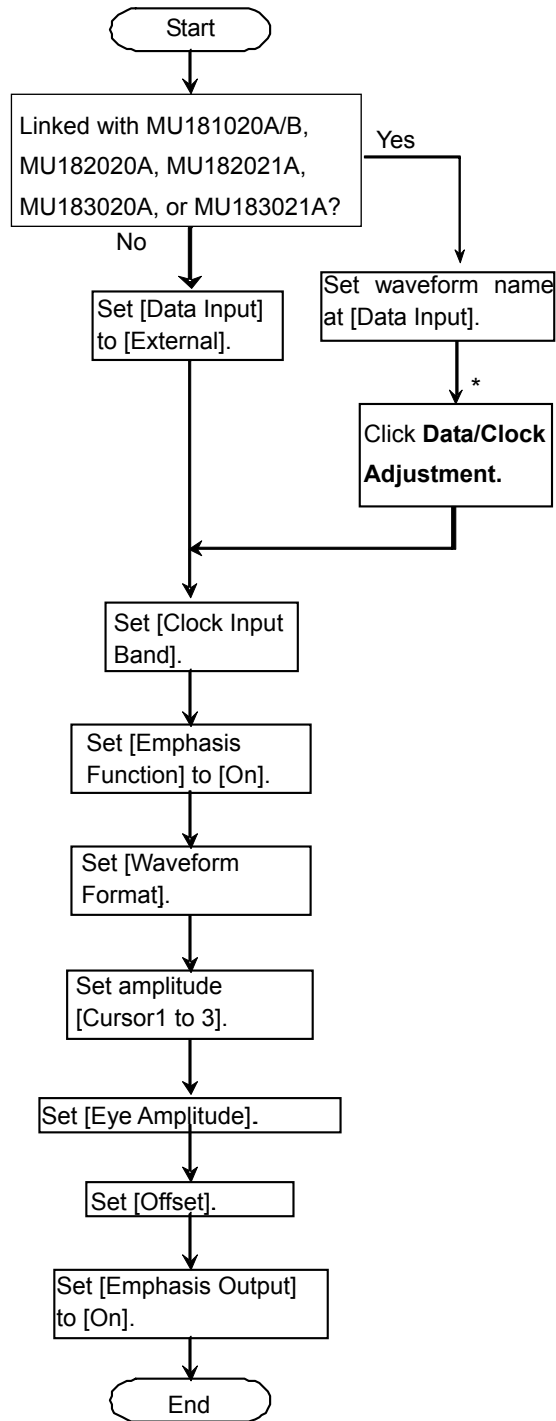


Figure 3.2-1 4Tap Emphasis Basic Setting Procedure

*: When using Option-x02, Data Clock Adjustment is used when a clock is connected to Doubler Input.

3.3 Input Signal Settings

The connection destination for the data input to the MP1825B is set.

1. Display the full screen.
2. Set **Emphasis Output** to **Off**.
3. Select the signal connected to the rear-panel data input connector from the **Data Input** list box.

1:External

2:UnitX:SlotY:MU181020A/B

3:UnitX:SlotY:MU182020A

4:UnitX:SlotY:MU182021A Data1 or Data2

5:UnitX:SlotY:MU183020A Data1 or Data2

6:UnitX:SlotY:MU183021A Data1, Data2, Data3 or Data4

The unit number is indicated by X and the slot number is indicated by Y.

No value is displayed at Bit Rate Monitor when the Data Input setting is External.

4. When **Data Input** is set to **External**, **MU183020A** or **MU183021A** configure **Clock Input Band** according to the table below.

Table 3.3-1 Clock Input Band Settings

Data Input Setting	Bitrate Setting (Gbit/s)	Clock Input Band Setting	Back Panel Connection
1:External	8 to 28	Half Rate Clock	Figure 3.3-5
	1 to 28*1	Full Rate Clock	Figure 3.3-3
	1 to 32.1*2	Full Rate Clock	Figure 3.3-3
2:UnitX:SlotY:MU181020A/B	1 to 14		Figure 3.3-4
3:UnitX:SlotY:MU182020A	8 to 28*1		Figure 3.3-5
5:UnitX:SlotY:MU183020A	2.4 to 14		Figure 3.3-6
	8 to 28*1		Figure 3.3-7
	2.4 to 32.1*2		Figure 3.3-8

*1: Option x02 only

*2: Option x06 only

Phase difference adjustment between data and clock

When **Data Input** is set to **External**, the phase difference between data input to Data Input and clock input to Clock Input is adjusted by using Pulse Pattern Generator.

Use sampling oscilloscope to adjust the phase difference.

In case of MP1825B-x01, adjust so that the clock rising edge is within the range of ± 275 mUI from the center of data (eye pattern), as shown in the following illustration.

1. Place the marker 1, which is the center of data (eye pattern).
2. Place the marker 2 over the center of clock rising edge.
3. Adjust the Delay Time of Pulse Pattern Generator so that the time difference between marker 1 and 2 is less than 275 mUI.

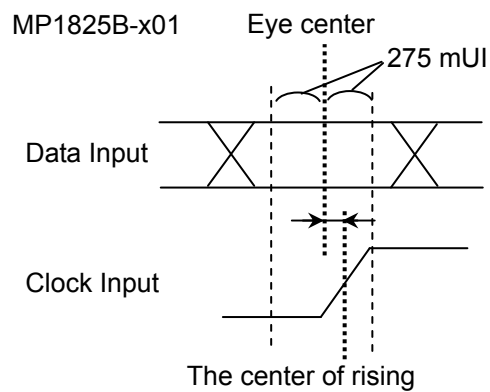


Figure 3.3-1 Phase Difference Between Data Input and Clock Input (MP1825B-x01)

In case of MP1825B-x02, adjust so that the clock rising edge is between the range of ± 275 mUI and $+18$ ps, which is the center of data (eye pattern), as shown in the following illustration.

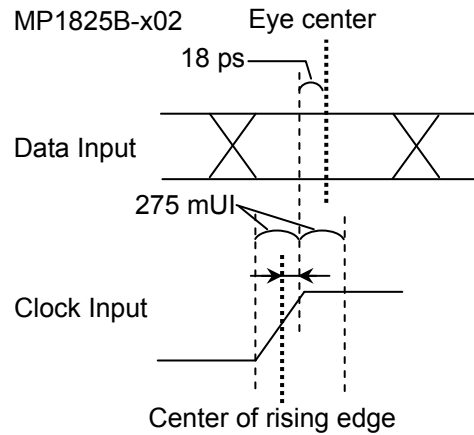


Figure 3.3-2 Phase Difference Between Data Input and Clock Input (MP1825B-x02)

1. Place the marker 1 so that it is 18 ps left of the center of data (eye pattern).
2. Place the marker 2 over the center of clock rising edge.
3. Adjust the Delay Time of Pulse Pattern Generator so that the time difference between marker 1 and 2 is less than 275 mUI.

CAUTION

When connecting the output of an external PPG to the MP1825B Clock Input or Data Input connectors as shown in Figure 3.3-3, ensure that the PPG output voltage does not exceed the permitted input voltage range of MP1825B.

There is a risk of causing damage to the internal circuits if the voltage of the signal input to the MP1825B Clock Input or Data Input connectors exceeds the voltage range specified in Chapter 1.3 “Specifications”.

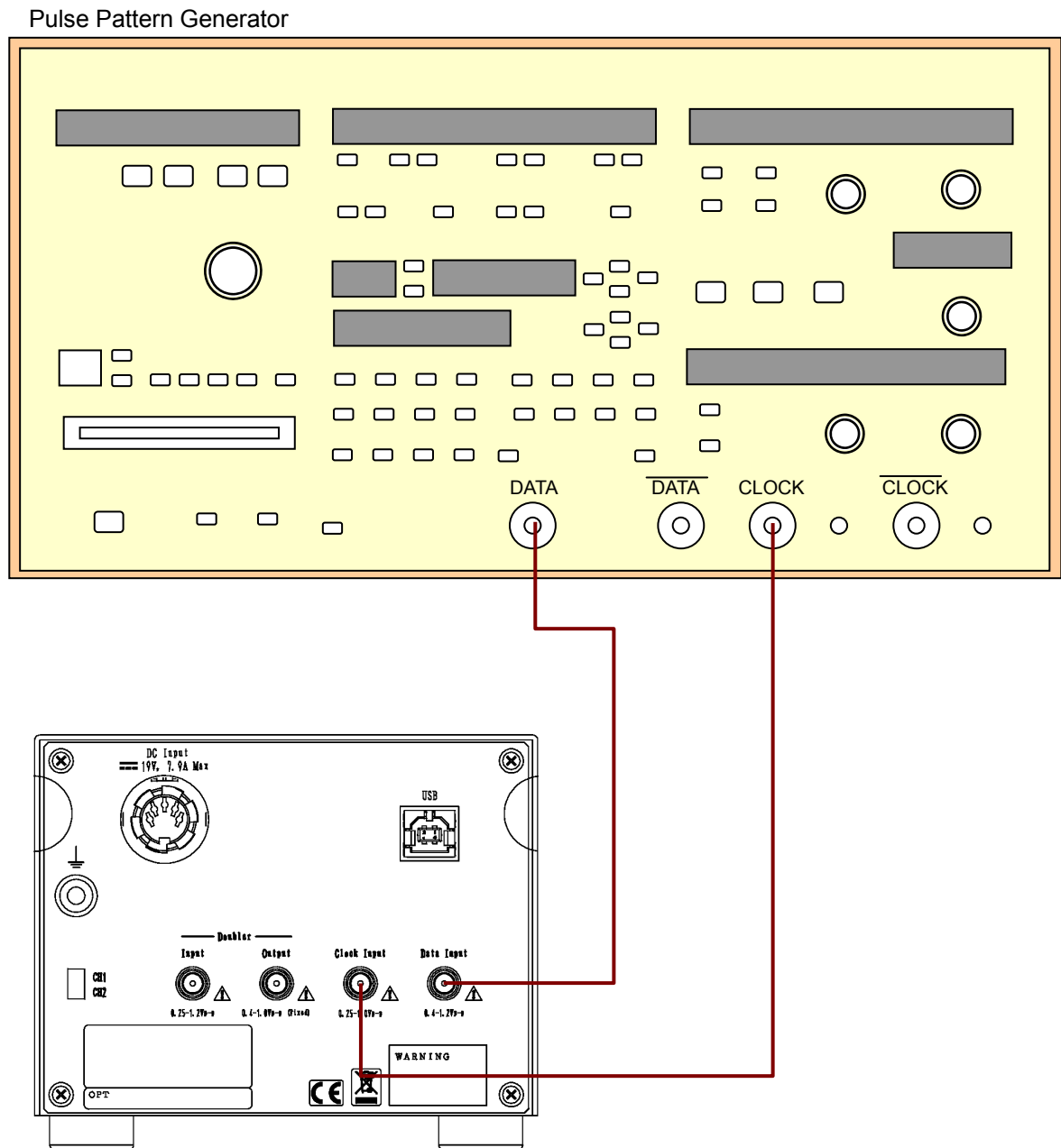


Figure 3.3-3 Connection to Pulse Pattern Generator (Bit rate 1 to 28 Gbit/s)

Notes:

- Adjust the Data/Clock phase difference that are input to Data Input and Clock Input, as shown in Figure 3.3-1.
- In case of MP1825B-x06, it operates in bit rate 1 to 32.1 Gbit/s.

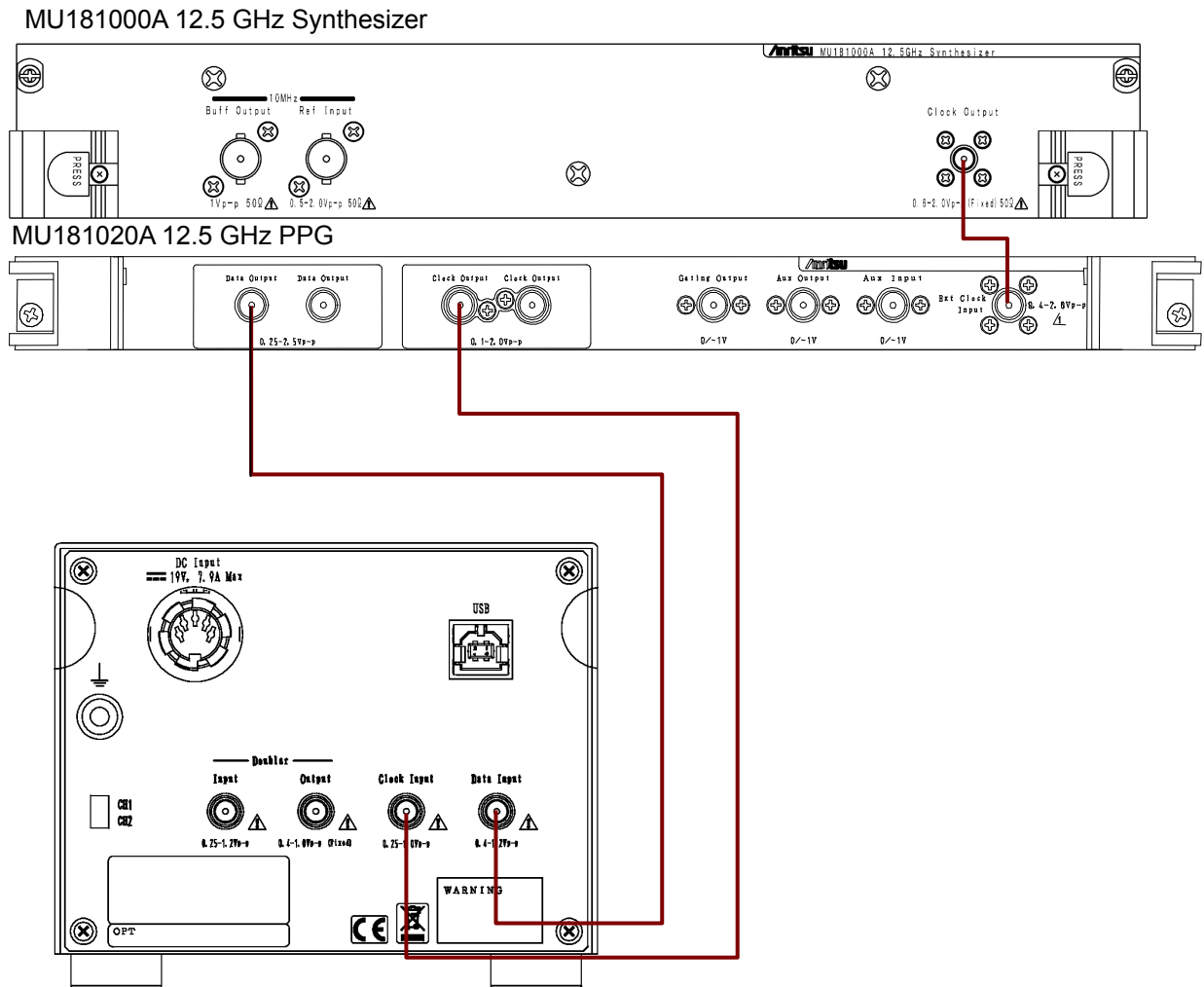


Figure 3.3-4 Connection to MU181020A/B Pulse Pattern Generator (Bit rate 1 to 14 Gbit/s)

Notes:

- If MP1825B-x02 and MP1825B-x04 are installed on MP1825B, the indicator on **Calibration** may turn red. This is not a malfunction.
- Adjust the Data/Clock phase difference that are input to Data Input and Clock Input, as shown in Figure 3.3-1. In case of MP1825B-x03, the phase difference can be auto-adjusted by using the Data/Clock Adjustment function.

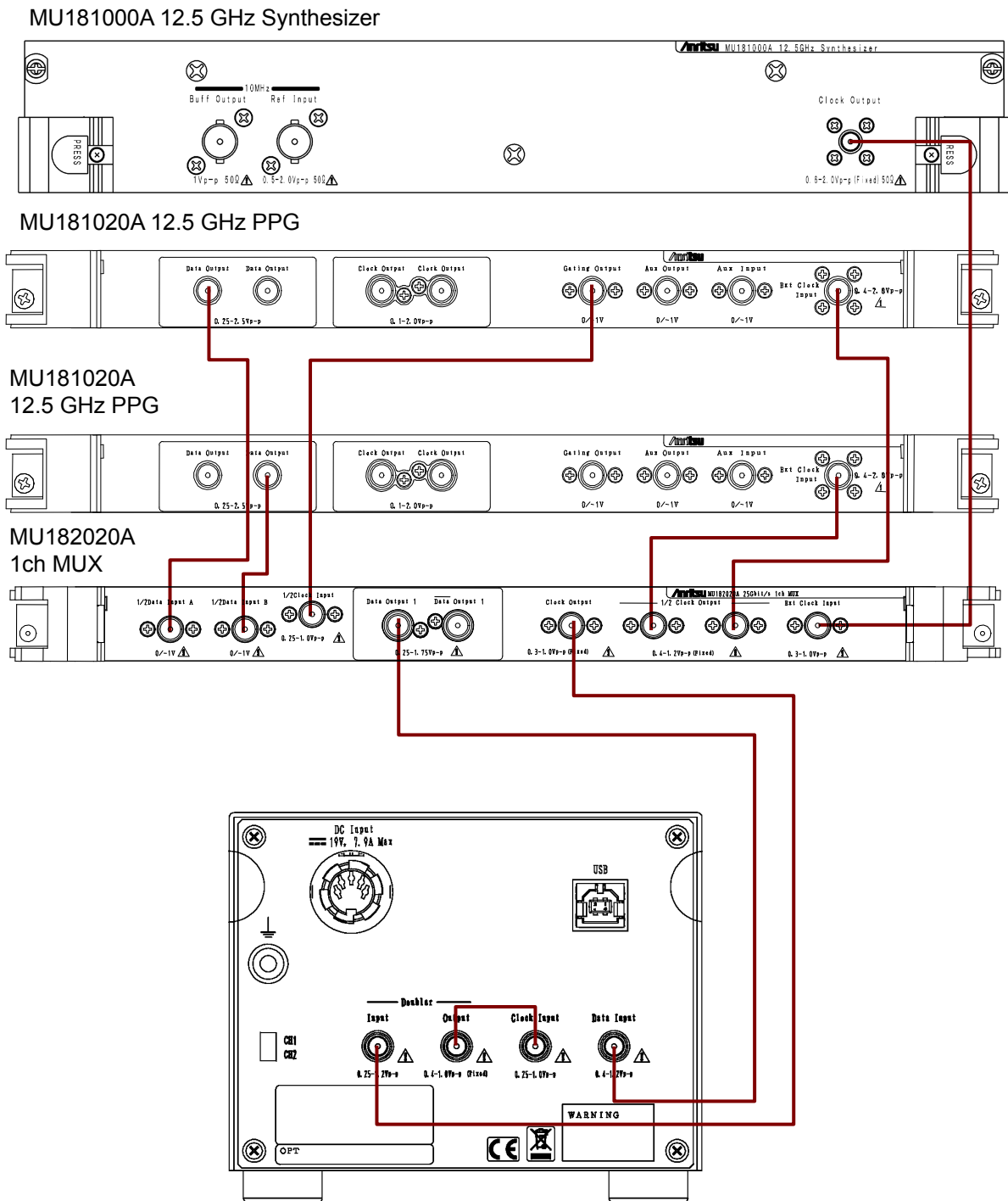


Figure 3.3-5 Connection to MU182020A 25Gbit/s 1ch MUX(Bit Rate 8 to 28 Gbit/s)

Note:

Adjust the phase difference between data and clock to be input to Data Input and Clock Input, as shown in Figure 3.3-2. In case of MP1825B-x04, the phase difference can be auto-adjusted by using the Data/Clock Adjustment function.

