MX183000A
High-Speed Serial Data Test Software Operation Manual

Third Edition

- **For safety and warning information, please read this manual before attempting to use the equipment.**
- **Additional safety and warning information is provided in the MP1800A Signal Quality Analyzer Installation Guide and the MT1810A 4 Slot Chassis Installation Guide. Please also refer to one of these documents before using the equipment.**
- **Keep this manual with the equipment.**

ANRITSU CORPORATION

Document No.: M-W3813AE-3.0

Safety Symbols

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

Symbols used in manual

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

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

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

Safety Symbols Used on Equipment and in Manual

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

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

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

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

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

These indicate that the marked part should be recycled.

MX183000A
High-Speed Serial Data Test Software
Operation Manual

1 February 2016 (First Edition)
31 May 2016 (Third Edition)

Equipment Certificate

Anritsu Corporation guarantees that this equipment was inspected at shipment and meets the published specifications.

Anritsu Warranty

- During the warranty period, Anritsu Corporation will repair or exchange this software free-of-charge if it proves defective when used as described in the operation manual.
- The warranty period is 6 months from the purchase date.
- The warranty period after repair or exchange will remain 6 months from the original purchase date, or 30 days from the date of repair or exchange, depending on whichever is longer.
- This warranty does not cover damage to this software caused by Acts of God, natural disasters, and misuse or mishandling by the customer.

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.

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

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.

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.

1. Grant of License and Limitations

1. Regardless of whether this Software was purchased from or provided free-of-charge by Anritsu, you agree not to rent, lease, lend, or otherwise distribute this Software to third parties and further agree not to disassemble, recompile, reverse engineer, modify, or create derivative works of this Software.
2. You may make one copy of this Software for backup purposes only.
3. You are not permitted to reverse engineer this software.
4. This EULA allows you to install one copy of this Software on one piece of Equipment.

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.

3. Limitation of Liability

a. If a fault (bug) is discovered in this Software, preventing operation as described in the operation manual or specifications whether or not the customer uses this software as described in the manual, Anritsu shall at its own discretion, fix the bug, or exchange the software, or suggest a workaround, free-of-charge. However, notwithstanding the above, the following items shall be excluded from repair and warranty.

   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.

Before Using VISA*1

For Those Who Use MP1800A

To use the MX183000A High-Speed Serial Data Test Software (hereafter MX183000A), you are required to install National Instruments™ (hereafter NI™) NI-VISA™*2 on the PC controller. We recommend using NI-VISA™*2 provided in the USB memory stick that contains MX183000A.

You are allowed to use NI-VISA™*2 contained in the USB memory stick only for the purpose of using it for MX183000A. Use of NI-VISA™*2 for any other product or purpose is prohibited.
When uninstalling MX183000A from the PC controller, uninstall NI-VISA™ that was installed from the USB memory stick as well.

Glossary of Terms:

*1: VISA: Virtual Instrument Software Architecture
I/O software specification for remote control of measuring instruments using interfaces such as GPIB, Ethernet, USB, etc.

*2 :NI-VISA™
World de facto standard I/O software interface developed by NI and standardized by the VXI Plug&Play Alliance.

Trademarks:

- National Instruments™, NI™, NI-VISA™ and National Instruments Corporation are all trademarks of National Instruments Corporation

Before Using VISA*1

For Those Who Use MT1810A

To use the MX183000A High-Speed Serial Data Test Software (hereafter MX183000A), you are required to install National Instruments™ (hereafter NI™) NI-VISA™*2 on the PC controller.

You need to get the NI-VISA™ Installer yourself.
The USB memory stick for MX183000A does not contain NI-VISA™ because MT1810A does not include any NI™ hardware.

Glossary of Terms:

*1: VISA: Virtual Instrument Software Architecture
I/O software specification for remote control of measuring instruments using interfaces such as GPIB, Ethernet, USB, etc.

*2 :NI-VISA™
World de facto standard I/O software interface developed by NI and standardized by the VXI Plug&Play Alliance.

Protection Against Computer Virus Infections

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

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.

CE Conformity Marking

Anritsu affixes the CE Conformity marking on the following product(s) in accordance with the Decision 768/2008/EC to indicate that they conform to the EMC and LVD directive of the European Union (EU).

CE marking

1. Product Model

Software: MX183000A High-Speed Serial Data Test Software

2. Applied Directive and Standards

When the MX183000A Jitter/Noise Tolerance Test Software is installed in the MP1800A or MT1810A, the applied directive and standards of this unit conform to those of the MP1800A or MT1810A main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that MX183000A can be used with.

RCM Conformity Marking

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

RCM marking

1. Product Model

Software: MX183000A High-Speed Serial Data Test Software

2. Applied Directive and Standards

When the MX183000A is installed in the MP1800A or MT1810A, the applied directive and standards of this unit conform to those of the MP1800A or MT1810A main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that MX183000A can be used with.

About This Manual

A testing system comprised of the MP1800A Signal Quality Analyzer, MT1810A 4-Slot Chassis, module(s), and control software is called the Signal Quality Analyzer series. A set of operation manuals of the Signal Quality Analyzer series consists of separate documents about installation guide, the mainframe, remote control operation, module(s), control software, and extended applications as shown below.

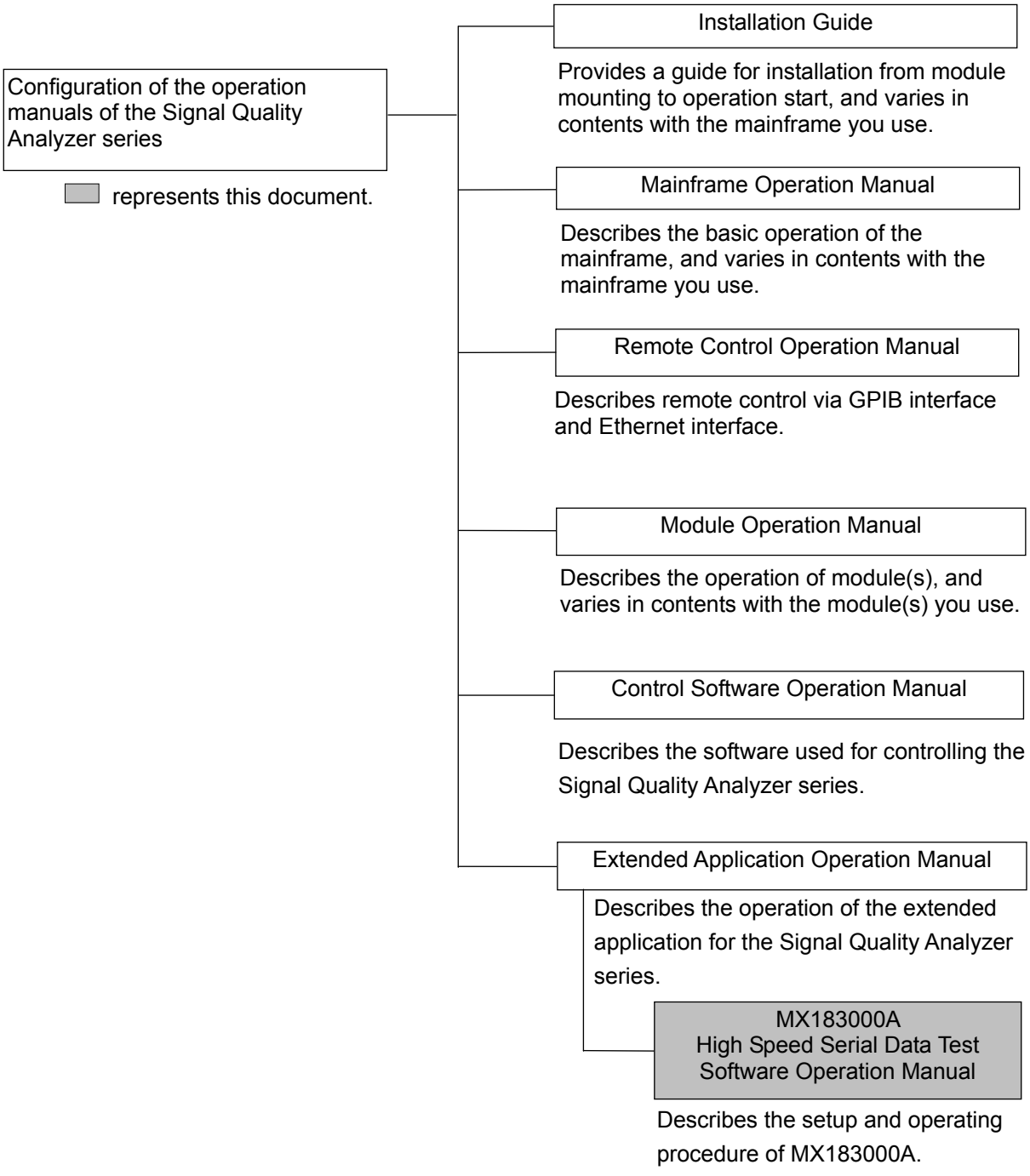


Table of Contents

IV.

Chapter 1 Outline

This section outlines the details of the MX183000A High-Speed Serial Data Test Software.

1.1 Outline

The MX183000A High-Speed Serial Data Test Software (hereinafter referred to as "MX183000A ") controls the following devices and allows jitter tolerance to be measured in compliance with the relevant standards for the 10 Gbit/s and 20 Gbit/s bands, together with generation of PCIe/USB link sequences.

- MP1800A Signal Quality Analyzer or
  MT1810A 4-slot Chassis
- MU181000A 12.5 GHz Synthesizer or
  MU181000B 12.5 GHz 4-port Synthesizer
- MU181500B Jitter Modulation Source
- MU183020A 28G/32G bit/s PPG or
  MU183021A 28G/32G bit/s 4ch PPG
- MU183040A 28G/32G bit/s ED or
  MU183041A 28G/32G bit/s 4ch ED
- MU183040B 28G/32G bit/s High Sensitivity ED or
  MU183041B 28G/32G bit/s 4ch High Sensitivity ED

MX183000A controls MP1800A or MT1810A via Ethernet. Jitter Tolerance Measurement mode measures the bit error rate or bit error while varying the MU181500B jitter frequency and amplitude.

PCIe/USB Link Sequence mode generates data sequences for setting the target device to loop-back state using 32G PPG.

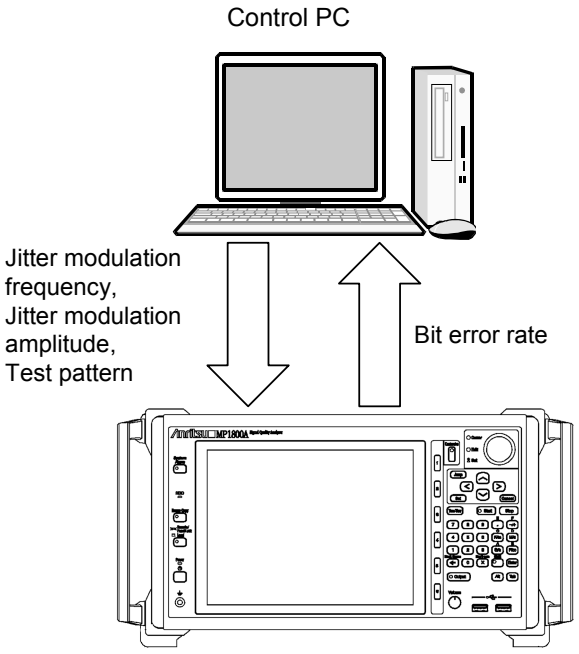


Figure 1.1-1 Setup and measurement items of MX183000A

MX183000A features the following three measurement functions.

PCIe Link Sequence

The PCIe Link Sequence function generates data sequences for setting the target device to loop-back state using 32G PPG.

USB Link Sequence

The USB Link Sequence function generates data sequences for setting the target device to loop-back state using 32G PPG.

Jitter Tolerance Test

The Jitter Tolerance Test sends the jitter modulated data to the target device, and measures the tolerance point indicated by the maximum jitter amplitude under the specified bit error rate. The high-rate jitter tolerance point can also be used to estimate the low-rate jitter tolerance point such as E-20.
The Jitter Tolerance test displays the jitter modulation frequency and amplitude in graph and table form.

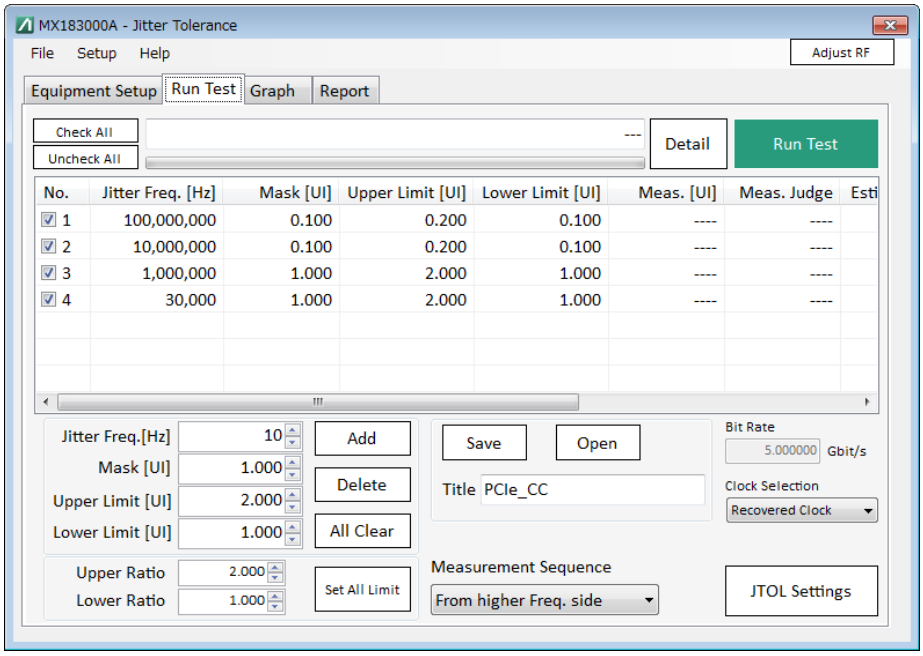


Figure 1.1-2 Jitter Tolerance Run Test Tab Screen

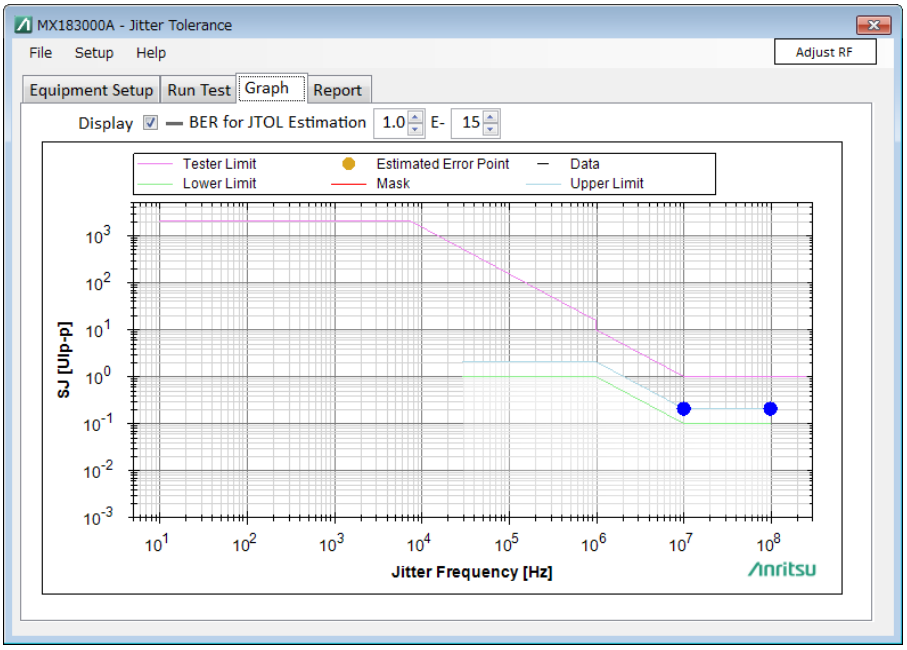


Figure 1.1-3 Jitter Tolerance Graph Screen

1.2 Features

MX183000A has the following features.

- PCIe link sequence generation
- USB3.0/3.1 link sequence generation
- Jitter tolerance measurement involves testing by controlling the MU181500B and varying SJ while adding jitter such as RJ or BUJ at a fixed value.
- Jitter tolerance measurement provides three methods for varying jitter amplitude depending on the characteristics of Serdes, as shown below.
  Binary search
  Downward search from the upper limit value to the lower limit value
  Upward search from the lower limit value to the upper limit value
- Estimation of low-rate jitter tolerance results
- Mask measurement according to various standards is available.
- MX183000A can control up to three MP1800A signal quality analyzers or 4-slot-chassis MT1810A.
- Measurement results can be output in the html or CSV format.

1.3 Model Names and Options

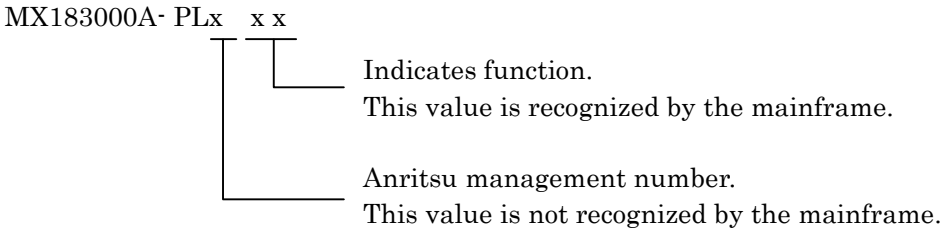
Table1.3-1 shows the model names and options for this unit. Options can be added by entering a license key. Refer to 2.4 "License Key Issuing Procedure" for details.

Table 1.3-1 MX183000A Model Names and Options

Model	Name	Remarks
MX183000A	High-Speed Serial Data Test Software	One of the following options must be included. All the options can be mounted at the same time.
MX183000A-PL001	Jitter Tolerance Test	
MX183000A-PL011	PCIe Link Sequence	
MX183000A-PL012	USB Link Sequence	

Note:

Option name format is as follows:



1.4 Uses

MX183000A is used for the following purposes.

- PCIe link sequence generation
- USB3.0/3.1 link sequence generation
- Serdes device jitter tolerance measurement in compliance with the relevant standards in the 2.4 to 32 Gbit/s band.

The following table shows the test items MX183000A supports for the relevant standards and different target devices (DUTs).

Table 1.4–1 MX183000A Supported Standards and DUTs

Supported Standard		DUT	Link Sequence Generation	Jitter Tolerance Measurement
PCIe	1.x/2.0/3.x/4.0	Addin Card	✓	✓
		System Board		
USB	3.0/3.1	Device	✓	
		Host	✓	

1.5 Glossary

The following table contains the abbreviations used in this document and MX183000A.

Table 1.5-1 Abbreviation

Abbreviation	Full Term
BER	Bit Error Rate
BUJ	Bounded Uncorrelated Jitter
CSV	Comma Separated Value
DEMUX	De-multiplexer
DUT	Device Under Test
ED	Error Detector
EIEOS	Electrical Idle End Ordered Set
FTS	Fast Training Sequence
HPF	High Pass Filter
HTML	Hyper Text Markup Language
LBPM	LFPS-Based PWM Messaging
LFPS	Low Frequency Periodic Signaling
LPF	Low Pass Filter
LTSSM	Link Training and Status State Machine
MUX	Multiplexer
OS	Ordered Set
PCIe	PCI Express
PPG	Pulse Pattern Generator
PRBS	Pseudo-Random Bit Sequence
RJ	Random Jitter
Serdes	Serializer/Deserializer
SSC	Spread Spectrum Clock
SJ	Sinusoidal Jitter
SKP	Skip
SRIS	Separate Reference Clocks with Independent SSC
SRNS	Separate Reference Clocks with No SSC
TS	Training Sequence
UI	Unit Interval
USB	Universal Serial Bus

Chapter 2 Before Use

This chapter describes preparation required before using MX183000A.

2.1 Unpacking

At unpacking, refer to the standard configuration list shown in Table A-1 “Configuration” in Appendix A to make sure all items are included. Contact your Anritsu Service and Sales Office or an agent if any part is missing or damaged.

2.2 Operating Environment

As for the operating environment of a control personal computer (PC), refer to Table A-2 “Operation Environment” in Appendix A.

MX183000A can be run on a control PC as well as on the MP1800A Signal Quality Analyzer (hereafter, MP1800A). When you install MX183000A on MP1800A, use the mouse to operate the software.

⚠ CAUTION

When either one of the following operations starts during the startup process of MX183000A, it might not work well.

- **Running another application at the same time**
- **Closing the lid of a laptop PC**
- **Using Screen Saver**
- **Battery saving operation in a laptop PC**

Refer to the PC operation manual to disable each feature.

2.3 Installation/Uninstallation

MX183000A can be used in two installation modes: installation on MP1800A and installation on an external PC.

This section describes how to install MX183000A when using MP1800A. When using MP1800A, use the NI-VISA Installer in the USB memory stick that contains MX183000A (see page vi “Before Using VISA For Those Who Use MP1800A”).
When using MT1810A, you need to obtain the NI-VISA Installer yourself.

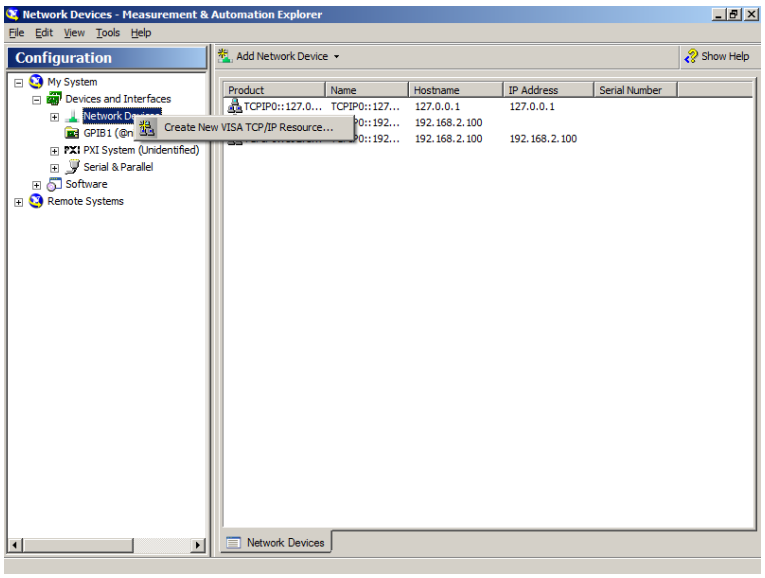
2.3.1 Installing

1. Install NI-VISA on the MP1800A or the external PC on which the MX183000A is to be installed. If NI-VISA is already installed, skip steps 2 to 4 and proceed to step 5
2. To install NI-VISA on the MP1800A, insert the USB memory stick into the MP1800A and copy the installation file to the built-in HDD. To install NI-VISA on the external PC, insert the USB memory stick into the external PC.
3 End all active applications. End Main application, and click the **Close (X)** button on the Selector screen.
4. Execute visa462full.exe to start installation.

   The file is stored in the following folder in the USB memory stick.
   \Software\visa462full.exe

   Install as instructed on the screen.
5. Set up NI-VISA. Launch Measurement & Automation Explorer from the Start menu.

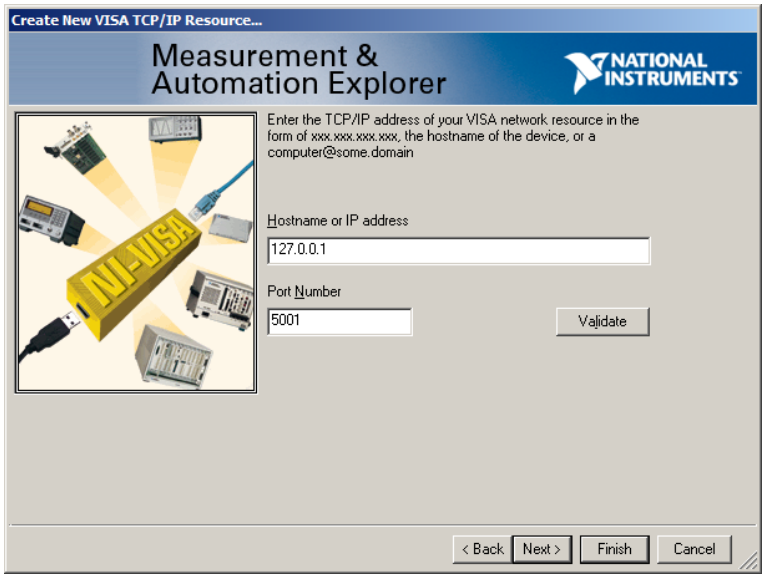
6. Right-click Network Devices and click **Create New VISA TCP/IP Resource...**.



7. Select Manual Entry or Raw Socket, and then click **Next**.

8. Enter the appropriate values for MP1800A* in Hostname or IP address and Port Number, and then click **Next**.

   *: The default values for MP1800A are IP:192.168.2.100 and Port:5001.



9. Confirm that the IP address and Port Number values entered in step 8 are shown for Resource Name, and then click **Finish**.

10. Install MX183000A. Run the following file on the PC or MP1800A on which NI-VISA is installed.

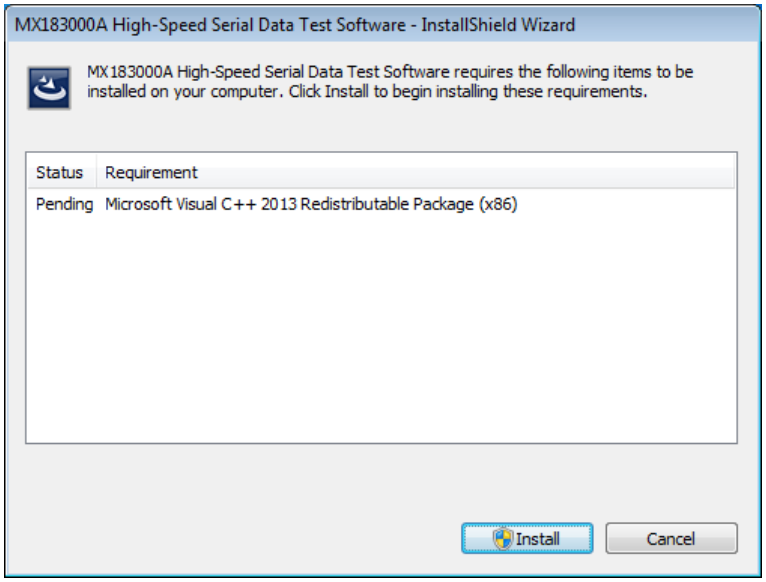
    \Installer\MX183000A_VER_x_xx_xx.exe

    "x_xx_xx" here corresponds to the software version.

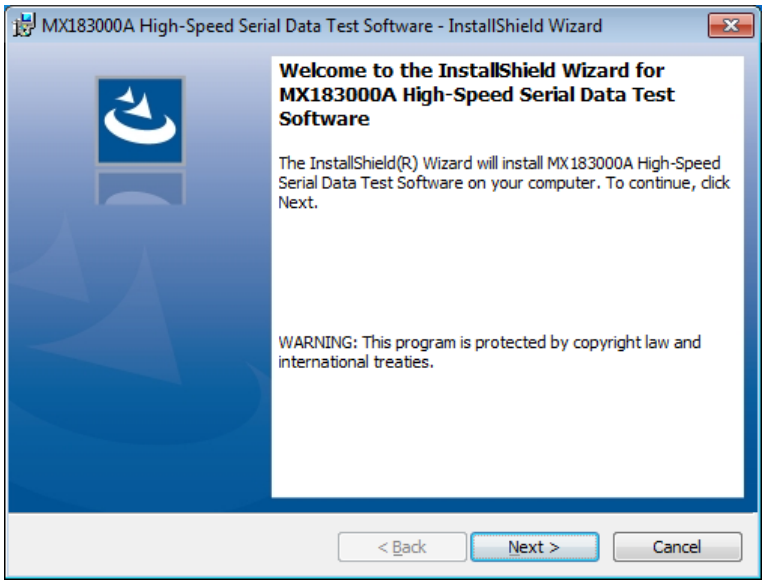
    If the software is already installed, a message dialog saying "Reinstall all program features installed by the previous setup." will appear when you attempt to install by overwriting. To continue with

the installation, click Yes. (Skip steps 11 to 15 and proceed to step 16.)

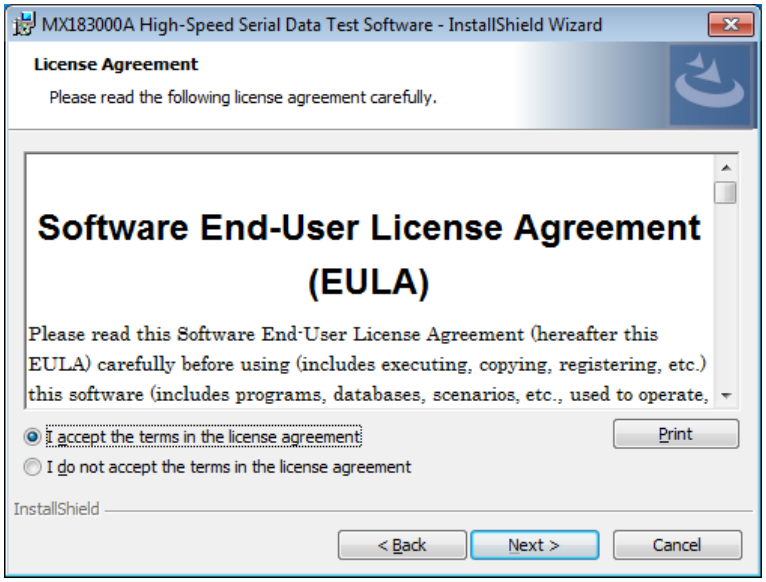
11. Click **Install** on the following screen.



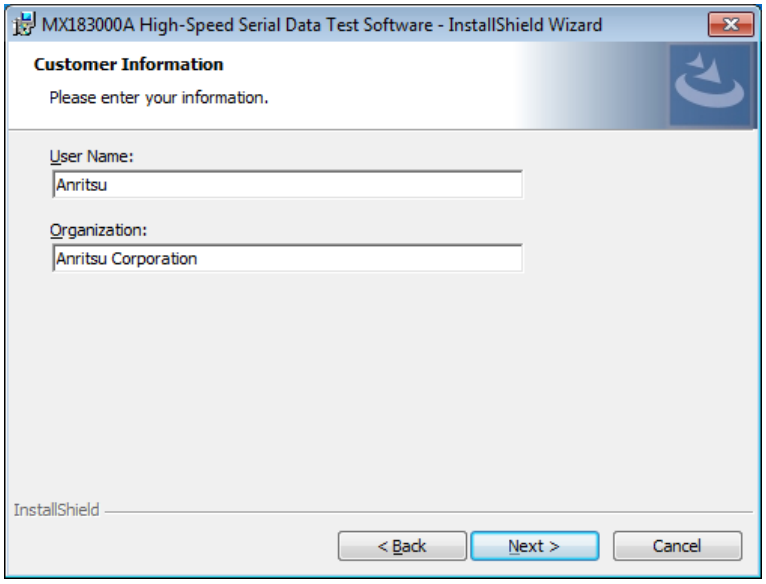
12. The installer is activated. Click **Next**.



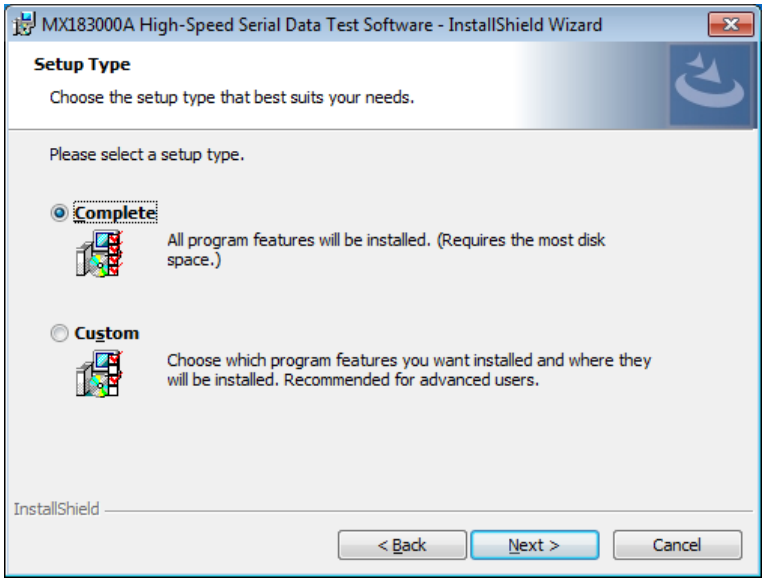
13. Select I accept the terms in the license agreement, and then click **Next**.



