

# **MP1862A 56G/64Gbit/s DEMUX Operation Manual**

**Second 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**

# 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.

MP1862A 56G/64Gbit/s DEMUX  
Operation Manual

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Printed in Japan

# For Safety

## **WARNING**



### **Electric Shock**

### **Repair**



- ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the advice in the operation manual is not followed, there is a risk of personal injury or reduced equipment performance. The alert mark shown on the left may also be used with other marks and descriptions to indicate other dangers.
- Overvoltage Category  
This equipment complies with overvoltage category II defined in IEC 61010. DO NOT connect this equipment to the power supply of overvoltage category III or IV.
- To ensure that the equipment is grounded, always use the supplied 3-pin power cord, and insert the plug into an outlet with a ground terminal. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock or causing damage to the internal components.
- Only qualified service personnel with a knowledge of electrical fire and shock hazards should service this equipment. This equipment cannot be repaired by the operator. DO NOT attempt to remove the equipment covers or unit covers or to disassemble internal components. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

# For Safety

## **WARNING**

### **Calibration**



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

### **Falling Over**

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

# For Safety

## CAUTION

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### **Cleaning**

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

### **Check Terminal**



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

### **Use in a Residential Environment**

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

### **Use in Corrosive Atmospheres**

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

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## 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<sup>(Note)</sup>.
- The fault is due to activities or ingress of living organisms, such as insects, spiders, fungus, pollen, or seeds.

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

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

Note:

For the purpose of this Warranty, "unusual environment" means use:

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

## **Anritsu Corporation Contact**

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

## Notes On Export Management

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

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

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



## Crossed-out Wheeled Bin Symbol

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



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

# Software End-User License Agreement (EULA)

Please read this Software End-User License Agreement (hereafter this EULA) carefully before using (includes executing, copying, registering, etc.) this software (includes programs, databases, scenarios, etc., used to operate, set, etc., Anritsu electronic equipment). By reading this EULA and using this software, you are agreeing to be bound by the terms of its contents and Anritsu Corporation (hereafter Anritsu) hereby grants you the right to use this Software with the Anritsu-specified equipment (hereafter Equipment) for the purposes set out in this EULA.

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## 2. Disclaimers

To the extent not prohibited by law, in no event shall Anritsu be liable for personal injury, or any incidental, special, indirect or consequential damages whatsoever, including, without limitation, damages for loss of profits, loss of data, business interruption or any other commercial damages or losses, arising out of or related to your use or inability to use this Software.

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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**

You may not use or otherwise export or re-export directly or indirectly this Software except as authorized by Japanese and United States law. In particular, this software may not be exported or re-exported (a) into any Japanese or US embargoed countries or (b) to anyone on the Japanese or US Treasury Department's list of Specially Designated Nationals or the US Department of Commerce Denied Persons List or Entity List. By using this Software, you warrant that you are not located in any such country or on any such list. You also agree that you will not use this Software for any purposes prohibited by Japanese and US law, including, without limitation, the development, design and manufacture or production of missiles or nuclear, chemical or biological weapons of mass destruction.

#### **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.

## Protection Against Computer Virus Infections

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Prior to the software installation

Before installing this software or any other software recommended or approved by Anritsu, run a virus scan on your computer, including removable media (e.g. USB memory stick and CF memory card) you want to connect to your computer.

When using this software and connecting with the measuring instrument

- Copying files and data

On your computer, do not save any copies other than the following:

- Files and data provided by Anritsu
- Files created by this software
- Files specified in this document

Before copying these files and/or data, run a virus scan, including removable media (e.g. USB memory stick and CF memory card).

- Connecting to network

Connect your computer to the network that provides adequate protection against computer viruses.

## Cautions on Proper Operation of Software

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This software may not operate normally if any of the following operations are performed on your computer:

- Simultaneously running any software other than that recommended or approved by Anritsu
- Closing the lid (Laptop computer)
- Turning on the screen saver function
- Turning on the battery-power saving function (Laptop computer)

For how to turn off the functions, refer to the operation manual that came with your computer.

## Cautions against computer virus infection

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

# 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

Model: MP1862A 56G/64Gbit/s DEMUX

### 2. Applied Directive and Standards

EMC: Directive 2004/108/EC

LVD: Directive 2006/95/EC

### 3. Applied Standards

- EMC: Emission: EN 61326-1: 2013 (Class A)  
Immunity: EN 61326-1: 2013 (Table 2)

	Performance Criteria*
IEC 61000-4-2 (ESD)	B
IEC 61000-4-3 (EMF)	A
IEC 61000-4-4 (Burst)	B
IEC 61000-4-5 (Surge)	B
IEC 61000-4-6 (CRF)	A
IEC 61000-4-8 (RPFMF)	A
IEC 61000-4-11 (V dip/short)	B, C

\*: Performance Criteria

A: The equipment shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

- B: The equipment shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.
- C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

Harmonic current emissions:

EN 61000-3-2: 2006 +A1:2009 A2:2009

(Class A equipment)

No limits apply to this equipment with an active input power under 75 W.

- LVD: EN 61010-1: 2010 (Pollution Degree 2)

#### **4. Authorized representative**

Name: Murray Coleman  
Head of Customer Service EMEA  
ANRITSU EMEA Ltd.

Address, city: 200 Capability Green, Luton  
Bedfordshire, LU1 3LU

Country: United Kingdom

# 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

Model: MP1862A 56G/64Gbit/s DEMUX

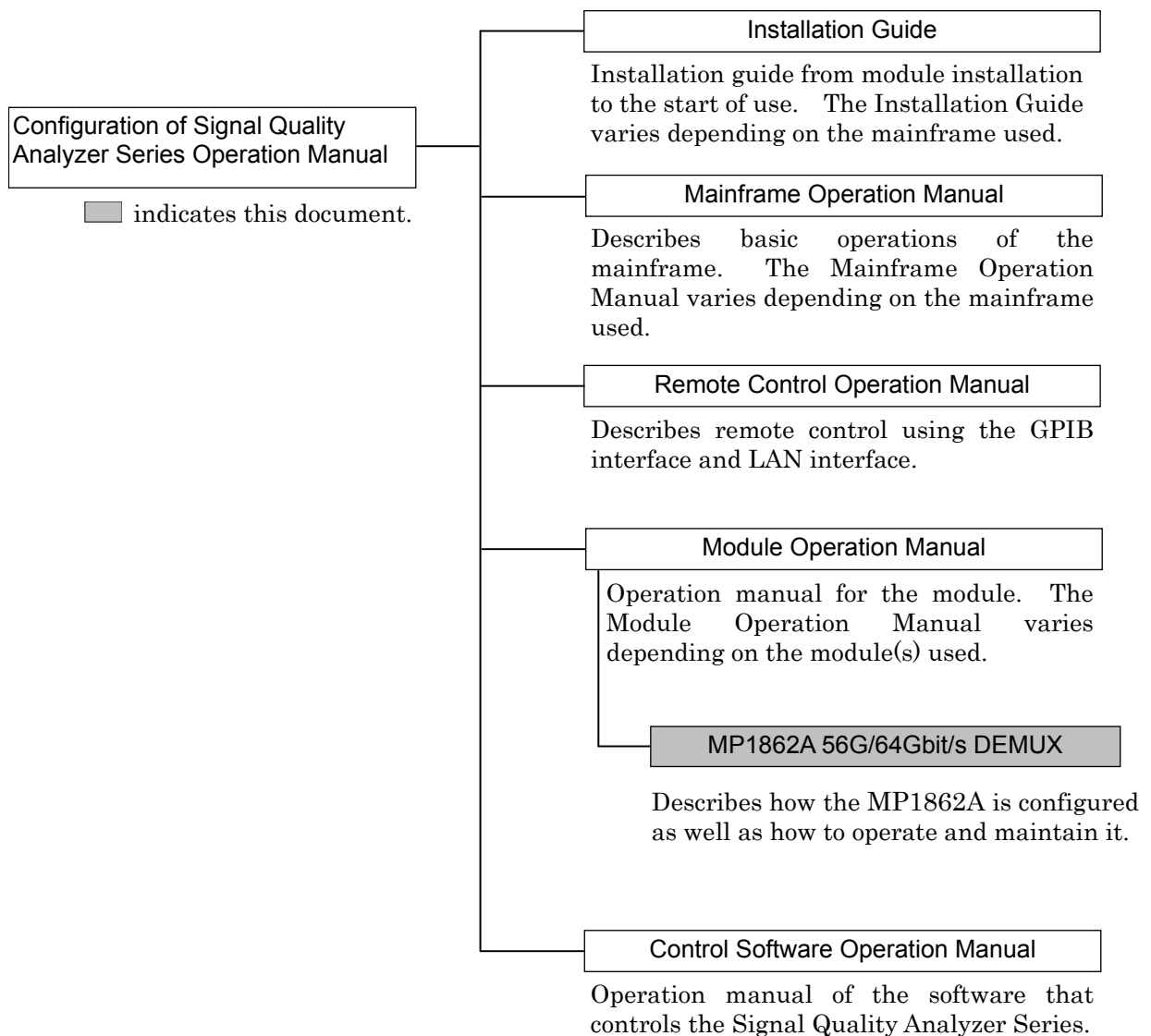
### 2. Applied Directive and Standards

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



# About This Manual

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



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# Chapter 1 Overview

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This chapter provides an overview of the MP1862A 56G/64Gbit/s DEMUX (hereinafter, referred to as “MP1862A”).

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## 1.1 Product Overview

The MP1862A can be used with 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 8 to 64.2 Gbit/s using a combination of the MU183040A/B 32Gbit/s Error Detector and the MU183041A/B 32Gbit/s 4ch Error Detector (hereafter MU18304xA/B).

Various option configurations are available for the MP1862A. This module is therefore useful for research, development, and production of various types of digital communication equipment, modules, and devices.

The features of the MP1862A are as follows:

- Operating rates: 8 to 56.2 Gbit/s (64.2Gbit/s using additional options)
- Divides input data signal into 1:2
- Capable of measuring PRBS, Data, Zero-Substitution, Mixed, and Sequence patterns (when used with MU18304xA/B).
- Supports analysis of 8 to 64.2 Gbit/s input data such as Eye/Bathtub (When used with MU18304xA/B)
- Supports future use by installing options.
- Controlled by MX180000A Control Software when either MP1800A or controller PC connected

## 1.2 Product Composition

### 1.2.1 Standard composition

Table 1.2.1-1 show the standard composition of the MP1862A.

**Table 1.2.1-1 Standard composition for MP1862A**

Item	Model	Product name	Q'ty	Remarks
Mainframe	MP1862A	56 G/64 Gbit/s DEMUX	1	
Accessories	J1657A	Coaxial cable (1 m, K Connector)	2	Data Output1/2
	J1668A	Coaxial Cable (0.8 m, K connector)	1	1/2 Clock Output
	J1654A	U Link Cable B	1	Delayed Clock Output to Mux Clock Input
	J1363A	Protection cap	2	Data Input/XData Input
	41V-6	Precision fixed attenuator 6 dB	2	Data Input/XData Input
	J1632A	Terminator	5	Clock Output 1/2 Clock Output Data Output1/2 Buffered Clock Output
	J1341A	Open	1	External Clock Input
	J1475A	USB cable	1	
	Z1312A	AC adapter	1	
	G0342A	ESD Discharger	1	
		Power cord 2.5m	1	
	Z0897A	MP1800A Manual CD	1	CD-ROM version
	Z0918A	MX180000A Software CD	1	CD-ROM

## 1.2.2 Options

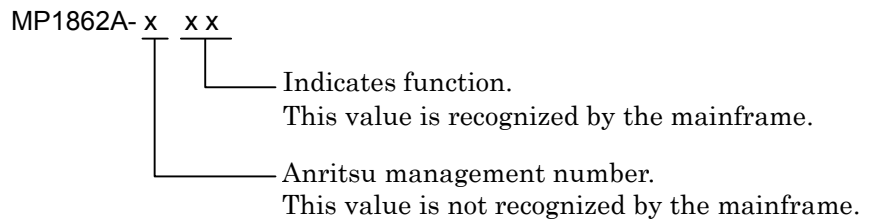
Table 1.2.2-1 shows the options for the MP1862A. Table 1.2.2-2 shows the accessories for the MP1862A. All options are sold separately.

**Table 1.2.2-1 Options for MP1862A**

Model name	Product name	Remarks
MP1862A-x01	64Gbit/s Extension	

**Note:**

Option name format is as follows:



## 1.2.3 Application parts

Table 1.2.3-1 shows the application parts for the MP1862A. All application parts are sold separately.

**Table 1.2.3-1 Application parts**

Model	Product name	Remarks
J1600A	Skew match pair cable (0.2 m, V connector)	Cable for measurement
J1656A	Coaxial cable set (MP1861A-MP1862A)	Two (a pair) for jitter tolerance measurement
J1646A	Passive Equalizer 6 dB (V connector)	
Z0306A	Wrist strap	
J1678A	ESD Protection Adapter-K	K connector
J1679A	ESD Protection Adapter-V	V connector



## 1.3 Specifications

### 1.3.1 Specifications for MP1862A

Table 1.3.1-1 Specifications for MP1862A

Item		Specifications	Remarks
Operating Bit Rate		8 to 56.2 Gbit/s 8 to 64.2 Gbit/s (when MP1862A-x01 installed)	
External Clock Input	Number of Input	1 (Ext. Clock Input)	To input a half-rate clock from the <b>Clock Output1</b> connector of MP1861A.
	Frequency	4 to 28.1 GHz 4 to 32.1 GHz (when MP1862A-x01 installed)	
	Amplitude	0.3 to 1.0 V <sub>p-p</sub>	
	Termination	50 Ω/AC	
	Connector	K (f.)	
Data Output	Number of Output	2 (Data Output 1, Data Output 2)	To MU18304xA/B Data Input
	Level	0/-0.4 V H: -0.1 to +0.1 V L: -0.6 to -0.3V	
	Termination	50 Ω/GND	
	Connector	K (f.)	
1/2 Clock Output	Number of Output	1 (1/2 Clock Output)	To output to the <b>Clock Input</b> connector of MU18304xA/B. Output frequency: Half of the frequency input to the <b>Ext Clk Input</b> connector.
	Frequency	2 to 14.05 GHz 2 to 16.05 GHz (when MP1862A-x01 installed)	
	Amplitude	0.3 to 1.0 V <sub>p-p</sub>	
	Termination	50 Ω/AC	
	Connector	SMA (f.)	
Clock Output	Number of Output	1 (Clock Output)	To be terminated into 50 Ω when not in use. Output frequency: The same as the frequency input to the <b>Ext Clk Input</b> connector.
	Frequency	4 to 28.1 GHz 4 to 32.1 GHz (when MP1862A-x01 installed)	
	Amplitude	0.4 to 1.0 V <sub>p-p</sub>	
	Termination	50 Ω/AC	
	Connector	K (f.)	

**Table 1.3.1-1 Specifications for MP1862A (Cont'd)**

Item		Specifications	Remarks
Buffered Clock Output	Number of Output	1 (Buffered Clock Output)	To be terminated into 50 Ω when not in use. Output frequency: The same as the frequency input to the <b>Ext Clk Input</b> connector.
	Frequency	4 to 28.1 GHz 4 to 32.1 GHz (when MP1862A-x01 installed)	
	Amplitude	0.2 to 1.0 Vp-p	
	Termination	50 Ω/AC	
	Connector	K (f.)	
Delayed Clock Output	Number of Output	1 (Delayed Clock Output)	To output the clock having the 1x, 2x or 4x frequency of the clock input to the <b>External Clock Input</b> connector.
	Frequency	4 to 28.1 GHz 4 to 32.1 GHz (when MP1862A-x01 installed)	
	Amplitude	0.2 to 1.0 Vp-p	
	Termination	50 Ω/AC	
	Connector	K (f.)	
Demux Clock Input	Number of Input	1 (Demux Clock Input)	To be connected to the <b>Delayed Clock Output</b> connector. To output the clock having the 1x, 2x or 4x frequency of the clock input to the <b>External Clock Input</b> connector.
	Frequency	4 to 28.1 GHz 4 to 32.1 GHz (when MP1862A-x01 installed)	
	Amplitude	0.2 to 1.0 Vp-p	
	Termination	50 Ω/AC	
	Connector	K (f.)	

Table 1.3.1-1 Specifications for MP1862A (Cont'd)

Item	Specifications	Remarks	
Data Input	Number of Input	2 (Data/ $\overline{\text{Data}}$ Input) (Differential)	
	Input Conditions	Selectable from Single-ended 50 $\Omega$ , Differential 50 $\Omega$ , or Differential 100 $\Omega$ Data or XData can be set to input for Single-ended interface. Tracking, Independent, or Alternate can be set for Differential Interface. When setting to Alternate, Data-XData or XData-Data can be set. (Only when absolute difference between Data Threshold and XData Threshold is 3.0 V or less)	
	Input Format	NRZ	
	Amplitude	0.125 to 1.0 V <sub>p-p</sub> *1, *5	
	Threshold	-3.5 to +3.3 V /1 mV step • Data and XData can be set separately. • Absolute difference between Data Threshold and XData Threshold : 3.0 V or less	
	Input Sensitivity *2, *3, *4, *6	Typ.25mV, $\leq 40\text{mV}@56.2\text{Gbit/s}$ Typ.30mV@64.2Gbit/s *8	
	Phase Margin	Typ. 200 deg*7, *8	
	Termination	50 $\Omega$ /GND, Variable	
	Termination Voltage	When Variable is selected for Termination: -2.5 to +3.5 V /0.01V step	
	Connector	V (f.)	

\*1: Defined based on the condition where Single-ended 50  $\Omega$  is selected.

\*2: Defined under the following test pattern conditions:

- PRBS2<sup>31</sup>-1
- Mark Ratio 1/2

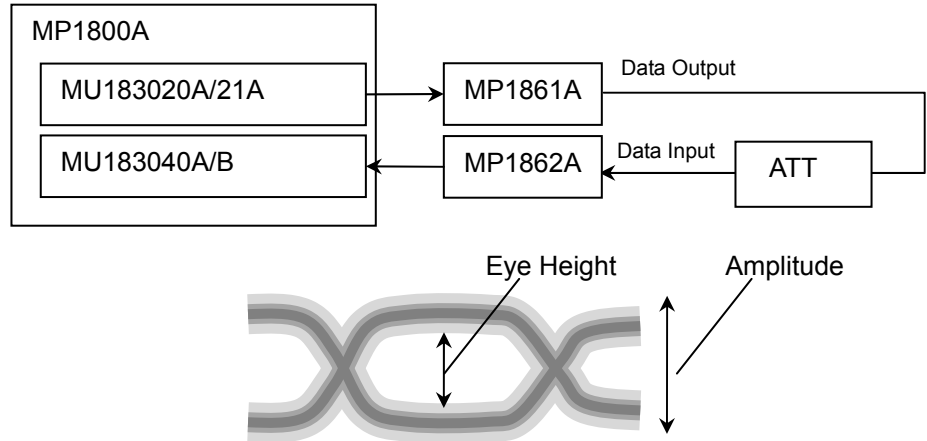
\*3: Defined in the temperature range of 20 to 30°C.

\*4: Defined by looping back a signal through J1600A coaxial cable, 41V-6 fixed attenuator, and MP1861A.

\*5: The input amplitude corresponds to the operating range of the Auto Search and Auto Measurement functions, and the lower limit for the input amplitude is defined by Eye Height.

\*6: This is determined by Eye Height.

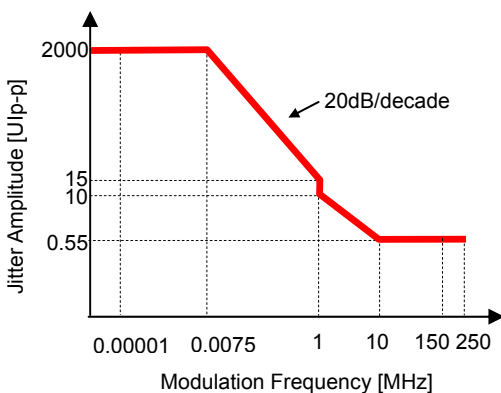
The output amplitude must be that of MP1861A + ATT with an error rate being “1E-9” or lower in the following measuring system (a sampling oscilloscope with more than 70 GHz bandwidth is used for output amplitude observations).



\*7: At a bit rate of 56.2 Gbit/s

\*8: At a bit rate of 64.2 Gbit/s (with MP1862A-x01 installed)

Table 1.3.1-1 Specifications for MP1862A (Cont'd)

Item		Specifications	Remarks
Jitter tolerance *2,*7,*8	When interacting with MU18304xA/B	This item is defined under the following conditions: <ul style="list-style-type: none"> <li>• Bit rate:                             <ul style="list-style-type: none"> <li>56.2 Gbit/s</li> <li>64.2 Gbit/s *8</li> </ul> </li> <li>• Pattern: PRBS2<sup>31</sup>-1</li> <li>• Temperature: 20 to 30°C</li> <li>• Loopback connection with MP1861A</li> </ul> The following shall be applied simultaneously by using MU181500B: <ul style="list-style-type: none"> <li>• SSC with a 5300 ppm amplitude</li> <li>• RJ of 0.3 UI</li> </ul> Modulation frequency: <ul style="list-style-type: none"> <li>56.2 Gbit/s: Up to 250 MHz</li> <li>64.2 Gbit/s: Up to 150 MHz</li> </ul> 	
Clock Phase Variability	Phase Setting Range	-1000 to +1000 mUI/4 mUI Step	
	Phase Setting Error	Typ. ±50mUIp·p (≤ 56.2 Gbit/s)*9 Typ. ±50 mUIp·p (> 56.2Gbit/s, when MP1862A-x01 installed)*9	
	mUI-ps Conversion	Provided	
	Calibration	Provided (When jitter modulation is off)	
	Relative 0	Provided	
	Jitter Input	Provided	

\*9: The values are specified, assuming an oscilloscope with a linearity of less than 200 fs will be used.

Table 1.3.1-1 Specifications for MP1862A (Cont'd)

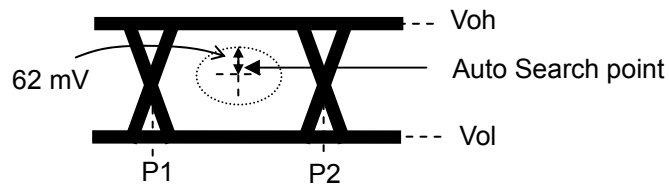
Item		Specifications	Remarks
Auto Measurement *5, *10		Auto Search, Eye Margin, Eye Diagram, Bathtub	
BER Measurement Results		To be displayed on screen.	
Control interface		USB 2.0 or 1.1 Type B × 1	
Channel setting		Can be selected from CH1 to CH4.	
Power (AC adapter)	Input voltage	AC 100 to 240 V *11	
	Input frequency	50 to 60 Hz	
	Output power	DC 19 V, 7.9A (Max)	
Power consumption		DC 19 V, 4 A	
Dimension (Excluding protrusions)		90.9 mm (H), 120 mm (W), 140 mm (D)	
Mass		5.0 kg or less	
Environmental Performance	Operation Temperature	+15 to +35°C (ambient temperature of equipment)	
	Storage Temperature	-20 to +60°C	

\*10: The Auto Search function obtains a point in the vicinity of the following as an optimum point:

- $(V_{oh} + V_{ol}) / 2$  in voltage direction
- $(P1 + P2) / 2$  in phase direction

The Auto Search function runs normally on a signal observed by an oscilloscope if there is no sample point within  $\pm 62\text{mV}$  in voltage direction from the auto search point.

To execute the Auto Search function if **Differential 50 Ω** or **Differential 100 Ω** is selected in the **Input Condition** box of the **Data** area, input a signal by AC coupling.



\*11: Operating voltage: within the range of +10% to -15% from the rated voltage

## Chapter 2 Before Use

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This chapter describes preparation required before using MP1862A.

2.1	Preparation Before Use .....	2-2
2.1.1	Environmental Conditions of Installation Site ...	2-2
2.1.2	Clearance from Fan .....	2-2
2.1.3	Power Connection .....	2-3
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## 2.1 Preparation Before Use

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

### 2.1.1 Environmental Conditions of Installation Site

The MP1862A operates in the temperature range from 15 to 35°C. Avoid using it under any of the following environment conditions that may cause failure.

- Strong vibrations
- High humidity or dust
- Direct sunlight
- Chemically active gases
- Substantial temperature changes

**Note:**

Condensation may form inside of the MP1862A if it is moved to a warm location after operating for a long time in a cool location. In such a case, be sure to wait until the MP1862A becomes completely dry before turning on the power. Doing so with condensation present may cause a short circuit and damage the MP1862A.

### 2.1.2 Clearance from Fan

A cooling fan is provided on the sides of the MP1862A. Install the MP1862A at least 10 cm away from walls, peripheral devices, or the like to prevent blockage of ventilation. Insufficient ventilation may cause the internal temperature to rise, resulting in failure.

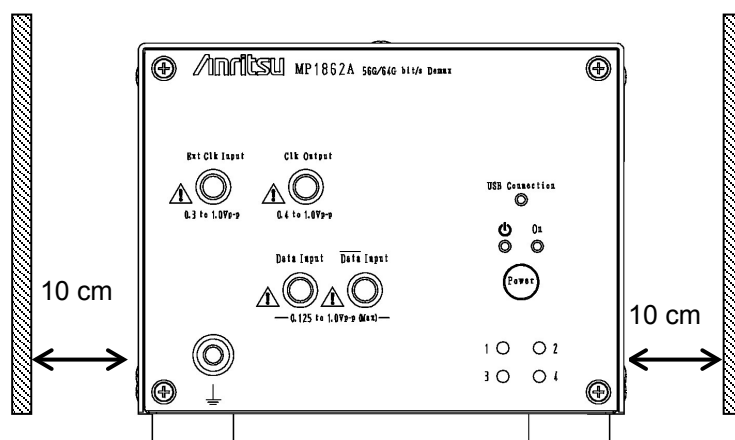


Figure 2.1.2-1 Clearance from fan



### 2.1.3 Power Connection

This section describes the procedures for supplying power.

Use a supplied AC adapter. If AC adapter other than the supplied one is used, the MP1862A may be damaged.

Connect the shielded connector from the AC adapter to the rear panel connector of the MP1862A. Refer to Figure 2.1.3-1.

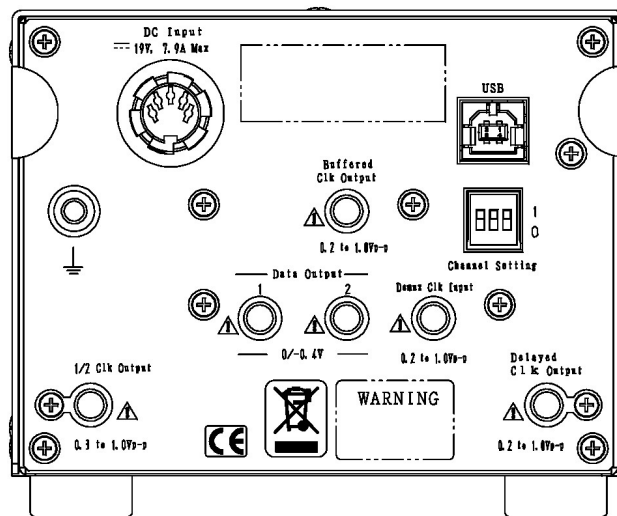


Figure 2.1.3-1 Rear Panel of MP1862A

Insert the power plug into an outlet, and connect the other end to the power inlet on the rear panel. To ensure that the instrument is earthed, always use the supplied 3-pin power cord, and insert the plug into an outlet with an earth terminal.

#### **WARNING**

If the power cord is connected without grounding MP1862A, there is a risk of receiving a fatal electric shock. In addition, the peripheral devices connected to MP1862A may be damaged.

When connecting to the power supply, DO NOT connect to an outlet without a ground terminal. Also, avoid using electrical equipment such as an extension cord or a transformer.

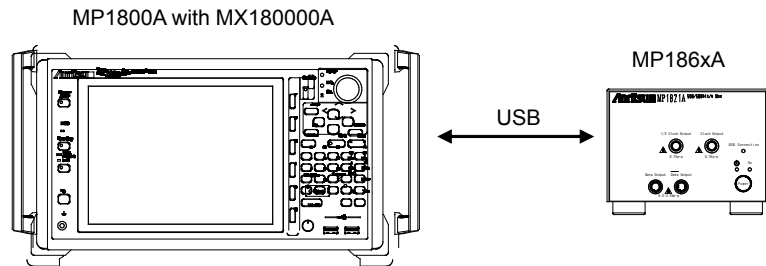
## 2.1.4 Usage Patterns of MP1862A

This section describes the two ways to control MP1862A and how to connect to MP1800A or control PC.

MP1862A is controlled via the MX180000A Control Software installed to MP1800A or control PC. When connecting MP1862A to MP1800A (control PC), use the standard accessory USB cable.

(1) Connecting MP1800A:

Connect the USB connector (type A) to the front panel or rear panel of MP1800A, and then connect the USB connector (type B) to MP1862A.



**Figure 2.1.4-1 Connecting to MP1800A**

To connect two MP1862As to MP1800A, connect them to the USB connectors (type A) on MP1800A's front panel.

MP1862As may not be able to function properly if one of them is connected to the USB connector on MP1800's rear panel. To connect more than two MP1862As, connect a USB hub to the front or rear panel of MP1800A, and then connect each of MP1862As to MP1800A via the USB hub.

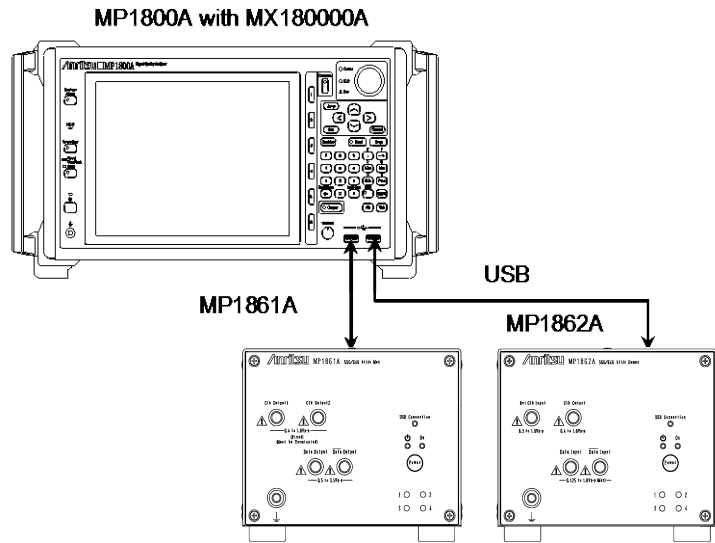
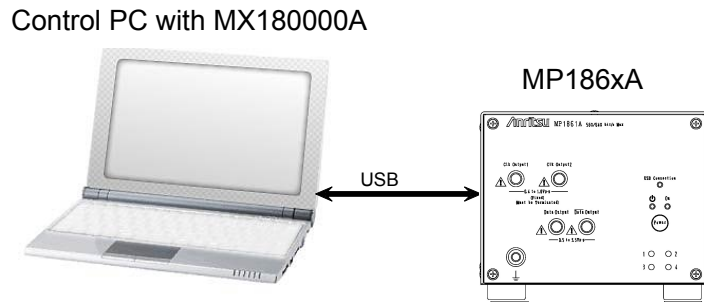


Figure 2.1.4-2 Connecting Multiple MP186xAs to MP1800A

(2) Connecting to control PC:

Connect the USB connector (type A) to PC, and then connect the USB connector (type B) to the MP1862A.



**Figure 2.1.4-3 Connecting to Control PC**

Note the following when connecting two MP186xAs to control PC:

- For PC with multiple USB connectors, connect to the USB connector with the same USB controller, as shown below. It may not function normally if connecting to the connector with different USB controller.
- If the number of USB connectors on the Control PC is not enough, use a USB hub.

**Note :**

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

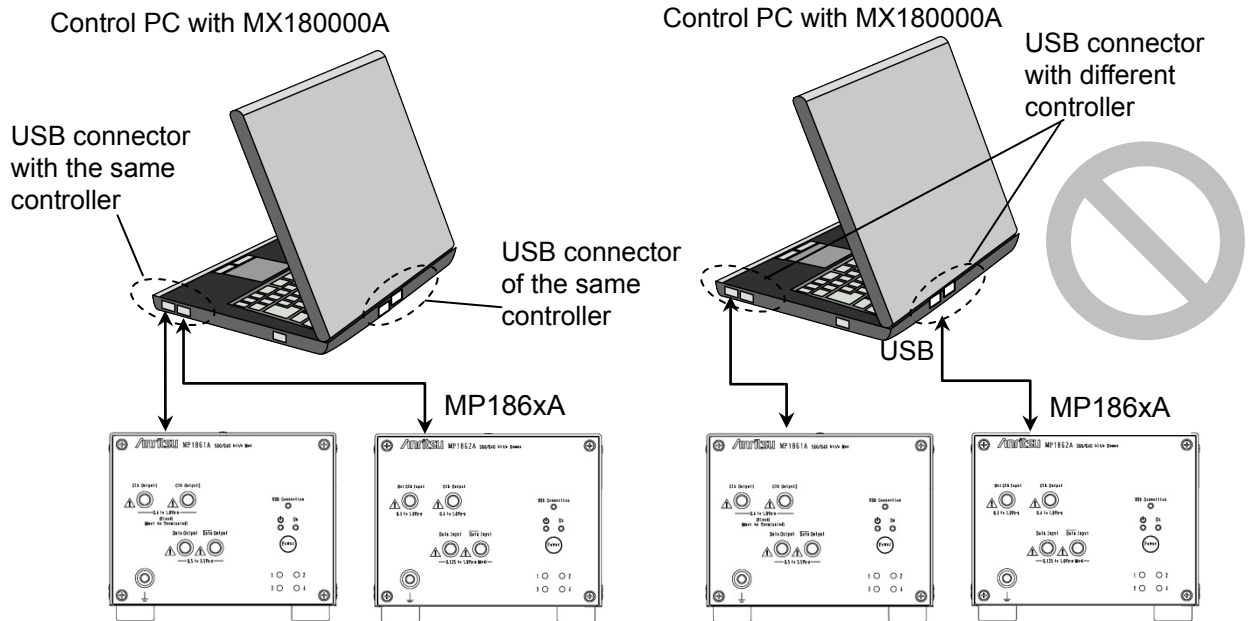


Figure 2.1.4-4 Connecting Control PC to Two MP186xAs

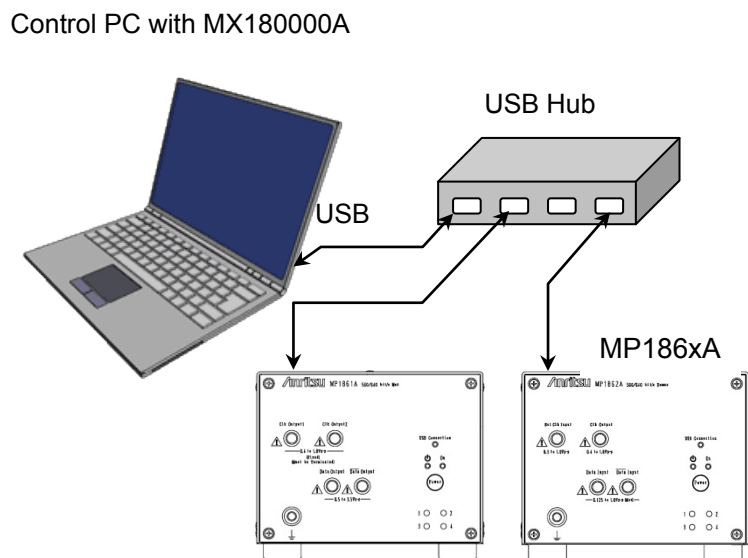


Figure 2.1.4-5 Connecting Control PC Using A USB Hub

Using other USB devices

Refer to the following for how to use commercially available USB devices when MP1862A is in use.

Connect the USB device before starting the MP1800A; do not connect or disconnect USB devices while using the MX180000A Control Software. In addition, only read measurement data using a USB device after exiting the MX180000A Control Software (closing selector screen). Use a PC that meets or exceeds the following specifications.

**Table 2.1.4-1 Required Specifications for Control PC (For Windows XP)**

<b>Item</b>	<b>Specifications</b>
Compatibility	IBM-PC or compatible PC
CPU	Pentium4 processor and 1.6 GHz or higher
OS	Windows XP Version 2002 Service Pack 2
Memory	≥ 512 MB
Monitor resolution	800 × 600 dots or more
Display color	≥ 256 colors
CD-ROM driver	Required when installing the software package
Hard Disk	Required free disk space for installing the software package: At least 200 MB
USB Interface	USB 2.0 or USB 1.1

Table 2.1.4-2 Required Specifications for Control PC (For Windows 7)

Item	Specifications
Compatibility	IBM-PC or compatible PC
CPU	1 GHz or faster 32-bit (x86) or 64-bit (x64) processor
OS	Windows 7 Professional/Enterprise/Ultimate
Memory	32-bit: 1 GB RAM 64-bit: 2 GB RAM
Monitor resolution	800 × 600 dots or more
Display color	≥ 256 colors
CD-ROM driver	Required when installing the software package
Hard Disk	Required free disk space for installing the software package: At least 200 MB
USB Interface	10 BASE-T or 100 BASE-TX

The MP1862A will not operate normally when performing the following operations and functions on the PC while the MX180000A is operating.

- (1) Running another application at same time
- (2) Closing lid of laptop PC
- (3) Running screen saver
- (4) Running battery save function

Read the PC instruction manual to switch off the screen saver and battery save functions described in items (3) and (4) above.

**Note:**

Operation is not assured even with PCs meeting the specifications outlined in Table 2.1.4-1 or Table 2.1.4-2.

## 2.2 Getting Started with MX180000A

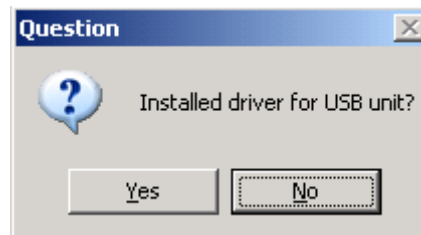
This section explains how to install the software and how to start and exit MX180000A.

### 2.2.1 Installing MX180000A

Note the following procedure when installing software for the MP1862A in the MP1800A or remote PC.

The following examples show the case when the software is installed in the MP1800A. For the general software installation procedures, refer to the *MP1800A Installation Guide (W2747AE)* or *MT1810A Installation Guide (W2748AE)*.

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



**Figure 2.2.1-1 Confirmation Dialog of USB Driver Installation (1)**

- (2) For Windows 7, a confirmation dialog box is displayed to ask if you want to install Anritsu Corporation Universal Serial BUS Controller. Click **Yes** to continue installation.  
Click **Continue Anyway** to continue installation.



- (3) For Windows XP, when the screen shown in Figure 2.2.1-2 is displayed, click **Continue Anyway** to continue.

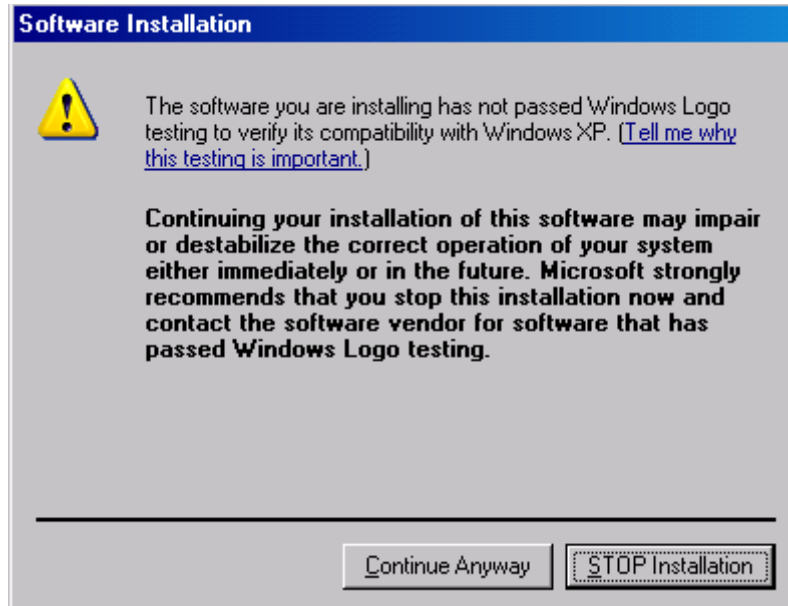


Figure 2.2.1-2 Confirmation Dialog of USB Driver Installation (2)

**Note:**

The screen as shown in Figure 2.2.1-1 may not be displayed on the front page. If software installations take a long time, check that the screen as shown in Figure 2.2.1-1 is hidden at the back of the other screen.

- (4) The following window is displayed when the installation completes normally. Click **Finish** to end the installation procedure.

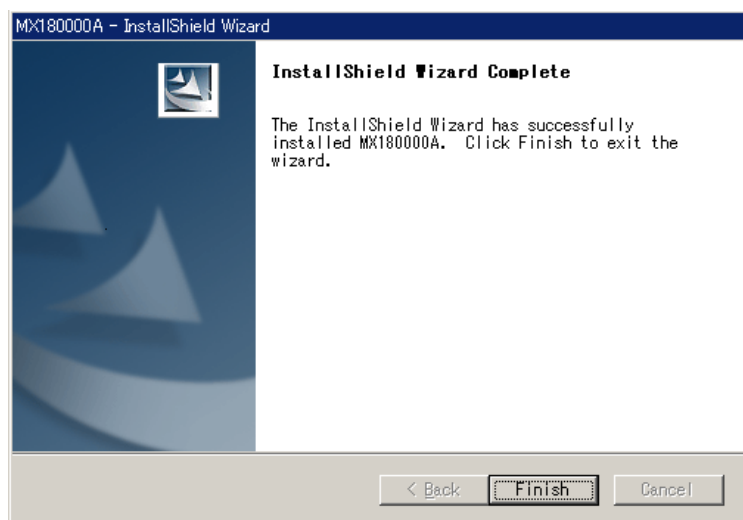


Figure 2.2.1-3 Completing Installation

When the MP1862A is connected to the MP1800A or remote PC after software installation, install the driver using the following procedures. The following example show when the MP1862A is connected to the MP1800A.

- (1) Connect the MP1800A and MP1862A using a USB cable.  
For Windows 7, the driver is installed automatically.  
For Windows XP, perform the step 2 to 5 to install the driver.
- (2) The Found New Hardware Wizard screen is displayed to confirm windows update. Select **No, not this time** and press **Next**.

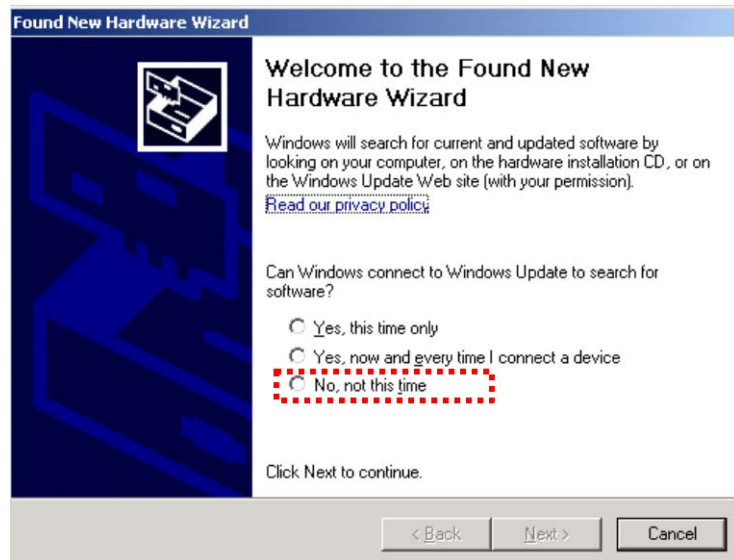


Figure 2.2.1-4 Confirmation of Windows Update

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



Figure 2.2.1-5 Software Installation

- (4) Figure 2.2.1-6 is displayed when the hardware is found. Press **Continue Anyway** to continue the installation procedures.

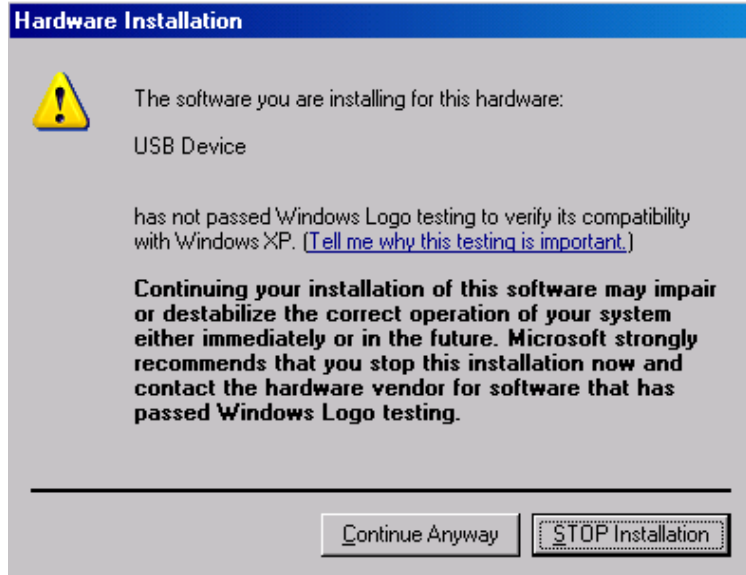


Figure 2.2.1-6 Hardware Installation

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



Figure 2.2.1-7 Completing Installation

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

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

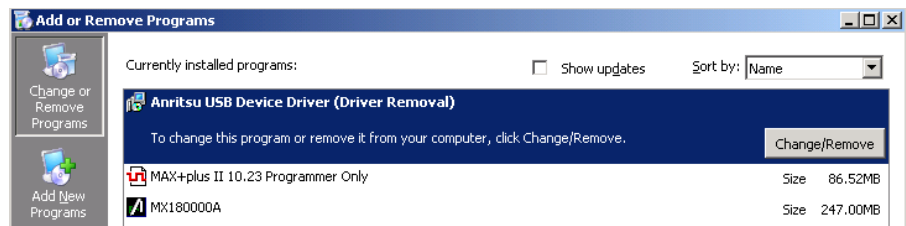


Figure 2.2.1-8 Removing USB Driver

## 2.2.2 Starting MX180000A

When connecting to MP1800A:

- (1) Connect the MP1862A and MP1800A as explained in Section 2.1.4.
- (2) Connect the AC adapter to the P1862A and set the power switch to ON.

The LED lights green while power is on.

- (3) When the MP1800A is turned on, Windows boots and the MX180000A starts automatically. Select [Main application] on the selector screen.
- (4) The MP1862A control screen is displayed.

When connecting to control PC

- (1) Connect the MP1862A and control PC as explained in Section 2.1.4.
- (2) Connect the AC adapter to the MP1862A and set the power switch to ON.

The LED lights green while power is on.

- (3) Start the MX180000A controller PC and select Main application on the selector screen.
- (4) The MP1862A control screen is displayed.

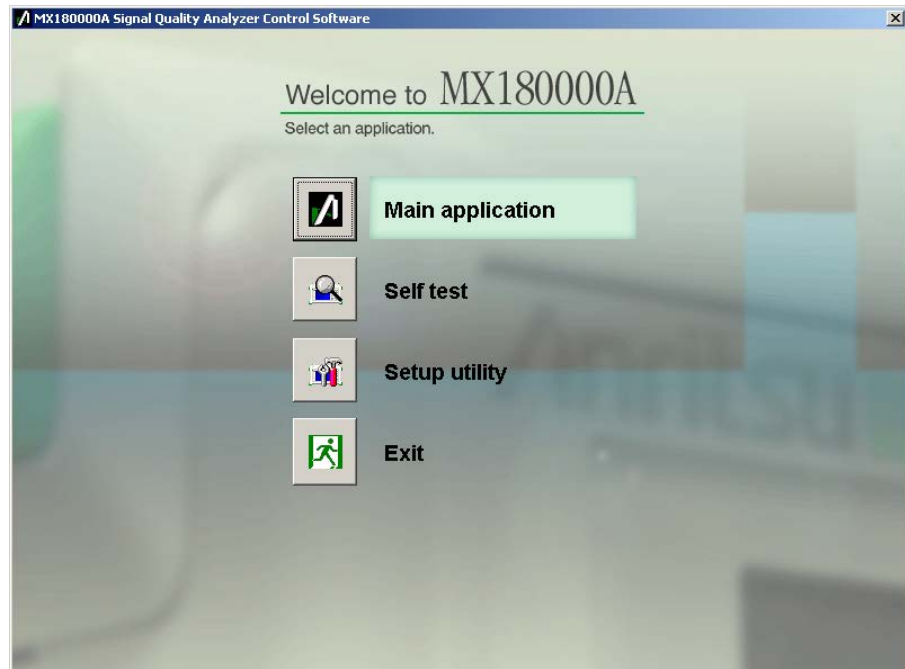


Figure 2.2.2-1 Selector Screen

### 2.2.3 Exiting MX18000A

When connecting to MP1800A:

- (1) Press and hold the power switch on the MP1800A front panel or click the **Shut down** button on the selector screen. After the application are shut down, the MP18000A Power lamp goes off, and then the Standby LED lights up.
- (2) Set the MP1862A power switch to OFF.  
The LED lights orange, indicating the standby status.

