MU182040A
25Gbit/s 1ch DEMUX
MU182041A
25Gbit/s 2ch DEMUX
Operation Manual

Seventh 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 and the MT1810A 4 Slot Chassis Installation Guide. Please also refer to one of these documents before using the equipment.**
- **Keep this manual with the equipment.**

ANRITSU CORPORATION

Document No.: M-W3129AE-7.0

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.

MU182040A 25Gbit/s 1ch DEMUX
MU182041A 25Gbit/s 2ch DEMUX
Operation Manual

30 September 2008 (First Edition)
20 June 2013 (Seventh Edition)

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 environments" 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 places where chemically active gases (SO_2, H_2S, Cl_2, NH_3, NO_2, or HCl, 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 CD version.

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1. Copying, except for archival purposes.
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3. Analyzing the incorporated software including but not limited to modifying, decompiling, disassembling, and reverse engineering.

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   i) If this Software is deemed to be used for purposes not described in the operation manual or specifications.
   ii) If this Software is used in conjunction with other non-Anritsu-approved software.
   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.
   v) For any other reasons out of Anritsu's direct control and responsibility, such as but not limited to, natural disasters, software virus infections, etc.

b. Expenses incurred for transport, hotel, daily allowance, etc., for on-site repairs by Anritsu engineers necessitated by the above faults shall be borne by you.

c. The warranty period for faults listed in article 3a above covered by this EULA shall be either 6 months from the date of purchase of this Software or 30 days after the date of repair, whichever is longer.

4. Export Restrictions

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5. Termination

Anritsu shall deem this EULA terminated if you violate any conditions described herein. This EULA shall also be terminated if the conditions herein cannot be continued for any good reason, such as violation of copyrights, patents, or other laws and ordinances.

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.

7. Responsibility after Termination

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.

CE Conformity Marking

Anritsu affixes the CE Conformity marking on the following product(s) in accordance with the Council Directive 93/68/EEC to indicate that they conform to the EMC and LVD directive of the European Union (EU).

CE marking

1. Product Model

Plug-in Units: MU182040A 25 Gbit/s 1ch DEMUX
MU182041A 25 Gbit/s 2ch DEMUX

2. Applied Directive and Standards

When the MU182040A 25 Gbit/s 1ch DEMUX or MU182041A 25 Gbit/s 2ch DEMUX is installed in the MP1800A or MT1810A, the applied directive and standards of this unit conform to those of the MP1800A or MT1810A main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that MU182040A/41A can be used with.

C-Tick Conformity Marking

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

C-Tick marking

1. Product Model

Plug-in Units: MU182040A 25 Gbit/s 1ch DEMUX
MU182041A 25 Gbit/s 1ch DEMUX

2. Applied Directive and Standards

When the MU182040A 25 Gbit/s 1ch DEMUX or MU182041A 25 Gbit/s 2ch DEMUX is installed in the MP1800A or MT1810A, the applied directive and standards of this unit conform to those of the MP1800A or MT1810A main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that MU182040A/41A can be used with.

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.

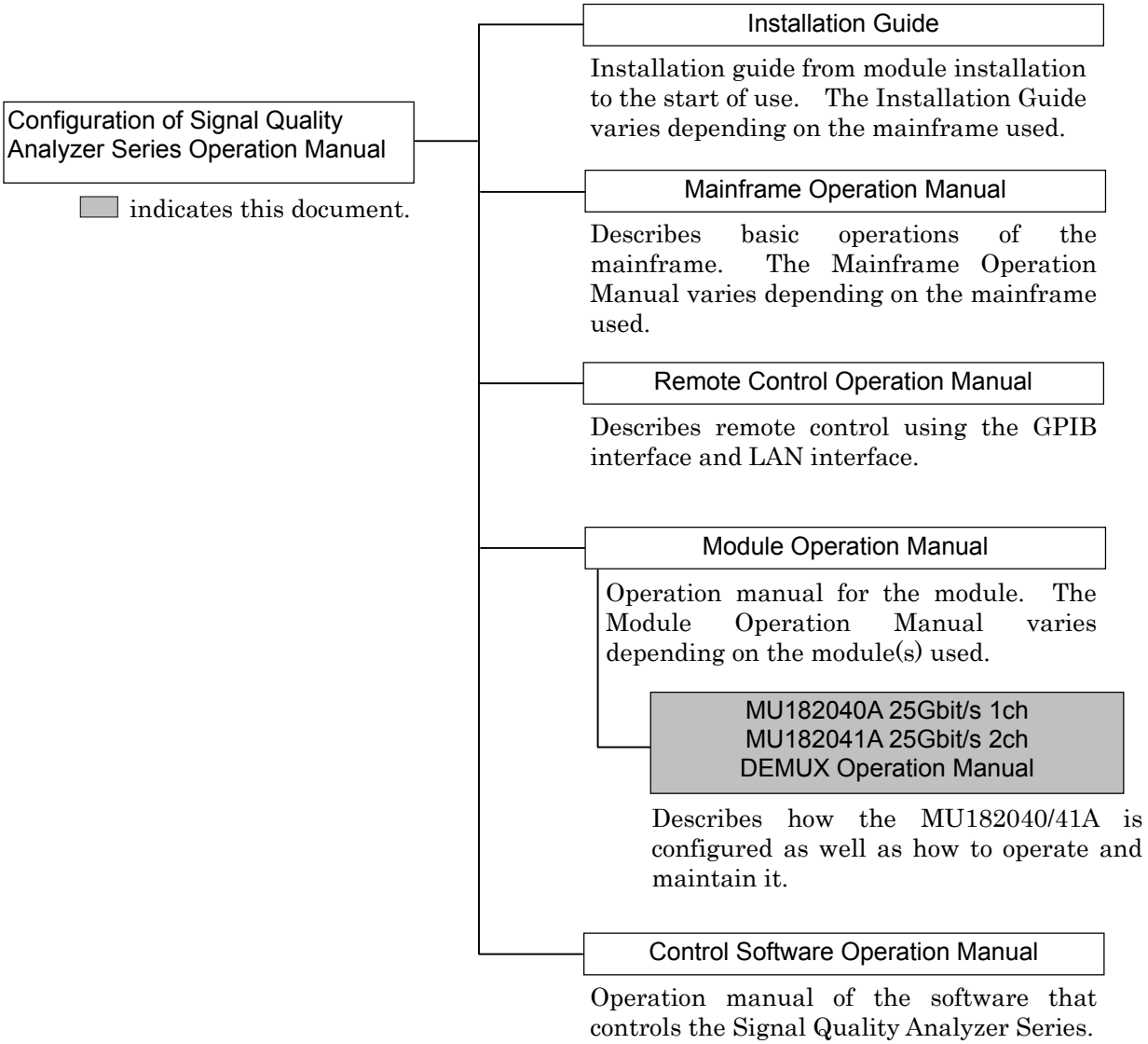

Table of Contents

IV.

Chapter 1 Overview

This chapter provides an overview of the MU182040A 25Gbit/s 1ch DEMUX and the MU182041A 25Gbit/s 2ch DEMUX (hereinafter, referred to as "MU182040/41A").

1.1 Product Overview

The MU182040/41A is a plug-in module that can be built into a Signal Quality Analyzer Series mainframe. This equipment measures each of the PRBS, DATA, Zero-Substitution, and Mixed patterns in the operating frequency range using a combination of the MU181040A 12.5Gbit/s Error Detector and the MU181040B 14Gbit/s Error Detector (hereafter MU181040A/B).
Various option configurations are available for the MU182040/41A. This module is therefore useful for research, development, and production of various types of digital communication equipment, modules, and devices.

The features of the MU182040/41A are as follows:

Operating rates: 8 to 25 Gbit/s (28 Gbit/s using additional options)
Divides input data signal into 1:2 (MU182040A) or 2:4 (MU182041A)
Capable of measuring PRBS, Data, Zero-Substitution, Mixed, and Sequence patterns (when used with MU181040A/B).
Supports analysis of 25G input data such as Eye/Q/Bathtub (When used with MU181040A/B)
Supports a variety of applications such as research, development, and production of devices, by installing options.
Flexible for functional expansion in the future, by installing additional options.

1.2 Product Composition

1.2.1 Standard composition

Table 1.2.1-1 and Table 1.2.1-2 show the standard composition for the MU182040A/41A.

Table 1.2.1-1 Standard composition for MU182040A

Item	Model name	Product name	Q'ty	Remarks
Mainframe	MU182040A	25 Gbit/s 1ch DEMUX	1	
Accessory	J1137	Coaxial Terminator	4	50 SMA
	J1341A	Open	3	
	J1359A	Coaxial adapter (K-P, K-J, SMA compatibility)	2	
	Z0897A	MP1800A Manual CD	1	CD-ROM version
	Z0918A	MX180000A Software CD	1	CD-ROM version

Table 1.2.1-2 Standard composition for MU182041A

Item	Model name	Product name	Q'ty	Remarks
Mainframe	MU182041A	25 Gbit/s 2ch DEMUX	1	
Accessory	J1137	Terminator	8	50 SMA
	J1341A	Open	5	
	J1359A	Coaxial adapter (K-P, K-J, SMA compatibility)	4	
	Z0897A	MP1800A Manual CD	1	CD-ROM version
	Z0918A	MX180000A Software CD	1	CD-ROM version

1.2.2 Options

Table 1.2.2-1 and Table 1.2.2-2 show the options for the MU182040A/41A. And Table 1.2.2-3 shows the accessories for the MU182040/41A. All options are sold separately.

Table 1.2.2-1 Options for MU182040A

Model name	Product name	Remarks
MU182040A-x01	28 Gbit/s Extension	
MU182040A-x02	Clock Input Band Switch	
MU182040A-x03	28.1 Gbit/s Extension	Can be installed together with MU182040A-x01.
MU182040A-x30	25GHz Variable Clock Delay	Cannot be installed together with MU182040A-x31.
MU182040A-x31	28GHz Variable Clock Delay	Cannot be installed together with MU182040A-x30.

Table 1.2.2-2 Options for MU182041A

Model name	Product name	Remarks
MU182041A-x01	28 Gbit/s Extension	
MU182041A-x02	Clock Input Band Switch	
MU182041A-x03	28.1 Gbit/s Extension	Can be installed together with MU182041A-x01.
MU182041A-x30	25GHz Variable Clock Delay	Cannot be installed together with MU182041A-x31.
MU182041A-x31	28GHz Variable Clock Delay	Cannot be installed together with MU182041A-x30.

*1: Notice of MU182040A/41A-x03 option name indication

Option name of MU182040A-x01+x03, or MU182041A-x01+x03 is indicated on the module ejector. On option display of the software, it is displayed as "MU182040A/41A-x01(28Gbit/s Extension)". However, the operation between 8.0 to 28.1 Gbit/s bit rate is guaranteed.

Note:

Option name format is as follows:

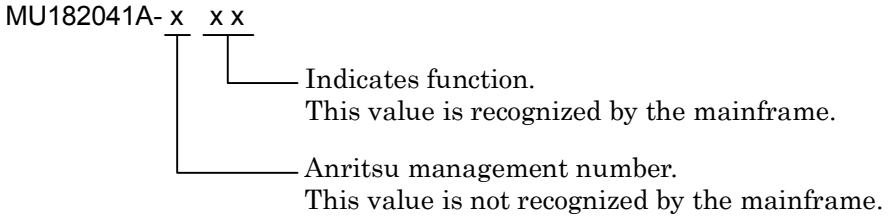

Table 1.2.2-3 Accessory for options

Target Option	Model name/ symbol	Product name	Q'ty	Remarks
MU182040A-x02	J1359A	Coaxial adapter (K-P, K-J, SMA compatibility)	1	
MU182041A-x02	J1359A	Coaxial adapter (K-P, K-J, SMA compatibility)	1	

1.2.3 Application parts

Table 1.2.3-1 shows the application parts for the MU182040A/41A.
All application parts are sold separately.

Table 1.2.3-1 Application parts

Model name/ symbol	Product name	Remarks
J1137	Terminator	50 SMA
J1342A	Coaxial cable 0.8m	
J1359A	Coaxial adaptor (K-P.K-J,SMA)	
J1427A	Cable kit for 20A/40A(Tx/Rx ,Opt16)	1/2 Data Input×2 (TX) 1/2 Clock Input×1 (TX) 1/2 Clock Output×2 (TX) 1/2 Data Output×2 (RX) 1/2 Clock Output×2 (RX)
J1429A	Cable kit for 41A(Rx ,Opt15)	1/2 Data Output×4 1/2 Clock Output×4
J1430A	Cable kit for 41A(Rx ,Opt16)	1/2 Data Output×4 1/2 Clock Output×4
J1439A	Coaxial cable(0.8m, K connector)	K connector
J1448A	Cable kit for 20A/40A(Tx/Rx ,Opt15)	1/2 Data Input×2 (TX) 1/2 Clock Input×1 (TX) 1/2 Clock Output×2 (TX) 1/2 Data Output×2 (RX) 1/2 Clock Output×2 (RX)
J1449A	Measurement kit (K connector)	Coaxial cable (0.8m, K connector)×2 Coaxial cable 0.8 m×2 Coaxial cable 1 m×1
W3129AE	MU182040A/MU182041A Operation manual	Printed version
Z0306A	Wrist strap	

1.3 Specifications

1.3.1 Specifications for MU182040A

Table 1.3.1-1 Specifications for MU182040A

Item		Specifications	Remarks
Operating Bit Rate		8.0 to 25.0 Gbit/s 8.0 to 28.0 Gbit/s(When MU182040A-x01 is installed) 8.0 to 28.1 Gbit/s (When MU182040A-x01+x03 is installed)	
External Clock Input	Number of Input	1	
	Frequency	4.0 to 12.5 GHz	Without MU182040A-x01,x02
		4.0 to 14.0 GHz	With MU182040A-x01, without x02
		4.0 to 14.05 GHz	With MU182040A-x01, x03 ,without x02
		4.0 to 12.5 GHz(when Half Rate Clock selected) 8.0 to 25.0 GHz(when Full Rate Clock selected)	Without MU182040A-x01 , with x02
		4.0 to 14.0 GHz(when Half Rate Clock selected) 8.0 to 28.0 GHz(when Full Rate Clock selected)	With MU182040A-x01,x02
		4.0 to 14.05 GHz(when Half Rate Clock selected) 8.0 to 28.1 GHz(when Full Rate Clock selected)	With MU182040A-x01,x02,x03
	Amplitude	0.3 to 1.0 Vp-p	
	Termination	AC/50 Ω	
	Connector	SMA(When MU182040A-x02 is not installed) K(When MU182040A-x02 is installed)	
1/2 Data Output	Number of Input	2 (1/2 Data Output A, 1/2 Data Output B)	To MU181040A/B Data Input
	Level	0/－0.4 V H:－0.1 to ＋0.1 V L:－0.5 to －0.3V	
	Termination	50 Ω/GND	
	Connector	SMA	

Table 1.3.1-1 Specifications for MU182040A (continued)

Item		Specifications	Remarks
1/2 Clock Output	Number of Input	2	To MU181040A/B Clock Input
	Amplitude	Min. 0.4 Vp-p, Max. 1.2 Vp-p	
	Termination	AC/50 Ω	
	Connector	SMA	
Data Input	Number of Input	2 (Data Input , XData Input (Differential))	
	Input Amplifier	Single-ended 50 Ω, Differential 50 Ω, Switchablet to differential 100 Ω	
	Input Format	NRZ	
	Amplitude	0.25 to 2.0 Vp-p(different input amplitude)	
	Threshold	−3.5 V to +3.3 V/1 mV Step (Absolute value of difference of Data, XData Threshold = 1.5 V max.) Switchiable by setting Tracking , Independent, Alternate When setting Alternate: Switchiable by setting Data-XData , XData-Data (Absolute value of difference of Data, XData Threshold = 1.5 V max.)	
	Input Sensitivity	Typ. 50 mVp-p (@25 Gbit/s, 20 Gbit/s, PRBS2^{31} − 1 , Single-ended , Mark ratio 1/2, 20 to 30°C)	
	Phase Margin	Typ. 28 ps (@25 Gbit/s , PRBS2^{31} − 1 , Single-ended, Mark ratio 1/2, 0.5 Vp-p Input)	
	Termination Voltage	−2.5 to +3.5 V/10 mV Step (at Termination Variable setting, Sink/Source current 60 mA max.)	
	Defined Interface	GND, Variable	
	Connector	K	

Table 1.3.1-1 Specifications for MU182040A (continued)

Item		Specifications	Remarks
Auto Adjust/ Auto Search	Auto Adjust Input Format	NRZ persudo random pattern (Mark Ratio1/2)	
	Auto Search Input Format	NRZ (with min. 1 bit transition in 128 bits, rising/falling edge count ratio at least 20% of pattern length, and Mark Ratio of 1/8 to 7/8)	
	Input Sensitivity	Typ. 250 mVp-p(20 to 30°C)	
Variable Clock Delay	Operation Frequency	8 GHz to 25 GHz	When MU182040A-x30 is installed
		8 GHz to 28 GHz	When MU182040A-x31 is installed
		8 GHz to 28.1 GHz	When MU182040A-x03 ,x31 is installed
	Phase Setting Range	−2000 to +2000 mUI	
	Phase Setting Resolution	2 mUI	
	Phase Setting Error	Typ. 50 mUIpp	
	mUI-psConversion	Provided	
Measurement			
Measurement types	Error Rate	0.0001E−18 to 1.0000E−00	When this equipment and MU181040A/B installed in same main frame and 2 ch Combination selected
	Error Count	0 to 9999999, 1.0000E07 to 9.9999E17	
	Error Interval	0 to 9999999, 1.0000E07 to 9.9999E17	
	%Error Free Interval	0.0000 to 100.0000	
	Frequency	8,000.000 MHz to 28,000.000 MHz	
	Frequency measurement accuracy	1 ppm 1 kHz (standard when 10 MHz main frame reference clock calibrated)	
	Clock Count	0 to 9999999, 1.0000E07 to 9.9999E17	
	Sync Loss Interval	0 to 9999999, 1.0000E07 to 9.9999E17	
	Clock Alarm Interval	0 to 9999999, 1.0000E07 to 9.9999E17	

Table 1.3.1-1 Specifications for MU182040A (continued)

Item		Specifications	Remarks
Automatic measurement function	ISI analysis	Supported	
	Eye Margin	When MU182040A-x30 or x31 installed (when not installed, Threshold direction only)	
	Eye Diagram	When MU182040A-x30 or x31 installed	
	Q-factor	When MU182040A-x30 or x31 installed	
	Bathtub	When MU182040A-x30 or x31 installed	
Dimension		234 mm(W)×21 mm(H)×175 mm(D) (with Compact-PCI 1 slot but excluding protrusions)	
Mass		2.5 kg max. (including options)	
Environmental Performance	Operation Temperature	＋15 to ＋35°C (ambient temperature around equipment when installed in the mainframe)	
	Storage Temperature	－20 to ＋60°C	

1.3.2 Specifications for MU182041A

Table 1.3.2-1 Specifications for MU182041A

Item		Specifications	Remarks
Operating bit rate		8.0 to 25.0 Gbit/s 8.0 to 28.0 Gbit/s(When MU182041A-x01 is installed) 8.0 to 28.1 Gbit/s (When MU182041A-x01+x03 is installed)	
External clock input	Number of Input	1	
	Frequency	4.0 to 12.5 GHz	Without MU182041A-x01,x02
		4.0 to 14.0 GHz	With MU182041A-x01 , without x02
		4.0 to 14.05 GHz	With MU182041A-x01,x03,without x02
		4.0 to 12.5 GHz (When Half Rate Clock selected) 8.0 to 25.0 GHz (Full Rate Clock selected)	Without MU182041A-x01 , with x02
		4.0 to 14.0 GHz (When Half Rate Clock selected) 8.0 to 28.0 GHz (When Full Rate Clock selected)	With MU182041A-x01,x02
		4.0 to 14.05 GHz (When Half Rate Clock selected) 8.0 to 28.1 GHz (When Full Rate Clock selected)	With MU182041A-x01,x02,x03
	Amplitude	0.3 to 1.0 Vp-p	
	Termination	AC/50 Ω	
	Connector	SMA(When MU182041A-x02 is not installed) K(When MU182041A-x02 is installed)	
1/2 Data Output	Number of Output	4 (1/2 Data Output 1A, 1/2 Data Output 1B, 1/2 Data Output 2A, 1/2 Data Output 2B)	To MU181040A/B Data Input
	Level	0/－0.4 V H:－0.1 to ＋0.1 V L:－0.5 to －0.3V	
	Termination	50 Ω/GND	
	Connector	SMA	

Table 1.3.2-1 Specifications for MU182041A (continued)

Item		Specifications	Remarks
1/2 Clock Output	Number of Output	4	To MU181040A/B Clock Input
	Amplitude	Min. 0.4 Vp-p, Max. 1.2 Vp-p	
	Termination	AC/50 Ω	
	Connector	SMA	
Data Input	Number of Input	4 (Data1 Input, XData1 Input, Data2 Input, XData2 Input(2×Differential))	
	Input Amplifier	Single-ended 50 Ω, Differential 50 Ω, Swichable to differential 100 Ω Selectable from Data, XData	
	Input Format	NRZ	
	Amplitude	0.25 to 2.0 Vp-p(different input amplitude)	
	Threshold	−3.5 V to +3.3 V/1 mV Step(independent setting supported) (Absolute value of difference of Data, XData Threshold = 1.5 V max.) Switchiable by selecting Tracking, Independent, and Alternate When setting Alternate: Switchiable by setting Data-XData, and XData-Data (Absolute value of difference of Data, XData Threshold = 1.5 V max.)	
	Input Sensitivity	Typ. 50 mVp-p (@25 Gbit/s, 20 Gbit/s, PRBS$2^{31}-1$, Single-ended, Mark ratio 1/2, 20 to 30°C)	
	Phase Margin	Typ. 28 ps (@25 Gbit/s, PRBS$2^{31}-1$, Single-ended, Mark ratio 1/2, 0.5 Vp-p Input)	
	Termination Voltage	−2.5 to +3.5 V/10 mV Step (at Termination Variable setting, Sink/Source current 60 mA max.)	
	Defined Interface	GND, Variable	
	Connector	K	
Auto Adjust/ Auto Search	Auto Adjust Input Format	NRZ pseudo random pattern (Mark Ratio1/2)	
	Auto Search Input Format	NRZ (with min. 1 bit transition in 128 bits, rising/falling edge count ratio at least 20% of pattern length, and Mark Ratio of 1/8 to 7/8)	
	Input Sensitivity Typ. 250 mVp-p(20 to 30°C)		

Table 1.3.2-1 Specifications for MU182041A (continued)

Item		Specifications	Remarks
Variable Clock Delay	Operation Frequency	8 GHz to 25 GHz	When MU182041A-x30 is installed
		8 GHz to 28 GHz	When MU182041A-x31 is installed
		8 GHz to 28.1 GHz	When MU182041A-x03 ,x31 is installed
	Phase Setting Range	−2000 to +2000 mUI	
	Phase Setting Resolution	2 mUI	
	Phase Setting Error	Typ. 50 mUIpp	
	mUI-ps Conversion	Provided	
Measurement			
Measurement types	Error Rate	0.0001E−18 to 1.0000E−00	When this equipment and MU181040A/B installed in same main frame *and* 2 ch Combination selected
	Error Count	0 to 9999999, 1.0000E07 to 9.9999E17	
	Error Interval	0 to 9999999, 1.0000E07 to 9.9999E17	
	%Error Free Interval	0.0000 to 100.0000	
	Frequency	8,000.000 MHz to 28,000.000 MHz	
	Frequency measurement accuracy	1 ppm 1 kHz (standard when 10 MHz main frame reference clock calibrated)	
	Clock Count	0 to 9999999, 1.0000E07 to 9.9999E17	
	Sync Loss Interval	0 to 9999999, 1.0000E07 to 9.9999E17	
	Clock Alarm Interval	0 to 9999999, 1.0000E07 to 9.9999E17	
Automatic measurement function	ISI analysis	Supported	
	Eye Margin	When MU182041A-x30 or x31 installed (when not installed, Threshold direction only)	
	Eye Diagram	When MU182041A-x30 or x31 installed	
	Q-factor	When MU182041A-x30 or x31 installed	
	Bathtub	When MU182041A-x30 or x31 installed	

Table 1.3.2-1 Specifications for MU182041A (continued)

Item		Specifications	Remarks
Dimension		234 mm(W)×42 mm(H)×175 mm(D) (with Compact-PCI 1 slot but excluding protrusions)	
Mass		5.0 kg max. (including options)	
Environmental Performance	Operation Temperature	＋15 to ＋35°C (ambient temperature around equipment when installed in the mainframe)	
	Storage Temperature	－20 to ＋60°C	

Chapter 2 Preparation before Use

This chapter describes preparations required before using the MU182040A/41A.