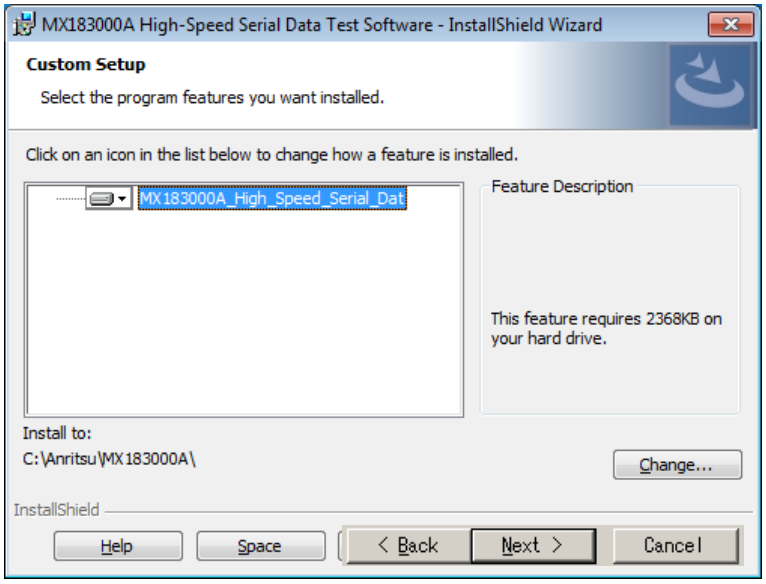
14. Enter User Name and Organization and then click **Next**.



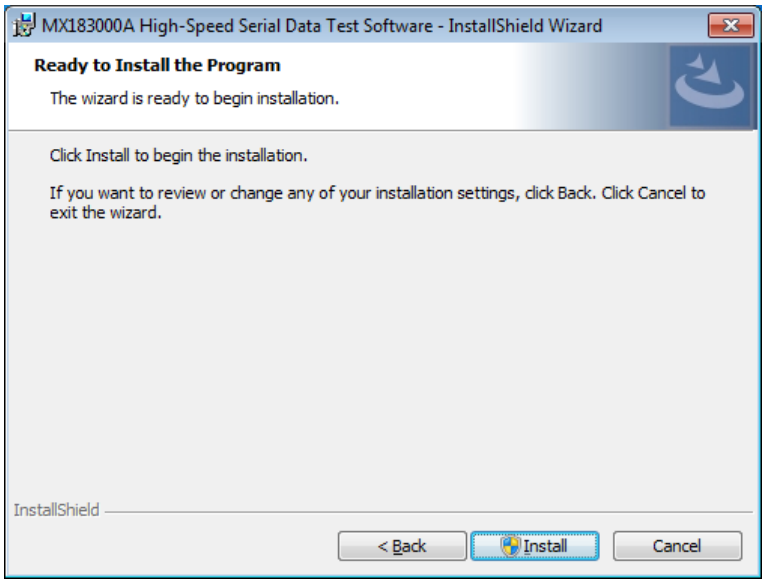
15. Select a setup type and click **Next**.
    If **Custom** is selected, you can select the location where you want to install* MX183000.
    If **Complete** is selected, proceed to step 16.
    *: The default installation location is C:\Anritsu\MX183000A\.



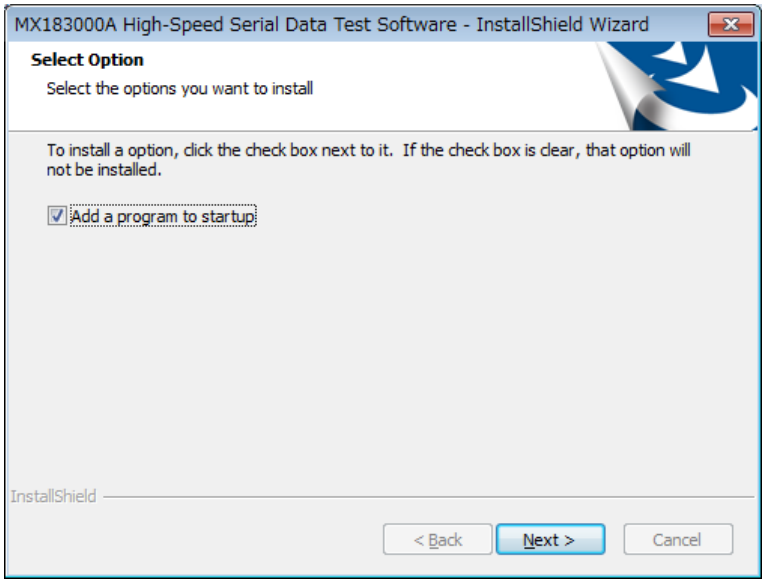
16. Click **Change** to select the installation location. Then click **Next**.



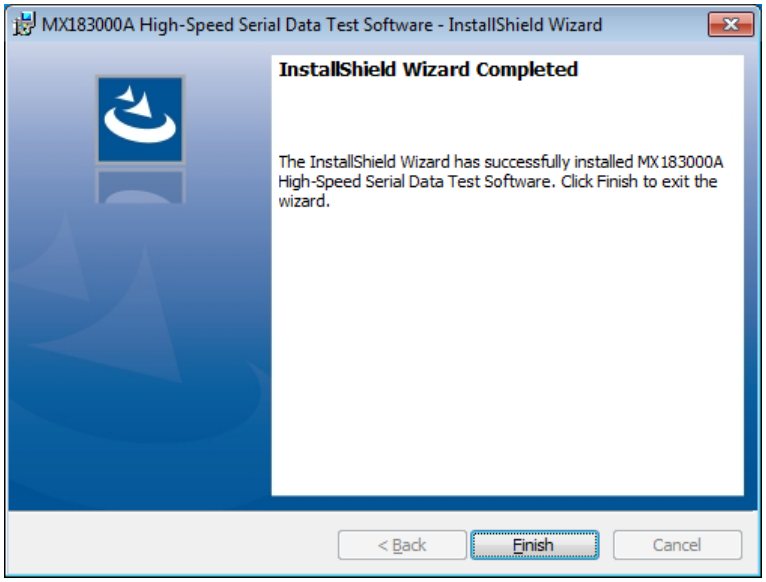
17. Click **Install**.



18. Make sure **Add a program to startup** is selected and click the **Next** button.



19. When the installation completes successfully, the following window appears. Click **Finish** to end installation.

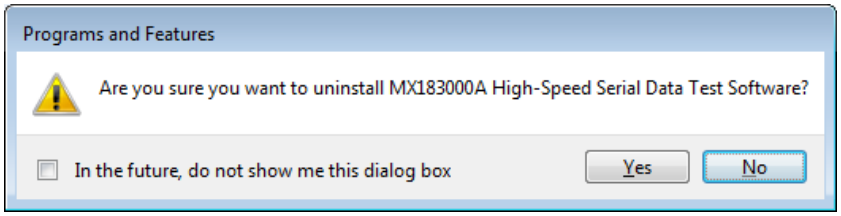


2.3.2 Uninstallation

This section describes the procedure for uninstalling MX183000A . Do the following procedure in MP1800A or external PC.

1. Select **Control Panel** in the **Start** menu to open the Control Panel.
2. Click **Programs and Features** in the Control Panel.
3. Select MX183000A in the list box and click **Uninstall** to start uninstallation.

   When the following dialog box appears, click **Yes**.



2.4 License Key Activation

The paid options for this software (options PL001, PL011, and PL012) are activated using a license key.

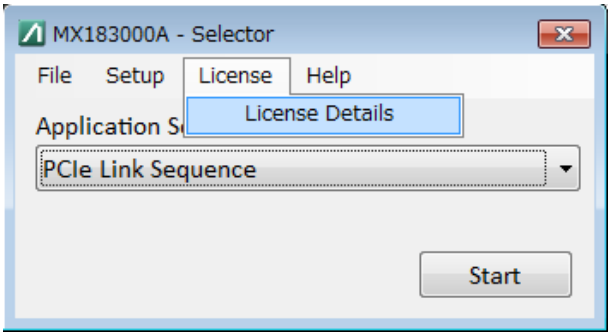
Even if the license is not activated, all the options are available for 30-day trial period from the first installation date.

A license is specific data of each MP1800A or PC. The license file saved in a USB memory stick can be used only for a specific MP1800A or PC. To transfer the license file, refer to 2.4.3 "Transferring license".

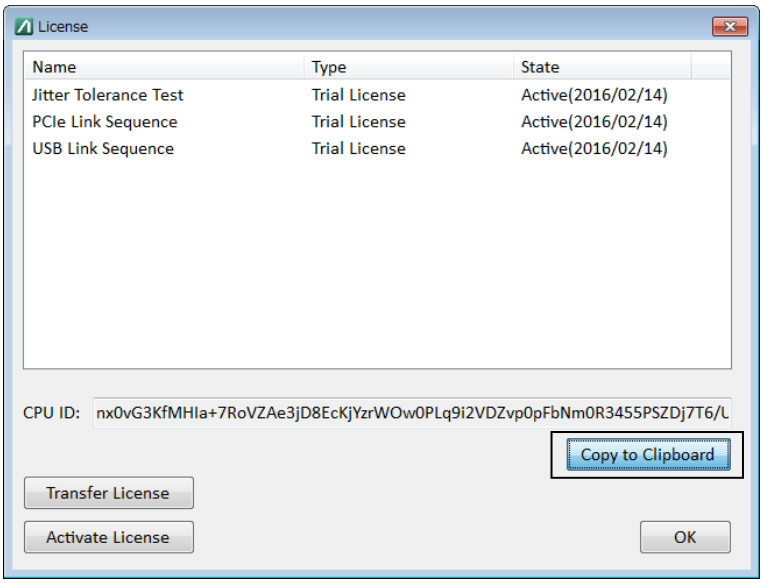
2.4.1 Purchasing license

To purchase a license, the CPU ID of the MP1800A or PC on which you use this software is required. Perform the following steps to obtain a CPU ID.

1. Select **License** > **License Details**.



2. Click **Copy to Clipboard** on the License window to obtain a CPU ID.

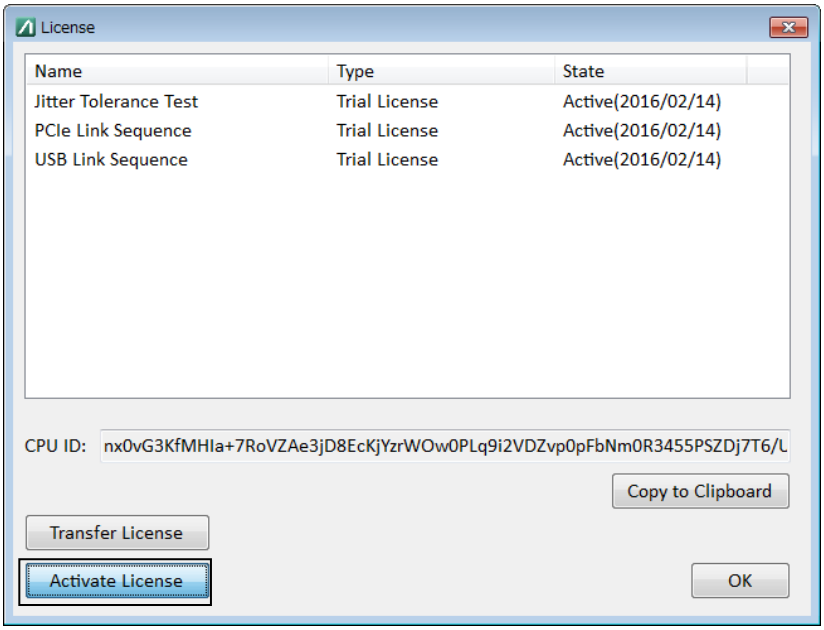


3. Please provide the CPU ID and serial number of your MP1800A or MT1810A to our sales representative.

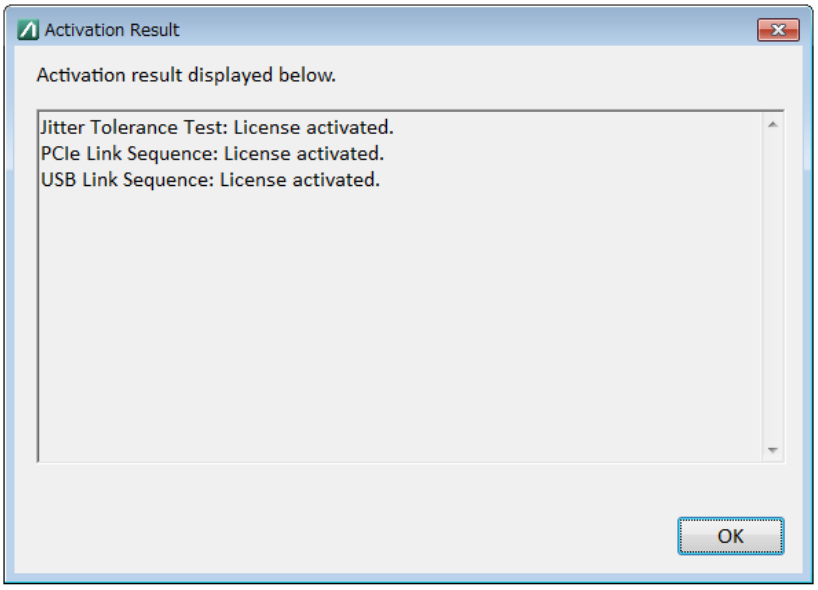
2.4.2 Activating license

Perform the following steps to activate the license.

1. Start up the MX183000A and select **License** > **License Details**.
2. Click **Activate Licenses** on the **License** window.



3. When inputting a license file is prompted, load the license file provided by Anritsu. When the activation is completed, the license is valid.



2.4.3 Transferring license

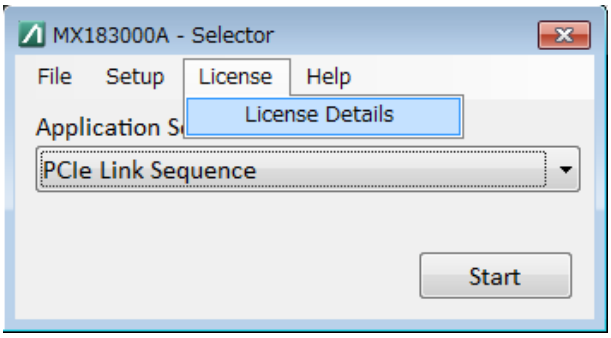
How to transfer the MX183000A to another MP1800A or PC is explained below. The transfer destination and source are both PCs in the example here.

Notes:

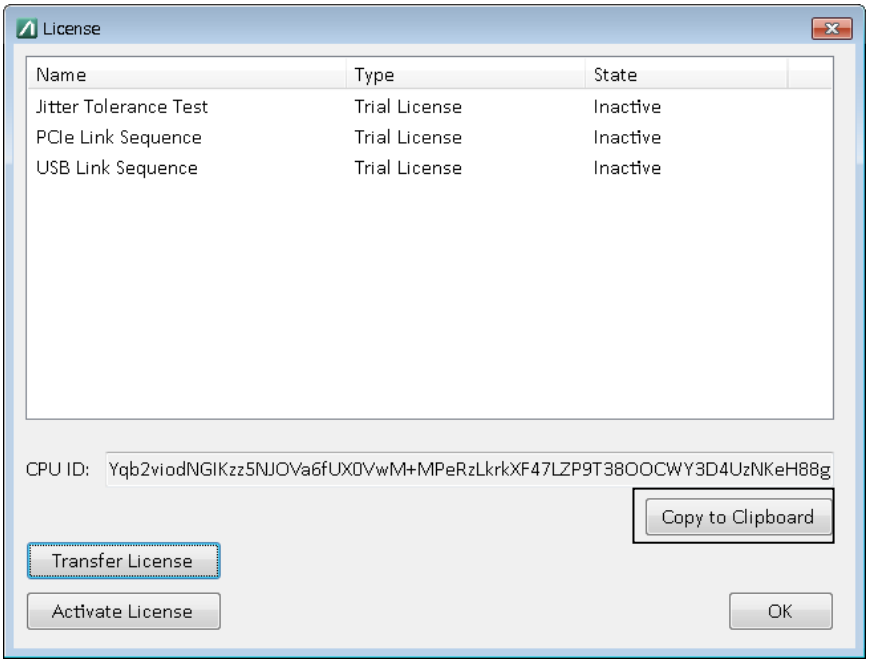
A file made after the license transfer is necessary to activate the license, so store the file with care.

After transferring the file, the license on the source PC becomes invalid and its functions are no longer usable.

1. Start up the MX183000A on the destination PC and select **License** > **License Details**.

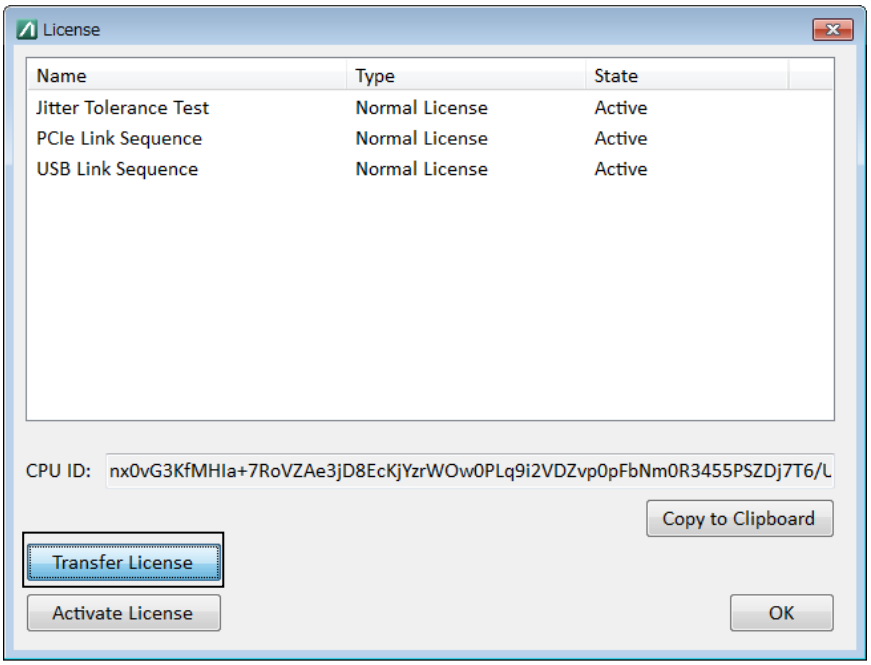


2. Click **Copy to Clipboard** on the License window to obtain a CPU ID.

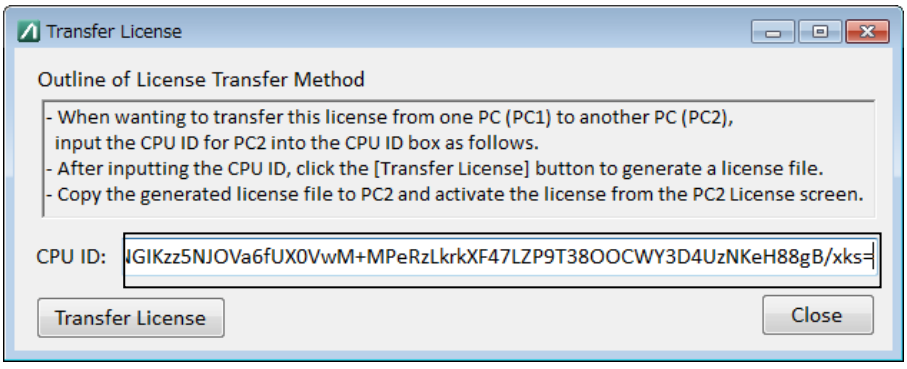


3. Paste the obtained CPU ID on a text editor file, etc. and save. Move the file to the source PC.

4. Start up the MX183000A on the source PC and select **License** > **License Details**.
5. Click **Transfer License**.



6. When inputting a CPU ID is prompted on the **Transfer License** window, paste the CPU ID obtained at Step 3.



7. Click the **Transfer License** button. Store the license file in an arbitrary place on the PC. Give an arbitrary name to the license file.
8. Transfer the saved license file to the destination PC. For how to activate the license on the destination PC, refer to 2.4.2 “Activating license”.

Chapter 3 Connecting Equipment

This chapter describes the types of equipment to be controlled by MX183000A and connecting procedures.

3.1 Target Equipment

Shown below are the models of equipment to be controlled by MX183000A and the number of equipment required for each connection. Equipment marked as "-" in the Quality column are not used.

Table 3.1-1 Equipment configuration for each measurement type (when MP1800A is used)

			Quantity for each connecting procedure			
Equipment Type	**Model**	**Options**	**Jitter Tolerance Test**	**PCIe Link Sequence**	**USB Link Sequence (Using USB Measurement Kit)**	**USB Link Sequence (Using USB Test Adapter)**
Signal Quality Analyzer	MP1800A	x02, x07*2, x32	1	1	1	1
Synthesizer	MU181000A/B*1		–	–	1	1
		x01	1	1	–	–
Jitter Source	MU181500B		1	1	1	1
32G PPG	MU183020A		1	–	–	–
		x30/x31	–	1	1	1
32G ED	MU183040A/B		1	–	–	–
	MU183040B	x22	(1)*3	1	–	–
		x23	(1)*3	–	–	–
Emphasis	MP1825B*1	x02	–	1	1	1
Vector signal generator	MG3710A*1	x02, x29, x36, x41, x42, x66, x71, x72	–	2	–	–
N-SMA ADAPTOR	J1398A		–	4	–	–
3dB ATT	41KC-3		–	2	–	–
6dB ATT	41KC-6		–	2	–	–
20dB ATT	41KC-20		–	2	–	–
Splitter	K241C		–	2	–	–
Pick Off Tee	J1510A		–	2	–	2

*1: Cannot be controlled directly from this software.

*2: Not required if controlling from an external PC.

*3: Select one ED.

Table 3.1-1 Equipment configuration for each measurement type (when MP1800A is used) (Cont'd)

Equipment Type	Model	Options	Quantity for each connecting procedure			
			Jitter Tolerance Test	PCIe Link Sequence	USB Link Sequence (Using USB Measurement Kit)	USB Link Sequence (Using USB Test Adapter)
USB Measurement Kit*4	Z1927A		–	–	1	–
BNC-SMA connector cable	J1508A		(2)*6	(2) *6	–	–
Cable set	J1615A		–	(1) *6	(1) *6	(1) *6
Coaxial skew match cable(0.8m, K connector)	J1551A		–	2	–	2
Coaxial cable 0.3m	J1624A		(2)*6	(2)*6	–	2 + (2)*6
Coaxial cable 1m	J1625A		–	6	–	3
Coaxial cable 0.1m (SMP-J,SMA-J) *5	J1715A		–	4	–	–
GND connection cable	J1627A		(1)*6	(1)*6	(1)*6	(1)*6

*4: The kit includes components necessary for testing a USB device. Refer to Table 3.1-3 "Components of USB Measurement Kit" for details.

*5: For handling the SMP connector, refer to 3.3 "PCIe Link Sequence Connection Procedure".

*6: These components are standard accessories for the MP1800A/MT1810A, MP1825B, MU181500B, and MU181000A.

Table 3.1-2 Equipment configuration for each measurement type (when MT1810A is used)

			Quantity for each connecting procedure			
Equipment Type	**Model**	**Options**	**Jitter Tolerance Test**	**PCIe Link Sequence**	**USB Link Sequence (Using USB Measurement Kit)**	**USB Link Sequence (Using USB Test Adapter)**
Signal Quality Analyzer	MT1810A	x02, x32	2	2	2	2
Synthesizer	MU181000A/B*1		–	–	1	1
		x01	1	1	–	–
Jitter Source	MU181500B		1	1	1	1
32G PPG	MU183020A		1	–	–	–
		x30/x31	–	1	1	1
32G ED	MU183040A/B MU183040B		1	–	–	–
		x22	(1) *2	1	–	–
		x23	(1) *2	–	–	–
Emphasis	MP1825B*1	x02	–	1	1	1
Vector signal generator	MG3710A*1	x02, x29, x36, x41, x42, x66, x71, x72	–	2	–	–
N-SMA ADAPTOR	J1398A		–	4	–	–
3dB ATT	41KC-3		–	2	–	–
6dB ATT	41KC-6		–	2	–	–
20dB ATT	41KC-20		–	2	–	–
Splitter	K241C		–	2	–	–
Pick Off Tee	J1510A		–	2	–	2
USB Measurement Kit*3	Z1927A		–	–	1	–

*1: Cannot be controlled directly from this software.

*2: Select one ED.

*3: The kit comes with components needed to test USB devices. For details, refer to Table 3.1-3 “Components of USB Measurement Kit”.

Table 3.1-2 Equipment configuration for each measurement type (when MT1810A is used) (Cont'd)

Equipment Type	Model	Options	Quantity for each connecting procedure			
			Jitter Tolerance Test	PCIe Link Sequence	USB Link Sequence (Using USB Measurement Kit)	USB Link Sequence (Using USB Test Adapter)
BNC-SMA connector cable	J1508A		(2)*5	(2)*5	–	–
Coaxial skew match cable(0.8m, K connector)	J1551A		–	2	–	2
Cable set	J1615A		–	(1) *5	(1) *5	(1) *5
Coaxial cable 0.3m	J1624A		(2)*5	(2)*5	–	2 + (2)*5
Coaxial cable 1m	J1625A		–	6	–	3
GND connection cable	J1627A		(1)*5	(1)*5	(1)*5	(1)*5
Coaxial cable 0.1m (SMP-J,SMA-J)*4	J1715A		–	4	–	–

*4: For handling the SMP connector, refer to 3.3 "PCIe Link Sequence Connection Procedure".

*5: These components are standard accessories for MP1800A/MT1810A, MP1825B, MU181500B, and MU181000A respectively from the top of the table.

Table 3.1-3 Components of USB Measurement Kit

Model	Name	Quantity
K250	BIAS TEE	2
J1510A	Pick Off Tee	3
BX02-0476-00	2dB ATT	1
BX03-0476-00	3dB ATT	1
BX04-0476-00	4dB ATT	1
J1359A	Coaxial Adaptor (K-P.K-J,SMA)	1
J1551A	Coaxial skew match cable(0.8m, K connector)	1
J1624A	Coaxial Cable 0.3m	1
J1625A	Coaxial Cable 1m	3
J1632A	Terminator	1

3.2 Jitter Tolerance Test Connection Procedure

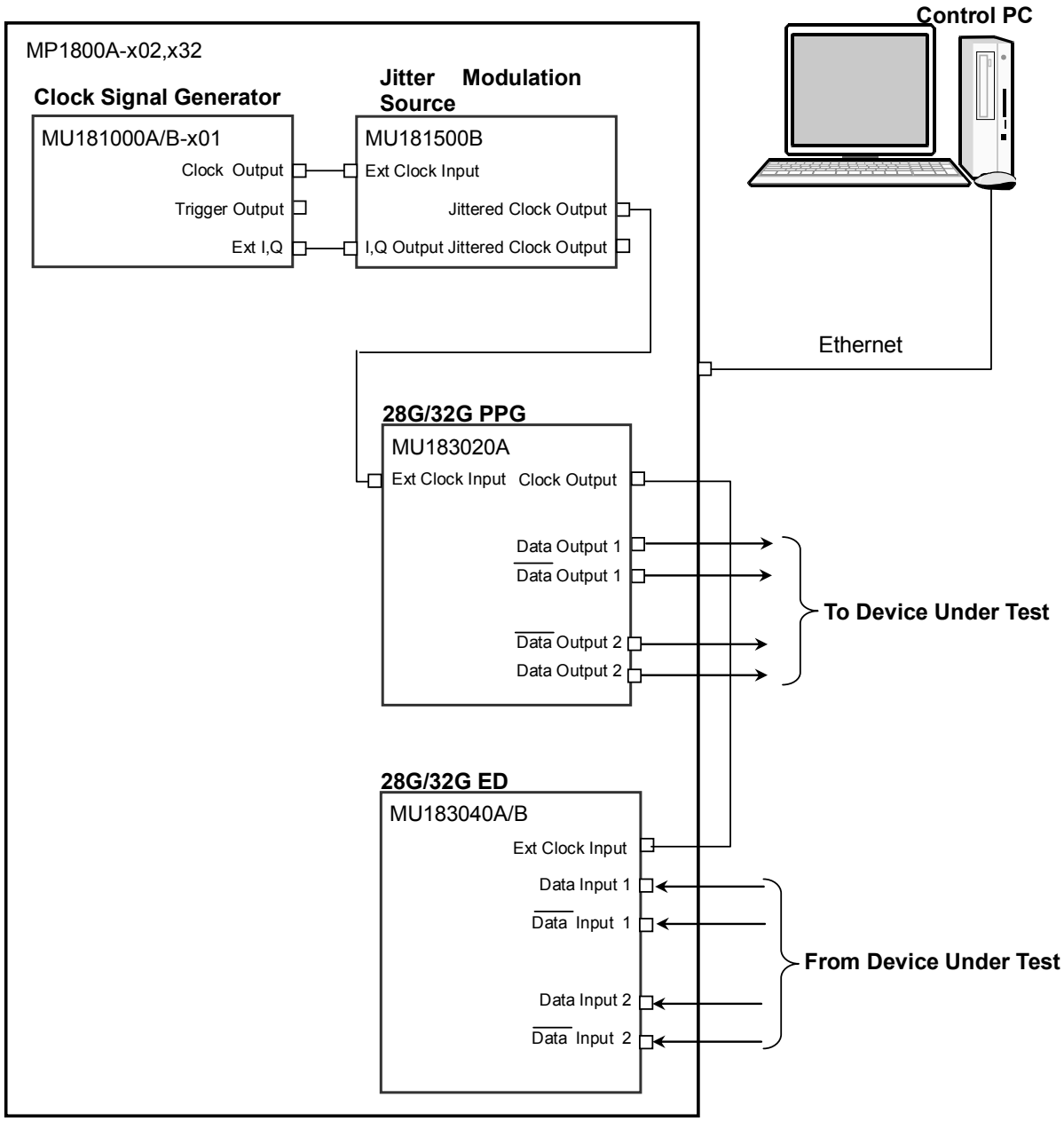


Figure 3.2-1 Jitter Tolerance Test Connection Procedure

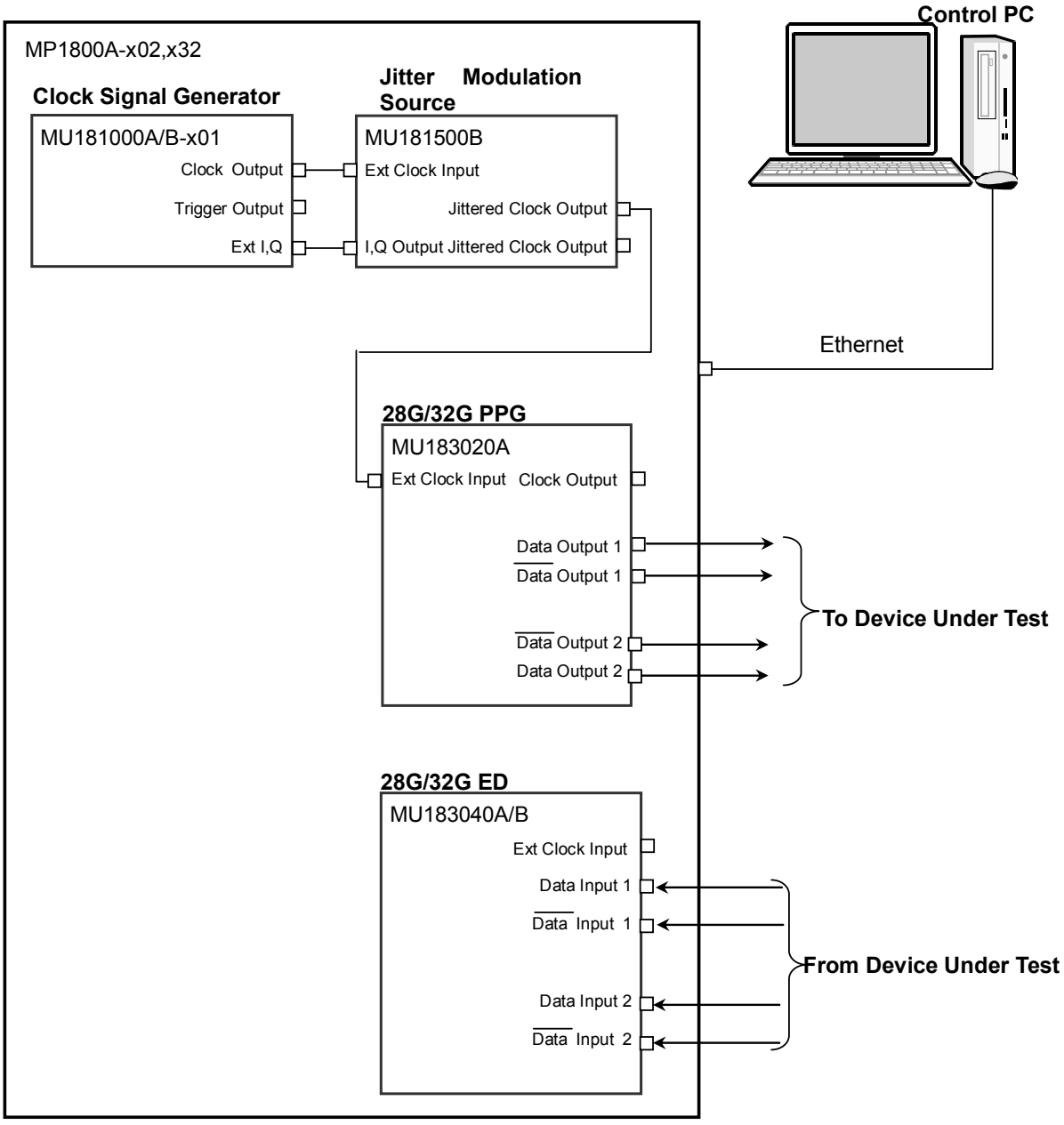


Figure 3.2-2 Jitter Tolerance Test Connection Procedure (Using Clock Recovery)

1. When MX183000A is installed on a control PC, connect the control PC to MP1800A with an Ethernet cable.
   When MX183000A is installed on MP1800A, Ethernet cable connection is not required.
   MP1800A requires the MP1800A-x02 LAN option.
2. Set up as follows using the Remote Control tab on Setup Utility.
   Activate Interface: Ethernet
   Performance: Enhanced
3. Mount MU181000A/B-x01 and MU181500B in MP1800A-x02, x32.
4. Mount MU183020A in Slot 3 of MP1800A-x02, x32.
5. Mount MU183040A/B in Slot 4 of MP1800A-x02, x32.
6. Connect the **Clock Output** connector of MU181000A/B-x01 to the **Ext Clock Input** connector of MU181500B with a coaxial cable.
7. Use BNC-SMA cables (J1508A) to connect the Ext.I,Q connector of the MU181000A/B-x01 and the I,Q Output connector of the MU181500B. (2 connections)
8. Connect the Jittered Clock Output connector of MU181500B and the Ext. Clock Input connector of MU183020A using a coaxial cable.
9. If using Clock Recovery, proceed to Step 10.Use a coaxial cable to connect the Clock Output connector of the MU183020A and the Ext Clock Input connector of the MU183040A/B.
10. Connect the **Data Output**, **$\overline{\text{Data}}$ Output** connectors of MU183020A to the **Data Input**, **$\overline{\text{Data}}$ Input** connectors of a device under test with four coaxial cables.
11. Use coaxial cables to connect the Data Output and **$\overline{\text{Data}}$** Output connectors of the DUT and the Data Input and **$\overline{\text{Data}}$** Input connectors of the MU183040A/B.
12. Select MU181000A/B for Synthesizer Clock Source for the MU181500B.