When connecting to control PC:

- (1) Close **Main application** to display the selector screen.
- (2) Press **Exit** on the selector screen to close the window.
- (3) Set the MP1862A power switch to **OFF**.  
The LED lights orange, indicating the standby status.

**Notes:**

- To cut the power without following the above procedure, press the MP1862A power switch for more than 10 seconds to enter the standby status.
- Do not disconnect the power cord and AC adapter without first turning off the MP1862A as described above, otherwise the MP1862A may be damaged.

## 2.2.4 Messages that are displayed when connecting/disconnecting the USB cable

This section describes the messages that are displayed when the USB cable is connected to or disconnected from MP1862A.

When disconnecting the USB connection of this equipment for some unexpected reason, follow the procedure described below to minimize the impact on running applications. However, all the USB disconnection cannot be assured by this operation. Normally, follow the startup and shutdown procedures described in sections 2.2.2 and 2.2.3, respectively.

When USB connection disconnected while application running:

- (1) The following dialog screen is displayed when the USB connection is disconnected.

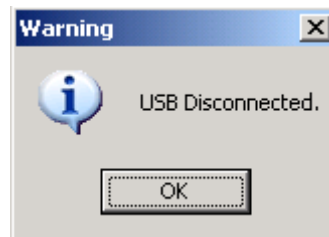


Figure 2.2.4-1 USB Disconnected

- (2) The buttons for calling screens are disabled and the screen goes blank. The Data Output and Clock Output are set forcibly to OFF.
- (3) The MP1800A module connected to this equipment can still be used.

When USB device connected while application running:

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

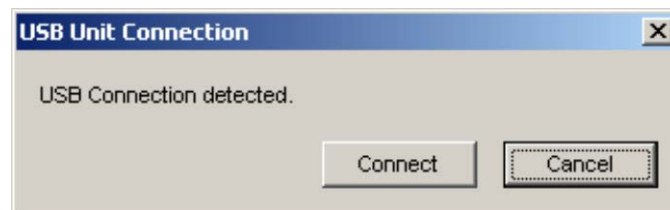
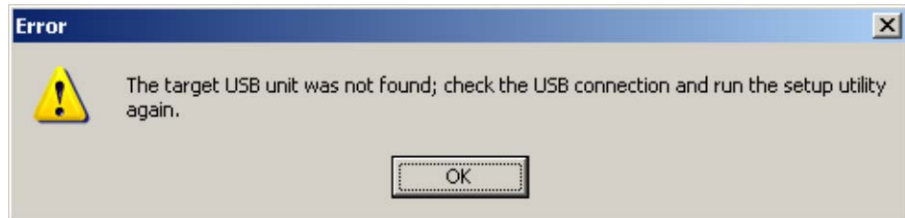


Figure 2.2.4-2 USB Connection Message

- (2) If there is a backup file (saved when previous application terminated when connection made), each setting is restored. Each setting is restored when reconnecting previously connected equipment that has been disconnected.
- (3) The button for calling screens is enabled and the screen is displayed for use. The Data Output and Clock Output are OFF.

When USB connection disconnected while using Setup utility:

- (1) No warning is issued at the instant of disconnection.
- (2) If processing is executed when the equipment is already disconnected, a message indicating that the equipment is not connected is displayed.



**Figure 2.2.4-3 USB Disconnection Message while Setup Utility in Use**

- (3) The MP1800A module connected to this equipment can still be used.

When USB device connected while using Setup utility:

- (1) When a connection is made while using the Setup utility, the equipment is not recognized.
- (2) Restart from the selector screen after setting the power OFF and ON and running the Setup utility once more.

### **CAUTION**

---

**If the connection between MP1862A, MP1800A and controller PC is broken during downloading with the Setup utility, MP1862A may no longer operate normally. NEVER break the connection during downloading.**

---



## 2.3 Other Usage Methods

This section explains how to check the installed software version, perform software updates, and initialize the settings.

For how to operate the MX180000A, refer to the *MX180000A Signal Quality Analyzer Control Software Operation Manual*.

### 2.3.1 Checking Installed Software Version

The installed software versions can be checked in both Version Information of MX180000A and Setup Utility screen.

To check in the Version Information screen

Click **Help** on the main application menu bar, menu, and then click **Version**. In the Version Information screen, you can check the version of the software currently installed.

Slot Number	Model Number	Object File Name	Serial Number	Version
Mainframe	MX180000A	Signal Quality Analyzer Control Software		0.14.01
		Setup Utility		0.14.00
		Self Test		5.02.00
	MX180000A-01	Pre-Code		
	MX180000A-02	De-Code		
USB1	MP1821A	50G/56Gbit/s MUX	6123456789	0.00.01
		MP1821A_Mux.FPGA		0.00.07
		MP1821A_Mux_Delay.FPGA		1.00.04
		MP1821A_Mux.SYST		0.13.07
	MP1821A-01	56Gbit/s Extension		
	MP1821A-02	Clock Input Band Switch		
	MP1821A-13	Variable Data Output (0.5 to 3.5Vp-p)		

Figure 2.3.1-1 Version Information Screen of MX180000A

In the Version Software screen, the software that does not match the installed version is highlighted in yellow. Update the software highlighted in yellow as described in Section 2.3.2. The equipment may not be able to operate normally if it is used without updating the software highlighted in yellow.

To check in the Setup Utility screen

To log in to the setup utility, select **Setup utility** in the selector screen that appears when MX180000A is started, and then click **User** in the **Login** box,

On the **Version** tab below, you can check the version of the software currently installed.

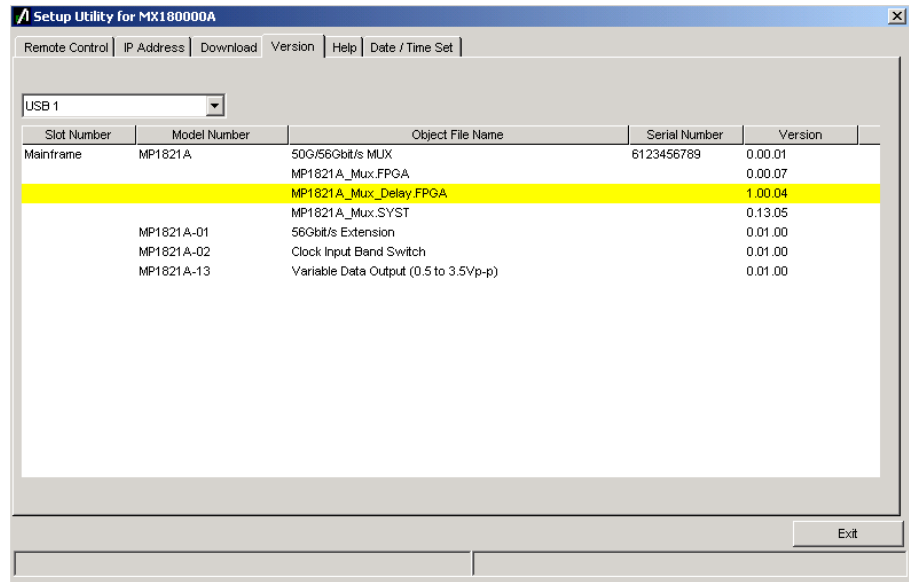


Figure 2.3.1-2 Version Tab of the Setup Utility Screen

On the **Version** tab of the Setup Utility screen, the software that does not match the installed version is highlighted in yellow. Update the software highlighted in yellow as described in Section 2.3.2. The equipment may not be able to operate normally if it is used without updating the software highlighted in yellow.

### 2.3.2 Updating Software

The equipment software can be updated from the Setup utility screen.

When installing a new software version, there may sometimes be a mismatch with already installed software and operation is not assured. To solve the problem of mismatched installed software versions, start the Setup utility and click the **Download** tab to display the download files in the downloaded file display field. Put checkmarks in the boxes opposite the files to be upgraded and click the **Load** button to start the download. When download is completed normally, the installed software can be upgraded.

Normally, the installed software is upgraded to the latest version when the **Load** button is clicked.

2  
Before Use

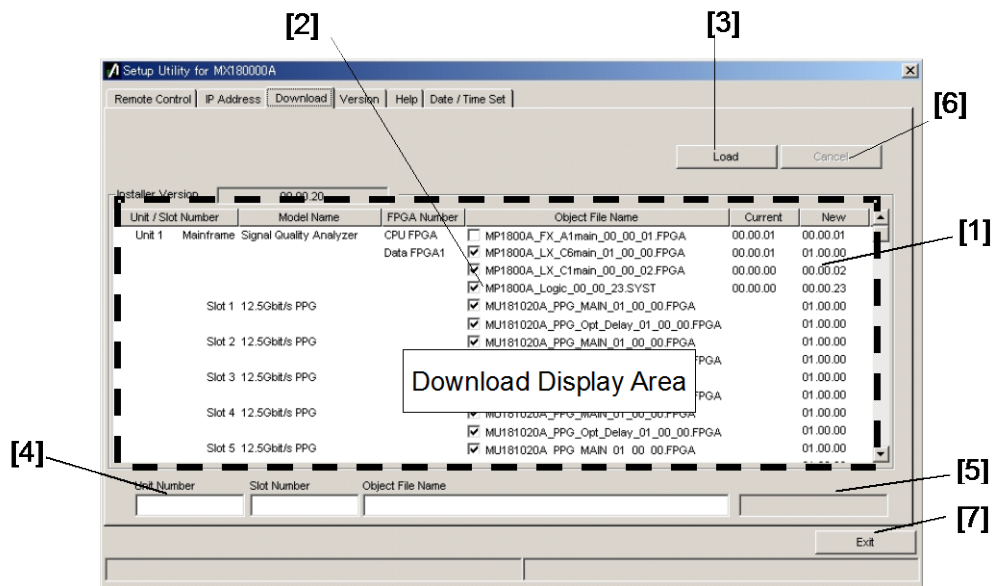


Figure 2.3.2-1 Download Screen

**Table 2.3.2-1 Download Screen**

No.	Function and Usage
[1]	This displays files that can be downloaded Versions displayed in the New column are versions of object files offered by the MX180000A SQA control software. Versions displayed in the Current column are the versions of software already installed in the equipment. If there is a mismatch between versions in New and Current, place checkmarks in the boxes and download the new files.
[2]	These are checkboxes for files to download. When it is necessary to download the latest version (because there are differences between the New and Current versions), the checkbox is marked automatically.
[3]	This executes download using the MX180000A SQA control software installer. The versions of files saved to the internal hard disk are compared with versions to be downloaded for each module in this equipment, and if there are differences, the files are downloaded.
[4]	This displays the download slot number and file name.
[5]	This displays the download status.
[6]	This suspends downloading.
[7]	This quits the setup utility.

**Notes:**

- If the Current version is not displayed and there is no checkmark in the checkbox, put a checkmark in the checkbox and execute download.
- Downloading the FPGA as described below takes about 10 minutes per file. The power must be toggled OFF and ON to enable the update. Set the power to OFF as described in section 2.2.3.

xx in the filename MP186xA\_MUX\_Opt\_Delay\_xx\_xx\_xx.FPGA indicates the version.

 **CAUTION**

---

**If the connection between MP1862A, MP1800A and controller PC is broken during downloading with the Setup utility, MP1862A may no longer operate normally. NEVER break the connection during downloading.**

---

### 2.3.3 Initializing Settings

Click **Initialize** in the File menu of the MX180000A SQA control software to initialize the equipment to the factory defaults. In addition, the equipment settings can be returned to the factory defaults using the Setup utility; start the utility and click the **Help** tab.

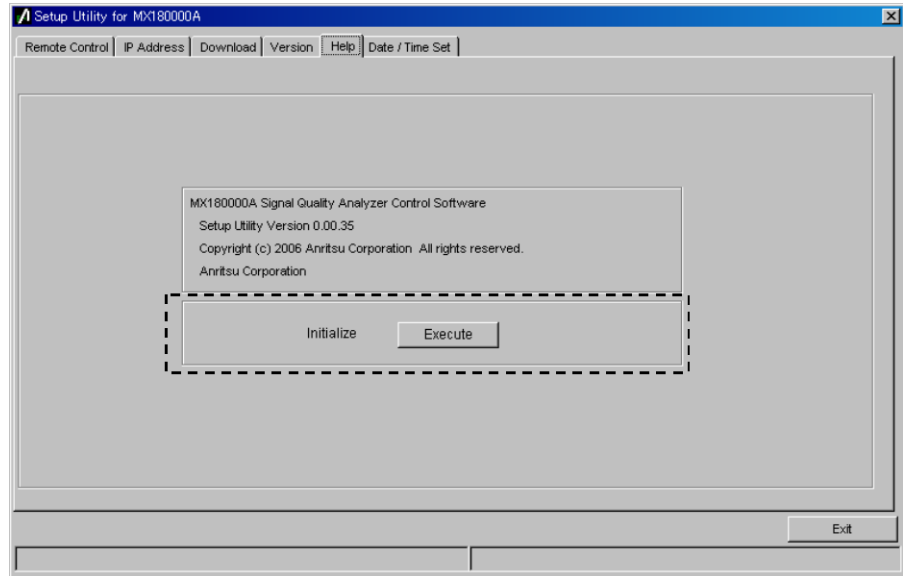


Figure 2.3.3-1 Initializing Settings

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

## 2.4 Preventing Damage

Be sure to observe the rating ranges when connecting input and output of the MP1862A. Otherwise, the MP1862A may be damaged.



### CAUTION

---

- Do not apply a voltage exceeding the rated voltage of MP1862A. Excessively high input voltage can damage the circuit.
  - When output is used at the 50  $\Omega$ /GND terminator, never feed any current or input signals to the output.
  - As a countermeasure against static electricity, ground other devices to be connected (including experimental circuits) with ground wires before connecting the I/O connector.
  - The outer conductor and core of the coaxial cable may become charged as a capacitor. Use any metal to discharge the outer conductor and core before use.
  - Never open the MP1862A. If you open it and the MP1862A has failed or sufficient performance cannot be obtained, we may decline to repair the MP1862A.
  - The MP1862A has many important circuits and parts including hybrid ICs. These parts are extremely sensitive to static electric charges, so never open the case of the MP1862A.
  - To protect the MP1862A from e being damaged by static electricity, be sure to observe the following:
    - Spread a conductive sheet on a workbench.
    - Wear a wrist strap connected to the conductive sheet or the frame ground of MP1862A
-

# Chapter 3 Panel Layout and Connectors

---

This chapter describes the panels and connectors of MP1862A.

3.1	Panel Layout.....	3-2
3.1.1	MP1862A Front Panel .....	3-2
3.1.2	MP1862A Rear Panel.....	3-3
3.2	Inter-Module Connection .....	3-5
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## 3.1 Panel Layout

### 3.1.1 MP1862A Front Panel

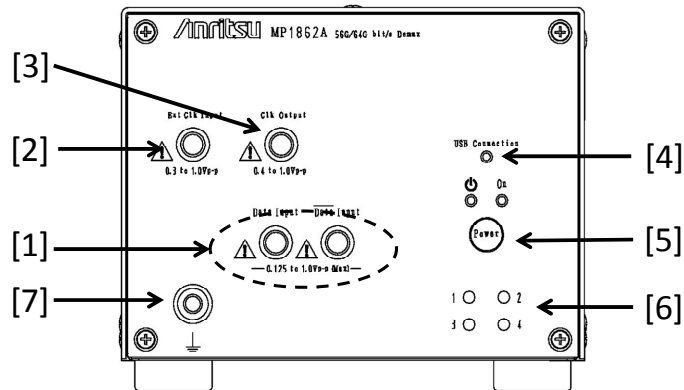


Figure 3.1.1-1 MP1862A Front Panel

Table 3.1.1-1 MP1862A Front Panel Name and Function

No.	Name	Description
[1]	Data Input connectors Data Input connectors	Connectors for inputting differential data signals. Support both differential and single-ended input signals.
[2]	Ext. Clock Input connector	Connectors for inputting clock signal used as reference for equipment operation
[3]	Clock Output connector	Connector for outputting the same frequency clock as the clock that is input to the <b>Ext. Clock Input</b> connector. Terminate into 50 Ω when not in use.
[4]	USB Connection LED	Displays status of connection between MP1862A and MP1800A or control PC The LED is lit when the MP1862A can be controlled.
[5]	Power Switch	Switches from ON to Standby When AC adapter and power code are connected, the switch LED lights orange in the Standby status and green at ON.
[6]	Channel number indicators (LEDs)	The lamp of the set channel number illuminates. 1: Blue, 2: Pink, 3: Purple, 4: Orange Set the channel number with the Channel Setting switch on the rear panel of MP1862A.
[7]	Frame ground	To which connects a wrist strap for antistatic measures before using MP1862A. Always wear the wrist strap when using MP1862A.



## 3.1.2 MP1862A Rear Panel

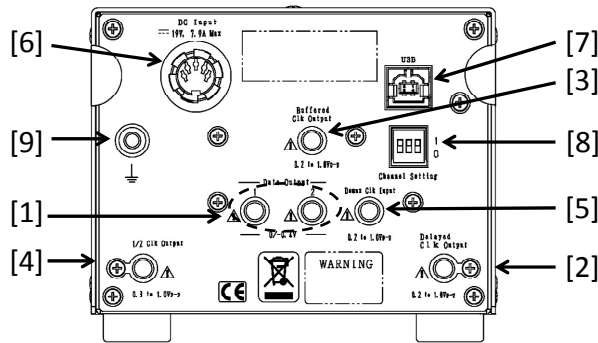


Figure 3.1.2-1 MP1862A Rear Panel

Table 3.1.2-1 MP1862A Rear Panel Name and Function

No.	Name	Description
[1]	Data Output 1 connectors Data Output 2 connectors	Outputs for 1:2 divided Data/ Data Input signals Connector for outputting data signals to the system MU18304xA/B.
[2]	Delayed Clock Output connector	Connector for outputting the clock signal that is half of frequency of the operating bit rate. Connect to the <b>Demux Clock Input</b> connector using the supplied J1654A U-link cable B.
[3]	Buffered Clock Output connector	Connector for outputting the same frequency clock as the clock that is input to the <b>Ext. Clock Input</b> connector. Terminate into 50 $\Omega$ when not in use.
[4]	1/2 Clock Output connector	Connector for outputting the clock signal (reference clock for MU18304xA/B) that is half of the frequency clock output to the <b>Delayed Clock Output</b> connector.
[5]	Demux Clock Input connector	Connector for inputting the clock signal that is half of frequency of the operating bit rate. Connect to the <b>Delayed Clock Output</b> connector using the supplied J1654A U-link cable B.
[6]	DC Input connectors	Connector for connecting AC adapter supplied as standard accessory Do not use non-Anritsu AC adapters, otherwise there is a risk of damage to the equipment.
[7]	USB port	Used for connecting MP1800A or controller PC to this equipment Do NOT connect anything other than the MP1800A or controller PC.

**Table 3.1.2-1 MP1862A Rear Panel Name and Function (Cont'd)**

No.	Name	Description										
[8]	Channel Setting switch	<p>Sets the channel number of MP1862A.</p> <table border="1" data-bbox="639 495 1137 701"> <thead> <tr> <th data-bbox="639 495 890 539">Channel Number</th> <th data-bbox="890 495 1137 539">Switch Setting</th> </tr> </thead> <tbody> <tr> <td data-bbox="639 539 890 584">1</td> <td data-bbox="890 539 1137 584">0,0,0</td> </tr> <tr> <td data-bbox="639 584 890 629">2</td> <td data-bbox="890 584 1137 629">1,0,0</td> </tr> <tr> <td data-bbox="639 629 890 674">3</td> <td data-bbox="890 629 1137 674">0,1,0</td> </tr> <tr> <td data-bbox="639 674 890 701">4</td> <td data-bbox="890 674 1137 701">1,1,0</td> </tr> </tbody> </table> <p>Make sure the power to MP1862A has been shut off before changing the channel switch settings. The new channel number setting is enabled when powering on the next time.</p>	Channel Number	Switch Setting	1	0,0,0	2	1,0,0	3	0,1,0	4	1,1,0
Channel Number	Switch Setting											
1	0,0,0											
2	1,0,0											
3	0,1,0											
4	1,1,0											
[9]	Frame ground	<p>Connector for wrist strap to discharge static electricity Always wear a wrist strap when using this equipment.</p>										

## 3.2 Inter-Module Connection

This section describes precautions to follow when handling the equipment. Prevent the equipment from being damaged by static electricity.

### **WARNING**

- Do not apply a voltage exceeding the rated voltage of MP1862A. Excessively high input voltage can damage the circuit.
- As an antistatic measure, make sure the other devices (including experimental circuits) be connected with ground wires before connecting the I/O connector.
- Be sure to discharge static electricity from the outer conductors and cores of the coaxial cables by touching them with any metal object before connecting the coaxial cables.
- 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.
- To protect the MP1862A from being damaged by static electricity, be sure to observe the following:
  - Spread a conductive sheet on a workbench.
  - Wear a wrist strap connected to the conductive sheet or the frame ground of MP1862A.
- Do not apply excessive force to connectors when removing the cables from MP1862A. Excessive force can degrade the characteristics or cause failures. Be sure to use a torque wrench when connecting/disconnecting the cables. (Recommended torque: 0.9 N-M).

 **CAUTION**

---

Avoid inputting the signal exceeding the maximum input level of MP1862A when connecting the Data Output connector of MP1861A to the Data Input1 and 2 connectors of MP1862A.

Maximum input level of the Data Input1 and 2 connectors of MP1862A: 1.00 V

Maximum data output level:

MP1861A-x13: 3.50 Vp-p

MP1861A-x11: 2.50 Vp-p

The Data Input connector of MP1862A can be damaged if the signal exceeding the maximum input level is input.

---

### 3.2.1 1ch TRx connection

This section describes a connection example using one MP1862A and one MP1861A 56G/64G MUX (hereafter, MP1861A).

According to the following procedure, connect the equipment as shown in Figure 3.2.1-1.

[Equipment configuration]

MP1862A (this module)

MP1861A

MP1800A

MU183020A-x22/x23+x31

MU183040B

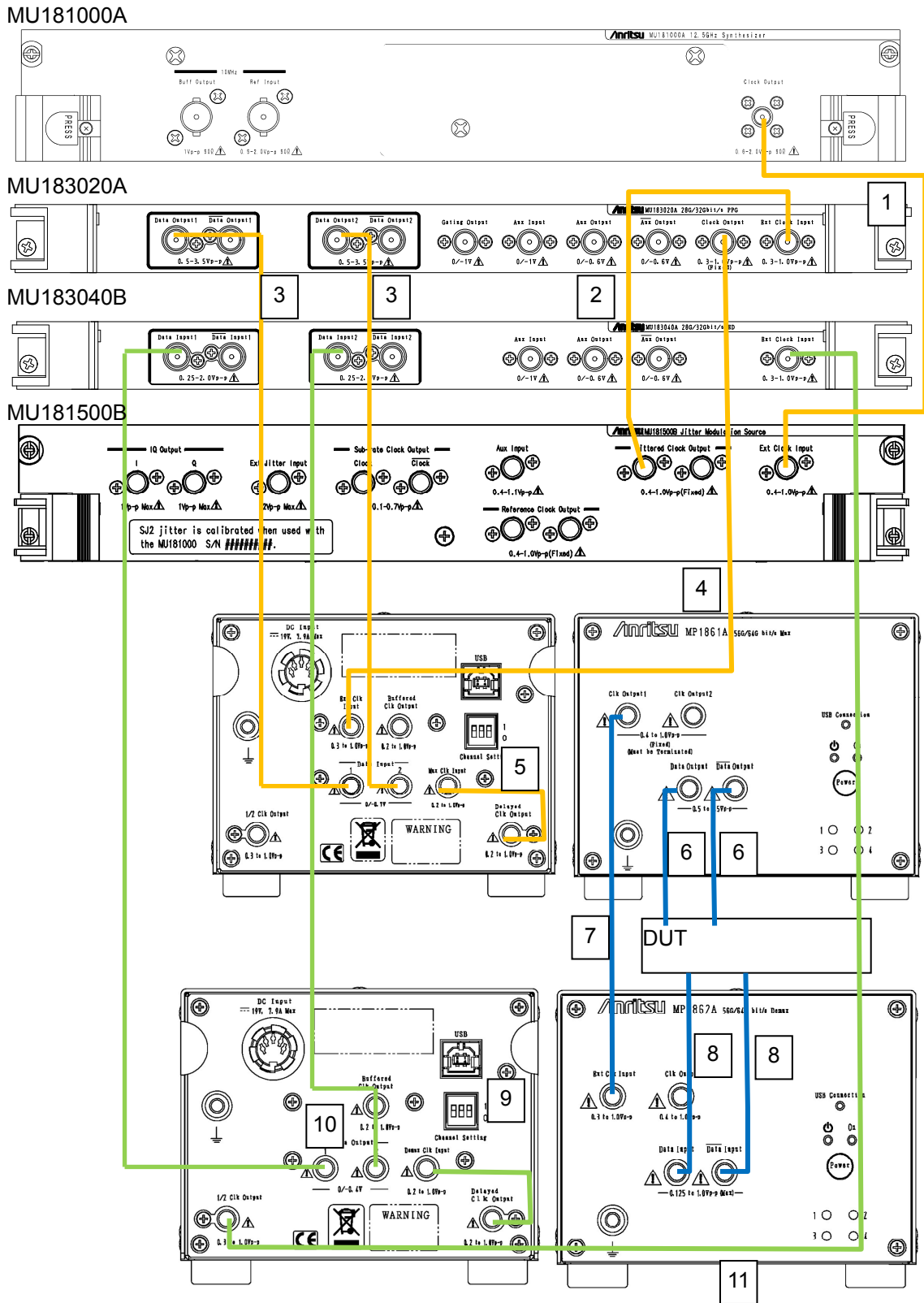
MU181500B

MU181000A

DUT (Device under test)

[Procedure]

1. Connect the **Clock Output** connector of MU181000A and the **Ext. Clock Input** connector of MU181500B by using the J1624A coaxial cable that comes with MU181000A.
2. Connect the **Jittered Clock Output** connector of MU181500B and the **Ext. Clock Input** connector of MU183020A by using the J1624A coaxial cable that comes with MU181500B.
3. Connect the **Data Input1/2** connectors on the rear panel of MP1861A and the **Data Output1/2** connectors of MU183020A respectively by using coaxial cables. The coaxial cables must be one of the following:
  - J1658A coaxial skew match pair cable that comes with MP1861A
  - Coaxial cables that are of the same length
4. Connect the **Clock Output** connector of MU183020A and the **Ext. Clock Input** connector on the rear panel of MP1861A by using the J1652A coaxial cable that comes with MP1861A.
5. Connect the **Delayed Clock Output** and **MUX Clock Input** connectors on the rear panel of MP1861A by using the J1654A cable that comes with MP1862A.
6. Connect the **Data Output** and **Data Output** connectors on the front panel of MP1861A to the DUT by using coaxial cables.
7. Connect the **Clock Output** connector on the front panel of MP1861A and the **Ext. Clock Input** connector on the front panel of MP1862A by using a coaxial cable. On the **Interface** tab of MP1862A, click **Half Rate** in the **Clock Input Band** box.
8. Connect the DUT and the **Data Input** and **Data Input** connectors on the front panel of MP1862A by using coaxial cables.
9. Connect the **Delayed Clock Output** and **DEMUX Clock Input** connectors on the rear panel of MP1862A by using the J1654A cable that comes with MP1862A.
10. Connect the **Data Output1/2** connectors on the rear panel of MP1862A and the **Data Input1/2** connectors of MU183040B respectively by using coaxial cables. The coaxial cables must be one of the following:
  - J1657A coaxial cables that come with MP1862A
  - Coaxial cables that are of the same length
11. Connect the **1/2 Clock Output** connector on the rear panel of MP1862A and the **Ext. Clock Input** connector of MU183040B by using the J1668A coaxial cable that comes with MP1862A.



3

Panel Layout and Connectors

Figure 3.2.1-1 1ch TRx Connection Example

### 3.2.2 2ch Rx connection

This section describes a connection example using two MP1862As and two MU183040Bs.

According to the following procedure, connect the equipment as shown in Figure 3.2.2-1.

[Equipment configuration]

Two MP1862As (this module)

MP1800A

Two MU183040Bs

MU181500B

MU181000A

DUT (Device under test)

[Procedure]

1. Connect the **Data Output1/2** connectors on the rear panel of each of two MP1862As and the **Data Input1/2** connectors of two MU183040Bs, respectively by using coaxial cables. The coaxial cables must be one of the following:
  - The supplied J1657A coaxial cables
  - Coaxial cables that are of the same length
2. Connect the **1/2 Clock Output** connector on the rear panel of MP1862A and the **Ext. Clock Input** connector of MU183040B by using the supplied J1668A coaxial cable.
3. Connect the **Delayed Clock Output** and **DEMUX Clock Input** connectors on the rear panel of MP1862A, by using the J1654A cable that comes with MP1862A.
4. Connect the **Data Input** and **Data Input** connectors on the front panel of MP1862A to the DUT by using coaxial cables.
5. To the **Ext. Clock Input** connector on the front panel of MP1862A, connect the clock signal to be output from a data generator like MP1861A.

Then, on the **Interface** tab of MP1862A, in the **Clock Input Band** box, click the option that matches both bit rate and clock rate to be used by MP1862A. For details on how to set the Clock Input Band, refer to 4.4.1 “Input setting items”.



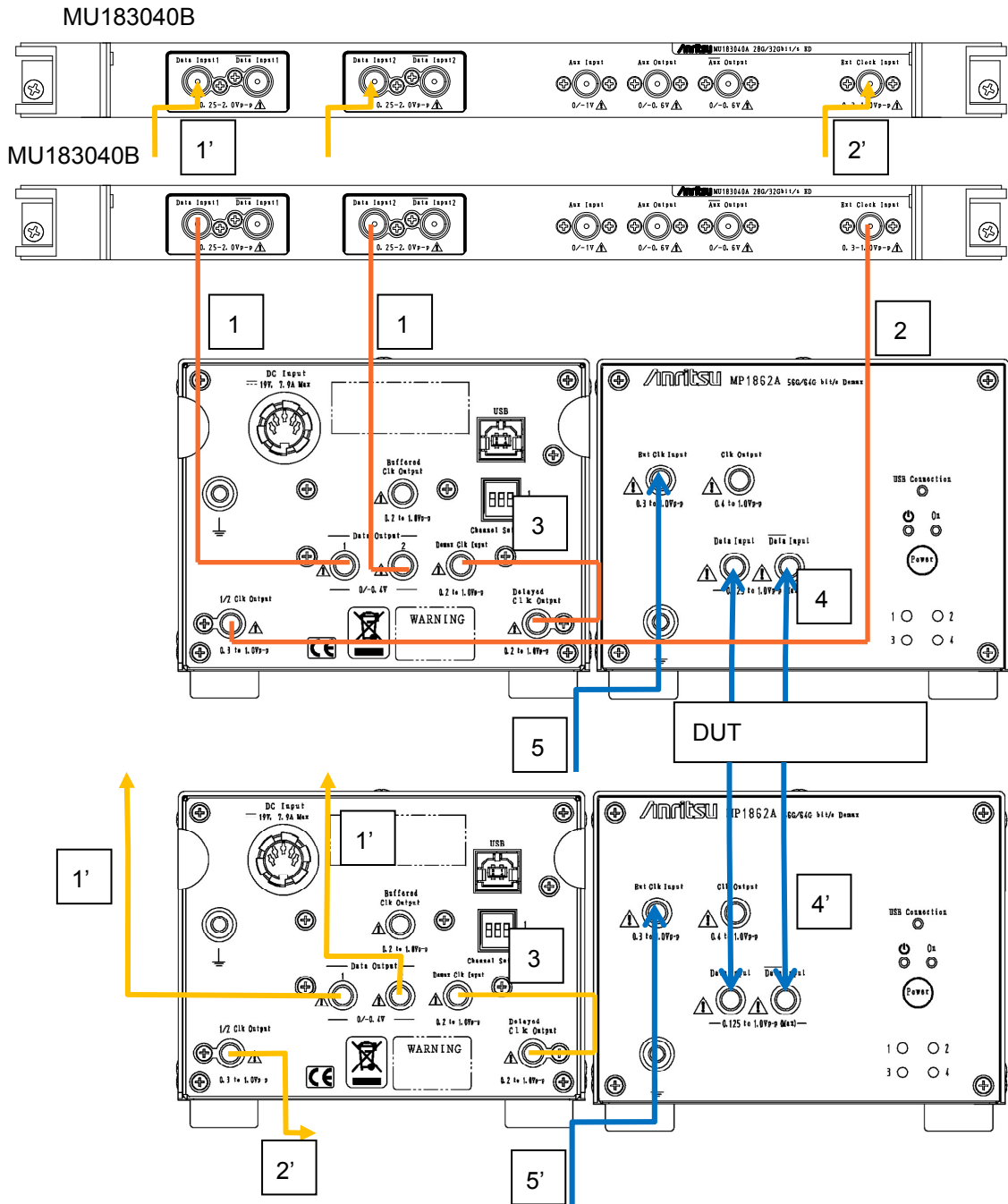


Figure 3.2.2-1 2ch Rx Connection Example

3  
Panel Layout and Connectors

### 3.2.3 1ch TRx connection for bathtub jitter measurement

This section describes a connection example for performing bathtub jitter measurement by using MP1862A, MP1861A, and MU181500B which is installed to MP1800A.

When performing bathtub jitter measurement, connect the equipment as shown in Figure 3.2.3-1 and according to the procedure below, because a clean clock (clock without jitter modulation) needs to be input to MP1862A.

[Equipment configuration]

MP1862A  
MP1861A  
MP1800A  
MU183020A-x22/x23+x31  
MU183040B  
MU181500B  
MU181000A  
DUT (Device under test)

[Procedure]

1. Connect the **Clock Output** connector of MU181000A and the **Ext. Clock Input** connector of MU181500B by using the J1624A coaxial cable that comes with MU181000A.
2. Connect the **Jittered Clock Output** connector of MU181500B and the **Ext. Clock Input** connector of MU183020A by using the J1624A coaxial cable that comes with MU181500B.
3. Connect the **Data Input1/2** connectors on the rear panel of MP1861A and the **Data Output1/2** connectors of MU183020A respectively by using coaxial cables. The coaxial cables must be one of the following:
  - J1658A coaxial cables that come with MP1861A
  - Coaxial cables that are of the same length
4. Connect the **Clock Output** connector of MU183020A and the **Ext. Clock Input** connector on the rear panel of MP1861A by using the coaxial cable.
5. Connect the **Delayed Clock Output** and **MUX Clock Input** connectors on the rear panel of MP1861A by using the J1654A cable that comes with MP1862A.
6. Connect the **Data Output** and **Data Output** connectors on the front panel of MP1861A to the DUT by using coaxial cables.
7. Connect the DUT and the **Data Input** and **Data Input** connectors on the front panel of MP1862A by using coaxial cables.

8. Connect the **Delayed Clock Output** and **DEMUX Clock Input** connectors on the rear panel of MP1862A by using the J1654A cable that comes with MP1862A.
9. Connect the **Data Output1/2** connectors on the rear panel of MP1862A and the **Data Input1/2** connectors of MU183040B respectively by using coaxial cables. The coaxial cables must be one of the following:
  - J1657A coaxial cables that come with MP1862A
  - Coaxial cables that are of the same length
10. Connect the **1/2 Clock Output** connector on the rear panel of MP1862A and the **Ext. Clock Input** connector of MU183040B by using the J1668A coaxial cable that comes with MP1862A.
11. Connect the **Reference Clock Output** connector of MU181500B and the **Ext. Clock Input** connector on the front panel of MP1862A by using a coaxial cable.

Then, on the **Interface** tab of MP1862A, in the **Clock Input Band** box, click the option that matches both bit rate and clock rate to be used by MP1862A. For details on how to set the Clock Input Band, refer to 4.4.1 “Input setting items”. For bathtub jitter measurement, refer to 4.9 “Bathtub Function”.

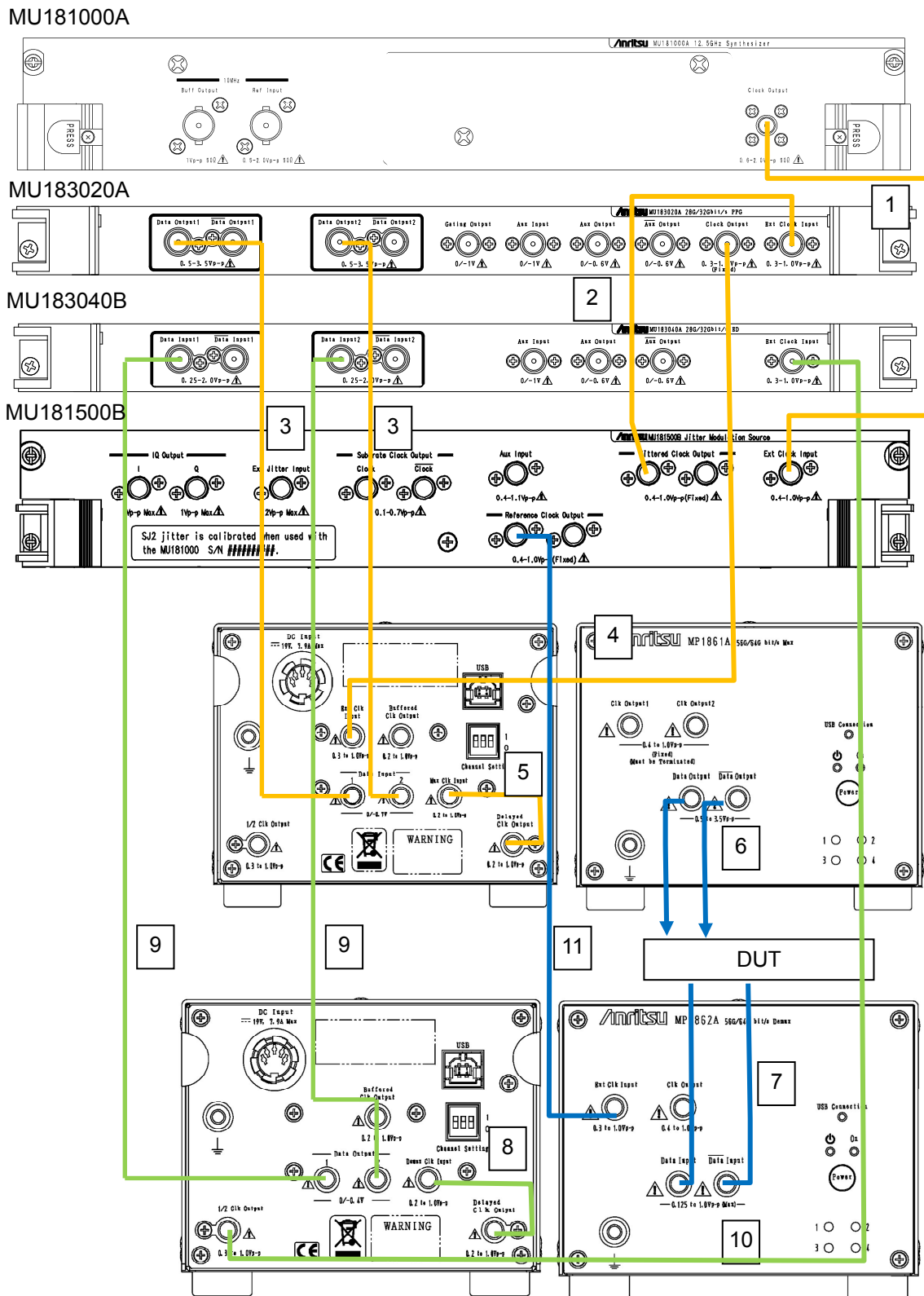


Figure 3.2.3-1 1ch TRx Connection Example (For Bathtub Jitter Measurement)

# Chapter 4 Window Operations

---

This chapter describes the items on each tab of the operation window.

4.1	Configuration of Operation Screen .....	4-2
4.2	Configuration of the Operation Window .....	4-4
4.3	Displaying Measurement Results .....	4-5
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## 4.1 Configuration of Operation Screen

This section describes the items on the operation window for MP1862A.

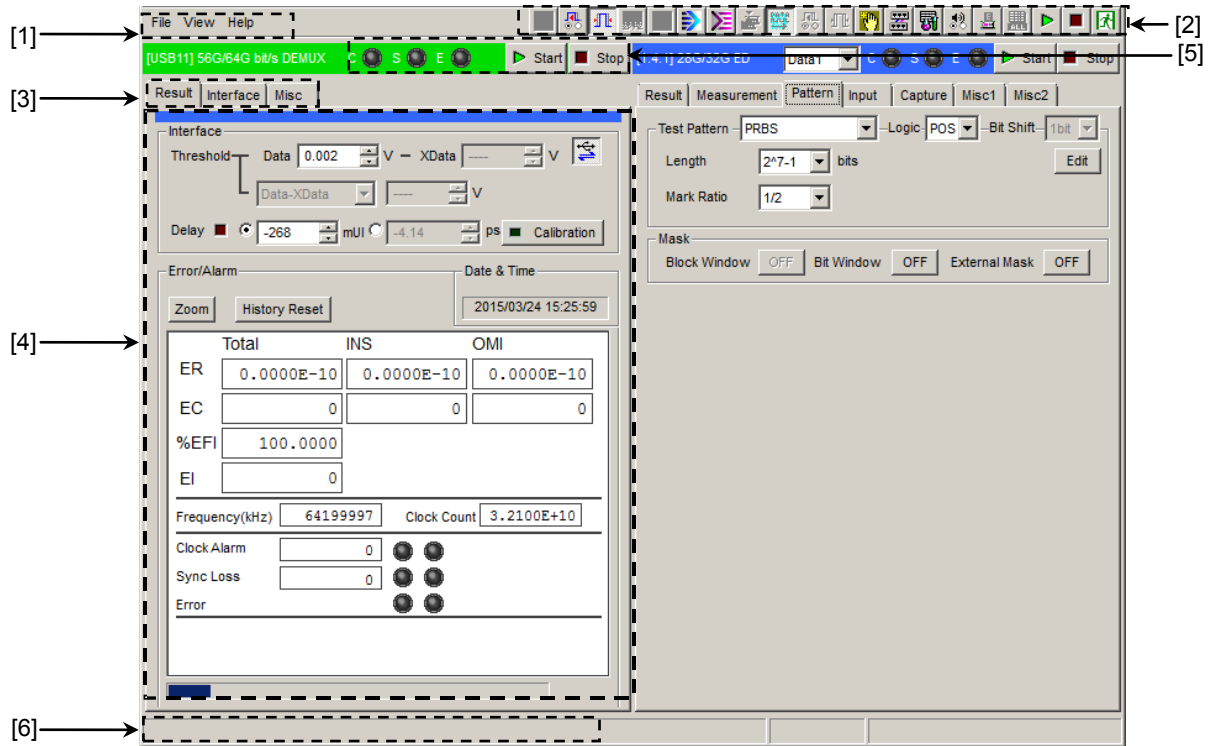



Figure 4.1-1 Overall View of Operation Screen

The operation window is composed of six blocks as shown in Figure 4.1-1. The function of each block is described in Table 4.1-1.

Table 4.1-1 Function of Each Block

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. To open the MP1862A operation window, click the <b>USB DEMUX</b> button (  ).
[3]	Function setting selection tabs	Switches the module operation tab according to the function items.
[4]	Operation window	Configures settings specific to each module.
[5]	Module common function area	Contains the following controls for functions specific to the module. Start button Stop button C: Clock Loss LED S: Sync Loss LED E: Error LED
[6]	USB connection	Displays USB connection status.

## 4.2 Configuration of the Operation Window

This section describes the tabs of the operation window for MP1862A.

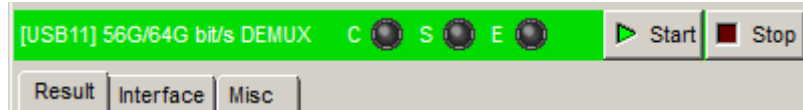


Figure 4.2-1 Function Setting Selection Tabs

Table 4.2-1 Function Setting Selection Tabs

Tab name	Function
Result	Measurement results are displayed. Tab is displayed when the MP1862A and either the MU18304xA or the MU18304xB are installed in the same main frame and 4 ch Combination is executed. In addition to the above conditions, the measurement result is displayed when the <b>DEMUX-ED Link</b> button is on.
Interface	This sets the Data/Clock input interface.
Misc	Sets whether to operate linked with the MU18304xA/B 32G ED and opens the configuration dialog box for the ED you want to operate linked with MP1862A.


Up to 4 MP1862As (CH1 to CH4) can be controlled by using one MP1800A or control PC. The operation window can be toggled one after another (CH1 to CH4) by repeatedly clicking the **USB DEMUX** button (  ).

Table 4.2-2 Channel Numbers and Title-Bar Names

Channel Number of MP1862A	Name on Title Bar
1	[USB11] 56G/64G bit/s DEMUX
2	[USB12] 56G/64G bit/s DEMUX
3	[USB13] 56G/64G bit/s DEMUX
4	[USB14] 56G/64G bit/s DEMUX



## 4.3 Displaying Measurement Results

To display the measurement results, click the **Result** tab on the operation window. The **Result** tab consists of the setting area (upper) and the result display area (lower). You can view the measurement results while checking the setting items of the MP1862A.

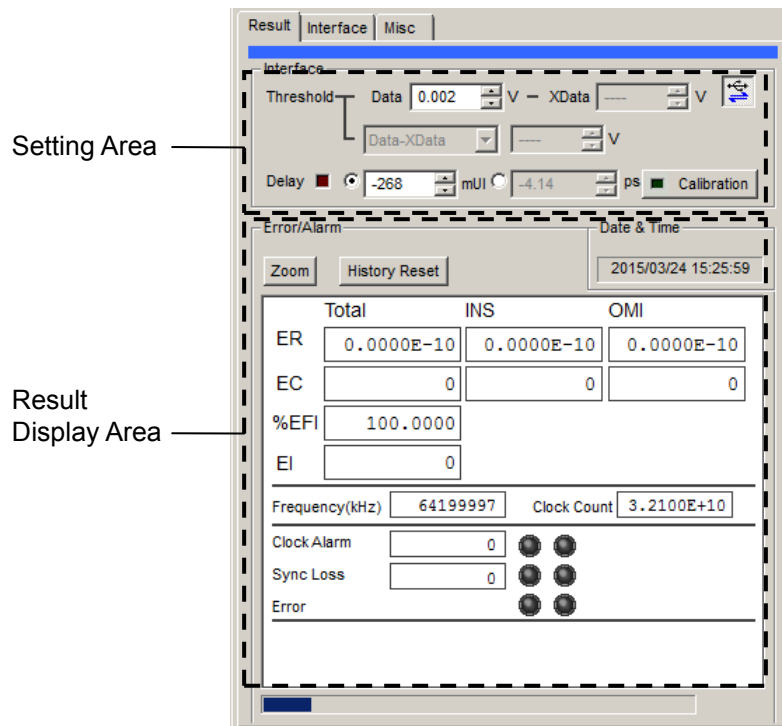


Figure 4.3-1 Result Tab

In the setting area, you can view the settings configured on the **Interface** tab.

### 4.3.1 Interface setting items

The setting items are limited by the input conditions set on the **Interface** tab of the module operation window. For details, refer to 4.4.1 “Input setting items”.

In addition, MP1862A and ED module can be linked depending on the settings using the **DEMUX-ED Link** button.