2.1 Installation to Signal Quality Analyzer

For information on how to install the MU182040A/41A to the Signal Quality Analyzer and how to turn on the power, refer to Chapter 2 "Preparation before Use" in the Signal Quality Analyzer Series Installation Guide.
For the installation position of the mainframe, refer to the release note included in this equipment or refer to the Anritsu homepage (http://www.anritsu.com).

2.2 How to Operate Application

The modules connected to the Signal Quality Analyzer are controlled by operating the MX180000A Signal Quality Analyzer Control Software (hereinafter, referred to as "MX180000A").

For information on how to start up, shut down, and operate MX180000A, refer to the MX180000A Signal Quality Analyzer Control Software Operation Manual.

2.3 Preventing Damage

Be sure to observe the rating ranges when connecting input and output of the MU182040A/41A. Otherwise, the MU182040A/41A may be damaged.

CAUTION ⚠

1. **When signals are input to the MU182040A/41A, avoid excessive voltage beyond the rating. Otherwise, the circuit may be damaged.**

2. **When output is used at the 50 W/GND terminator, never feed any current or input signals to the output.**

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

4. **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.**

5. **Never open the MU182040A/41A. If you open it and the MU182040A/41A has failed or sufficient performance cannot be obtained, we may decline to repair the MU182040A/41A.**

6. **The MU182040A/41A incorporates important parts and circuits, such as a hybrid IC, which are vulnerable to static electricity. Do not open the MU182040A/41A to touch such components.**

7. **The hybrid IC incorporated in the MU182040A/41A is hermetically shielded. Do not open the hybrid IC. If you open it and sufficient performance cannot be obtained, we may decline to repair the MU182040A/41A.**

8. **To protect the MU182040A/41A from electrostatic discharge failure, a conductive sheet should be placed onto the workbench, and the operator should wear an electrostatic discharge wrist strap. Connect the ground connection end of the wrist strap to the conductive sheet or to the ground terminal of the mainframe.**

Chapter 3 Panel Layout and Connectors

This chapter describes the panel and connectors of the MU182040A/41A.

3.1 Panel Layout

3.1.1 MU182040A Panel

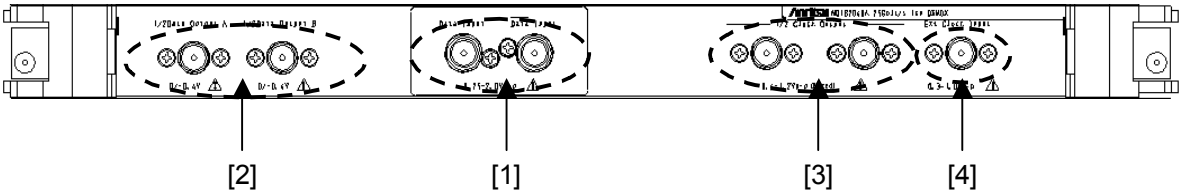

Fig. 3.1.1-1 Panel layout of MU182040A

Table 3.1.1-1 Connectors on MU182040A panel

Symbol	Name	Description
[1]	Data Input connectors XData Input connectors	Connector for inputting 2:1 multiplexed differential data signals. Support both differential and single-ended input signals.
[2]	1/2 Data Output A connectors 1/2 $\overline{\text{Data}}$ Output B connectors	Outputs for 1:2 divided Data/$\overline{\text{Data}}$ Input signals Connector for outputting data signals to two system MU181040A/B.
[3]	1/2 Clock Output connector	Output for 1/2 Clock signal
[4]	External Clock Input connectors	Output for Clock signal

3.1.2 MU182041A Panel

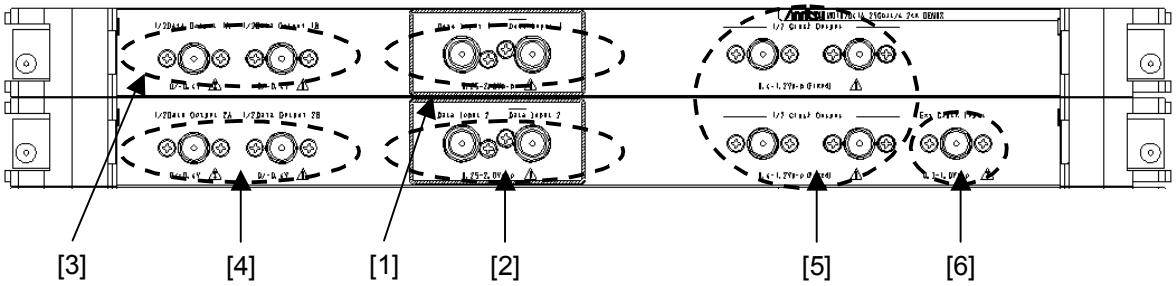

Fig. 3.1.2-1 Panel layout of MU182041A

Table 3.1.2-1 Connectors on MU182041A panel

Symbol	Name	Description
[1]	Data Input1 connector XData Input1 connector	Connector for inputting 2:1 multiplexed differential data signals. Support both differential and single-ended input signals.
[2]	Data Input2connector XData Input2 connector	Connector for inputting 2:1 multiplexed differential data signals. Support both differential and single-ended input signals.
[3]	1/2 Data Output 1A connector 1/2 Data Output 1B connector	Outputs for 1:2 divided Data/$\overline{\text{Data}}$ Input1 signals Connector for outputting data signals to two system MU181040A/B.
[4]	1/2 Data Output 2A connector 1/2 Data Output 2B connector	Outputs for 1:2 divided Data/$\overline{\text{Data}}$ Input2 signals Connector for outputting data signals to two system MU181040A/B.
[5]	1/2 Clock Output connector	Output for 1/2 Clock signal
[6]	External Clock Input connectors	Output for Clock signal

3.2 Inter-Module Connection

A connection example between the MU182040A/41A, MU181040B 14 Gbit/s Error Detector (hereinafter, referred to as "MU181040B") that are inserted into a mainframe is shown below. Use the following procedure to connect these devices, and refer to Fig. 3.2-1 and Fig. 3.2-2.

Note:

Avoid static electricity when handling the devices.

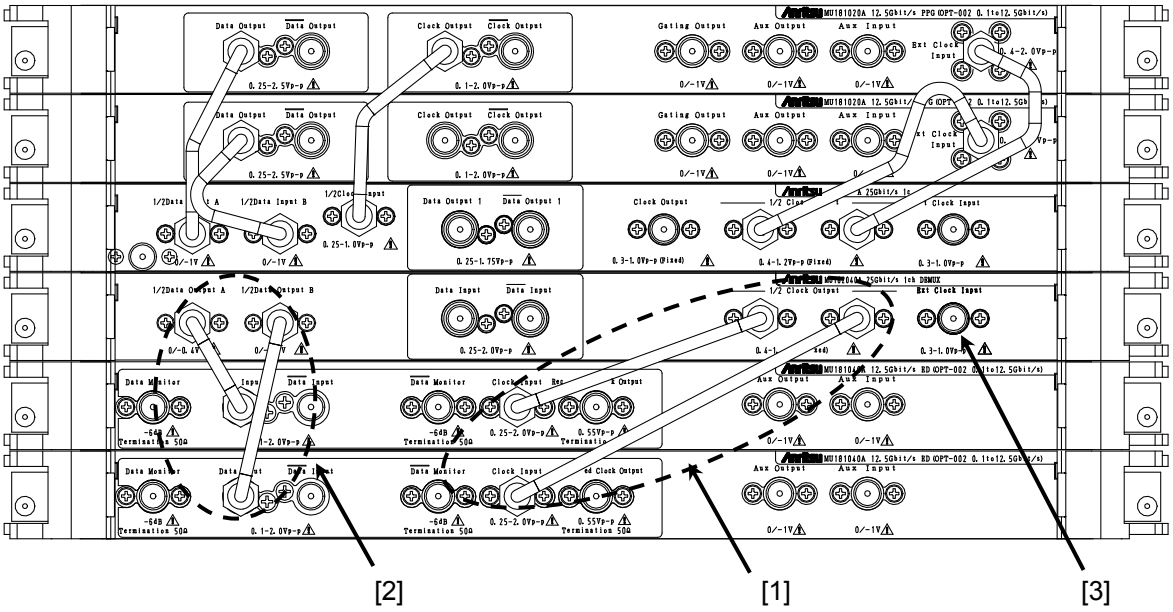

Fig. 3.2-1 Inter-module connection example when MU182040A is installed

1. Use coaxial cables to connect the Ext. Clock Input connectors of the two MU181040B units with the 1/2 Clock Output connectors of this module. Ensure that the coaxial cables are exactly the same length or use the supplied accessory cables (J1427A or J1448A).
2. Use coaxial cables to connect the Data Input connectors of the two MU181040B units with the 1/2 Data Output A, B connectors of this module. Ensure that the coaxial cables are exactly the same length or use the supplied accessory cables (J1427A or J1448A).
3. Use a coaxial cable to connect the Clock signal source with the Ext. Clock Input connector of this module.

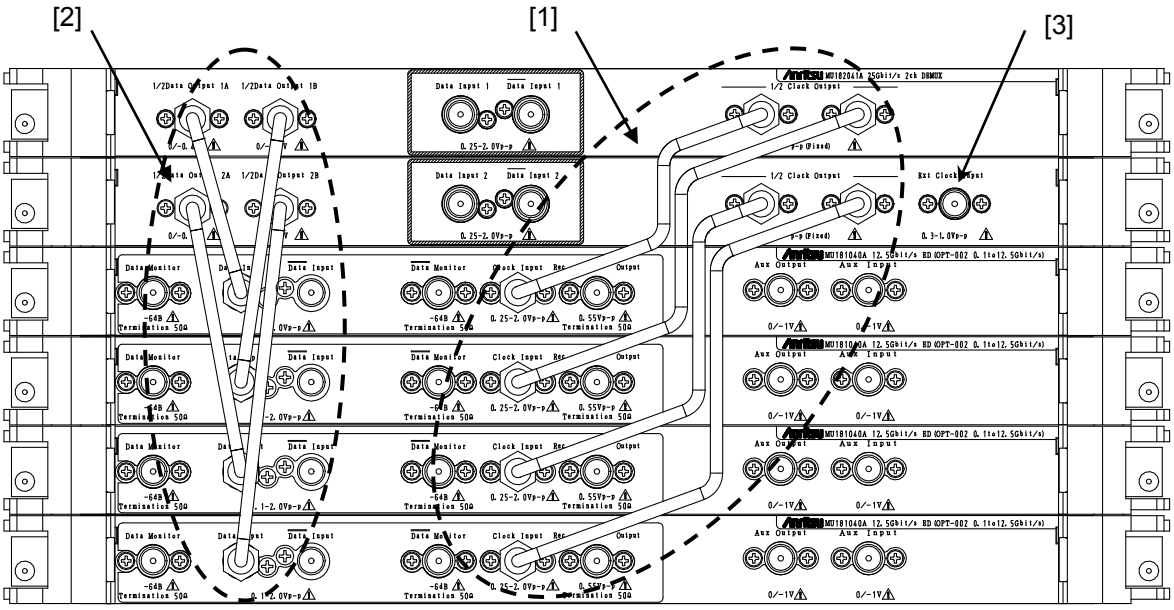

Fig. 3.2-2 Inter-module connection example when MU182041A is installed

1. Use coaxial cables to connect the Ext. Clock Input connectors of the four MU181040B units with the 1/2 Clock Output connectors of this module. Ensure that the coaxial cables are exactly the same length or use the supplied accessory cables (J1429A or J1430A).
2. Use coaxial cables to connect the Data Input connectors of the four MU181040B units with the 1/2 Data Output 1A, 1B, 2A, 2B connectors of this module. Ensure that the coaxial cables are exactly the same length or use the supplied accessory cables (J1429A or J1430A).
3. Connect the DUT or MU182021A 25 Gbit/s 2ch MUX Clock Output connector and the External Clock Input connector of the main frame using a coaxial cable.

WARNING ⚠

1. **When signals are input to this device, avoid excessive voltage beyond the rating. Otherwise, the circuit may be damaged.**

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

3. **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.**

4. **The power supply voltage rating for the mainframe is shown on the rear panel. Be sure to operate the mainframe within the rated voltage range. The mainframe may be damaged if a voltage out of the rating range is applied.**

5. **To protect the device from electrostatic discharge failure, a conductive sheet should be placed onto the workbench, and the operator should wear an electrostatic discharge wrist strap. Connect the ground connection end of the wrist strap to the conductive sheet or to the ground terminal of the mainframe.**

6. **When removing a cable from a connector on the front panel of the device, be careful not to add excessive stress to the connector. Addition of excessive stress to a connector may result in characteristic degradation or a failure.**
   Use a torque wrench (recommended torque: 0.9 N-M) when attaching or removing a cable.

Chapter 4 Configuration of Setup Dialog Box

This chapter explains the functions of each tab in the operation screens of this module.

4.1 Configuration of Entire Setup Dialog Box

The configuration of the setup dialog box when the MU182040A/41A is inserted into a mainframe is shown below.

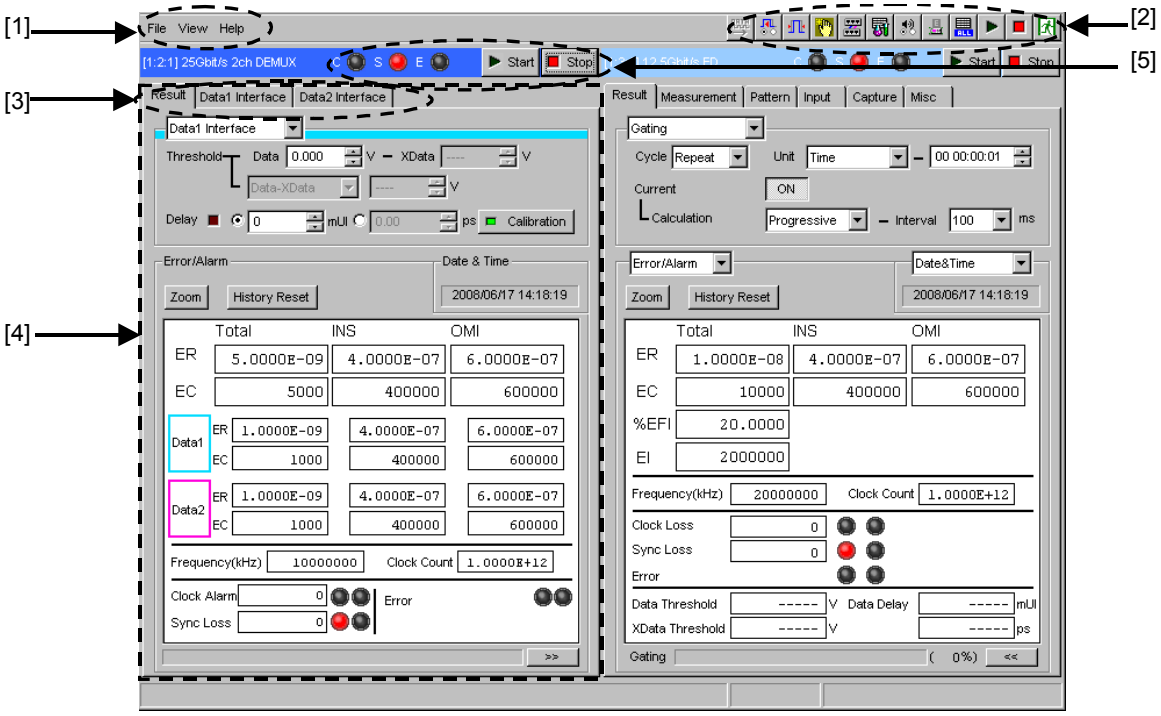

Figure 4.1-1 Configuration of entire setup dialog box

The setup dialog box mainly consists of five blocks ([A] to [E] in the figure above). The following table describes each of the blocks.

Table 4.1-1 Functions of blocks

No.	Block	Function
[1]	Menu bar	Selects the setting functions related to the entire device.
[2]	Module function buttons	Shortcut buttons for the function items common to the connected modules. Users can customize up to 17 pre-defined function buttons according to their own applications.
[3]	Function setting selection tabs	Click to switch the module operation tab window according to the function items.
[4]	Operation tab window	Configures settings specific to each module. See Chapter 5 “Operation Method” for details.
[5]	Module common function area	Contains the following controls for functions specific to the module. Start/Stop button C: Clock Loss LED S: Sync Loss LED E: Error LED

4.2 Operation Tab Windows

The MU182040A/41A operation tab windows are listed below.

Figure 4.2-1 Function setting selection tabs

Table 4.2-1 List of function setting selection tabs

Tab window	Function
Result	Measurement results are displayed. This is displayed when this module and either the MU181040A or the MU181040B are installed in the same main frame *and* either 2 ch Combination or 25G x 2 ch Combination is executed.
Data1 Interface	This sets the Data1-side input interface.
Data2 Interface	This sets the Data2-side input interface. It is only displayed for the MU182041A.

4.3 Displaying Measurement Result

Click the [Result] tab on the operation tab window to display measurement results. The Result tab window consists of the item setting area (upper) and the result display area (lower). Measurement results can be viewed while changing the setting items of the MU182040A/41A.

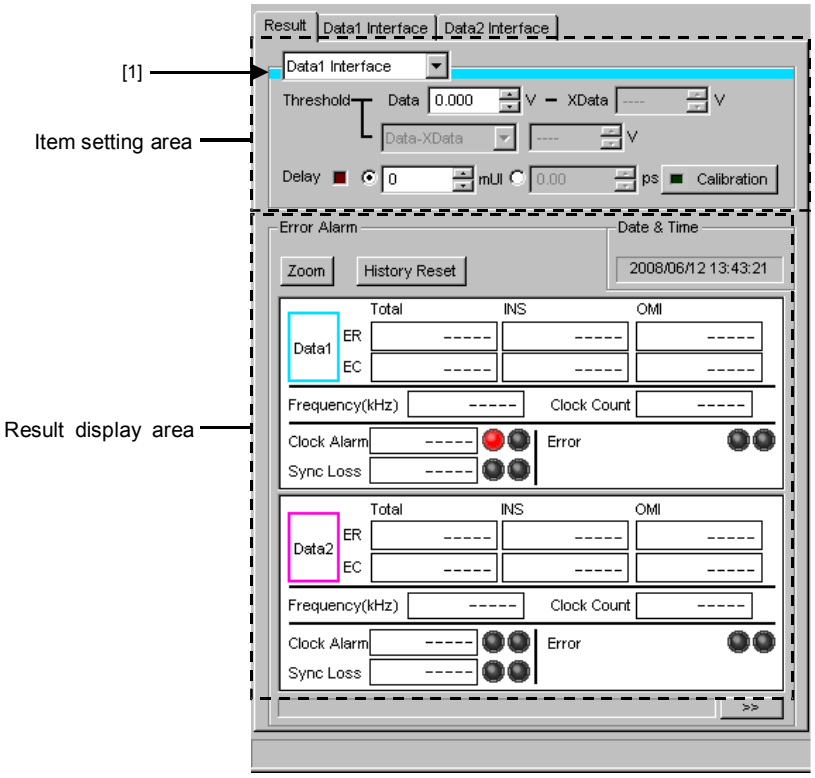

Figure 4.3-1 Result tab window

The setting items change according to the item selected in the list box ("1" in the figure above) in the item setting area.

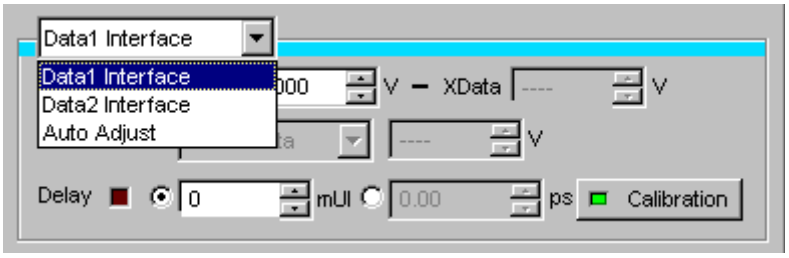

Figure 4.3-2 Item setting area

Table 4.3-1 Setting items in list box in item setting area

Item	Description
Data1 Interface	This performs settings related to the Data1-side input signal interface.(MU182040A/41A)
Data2 Interface	This performs settings related to the Data2-side input signal interface.(MU182041A)
Auto Adjust	This monitors the results when Auto Adjust is executed.

4.3.1 Setting items when Data Interface is selected

This chapter describes the setting items when Input is selected from the list box in the item setting area ("1" in Figure 4.3-1). See Chapter 4.4.1 "Input setting items" for details.

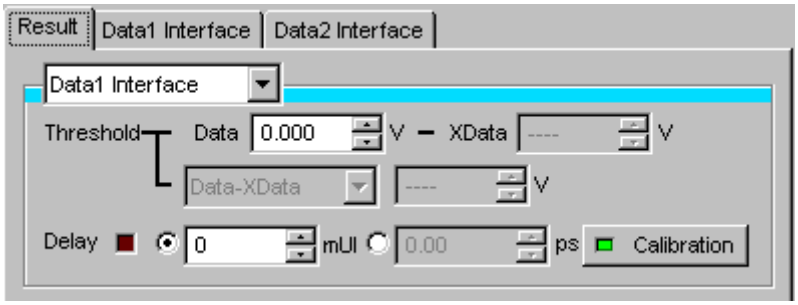

Figure 4.3.1-1 Items when Input is selected

The Data or XData input threshold voltage and phase can be changed while observing the measurement results.

4.3.2 Error/Alarm Result Displays

This is displayed when this module and either the MU181040A or the MU181040B are installed in the same mainframe *and* either 2 ch Combination or 25G x 2 ch Combination is executed.
The measurement results are calculated and monitored from the MU181040A or MU181040B results.