    3.3 “Input Signal Settings” in *MU181500B Jitter Modulation Source Operation Manual*
13. Select MU181500B in Clock Setting of the **Misc2** tab of MU183020A.

    5.6 “Misc2 Function” in the *MU183020A 28G/32G PPG MU183021A 28G/32G 4ch PPG Operation Manual*

3.3 PCIe Link Sequence Connection Procedure

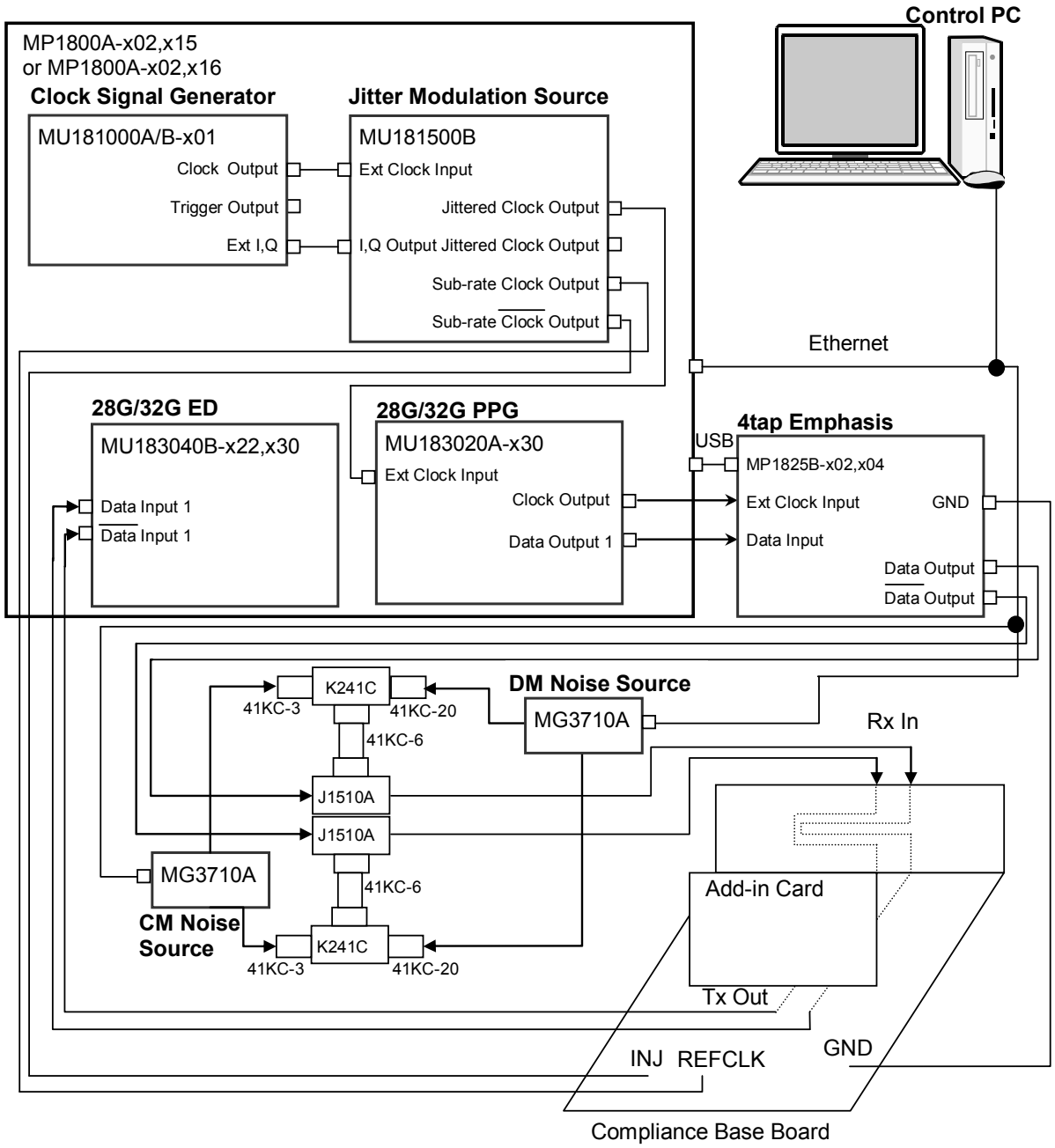


Figure 3.3-1 PCIe Link Sequence Connection Procedure

1. When MX183000A is installed on a control PC, connect the control PC to MP1800A with an Ethernet cable. Or connect the MP1800A to the MP1825B with a USB cable.
   When MX183000A is installed on MP1800A, Ethernet cable connection is not required.
   MP1800A requires MP1800A-x02 LAN option.
2. Set up as follows using the Remote Control tab on Setup Utility.
   Activate Interface: Ethernet
   Performance: Enhanced
3. Mount MU181000A/B-x01 and MU181500B in MP1800A-x02, x32.
4. Mount MU183020A-x30 in Slot 3 of MP1800A-x02, x32.
5. Mount MU183040A/B in Slot 4 of MP1800A-x02, x32.
6. Connect the **Clock Output** connector of MU181000A/B-x01 to the **Ext Clock Input** connector of MU181500B with a coaxial cable.
7. Use BNC-SMA cables (J1508A) to connect the Ext.I,Q connector of the MU181000A/B-x01 and the I,Q Output connector of the MU181500B. (2 connections)
8. Connect the Jittered Clock Output connector of the MU181500B and the Ext. Clock Input connector of the MU183020A-x30 using a coaxial cable.
9. Use coaxial cables to connect the Sub-rate Clock Output and XClock Output of the MU181500B to the DUT REFCLK and INJ connectors.
10. Use a 130 cm coaxial cable (J1611A) to connect the Clock Output connector of the MU183020A-x30 and the Ext Clock Input connector of the MP1825B-x02.
11. Use an 80 cm coaxial cable (J1612A) to connect the Data Output connector of the MU183020A-x30 and the Data Input connector of the MP1825B-02.
12. Connect MG3710A to 41KC-3, 41KC-6, 41KC-20, K241C and J1510A as shown in Figure. 3.3-1. The MG3710A output is the RF Output connector.
13. Set the MG3710A IP address, and connect to the PC.
14. Connect the J1510A to the MP1825B-x02 Data Output and $\overline{\text{Data}}$ Output connector.
15. Use an 80 cm coaxial cable (J1551A) to connect the J1510A and the Compliance Base Board input (Rx In). (2 connections) Do not mount the Addin Card at this stage.
16. Use a GND connector cable (J1627A) to connect the DUT GND and MP1825B-x02 GND jacks.

17. Select MU181000A/B for Clock Source for the MU181500B.

    ☞ 3.3 “Input Signal Settings” in *MU181500B Jitter Modulation Source Operation Manual*

18. Select MU181500B in Clock Setting of the **Misc2** tab of MU183020A-x30.

    ☞ 5.6 “Misc2 Function” in the *MU183020A 28G/32G PPG MU183021A 28G/32G 4ch PPG Operation Manual*

19. On the Misc2 tab of MU183020A-x30, select **Full Rate** in the Output Clock Rate box.

    ☞ 5.6 “Misc2 Function” in the *MU183020A 28G/32G PPG MU183021A 28G/32G 4ch PPG Operation Manual*

20. Select the PPG connected for MP1825B-x02 Data Input.

    ☞ 3.3 “Input Signal Settings” in *MP1825B 4Tap Emphasis Operation Manual*

21. Select **Full Rate** for MP1825B-x02 Clock Input.

    ☞ 3.3 “Input Signal Settings” in *MP1825B 4Tap Emphasis Operation Manual*

22. Connect the Compliance Base Board output (Tx Out) to a real-time oscilloscope, and calibrate the Eye Pattern (amplitude, Jitter, and Emphasis settings).

23. Once Eye Pattern calibration is complete, connect the Compliance Base Board output (Tx Out) to the MU183040B-x22 Data Input and $\overline{\text{Data}}$ Input connector with an 80 cm coaxial cable (J1551A).

24. Select Recovery Clock from Clock Setup Selection in the MU183040B-x22 Input tab.

    ☞ 5.4 “Input Signal Settings” in the *MU183040A MU183041A/MU183040B/MU183041B Operation Manual*

⚠ CAUTION

The SMP connector can withstand 100 insertion/removal cycles. Do not exceed this limit when you need to insert and remove the connector repeatedly. Exceeding the limit may cause performance deterioration by contact failure or connector damage.

3.4 USB Link Sequence Connection Procedure (Using USB Test Adapter)

There are two connection procedures for USB Link Sequence.
We recommend a procedure using the USB Test Adapter here for its user-friendliness.

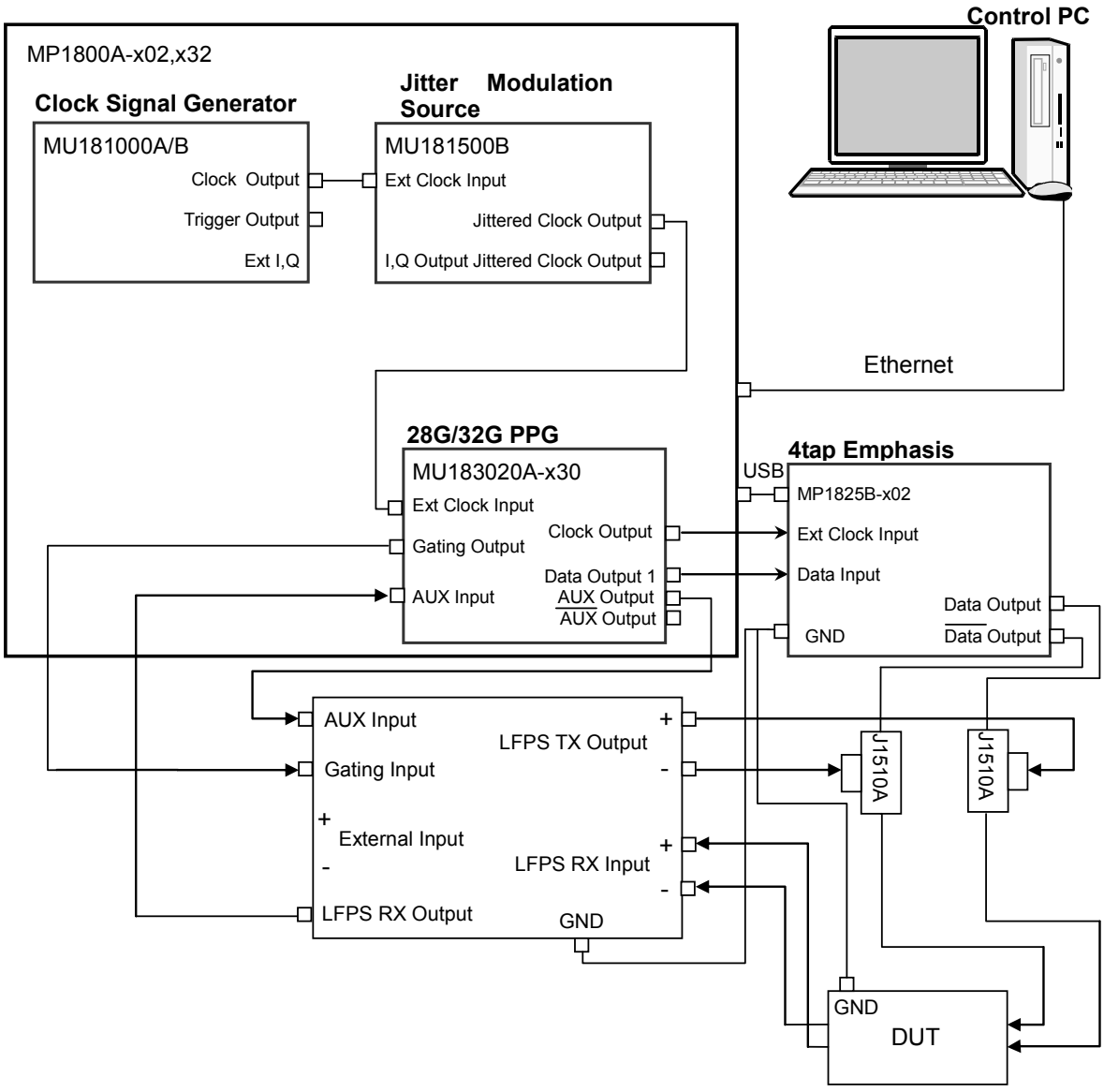


Figure 3.4-1 USB Link Sequence Connection Using USB Test Adapter

1. When MX183000A is installed on a control PC, connect the control PC to MP1800A with an Ethernet cable. Or connect the MP1800A to the MP1825B with a USB cable.
   When MX183000A is installed on MP1800A, Ethernet cable connection is not required.
   MP1800A requires the MP1800A-x02 LAN option.
2. Set up as follows using the Remote Control tab on Setup Utility.
   Activate Interface: Ethernet
   Performance: Enhanced
3. Mount MU181000A/B-x01 and MU181500B in MP1800A-x02, x32.
4. Mount MU183020A-x30 in Slot 3 of MP1800A-x02, x32.
5. Connect the **Clock Output** connector of MU181000A/B to the **Ext Clock Input** connector of MU181500B with a coaxial cable.
6. Connect the Jittered Clock Output connector of the MU181500B and the Ext. Clock Input connector of the MU183020A-x30 using a coaxial cable.
7. Use a 130 cm coaxial cable (J1611A) to connect the Clock Output connector of the MU183020A-x30 and the Ext Clock Input connector of the MP1825B-x02.
8. Use an 80 cm coaxial cable (J1612A) to connect the Data Output connector of the MU183020A-x30 and the Data Input connector of the MP1825B-02.
9. Connect the Data Output and $\overline{\text{Data}}$ Output connectors of the MP1825B-x02 and the Pick Off Tee (J1510A) (2 connections).
10. Connect the J1510A and the LFPS TX Output connector of the USB Test Adapter with a 30 cm coaxial cable (J1624A) as in Figure 3.4-1.
11. Connect the J1510A and DUT with 80 cm coaxial cable (J1612A) as in Figure 3.4-1. (2 connections)
12. Use a GND connector cable (J1627A) to connect the DUT GND and MP1825B-x02 GND jacks.
13. Use a cable supplied with the USB Test Adapter to connect the USB Test Adapter GND and MP1825B-x02 GND jacks.
14. Use a 100 cm coaxial cable (J1625A) to connect the AUX Output connector of the MU183020A-x30 and the AUX Input connector of the USB Test Adapter.
15. Use a 100 cm coaxial cable (J1625A) to connect the Gating Output connector of the MU183020A-x30 and the Gating Input connector of the USB Test Adapter.
16. Use a 100 cm coaxial cable (J1625A) to connect the AUX Input connector of the MU183020A-x30 and the LFPS RX Output connector of the USB Test Adapter.

17. Use an 80 cm coaxial cable (J1551A) to connect the LFPS RX Input connector of the USB Test Adapter and the DUT.
18. Select MU181000A/B for Clock Source for the MU181500B.

    ☞ 3.3 “Input Signal Settings” in *MU181500B Jitter Modulation Source Operation Manual*

19. Select MU181500B in Clock Setting of the **Misc2** tab of MU183020A-x30.

    ☞ 5.6 “Misc2 Function” in the *MU183020A 28G/32G PPG MU183021A 28G/32G 4ch PPG Operation Manual*

20. On the Misc2 tab of MU183020A-x30, select **Full Rate** in the Output Clock Rate box.

    ☞ 5.6 “Misc2 Function” in the *MU183020A 28G/32G PPG MU183021A 28G/32G 4ch PPG Operation Manual*

21. Select the PPG connected for MP1825B-x02 Data Input.

    ☞ 3.3 “Input Signal Settings” in *MP1825B 4Tap Emphasis Operation Manual*

22. Select **Full Rate** for MP1825B-x02 Clock Input.

    ☞ 3.3 “Input Signal Settings” in MP1825B 4Tap Emphasis Operation

3.5 USB Link Sequence Connection Procedure (Using USB Measurement Kit)

There are two connection procedures for USB Link Sequence.
We recommend a procedure using the USB Test Adapter in Section 3.4 for its user-friendliness.

3.5.1 Connection diagram and procedure

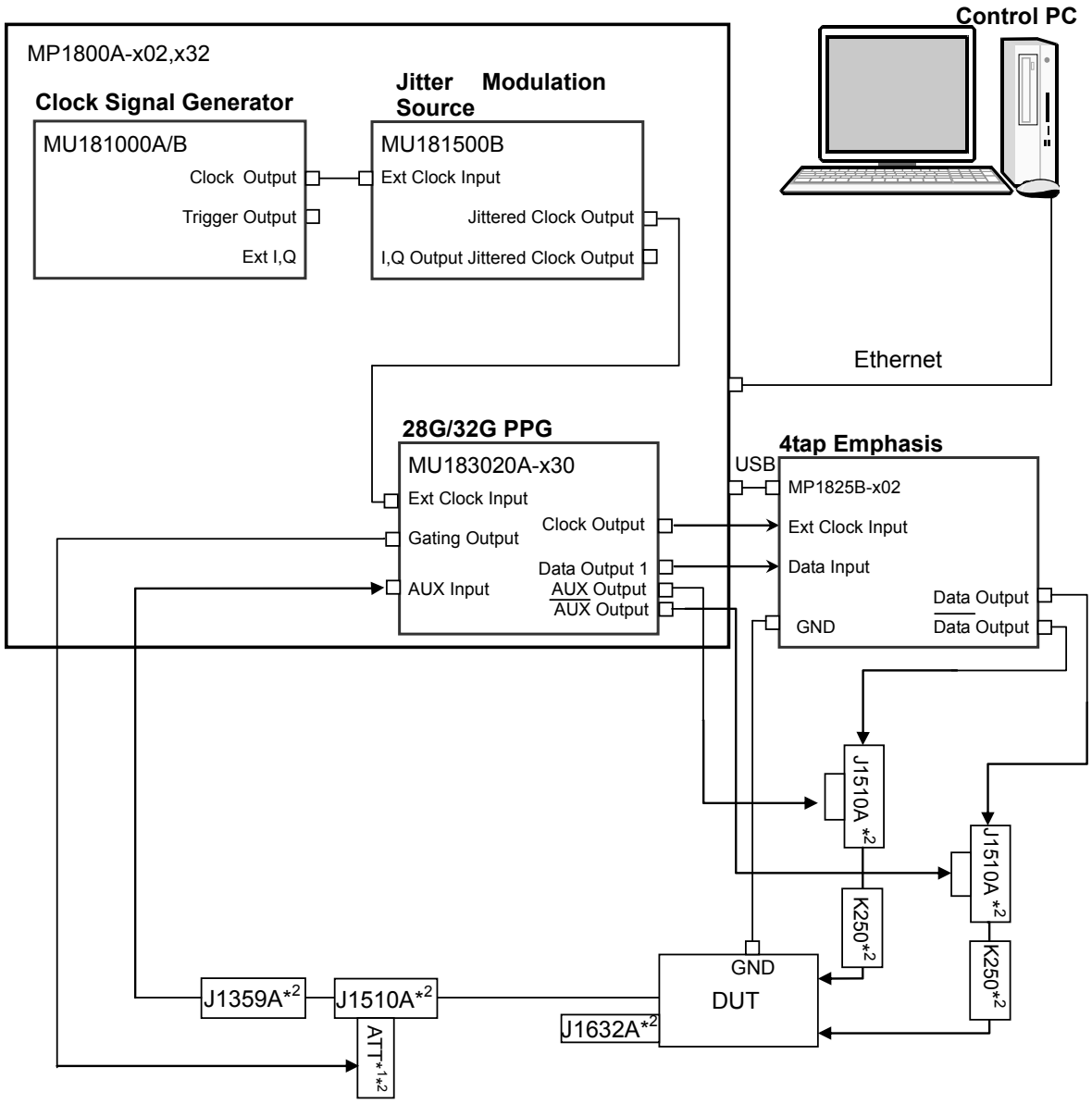


Figure 3.5.1-1 USB Link Sequence Connection Procedure

*1: The recommended ATT setting is 3 dB. However, because the gating output level of the 32G PPG is varied, occasionally the LFPS signals from the DUT cannot be received normally in 3 dB and the 32G PPG does not start sending the sequence. In that case, change the attenuation of the ATT. For how to decide attenuation, refer to 3.5.2 "Selecting attenuation in USB link sequence connection".

*2: Included in the USB measurement kit (Z1927A). For included components, refer to Table 3.1-3 "Components of USB Measurement Kit".

1. When MX183000A is installed on a control PC, connect the control PC to MP1800A with an Ethernet cable. Or connect the MP1800A to the MP1825B with a USB cable.
   When MX183000A is installed on MP1800A, Ethernet cable connection is not required.
   MP1800A requires the MP1800A-x02 LAN option.
2. Set up as follows using the Remote Control tab on Setup Utility.
   Activate Interface: Ethernet
   Performance: Enhanced
3. Mount MU181000A/B-x01 and MU181500B in MP1800A-x02, x32.
4. Mount MU183020A-x30 in Slot 3 of MP1800A-x02, x32.
5. Connect the **Clock Output** connector of MU181000A/B to the **Ext Clock Input** connector of MU181500B with a coaxial cable.
6. Connect the Jittered Clock Output connector of the MU181500B and the Ext. Clock Input connector of the MU183020A-x30 using a coaxial cable.
7. Use a 130 cm coaxial cable (J1611A) to connect the Clock Output connector of the MU183020A-x30 and the Ext Clock Input connector of the MP1825B-x02.
8. Use an 80 cm coaxial cable (J1612A) to connect the Data Output connector of the MU183020A-x30 and the Data Input connector of the MP1825B-02.
9. Connect the J1510A to the MP1825B-x02 Data Output and $\overline{\text{Data}}$ Output connector.
10. Connect the J1510A and K250. (2 connections)
11. Use an 80 cm coaxial cable (J1551A) to connect the K250 and DUT. (2 connections)
12. Use a GND connector cable (J1627A) to connect the DUT GND and MP1825B-x02 GND jacks.

13. Connect the MU183020A-x30 $\overline{\text{AUX}}$ Output connector and AUX Output connector to the J1510A.
14. Use a 30 cm coaxial cable (J11624A) to connect the J1510A, J1359A, and ATT as shown in the figure. Measure the voltage for Gating Output zero load using a tester beforehand, and select the ATT to be used referring to 3.5.2 "Selecting attenuation in USB link sequence connection". K261 is not required if the USB TX connection is AC.

Note:

If the USB TX is not AC coupled, DC block is required.We recommend the K261 for DC block.

15. Use a 100 cm coaxial cable (J1625A) to connect the DUT output connector and K261 (J1510A). Terminate the differential output terminal using J1632A.
16. Connect the J1359 to the MU183020A-x30 AUX Input terminal.
17. Connect the ATT to the MU183020A-x30 Gating Output terminal.
18. Select MU181000A/B for Clock Source for the MU181500B.

☞ 3.3 "Input Signal Settings" in *MU181500B Jitter Modulation Source Operation Manual*

19. On the Misc2 tab of MU183020A-x30, select MU181500B in the Clock Source box.

☞ 5.6 "Misc2 Function" in the *MU183020A 28G/32G PPG MU18302 1A 28G/32G 4ch PPG Operation Manual*

20. On the Misc2 tab of MU183020A-x30, select **Full Rate** in the Output Clock Rate box.

☞ 5.6 "Misc2 Function" in the *MU183020A 28G/32G PPG MU183021A 28G/32G 4ch PPG Operation Manual*

21. Select the PPG connected for MP1825B-x02 Data Input.

☞ 3.3 "Input Signal Settings" in *MP1825B 4Tap Emphasis Operation Manual*

22. Select **Full Rate** for MP1825B-x02 Clock Input.

☞ 3.3 "Input Signal Settings" in *MP1825B 4Tap Emphasis Operation Manual*

3.5.2 Selecting attenuation in USB link sequence connection

1. Click **File** > **Initialize** on the MX180000A menu bar.
2. Set Pulse Width to 0 bit for Pattern Sequence on the MU183020A **Misc1** tab.

☞ 5.5 “Misc1 Function” in the *MU183020A 28G/32G PPG MU18302 1A 28G/32G 4ch PPG Operation Manual*

3. Connect the MU183020A and oscilloscope as in Figure 3.5.2-1.
4. Measure direct voltage by oscilloscope under four different ATT conditions: None, 2 dB, 3 dB, and 4 dB.
5. Take the ATT that has a direct voltage value closest to “–0.4 V”.

Note:

If the direct voltage value is the closest to –0.4 V when the ATT is 3 dB, the LFPS signals from the DUT cannot be received probably due to a cause other than gating output level. Re-check the PPG setting and device connection.

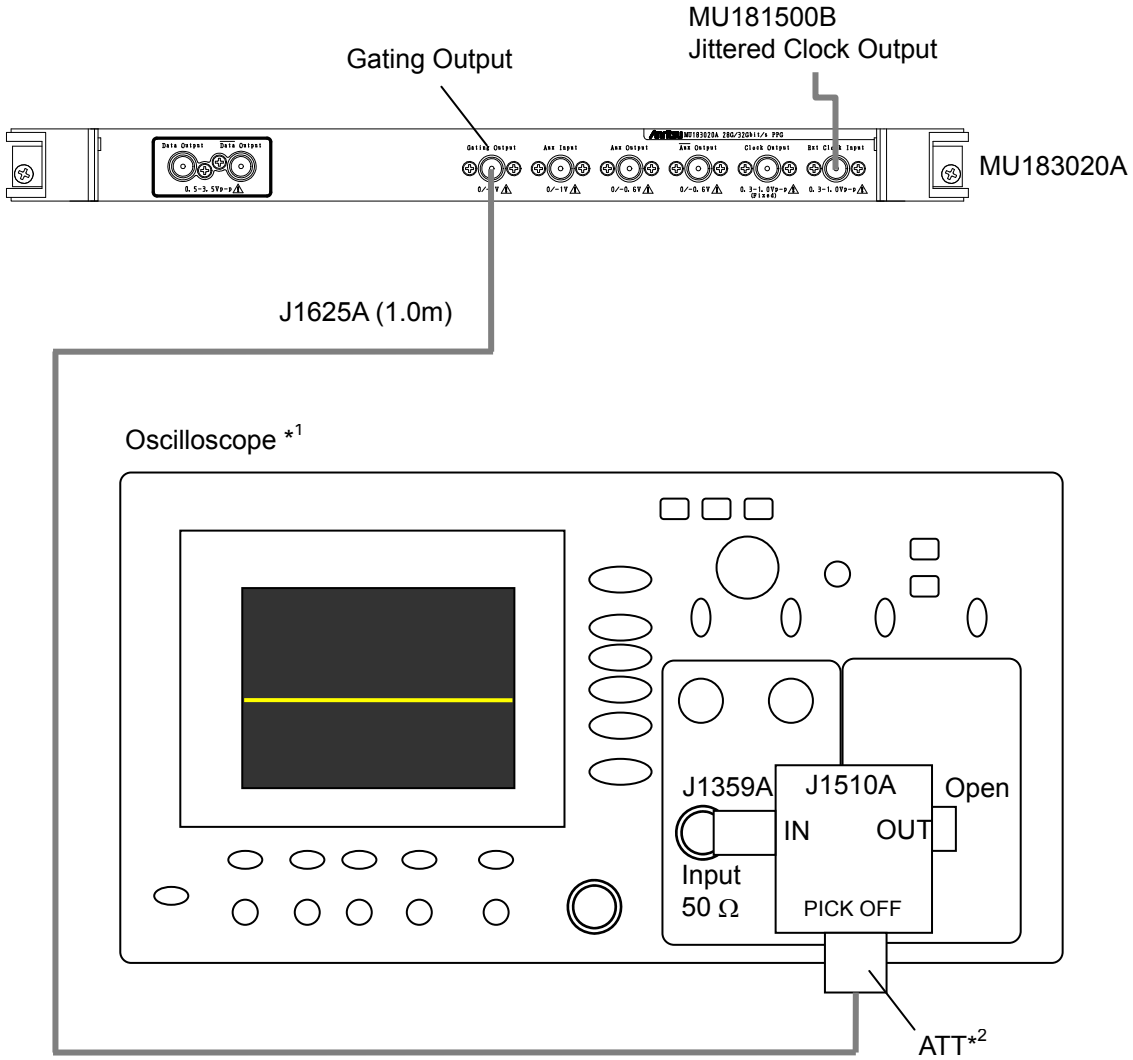


Figure 3.5.2-1 Connection for Selecting ATT Attenuation

*1: Use an oscilloscope which has the input impedance of 50 Ω.

*2: Perform measurement under four different ATT conditions: None, 2 dB, 3 dB, and 4 dB.

Chapter 4 Operation

This chapter describes the methods for measurement and the procedures for screen operation.

4.1 Start up and Exit

This section explains the startup and exit procedures for cases where MX183000A is installed on MP1800A and cases where it is installed on an external PC.

4.1.1 When using on MP1800A

MX183000A is launched automatically when the MP1800A is started. The following procedures describe how to start up for the first time after installing or after closing the software.

Startup procedure

(1) Click the **Auto Measurement** button on the tool bar of the MX180000A Signal Quality Analyzer Control Software (hereafter, MX180000A). The Auto Measurement Select screen appears.

Figure 4.1.1-1 Auto Measurement button

(2) Click **High Speed** Serial Data **Test Software** on the Auto Measurement Select screen. MX183000A starts up and the Main screen appears.

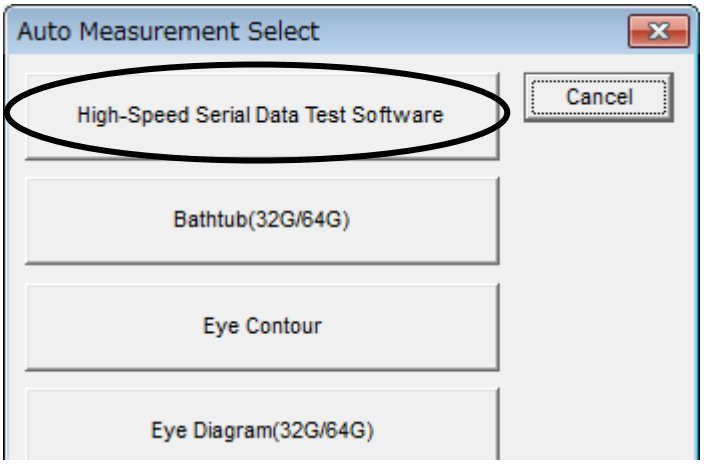


Figure 4.1.1-2 Auto Measurement Select screen

When **High-Speed Serial Data Test Software** is not displayed on the above screen, add this software by Auto Measurement Setup.

For the details of MX180000A, see *MX180000A Signal Quality Analyzer Control Software Operation Manual*.