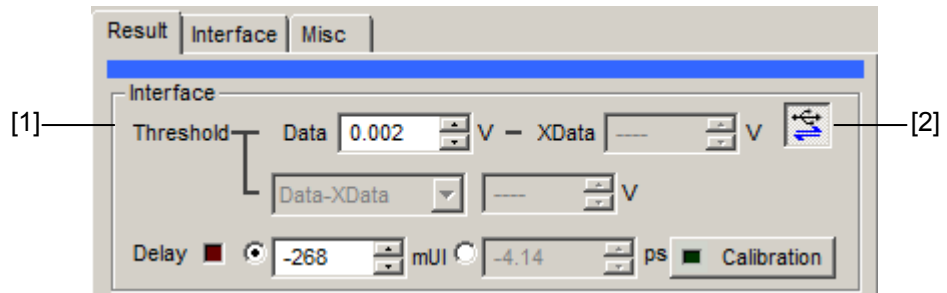


Figure 4.3.1-1 Interface setting items

- [1] The Data or XData input threshold voltage and phase can be changed while checking the measurement results.
- [2] This switches the linkage between the MP1862A and ED module. When the **DEMUX-ED Link** button is on, the measurement result for the ED module is displayed in the result window of the MP1862A. The button status is displayed as Link ON, Link OFF and Unavailable as shown from the left in Figure 4.3.1-2.



Figure 4.3.1-2 DEMUX-ED Link Button

### 4.3.2 Error/Alarm Result Displays

Measurement results are displayed only when both of the following conditions are met:

- MP1862A is connected to MP1800A to which MU183040A/B or MU183041A/B is installed.
- The DEMUX-ED Link button is on.

When the **DEMUX-ED Link** button is off, hyphens are displayed instead of measurement results. The **DEMUX-ED Link** button is available only when MU18304xA/B is in the 2ch Combination state.

In this area, measurement results obtained from MU183040A/B or MU183041A/B are compiled and displayed.

This section explains the measurement results when installing the following mainframe and modules.

Mainframe: MP1862A  
 MP1800A-015  
 Slot4: MU183040A or MU183040B Data1-2 2ch Combination

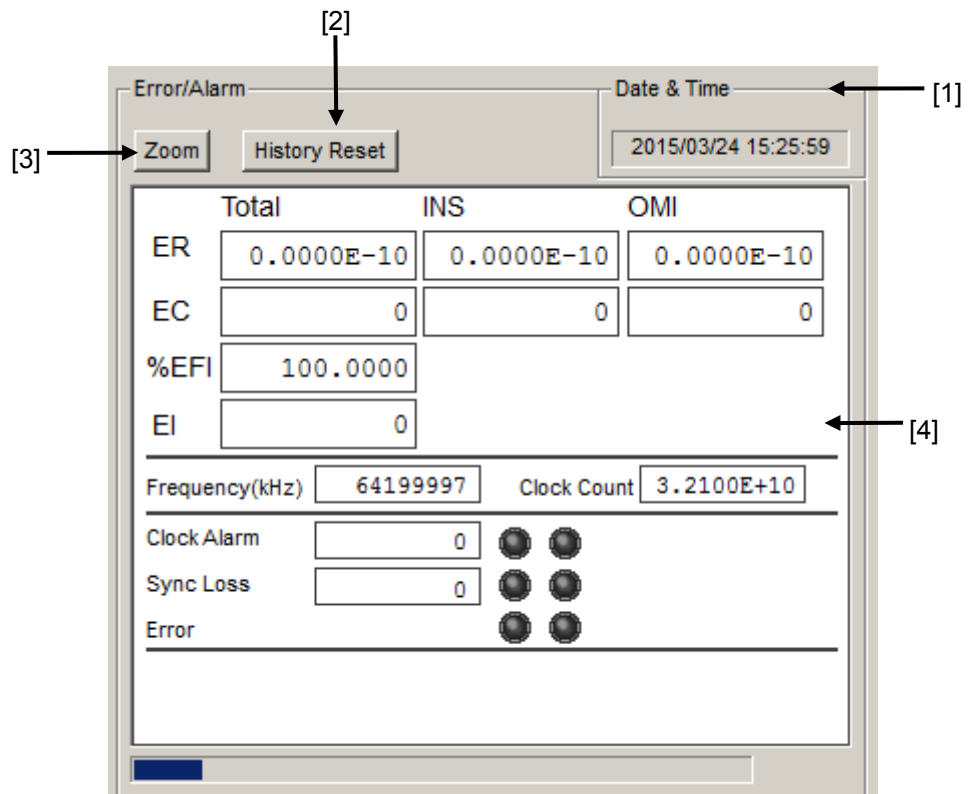


Figure 4.3.2-1 Items when Error/Alarm selected

- [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] Measurement results  
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.

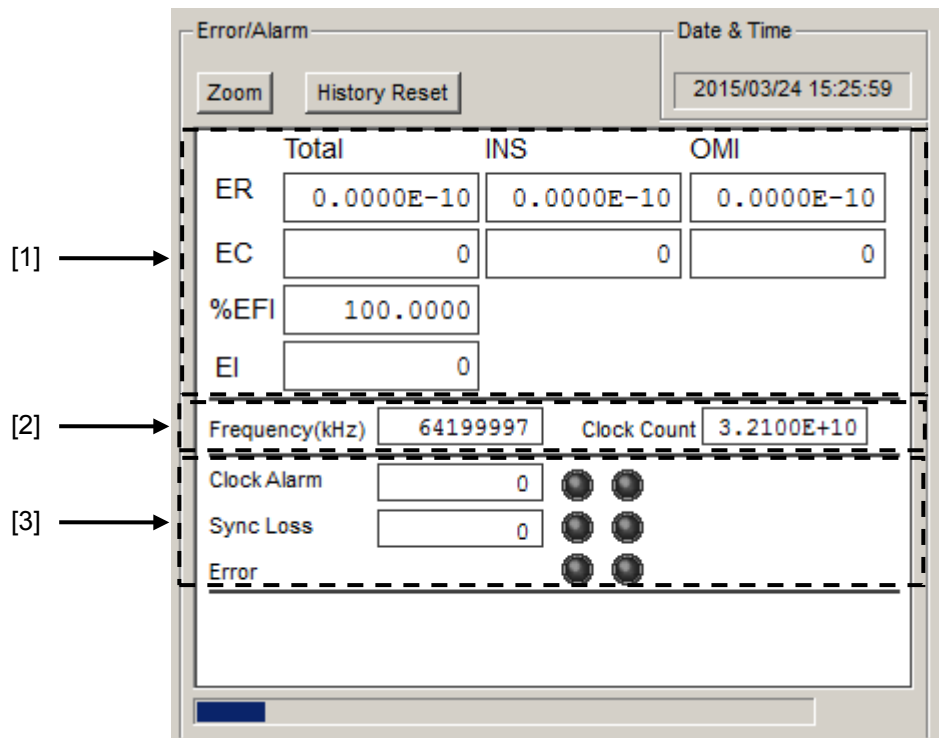


Figure 4.3.2-2 Measurement Result Display window

Table 4.3.2-1 Configuration of Measurement Result Display window

Item		Function
[1]	ER	Displays the total error rate of MU183040A/B Slot4 Data1-2.
	EC	Displays the total error count of MU183040A/B Slot4 Data1-2.
	%EFI	Displays the total %EFI (Error Free Interval) of MU183040A/B Slot4 Data1-2.
	EI	Displays the total EI (Error Interval) of MU183040A/B Slot4 Data1-2.
[2]	Frequency	Displays the total frequency of MU183040A/B Slot4 Data1-2.
	Clock Count	Displays the total clock count of MU183040A/B Slot4 Data1-2.
[3]	Clock Alarm	Displays the number of clock alarm intervals of MU183040A/B Slot4 Data1-2. Also displays alarms using indicators. Red: Current data Yellow: History data
	Sync Loss	Displays the number of sync loss intervals in MU183040A/B Slot4 Data1-2. Also displays alarms using indicators. Red: Current data Yellow: History data
	Error	Displays the error status of MU183040A/B Slot4 Data1-2. Red: Current data Yellow: History data

When the enlarged display is set (**Zoom** is selected), the items shown in Table 4.3.2-2 are displayed in the result display area with Error/Alarm selected.

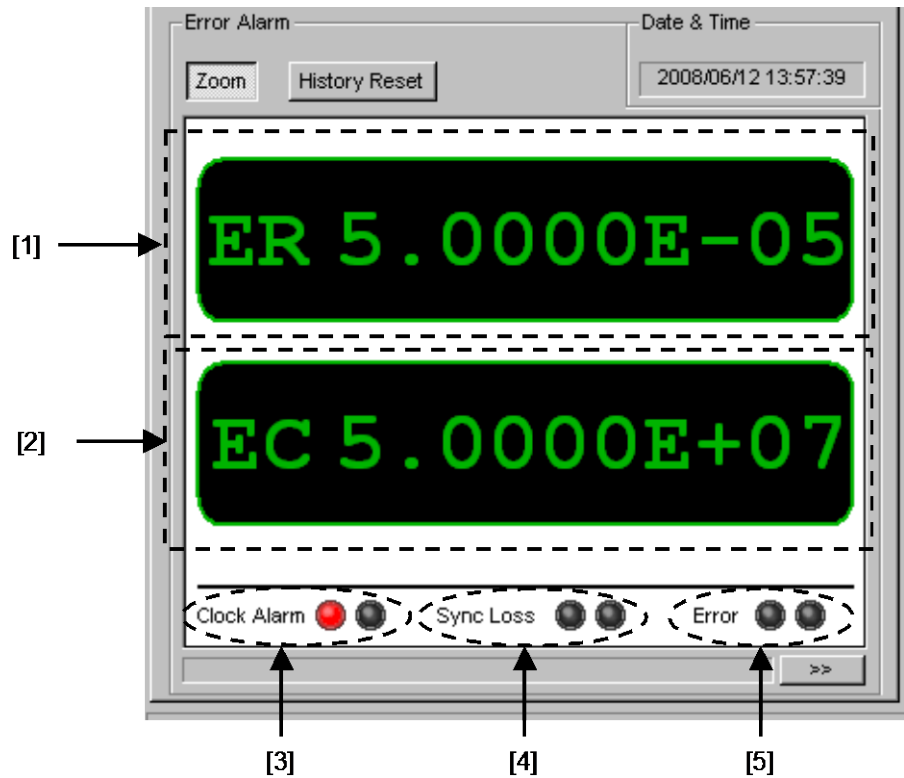


Figure 4.3.2-3 Measurement Result Screen Configuration when Selecting Zoom

Table 4.3.2-2 Measurement Result Screen Configuration when Selecting Zoom

Item		Function
[1]	ER	Displays the total error rate of MU183040A/B Slot4 Data1-2.
[2]	EC	Displays the total error count of MU183040A/B Slot4 Data1-2.
[3]	Clock Alarm	Displays the clock alarm status of MU183040A/B Slot4 Data1-2. Red: Current data Yellow: History data
[4]	Sync Loss	Displays the sync loss of MU183040A/B Slot4 Data1-2. Red: Current data Yellow: History data
[5]	Error	Displays the error status of MU183040A/B Slot4 Data1-2. Red: Current data Yellow: History data

## 4.4 Setting Input Interface

To set the Input interface, click the **Interface** tab on the operation window.

### 4.4.1 Input setting items

The **Interface** tab consists of the data setting area (upper) and the clock setting area (lower). The Data signal is input to the **Data Input** connector of MP1862A and the XData signal is input to the **Data Input** connector. The following explains the XData settings related to the **Data Input** connector.

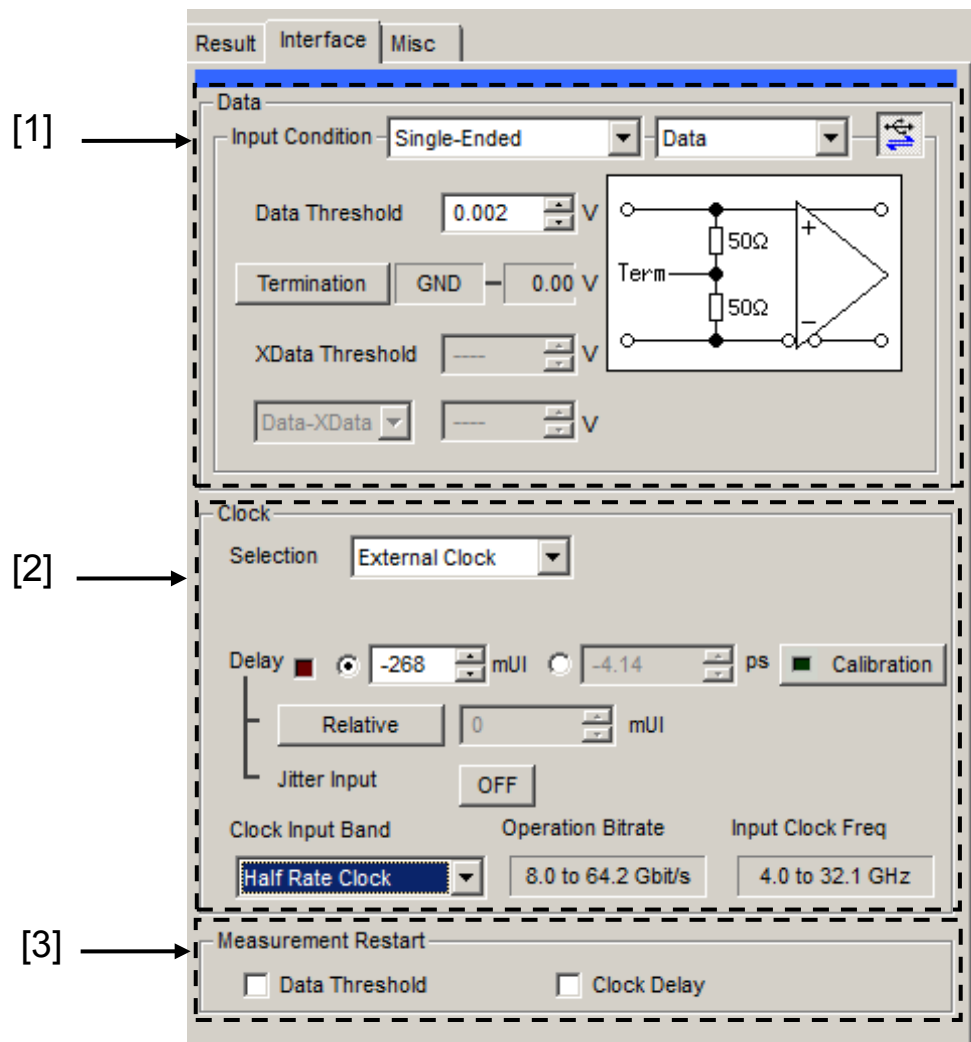
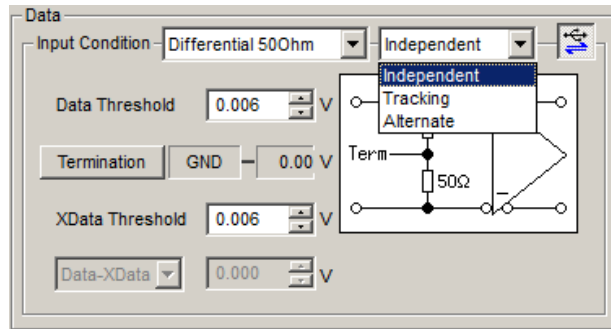


Figure 4.4.1-1 Interface Tab

[1] Set the data input conditions.

- When the Input Condition is Differential 50Ohm



- When the Input Condition is Single-Ended

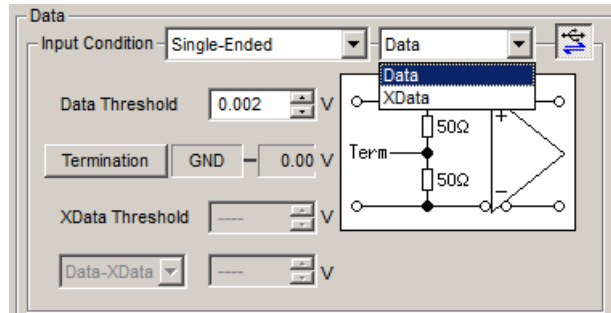


Figure 4.4.1-2 Setting Data input conditions

Table 4.4.1-1 Data input condition setting items (Input Condition)

Data input condition setting items		Description	
Differential 50 Ohm, Differential 100 Ohm	Independent	Uses Data and XData as the differential input. Thresholds for Data and XData can be changed independently.	
	Tracking	Uses Data and XData as the differential input. The threshold for XData tracks the setting for Data.	
	Alternate	Data-XData	Sets the threshold for the difference between Data and XData, using Data as a reference.
		XData-Data	Sets the threshold for the difference between XData and Data, using XData as a reference.
Single-Ended	Data	Uses the Data side as single-ended input.	
	XData	Uses the XData side as single-ended input.	



## CAUTION

Be sure to connect the supplied protection cap (J1363A) to the data input connector you don't use when the data input condition is set to Single-ended.

Operating while signal is input to the unused connector can cause malfunction.

Table 4.4.1-2 Data input condition setting items

Data Termination setting items		Description
Differential 100Ohm	–	When the input connector is open, the midpoint of the Data terminator (50 Ω) and the XData terminator (50 Ω) is connected to the ground through a high resistance for equipment safety.
Differential 50 Ohm	GND	Terminated at 50 Ω/GND
Single-Ended	Variable	Terminates into a setting voltage in the range of 50 W/–2.5 to +3.5 V, in 10 mV steps.

4

Window Operations

## CAUTION

- Avoid feeding excessively high current to the internal termination resistor of MP1862A. Failure to do so may degrade the performance or cause a malfunction.
- If a differential signal is input to each of the Data and XData connectors when Single-Ended is clicked in the Input Condition box, the threshold margin will be doubled.

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. If <b>Differential 50Ohm</b> or <b>Differential 100Ohm</b> is clicked in the <b>Input Condition</b> box, values for <b>Data Threshold</b> and <b>XData Threshold</b> are restricted so that the difference (absolute value) of them can be within 3.000 V.
Data-XData XData-Data	Set in range of –3.000 to +3.000 in 0.001-V steps.

[2] Set the Clock input conditions.

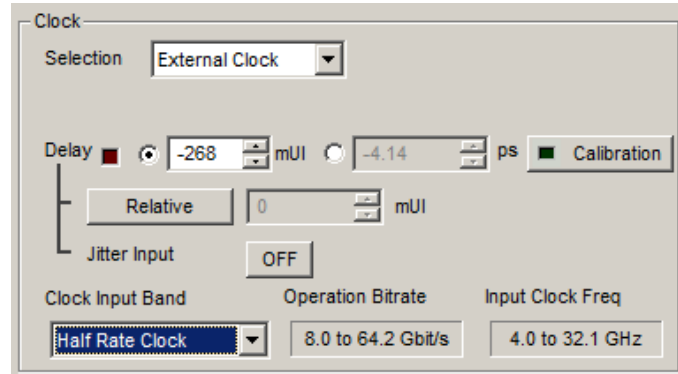


Figure 4.4.1-3 Clock Input Setting

Table 4.4.1-4 Composition of Clock Input Setting Screen

Setting items		Description	
Clock Input Band	Auto / Manual	Auto: Sets bit rate of input data and performs measurement automatically Manual: Sets bit rate of input data manually This setting can be used when measuring Burst data.	
Clock Input Band	Range of Operation Bitrate	Input Clock Freq value (Display)	Relationship Between Bitrate and Clock
Half Rate Clock	8.0 to 64.2Gbit/s	4.0 to 32.1GHz	Operates at a 1/2 clock.
Quarter Rate Clock	>25 to 50Gbit/s	>6.25 to 12.5GHz	Operates at a 1/4 clock.
One eighth Rate Clock	>50 to 64.2Gbit/s	>6.25 to 8.025GHz	Operates at a 1/8 clock.

Table 4.4.1-4 Composition of Clock Input Setting Screen (Cont'd)

Setting items		Setting items
Delay	mUI	Sets a delay in the range of -1000 to 1000 mUI, in 4 mUI steps. This module operates based on UI units. Increasing the numeric value increases the delay.
	ps	Sets a delay in steps of ps units, equivalent to 4 mUI. The setting range is the equivalent to the range of -1000 to 1000 mUI that is converted into ps units. 64 GHz: -15.6 to 15.6 ps 56 GHz: -17.8 to 17.8 ps 25 GHz: -40 to 40 ps When the red frequency counter value range is incorrect, "----" is displayed.
	Calibration	Clicking <b>Calibration</b> executes self calibration. When the alarm indicator on the button is red, calibration should be performed. Sometimes, the delay time may be changed greatly by executing calibration, so take care when performing calibration during measurement.
	Relative	Clicking <b>Relative</b> sets the current delay in 4-mUI steps relative to the reference value of 0 mUI. When <b>Relative</b> is clicked again, the setting is converted from the relative value to the current delay value.
	Jitter Input	Sets whether to input jitter. To perform jitter tolerance test while inputting jitter-modulation applied clock, this button must be ON. Refer to 4.4.2 "When inputting jitter-modulated signals" for details.

**Notes:**

- When the frequency or the temperature condition is changed, the alarm indicator on **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.
- Values displayed in ps units vary as the frequency changes, because the MP1862A sets phases in mUI units as an internal standard.
- The phase setting accuracy varies depending on the option selected in the **Pattern Sequence** box of the **Misc1** tab for MU183040A/B. If **Burst** is selected, the phase setting accuracy becomes lower than that of when **Repeat** is selected.

- When inputting a jitter-modulated clock while Jitter Input of Delay is OFF, sometimes, the phase becomes unstable.
- When inputting a jitter-modulated clock, if the Delay lamp is lit, sometimes, the phase setting error becomes large.
- When inputting a signal to this module, do not input a voltage exceeding the specified value, otherwise the circuits may be damaged.
- As countermeasure to static electricity, before connecting to an input connector, always ground the other equipment (including test circuit).
- 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.
- During Auto Search execution, the delay amount of **Delay** is always changed in order to drive the clock phase to the optimum point. Therefore, the alarm indicators of **Delay** and **Calibration** light up in red continuously. This is not abnormal.

- [3] Select the measurement restart conditions.

This can be selected when the MP1862A and either the MU183040A/B or the MU183041A/B are installed in the same main frame, 4 ch Combination is executed, and the **DEMUX-ED Link** button is on.

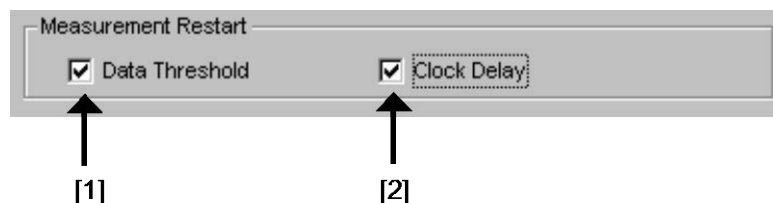


Figure 4.4.1-4 Setting Screen for Measurement Restart Conditions

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. (Refer to 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.

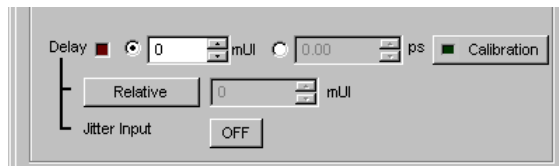


Figure 4.4.2-1 Clock delay setting items

**Notes:**

- When jitter-modulated clock is input while **Jitter Input** of Delay is set to **OFF**, the phase may become unstable.
- The Delay lamp may light up when a jitter-modulated clock signal is input. In addition, phase setting error may increase.
- 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.

Table 4.4.2-1 Jitter Input setting and use

Jitter Input	Use
ON	Jitter Tolerance Measurement BER measurement when jitter amount applied to clock signal is big. (Delay is unstable when <b>Jitter Input</b> is <b>OFF</b> .)
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 located on the **Auto Search** module function button, **Auto Search(32G)** is displayed for help.



Figure 4.5-1 Auto Search Button

The Auto Search function is available only when all of the following conditions are met:

- MP1862A is connected to MP1800A to which MU183040A/B or MU183041A/B is installed.
- MU18304xA/B is in the 2ch Combination state.
- The **DEMUX-ED** button is on.

### 4.5.1 Input setting items in Auto Search dialog box

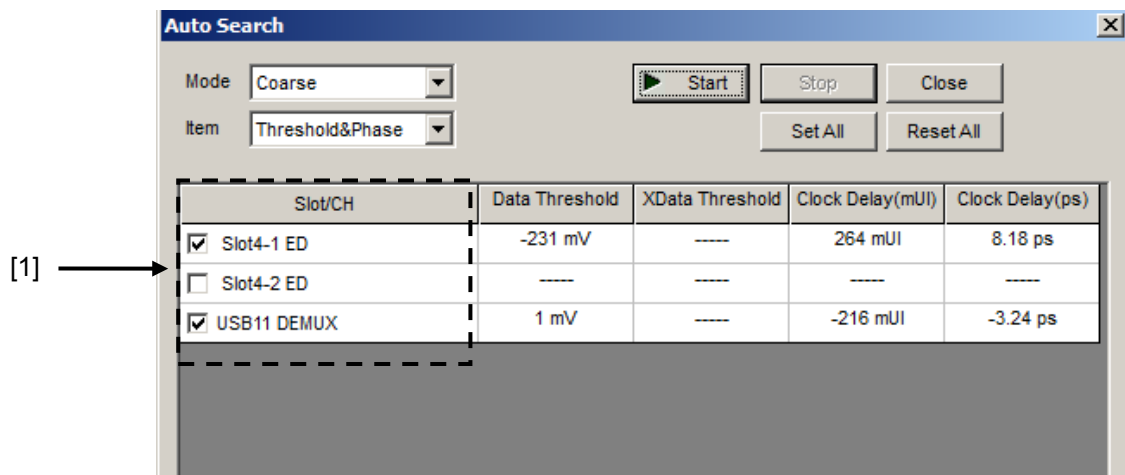


Figure 4.5.1-1 Auto Search Window

- [1] Select the check box for the USB number where Auto Search is to be executed.

To use Auto Search, refer to Section 5.8 “Auto Search” in the *MU183040A/B Operation Manual*.

## 4.6 Capture Function

To capture and analyze the input test pattern data, click **Capture** on the **Capture** tab for MU183040A/B or MU183041A/B.

It is possible to perform the Capture analysis using 2ch Combination coupled with the MP1862A.

To use Capture Function, refer to Section 5.5 “Capturing Test Patterns” in the *MU183040A/B Operation Manual*.



## 4.7 Eye Margin Measurement

At Eye Margin measurement, the phase and threshold voltage margins are measured from the eye diagram input to the MP1862A as follows.

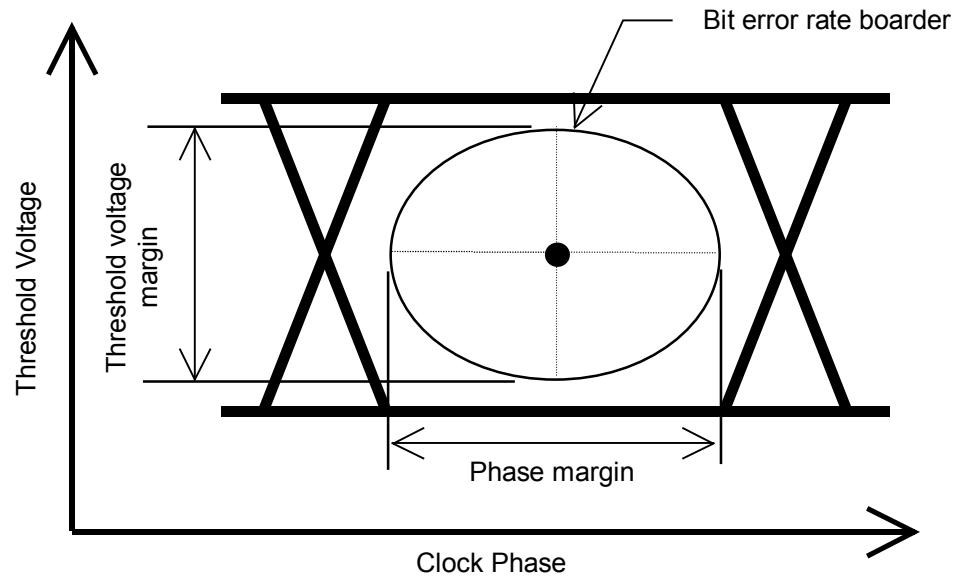


Figure 4.7-1 Eye Margin Measurement

The Eye Margin measurement for 64 Gbit/s input data is available only when all of the following conditions are met:

- MP1862A is connected to MP1800A to which MU183040A/B or MU183041A/B is installed.
- MU18304xA/B is in the 2ch Combination state.
- The **DEMUX-ED** button is on.

To use the Eye Margin measurement function, click the **Auto Measurement** module function button, and then select **Eye Margin(32G/64G)**. Refer to the *MX180000A Signal Quality Analyzer Control Software Operation Manual* for details.

### 4.7.1 EyeMargin window

Figure 4.7.1-1 shows the EyeMargin window.

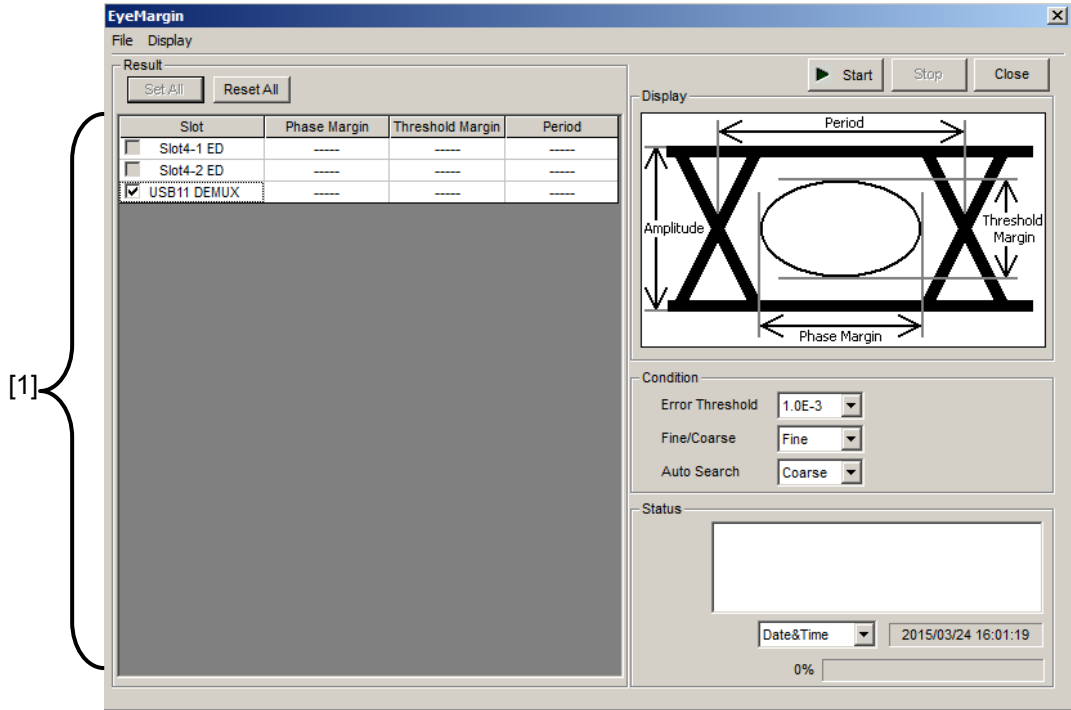


Figure 4.7.1-1 EyeMargin Window

- [1] Select the check box for the USB number you want to measure.  
To use Eye Margin Measurement, refer to Section 5.10 “Auto Adjust” in the *MU183040A/B Operation Manual*.

## 4.8 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.

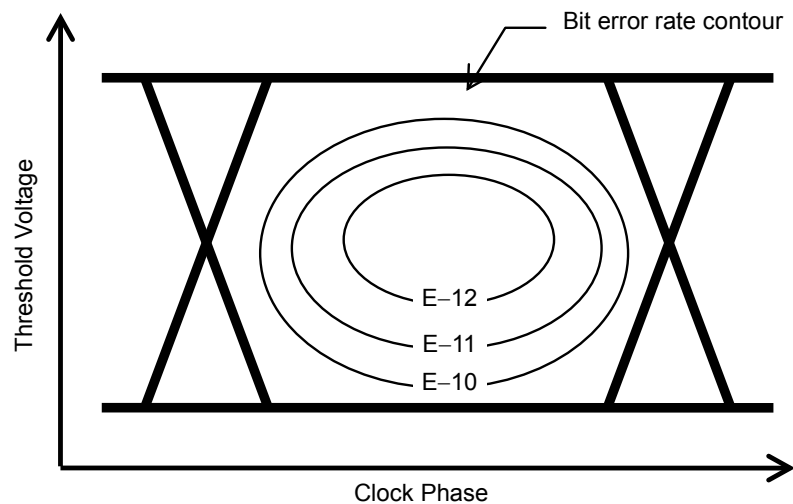


Figure 4.8-1 Schematic Diagram of Eye Diagram Measurement

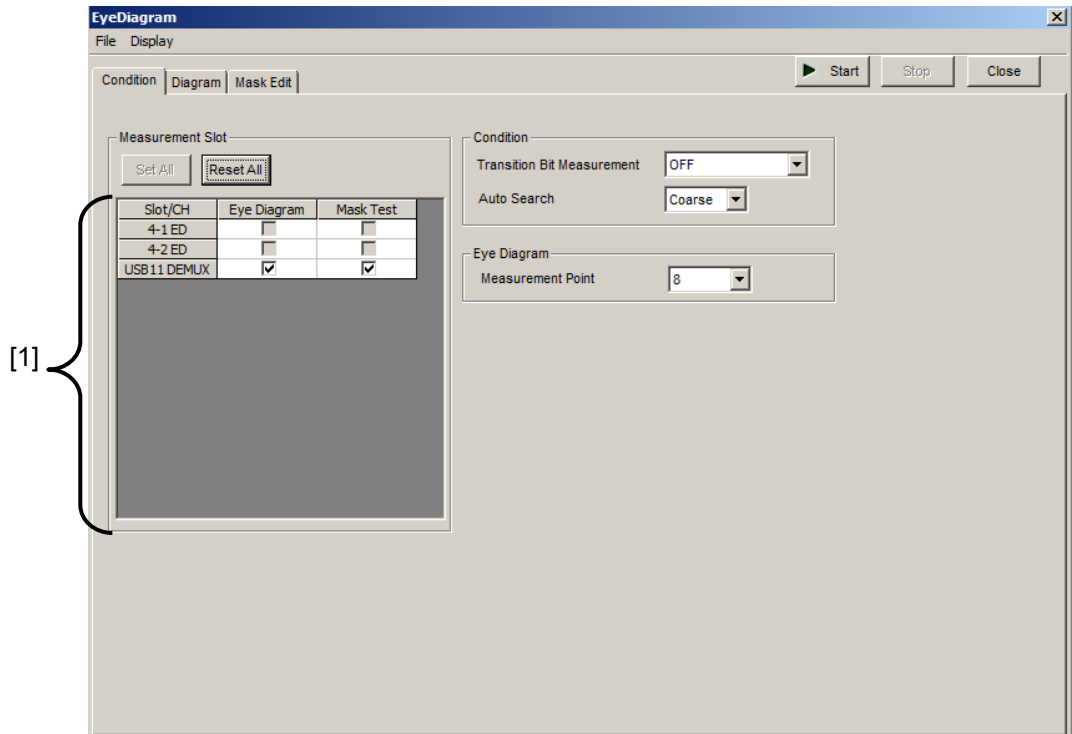
The Eye Diagram measurement for 64 Gbit/s input data is available only when all of the following conditions are met:

- MP1862A is connected to MP1800A to which MU183040A/B or MU183041A/B is installed.
- MU18304xA/B is in the 2ch Combination state.
- The **DEMUX-ED** button is on.

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.

### 4.8.1 Eye Diagram Screen (Condition Tab)

Figure 4.8.1-1 shows the **Condition** tab.



**Figure 4.8.1-1 Condition Tab**

- [1] Select the check box for the USB number you want to measure.  
To use Eye Diagram, refer to Section 5.11 “Eye Diagram Measurement” in the *MU183040A/B Operation Manual*.

### 4.8.2 Eye Diagram Screen (Diagram Tab)

Figure 4.8.2-1 shows the Diagram tab.

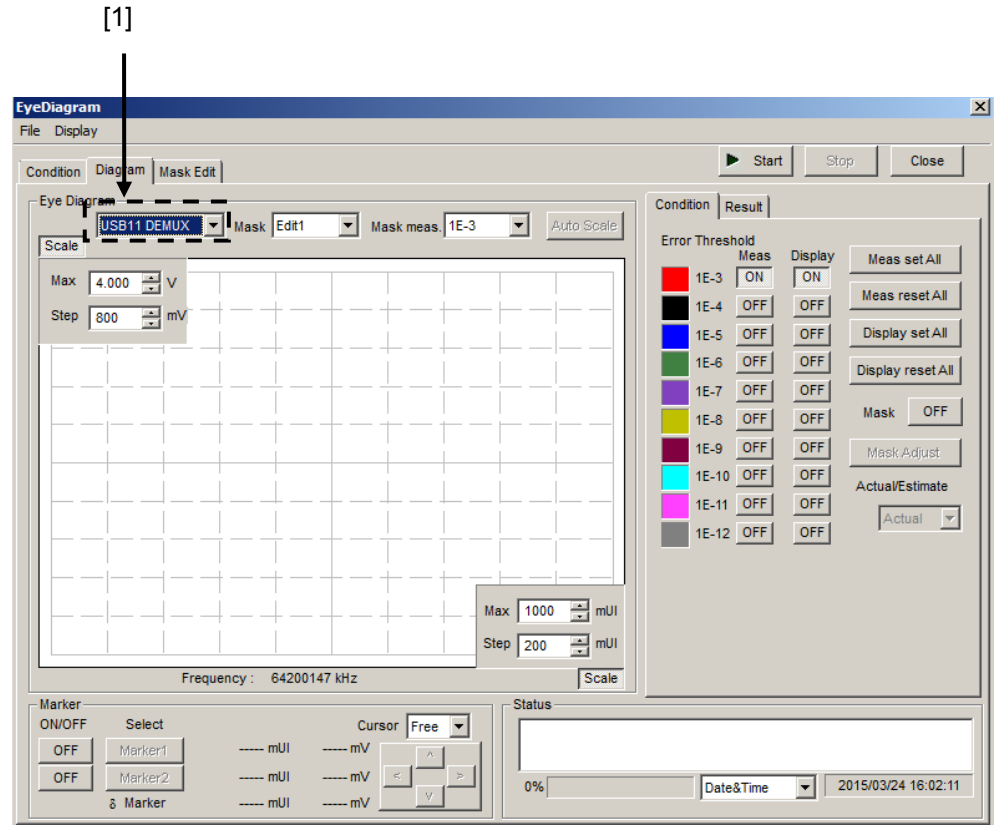


Figure 4.8.2-1 Diagram Tab

[1] Select the USB number you want to measure.

To use Eye Diagram, refer to Section 5.11 “Eye Diagram Measurement” in the *MU183040A/B Operation Manual*.

## 4.9 Bathtub Function

The Bathtub measurement for 64 Gbit/s input data is available only when all of the following conditions are met:

- MP1862A is connected to MP1800A to which MU183040A/B or MU183041A/B is installed.
- MU18304xA/B is in the 2ch Combination state.
- The DEMUX-ED button is on.

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

## 4.9.1 Displaying Bathtub measurement results in Bathtub window

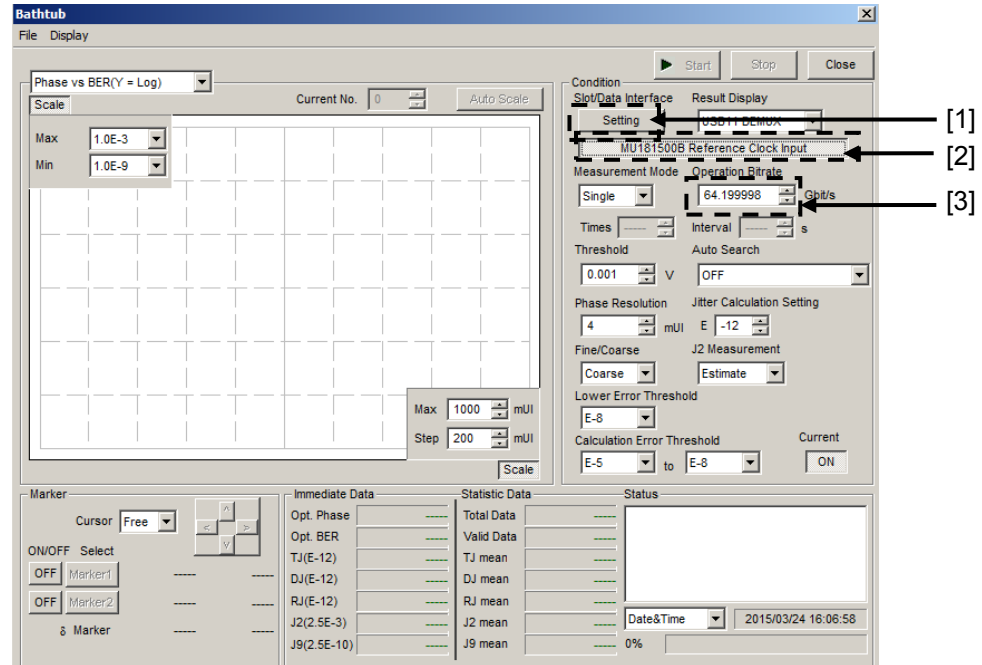


Figure 4.9.1-1 Bathtub Window

- [1] Opens the **Measurement Target** dialog box, where you can select the Slot or USB number(s) you want to measure.
- [2] To perform bathtub jitter measurement, click **MU181500B Reference Clock Input** to display the **Operation Bit Rate**. Connect the equipment, as indicated on the screen or referring to Section 3.2.3. (Clean clock without jitter modulation added must be input to MP1862A.)
- [3] Sets the operation bitrate.

Refer to Section 5.12 “Bathtub Function” in the MU183040A/B Operation Manual for the following:

- Bathtub measurement without jitter applied
- How to set the parameters other than [1], [2] and [3] in the Bathtub window
- How to perform bathtub measurement

## 4.10 Multi Channel Functions

MU183040A/B and MU183041A/B provide the Multi-channel functions that can generate data combining outputs from multiple channels.

The Multi-channel functions include the Combination and Channel Synchronization functions.

Available functions vary depending on model and its option.

Combination Function Types

- (1) 4ch Combination: MU183041A/B
- (2) 2ch Combination: MU183040A/B-x20, MU183041A/B

**Table 4.10-1 Multi-channel functions that the respective models support**

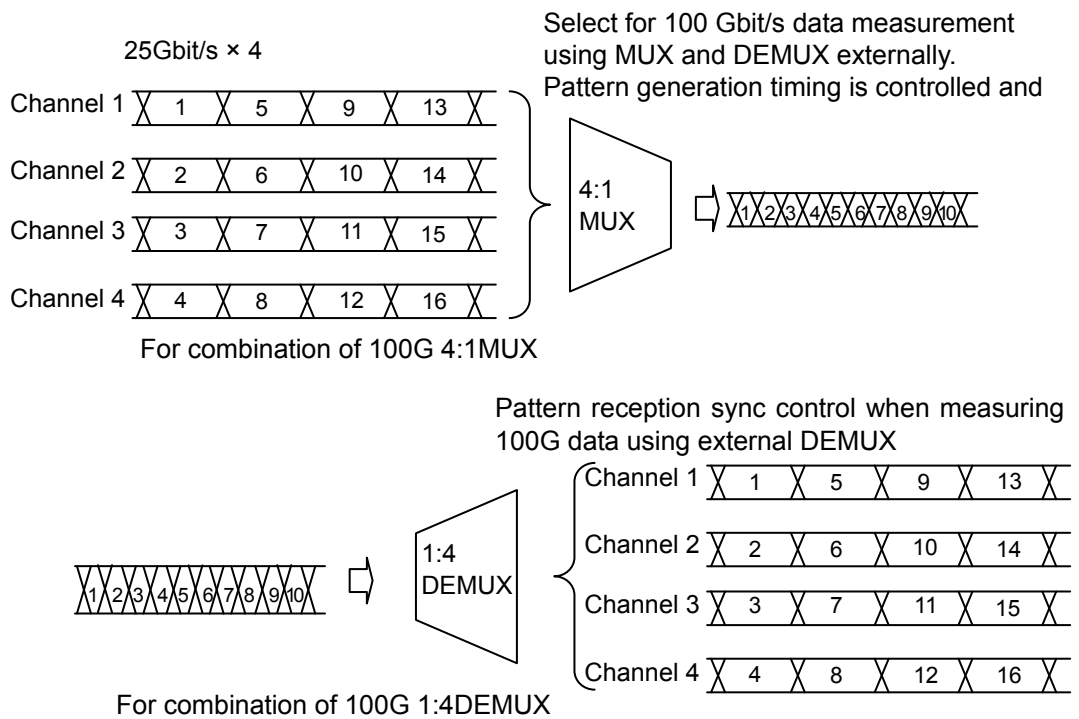
<b>Model/Option</b>	<b>2ch Combi</b>	<b>4ch Combi</b>
MU183040A MU183040B		
MU183040A-x20 MU183040A-x20	√	
MU183041A	√	√



### 4.10.1 Combination function

The Combination function can synchronize generation or reception of patterns among channels of MU183020A/MU183021A and MU183040A/MU183041A and evaluate 40 Gbit/s application and 100 Gbit/s application.

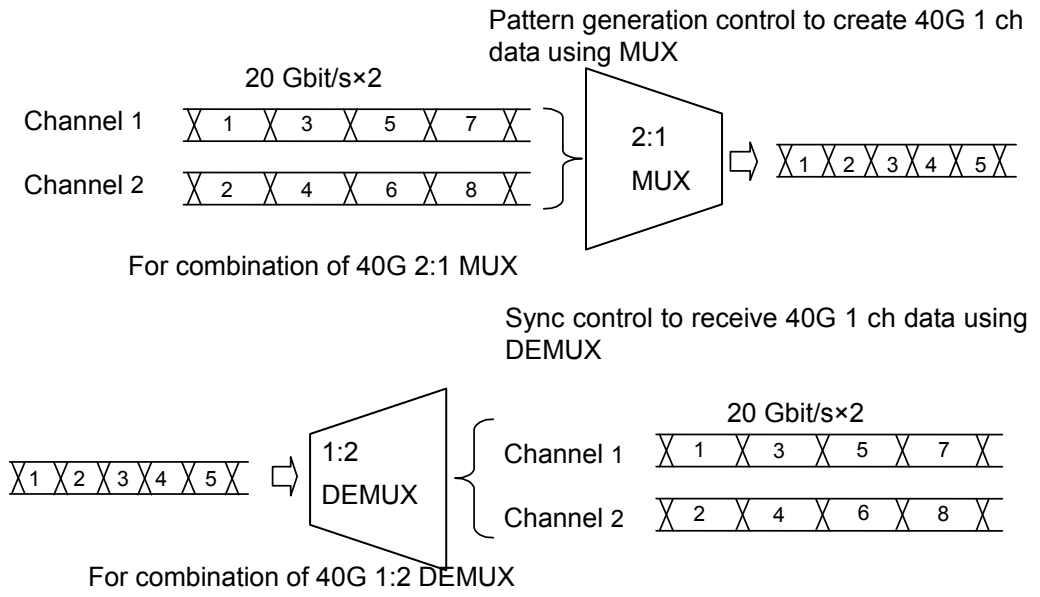
By combining four 28 Gbit/s channels by the MU183021A, the serial data at 111.8 Gbit/s of OTU4 (Optical channel Transport Unit 4) can be generated.



**Figure 4.10.1-1 4ch Combination pattern generation/reception**

By combining two channels of 20 Gbit/s data, 40 Gbit/s serial data that is bit rate of 40 GbE or OTU3 can be generated.

Different from the conventional method of combining four 10 Gbit/s data, this function can evaluate multiple DUTs by using a single MP1800A or MT1810A



**Figure 4.10.1-2 2ch Combination pattern generation/reception**

### 4.10.2 Combination Setting

The Multi Channel function synthesizes patterns among channels of MU183040A/41A/40B/41B, and enables reception synchronization. This enables the evaluation of the 100 Gbit/s application and 40 Gbit/s application.

Combination Function Types

- (1) 4ch Combination: MU183041A/B
- (2) 2ch Combination × 2: MU183041A/B
- (3) 2ch Combination: MU183041A/B or MU183040A/B-x20

Combination function measures bit error by synthesizing bit sequences that multiple channels receive.