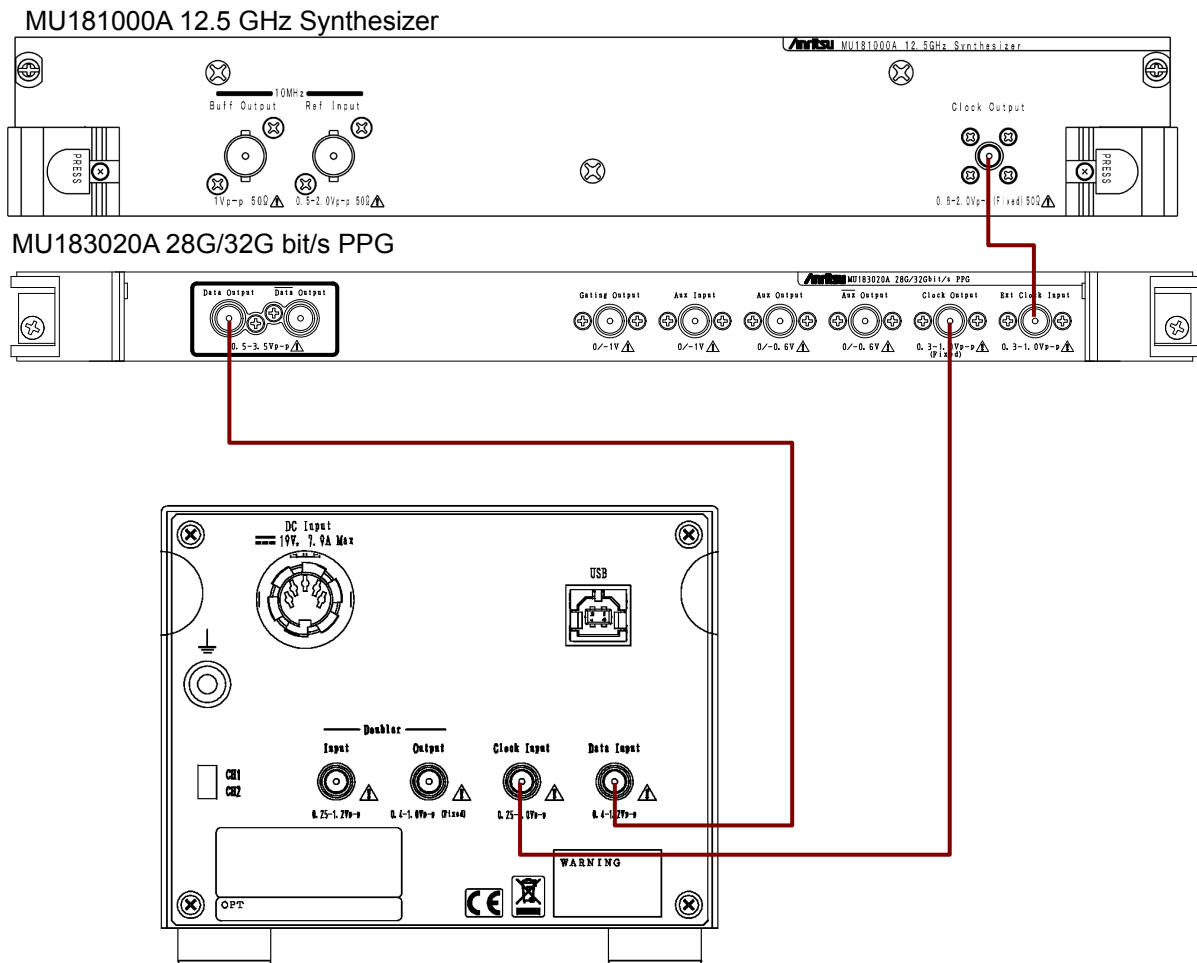


Figure 3.3-6 Connection to MU183020A 28G/32G PPG (Bit rate 2.4 to 14 Gbit/s)

Notes:

- Calibration LED lamp may light when connecting MP1825B-x02, x04 and MU183020A. This is not a malfunction.
- Adjust the phase difference between data and clock to be input to Data Input and Clock Input, as shown in Figure 3.3-1. In case of MP1825B-x03, the phase difference can be auto-adjusted by using the Data/Clock Adjustment function.
- For connection shown in Figure 3.3-6, set Output Clock Rate of MU183020A as **Full rate**. For MU183020A setting method, refer to Chapter 5 “Operation Method” in the *MU183020A 28G/32G bit/s PPG MU183021A 28G/32G bit/s 4ch PPG Operation Manual*.

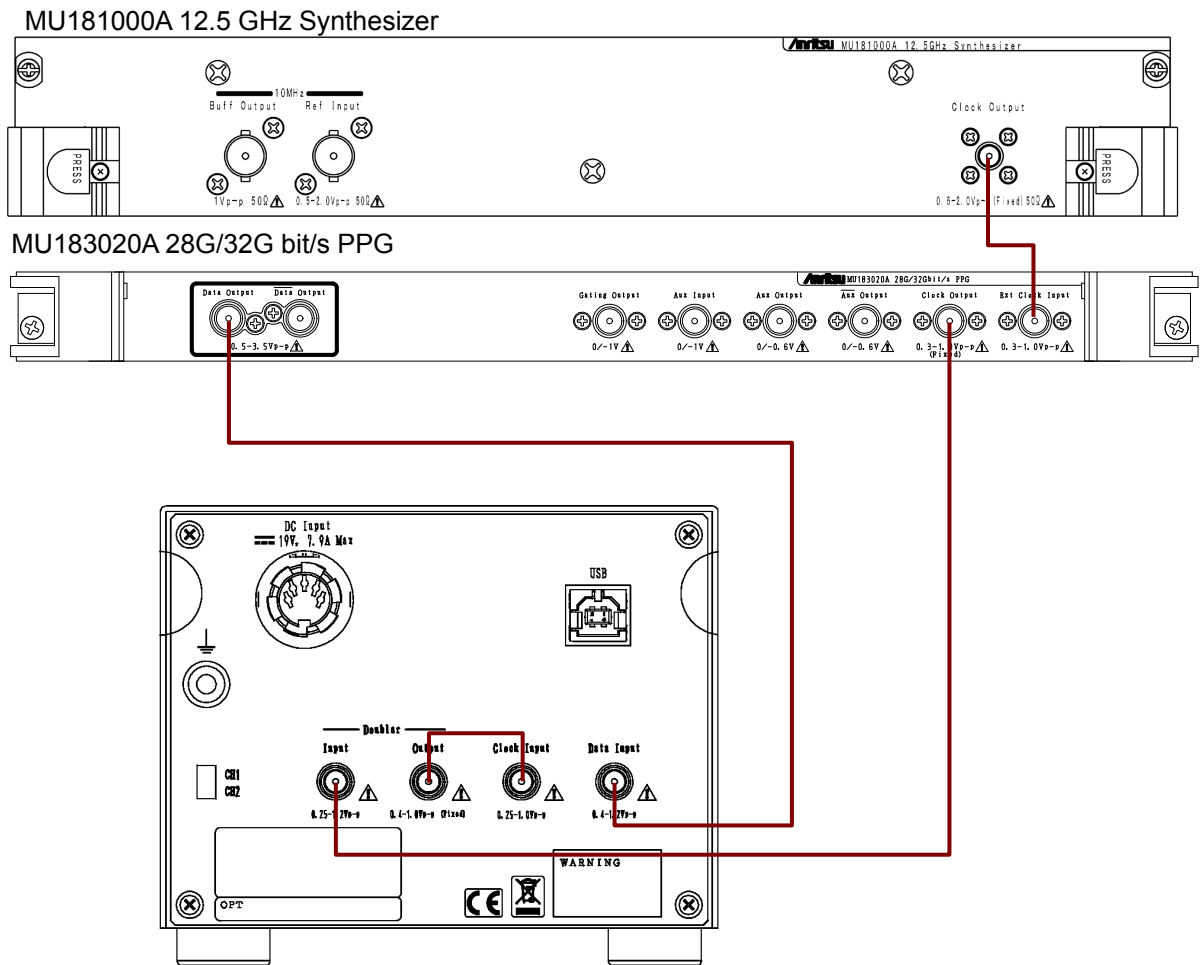


Figure 3.3-7 Connection to MU183020A 28G/32G PPG (Bit Rate 8 to 28 Gbit/s)

Notes:

- Adjust the phase difference between data and clock to be input to Data Input and Clock Input, as shown in Figure 3.3-2. In case of MP1825B-x04, the phase difference can be auto-adjusted by using the Data/Clock Adjustment function.
- For connection shown in Figure 3.3-7, set Output Clock Rate of MU183020A as **Half rate**. For MU183020A setting method, refer to Chapter 5 “Operation Method” in the *MU183020A 28G/32G bit/s PPG MU183021A 28G/32G bit/s 4ch PPG Operation Manual*.

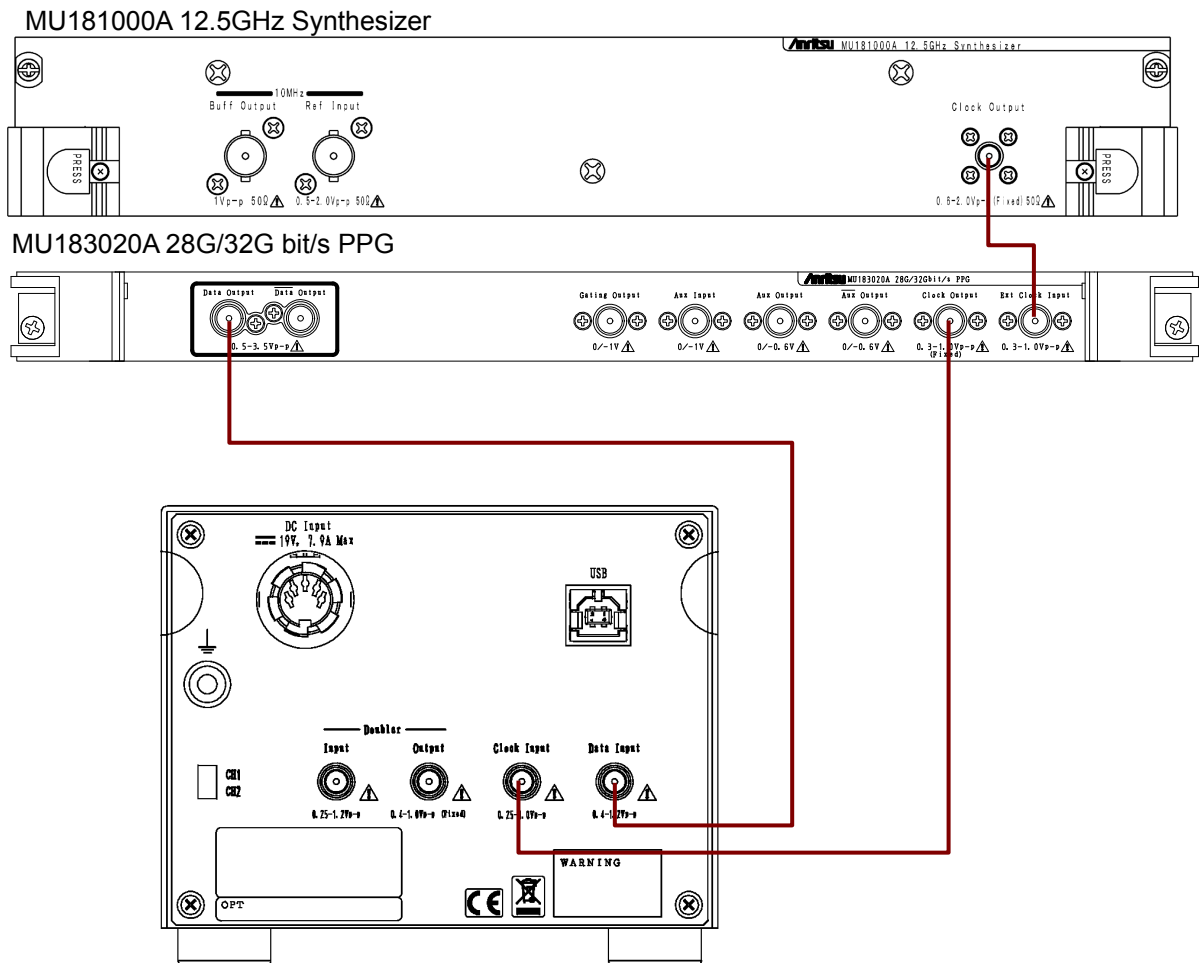


Figure 3.3-8 Connection to MU183020A 28G/32G PPG (Bit Rate 28.1 to 32.1 Gbit/s)

Notes:

- Adjust the phase difference between data and clock to be input to Data Input and Clock Input, as shown in Figure 3.3-2.
- When the Delay (Option x30/31) is installed in the MU183020A, phase difference can be adjusted by Data/Clock Adjustment function in the range of 2.4 to 32.1 Gbit/s. Set **Clock Input** of MP1825B to **Full Rate Clock**.
- For connection shown in Figure 3.3-8, set Output Clock Rate of MU183020A as **Full rate**. For MU183020A setting method, refer to Chapter 5 “Operation Method” in the *MU183020A 28G/32G bit/s PPG MU183021A 28G/32G bit/s 4ch PPG Operation Manual*.

3.4 Amplitude Settings

3.4.1 Waveform format

The types of waveform that can be generated by MP1825B are shown below.

A waveform with emphasis applied to a repeating pattern of "1" and "0" for 6 bits each is displayed on the screen.

At a random pattern, a different waveform from the screen display is output.

The waveform type is selected using **Waveform Format**.

Table 3.4.1-1 Pre-Emphasis Waveform format

Waveform Format setting	Output waveform	Remarks
1:2Post/1Pre-cursor		Cursor1 \geq Cursor2
2:3Post-cursor		Cursor1 \geq Cursor2 Cursor1 \geq Cursor3
3:1Post/1Pre-cursor		

Table 3.4.1-1 Pre-Emphasis Waveform format (Cont'd)

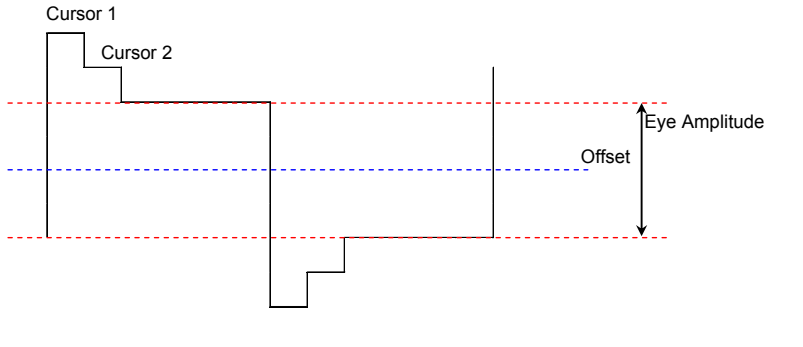
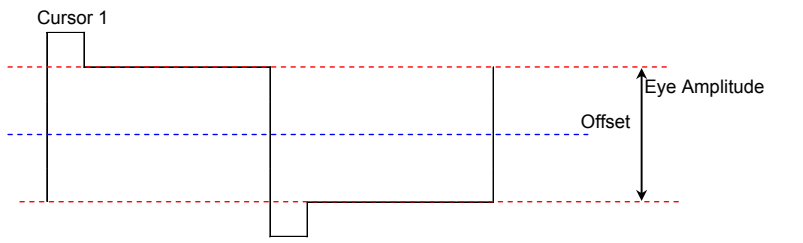
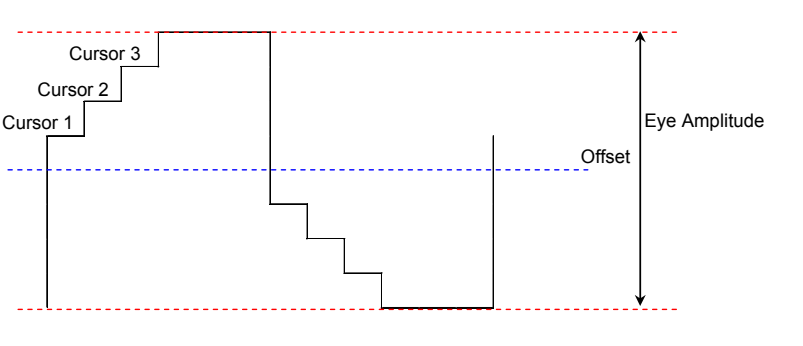
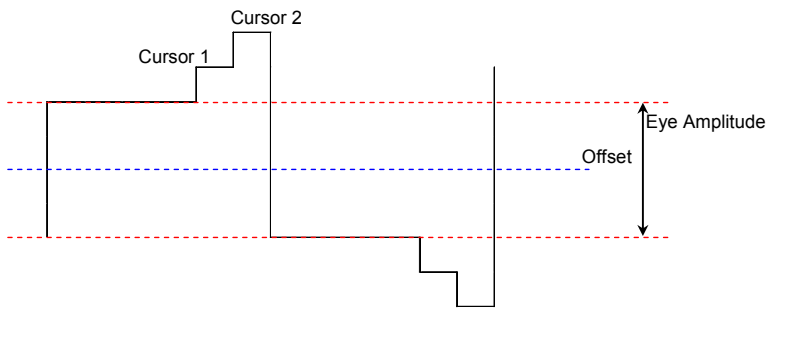
Waveform Format setting	Output waveform	Remarks
4:2Post-cursor		Cursor1 ≥ Cursor2
5:1Post-cursor		
6:Rev. 3Post-cursor		Cursor3 ≥ Cursor2 Cursor2 ≥ Cursor1
7:2Pre-cursor		Cursor2 ≥ Cursor1

Table 3.4.1-1 Pre-Emphasis Waveform format (Cont'd)

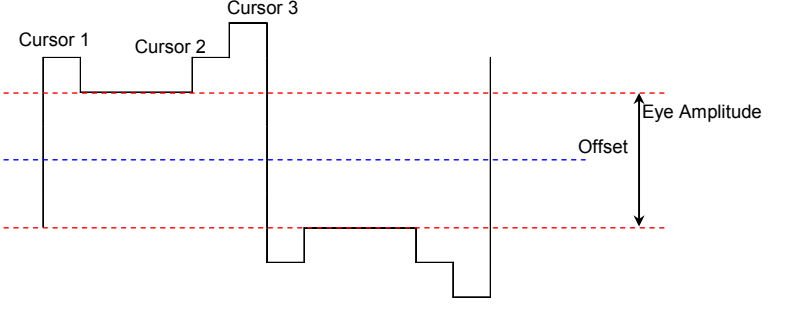
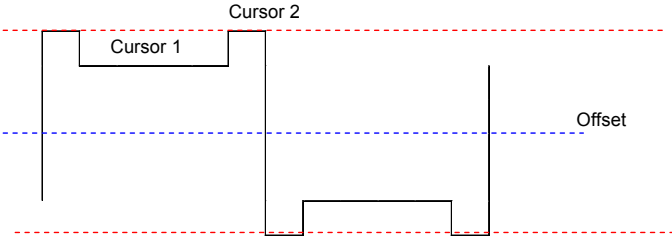
Waveform Format setting	Output waveform	Remarks
8:1Post/2Pre-curs or	 <p>The diagram shows a digital waveform with three cursors: Cursor 1, Cursor 2, and Cursor 3. The waveform is bounded by two red dashed lines representing the eye amplitude. A blue dashed line indicates the offset. A vertical double-headed arrow between the red lines is labeled 'Eye Amplitude'. The waveform shows a transition from high to low, with the signal level rising before the transition (pre-emphasis) and falling after (post-cursor).</p>	Cursor3 ≥ Cursor2

Table 3.4.1-2 De-Emphasis Waveform format

Waveform Format setting	Output waveform	Remarks
1:1Post/1Pre-curs or	 <p>The diagram shows a digital waveform with two cursors: Cursor 1 and Cursor 2. The waveform is bounded by two red dashed lines. A blue dashed line indicates the offset. The waveform shows a transition from high to low, with the signal level rising before the transition (pre-cursor) and falling after (post-cursor).</p>	

3.4.2 Voltage setting

Set the voltages for Cursor1 to 3, Eye Amplitude, and Offset by clicking the up and down arrows.

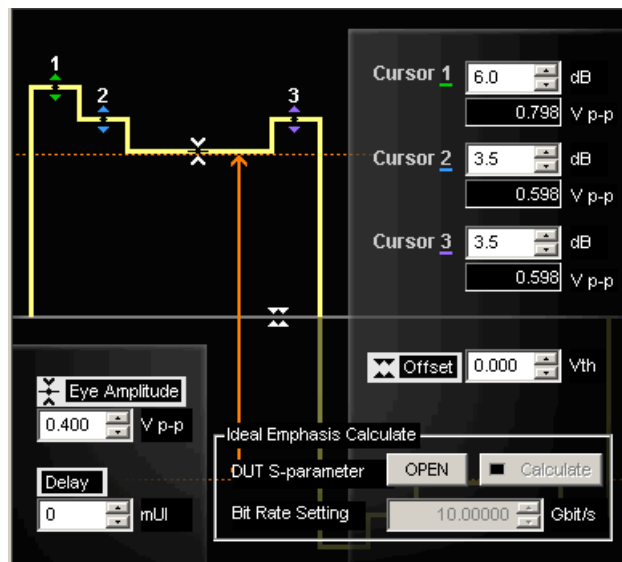


Figure 3.4.2-1 Cursor and Voltage Setting Display

1. Display the MP1825B Control screen.
2. Set **Emphasis Function** to **ON**.
3. In the **Waveform Format** box, select the waveform type.
4. In the **Cursor** and **Eye Amplitude** boxes, specify the amplitude voltage values by using the up and down arrows or by entering the values.
5. In the **Offset** box, specify the offset voltage by using the up and down arrows or by entering the value.
6. To enable the Offset voltage set at step 5, set **Offset** to **AC OFF**.

Cursor1, 2 can only be set to a larger value than Eye Amplitude at the following **Waveform Format** types:

3:1Post/1Pre-cursor
 4:2Post-cursor
 5:1Post-cursor

Cursor1, 3 can only be set to a larger value than Eye Amplitude at the following **Waveform Format** types:

1:2Post/1Pre-cursor
 2:3Post-cursor

When **Format** is **6: Rev. 3Post-cursor**, Cursor1 to 3 can only be set to a smaller value than Eye Amplitude.

The maximum amplitude setting for each cursor is 1.5 Vp-p.
However, the actual emphasis output varies according to the pattern.

With repeating pattern of "1" for 4 bits and "0" for 4 bits: 1.5 Vp-p max

With 2Post-1Pre at alternate pattern of "1" and "0": 3.0 Vp-p max

With 1Post-1Pre at alternate pattern of "1" and "0": 3.0 Vp-p max

3.4.3 Optimum value setting function

MP1825B can calculate optimum emphasis settings for the DUT from the S-parameter inverse characteristics, by loading a DUT S-parameter file.

S-parameters (s2p and s4p files) stored in the models below can be opened.

- Vector Network Analyzer MS4640A Series
- BERTwave MP2100A Series

Note:

Up to 2000 frequency points of s2p and s4p files can be read. Also, up to 1 MB of the file size can be read.