This section explains the measurement results when installing following mainframe and modules.
Mainframe: MP1800A-015
Slot1 to 4: MU181040A or MU181040B
Slot6: MU182040A orMU182041A

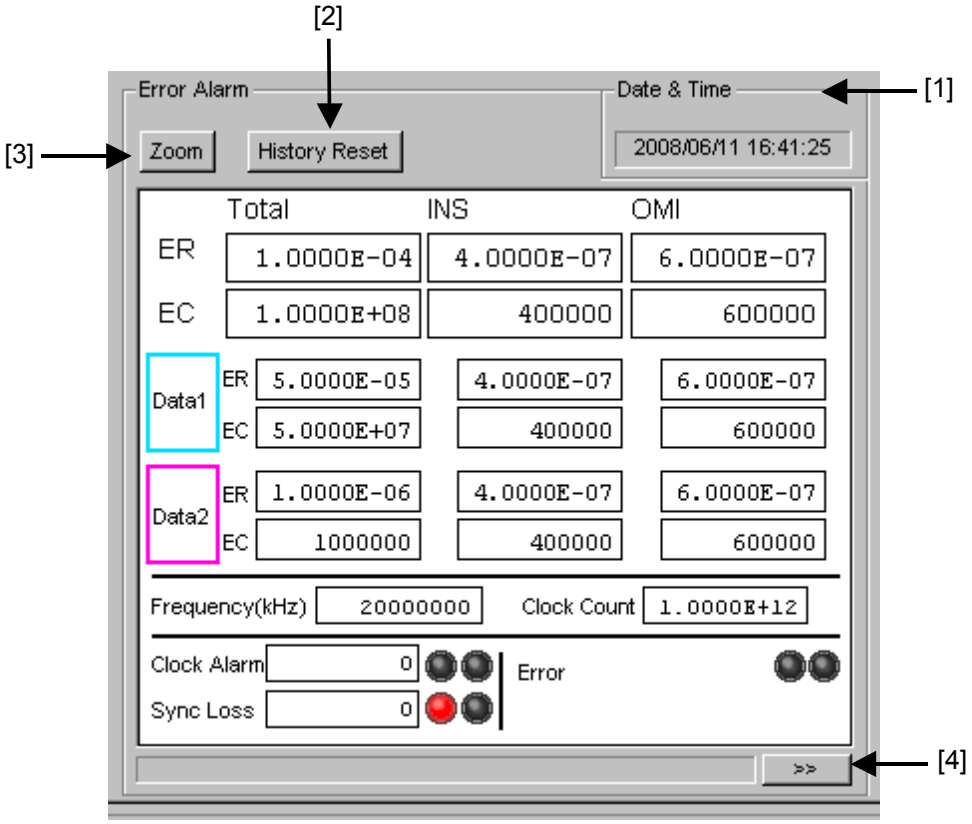

Figure 4.3.1-1 Items when Error/Alarm is selected

[1] Select the measurement time display type.

Date&Time: Select to display the current time.

[2] Reset Error/Alarm history data.

History Reset: Click to reset the history data of the error/alarm display.

[3] Enable or disable enlarged display of Error/Alarm measurement result.

Zoom: Toggles zooming of error count, error rate, Clock Alarm generation status, Sync Loss generation status, and error generation status ON/OFF

[4] Open or close the Error/Alarm measurement results sub-screens. Controls opening and closing of the measurement results dialog

When the enlarged display is disabled (Zoom is not selected), the items shown in Table 4.3.2-1 are displayed in the result display area with Error/Alarm selected.

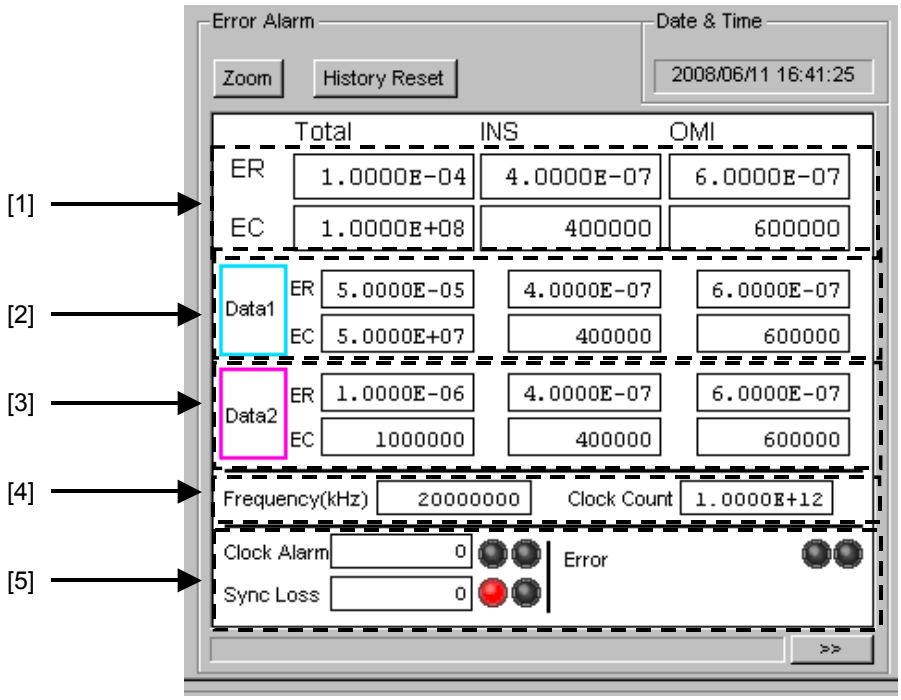

Figure 4.3.1-2 25G x 2 ch Combination Result Screen(MU182041A)

Table 4.3.1-1 Control Configuration when 25G x 2 ch Combination Zoom Display Not Selected (MU182041A)

Item		Function
[1]	ER	Displays Total error rate for MU181040A/B Slot1 to 4
	EC	Displays Total error count for MU181040A/B Slot1 to 4
[2]	Data1 ER	Displays Total error rate for MU181040A/B Slot1 to 2
	Data1 EC	Displays Total error count for MU181040A/B Slot1 to 2
[3]	Data2 ER	Displays Total error rate for MU181040A/B Slot3 to 4
	Data2 EC	Displays Total error count for MU181040A/B Slot3 to 4
[4]	Frequency	Displays Total frequency for MU181040A/B Slot1 to 4
	Clock Count	Displays Total clock count for MU181040A/B Slot1 to 4
[5]	Clock Alarm	Displays clock loss, CR Unlock alarm interval number for this equipment and MU181040A/B Slot1 to 4. Also displays alarms using LEDs. Lights in red: Current data Lights in yellow: History data
	Sync Loss	Displays Sync loss interval number for this equipment and MU181040A/B Slot1 to 4. Also displays alarms using LEDs. Lights in red: Current data Lights in yellow: History data
	Error	Dislays error generation status for MU181040A/B Slot1 to 4 Lights in red: Current data Lights in yellow: History data

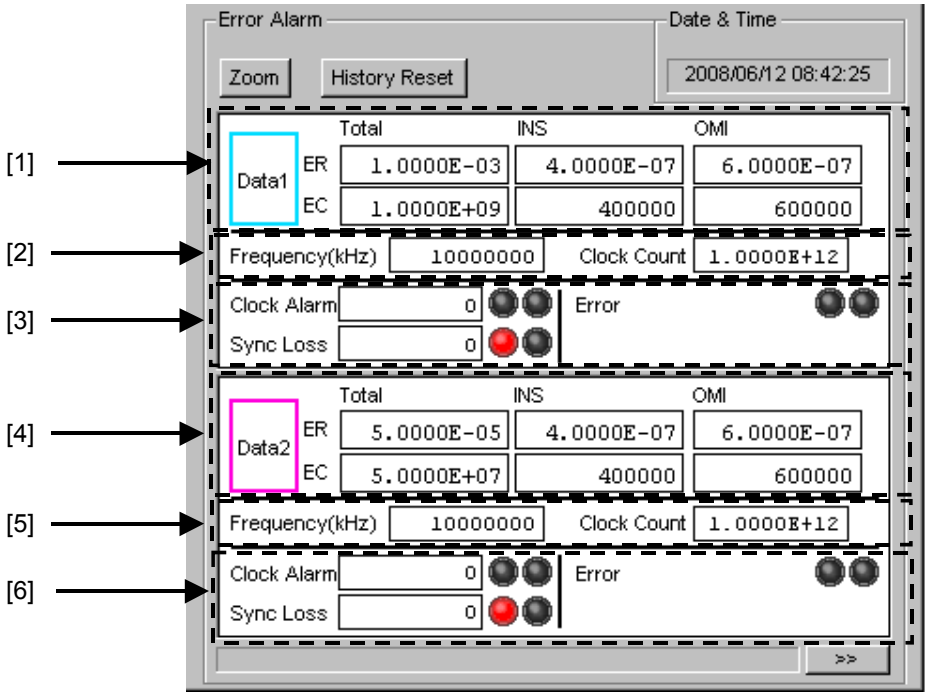

Figure 4.3.2-3 2 ch Combination Result Screen (MU182041A)

Table 4.3.1-2 Control Configuration when 2 ch Combination Zoom Display Not Selected (MU182041A)

Item		Function
[1]	ER	Displays Total error rate for MU181040A/B Slot1 to 2
	EC	Displays Total error count for MU181040A/B Slot1 to 2
	%EFI	Displays Total %EFI for MU181040A/B Slot1 to 2.
	EI	Displays Total EI for MU181040A/B Slot1 to 2.
[2]	Frequency	Displays Total frequency for MU181040A/B Slot1 to 2
	Clock Count	Displays Total clock count for MU181040A/B Slot1 to 2
[3]	Clock Alarm	Displays clock loss, CR Unlock alarm interval number for this equipment and MU181040A/B Slot1 to 2. Also displays alarms using LEDs. Lights in red: Current data Lights in yellow: History data
	Sync Loss	Displays Sync loss interval number for this equipment and MU181040A/B Slot1 to 2. Also displays alarms using LEDs. Lights in red: Current data Lights in yellow: History data
	Error	Displays error generation status for MU181040A/B Slot1 to 2 Lights in red: Current data Lights in yellow: History data
[4]	Data/XData Threshold	Threshold voltage detection monitor for DEMUX input at Auto Adjustment
	Delay	Delay setting detection monitor for DEMUX input at Auto Adjustment

Table 4.3.1-2 Control Configuration when 2 ch Combination Zoom Display Not Selected (MU182041A) (continued)

Item		Function
[5]	Frequency	Displays Total frequency for MU181040A/B Slot3 to 4
	Clock Count	Displays Total clock count for MU181040A/B Slot3 to 4
[6]	Clock Alarm	Displays clock loss, CR Unlock alarm interval number for this equipment and MU181040A/B Slot3 to 4. Also displays alarms using LEDs. Lights in red: Current data Lights in yellow: History data
	Sync Loss	Displays Sync loss interval number for this equipment and MU181040A/B Slot3 to 4. Also displays alarms using LEDs. Lights in red: Current data Lights in yellow: History data
	Error	Displays error generation status for MU181040A/B Slot3 to 4 Lights in red: Current data Lights in yellow: History data

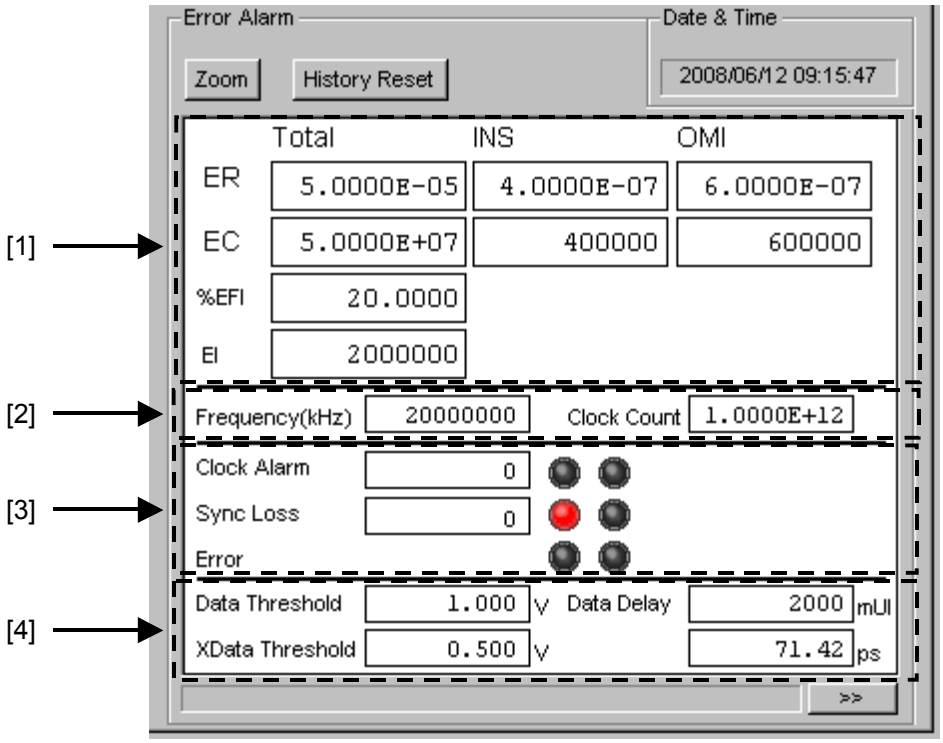

Figure 4.3.1-4 2 ch Combination Result Screen (MU182040A)

Table 4.3.1-3 Control Configuration when 2 ch Combination Zoom Display Not Selected (MU182040A)

Item		Function
[1]	ER	Displays Total error rate for MU181040A/B Slot1 to 2
	EC	Displays Total error count for MU181040A/B Slot1 to 2
	%EFI	Displays Total %EFI for MU181040A/B Slot1 to 2.
	EI	Displays Total EI for MU181040A/B Slot1 to 2.
[2]	Frequency	Displays Total frequency for MU181040A/B Slot1 to 2
	Clock Count	Displays Total clock count for MU181040A/B Slot1 to 2
[3]	Clock Alarm	Displays clock loss, CR Unlock alarm interval number for this equipment and MU181040A/B Slot1 to 2. Also displays alarms using LEDs. Lights in red: Current data Lights in yellow: History data
	Sync Loss	Displays Sync loss interval number for this equipment and MU181040A/B Slot1 to 2. Also displays alarms using LEDs. Lights in red: Current data Lights in yellow: History data
	Error	Displays error generation status for MU181040A/B Slot1 to 2 Lights in red: Current data Lights in yellow: History data

Table 4.3.1-3 Control Configuration when 2 ch Combination Zoom Display Not Selected (MU182040A) (continued)

Item		Function
[4]	Data/XData Threshold	Threshold voltage detection monitor for DEMUX input at Auto Adjustment
	Data Delay	Delay setting detection monitor for DEMUX input at Auto Adjustment

When the enlarged display is enabled (Zoom is selected), the items shown in Table 4.3.2-5 are displayed in the result display area with Error/Alarm selected.

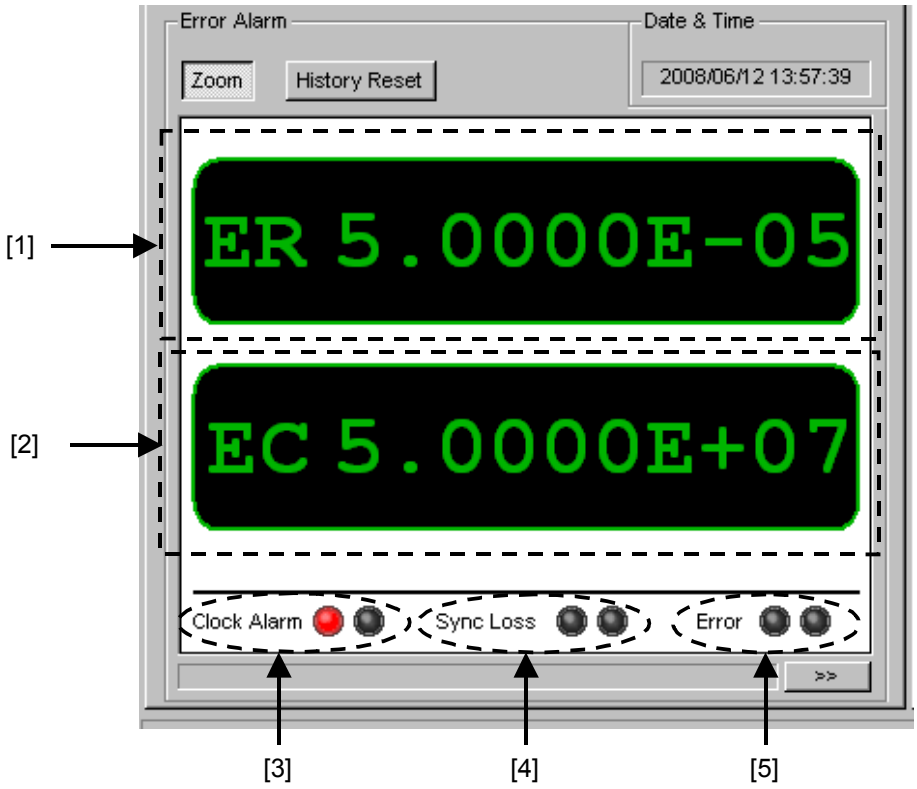

Figure 4.3.1-5 Control Configuration Screen when 25G x 2 ch Combination or 2 ch Combination Zoom Display Selected (MU182041A/MU182040A)

Table 4.3.1-4 Control Configuration when 25G x 2 ch Combination or 2 ch Combination Zoom Display Selected (MU182041A/MU182040A)

Item		Function
[1]	ER	Displays Total error rate for MU181040A/B Slot1 to 4 (MU181040A/B Slot1 to 2 or 3 to 4 when MU182040A installed)
[2]	EC	Displays Total error count for MU181040A/B Slot1 to 4 (MU181040A/B Slot1 to 2 or 3 to 4 when MU182040A installed)
[3]	Clock Alarm	Displays Clock loss and CR Unlock generation status for this module and MU181040A/B Slot1 to 4 (MU181040A/B Slot1 to 2 or 3 to 4 when MU182040A installed) Lights in red: Current data Lights in yellow: History data
[4]	Sync Loss	Displays sync loss and generation status for MU181040A/B Slot1 to 4 (MU181040A/B Slot1 to 2 or 3 to 4 when MU182040A installed) Lights in red: Current data Lights in yellow: History data

Table 4.3.1-4 Control Configuration when 25G x 2 ch Combination or 2 ch Combination Zoom Display Selected (MU182041A/MU182040A)

Item		Function
[5]	Error	Displays error generation status for MU181040A/B Slot1 to 4 (MU181040A/B Slot1 to 2 or 3 to 4 when MU182040A installed) Lights in red: Current data Lights in yellow: History data

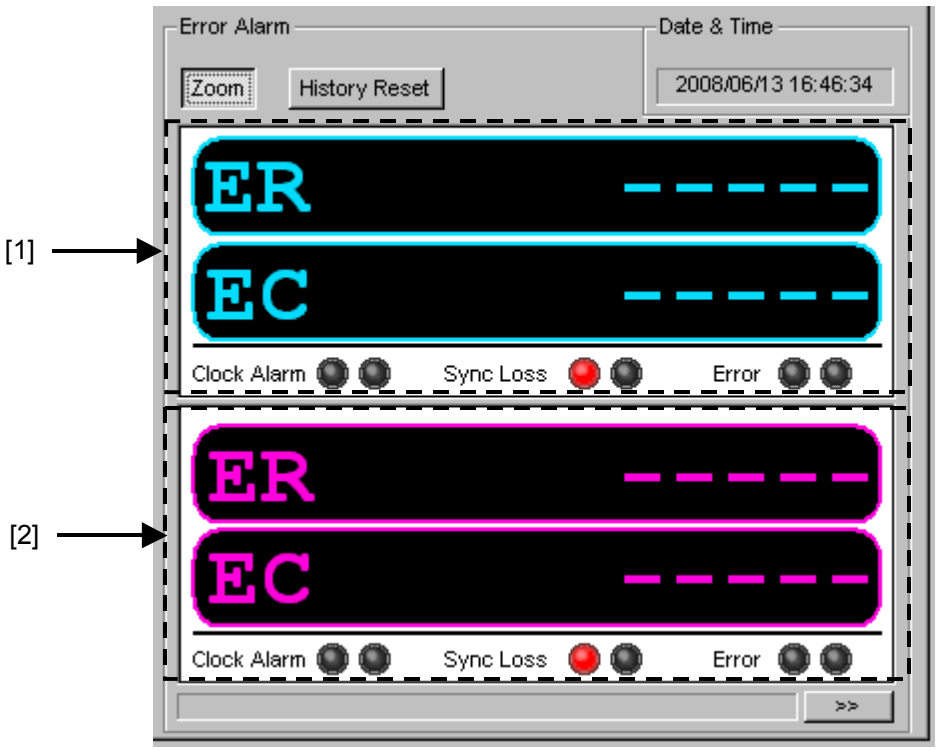

Figure 4.3.1-6 Control Configuration Screen when 2 ch Combination Zoom Display Selected (MU182041A)

Table 4.3.1-5 Control Configuration when 25G x 2 ch Combination Zoom Display Selected (MU182041A)

Item		Function
[1]	ER	Displays Total error rate for MU181040A/B Slot1 to 2
	EC	Displays Total error count for MU181040A/B Slot1 to 2
	Clock Alarm	Displays clock loss, CR Unlock generation status for this module and MU181040A/B Slot1 to 2 Lights in red: Current data Lights in yellow: History data
	Sync Loss	Displays sync loss and generation status for this module and MU181040A/B Slot1 to 2 Lights in red: Current data Lights in yellow: History data
	Error	Displays error generation status for this module and MU181040A/B Slot1 to 2 Lights in red: Current data Lights in yellow: History data
[2]	ER	Displays Total error rate for MU181040A/B Slot3 to 4
	EC	Displays Total error count for MU181040A/B Slot3 to 4
	Clock Alarm	Displays clock loss, CR Unlock generation status for this module and MU181040A/B Slot3 to 4 Lights in red: Current data Lights in yellow: History data
	Sync Loss	Displays sync loss and generation status for this module and MU181040A/B Slot3 to 4 Lights in red: Current data Lights in yellow: History data
	Error	Displays error generation status for this module and MU181040A/B Slot3 to 4 Lights in red: Current data Lights in yellow: History data

Table 4.3.1-6 shows the configuration of the measurement results displays.