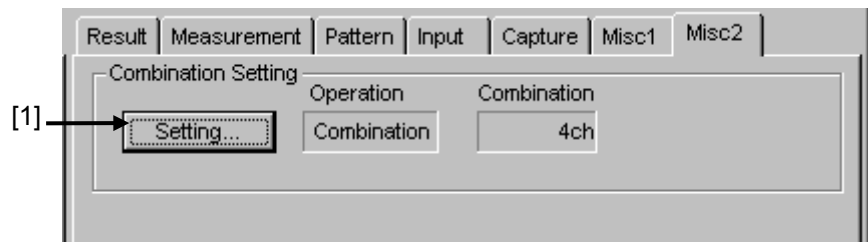


Figure 4.10.2-1 Combination Setting window

- [1] Opens the **Combination Setting** dialog box.

The contents of the dialog box vary, depending on the model or option.

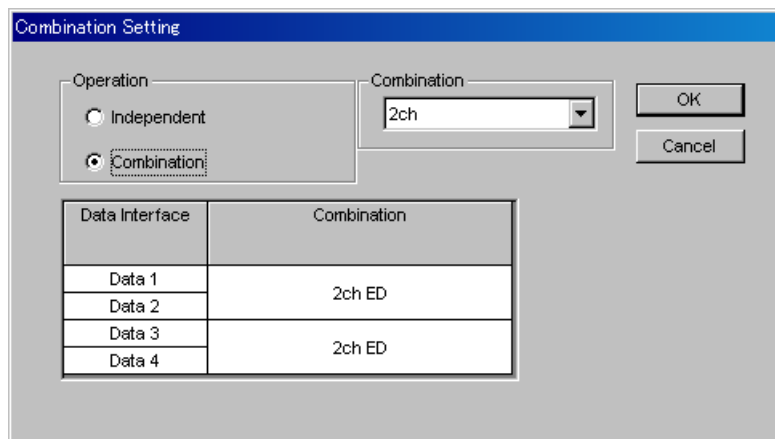


Figure 4.10.2-2 Combination Setting dialog box

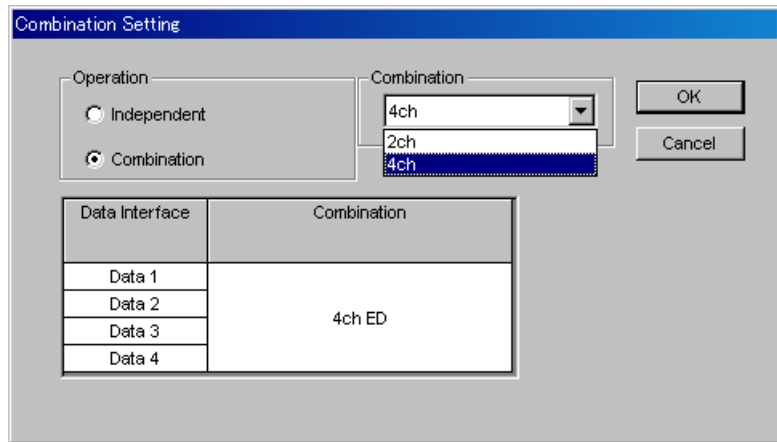


Figure 4.10.2-3 Combination Setting dialog box

Table 4.10.2-1 Screen Layout of Combination Setting

Operation setting items		Description
Independent		Operates each channel of MU183040A/B or MU183041A/B independently.
Combination	2ch	Synchronizes two channels of MU183040A/B-x20 or MU183041A/B.
	4ch	Synchronizes four channels of MU183041A/B.

To confirm the operation settings you made, click **OK**.

By selecting **Combination**, buttons to select channels are displayed in the ED window.

## *Chapter 5 Use Examples*

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This chapter provides use examples of measurement using the MP1861A/MP1862A.

5.1	Achieving Error-Free Data Transmission .....	5-2
5.2	Measuring Optical Transceiver Module .....	5-4
5.3	Testing Jitter Tolerance .....	5-6

## 5.1 Achieving Error-Free Data Transmission

This section describes how to remove all bit errors (achieve an error-free data transmission) with MP1861A and MP1862A placed in an opposite state.

The equipment used in the following example is:

MP1800A-016:	1
MU183020A-x01/x23/x31:	1
MU183040B-x01/x20:	1
MU181000A:	1
MU181500B:	1
MP1861A-x01/x13/x30:	1
MP1862A-x01:	1






1. Connect MP1800A, MP1861A and MP1862A to the same ground.
2. Connect the power cords of MP1861A, MP1862A and MP1800A.
3. Turn on the power to MP1861A, MP1862A and MP1800A, and then set the measurement conditions as follows:
4. On the menu bar of MX180000A, click the **File** menu, and then click **Initialize** to reset all the settings to the factory defaults.
5. Connect the equipment as shown in Figure 5.1-1 “Equipment Connection for Error-Free Check”.
6. In the MU181500B window, click **Synthesizer**, and then select **MU181000A**.
7. On the **Misc2** tab of MU183020A, select **MU181500B** in the **Clock Source** box.
8. On the **Misc2** tab of MU183020A, input the operating bit rate in the **Bit Rate** box.

The bit rate of the signal output from MP1861A is twice of the bit rate set here.

Example:

To output a signal with a bit rate of 60 Gbit/s from MP1861A, input “30” here.

9. On the **Misc2** tab of MU183020A, select **Fullrate** in the **Output Clock Rate** box.
10. On the **Misc2** tab of each MU183020A and MU183040B, click **Setting** in the **Combination Setting** area, and then in the **Combination Setting** dialog box, click **Combination**, and then select **2ch** in the **Combination** box.
11. On the **Pattern** tab of each MU183020A and MU183040B, select a test pattern. The selected test pattern is reflected to all the channels.

12. On the **Data Interface** tab of MP1861A, click the **MUX-PPG Link** button (  ).
13. On the **Data Interface** tab of MP1862A, click the **DEMUX-ED Link** button (  ).
14. Turn on the output from MP1861A by click the **Output** module function button (  ) or pressing the **Output** key on the front panel of MP1800A.
15. Click the **Auto Search** module function button (  ).
16. In the Auto Search window, select the **USB11 DEMUX** check box in the **Slot/CH** column, and then click **Start**.  
Refer to Section 4.5 “Executing Auto Search” in the *MP1862A 56G/64G bit/s DEMUX Operation Manual*.
17. Click the **Start** module function button (  ).
18. On the **Result** tab of MP1862A, check the measurement results.

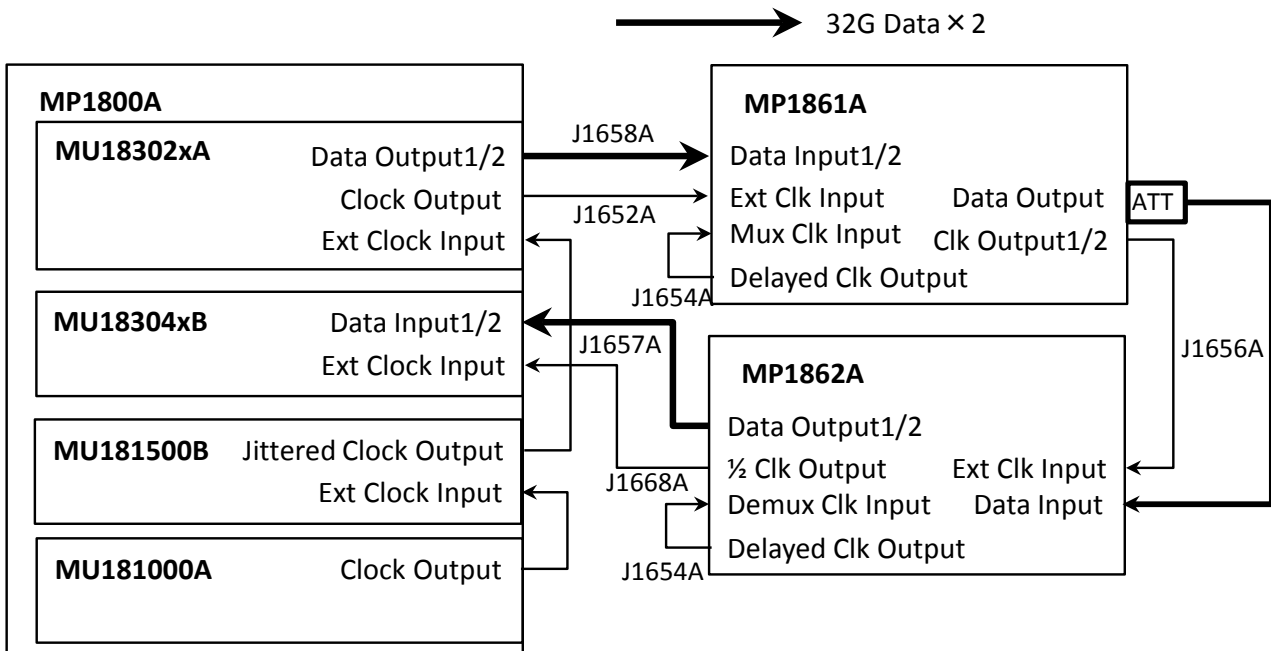


Figure 5.1-1 Equipment Connection for Error-Free Check

## 5.2 Measuring Optical Transceiver Module

This section explains how to measure 56G optical devices using the MP1800A and MP1861A/MP1862A.

### CAUTION


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**Check that the output level of the DUT (O/E) matches the data input range for MP1862A. If it is out of range, adjust the input level to MP1862A using an attenuator.**

---

The equipment used in the following example is:

MP1800A-016:	1
MU183020A-x01/x23/x31:	1
MU183040B-x01/x20:	1
MU181000A:	1
MU181500B:	1
MP1861A-x01/x13/x30:	1
MP1862A-x01:	1

1. Place the equipment in the error-free state according to the procedure in 5.1 “Achieving Error-Free Data Transmission”.
2. Turn off the output from MP1861A by clicking the **Output** module function button () or pressing the **Output** key on the front panel of MP1800A.
3. On the **Data Interface** tab of MP1861A, set the data output interface so that it does not exceed the input voltage range of the DUT (E/O).
4. On the **Pattern** tab of MU183020A, select a test pattern for the Tx side.  
Once a test pattern is set for a channel of MU183020A, the set test pattern is reflected to all the channels.
5. On the **Interface** tab of MP1862A, set the data input interface so that it can detect the signal output from the DUT (O/E).
6. On the **Pattern** tab of MU183040B, select a test pattern for the Rx side.  
Once a test pattern is set for a channel of MU183040B, the set test pattern is reflected to all the channels.
7. Turn off the power to MP1861A, MP1862A and MP1800A.
8. Connect MP1861A, MP1862A and DUT by using applicable coaxial cables or equivalent.

Before connecting the DUT, short the cores and outer conductors of the cables by using a thin pointed metal stick such as tweezers.

Connect the equipment as shown in Figure 5.2-1.



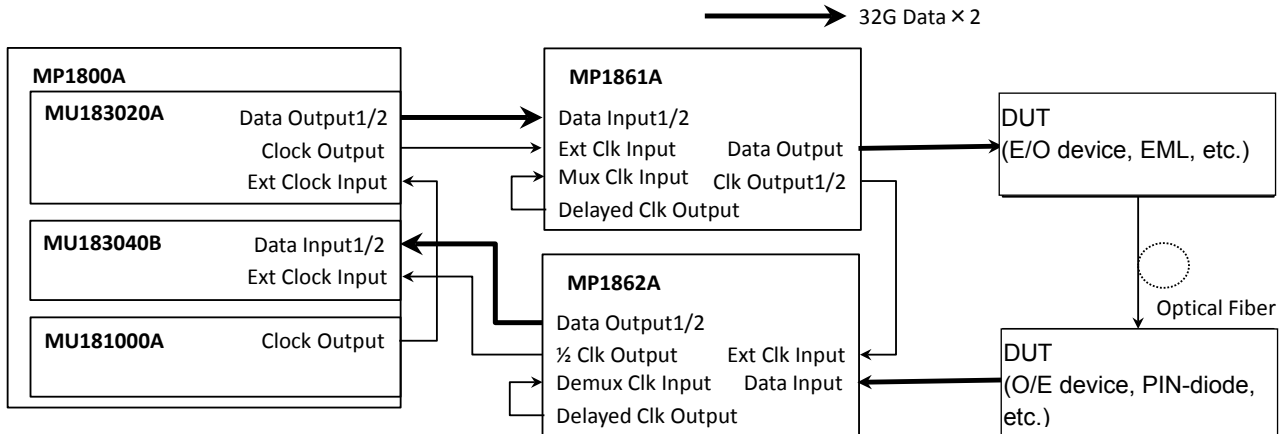





Figure 5.2-1 Connection diagram for Optical module evaluation

9. Turn on the MP1862A, DUT, MP1861A and MP1800A in order.

### ⚠ 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 and MP1861A before changing the cable connection.


10. On the **Data Interface** tab of MP1861A, select **ON** in the **Data/XData** box.
11. Turn on the output from MP1861A by clicking the **Output** module function button (  ) or pressing the **Output** key on the front panel of MP1800A.
12. Click the **Auto Search** module function button (  ).
13. Click the **Start** module function button (  ).
14. On the **Result** tab of MP1862A, check the measurement results.
15. On the **Data Interface** tab of MP1861A, measure the sensitivity of the DUT (E/O), changing the values in the **Amplitude** and **Offset** boxes.

## 5.3 Testing Jitter Tolerance



This section describes how to test jitter tolerance by using MP1861A and MP1862A.

The equipment used in the following example is:

MP1800A-016:	1
MU183020A-x01/x23/x31:	1
MU183040B-x01/x20:	1
MU181000A:	1
MU181500B:	1
MP1861A-x01/x13/x30:	1
MP1862A-x01:	1

1. Place the equipment in the error-free state according to the procedure in 5.1 “Achieving Error-Free Data Transmission”. Be sure to use the cables that come with MP1861A and MP1862A.
2. Turn off the output from MP1861A by clicking the **Output** module function button () or pressing the **Output** key on the front panel of MP1800A.
3. On the **Data Interface** tab of MP1861A, set the data output interface so that it does not exceed the input voltage range of the DUT.
4. On the **Interface** tab of MP1862A, set the data input interface so that it can detect the signal output from the DUT.
5. Connect the **Data Output** and  $\overline{\text{Data}}$  **Output** connectors of MP1861A to the input connectors of the DUT by using coaxial cables.
6. Connect the **Data Input** and  $\overline{\text{Data}}$  **Input** connectors of MP1862A to the output connectors of the DUT by using coaxial cables.
7. Adjust the length of the cable used for the **Clk Output1/2** connector of MP1861A and the **Ext Clk Input** connector of MP1862A so that it becomes equivalent to the delay between the **Data Output** connector of MP1861A and the **Data Input** connector of MP1862A.

Jitter tolerance may not be tested properly unless the delay length is set properly.

8. On the **Data Interface** tab of MP1861A, switch the **Jitter Input** to **ON**.
9. Turn on the output from MP1861A by clicking the **Output** module function button () or pressing the **Output** key on the front panel of MP1800A.
10. Click the **Auto Measurement** module function button ()
11. Click **Jitter Noise Tolerance Test Software**.

For how to use the MX181500A Jitter/Noise Tolerance Test Software,

refer to the *MX181500A Jitter/Noise Tolerance Test Software Operation Manual*.



# Chapter 6 Performance Test

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This chapter describes the performance testing of the MP1862A.

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## **6.1 Overview**

Performance tests are executed to check that the major functions of the MP1862A meet the required specifications. Execute performance tests at acceptance inspection, operation check after repair, and periodic (once every six months).

## 6.2 Devices Required for Performance Tests

Before starting performance tests, warm up the MP1862A 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 Test**

Device Name	Required Performance
Pulse Pattern Generator + MUX (MP1800A-015/016 + MU183020A-x22/x23, x31 + MU181000A/B) MUX (MP1861A) Error Detector (MU183040A/B-x20)	Operating frequency: 8 to 56.2 GHz Data clock phase variable: 2 UI or more
Pulse Pattern Generator + MUX (MP1800A-015/016 + MU183020A-x01, x22/x23, x31 + MU181000A/B) MUX (MP1861A-x01) Error Detector (MU183040A/B-x01, x20)	Operating frequency: 8 to 64.2 GHz Data clock phase variable: 2 UI or more
Sampling Oscilloscope	70 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.

- Operating frequency range
- Input level
- Pattern
- Error detection

### 6.3.1 Operating frequency

(1) Specifications

Table 6.3.1-1 Specifications

Model	Option	Specifications
	x01	
MP1862A	No	4 to 28.1 GHz
	Yes	4 to 32.1 GHz

(2) Connection

Figure 6.3.1-1 shows the connection example using MP1861A, MU183020A (MU183020A-x01, x22/x23, x30), MP1862A, MU183040A/B (MU183040A/B-x01, x20), and MU181000A/B. Before connecting the devices, be sure to use a sampling oscilloscope to check if the frequency and level of the signals output from the MP1862A is proper.

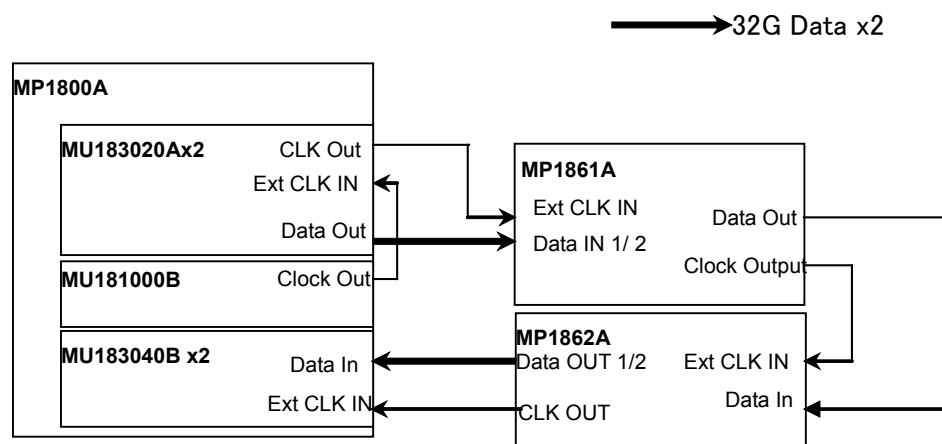



Figure 6.3.1-1 Module Connection



## (3) Procedure

1. Connect each measuring instrument using cables as shown in Figure 6.3.1-1.
2. Connect the MP1862A to the MP1800A and switch on the power. Switch on the power of the MP1800A and each measuring instrument and allow them to warm up.
3. On the **Misc2** tab of each MU183020A and MU183040B, click **Setting**, and then in the **Combination Setting** dialog box, click **Combination** and then click **2ch**. In addition, in the **Clock Setting** area, click **Fullrate** in the **Output Clock Rate** box.
4. Set the parameters as follows, and then perform the Auto Adjust function for Data1 and 2 of MU183040B.  
**Data Interface** tab (MP1861A)
  - Amplitude: 0.5 Vpp
  - Offset: Vth, 0 V**Pattern** tab (Each of MU183020A and MU183040B)
  - Test Pattern: PRBS 31
  - Mark Ratio: 1/2
5. Select the **Output** module function button ().
6. Adjust the MP1862A phase and threshold to the optimum values. (Use the auto search function.)
7. Check that no error is detected by the MU183040B.
8. By repeating steps 6 and 7 while varying the operating frequency, check for any error in the rated operating frequency range.

### 6.3.2 Input level

(1) Specifications

**Table 6.3.2-1 Specifications**

Option		Specifications
MP1862A	Data Input XData Input	Input amplitude: 0.125 to 1.0 V <sub>p-p</sub> Threshold voltage: -3.5 to +3.3 V

(2) Connection

Refer to Figs. 6.3.1-1 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 MP1861A and threshold voltage of MP1862A as shown in Table 6.3.2-2, turn on the MP1861A output, and then press the **Start** key on the front panel of MP1800A.  
Adjust the phase as required to make sure that there is no bit error.

**Table 6.3.2-2 Input level test setting when MP1862A is installed**

No.	MP1821A			MP1862A	
	Termination	Amplitude [V <sub>p-p</sub> ]	Offset (V <sub>th</sub> ) [V]	Termination	Threshold voltage [V]
1	GND	1.0	-2.500	GND	-2.500
2		0.25*	-1.127		-1.127
3		0.25*	+1.528		+1.528
4		1.0	+2.800		+2.800

\*: To output the signal with an amplitude of 0.25 V<sub>p-p</sub>, use the 41V-6 precision fixed attenuator 6 dB (standard accessory) with MP1861A set to 0.5 V<sub>p-p</sub>.

**Note:**

To change the termination conditions, be sure to set MP1861A and MP1862A in the procedure below. Unless the termination conditions are changed to the same values in the following procedure, both of MP1861A and MP1862A may be damaged.

- (1) Turn off the MP1861A output.
- (2) Set the termination condition of MP1862A to GND.
- (3) Change the termination conditions of MP1861A.
- (4) Set the termination conditions of MP1862A to be the same as MP1861A.

3. Remove the cable from the Data input connectors, and then connect the XData connectors.  
In the MP1862A input window, select “Single-Ended” - “XData” for Input Condition. Next, set the output level and threshold voltage in the same manner as shown in Steps 2 and check that no error occurs.

### 6.3.3 Pattern

(1) Patterns to be tested

- PRBS pattern
- Zero Substitution pattern

(2) Connection

See Figure 6.3.1-1 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 MP1861A to ON and press the measurement start button of the MP1862A. Adjust the phase as required, and check that no error occurs.
3. For both the MU183020A and the MU183040A/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. For both the MU183020A and the MU183040A/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:	$0.0000 \times 10^{-16}$ to 1.0000
Error count:	0 to $1 \times 10^{16}$
Error free interval (EFI):	0.0000 to 100.0000%
Error interval (EI):	0 to $1 \times 10^{16}$
Clock frequency:	8 to 64.2 GHz, accuracy: $\pm(10 \text{ ppm} + 1 \text{ kHz})$

(2) Connection

See Figure 6.3.1-1 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 bit rate of MU183020A to 32.1 Gbit/s, turn on the MP1861A output, and then press the **Start** key on the front panel of MP1800A.
3. On the **Error Addition** tab of MU183020A, enable (ON) the error addition function, and then make sure that the ER measurement result on the **Result** tab of MP1862A matches the value set in the **Rate** box on the **Error Addition** tab of MU183020A.
4. Set “Single” for error insertion of the MU183020A (set “Single” for Variation in the MU183020A Error Addition tab window). In the Gating field on the MU183040A/B Measurement tab window, set “Single” for Cycle, and set the measurement time to 20 seconds.
5. Press the error insertion Single button of the MU183020A once during the measurement (20 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



# Chapter 7 Remote Commands

---

This chapter provides the MP1862A remote commands.

For the MX180000A remote functions, refer to the *MX180000A Signal Quality Analyzer Control Software Operation Manual Remote Control*.

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## 7.1 Status Commands

This section explains the Alarm/Error status commands for the MP1862A 56G/64Gbit/s DEMUX.

### **:INSTrument:DEMUX[:EVENT]?**

---

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 to 2112            Sum total of the bit of event register (DECIMAL) Available bit 64 (Bit 6)            Delay Busy 2048 (Bit 11)        Delay Calibration Require
Function	Queries event at 64Gbit/s DEMUX status.
Example	> :INSTrument:DEMUX:EVENT? Or > :INSTrument:DEMUX? < 64

### **:INSTrument:DEMUX:CONDition?**

---

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 to 2112            Sum total of the bit of condition register (DECIMAL) Available bit 64 (Bit 6)            Delay Busy 2048 (Bit 11)        Delay Calibration Require
Function	Queries condition at 64Gbit/s DEMUX status.
Example	> :INSTrument:DEMUX:CONDition? < 64

### **:INSTrument:DEMUX:PTRansition <numeric>**

---

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 0 to 2112            Sum total of the bit of transition filter (DECIMAL) Available bit 64 (Bit 6)            Delay Busy 2048 (Bit 11)        Delay Calibration Require
Function	Sets the transition filter (positive transition) of the 64Gbit/s DEMUX status.
Example	To set the transition filter (positive transition) of the 64Gbit/s DEMUX status to 1: > :INSTrument:DEMUX:PTRansition 64



**:INSTRument:DEMUX:PTRansition?**

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 to 2112          Sum total of the bit of transition filter (DECIMAL)
Function	Queries the condition of the transition filter (positive transition) of the 64Gbit/s DEMUX status.
Example	> :INSTRument:DEMUX:PTRansition? < 64

**:INSTRument:DEMUX:NTRansition <numeric>**

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 0 to 2112          Sum total of the bit of transition filter (DECIMAL) Available bit 64 (Bit 6)          Delay Busy 2048 (Bit 11)      Delay Calibration Require
Function	Sets the transition filter (negative transition) of the 64Gbit/s DEMUX status.
Example	To set the transition filter (negative transition) of the 64Gbit/s DEMUX status to 1: > :INSTRument:DEMUX:NTRansition 64

**:INSTRument:DEMUX:NTRansition?**

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 to 2112          Sum total of the bit of transition filter (DECIMAL)
Function	Queries the transition filter (negative transition) of the 64Gbit/s DEMUX status.
Example	> :INSTRument:DEMUX:NTRansition? < 64

**:INSTRument:DEMUX:RESet**

Function	Initializes event at 64Gbit/s DEMUX status.
Example	> :INSTRument:DEMUX:RESet

## 7.2 Common Commands

### 7.2.1 Configuration Commands

Table 7.2.1-1 Configuration Commands

No.	Item	Command
[1]	Setting for USB unit number	:USB:ID :USB:ID?
[2]	Setting the auto measurement function to be operated	:SYSTem:CFUNction :SYSTem:CFUNction?
[3]	Module screen display	:DISPlay:ACTive
[4]	Query for USB name of mainframe	:SYSTem:CONDition:USB?
[5]	Query for software status	:SYSTem:CONDition?
[6]		CND?
[7]	Query for system error	:SYSTem:INFormation:ERRor?
[8]		INF?
[9]	Query for mainframe information	:SYSTem:UNIT?
[10]		UNT?

#### :USB:ID <usb number>

Parameter	<usb_number>=<DECIMAL NUMERIC PROGRAM DATA>
	11 USB number 11 (Channel 1)
	12 USB number 12 (Channel 2)
	13 USB number 13 (Channel 3)
	14 USB number 14 (Channel 4)
Function	Sets MP1862A to be controlled using USB number.
Example	> :USB:ID 11

#### :USB:ID?

Response	<usb_number>=< NR1 NUMERIC RESPONSE DATA >
	11 to 14 USB number 11 to 14(Channel 1 to 4)
Function	Queries the USB number of the MP1862A being operated.
Example	> :USB:ID?

> 11

**Note:**

In order to remote control the module mounted in MP1800A/MP1810A after remote controlling MP1862A with this command, use :UENTry:ID, :MODule:ID to switch the target unit to MP1800A.

For details of UENTry:ID, :MODule:ID commands, refer to 7.1 “Common Commands” in the *MX180000A Signal Quality Analyzer Control Software Operation Manual Remote Control*.

**:SYSTem:CFUNction <function>**

Parameter	<function>=<CHARACTER PROGRAM DATA>
	OFF Off
	ASE32 Auto Search (MU183040A/41A/40B/41B, MP1862A)
	EMAR32 Eye Margin measurement (MU183040A/41A/40B/41B, MP1862A)
	EDI32 Eye Diagram measurement (MU183040A/41A/40B/41B, MP1862A)
	BTUB32 Bathtub measurement (MU183040A/41A/40B/41B, MP1862A)
	AADJ32 Auto Adjust (MU183040A/41A/40B/41B)
	QAN32 Q measurement (MU183040A/41A/40B/41B)
	<b>Note:</b>
	If set to Off, the previous interface settings are restored.
Function	Sets the auto measurement function you want to operate.
Example	To set the common function you want to operate to Auto Search (32G/64G): > :SYSTem:CFUNction ASE32
Compatibility	Incompatible with existing models.

**:SYSTem:CFUNction?**

Response	<function>=<CHARACTER RESPONSE DATA>
	OFF Off
	ASE32 Auto Search (MU183040A/41A/40B/41B, MP1862A)
	EMAR32 Eye Margin measurement (MU183040A/41A/40B/41B, MP1862A)
	EDI32 Eye Diagram measurement (MU183040A/41A/40B/41B, MP1862A)
	BTUB32 Bathtub measurement (MU183040A/41A/40B/41B, MP1862A)
	AADJ32 Auto Adjust (MU183040A/41A/40B/41B)
	QAN32 Q measurement (MU183040A/41A/40B/41B)
Function	Queries the auto measurement function being operated.
Example	> :SYSTem:CFUNction? < ASE32
Compatibility	Incompatible with existing models.





**Note:**

"-----" is output if Logic boot is not installed.

<application>=<STRING RESPONSE DATA>

XXXX.XX.XX

1.00.00 to 9999.99.99

Logic Application version

**Note:**

"-----" is output if Logic Application is not installed.

<opt>=<STRING RESPONSE DATA>

XXXXXX/XXXXX

Option number

OPTXXX

**Note:**

All installed options are output. NONE is output if no option is installed.

Function

Queries the software status of the MP1861A.

Example

```
> :SYSTem:CONDition?
```

```
<
```

```
6201234567,1.00.00,1.00.20,OPT302,1.00.00,1.00.00,OPT12,OPT14,
MU181000A,6201234568,1.00.00,1.00.00,1.00.00,OPT101,
MU181020A,6201234569,1.00.00,1.00.00,1.00.00,OPT001,OPT220,
MU181040A,6201234571,1.00.00,1.00.00,1.00.00,OPT002,OPT220
MP1861A,6201234571,1.00.00,1.00.00,1.00.00,OPT002,OPT030
```

**CND?**

Response	<p>&lt;mainframe&gt;,&lt;slot1&gt;,...,&lt;slot644&gt;,&lt;usb1&gt;,...,&lt;usb1274&gt;</p> <p>&lt;mainframe&gt;      Previous function omitted</p> <p>&lt;slotx&gt;            Previous function omitted</p> <p>&lt;usb x&gt;=&lt;module&gt;,&lt;serial&gt;,&lt;fpga1&gt;[,&lt;fpga2&gt;],&lt;boot&gt;,&lt;application&gt;,&lt;opt&gt;</p> <p>x indicates a USB number. The USB number is 1 to 127.</p> <p>&lt;module&gt;=&lt;STRING RESPONSE DATA&gt;</p> <p>XXXXXXXXXX (FIX9)      Refer to Table 7.2.1-2 “Option Character Correspondence Table”.</p> <p><b>Note:</b></p> <p style="padding-left: 40px;">NONE is output if no module is installed.</p> <p>&lt;serial&gt;=&lt;STRING RESPONSE DATA&gt;</p> <p>XXXXXXXXXXXX (FIX10)    0000000000 to 9999999999</p> <p>Serial number</p> <p><b>Note:</b></p> <p style="padding-left: 40px;">“-----” is output if no module is installed.</p> <p>&lt;fpga1&gt;[,&lt;fpga2&gt;,.....] = &lt;STRING RESPONSE DATA&gt;</p> <p>XXXX.XX.XX (FIX10)      1.00.00 to 9999.99.99</p> <p>FPGA version</p> <p>&lt;boot&gt;=&lt;STRING RESPONSE DATA&gt;</p> <p>XXXX.XX.XX (FIX10)      1.00.00 to 9999.99.99</p> <p>Logic Boot version</p> <p><b>Note:</b></p> <p style="padding-left: 40px;">“-----” is output if Logic boot is not installed.</p> <p>&lt;application&gt;=&lt;STRING RESPONSE DATA&gt;</p> <p>XXXX.XX.XX (FIX10)      1.00.00 to 9999.99.99</p> <p>Logic Application version</p> <p><b>Note:</b></p> <p style="padding-left: 40px;">“-----” is output if Logic Application is not installed.</p> <p>&lt;opt&gt;=&lt;STRING RESPONSE DATA&gt;</p> <p>XXXXXX (FIX6)            Option number</p> <p>OPTXXX:</p> <p><b>Note:</b></p> <p style="padding-left: 40px;">All installed options are output.</p> <p style="padding-left: 40px;">NONE is output if no option is installed.</p>
Function	Queries the software status of the MP1861A.
Example	<pre>&gt; CND? &lt; CND 6201234567, 1.00.00, 1.00.20,OPT301,OPT302, 1.00.00, 1.00.00,OPT 12, ..., MP1861A,6201234571, 1.00.00, 1.00.00,1.00.00,OPT002,</pre>

OPT030

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

---

Parameter	<unit>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                    1 to 4/1 Step *<unit> must be set to 1 when querying USB. <usb>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 127                1 to 127/1 Step
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0                        NONE 1                        PLL Unlock 2                        Temperature 3                        Fan All the system errors that have currently occurred are displayed, delimited with a comma (.).
Function	Queries the System Error contents.
Example	> :SYSTem:INFormation:ERRor? 1,1 < 1, 2, 3 (when a system error has occurred for PLL Unlock, Temperature, or Fan) < 0 (when no system error has occurred)

### **INF? <unit>[,<usb>]**

---

Parameter	<unit>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                    Mainframe number *<unit> must be set to 1 when querying USB. <usb>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 127                USB Mainframe number
Response	<numeric> = <DEFINITE LENGTH ARBITORARY BLOCK RESPONSE DATA> #B0000                NONE #B100                PLL Unlock #B0100                Temperature #B0010                Fan #B0001                Overcurrent
Function	Queries the content of the system error that has currently occurred.
Example	To query the System Error contents using one mainframe: > INF? 1 < INF #B1000



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

Parameter	<p>&lt;numeric&gt;=&lt;NR1 NUMERIC PROGRAM DATA&gt;  1 to 4 Mainframe number  "1" for the MP1800A, "1 to 4" for the MT1810A.  &lt;numeric&gt;=&lt;NR1 NUMERIC PROGRAM DATA&gt;  1 to 127 Mainframe number</p>
Response	<p>&lt;mainframe&gt;=  &lt;unit&gt;,&lt;serial&gt;,&lt;mver&gt;,&lt;hver&gt;,&lt;opt1&gt;,&lt;sbver&gt;,&lt;saver&gt;,&lt;opt2&gt;  &lt;unit&gt;=&lt;STRING RESPONSE DATA&gt;  XXXXXXXXX Model name Example: MP1861A  See Table 7.2.1-2 "Option Character Correspondence Table".  <b>Note:</b>  NONE is output if no module is installed.</p> <p>&lt;serial&gt;=&lt;STRING RESPONSE DATA&gt;  XXXXXXXXXXXX 0000000000 to 9999999999  Mainframe serial number  <b>Note:</b>  Alphabetic characters may be included.</p> <p>&lt;mver&gt;=&lt;STRING RESPONSE DATA&gt;  XXXX.XX.XX 1.00.00 to 9999.99.99  Main application software version</p> <p>&lt;hver&gt;=&lt;STRING RESPONSE DATA&gt;  XXXX.XX.XX 1.00.00 to 9999.99.99  Mainframe hardware version</p> <p>&lt;opt1&gt;=&lt;STRING RESPONSE DATA&gt;  OPTXXX For option number, see Table 7.1.1-2 "Option character correspondence table".  <b>Note:</b>  All installed options are output.  NONE is output if no option is installed.</p> <p>&lt;sbver&gt;=&lt;STRING RESPONSE DATA&gt;  XXXX.XX.XX 1.00.00 to 9999.99.99  Sub application software version  (Boot part)</p> <p>&lt;saver&gt;=&lt;STRING RESPONSE DATA&gt;  XXXX.XX.XX 1.00.00 to 9999.99.99  Sub application software version  (Application part)</p> <p>&lt;opt2&gt;=&lt;STRING RESPONSE DATA&gt;</p>



<sbver>=<STRING RESPONSE DATA>

XXXX.XX.XX

1.00.00 to 9999.99.99

Sub application software version  
(Boot part)

<saver>=<STRING RESPONSE DATA>

XXXX.XX.XX

1.00.00 to 9999.99.99

Sub application software version  
(Application part)

Function

Queries the mainframe information including model and serial number.

Example

To query the USB7 information:

> UNT? 1,7

< MP1861A,6201234568,1.00.00,1.00.00,OPT01,1.00.00,1.00.00

## 7.2.2 File menu commands

Table 7.2.2-1 File Menu Commands

No.	Item	Command
1	Open	:SYSTem:MMEMory:DEMux:RECall
2	Save	:SYSTem:MMEMory:DEMux:STORe
3	Print	:SYSTem:PRINt:DEMux

### **:SYSTem:MMEMory:DEMux:RECall <file\_name>**

Parameter	<file_name>=<STRING PROGRAM DATA> "<drv>:\[<dir>]<file>" <drv> = C,D,E,F <dir>=<dir1>\<dir2>\... (Omitted for the root directory) <file> = File name
Function	Opens DEMUX setting data.
Example	> :SYSTem:MMEMory:DEMux:RECall "C:\Test\example"

### **:SYSTem:MMEMory:DEMux:STORe<file\_name>,<data\_type>,<file\_type>**

Parameter	<file_name>=<STRING PROGRAM DATA> "<drv>:\[<dir>]<file>" <drv> = C,D,E,F <dir>=<dir1>\<dir2>\... (Omitted for the root directory) <file> = File Name <data_type>=<CHARACTER PROGRAM DATA> UDX                56G DEMUX Setup UER                56G DEMUX Error ▪ Alarm Result <file_type>=<CHARACTER PROGRAM DATA> BIN                Binary file CSV                CSV file TXT                Text file
Function	Saves DEMUX setting data. <b>Note:</b> The settings will not be read from the saved file if the file name is changed.
Example	To specify save destination for all setting files and save them with a comment and measurement result data: > :SYSTem:MMEMory:DEMux:STORe "C:\Test\example",UMX,TXT

---

**:SYSTem:PRINT:DEMux**

---

Parameter	None
Function	Prints DEMUX measurement result data.
Example	> :SYSTem:PRINT:DEMux

## 7.3 64G DEMUX Commands

### 7.3.1 Interface tab

#### 7.3.1.1 Data setting commands

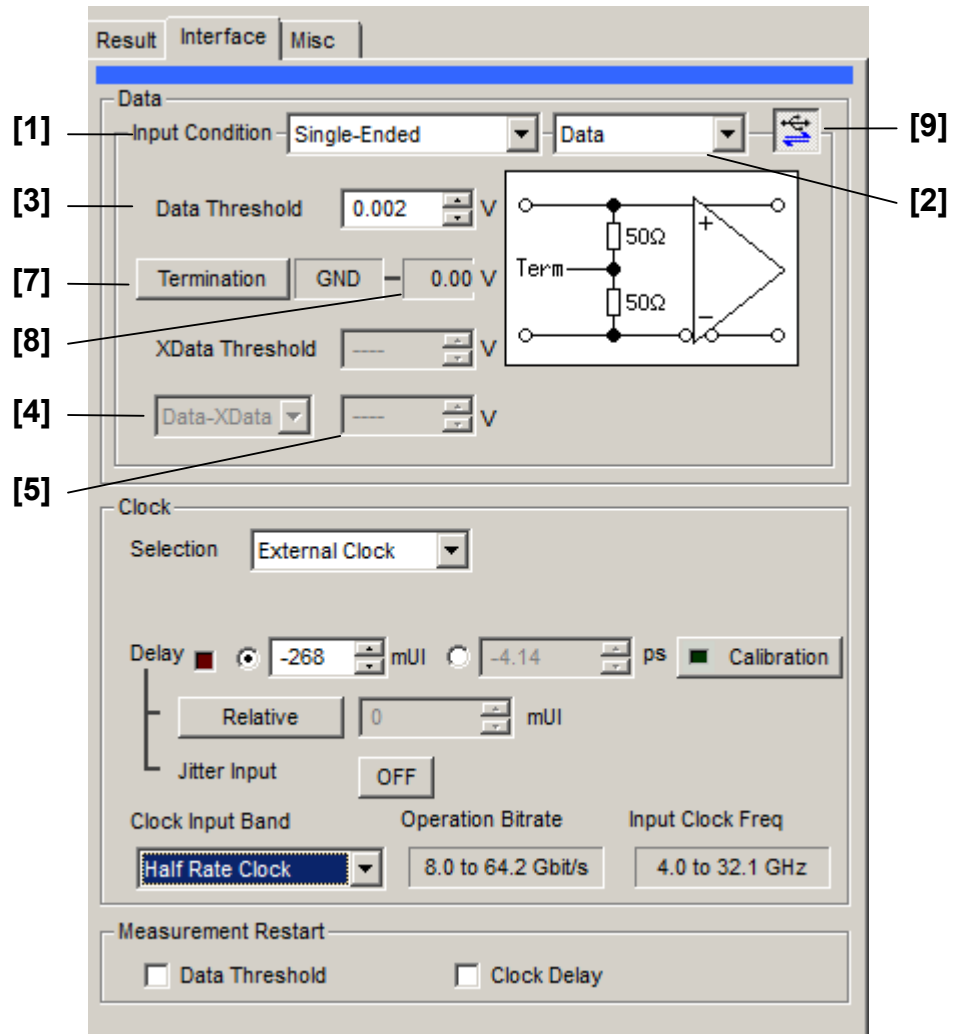


Figure 7.3.1.1-1 Data Area of the Interface Tab

Table 7.3.1.1-1 Data Interface Setting Commands

No.	Item	Command
[1]	Input Condition	:DEMux:DATA:INTerface
		:DEMux:DATA:INTerface?
[2]	No label (Differential type setting)	:DEMux:DATA:DIFFerential
		:DEMux:DATA:DIFFerential?
[3]	No label (Differential reference signal setting)	:DEMux:DATA:SINGle
		:DEMux:DATA:SINGle?
[4]	Data Threshold X Data Threshold	:DEMux:DATA:THReshold
		:DEMux:DATA:THReshold?
[5]	No label (Differential reference signal setting)	:DEMux:DATA:DIFFerential:BASis
		:DEMux:DATA:DIFFerential:BASis?
[6]	No label (Differential data threshold setting)	:DEMux:DATA:DIFFerential:THReshold
		:DEMux:DATA:DIFFerential:THReshold?
[7]	Termination	:DEMux:DATA:TERMination
		:DEMux:DATA:TERMination?
[8]	No label (Termination voltage setting)	:DEMux:DATA:TLEVel
		:DEMux:DATA:TLEVel?
[9]	DEMUX/ED Link	:SYSTem:LINK:DEMuxed
		:SYSTem:LINK:DEMuxed?

### **:DEMUX:DATA:INTERface <input>**

---

Parameter	<input>=<CHARACTER PROGRAM DATA> SINGle            Single Ended DIF50ohm        Differential 50 Ω DIF100ohm       Differential 100 Ω
Function	Sets data input interface.
Example	To set Data Interface interface to single connection: > :DEMUX:DATA:INTERface SINGle
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMUX:DATA:INTERface?**

---

Response	<interface>=<CHARACTER RESPONSE DATA> SING, DIF50, DIF100
Function	Queries data input interface.
Example	To query Data Interface interface: > :DEMUX:DATA:INTERface? < SING
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMUX:DATA:DIFFerential <item>**

---

Parameter	<item>=<CHARACTER PROGRAM DATA> INDependent     Data/Xdata independent setting TRACKing        Data/Xdata common setting ALTErnate        Data/Xdata differential setting
Function	Sets the differential type when the data input interface is differential.
Example	To set the differential type for Data1Interface to Independent: > :DEMUX:DATA:DIFFerential INDependent
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMUX:DATA:DIFFerential?**

---

Response	<item>=<CHARACTER RESPONSE DATA> IND, TRAC, ALT
Function	Queries the differential type when the data input interface is set to Differential.
Example	To query the differential type for Data1Interface: > :DEMUX:DATA:DIFFerential? < IND
Compatibility	Compatible with MU182040A and MU182041A.



**:DEMUX:DATA:SINGLE <item>**

Parameter	<item>=<CHARACTER PROGRAM DATA> DATA           Data is selected XDATA          XData is selected
Function	Sets input port for Single data input.
Example	To set Data Interface input port to data: > :DEMUX:DATA:SINGLE DATA
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMUX:DATA:SINGLE?**

Response	<item>=<CHARACTER RESPONSE DATA> DATA           Data is selected XDATA          XData is selected
Function	Queries input port for Single data input.
Example	To query Data Interface input port: > :DEMUX:DATA:SINGLE? < DATA
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMUX:DATA:THRESHOLD <port>,<numeric>**

Parameter	<port>=<CHARACTER PROGRAM DATA> DATA, XDATA (At Single, input the selected port.) <numeric>=<DECIMAL NUMERIC PROGRAM DATA> -3.500 to 3.300           -3.500 to 3.300 V/0.001 V Step
Function	Sets data input threshold value for specific port.
Example	To set threshold value for Data1Interface input port to -0.5 V: > :DEMUX:DATA:THRESHOLD DATA, -0.5
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMUX:DATA:THRESHOLD? <port>**

Parameter	<port>=<CHARACTER PROGRAM DATA> DATA, XDATA (At Single, input the selected port.)
Response	<numeric>=<NR2 NUMERIC RESPONSE DATA>
Function	Queries data input threshold value for specific port.
Example	To query threshold value for Data Interface input port: > :DEMUX:DATA:THRESHOLD? DATA < -0.500
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMux:DATA:DIFFerential:BASis <basis>**

---

Parameter	<basis>=<CHARACTER PROGRAM DATA> DATA                Sets the differential reference signal to Data. XDATA               Sets the differential reference signal to XData.
Function	Sets the differential reference signal for the data input threshold value.
Example	To set the differential reference signal for the threshold for Data Interface to Data:  > :DEMux:DATA:DIFFerential:BASis DATA
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMux:DATA:DIFFerential:BASis?**

---

Response	<basis>=<CHARACTER RESPONSE DATA> DATA                Sets the differential reference signal to Data. XDAT                Sets the differential reference signal to XData.
Function	Queries the differential reference signal for the data input threshold value.
Example	To query the differential reference signal for the threshold for Data Interface:  > :DEMux:DATA:DIFFerential:BASis? < DATA
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMux:DATA:DIFFerential:THReshold <numeric>**

---

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> -3.000 to 3.000                -3.000 to 3.000 V/0.001 V Step
Function	Sets data input threshold value at differential input.
Example	To set Data Interface differential data input value to -0.250 V:  > :DEMux:DATA:DIFFerential:THReshold -0.250
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMux:DATA:DIFFerential:THReshold?**

---

Response	<numeric>=<NR2 NUMERIC RESPONSE DATA>
Function	Queries data input threshold value at differential input.
Example	To query Data Interface differential data input value:  > :DEMux:DATA:DIFFerential:THReshold? < -0.250
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMUX:DATA:TERMINATION <term>**

Parameter	<term>=<CHARACTER PROGRAM DATA> GND                    50 Ω to GND VARIABLE                50 Ω to Variable Voltage
Function	Sets the data input termination condition.
Example	To set the termination condition of Data Interface to GND: > :DEMUX:DATA:TERMINATION GND
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMUX:DATA:TERMINATION?**

Response	<term>=<CHARACTER RESPONSE DATA> GND, VAR
Function	Queries the data input termination condition.
Example	To query the termination condition of Data Interface: > :DEMUX:DATA:TERMINATION? < GND
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMUX:DATA:TLEVEL <numeric>**

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> -2.50 to 3.50                    -2.50 to 3.50 V/0.01 V Step
Function	Sets the termination voltage when the input termination condition is set to Variable.
Example	To set the termination voltage to -2.5 when the input termination condition is set to Variable: > :DEMUX:DATA:TLEVEL -2.5
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMUX:DATA:TLEVEL?**

Response	<numeric>=<NR2 NUMERIC RESPONSE DATA>
Function	Queries the termination voltage when the input termination condition is set to Variable.
Example	To query the termination voltage when the input termination condition is set to Variable: > :DEMUX:DATA:TLEVEL? < -2.50
Compatibility	Compatible with MU182040A and MU182041A.