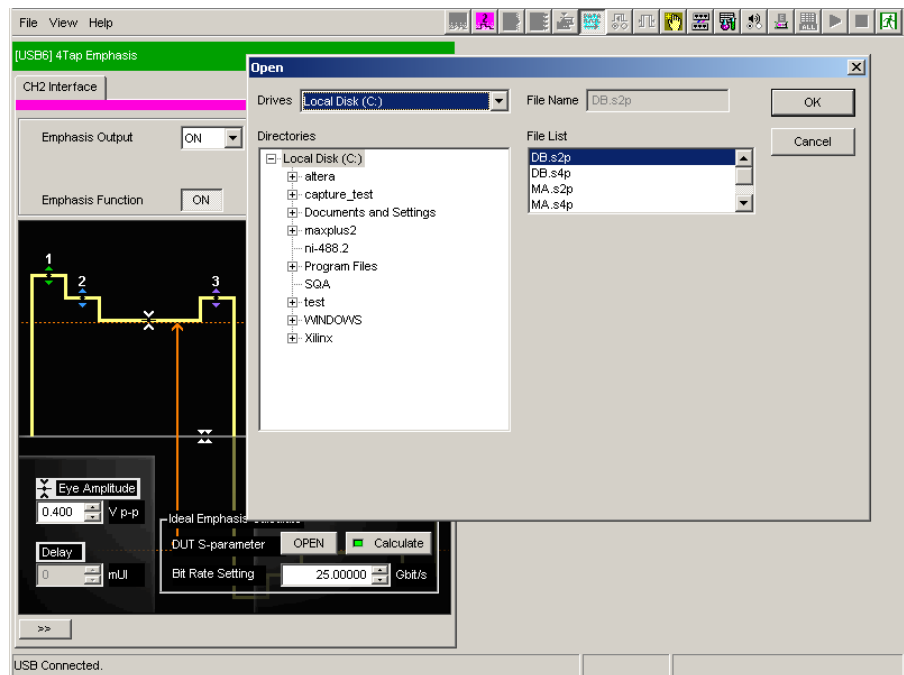


Figure 3.4.3-1 Ideal Emphasis Function

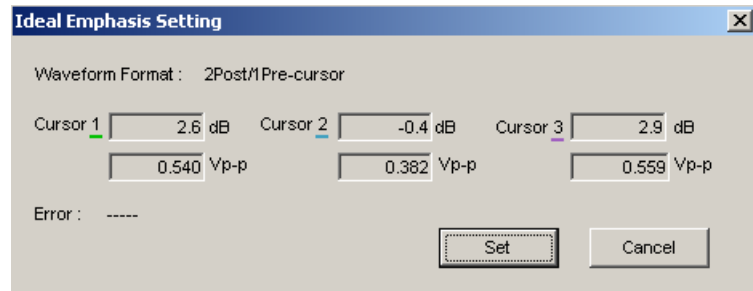


Figure 3.4.3-2 Ideal Emphasis Setting Screen

1. Display the MP1825B Control screen.
2. Set **Emphasis Function** to **ON**.
3. In the **Waveform Format** box, select the waveform type.

Note:

Ideal Emphasis function cannot be used when **Rev.3Post-Cursor** or **2Pre-cursor** is selected.

4. Click the DUT S-parameter **Open** button.
5. Select s2p file or s4p file to open.
6. The optimum setting value of the file selected in Step 5 is displayed. Confirm the voltage set to each Cursor and click **Set**.

Note:

When the value calculated from the loaded file exceeds the setting limit (20 dB) of MP1825B or the optimum value cannot be set because of the setting restriction of MP1825B, "Alarm" is displayed.

7. The setting is reflected to each Cursor and the **Calculate** button lamp lights in green.
8. When **Waveform Format**, each Cursor setting value, and operation bit rate are changed, the **Calculate** button lamp turns off. To set the optimum value again, click the **Calculate** button and repeat the operation in Step 6.

3.5 Setting Restrictions for Other Modules

When the Data Input setting described in 3.3 “Input Signal Settings” is set to something other than External, there are some restrictions on the settings for other modules.

The restricted settings and values are shown in the following table.

Table 3.5-1 Restrictions for Other Modules

Data Input Setting	Restricted Item	Settings
X:Y:MU181020A/B* ¹	Data Amplitude	1 V* ²
	Data Cross Point	50%
	Data Defined Interface	Variable
	Data Offset	0 V
	Data/XData AC On/Off	Off
	Data/XData Level Guard On/Off	Off
	Delay	0 mUI (0 ps)
	Relative	OFF
	Jitter Input	OFF
	Unit Offset	0 mUIp-p
X:Y:MU182020A* ¹ X:Y:MU182021A* ¹ Data1 or Data2	Data Amplitude	1 V
	Data Cross Point	50%
	Data Defined Interface	Variable
	Data External ATT Factor	0 dB
	Data Offset	0 V
	Data/XData AC On/Off	Off
	Data/XData Level Guard On/Off	Off
	Data/XData Half Period Jitter	0
	Data1/Data2 Tracking	Off
	Emphasis Output	Off
	Delay	0 mUI (0 ps)
	Relative	OFF
	Jitter Input	OFF
Unit Offset	0 mUIp-p	

*1: Input the unit number at X and the slot number at Y.

*2: For MU181020A/B-001: 0.8 V

Table 3.5-1 Restrictions for Other Modules (Cont'd)

Data Input Setting	Restricted Item	Settings
X:Y:MU183020A* ¹ Data1 or Data2	Data Amplitude	1 V
	Data Cross Point	50%
X:Y:MU183021A* ¹ Data1, Data2, Data3, or Data4	Data Defined Interface	Variable
	Data External ATT Factor	0 dB
	Data Offset	0 V
	Data/XData AC On/Off	Off
	Data/XData Level Guard On/Off	Off
	Data/XData Half Period Jitter	0
	Delay	0 mUI (0 ps)
	Relative	OFF
	Jitter Input	OFF



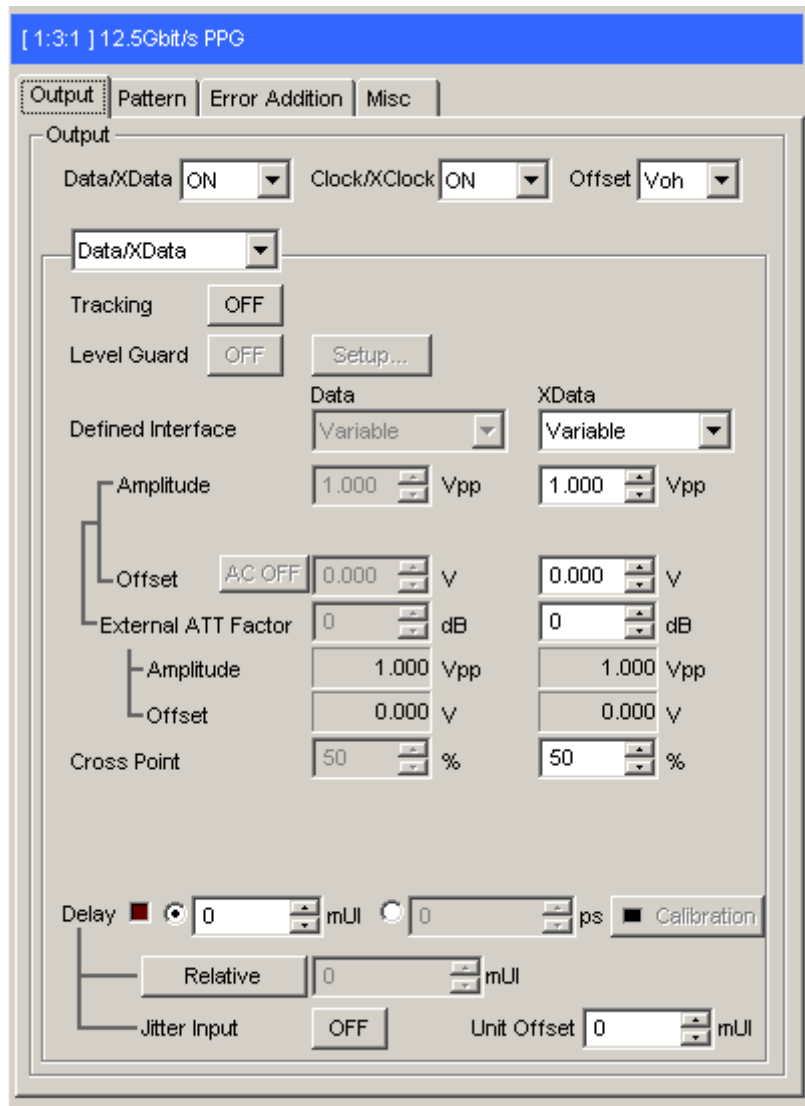


Figure 3.5-1 Example of Restricted Settings Screen

Figure 3.5-1 shows an example of the Module screen with restricted settings.

Text boxes with restricted setting items and labels on restricted buttons are displayed in gray.

3.6 Saving and Reading Settings




The MP1825B settings can be saved to a file.

1. Click **File** on the menu bar.
2. Click **Save**. The Save Screen is displayed.
3. Set the **Modules** pull down menu to **MP1825B**.
The **File Type** becomes **Binary**.
4. Set the saved file destination at **Drives** and **Directories**.
5. Input the name of the saved file at **File Name**. The file extension is EMP (and can be omitted).
6. Click **OK** to save the file with the MP1825B setting conditions.

The saved settings file can be read using the following procedure.

1. Click **File** on the menu bar.
2. Click **Open**. The Open screen is displayed.
3. Set the **Modules** pull down menu to **MP1825B**.
4. Specify the path to the saved settings file using **Drives** and **Directories**.
5. Select the file name from **File List**.
6. Click **OK** to set the file settings to MP1825B.

3.7 Alarm Information Display

If an internal error occurs, In case of an internal error, the appearance of  in the function button bar changes to . Clicking  displays the System Alarm screen.

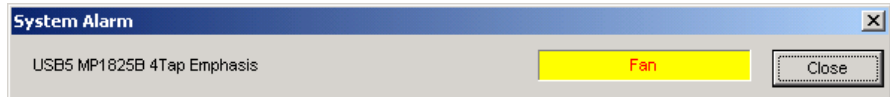


Figure 3.7-1 System Alarm Screen (When System Error is Detected)

Table 3.7-1 System Alarm Screen

Name	Explanation
Fan	Detected internal fan fault
Temperature	Detected abnormal internal temperature

When a temperature abnormality occurs, the System Alarm screen is displayed automatically.

If the temperature fault continues for more than 30 seconds, the MP1825B is powered-down automatically.

Chapter 4 Example of Use

This chapter explains some usage examples.

4.1	Measuring Receiver Degraded Waveform Tolerance ..	4-2
4.2	25 Gbit/s Emphasis Waveform Measurement	4-5
4.3	Crosstalk Measurement.....	4-8
4.4	Waveform Deterioration Resistance Measurement of 32.1 Gbit/s Transmission Path.....	4-11

4.1 Measuring Receiver Degraded Waveform Tolerance

This section explains how to measure the tolerance of a digital data receiver to degraded waveforms using the following modules in the MP1800A.

- MU181000A 12.5GHz Synthesizer
 - MU181020A 12.5Gbit/s Pulse Pattern Generator (With Option x21)
 - MU181040A 12.5Gbit/s Error Detector (With Option x02)
1. Connect Clock Output of this MU181000A Synthesizer (hereafter MU181000A) to Ext Clock Input of the MU181020A 12.5Gbit/s Pulse Pattern Generator (hereafter MU181020A) using a coaxial cable.
 2. Use a coaxial cable to connect the Clock Output of the MU181020A and Clock Input on the back panel of the MP1825B.
 3. Use a coaxial cable to connect the Data Output of the MU181020A and Data Input on the back panel of the MP1825B.
 4. Connect the input connectors of the device under test to $\overline{\text{Data}}$ Output and Data Output of this unit using coaxial cables. If the device under test has only one input connector, connect it to Data Output of this unit. Connect the supplied coaxial terminator to $\overline{\text{Data}}$ Output.
 5. Use a coaxial cable to connect the Clock Buffer Output connector on the front panel of this instrument to the Clock Input connector of the MU181040A Error Detector (MU181040A hereafter).
 6. Connect the output connectors of the device under test to the MU181040A Error Detector (hereafter MU181040A) Data Input and Input connectors using coaxial cables. If the device under test has only one output connector, connect to Data Input of the MU181040A. Do not connect anything to $\overline{\text{Data}}$ Input.
 7. Press the MU181000A Slot button.
Set the Frequency and Offset.
 8. Press the MU181020A Slot button.
 9. Click **Pattern** tab. Set the data pattern.
 10. Click **4Tap Emphasis** in the MX181000A function buttons.
 11. Click **Data Input** and set **MU181020A**.
 12. Click **Emphasis Function** and set the display to **ON**.
 13. Click **Waveform Format** and set the waveform.
 14. Click [\blacktriangledown], [\blacktriangle] at **Cursor1**, **Cursor2**, **Cursor3**, **Amplitude**, and **Offset** of the waveform screen to set the voltages.

4.1 Measuring Receiver Degraded Waveform Tolerance

15. Click **Emphasis Output** and set to **On**.
16. Click **Adjust** for **Data/Clock Adjustment**.
17. Press the MU181040A Slot button.
18. Click the **Input** tab. Sets input voltage of MU181040A.
19. Click the **Pattern** tab. Set the same data pattern as step 9.
20. Click the **Result** tab. Measure the bit error rate.
21. Change the voltage at step 15 and repeat the bit error rate measurement procedure of step 20.

Refer to the following operation manual for the operation screens of the MU181020A and MU181040A.

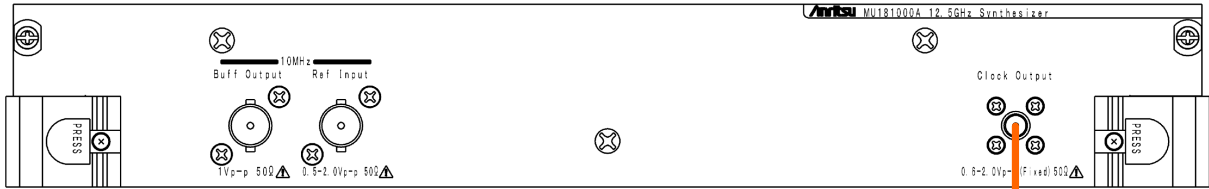
MU181020A 12.5 Gbit/s PPG MU181020B 14 Gbit/s PPG Operation Manual

MU181040A 12.5 Gbit/s ED MU181040B 14 Gbit/s ED Operation Manual

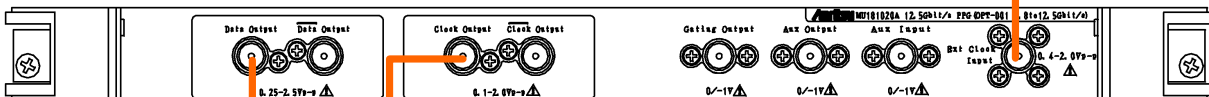
4

Example of Use

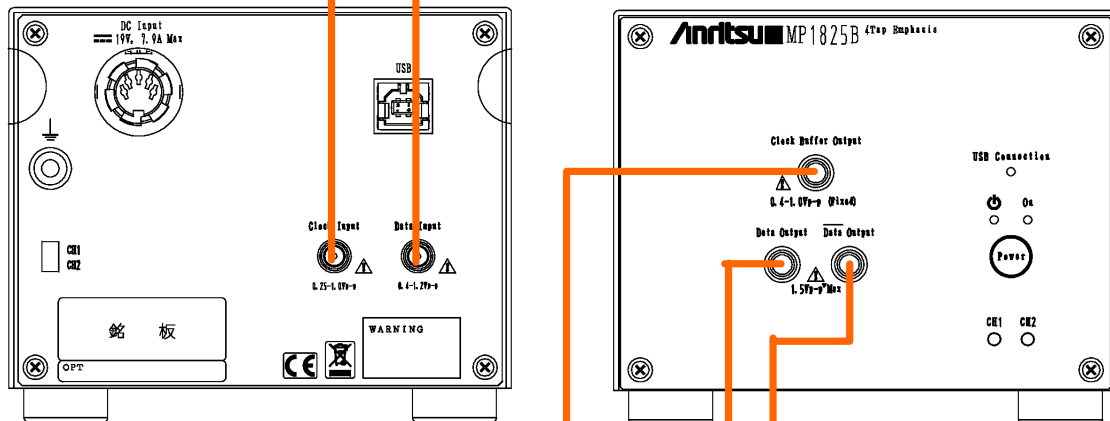
MU181000A 12.5GHz Synthesizer



MU181020A 12.5Gbit/s PPG



MP1825B-x01 4Tap Emphasis



Rear

Front

MU181040A 12.5Gbit/s ED

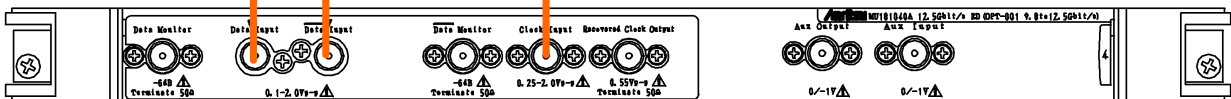


Figure 4.1-1 Receiver Degraded Waveform Tolerance Measurement Setup

4.2 25 Gbit/s Emphasis Waveform Measurement

This section explains how to measure an emphasized 25 Gbit/s data waveform using the following modules in the MP1800A.

- MU181000A 12.5GHz Synthesizer
 - MU181020A 12.5Gbit/s Pulse Pattern Generator, 2 units
 - MU182020A 25Gbit/s 1ch MUX
 - Sampling Oscilloscope
1. Connect the MU181000A Clock Output of this module to the Ext Clock Input of the MU182020A 25Gbit/s 1ch MUX (hereafter MU182020A) using coaxial cable.
 2. Use coaxial cables to connect 1/2 Clock Output of the MU182020A to Ext Clock Input of the MU181020A (two connections).
 3. Use coaxial cables to connect Data Output of the MU181020A to 1/2 Data Input of the MU182020A (two connections).
 4. Use the coaxial cable to connect Clock Output of the MU181020A to 1/2 Clock Input of the MU182020A.
 5. Use a coaxial cable to connect the Clock Output of the MU181020A with Doubler Input on the back panel of the MP1825B.
 6. Use a coaxial cable to connect Doubler Output and Clock Input on the back panel of the MP1825B.
 7. Use a coaxial cable to connect the Data Output of MU182020A and Data Input on the back panel of the MP1825B.
 8. Use coaxial cables to connect the sampling oscilloscope input with Data Output and $\overline{\text{Data}}$ Output of the MP1825B.
 9. Use a coaxial cable to connect the AUX Output of the MU181020A and the trigger input connector of the sampling oscilloscope.
 10. Press the MU181000A Slot button.
Set the frequency to 12500 MHz.
 11. Press the MU181020A Slot button.
 12. Click the **Pattern** tab. Set the data pattern.
 13. When the AUX Output of the MU181020A is connected to the sampling oscilloscope, click the **Misc** tab. Set AUX Output.
 14. Click **4Tap Emphasis** in the MX180000A function buttons.
 15. Click **Data Input** and set **MU182020A**.
 16. Click **Clock Input Band** and set **Half Rate Clock**.
 17. Click **Emphasis Function** and set the display to **ON**.
 18. Click **Waveform Format** and set the waveform.

19. Click [▼], [▲] at **Cursor1**, **Cursor2**, **Cursor3**, **Amplitude**, and **Offset** of the waveform screen to set the voltages.
20. Click **Emphasis Output** and set to **On**.
21. Click **Adjust** for **Data/Clock Adjustment**.
22. Measure the waveform using the sampling oscilloscope.
23. Change the voltage at step 20 and repeat the waveform measurement procedure of step 22.

Refer to the following operation manual for the operation screens of the MU181020A, MU181040A, and MU182020A.