Exit procedure

(1) Open the File menu and click **Exit**.

(2) Click the **Close** button on the Main screen to exit MX183000A.

(3) Turn off the power of all instruments.

4.1.2 When using on an external PC

Startup procedure

Start MX183000A by clicking **Start**, **All programs**, **MX183000A**, and then **High Speed Serial Data Test Software** in this order.
If you have created a shortcut on your desk top, double-click the shortcut.
Start MX183000A to display the Main screen.

Exit procedure

(1) Open the File menu and then click **Exit**.

(2) Click the **Close** button on the Main screen to exit MX183000A.

(3) Turn off the power of all instruments.

4.2 Setup Procedure

The basic setup procedure is as shown below:

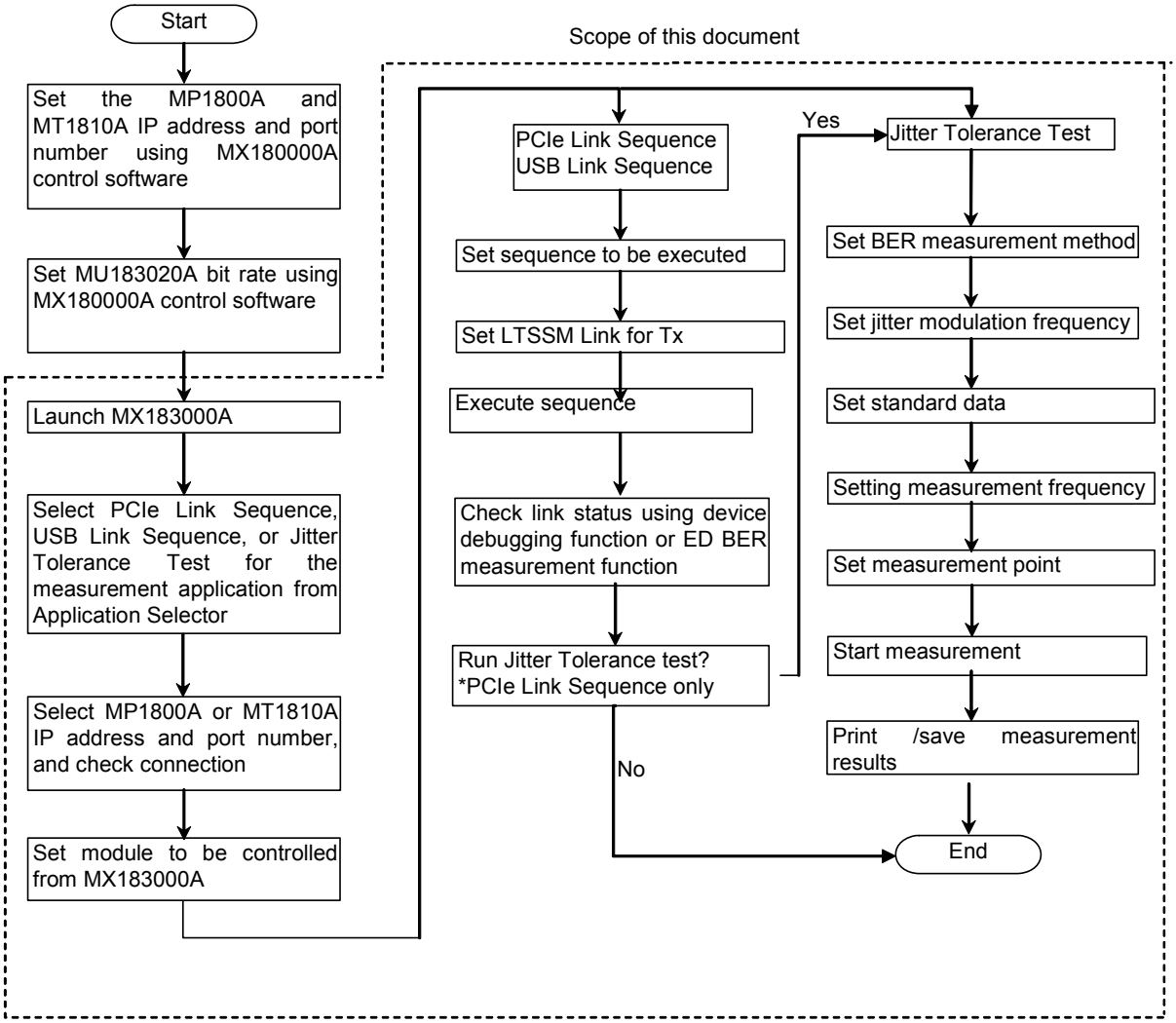


Figure 4.2-1 Setup procedure

4.3 Measurement System Configuration

4.3.1 Selecting Application

On launching the software, the Selector screen is displayed. The Selector screen allows you to select the application for measurement.

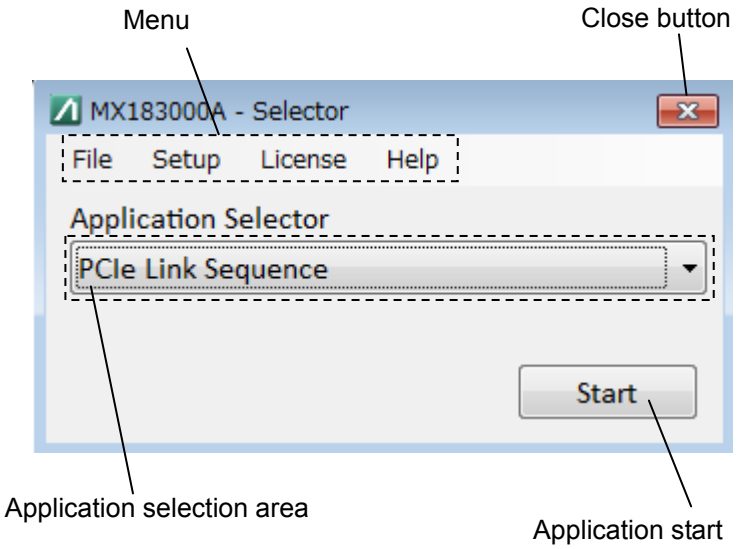


Figure 4.3.1-1 Selector Screen

Table 4.3.1-1 Selector Screen

Item	Description
Application selection area	Selects the application for measurement. The applications available for selection will vary depending on the options installed. ● PCIe Link Sequence Refer to 4.4 "PCIe Link Sequence." ● USB Link Sequence Refer to 4.5 "USB Link Sequence." ● Jitter Tolerance Test Refer to 4.6 "Jitter Tolerance."
Application start	Displays the measurement screen for the corresponding application.
Close button	Exits the software.

The screen menu includes the following items.

Table 4.3.1-2 Menu Items

Menu		Description
File		
	Exit	Exits the software.
Setup		
	Remote	Displays the remote setup for the software and external PC.
License		
	License Details	Displays the screen for adding license keys for the software.
Help		
	About	Displays the version information and installed options.

4.3.2 Connecting Measurement Equipment

When the application is started, the Equipment Setup screen is displayed. The Equipment Setup screen allows you to set the connections to equipment, select connected equipment, and select the type of measurement.

1. Click Connection Guide. The measurement equipment connection diagram is displayed. Connect the measurement equipment, referring to the connection diagram and the details in Chapter 3.
2. Click **Search Start**. The software searches for equipment, and displays the equipment currently connected in the connected equipment display area.
3. Click **Connect** to connect the required equipment.

If the equipment connected has been changed, repeat the equipment search.

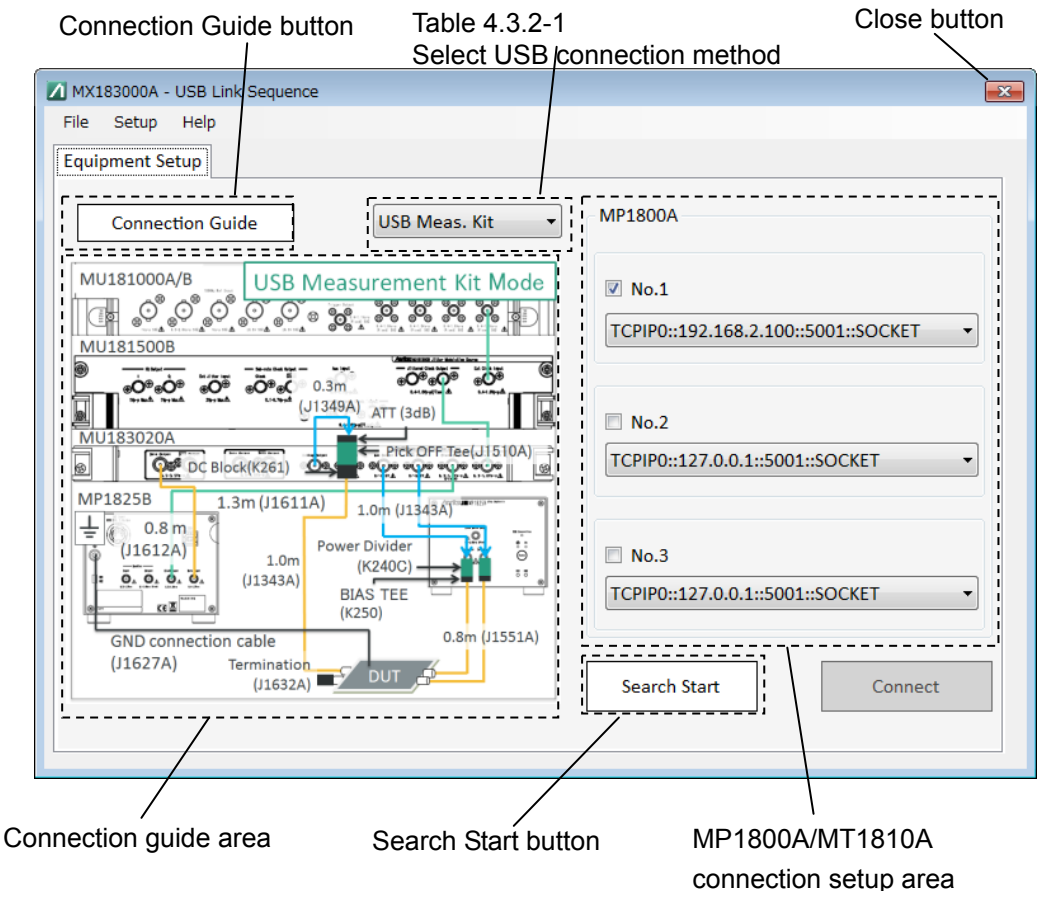


Figure 4.3.2-1 Equipment Setup Screen (Before Starting Search)

Table 4.3.2-1 Equipment Setup Setting Item

Item	Description
Select USB connection method	Select a method to connect the USB Link Sequence from the selections below. • Uses the USB Test Adapter. • Uses the USB measurement kit.

*: This command is displayed only when the MX183000A starts up in USB Link Sequence.

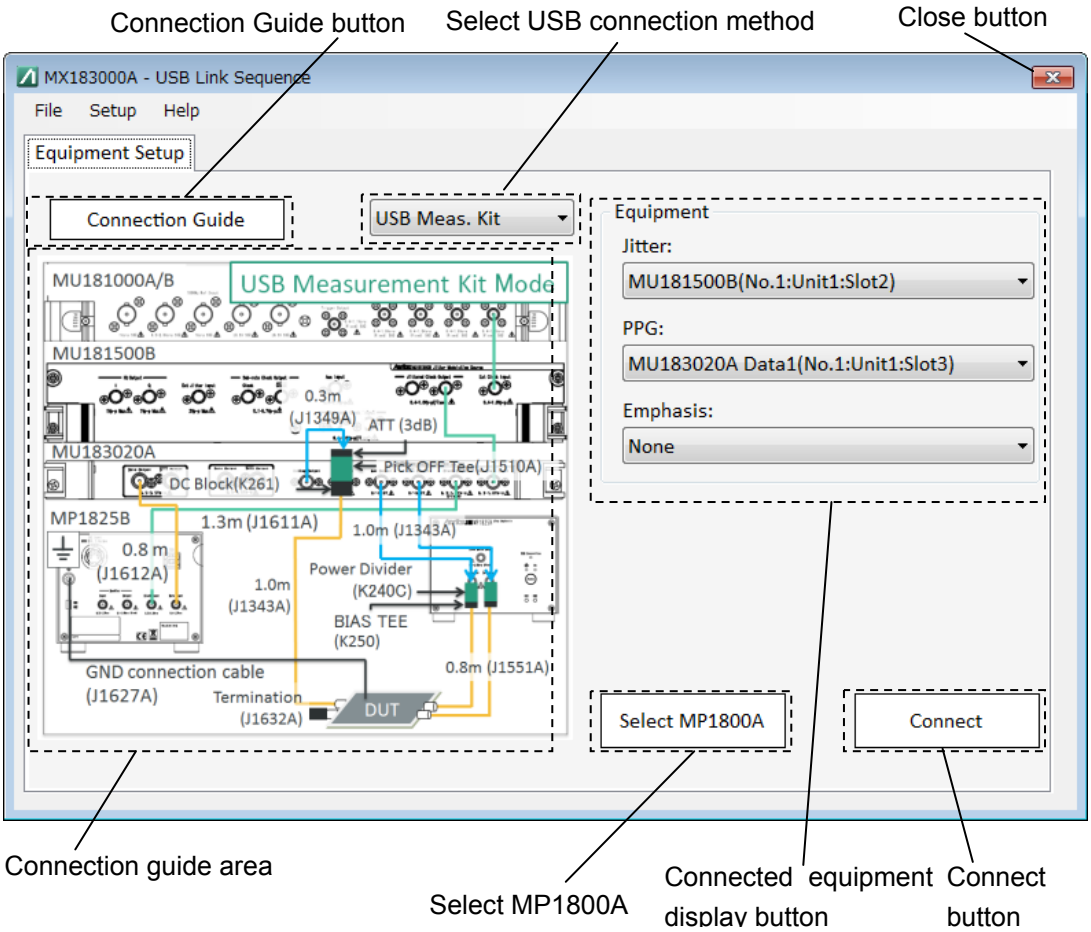


Figure 4.3.2-2 Equipment Setup Screen (After Searching)

Note:

Do not disconnect the Ethernet cable connecting the MP1800A or MT1810A while equipment searching is in progress. The software cannot recognize equipment correctly if the cable is disconnected.

4.3.3 Entering Compliance Test Mode

When this software is connected to the MX180000A, the 28G/32G PPG enters Compliance Test Mode and the screen is displayed as Figure 4.3.2-3.
The 28G/32G PPG is operating in Compliance Test Mode, so the normal test pattern cannot be sent.

Notes:

- The **Return to normal BERT mode** button appears as below while adjusting (Refer to Section 4.3.4), but do not click this button. If clicked, disconnect this software from the MX183000A and re-connect. (Refer to Section 4.3.2.)

- If the **Return to normal BERT mode** button is displayed even after disconnecting this software from the MX180000A, click the **Return to normal BERT mode** button to return the 28G 32G PPG to normal mode.

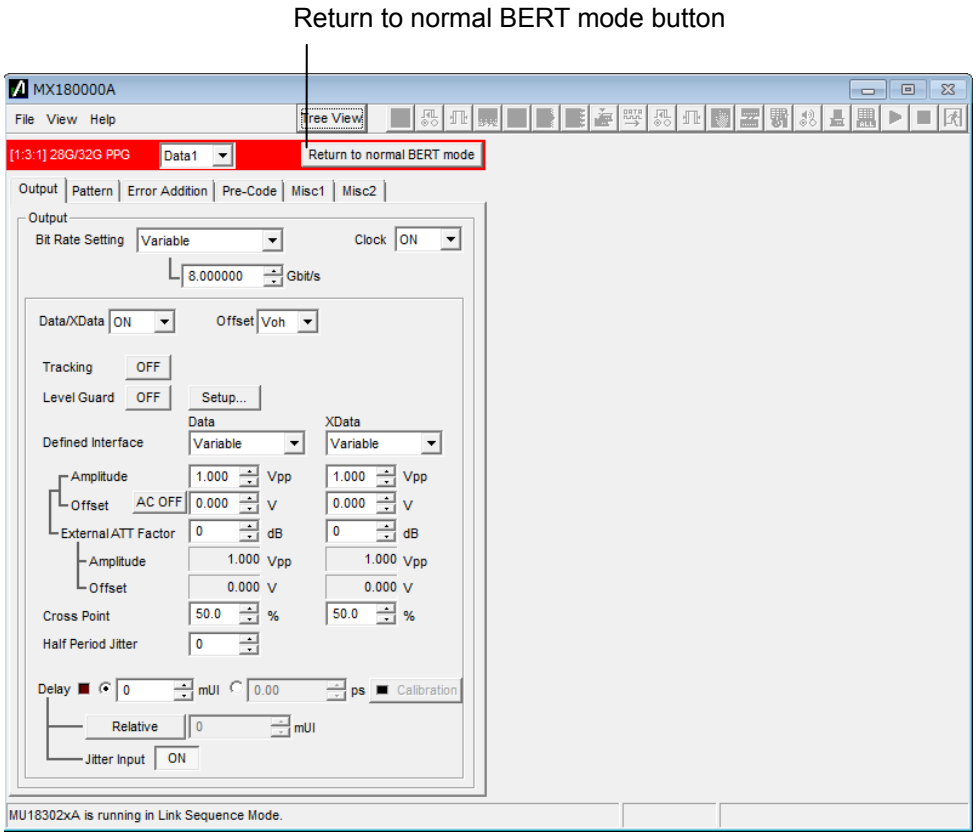


Figure 4.3.3-1 28G/32G PPG Window (after connecting from MX183000A)

4.3.4 RF Setting of MX180000A

Click the **Adjust RF** button to display the Adjusting dialog box of Figure 4.3.4-1 below.

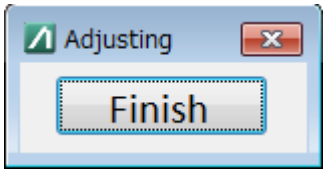


Figure 4.3.4-1 Adjusting dialog box

While the Adjusting message is displayed, the settings of the MU181500B and MP1825B that are installed on the MP1800A can be edited.
For main setting items, refer to Table 4.3.4-1.

Note:

While displaying the Adjusting dialog box, do not click the **Return to normal BERT mode** button on the 28G 32G PPG screen. (See Section 4.3.3.) If clicked, disconnect this software from the MX183000A and re-connect. (Refer to Section 4.3.2.)

Click the **Finish** button after Adjusting is completed.

Table 4.3.4-1 Setting Items for Adjusting

Module	Setting Items
MU181500B Jitter Modulation Source	SJ/SJ2
	SSC
	RJ
	BUJ
MP1825B 4Tap Emphasis	Cursor or coefficient values
	Eye Amplitude value

For details of settings, refer to the following.<0

☞ 3.4 “Setting Jitter” in the *MU181500B Jitter Modulation Source Operation Manual*

☞ 7.10.3 “Jitter Setting Commands” in the *MX180000A Signal Quality Analyzer Control Software Remote Control Operation Manual*

☞ 3.1.3 “MP1825B Control Screens” in the *MP1825B 4Tap Emphasis Operation Manual*

5.5.2 “Waveform Settings” in the *MP1825B 4Tap Emphasis Operation Manual*

4.4 PCIe Link Sequence

4.4.1 PCIe Link Sequence Setup Screen

Clicking the Sequence tab displays the following PCIe Link Sequence setup screen. The references for each setup area are shown in the following figure.

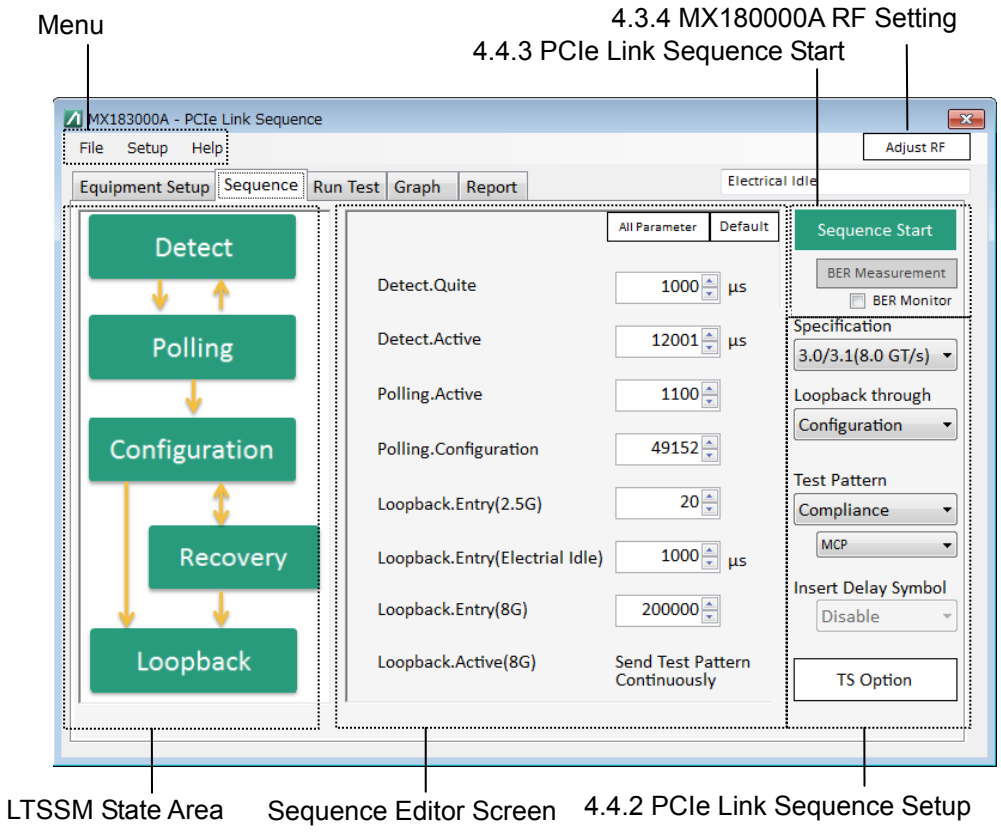


Figure 4.4.1-1 PCIe Link Sequence Setup Screen

The screen menu includes the following items. For details of items other than files, refer to Table 4.3.1-2 Menu Items, as these are the same as for the Selector screen.

Table 4.4.1-1 Menu Items

Menu		Description
File		
	Load	Loads measurement parameters from a file.
	Save	Saves the measurement parameters to a file.
	Initialize	Initializes the parameters.
	Exit	Exits the software. Measurement results are not saved.

The LTSSM State area displays an overview of the LTSSM State. Clicking a state displays the corresponding LTSSM Sub State on the Sequence Editor screen.

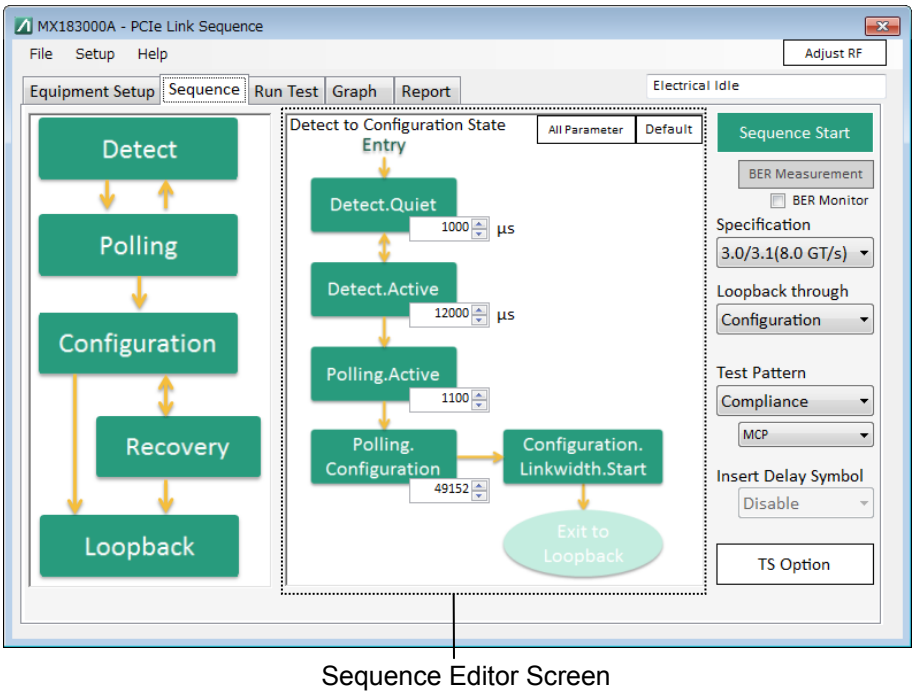


Figure 4.4.1-2 PCIe Link Sequence Setup Screen (2)

Table 4.4.1-2 Sequence Editor Setup Items

Menu	Description
All Parameter	Returns from the Sequence Editor screen to the All Parameter display.
Default	Resets values entered in Sequence Editor to their default values.

4.4.2 PCIe Link Sequence Setup

Sets the PCIe sequence, sequence type, and test pattern for measurement.

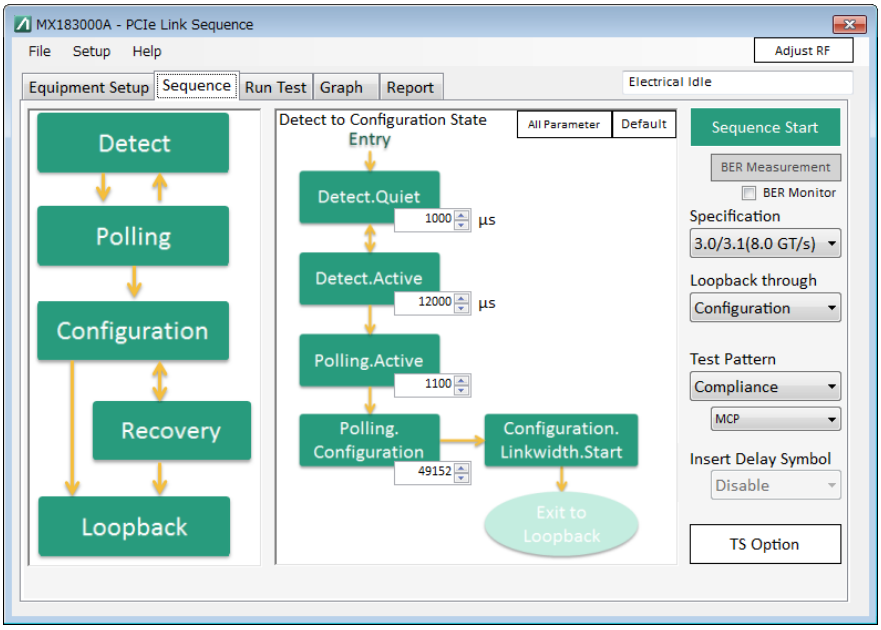


Figure 4.4.2-1 PCIe Link Sequence Setup Screen (Rev3.0/3.1/Configuration)

Clicking TS Option displays the individual PCIe Sequence setup screen shown in Figure 4.4.2-2.

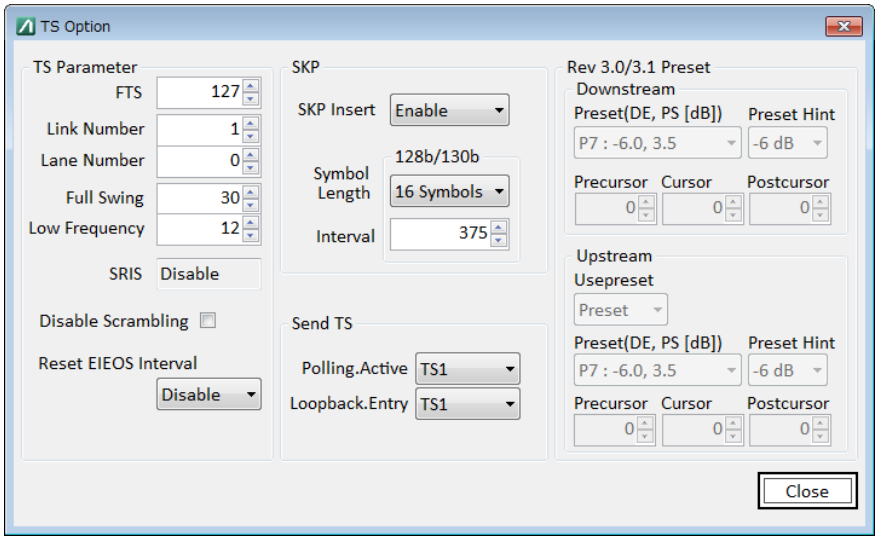


Figure 4.4.2-2 PCIe Link Sequence TS Option Screen (Rev3.x/Rev4.0)

Table 4.4.2-1 PCIe Link Sequence Setup Items

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Specification</td><td>Selects the PCIe specification from Rev1.0/1.1 (2.5 GT/s), 2.0 (5.0 GT/s), 3.0/3.1 (8.0 GT/s), and 4.0 (16.0 GT/s).
If MU181000A/B is installed, set the 32G PPG Operation Bitrate to Rev1:2.5 Gbit/s, Rev2:5.0 Gbit/s, Rev3:8.0 Gbit/s, and Rev4:16 Gbit/s respectively.
Altering this item changes the sequence displayed in Sequence Editor.</td></tr>
<tr><td>Loopback through</td><td>Sets the sequence type when DUT is set to Loopback.
Altering this item changes the sequence displayed in Sequence Editor.
The following selections are available depending on the Specification Rev. setting.
<table>
<tr><th>Revision</th><th>Configuration</th><th>Recovery</th></tr>
<tr><td>1.0/1.1(2.5 GT/s)</td><td>✓</td><td></td></tr>
<tr><td>2.0(5.0 GT/s)</td><td>✓</td><td>✓</td></tr>
<tr><td>3.0/3.1(8.0 GT/s)</td><td>✓</td><td>✓</td></tr>
<tr><td>4.0(16.0 GT/s)</td><td></td><td>✓</td></tr>
</table></td></tr>
<tr><td>Test Pattern</td><td>Selects the test pattern ultimately output after starting the sequence from Compliance or PRBS.
Selecting Compliance displays the PCIe standard test pattern selection controller, and selecting PRBS displays the PRBS level setting controller.
The pattern is set automatically in accordance with 32G PPG/ED to suit the Compliance/PRBS setting.</td></tr>
<tr><td>PRBS</td><td>Sets the number of the PRBS pattern stages for 32G PPG/ED.</td></tr>
<tr><td>MCP/CP</td><td>Set the standard test pattern for PCIe.</td></tr>
<tr><td>Insert Delay Symbol</td><td>Sets whether to insert Delay Symbol in MCP/CP.
Cannot be set if the Specification Rev. setting is 3.0/3.1 (8.0 GT/s) or 4.0 (16.0 GT/s).</td></tr>
<tr><td>TS Option</td><td>The dialog box shown in Figure 4.4.2-2 is displayed, allowing individual PCIe Sequence setting.</td></tr>
</table>

Table 4.4.2-2 Loopback through Configuration Setup Items

Item			Description
Rev1.x/2.0/3.x Loopback through "Configuration"			
	Detect.Quite		Sets the waiting time for Detect.Quite.
	Detect.Active		Sets the waiting time for Detect.Active.
	Polling.Active		Sets the number of times patterns are sent for Polling.Active.
	Polling.Configuration		Sets the number of times patterns are sent for Polling.Configuration.
	Loopback.Entry(Electrical Idle)*1		Sets the waiting time for Loopback.Entry(Electrical Idle).
	Loopback.Entry		Sets the number of times patterns are sent for Loopback.Entry. Three types are available: 2.5G, 5G, and 8G.
	Loopback.Active		Sends a pattern specified for Test Pattern.
Rev2.0/3.x/4.0 Loopback through "Recovery"			
	Detect		
		Quite	Sets the waiting time for Detect.Quite.
		Active	Sets the waiting time for Detect.Active.
	Polling		
		Active	Sets the number of times patterns are sent for Active.
		Configuration	Sets the number of times patterns are sent for Configuration.
	Configuration		
		Linkwidth.Start	Sets the number of times patterns are sent for Linkwidth.Start.
		Linkwidth.Accept	Sets the number of times patterns are sent for Linkwidth.Accept.
		Lane.Wait	Sets the number of times patterns are sent for Lane.Wait.
		Lane.Accept	Sets the number of times patterns are sent for Lane.Accept.
		Complete	Sets the number of times patterns are sent for Complete.
		Idle	Sets the waiting time for Idle.
	Recovery		
		RcvrLock	Sets the number of times patterns are sent for Rcvr.Lock.
		Rcvr.Cfg(EQTS2)	Sets the number of times patterns are sent for RcvrCfg.
		Speed*2	Sets the waiting time for Speed.
		Equalization.Phase1*1	Sets the number of times patterns are sent for Equalization.Phase1.
		RcvrCfg(TS2)	Sets the number of times patterns are sent for RcvrCfg.
		Idle	Sets the waiting time for Idle.
	Loopback		
		Entry*2	Sets the number of times patterns are sent for Entry.
		Active*2	Sends a pattern specified for Test Pattern.

*1: Available for Rev 2.0 and Rev 3.x.