### **:SYSTem:LINK:DEMuxed <boolean>**

---

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> OFF or 0, On or 1
Function	Sets link between 64G DEMUX and 32G ED ON/OFF.
Example	To set link between 64G DEMUX and 32G ED to ON: > :SYSTem:LINK:DEMuxed ON
Compatibility	No backwards compatibility

### **:SYSTem:LINK:DEMuxed?**

---

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0                   Link between 64G DEMUX and 32G ED OFF 1                   Link between 64G DEMUX and 32G ED ON
Function	Queries link between 56G DEMUX and 4ch ED ON/OFF.
Example	> :SYSTem:LINK:DEMuxed? < 1
Compatibility	No backwards compatibility

7.3.1.2 Clock setting commands

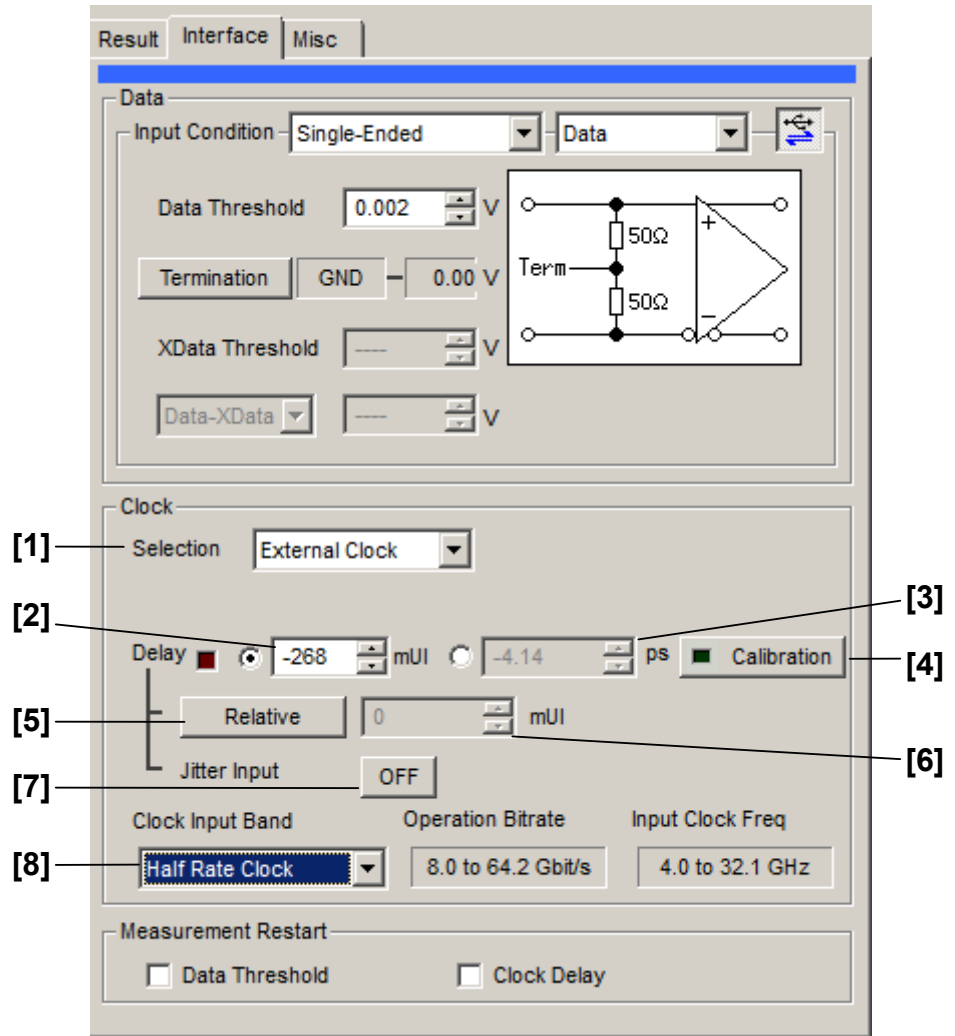


Figure 7.3.1.2-1 Clock Area of the Interface Tab

**Table 7.3.1.2-1 Clock Interface Setting Commands**

No.	Item	Command
[1]	Selection	:DEMUX:CLOCK:SELECTION
		:DEMUX:CLOCK:SELECTION?
[2]	Delay (mUI units)	:DEMUX:CLOCK:UIDELAY
		:DEMUX:CLOCK:UIDELAY?
[3]	Delay (ps units)	:DEMUX:CLOCK:PDELAY
		:DEMUX:CLOCK:PDELAY?
[4]	Calibration	:DEMUX:CLOCK:CALIBRATION
[5]	Relative	:DEMUX:CLOCK:RELATIVE
		:DEMUX:CLOCK:RELATIVE?
[6]	No label (Settings of relative values)	:DEMUX:CLOCK:RDELAY
		:DEMUX:CLOCK:RDELAY?
[7]	Jitter Input	:DEMUX:CLOCK:JINPUT
		:DEMUX:CLOCK:JINPUT?
[8]	Clock Input Band Switch	:DEMUX:CLOCK:BAND
		:DEMUX:CLOCK:BAND?

**:DEMux:CLOCK:SElection <sel>**

Parameter	<sel>=<CHARACTER PROGRAM DATA> EXTernal          External Clock
Function	Sets clock input type.
Example	To set Data Interface clock input type to external clock: > :DEMux:CLOCK:SElection EXTernal
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMux:CLOCK:SElection?**

Response	<sel>=<CHARACTER RESPONSE DATA> EXT                  External Clock
Example	To query Data Interface clock input type: > :DEMux:CLOCK:SElection? < EXT
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMux:CLOCK:UIDelay<numeric>**

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> -1000 to 1000      -1000 to 1000mUI/4mUI Step
Function	Sets clock input phase variation in mUI units.
Example	To set Data Interface clock phase variation to -1000 mUI: > :DEMux:CLOCK:UIDelay -1000
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMux:CLOCK:UIDelay?**

Parameter	<interface>=<DECIMAL NUMERIC PROGRAM DATA>
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
Function	Queries clock input phase variation in mUI units.
Example	To query Data Interface clock phase variation in mUI units: > :DEMux:CLOCK:UIDelay? < -1000
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMUX:CLOCK:PDELAY<numeric>**

---

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> -20 to 20                      -20 to 20 ps/0.08ps Steps (at 50 GHz) -17.85 to 17.85                -17.85 to 17.85 ps/0.08ps Steps (at 56 GHz) -15.62 to 15.62                -15.62 to 15.62 ps/0.08ps Steps (at 64 GHz) Converted from the calculated frequency value, based on the setting resolution of mUI.
Function	Sets the variable clock input phase in ps units. The value specified in ps units may not be set exactly due to resolution. In this event, the most approximate value is set.
Example	To set the variable clock phase of Data Interface to -40 ps: > :DEMUX:CLOCK:PDELAY -40
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMUX:CLOCK:PDELAY?**

---

Parameter	<interface>=<DECIMAL NUMERIC PROGRAM DATA>
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
Function	Queries clock input phase variation and units.
Example	To query Data Interface clock phase variation in ps units: > :DEMUX:CLOCK:PDELAY? < -40
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMUX:CLOCK:CALIBRATION**

---

Parameter	<interface>=<DECIMAL NUMERIC PROGRAM DATA>
Function	Calibrates input clock phase setting.
Example	To calibrate Data Interface input clock phase setting: > :DEMUX:CLOCK:CALIBRATION
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMUX:CLOCK:RELATIVE <boolean>**

---

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> 0 or OFF                      Reference OFF 1 or ON                        Reference ON
Function	Sets clock input phase variation reference ON/OFF.
Example	To set Data Interface clock input phase variation reference to ON: > :DEMUX:CLOCK:RELATIVE ON
Compatibility	Compatible with MU182040A and MU182041A.



**:DEMux:CLOCK:RELative? [<interface>]**

Response	<boolean>=<NR1 NUMERIC RESPONSE DATA> 0 Reference OFF 1 Reference ON
Function	Queries clock input phase variation reference setting.
Example	To query Data Interface clock input phase variation reference: > :DEMux:CLOCK:RELative? < 1
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMux:CLOCK:RDElay <numeric>,<unit>**

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> (mUI units) -2000 to 2000 -2000 to 2000 mUI /4 mUI Step (ps units) Converted from the calculated frequency value, based on the setting resolution of mUI. <unit>=< CHARACTER PROGRAM DATA> UI mUI units PS ps units (The ps unit is selected when <unit> is omitted.)
Function	Sets clock input phase variation reference value and units. Setting is performed as an increment from the reference value. The specified value may not be exactly set as is when the ps unit is set, due to the limitation of the setting resolution. The value is adjusted to the most approximate value and set in this event.
Example	To set Data Interface clock phase variation reference to -1000 mUI: > :DEMux:CLOCK:RDElay -1000,UI
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMux:CLOCK:RDElay? [<unit>]**

Parameter	<unit>=< CHARACTER PROGRAM DATA> UI mUI units PS ps units (The ps unit is selected when <unit> is omitted.)
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
Function	Queries clock input phase variation reference value and units.
Example	To query Data Interface clock phase variation reference UI units: > :DEMux:CLOCK:RDElay? UI < -1000
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMUX:CLOCK:JINPut <boolean>**

---

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> 0 or OFF            Jitter Input OFF 1 or ON             Jitter Input ON
Function	Sets Jitter Input ON/OFF.
Example	To set Data Interface Jitter Input to ON: > :DEMUX:Clock:JINPut ON
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMUX:CLOCK:JINPut?**

---

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0                    Jitter Input OFF 1                    Jitter Input ON
Function	Queries Jitter Input ON/OFF.
Example	To query Data Interface Jitter Input ON/OFF: > :DEMUX:CLOCK:JINPut? < 1
Compatibility	Compatible with MU182040A and MU182041A.

### **:DEMUX:CLOCK:BAND <sw>**

---

Parameter	<sw>=<CHARACTER PROGRAM DATA> HALFrate            Half Clock Rate QUATerrate         Quarter Clock Rate EIGHthrate         1/8 Clock Rate
Function	Switches Clock Input Band Switch.
Example	To switch Data Interface Clock Input Band Switch to Half: > :DEMUX:Clock:BAND HALF
Compatibility	Incompatible with existing models.

### **:DEMUX:CLOCK:BAND?**

---

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> HALFrate            Half Clock Rate QUATerrate         Quarter Clock Rate EIGHthrate         1/8 Clock Rate
Function	Queries Clock Input Band Switch.
Example	To query Data Interface Clock Input Band Switch: > :DEMUX:CLOCK:BAND? < HALF
Compatibility	Incompatible with existing models.

7.3.1.3 Measurement Restart setting commands

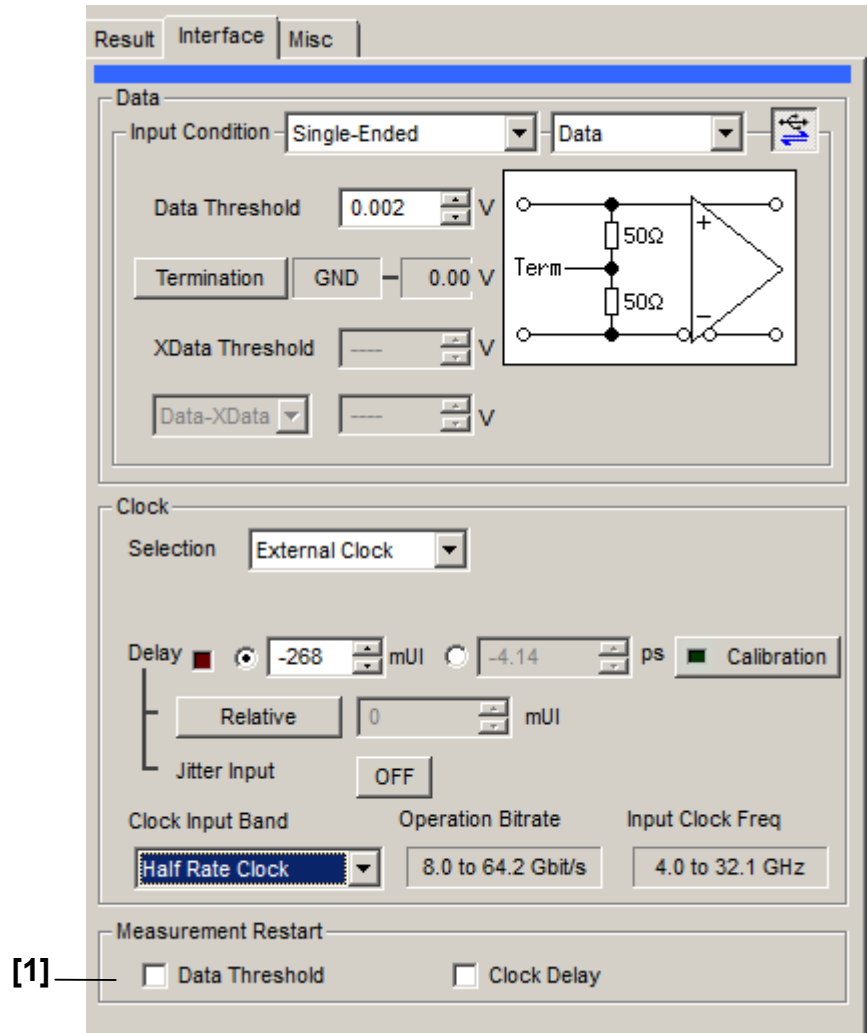


Figure 7.3.1.3-1 Measurement Restart Area of the Interface Tab

Table 7.3.1.3-1 Measurement Restart Setting Commands

No.	Item	Command
[1]	Measurement Restart	:DEMUX:MEASURE:MREStart
		:DEMUX:MEASURE:MREStart?

**:DEMux:MEASure:MREStart <data>,<clock>**

---

Parameter	<data>=< BOOLEAN PROGRAM DATA > 0 or OFF           Set measurement restart at Data Threshold change to OFF. 1 or ON            Set measurement restart at Data Threshold change to ON. <clock>=< BOOLEAN PROGRAM DATA > 0 or OFF           Set measurement restart at Clock Delay change to OFF. 1 or ON            Set measurement restart at Clock Delay change to ON.
Function	Sets measurement restart conditions.
Example	To set Data Interface measurement restart conditions: > :DEMux:MEASure:MREStart 0,0
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMux:MEASure:MREStart?**

---

Response	<data>=< NR1 NUMERIC RESPONSE DATA > <clock>=< NR1 NUMERIC RESPONSE DATA > 0                   Measurement restart OFF 1                   Measurement restart ON
Function	Queries measurement restart conditions.
Example	To query Data Interface measurement restart conditions: > :DEMux:MEASure:MREStart? < 0,0
Compatibility	Compatible with MU182040A and MU182041A.

### 7.3.2 Result tab

#### 7.3.2.1 Result setting commands

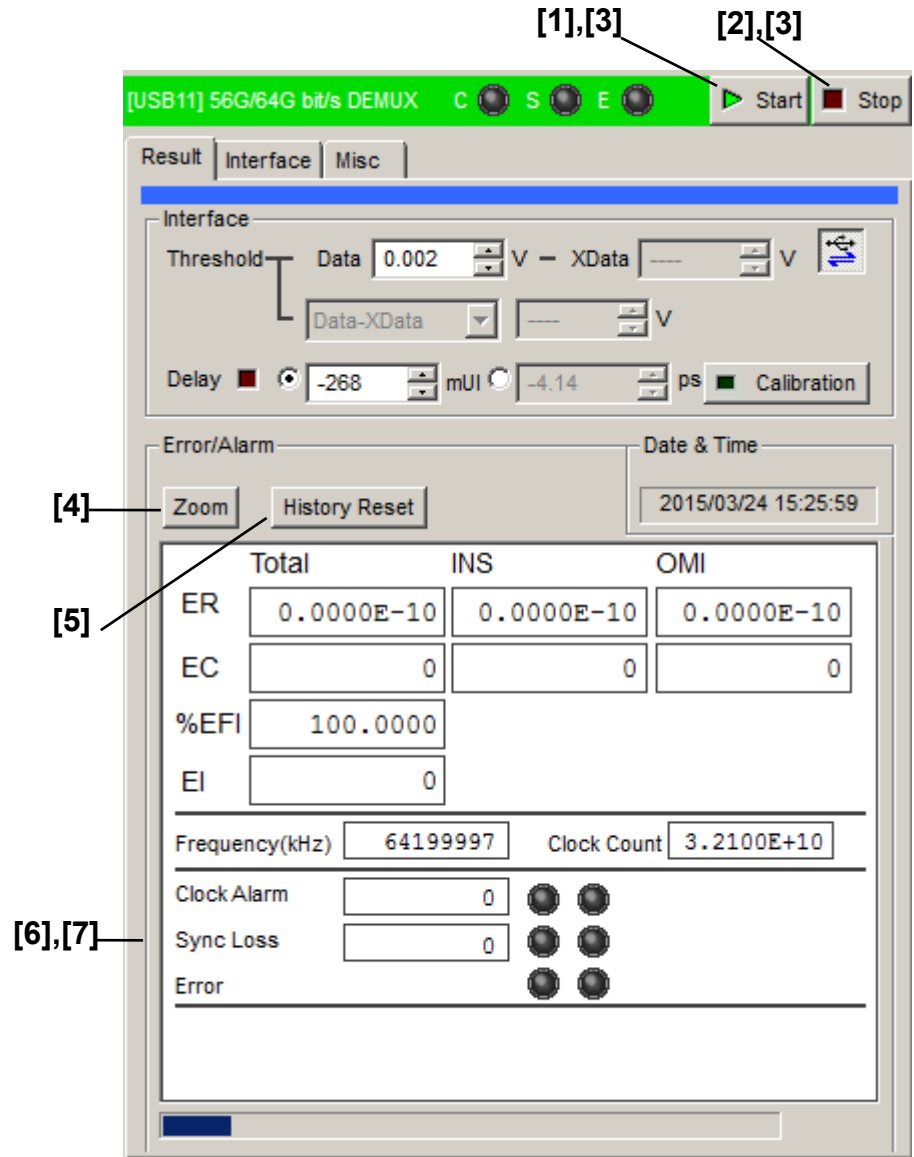


Figure 7.3.2.1-1 Result Tab

Table 7.3.2.1-1 Result Setting Commands

No.	Item	Command
[1]	Start	:DEMux:MEASure:START
[2]	Stop	:DEMux:MEASure:STOP
[3]	Query measurement conditions	:DEMux:MEASure:EALarm:STATe?
[4]	Zoom	:DEMux:RESult:ZOOM
		:DEMux:RESult:ZOOM?
[5]	History Reset	:DEMux:RESult:EALarm:HRESet
[6]	No label (Query measurement data of error alarm)	:DEMux:CALCulate:DATA:EALarm?
[7]	No label (Query window items)	:DEMux:CALCulate:DATA:MONitor?

### **:DEMux:MEASure:START**

Function Starts MP1862A BER measurement in same unit and restarts during measurement.

Example To start MP1862A BER measurement in same unit:  
> :DEMux:MEASure:START

Compatibility Compatible with MU182040A and MU182041A.

### **:DEMux:MEASure:STOP**

Function Stops MP1862A BER measurement in same unit.

Example To stop MP1862A BER measurement in same unit:  
> :DEMux:MEASure:STOP

Compatibility Compatible with MU182040A and MU182041A.

### **:DEMux:MEASure:EALarm:STATe?**

Response <numeric>=< NR1 NUMERIC RESPONSE DATA >  
0 Stopped  
1 Measuring

Function Queries measurement progress at MP1862A bit error or alarm in same unit.

Example > :DEMux:MEASure:EALarm:STATe?  
< 0

Compatibility Compatible with MU182040A and MU182041A.

**:DEMUX:RESult:ZOOM <boolean>**


---

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> 0 or OFF           Zoom out display 1 or ON            Zoom in display
Function	Sets zooming for measured results display ON/OFF
Example	To set zooming for measured results display to ON: > :DEMUX:RESult:ZOOM ON
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMUX:RESult:ZOOM?**


---

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0                   Zoom out display 1                   Zoom in display
Function	Queries zooming for measured results display ON/OFF.
Example	> :DEMUX:RESult:ZOOM? < 1
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMUX:RESult:EALarm:HRESet**


---

Function	Resets measured results display history.
Example	> :DEMUX:RESult:EALarm:HRESet
Compatibility	Compatible with MU182040A and MU182041A.

**:DEMUX:CALCulate:DATA:EALarm? <string>**

Parameter <string>=<STRING PROGRAM DATA>  
 "CURRENT:<result>" Current data  
 "LAST:<result>" Measurement end data  
 Refer to Table 7.3.2.1-3 for the <result> contents.

Response <string>=<STRING RESPONSE DATA>

**Table 7.3.2.1-2 Response Format**

Form	Format	Description
Form1 Integer type	"XXXXXXXX"	For 0 to 9999999
	"X.XXXEEXX"	For 1.0000E07 to 9.9999E16
	"-----"	When no data corresponds to the query
Form2 Fraction type	"X.XXXE-XX"	For 0.0000E-16 to 1.0000E00
	"-----"	When no data corresponds to the query
Form3 % type	"XXX.XXXXX"	For 0.0000 to 100.0000
	"-----"	When no data corresponds to the query
Form4 Frequency type	"XXXXXXXXXX"	For 0 to MAX(Hz)
	"-----"	When no data corresponds to the query
Form5 Voltage type	"XX.XXX,XX.XXX"	For -4.000 to +4.000(V)
	"----,-----"	When no data corresponds to the query
Form6 Phase type	"xxxxx,xxx.xx"	mUI units, ps units
	"----,-----"	When no data corresponds to the query

Function Queries measured data for parameter.

Example To query the total error rate of the current data  
 > :DEMUX:CALCulate:DATA:EALarm? "CURRENT:ER:TOTAL"  
 < : "0.0000E-16"

Compatibility Compatible with MU182040A and MU182041A.

**Table 7.3.2.1-3 Parameter**

Form		<result>	Format
Error Rate	Total INS OMI	ER:TOTAL ER:INSertion ER:OMISsion	Form2
Error Count	Total INS OMI	EC:TOTAL EC:INSertion EC:OMISsion	Form1
%EFI	Total	EFI:TOTAL	Form3
EI	Total	EI:TOTAL	Form1
Frequency (kHz)		FREQuency	Form4
Clock Count		CC:TOTAL	Form1
Clock Alarm		AINterval:CALarm	Form1
Sync Loss		AINterval:PSLoss	Form1



**:DEMUX:CALCulate:DATA:MONitor? <item>**

Parameter <item>=<STRING PROGRAM DATA>  
 "BIT:TOTAL" Bit Error (Total Error)  
 "PSLoss" Pattern Sync Loss  
 "CALarm" Clock Alarm

Response <string>=<STRING RESPONSE DATA>

**Table 7.3.2.1-4 Response Format**

Form	Format	Description
Form1	"Occur"	When an alarm occurs
	"Not Occur"	When no alarm occurs
	"-----"	When no data corresponds to the query

Function Queries real-time occurrence status of monitor items specified by parameters.

Example To query Bit Error occurrence status:  
 > :DEMUX:CALCulate:DATA:MONitor? "BIT:TOTAL"  
 < "Occur"

Compatibility Compatible with MU182040A and MU182041A.

### 7.3.3 Misc tab

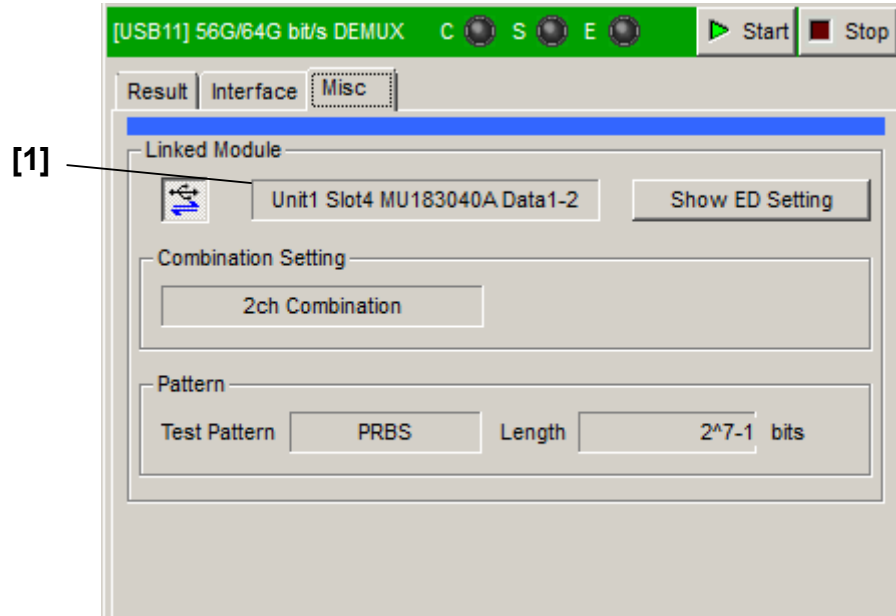


Figure 7.3.3-1 Misc Tab

Table 7.3.3-1 Misc Setting Commands

No.	Item	Command
[1]	Query for linked ED information	:SYSTem:LINK:DEMuxed:INFO?

#### :SYSTem:LINK:DEMuxed:INFO?

Response	<pre>&lt;sw&gt;=&lt;CHARACTER RESPONSE DATA&gt; "&lt;unit&gt;:&lt;slot&gt; &lt;module&gt; &lt;data&gt;" &lt;unit&gt;:1 to 4          Unit No.1 to 4 &lt;slot&gt;:1 to 6         Slot No.1 to 6 &lt;module&gt;:MU183040A/B,MU183041A/B &lt;data&gt;: Data1-2 or Data3-4</pre>
Function	Queries the information of the 32G ED that operates linked with the 64G DEMUX.
Example	<pre>&gt; :SYSTem:LINK:DEMuxed:INFO? &lt; "1:1 MU183040A Data1-2"</pre>
Compatibility	Incompatible with existing models.

## 7.4 Automatic Measurement Commands

This section describes only the MP1862A measurement application commands that are changed from MU183040A/B. For details on the auto measurement functions, refer to the *MU183040A/B Operation Manual*. Make sure to specify the auto measurement function you want to operate with the :SYSTEM:CFUNCTION command before executing an auto measurement command. For details on the :SYSTEM:CFUNCTION command, refer to Section 7.2.1 “Configuration Commands”.

### 7.4.1 Auto Search

Before using a command described in this section, make sure to set Auto Search with the following command:

```
:SYSTEM:CFUNCTION ASE32
```

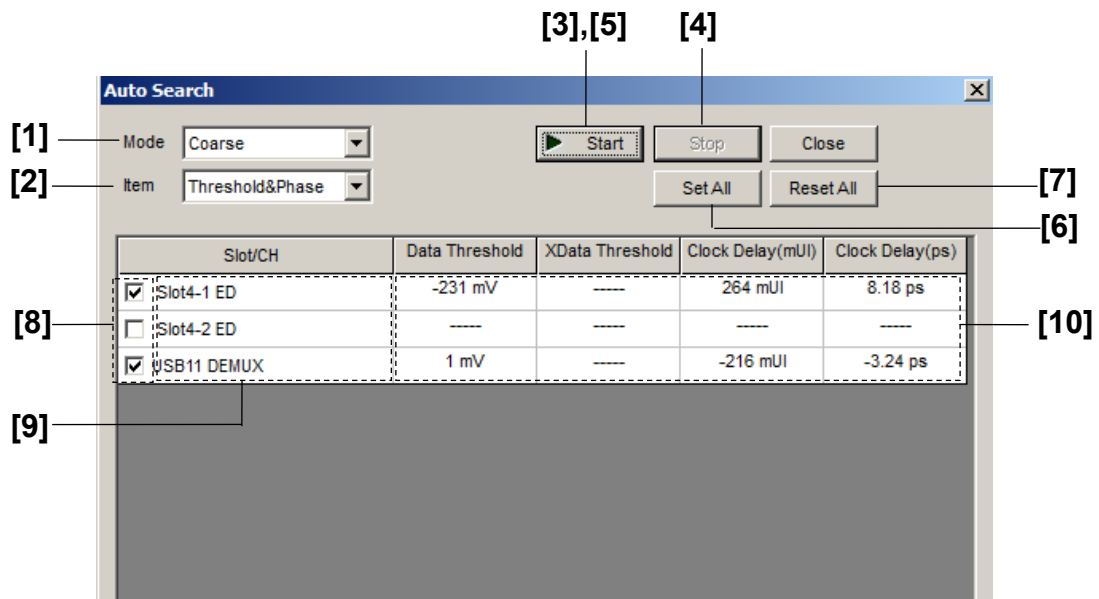


Figure 7.4.1-1 Auto Search Window

**Table 7.4.1-1 Auto Search Setting Commands**

No.	Item	Command
[1]	Mode	:SENSe:MEASure:ASEarch:SMODE
		:SENSe:MEASure:ASEarch:SMODE?
[2]	Item	:SENSe:MEASure:ASEarch:MODE
		:SENSe:MEASure:ASEarch:MODE?
[3]	Start	:SENSe:MEASure:ASEarch:START
[4]	Stop	:SENSe:MEASure:ASEarch:STOP
[5]	No label (Query for function state)	:SENSe:MEASure:ASEarch:STATE?
[6]	Set All	:SENSe:MEASure:ASEarch:SLASet
[7]	Reset All	:SENSe:MEASure:ASEarch:SLAReset
[8]	Slot Select	:SENSe:MEASure:ASEarch:SELSlot
		:SENSe:MEASure:ASEarch:SELSlot?
[9]	No label (Query for slot state)	:SENSe:MEASure:ASEarch:SLOT?
[10]	No label (Query for auto search results)	:CALCulate:DATA:ASEarch?

**:SENSe:MEASure:ASEarch:SMODE <mode>**

Parameter <mode>=<CHARACTER PROGRAM DATA>  
 FINE Fine mode  
 COARse Coarse mode  
 Function Sets the Auto Search mode.  
 Example To set the Auto Search mode to Fine:  
 > :SENSe:MEASure:ASEarch:SMODE FINE  
 Compatibility Compatible with MU183040A/B.

**:SENSe:MEASure:ASEarch:SMODE?**

Response <mode>=<CHARACTER RESPONSE DATA>  
 FINE, COAR  
 Function Queries the Auto Search mode.  
 Example > :SENSe:MEASure:ASEarch:SMODE?  
 < FINE  
 Compatibility Compatible with MU183040A/B.

**:SENSe:MEASure:ASEarch:MODE <mode>**

Parameter	<mode>=<CHARACTER PROGRAM DATA> PTHReshold      Phase & Threshold THReshold        Threshold PHASe            Phase
Function	Sets the execution item of Auto Search.
Example	To set the execution item of Auto Search to Phase & Threshold: > :SENSe:MEASure:ASEarch:MODE PTHReshold
Compatibility	Compatible with MU183040A/B.

**:SENSe:MEASure:ASEarch:MODE?**

Response	<mode>=<CHARACTER RESPONSE DATA> PTHR             Phase & Threshold THR              Threshold PHAS             Phase
Function	Queries the execution item of Auto Search.
Example	> :SENSe:MEASure:ASEarch:MODE? < PTHR
Compatibility	Compatible with the MP1632C.

**:SENSe:MEASure:ASEarch:STARt**

Function	Starts the Auto Search function.
Example	> :SENSe:MEASure:ASEarch:STARt
Compatibility	Compatible with the MP1632C.

**:SENSe:MEASure:ASEarch:STOP**

Function	Stops the Auto Search function.
Example	> :SENSe:MEASure:ASEarch:STOP
Compatibility	Compatible with the MP1632C.

**:SENSe:MEASure:ASEarch:STATe?**

Response	<boolean>=<NR1 NUMERIC RESPONSE DATA> 1                 Started 0                 Stopped -1                Auto Search failure (when any slot has failed)
Function	Queries the Auto Search function state.
Example	> :SENSe:MEASure:ASEarch:STATe? < 1
Compatibility	Compatible with the MP1632C.

### **:SENSe:MEASure:ASEarch:SLASet**

---

Function	Sets Auto Search execution for all slots to ON.
Example	> :SENSe:MEASure:ASEarch:SLASet
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:ASEarch:SLAReset**

---

Function	Sets Auto Search execution for all slots to OFF.
Example	> :SENSe:MEASure:ASEarch:SLAReset
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:ASEarch:SELSlot <slot>,<interface>,<boolean>[,<unit>]**

---

Parameter	<slot>=<CHARACTER PROGRAM DATA> SLOT1 to SLOT6            Slots No. 1 to No. 6 1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A USB11 to USB14            USB No.11 to 14 <interface>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Data1 to 4 Fixed to 1 if using a USB module. <boolean>=<BOOLEAN PROGRAM DATA> ON, 1                      Auto Search ON OFF, 0                     Auto Search OFF [<unit>]=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Mainframe Nos. 1 to 4 When using two or more MT1810A units in serial connection, specify the mainframe number. Can be omitted. Mainframe No. 1 is specified when omitted.
Function	Selects the slot for execution of Auto Search.
Example	To set Auto Search of USB No.11 to ON: > :SENSe:MEASure:ASEarch:SELSlot USB11,1,ON
Compatibility	Incompatible with existing models. (The parameters are different.)

**:SENSe:MEASure:ASEarch:SELSlot? <slot>,<interface>[,<unit>]**

Parameter	<slot>=<CHARACTER PROGRAM DATA> SLOT1 to SLOT6            Slots No. 1 to No. 6 1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A USB11 to USB14            USB No.11 to 14 <interface>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Data1 to 4 [<unit>]=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Mainframe Nos. 1 to 4 When using two or more MT1810A units in serial connection, specify the mainframe number. Can be omitted. Mainframe No. 1 is specified when omitted.
Response	<boolean>=<NR1 NUMERIC RESPONSE DATA> 1                            ON 0                            OFF
Function	Queries the ON/OFF state of Auto Search for each slot.
Example	To query the ON/OFF state of Auto Search for USB No.11: > :SENSe:MEASure:ASEarch:SELSlot? USB11,1 < 1
Compatibility	Incompatible with existing models. (The parameters are different.)

**:SENSe:MEASure:ASEarch:SLOT? <slot>,<unit>**

Parameter	<slot>=<CHARACTER PROGRAM DATA> SLOT1 to SLOT6            Slots No. 1 to No. 6 1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A USB11 to USB14            USB No.11 to 14 [<unit>]=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Mainframe Nos. 1 to 4 When using two or more MT1810A units in serial connection, specify the mainframe number. Can be omitted. Mainframe No. 1 is specified when omitted.
Response	<interface>=<NR1 NUMERICRESPONSE DATA> 1 to 4                      Data1 to 4 <b>Note:</b> The interface numbers of all the data interfaces to which the Auto Search function can be executed are returned in a comma-separated string. 1 is returned if Auto Search for an MP1862A is ON. If all the targets are OFF, "Parameter Error" is returned.
Function	Queries the data interface(s) to which the Auto Search function can be executed..
Example	To query the data interface(s) to which the Auto Search function for USB

No.11 can be executed:

```
> :SENSE:MEASure:ASEarch:SLOT? USB11
< 1
```

Compatibility Incompatible with existing models.

**:CALCulate:DATA:ASEarch? <slot>,<interface>[,<unit>]**

---

Parameter	<p>&lt;slot&gt;=&lt;CHARACTER PROGRAM DATA&gt;                  SLOT1 to SLOT6            Slots No. 1 to No. 6                  1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A                  USB11 to USB14            USB No.11 to 14</p> <p>&lt;interface&gt;=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;                  1 to 4                      Data1 to 4</p> <p>[&lt;unit&gt;]=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;                  1 to 4                      Mainframe Nos. 1 to 4                  When using two or more MT1810A units in serial connection, specify the                  mainframe number.                  Can be omitted. Mainframe No. 1 is specified when omitted.</p>
Response	<p>&lt;data&gt;,&lt;xdata&gt;,&lt;delay&gt;,&lt;numeric1&gt;,&lt;numeric2&gt;,&lt;numeric3&gt;,&lt;numeric4&gt;                  &lt;data&gt;,&lt;xdata&gt;,&lt;delay&gt;,&lt;STRING RESPONSE DATA&gt;                  "Done"                      Normal termination                  "Fail"                      Abnormal termination                  "----"                      Not executed</p> <p>&lt;numeric1&gt;,&lt;numeric2&gt;=&lt;NR2 NUMERIC RESPONSE DATA&gt;                  -3.500 to 3.300            -3.500 to 3.300 V/Step 0.001 V                  "----"                      Not executed                  "----"                      Abnormal termination</p> <p>&lt;numeric3&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt;                  -1000 to 1000            -1000 to 1000 mUI/Step 1 mUI                  "----"                      Not executed                  "----"                      Abnormal termination</p> <p>&lt;numeric4&gt;=&lt;NR2 NUMERIC RESPONSE DATA&gt;                  -xxx.xx to xxx.xx ps (This value is converted from mUI units.)                  "----"                      Not executed                  "----"                      Abnormal termination</p>
Function	Queries the Auto Search results.
Example	<p>To query the Auto Search results of USB No.11:</p> <pre>&gt; :CALCulate:DATA:ASEarch? USB11,1 &lt; "Done", "Done", "Done",1.000,1.100,-500,50.00 &lt; "Done", "Done", "----",1.000,1.100,0,0.00 (When not executed in the Phase direction)</pre>
Compatibility	Incompatible with existing models. (The parameters are different.)



## 7.4.2 Eye Margin Measurement

This section describes the commands for Eye Margin measurement.

### 7.4.2.1 Measurement setting commands

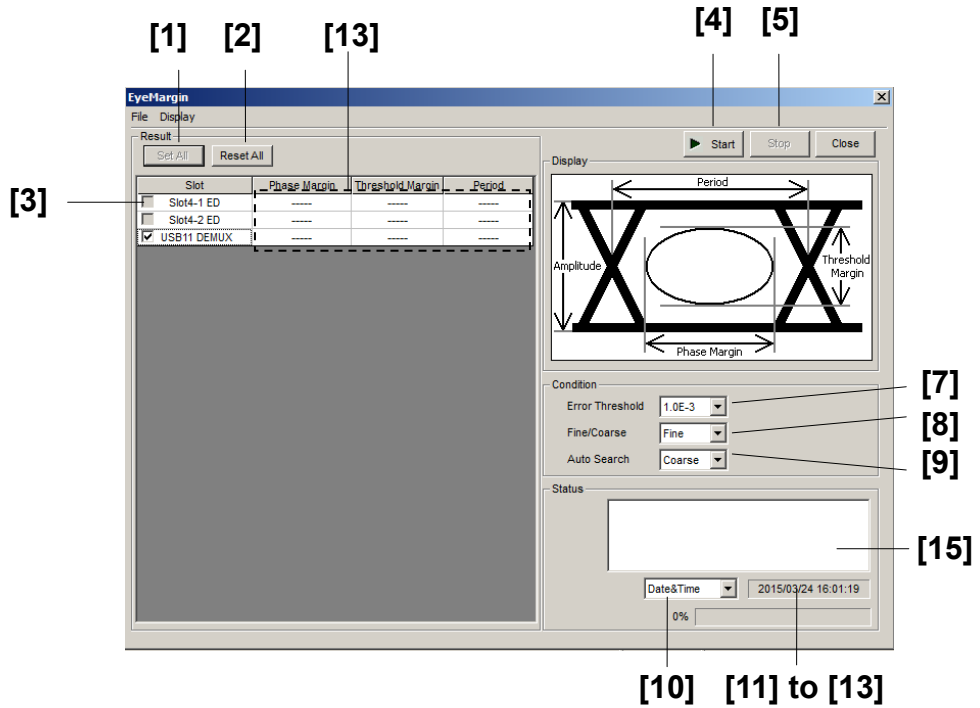


Figure 7.4.2.1-1 EyeMargin Window

**Table 7.4.2.1-1 Eye Margin Measurement Setting Commands**

No.	Item	Command
[1]	Set All	:SENSe:MEASure:EMARgin:MARGin:ASLot
[2]	Reset All	:SENSe:MEASure:EMARgin:MARGin:RSLot
[3]	Slot	:SENSe:MEASure:EMARgin:MARGin:SLOT
		:SENSe:MEASure:EMARgin:MARGin:SLOT?
[4]	Start	:SENSe:MEASure:STARt
[5]	Stop	:SENSe:MEASure:STOP
[6]	No label (Query for measurement state)	:SENSe:MEASure:EMARgin:STATe?
[7]	Error Threshold	:SENSe:MEASure:EMARgin:MARGin:THReshold
		:SENSe:MEASure:EMARgin:MARGin:THReshold?
[8]	Fine/Coarse	:SENSe:MEASure:EMARgin:MARGin:RESolution
		:SENSe:MEASure:EMARgin:MARGin:RESolution?
[9]	Auto Search	:SENSe:MEASure:EMARgin:MARGin:ASEarch
		:SENSe:MEASure:EMARgin:MARGin:ASEarch?
[10]	Selection of measurement time display	:SENSe:MEASure:EMARgin:TIME
		:SENSe:MEASure:EMARgin:TIME?
[11]	Query for date and time	:SENSe:MEASure:EMARgin:DTIME?
[12]	Query for measurement start time	:SENSe:MEASure:EMARgin:STARt?
[13]	Query for measurement elapsed time	:SENSe:MEASure:EMARgin:ELAPsed?
[14]	Query for measurement result	:CALCulate:DATA:EMARgin?
[15]	No label (Query for measurement status)	:CALCulate:DATA:EMARgin:STATus?

**:SENSe:MEASure:EMARgin:MARGin:ASLot**

Function                      Selects all Eye Margin measurement slots to be set to ON.  
 Example                      > :SENSe:MEASure:EMARgin:MARGin:ASLot  
 Compatibility                Incompatible with existing models.

**:SENSe:MEASure:EMARgin:MARGin:RSLot**

Function                      Selects all Eye Margin measurement slots to be set to OFF.  
 Example                      > :SENSe:MEASure:EMARgin:MARGin:RSLot  
 Compatibility                Incompatible with existing models.

### **:SENSe:MEASure:EMARgin:MARGin:SLOT <slot>,<interface>,<boolean>[,<unit>]**

Parameter	<p>&lt;slot&gt;=&lt;CHARACTER PROGRAM DATA&gt;  SLOT1 to SLOT6            Slots No. 1 to No. 6  1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A  USB11 to USB14            USB No.11 to 14  &lt;interface&gt;=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;  1 to 4                        Data1 to 4  Fixed to 1 if using a USB module.  &lt;boolean&gt;=&lt;BOOLEAN PROGRAM DATA&gt;  ON or 1                      ON  OFF or 0                     OFF  [&lt;unit&gt;]=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;  1 to 4                        Mainframe Nos. 1 to 4  When using two or more MT1810A units in serial connection, specify the mainframe number.  Can be omitted. Mainframe No. 1 is specified when omitted.</p>
Function	Selects the Eye Margin measurement slot.
Example	To set Eye Margin measurement of USB No.11 to ON: > :SENSe:MEASure:EMARgin:MARGin:SLOT USB11,1,ON
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EMARgin:MARGin:SLOT? <slot>,<interface>[,<unit>]**

Parameter	<p>&lt;slot&gt;=&lt;CHARACTER PROGRAM DATA&gt;  SLOT1 to SLOT6            Slots No. 1 to No. 6  1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A  USB11 to USB14            USB No.11 to 14  &lt;interface&gt;=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;  1 to 4                        Data1 to 4  Fixed to 1 if using a USB module  [&lt;unit&gt;]=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;  1 to 4                        Mainframe Nos. 1 to 4  When using two or more MT1810A units in serial connection, specify the mainframe number.  Can be omitted. Mainframe No. 1 is specified when omitted.</p>
Response	<p>&lt;boolean&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt;  1                              ON  0                              OFF</p>
Function	Queries whether the specified slot is subject to Eye Margin measurement.
Example	To query whether USB No.11 is subject to measurement: > :SENSe:MEASure:EMARgin:MARGin:SLOT? USB11,1 < 1
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:STARt**

---

Function	Starts the Eye Margin measurement.
Example	> :SENSe:MEASure:STARt
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:STOP**

---

Function	Stops the Eye Margin measurement.
Example	> :SENSe:MEASure:STOP
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EMARgin:STATe?**

---

Response	<boolean>=<NR1 NUMERIC RESPONSE DATA> 1 Starts measurement 0 Stops measurement -1 Measurement failure
Function	Queries the Eye Margin measurement state.
Example	> :SENSe:MEASure:EMARgin:STATe? < 1
Compatibility	Compatible with the MP1632C.

### **:SENSe:MEASure:EMARgin:MARGin:THReshold <thre>**

---

Parameter	<thre>=<CHARACTER PROGRAM DATA> E_3 to E_12 1E-3 to 1E-12/1 Step
Function	Sets the threshold value that is to be the boundary of the Eye Margin measurement margin.
Example	To set the threshold value that is to be the Eye Margin measurement margin to 1E-4: > :SENSe:MEASure:EMARgin:MARGin:THReshold E_4
Compatibility	Compatible with the MP1632C.

### **:SENSe:MEASure:EMARgin:MARGin:THReshold?**

---

Response	<thre>=<CHARACTER RESPONSE DATA> E_3 to E_12 1E-3 to 1E-12
Function	Queries the threshold value that is to be the boundary of the Eye Margin measurement margin.
Example	> :SENSe:MEASure:EMARgin:MARGin:THReshold? < E_4
Compatibility	Compatible with the MP1632C.

**:SENSe:MEASure:EMARgin:MARGin:RESolution <type>**

Parameter	<type>=<CHARACTER PROGRAM DATA> FINE                    Fine mode COARse                Coarse mode
Function	Sets the accuracy of the error ratio for the Eye Margin measurement.
Example	To set the accuracy of the error ratio for the Eye Margin measurement to the Fine mode: > :SENSe:MEASure:EMARgin:MARGin:RESolution FINE
Compatibility	Compatible with the MP1632C.

**:SENSe:MEASure:EMARgin:MARGin:RESolution?**

Response	<type>=<CHARACTER RESPONSE DATA> FINE, COAR
Function	Queries the accuracy of the error ratio for the Eye Margin measurement.
Example	> :SENSe:MEASure:EMARgin:MARGin:RESolution? < FINE
Compatibility	Compatible with the MP1632C.

**:SENSe:MEASure:EMARgin:MARGin:ASearch <boolean>[,<mode>]**

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> ON or 1                Auto Search ON OFF or 0               Auto Search OFF <mode>=<DECIMAL NUMERIC PROGRAM DATA> 1                        Coarse 2                        Fine <b>Note:</b> <mode> can be omitted. Coarse is specified when omitted.
Function	Selects whether to perform Auto Search upon start of the Eye Margin measurement.
Example	To set Auto Search upon start of the Eye Margin measurement to ON: > :SENSe:MEASure:EMARgin:MARGin:ASearch ON
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EMARgin:MARGin:ASEarch?**

---

Response	<boolean>=<NR1 NUMERIC RESPONSE DATA> 0 OFF 1 ON (Coarse) 2 ON (Fine)
Function	Queries whether to perform Auto Search upon start of the Eye Margin measurement.
Example	> :SENSe:MEASure:EMARgin:MARGin:ASEarch? < 1
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EMARgin:TIME <type>**

---

Parameter	<type>=<CHARACTER PROGRAM DATA> DTIME Displays the current date and time. STARt Displays the measurement start time. ELAPsed Displays the elapsed time based on the measurement period.
Function	Selects the Eye Margin measurement time display type.
Example	To set the Eye Margin measurement time display type to measurement start time (Start Time): > :SENSe:MEASure:EMARgin:TIME STARt
Compatibility	Compatible with the MP1632C.

### **:SENSe:MEASure:EMARgin:TIME?**

---

Response	<type>=<CHARACTER RESPONSE DATA> DTIME Displays the current date and time. STARt Displays the measurement start time. ELAPsed Displays the elapsed time based on the measurement period.
Function	Queries the Eye Margin measurement time display type.
Example	> :SENSe:MEASure:EMARgin:TIME? < STAR
Compatibility	Compatible with the MP1632C.

**:SENSe:MEASure:EMARgin:DTIME?**

Response	<pre>&lt;year&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt; 2000 to 2036           Year 2000 to 2036 &lt;month&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 1 to 12               January to December &lt;day&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 1 to 31               1st to 31st &lt;hour&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 23               0 to 23 hours &lt;minute&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59               0 to 59 minutes &lt;second&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59               0 to 59 seconds</pre>
Function	Queries the current date and time during Eye Margin measurement.
Example	<pre>&gt; :SENSe:MEASure:EMARgin:DTIME? &lt; 2012, 4, 1, 23, 59, 59</pre>
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:EMARgin:START?**

Response	<pre>&lt;year&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt; 0, 2000 to 2036       Year 2000 to 2036 &lt;month&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 12               January to December &lt;day&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 31               1st to 31st &lt;hour&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 23               0 to 23 hours &lt;minute&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59               0 to 59 minutes &lt;second&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59               0 to 59 seconds</pre> <p><b>Note:</b></p> <p>The following is output when no measurement is performed: &lt; 0,0,0,0,0,0</p>
Function	Queries the Eye Margin measurement start time.
Example	<pre>&gt; :SENSe:MEASure:EMARgin:START? &lt; 2012, 4, 1, 23, 59, 59</pre>
Compatibility	Compatible with the MP1632C.

**:SENSe:MEASure:EMARgin:ELAPsed?**

Response <day>=<NR1 NUMERIC RESPONSE DATA>  
 0, 1 to 99 0 to 99 days  
 <hour>=<NR1 NUMERIC RESPONSE DATA>  
 0 to 23 0 to 23 hours  
 <minute> = <NR1 NUMERIC RESPONSE DATA>  
 0 to 59 0 to 59 minutes  
 <second> = <NR1 NUMERIC RESPONSE DATA>  
 0 to 59 0 to 59 seconds  
**Note:**  
 The following is output when no measurement is performed:  
 < 0,0,0,0

Function Queries the Eye Margin measurement elapsed time (Elapsed Time).