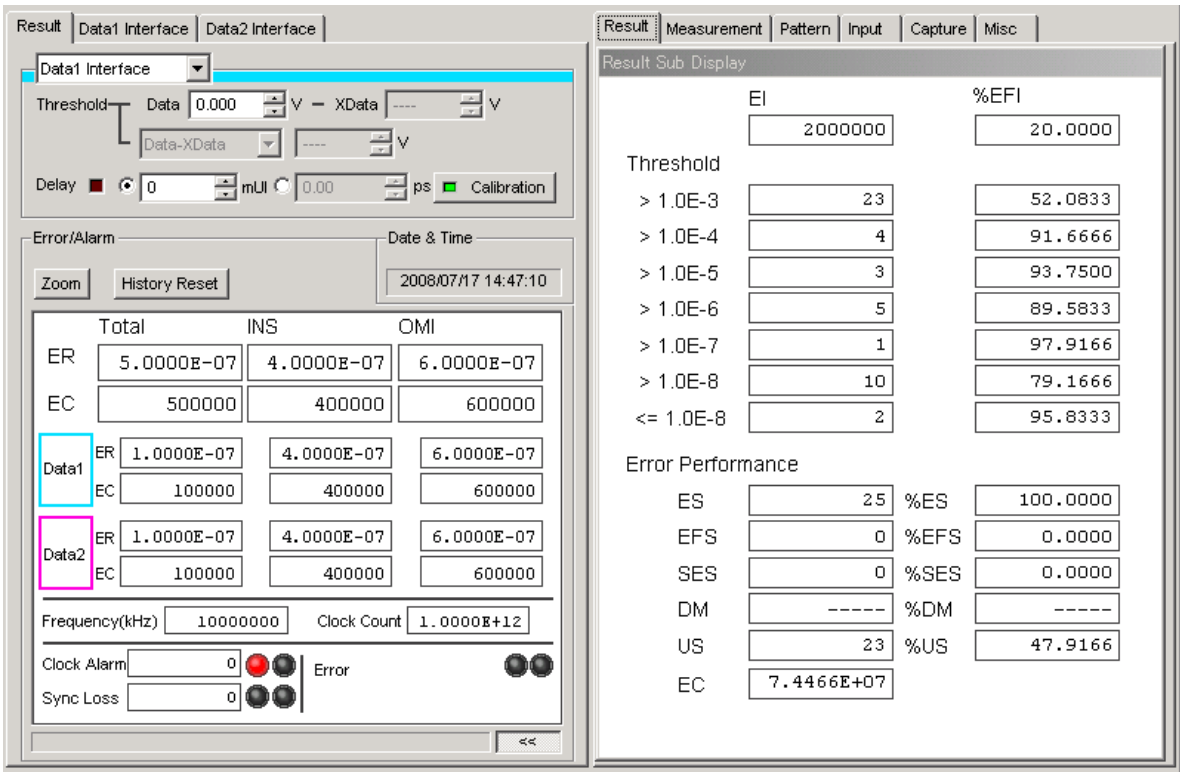

Figure 4.3.1-7 Measurement Results Sub-screen

Table 4.3.1-6 Configuration of Measurement Results Sub-screen

Item	Function
Threshold EI %EFI	The Total for Data1/Data2 and the Total Threshold EI/%EFI and Error Performance for Data1 and Data2 are displayed depending on the Combination setting.
>1.0E−3	
>1.0E−4	
>1.0E−5	
>1.0E−6	
>1.0E−7	
>1.0E−8	
<=1.0E−8	
Error Performance	
ES	
EFS	
SES	
DM	
US	

Table 4.3.1-6 Configuration of Measurement Results Sub-screen (Cont'd)

Item	Function
EC	The Total for Data1/Data2 and the Total Threshold EI/%EFI and Error Performance for Data1 and Data2 are displayed depending on the Combination setting.
%ES	
%EFS	
%SES	
%DM	
%US	

4.4 Setting Input Interface

The input interface settings are selected at [Data1 Interface] and [Data2 Interface] of the Operation screen.

4.4.1 Input setting items

The top field is for the Data settings and the bottom field is for the Clock settings. The Data signal is input to the Data Input connector of this module and the XData signal is input to the $\overline{\text{Data}}$ Input connector. The following explains the XData settings related to the $\overline{\text{Data}}$ Input connector.

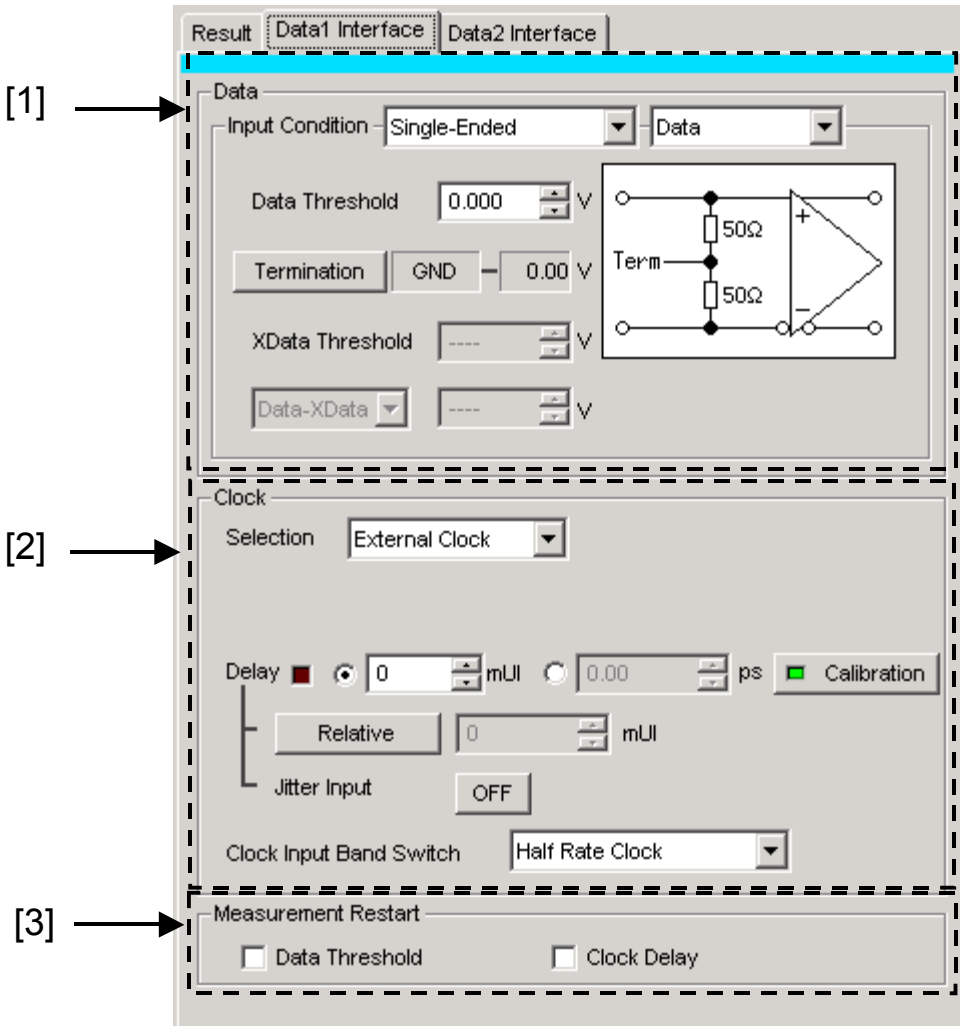

Figure 4.4.1-1 Data1 Interface/Data2 Interface Setting window

[1] Set the data input conditions.

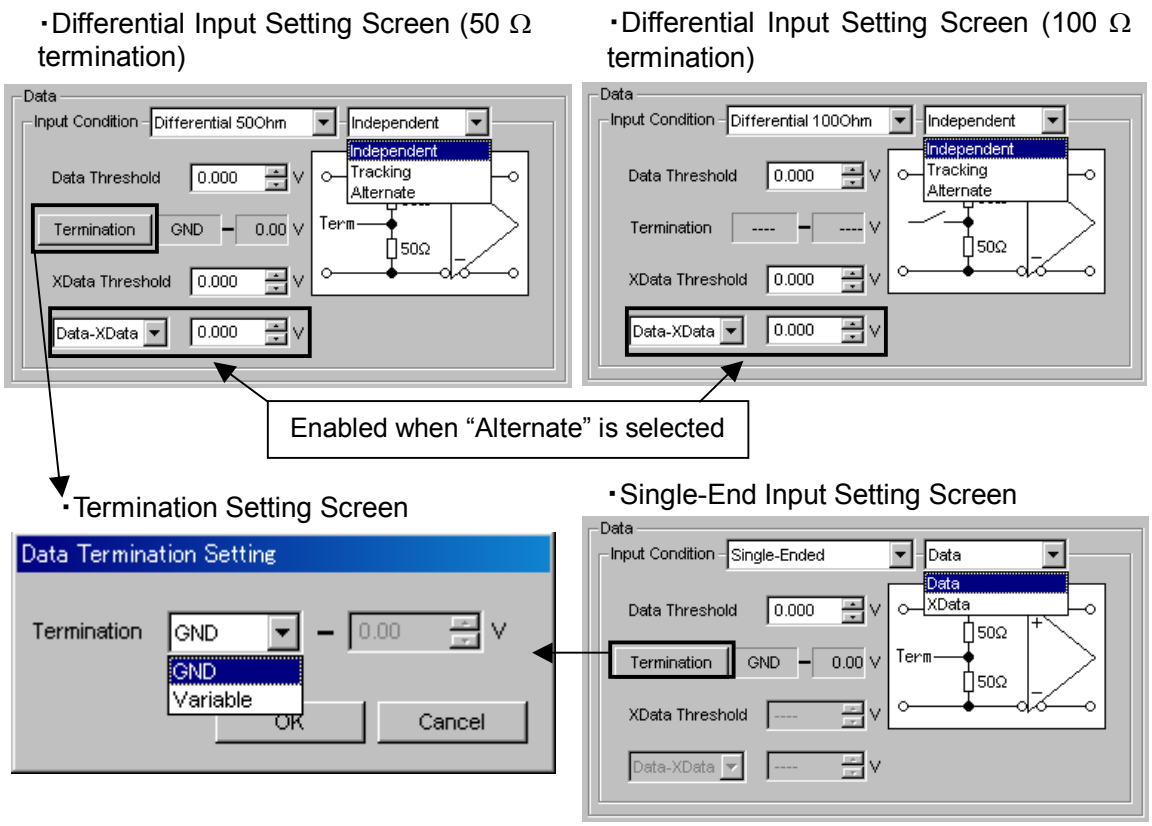

Figure 4.4.1-2 Setting Data input conditions

Table 4.4.1-1 Data input condition setting items

Data input condition setting items			Description
Differential 100 Ohm Differential 50 Ohm	Independent		Uses Data and XData as the differential input. The Data threshold and XData threshold can be changed independently
	Tracking		Uses Data and XData as the differential input. The Data threshold and XData threshold can be changed in conjunction.
	Alternate	Data-XData	Uses Data and XData as the differential input. The Data threshold and XData threshold can be changed interrelatedly, in conjunction with a difference between Data and XData (Data – XData).
		XData-Data	Uses Data and XData as the differential input. The Data threshold and XData threshold can be changed interrelatedly, in conjunction with a difference between XData and Data (XData – Data).

Table 4.4.1-1 Data input condition setting items(Cont'd)

Data input condition setting items		Description
Single-Ended	Data	Used the Data side as single-ended input. ***Note:*** Be sure to attach the supplied Open to the unused input connector at the XData side before use. Malfunction may result if a signal is input to the unused connector.
	XData	Used the XData side as single-ended input. ***Note:*** Be sure to attach the supplied Open to the unused input connector at the Data side before use. Malfunction may result if a signal is input to the unused connector.

Table 4.4.1-2 Data input condition setting items

Data Termination setting items		Description
Differential 100 Ohm	None	To assure equipment safety, when the input connector is open, the center line of the Data or XData side 50-Ω termination is fixed at GND potential via a high resistance.
Differential 50 Ohm Single－Ended	GND	Terminated at 50 Ω/GND
	Variable	Terminated at 50 Ω and any voltage in range of –2.5 to +3.5 Vset in 10-mV steps

Table 4.4.1-3 Threshold Voltage settings

Setting items	Description
Data Threshold XData Threshold	Set in range of –3.500 to +3.300 V in 0.001-V steps. However, when either [Differential 50 Ohm] or [Differential 100 Ohm] is set at [Input] of the Operation screen, the absolute difference between each setting for Data and XData is limited to 1.500 V max.
Data－XData XData－Data	Select either Data-XData or XData-Data. The setting range is –1.500 to +1.500 V in 0.001-V steps.

Notes:

1. Ensure that the peak current does not exceed the built-in termination, otherwise there is a risk of equipment damage or degraded peformance.

2. If Single-Ended input is selected and a differential signal is input to the Data and XData connectors, the threshold margin increases by several orders of magnitude.

3. When inputting a signal to this module, do not input a voltage exceeding the specified value, otherwise the circuits may be damaged.

4. As countermeasure to static electricity, before connecting to an input connector, always ground the other equipment (including test circuit).

5. Sometimes, a coaxial cable can accumulate a charge between the outer and inner conductors rather like a capacitor. Always take antistatic measures such as grounding the outer conductor before connecting the cable.

[2] Set the Clock input conditions.

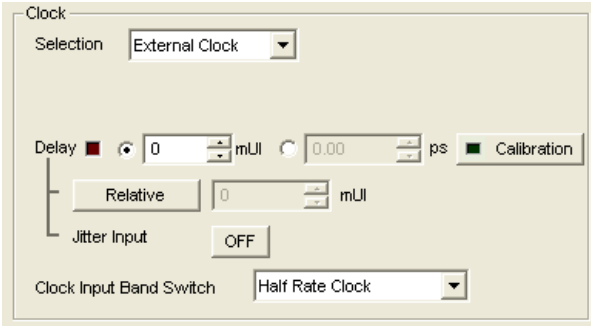

Figure 4.4.1-4 Clock Delay Setting Screen

Table 4.4.1-4 Composition of Clock input setting screen It

Setting items		Description
Delay	mUI	Sets delay from –2000 to 2000 mUI in 2-mUI steps This module operates based on UI units. Increasing the numeric value increases the delay.
	ps	The delay can be set in steps of ps units, equivalent to 2 mUI. The setting range is the range converting –2000 to 2000 mUI in ps units. 25 GHz : −80 to 80 ps 12.5 GHz : −160 to 160 ps 8 GHz : −250 to 250 ps When the red frequency counter value range is incorrect,「---- ps」 is displayed.
	Calibration	Pressing the [Calibration] button executes self calibration. When the LED above the button is red, calibration should be performed. When the LED is green, calibration is OK. Sometimes, the delay time may be changed greatly by executing calibration, so take care when performing calibration during measurement.
	Relative	Pressing the [Relative] button sets the current delay in 2-mUI steps relative to the reference value of 0 mUI. When the [Relative] button is pressed again, the setting is converted from the relative value to the current delay value.
	Jitter Input	ON: Select when testing jitter tolerance by inputting Jitter clock to this module. Refer to 4.4.2 “When inputting jitter-modulated signals” for detail. OFF: Default setting
Clock Input Band Switch (When MU182040/ 41A-x02 is installed)	Half Rate Clock	Select when input clock is half input data.
	Full Rate Clock	Select when input clock is same as input data.

Notes:

1. When the frequency or the temperature condition is changed, the LED on the [Calibration] lights, prompting performance of calibration. If calibration is not performed at this time, the error in the phase setting may be greater than at a normal phase setting.

2. Values displayed in ps units vary as the frequency changes, because the MU182040A/41A sets phases in mUI units as an internal standard.

3. When Burst is selected at Pattern Sequence of the Misc screen, the phase setting accuracy becomes worse than when Repeat is selected.

4. When inputting a jitter-modulated clock while Jitter Input of Delay is OFF, sometimes, the phase becomes unstable.

5. When inputting a jitter-modulated clock,if the Delay lamp is lit, sometimes, the phase setting error becomes large.

6. When inputting a signal to this module, do not input a voltage exceeding the specified value, otherwise the circuits may be damaged.

7. As countermeasure to static electricity, before connecting to an input connector, always ground the other equipment (including test circuit).

8. Sometimes, a coaxial cable can accumulate a charge between the outer and inner conductors rather like a capacitor. Always take antistatic measures such as grounding the outer conductor before connecting the cable.

9. During Auto Adjust execution, the delay amount of [Delay] is always changed in order to drive the clock phase to the optimum point. Therefore, the LEDs of [Delay] and [Calibration] buttons light up in red continuously. This is not abnormal.

[3] Select the measurement restart conditions.
This can be selected when this module and either the MU181040A or the MU181040B are installed in the same main frame and either 2 ch Combination or 25G 2 ch Combination is executed.

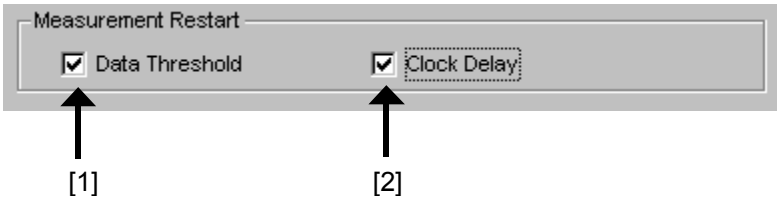

Figure 4.4.1-5 Setting screen for measurement restart conditions

Table 4.4.1-5 Setting screen for measurement restart conditions

Input setting items		Description
Measurement Restart	Data Threshold	Restarts measurement when changing Threshold voltage of this module at check
	Clock Delay	Restarts measurement when changing Delay of this module at check

4.4.2 When inputting jitter-modulated signals

- When executing jitter tolerance test, etc. by inputting jitter-modulated clock, set Jitter Input of Delay to ON to avoid malfunction of Delay caused by excess jitter modulation. (See Figure 4.4.2-1). When using the MU181000A/B (with Option 001 Jitter Modulation) or MU181500B, set Jitter Input of Delay to ON, and then set Jitter Modulation of the MU181000A/B or MU181500B to ON.
- When executing Calibration of Delay, set jitter modulation of input signal to non-modulation.

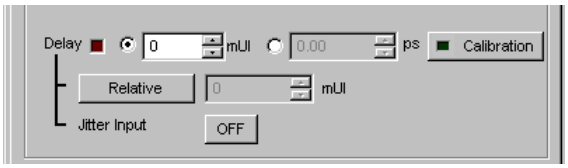

Figure 4.4.2-1 Clock delay setting items

Notes:

1. When jitter-modulated clock is input while Jitter Input of Delay is set to OFF, the phase may become unstable.

2. The Delay lamp may light up when a jitter-modulated clock signal is input. In addition, phase setting error may increase.

3. The Delay function has feedback process to improve its setting accuracy at default setting (Jitter Input is set to OFF.). However, if Jitter Input is set to ON, the setting accuracy is lowered because the feedback process is stopped.

Jitter Input	Use
ON	Jitter Tolerance MeasurementBER measurement when jitter amount applied to clock signal is big. Delay is unstable when Jitter Input is OFF.
OFF	Phase margin measurement Eye Margin measurement, Eye Diagram measurement, Bathtub measurement

4.5 Executing Auto Search

The Auto Search function is for optimizing the input Data and XData input signal Threshold voltage and phase. Click the [Auto Search] module function button to display the Auto Search dialog box. The Auto Search setting items can be set in this dialog box. The [Auto Search] module function button can be displayed and hidden by selecting [Button Menu…] from the View menu on the menu bar.

When the pointer is closed to the [Auto Search], " Auto Search " is displayed for help.

Figure 4.5-1 [Auto Search] tool button

4.5.1 Input setting items in Auto Search dialog box

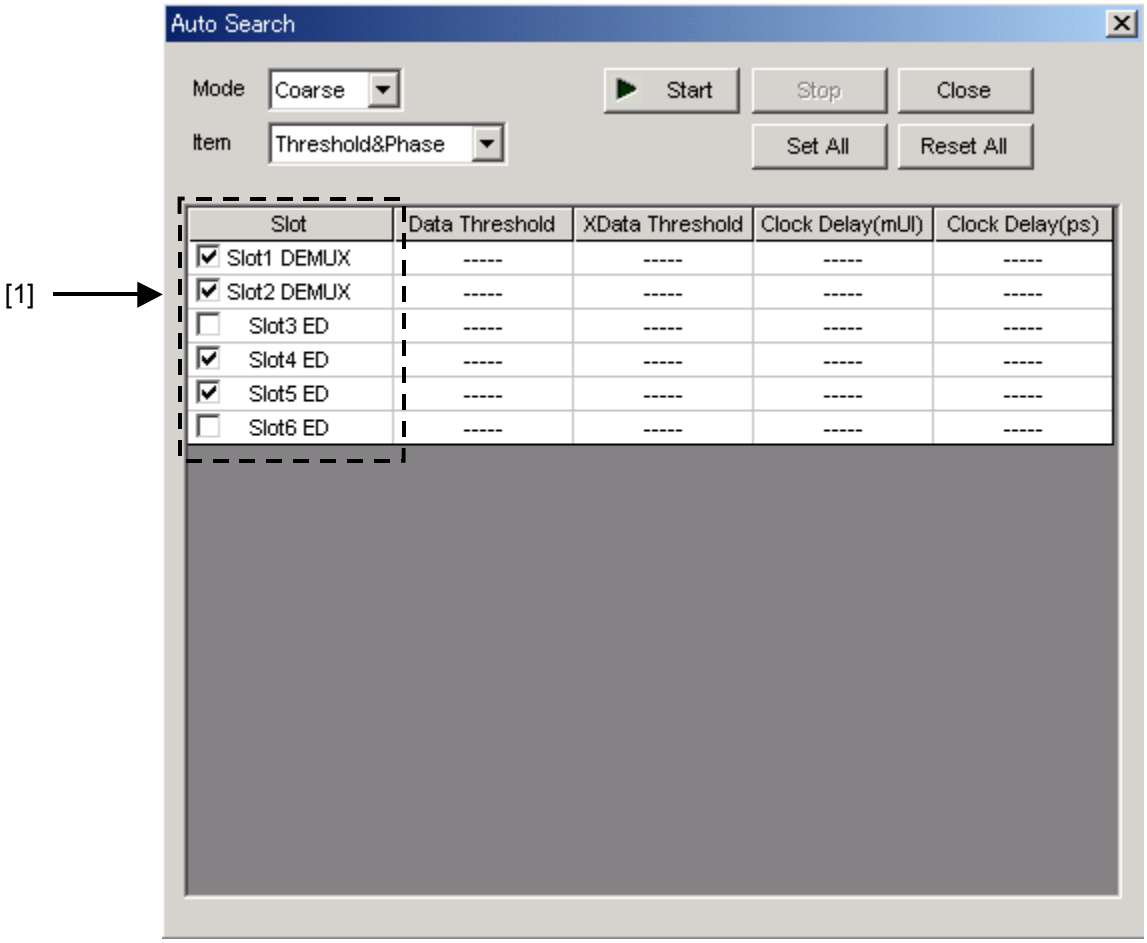

Figure 4.5.1-1 Auto Search window

[1] Put a checkmark in the checkbox for the Slot No. where Auto Search is to be executed. Select Slot No. installed by this module.

When the module is the MU182041A, Auto Search can be executed separately for each of Data1,and Data2. In this case, the lowest Slot No. is the Data1 Interface.

To use Auto Search, refer to Section 5.7 Auto Search in the MU181040A/B Operation Manual.

4.6 Executing Auto Adjust

The Auto Adjust function automatically adjusts the threshold voltage and phase to the optimum values when the interface conditions for the signals to be input to the MU182040A/41A have changed. Click the [Auto Adjust] module function button to display the Auto Adjust dialog box. The Auto Adjust setting items can be set in this dialog box. The [Auto Adjust] module function button can be displayed and hidden by selecting [Button Menu…] from the View menu on the menu bar.