*2: Three types are available: 5G, 8G, and 16G.

Table 4.4.2-3 TS Option Setup Items

Item		Description
TS Parameter		
	FTS	Sets the TS FTS Number.
	Link Number	Sets the TS Link Number.
	Lane Number	Sets the TS Lane Number.
	Full Swing	Sets the TS Full Swing.
	Low Frequency	Sets the TS Low Frequency.
	SRIS	Displays the Separate Refclock with Independent SSC operation.
	Disable Scrambling	Sets whether to use scrambling for TS.
	Reset EIEOS Interval	Sets the TS Reset EIEOS Interval value.
SKP		
	SKP Insert	Sets whether to insert SKP OS while sending TS.
	Symbol Length	Specifies the SKP OS length.
	Interval	Specifies the SKP OS interval.
Send TS		
	Polling.Active	Sets the type of TS sent for Polling Active State.
	Loopback.Entry	Sets the type of TS sent for Loopback Entry State.
Rev3.x/Rev4.0 Preset Downstream*		Displays the parameters used by the Downstream Port (32G PPG) which is set in TS sent by the 32G PPG..
	Preset(DE,PS[dB])	Transmitter Preset value.
	Preset Hint	Receiver Preset Hint value.
	Precursor	Precursor value.
	Cursor	Cursor value.
	Postcursor	Postcursor value.
Rev3.x/Rev4.0 Preset Upstream*		Displays the parameters requested by 32G PPG from the DUT (Upstream Port) and set in TS sent by the 32G PPG.
	Usepreset	The parameter to be used by Upstream Port (either Preset or Cursor) is displayed.
	Preset(DE,PS[dB])	Transmitter Preset value.
	Preset Hint	Receiver Preset Hint value.
	Precursor	Precursor value.
	Cursor	Cursor value.
	Postcursor	Postcursor value.

*: These values are fixed, and cannot be changed.
Displayed for Rev3 and Rev4.

4.4.3 PCIe Link Sequence Start

Press the PCIe Compliance Base Board reset switch before starting measurement. Then click Sequence Start to start the sequence.
The button display changes to [Stop] while the sequence is being sent. The display changes to [Unlink] once the sequence transmission is complete and the PPG status changes from Electrical Idle to Loopback.Active. A test pattern is sent from the PPG here.
Clicking Unlink while the test pattern is being sent aborts the test pattern transmission, and the PPG returns to Electrical Idle status.
Successful linking can be confirmed using the device debugging function or MX183000A screen. The Loopback.Active display will change as follows depending on the 32G ED status.

Table 4.4.3-1 Link Status Confirmation

Loopback Active. display	32G ED status
Loopback Active. Clock Loss.	Clock Loss
Loopback Active. Sync Loss.	Sync Loss
Loopback Active. Error.	Error
Loopback Active. Error Free.	Error Free
Loopback Active.	32G ED not installed

If you wish to measure Jitter Tolerance after this, refer to 4.6 "Jitter Tolerance Test" for details of the Run Test tab, Graph tab, and Report tab.

If you wish to measure BER after this, click BER Measurement.Selecting BER Monitor displays the BER measurement results. The pass/fail judgment criteria are determined by the value selected in Specification. (See Table 4.4-3-2.)
The function is enabled and available only when 32G ED is installed.

Table 4.4.3-2 BER Measurement Pass/Fail Judgment

Specification	Measurement time [sec.]	Pass/fail judgment condition
1.0/1.1	400	Pass if the error count does not exceed 1 after the measurement time on the left.
2.0	200	
3.0/3.1	125	
4.0	63	

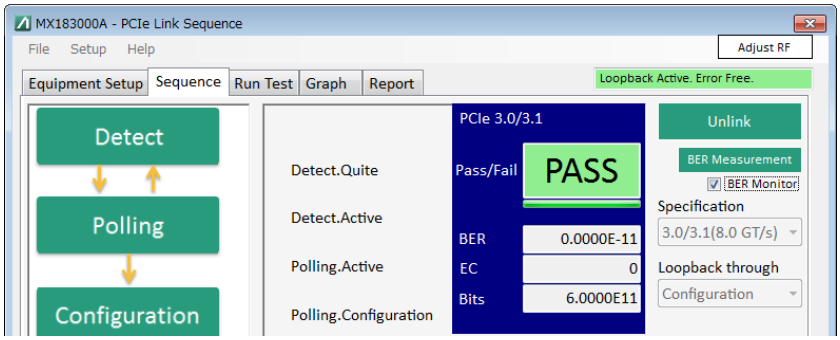


Figure 4.4.3-1 BER Measurement Results (Pass)

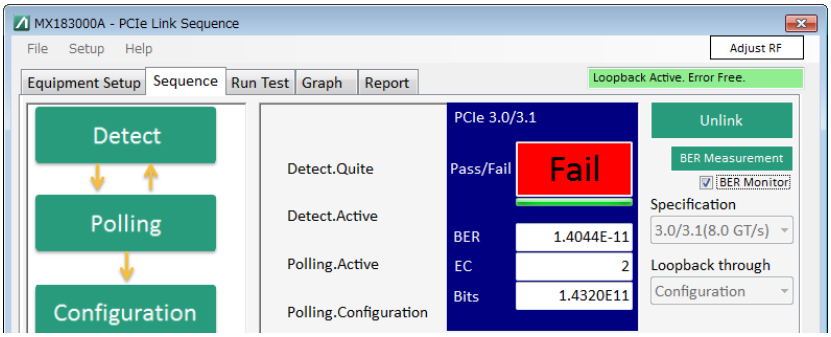


Figure 4.4.3-2 BER Measurement Results (Fail)

4.5 USB Link Sequence

4.5.1 USB Link Sequence Setup Screen

Clicking the Sequence tab displays the following USB Link Sequence setup screen. The references for each setup area are shown in the following figure.

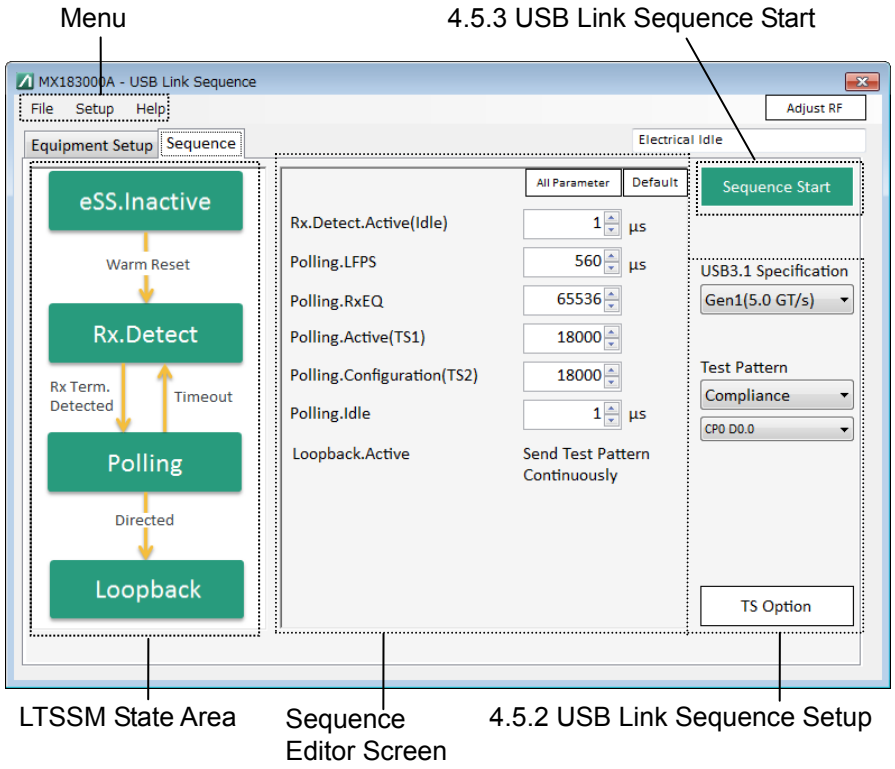


Figure 4.5.1-1 USB Link Sequence Setup Screen

The screen menu is the same as in Table 4.4.1-1.

The LTSSM State area displays an overview of the LTSSM State. Clicking a state displays the corresponding LTSSM Sub State on the Sequence Editor screen.

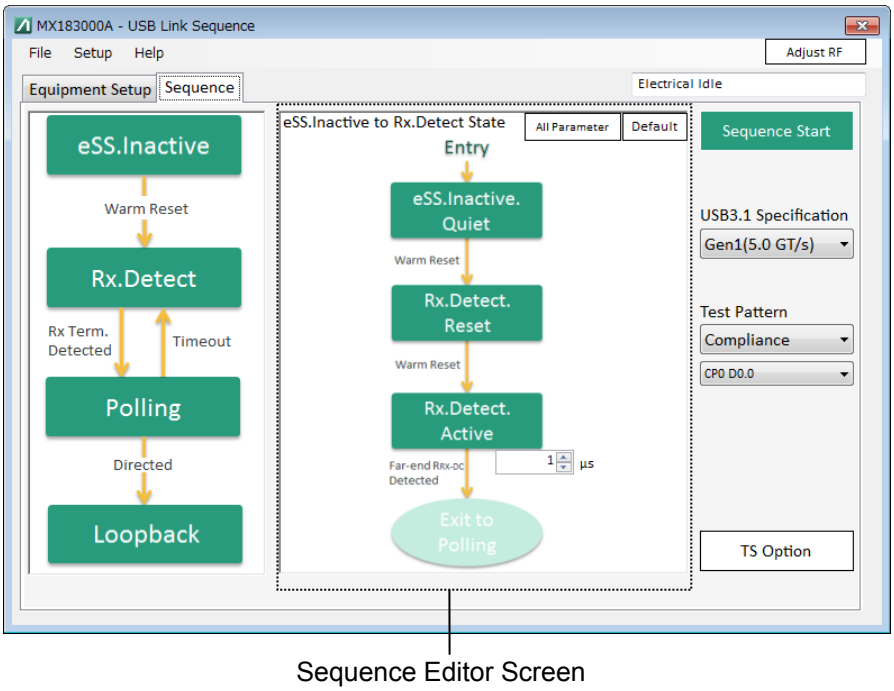


Figure 4.5.1-2 USB Link Sequence Setup Screen (2)

Table 4.5.1-1 Sequence Editor Setup Items

Menu	Description
All Parameter	Returns from the Sequence Editor screen to the All Parameter display.
Default	Resets values entered in Sequence Editor to their default values.

4.5.2 USB Link Sequence Setup

Sets the USB sequence, sequence type, and test pattern for measurement.

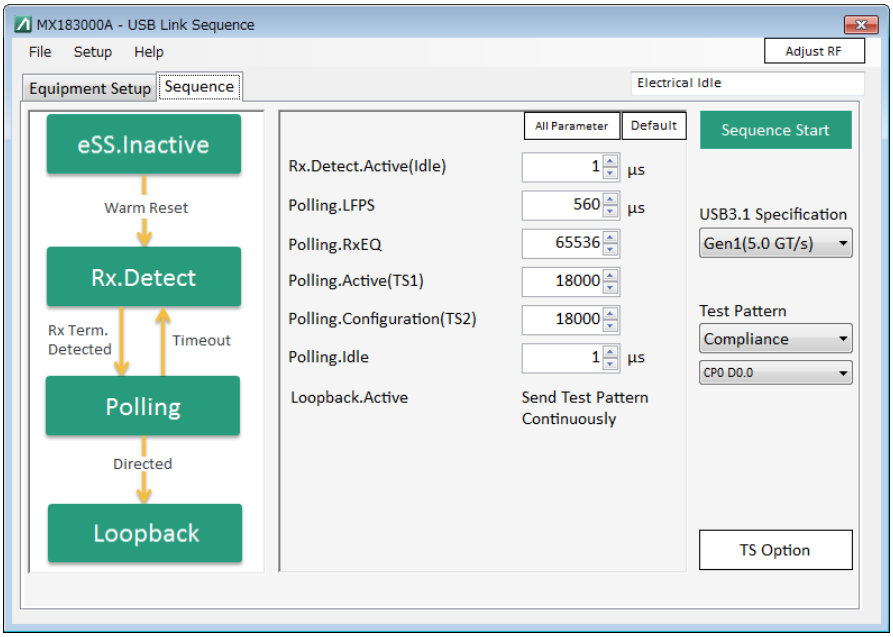


Figure 4.5.2-1 USB Sequence Setup Screen (Gen1(5.0 GT/s))

Clicking TS Option displays the individual USB Sequence setup screen shown in Figure 4.5.2-2.

Figure 4.5.2-2 TS Option Screen (Gen1)

Table 4.5.2-1 USB Link Sequence Setting Items

Item	Description
USB3.1 Specification	Selects and sets the USB specification from Gen1(5.0 GT/s) and Gen2(10.0 GT/s). If MU181000A/B is installed, set the 32G PPG Operation Bitrate to Gen1:5.0 GT/s and Gen2:10 GT/s respectively. Altering this item changes the sequence displayed in Sequence Editor.
Test Pattern	Selects the test pattern ultimately output after starting the sequence from Compliance or USER. Selecting Compliance displays the USB standard test pattern selection controller. Selecting USER automatically sets a test pattern specified for 32G PPG on the MX180000A. If Compliance is set, the pattern is set automatically in accordance with 32G PPG.* Selectable value changes depending on the value set for USB3.1 Specification.
TS Option	Enables the setting screen display and setting status for the USB Link Sequence in Figure 4.5.2-2 to be altered.

*: Selecting CP5 or CP6 does not change de-emphasis setting that is actually output.

Table 4.5.2-2 Sequence Editor Setup Items

Item		Description
Gen1(5.0GT/s)		
	Rx.Detect.Active(Idle)	Sets the Electrical Idle time for Rx.Detect.Active.
	Polling.LFPS	Sets the LFPS time for transmission in Polling.LFPS state.
	Polling.RxEQ	Sets the TSEQ times for transmission in Polling.RxEQ state.
	Polling.Active(TS1)	Sets the number of TS1 cycles for transmission in Polling.Active state.
	Polling.Configuration(TS2)	Sets the number of TS2 cycles for transmission in Polling.Configuration state.
	Polling.Idle	Sets the Electrical Idle time for Polling.Idle.
	Loopback.Active	Sends a pattern specified for Test Pattern.
Gen2(10.0GT/s)		
	Rx.Detect.Active(Idle)	Sets the Electrical Idle time for Rx.Detect.Active.
	Polling.LFPS(SCD1)	Sets the LFPS(SCD1) time for transmission in Polling.LFPS state.
	Polling.LFPS(SCD2)	Sets the LFPS(SCD2) time for transmission in Polling.LFPS state.
	Polling.PortMatch(PHY Capability LBPM)	Sets the LBPM time for transmission in Polling. PortMatch state.
	Polling.PortConfig(PHY Ready LBPM)	Sets the LBPM time for transmission in Polling. PortConfig state.
	Polling.RxEQ	Sets the TSEQ times for transmission in Polling.RxEQ state.
	Polling.Active(TS1)	Sets the number of TS1 cycles for transmission in Polling.Active state.
	Polling.Configuration(TS2)	Sets the number of TS2 cycles for transmission in Polling.Configuration state.
	Polling.Idle	Sets the Electrical Idle time for Polling.Idle.
	Loopback Active	Sends a pattern specified for Test Pattern.

Table 4.5.2TS Option Setup Items

Item			Description
Link Configuration			
	Loopback		Displays the TS Loopback Bit to be transmitted.
	Disable Scrambling		Enables or disables scrambling.
SKP			
	SKP Insert		Sets whether SKP OS insertion while sending TS.
	Symbol Length		Sets the SKP OS symbol length.
	SKP Interval		Sets the interval for inserting SKP OS.
Warm Reset			
	tBurst		Displays the tBurst time (ms).
tPeriod			Displays the tPeriod time (ns).
Duty			Displays Duty (%).
LFPS			
	tBurst		Displays the tBurst time (ms).
	SuperSpeed tRepeat		Displays SuperSpeed tRepeat.
	SuperSpeedPlus		
		Logic0	Displays the SuperSpeedPlus Logic0 time (µs).
		Logic1	Displays the SuperSpeedPlus Logic1 time (µs).
		SCD1	Displays the SuperSpeedPlus SCD1 cycle (µs).
		SCD2	Displays the SuperSpeedPlus SCD2 cycle (µs).
LBPM			
	tLFPS-1		Displays the LFPS One Burst time (µs).
	tLFPS-0		Displays the LBPS Zero Burst time (µs).
	tPWM		Displays the LBPM Repeat time (µs).

4.5.3 USB Link Sequence Start

Press the USB Compliance Board reset switch before starting measurement.
Then click **Sequence Start** to start the sequence.
The button display changes to [Stop] while the sequence is being sent.
The display returns to [Sequence Start] once the sequence transmission is complete and the PPG status changes from Electrical Idle to Loopback. Active, and a test pattern is sent from the PPG.
Clicking **Unlink** while the test pattern is being sent aborts the test pattern transmission, and the PPG returns to Electrical Idle status.
Successful linking can be confirmed using the device debugging function.

4.6 Jitter Tolerance Test

4.6.1 Jitter Tolerance Test Setup Screen

Clicking the Run Test tab displays the following Jitter Tolerance setup screen. The references for each setup area are shown in the following figure.

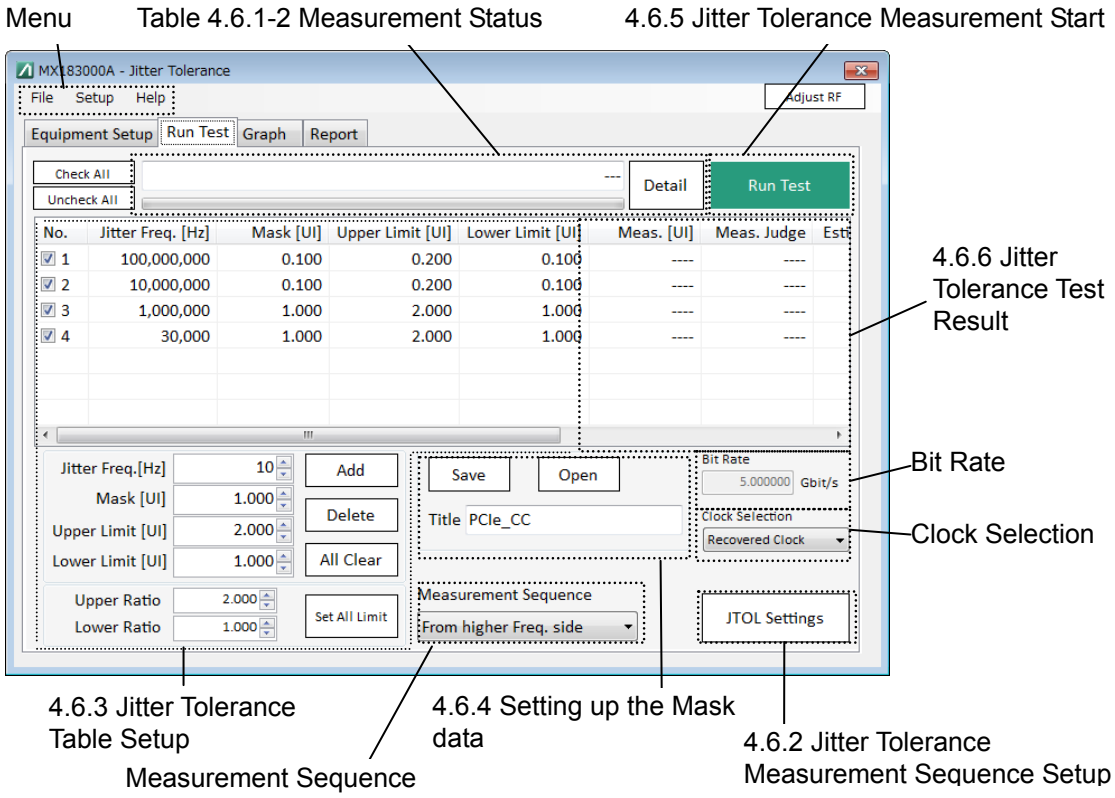


Figure 4.6.1-1 Jitter Tolerance Setup Screen

Table 4.6.1-1 Measurement Sequence Setting Items

Item	Description
Measurement Sequence	Specifies the measurement sequence direction. From higher Freq.side: Measure s from the higher modulation frequency side. From lower Freq.side: Measures from the lower modulation frequency side.
BitRate	Displays the current bit rate.
Clock Selection*	Selects Recovered Clock or External Clock for the clock.

*: Can be changed when started in PCIe Link Sequence and the MU18304xB with Option 22 or 23 installed is selected for Equipment.
Not displayed when started by Jitter Tolerance Test.

Table 4.6.1-2 Measurement Status

Item	Description
Measurement progress bar	Indicates the measurement progress as a percentage of the progress bar.
Measurement Status	Displays the current measurement status.

4.6.2 Jitter Tolerance Measurement Sequence Setup

When measuring Jitter Tolerance, set parameters for the test pattern, stable time, executing/not executing auto search, Pass/Fail judgment condition, error judgment unit, Pass/Fail judgment error threshold, and measurement time.

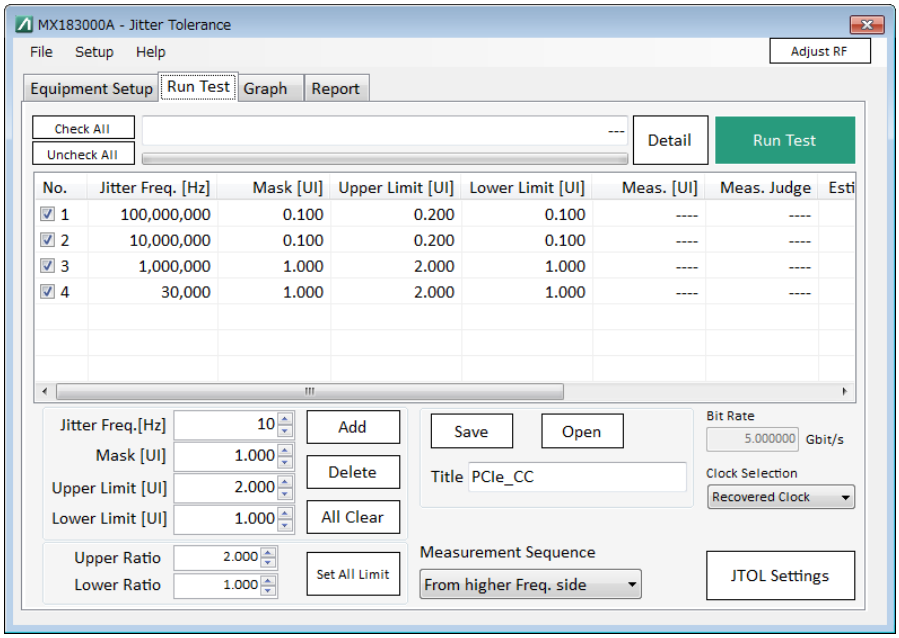


Figure 4.6.2-1 Jitter Tolerance Setup Screen

Clicking JTOL Settings displays the individual Jitter Tolerance setup screen shown in Figure 4.6.2-2, and allows the settings to be altered.

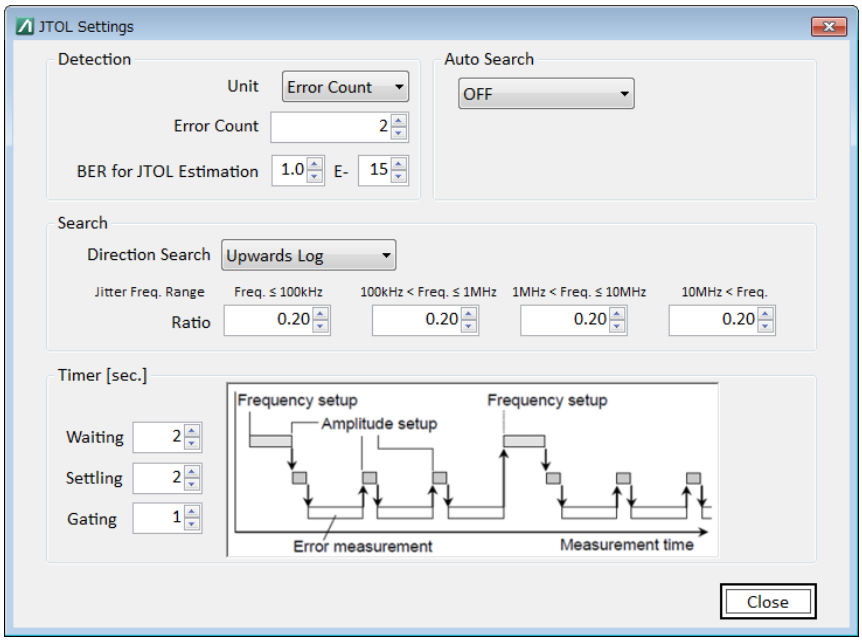


Figure 4.6.2-2 JTOL Settings Screen

Table 4.6.2-1 JTOL Settings Items

Item		Description
Detection		
	Unit	Sets whether error rate or error count is used for pass/fail judgment. Error Rate: Judges using error rate. Error Count: Judges using error bit count. (default) Estimate: Judges using error rate. Measures jitter tolerance using the error rate determined from the Direction Search setting such as 1E–6 as the target. The measurement results from this process are used to estimate the jitter tolerance for the value specified by BER for JTOL Estimation. ***Note:*** A BER for a rate lower than the intermediate measurement is estimated even using the Error Rate/Count Rate setting, but estimation may not be possible for certain intermediate results. Setting to Estimate allows BER to be estimated reliably. For details, refer to Section 4.7.3 "Jitter Tolerance Estimate".
	Error Count/ Error Threshold	Sets the threshold for judgment using the judgment method selected in Unit. The judgment will be Fail if the bit error value exceeds the threshold. When Unit is set to Error Rate: 1E–3 to E–12 1E–1 Step (Default: 1E–12) When Unit is set to Error Count: 0 to 10000000/Step 1 (default: 2) When Unit is set to Estimate: Cannot be changed.
	BER for JTOL Estimation	The error rate used for Estimate can be changed. The results will be refreshed even if this value is changed after the Jitter Tolerance Test.
Auto Search		Selects whether Auto Search for MU183040A/B and MU183041A/B is executed before measurement. OFF: Auto Search is not performed before measurement. (default) FINE: Auto Search (FINE) is performed before measurement. COARSE: Auto Search (COARSE) is performed before measurement. This operation is not available in the following cases, as Auto Search cannot be executed. ● Auto Adjustment is executed by the DUT. ● Auto Sync is set to Off.

Table 4.6.2-1 JTOL Settings Items (Cont'd)

Item		Description
Direction Search		Sets jitter modulation amplitude change direction and method. Refer to the description in Section 4.7.1 "Measurement Sequence." ● Binary ● Downwards Linear ● Downwards Log ● Upwards Linear ● Upwards Log ● Binary + Linear ***Note:*** Only the following three selections are available when Estimate is selected. 1 Binary Measures BER with 1E–6 as the target for the measurement range. Calculates the estimate curve from the data obtained in the measurement process. 2 Downwards Linear Measures BER with 1E–7 as the target. Calculates the estimate curve in the same way as for (1). 3 Upwards Linear Measures BER with 1E–5 as the target. Calculates the estimate curve in the same way as for (1).
	Step	Enabled when Downwards Linear or Upwards Linear is selected. Sets change ratio of jitter amplitude for each modulation frequency band below. Jitter Freq.≤100 kHz 100 kHz<Jitter Freq.≤1 MHz 1 MHz <Jitter Freq.≤10 MHz 10 MHz<Jitter Freq.
	Ratio	Enabled when Downwards Log or Upwards Log is selected. Sets change ratio of jitter amplitude for each modulation frequency band below. Jitter Freq.≤100 kHz 100 kHz<Jitter Freq.≤1 MHz 1 MHz <Jitter Freq.≤10 MHz 10 MHz<Jitter Freq.
Timer[sec.]		
	Waiting	Sets the waiting time after changing the jitter modulation frequency until the next process starts. Refer to Section 4.7.2 "Measurement time".
	Settling	Sets the waiting time after changing the jitter modulation amplitude until the BER measurement starts.
	Gating	Sets the measurement time until judgment ends. Fixed at 1 second when Estimate is selected for Direction Unit.

4.6.3 Jitter Tolerance Table Setup

The Jitter Tolerance Table setting area is used to set the SJ modulation frequency for measuring jitter tolerance.

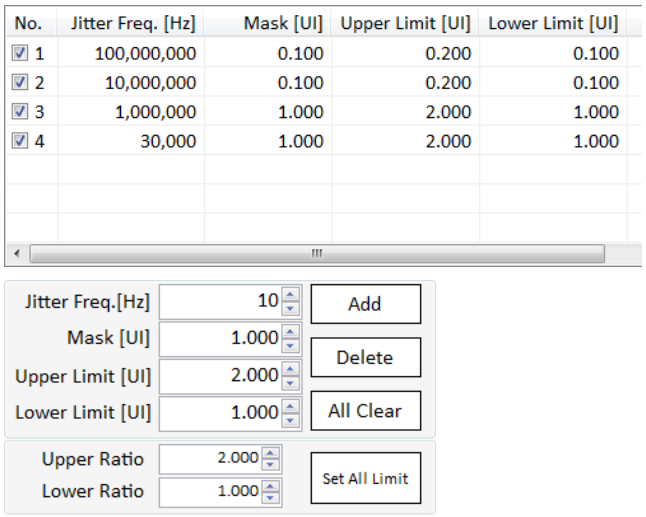
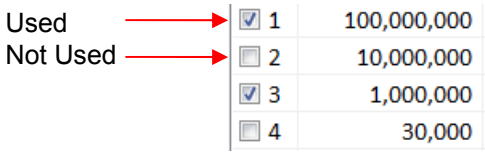


Figure 4.6.3-1 Jitter Tolerance Table Setting Area



The column on the left is for the check boxes, as shown in the figure above. The frequencies checked will be used for measurement.

Table 4.6.3-1 Jitter Tolerance Table Setting Items

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Jitter Freq. [Hz]</td><td>Sets the jitter modulation frequency.
The setting range is equal to the setting range of the modulation frequency of MU181500B.
<table>
<tr><th>Setting range [Hz]</th><th>Setting resolution [Hz]</th></tr>
<tr><td>10 to 10 000</td><td>1</td></tr>
<tr><td>10 010 to 100 000</td><td>10</td></tr>
<tr><td>100 100 to 1 000 000</td><td>100</td></tr>
<tr><td>1 001 000 to 10 000 000</td><td>1 000</td></tr>
<tr><td>10 010 000 to 100 000 000</td><td>10 000</td></tr>
<tr><td>100 100 000 to 250 000 000</td><td>100 000</td></tr>
</table></td></tr>
<tr><td>Mask[UI]</td><td>Sets the mask for the modulation frequency.
The setting range is the setting range for the MU181500B amplitude. The available ranges and resolutions will vary depending on the 32G PPG Bit Rate and Clock Setting.
For Bit Rate: 30.000004 to 32.1 Gbit/s
<table>
<tr><th>Frequency [Hz]</th><th>Setting range [UIp-p]</th><th>Setting resolution [UIp-p]</th></tr>
<tr><td>10 to 100 000</td><td>0 to 1000</td><td>0.004</td></tr>
<tr><td>100 100 to 1 000 000</td><td>0 to 100</td><td>0.004</td></tr>
<tr><td>1 001 000 to 10 000 000</td><td>0 to 8</td><td>0.004</td></tr>
<tr><td>10 010 000 to 250 000 000</td><td>0 to 0.5</td><td>0.004</td></tr>
</table>
For Bit Rate: 15.000002 to 30 Gbit/s, Clock Setting: Full Rate or
Bit Rate: 2.4 to 30 Gbit/s, Clock Setting: Half Rate
<table>
<tr><th>Frequency [Hz]</th><th>Setting range [UIp-p]</th><th>Setting resolution [UIp-p]</th></tr>
<tr><td>10 to 100 000</td><td>0 to 2000</td><td>0.002</td></tr>
<tr><td>100 100 to 1 000 000</td><td>0 to 200</td><td>0.002</td></tr>
<tr><td>1 001 000 to 10 000 000</td><td>0 to 16</td><td>0.002</td></tr>
<tr><td>10 010 000 to 250 000 000</td><td>0 to 1</td><td>0.002</td></tr>
</table>
For Bit Rate: 4.000002 to 15 Gbit/s, Clock Setting: Full Rate
<table>
<tr><th>Frequency [Hz]</th><th>Setting range [UIp-p]</th><th>Setting resolution [UIp-p]</th></tr>
<tr><td>10 to 100 000</td><td>0 to 1000</td><td>0.001</td></tr>
<tr><td>100 100 to 1 000 000</td><td>0 to 100</td><td>0.001</td></tr>
<tr><td>1 001 000 to 10 000 000</td><td>0 to 8</td><td>0.001</td></tr>
<tr><td>10 010 000 to 250 000 000</td><td>0 to 0.5</td><td>0.001</td></tr>
</table></td></tr>
</table>

Table 4.6.3-2 Jitter Tolerance Table Setting Items (Cont'd)

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Max Limit[UI] (Cont'd)</td><td>For Bit Rate: 2.4 to 4 Gbit/s, Clock Setting: Full Rate
<table>
<tr><th>Frequency [Hz]</th><th>Setting range [UIp-p]</th><th>Setting resolution [UIp-p]</th></tr>
<tr><td>10 to 100 000</td><td>0 to 500</td><td>0.001</td></tr>
<tr><td>100 100 to 1 000 000</td><td>0 to 100</td><td>0.001</td></tr>
<tr><td>1 001 000 to 10 000 000</td><td>0 to 8</td><td>0.001</td></tr>
<tr><td>10 010 000 to 250 000 000</td><td>0 to 0.5</td><td>0.001</td></tr>
</table></td></tr>
<tr><td>Upper Limit [UI]</td><td>Sets the upper limit. Be sure to enter a value not less than the value set for Mask.
The setting range is the same as the setting range above.</td></tr>
<tr><td>Lower Limit [UI]</td><td>Sets the lower limit. Be sure to enter a value not exceeding the value set for Mask.
The setting range is the same as the setting range above.</td></tr>
<tr><td>Add</td><td>Adds the value entered above to the Jitter Tolerance Table.</td></tr>
<tr><td>Delete</td><td>Deletes the jitter modulation frequency data for the checkboxes selected.</td></tr>
<tr><td>All Clear</td><td>Deletes all jitter modulation frequency data.</td></tr>
<tr><td>Upper Ratio</td><td>Resets the Upper Limit value as a ratio of the value set for Mask. Click Set All Limit to update the changes.</td></tr>
<tr><td>Lower Ratio</td><td>Resets the Lower Limit value as a ratio of the value set for Mask. Click Set All Limit to update the changes.</td></tr>
<tr><td>Set All Limit</td><td>Resets all of the Upper Limit [UI] and Lower Limit [UI] values for the frequencies selected using the check boxes in the Jitter Tolerance Table.</td></tr>
</table>

4.6.4 Setting up the Mask data

Mask data is the amplitude value with which the Pass/Fail judgment is made on the Jitter Tolerance measurement value. If the jitter amplitude measurement value is smaller than the value of the mask data, the judgment result will be Fail.