Example > :SENSe:MEASure:EMARgin:ELAPsed?  
 < 99, 23, 59, 59

Compatibility Compatible with the MP1632C.

**:CALCulate:DATA:EMARgin? <slot>,<interface>,<string>[,<unit>]**

Parameter <slot>=<CHARACTER PROGRAM DATA>  
 SLOT1 to SLOT6 Slots No. 1 to No. 6  
 1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A  
 USB11 to USB14 USB No.11 to 14  
 <interface>=<DECIMAL NUMERIC PROGRAM DATA>  
 1 to 4 Data1 to 4  
 Fixed to 1 if using a USB module  
 <string>=<STRING PROGRAM DATA>  
 For details on <string>, refer to Table 7.4.2.1-2.  
 [<unit>]=<DECIMAL NUMERIC PROGRAM DATA>  
 1 to 4 Mainframe Nos. 1 to 4  
 When using two or more MT1810A units in serial connection, specify the mainframe number.  
 Can be omitted. Mainframe No. 1 is specified when omitted.

**Table 7.4.2.1-2 Eye Margin Measurement Items <string>**

Item	<string>	Response form
Phase margin	"PHASe"	Form 1
Threshold margin	"THReshold"	Form2
Period	"PERiod"	Form1

Response <result>=<STRING RESPONSE DATA>  
 For details on the measurement data <result>, refer to the table below.



Table 7.4.2.1-3 Eye Margin Measurement Results &lt;result&gt;

Form	Format	Description
Form1 Phase type	" XXXX"	For 0 to MAX (mUI/ps) Displays in the selected unit.
	"Failed"	For measurement failure
	"-----"	When no data corresponds to the query.
Form2 Threshold type	" XXXX"	0 to MAX (mVpp)
	"Failed"	For measurement failure
	"-----"	When no data corresponds to the query.

Function	Queries the Eye Margin measurement results.
Example	To query the Eye Margin measurement results of USB No.11: > :CALCulate:DATA:EMARgin? USB11,1, "THReshold" < " 0"
Compatibility	Incompatible with existing models.

### :CALCulate:DATA:EMARgin:STATus?

Response	<string>=<STRING RESPONSE DATA>
	"" When no alarm exists
	"Sync Loss" Sync. Loss
	"Clock Loss" Clock Loss
	"Out of range" Out of range
	"Illegal Error" Illegal Error
	"Meas. Threshold exceeded" Number of errors exceeds the target rate

**Note:**

When two or more alarms have occurred, they are displayed in the following order:

Illegal Error>Clock Loss  
>Sync Loss>Out of range

Function	Queries the Eye Margin measurement status.
Example	> :CALCulate:DATA:EMARgin:STATus? < "Sync Loss"
Compatibility	Incompatible with existing models.

### 7.4.2.2 File menu setting commands

**Table 7.4.2.2-1 File Menu Setting Commands**

No.	Item	Command
[1]	Open	:SYSTem:MMEMory:MARGin:RECall
[2]	Save	:SYSTem:MMEMory:MARGin:STORe

#### **:SYSTem:MMEMory:MARGin:RECall <file\_name>**

---

Parameter <file\_name>=<STRING PROGRAM DATA>  
 "<drv>:\<dir><file>"  
 <drv> = C,D,E,F  
 <dir>=<dir1>\<dir2>\...(Omitted for the root directory)  
 <file> = File Name

Function Opens the Eye Margin measurement result data.

Example > :SYSTem:MMEMory:MARGin:RECall "C:\Test\example"

Compatibility Incompatible with existing models.

#### **:SYSTem:MMEMory:MARGin:STORe <file\_name>,<file\_type>**

---

Parameter <file\_name>=<STRING PROGRAM DATA>  
 "<drv>:\<dir><file>"  
 <drv> = C,D,E,F  
 <dir>=<dir1>\<dir2>\...(Omitted for the root directory)  
 <file> = File Name  
 <file\_type>=<CHARACTER PROGRAM DATA>  
 BIN Binary file  
 CSV CSV file  
 TXT Text file

Function Saves the Eye Margin measurement result data.

**Note:**  
 The settings will not be read from the saved file if the file name is changed.

Example To save the Eye Margin measurement result data by specifying the save destination, file name, and file format:  
 > :SYSTem:MMEMory:MARGin:STORe "C:\Test\example",TXT

Compatibility Incompatible with existing models.

### 7.4.3 Eye Diagram Measurement

This section describes the commands for Eye Diagram measurement. Commands are described for each tab.

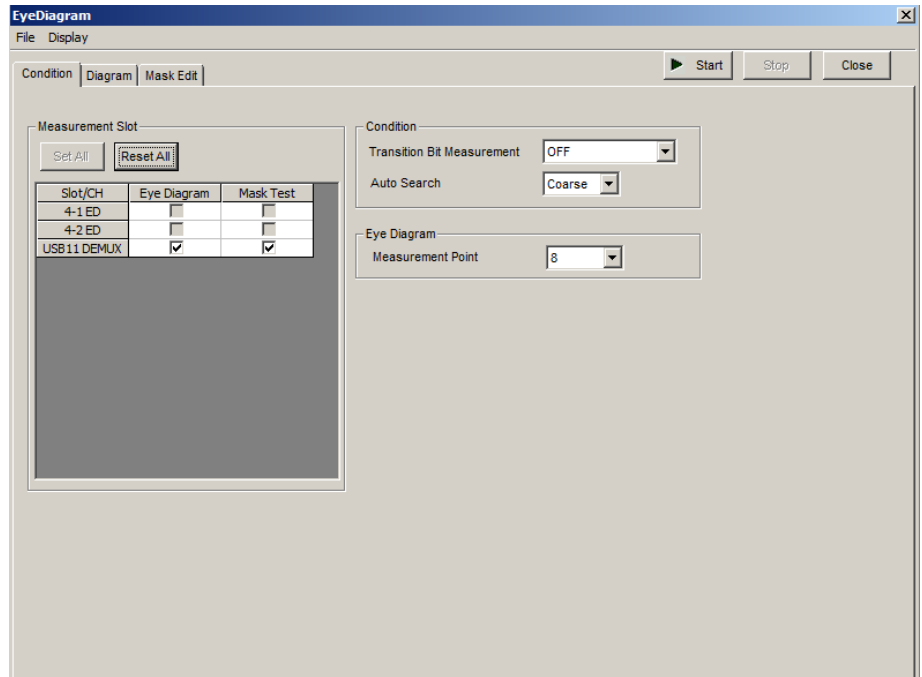


Figure 7.4.3-1 EyeDiagram Window

#### 7.4.3.1 Condition setting commands

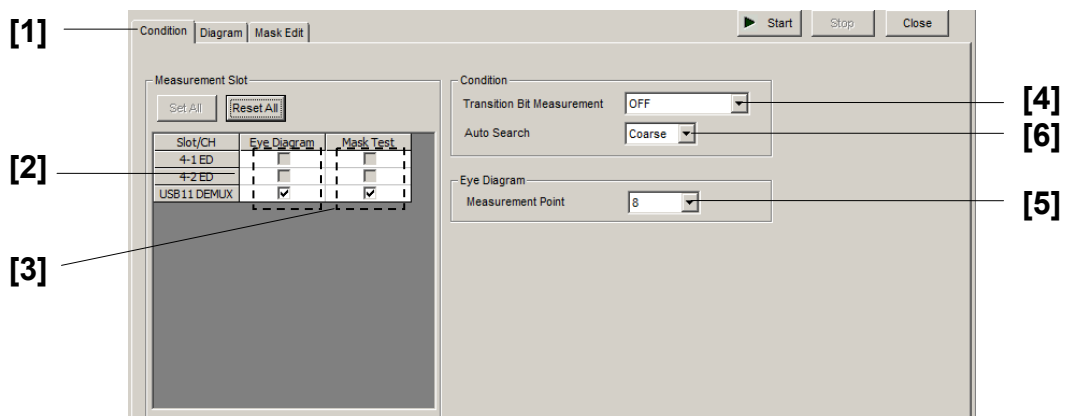


Figure 7.4.3.1-1 Condition Tab

**Table 7.4.3.1-1 Condition Tab Setting Commands**

No.	Item	Command
[1]	Tab Selection	:DISPlay:RESult:EDIagram:TABSelect
		:DISPlay:RESult:EDIagram:TABSelect?
[2]	Slot Eye Diagram	:SENSe:MEASure:EDIagram:DIAGram:SLOT
		:SENSe:MEASure:EDIagram:DIAGram:SLOT?
[3]	Slot Mask Test	:SENSe:MEASure:EDIagram:MTESt:SLOT
		:SENSe:MEASure:EDIagram:MTESt:SLOT?
[4]	Transition Bit Measurement	:SENSe:MEASure:EDIagram:DIAGram:TRANsition
		:SENSe:MEASure:EDIagram:DIAGram:TRANsition?
[5]	Measurement Point	:SENSe:MEASure:EDIagram:DIAGram:TYPE
		:SENSe:MEASure:EDIagram:DIAGram:TYPE?
[6]	Auto Search	:SENSe:MEASure:EDIagram:DIAGram:ASEarch
		:SENSe:MEASure:EDIagram:DIAGram:ASEarch?

**:DISPlay:RESult:EDIagram:TABSelect <tab>**

Parameter <tab>=<CHARACTER PROGRAM DATA>  
 CONDition Condition tab  
 DIAGram Diagram tab  
 MASKedit Mask Edit tab

Function Switches the Eye Diagram measurement tab display.

Example To display the Eye Diagram measurement Condition tab:  
 > :DISPlay:RESult:EDIagram:TABSelect CONDition

Compatibility Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TABSelect?**

Response <tab>=<CHARACTER RESPONSE DATA>  
 COND, DIAG, MASK

Function Queries the Eye Diagram measurement tab display.

Example > :DISPlay:RESult:EDIagram:TABSelect?  
 < COND

Compatibility Incompatible with existing models.

### **:SENSe:MEASure:EDIagram:DIAGram:SLOT <slot>,<interface>,<boolean>[,<unit>]**

Parameter	<p>&lt;slot&gt;=&lt;CHARACTER PROGRAM DATA&gt;  SLOT1 to SLOT6                      Slots No. 1 to No. 6  1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A  USB11 to USB14                      USB No.11 to 14  &lt;interface&gt;=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;  1 to 4                                      Data1 to 4  Fixed to 1 if using a USB module  &lt;boolean&gt;=&lt;BOOLEAN PROGRAM DATA&gt;  ON or 1                                      Eye Diagram measurement ON  OFF or 0                                      Eye Diagram measurement OFF  [&lt;unit&gt;]=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;  1 to 4                                      Mainframe Nos. 1 to 4  When using two or more MT1810A units in serial connection, specify the mainframe number.  Can be omitted. Mainframe No. 1 is specified when omitted.</p>
Function	Selects the Eye Diagram measurement slot.
Example	To set USB No.11 as a target of Eye Diagram measurement: <pre>&gt; :SENSe:MEASure:EDIagram:DIAGram:SLOT USB11,1,ON</pre>
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDIagram:DIAGram:SLOT? <slot>,<interface>[,<unit>]**

Parameter	<p>&lt;slot&gt;=&lt;CHARACTER PROGRAM DATA&gt;  SLOT1 to SLOT6                      Slots No. 1 to No. 6  1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A  USB11 to USB14                      USB No.11 to 14  &lt;interface&gt;=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;  1 to 4                                      Data1 to 4  Fixed to 1 if using a USB module  [&lt;unit&gt;]=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;  1 to 4                                      Mainframe Nos. 1 to 4  When using two or more MT1810A units in serial connection, specify the mainframe number.  Can be omitted. Mainframe No. 1 is specified when omitted.</p>
Response	<p>&lt;boolean&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt;  ON or 1                                      Eye Diagram measurement ON  OFF or 0                                      Eye Diagram measurement OFF</p>
Function	Queries whether the specified slot is targeted for the Eye Diagram measurement.
Example	To query whether USB No.11 is subject to measurement: <pre>&gt; :SENSe:MEASure:EDIagram:DIAGram:SLOT? USB11,1</pre>

Compatibility < 1  
 Incompatible with existing models.

**:SENSe:MEASure:EDIagram:MTESt:SLOT  
 <slot>,<interface>,<boolean>[,<unit>]**

---

Parameter <slot>=<CHARACTER PROGRAM DATA>  
 SLOT1 to SLOT6 Slots No. 1 to No. 6  
 1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A  
 USB11 to USB14 USB No.11 to 14  
 <interface>=<DECIMAL NUMERIC PROGRAM DATA>  
 1 to 4 Data1 to 4  
 Fixed to 1 if using a USB module  
 <boolean>=<BOOLEAN PROGRAM DATA>  
 ON or 1 Mask Test measurement ON  
 OFF or 0 Mask Test measurement OFF  
 [<unit>]=<DECIMAL NUMERIC PROGRAM DATA>  
 1 to 4 Mainframe Nos. 1 to 4  
 When using two or more MT1810A units in serial connection, specify the  
 mainframe number.  
 Can be omitted. Mainframe No. 1 is specified when omitted.

Function Selects the Mask Test measurement slot.

Example To set USB No. 11 as a target of Mask Test measurement:  
 > :SENSe:MEASure:EDIagram:MTESt:SLOT USB11,1,ON

Compatibility Incompatible with existing models.

**:SENSe:MEASure:EDIagram:MTESt:SLOT? <slot>,<interface>[,<unit>]**

---

Parameter <slot>=<CHARACTER PROGRAM DATA>  
 SLOT1 to SLOT6 Slots No. 1 to No. 6  
 1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A  
 USB11 to USB14 USB No.11 to 14  
 <interface>=<DECIMAL NUMERIC PROGRAM DATA>  
 1 to 4 Data1 to 4  
 Fixed to 1 if using a USB module  
 [<unit>]=<DECIMAL NUMERIC PROGRAM DATA>  
 1 to 4 Mainframe Nos. 1 to 4  
 When using two or more MT1810A units in serial connection, specify the  
 mainframe number.  
 Can be omitted. Mainframe No. 1 is specified when omitted.

Response <boolean>=<NR1 NUMERIC RESPONSE DATA>  
 1 ON  
 0 OFF

Function Queries whether the specified slot is targeted for the Mask Test

Example	<p>measurement.</p> <p>To query whether the slot 1, Data 1 is targeted for the Mask Test measurement:</p> <pre>&gt; :SENSe:MEASure:EDIagram:MTESt:SLOT? SLOT1,1 &lt; 1</pre>
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDIagram:DIAGram:TRANSition <type>**

Parameter	<p>&lt;type&gt;=&lt;CHARACTER PROGRAM DATA&gt;</p> <p>OFF            OFF</p> <p>TRANSition    Transition</p> <p>NONTran       Non Transition</p>
Function	Sets Transition/Non Transition error detection.
Example	<p>To set to Transition error detection:</p> <pre>&gt; :SENSe:MEASure:EDIagram:DIAGram:TRANSition TRANSition</pre>
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDIagram:DIAGram:TRANSition?**

Response	<p>&lt;type&gt;=&lt;CHARACTER RESPONSE DATA&gt;</p> <p>OFF</p>
Function	Queries the Transition/Non Transition error detection setting state.
Example	<pre>&gt; :SENSe:MEASure:EDIagram:DIAGram:TRANSition? &lt; OFF</pre>
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDIagram:DIAGram:TYPE <type>**

Parameter	<p>&lt;type&gt;=&lt;CHARACTER PROGRAM DATA&gt;</p> <p>POINT8        8 Point</p> <p>POINT16       16 Point</p> <p>POINT32       32 Point</p> <p>POINT64       64 Point</p> <p>POINT128      128 Point</p>
Function	Sets the number of measurement points during Eye Diagram measurement.
Example	<p>To set the number of measurement points during Eye Diagram measurement to 8 points:</p> <pre>&gt; :SENSe:MEASure:EDIagram:DIAGram:TYPE POINT8</pre>
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDIagram:DIAGram:TYPE?**

---

Response	<type>=<CHARACTER RESPONSE DATA> POIN8, POIN16, POIN32, POIN64, POIN128
Function	Queries the number of measurement points during Eye Diagram measurement.
Example	> :SENSe:MEASure:EDIagram:DIAGram:TYPE? < POIN8
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDIagram:DIAGram:ASEarch <setting>[,<mode>]**

---

Parameter	<setting>=<BOOLEAN PROGRAM DATA> ON or 1            Auto Search ON OFF or 0           Auto Search OFF <mode>=<DECIMAL NUMERIC PROGRAM DATA> 1                   Coarse 2                   Fine <b>Note:</b> <mode> can be omitted. Coarse is specified when omitted.
Function	Selects whether to execute Auto Search when starting the Eye Diagram Measurement.
Example	To set Auto Search to On when starting the Eye Diagram Measurement: > :SENSe:MEASure:EDIagram:DIAGram:ASEarch ON,2
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDIagram:DIAGram:ASEarch?**

---

Response	<setting>=<NR1 NUMERIC RESPONSE DATA> 0                   OFF 1                   ON (Coarse) 2                   ON (Fine)
Function	Queries whether to execute Auto Search when starting the Eye Diagram Measurement.
Example	> :SENSe:MEASure:EDIagram:DIAGram:ASEarch? < 2
Compatibility	Incompatible with existing models.



### 7.4.3.2 Diagram setting commands

This section describes the commands for the respective areas of the **Diagram** tab.

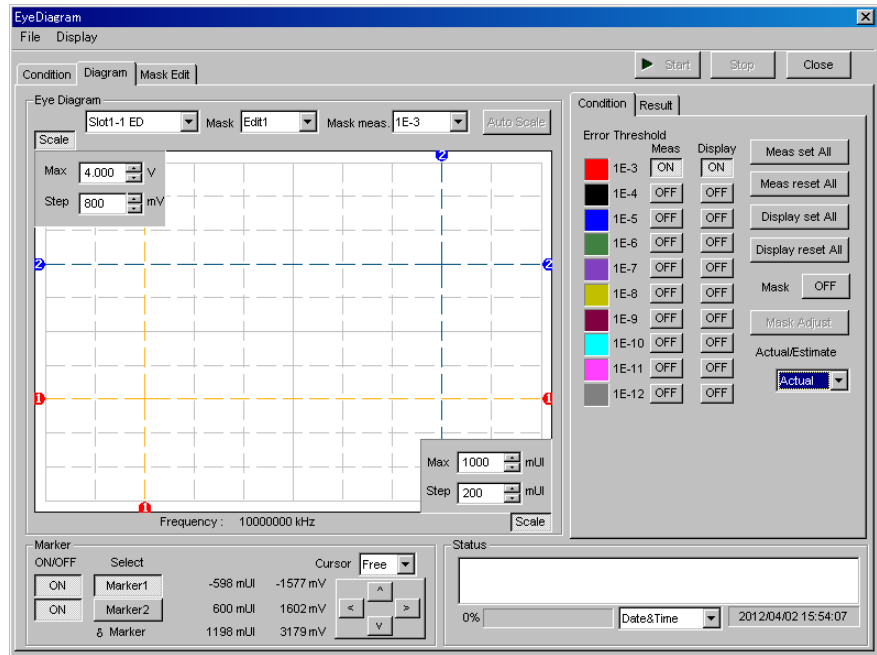


Figure 7.4.3.2-1 Diagram Tab

7.4.3.2.1 Graph display setting commands

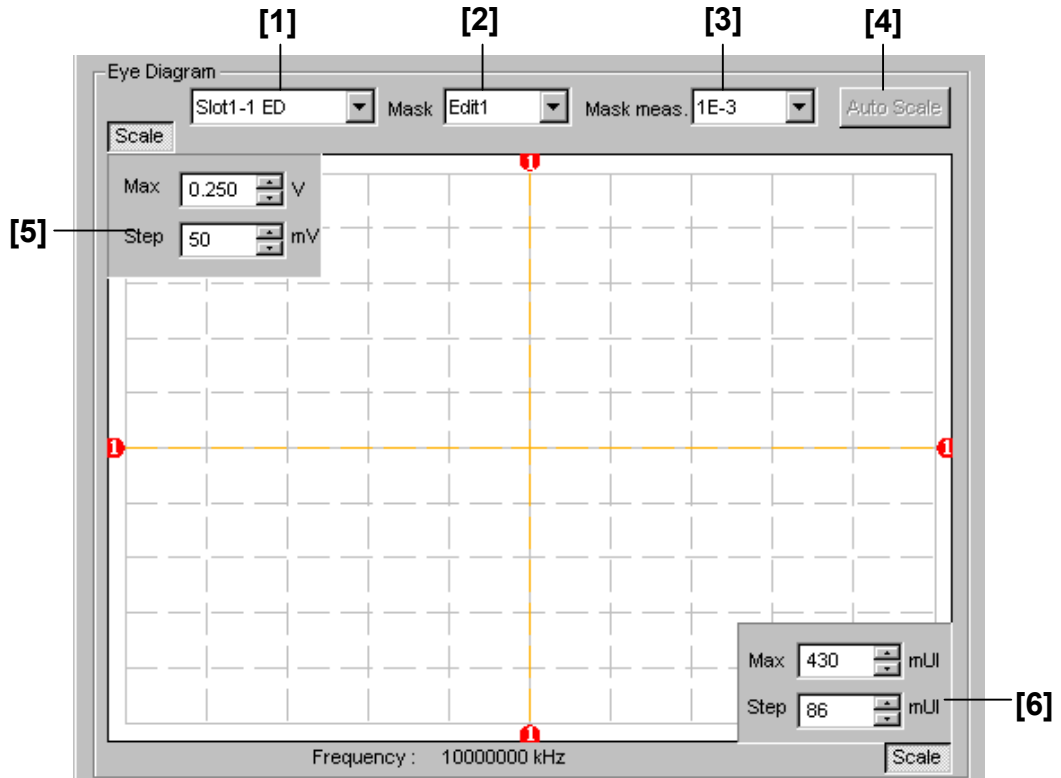


Figure 7.4.3.2.1-1 Eye Diagram Area

Table 7.4.3.2.1-1 Graph Display Setting Commands

No.	Item	Command
[1]	No label (Result display slot setting)	:DISPlay:RESult:EDIagram:SLOT :DISPlay:RESult:EDIagram:SLOT?
[2]	Mask	:DISPlay:RESult:EDIagram:TEMPlate:SElect :DISPlay:RESult:EDIagram:TEMPlate:SElect?
[3]	Mask meas.	:DISPlay:RESult:EDIagram:TEMPlate:THReshold :DISPlay:RESult:EDIagram:TEMPlate:THReshold?
[4]	Auto Scale	:DISPlay:RESult:EDIagram:SCALe:ASCale
[5]	Max/Step	:DISPlay:RESult:EDIagram:SCALe:VOLTage :DISPlay:RESult:EDIagram:SCALe:VOLTage?
[6]	Max/Step	:DISPlay:RESult:EDIagram:SCALe:PHASe :DISPlay:RESult:EDIagram:SCALe:PHASe?

**:DISPlay:RESult:EDIagram:SLOT <slot>,<interface>[,<unit>]**

Parameter	<slot>=<CHARACTER PROGRAM DATA> SLOT1 to SLOT6            Slots No. 1 to No. 6 1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A USB11 to USB14            USB No.11 to 14 <interface>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Data1 to 4 Fixed to 1 if using a USB module [<unit>]=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Mainframe Nos. 1 to 4 When using two or more MT1810A units in serial connection, specify the mainframe number. Can be omitted. Mainframe No. 1 is specified when omitted.
Function	Selects the Eye Diagram result display target slot.
Example	To set the Eye Diagram result display target slot to slot No. 1, Data 1: > :DISPlay:RESult:EDIagram:SLOT SLOT1,1
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:SLOT? [<unit>]**

Parameter	[<unit>]=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Mainframe Nos. 1 to 4 When using two or more MT1810A units in serial connection, specify the mainframe number. Can be omitted. Mainframe No. 1 is specified when omitted. USB11 to USB14            USB No.11 to 14 Fixed to 1 if using a USB module
Response	<slot>=<CHARACTER RESPONSE DATA> SLOT1 to SLOT6            Slots No. 1 to No. 6 <interface>=<NR1 NUMERIC PROGRAM DATA> 1 to 4                      Data1 to 4
Function	Queries the Eye Diagram result display target slot.
Example	> :DISPlay:RESult:EDIagram:SLOT? < SLOT1,1
Compatibility	Incompatible with existing models.

### **:DISPlay:RESult:EDIagram:TEMPlate:SElect <type>**

---

Parameter	<type>=<CHARACTER PROGRAM DATA> E1                    Edit1 E2                    Edit2 E3                    Edit3 E4                    Edit4
Function	Sets the mask pattern for performing the Eye Diagram mask test.
Example	To set the mask pattern for performing the Eye Diagram mask test to Edit2: > :DISPlay:RESult:EDIagram:TEMPlate:SElect E2
Compatibility	Incompatible with existing models.

### **:DISPlay:RESult:EDIagram:TEMPlate:SElect?**

---

Response	<type>=<CHARACTER RESPONSE DATA> E1, E2, E3, E4
Function	Queries the mask pattern for performing the Eye Diagram mask test.
Example	> :DISPlay:RESult:EDIagram:TEMPlate:SElect? < E2
Compatibility	Incompatible with existing models.

### **:DISPlay:RESult:EDIagram:TEMPlate:THReshold <thre>**

---

Parameter	<thre>=<CHARACTER PROGRAM DATA> E_3 to E_12        1E-3 to 1E-12/1 Step
Function	Sets the Error Threshold for performing the Eye Diagram mask test.
Example	To set the Error Threshold for performing the Eye Diagram mask test to E-3: > :DISPlay:RESult:EDIagram:TEMPlate:THReshold E_3
Compatibility	Incompatible with existing models.

### **:DISPlay:RESult:EDIagram:TEMPlate:THReshold?**

---

Response	<thre>=<CHARACTER RESPONSE DATA>
Function	Queries the Error Threshold for performing the Eye Diagram mask test.
Example	> :DISPlay:RESult:EDIagram:TEMPlate:THReshold? < E_3
Compatibility	Incompatible with existing models.

### **:DISPlay:RESult:EDIagram:SCALE:ASCale**

---

Function	Automatically adjusts the Eye Diagram measurement graph scale.
Example	> :DISPlay:RESult:EDIagram:SCALE:ASCale
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:SCALE:VOLTage <max>,<step>**

Parameter	<max>=<DECIMAL NUMERIC PROGRAM DATA> -3.990 to 4.000                      -3.990 to 4.000 V/0.001 V Step <step>=<DECIMAL NUMERIC PROGRAM DATA> 0.001 to 0.800                      0.001 to 0.800 V/0.001 V Step The range varies depending on the option status and input interface setting.
Function	Sets the maximum value in the direction of the Threshold of the Eye Diagram graph, and the grid resolution.
Example	To set the maximum value in the direction of the Threshold of the Eye Diagram graph to 4.000 V, and the grid resolution to 0.800 V: > :DISPlay:RESult:EDIagram:SCALE:VOLTage 4.000,0.800
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:SCALE:VOLTage?**

Response	<max>=<NR2 NUMERIC RESPONSE DATA> -3.990 to 4.000                      -3.990 to 4.000 V <step>=<NR2 NUMERIC RESPONSE DATA> 0.001 to 0.800                      0.001 to 0.800 V
Function	Queries the maximum value in the direction of the Threshold of the Eye Diagram graph, and the grid resolution.
Example	> :DISPlay:RESult:EDIagram:SCALE:VOLTage? < 4.000,0.800
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:SCALE:PHASe <max>,<step>**

Parameter	<max>=<DECIMAL NUMERIC PROGRAM DATA> -990 to 1000                      -990 to 1000 mUI/1 mUI Step <step>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 200                      1 to 200 mUI/1 mUI Step
Function	Sets the maximum value in the direction of the Phase of the Eye Diagram graph, and the grid resolution.
Example	To set the maximum value in the direction of the Phase of the Eye Diagram graph to 1000, and the grid resolution to 10 mUI: > :DISPlay:RESult:EDIagram:SCALE:PHASe 1000,10
Compatibility	Incompatible with existing models.

## **:DISPlay:RESult:EDIagram:SCALE:PHASe?**

---

Response	<code>&lt;max&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt;</code> <code>&lt;step&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt;</code> The maximum value and grid resolution in the phase direction are returned, with separated by a comma (,).
Function	Queries the maximum value in the direction of the Phase of the Eye Diagram graph, and the grid resolution.
Example	<code>&gt; :DISPlay:RESult:EDIagram:SCALE:PHASe?</code> <code>&lt; 1000,10</code>
Compatibility	Incompatible with existing models.

7.4.3.2.2 Condition setting commands

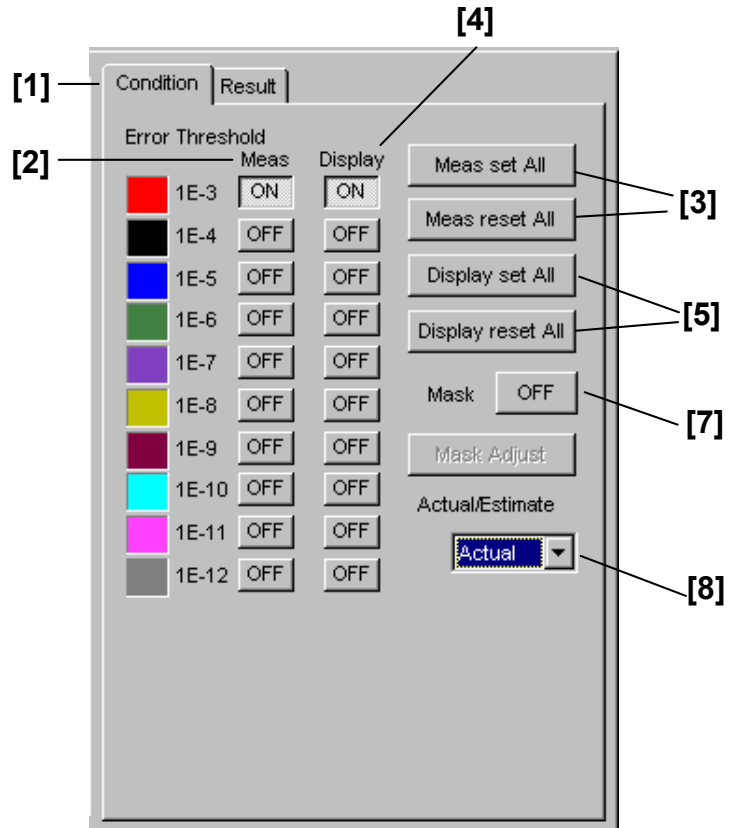


Figure 7.4.3.2.2-1 Condition Tab (Actual)

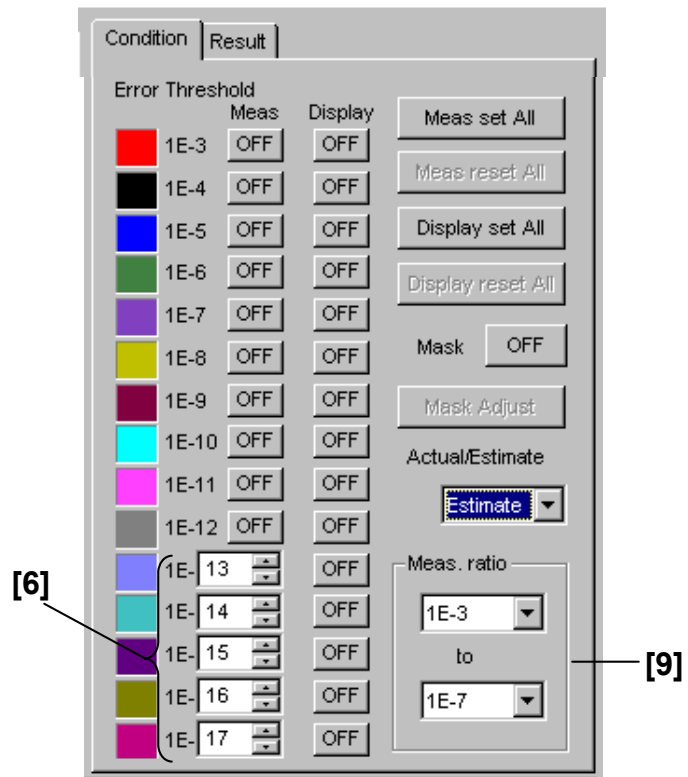


Figure 7.4.3.2.2-2 Condition Tab (Estimate)



Table 7.4.3.2.2-1 Graph Display Setting Commands

No.	Item	Command
[1]	Condition Detail Result	:DISPlay:RESult:EDIagram:DIAGram:TABSelect
		:DISPlay:RESult:EDIagram:DIAGram:TABSelect?
[2]	Meas	:SENSe:MEASure:EDIagram:DIAGram:THReshold
		:SENSe:MEASure:EDIagram:DIAGram:THReshold?
[3]	Meas set All Meas reset All	:SENSe:MEASure:EDIagram:DIAGram:ATHReshold
[4]	Display	:DISPlay:RESult:EDIagram:ERATe
		:DISPlay:RESult:EDIagram:ERATe?
[5]	Display set All Display reset All	:DISPlay:RESult:EDIagram:AERate
[6]	Setting of error rate for Estimate measurement	DISPlay:RESult:EDIagram:EERate
		DISPlay:RESult:EDIagram:EERate?
[7]	Mask	:DISPlay:RESult:EDIagram:DISPlay:MASK
		:DISPlay:RESult:EDIagram:DISPlay:MASK?
[8]	Actual/Estimate	:DISPlay:RESult:EDIagram:ESTimate
		:DISPlay:RESult:EDIagram:ESTimate?
[9]	Meas.ratio	:SENSe:MEASure:EDIagram:DIAGram:BTHReshold
		:SENSe:MEASure:EDIagram:DIAGram:BTHReshold?
[10]	Query for measurement point	:SENSe:MEASure:EDIagram:DIAGram:POINT?
[11]	Query for measurement result	:CALCulate:DATA:DIAGram?

**:DISPlay:RESult:EDIagram:DIAGram:TABSelect <tab>**

Parameter	<tab>=<CHARACTER PROGRAM DATA> CONDition      Condition tab RESult          Result tab
Function	Switches the tab display within the Diagram tab.
Example	To display the Result tab within the Diagram tab: > :DISPlay:RESult:EDIagram:DIAGram:TABSelect RESult
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:DIAGram:TABSelect?**

Response	<tab>=<CHARACTER RESPONSE DATA> COND, RES
Function	Queries the tab selected in the Diagram tab.
Example	> :DISPlay:RESult:EDIagram:TABSelect? < COND
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:EDIagram:DIAGram:THReshold <thre>,<boolean>**

Parameter	<type>=<CHARACTER PROGRAM DATA> E_3 to E_12      1E-3 to 1E-12/1 Step <boolean>=<BOOLEAN PROGRAM DATA> ON or 1            Selects ON OFF or 0           Selects OFF
Function	Sets the Eye Diagram measurement target error rate.
Example	To set the Eye Diagram measurement target error rate to 1E-12: > :SENSe:MEASure:EDIagram:DIAGram:THReshold E_12,ON
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:EDIagram:DIAGram:THReshold?**

Response	<type>=<CHARACTER RESPONSE DATA> E_3 to E_12      1E-3 to 1E-12 NONE              When all OFF The selected threshold options are returned, with separated by a comma(s).
Function	Queries the Eye Diagram measurement target error rate.
Example	> :SENSe:MEASure:EDIagram:DIAGram:THReshold? < E_3,E_10,E_12
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:EDIagram:DIAGram:ATHReshold <boolean>**

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> ON or 1            Sets all ON OFF or 0           Sets all OFF
Function	Sets all Eye Diagram measurement target error rates to be ON or OFF.
Example	To set all Eye Diagram measurement target error rates to be ON: > :SENSe:MEASure:EDIagram:DIAGram:ATHReshold ON
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:ERATe <thre>,<boolean>**

Parameter	<type>=<CHARACTER PROGRAM DATA> E_3 to E_17      1E-3 to 1E-17/1 Step <boolean>=<BOOLEAN PROGRAM DATA> ON or 1            Display select ON OFF or 0           Display select OFF
Function	Sets the target error rate of the Eye Diagram measurement result display.
Example	To set the target error rate of the Eye Diagram measurement result display to 1E-12: > :DISPlay:RESult:EDIagram:ERATe E_12,1

Compatibility Incompatible with existing models.

### **:DISPlay:RESult:EDiagram:ERATe?**

Response <type>=<CHARACTER RESPONSE DATA>  
 E\_3 to E\_17 1E-3 to 1E-17  
 NONE When all OFF  
 The selected threshold is delimited with a comma (,) and returned.

Function Queries the target error rate of the Eye Diagram measurement result display.

Example > :DISPlay:RESult:EDiagram:ERATe?  
 < NONE

Compatibility Incompatible with existing models.

### **:DISPlay:RESult:EDiagram:AERate <boolean>**

Parameter <boolean>=<BOOLEAN PROGRAM DATA>  
 ON or 1 Sets all ON  
 OFF or 0 Sets all OFF

Function Sets all target error rates of the Eye Diagram measurement result display to be ON or OFF.

Example To set all target error rates of the Eye Diagram measurement result display to be ON:  
 > :DISPlay:RESult:EDiagram:AERate 1

Compatibility Incompatible with existing models.

### **:DISPlay:RESult:EDiagram:EERate <numeric>**

Parameter <numeric>=<DECIMAL PROGRAM DATA>  
 13 to 199 1E-13 to 1E-199/1 Step  
 Up to five parameters can be set, delimited with a comma (,).

Function Sets the result display error rate in Estimate measurement from E-13 to E-199.

Example To display the result display error rate in Estimate measurement for 1E-15, 1E-100, 1E-150, 1E-199, and 1E-180:  
 >:DISPlay:RESult:EDiagram:EERate 15,100,150,199,180

Compatibility Incompatible with existing models.

### **:DISPlay:RESult:EDIagram:EERate?**

---

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 13 to 199            1E-13 to 1E-199 Returns five responses, delimited with a comma (,).
Function	Queries the result display error rate setting in Estimate measurement from E-13 to E-199.
Example	>:DISPlay:RESult:EDIagram:EERate? <15,100,150,199,180
Compatibility	Incompatible with existing models.

### **:DISPlay:RESult:EDIagram:DISPlay:MASK <boolean>**

---

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> ON or 1            Display OFF or 0            Clear
Function	Selects between displaying and clearing the mask test result during Eye Diagram measurement.
Example	To display the mask test result during Eye Diagram measurement: > :DISPlay:RESult:EDIagram:DISPlay:MASK ON
Compatibility	Incompatible with existing models.

### **:DISPlay:RESult:EDIagram:DISPlay:MASK?**

---

Response	<boolean>=<NR1 NUMERIC RESPONSE DATA> 1                    Display 0                    Clear
Function	Queries the setting whether to display or clear the mask test result during Eye Diagram measurement..
Example	> :DISPlay:RESult:EDIagram:DISPlay:MASK? < 1
Compatibility	Incompatible with existing models.

### **:DISPlay:RESult:EDIagram:ESTimate <type>**

---

Parameter	<type>=<CHARACTER PROGRAM DATA> ACTual            Actual measurement ESTimate            Estimate measurement
<b>Note:</b> The Estimate measurement cannot be selected when the number of measurement points is set to 8.	
Function	Selects between Actual and Estimate measurement during Eye Diagram measurement.



**:SENSe:MEASure:EDIagram:DIAGram:POINT?  
<slot>,<interface>,<thre>[,<unit>]**

---

Parameter	<p>&lt;slot&gt;=&lt;CHARACTER PROGRAM DATA&gt;                  SLOT1 to SLOT6                Slots No. 1 to No. 6                  USB11 to USB14                USB No.11 to 14                  &lt;interface&gt;=&lt; DECIMAL NUMERIC PROGRAM DATA&gt;                  1 to 4                                Data1 to 4                  Fixed to 1 if using a USB module                  &lt;thre&gt;=&lt;CHARACTER PROGRAM DATA&gt;                  E_3 to E_12                        1E-3 to 1E-12                  [&lt;unit&gt;]=&lt;DECIMAL NUMERIC PROGRAM DATA&gt;                  1 to 4                                Mainframe Nos. 1 to 4                  When using two or more MT1810A units in serial connection, specify the mainframe number.                  Can be omitted. Mainframe No. 1 is specified when omitted.</p>
Response	<p>&lt;numeric&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt;                  1 to 128                                Returns a valid point.                  0    Returns 0 when all points are invalid.                  Multiple valid points are delimited with a comma (,) and returned</p>
Function	<p>Queries the valid points in each threshold during the Eye Diagram measurement for a specific slot.</p>
Example	<p>To query the valid points in slot No. 1 during measurement with threshold E-3:                  &gt; :SENSe:MEASure:EDIagram:DIAGram:POINT? USB11,1,E_3                  &lt; 1,2,3,4,128</p>
Compatibility	<p>Incompatible with existing models.</p>

**:CALCulate:DATA:DIAGram? <slot>,<interface>,<string>[,<unit>]**

Parameter	<slot>=<CHARACTER PROGRAM DATA> SLOT1 to SLOT6                Slots No. 1 to No. 6 USB11 to USB14                USB No.11 to 14 <interface>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                            Data1 to 4 Fixed to 1 if using a USB module <string>=<STRING PROGRAM DATA> <result>                        Measurement data For details on <result>, refer to Table 7.12.10.2.2-3. [<unit>]=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                            Mainframe Nos. 1 to 4 When using two or more MT1810A units in serial connection, specify the mainframe number. Can be omitted. Mainframe No. 1 is specified when omitted.
Response	<string>=<STRING RESPONSE DATA>

**Table 7.4.3.2.2-2 Response Format**

Type	Format	Description
Form1 Eye Map type	"XXXXX,YYYYY"	XXXXX: Phase (mUI or ps) Displayed in the selected unit. YYYYY: Threshold (mV)
	"-----,-----"	When no data corresponds to the query

Function	Queries the Eye Diagram measurement results of the specified slot and point.
----------	--

**Table 7.4.3.2.2-3 Eye Diagram Measurement Items <result>**

Item	<result>	Response Format
Eye Map type	"MAP:E_3:POINT1",...,"MAP:E_3:POINT128"	Form1
	"MAP:E_4:POINT1",...,"MAP:E_4:POINT18"	
	"MAP:E_11:POINT1",...,"MAP:E_11:POINT128"	
	"MAP:E_12:POINT1",...,"MAP:E_12:POINT128"	

Example	To query the Eye Diagram measurement results of USB No.11 and E-3 point: >:CALCulate:DATA:DIAGram? SLOT1, 2,"MAP:E_3:POINT1" <" 100, 1000"
---------	--

Compatibility	Incompatible with existing models.
---------------	------------------------------------

**:CALCulate:DATA:EDIagram:MASK? <slot>,<interface>[,<unit>]**

Parameter <slot>=<CHARACTER PROGRAM DATA>  
 SLOT1 to SLOT6 Slots No. 1 to No. 6  
 USB11 to USB14 USB No.11 to 14  
 <interface>=<DECIMAL NUMERIC PROGRAM DATA>  
 1 to 4 Data 1 to 4  
 Fixed to 1 if using a USB module  
 [<unit>]=<DECIMAL NUMERIC PROGRAM DATA>  
 1 to 4 Mainframe No. 1 to 4  
 When using two or more MT1810A units in serial connection, specify the mainframe number.  
 Can be omitted. Mainframe No. 1 is specified when omitted.

Response <string>=<STRING RESPONSE DATA>

**Table 7.4.3.2.2-4 Response Format**

Form	Format	Description
Form1 EyeResult type	"XX,Y,Y,Y...Y"	XX: Pass,Failure Y: 1 to 32 (NG mask point) <b>Note:</b> Multiple NGs are delimited with a comma (,) and returned for the corresponding number of NGs.
	"--,--"	When no data corresponds to the query.

Function Queries the measurement result of the Eye Diagram Mask Test.

Example To query the Mask Test result of USB No.11:  
 >:CALCulate:DATA:EDIagram:MASK? "USB11,1"  
 <"Failure,1,2,3,4,32"  
 <"Pass"



7.4.3.3 Diagram (Status) setting commands

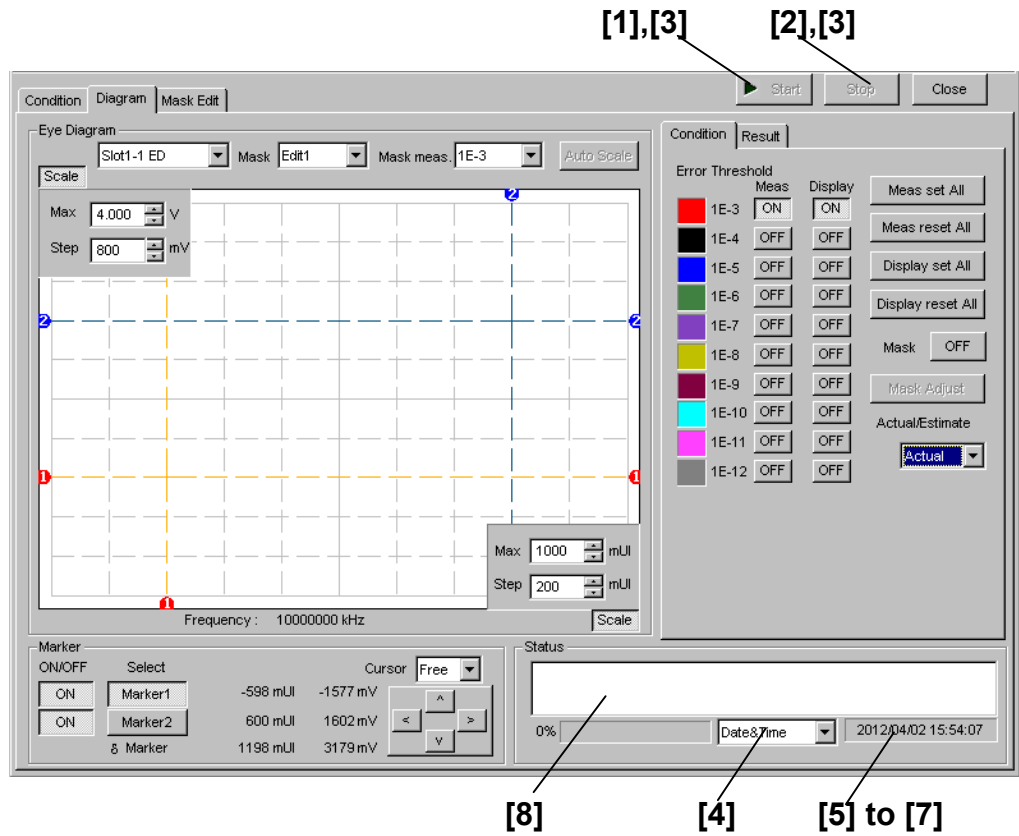


Figure 7.4.3.3-1 Diagram Tab (Start and Stop Buttons and Status Display)

Table 7.4.3.3-1 Diagram Tab (Status) Setting Commands

No.	Item	Command
[1]	Start	:SENSE:MEASure:EDIagram:DIAGram:START
[2]	Stop	:SENSE:MEASure:EDIagram:DIAGram:STOP
[3]	Query for measurement state	:SENSE:MEASure:EDIagram:STATe?
[4]	No label (Setting of time display)	:SENSE:MEASure:EDIagram:TIME :SENSE:MEASure:EDIagram:TIME?
[5]	Query for current time	:SENSE:MEASure:EDIagram:DTIME?
[6]	Query for measurement start time	:SENSE:MEASure:EDIagram:START?
[7]	Query for measurement elapsed time	:SENSE:MEASure:EDIagram:ELAPsed?
[8]	Query for measurement status	:CALCulate:DATA:EDIagram:STATus?

### **:SENSe:MEASure:EDiagram:DIAGram:START**

---

Function	Starts the Eye Diagram measurement.
Example	> :SENSe:MEASure:EDiagram:DIAGram:START
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDiagram:DIAGram:STOP**

---

Function	Stops the Eye Diagram measurement.
Example	> :SENSe:MEASure:EDiagram:DIAGram:STOP
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDiagram:STATe?**

---

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	1 Measurement has been started.
	0 Measurement has been stopped.
	-1 Measurement has failed.
Function	Queries the Eye Diagram measurement status.
Example	> :SENSe:MEASure:EDiagram:STATe? < 1
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDiagram:TIME <type>**

---

Parameter	<type>=<CHARACTER PROGRAM DATA>
	DTime Current date and time
	STARt Measurement start time
	ELAPsed Elapsed time based on the measurement period
Function	Selects the Eye Diagram measurement time display type.
Example	To set the Eye Diagram measurement time display type to measurement start time (Start Time): > :SENSe:MEASure:EDiagram:TIME STARt
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:EDiagram:TIME?**

---

Response	<type>=<CHARACTER RESPONSE DATA>
	DTime Current date and time
	STARt Measurement start time
ELAPsed	Elapsed time based on the measurement period
Function	Queries the Eye Diagram measurement time display type.
Example	> :SENSe:MEASure:EDiagram:TIME? < STAR
Compatibility	Incompatible with existing models.