MU181020A 12.5 Gbit/s PPG MU181020B 14 Gbit/s PPG Operation Manual

MU181040A 12.5 Gbit/s ED MU181040B 14 Gbit/s ED Operation Manual

MU182020A 25Gbit/s 1ch MUX MU182021A 25Gbit/s 2ch MUX Operation Manual

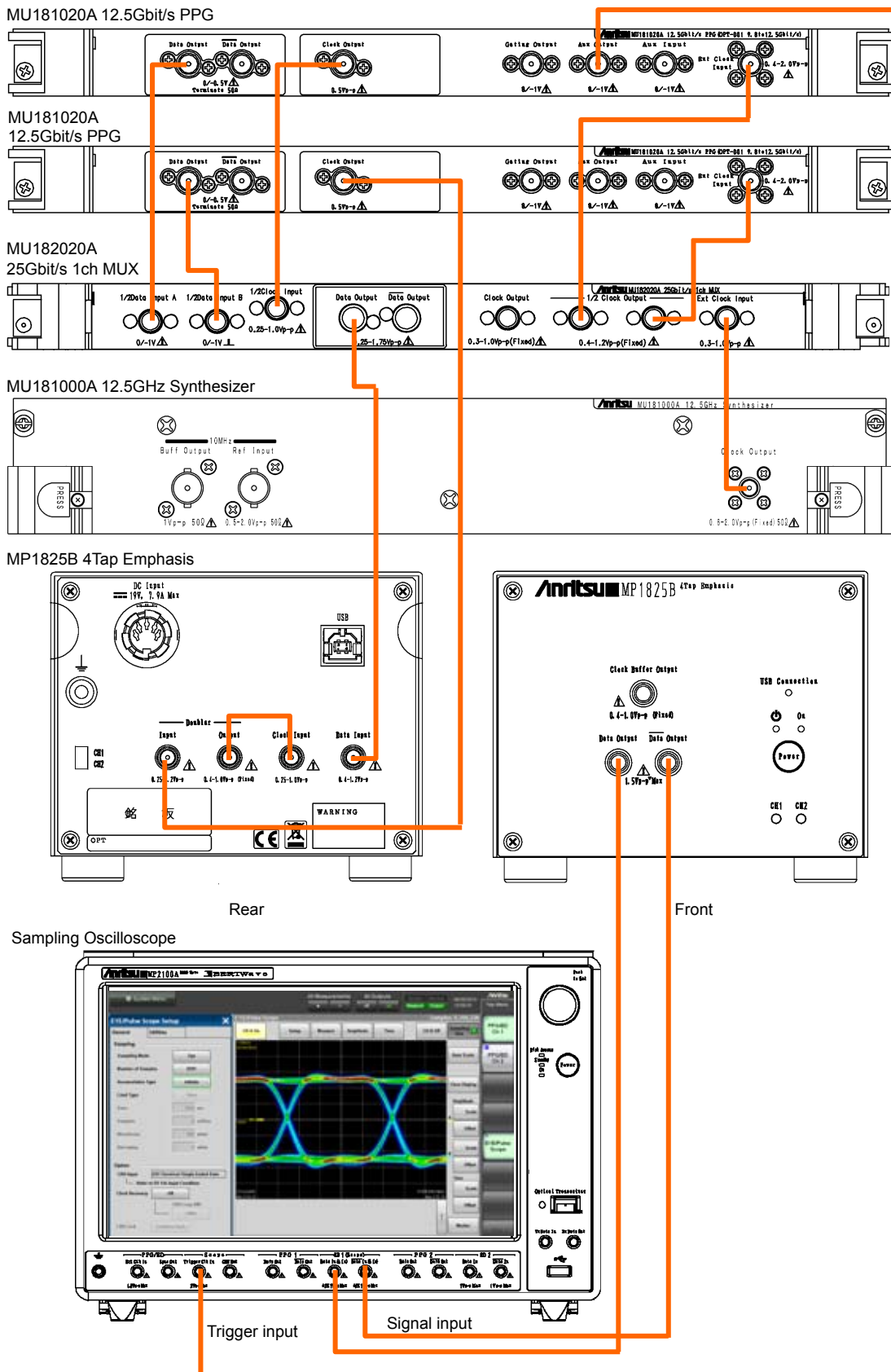


Figure 4.2-1 25 Gbit/s Emphasis Waveform Measurement Setup

4.3 Crosstalk Measurement

This section explains bit error rate measurement using two MP1825B-x01 units and the following modules installed in the MP1800A. One of the MP1825B-x01 units requires Option x03.

- MU181000A 12.5GHz Synthesizer
 - MU181020A 12.5Gbit/s Pulse Pattern Generator, 2 units
 - MU181040A 12.5Gbit/s Error Detector, 2 units
1. Use coaxial cables to connect Clock Output of the MU181000B to Ext Input Clock of the MU181020A (two connections).
 2. Use a coaxial cable to connect the MU181020A Clock Output and Clock Input on the back panel of the MP1825B (two connections).
 3. Use a coaxial cable to connect the Data Output of MU181020A and Data Input on the back panel of the MP1825B (two connections).
 4. Connect the input terminals of the device under test to $\overline{\text{Data}}$ Output and Data Output of MP1825B using coaxial cables (two connections).
 5. Connect the output terminals of the device under test to $\overline{\text{Data}}$ Input and Data Input of MU181040A using coaxial cables (two connections).
 6. Connect the Clock Buffer Output of MP1825B to the Clock Input of MU181040A using coaxial cables (two connections).
 7. Press the MU181000B Slot button.
Set the Frequency and Offset.
 8. Press the MU181020A Slot button.
 9. Click the **Pattern** tab. Set the data pattern.
Make the settings at steps 8 and 9 at both MU181020A units.
 10. Click **4Tap Emphasis** in the MX180000A function buttons.
 11. Click **Data Input** and set **MU181020A**.
Set both Ch1 and Ch2 at steps 10 to 16.
 12. Click **Emphasis Function** and set the display to **ON**.
 13. Click **Waveform Format** and set the waveform.
 14. Click **▼**, **▲** at **Cursor1**, **Cursor2**, **Cursor3**, **Amplitude**, and **Offset** of the waveform screen to set the voltages.
 15. Click **Emphasis Output** and set to **On**.
 16. Click **Adjust** for **Data/Clock Adjustment**.
 17. Click the **Calibration** button of the MP1825B in which Option x03 is installed. Fine-adjust Delay so that the phase difference of the two MP1825B units is 0 or set Relative.

18. Click the Delay text box and set the skew.
19. Press the MU181040A Slot button.
Perform the settings in steps 20 to 22 for both MU181020A units.
20. Click the **Input** tab. Sets input voltage of MU181040A.
21. Click the **Pattern** tab. Set the same data pattern as step 9.
22. Click the **Result** tab. Measure the bit error rate.
23. Change the voltage at step 15 and step 18 and repeat the bit error rate measurement procedure of step 22.

Refer to the following manuals for details of the MU181020A, MU181040A, and synthesizer screen operations.

MU181000A/B Synthesizer Operation Manual

MU181020A 12.5 Gbit/s PPG MU181020B 14 Gbit/s PPG Operation Manual

MU181040A 12.5 Gbit/s ED MU181040B 14 Gbit/s ED Operation Manual

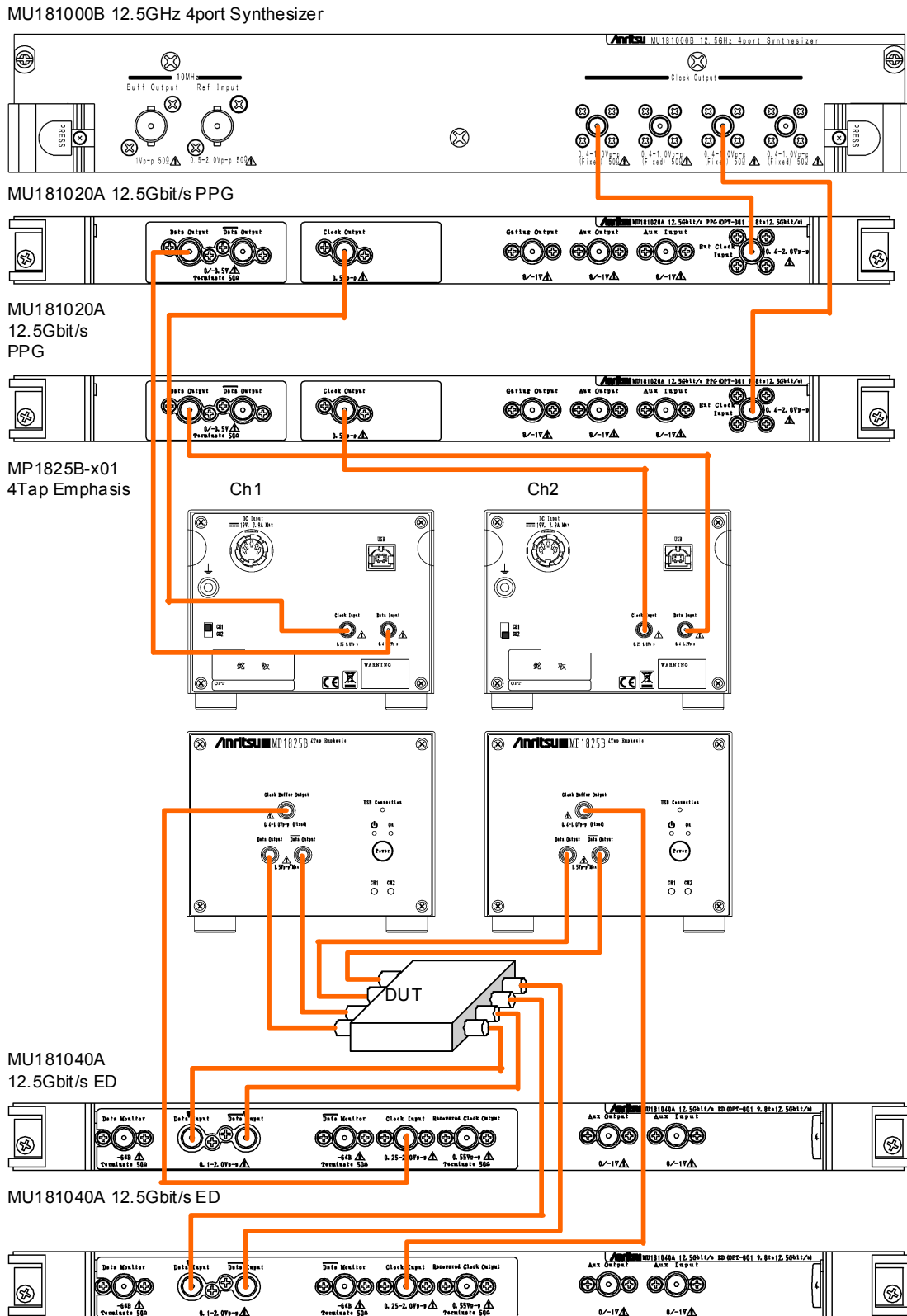


Figure 4.3-1 Crosstalk Measurement Example

4.4 Waveform Deterioration Resistance Measurement of 32.1 Gbit/s Transmission Path

This section explains how to measure the tolerance of 32.1 Gbit/s transmission path to degraded waveforms using the following modules in the MP1800A.

- MU181000A 12.5GHz Synthesizer
- MU183020A 28G/32G bit/s PPG (With Option x30)
- MU183040A 28G/32G bit/s ED

1. Install the 6dB fixed attenuator to the Clock Output of the MU181000A, and connect it to Ext Clock Input of the MU183020A 28G/32G bit/s PPG (hereafter MU183020A) with coaxial cable.
2. Use a coaxial cable to connect the Clock Output of the MU183020A and Clock Input on the back panel of the MP1825B.
3. Use a coaxial cable to connect the Data Output of the MU183020A and Data Input on the back panel of the MP1825B.
4. Connect the input connectors of the device under test to $\overline{\text{Data}}$ Output and Data Output of this unit using coaxial cables. If the device under test has only one input connector, connect it to $\overline{\text{Data}}$ Output of this unit. Connect the supplied coaxial terminator to $\overline{\text{Data}}$ Output.
5. Connect the AUX Output of the MU183020A and the Doubler Input on the rear panel of the MP1825B with coaxial cable, and connect the Doubler Output on the rear panel of the MP1825B to the Ext Clock Input of the MU183040A 28G/32G bit/s ED (hereafter MU183040A) with coaxial cable.
6. Connect the output connectors of the device under test to $\overline{\text{Data}}$ Output and Data Output of the MU183040A using coaxial cables. If the device under test has only one output connector, connect to Data Input of the MU183040A. Do not connect anything to $\overline{\text{Data}}$ Input.
7. Press the MU183020A Slot button.
8. Click **Misc1** tab. Set **AUX Output** to **1/N Clock** and **1/4 Clock**.
9. Click **Misc2** tab. Set **Clock Source** to **MU181000A** and set **Bit Rate**. Set **Output Clock Rate** to **Fullrate**.
10. Click **Pattern** tab. Set the data pattern.
11. Click **4Tap Emphasis** in the MX181000A function buttons.

12. Click **Data Input** and set **MU183020A**. Set **Clock Input** to **Full Rate Clock**.
13. Click **Emphasis Function** and set the display to **ON**.
14. Click **Waveform Format** and set the waveform.
15. Click [▼], [▲] at **Cursor1**, **Cursor2**, **Cursor3**, **Amplitude**, and **Offset** of the waveform screen to set the voltages.
16. Click **Emphasis Output** and set to **On**.
17. Click **Adjust** for **Data/Clock Adjustment**.
18. Press the MU183040A Slot button.
19. Click the **Input** tab. Sets the input voltage and the clock delay of MU183040A.
20. Click the **Pattern** tab. Set the same data pattern as step 10.
21. Click the **Result** tab. Measure the bit error rate.
22. Change the voltage at step 16 and repeat the bit error rate measurement procedure of step 21.

Refer to the following operation manual for the operation screens of the MU183020A and MU183040A.

*MU183020A 28G/32G bit/s PPG MU183021A 28G/32G bit/s 4ch PPG
Operation Manual*

*MU183040A 28G/32G bit/s ED MU183041A 28G/32G bit/s 4ch ED
Operation Manual*

4.4 Waveform Deterioration Resistance Measurement of 32.1 Gbit/s Transmission Path

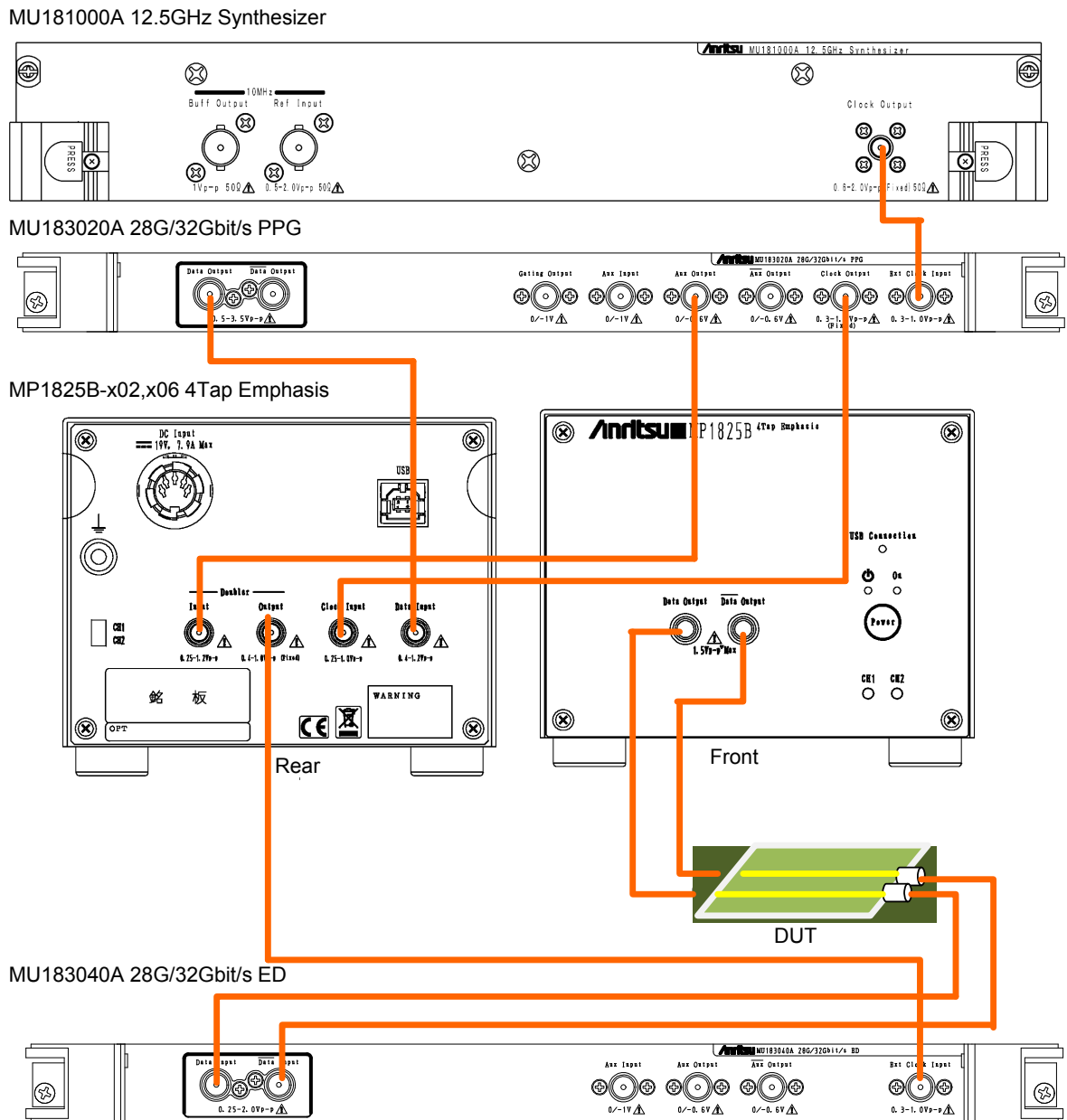


Figure 4.4-1 Measurement System for Waveform Deterioration Resistance of 32.1Gbit/s Transmission Path

4

Example of Use

Chapter 5 Remote Commands

This chapter explains setting and query commands for the MP1825B 4Tap Emphasis.

5.1	Command Description Method	5-2
5.2	MP1825B Commands (Tree View).....	5-3
5.3	System Setting Commands	5-5
5.4	Status Commands	5-11
5.5	Data Output Setting Commands.....	5-14
	5.5.1 Output Items	5-14
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5.6	Data and Clock Input Setting Commands	5-30
5.7	Delay Setting Commands	5-35
5.8	Screen Display Setting Commands.....	5-39
5.9	File Menu Setting Commands	5-40

5.1 Command Description Method

This chapter explains the notations used in the message syntax.

Table 5.1-1 Notation used in Command Syntax

Symbol	Usage
<>	Parameters enclosed in < > are character strings input to the program.
[]	Messages or parameters enclosed in square brackets can be omitted.
	Choose one from multiple choices. A B C D means choose from A, B, C, and D.
{ }	Groups choice in braces. A B ({C D}) means choose one of A, B(C), and B(D).
<CHARACTER DATA>	Short alphabet or alphanumeric
< DECIMAL NUMERIC DATA >	Decimal numeric value Example: -1.00, 256000, 1.3E-1
<NR1 NUMERIC DATA>	Decimal integer value Example: -100, 12500000
<NR2 NUMERIC DATA>	Decimal fraction Example: -0.02, 2.35
<STRING DATA>	Alphanumeric data Double or single quotes are required before and after the data.
<BOOLEAN DATA>	Data indicating logical true or false

5.2 MP1825B Commands (Tree View)

The following MP1825B commands are displayed in a tree view.

Before executing these commands, use the :USB:ID command to specify the USB number of the MP1825B to be remotely controlled.

For details of : USB:ID commands, refer to 5.3 “System Setting Commands”.

An error does not occur even when a coefficient different from Preset is set by sending the No. 29 ":SOURce:EMPHasis:PRESet" command. For details, refer to the command descriptions in Section 5.5.2 “Waveform settings”.

Table 5.2-1 MP1825B Command Tree

No.	Command Header 1	Command Header 2	Command Header 3	Command Header 4	Command/Query	Remarks
1	:INSTrument	:EMPHasis	:CONDotion		Q	
2			[:EVENT]		Q	
3			:NTRansition		C/Q	
4			:PTRansition		C/Q	
5			:RESet		C	
6	:OUTput	:CHANge	:CState		Q	PPG compatible
7		:DATA	:AOFFset		C/Q	PPG compatible
8			:BMONitor		Q	
9			:JINput		C/Q	PPG compatible
10			:OUTput		C/Q	PPG compatible
11			:PADjust		C/Q	PPG compatible
12			:PCALibration		C	PPG compatible
13			:RDElay		C/Q	PPG compatible
14			:RELative		C/Q	PPG compatible
15			:UIPadjust		C/Q	PPG compatible
16	:SOURce		:DISPlay	:SIZE		C
17		:EMPHasis	:CURSor[1 2 3]		C/Q	
18				:MONitor	Q	
19			:EAMplitude		C/Q	
20			:ENABle		C/Q	
21			:OFFSet		C/Q	
22			:WAVEform		C/Q	
23				:DEFault	C	
24			:BITRate		C/Q	
25			:TYPE		C/Q	
26			:UNIT		C/Q	
27			:V[A B C]	:MONitor	Q	
28			:STANdard		C/Q	
29	:PRESet			C/Q		

Table 5.2-1 MP1825B Command Tree (Cont'd)

No.	Command Header 1	Command Header 2	Command Header 3	Command Header 4	Command/Query	Remarks	
30	:SOURce	:EMPHasis	:COEFFicient	:SSIZE	C/Q		
31			:COEFFicient	:VALUe	C/Q		
32			:COEFFicient	:STEP	C		
33	:SYSTem	:CONDition			Q		
34			:USB		Q		
35		:INFOrmation	:ERRor		Q		
36		:INPut	:CBANd		C/Q		
37				:CRATe		C/Q	
38				:DCADjust		C	
39					:MANual	C/Q	
40					:SELEct	C/Q	
41				:DSELEct		C/Q	
42				:MODule	Q		
43		:MMEMory	:EMPHasis		:RECall	C	
44					:SPRecall	C	
45					:SPStatus	Q	
46					:STORe	C	
47	:UNIT			Q			
48	:USB	:ID	:RESet		C		
49	:DISPlay	:ACTive			C		

5.3 System Setting Commands

Table 5.3-1 System Setting Commands

Setting Items	Command
USB No. Setting	:USB:ID
	:USB:ID?
Querying device information	:SYSTem:CONDition?
	:SYSTem:CONDition:USB?
Querying system error	:SYSTem:INFormation:ERRor?
Querying system information	:SYSTem:UNIT?
Displaying Module screen	:DISPlay:ACTive

:USB:ID <usb number>

Parameter	<usb_number>=<DECIMAL NUMERIC PROGRAM DATA> 5, 6 USB number CH1:5, CH2:6
Function	Sets channel of MP1825B to be controlled using USB number.
Example of Use	To set MP1825B CH2 as control target: > :USB:ID 6

:USB:ID?