When the pointer becomes close to the [Auto Adjust], "Auto Adjust" is displayed for help.

The Auto Adjust function is enabled only when MU182040A/41A and MU181040A-002 (0.1 to 12.5 Gbit/s) is installed.

When Combination of this equipment is toggled to 2ch and 25Gx2ch, Auto Adjust is set for all EDs inside this equipment. (Auto Adjust is not set for this equipment.

Figure 4.6-1 [Auto Adjust] tool button

4.6.1 Input setting items in Auto Adjust dialog box

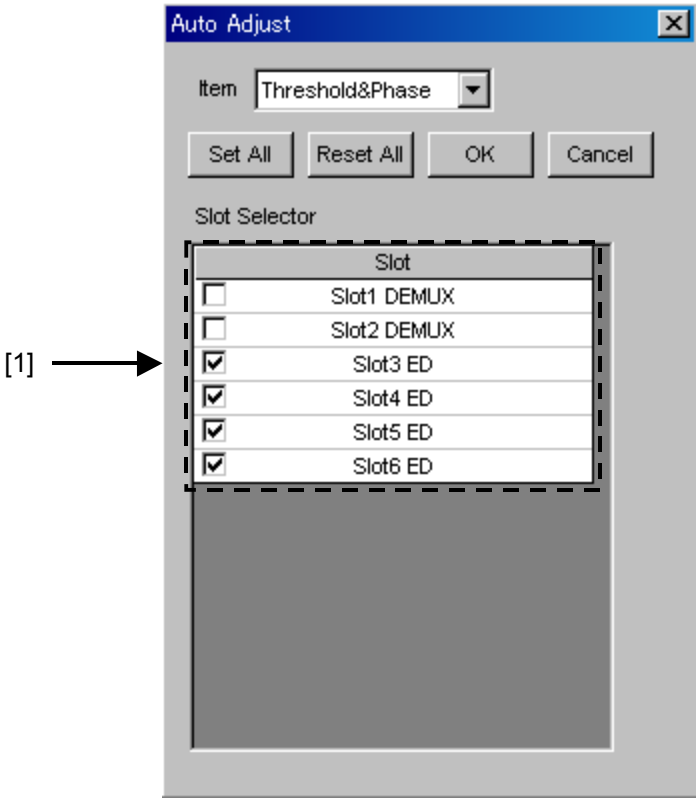

Figure 4.6.1-1 Auto Adjust window

[1] Put a checkmark in the checkbox for the Slot No. where Auto Adjust will be executed. Select Slot No. installed by this module.

When the module is the MU182041A, Auto Adjust can be executed separately for each of Data1,and Data2. In this case, the lowest Slot No. is the Data1 Interface.

To use Auto Adjust, refer to Section 5.8 Auto Adjust in the MU181040A/B Operation Manual.

4.7 ISI Measurement Function

ISI stands for Inter Symbol Interface. ISI measurement function is used for analysis of interferences between bits and block, by visually displaying a distribution of errors that occur between measuring bits and blocks.

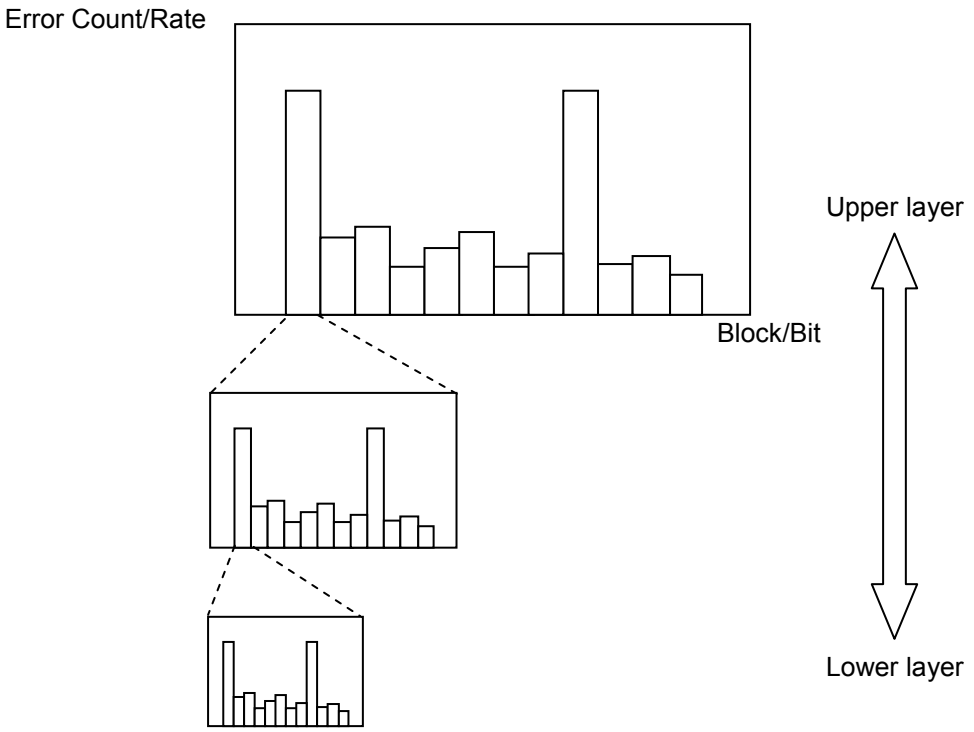

Figure 4.7-1 ISI measurement function

The ISI measurement function has the following features.

- Provides Zoom In and Zoom Out function for switching the test pattern hierarchically, from the entire of the pattern to 1 bit.
- Provides two graph display functions: Error Rate and Error Count.
- Capable of displaying up to a maximum of 64 blocks simultaneously, facilitating to recognize the interferences between bits and blocks visually.

To use the ISI measurement function, click the [Auto Measurement] module function button, and then select "ISI." See the MX180000A Signal Quality Analyzer Control Software Operation Manual for details.

4.7.1 Displaying ISI measurement results in ISI window

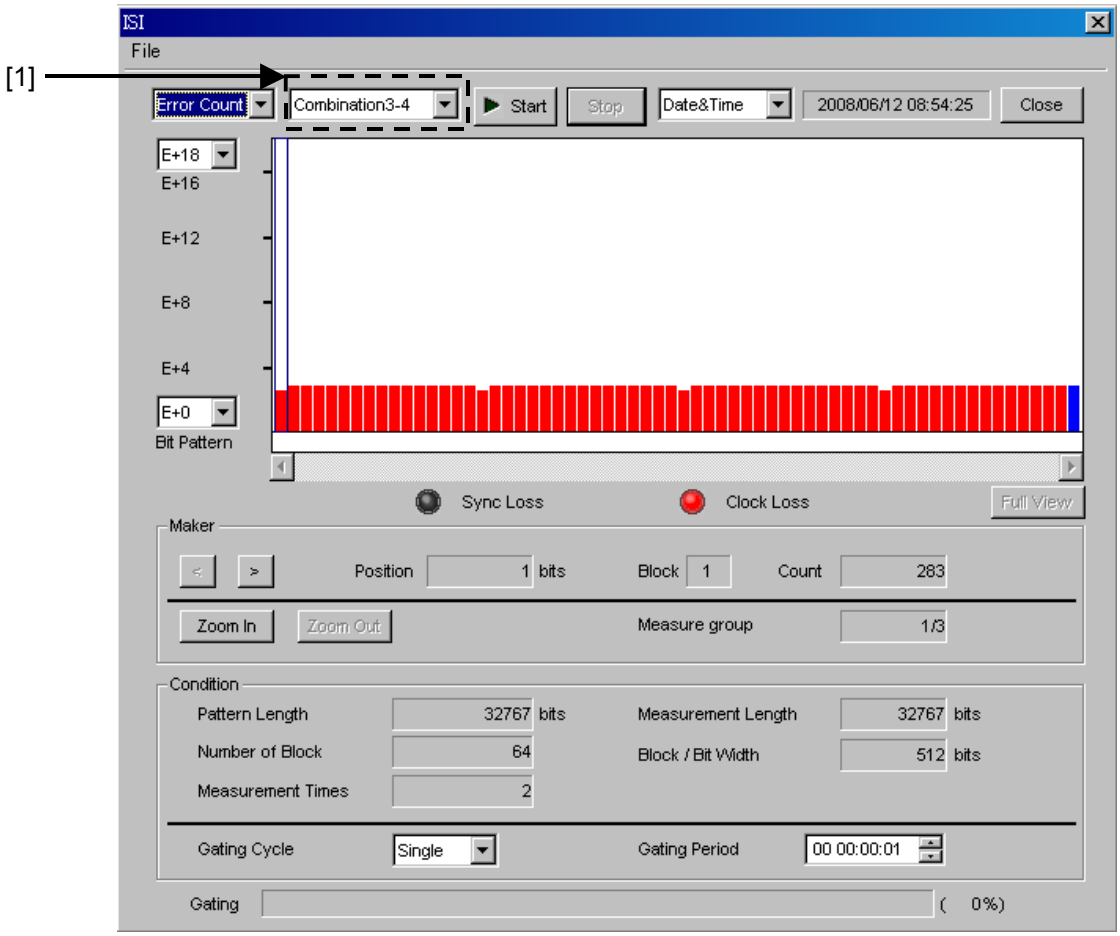

Figure 4.7.1-1 ISI window

[1] Select from the drop-down list.

To use ISI measurement, refer to Section 5.9 ISI Measurement Function in the MU181040A/B Operation Manual.

4.8 Capture Function

To capture and analyze the input test pattern, select [Capture] at the Operation screen of the MU181040A/B Error Detector module.

It is possible to perform the Capture analysis using 2ch Combination and 25G 2ch Combination coupled with this equipment.

To use Capture Function, refer to Section 5.5 Capturing Test Patterns in the MU181040A/B Operation Manual.

4.9 Eye Margin Measurement

At Eye Margin measurement, the phase and threshold voltage margins are measured from the eye diagram input to this module as follows:

- Eye margin of input 25G data
- Separate eye margin measurement for each of Data1 and Data2 when MU182041A installed
- Eye margin measurement from E−3 to E−12

To use the Eye Margin measurement function, click the [Auto Measurement] module function button, and then select "Eye Margin." See the MX180000A Signal Quality Analyzer Control Software Operation Manual for details.

25G Eye Margin measurement is supported when this module and the MU181040A/B are installed in the same main frame *and* either 25G x 2 ch Combination or 2 ch Combination is selected at the Combination setting screen.

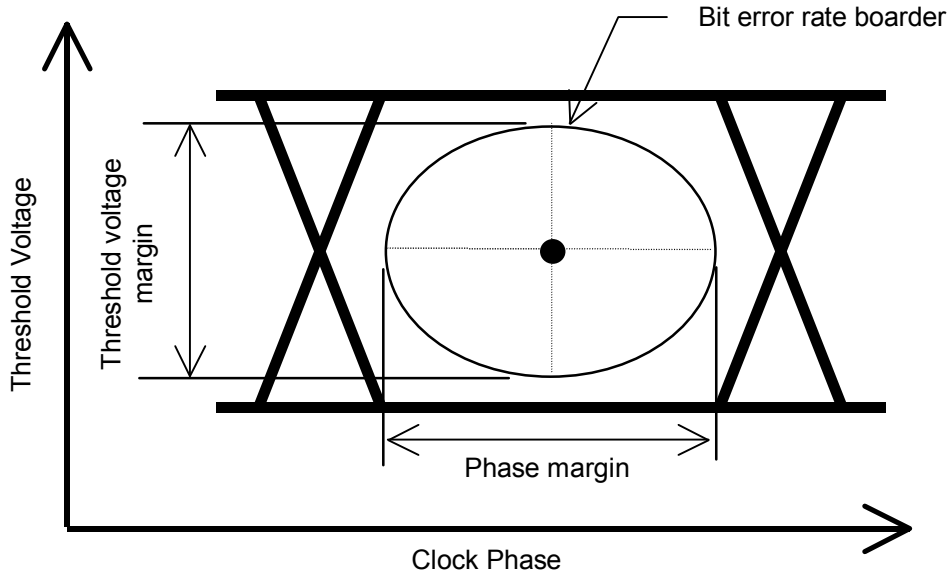

Figure 4.9-1 Schematic diagram of Eye Margin measurement

4.9.1 Eye Margin window

Figure 4.9.1-1 shows the Eye Margin window.

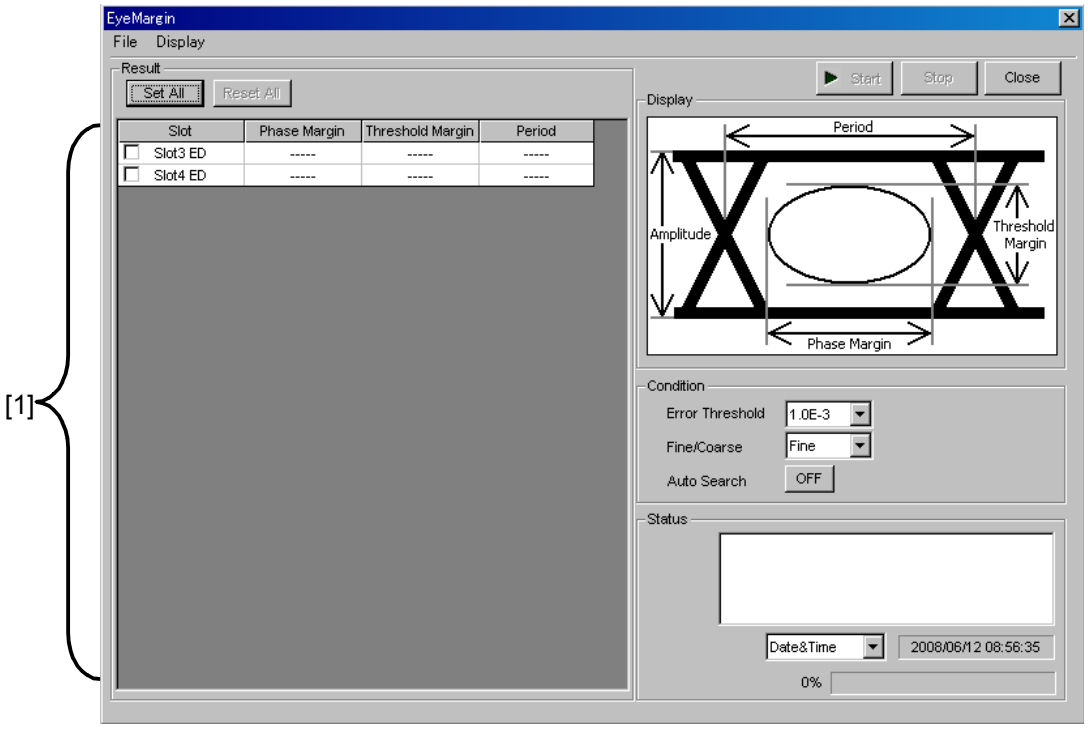

Figure 4.9.1-1 Eye Margin window

[1] Put a checkmark in the checkbox for the Slot No. to be measured.

Select Slot No. installed by this module. When the module is the MU182041A, Eye Diagram measurement can be executed separately for each of Data1,and Data2. In this case, the lowest Slot No. is the Data1 Interface.

To use Eye Margin Measurement, refer to Section 5.10 Auto Adjust in the MU181040A/B Operation Manual.

4.10 Eye Diagram Measurement

An eye diagram is a means for measuring digital signal quality. It visualizes an open-eye margin two-dimensionally.
For example, an eye diagram measurement can be used when it is required to measure the margin in the setting range for the threshold voltage and clock phase of a decision circuit, while quality with an error rate of E–12 or lower should be secured. In this event, a contour at an error rate of E–12 measured with eye diagram measurement can be obtained as a result. The required quality can be secured in the area inside the contour. Therefore, the wider this area, the higher the signal quality.

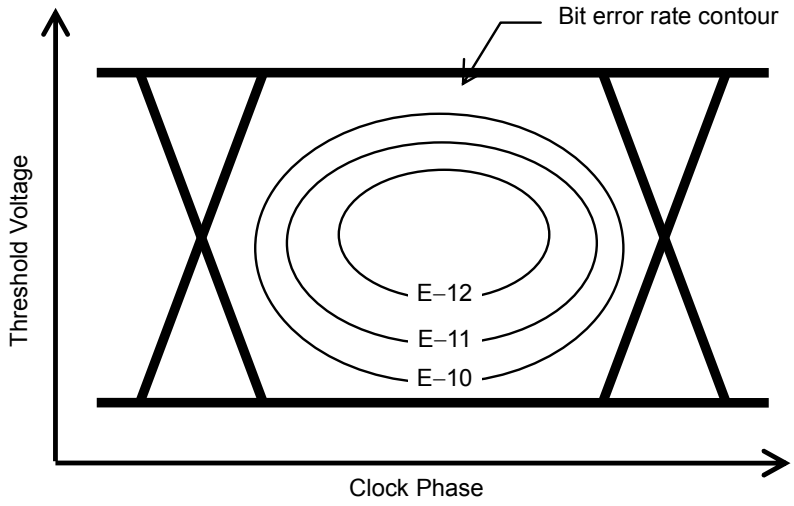

Figure 4.10-1 Schematic diagram of Eye Diagram measurement

The features are as follows:

- Eye diagram of input 25G data
- Separate eye diagram measurement for each of Data1 and Data2 when MU182041A installed
- Eye diagram measurement from E-2 to E-12
- Mask template display and mask template editing functions

To use the Eye Diagram measurement function, click the [Auto Measurement] module function button, and then select “Eye Diagram.” See the MX180000A Signal Quality Analyzer Control Software Operation Manual for details.

25G Eye Diagram measurement is supported when this module and the MU181040A/B are installed in the same main frame *and* either 25G x 2 ch Combination or 2 ch Combination is selected at the Combination setting screen.

4.10.1 Eye Diagram Screen-Condition Screen-

Figure 4.10.1-1 shows the Condition tab window.

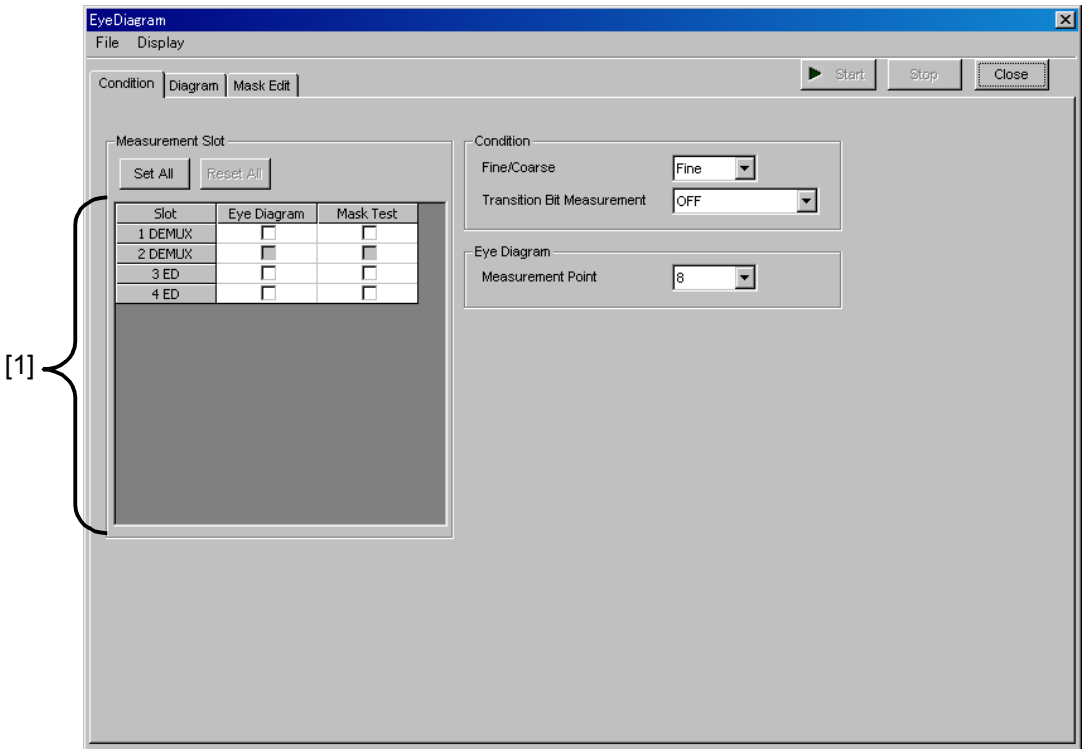

Figure 4.10.1-1 Condition tab window

[1] Put a checkmark in the checkbox for the Slot No. to be measured.

Select Slot No. installed by this module. When the module is the MU182041A, Eye Diagram measurement can be executed separately for each of Data1,and Data2. In this case, the lowest Slot No. is the Data1 Interface.

To use Eye Diagram, refer to Section 5.11 Eye Diagram Measurement in the MU181040A/B Operation Manual.

4.10.2 Eye Diagram Screen-Diagram Screen-

Figure 4.10.2-1 shows the Diagram tab window.

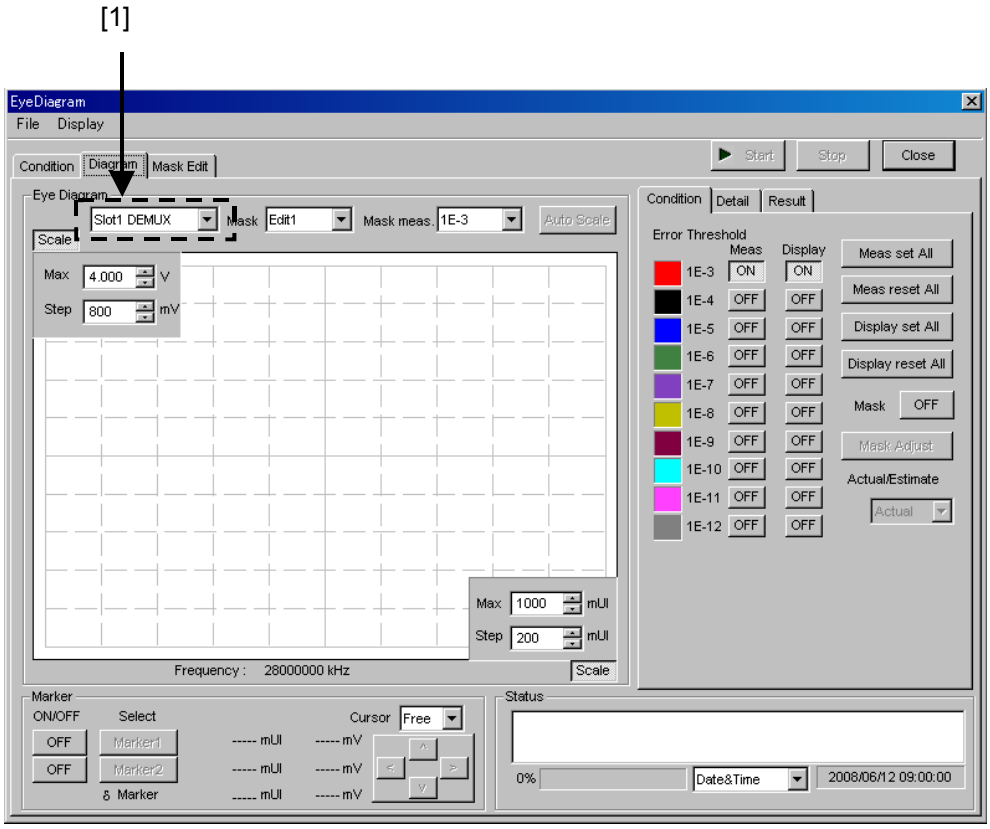

Figure 4.10.2-1 Diagram tab window

[1] Select the number of the slot where the MU182040A to be measured is inserted. Only slots where an MU182040A is inserted can be selected.