---

**:SENSe:MEASure:EDiagram:DTIME?**

Response	<pre> &lt;year&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt; 2000 to 2036           Year 2000 to 2036 &lt;month&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 1 to 12               January to December &lt;day&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 1 to 31               1st to 31st &lt;hour&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 23               0 to 23 hours &lt;minute&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59               0 to 59 minutes &lt;second&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59               0 to 59 seconds </pre>
Function	Queries the current date and time during Eye Diagram measurement.
Example	<pre> &gt; :SENSe:MEASure:EDiagram:DTIME? &lt; 2012, 4, 1, 23, 59, 59 </pre>
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:EDiagram:START?**

Response	<pre> &lt;year&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt; 0, 2000 to 2036       Year 2000 to 2036 &lt;month&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 12               January to December &lt;day&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 31               1st to 31st &lt;hour&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 23               0 to 23 hours &lt;minute&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59               0 to 59 minutes &lt;second&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59               0 to 59 seconds </pre> <p><b>Note:</b></p> <p>The following is output when no measurement is performed:  &lt; 0,0,0,0,0,0</p>
Function	Queries the Eye Diagram measurement start time (Start Time).
Example	<pre> &gt; :SENSe:MEASure:EDiagram:START? &lt; 2012, 4, 1, 23, 59, 59 </pre>
Compatibility	Incompatible with existing models.

### :SENSe:MEASure:EDIagram:ELAPsed?

---

Response	<p>&lt;day&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt;                  0, 1 to 99            0 to 99 days                  &lt;hour&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt;                  0 to 23                0 to 23 hours                  &lt;minute&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt;                  0 to 59                0 to 59 minutes                  &lt;second&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt;                  0 to 59                0 to 59 seconds</p> <p><b>Note:</b>                  The following is output when no measurement is performed:                  0,0,0,0</p>
Function	Queries the Eye Diagram measurement elapsed time (Elapsed Time).
Example	<p>&gt; :SENSe:MEASure:EDIagram:ELAPsed?                  &lt; 99, 23, 59, 59</p>
Compatibility	Incompatible with existing models.

### :CALCulate:DATA:EDIagram:STATus?

---

Response	<p>&lt;string&gt;=&lt;STRING RESPONSE DATA&gt;                  "            "                    When no alarm exists                  "Sync Loss"                    Sync Loss                  "Clock Loss"                    Clock Loss                  "Out of range"                    Out of range                  "Illegal Error"                    Illegal Error                  "Meas. Threshold exceeded"        Number of errors exceeds the target rate</p> <p><b>Note:</b>                  If two or more alarms have occurred, the one with the highest                  priority is returned:                  Illegal Error &gt; Clock Loss &gt; Sync Loss &gt; Out or range</p>
Function	Queries the status condition during Eye Diagram measurement.
Example	<p>&gt; :CALCulate:DATA:EDIagram:STATus?                  &lt; "Sync Loss"</p>
Compatibility	Incompatible with existing models.

7.4.3.4 Mask Edit setting commands

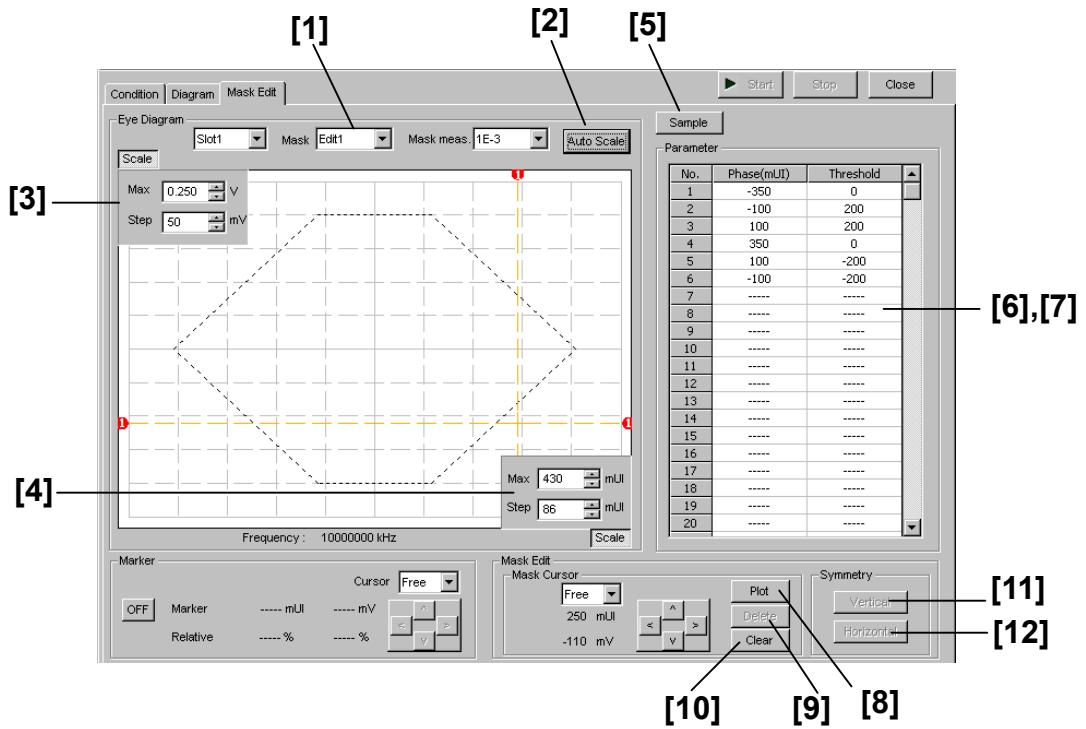


Figure 7.4.3.4-1 Mask Edit Tab

Table 7.4.3.4-1 Mask Edit Setting Commands

No.	Item	Command
[1]	Mask	:DISPlay:RESult:EDIagram:TEMPlate:PATtern :DISPlay:RESult:EDIagram:TEMPlate:PATtern?
[2]	Auto Scale	:DISPlay:RESult:EDIagram:TEMPlate:ASCale
[3]	Max Step	:DISPlay:RESult:EDIagram:TEMPlate:SCALE :DISPlay:RESult:EDIagram:TEMPlate:SCALE?
[4]	Max Step	:DISPlay:RESult:EDIagram:TEMPlate:PSCale :DISPlay:RESult:EDIagram:TEMPlate:PSCale?
[5]	Sample	:DISPlay:RESult:EDIagram:TEMPlate:SAMPle
[6]	Query for mask point count	:DISPlay:RESult:EDIagram:TEMPlate:PNUMBER?
[7]	Phase (mUI) Threshold	:DISPlay:RESult:EDIagram:TEMPlate:EDIT :DISPlay:RESult:EDIagram:TEMPlate:EDIT?
[8]	Plot	:DISPlay:RESult:EDIagram:TEMPlate:PLOT
[9]	Delete	:DISPlay:RESult:EDIagram:TEMPlate:DELEte
[10]	Clear	:DISPlay:RESult:EDIagram:TEMPlate:CLEAr
[11]	Vertical	:DISPlay:RESult:EDIagram:TEMPlate:VERTical
[12]	Horizontal	:DISPlay:RESult:EDIagram:TEMPlate:HORIZontal

**:DISPlay:RESult:EDIagram:TEMPlate:PATtern <type>**

Parameter	<type>=<CHARACTER PROGRAM DATA> E1                   Edit1 E2                   Edit2 E3                   Edit3 E4                   Edit4
Function	Sets the pattern to be edited during Eye Diagram measurement.
Example	To set the pattern to be edited during Eye Diagram measurement to Edit4: > :DISPlay:RESult:EDIagram:TEMPlate:PATtern E4
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:PATtern?**

Response	<type>=<CHARACTER RESPONSE DATA> E1, E2, E3, E4
Function	Queries the pattern that was edited during Eye Diagram measurement.
Example	> :DISPlay:RESult:EDIagram:TEMPlate:PATtern? < E4
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:AScale**

Function	Executes automatic adjustment of the Mask Edit measurement graph scale.
Example	> :DISPlay:RESult:EDIagram:TEMPlate:AScale
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:SCALE <max>,<step>**

Parameter	<max>=<DECIMAL NUMERIC PROGRAM DATA> -3.990 to 4.000                   -3.990 to 4.000 V/0.001 V Step <step>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 800                            1 to 800 mV/1 mV Step
Function	Sets the maximum value and the grid resolution in the direction of the Threshold of the Mask Edit graph.
Example	To set the maximum value and the grid resolution in the direction of the Threshold of the Mask Edit graph to 4.000 V and 800 mV, respectively: >:DISPlay:RESult:EDIagram:TEMPlate:SCALE 4.000,800
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:SCALE?**

Response	<max>=<NR2 NUMERIC RESPONSE DATA> <step>=<NR2 NUMERIC RESPONSE DATA>
Function	Queries the maximum value and the grid resolution in the direction of the Threshold of the Mask Edit graph.
Example	> :DISPlay:RESult:EDIagram:TEMPlate:SCALE? < 4000,800
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:PSCale <max>,<step>**

Parameter	<max>=<DECIMAL NUMERIC PROGRAM DATA> -990 to 1000                      -990 to 1000 mUI/1 mUI Step <step>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 200                              1 to 200 mUI/1 mUI Step
Function	Sets the maximum value and the grid resolution in the direction of the Phase of the Mask Edit graph.
Example	To set the maximum value and the grid resolution in the direction of the Phase of the Mask Edit graph to 1000 and 10 mUI, respectively: > :DISPlay:RESult:EDIagram:TEMPlate:PSCale 1000,10
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:PSCale?**

Response	<max>=<NR2 NUMERIC RESPONSE DATA> <step>=<NR2 NUMERIC RESPONSE DATA>
Function	Queries the maximum value and the grid resolution in the direction of the Phase of the Mask Edit graph.
Example	> :DISPlay:RESult:EDIagram:TEMPlate:PSCale? < 1000,10
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:SAMPLE <string>**

Parameter	<string>=<STRING PROGRAM DATA> "<drv>:\[<dir>]<file>" <drv> = C,D,E,F <dir>=<dir1>\<dir2>\...(Omitted for the root directory) <file> = File name
Function	Loads the selected sample pattern to the Edit Pattern.
Example	> :DISPlay:RESult:EDIagram:TEMPlate:SAMPLE "C:\Test\sample.MSK"
Compatibility	<b>Incompatible with existing models.</b>





**:DISPlay:RESult:EDIagram:TEMPlate:PLOT <phase>,<voltage>**

Parameter	<phase>=<DECIMAL NUMERIC PROGRAM DATA> -1000 to 1000                      -1000 to 1000 mUI/1 mUI Step <voltage>=<DECIMAL NUMERIC PROGRAM DATA> -4000 to 4000                      -4000 to 4000 mV/1 mV Step
Function	Sets a Mask point position.
Example	To set a Mask point position to 1000 mUI (phase), 4000 mV (voltage): > :DISPlay:RESult:EDIagram:TEMPlate:PLOT 1000,4000
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:DELete <pos>**

Parameter	<pos>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 32                      1 to 32 points, in 1-point steps
Function	Deletes the selected Mask point.
Example	To delete Mask point 3: > :DISPlay:RESult:EDIagram:TEMPlate:DELete 3
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:CLEar**

Function	Clears the selected Mask pattern.
Example	> :DISPlay:RESult:EDIagram:TEMPlate:CLEar
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:VERTical**

Function	Plots a Mask pattern onto the vertically-symmetric position.
Example	> :DISPlay:RESult:EDIagram:TEMPlate:VERTical
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:EDIagram:TEMPlate:HORizontal**

Function	Plots a Mask pattern onto the horizontally-symmetric position.
Example	> :DISPlay:RESult:EDIagram:TEMPlate:HORizontal
Compatibility	Incompatible with existing models.

### 7.4.3.5 File menu setting commands

Table 7.4.3.5-1 File Menu Setting Commands

No.	Item	Command
[1]	Open	:SYSTem:MMEMory:DIAGram:RECall
[2]	Save	:SYSTem:MMEMory:DIAGram:STORe

#### **:SYSTem:MMEMory:DIAGram:RECall <file\_name>,<file\_type>**

---

Parameter	<file_name>=<STRING PROGRAM DATA> "<drv>:\[<dir>]<file>" <drv> = C,D,E,F <dir>=<dir1>\<dir2>\...(Omitted for the root directory) <file> = File Name <file_type>=<CHARACTER PROGRAM DATA> BIN                Binary file TXT                Text (UMP) file
Function	Opens the Eye Diagram measurement result data.
Example	> :SYSTem:MMEMory:DIAGram:RECall "C:\Test\example",TXT
Compatibility	Incompatible with existing models.

## :SYSTem:MMEMory:DIAGram:STORe <file\_name>,<data\_type>,<file\_type>

Parameter	<p>&lt;file_name&gt;=&lt;STRING PROGRAM DATA&gt;          "&lt;drv&gt;:\[&lt;dir&gt;]&lt;file&gt;"          &lt;drv&gt; = C,D,E,F          &lt;dir&gt;=&lt;dir1&gt;\&lt;dir2&gt;\...(Omitted for the root directory)          &lt;file&gt; = File Name          &lt;data_type&gt;=&lt;CHARACTER PROGRAM DATA&gt;          EDG            Eye Diagram Result          UMP            Eye Mask Template File          &lt;file_type&gt;=&lt;CHARACTER PROGRAM DATA&gt;          BIN            Binary file          CSV            CSV file          TXT            Text file</p> <p>When BIN is selected for &lt;file_type&gt;, the Eye Diagram measurement settings and results are saved, regardless of the setting of &lt;data_type&gt;.          When UMP is selected for &lt;data_type&gt;, select TXT for &lt;file_type&gt;.</p>
Function	<p>Saves the Eye Diagram measurement result data.</p> <p><b>Note:</b></p> <p style="padding-left: 40px;">The settings will not be read from the saved file if the file name is changed.</p>
Example	<p>To save the Eye Mask Detail measurement results of the Eye Diagram measurement, by specifying the file format, file name, and save destination:</p> <pre>&gt; :SYSTem:MMEMory:DIAGram:STORe "C:\Test\example",EDG,TXT</pre>

### 7.4.4 Bathtub measurement

This section describes the commands for Bathtub measurement.

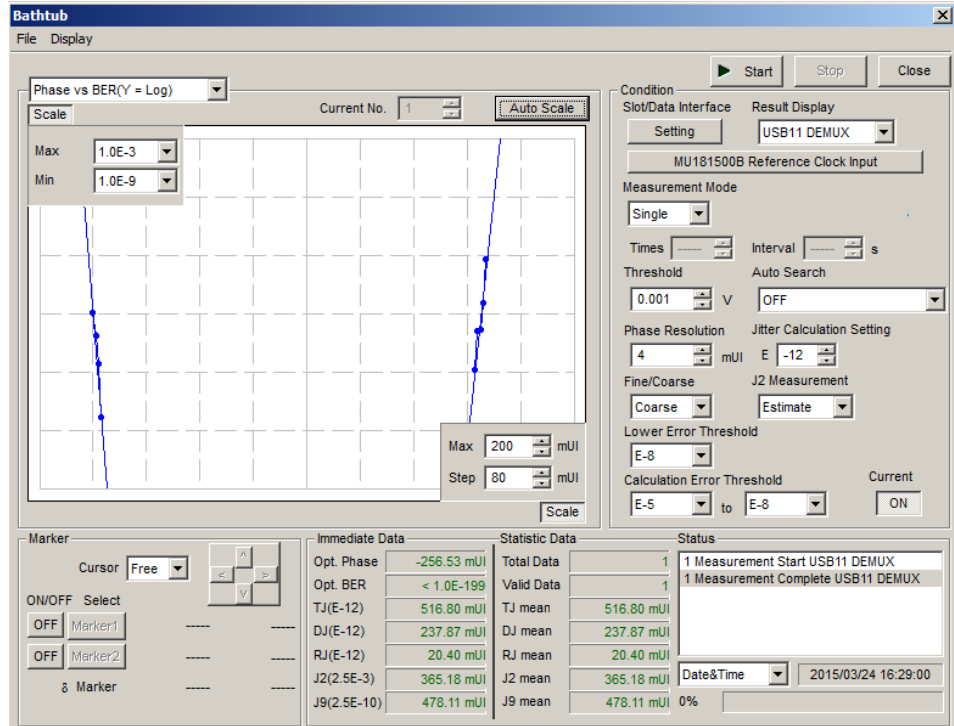


Figure 7.4.4-1 Bathtub Window

7.4.4.1 Measurement setting commands

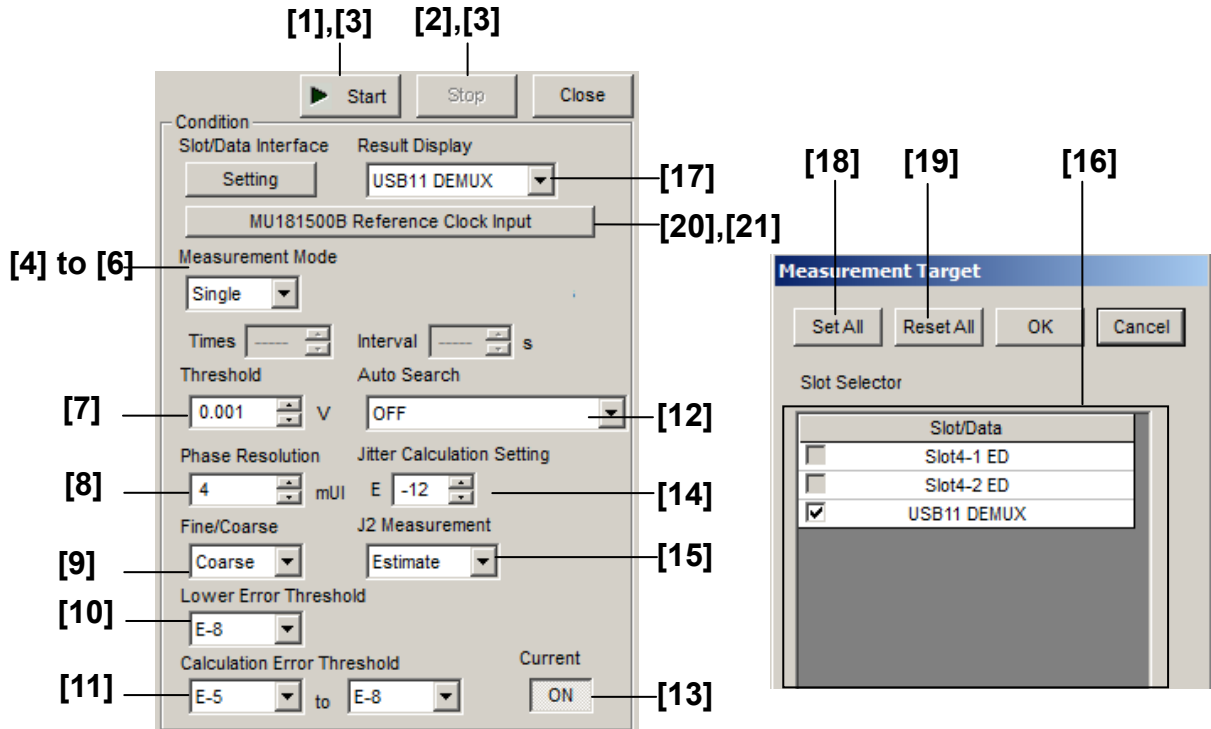


Figure 7.4.4.1-1 Measurement Setting Items

Table 7.4.4.1-1 Measurement Setting Commands

No.	Item	Command
[1]	Start	:SENSE:MEASure:BATHtub:START
[2]	Stop	:SENSE:MEASure:BATHtub:STOP
[3]	Measurement status query	:SENSE:MEASure:BATHtub:STATe?
[4]	Measurement Mode	:SENSE:MEASure:BATHtub:MODE
		:SENSE:MEASure:BATHtub:MODE?
[5]	Time	:SENSE:MEASure:BATHtub:TIME
		:SENSE:MEASure:BATHtub:TIME?
[6]	Interval	:SENSE:MEASure:BATHtub:INTerval
		:SENSE:MEASure:BATHtub:INTerval?
[7]	Threshold	:SENSE:MEASure:BATHtub:DATA
		:SENSE:MEASure:BATHtub:DATA?
[8]	Phase Resolution	:SENSE:MEASure:BATHtub:RESolution:MUI
		:SENSE:MEASure:BATHtub:RESolution:MUI?
[9]	Fine/Coarse	:SENSE:MEASure:BATHtub:ECOunt
		:SENSE:MEASure:BATHtub:ECOunt?

**Table 7.4.4.1-1 Measurement Setting Commands (Cont'd)**

No.	Item	Command
[10]	Lower Error Threshold	:SENSe:MEASure:BATHtub:RANGe
		:SENSe:MEASure:BATHtub:RANGe?
[11]	Calculation Error Threshold	:SENSe:MEASure:BATHtub:CALRange
		:SENSe:MEASure:BATHtub:CALRange?
[12]	Auto Search	:SENSe:MEASure:BATHtub:ASEarch
		:SENSe:MEASure:BATHtub:ASEarch?
[13]	Current	:SENSe:MEASure:BATHtub:CURRent
		:SENSe:MEASure:BATHtub:CURRent?
[14]	Jitter Calculation Setting	:SENSe:MEASure:BATHtub:JCALculation
		:SENSe:MEASure:BATHtub:JCALculation?
[15]	J2 Measurement	:SENSe:MEASure:BATHtub:J2Meas
		:SENSe:MEASure:BATHtub:J2Meas?
[16]	Selection of Slot(s) to be measured	:SENSe:MEASure:BATHtub:SELSlot
		:SENSe:MEASure:BATHtub:SELSlot?
[17]	Selection of Slot(s) you want to view measurement results	:SENSe:MEASure:BATHtub:DISPlay
[18]	Set All	:SENSe:MEASure:BATHtub:SLASet
[19]	Reset All	:SENSe:MEASure:BATHtub:SLAReset
[20]	MU181500B Reference Clock Input	:SENSe:MEASure:BATHtub:REFClock
		:SENSe:MEASure:BATHtub:REFClock?
[21]	Operation Bitrate	:SENSe:MEASure:BATHtub:OPERation
		:SENSe:MEASure:BATHtub: OPERation?

**:SENSe:MEASure:BATHtub:START**

Function Starts Bathtub measurement.  
 Example > :SENSe:MEASure:BATHtub:START  
 Compatibility Incompatible with existing models.

**:SENSe:MEASure:BATHtub:STOP**

Function Stops Bathtub measurement.  
 Example > :SENSe:MEASure:BATHtub:STOP  
 Compatibility Incompatible with existing models.

**:SENSe:MEASure:BATHtub:STATe?**

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0                    During measurement stop 1                    During measurement
Function	Queries the measurement processing state during Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:STATe? < 1
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:SELSlot  
<slot>,<interface>,<boolean>[,<unit>]**

Parameter	<Slot>=<CHARACTER PROGRAM DATA> SLOT1 to SLOT6            Slots No. 1 to No. 6 1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A USB11 to USB14            USB No,11 to 14 <interface>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Data1 to 4 Fixed to 1 if using a USB module <boolean>=<BOOLEAN PROGRAM DATA> ON or 1                    ON OFF or 0                   OFF [<unit>]=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Mainframe Nos. 1 to 4 When using two or more MT1810A units in serial connection, specify the mainframe number. Can be omitted. Mainframe No. 1 is specified when omitted.
Function	Selects a slot and data interface combination as a target of Bathtub measurement.
Example	To select USB No.11 as a target of Bathtub measurement: > :SENSe:MEASure:BATHtub:SELSlot USB11,1,ON
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:SELSlot? <slot>,<interface>[,<unit>]**

Parameter	<Slot>=<CHARACTER PROGRAM DATA> SLOT1 to SLOT6            Slots No. 1 to No. 6 1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A USB11 to USB14            USB No,11 to 14 <interface>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Data1 to 4 Fixed to 1 if using a USB module [<unit>]=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Mainframe Nos. 1 to 4 When using two or more MT1810A units in serial connection, specify the mainframe number. Can be omitted. Mainframe No. 1 is specified when omitted.
Response	<boolean>=<NR1 NUMERIC RESPONSE DATA> 1                            ON 0                            OFF
Function	Queries whether the specified slot and data interface combination is subject to Bathtub measurement.
Example	To query whether USB No.11 is subject to measurement: > :SENSe:MEASure:BATHtub:SELSlot? USB11,1 < 1
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:DISPlay <slot>,<interface>[,<unit>]**

Parameter	<slot>=<CHARACTER PROGRAM DATA> SLOT1 to SLOT6            Slots No. 1 to No. 6 1 to 6 when using the MP1800A, 1 to 4 when using the MT1810A USB11 to USB14            USB No,11 to 14 <interface>=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Data1 to 4 Fixed to 1 if using a USB module [<unit>]=<DECIMAL NUMERIC PROGRAM DATA> 1 to 4                      Mainframe No. 1 to 4 When using two or more MT1810A units in serial connection, specify the mainframe number. Can be omitted. Mainframe No. 1 is specified when omitted.
Function	Selects a slot and data interface combination you want to view Bathtub measurement results.
Example	To view Bathtub measurement results of USB No.11: > :SENSe:MEASure:BATHtub:DISPlay USB11,1
Compatibility	Incompatible with existing models.



**:SENSe:MEASure:BATHtub:SLASet**

Parameter	None
Function	Sets all Slot and Data Interface combinations as the Bathtub measurement objects.
Example	> :SENSe:MEASure:BATHtub:SLASet
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:SLAReset**

Parameter	None
Function	Resets all Slot and Data Interface combinations set as the Bathtub measurement objects.
Example	> :SENSe:MEASure:BATHtub:SLAReset
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:REFClock <boolean>**

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> 0 or OFF            Does not use MU181500B Reference Clock. 1 or ON             Uses MU181500B Reference Clock.
Function	Sets whether to use MU181500B Reference Clock in Bathtub measurement.
Example	Uses MU181500B Reference Clock. > :SENSe:MEASure:BATHtub:REFClock ON
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:REFClock?**

Response	<boolean>=<NR1 NUMERIC RESPONSE DATA> 0, 1
Function	Queries whether to use MU181500B Reference Clock in Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:REFClock? < 1
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:OPERation <numeric>**

---

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 8.000000 to 64.200000      8.000000 to 64.200000 Gbit/s / 0.000001 Step
Function	Sets the operating bit rate for using MU181500B Reference Clock in Bathtub measurement.
Example	To set the operating bit rate to 60.000000 Gbit/s: > :SENSe:MEASure:BATHtub:OPERation 60.000000
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:OPERation?**

---

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 8.000000 to 64.200000
Function	Queries the operating bit rate for using MU181500B Reference Clock in Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:OPERation? < 60.000000
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:MODE <mode>**

---

Parameter	<mode>=<CHARACTER PROGRAM DATA> SINGle                      Executes measurement once. REPeat                      Repeats measurement for the specified number of times. UNTimed                      Repeats measurement until measurement is stopped.
Function	Sets the measurement processing mode during Bathtub measurement.
Example	To set the measurement processing mode to Single mode: > :SENSe:MEASure:BATHtub:MODE SINGle
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:MODE?**

---

Response	<mode>=<CHARACTER RESPONSE DATA> SING, REP, UNT
Function	Queries the measurement processing mode during Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:MODE? < SING
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:TIMes <numeric>**

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 2 to 1000            2 to 1000 times, in 1-time steps
Function	Sets the number of measurements during Bathtub measurement.
Example	To set the number of measurements to 100 times: > :SENSe:MEASure:BATHtub:TIMes 100
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:TIMes?**

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
Function	Queries the number of measurements during Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:TIMes? < 100
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:INTerval <numeric>**

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 0 to 9999            0 to 9999 s/1 s Step
Function	Sets the measurement interval time during Bathtub measurement.
Example	To set the measurement interval time to 50 s.: > :SENSe:MEASure:BATHtub:INTerval 50
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:INTerval?**

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 to 9999            0 to 9999 s
Function	Queries the measurement interval time during Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:INTerval? < 50
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:DATA <numeric>**

---

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> -3.500 to 3.300                      -3.500 to 3.300 V/0.001 V Step
	The range varies according to the option and input interface settings.
Function	Sets the measurement voltage threshold position during Bathtub measurement.
Example	To set the measurement voltage threshold position to 0.5 V: > :SENSe:MEASure:BATHtub:DATA 0.5
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:DATA?**

---

Response	<nuemric>=<NR2 NUMERIC RESPONSE DATA>
Function	Queries the measurement voltage threshold position during Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:DATA? < 0.505
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:RESolution:MUI <numeric>**

---

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 4 to 100                      4 to 100 mUI/4 mUI Step
Function	Sets the Bathtub measurement phase resolution (mUI).
Example	To set the phase resolution to 10 mUI: > :SENSe:MEASure:BATHtub:RESolution:MUI 10
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:RESolution:MUI?**

---

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
Function	Queries the Bathtub measurement phase resolution (mUI).
Example	> :SENSe:MEASure:BATHtub:RESolution:MUI? < 4
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:ECOunt <mode>**

---

Parameter	<mode>=<CHARACTER PROGRAM DATA> FINE                      Fine (Number of error counts: 100) COARse                      Coarse (Number of error counts: 1)
Function	Sets the minimum error counts of Bathtub measurement.
Example	To set the minimum error counts to 100:

---

Compatibility > :SENSe:MEASure:BATHtub:ECOut FINE  
Incompatible with existing models.

### :SENSe:MEASure:BATHtub:ECOut?

Response <numeric>=<CHARACTER RESPONSE DATA>  
FINE, COAR

Function Queries the minimum error counts of Bathtub measurement.

Example > :SENSe:MEASure:BATHtub:ECOut?  
< FINE

Compatibility Incompatible with existing models.

### :SENSe:MEASure:BATHtub:RANGe <range>

Parameter <range>=<CHARACTER PROGRAM DATA>  
E\_7 to E\_14 E-7 to E-14

Function Sets the lower limit value of measurement error threshold during Bathtub measurement.

Example To set the lower limit value of measurement error threshold to E-12:  
> :SENSe:MEASure:BATHtub:RANGe E\_12

Compatibility Incompatible with existing models.

### :SENSe:MEASure:BATHtub:RANGe?

Response <range>=<CHARACTER RESPONSE DATA>

Function Queries the lower limit value of measurement error threshold during Bathtub measurement.

Example > :SENSe:MEASure:BATHtub:RANGe?  
< E\_12

Compatibility Incompatible with existing models.

### :SENSe:MEASure:BATHtub:CALRange <upper>,<lower>

Parameter <upper>=<CHARACTER PROGRAM DATA>  
E\_3 to E\_5 E-3 to E-5  
<lower>=<CHARACTER PROGRAM DATA>  
E\_7 to E\_14 E-7 to E-14

Function Sets the error threshold range during Bathtub measurement recalculation.

Example To set the error threshold range during recalculation to E-5 to E-10:  
> :SENSe:MEASure:BATHtub:CALRange E\_5,E\_10

Compatibility Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:CALRange?**

---

Response	<upper>,<lower>=<CHARACTER RESONSE DATA>
Function	Queries the error threshold range during Bathtub measurement recalculation.
Example	> :SENSe:MEASure:BATHtub:CALRange? < E_5,E_10
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:ASEarch**

---

Parameter	<item>=<CHARACTER PROGRAM DATA> OFF                   Auto Search OFF PHASe                Phase auto search (Coarse) PTHReshold        Phase & threshold auto search (Coarse) FPHase             Phase auto search (Fine) FPTHreshold       Phase & Threshold auto search (Fine)
Function	Sets execution of auto search during Bathtub measurement.
Example	To set the phase auto search ON: > :SENSe:MEASure:BATHtub:ASEarch PHASe
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:ASEarch?**

---

Response	<item>=<CHARACTER RESPONSE DATA> OFF, PHAS, PTHR, FPH, FPTH
Function	Queries the execution of auto search during Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:ASEarch? < PHAS
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:CURRent <boolean>**

---

Parameter	<boolean>=<BOOLEAN PROGRAM DATA> 0 or OFF            OFF: Updates at measurement termination. 1 or ON             ON: Updates every second.
Function	Sets the graph display update period during Bathtub measurement.
Example	To set the graph display update timing to every second: > :SENSe:MEASure:BATHtub:CURRent 1
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:CURRent?**

Response	<boolean>=<NR1 NUMERIC RESPONSE DATA> 0, 1
Function	Queries the graph display update period during Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:CURRent? < 1
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:JCALculation <setting>**

Parameter	<setting>=<DECIMAL NUMERIC PROGRAM DATA> 7 to 20                      E-7 to E-20 Specified as E-n where n: 7 to 20/1 step
Function	Sets the error rate used to calculate jitter at Bathtub measurement.
Example of use	To set jitter calculation error rate to E-14: > :SENSe:MEASure:BATHtub:JCALculation 14
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:JCALculation?**

Response	<setting>=<NR1 NUMERIC RESPONSE DATA> 7 to 20
Function	Queries the error rate used to calculate jitter at Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:JCALculation? < 14
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:J2Meas <mode>**

Parameter	<mode>=<CHARACTER PROGRAM DATA> ACTual                      Calculates J2 from BER measurement point. ESTimate                    Calculates J2 from Best Fit Line.
Function	Selects J2 calculation method.
Example	To set J2 calculation method to Actual: > :SENSe:MEASure:BATHtub:J2Meas ACTual
Compatibility	Incompatible with existing models.

## **:SENSe:MEASure:BATHtub:J2Meas?**

---

Response	<mode>=<CHARACTER RESPONSE DATA> ACT, EST
Function	Queries J2 calculation method.
Example	> :SENSe:MEASure:BATHtub:J2Meas? < ACT
Compatibility	Incompatible with existing models.



7.4.4.2 Graph display setting commands

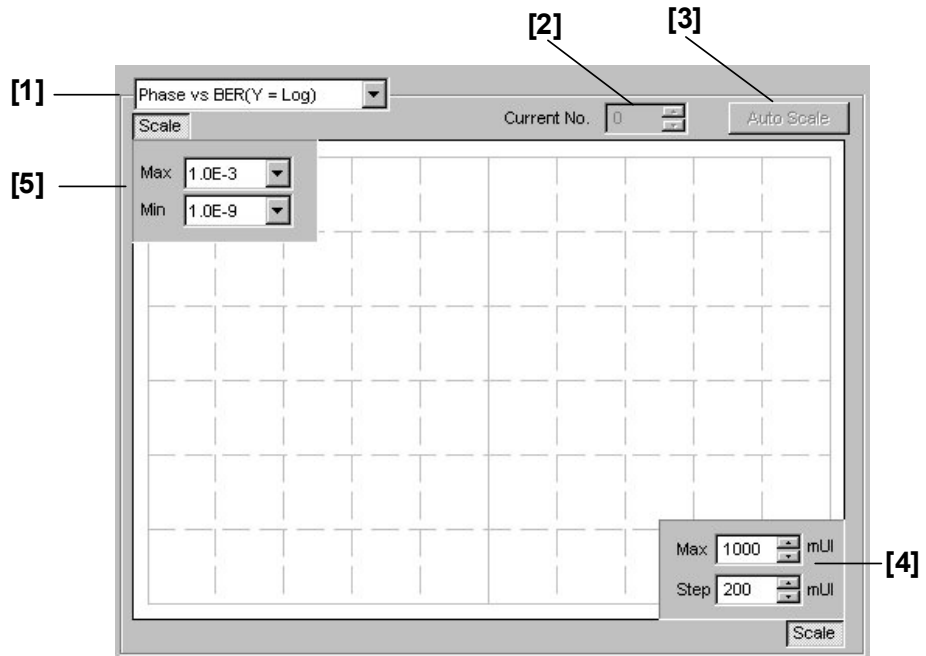


Figure 7.4.4.2-1 Graph Area

Table 7.4.4.2-1 Graph Display Setting Commands

No.	Item	Command
[1]	Display graph selection	:DISPlay:RESult:BATHtub:ITEM
		:DISPlay:RESult:BATHtub:ITEM?
[2]	Current No.	:DISPlay:RESult:BATHtub:MNUMber
		:DISPlay:RESult:BATHtub:MNUMber?
[3]	Auto Scale	:DISPlay:RESult:BATHtub:SCALE:ASCale
[4]	Horizontal axis scale setting	:DISPlay:RESult:BATHtub:SCALE:HORizontal
		:DISPlay:RESult:BATHtub:SCALE:HORizontal?
[5]	Vertical axis scale setting	:DISPlay:RESult:BATHtub:SCALE:VERTical
		:DISPlay:RESult:BATHtub:SCALE:VERTical?

7 Remote Commands



**:DISPlay:RESult:BATHtub:SCALE:ASCale**

Function	Automatically adjusts the graph display during Bathtub measurement.
Example	> :DISPlay:RESult:BATHtub:SCALE:ASCale
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:BATHtub:SCALE:HORizontal <max>[,<step>]**

Parameter	<max>,<step>=<DECIMAL NUMERIC PROGRAM DATA>
-----------	---

Table 7.4.4.2-2 Parameters

Form	<max>	<step>
Phase type	-900 to 1000 (mUI) /100 mUI Step	10 to 200 (mUI) /10 mUI Step
Histogram type	16,32,64,128,256	Omitted

Function	Sets the horizontal scale of the graph display during Bathtub measurement. In case of a histogram, <step> is omitted.
Example	To set the scale to maximum 800 mUI, in 100-mUI steps: > :DISPlay:RESult:BATHtub:SCALE:HORizontal 800,100
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:BATHtub:SCALE:HORizontal?**

Response	<max>,<step>=<NR2 NUMERIC RESPONSE DATA> Parameters are the same as those for :DISPlay:RESult:BATHtub:SCALE:HORizontal. <step> is omitted if the measurement item is histogram.
Function	Queries the horizontal scale of the graph display during Bathtub measurement.
Example	> :DISPlay:RESult:BATHtub:SCALE:HORizontal? < 800,100
Compatibility	Incompatible with existing models.

**:DISPlay:RESult:BATHtub:SCALE:VERTical <max>,<min>**

Parameter <max>,<min>=<DECIMAL NUMERIC PROGRAM DATA>

**Table 7.4.4.2-3 Parameters**

Form	<max>	<min>
Histogram Type	6 to 15 (E+6 to E+15)	Input 0
Error Rate Type	2 to 7 (E-2 to E-7)	8 to 15 (E-8 to E-15)

**Note:**

In case of the Error Rate type, the difference between the maximum and minimum value must be at least 6, and the value must be an even number.

Function Sets the vertical scale of the graph display during Bathtub measurement.  
 Example To set the scale during Error Rate type display to maximum E-4 and minimum E-10:  
 > :DISPlay:RESult:BATHtub:SCALE:VERTical 4,10  
 Compatibility Incompatible with existing models.

**:DISPlay:RESult:BATHtub:SCALE:VERTical?**

Response <min>,<max>=<NR2 NUMERIC RESPONSE DATA>

Parameters are the same as those for :DISPlay:RESult:BATHtub:SCALE:VERTical.  
 <min> is omitted if the measurement item is histogram.

Function Queries the vertical scale of the graph display during Bathtub measurement.  
 Example > :DISPlay:RESult:BATHtub:SCALE:VERTical?  
 < 4,10  
 Compatibility Incompatible with existing models.

7.4.4.3 Measurement result and status query commands

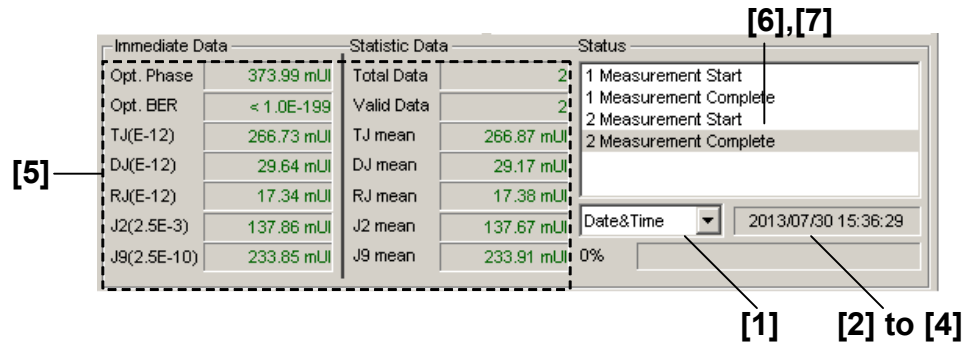


Figure 7.4.4.3-1 Measurement Result and Status Display Area

Table 7.4.4.3-1 Measurement Result and Status Query Commands

No.	Item	Command
[1]	Display time selection	:SENSE:MEASure:BATHtub:DTIME :SENSE:MEASure:BATHtub:DTIME?
[2]	Query for current time	:SENSE:MEASure:BATHtub:TIME:DTIME?
[3]	Query for measurement start time	:SENSE:MEASure:BATHtub:TIME:STARt?
[4]	Query for measurement elapsed time	:SENSE:MEASure:BATHtub:TIME:ELAPsed?
[5]	Query for result	:CALCulate:DATA:BATHtub?
[6]	Query for status	:CALCulate:DATA:BATHtub:STATus?
[7]	Query for clocking status	:CALCulate:DATA:BATHtub:CSTatus?

**:SENSE:MEASure:BATHtub:DTIME <type>**

Parameter	<type>=<CHARACTER PROGRAM DATA> DTIME Displays the current date and time. STARt Displays the measurement start time. ELAPsed Displays the elapsed time based on the measurement period.
Function	Selects the Bathtub measurement time display type.
Example	To set the Bathtub measurement time display type to measurement start time (Start Time): > :SENSE:MEASure:BATHtub:DTIME STARt
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:DTIME?**

---

Response	<type>=<CHARACTER RESPONSE DATA> DTIM, STAR, ELAP
Function	Queries the Bathtub measurement time display type.
Example	> :SENSe:MEASure:BATHtub:DTIME? < STAR
Compatibility	Incompatible with existing models.

### **:SENSe:MEASure:BATHtub:TIME:DTIME?**

---

Response	<year>=<NR1 NUMERIC RESPONSE DATA> 2000 to 2036                      Year 2000 to 2036 <month> = <NR1 NUMERIC RESPONSE DATA> 1 to 12                              January to December <day> = <NR1 NUMERIC RESPONSE DATA> 1 to 31                                1st to 31st <hour> = <NR1 NUMERIC RESPONSE DATA> 0 to 23                                0 to 23 hours <minute> = <NR1 NUMERIC RESPONSE DATA> 0 to 59                                0 to 59 minutes <second> = <NR1 NUMERIC RESPONSE DATA> 0 to 59                                0 to 59 seconds
Function	Queries the current date and time during the Bathtub measurement.
Example	> :SENSe:MEASure:BATHtub:TIME:DTIME? < 2012,12,31,23,59,59
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:TIME:START?**

Response	<pre> &lt;year&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt; 0, 2000 to 2036          Year2000 to 2036 &lt;month&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 12                 January to December &lt;day&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 31                 1st to 31st &lt;hour&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 23                 0 to 23 hours &lt;minute&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59                 0 to 59 minutes &lt;second&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59                 0 to 59 seconds "0,0,0,0,0" is returned if there is no measurement start time data. </pre>
Function	Queries the current date and time during the Bathtub measurement.
Example	<pre> &gt; :SENSe:MEASure:BATHtub:TIME:START? &lt; 2012, 12, 31, 23, 59, 59 </pre>
Compatibility	Incompatible with existing models.

**:SENSe:MEASure:BATHtub:TIME:ELAPsed?**

Response	<pre> &lt;day&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt; 0, 1 to 99             0 to 99 days &lt;hour&gt;=&lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 23               0 to 23 hours &lt;minute&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59               0 to 59 minutes &lt;second&gt; = &lt;NR1 NUMERIC RESPONSE DATA&gt; 0 to 59               0 to 59 seconds "0,0,0,0" is returned if there is no measurement start time data. </pre>
Function	Queries the measurement elapsed time during Bathtub measurement.
Example	<pre> &gt; :SENSe:MEASure:BATHtub:TIME:ELAPsed? &lt; 31, 23, 59, 59 </pre>
Compatibility	Incompatible with existing models.

**:CALCulate:DATA:BATHtub? <string>**

Parameter	<string>=<STRING PROGRAM DATA>
	<result1> For details on measurement data <result1>, refer to Table 7.4.4.3-2.
	<result2> For details on immediate data <result2>, refer to Table 7.4.4.3-3.
	<result3> For details on statistic data <result3>, refer to Table 7.4.4.3-4.

**Table 7.4.4.3-2 Phase vs. BER Measurement Result <result1>**

Item		<Result1>	Response Format
Phase vs BER (Phase and Error Rate)	Number of measurements 1 to 1000	"BATH:1"... "BATH:1000"	Form1
Histogram (Phase and Error Count)		"HIST:1"... "HIST:1000"	Form2

The measurement result for each Phase is delimited by a comma (,) and returned.

**Table 7.4.4.3-3 Phase vs. BER Immediate Data <result2>**

Item		<Result2>	Response Format
Optimum BER	Number of measurements 1 to 1000	"OPTBer:1"... "OPTBer:1000"	Form3
Optimum Phase		"OPTPh:1"... "OPTPh:1000"	Form4
Total Jitter		"TJ:1"... "TJ:1000"	Form4
Deterministic Jitter		"DJ:1"... "DJ:1000"	Form4
Random Jitter		"RJ:1"... "RJ:1000"	Form4
J2		"J2:1"... "J2:1000"	Form4
J9		"J9:1"... "J9:1000"	Form4

**Table 7.4.4.3-4 Phase vs. BER Measurement Statistic Data <result3>**

Item	<Result3>	Response Format
Total Data	"TOTal"	Form5
Valid Data	"VALid"	Form5
Total Jitter Mean	"TJMean"	Form4
Deterministic Jitter Mean	"DJMean"	Form4
Random Jitter Mean	"RJMean"	Form4
J2 Mean	"J2Mean"	Form4
J9 Mean	"J9Mean"	Form4



Response <string>=<STRING RESPONSE DATA>

Table 7.4.4.3-5 Response Format

Form	Format	Description
Form1 Phase-BER type	"XXXX.XX, Y.YYYYYE-YYY"	XXXX.XX: Phase (mUI or PS) Y.YYYYYE-YYY: Error Rate
	"-----,-----"	When no data corresponds to the query.
Form2 Histogram type	"XXXX.XX, Y.YYYYYE-YYY"	XXXX.XX: Phase (mUI or PS) Y.YYYYYE-YYY: Error Count
	"-----,-----"	When no data corresponds to the query.
Form3 Fraction type 1	"X.XXXxE-XXX"	When 0.0000E-016 to 1.0000E000
	"-----"	When no data corresponds to the query.
	"< 1.0E-199"	When E-199 or less
Form4 Fraction type 2	"XXXX.XX"	When -9999.99 to 9999.99
	"-----"	When no data corresponds to the query.
Form5 Integer type	"XXXX"	When 0 to 9999
	"----"	When no data corresponds to the query.

Function Queries the Phase vs. BER measurement result.

Example To query the Phase vs. BER the measurement result for the 10th time:  
 > :CALCulate:DATA:BATHtub? "BATH:10"  
 < "0,1.2345E-003","20,1.2345E-004","40,1.2345E-005",  
 "60,1.2345E-006"

Compatibility Incompatible with existing models.

### :CALCulate:DATA:BATHtub:STATus?

Response <string>=<STRING RESPONSE DATA>

""	When no alarm exists.
"Sync Loss"	Sync. Loss
"Clock Loss"	Clock Loss
"Out of range"	Out of range
"Illegal Error"	Illegal Error
"Clock Mismatch"	Clock Mismatch
"Meas. Threshold exceeded"	Number of errors exceeds the target rate

**Note:**

If two or more alarms have occurred, the one with the highest priority is returned:

Illegal Error > Clock Loss > Sync Loss > Out or range

Function Queries the Q measurement status.