Response	<usb_number>=<NR1 NUMERIC RESPONSE DATA> 5, 6 USB number CH1:5, CH2:6
Function	Queries USB number of controlled MP1825B
Example of Use	> :USB:ID? > 6

Note:

In order to remote control the module mounted in MP1800A/MP1810A after remote controlling MP1825B with this command, use :UENTry:ID,:MODule:ID to switch the target unit to MP1800A. For details of UENTry:ID,:MODule:ID commands, refer to 7.1 “Common Commands” in *MX180000A Signal Quality Analyzer Control Software Operation Manual Remote Control*.

:SYSTem:CONDition?

Response	<p>"<mainframe>, <slot x>, ..., <usb x>, ..., <usb 127>"</p> <p><mainframe> Refer to the explanation of :SYSTem:CONDition? query, in 7.1.1 "Commands for common settings" in <i>MX180000A Signal Quality Analyzer Control Software Operation Manual Remote Control</i>.</p> <p><slot x> Refer to the explanation of :SYSTem:CONDition? query, in 7.1.1 "Commands for common settings" in <i>MX180000A Signal Quality Analyzer Control Software Operation Manual Remote Control</i>.</p> <p><usb x>= <module>,<serial>,<fpga1>[,<fpga2>],<boot>,<application>,<opt> x indicates the USB number. The USB number is 1 to 127. <module>=<STRING RESPONSE DATA> XXXXXXXXXX Module name Ex: MP1825B</p> <p>Note: NONE is output when no module is mounted.</p> <p><serial>=<STRING RESPONSE DATA> XXXXXXXXXX 0000000000 to 9999999999 Serial number</p> <p>Note: "-----" is output when no module is mounted.</p> <p><fpga1>[,<fpga2>,...]=<STRING RESPONSE DATA> XXXX.XX.XX 1.00.00 to 9999.99.99 FPGA version</p> <p><boot>=<STRING RESPONSE DATA> XXXX.XX.XX 1.00.00 to 9999.99.99 Logic Boot version</p> <p>Note: "-----" is output when no Logic Boot is mounted.</p> <p><application>=<STRING RESPONSE DATA> XXXX.XX.XX 1.00.00 to 9999.99.99 Logic Application version</p> <p>Note: "-----" is output when no Logic Application is mounted.</p> <p><opt>=<STRING RESPONSE DATA> XXXXXX/XXXXX Option number Refer to Table 5.3-2 for option number of MP1825B.</p>
----------	---

Table 5.3-2 Option Character Table

Model/Name	Option Number	Option Name
MP1825B 4 Tap Emphasis	OPTx01	14 Gbit/s Operation
	OPTx02	28 Gbit/s Operation
	OPTx03	14 Gbit/s Variable Data Delay
	OPTx04	28 Gbit/s Variable Data Delay
	OPTx06	32.1 Gbit/s Extension

Note:

Outputs for the number of options mounted. NONE is output when no option is mounted.

Function

Queries the software status of MP1800A.

Example of Use

```
> :SYSTem:CONDition?
< 6201234567,1.00.00,1.00.20,OPT302,1.00.00,1.00.00,OPT1
2,OPT14,MU181000A,6201234568,1.00.00,1.00.00,1.00.00,OPT
101,MU181020A,6201234569,1.00.00,1.00.00,1.00.00,OPT001,
OPT220,MU181040A,6201234571,1.00.00,1.00.00,1.00.00,OPT0
02,OPT220,MP1825B,6201234571,1.00.00,1.00.00,1.00.00,OPT
002
```

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Remote Commands

:SYSTem:CONDition:USB?

Response

```
<usb1>, ..., <usb127>=<STRING RESPONSE DATA>
"XXXX" Main frame product name Ex: MP1825B
```

Function

Queries the product name of the USB module.

Example of Use

```
> :SYSTem:CONDition:USB?
< NONE,NONE,NONE,NONE,MP1825B,NONE,NONE,...,NONE
```

:SYSTem:INFormation:ERRor? <unit>[,<usb>]

Parameter	<unit>=<DECIMAL NUMERIC PROGRAM DATA> 1
	Note: When querying USB, set 1 for <unit>.
	<usb>=<DECIMAL NUMERIC PROGRAM DATA> 5 to 6 5:CH1, 6:CH2
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 NONE 2 Temperature 3 Fan
Function	All occurring System Errors are displayed, separated with comma. Queries the content of System Error.
Example of Use	> :SYSTem:INFormation:ERRor? 1,5 < 2,3 (System error at Temperature/Fan) < 0 (No system error)

:SYSTem:UNIT? <numeric>[,<usb>]

Parameter	<p><numeric>=<NR1 NUMERIC PROGRAM DATA> 1 When querying USB, set 1.</p> <p><numeric>=<NR1 NUMERIC PROGRAM DATA> 5 to 6 5:CH1, 6:CH2</p>
Response	<p><mainframe>= <unit>, <serial>, <mver>, <hver>, <opt1>, <sbver>, <saver>, <opt2> <unit>=<STRING RESPONSE DATA> XXXXXXXXXX Main Unit Name Ex: MP1825B</p> <p>Note: NONE is output when no module is mounted.</p> <p><serial>=<STRING RESPONSE DATA> XXXXXXXXXX 0000000000 to 9999999999 Mainframe serial number</p> <p>Note: Alphabetical characters may be included.</p> <p><mver>=<STRING RESPONSE DATA> XXXX.XX.XX 1.00.00 to 9999.99.99 Main application software version</p> <p><hver>=<STRING RESPONSE DATA> XXXX.XX.XX 1.00.00 to 9999.99.99 Mainframe hardware version</p> <p><opt1>=<STRING RESPONSE DATA> OPTXXX Refer to Table 5.3-2 for option number of MP1825B.</p> <p>Note: Outputs for the number of options mounted. NONE is output when no option is mounted.</p> <p><sbver>=<STRING RESPONSE DATA> XXXX.XX.XX 1.00.00 to 9999.99.99 Sub application software version (Boot part)</p> <p><saver>=<STRING RESPONSE DATA> XXXX.XX.XX 1.00.00 to 9999.99.99 Sub application software version (Application part)</p> <p><opt2>=<STRING RESPONSE DATA></p>
Function	Queries main frame model name, serial no., etc.
Example of Use	<p>To query USB6 main frame model name, serial no., etc.:</p> <pre>> :SYSTem:UNIT? 1,6 < "MP1825B,6201234568,1.00.00,1.00.00,OPT001,1.00.00,1.00.00"</pre>

:DISPlay:ACTive <unit>,<slot>[,<tab>]

Parameter	<p><unit>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4 Mainframe No. 1 to 4 Specify the mainframe number when connecting MT1810As. For MP1800A: fixed to No.1. 0 When specifying the USB module (MU1825B/MP1821A/MP1822A) <slot>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 6 Slot/USB No. 1 to 6 For MP1800A as available mainframe: 1 to 6. for MT1810A: 1 to 4. If the available mainframe is the USB module (<unit>=0), set USB No.1 to 6. [<tab>]=<DECIMAL NUMERIC PROGRAM DATA> 1 to X Tab ID No.1 to X Set to 1 when omitted. Tab ID 1 is assigned to the left most tab. Tab ID 2, 3, 4.... are assigned to other tabs in numerical order. The maximum tab ID “X” depends on the module model or options.</p>
Function	<p>Shows the screen of the specified module in front Note: This function is not available when display process of the measurement result is set to OFF. Set the display process to ON by :SYSTem:DISPlay:RESult ON command before using this function.</p>
Example of Use	<p>To display the Interface tab of MP1825B: (When MP1825B as USB5 is connected) > :DISPlay:ACTive 0,5,1</p>
Compatibility	<p>Incompatible with existing models.</p>

5.4 Status Commands

:INSTRument:EMPHasis[:EVENT]?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 to 60	Sum total of the bit of event register (DECIMAL)
	Available bit	
	4 (Bit2)	Delay Busy occurred
	8 (Bit3)	Adjust Require occurred
	16 (Bit4)	Data Clock Adjust in progress
	32 (Bit5)	Delay Calibration Require in progress
Function	Queries event at Emphasis status.	
Example of Use	<pre>> :INSTRument:EMPHasis:EVENT? or > :INSTRument:EMPHasis? < 16</pre>	

:INSTRument:EMPHasis:CONDition?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 to 60	Sum total of the bit of condition register (DECIMAL)
	Available bit	
	4 (Bit2)	Delay Busy occurred
	8 (Bit3)	Adjust Require occurred
	16 (Bit4)	Data Clock Adjust in progress
	32 (Bit5)	Delay Calibration Require in progress
Function	Queries condition at Emphasis status.	
Example of Use	<pre>> :INSTRument:EMPHasis:CONDition? < 16</pre>	

:INSTRument:EMPHasis:PTRansition <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 0 to 60	Sum total of the bit of transition filter (DECIMAL)
	Available bit	
	4 (Bit2)	Delay Busy occurred
	8 (Bit3)	Adjust Require occurred
	16 (Bit4)	Data Clock Adjust in progress
	32 (Bit5)	Delay Calibration Require in progress
Function	Sets the transition filter (positive transition) of the Emphasis status.	
Example of Use	To set the transition filter (positive transition) of the Emphasis status to 1:	
	<pre>> :INSTRument:EMPHasis:PTRansition 16</pre>	

:INSTRument:EMPHasis:PTRansition?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 to 60	Sum total of the bit of transition filter (DECIMAL)
Function	Queries contents of transition filter (positive transition) at Emphasis status.	
Example of Use	<pre>> :INSTRument:EMPHasis:PTRansition? < 16</pre>	

:INSTRument:EMPHasis:NTRansition <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 0 to 60	Sum total of the bit of transition filter (DECIMAL)
	Available bit	
	4 (Bit2)	Delay Busy occurred
	8 (Bit3)	Adjust Require occurred
	16 (Bit4)	Data Clock Adjust in progress
	32 (Bit5)	Delay Calibration Require in progress
Function	Sets the transition filter (negative transition) of the Emphasis status.	
Example of Use	To set the transition filter (negative transition) of the Emphasis status to 1:	
	<pre>> :INSTRument:EMPHasis:NTRansition 16</pre>	

:INSTRument:EMPHasis:NTRansition?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 to 60	Sum total of the bit of transition filter (DECIMAL)
Function	Queries contents of transmission filter (negative transition) at Emphasis status.	
Example of Use	> :INSTRument:EMPHasis:NTRansition? < 16	

:INSTRument:EMPHasis:RESet

Function	Initializes Emphasis status event.
Example of Use	> :INSTRument:EMPHasis:RESet

5.5 Data Output Setting Commands

5.5.1 Output Items

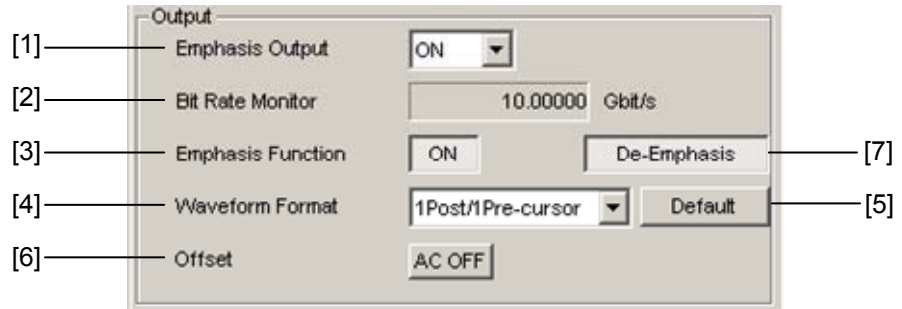


Figure 5.5.1-1 Output Item

Table 5.5.1-1 Output Item Setting Commands

No.	Setting Items	Command
[1]	Emphasis Output	:OUTPut:DATA:OUTPut
		:OUTPut:DATA:OUTPut?
[2]	Bit Rate Monitor	:OUTPut:DATA:BMONitor?
[3]	Emphasis Function	:SOURce:EMPHAsis:ENABle
		:SOURce:EMPHAsis:ENABle?
[4]	Waveform Format	:SOURce:EMPHAsis:WAVEform
		:SOURce:EMPHAsis:WAVEform?
[5]	Default	:SOURce:EMPHAsis:WAVEform:DEFault
[6]	Offset	:OUTPut:DATA:AOFFSet
		:OUTPut:DATA:AOFFSet?
[7]	Switching between Pre-Emphasis and De-Emphasis	:SOURce:EMPHAsis:TYPE
		:SOURce:EMPHAsis:TYPE?

:OUTPut:DATA:OUTPut <boolean>

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> OFF or 0 Sets Emphasis data output to OFF ON or 1 Sets Emphasis data output to ON
Function	Sets Emphasis data output to ON/OFF.
Example of Use	To set Emphasis data output to ON: > :OUTPut:DATA:OUTPut ON
Compatibility	Partially compatible with MU181020A/B.

:OUTPut:DATA:OUTPut?

Parameter	None
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 Sets Emphasis data output to OFF 1 Sets Emphasis data output to ON
Function	Queries Emphasis data output to ON/OFF.
Example of Use	> :OUTPut:DATA:OUTPut? 1 < 1
Compatibility	Partially compatible with MU181020A/B.

:OUTPut:DATA:BMONitor?

Parameter	None
Response	<string>=<STRING RESPONSE DATA>

Format	Explanation
"XX.XXXXX"	0.50000 to 32.00000 Gbit/s
"-----"	When no data corresponds to the query

Function	Queries BitRate of Emphasis data output.
Example of Use	> :OUTPut:DATA:BMONitor? < "12.50000"
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:ENABLE <boolean>

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> OFF or 0 Sets Emphasis function to OFF ON or 1 Sets Emphasis function to ON
Function	Sets Emphasis function to ON/OFF.
Example of Use	To set emphasis function to ON: > :SOURce:EMPHasis:ENABLE ON
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:ENABLE?

Parameter	None
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 Sets Emphasis function to OFF 1 Sets Emphasis function to ON
Function	Queries ON/OFF status of emphasis function.
Example of Use	> :SOURce:EMPHasis:ENABLE? 1 < 1
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:WAVeform <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 1 2 Post/1 Pre-cursor 2 3 Post-cursor 3 1 Post/1 Pre-cursor 4 2 Post-cursor 5 1 Post-cursor 6 Rev. 3 Post-cursor 7 2 Pre-cursor 8 1 Post/2 Pre-cursor
Function	Selects format of emphasis waveform.
Example of Use	To set emphasis waveform to “2Post/1Pre-Cursor”: > :SOURce:EMPHasis:WAVeform 1
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:WAVeform?

Parameter	None
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 1 to 8
Function	Queries format of emphasis waveform.
Example of Use	> :SOURce:EMPHasis:WAVeform? < 1
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:WAVeform:DEFault

Parameter	None
Function	Initializes emphasis waveform.
Example of Use	> :SOURce:EMPHasis:WAVeform:DEFault
Compatibility	Incompatible with existing models.

:OUTPut:DATA:AOFFset <boolean>

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> OFF or 0 Offset OFF (DC output) ON or 1 Offset ON (AC output)
Function	Sets Emphasis data output offset ON/OFF.
Example of Use	To set Emphasis data output offset to ON: > :OUTPut:DATA:AOFFset ON
Compatibility	Partially compatible with MU181020A/B.

:OUTPut:DATA:AOFFset?

Parameter	None
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 Offset OFF (DC output) 1 Offset ON (AC output)
Function	Queries Emphasis data output offset ON/OFF setting.
Example of Use	> :OUTPut:DATA:AOFFset? < 1
Compatibility	Partially compatible with MU181020A/B.

:SOURce:EMPHasis:TYPE <setting>

Parameter	<setting>=<CHARACTER PROGRAM DATA>
	PEMPhasis Pre-Emphasis
	DEMPphasis De-Emphasis
	COEFFicient Coefficient
Function	Selects setting mode of emphasis waveform.
Example of Use	To set setting mode of emphasis waveform to Pre-Emphasis: > :SOURce:EMPHasis:TYPE PEMPhasis
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:TYPE?

Parameter	None
Response	<setting>=<CHARACTER RESPONSE DATA>
	PEMP Pre-Emphasis
	DEMP De-Emphasis
	COEF Coefficient
Function	Queries setting mode of emphasis waveform.
Example of Use	> :SOURce:EMPHasis:TYPE? < PEMPhasis
Compatibility	Incompatible with existing models.

5.5.2 Waveform Settings

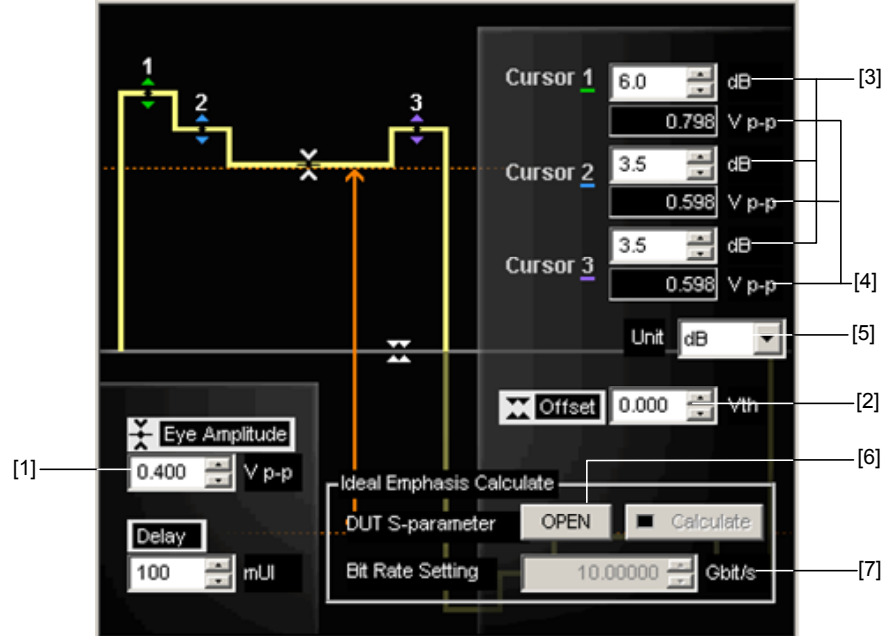


Figure 5.5.2-1 Waveform Settings (Pre-Emphasis)

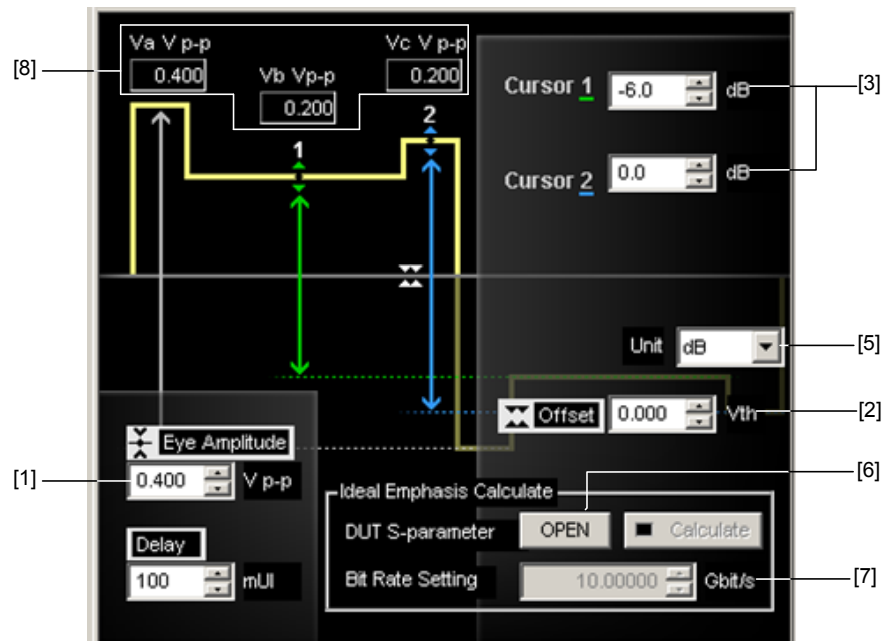


Figure 5.5.2-2 Waveform Settings (De-Emphasis)

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Remote Commands

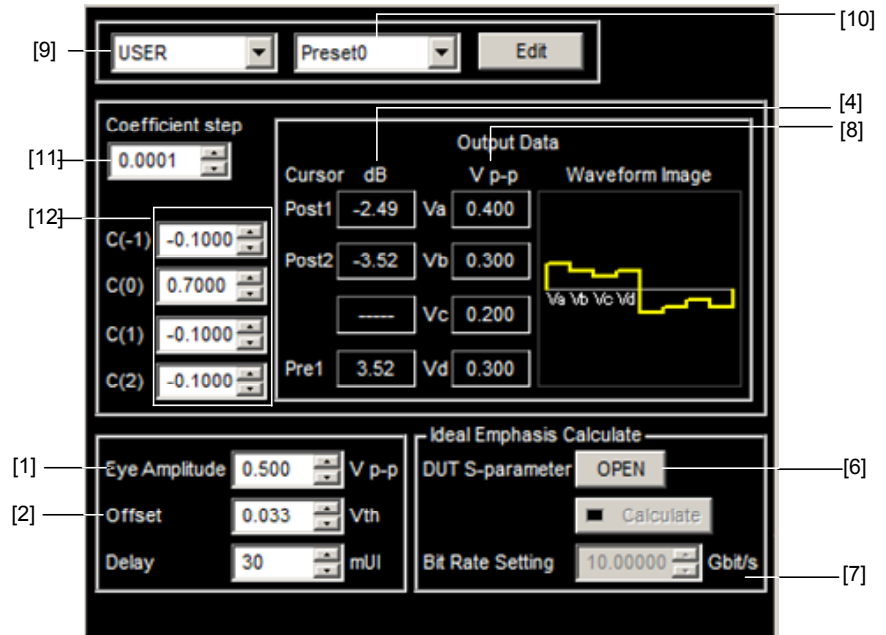


Figure 5.5.2-3 Waveform Settings (Coefficient)

Table 5.5.2-1 Waveform Setting Commands

No.	Setting Items	Command
[1]	Eye Amplitude	:SOURce:EMPHasis:EAMplitude
		:SOURce:EMPHasis:EAMplitude?
[2]	Offset	:SOURce:EMPHasis:OFFSet
		:SOURce:EMPHasis:OFFSet?
[3]	Cursor1 to Cursor3	:SOURce:EMPHasis:CURSor[1 2 3]
		:SOURce:EMPHasis:CURSor[1 2 3]?
[4]	Cursor1 to Cursor3 Voltage Monitor	:SOURce:EMPHasis:CURSor[1 2 3]:MONitor?
[5]	Unit	:SOURce:EMPHasis:UNIT
		:SOURce:EMPHasis:UNIT?
	No label	:OUTPut:CHANGe:CState?
[6]	Ideal Emphasis	:SYSTem:MMEMory:EMPHasis:SPRecall
		:SYSTem:MMEMory:EMPHasis:SPStatus?
[7]	Ideal Emphasis Bitrate	:SOURce:EMPHasis:BITRate
		:SOURce:EMPHasis:BITRate?
[8]	Voltage Monitor at De-Emphasis/Coefficient	:SOURce:EMPHasis:V[A B C D]:MONitor?
[9]	Standard	:SOURce:EMPHasis:STANdard
		:SOURce:EMPHasis:STANdard?
[10]	Preset*1	:SOURce:EMPHasis:PRESet
		:SOURce:EMPHasis:PRESet?
[11]	Coefficient step size	:SOURce:EMPHasis:COEFFicient:SSIZE
		:SOURce:EMPHasis:COEFFicient:SSIZE?
[12]	Coefficient value	:SOURce:EMPHasis:COEFFicient:VALUe
		:SOURce:EMPHasis:COEFFicient:VALUe?
		:SOURce:EMPHasis:COEFFicient:STEP

For details of Delay commands, refer to 5.7 “Delay Setting Commands”.