To use Eye Diagram, refer to Section 5.11 Eye Diagram Measurement in the MU181040A/B Operation Manual.

4.11 Q Analysis Function

The Q analysis function has the following features.

- Q measurement of 25G input data
- Separate Q measurement for each of Data1 and Data2 when MU182041A installed
- Conforms to OSFTP-9.
- Capable of calculating two Q values: Threshold vs. Q and Phase vs. Q.
- Provides rich graph displaying modes.
- Displays various measurement data, such as optimum bit error rate, threshold voltage, correlation coefficients of least-square method, and Gaussian parameters.
- Equipped with parameters for flexible Q-value measurement, including BER range and measurement accuracy for Q value calculation.

To use the Q analysis function, click the [Auto Measurement] module function button, and then select "Q Analysis." See the MX180000A Signal Quality Analyzer Control Software Operation Manual for details.

25G Q measurement is supported when this module and the MU181040A/B are installed in the same main frame *and* either 25G x 2 ch Combination or 2 ch Combination is selected at the Combination setting screen.

4.11.1 Displaying results of Threshold vs. Q measurement in Threshold vs Q tab window

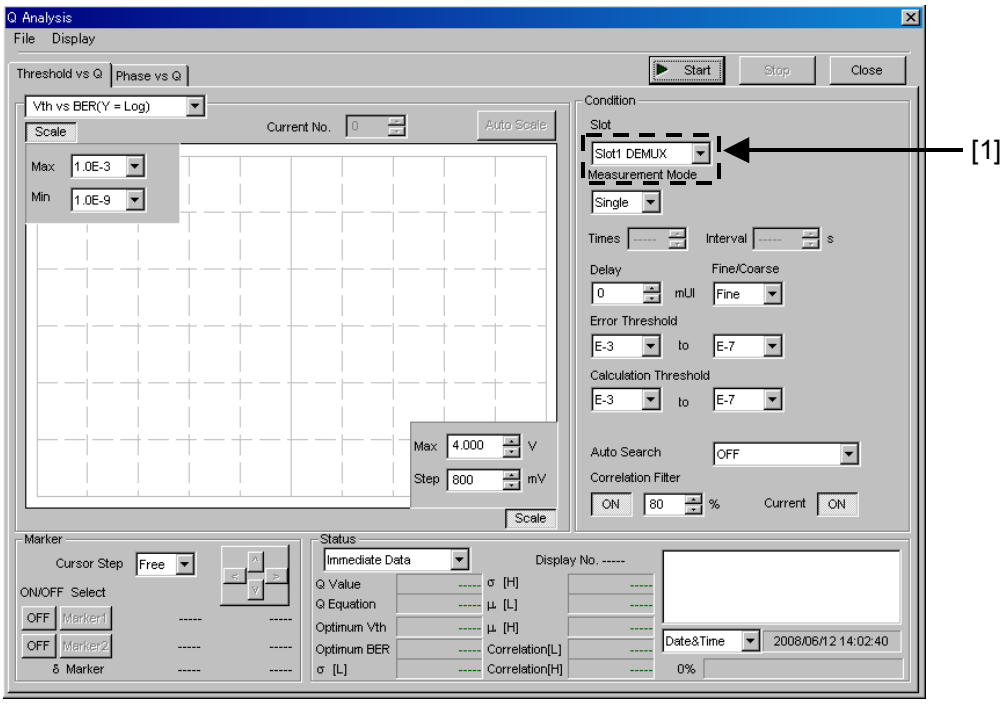

Figure 4.11.1-1 Threshold vs Q tab window

[1] Select Slot No. installed by this module. When the module is the MU182041A, Q measurement can be executed separately for each of Data1,and Data2. In this case, the lowest Slot No. is the Data1 Interface.

For the settings and measurement of “Q Analysis Function”, refer to section 5.12 “Q Analysis Function”.

4.12 Bathtub Function

The Bathtub function has the following features.

- Bathtub measurement of 25G input data
- Separate Bathtub measurement for each of Data1 and Data2 when MU182041A installed
- Provides rich graph displaying modes.
- Calculate TJ, DJ, RJ, as well as optimum phase and optimum bit error rate.

To use the Bathtub function, click the [Auto Measurement] module function button, and then select "Bathtub." See the MX180000A Signal Quality Analyzer Control Software Operation Manual for details.

25G Bathtub measurement is supported when this module and the MU181040A/B are installed in the same main frame *and* either 25G x 2 ch Combination or 2 ch Combination is selected at the Combination setting screen.

4.12.1 Displaying Bathtub measurement results in Bathtub window

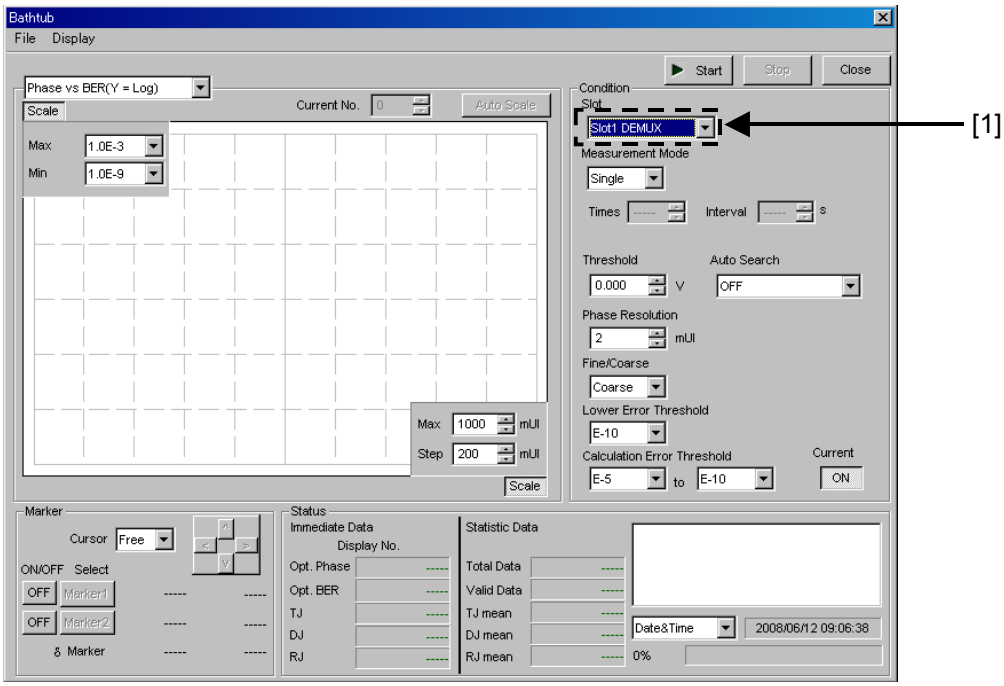

Figure 4.12.1-1 Bathtub window

[1] Select Slot No. installed by this module. When the module is the MU182041A, Bathtub measurement can be executed separately for

each of Data1,and Data2. In this case, the lowest Slot No. is the Data1 Interface.

For the settings and measurement of “Bathtub Function”, refer to section 5.13 “Bathtub Function”.

4.13 Multi Channel Function

When multiple MU181040A/B modules are installed into the MP1800A/MT1810A, synchronized operation of multiple channels is enabled. The Multi Channel function has separate Combination and Channel Synchronization functions

Combination Function Types

(1) 4 ch Combination: when four PPG/ED modules installed

(2) 25G x 2 ch Combination: when four PPG/ED modules installed

(3) 2 ch Combination: when two or more PPG/ED modules installed

Channel Synchronization Function Types

(1) 12.5G Channel Synchronization: when two or more PPG modules installed

(2) 25G Channel Synchronization: when four PPG modules installed

4.13.1 Combination function

The Multi-channel function synchronizes the generation and reception of patterns between modules, to evaluate 40 Gbit/s and PON applications.

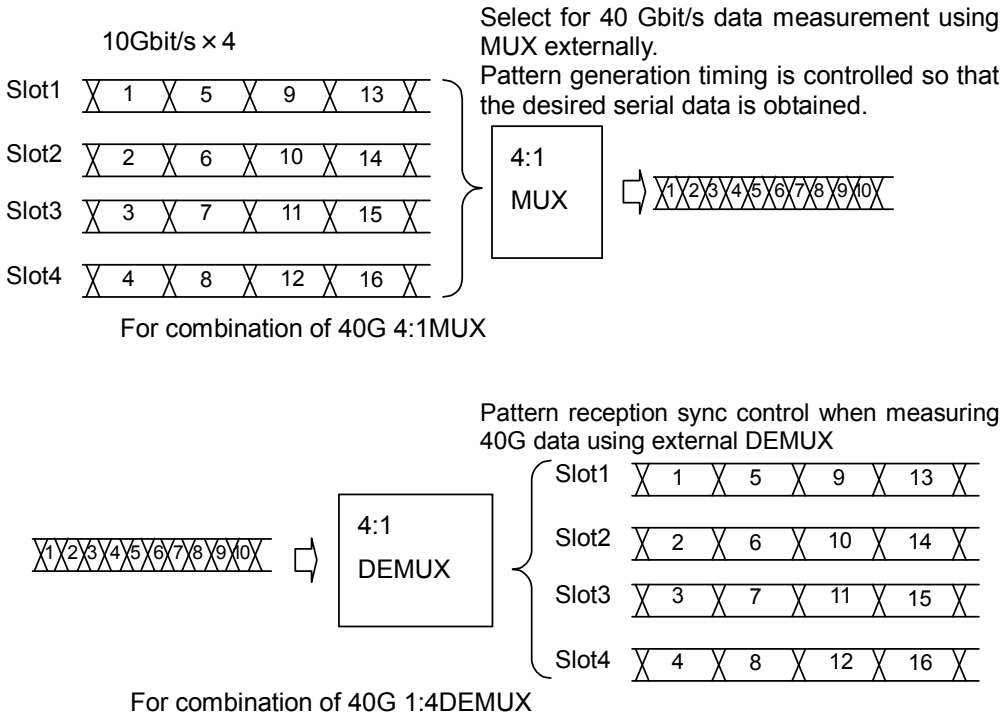

Figure 4.13.1-1 4ch Combination pattern generation/reception

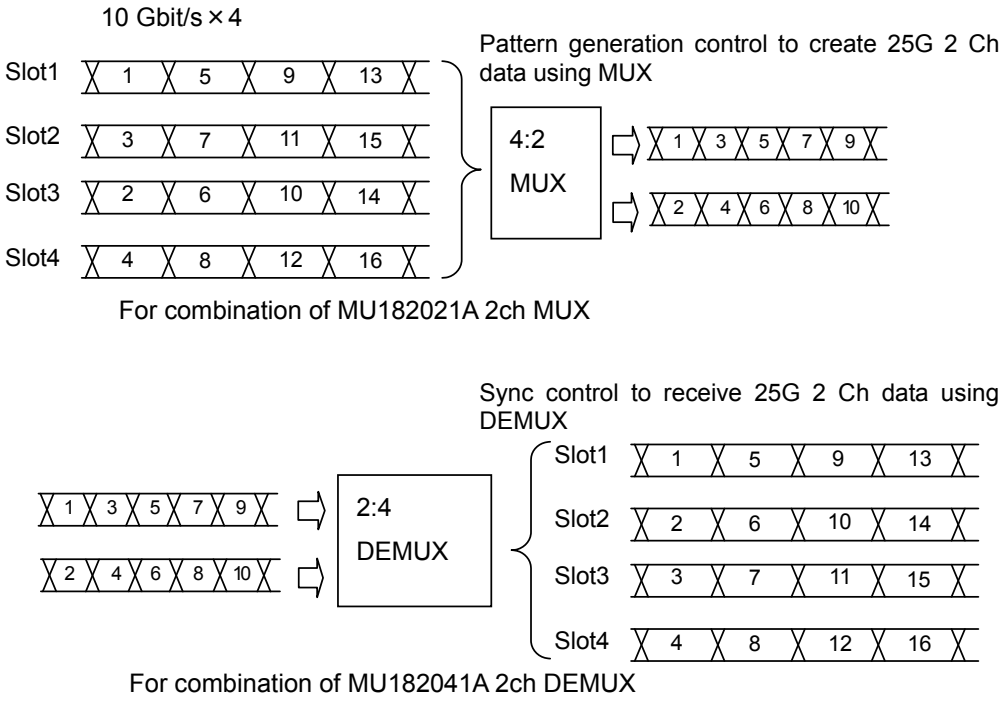

Figure 4.13.1-2 25Gx2ch Combination pattern generation/reception

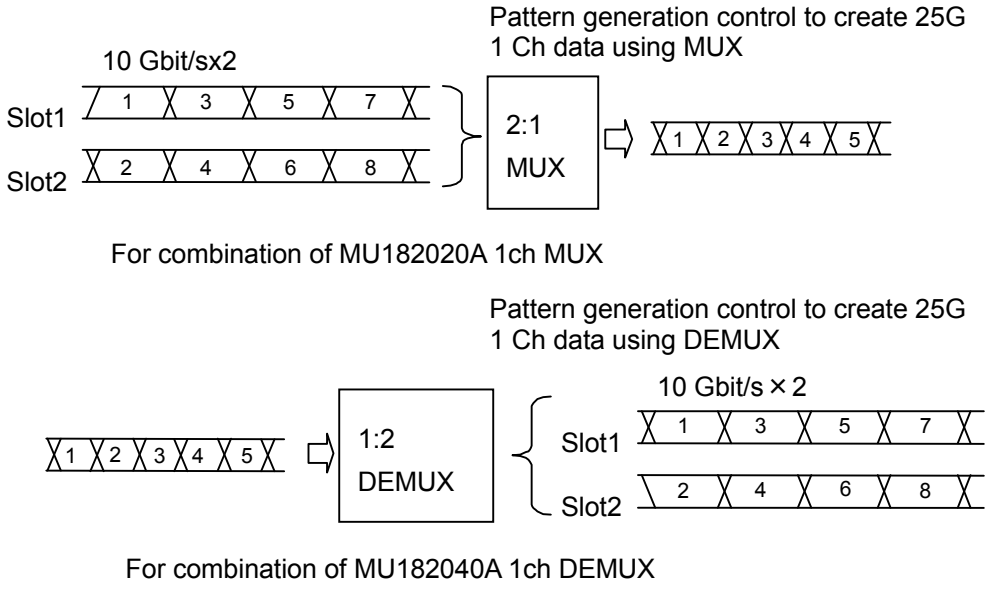

Figure 4.13.1-3 2ch Combination pattern generation/reception

4.13.2 Combination Setting

To use the Multi-channel function, click the [Combination Setting] module function button to open the Combination Setting dialog box for setting.

For details, refer to Section 5.3.3 "Combination setting" in the MX180000A Operation Manual.

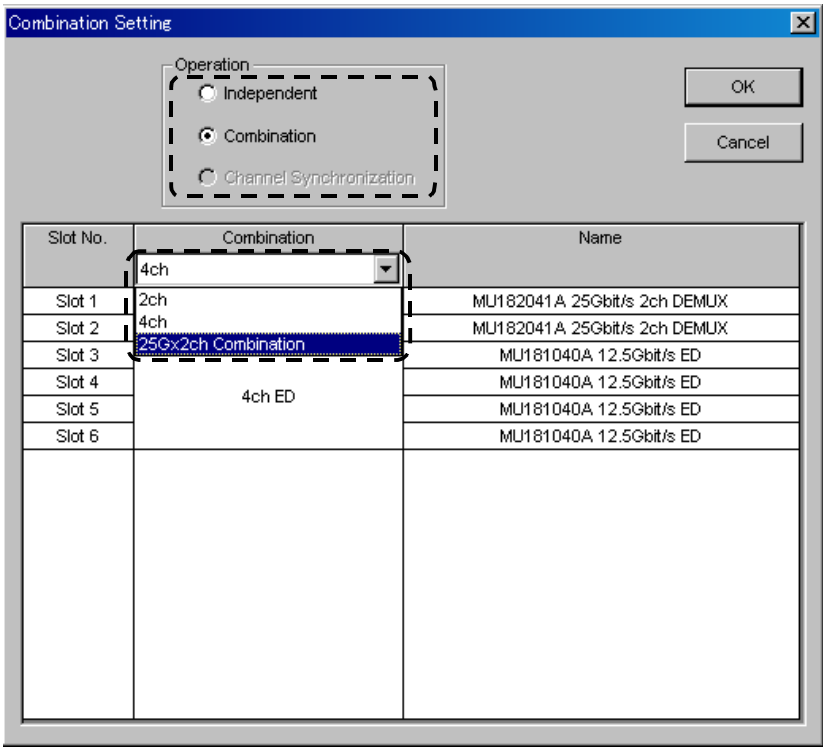

Figure 4.13.2-1 Combination Setting dialog box

Table 4.13.2-1 Screen Layout of Combination Setting

Operation setting items		Description
Independent		Select to operate PPG/ED independently
Combination	2ch	Select to perform 25 Gbit/s tests in combination with this module
	4ch	Select to perform 40 Gbit/s tests using an external MUX/DEMUX
	25Gx2ch Combination	Select to generate/receive 25 Gbit/s, 2 ch data in combination with this module
Channel Synchronization	12.5G CH Sync	Select to always output synchronized header bit for PON applications
	25G CH Sync	Select to always output synchronized header bit for two 25 Gbit/s channels

Press the [OK] button to confirm the selected operation.

Note :

When switching between 2ch Combination and 25Gx2ch Combination, the Auto Adjust is automatically executed for all the EDs inside this equipment.
For details, refer to Section 4.6 Executing Auto Adjust.

4.14 Result All dialog box

The Result All dialog box shows the error measurement results for each MU181040A/B module inserted, Combination measurement results, and Logging results. Click the [Result All] module function button.

Figure 4.14-1 ED Result All button

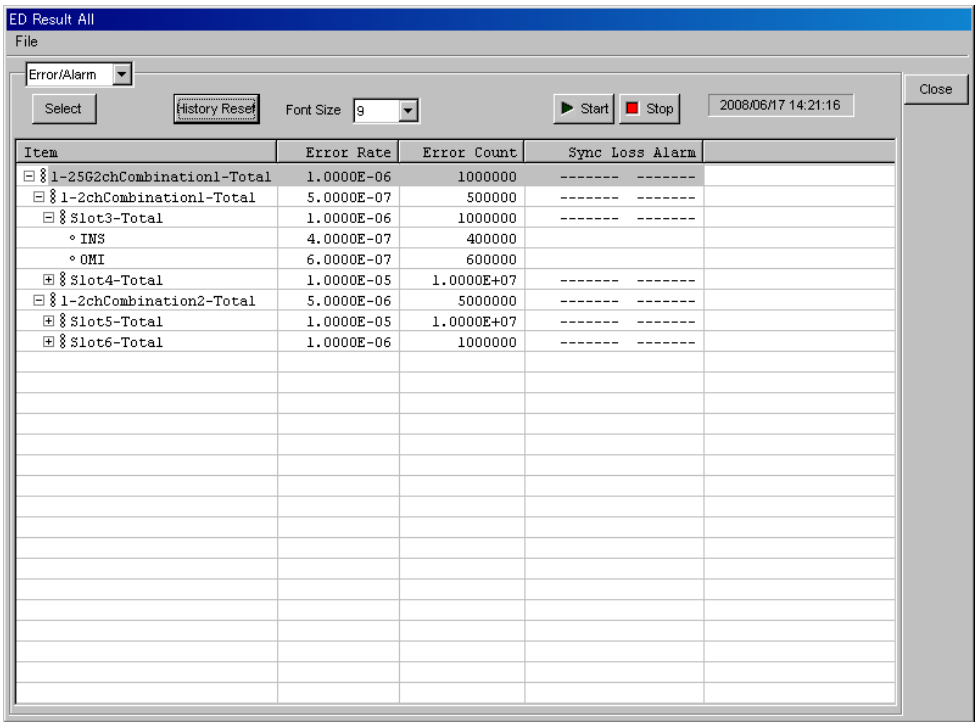

Figure 4.14-2 ED Result All dialog box

For the settings and measurement of “Result All”, refer to section 5.14.2 “ED Result All window”.

Chapter 5 Use Example

This chapter provides measurement examples using the MU182040A/41A.

5.1 Measuring Optical Device

This section explains test methods for 25 Gbit/s optical devices using the MP1800A.

The following shows a test example where the MU181020A/B, MU182020A, MU181040A/B, and MU182040A/41A are mounted onto the MP1800A.
The options configuring the test system are as follows:

MP1800A-016：1 module
MU181020A/B-002/x11/x30： 2 modules
MU182020A-x01/x02/x13/x31：1 module
MU181040A/B-002/x30：2 modules
MU182040A-x01/x02/x31：1 module
MG3693B：1 module

1. Ground the MP1800A and the device under test (DUT).
2. Connect the power cables.
3. Turn on the MP1800A, and set the measurement conditions as follows.
   1) Connect the MP1800A, MU181020A/B, MU182020A, MU181040A/B , MU182040A , MG3693B Signal Generator (hereafter MG3693B) as shown in Figure 5.1-1.
   2) When connecting the MU182020A and MU181020A/B , the two MU181020A/B modules must be synchronized. (This equipment requires synchronization of the four MU181020A/B modules when using the MU182021A.)
      In addition, when connecting the MU182040A and MU181040A/B , the two MU181040A/B modules must be synchronized. (This equipment requires synchronization of the four MU181040A/B modules when using the MU182041A.)
      Press the [Combination Setting] button of the module function keys and select 2 ch Combination.
   3) Match the data output interface of the MU181020A to the input interface of the DUT(E/O). The output is already OFF at this time.
   4) Set a test pattern for the sender side. The test pattern is selected at the MU181020A Pattern screen.
      Changing the setting for one channel of the MU181020A/B is reflected in the settings for all channels.

Set the operation bit rate at the MG3693B.

When the DUT requires a 1/1 Clock frequency, set the 1/1 operation rate at the MG3693B.

When the DUT requires a 1/2 Clock frequency, set the 1/2 operation rate at the MG3693B.

Clock Input Band SW in the Data Interface screen of MU182020A is toggled in accordance with the input operation rate.

6) Match the data input interface of this equipment to the output of the DUT (O/E). Set the termination conditions and threshold conditions in the Data Interface of this equipment.

7) Set the test pattern for the received side. The test pattern is selected at theMU181040A/B Pattern screen.

Changing the setting for one channel of the MU181040A/B is reflected in the settings for all channels.

8) Set the operation rate for the clock input to the MU182040A External Clock Input connector.

The Clock Input Band SW at the Data Interface Tab is switched according to the input operation rate.

9) When the setting procedure is completed, turn off the MP1800A and the MG3693B.

4. Connect the MP1800A and DUT.

Connect the input/output signals using the coaxial cable of application parts or an equivalent coaxial cable. At this time, short the core of the cables using a thin pointed metal stick, such as tweezers, before connection. See Fig. 5.1-1 for connection of the instruments.