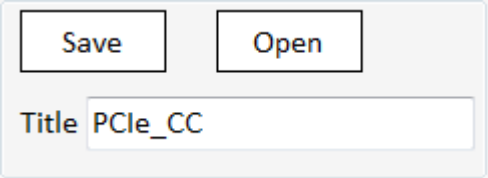


Figure 4.6.4-1 Mask Data Table setup area

Table 4.6.4-1 Mask Data Table setup items

Item	Description
Save	The table data edited by a user is saved to the user data file with the umsk extension.
Open	A dialog box is displayed to select the mask file.

4.6.5 Jitter Tolerance Measurement Start

Click **Run Test** to start measurement.
The measurement results are displayed in the Jitter Tolerance Table, and the results are displayed as a graph in the Graph tab.

The button display changes to [Stop Test] while measurement is in progress. When measurement is complete, the button display returns to [Run Test].
Clicking **Stop Test** aborts measurement.

4.6.6 Jitter Tolerance Test Result

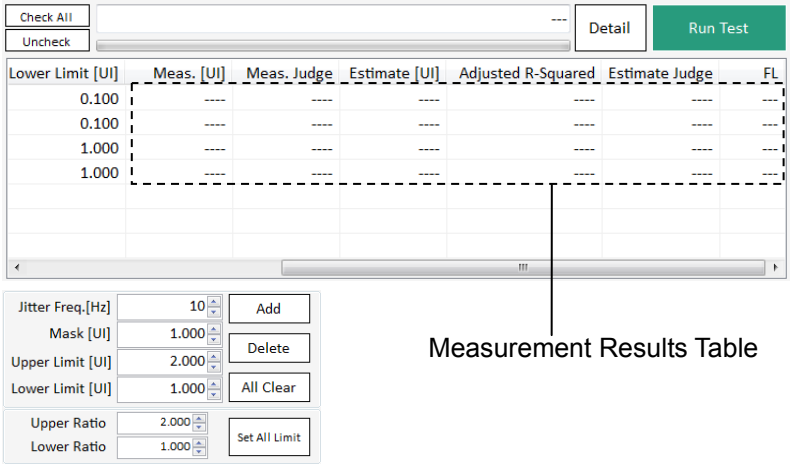


Figure 4.6.6-1 Jitter Tolerance Table Screen

Table 4.6.6-1 Jitter Tolerance Table

Item	Description
Meas.[UI]	Displays measured results.
Meas.Judge	Pass: Pass, Fail: Fail The pass/fail judgment is determined as fail if the jitter tolerance point is below the Mask set. If the modulation frequency is outside the frequency range set for the Mask Data Table, the specification for Mask Data Table modulation frequency closest to that modulation frequency is used as the pass/fail judgment datum.
Estimate[UI]	Displays the estimate for the error rate specified for BER for JTOL Estimation.
Adjusted R-Squared	Displays R^2 (free-adjusted coefficient of determination).
Estimeate.Judge	Judges the estimate in the same way as Meas.Judge.
FL	The following message is displayed if the measurement result matches the Upper Limit of fails due to the Lower Limit. Upper Limit ≥ Measurement result: OVF Lower Limit < Measurement result: UNF
Detail	The detailed measurement results table for the measurement points selected in Figure 4.6.6-1 is shown in a separate window. Figure 4.6.6-2 shows a typical window.

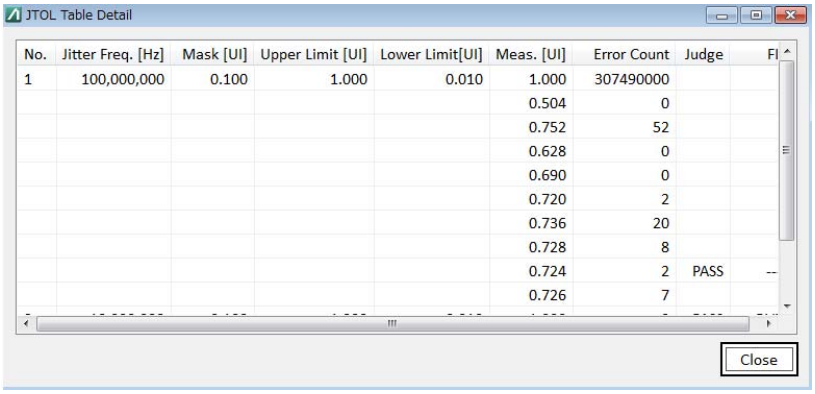


Figure 4.6.6-2 Jitter Tolerance Table Detail

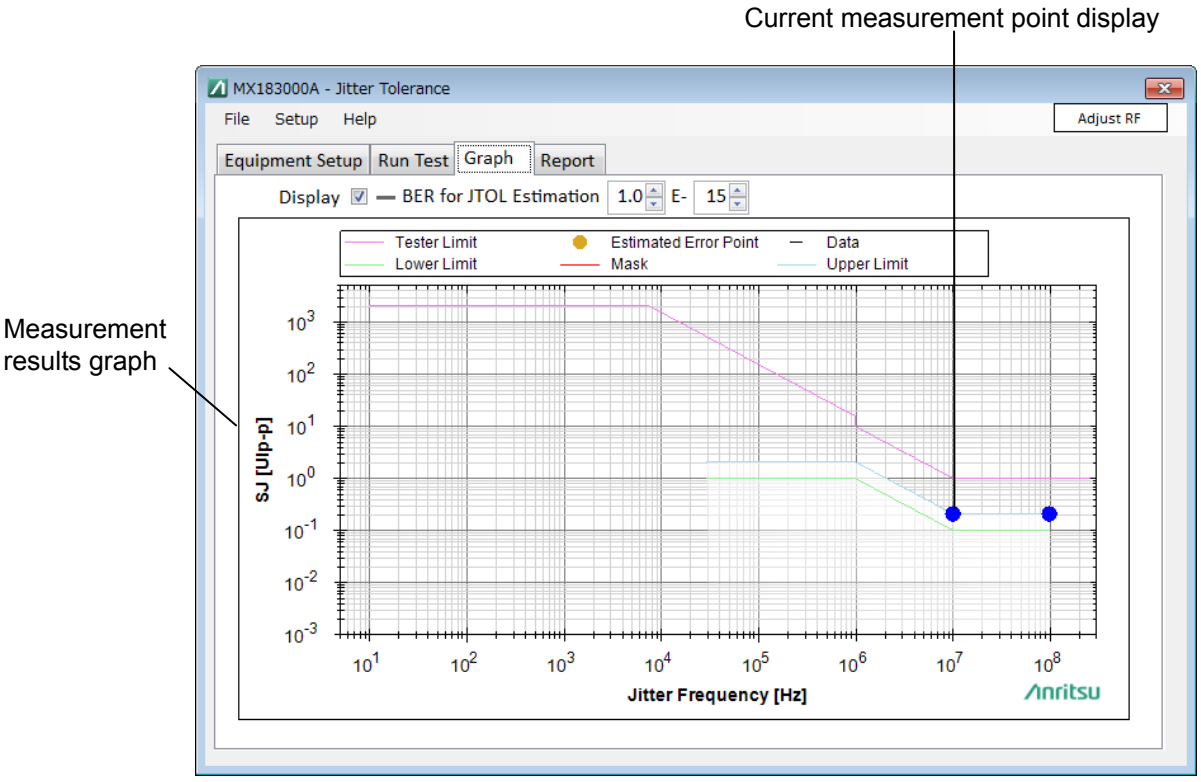


Figure 4.6.6-3 Jitter Tolerance Graph Tab

The estimate curve specified for BER for JTOL Estimation is displayed on the graph in the Graph tab. The estimate curve display can be toggled on or off using the check box.

4.6.7 Saving the graph and setting up the scale

Right-click in the measurement result graph display area on the Result screen, a submenu will appear.

You can copy and save the graph, or change the graph display from the submenu.

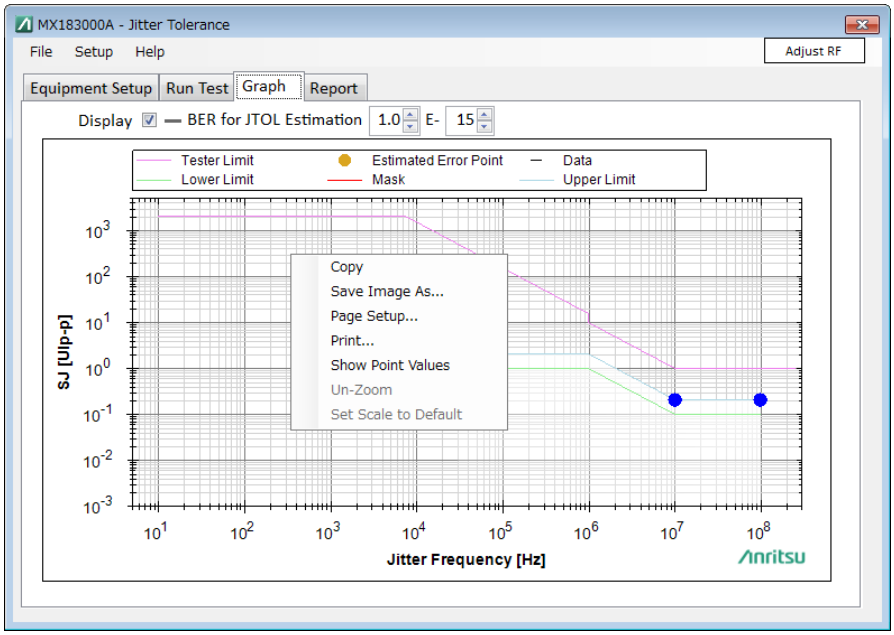


Figure 4.6.7-1 Submenu in the measurement result graph display area

Table 4.6.7-1 Submenu in the measurement result graph display

Item	Description
Copy	Copies the graph display area to the clip board.
Save Image As…	Saves the graph display area as a file in the specified format.
Page Setup…	Opens the graph printing settings.
Print	Prints out the graph.
Show Point Values	Displays the coordinates at the mouse cursor position.
Un-Zoom	Zooms out the graph.
Set Scale to Default	Displays the entire graph.

4.6.8 File Operation and Printing

Measurement result data can be saved from the Report tab screen.

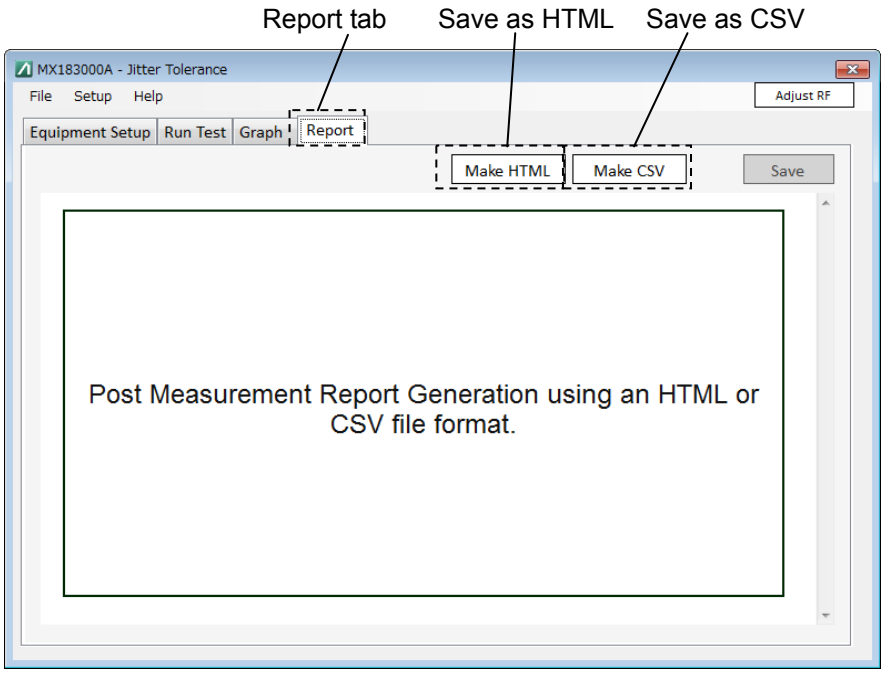


Figure 4.6.8-1 Report Tab Screen

1. Click the **Report** tab.
2. Click **Make HTML** button to print/save the data in the HTML format.
   The print image will appear.
3. Click **Make CSV** button to print/save the data in the CSV format.
   The print image will appear.
4. Click **Save** to save as a file in the format specified in steps (2) and (3).

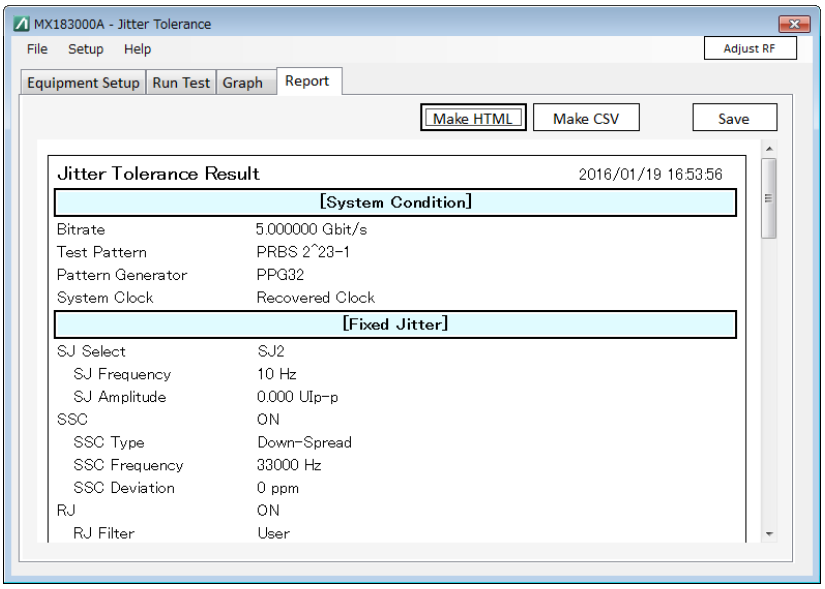


Figure 4.6.8-2 Result Screen-Report (Make HTML)

When you saved the data, the following files are created:

(1) HTML data

- Specified file name.htm
- conf.css
- IMG folder: A png file of the waveform and the graph will be created.
  The name of the file will be created in the specified file name xx.png. xx will be replaced by a number.
  If you double-click the htm file, you can display the saved result on a Web browser such as the Internet Explorer.
  Required file size to save HTML may sometimes be up to about 20MB. Verify the amount of free space on the hard disk before executing Save.

(2) CSV data

- Specified file name.csv

4.7 Jitter Tolerance Test Procedure

4.7.1 Measurement Sequence

Jitter Tolerance measures the tolerance of jitter per each listed jitter frequency.
Jitter tolerance is the maximum jitter amplitude at which the number of errors or the error rate becomes equal to or below the Pass/Fail Threshold. The following types of measurement methods are available:

- Binary

The binary search method is used to search for the target jitter amplitude.
The binary search method decreases its searching range of jitter amplitude by half for every measurement execution. If the error measurement value is equal to or below the value of Threshold, the jitter amplitude is increased; if it exceeds the value of Threshold, the jitter amplitude is decreased. The search ends when the amount of searching range becomes equal to or below the value of the permitted resolution setting. In the figure below, the jitter amplitude of the fourth measurement represents the final measurement result.

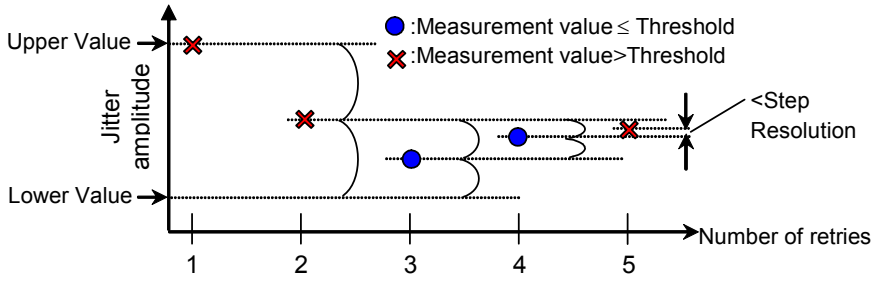


Figure 4.7.1-1 Procedure for the Binary Search measurement method

- Downwards

The jitter amplitude is decreased from the Start Value until the error measurement value becomes equal to or below the value of Threshold.
In the case of Downwards Linear, the jitter amplitude is decreased by the value set in Step.
In the case of Downwards Log, the jitter amplitude is decreased by the magnification set in Ratio.
In cases that the error measurement value still exceeds the Threshold even when the jitter amplitude becomes equal to or below Lower Value, the next step jitter amplitude will be taken as the final measurement value.

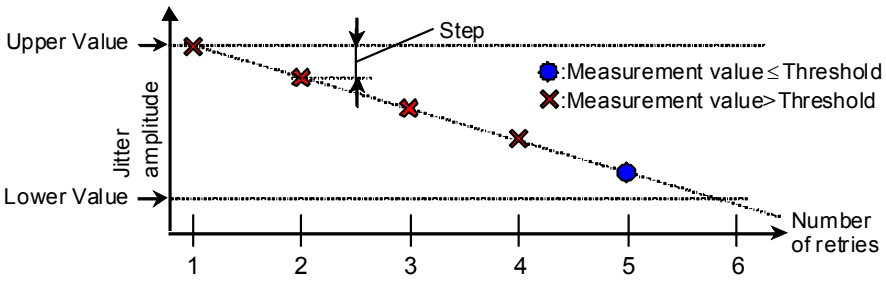


Figure 4.7.1-2 Procedure for Downwards Linear measurement

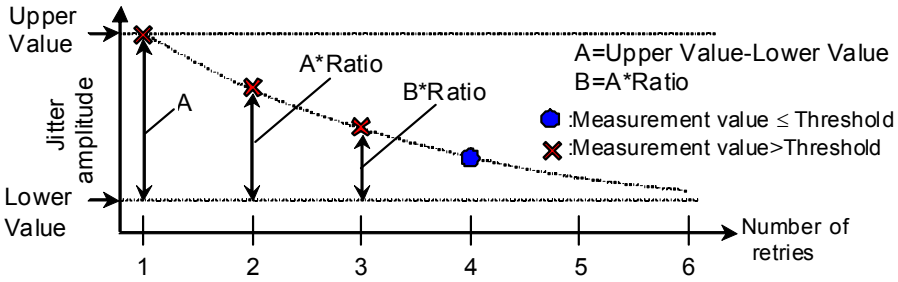


Figure 4.7.1-3 Procedure for Downwards Log measurement

- Upwards

The jitter amplitude is increased from the Start Value until the error measurement value exceeds the value of Threshold.
In the case of Upwards Linear, the jitter amplitude is increased by the value set in Step.
In the case of Upwards Log, the jitter amplitude is increased by the magnification set in Ratio.
In cases that the error measurement value still does not exceed the Threshold even when the jitter amplitude becomes equal to or above Upper Value, the next step jitter amplitude will be taken as the final measurement value.

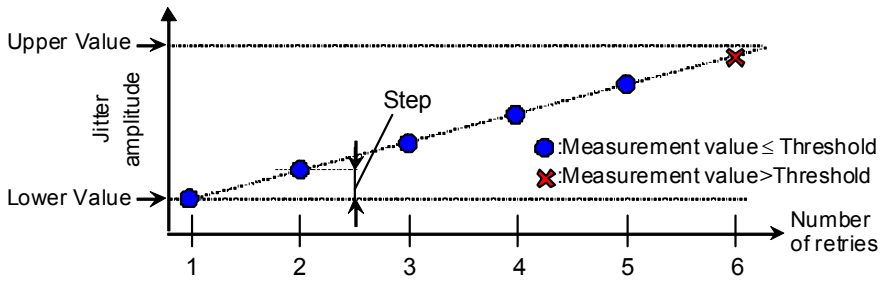


Figure 4.7.1-4 Procedure for Upwards Linear measurement

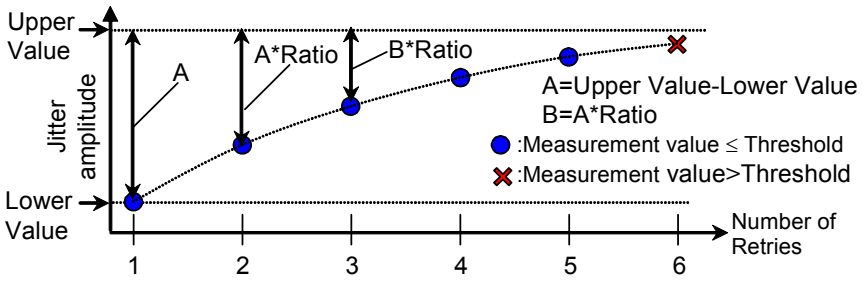


Figure 4.7.1-5 Procedure for Upwards Log measurement

- Binary + Linear

After searching the jitter amplitude from the lower value by the binary search method, the Upwards Linear measurement is executed.
From the point searched by the binary search method, the jitter amplitude is increased at a step of the value, which is a half of the value set for Step Resolution, until the error measurement value exceeds the Threshold value.

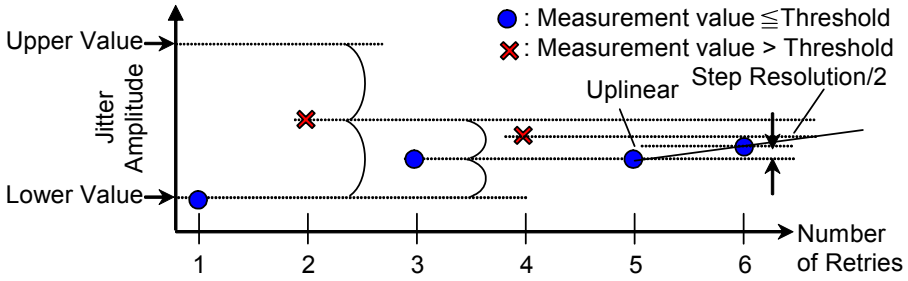


Figure 4.7.1-6 Procedure for Binary + Linear measurement

4.7.2 Measurement time

Repeat the process for measuring the bit error rate by changing the jitter frequency and jitter amplitude.
MX183000A setups the jitter frequency, the waiting time after changing the jitter amplitude, and the bit error rate measurement time under the following names:

Waiting: Waiting time after changing the jitter frequency
Settling: Waiting time after changing the jitter amplitude
Gating: Bit error rate measurement time

The time relationship in the Jitter Tolerance measurement is as shown in the figure below:

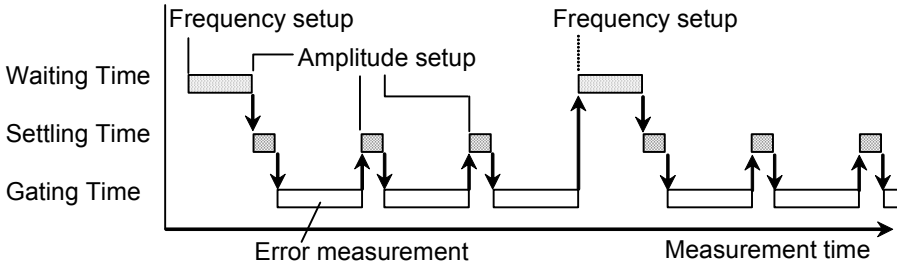
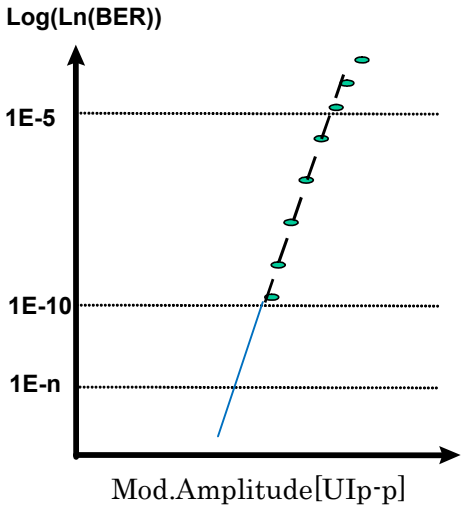


Figure 4.7.2-1 Setup time relationship

4.7.3 Jitter Tolerance Estimate

The MX183000A allows BER to be estimated for high rates such as 1E–6 and for low rates such as 1E–20.
For example, the BER for E–20 cannot be measured practically, as the error rate produces errors of 1 bit in 10^{10} seconds (>317 years) even with a 10 Gbit/s signal.

The distribution parameters σ and μ can be determined by measuring the correlation with jitter modulation (SJ) for bitter error rate over a particular range as shown in Figure 4.7.3-1. Jitter modulation estimate curves for jitter modulation frequencies can be calculated for any particular error rate using the equation in the distribution Figure 4.7.3-1.



$$BER(D) = \frac{1}{2}\left\{\frac{e^{-\frac{\left(\frac{|\mu - D|}{\sigma}\right)^2}{2}}}{\left(\frac{|\mu - D|}{\sigma}\right)\sqrt{2\pi}}\right\}$$

Figure 4.7.3-1 Noise Distribution Estimate and BER Estimate Calculation

The MX183000A allows an estimate curve to be plotted if three or more measurement results have an error rate between 1.0E–6 and 1.0E–9 while measuring Jitter Tolerance.

Intermediate results as shown in Figure 4.7.3-2 can be obtained for settings as shown in Table 4.6.2-1.

Unit: Estimate
Direction Search: Upwards Linear

Meas. [UI]	Error Rate
0.800	1.5050E-08
0.810	3.7400E-08
0.820	7.9250E-08
0.830	1.7350E-07
0.840	3.7240E-07
0.850	7.5995E-07
0.860	1.8573E-06

Figure 4.7.3-2 Example Intermediate Measurement Results for Upwards Linear (Unit Setting: Estimate)

As there are at least three measurement results with an error rate between 1.0E–6 and 1.0E–9, the approximation line shown in Figure 4.7.3-1 can be drawn, allowing estimation of BER for low rates such as E–20.

If Unit is Estimate, even if there are less than three measurement results with an error rate between 1.0E–6 and 1.0E–9, measurement is continued until there are three measurement results with an error rate between 1.0E–6 and 1.0E–9 by measuring with additional SJ values.

If you wish to determine jitter tolerance estimate results accurately for low rates, set Unit to Estimate.

Note:

Three or more measurement results between 1.0E–6 and 1.0E–9 cannot be obtained if the jitter amplitude reaches the Upper Limit, and the Error Rate at this point is 1.0E–9 or less. For this reason, jitter tolerance cannot be estimated for low rates.

Estimate curves can be drawn for intermediate measurement results even when Unit is set to Error Rate or Error Count.

Intermediate results as shown in Figure 4.7.3-3 can be obtained for settings as shown in Table 4.6.2-1.

Unit: Error Rate
Error Threshold: 1.0E–7
Direction Search: Binary

Meas. [UI]	Error Rate
1.000	1.6560E-03
0.504	0
0.752	1.5000E-10
0.876	5.4154E-06
0.814	5.2750E-08
0.844	5.3230E-07
0.828	1.5685E-07
0.820	8.4250E-08
0.824	1.0950E-07
0.822	8.5300E-08

Figure 4.7.3-3 Example Intermediate Measurement Results for Binary, Error Threshold 1.0E–7

In this case, as there are at least three measurement results with an error rate between 1.0E–6 and 1.0E–9, the approximation line shown in Figure 4.7.3-1 can be drawn, even without setting Unit to Estimate. BER can therefore be estimated for low rates such as E–20.

Intermediate results as shown in Figure 4.7.3-4 can be obtained for settings as shown in Table 4.6.2-1.

Unit: Error Rate
Error Threshold: 1.0E–10
Direction Search: Binary

Meas. [UI]	Error Rate
1.000	1
0.504	0
0.752	5.0000E-11
0.876	1.8923E-06
0.814	2.0900E-08
0.782	8.0000E-10
0.766	5.0000E-10
0.758	5.0000E-11
0.762	1.5000E-10
0.760	2.0000E-10

Figure 4.7.3-4 Example Intermediate Measurement Results for Binary, Error Threshold 1.0E–10

In this case, as there are only two measurement results with an error rate between 1.0E–6 and 1.0E–9, the approximation line shown in Figure 4.7.3-1 cannot be drawn, and BER cannot be estimated for low rates such as E–20.

If Unit is set to Estimate, measurement can be continued until three measurements are obtained between 1.0E–6 and 1.0E–9 by adding SJ values, but additional measurement is not performed when Unit is set other than to Estimate.
If you wish to determine jitter tolerance estimate results accurately for low rates, set Unit to Estimate.

Chapter 5 Remote Control

This chapter describes the remote control method and remote commands of MX183000A.

5.1 Setting Interface for Remote Control

This section describes the remote interface setting method for MX183000A.

1. Click the Remote(R) from Setup menu on the MX183000A main screen.

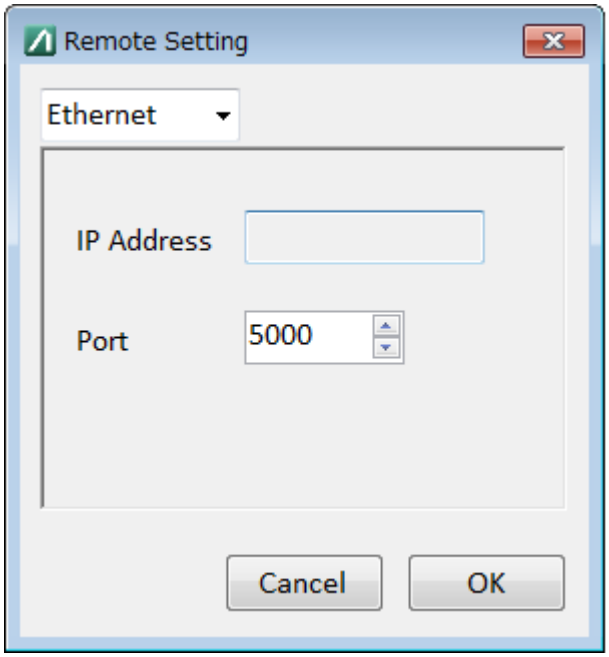


Figure 5.1-1 Remote Setting Screen

2. Select either Ethernet or GPIB.
3. When Ethernet of Remote Interface is selected

   TCP Port can be set. Set a number that does not duplicate the TCP Port setting for the MP1800A or control PC on which the software is installed.

   TCP Port setting initial value: 5000

   TCP Port setting range: 1024 to 5001

   The IP address cannot be changed on the Remote Setting screen. Change the IP address on the Setup Utility of the MP1800A or on the network setting of the PC controller.
4. If GPIB is selected

   Set the GPIB address within 1 to 30. The initial value is 3.

5.2 Remote Control Procedure

It describes how to control the MP1800A from a remote-control PC via an Ethernet or GPIB.