*1: An error does not occur even when a coefficient different from Preset is set by sending the ":SOURce:EMPHasis:PRESet" command. Refer to the following command descriptions for details.

:SOURce:EMPHasis:EAMPLitude <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> When set to Pre-Emphasis: 0.100 to 1.000 0.100 to 1.000 V/0.002 V step When set to De-Emphasis: 0.100 to 1.500 0.100 to 1.500 V/0.002 V step
Function	Sets emphasis waveform Eye Amplitude.
Example of Use	To set emphasis waveform Eye Amplitude to 1.000V: > :SOURce:EMPHasis:EAMPLitude 1.000
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:EAMPLitude?

Parameter	None
Response	<numeric>=<NR2 NUMERIC RESPONSE DATA> When set to Pre-Emphasis: 0.100 to 1.000 0.100 to 1.000 V When set to De-Emphasis: 0.100 to 1.500 0.100 to 1.500 V
Function	Queries emphasis waveform Eye Amplitude.
Example of Use	> :SOURce:EMPHasis:EAMPLitude? < 1.000
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:OFFSet <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> -1.000 to 1.000 -1.000 to 1.000 V/0.001 V step
Function	Sets offset of emphasis waveform.
Example of Use	To set offset of emphasis waveform to 0.50 V: > :SOURce:EMPHasis:OFFSet 0.50
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:OFFSet?

Parameter	None
Response	<numeric>=<NR2 NUMERIC RESPONSE DATA> -1.000 to 1.000 -1.000 to 1.000 V
Function	Queries offset of emphasis waveform.
Example of Use	> :SOURce:EMPHasis:OFFSet? < 0.500
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:CURSor[1|2|3] <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> When set to dB: -20.0 to 20.0 -20.0 to 20.0 dB/0.1 dB step When set to Vp-p: 0.050 to 1.500 0.050 to 1.500 V/0.001 V step When set to %: -1000 to 1000 -1000 to 1000%/1% step
Function	Sets each cursor (pre-cursor, post-cursor) for emphasis waveform.
Example of Use	To set cursor 1 value of emphasis waveform to 5.0 dB: Note: Command header: The value for cursor 1 is set when [1 2 3] of CURSor[1 2 3] is omitted. The short form is: CURS1, :CURS2, :CURS3. > :SOURce:EMPHasis:CURSor1 5.0
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:CURSor[1|2|3]?

Parameter	None
Response	<numeric>=<NR2 NUMERIC RESPONSE DATA> When set to dB: -20.0 to 20.0 -20.0 to 20.0 dB When set to Vp-p: 0.050 to 1.500 0.050 to 1.500 V When set to %: -1000 to 1000 -1000 to 1000%
Function	Queries setting of each cursor for emphasis waveform.
Example of Use	To query setting of cursor 1: > :SOURce:EMPHasis:CURSor1? < 5.0
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:CURSor[1|2|3]:MONitor?

Parameter	None
Response	<numeric>=<NR2 NUMERIC RESPONSE DATA> When emphasis waveform mode is Pre-Emphasis and unit is dB or % 0.050 to 1.500 0.050 to 1.500 V When emphasis waveform mode is Pre-Emphasis and unit is Vp-p When set to Coefficient -20 to 20 -20 to 20 dB
Function	Queries voltage conversion value for each cursor of emphasis waveform.
Example of Use	To query voltage conversion value for cursor 2: > :SOURce:EMPHasis:CURSor2:MONitor? < 1.250
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:UNIT <unit>

Parameter	<unit>=<CHARACTER PROGRAM DATA> DB Sets to dB. VPP Sets to Vp-p. PERCent Sets to %.
Function	Selects units of pre-cursor and post-cursor for emphasis waveform.
Example of Use	To set a cursor unit for emphasis waveform to dB: > :SOURce:EMPHasis:UNIT DB
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:UNIT?

Parameter	None
Response	<unit>=<CHARACTER RESPONSE DATA> DB Set to dB. VPP Set to Vp-p. PERCent Set to %.
Function	Queries a cursor unit for emphasis waveform.
Example of Use	> :SOURce:EMPHasis:UNIT? < DB
Compatibility	Incompatible with existing models.

:OUTPut:CHANge:CState?

Parameter	None
Response	<state>=<NR1 NUMERIC RESPONSE DATA> 0 Emphasis output setting change completed 1 Emphasis output setting change in progress
Function	Queries the completion status of emphasis output setting change.
Example of Use	> :OUTPut:CHANge:CState? < 1
Compatibility	Incompatible with existing models.

:SYSTem:MMEMory:EMPHasis:SPRecall <file_name>

Parameter	<file_name>=<STRING PROGRAM DATA> "<drv>:\[<dir>]<file>" <drv> = C,D,E,F <dir>=<dir1>\<dir2>\... (Omitted for a root directory) <file> = file name File name extension unnecessary
Function	Opens the S-parameter file for each Cursor setting execution.
Example of Use	> :SYSTem:MMEMory:EMPHasis:SPRecall "C:\Test\example"
Compatibility	Incompatible with existing models.

:SYSTem:MMEMory:EMPHasis:SPStatus?

Parameter	None
Response	"Amplitude setting range exceeded" When Cursor Amplitude is rounded by restrictions of Eye Amplitude "System setting range exceeded" When Cursor Amplitude is rounded by restrictions of Cursor Amplitude (below 20 dB), or restrictions of Waveform "-----" No file reading error or no file to read
Function	Queries the status of S-parameter file loading
Example of Use	> :SYSTem:MMEMory:EMPHasis:SPStatus?
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:BITRate

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 1.000000 to 28.000000 0.000001 Step
Function	Sets the Bitrate to be used for the calculation with Ideal Emphasis Calculate when Data Input is External.
Example of Use	To set the Bitrate to be used for the calculation to 14.5 Gbit/s: > :SOURce:EMPHasis:BITRate 14.500000
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:BITRate?

Parameter	None
Response	<numeric>=<NR2 NUMERIC RESPONSE DATA> 1.000000 to 28.000000 1.000000 to 28.000000 Gbit/s
Function	Queries the set value of Bitrate to be used for the calculation with Ideal Emphasis Calculate when Data Input is External.
Example of Use	> :SOURce:EMPHasis:BITRate? < 14.500000
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:V[A|B|C|D]:MONitor?

Parameter	None
Response	<numeric>=<NR2 NUMERIC RESPONSE DATA> 0.005 to 1.500 0.005 to 1.500 V
Function	Queries the voltage converted value of each cursor on waveform when De-Emphasis or Coefficient is selected.
Example of Use	To query corresponding voltage value of Va: > :SOURce:EMPHasis:VA:MONitor? < 1.250
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:STANdard <string>

Parameter	<string >=<STRING PROGRAM DATA> USER User-specified Preset values PCIe3 Preset values defined in the PCIe3 specification
Function	Changes the Preset values to the values specified for the selected standard. When USER is selected, the Preset value can be edited.
Example of Use	To set the mode which user can edit the Preset value: > :SOURce:EMPHasis:STANdard USER
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:STANdard?

Parameter	None
Response	<string >=<STRING PROGRAM DATA> USER,PCI3
Function	Queries the specified Standard.
Example of Use	> :SOURce:EMPHasis:STANdard? < USER
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:PRESet <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 0 Preset0 1 Preset1 2 Preset2 15 Preset15
Function	Loads the values registered in Preset 0 to 15 as Coefficients (C(-1) to C(2)).

Note:

Depending on the Eye Amplitude value, a value different from Preset may be set as Coefficient. A command error does not occur in this case.

After sending this command, make sure to use the “:SOURce:EMPHasis:COEFFicient:VALUe?” command to check the Coefficient values (C-1 to C2).

If a registered Preset value is different from a Coefficient value, edit Eye Amplitude and reset Preset. When setting Preset, a coefficient value is restricted by Emphasis Settings Peak Voltage of Data Output in Table 1.3-1 MP1825B Specifications.

Example of Use	To set the Preset value to 7: > :SOURce:EMPHasis:PRESet 7
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:PRESet?

Parameter	None
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 to 15
Function	Queries the current Preset value.
Example of Use	> :SOURce:EMPHasis:PRESet? < 7
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:COEFFicient:SSIZe <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 0.0001 to 0.1000 0.0001 to 0.1000 / 0.0001 step
Function	Sets the step of Coefficient value.
Example of Use	To set the step of Coefficient value to 0.0083: > :SOURce:EMPHasis:COEFFicient:SSIZe 0.0083
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:COEFFicient:SSIZe?

Parameter	None
Response	<numeric>=<NR2 NUMERIC RESPONSE DATA> 0.0001 to 0.1000 0.0001 to 0.1000 / 0.0001 step
Function	Queries the step of Coefficient value.
Example of Use	> :SOURce:EMPHasis:COEFFicient:SSIZe? < 0.0083
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:COEFFicient:VALUe C-1|0|1|2,<numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> -1.0000 to 1.0000* -1.0000 to 1.0000 / 0.0001 step *: The setting range depends on both the specified values of “C (-1), C (0), C (1), C (2)” and “Eye Amplitude”.
Function	Sets the step of Coefficient value.
Example of Use	To set the Coefficient value C (-1) to -0.1500: > :SOURce:EMPHasis:COEFFicient:VALUe C-1,-0.1500
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:COEFFicient:VALUe? C-1|0|1|2

Parameter	None
Response	<numeric>=<NR2 NUMERIC RESPONSE DATA> -1.0000 to 1.0000* -1.0000 to 1.0000 / 0.0001 step *: The setting range depends on both the specified values of “C (-1), C (0), C (1), C (2)” and “Eye Amplitude”.
Function	Queries the Coefficient value.
Example of Use	> :SOURce:EMPHasis:COEFFicient:VALUe? C2 < -0.1000
Compatibility	Incompatible with existing models.

:SOURce:EMPHasis:COEFFicient:STEP <C-1>,<C0>,<C1>,<C2>

Parameter	<C-1>,<C0>,<C1>,<C2>=<CHARACTER PROGRAM DATA> INCRement Increases the corresponding Coefficient value by 1step DECReament Decreases the corresponding Coefficient value by 1step HOLD Does not change the corresponding Coefficient value.
Function	The corresponding Coefficient value can be changed by 1 step by using command once.
Example of Use	Set the Step value by “:SOURce:EMPHasis:COEFFicient:SSIZE”. To set Coefficient values as follows: decrease C (-1) by 1step, increase C (0) by 1step, decrease C (1) by 1step, and hold C (2): > :SOURce:EMPHasis:COEFFicient:STEP DEC, INC, DEC, HOLD
Compatibility	Incompatible with existing models.

5.6 Data and Clock Input Setting Commands



Figure 5.6-1 Input Settings



Figure 5.6-2 Input Settings (synchronized with 32G PPG)

Table 5.6-1 Input Setting Commands

No.	Setting Items	Command
[1]	Data Input	:SYSTem:INPut:DSElect :SYSTem:INPut:DSElect?
[2]	Data Input acquisition candidate	:SYSTem:INPut:DSElect:MODule?
[3]	Data/Clock Adjustment Auto/Manual Select	:SYSTem:INPut:DCADjust:SElect :SYSTem:INPut:DCADjust:SElect?
[4]	Data/Clock Adjustment	:SYSTem:INPut:DCADjust
[5]	Data/Clock Adjustment Manual Setting	:SYSTem:INPut:DCADjust:MANual :SYSTem:INPut:DCADjust:MANual?
[6]	Clock Input Band	:SYSTem:INPut:CBANd :SYSTem:INPut:CBANd?
[7]	Clock Input (Full/Half)	:SYSTem:INPut:CRATe :SYSTem:INPut:CRATe?

:SYSTem:INPut:DSElect <input>

Parameter	<input>=<CHARACTER PROGRAM DATA> EXTernal External data source INTernal [1 to 8] Internal data source MU181020A/B, MU182020A/21A, or MU183020A/21A (Specified as 1 to 8 for multiple units)
Function	Selects data input source.
Example of Use	To select built-in PPG as data input source: > :SYSTem:INPut:DSElect INT
Compatibility	Incompatible with existing models.

:SYSTem:INPut:DSElect?

Parameter	None
Response	<numeric>=< CHARACTER RESPONSE DATA> EXT,INT1 to 8 <info>=<STRING RESPONSE DATA> "X:Y Z" X: Unit No. 1 to 2 Y: Slot No. 1 to 6 Z: Module number MU181020A, MU181020B, MU182020A, MU182021A Data1/Data2 MU183020A Data1/Data2 MU183021A Data1/Data2/Data3/Data4
Function	Queries the data input source.
Example of Use	> :SYSTem:INPut:DSElect? < INT1, "1:2 MU181020B"
Compatibility	Incompatible with existing models.

:SYSTem:INPut:DSElect:MODule?

Parameter	None
Response	<info>=<STRING RESPONSE DATA> "X:Y Z" X: Unit No. 1 to 2 Y: Slot No. 1 to 6 Z: Module number MU181020A, MU181020B, MU182020A, MU182021A Data1/Data2 MU183020A Data1/Data2 MU183021A Data1/Data2/Data3/Data4
Function	Queries candidates for data input source.
Example of Use	> :SYSTem:INPut:DSElect:MODule? < "1:2 MU181020B", "1:3 MU181020B", "1:6 MU181021A Data1", "1:6 MU181021A Data2"
Compatibility	Incompatible with existing models.

:SYSTem:INPut:DCADjust:SElect <setting>

Parameter	<setting>=<CHARACTER PROGRAM DATA> AUTO Sets to Data/Clock Adjust to Auto. MANual Sets to Data/Clock Adjust to Manual. LOWamp Changes the Amplitude and sets Data/Clock Adjust to Auto, when outputting a low amplitude signal.
Function	Sets Data/Clock Adjust function to Auto, or to Manual.
Example of Use	To set Data/Clock Adjust function to Auto: > :SYSTem:INPut:DCADjust:SElect AUTO
Compatibility	Incompatible with existing models.

:SYSTem:INPut:DCADjust:SElect?

Response	< setting >=<CHARACTER PROGRAM DATA> AUTO, MAN, LOW
Function	Queries execution method of Data/Clock Adjust function.
Example of Use	> :SYSTem:INPut:DCADjust:SElect? < AUTO
Compatibility	Incompatible with existing models.

:SYSTem:INPut:DCADjust

Parameter	None
Function	Adjusts phase of data and clock input to emphasis module.
Example of Use	> :SYSTem:INPut:DCADjust
Compatibility	Incompatible with existing models.

:SYSTem:INPut:DCADjust:MANual <numeric>

Parameter	<numeric >=<DECIMAL NUMERIC PROGRAM DATA> -1000 to 1000 -1000 to 1000 mUI / 1 mUI Step
Function	Sets Data/Clock Adjust function to Manual.
Example of Use	To set Manual value of Data/Clock Adjust function to 200 mUI: > :SYSTem:INPut:DCADjust:MANual 200
Compatibility	Incompatible with existing models.

:SYSTem:INPut:DCADjust:MANual?

Response	< numeric >=< NR1 NUMERIC RESPONSE DATA> -1000 to 1000
Function	Queries Data/Clock Adjust function's Manual value.
Example of Use	> :SYSTem:INPut:DCADjust:MAN? < 200
Compatibility	Incompatible with existing models.

:SYSTem:INPut:CBANd <rate>

Parameter	<rate>=<CHARACTER PROGRAM DATA> HALFrate Operate at 1/2 clock FULLrate Operate at 1/1 clock
Function	Selects input data and clock correlation.
Example of Use	To set input data/clock setting to Half Rate: > :SYSTem:INPut:CBANd HALF
Compatibility	Incompatible with existing models.

:SYSTem:INPut:CBANd?

Parameter	None
Response	<rate>=<CHARACTER RESPONSE DATA> HALF, FULL
Function	Queries input data/clock setting.
Example of Use	> :SYSTem:INPut:CBANd? < HALF
Compatibility	Incompatible with existing models.

:SYSTem:INPut:CRATe <rate>

Parameter	<rate>=<CHARACTER PROGRAM DATA> HALFrRate Operate at 1/2 clock FULLrRate Operate at 1/1 clock
Function	Selects input data and clock correlation when synchronized with 32G PPG.
Example of Use	To set input data/clock setting to Half Rate: > :SYSTem:INPut:CRATe HALFrRate
Compatibility	Incompatible with existing models.

:SYSTem:INPut:CRATe?

Response	<rate>=<CHARACTER RESPONSE DATA> HALF, FULL
Function	Queries input data/clock settings when synchronized with 32G PPG.
Example of Use	> :SYSTem:INPut:CRATe? < HALF
Compatibility	Incompatible with existing models.

5.7 Delay Setting Commands



Figure 5.7-1 Delay Setting

Table 5.7-1 Delay Setting Command

No.	Setting Items	Command
[1]	Delay (mUI setting)	:OUTPut:DATA:UIPadjust :OUTPut:DATA:UIPadjust?
[2]	Delay (ps setting)	:OUTPut:DATA:PADJust :OUTPut:DATA:PADJust?
[3]	Relative	:OUTPut:DATA:RELative :OUTPut:DATA:RELative?
[4]	No label (Setting Relative value)	:OUTPut:DATA:RDElay :OUTPut:DATA:RDElay?
[5]	Calibration	:OUTPut:DATA:PCALibration
[6]	Jitter Input	:OUTPut:DATA:JINPut :OUTPut:DATA:JINPut?

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Remote Commands

:OUTPut:DATA:UIPadjust <numeric>

Parameter	<numeric >=<DECIMAL NUMERIC PROGRAM DATA> When synchronized with PPG: -1000 to 1000 -1000 to 1000 mUI/ 1 mUI Step When synchronized with MUX or 32G PPG: -1000 to 1000 -1000 to 1000 mUI/ 2 mUI Step
Function	Sets phase of emphasis data output in mUI units.
Example of Use	To set emphasis data output phase to 500 mUI: > :OUTPut:DATA:UIPadjust 500
Compatibility	Compatible with MU181020A/B.

:OUTPut:DATA:UIPadjust?

Response	<numeric >=<NR1 NUMERIC RESPONSE DATA> -1000 to 1000 -1000 to 1000 mUI
Function	Queries phase of emphasis data output in mUI units.
Example of Use	> :OUTPut:DATA:UIPadjust? < 500
Compatibility	Compatible with MU181020A/B.

:OUTPut:DATA:PADJust <numeric>

Parameter	<numeric >=<DECIMAL NUMERIC PROGRAM DATA> -10000 to 10000 -10000 to 10000 ps / 10 ps step (at 0.1 GHz) -80 to 80 -80 to 80 ps / 0.08 ps step (at 12.5 GHz) Converts mUI setting resolution from calculated frequency
Function	Sets phase of emphasis data output in ps units. There may be some values that cannot be set depending on the setting resolution. Set the nearest value when this occurs.
Example of Use	To set phase of emphasis data output to 100 ps: > :OUTPut:DATA:PADJust 100
Compatibility	Compatible with MU181020A/B.

:OUTPut:DATA:PADJust?

Response	<numeric>=<NR2 NUMERIC RESPONSE DATA> -10000 to 10000 -10000 to 10000 ps / 10 ps step (at 0.1 GHz) -80 to 80 -80 to 80 ps / 0.08 ps step (at 12.5 GHz) Converts mUI setting resolution from calculated frequency
Function	Queries emphasis data output phase in ps units.
Example of Use	> :OUTPut:DATA:PADJjust? < 100
Compatibility	Compatible with MU181020A/B.