Check that the output level of the DUT(O/E) matches the data input range for this module. If it is out of range, adjust the level using an attenuator.

5. Turn on the measuring instruments in the following order:

MP1800A DUT

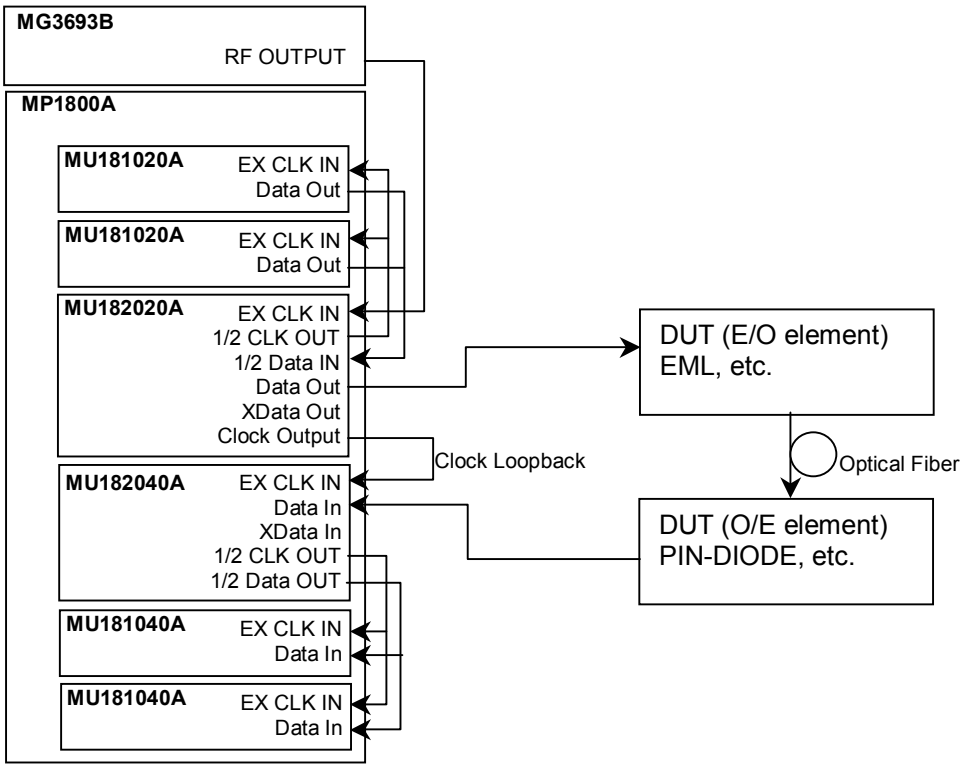

Fig. 5.1-1 Connection diagram for Optical Devices

CAUTION ⚠

The DUT may be damaged if a signal line is connected or disconnected while the output is ON. Be sure to set the output OFF before changing the cable connection.

6. Enable the signal output.
   Set Data/XData Output in the Data Interface screen of MU182020A to ON. Then, either set ON at the [Output ON/OFF] button of the module function keys, or set the MP1800A front panel [Output] button to ON.
7. Set the optimum thresholds and phase margin for the MU182040A/41A. Press [Auto Adjust] button of the module function to automatically set the optimum threshold and Delay for the DUT.
8. Start measurement.
   The BER measurement result can be confirmed on the Result window.

9. After confirming that the DUT is operating normally, it is possible to measure the sensitivity of the DUT (E/O) by setting the output level of MU182020A to minimum.

5.2 DQPSK Transmission

This section explains how to use 25 Gbit/s DQPSK transmission tests with the MP1800A.

The following shows a test example where the MU181020A/B, MU182021A, MU181040A/B, and MU182040A/41A are mounted onto the MP1800A.
The options configuring the test system are as follows:

MP1800A-016：2 modules
MU181020A/B-002/x11/x30：4 modules
MU182021A-x01/x02/x13/x31：1 module
MU181040A/B-002/x30：4 modules
MU182041A-x01/x02/x31：1 module
MG3693B：1 module

1. Connect the GND of the MP1800A, device under test (DUT).
2. Connect the power cables.
3. Turn on the MP1800A and set the measurement conditions as follows.
   1) Connect the MP1800A, MU181020A/B, MU182021A, MU181040A/B, MU182041A, and MG3693B as shown in Figure 5.2-1.
   2) When connecting the MU182021A and MU181020A/B, the four MU181020A/B modules must be synchronized.
      In addition, when connecting the MU182040A and MU182041A, the four MU181040A/B modules must be synchronized.
      Press the [Combination Setting] button of the module function keys and select 25Gx 2 ch Combination.
   3) Adjust the data output interface of the MU182021A to the input interface of the DUT(DQPSK Precoder). The output is already OFF at this time.
   4) Set a test pattern for the sender side. The test pattern is selected at the MU181020A Pattern screen.
      Changing the setting for one channel of the MU181020A/B is reflected in the settings for all channels.
   5) Set the operation bit rate at the MG3693B.When generating a CSRZ signal, set a 1/2 operation rate at the MG3693B.
      Set the Clock Input Band SW at the MU182021A Clock Interface Tab to Half Rate Clock. (When generating an RZ signal, set a 1/1 bit rate at the MG3693B. and the Clock Input Band SW to Full Rate Clock.)

6) Match the clock output interface to the input of the DUT (Driver AMP driving the LN Modulator used for CSRZ generation). The Output is already set to off at this time.

7) Set the test pattern for the receive side. Select a test pattern at the MU181040A/B Pattern screen. Changing the setting for one channel of the MU181040A/B is reflected in the settings for all channels.

8) Set the operation rate for the Clock input to External Clock Input of this module. The Clock Input Band SW at the Clock Interface Tab is switched according to the input operation rate.

9) When setting the parameters completely, turn off the MP1800A and MG3693B.

4. Connect the MP1800A and the DUT.
   Connect the input/output signals using the coaxial cable of application parts or an equivalent coaxial cable. At this time, short the cable cores, using a thin pointed metal stick such as tweezers before connection.

   See Fig. 5.2-1 for connection of the instruments.
   Check that the output level of the DUT(CSRZ-DQPSK Encoder Module) matches the data input range for this module. If not, adjust the output level using an attenuator.

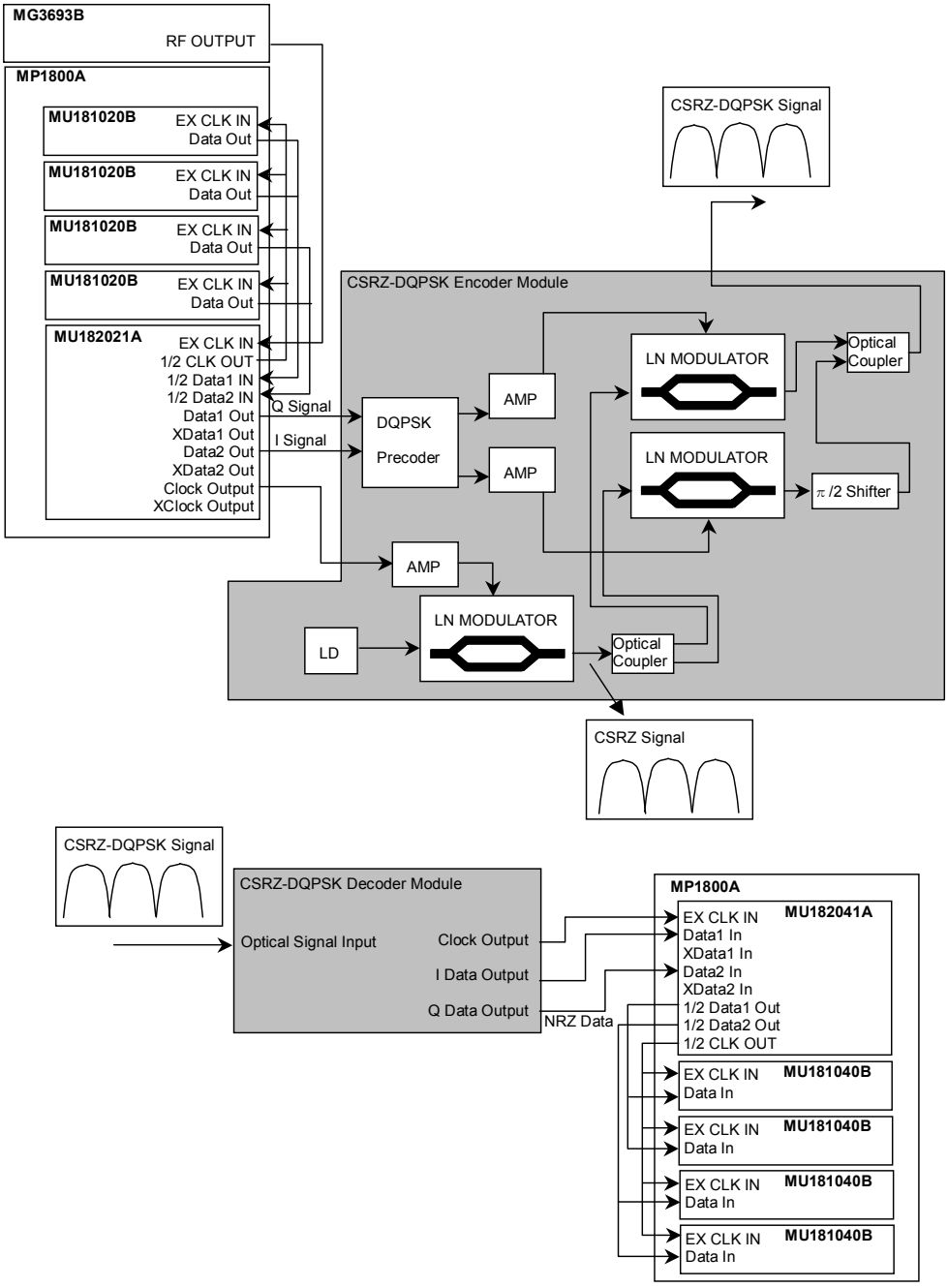

Fig 5.2-1 Connection diagram for DQPSK module evaluation

5. Turn on the MP1800A first, and then the DUT.

CAUTION ⚠

The DUT may be damaged if a signal line is connected or disconnected while the output is ON. Be sure to turn off the MP1800A before changing the cable connection.

6. Enable the signal output of MU182021A.
   Set Data/XData Output and Clock /XCock Output of the MU181020A/B Output screen to ON. Set Data/XData Output and Clock Output of the MU182020A Data Interface screen to ON.
   Last, either set ON at the [Output ON/OFF] button of the module function keys, or set the MP1800A front panel [Output] button to ON.
7. Set the Delay for MU182021Aの Data1 and Data2.
   When isolating the LN Modulator used for the DUT CSRZ Signal and I/Q signal modulation, adjust the values of Data1 and Data2 so that the final output waveform is the same as the CSRZ Signal waveform. Synchronizing the position where this output becomes 0 with 0 of the CSRZ Signal output generates the correct CSRZ Signal.
8. Set the Threshold voltage and phase for this module.
   Press [Auto Adjust] button of the module function to automatically set the optimum threshold and Delay for the DUT.
9. Start measurement.
   The BER measurement result can be confirmed on the Result window.
10. After confirming that the DUT (transmission section/reception section) is operating normally, it is possible to perform transmission test by the CSRZ-DQPSK signal if the test object (such as Fiber) is placed between transmission section and reception section.

Chapter 6 Performance Test

This chapter describes the performance testing of the MU182040A/41A.

6.1 Overview

Performance tests are executed to check that the major functions of the MU182040A/41A meet the required specifications. Execute performance tests at acceptance inspection, operation check after repair, and periodic (once every six months) testing.

6.2 Devices Required for Performance Tests

Before starting performance tests, warm up the MU182040A/41A and the measuring instruments for at least 30 minutes. Table 6.2-1 shows the devices required for performance tests.

Table 6.2-1 Devices required for performance tests

Device Name	Required Performance
Pulse Pattern Generator + MUX (MP1800A-015/016 + MU18202xA + 2 MU181020A/B units)	Operating frequency: 8 to 25 GHz Data clock phase variable: 2 UI or more
Pulse Pattern Generator + MUX (MP1800A-015/016 + MU18202xA + 2 MU181020B units)	Operating frequency: 8 to 28 GHz Data clock phase variable: 2 UI or more
Signal generator (MG3693B)	Operating frequency: 2 to 30 GHz
Sampling Oscilloscope	50 GHz or more band

Note:

Before starting the performance tests, warm up the device under test and the measuring instruments for at least 30 minutes and wait until they become sufficiently stabilized, unless otherwise specified. Additional conditions are required for maximum measurement accuracy: measurements must be performed at room temperature, fluctuations of AC power supply voltage must be small, and noise, vibration, dust, and humidity must be insignificant.

6.3 Performance Test Items

This section describes the following test items.

1. Operating frequency range
2. Input level
3. Pattern
4. Error detection

6.3.1 Operating frequency

(1) Specifications

Table 6.3.1-1 Specifications

Device Name	Option		Specifications
	x01	x02	
MU182040A/41A	No	No	4 to 12.5 GHz
	Yes	No	4 to 14 GHz
	No	Yes	When selecting Full Rate Clock : 8 to 25 GHz When selecting Half Rate Clock : 4 to 12.5 GHz
	Yes	Yes	When selecting Full Rate Clock : 8 to 28 GHz When selecting Half Rate Clock : 4 to 14 GHz

(2) Connection

When using the MU182040A, connect the MU181020A/B (MU181020A/B-x02, x11, x3), MU182020A, MU181040A/B (MU181040A/B-x02, x30) and MG3693B as shown in Figure 6.3.1-1.
When using the MU182041A, connect the MU182021, and MU181040A/B (MU181040A/B-x02, x30) as shown in Figure 6.3.1-2.
Before connecting the devices, be sure to use a sampling oscilloscope to check if the frequency and level of the signals output from the MU182020A/21A is proper.

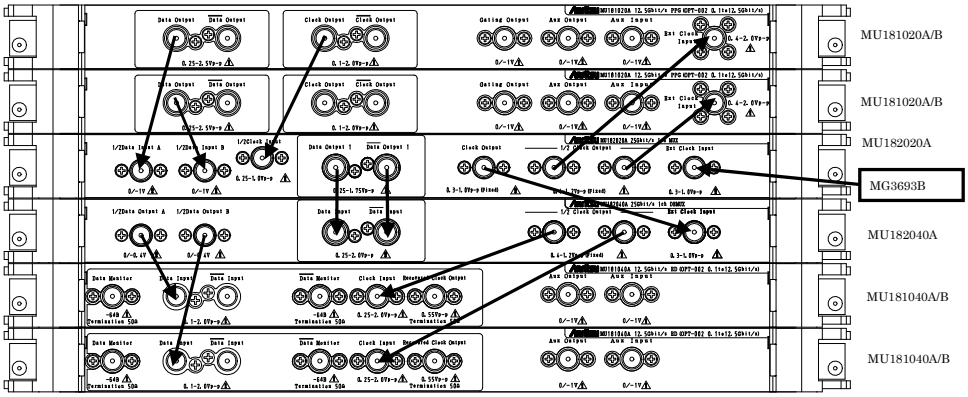

Fig 6.3.1-1 Module Connections for MU182040A

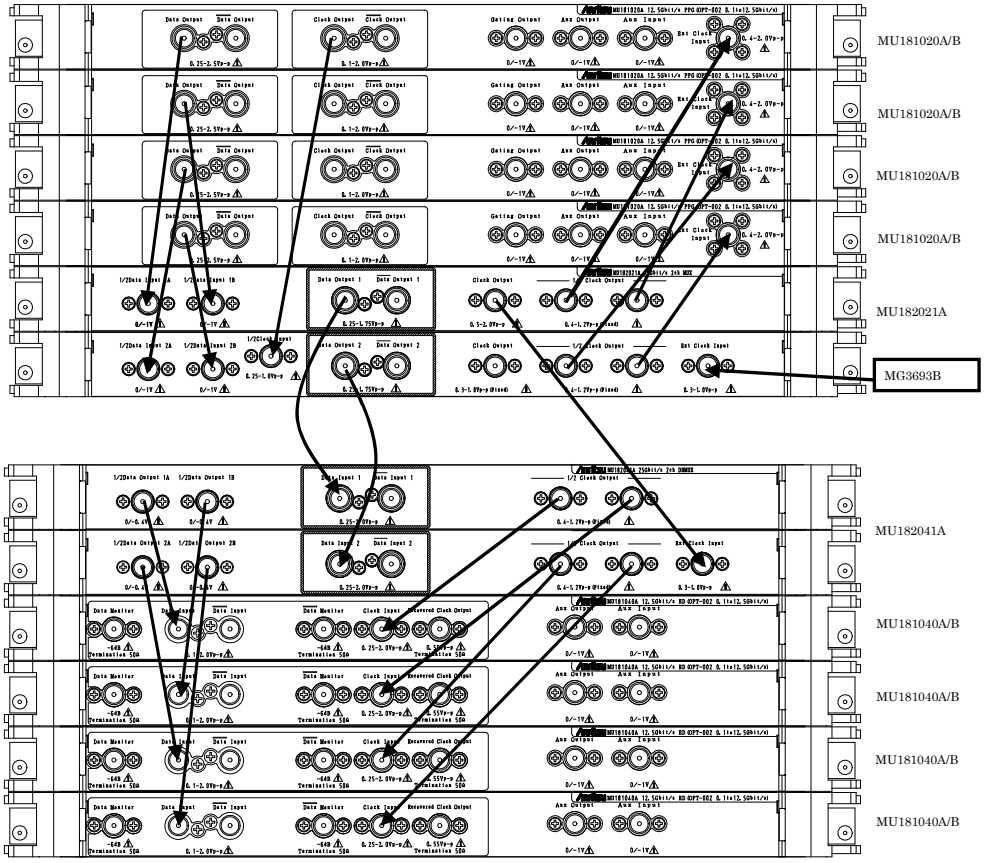

Fig 6.3.1-2 Module Connections for MU182041A

(3) Procedure

1. Insert the power plug of the mainframe to an outlet. Be sure to use the 3-pin power cord for grounding, and insert the plug into an outlet with a ground terminal.

2. Use coaxial cables to connect the MU181020A/B, MU182020A/21A, MG3693B, and MU181040A/B with this module as shown in Figures 6.3.1-1 or 6.3.1-2.
3. Select [Initialize] from the File menu on the menu bar to initialize all the settings for the devices.
   Note that all the settings return to the factory shipment settings after initialization. If you want to keep some settings, save them by selecting [Save] from the File menu before executing initialization.
4. Press the [Combination] button for the module function and select 2 Ch Combination.
5. Set the frequency of the MG3693B to a value within the specification, and adjust the phase of the MU182040A so that an error does not occur at the set frequency.
   When Auto Adjust is set to ON at the MP1800A function buttons and this module and the MU181040A/B, the phase of this module is adjusted continually to the optimum value even when the frequency changes, making manual phase adjustment unnecessary.

6.3.2 Input level

(1) Specifications

Table 6.3.2-1 Specifications

Option		Specifications
MU182040A	Data Input	Input amplitude:0.25 to 2.0 Vp-p Threshold voltage:−0.35 to +0.35 V
MU182041A	Data Input 1	Input amplitude:0.25 to 2.0 Vp-p Threshold voltage:−3.5 to +3.3 V
	Data Input 2	Input amplitude:0.25 to 2.0 Vp-p Threshold voltage:−3.5 to +3.3 V

(2) Connection

Refer to Figs. 6.3.1-1 and 6.3.1-2 for the connections.

(3) Procedure

1. Connect devices and configure the settings in the same manner as shown in Steps 2 and 3 in Section 6.3.1.
2. Set the output level of the MU181020A and the threshold voltage of the MU182040A as shown in Table 6.3.2-1 or 6.3.2-2. Next, set the output of the MU182020A/21A to ON and press the start button of the MU182040A. Adjust the phase as required, and check that no error occurs.

Table 6.3.2-2 Input level test setting when MU182040A/41A is installed

	MU182020A/21A			MU182040A/41A	
No.	Termination	Amplitude [Vp-p]	Offset (Vth) [V]	Termination	Threshold voltage [V]
1	GND	2.0	−3.5	GND	−3.500
2		0.1	−3.5		−3.500
3		2.0	+3.5		+0.350
4		0.1	+3.5		+0.350
5	NECL	0.8	−1.3	Variable: −2.0 V	−1.300
6	LVPECL	0.8	+2.0	Variable: +1.3 V	+2.000
7	PCML	0.5	+3.05	Variable: +3.3 V	+3.050

Note:

When changing the termination condition, configure the settings of the MU181020A/21A and the MU182040A in the following order. The MU181020A/B and the MU182040A/41A may be damaged if the settings are configured in an incorrect order or the termination condition is not set correctly.

[1] Set the output of the MU181020A/21A to OFF.

[2] Set the termination condition for the MU182040A/41A to GND.

[3] Change the termination condition for the MU182020A/21A.

[4] Set the termination condition for the MU182040A/41A to that for the MU182020A/21A set in Step [3].

3. Remove the cable from the Data connectors, and then connect the XData connectors, using a coaxial cable.
   In the MU182040A/41A Input tab window, select "Single-Ended" - "XData" for Input Condition. Next, set the output level of the MU181020A/21A and the threshold voltage of the MU182040A/41A as shown in Table 6.3.2-1 or 6.3.2-2, and check that no error occurs.

6.3.3 Pattern

(1) Patterns to be tested

PRBS pattern
Zero Substitution pattern

(2) Connection

See Fig. 6.3.1-1 and Fig. 6.3.1-2 for the device connection.

(3) Procedure

1. Connect devices and configure the settings in the same manner as shown in Steps 2 and 3 in Section 6.3.1.
2. Set the output of the MU182020A/21A to ON and press the measurement start button of the MU182040A/41A. Adjust the phase as required, and check that no error occurs.
3. For both the MU181020A/B and the MU181040A/B, set the PRBS pattern length to 2n – 1, changing the value of n to 7, 9, 10, 11, 15, 20, 23, and 31, and check that no error occurs.
4. Set the PRBS pattern length to 231 – 1, changing the mark rate to 1/8, 1/4, 1/2, 3/4, and 7/8. Set [Pattern] at the MU181020A/B and MU181040A/B to change the Mark Ratio and Logic POS/NEG. Check that no error occurs.
5. For both the MU181020A/B and the MU181040A/B, set the test pattern to Zero Substitution, then, set Length to 2n – 1, changing the value of n to 7, 9, 10, 11, 15, 20, and 23, and check that no error occurs. Next, set Length to 2n, changing the value of n to 7, 9, 10, 11, 15, 20, and 23, and confirm that no error occurs.

6.3.4 Error detection

(1) Specifications

Error rate:	0.0000 × 10^{-16} to 1.0000
Error count:	0 to 1 × 10^{16}
Error free interval (EFI):	0.0000 to 100.0000%
Error interval (EI):	0 to 1 × 10^{16}
Clock frequency:	4 to 25 GHz, accuracy: ±(10 ppm + 1 kHz)

(2) Connection

See Fig. 6.3.1-1 and Fig. 6.3.1-2 for the device connection.