Set the MP1800A Setup Utility as follows for both Ethernet and GPIB.
Activate Interface: Ethernet
Performance: Enhanced

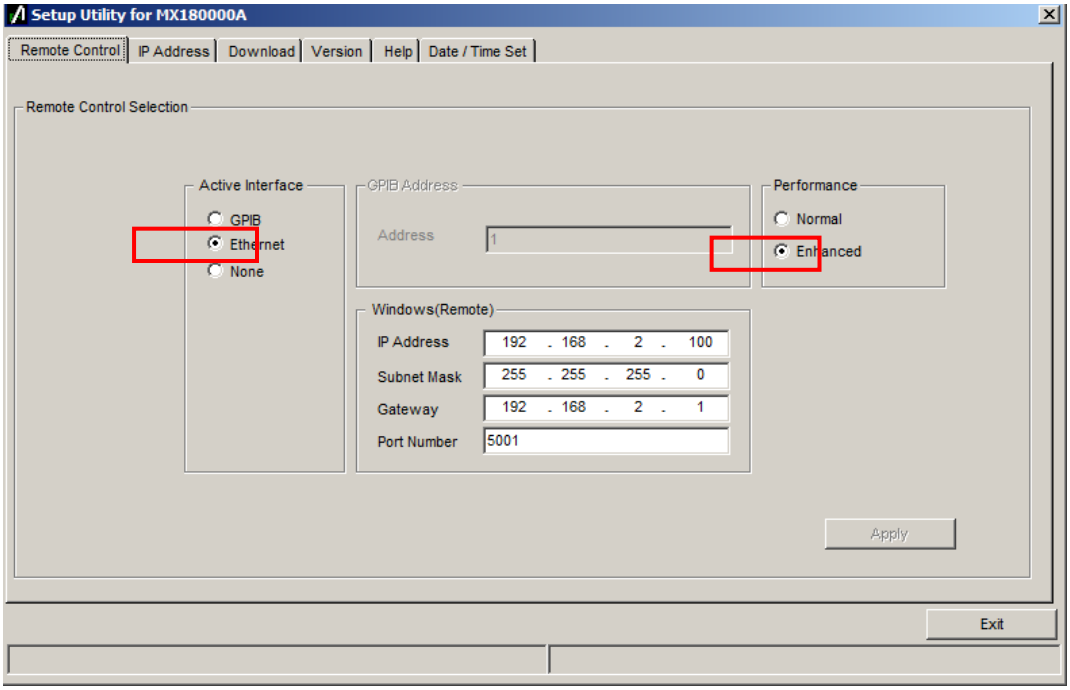


Figure 5.2-1 MP1800A Setup Utility Settings

When controlling the MP1800A via Ethernet
There are two following methods when MX183000A is remotely controlled via Ethernet:

- Controlling MX183000A installed in the PC for the remote control
- Controlling MX183000A installed in the MP1800A

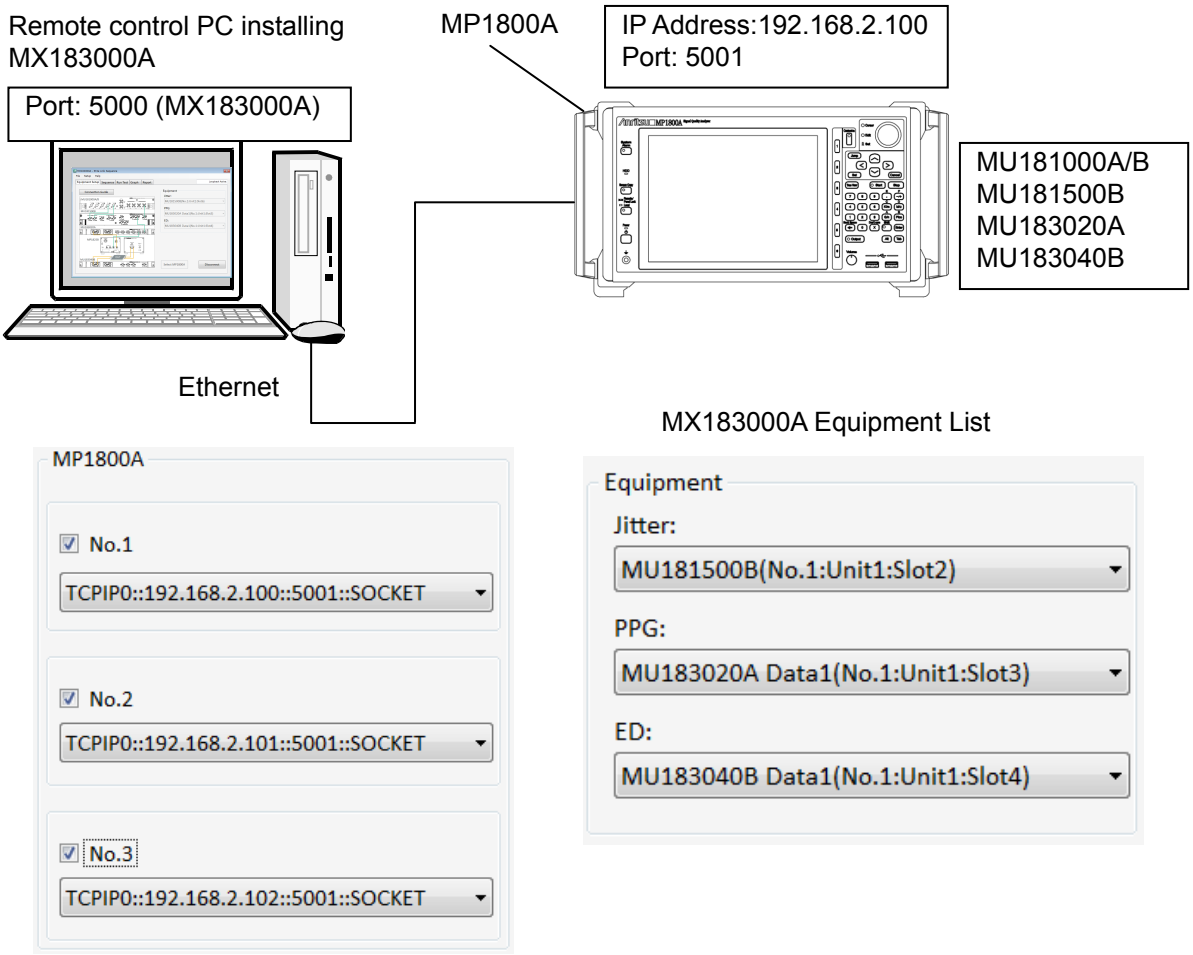


Figure 5.2-2 Remote Control System Configuration (Ethernet Control 1)

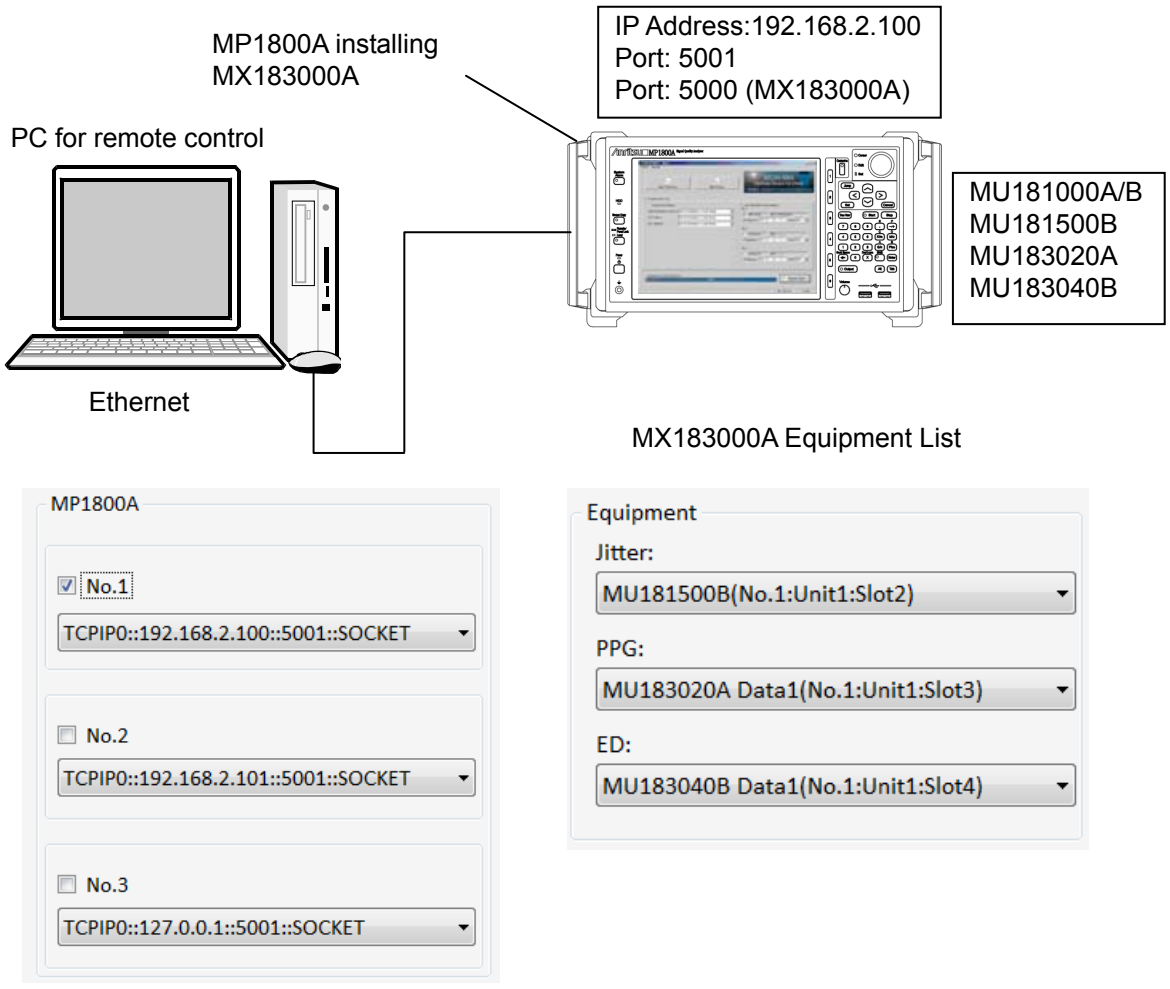


Figure 5.2-3 Remote Control System Configuration (Ethernet Control 2)

In the system configuration as shown in Figure 5.2-2, the IP address for transmitting MX183000A to the remote control software is “127.0.0.1” and the port number is “5000”.
In the system configuration as shown in Figure 5.2-3, the IP address for transmitting MX183000A to the remote control software is “192.168.2.100” and the port number is “5000”.

When controlling the MP1800A via GPIB
MX183000A can be controlled remotely via GPIB as follows.

- Controlling MX183000A installed in the MP1800A

Note that the MP1800A cannot be controlled via GPIB from MX183000A on the remote control PC.

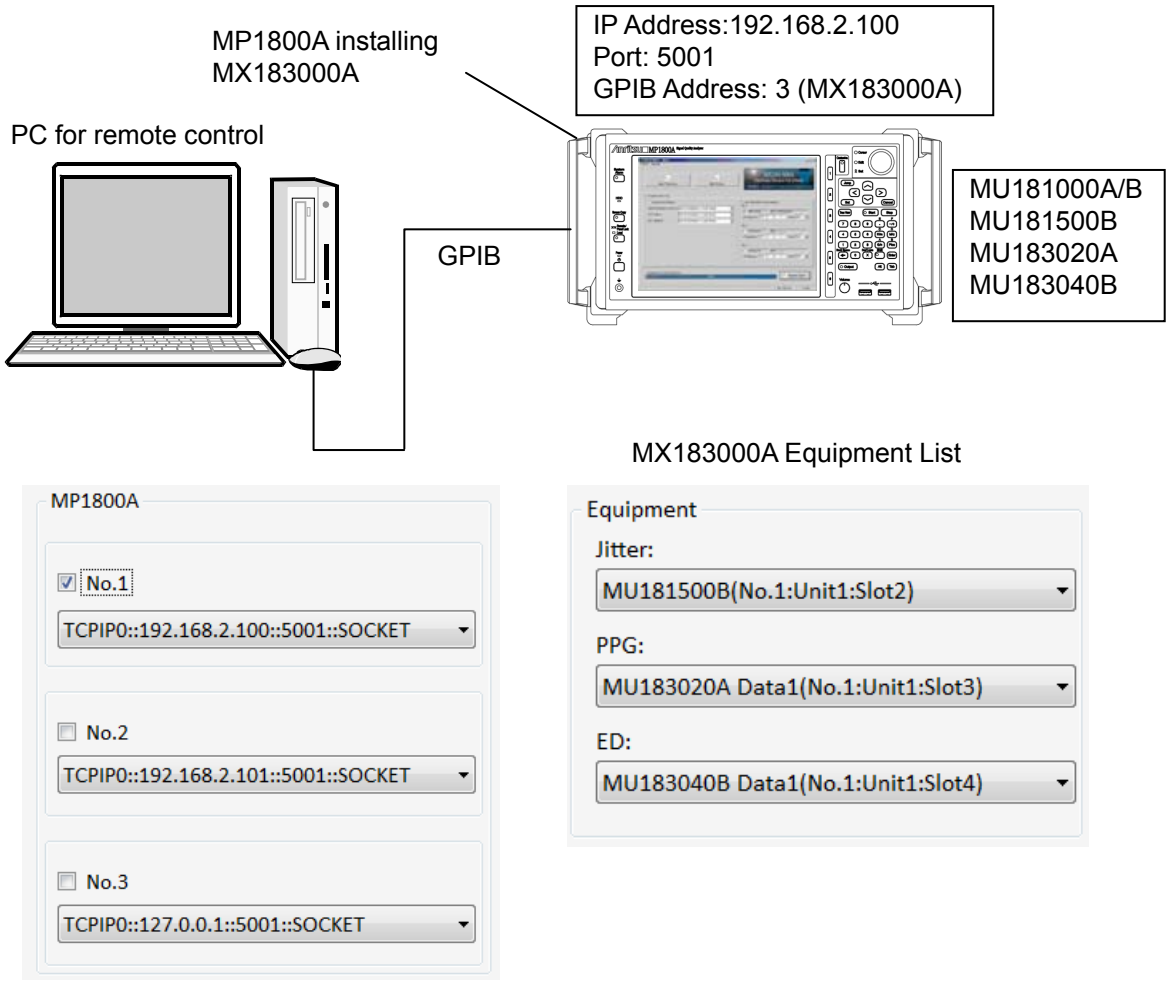


Figure 5.2-4 Remote Control System Configuration (GPIB Control)

In the system configuration in Figure 5.2-4, the GPIB address for communication between the remote control software and MX183000A is "3".

This is an example of the procedure for performing a jitter tolerance test.

1. Connect the MP1800A and the remote control PC with Ethernet or GPIB.
2. Start MX183000A, and displays the Selector screen.

3. Click Setup on the menu. The Remote Setting screen is displayed.
4. Set the remote interface port number for MX183000A to 5000 or the GPIB address to 3. Refer to Section 5.1 “Setting Interface for Remote Control”.
5. Start the Jitter Tolerance test application.
```
:SYSTem:MEASure:SELect TOL
```
6. Send the following command to search the MP1800A in the controller.
```
:SYSTem:EQUipment:SEARch:SETTing
TCPIP0::127.0.0.1::5001::SOCKET,1
:SYSTem:EQUipment:SEARch:ENABle 1,1
:SYSTem:EQUipment:SEARch:ENABle 0,2
:SYSTem:EQUipment:SEARch:ENABle 0,3
:SYSTem:EQUipment:SEARch:STARt
```
7. Check the unit numbers of detected equipment.
```
:SYSTem:EQUipment:SETTing? JITTer
:SYSTem:EQUipment:SETTing? PPG
:SYSTem:EQUipment:SETTing? ED
```
8. Set the unit number for the equipment detected.
```
:SYSTem:EQUipment:SETTing JITTer,1,1,2
:SYSTem:EQUipment:SETTing PPG,1,1,3
:SYSTem:EQUipment:SETTing ED,1,1,4
```
9. Connect to the controller.
```
:SYSTem:EQUipment:CONNect
```
10. Start the Tolerance measurement.
```
:DISPlay:MEASure:CHANge RUNTest
:SENSe:MEASure:JITTer:STARt
```
11. During Tolerance measurement, the only remote control operations possible are measurement stop and obtain measurement status.
```
:SENSe:MEASure:JITTer:STATe?
:SENSe:MEASure:JITTer:STOP
```
12. Acquire the measurement result after the Tolerance measurement is finished.
```
 :CALCulate:RESult:DATA? ALL
```
13. Save the report in HTML/CSV format.
```
:SYSTem:MMEMory:RESult:STORe
"D:\test_folder\test",HTML
:SYSTem:MMEMory:RESult:STORe
"D:\test_folder\test",CSV
```
14. Close the application.
```
:SENSe:MEASure:JITTer:STOP
:SYSTem:MEASure:SELect NONE
```

This is an example of the procedure for jitter tolerance testing using a PCIe device.

1. Start the PCIe Link Sequence application.
   `:SYSTem:MEASure:SELect PCI`
2. Connect using steps 6 to 9 in the jitter tolerance test example procedure.
3. Set the test target specification to Revision 3.
   `:DISPlay:MEASure:CHANge SEQuence`
   `:LTRaining:SEQuence:SPECification REV3`
4. Set the test pattern to Modified Compliance Pattern.
   `:SOURce:PATTern:TYPE COMPliance`
   `:LTRaining:SEQuence:TEST:PATTern MCP`
5. Send a sequence to loopback the DUT.
   `:LTRaining:SEQuence:STARt`
6. During sequence transmission, the only remote control operations possible are measurement stop and obtain measurement status.
   `:LTRaining:SEQuence:STATe?`
   `:LTRaining:SEQuence:STOP`
7. When the Option PL001 is installed, perform the jitter tolerance test on the DUT in loopback status using steps 10 to 13 in the jitter tolerance test example procedure.
8. Close the application.
   `:SENSe:MEASure:JITTer:STOP`
   `:LTRaining:SEQuence:STOP`
   `:SYSTem:MEASure:SELect NONE`

This is an example of the procedure for sending a Link Sequence using a USB device.

1. Start the USB Link Sequence application.
   `:SYSTem:MEASure:SELect USB`
2. Connect using steps 6 to 9 in the jitter tolerance test example procedure.
3. Set the test target specification to GEN 1.
   `:DISPlay:MEASure:CHANge SEQuence`
   `:LTRaining:SEQuence:SPECification GEN1`
4. Set the test pattern to Compliance Pattern CP0.
   `:SOURce:PATTern:TYPE COMPliance`
   `:LTRaining:SEQuence:TEST:PATTern 0`
5. Send a sequence to loopback the DUT. *
   `:LTRaining:SEQuence:STARt`

   *: When this command is sent, the DUT should be connected to the USB test fixture.
6. During sequence transmission, the only remote control operations possible are measurement stop and obtain measurement status.
   `:LTRaining:SEQuence:STATe?`
   `:LTRaining:SEQuence:STOP`
7. Close the application.
   `:LTRaining:SEQuence:STOP`
   `:SYSTem:MEASure:SELect NONE`

5.3 Command Description Method

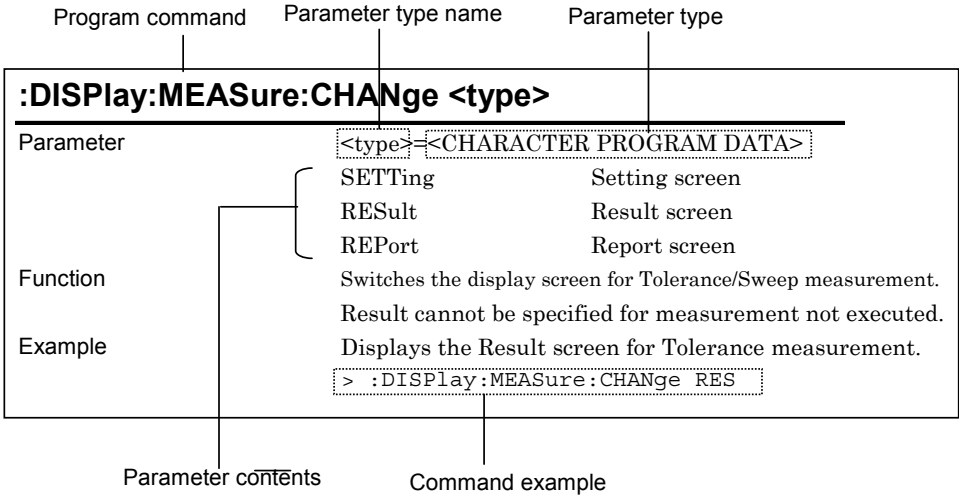
This chapter explains the notations used in the message syntax.

Table 5.3-1 Notation used in Command Syntax

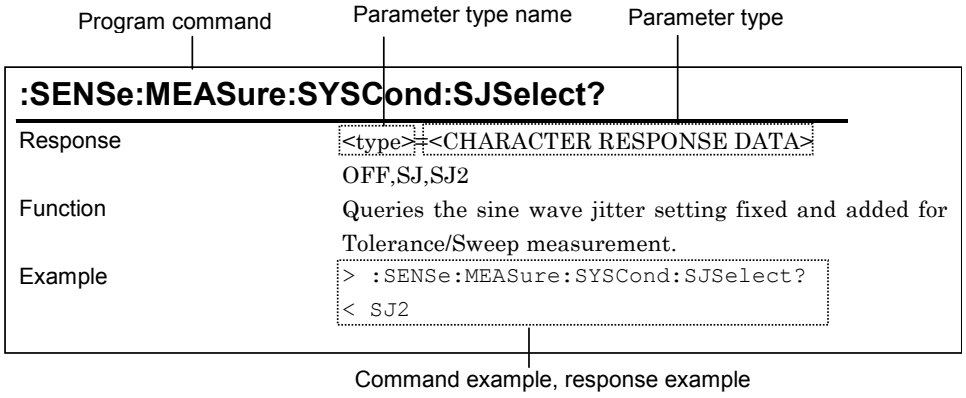
Symbol	Usage
<>	Parameters enclosed in < > are character strings input to the program.
[]	Messages or parameters enclosed in square brackets can be omitted.
|	Choose one from multiple choices. A|B|C|D means choose from A, B, C, and D.
{}	Groups choice in braces. A|B({C|D}) means choose one of A, B(C),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

The following shows the description example of command.

■Example of program command



■Example of query command



The < and > in the example indicate the response and the program message respectively.

Notes:

- Any commands for MX183000A are sequential commands.
- If commands have restrictions, other settings may be affected. For the setting items to be affected and conditions to be restricted, refer to *MX180000A Signal Quality Analyzer Control Software Operation Manual* and operation manual for each module.
- When the parameters of program command and query command are same, the parameter of query command may be omitted.

5.4 IEEE488.2 Common Commands

MX183000A supports the following IEEE188.2 common commands.

Table 5.4-1 IEEE488.2 Common Commands List

Mnemonic	Command's full spell
*CLS	Clear Status Command
*IDN?	Identification Query

*CLS Clear Status Command

Parameter: None

Function: Clears any event register and queue excluding output queues and their MAV summary messages for MX183000A.

Example:
```
> *CLS
```

*IDN? Identification Query

Parameter: None

Response:
<Manufacturer>, <Model>, <Serial No.>
<Manufacturer>, <Model>=<CHARACTER RESPONSE DATA>
ANRITSU
MX183000A
<Serial No.>=<NR1 NUMERIC RESPONSE DATA>
0000000000
The serial No. of MX183000A is always "0000000000".
Main frame Serial number

Function: Reports manufacture name, model, etc.

Example:
```
> :MFRame:ID 0
> *IDN?
< ANRITSU,MX183000A,0000000000
```

5.5 MX183000A Command List (Tree)

The command list of MX183000A is displayed in tree.

Table 5.5-1 MX183000A Command Tree

No.	Command Header 1	Command Header 2	Command Header 3	Command Header 4	Command Header 5	Command/ Query
1	:CALCulate	:DATA	:EALarm			Q
2		:RESult	:EMONitor			Q
3			:DATA			Q
4			:STATus			Q
5	:DISPlay	:MEASure	:CHANge			C
6		:RESult	:BER			C/Q
7			:ESTimate			C/Q
8				:ERATe		C/Q
9	:INPut	:CLOCk	:SELection			C/Q
10	:LTRaining	:SEQuence	:DESign	:GEN1		C/Q
11				:GEN2		C/Q
12				:REV1	:CONFiguration	C/Q
13				:REV2	:CONFiguration	C/Q
14					:RECovery	C/Q
15				:REV3	:CONFiguration	C/Q
16					:RECovery	C/Q
17				:REV4	:RECovery	C/Q
18			:DSCRamble			C/Q
19			:DSYMbol			C/Q
20			:FSWing			C/Q
21			:FTS			C/Q
22			:INITialize			C
23			:LANenum			C/Q
24			:LENTry	:TS		C/Q
25			:LFRequency			C/Q
26			:LINKnum			C/Q
27			:LTHRough			C
28			:PACTive	:TS		C/Q
29			:REIeos	:INTerval		C/Q

Table 5.5-1 MX183000A Command Tree (Cont'd)

No.	Command Header 1	Command Header 2	Command Header 3	Command Header 4	Command Header 5	Command/ Query
30	:LTRaining	:SEQuence	:SKP			C/Q
31				:SLENgth	:8B10B	C/Q
32					:128B130B	C/Q
33					:128B132B	C/Q
34				:INTerval	:8B10B	C/Q
35					:128B130B	C/Q
36					:128B132B	C/Q
37			:SPECification			C/Q
38			:STARt			C
39			:STATe			Q
40			:STOP			C
41			:TEST	:PATTern		C/Q
42	:SENSe	:JITTer	:TABLe	:ADD		C
43				:ADELete		C
44				:DELete		C
45				:FREQuency		Q
46				:INDex		Q
47		:MEASure	:BER	:STARt		C
48				:STATe		Q
49				:STOP		C
50			:BERCond	:ASEarch		C/Q
51				:GTIMe		C/Q
52				:RATiosetting		C/Q
53				:RESolution		C/Q
54				:SEARch		C/Q
55				:SEQuence		C/Q
56				:SSETing		C/Q
57				:STIMe		C/Q
58				:THReshold		C/Q
59				:UNIT		C/Q
60				:WTIMe		C/Q
61			:JITTer	:STARt		C
62				:STATe		Q
63				:STOP		C
64			:SYSCond	:BITRate		Q
65			:TABLedata	:OPEN		C
66				:SELect		Q
67				:SAVe		C

Table 5.5-1 MX183000A Command Tree (Cont'd)

No.	Command Header 1	Command Header 2	Command Header 3	Command Header 4	Command Header 5	Command/ Query
68	:SOURce	:PATTern	:TYPe			C/Q
69			:PRBS	:LENGth		C/Q
70	:SYSTem	:ERRor				Q
71		:EQUipment	:CONNect			C
72			:DCONnect			C
73			:LFPS			C/Q
74			:SEARch	:ENABle		C/Q
75				:SETTing		C/Q
76				:STARt		C
77			:SETTing			C/Q
78				:MODule		Q
79		:MEASure	:EXIT			C
80			:INITialize			C
81			:SELect			C/Q
82		:MMEMory	:RESult	:STORe		C
83			:SETTing	:RECall		C
84				:STORe		C
85		:TERMination				C/Q

5.6 Common Command

This section explains the commands for the common setting and function of MX183000A.

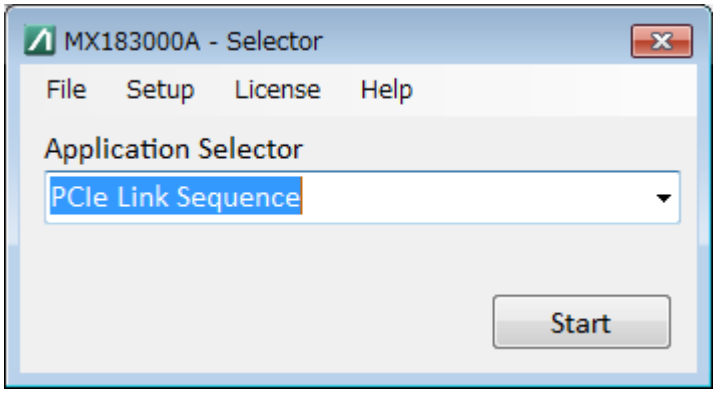


Figure 5.6-1 Selector Screen

Table 5.6-1 Common Command

Setting Item	Command
Queries error message	:SYSTem:ERRor?
Sets terminator	:SYSTem:TERMination
	:SYSTem:TERMination?
Start application setting	:SYSTem:MEASure:SELect
	:SYSTem:MEASure:SELect?
Displayed tab switching	:DISPlay:MEASure:CHANge

:SYSTem:ERRor?

Parameter	None
Response	<error/event_number>,"<error/event_description>" <error/event_number>=<NR1 NUMERIC RESPONSE DATA> –32768 to 32767 The value of zero indicates no error or no event occurrence. Others return standard errors reserved by SCPI or equipment-specific errors. <error/event_description>=<STRING RESPONSE DATA> Error messages corresponding to each <error/event_number>. The maximum length of this character string is 255 characters.
Function	Queries error messages that exist in errors or event queues.
Example	`> :SYSTem:ERRor?` `< 0, "No error"`

:SYSTem:TERMination <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA> 0 LF + EOI 1 CR + LF + EOI
Function	Sets terminator type of response data.
Example	To set terminator type to LF + EOI `> :SYSTem:TERMination 0`

:SYSTem:TERMination?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 0 LF + EOI 1 CR + LF + EOI
Function	Queries terminator of response data
Example	`> :SYSTem:TERMination?` `< 0`

:SYSTem:MEASure:SELect <item>

Parameter	<item>=<CHARACTER PROGRAM DATA>	
	NONE	Selector
	TOLerance	Jitter Tolerance Test
	PCI	PCIe Link Sequence
	USB	USB Link Sequence
Function	Selects the application to be started.	
Example	To select and start PCIe Link Sequence	
	`> :SYSTem:MEASure:SELect PCI`	

:SYSTem:MEASure:SELect <item>?