:OUTPut:DATA:RDElay? [<unit>]

Parameter	[<unit>]=<CHARACTER PROGRAM DATA> UI mUI unit PS ps unit When [<unit>] is omitted, ps units are set.
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> XXXXX.XX At ps units, the mUI setting resolution is converted from the calculated frequency value.
Function	Queries value and units of relative display for emphasis data output delay.
Example of Use	> :OUTPut:DATA:RDElay? UI < -1000
Compatibility	Compatible with MU181020A/B.

:OUTPut:DATA:PCALibration

Function	Calibrates emphasis data output phase.
Example of Use	> :OUTPut:DATA:PCALibration
Compatibility	Compatible with MU181020A/B.

:OUTPut:DATA:JINPut <boolean>

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> OFF or 0 Jitter input OFF ON or 1 Jitter input ON
Function	Sets Jitter Input addition status.
Example of Use	To set Jitter Input addition status to ON: > :OUTPut:DATA:JINPut ON
Compatibility	Compatible with MU181020A/B.

:OUTPut:DATA:JINPut?

Parameter	None
Response	<numeric>=<NR2 NUMERIC RESPONSE DATA> 0 Jitter input OFF 1 Jitter input ON
Function	Queries the Jitter Input button setting.
Example of Use	> :OUTPut:DATA:JINPut? < 1
Compatibility	Compatible with MU181020A/B.

5.8 Screen Display Setting Commands

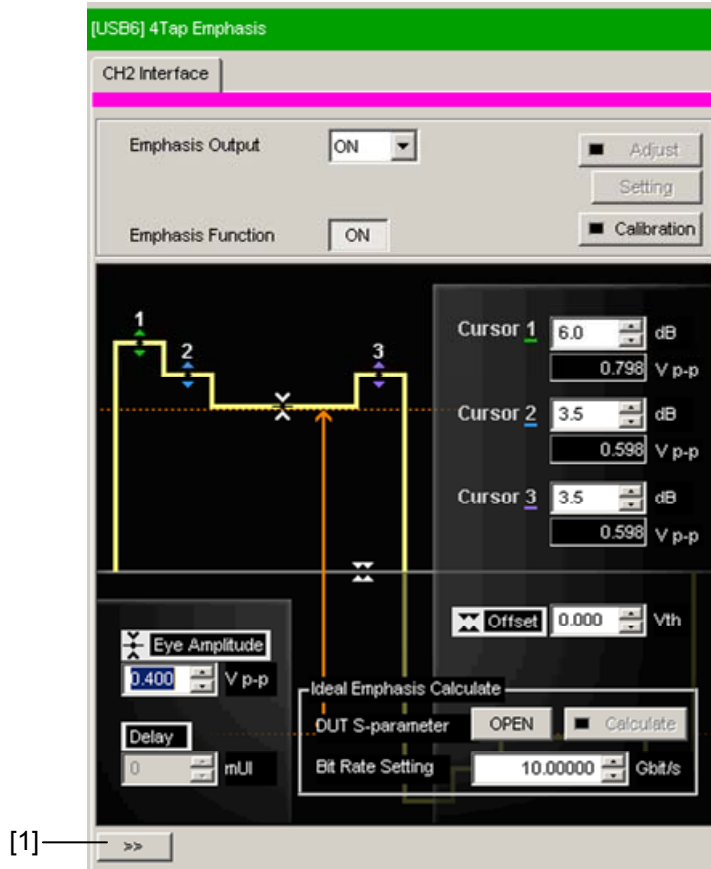


Figure 5.8-1 Display Switching

Table 5.8-1 Screen Display Setting Commands

No.	Setting Items	Command
[1]	Switch Display	:SOURce:DISPlay:SIZE

:SOURce:DISPlay:SIZE <setting>

Parameter	<setting>=<CHARACTER PROGRAM DATA> FULL Full Screen Display HALF Half Screen Display
Function	Sets display size for the setting screen.
Example of Use	To display full size setting screen: > :SOURce:DISPlay:SIZE FULL
Compatibility	Incompatible with existing models.

5.9 File Menu Setting Commands

Table 5.9-1 File Menu Setting Commands

Setting Items	Command
Open	:SYSTem:MMEMory:EMPHasis:RECall
Save	:SYSTem:MMEMory:EMPHasis:STORE

:SYSTem:MMEMory:EMPHasis:RECall <file_name>

Parameter	<file_name>=<STRING PROGRAM DATA> "<drv>:\[<dir>]<file>" <drv> = C,D,E,F <dir>=<dir1>\<dir2>\...(Omitted when root directory) <file> = File name
Function	Reads MP1825B setting data.
Example of Use	> :SYSTem:MMEMory:EMPHasis:RECall "C:\Test\example"
Compatibility	Incompatible with existing models.

:SYSTem:MMEMory:EMPHasis:STORE

<file_name>,<data_type>,<file_type>

Parameter	<file_name>=<STRING PROGRAM DATA> "<drv>:\[<dir>]<file>" <drv> = C,D,E,F <dir>=<dir1>\<dir2>\...(Omitted when root directory) <file> = File name <data_type>=<CHARACTER RESPONSE DATA> EMP Emphasis Setup <file_type>=<CHARACTER PROGRAM DATA> BIN Binary file
Function	Saves MP1825B setting data. Note: Note that if the name of the saved file is changed, it is no longer possible to read the setting data.
Example of Use	To specify save destination, file name and file format for MP1825B setting data: > :SYSTem:MMEMory:EMPHasis:STORE "C:\Test\example",EMP,BIN
Compatibility	Incompatible with existing models.

Chapter 6 Maintenance

This chapter describes the maintenance of the MP1825B.

6.1	Daily Maintenance	6-2
6.2	Software Update	6-3
6.3	Storage Precautions	6-5
6.4	Transportation.....	6-6
6.5	Calibration.....	6-7
6.6	Disposal	6-8

6.1 Daily Maintenance

Wipe off any external stains with a cloth dampened with diluted mild detergent.

Vacuum away any accumulated dust or dirt with a vacuum cleaner.

Tighten any loose parts fixed with screws, using the specified tools.

6.2 Software Update

The MP1825B software can be updated from the Setup Utility screen.

Installing a new software version will cause a version mismatch with the built-in software. Operation is not assured if there is a software version mismatch.

To remove the mismatch with built-in software, run the Setup Utility and click the **Download** tab.

The downloaded files are displayed in the Download File area and downloading is started by putting a check mark against files to be updated and clicking the **Load** button.

The built-in software can be updated after the download is completed.

Usually, clicking the **Load** button updates the built-in software to the latest version.

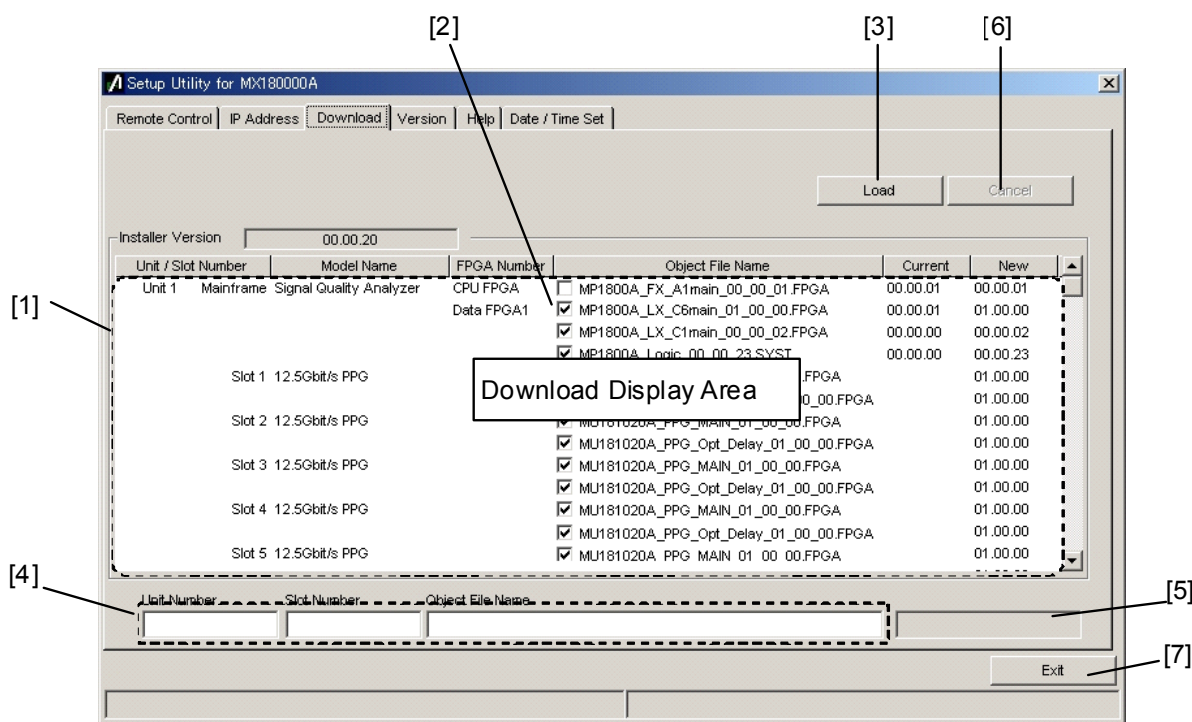


Figure 6.2-1 Download Screen

Table 6.2-1 Download Screen

No.	Function/Operation Method
[1]	Displays list of files available for download Versions indicated in the New column are available versions of files supported by the installed MX180000A. Versions indicated in the Current column are the versions of the currently installed software. When there is a mismatch between the New and Current versions, put a check mark against the new version and execute the download.
[2]	Check boxes for files available for download When it is necessary to download the latest version (because there is a mismatch between the current and new versions), check marks are placed automatically in these check boxes.
[3]	Executes download The versions of the files saved in the built-in HDD and the versions of the files for download for each module are compared by the MX180000A installer and if there is a difference in the versions, the files are downloaded.
[4]	Indicates slot number and filename for download target
[5]	Indicates download status
[6]	Stops download
[7]	Quits Setup Utility

Notes:

- If there is no Current version display and no check mark in the check box, put a check mark in the check box and execute download.
- Download of the FPGA files described below requires about 10 minutes for each file. In addition, it is necessary to toggle the power OFF and ON again to enable the updates after downloading. Switch the power OFF and ON according to the description in section 2.6.2 "Exiting".

The xx characters in the MP1825B_Emphasis
_Delay1_xx_xx_xx.FPGA file names indicate the software version.

 **CAUTION**

If the connection between the MP1825B and the MP1800A or the PC controller is disconnected during download by the setup utility, operation may be abnormal.

NEVER disconnect the USB connection during downloading.

6.3 Storage Precautions

Wipe off dust, fingerprint marks, stains, spots, etc. from the surface of the MP1825B before storing it. Avoid storing the MP1825B in these places

- 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
- Places with temperatures and relative humidity in the following ranges:
 - Temperature range of $\leq -20^{\circ}\text{C}$ or $\geq 60^{\circ}\text{C}$
 - Humidity range of $\geq 85\%$

Recommended storage conditions

It is recommended that the MP1825B be stored in a place that meets the ambient conditions suggested above, plus the following conditions, if it is not to be used for a long period of time:

- Temperature: 5 to 30°C
- Humidity: 40 to 75%
- Little temperature and humidity fluctuations within one day

6.4 Transportation

Use the original packing materials, if possible, when packing the MP1825B for transport. If you do not have the original packing materials, pack the MP1825B according to the following procedure.

When handling the MP1825B, always wear clean gloves, and handle it gently so as not to damage it.

<Procedure>

1. Use a dry cloth to wipe off any stain or dust on the exterior of the MP1825B.
2. Check for loose or missing screws.
3. Provide protection for structural protrusions and parts that can easily be deformed, and wrap the MP1825B with a sheet of polyethylene. Finally, cover with moisture-proof paper.
4. Place the wrapped MP1825B into a cardboard box, and tape the flaps with adhesive tape. Furthermore, store it in a wooden box as required by the transportation distance or method.

During transportation, place it under an environment that meets the conditions described in Section 6.3 “Storage Precautions”.

6.5 Calibration

Regular maintenance such as periodic inspections and calibration is essential for the Signal Quality Analyzer Series for long-term stable performance. Regular inspection and calibration are recommended for using the Signal Quality Analyzer Series in its prime condition at all times. The recommended calibration cycle after delivery of the Signal Quality Analyzer Series is twelve months.

If you require support after delivery, 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 PDF version.

We may not provide calibration or repair if any of the following cases apply.

- Five or more years have elapsed after production and parts for the instrument are difficult to obtain, or it is determined that reliability cannot be maintained after calibration/repair due to significant wear.
- Circuit changes, repair, or modifications are done without our approval.
- It is determined that the repair cost would be higher than the price of a new item.

6.6 Disposal

Confirm the notes described in the Signal Quality Analyzer Series Installation Guide and observe national and local regulations when disposing of the MP1825B. When disposing this product, check with your local solid waste officials for details in your area for recycling options or proper disposal.

Appendix A List of Default Settings

Table A-1 List of Default Settings for MP1825B

Item	Default	Remarks
Emphasis Output	ON	
Emphasis Function	ON	
Pre/De-Emphasis/ Coefficient	Pre-Emphasis	
Waveform Format	2Post/1Pre-cursor	
Offset	AC OFF	
Data Input	External	
Data/Clock Adjustment	Auto	
Clock Input	Half Rate Clock	
Clock Input Band	Half Rate Clock	
Cursor 1	6.0	dB
Cursor 2	3.5	dB
Cursor 3	3.5	dB
Eye Amplitude	0.4	V _{p-p}
Offset	0	V _{th}
Delay	0	mUI
Relative	OFF	
Jitter Input	OFF	
Bit Rate Setting	10.00000	Gbit/s
Unit	dB	

Table A-2 List of Default Settings (When Coefficient is selected)

Item	Default	Remarks
Standard	USER	
Preset	Preset0	
Coefficient step	0.0001	
C (-1)	0.0000	The values defined by Preset are loaded by performing initialization.
C (0)	1.0000	
C (1)	0.0000	
C (2)	0.0000	

Appendix B Connection Examples for Jitter Measurement

Appendix B describes recommended examples of how to connect MU183020A, MU183040A/B, MU181500B, and/or MP1825B by using applicable coaxial cables. When measurement is performed with jitter added to clock signals by using MU181500B, performance of each instrument is ensured by connecting as described below.

B.1	Jitter-PPG Connection	B-2
B.2	Jitter-PPG-ED Connection.....	B-3
B.3	Jitter-PPG-Emphasis Connection	B-5
B.4	Jitter-PPG-Emphasis-ED Connection.....	B-7
B.5	Jitter-2ch PPG-Two Emphasis Units Connection	B-10
B.6	Jitter-2ch PPG-Two Emphasis Units-ED Connection.	B-13

B.1 Jitter-PPG Connection

[Equipment configuration]

MU183020A

MU181500B

DUT

[How to connect instruments, Cable length requirements]

1. Connect a synthesizer and MU181500B's **Ext. Clock Input** connector. The cable length is not especially specified.
2. Connect MU181500B's **Jittered Clock Output** connector and MU183020A's **Ext. Clock Input** connector. The cable length is not especially specified.
- 3, 4. Use a J1551A coaxial skew match cable (applicable part, pair cable, 0.8 m) to connect MU183020A's **Data Output** and **XData Output** connectors to a DUT.

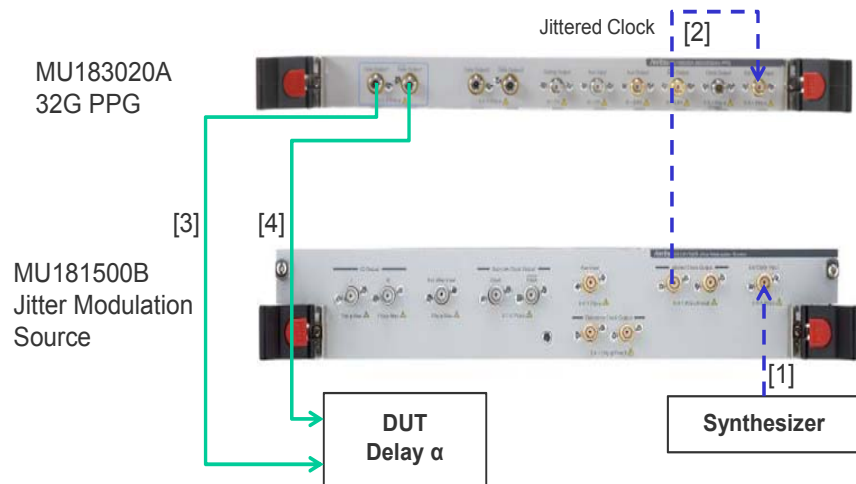


Figure B.1-1 Jitter-PPG Connection Example

B.2 Jitter-PPG-ED Connection

[Equipment configuration]

MU183020A

MU183040B

MU181500B

DUT

[How to connect instruments, Cable length requirements]

1. Connect a synthesizer and MU181500B's **Ext. Clock Input** connector. The cable length is not especially specified.
2. Connect MU181500B's **Jittered Clock Output** connector and MU183020A's **Ext. Clock Input** connector. The cable length is not especially specified.
- 3, 4. Use a J1551A coaxial skew match cable (Pair cable, 0.8 m) to connect MU183020A's **Data Output** and **XData Output** connectors to a DUT.
- 5, 6. Use a J1551A coaxial skew match cable (Pair cable, 0.8 m) to connect MU183040B's **Data Input** and **XData Input** connectors to a DUT.
7. Anritsu recommends use of the MU183040B Clock Recovery Option-x22/x23 to supply clock signals to ED. If the option is used, you don't need to connect Cable [7]. If the option is not used, connect the MU183020A's **Clock Output** connector and MU183040B's **Ext. Clock Input** connector with a cable having a length equivalent to the sum of the following:
 - Length of the cable that connects MU183020A's Data Output connector and MU183040B's Data Input connector.
 - Length of the cable that has a length corresponding to a DUT delay amount.In the following example, a cable having a length of $(1.6\text{m} + \alpha)$ is used to connect the connectors:

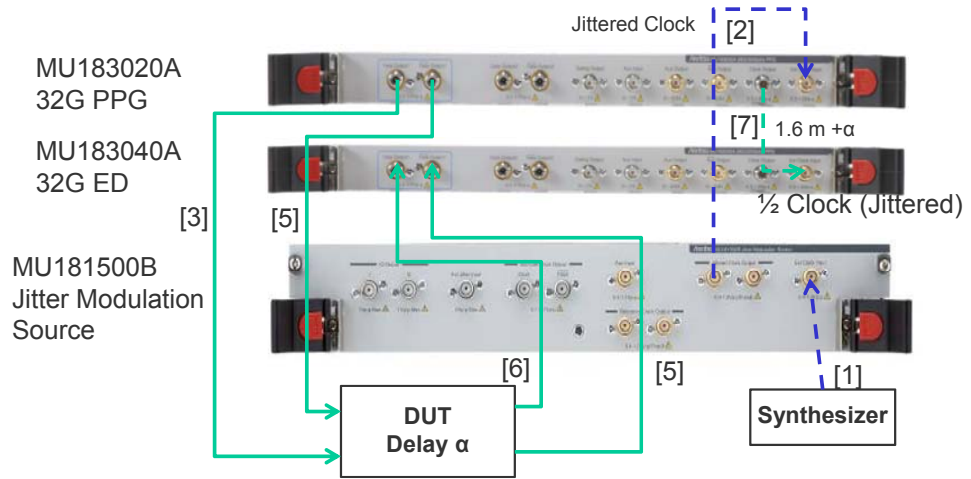


Figure B.2-1 Jitter-PPG-ED Connection Example

B.3 Jitter-PPG-Emphasis Connection

[Equipment configuration]

MU183020A

MU181500B

MP1825B

DUT

J1615A Coaxial Cable Set (Jitter-PPG-Emphasis)

[How to connect instruments, Cable length requirements]

1. Connect a synthesizer and MU181500B's **Ext. Clock Input** connector. The cable length is not especially specified.
2. Connect MU181500B's **Jittered Clock Output** connector and MU183020A's **Ext. Clock Input** connector. The cable length is not especially specified.
3. Use a coaxial cable (applicable part, 0.8 m, K connector) to connect MU183020A's **Data Output** connector and MP1825B's **Data Input** connector.
4. Use a coaxial cable (applicable part, 1.3 m, K connector) to connect MU183020A's **Clock Output** connector and MP1825B's **Clock Input** connector. Then, on the **Misc2** tab of MU183020A, select **Full Rate Clock** in the **Output Clock Rate** box. (Figure B.3-2)
- 5, 6. Use a J1551A coaxial skew match cable (applicable part, pair cable, 0.8 m) to connect MP1825B's **DataOutput** and **XData Output** connectors to a DUT.