Example > :CALCulate:DATA:BATHtub:STATus?  
 < "Sync Loss"



## 7.4.4.4 File menu setting commands

Table 7.4.4.4-1 File Menu Setting Commands

No.	Item	Command
[1]	Open	:SYSTem:MMEMory:BATHtub:RECall
[2]	Save	:SYSTem:MMEMory:BATHtub:STORe

**:SYSTem:MMEMory:BATHtub:RECall <file\_name>**

Parameter	<file_name>=<STRING PROGRAM DATA> "<drv>:\[<dir>]<file>" <drv> = C,D,E,F <dir>=<dir1>\<dir2>\...(Omitted for the root directory) <file> = File name
Function	Opens the Bathtub measurement result data.
Example	> :SYSTem:MMEMory:BATHtub:RECall "C:\Test\example"
Compatibility	Incompatible with existing models.

**:SYSTem:MMEMory:BATHtub:STORE  
<file\_name>,<data\_type>,<file\_type>**

Parameter	<file_name>=<STRING PROGRAM DATA> "<drv>:\[<dir>]<file>" <drv> = C,D,E,F <dir> = <dir1>\<dir2>\...(Omitted for the root directory) <file> = File name <data_type> = <CHARACTER RESPONSE DATA> PSB                   Phase vs BER Result <file_type> = <CHARACTER RESPONSE DATA> BIN                   Binary File CSV                   CSV File TXT                   Text File
Function	Saves the Bathtub measurement result data. <b>Note:</b> The settings will not be read from the saved file if the file name is changed.
Example	To save the Bathtub measurement result data by specifying the save destination (C:\Test), file name (example), and file format (CSV): > :SYSTem:MMEMory:BATHtub:STORE "C:\Test\example", PSB, CSV
Compatibility	Incompatible with existing models.



## *Chapter 8 Maintenance*

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This chapter describes the maintenance of the MP1862A.

8.1	Daily Maintenance .....	8-2
8.2	Cautions on Storage .....	8-2
8.3	Transportation.....	8-3
8.4	Calibration.....	8-3
8.5	Disposal .....	8-4

## 8.1 Daily Maintenance

- Wipe off any external stains with a cloth dampened with diluted mild detergent.
- Vacuum away any accumulated dust or dirt with a vacuum cleaner.
- Tighten any loose parts fixed with screws, using the specified tools.

## 8.2 Cautions on Storage

Wipe off any dust, soil, or stain on the MP1862A prior to storage. Avoid storing the MP1862A 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 MP1862A may become oxidized
- Where strong vibrations are present
- Under either of the following temperature and humidity conditions:  
Temperature range of  $\leq -20^{\circ}\text{C}$  or  $\geq 60^{\circ}\text{C}$   
Humidity range of  $\geq 85\%$

### 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  $30^{\circ}\text{C}$
- Humidity range of 40 to 75%
- Slight daily fluctuation in temperature and humidity

## 8.3 Transportation

Use the original packing materials, if possible, when packing the MP1862A for transport. If you do not have the original packing materials, pack the MP1862A according to the following procedure. When handling the MP1862A, 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 MP1862A.
2. Check for loose or missing screws.
3. Provide protection for structural protrusions and parts that can easily be deformed, and wrap the MP1862A with a sheet of polyethylene. Finally, cover with moisture-proof paper.
4. Place the wrapped MP1862A 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 8.2 “Cautions on Storage”.

## 8.4 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.

## **8.5 Disposal**

Confirm the notes described in the Signal Quality Analyzer Series Installation Guide and observe national and local regulations when disposing of the MP1862A.



# *Chapter 9 Troubleshooting*

---

This chapter describes how to check for errors that may occur during MP1862A operation.

9.1	Problems That May Occur When Starting MP1862A ...	9-2
9.2	Synchronization Not Established .....	9-3

## 9.1 Problems That May Occur When Starting MP1862A

Table 9.1-1 Remedies for Problems That May Occur When Starting MP1861A

Symptom	Location to Check	Remedy
A MP1862A is not recognized.	Are the MP1862A and MP1800A or control PC connected properly?	Refer to Section 2.1 “Preparation Before Use” in this manual.
	Is the MP1862A power switch turned on?	Refer to Section 2.1 “Preparation Before Use” in this manual.
	Is the appropriate software installed?	To check the appropriate modules and software version of the MP1862A, access to “MP1800 Series Signal Quality” on your Web site ( <a href="http://www.anritsu.com">http://www.anritsu.com</a> ). 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.

## 9.2 Synchronization Not Established

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

**Table 9.2-1** Items to be checked

Symptom	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. <b>Note:</b> Use the frequency counter to check the current clock frequency.
Termination conditions	Was the termination potential adjusted?	Set the termination potential correctly. <b>Note:</b> Incorrect setting may result in unit failure.
Output conditions	Are the connection cables between this module and MU18304xA/B matched?	Check the connection point and tighten the connector.
	Are the connection cables between this module and the MU18304xA/B connected correctly?	Connect MP1862A and MU18304xA/B with cables in the order specified in Chapter 3.
	Are the threshold and phase of MP1862A and MU18304xA/B correct?	Either set Auto Adjust to ON at the MU18304xA/B or run Auto Search or perform manual adjustment.

Table 9.2-1 Items to be checked (Cont'd)

Symptom	Location to Check	Remedy
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 Search out of range?	Adjust it manually.
Phase	Is the operating limit for Auto Search out of range?	Adjust it manually.
Pattern	Are the MU18302xA/B and MU18304xA/B patterns matched?	Match the patterns.
Synchronization	Is Auto Sync set to On at the MU18304xA/B?	Set it to On. Re-synchronization is performed automatically.
	Have you tried with a different MU18304xA/B Sync Control setting?	Optimal synchronization method varies according to the pattern type. <b>Note:</b> Can be set for patterns except PRBS.
Other	Is MU18304xA/B Bit/Block Window set to Off?	Set it to Off.
	Is MU18304xA/B External Mask set to Off?	Set it to Off.
	Is the MU18304xA/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 A List of Initial Settings

Appendix A describes the default settings for MP1862A.

To initialize all the settings to the factory defaults, click the **File** menu, and then click **Initialize**.

**Table A.1-1 List of Default Settings for MP1862A**

Setting Function	Main Item	Secondary Item	Tertiary Item	Default Setting
Result	Switch of setting items	Result display format		Error/Alarm
		Time display format		Date&Time
		Error/Alarm display	Error/Alarm measurement result zoom display	OFF
	Start of Error/Alarm measurement			—
	Stop of Error/Alarm measurement			—
Interface	Data Input	Input Condition		Single-Ended
		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
		Clock phase variable (mUI)		0 mUI
		Clock phase variable (ps)		0.00 ps
		Clock phase calibration		—
		Clock Delay Relative selection		OFF
		Jitter Input		OFF
		Clock Input Band		Half Rate Clock
Misc	Information of linked ED			—
	Settings for linked ED			—
—	DEMUX/ED Link			OFF



## *Appendix B Setting Restrictions*

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B.1	Combination Function Configuration .....	B-2
B.2	Settings Common in Combination System .....	B-3

## **B.1 Combination Function Configuration**

This section describes the requirements for executing the Combination function by using MU181040A/41A modules.

The following requirement must be satisfied to execute the Combination function:

Requirement for enabling the Combination function

- The model is the MU183040A/B-x20 or MU183041A/B.



## B.2 Settings Common in Combination System

When the MU183040A/B or MU183041A/B is used in a Combination system, some setting items will apply to all the other modules in the Combination system.

Table B.2-1 shows whether the setting items are common or independent in a Combination system.

**Table B.2-1 Common/Independent Setting Items in Combination System**

Setting 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	Common
	Start of Error/Alarm measurement	Common		
Stop of Error/Alarm measurement	Common			
Measurement	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		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		

Table B.2-1 Common/Independent Setting Items in Combination System (Cont'd)

Setting Function	Main Category	Sub-Category	Individual Setting Item	Common/Independent
Measurement (Continued)	Measurement condition (Error/Alarm Condition)	Interval for EI and EFI measurements		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		Common
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	
	Standard for Recovered Clock Bitrate		Common	
	Recovered Clock Bitrate		Common	
	Loop Bandwidth		Common	
	The value of division for calculating the Loop Bandwidth		Common	
	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 phase variable (Jitter Input)		Common	

\*: Settings shared by the PPG are omitted here. For details, refer to the *MU183020A 28G/32G bit/s MU183021A 28G/32G bit/s 4ch Pulse Pattern Generator Operation Manual*.

*B.2 Setting Restrictions Settings Common in Combination System*

**Table B.2-1 Common/Independent Setting Items in Combination System (Cont'd)**

<b>Setting Function</b>	<b>Main Category</b>	<b>Sub-Category</b>	<b>Individual Setting Item</b>	<b>Common/Independent</b>
Capture	Capture Conditions Setting Screen	Capture block division number setting		Common
		Capture trigger selection		Common
		Capture storing position selection		Common
		Capture trigger match pattern length setting		Common
		Capture trigger pattern format selection		Common
		Capture trigger mask pattern editing		Common
		Capture trigger match pattern editing		Common
	Capture Result Acquisition	Selection of how to acquire capture result		Common
		Specifying start block to acquire capture result		Common
		Specifying block count to acquire capture result		Common
	Capture Result Bit Pattern Display			Common
	Capture Result Bitmap Display	Setting line wrapping length of capture data		Common
		Searching error position		Common
		Setting data thinning rate		Common
Capture Result Block Display	Searching error position		Common	

Table B.2-1 Common/Independent Setting Items in Combination System (Cont'd)

Setting Function	Main Category	Sub-Category	Individual Setting Item	Common/Independent
Misc1	Signal generation (Pattern Sequence)	Signal generation method		Common
		Burst signal input		Common
		Burst trigger delay		Common
		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		
Misc2	Combination Setting	Operation		Common
		Combination		Common
	Grouping Setting	Grouping item setting		Common
Auto measurement	Auto Adjust	Item		Common
		Slot selection		Independent
	Auto Search	Measurement mode		Common
		Item		Common
		Slot selection		Independent
	Eye Diagram/ Eye Margin/ Bathtub/Q measurement	All items		Independent

# Appendix C Performance Test Record Sheet

## C.1 Performance Test Record Sheet

Equipment Name: MP1862A 56G/64Gbit/s DEMUX

Serial No.:

Ambient Temperature: °C

Relative Humidity: %

**Table C.1-1 Operating Frequency Range**

Device Name	Options	Specification	Results
	x01		
MP1862A	No	4 to 28.1 GHz	
	Yes	4 to 32.1 GHz	

**Table C.1-2 Input level range**

Device Name	Item	Specification	Results
MP1862A	Data Input XData Input	Input amplitude: 0.125 to 1.0 Vp-p Threshold voltage: No error occurs within the range from -3.5 to +3.3 V	

**Table C.1-1 Interface range**

No.	MP1861A			MP1862A		Results
	Termination	Amplitude [Vp-p]	Offset (Vth) [V]	Termination	Threshold voltage [V]	
1	GND	1.0	-2.500	GND	-2.500	
2		0.25	-1.127		-1.127	
3		0.25	+1.528		+1.528	
4		1.0	+2.800		+2.800	

**Table C.1-2 Test pattern**

Option Configuration	Specification	Results
PRBS, $2^{n-1} = 7, 9, 10, 11, 15, 20, 23, 31$ , Mark ratio: 1/2	No error	
Zero Substitution, Length: $2^{n-1}$ , $n = 7, 9, 10, 11, 15, 20, 23$ or $2n$ , $n = 7, 9, 10, 11, 15, 20, 23$	No error	

**Table C.1-3 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	

# *Appendix D Fault Diagnosis Tool*

---

This appendix describes the fault diagnosis tool using the MP1861A and MP1862A, 32G PPG, ED, and synthesizer.

- The fault diagnosis tool diagnoses hardware faults by running loop-back tests on the MP1861A and MP1862A.
- It supports MX180000A version 8.00.00 or later.

D.1	Startup procedure .....	D-2
D.2	Execution procedure .....	D-3
D.3	Viewing and saving results .....	D-5
D.4	Remote setting .....	D-6
D.5	Software Licenses .....	D-7

## D.1 Startup procedure

The startup procedure for the diagnosis tool is shown below.

Select Remote Script Application on the Windows Start menu. The Start menu can be displayed by connecting a keyboard and pressing the Windows key.

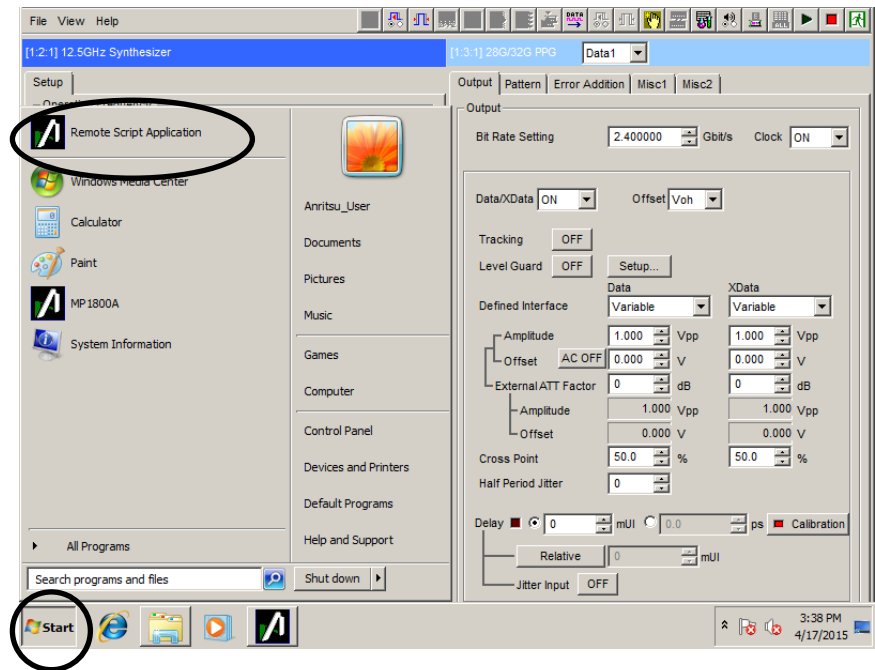


Figure D.1-1 Start button



## D.2 Execution procedure

The diagnosis procedure is shown below.

- (1) Once the Remote Script tool has launched, click "File" → "DEMUX Diagnosis" in the menu.

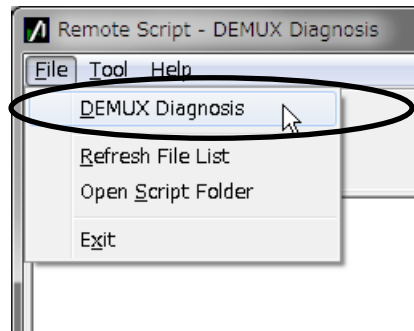


Figure D.2-1 File menu

- (2) Click the Setup button and select the test condition.

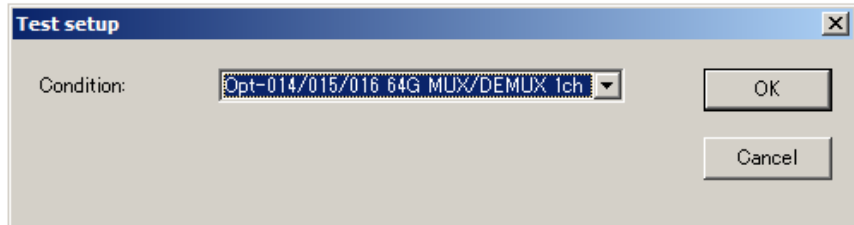


Figure D.2-2 Test condition selection

- (3) After selecting the condition, clicking the Guide button displays the connection diagram.

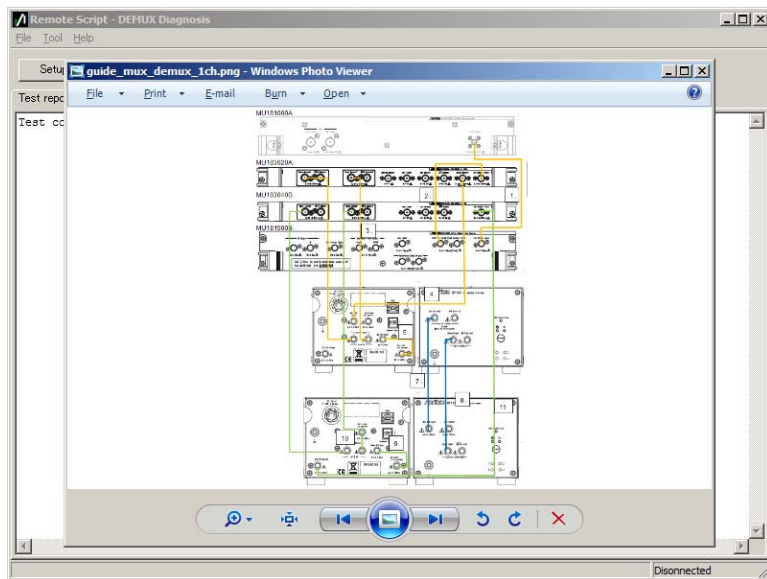


Figure D.2-3 Connection diagram

(4) Click the Start button to start the diagnosis.

**Note:**

Executing fault diagnosis initializes the other module settings for the MP1861A and MP1862A.

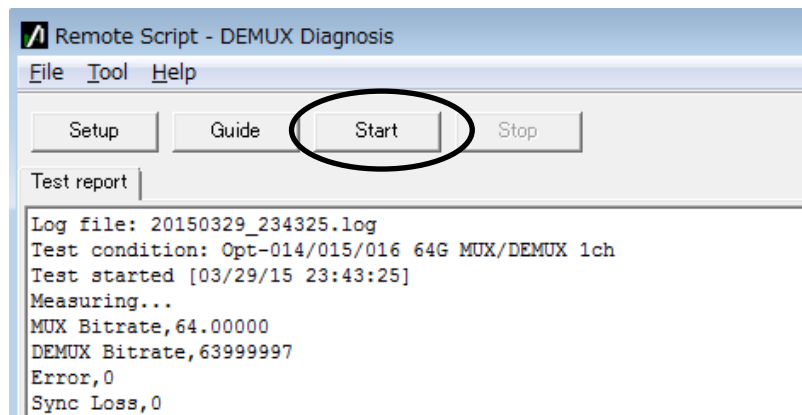


Figure D.2-4 Starting diagnosis

## D.3 Viewing and saving results

The results are displayed once diagnosis is complete.

The diagnosis results are also automatically saved as a log file. The log file name is determined automatically from the time and date.

The destination for saving the log file will be as follows for the default installation configuration.

C:\Anritsu\MP1800A\DiagnosticTool\Script\DemuxDiag\Log

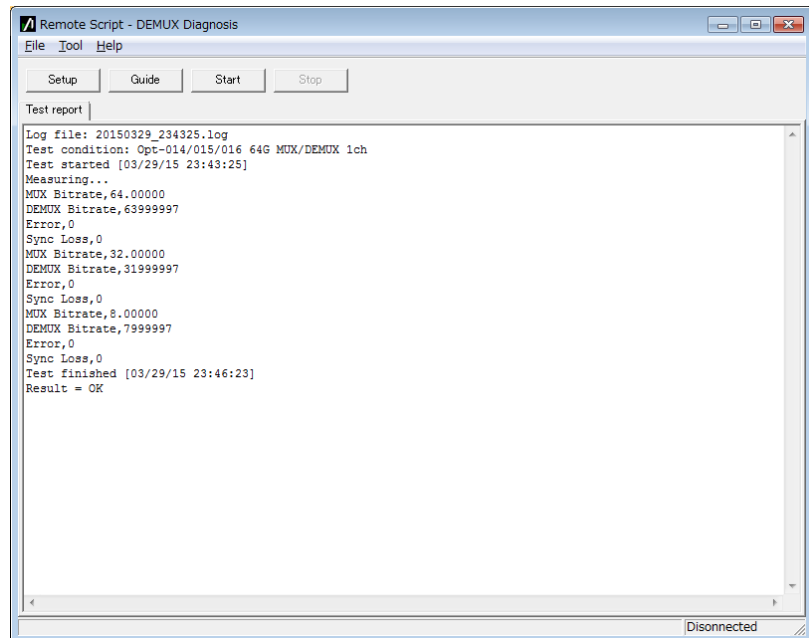


Figure D.3-1 Displaying diagnosis results

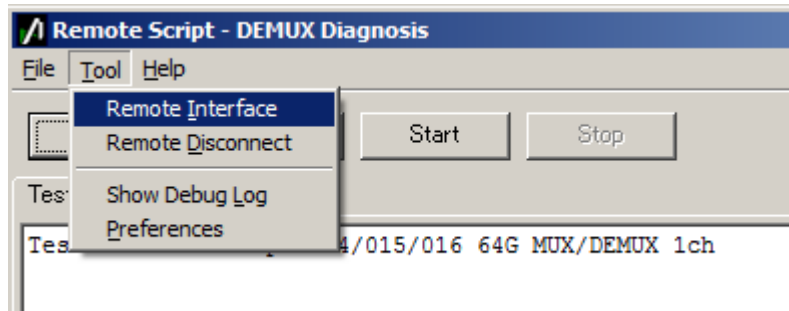
## D.4 Remote setting

This tool performs a diagnosis via an Ethernet using remote functions. Set the remote setting to Ethernet in the Setup Utility. For details of the Setup Utility and remote settings, refer to the MX180000A Operation Manual.

**Note:**

To use Ethernet remote with the MP1800A, Option MP1800-x02 is required.

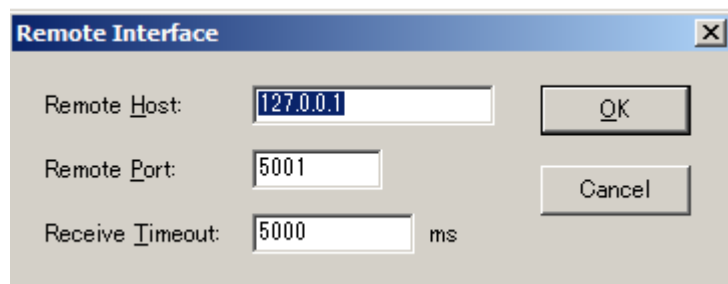
The remote settings for this tool are set by selecting Tool and then Remote Interface in the menu.



The initial settings are as follows:

Remote Host: 127.0.0.1 (Loopback address)

Remote Port: 5001 (MP1800A default)



## D.5 Software Licenses

This instrument comes with the package software as described in Table D.5-1.

For inquiries about software licenses, refer to the Anritsu website. (<http://www.anritsu.com>)

Note, however, that the package software is not covered by the Anritsu Software License Agreement.

**Table D.5-1 Package Name and License**

Package	License
Lua	MIT

Lua:

License for Lua 5.0 and later versions

Copyright © 1994–2010 Lua.org, PUC-Rio.

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## *Appendix E Sequence Examples*

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This appendix describes sequence examples for BER and automatic measurement using 64G MUX and 64G DEMUX with remote commands.

E.1	System Configuration .....	E-2
E.2	Initialization .....	E-4
E.3	Setting Examples of Measurement Conditions.....	E-6
E.3.1	Setting example of Test Conditions - Pattern, Measurement - .....	E-6
E.3.2	Setting example of Test Conditions - RF Output / Input - .....	E-6
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E.4	Auto Search Execution Example .....	E-10
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E.5.3	Eye Diagram measurement execution example .....	E-14
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## E.1 System Configuration

The system configuration for the sequence examples consists of the MP1800A with the following devices installed.

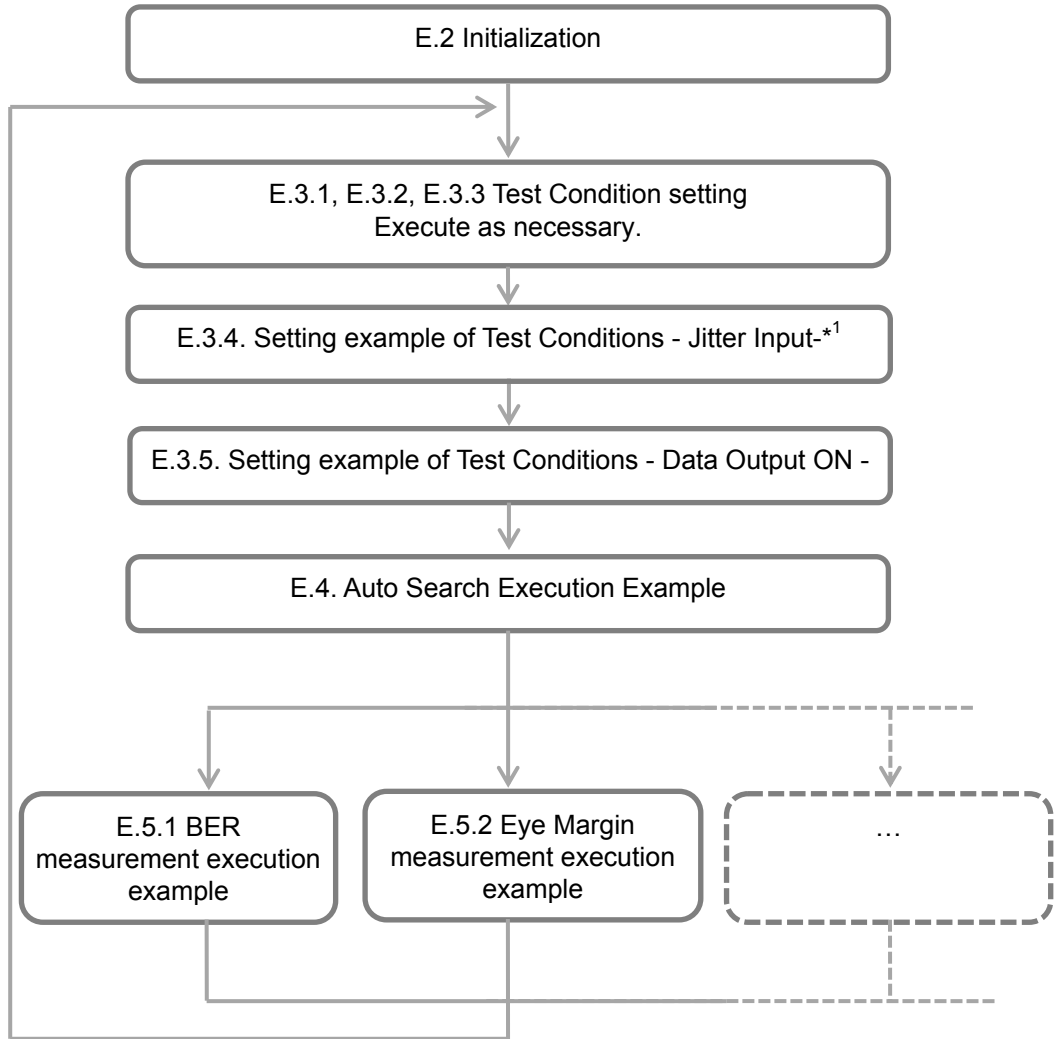
The values of "X" in "MOD:ID X" and ":USB:ID X" should be altered if the device installation locations are changed.

**Table E.1-1 System configuration for sequence examples**

Unit	Module	Module Name	Remarks
UENT (MP1800A)	MOD1	MU181000A	Synthesizer
	MOD2		
	MOD3	MU183020A	PPG
	MOD4	MU183040B	ED
	MOD5	MU181500B	Jitter Module The setting procedure, such as for initialization, will differ if the MU181500B is not installed.
	MOD6		
USB7	-	MP1861A	MUX
USB11	-	MP1862A	DEMUX



Execution examples described from E.2 onward should be used with the examples combined as shown below.



\*: Will vary depending on the device configuration and items measured.  
For specific details, refer to the individual items.

## E.2 Initialization

This section describes an example procedure for enabling MUX and DEMUX after initializing the system.

**Table E.2-1 Initialization procedure example**

Remote Commands	Explanation of Commands
:UENT:ID 1 :SYST:MEM:INIT  Wait 10000 ms. *2	Sets the remote command destination to MP1800A.*1 Initializes the system. Initialization takes up to 10 seconds to complete.
:UENT:ID 1;:MOD:ID 6  :SYST:INP:CSEL INT1 Wait 1000 ms. *2 :UENT:ID 1;:MOD:ID 3 :SYST:INP:CSEL INT2 Wait 1000 ms. *2	Sets the remote command destination to Jitter Module.*1 Links the Jitter Module and Synthesizer. Link setting requires about one second. Sets the remote command destination to PPG.*1 Links the PPG and Jitter Module. Link setting requires about one second.
:SYST:OUTP:CRAT FULL :MCOM:OPER:SETT 2 Wait 5000 ms. *2	Sets the PPG Clock Output to "Full Rate". Sets the PPG combination to "2ch". Combination setting requires about five seconds.
:USB:ID 7 :SYST:LINK:MUXP ON Wait 3000 ms. *2	Sets the remote command destination to MUX.*1 Links the PPG and MUX. Link setting requires about 3 seconds.
:UENT:ID 1;:MOD:ID 4 :MCOM:OPER:SETT 2 Wait 5000 ms. *2	Sets the remote command destination to ED.*1 Sets the ED combination to "2ch". Combination setting requires about five seconds.
:USB:ID 11 :SYST:LINK:DEM ON Wait 3000 ms. *2	Sets the remote destination to DEMUX.*1 Links the ED and DEMUX. Link setting requires about 3 seconds.

\*1: Sets the remote command destination for the MX180000A Main Application.

\*2: Wait indicates the recommended wait time for the MX180000A before transmitting the next command. This command is not supported by the MP1800A.

The items shaded in gray in the table above should be replaced with the following remote commands if the MU181500B Jitter Module is not installed in Slot 5 and 6.

<b>Remote Commands</b>	<b>Explanation of Commands</b>
:UENT:ID 1;:MOD:ID 3 :SYST:INP:CSEL INT Wait 1000 ms. * <sup>2</sup>	Sets the remote command destination to PPG. Links the PPG and Synthesizer. Link setting requires about one second.

## E.3 Setting Examples of Measurement Conditions

### E.3.1 Setting example of Test Conditions - Pattern, Measurement -

This section describes an example procedure for setting measurement conditions.

Test Pattern, Measurement settings apply to the PPG/ED linked to the MUX/DEMUX.

**Table E.3.1-1 Setting example of Test Pattern and Measurement**

Remote Commands	Explanation of Commands
:UENT:ID 1;:MOD:ID 3 :SOUR:PATT:TYPE PRBS :SOUR:PATT:PRBS:LENG 31	Sets the remote command destination to PPG. Sets the PPG Test Pattern to "PRBS31".
:UENT:ID 1;:MOD:ID 4 :SENS:PATT:TYPE PRBS :SENS:PATT:PRBS:LENG 31 :SENS:MEAS:EAL:MODE SING	Sets the remote command destination to ED. Sets the ED Test Pattern to "PRBS31". Sets the ED measurement mode to "single". Measurement stops when the following measurement cycle conditions are satisfied.
:SENS:MEAS:EAL:UNIT CLOC :SENS:MEAS:EAL:CLOC E_12	Sets the ED measurement cycle units to "Clock". Sets the ED measurement cycle to a Clock Count of 1E + 12.

### E.3.2 Setting example of Test Conditions - RF Output / Input -

This section describes an example procedure for setting the functions displayed in the MUX "Data Interface tab" or DEMUX "Interface tab".

**Table E.3.2-1 Setting example of Data Input/Output**

Remote Commands	Explanation of Commands
:USB:ID 11 :DEM:DATA:INT DIF50 :DEM:DATA:DIFF ALT	Sets the remote command destination to DEMUX. Sets the DEMUX Data Input Condition to "Differential 50ohm" "Alternate".
:USB:ID 7 :MUX:DATA:TRAC ON	Sets the remote command destination to MUX. Sets the MUX Data and Xdata output conditions to the same values.
:MUX:DATA:AMPL DATA, 0.500	Sets the MUX Data Output Amplitude to "0.5 Vpp".

### E.3.3 Setting example of Test Conditions - Data Bitrate -

This section describes an example procedure for setting Output Bitrate. The Bitrate settings apply to the PPG/ED linked to the MUX/DEMUX.

**Table E.3.3-1 Setting example of Output Bitrate**

Remote Commands	Explanation of Commands
:UENT:ID 1;:MOD:ID 3 :OUTP:DATA:BITR 28.0  Wait 10000 ms.*	Sets the remote command destination to PPG. Sets the PPG output bit rate to 25G (56G for MUX output). Up to 10 seconds are required for the system clock to stabilize and for completion of phase adjustment of the Data and Clock input to the MUX.

\*: Wait- indicates the recommended wait time for sending the command. This command is not supported by the MP1800A.

### E.3.4 Setting example of Test Conditions - Jitter Input-

This section describes an example procedure for setting Jitter Input. The recommended Jitter Input setting varies depending on the measurement conditions.

For Eye Diagram, Eye Margin, and Bathtub measurement:

- Send the following remote commands when the MU181500B Jitter Module is installed.

**Table E.3.4-1 Jitter Input examples with MU181500B installed**

Remote Commands	Explanation of Commands
:USB:ID 7 :MUX:DATA:JINP OFF :USB:ID 11 :DEM:CLOC:JINP OFF :DEM:CLOC:BAND QUAT	Sets the remote command destination to MUX. Sets MUX Jitter Input to OFF. Sets the remote command destination to DEMUX. Sets DEMUX Jitter Input to OFF. Sets DEMUX Clock Input to Quarter Rate.* The DEMUX Ext Clk Input and Jitter Module Reference Clock Output must be connected using a coaxial cable.
:UENT:ID 1;:MOD:ID 6  :OUTP:AUX:REFC 1	Sets the remote command destination to Jitter Module. Sets Reference Clock to 1/1 clock output.

\*: Sets the argument as shown below depending on the measurement bit rate.

$$60 \text{ Gbps} < \text{Bitrate} \leq 64 \text{ Gbps} \quad 1/8 \text{ Clock Rate(EIGH)}$$

30 Gbps < Bitrate ≤ 60 Gbps Quarter Clock Rate(QUAT)  
 Bitrate ≤ 30 Gbps Half Clock Rate(HALF)

- Send the following remote commands when the MU181500B (Jitter Module) is not installed.

**Table E.3.4-2 Jitter Input examples with MU181500B not installed**

Remote Commands	Explanation of Commands
:USB:ID 7 :MUX:DATA:JINP OFF :USB:ID 11 :DEM:CLOC:JINP OFF :DEM:CLOC:BAND HALF	Sets the remote command destination to MUX. Sets MUX Jitter Input to OFF.*1 Sets the remote command destination to DEMUX. Sets DEMUX Jitter Input to OFF.*1 Sets DEMUX Clock Input to Half Rate. The DEMUX Ext Clk Input and MUX Clk Output (or equivalent signal) must be connected using a coaxial cable.

Send the following remote commands for MX181500A Jitter Application measurement.  
 MX181500A Jitter Application is launched after this command is sent.  
 For example command sequences and how to start MX181500A, refer to the MX181500A Operation Manual.

**Table E.3.4-3 Jitter Input examples for MX181500A Jitter Application Measurement**

Remote Commands	Explanation of Commands
:USB:ID 7 :MUX:DATA:JINP ON :USB:ID 11 :DEM:CLOC:JINP ON :DEM:CLOC:BAND HALF	Sets the remote command destination to MUX. Sets MUX Jitter Input to ON. Sets the remote command destination to DEMUX. Sets DEMUX Jitter Input to ON. Sets DEMUX Clock Input to Half Rate. The DEMUX Ext Clk Input and MUX Clk Output (or equivalent signal) must be connected using a coaxial cable.

### E.3.5 Setting example of Test Conditions - Data Output ON -

This section describes the procedure for setting the MUX Data Output to ON.

**Table E.3.5-1 Setting example of MP1861A Data Output ON**

Remote Commands	Explanation of Commands
<pre>:USB:ID 7 :MUX:DATA:OUTP ON :SOUR:OUTP:ASET ON Wait 6000 ms. *2 :SYST:INP:DCAD:AUTO ON</pre>	<p>Sets the remote command destination to MUX.            Enables the MUX Data Output.            Enables Data Output for the entire system.            The phase of the Data and Clock input to the MUX is automatically adjusted after initialization. About six seconds are required until completion.*1            Enables the function to automatically adjust the phase of the Data and Clock input to the MUX.*2</p>

\*1: Wait- indicates the recommended wait time for sending the command. This command is not supported by the MP1800A.

\*2: To specify the timing for executing phase adjustment of the Data and Clock input to the MUX, set to OFF. If set to OFF, the Wait processing unit can be replaced using the procedure described in "E.6 Use Example of Status Command".

## E.4 Auto Search Execution Example

This section describes an example procedure for Auto Search with respect to DEMUX.

Using Auto Search sets the optimum Vth, Delay for the input Data.

**Table E.4-1 Auto Search execution setting example**

Remote Commands	Explanation of Commands
:SYST:CFUN OFF	Closes the Automatic Measurement screen currently open.
:SYST:CFUN ASE32	Opens the Auto Search screen.
:SENS:MEAS:ASE:SLAS	Enables all modules allowing Auto Search.
:SENS:MEAS:ASE:SMOD COAR	Selects Auto Search Coarse.
:SENS:MEAS:ASE:MODE PTHR	Selects Search for the Vth, Phase direction.
:SENS:MEAS:ASE:STAR	Starts Auto Search.
	About 20 seconds are required for DEMUX Auto Search (Coarse) to complete. (When the DEMUX Input Condition is Single ended)
:SENS:MEAS:ASE:STAT?	Determines that Auto Search has started. A return value of "1" indicates that measurement has started.*
:SENS:MEAS:ASE:STAT?	Determines that Auto Search has ended. A return value of "0" indicates that measurement has ended, and a value of "-1" indicates that measurement failed.*
:SYST:CFUN OFF	Closes the Auto Search screen.

\*: Use processing corresponding to C language "for" and "While" statements for this processing to send queries until the expected value is detected. Set the sending interval between queries to at least 200 ms to avoid overloading the instrument used for the measurement processing. Execute the next command after the expected value has been detected.



## E.5 Measurement

### E.5.1 BER measurement execution example

This section describes an example procedure for BER measurement.

**Table E.5.1-1 BER measurement setting example**

Remote Commands	Explanation of Commands
:USB:ID 11;:DISP:ACT 0,11,1	Sets the remote command destination to DEMUX.
:DEM:MEAS:STAR	Starts BER measurement.
:DEM:MEAS:EAL:STAT?	Determines that BER measurement has started. A return value of "1" indicates that measurement has started.*
:DEM:MEAS:EAL:STAT?	Determines that BER measurement has ended. The return value will be "0" when measurement ends if the ED Measurement Conditions are set to "Single".*
:DEM:MEAS:STOP	Stops BER measurement after the wait time if the ED measurement cycle is set to "Repeat" or "Untimed".
:DEM:CALC:DATA:EAL? "CURR:FREQ"	Queries Frequency.
:DEM:CALC:DATA:EAL? "CURR:ER:TOT"	Queries Error Rate.
:DEM:CALC:DATA:EAL? "CURR:EC:TOT"	Queries Error Count.
:DEM:CALC:DATA:EAL? "CURR:CC:TOT"	Queries Clock Count.
:DEM:CALC:DATA:EAL? "CURR:AINT:PSL"	Queries the Sync Loss occurrence state.

- \*: Use processing corresponding to C language "for" and "While" statements for this processing to transmit queries until the expected value is detected. Set the sending interval between queries to at least 200 ms to avoid overloading the instrument used for the measurement processing. Execute the next command after the expected value has been detected.

## E.5.2 Eye Margin measurement execution example

This section describes an example procedure for Eye Margin.

**Table E.5.2-1 Eye Margin measurement setting example**

Remote Commands	Explanation of Commands
:UENT:ID 1 :SYST:CFUN OFF :SYST:CFUN EMAR32 :SENS:MEAS:EMAR:MARG:SLOT USB11,1,ON	Sets the remote command destination to MP1800A. Closes the Automatic Measurement screen currently open. Opens the Eye Margin measurement screen. Sets the measurement target to USB11 (DEMUX).
:SENS:MEAS:EMAR:MARG:ASE ON,1 :SENS:MEAS:EMAR:MARG:RES COAR :SENS:MEAS:EMAR:MARG:THR E_8 :SENS:MEAS:STAR :SENS:MEAS:EMAR:STAT?	Executes Auto Search Coarse when measurement starts. Sets the measurement accuracy to Coarse. Sets the measured BER value to 1E-8.
:SENS:MEAS:EMAR:STAT?	Starts Eye Margin measurement.
:SENS:MEAS:STOP	Determines that Eye Margin measurement has started. A return value of "1" indicates that measurement has started.*1
:CALC:DATA:EMAR? USB11,1,"THR" :CALC:DATA:EMAR? USB11,1,"PHAS"	Determines that Eye Margin measurement has ended. A return value of "0" indicates that measurement has ended, and a value of "-1" indicates that measurement failed.*1 Stops Eye Margin measurement.
:SYST:MMEM:MARG:STOR "C:\Test\emexample",CSV	Returns the Eye Margin (Threshold) results.
:SYST:MMEM:MARG:STOR "C:\Test\emexample",BIN	Returns the Eye Margin (Phase) results.
:SYST:CFUN OFF	Saves the measurement results in CSV format to a specified folder.*2 Saves the measurement results in BIN format to a specified folder.*2.*3 Closes the Eye Margin measurement screen.

\*1: Use processing corresponding to C language "for" and "While" statements for this processing to send queries until the expected value is detected. Set the sending interval between queries to at least 200 ms to avoid overloading the instrument used for the measurement processing. Execute the next command after the expected value has been detected.

\*2: If no directory exists for saving measurement results ("C:\Test" in this example), one must be created beforehand by the user. Saving using the same file name ("example" in this example) will overwrite

the previous results. Alter the file name if you wish to repeatedly save results.

- \*3: Saved BIN results can be loaded by sending the following command with the Eye Margin measurement screen open.

```
:SYST:MMEM:MARG:REC "C:\Test\emexample"
```

### E.5.3 Eye Diagram measurement execution example

This section describes an example procedure for Eye Diagram.

**Table E.5.3-1 Eye Diagram measurement setting example**

Remote Commands	Explanation of Commands
<pre> :UENT:ID 1 :SYST:CFUN OFF :SYST:CFUN EDI32 :SENS:MEAS:EDI:DIAG:SLOT USB11,1,ON :SENS:MEAS:EDI:DIAG:TYPE POIN16 :SENS:MEAS:EDI:DIAG:ASE OFF  :DISP:RES:EDI:TABS DIAG  :SENS:MEAS:EDI:DIAG:ATHR OFF :DISP:RES:EDI:AER OFF :SENS:MEAS:EDI:DIAG:THR E_3,ON :DISP:RES:EDI:ERAT E_3,1 :SENS:MEAS:EDI:DIAG:THR E_8,ON :DISP:RES:EDI:ERAT E_8,1 :SENS:MEAS:EDI:DIAG:STAR :SENS:MEAS:EDI:STAT?  :SENS:MEAS:EDI:STAT?  :SENS:MEAS:EDI:DIAG:STOP :DISP:RES:EDI:SCAL:ASC :SYST:MMEM:DIAG:STOR "C:\Test\edexample",EDG,CSV :SYST:MMEM:DIAG:STOR "C:\Test\edexample",EDG,BIN :SYST:CFUN OFF                     </pre>	<p>Sets the remote command destination to MP1800A.</p> <p>Closes the Automatic Measurement screen currently open.</p> <p>Opens the Eye Diagram measurement screen.</p> <p>Sets the measurement target to USB11 (DEMUX).</p> <p>Sets the number of measurement points to 16.</p> <p>Does not execute Auto Search Coarse when measurement starts.</p> <p>Displays the Eye Diagram Diagram screen.</p> <p>Clears the measurement and BER value displayed.</p> <p>Sets the measurement and displayed BER value to 1E-3.</p> <p>Sets the measurement and displayed BER value to 1E-8.</p> <p>Starts Eye Diagram measurement.</p> <p>Determines that Eye Diagram measurement has started. A return value of "1" indicates that measurement has started.*1</p> <p>Determines that Eye Diagram measurement has ended. A return value of "0" indicates that measurement has ended, and a value of "-1" indicates that measurement failed.*1</p> <p>Stops Eye Diagram measurement.</p> <p>Adjusts the measurement screen scale.</p> <p>Saves the measurement results in CSV format to a specified folder.*2</p> <p>Saves the measurement results in BIN format to a specified folder.*2.*3</p> <p>Closes the Eye Diagram measurement screen.</p>

\*1: Use processing corresponding to C language "for" and "While" statements for this processing to send queries until the expected value is detected. Set the sending interval between queries to at least 200 ms to avoid overloading the instrument used for the

measurement processing. Execute the next command after the expected value has been detected.

\*2: If no directory exists for saving measurement results ("C:\Test" in this example), one must be created beforehand by the user. Saving using the same file name ("example" in this example) will overwrite the previous results. Alter the file name if you wish to repeatedly save results.

\*3: Saved BIN results can be loaded by sending the following command with the Bathtub measurement screen open.

```
:SYST:MMEM:DIAG:REC "C:\Test\edexample",BIN
```

### E.5.4 Bathtub measurement execution example

This section describes an example procedure for Bathtub measurement. This example assumes that DEMUX has been synchronized with the input data by executing Auto Search beforehand. (Refer to E.4 Auto Search Execution Example.)

**Table E.5.4-1 Bathtub measurement setting example**

Remote Commands	Explanation of Commands
:UENT:ID 1 :SYST:CFUN OFF :SYST:CFUN BTUB32	Sets the remote command destination to MP1800A. Closes the Automatic Measurement screen currently open. Opens the Bathtub measurement screen.
:SENS:MEAS:BATH:SELS USB11,1,ON :SENS:MEAS:BATH:ASE OFF :SENS:MEAS:BATH:MODE REP :SENS:MEAS:BATH:TIM 5 :SENS:MEAS:BATH:RES:MUI 4 :SENS:MEAS:BATH:ECO COAR	Sets the Bathtub measurement target to USB11 (DEMUX). Sets so that Auto Search is not performed when measurement starts. Sets measurement to Repeat mode. Set the repeat measurement count to five times. Sets the minimum number of Delay steps to "4 mUI".
:SENS:MEAS:BATH:RANG E_10 :SENS:MEAS:BATH:CALR E_5,E_10	Determines BER for a measurement point when an error is counted during measurement at that measurement point.
:SENS:MEAS:BATH:STAR :SENS:MEAS:BATH:STAT?	Sets the lower limit for the measured BER range to 1E-10. Sets the BER range used for jitter calculation from 1E-5 to 1E-10.
:SENS:MEAS:BATH:STAT?	
:SENS:MEAS:BATH:STOP :SYST:MMEM:BATH:STOR "C:\Test\btexample",PSB,CSV :SYST:MMEM:BATH:STOR "C:\Test\btexample",PSB,BIN :SYST:CFUN OFF	Starts Bathtub measurement. Determines that Bathtub measurement has started. A return value of "1" indicates that measurement has started.*1 Determines that Bathtub measurement has ended. A return value of "0" indicates that measurement has ended.*1 Stops Bathtub measurement. Saves the measurement results in CSV format to a specified folder.*2 Saves the measurement results in BIN format to a specified folder.*2 *3 Closes the Bathtub screen.

\*1: Use processing corresponding to C language "for" and "While" statements for this processing to send queries until the expected value is detected. Set the sending interval between queries to at least 200 ms to avoid overloading the instrument used for the

measurement processing. Execute the next command after the expected value has been detected.

\*2: If no directory exists for saving measurement results ("C:\Test" in this example), one must be created beforehand by the user. Saving using the same file name ("example" in this example) will overwrite the previous results. Alter the file name if you wish to repeatedly save results.

\*3: Saved BIN results can be loaded by sending the following command with the Bathtub measurement screen open.

```
:SYST:MMEM:BATH:REC "C:\Test\btexample"
```

## E.6 Use Example of Status Command

This section describes an example procedure for executing PPG-MUX Adjustment and loading status using remote commands.

**Table E.6-1 Use Example of Status Command**

Remote Commands	Explanation of Commands
:USB:ID 7;:DISP:ACT 0,7,1	Sets the remote command destination to MUX.
:INST:MUX:RES	Initializes the status register.
:INST:MUX:PTR 32	Sets the positive logic Transition. Set to 32 (bit 5) here to determine the Adjustment state between PPG-MUX.
:INST:MUX:NTR 0	Sets the negative logic Transition. Set to 0 here, as negative logic is not checked.
:INST:MUX:EVEN?	Clears Event with one query.
:SYST:INP:DCAD	Starts PPG-MUX Adjustment.
:INST:MUX:EVEN?	Determines that Adjustment has started. Querying continues until the return value is "32".*
:INST:MUX:COND?	Determines that Adjustment has ended. Querying continues until the return value is "0".*

\*: Use processing corresponding to C language "for" and "While" statements for this processing to send queries until the expected value is detected. Set the sending interval between queries to at least 200 ms to avoid overloading the instrument used for the measurement processing. Execute the next command after the expected value has been detected.