(3) Procedure

1. Connect devices and configure the settings in the same manner as shown in Steps 2 and 3 in Section 6.3.1.
2. Set the frequency of the MG3693B to 25 GHz, set the output of the MU182020A/21A to ON, and then press the measurement start button of the MU182040A/41A. Adjust the phase as required, and check that no error occurs.
3. Enable the error insertion function of the MU181020A/B, and check that the ER measurement result in the MU182040A/41A Result tab window equals to the value set for error insertion of the MU181020A/B.
   When using the MU182041A, perform the same settings for each of Data1 and Data2.
4. Set "Single" for error insertion of the MU181020A/B (set "Single" for Variation in the MU181020A/B Error Addition tab window). In the Gating field on the MU181040A/B Measurement tab window, set "Single" for Cycle, and set the measurement time to 40 seconds.
5. Press the measurement start button of the MU182040A/41A to start measurement. Next, press the error insertion Single button of the MU181020A once during the measurement (40 seconds). When the measurement has finished, check that the measurement results are as follows.

Error rate (ER):	1.0000E – 12
Error count (EC):	1.0000E – 00
Error free interval (%EFI):	99.9900%
Error interval (EI):	1

   When using the MU182041A, perform the same settings for each of Data1 and Data2.

Chapter 7 Maintenance

This chapter describes maintenance of the MU182040A/41A.

7.1 Daily Maintenance

- Wipe off any external stains with a cloth damped 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.

7.2 Cautions on Storage

Wipe off any dust, soil, or stain on the MU182040A/41A prior to storage. Avoid storing the MU182040A/41A in any of the following locations:

- Where there is direct sunlight
- Where there is dust
- Where humidity is high and dew may accumulate
- Where chemically active gases are present
- Where the MU182040A/41A may become oxidized.
- Where strong vibrations are present
- Under the following temperature and humidity conditions:
  Temperature range of ≤–20°C or ≥60°C
  Humidity range of ≥85%

Recommended storage conditions

In addition to the abovementioned storage cautions, the following environment conditions are recommended for long-term storage.

- Temperature range of 5 to 30°C
- Humidity range of 40 to 75%
- Slight daily fluctuation in temperature and humidity

7.3 Transportation

Use the original packing materials, if possible, when packing the MU182040A/41A for transport. If you do not have the original packing materials, pack the MU182040A/41A according to the following procedure. When handling the MU182040A/41A, 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 MU182040A/41A.
2. Check for loose or missing screws.
3. Provide protection for structural protrusions and parts that can easily be deformed, and wrap the MU182040A/41A with a sheet of polyethylene. Finally, cover with moisture-proof paper.
4. Place the wrapped MU182040A/41A 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.
5. During transportation, place it under an environment that meets the conditions described in Section 7.2 “Cautions on Storage”.

7.4 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 CD version.

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

- Seven 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.

7.5 Disposal

Confirm the notes described in the Signal Quality Analyzer Series Installation Guide and observe national and local regulations when disposing of the MU182040A/41A.

Chapter 8 Troubleshooting

This chapter describes how to check whether a failure has arisen when an error occurs during the operation of the MU182040A/41A.

8.1 Problems Discovered during Module Replacement

Table 8.1-1 Remedies for problems discovered during replacement of MU182040A/41A

Symptom	Location to Check	Remedy
A module is not recognized.	Is the module installed properly?	Install the module again by referring to Section 2.3 "Installing and Removing Modules" in the installation guide.
	Are the appropriate modules installed?	To check the appropriate modules and software version of the MU182040A/41A, access to "MP1800 Series Signal Quality" on your Web site (http://www.anritsu.com). Right-click the "MP1800 Series Signal Quality" and you can access to your area website. If the appropriate modulus are not recognized, it may have failed. Contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

8.2 Handling Suspected Failure

- Synchronization cannot be established (error measurement cannot be performed)

Table 8.2-1 Items to be checked

Item	Location to Check	Remedy
Input conditions	Do the quality, status and length of the connection cables comply with the specifications?	Replace with a suitable cable.
	Is the cable connection correct and secure?	Confirm the destination and check if the connector is tightened securely.
	Are the single and differential (50/100 Ω) inputs set correctly?	Set the correct value.
	Is the input level correct?	Check the level by using an oscilloscope, etc.
	Are the input bit rate and clock frequency set correctly?	Set the bit rate and clock frequency correctly. ***Note:*** Use the frequency counter to check the current clock frequency.
Termination conditions	Was the termination potential adjusted?	Set the termination potential correctly. ***Note:*** Incorrect setting may result in unit failure.

Table 8.2-1 Items to be checked (Cont'd)

Item	Location to Check	Remedy
Output conditions	Are the connection cables between this module and MU181040A/B matched?	Check the connection point and tighten the connector.
	Are the connection cables between this module and the MU181040A/B connected correctly?	Connect the cables between this module and the MU181040A/B as described in chapter 3 in the correct sequence.
	Are the threshold and phase of this module and MU181040A/B matched?	Either set Auto Adjust to ON at the MU181040A/B or run Auto Search or perform manual adjustment.
Threshold	During differential input, is the difference between the Data and XData threshold voltages above 1.5 V?	The difference value should be within 1.5 V.
	Is the operating limit for Auto Adjust or Auto Search out of range?	Adjust it manually.
Phase	Is the operating limit for Auto Adjust or Auto Search out of range?	Adjust it manually.
Pattern	Are the MU181020A/B and MU181040A/B patterns matched?	Match the patterns.
Synchronization	Is Auto Sync set to On at the MU181040A/B?	Set it to On. Re-synchronization is performed automatically.
	Have you tried with a different MU181040A/B Sync Control setting?	Optimal synchronization method varies according to the pattern type. ***Note:*** Can be set for patterns except PRBS.
Other	Is MU181040A/B Bit/Block Window set to Off?	Set it to Off.
	Is MU181040A/B External Mask set to Off?	Set it to Off.
	Is the MU181040A/B Repeat mode set?	Set the Repeat mode.

If a problem cannot be solved using any of the items listed above, perform initialization and check the items again. If the problem still occurs, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

Appendix

Appendix A List of Initial Settings

A.1 List of Initialized Settings

This appendix shows the MU182040A and the MU182041A settings that are initialized to the defaults at factory shipment.

In addition, All settings can be initialized using the Initialize pull-down from the File menu.

Table A.1–1 List of Initialized Items for MU182040A

Setting Function	Main Item	Secondary Item	Tertiary Item	Default Setting
Result (Data)	Switch of setting items	Result display format		Error･Alarm
		Time display format		Date&Time
		Error/ Alarm display	Error/Alarm measurement result zoom display	OFF
			Error/Alarm measurement result sub window open/close	OFF
	Start of Error/Alarm measurement			—
	Stop of Error/Alarm measurement			—
Input (Data)	Data Input	Input Condition		Single
		Data/XData selection		Data
		Data input threshold		0.000 V
		XData input threshold		0.000 V
		Data input threshold differential type(Alternate)		Data-Xdata
		Data input threshold differential type(Alternate)		0.000 V
		Data input termination setup dialog box display		—
		Data input termination condition		GND
		Data input termination voltage		0.00 V
	Clock Input	Selection		External Clock
		Clock phase unit		mUI (MU182040A-x30, x31)
		Clock phase variable (mUI)		0 mUI (MU182040A-x30, x31)
		Clock phase variable (ps)		0.00 ps (MU182040A-x30, x31)
		Clock phase calibration		— (MU182040A-x30, x31)
		Clock Delay Relative selection		OFF (MU182040A-x30, x31)

Table A.1–2 List of Initialized Items for MU182041A

Setting Function	Main Item	Secondary Item	Tertiary Item	Default Setting
Result (Data1, 2)	Switch of setting items	Result display format		Error･Alarm
		Time display format		Date&Time
		Error/ Alarm display	Error/Alarm measurement result zoom display	OFF
			Error/Alarm measurement result sub window open/close	OFF
	Start of Error/Alarm measurement			—
	Stop of Error/Alarm measurement			—
Input (Data1, 2)	Data Input	Input Condition		Single
		Data/XData selection		Data
		Data input threshold		0.000 V
		XData input threshold		0.000 V
		Data input threshold differential type(Alternate)		Data-XData
		Data input threshold differential type(Alternate)		0.000 V
		Data input termination setup dialog box display		—
		Data input termination condition		GND
		Data input termination voltage		0.00 V
	Clock Input	Selection		External Clock
		Clock phase unit		MUI (MU182041A-x30, x31)
		Clock phase variable (mUI)		0 mUI (MU182041A-x30, x31)
		Clock phase variable (ps)		0.00 ps (MU182041A-x30, x31)
		Clock phase calibration		— (MU182041A-x30, x31)
		Clock Delay Relative selection		OFF (MU182041A-x30, x31)

Appendix B Setting Restrictions

B.1 Combination Function Configuration

The conditions required to execute the Combination function by using multiple MU181040A/B modules are described below.

All of the following conditions must be satisfied to execute the Combination function.

Enabling conditions for Combination function

- Two or more MU181040A/B modules are mounted on one mainframe. When the mainframe option is 015, they shall be mounted from Slot 1, from the top downward; while in the case of 016 they shall be mounted from the bottom upward starting from Slot 6.
- Do not mix MU181040A and MU181040B modules. In addition, do not mix options.

  Example:

  When the MU181040A is installed, either only the MU181040A-001 or only the MU181040A-002 can be installed. When the MU1801040B is installed, only the MU181040B-002 can be installed.
- The mainframe option must be either option 015 or 016.

In addition, the following restriction is added for the Combination function.

Restriction for Combination function

- The Sequence pattern cannot be used as the test pattern.

B.2 Combination Operation

When this module and the MU181040A/B are installed in the same mainframe and either 2 Ch Combination or 25G x 2 Ch Combination is selected, operation of this module and the MU181040A/B can be linked (combined).

a) MP1800A-015 2ch Combination

Figure B.2-1 shows combined operation of the MU181040A/B in slot1 and slot2 and the MU182040A in slot5 (Data1 for 41A). The measurement results displayed at the Result tabl of this module are the Total for the MU181040A/B in Slot1 nd Slot2.
The MU181040A/B in slot3 and slot4 and the MU182040A in slot6 are linked (Data2 for 41A).
The measurement results displayed at the Result tabl of this module are the Total for the ED in Slot3 nd Slot4.

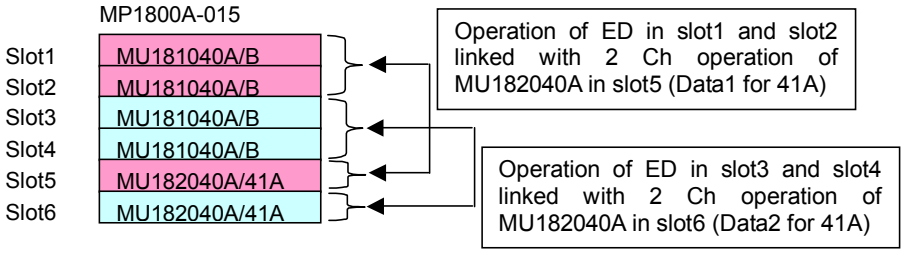

Fig B.2-1 MP1800A-015 2ch Combination Operation

b) MP1800A-015 25Gx2ch Combination

Figure B.2-2 shows combined operation of the MU181040A/B in slot1 to slot4 and the MU182040A/41A in slot5 and slot6. The measurement results displayed at the Result tabl of this module are the Total for the 4 MU181040A/B in Slot1.

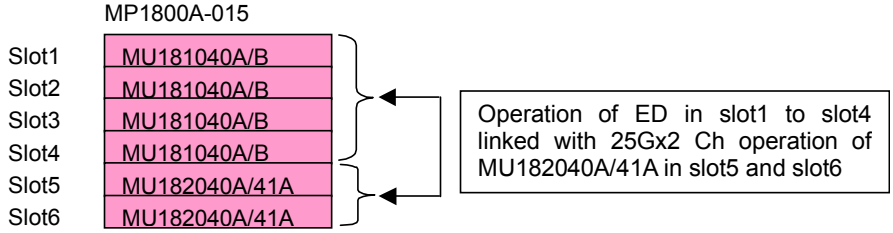

Fig B.2-2 MP1800A-015 25Gx2ch Combination Operation

c) MP1800A-016 2ch Combination

Figure B.2-3 shows combined operation of the MU181040A/B in slot3 and slot4 and the MU182040A in slot1 (Data1 for 41A). The measurement results displayed at the Result tabl of this module are the Total for the MU181040A/B in Slot3 nd Slot4.

The MU181040A/B in slot5 and slot6 and the MU182040A in slot2 are linked (Data2 for 41A).

The measurement results displayed at the Result tabl of this module are the Total for the MU181040A/B in Slot5 nd Slot6.

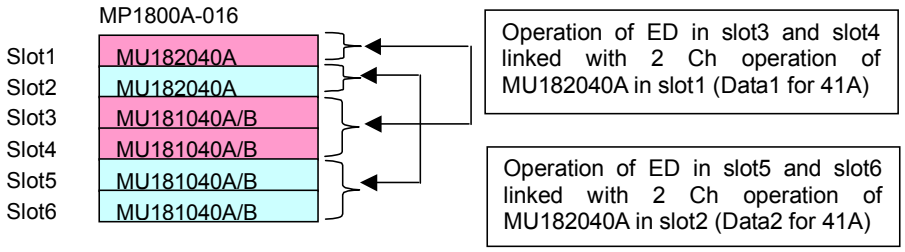

Fig B.2-3 MP1800A-016 2ch Combination Operation

d) MP1800A-016 25Gx2ch Combination

Figure B.2-4 shows combined operation of the MU181040A/B in slot3 to slot6 and the MU182040A/41A in slot1 and slot2. The measurement results displayed at the Result tabl of this module are the Total for the 6 MU181040A/B in Slot3.

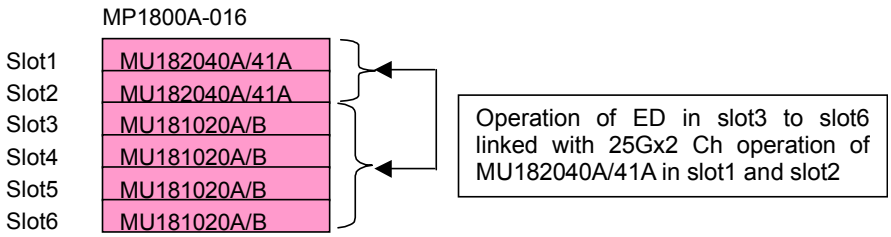

Fig B.2-4 MP1800A-016 25Gx2ch Combination Operation

B.3 Settings Common in Combination System

When the MU182040A/41A is used in a Combination system, some setting items will apply to all the MU181040A/B modules in the Combination system.

Table B.3-1 shows whether the setting items are common or independent in a Combination system.

Table B.3-1 Common/Independent Setting Items in Combination System

Function	Main Category	Sub-Category	Individual Setting Item	Common/ Independent
Result	Switch of setting items	Setting display format		Independent
		Result display format		Independent
		Time display format		Independent
		Error/Alarm display	Error/Alarm measurement result zoom display	Independent
			Error/Alarm measurement result sub window open/close	Independent
		Settings and result display for Logging	Logging execution	Common
			Logging result display	Common
			Log condition setup dialog box display	Common
		Settings and result display for histogram	Histogram execution	Independent
			Histogram calculation resolution	Common
			Histogram display resolution	Independent
			Histogram result type	Independent
			Histogram vertical scale settings	Independent
			Histogram result time	Independent
			Error detection method	Independent
			Error alarm search	Independent
	Start of Error/Alarm measurement			Common
	Stop of Error/Alarm measurement			Common

Table B.3-1 Common/Independent Setting Items in Combination System (Cont'd)

Function	Main Category	Sub-Category	Individual Setting Item	Common/ Independent
Measure-ment	Measurement period (Gating)	Measurement period unit (Unit)		Common
		Measurement period time		Common
		Clock count for measurement period		Common
		Error count for measurement period		Common
		Block count for measurement period		Common
		Measurement processing method (Cycle)		Common
		Measurement result data display (Current)		Common
		Known data processing method (Calculation)		Common
		Known data display update cycle		Common
	Re-synchronization (Auto Sync)	Re-synchronization execution		Common
		Threshold for automatic synchronization function		Common
	Synchronization method (Sync Control)	Synchronization method		Common
		Unique pattern length for frame synchronization		Common
		PRGM pattern start position		Common
		Edit of synchronization mask pattern		Common
	Measurement condition (Error/Alarm Condition)	Interval for EI and EFI measurements		Common
		SES generation threshold		Common
		Clock Loss generation interval for Performance measurement		Common
		CR Unlock generation interval for Performance measurement		Common
		Sync Loss generation interval for Performance measurement		Common
Pattern*	Mask	Block Window execution		Common
		Block Window setting		Common
		Bit Window execution		Common
		Bit Window bit string setting		Common
		External Mask ON/OFF		Independent

*: Items shared with the pulse pattern generator are omitted. See the MU181020A/B Operation Manual for details.

Table B.3-1 Common/Independent Setting Items in Combination System (Cont'd)

Function	Main Category	Sub-Category	Individual Setting Item	Common/ Independent
Input	Data input	Input condition		Independent
		Differential type		Independent
		Data/XData selection		Independent
		Data input threshold		Independent
		XData input threshold		Independent
		Data input threshold differential type		Independent
		Data input threshold differential		Independent
		Data input termination setup dialog box display		Independent
		Data input termination condition		Independent
		Data input termination voltage		Independent
	Clock Input	Selection		Common
		Recovered clock frequency selection		Common
		Recovered clock frequency setting		Common
		Recovered clock output polarity		Independent
		Clock phase unit		Independent
		Clock phase variable (mUI)		Independent
		Clock phase variable (ps)		Independent
		Clock phase calibration		Independent
		Clock phase reference		Independent
		Clock phase variable (reference mUI)		Independent
		Clock phase variable (reference ps)		Independent
		Clock input termination setup dialog box display		Independent
		Clock input termination condition		Independent
		Clock input termination voltage		Independent
Capture	Capture condition setup dialog box display	Capture block division number		Common
		Capture trigger		Common
		Capturing start position		Common
		Capture trigger match pattern length		Common
		Capture trigger pattern format		Common
		Edit of capture trigger mask pattern		Common
		Edit of capture trigger match pattern		Common
	Capture result acquisition	Capture result acquisition method		Common
		Capture result acquisition start block		Common
		Capture result acquisition block count		Common
	Capture result bit pattern display			Independent
	Capture result bit map display	Capture data turning point		Common
		Capture error point		Independent
		Capture data display scale		Common
	Capture result Block display	Capture error point		Common

Table B.3-1 Common/Independent Setting Items in Combination System (Cont'd)

Function	Main Category	Sub-Category	Individual Setting Item	Common/ Independent
Misc	Signal generation (Pattern Sequence)	Signal generation method		Common
		Burst signal input		Common
		Burst trigger delay		Independent
		Burst trigger delay automatic adjustment		Common
		Burst signal interval		Common
		Burst cycle		Common
	Synchronized output (Aux Output)	Auxiliary output		Common
		Setting auxiliary output 1/N Clock		Common
		Synchronized output position (for Data, PRBS, and Zero Substitution pattern)		Common
		Block No. of synchronized output position (for Mixed-Data pattern)		Common
		Row No. of synchronized output position (for Mixed-Data pattern)		Common
	Aux Input	Connector		Common
	Measurement restart condition (Measurement Restart)	Measurement restart upon input threshold change		Common
		Measurement restart upon clock phase change		Common

Table B.3-1 Common/Independent Setting Items in Combination System (Cont'd)

Function	Main Category	Sub-Category	Individual Setting Item	Common/ Independent
Auto measurement	Auto Adjust	Item		Common
		Slot selection		Independent
	Auto Search	Measurement mode		Common
		Item		Common
		Slot selection		Independent
	ED Result All	Switching all measurement results display		Common
		Error/ Alarm	Measurement result display item selection	Common
			History reset	Common
		Logging	Logging execution selection	Common
			Logging condition setting	Common
			Logging result delete	Common
		Start of measurement		Common
		Stop of measurement		Common
	ISI	File menu		Independent
		Measurement target slot selection		Independent
		Measurement processing method selection (Gating Cycle)		Independent
		Measurement period time setting (Gating Period)		Independent
		Measurement type selection		Independent
		Start of measurment		Independent
		Stop of measuremenet		Independent
		Time display selection		Independent
		Marker movement		Independent
		Transition between layers	Upper (Zoom In)	Independent
			Lower (Zoom Out)	Independent
	Eye Diagram/ Eye Margin/ Bathtub/Q measurement	All items		Independent

C.1 Performance Test Result Sheet

Equipment Name: MU182040A 25Gbit/s 1ch DEMUX Module
MU182041A 25Gbit/s 2ch DEMUX Module

Serial No.:

Ambient Temperature: °C

Relative Humidity: %

Table C.1–1 Operating Frequency Range

Device Name	Options		Specification	Results
	x01	x02		
MU182040A/41A	No	No	4 to 12.5 GHz	
	Yes	No	4 to 14 GHz	
	No	Yes	When selecting Full Rate Clock : 8 to 25 GHz When selecting Half Rate Clock : 4 to 12.5 GHz	
	Yes	Yes	When selecting Full Rate Clock : 8 to 28 GHz When selecting Half Rate Clock : 4 to 14 GHz	

Table C.1–2 Input level range

Device Name	Item	Specification	Results
MU182040A	Data Input	Input amplitude:0.25 to 2.0 Vp-p Threshold voltage: No error occurs within the range from −0.35 to +0.35 V	
MU182041A	Data Input 1	Input amplitude:0.25 to 2.0 Vp-p Threshold voltage: No error occurs within the range from −3.5 to +3.3 V	
	Data Input 2	Input amplitude:0.25 to 2.0 Vp-p Threshold voltage: No error occurs within the range from −3.5 to +3.3 V	

Table C.1–3 Interface range

	MU182020A/21A			MU182040A/41A		Results
No.	Termination	Amplitude [Vp-p]	Offset (Vth) [V]	Termination	Threshold voltage [V]	
1	GND	2.0	−3.5	GND	−3.500	
2		0.1	−3.5		−3.500	
3		2.0	+3.5		+0.350	
4		0.1	+3.5		+0.350	
5	NECL	0.8	−1.3	NECL	−1.300	
6	LVPECL	0.8	+2.0	LVPECL	+2.000	
7	PCML	0.5	+3.05	PCML	+3.050	

Table C.1–4 Test pattern

Option Configuration	Specification	Results
PRBS, Length: 2n–1 (n = 7, 9, 10, 11, 15, 20, 23, 31), Mark ratio: 1/2	No error	
PRBS, Length: 2^{31}–1, Mark ratio: 1/8, 1/4, 3/4, 7/8	No error	
Zero Substitution, Length: 2n–1 (n = 7, 9, 10, 11, 15, 20, 23) or 2n (n = 7, 9, 10, 11, 15, 20, 23)	No error	

Table C.1–5 Error detection

Option Configuration	Specification	Results
Error rate (ER)	1.0000E−11	
Error count (EC)	1.0000E−00	
Error free interval (EFI)	99.9900%	
Error interval (EI)	1	
Clock frequency (Frequency)	999500 to 1005000 kHz	