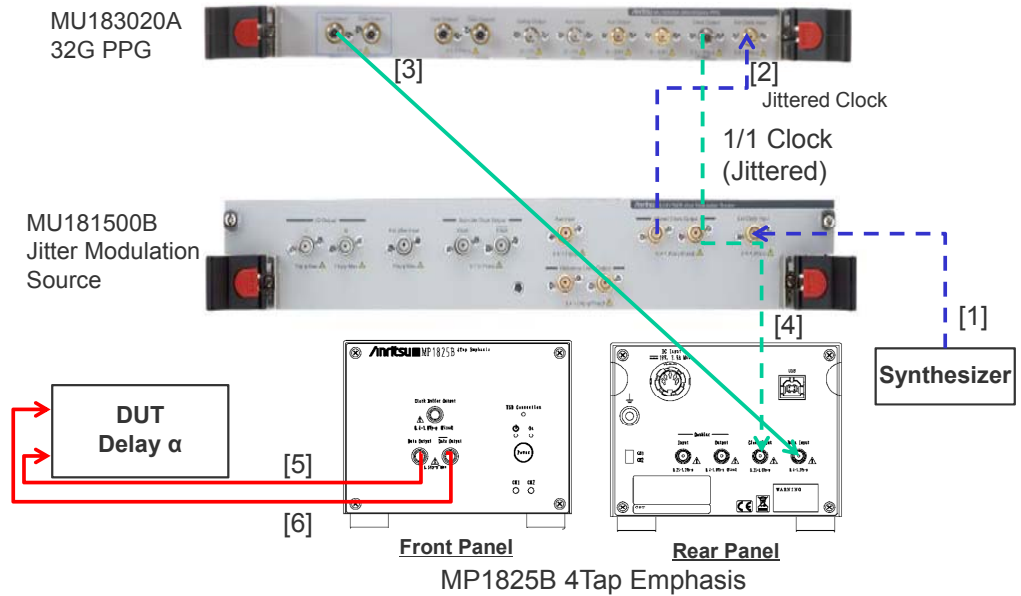


Figure B.3-1 Jitter-PPG-Emphasis Connection Example

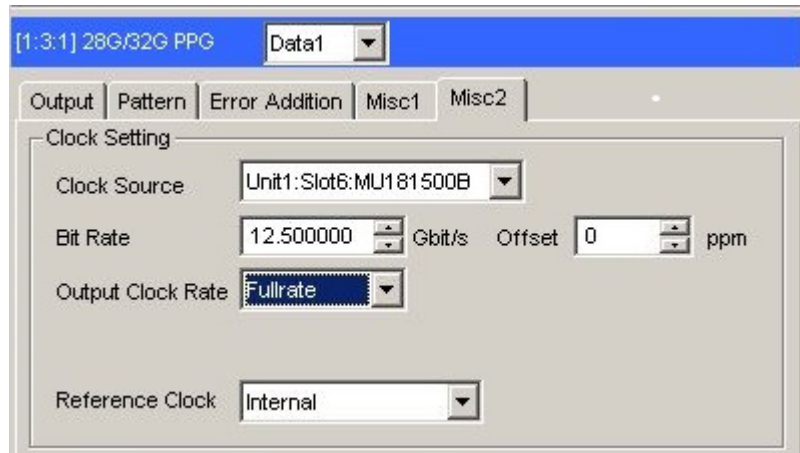


Figure B.3-2 Output Clock Rate Setting on the Misc2 Tab of MU183020A

B.4 Jitter-PPG-Emphasis-ED Connection

[Equipment configuration]

MU183020A

MU183040B

MU181500B

MP1825B

DUT

J1615A Coaxial Cable Set (Jitter-PPG-Emphasis)

[How to connect instruments, Cable length requirements]

1. Connect a synthesizer and MU181500B's **Ext. Clock Input** connector. The cable length is not especially specified.
2. Connect MU181500B's **Jittered Clock Output** connector and MU183020A's **Ext. Clock Input** connector. The cable length is not especially specified.
3. Use a coaxial cable (applicable part, 0.8 m, K connector) to connect MU183020A's **Data Output** connector and MP1825B's **Data Input** connector.
4. Use a coaxial cable (applicable part, 1.3 m, K connector) to connect MU183020A's **Clock Output** connector and MP1825B's **Clock Input** connector. Then, on the **Misc2** tab of MU183020A, select **Fullrate** in the **Output Clock Rate** box. (Figure B.3-2)
- 5, 6. Use a J1551A coaxial skew match cable (applicable part, pair cable, 0.8 m) to connect MP1825B's **Data Output** and **XData Output** connectors to a DUT.
- 7, 8. Use a J1551A coaxial skew match cable (applicable part, pair cable, 0.8 m) to connect a DUT with MU183040B's **Data Input** and **XData Input** connectors.
- 9.10 Anritsu recommends use of the MU183040B Clock Recovery Option-x22/x23 to supply clock signals to ED. If the option is used, you don't need to connect Cables [9] and [10]. If the option is not used, connect MU183020A's **AUX Output** connector and MP1825B's **Doubler Input** connector, and MP1825B's **Doubler Output** connector and MU183040B's **Ext. Clock Input** connector respectively with each cable having a length equivalent to the sum of the following:
 - Length of the cable that connects MP1825B's Data Output connector and MU183040B's Data Input connector.
 - (Length of the cable that has a length corresponding to DUT delay amount) – 0.5 m.

In the following example, a cable having a length of (1.6 m – 0.5

Appendix B Connection Examples for Jitter Measurement

$m + \alpha$) is used. Then, on the Misc1 tab of MU183020A, set the clock rate to 1/4 Clock in the AUX Output area. (Figure B.4-2.)

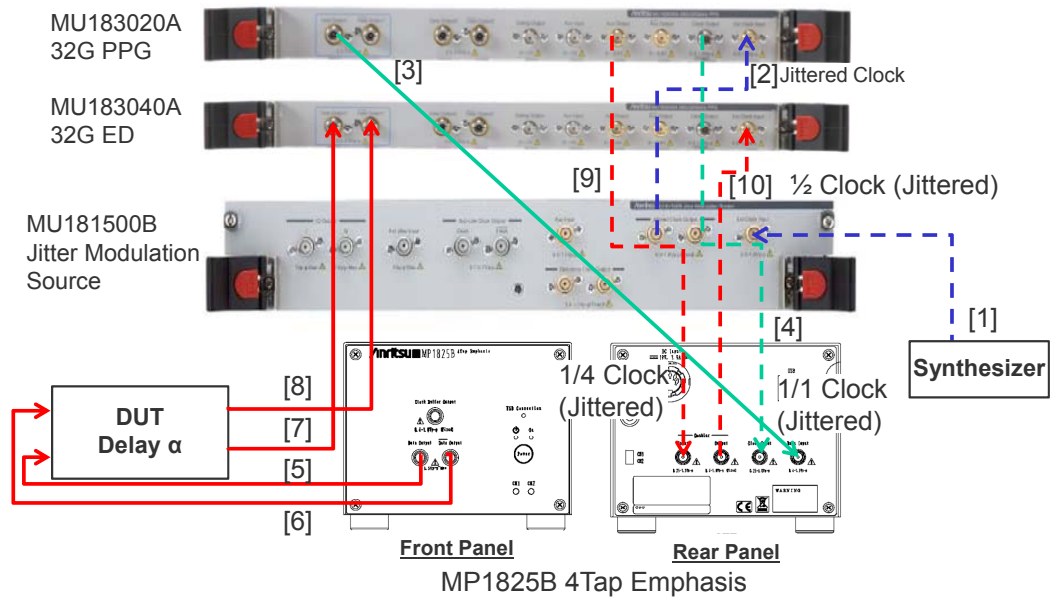


Figure B.4-1 Jitter-PPG-Emphasis-ED Connection Example

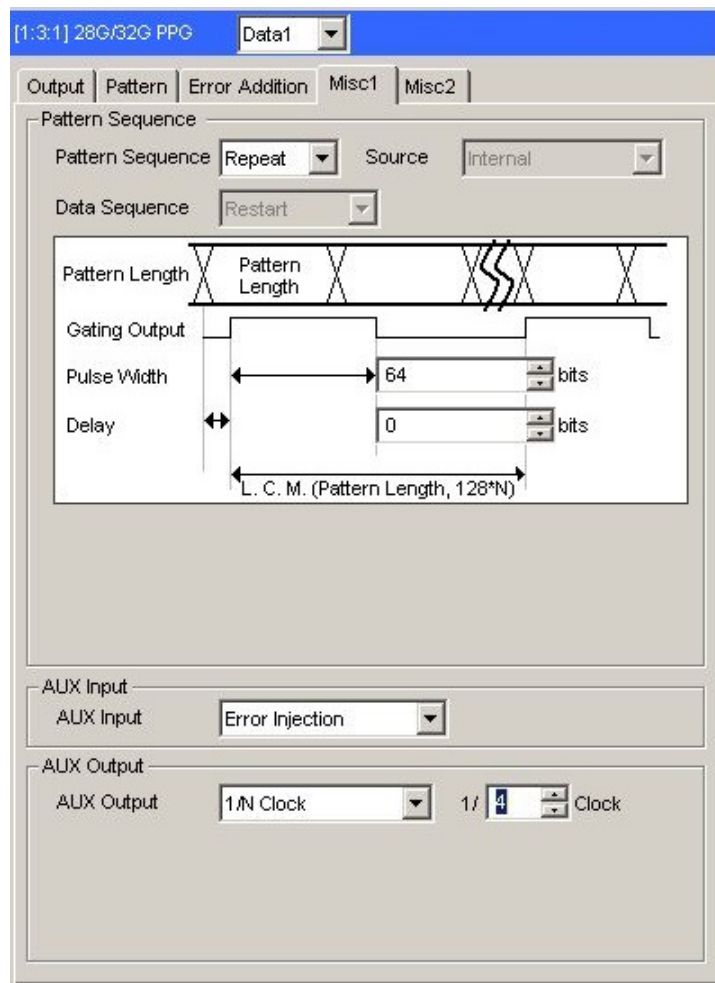


Figure B.4-2 AUX Output Setting on the Misc1 Tab of MU183020A

B.5 Jitter-2ch PPG-Two Emphasis Units Connection

[Equipment configuration]

MU183020A-22/23 2ch PPG

MU181500B

MP1825B-02 (Two units)

DUT

J1618A Coaxial Cable Set (Jitter-2chPPG-Emphasis)

[How to connect instruments, Cable length requirements]

1. Connect a synthesizer and MU181500B's **Ext. Clock Input** connector. The cable length is not especially specified.
2. Use a coaxial cable (applicable part, 0.9 m, K connector) to connect MU181500B's **Jittered Clock Output** connector and MU183020A's **Ext. Clock Input** connector.
- 3, 4. Use coaxial cables (applicable part, 0.8 m, K connector) to connect MU183020A's **Data Output1** and **Data Output2** connectors respectively with the **Data Input** connector of each MP1825B No.1 and 2. Then, on the **Misc2** tab of MU183020A, select **Halfrate** in the **Output Clock Rate** box. (Figure B.5-2)
5. Use a coaxial cable (applicable part, 0.3 m, APC 3.5mm connector) to connect MU181500B's **Jittered Clock Output** connector and **AUX Input** connector.
- 6, 7. Use coaxial cables (applicable part, 0.8 m, APC 3.5 mm connector) to connect MU181500B's **Reference Clock Output** connectors respectively with the **Doubler Input** connector of each MP1825B No.1 and 2. Then, connect MP1825B's **Doubler Output** and **Clock Input** connectors with the semi-rigid coaxial cable that comes with MP1825B. After that switch MU181500B's AUX clock input signal to **AUX Input** and set the Reference Clock to **1/1**. (Figure B.5-3)
- 8, 9. Use J1439A coaxial cables (applicable part, 0.8 m) to connect the **Data Output** connector of each MP1825B No.1 and 2 to a DUT.

B.5 Jitter-2ch PPG-Two Emphasis Units Connection

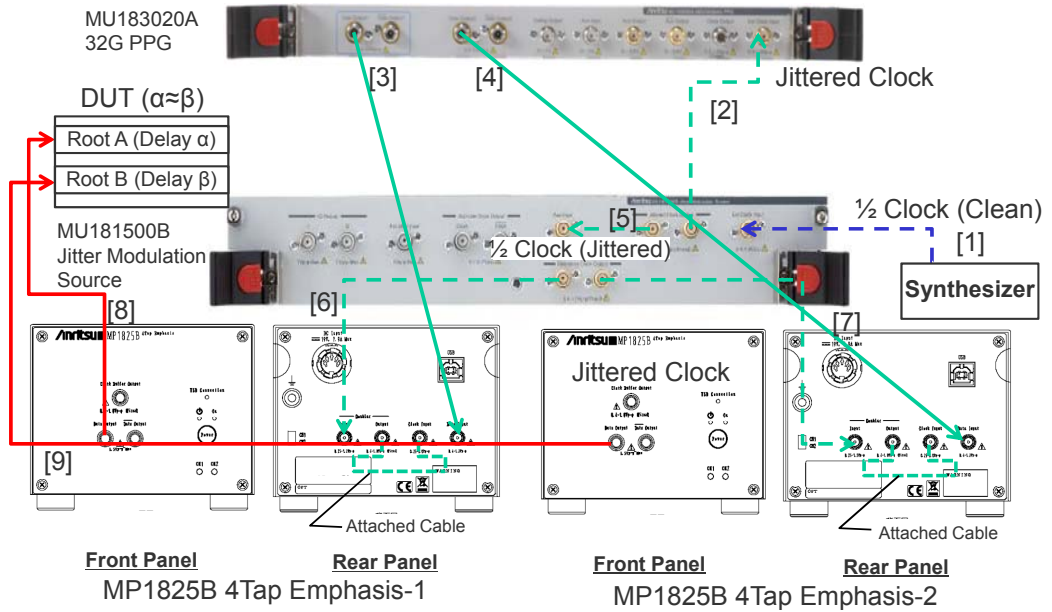


Figure B.5-1 Jitter-2ch PPG-Two Emphasis Units Connection Example

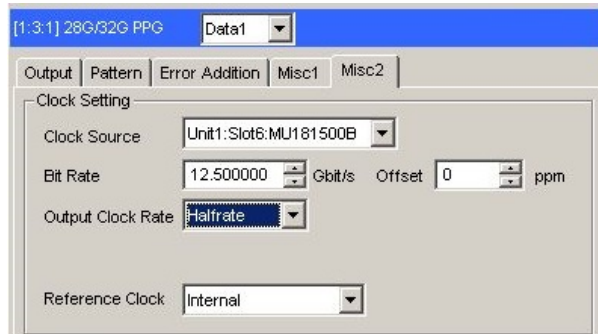


Figure B.5-2 Output Clock Rate Setting on the Misc2 Tab of MU183020A

Appendix B Connection Examples for Jitter Measurement

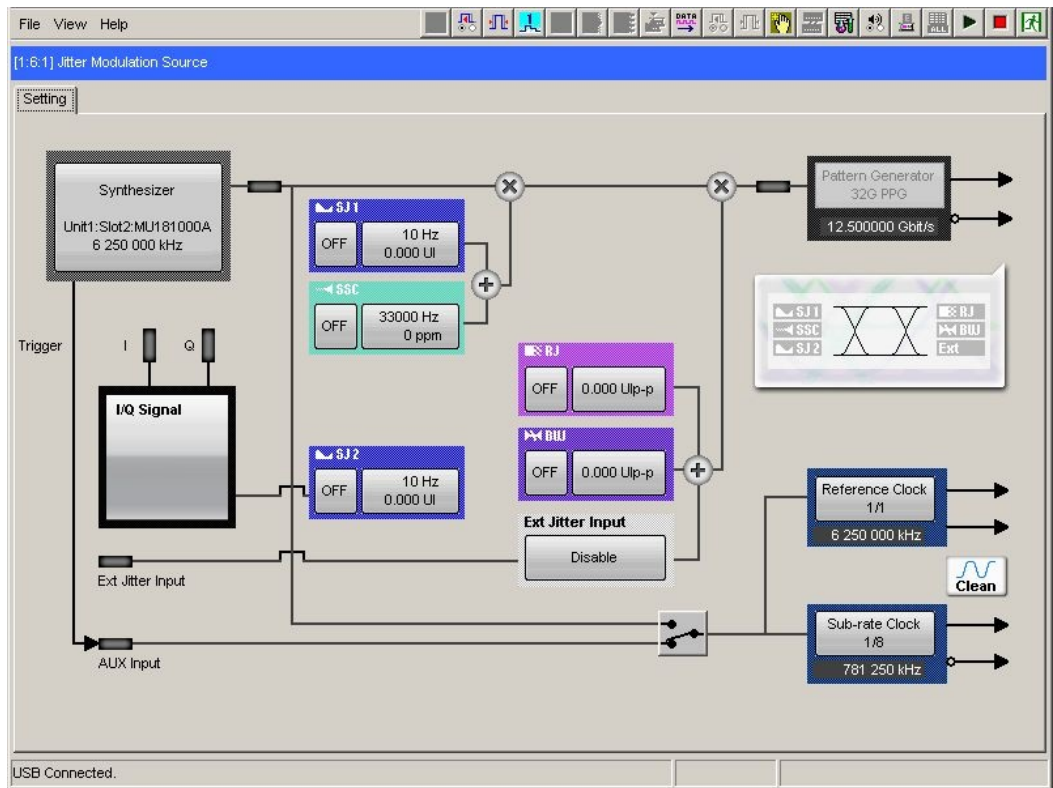


Figure B.5-3 Setting MU181500B's AUX and Reference Clock

B.6 Jitter-2ch PPG-Two Emphasis Units-ED Connection

[Equipment configuration]

MU183020A-22/23 2ch PPG

MU181500B

MP1825B-02 (Two units)

MU183040B-20 2ch ED

DUT

J1618A Coaxial Cable Set (Jitter-2chPPG-Emphasis)

[How to connect instruments, Cable length requirements]

1. Connect a synthesizer and MU181500B's **Ext. Clock Input** connector. The cable length is not especially specified.
2. Use a coaxial cable (applicable part, 0.9 m, K connector) to connect MU181500B's Jittered Clock Output connector and MU183020A's Ext. Clock Input connector.
- 3, 4. Use coaxial cables (applicable part, 0.8 m, K connector) to connect MU183020A's **Data Output1** and **Data Output2** connectors respectively with the **Data Input** connector of each MP1825B No.1 and 2. Then, on the **Misc2** tab of MU183020A, select **Halfrate** in the **Output Clock Rate** box. (Figure B.5-2)
5. Use a coaxial cable (applicable part, 0.3 m, APC 3.5mm connector) to connect MU181500B's **Jittered Clock Output** connector and **AUX Input** connector.
- 6, 7. Use coaxial cables (applicable part, 0.8 m, APC 3.5 mm connector) to connect MU181500B's **Reference Clock Output** connectors respectively with the **Doubler Input** connector of each MP1825B No.1 and 2. Then, connect MP1825B's **Doubler Output** and **Clock Input** connectors with the semi-rigid coaxial cable that comes with MP1825B. After that switch MU181500B's AUX clock input signal to **AUX Input** and set the Reference Clock to 1/1. (Figure B.5-3)
- 8, 9. Use J1439A coaxial cables (applicable part, 0.8 m) to connect the **Data Output** connector of each MP1825B No.1 and 2 to a DUT.
- 10, 11. Use J1439A coaxial cables (applicable part, 0.8 m) to connect a DUT with MU183040B's **Data Input1** and **Data Input2** connectors.
12. Anritsu recommends use of the MU183040B Clock Recovery Option-x22/x23 to supply clock signals to ED. If the option is used, you don't need to connect Cable [12]. If the option is not used, connect the MP1825B's **Clock Buffer Output** connector and MU183040B's **Ext. Clock Input** connector with a cable having a length equivalent to the sum of the following:

Appendix B Connection Examples for Jitter Measurement

- Length of the cable that connects MP1825B's Data Output connector and MU183040B's Data Input connector.
 - (Length of the cable that has a length corresponding to DUT delay amount ($\alpha \approx \beta$)) + 0.5 m.
- In the following example, a cable having a length of (1.6 m + 0.5 m + α) is used.

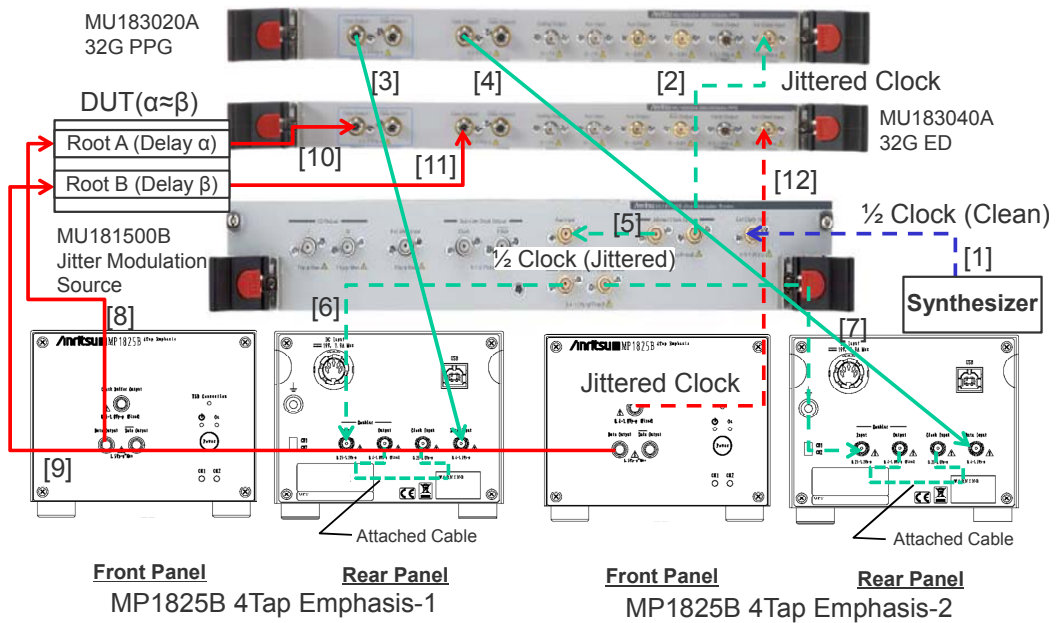


Figure B.6-1 Jitter-2ch PPG-Two Emphasis Units-ED Connection Example

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