Response	<item>=<CHARACTER RESPONSE DATA>
	NONE,TOL,PCI,USB
Function	Queries the application running.
Example	`> :SYSTem:MEASure:SELect?`
	`< PCI`

:DISPlay:MEASure:CHANge <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	EQUipment	Setting window
	SEQuence	Sequence screen
	RUNTest	RunTest screen
	GRAPh	Graph screen
	REPort	Report window
Function	Switches between application display screens.	
	This command can be used after the application has been started using the :SYSTem:MEASure:SELect command and connected to the MP1800A using :SYSTem:EQUipment:CONNect.	
	Some screens may not be available depending on the particular MX183000A license.	
Example	To display the Tolerance Measurement Report screen	
	`> :DISPlay:MEASure:CHANge REPort`	

5.7 Setting Measurement System

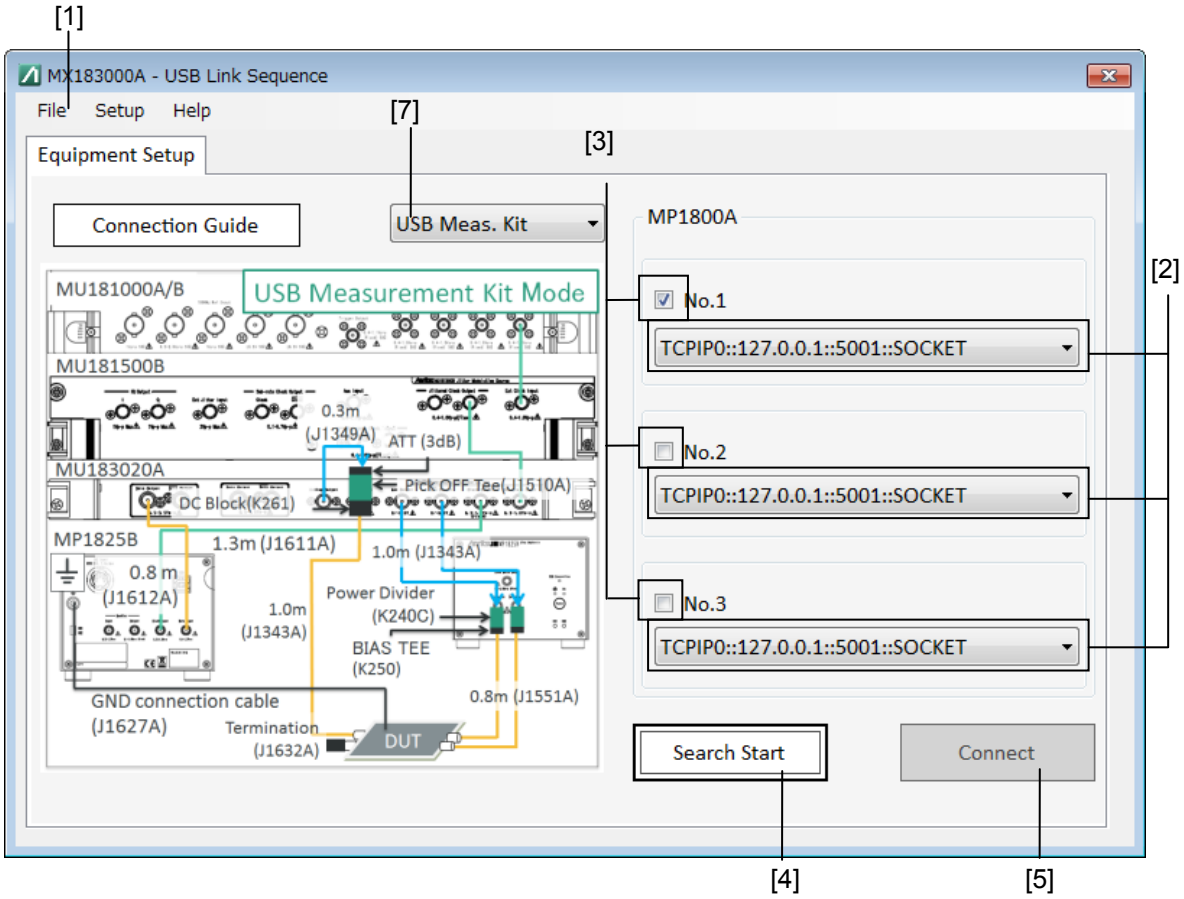


Figure 5.7-1 Equipment Setup Screen

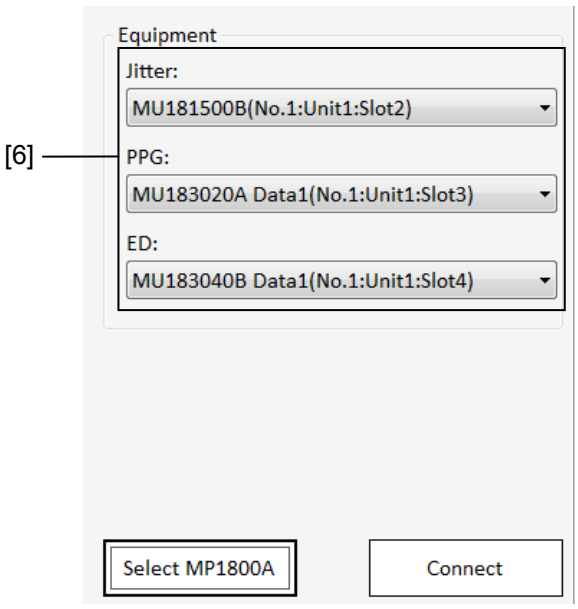


Figure 5.7-2 Equipment Setup Screen After Search Completion

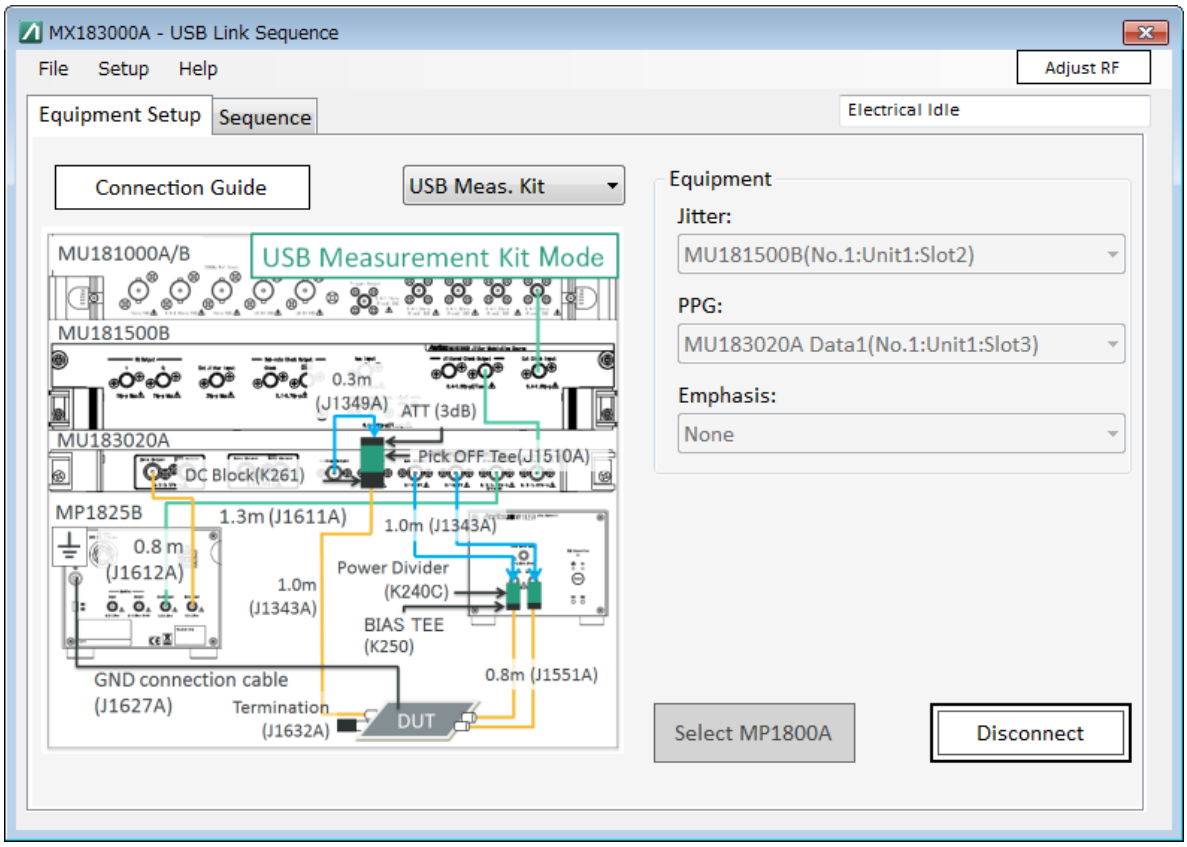


Figure 5.7-3 Equipment Setup Screen After Connect Completion

":SYSTem:EQUipment:CONNect" must be used to connect to the MP1800A except when using the following commands.

:SYSTem:MEASure:SELect
:SYSTem:MEASure:EXIT
:SYSTem:EQUipment:SEARch:SETTing
:SYSTem:EQUipment:SEARch:STARt
:SYSTem:EQUipment:SEARch:ENABle
:SYSTem:EQUipment:SEARch:SETTing
:SYSTem:EQUipment:SETTing:MODule
:SYSTem:EQUipment:CONNect

Table 5.7-1 Setting Commands of Main Window

No.	Setting Item	Command
[1]	Exit	:SYSTem:MEASure:EXIT
	Initialize	:SYSTem:MEASure:INITialize
	Save	:SYSTem:MMEMory:SETTing:STORe
	Load	:SYSTem:MMEMory:SETTing:RECall
[2]	MP1800A	:SYSTem:EQUipment:SEARch:SETTing
		:SYSTem:EQUipment:SEARch:SETTing?
[3]	Search Enable	:SYSTem:EQUipment:SEARch:ENABle
		:SYSTem:EQUipment:SEARch:ENABle?
[4]	Search Start	:SYSTem:EQUipment:SEARch:STARt
[5]	Connect	:SYSTem:EQUipment:CONNect
	Disconnect	:SYSTem:EQUipment:DCONnect
[6]	Equipment	:SYSTem:EQUipment:SETTing
		:SYSTem:EQUipment:SETTing?
		:SYSTem:EQUipment:SETTing:MODule?
[7]	Select USB connection method	:SYSTem:EQUipment:LFPS
		:SYSTem:EQUipment:LFPS?

:SYSTem:MEASure:EXIT

Parameter None

Function Closes the application.

Example
```
> :SYSTem:MEASure:EXIT
```

:SYSTem:MEASure:INITialize

Parameter None

Function Initializes the various measurement setting conditions.

Example
```
> :SYSTem:MEASure:INITialize
```

:SYSTem:MMEMory:SETTing:STORe <file_name>

Parameter <file_name>=<STRING PROGRAM DATA>
"<drv>:\<dir1>\<dir2>\<file>"
<drv>=C,D,E,F Drive name
<dir>=xxxxxxxx Directory name
<file>=xxxxxxxxx File name

Function Saves the measurement setting conditions.

Example
```
> :SYSTem:MMEMory:SETTing:STORe
"C:\test_folder\test_setting"
```

:SYSTem:MMEMory:SETTing:RECall <file_name>

Parameter	<file_name>=<STRING PROGRAM DATA>
	"<drv>:\<dir1>\<dir2>\<file>"
	<drv>=C,D,E,F Drive name
	<dir>=xxxxxxxx Directory name
	<file>=xxxxxxxxx File name
Function	Loads measurement setting conditions.
Example	`> :SYSTem:MMEMory:SETTing:RECall "C:\test_folder\test_setting"`

:SYSTem:EQUipment:SEARch:SETTing <info>,<number>

Parameter	<number>=<DECIMAL NUMERIC PROGRAM DATA>
	1 to 3 No.1 to 3
	<info>=<STRING PROGRAM DATA>
	TCPIP0::<address>::<port>::SOCKET
	<address>=xxx.xxx.xxx.xxx IP address
	<port>=xxxx port
	<number>=<DECIMAL NUMERIC PROGRAM DATA>
	1 to 3 No.1 to 3
Function	Specifies the controller number, and sets the IP address and port.
Example	Set the MP1800A assigned the IP Address 192.168.2.100 and port 5001 to controller No. 2.
	`>:SYSTem:EQUipment:SEARch:SETTing TCPIP0::192.168.2.100::5001::SOCKET,2`

:SYSTem:EQUipment:SEARch:SETTing? <number/type>

Parameter
<number>=<DECIMAL NUMERIC PROGRAM DATA>
1 to 3 No.1 to 3
<type>=<CHARACTER PROGRAM DATA >
LIST Connection target candidate list

Response
For argument <number>
<string>=<STRING RESPONSE DATA>
<string>=TCPIP0::<address>::<port>::SOCKET
<address>=<STRING RESPONSE DATA>
Output in form 223.255.255.254
<port>=<NR1 NUMERIC RESPONSE DATA >
1024 to 5001
For argument <type>
<string>=<STRING RESPONSE DATA>
<string>="TCPIP0::<address1>::<port1>::SOCKET,
TCPIP0::<address2>::<port2>::SOCKET,
…
TCPIP0::<address8>::<port8>::SOCKET,
TCPIP0::<address9>::<port9>::SOCKET"

Function
Specifies the controller number, and queries the IP address and port.
Displays the connection target candidate list.

Example
To query the IP address and port for the controller No. 2 MP1800A

```
> :SYSTem:EQUipment:SEARch:SETTing? 2
< TCPIP0::192.168.2.100::5001::SOCKET
```

Displays the connection target candidate list.

```
> :SYSTem:EQUipment:SEARch:SETTing? LIST
"TCPIP0::192.168.2.100::5001::SOCKET,TCPIP0::192.168.2.1
01::5001::SOCKET,TCPIP0::127.0.0.1::5001::SOCKET
```

:SYSTem:EQUipment:SEARch:ENABle <boolean>,[<number>]

Parameter
< boolean>=<BOOLEAN PROGRAM DATA>
ON or 1 Search ON
OFF or 0 Search OFF
<number>=<DECIMAL NUMERIC PROGRAM DATA>
1 to 3 No.1 to 3

Note:

When <number> is omitted, No.1 is set.

Function
Selects the search target equipment (MP1800A/MT1810A main unit).

Example
To set No.2 as the search target.

```
> :SYSTem:EQUipment:SEARch:ENABle 1,2
```

:SYSTem:EQUipment:SEARch:ENABle? [<number>]

Parameter	<number>=<DECIMAL NUMERIC PROGRAM DATA>
	1 to 3 No.1 to 3
	Note:
	When <number> is omitted, No.1 is queried.
Response	<boolean>=<NR1 NUMERIC RESPONSE DATA>
	1 Search ON
	0 Search OFF
Function	Queries the ON/OFF setting of the search target.
Example	To query the search setting of No.2.
	`> :SYSTem:EQUipment:SEARch:ENABle? 2`

:SYSTem:EQUipment:SEARch:STARt

Parameter	None
Function	Starts searching for the modules installed on the MP1800A specified as the controller.
Example	`> :SYSTem:EQUipment:SEARch:STARt`

:SYSTem:EQUipment:SETTing <type>,<number>,<unit>,<slot>[,<data_if>]

Parameter

<type>=<CHARACTER PROGRAM DATA>

JITTer	Jitter Modulation Source
PPG	PPG
ED	ED

<number>=<DECIMAL NUMERIC PROGRAM DATA>

1 to 3	MP1800A No.1 to 3

<slot>=<DECIMAL NUMERIC PROGRAM DATA>

1 to 6	Slot 1 to 6

[<data_if>]=<DECIMAL NUMERIC PROGRAM DATA>

1 to 4	Data 1 to 4

Note:

<data_if> can be set when the module installed in slot is bellow:
MU183020A, MU183021A, MU183040A/B, MU183041A/B
Data 1 is specified when omitted.

If <data_if> is set to other modules, the parameter error occurs.

With PCIe Link Sequence and USB Link Sequence, PPG <data_if> can be set to "1" only.

Function

Selects the equipment to be used for the measurement.

Example

To assign MP1800A No.1, Unit 1, and Slot 4 to Jitter Modulation Source.

```
> :SYSTem:EQUipment:SETTing JITTer,1,1,4
```

Assign MP1800A No. 1, Unit 1, Slot 4, Data 2 to the PPG.

```
> :SYSTem:EQUipment:SETTing PPG,1,1,4,2
```

:SYSTem:EQUipment:SETTing? <type>

Parameter

<type>=<CHARACTER PROGRAM DATA>

JITTer	Jitter Modulation Source
PPG	PPG
ED	ED

Response

<number>=<NR1 NUMERIC RESPONSE DATA>

1 to 3	MP1800A No.1 to 3
0	None

<unit>=<NR1 NUMERIC RESPONSE DATA>

1 to 4	Unit 1 to 4

<slot>=<NR1 NUMERIC RESPONSE DATA>

1 to 6	Slot 1 to 6
0	None

[<data_if>]=<NR1 NUMERIC RESPONSE DATA>

1 to 4	Data 1 to 4

Note:

<data_if> returns when the module installed in slot is bellow:

MU183020A, MU183021A, MU183040A/B, MU183041A/B

Function

Queries the equipment used for the measurement.

Example

To query the equipment used for the jitter modulation source.

```
> :SYSTem:EQUipment:SETTing? JITTer
< 1,1,4
```

When equipment is not assigned, the response of (None) is as follows:

```
< 0,0,0
```

:SYSTem:EQUipment:SETTing:MODule? <type>

Parameter

<type>=<CHARACTER PROGRAM DATA>

JITTer	Jitter Modulation Source
PPG	PPG
ED	ED

Response

<string>=<STRING RESPONSE DATA>

"<number>,<unit>,<slot>,[<data_if>]" (Up to 12)

<number>=<NR1 NUMERIC RESPONSE DATA>

1 to 3	MP1800A No.1 to 3
0	None

<unit>=<NR1 NUMERIC RESPONSE DATA>

1 to 4	Unit 1 to 4

<slot>=<NR1 NUMERIC RESPONSE DATA>

1 to 6	Slot 1 to 6
0	None

[<data_if>]=<NR1 NUMERIC RESPONSE DATA>

1 to 4	Data 1 to 4

Note:

<data_if> returns when the module installed in slot is bellow:

MU183020A, MU183021A, MU183040A/B, MU183041A/B

Function

Queries the equipment candidate to be used for the measurement. Selectable main unit No., Unit, and Slot are selected from the already searched equipment units.

Example

To query the equipment candidate for the jitter modulation source.

```
> :SYSTem:EQUipment:SETTing:MODule? JITTer
< "1,1,4","2,1,4","3,1,4"
```

When the equipment candidate does not exist, the response is as follows:

```
< 0,0,0
```

When MU183020A-x22/x23 are candidates for PPG, the response is as follows:

```
< "1,1,3,1","1,1,3,2"
```

:SYSTem:EQUipment:CONNect

Parameter	None
Function	Connects to the MP1800A with the IP address selected by :SYSTem:EQUipment:SEARch:ENABle. This command can be used after searching for equipment using :SYSTem:EQUipment:SEARch:SETTing.
Example	To connect to the MP1800A `> :SYSTem:EQUipment:CONNect`

:SYSTem:EQUipment:DCONnect

Parameter	None
Function	Disconnects from the MP1800A.
Example	To disconnect from the MP1800A `> :SYSTem:EQUipment:DCONnect`

:SYSTem:EQUipment:LFPS <type>

Parameter	<type>=<CHARACTER PROGRAM DATA> ADAPter Uses the USB Test Adapter. MKIT Uses the USB measurement kit.
Function	Select a method to connect a USB device.
Example	To select the connection method using the USB Test Adapter. `> :SYSTem:EQUipment:LFPS ADAPter` ***Note:*** This command is available when the MX183000A starts up in USB Link Sequence. It is unavailable when the MX183000A starts up in Jitter Tolerance Test or PCIe Link Sequence.

:SYSTem:EQUipment:LFPS?

Response	<type>=<CHARACTER PROGRAM DATA> ADAP, MKIT
Function	Queries a method to connect a USB device.
Example	> :SYSTem:EQUipment:LFPS? `< ADAP` ***Note:*** This command is available when the MX183000A starts up in USB Link Sequence. It is unavailable when the MX183000A starts up in Jitter Tolerance Test or PCIe Link Sequence.

5.8 PCIe Link Sequence Setup Screen (With Option 011 Installed)

This setup screen is available only when Option 011 is installed, when PCIe Link Sequence is started on the Selector screen, and when the MP1800A has been connected using Equipment Setup.

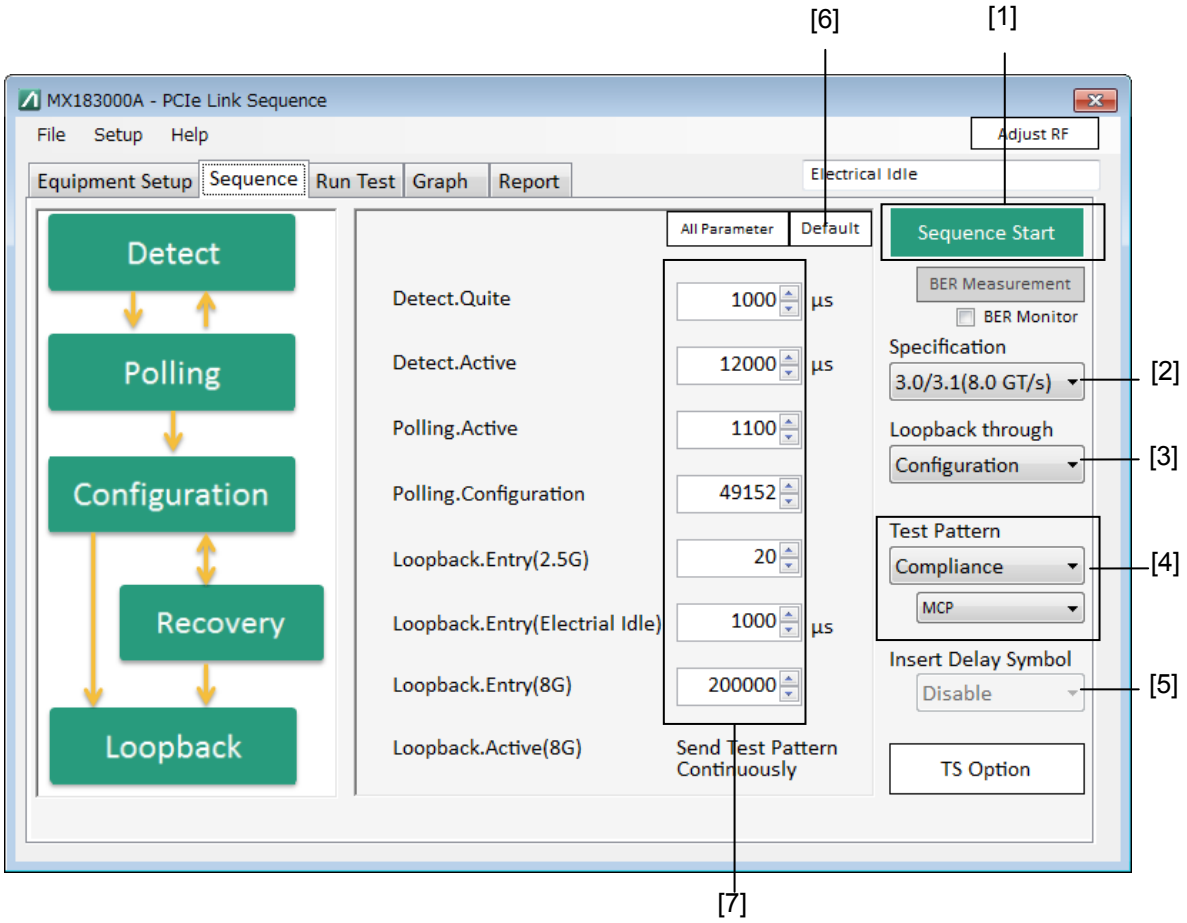


Figure 5.8-1 Sequence Screen

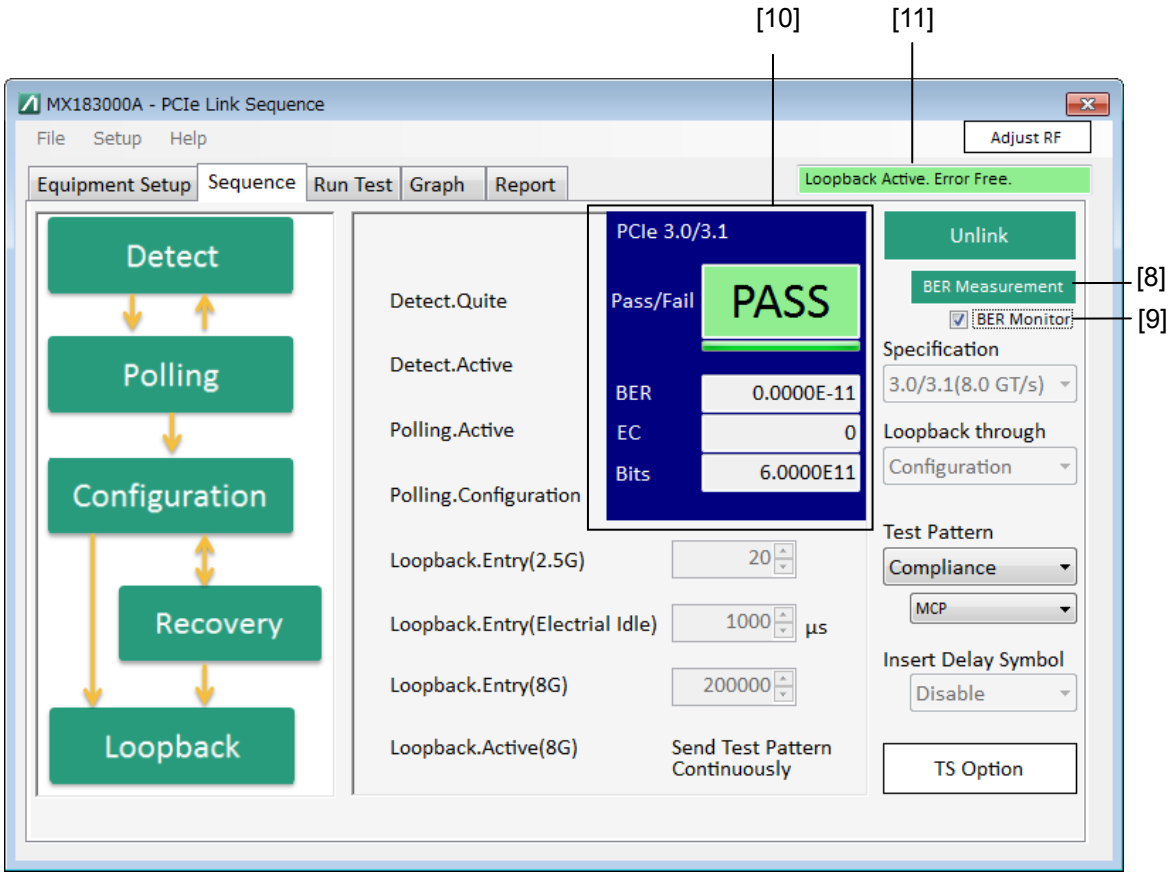


Figure 5.8-2 Sequence Screen (BER Measurement)

Table 5.8-1 Sequence Screen Setup Commands

No.	Setting Item	Command
[1]	Sequence Start	:LTRaining:SEQuence:STARt
	Sequence Stop	:LTRaining:SEQuence:STOP
	State	:LTRaining:SEQuence:STATe?
[2]	Specification	:LTRaining:SEQuence:SPECification
		:LTRaining:SEQuence:SPECification?
[3]	Loopback through	:LTRaining:SEQuence:LTHRough
		:LTRaining:SEQuence:LTHRough?
[4]	Test Pattern	:SOURce:PATTern:TYPE
		:SOURce:PATTern:TYPE?
		:LTRaining:SEQuence:TEST:PATTern
		:LTRaining:SEQuence:TEST:PATTern?
		:SOURce:PATTern:PRBS:LENGth
		:SOURce:PATTern:PRBS:LENGth?
[5]	Insert Delay Symabol	:LTRaining:SEQuence:DSYMbol
		:LTRaining:SEQuence:DSYMbol?
[6]	Default	:LTRaining:SEQuence:INITialize
[7]	Sequence	:LTRaining:SEQuence:DESign:REV1:CONF
		:LTRaining:SEQuence:DESign:REV1:CONF?
		:LTRaining:SEQuence:DESign:REV2:CONF
		:LTRaining:SEQuence:DESign:REV2:CONF?
		:LTRaining:SEQuence:DESign:REV2:REC
		:LTRaining:SEQuence:DESign:REV2:REC?
		:LTRaining:SEQuence:DESign:REV3:CONF
		:LTRaining:SEQuence:DESign:REV3:CONF?
		:LTRaining:SEQuence:DESign:REV3:REC
		:LTRaining:SEQuence:DESign:REV3:REC?
		:LTRaining:SEQuence:DESign:REV4:REC
		:LTRaining:SEQuence:DESign:REV4:REC?
[8]	BER Measurement Start	:SENSe:MEASure:BER:STARt
	BER Measurement Stop	:SENSe:MEASure:BER:STOP
	BER Measurement Start	:SENSe:MEASure:BER:STATe?
[9]	BER Monitor	:DISPlay:RESult:BER
		:DISPlay:RESult:BER?
[10]	BER Measurement Result	:CALCulate:DATA:EALarm?
[11]	28G/32G ED	:CALCulate:RESult:EMONitor?

:LTRaining:SEQuence:STARt

Parameter	None
Function	Starts sending a sequence pattern to loopback the DUT. Once the transmission is complete, the pattern selected by Test Pattern is sent.
Example	`> :LTRaining:SEQuence:STARt`

:LTRaining:SEQuence:STOP

Parameter	None
Function	Stops sending a sequence pattern and test pattern and sets to Electrical Idle.
Example	`> :LTRaining:SEQuence:STOP`

:LTRaining:SEQuence:STATe?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	0	Stop
	1	Sending
	2	Sending test pattern
Function	Queries the sequence pattern transmission status.	
Example	`> :LTRaining:SEQuence:STATe?` `< 1`	

:LTRaining:SEQuence:SPECification <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	REV1	Revision1.0/1.1
	REV2	Revision2.0
	REV3	Revision3.0/3.1
	REV4	Revision4.0
Function	Selects the environment (revision) to loopback the DUT.	
Example	To set the environment to REV4(16.0 GT/s) `> :LTRaining:SEQuence:SPECification REV4`	

Note:

The clock frequency input to MU181500B must be changed by the user when MU181000A/B is not installed.

:LTRaining:SEQuence:SPECification?

Response	<type>=<CHARACTER RESPONSE DATA>
	REV1, REV 2, REV 3, REV 4
Function	Queries the environment to loopback the DUT.
Example	> :LTRaining:SEQuence:SPECification?
	< REV4

:LTRaining:SEQuence:LTHRough <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	CONFiguration	Configuration route
	RECovery	Recovery route
Function	Select the LTSSM route to loopback the DUT.	
Example	To set the state route to Configuration route	
	> :LTRaining:SEQuence:LTHRough CONFiguration	

:LTRaining:SEQuence:LTHRough?

Response	<type>=<CHARACTER RESPONSE DATA>
	REC, CONF
Function	Queries the LTSSM route to loopback the DUT.
Example	> :LTRaining:SEQuence:LTHRough?
	< CONF

:SOURce:PATTern:TYPE <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	COMPliance	Compliance pattern
	PRBS	PRBS pattern
Function	Selects the test pattern to be sent after the sequence has been sent.	
Example	To set the test pattern to Compliance Pattern	
	>:SOURce:PATTern:TYPE COMPliance	

:SOURce:PATTern:TYPE?

Response	<type>=<CHARACTER RESPONSE DATA>
	COMP, PRBS
Function	Queries the test pattern to be sent after the sequence has been sent.
Example	> :SOURce:PATTern:TYPE?
	< COMP

:LTRaining:SEQuence:TEST:PATTern <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	CP	Compliance Pattern
	MCP	Modified Compliance Pattern
Function	Selects the type of Compliance Pattern to be sent when test pattern ":SOURce:PATTern:TYPE" is set to Compliance.	
Example	`> :LTRaining:SEQuence:TEST:PATTern CP`	

:LTRaining:SEQuence:TEST:PATTern?

Response	<type>=<CHARACTER RESPONSE DATA>	
	CP	Compliance Pattern
	MCP	Modified Compliance Pattern
Function	Queries the type of Compliance Pattern to be sent.	
Example	`> :LTRaining:SEQuence:TEST:PATTern?`	
	`< CP`	

:SOURce:PATTern:PRBS:LENGth <numeric >

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	7	2^n-1 (n=7)
	9	2^n-1 (n=9)
	10	2^n-1 (n=10)
	11	2^n-1 (n=11)
	15	2^n-1 (n=15)
	20	2^n-1 (n=20)
	23	2^n-1 (n=23)
	31	2^n-1 (n=31)
Function	Sets the number of stages (2^n-1 (n=7, 9, 10, 11, 15, 20, 23, or 31)) for PRBS pattern reception.	
Example	To set the number of stages for PRBS pattern reception to 2^7-1.	
	`> :SOURce:PATTern:PRBS:LENGth 7`	

:SOURce:PATTern:PRBS:LENGth?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	7, 9, 10, 11, 15, 20, 23, 31
Function	Queries the number of stages for PRBS pattern reception.
Example	`> :SOURce:PATTern:PRBS:LENGth?`
	`< 7`

:LTRaining:SEQuence:DSYMbol <boolean>

Parameter	<boolean>=<BOOLEAN PROGRAM DATA>	
	OFF or 0	Delay Symbol not inserted
	ON or 1	Delay Symbol inserted
Function	Selects whether to insert a Delay Symbol.	
Example	`> :LTRaining:SEQuence:DSYMbol ON`	

:LTRaining:SEQuence:DSYMbol?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	0	Delay Symbol not inserted
	1	Delay Symbol inserted
Function	Queries whether the Delay Symbol is to be inserted.	
Example	`> :LTRaining:SEQuence:DSYMbol?`	
	`< 1`	

:LTRaining:SEQuence:INITialize [<spec>][,<state>]

Parameter	<spec>=<CHARACTER PROGRAM DATA>	
	REV1	Revision1.0/1.1
	REV2	Revision2.0
	REV3	Revision3.0/3.1
	REV4	Revision4.0
	<state>=<CHARACTER PROGRAM DATA>	
	CONFiguration	Configuration root
	RECovery	Recovery root

Note:

If <state> is omitted, the <spec> pattern specified is initialized.

If <spec><state> is omitted, all patterns are initialized.

Function	Sets all sequence parameters to their initial values.
Example	To initialize the parameters for REV2 Recovery Root
	`> :LTRaining:SEQuence:INITialize REV2,RECovery`

:LTRaining:SEQuence:DESign:REV1:CONFiguration <type>,<numeric>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	LEMaster	LOOPBACK_ENTRY_MASTER
	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles per step
	1 to 1000000	1 to 1000000 µs Wait time/1 µs Step
Function	Sets a sequence pattern to loopback the DUT (REV1).	

Example	To set the wait for DETECT_QUITE to 100 µs
	`> :LTRaining:SEQuence:DESign:REV1:CONFiguration DQU,100`
	To set the number of times POLLING_ACTIVE patterns are sent to 1024
	`> :LTRaining:SEQuence:DESign:REV1:CONFiguration PACTive,1024`	

:LTRaining:SEQuence:DESign:REV1:CONFiguration? <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	LEMaster	LOOPBACK_ENTRY_MASTER
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles
	1 to 1000000	1 to 1000000 µs Wait time
Function	Queries the sequence pattern to loopback the DUT. (REV1)	

Example	`>:LTRaining:SEQuence:DESign:REV1:CONFiguration? DQU`
	`< 100`
	`>:LTRaining:SEQuence:DESign:REV1:CONFiguration? PACT`
	`< 1024`	

:LTRaining:SEQuence:DESign:REV2:CONFiguration<type>,<numeric>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	LEMaster1	LOOPBACK_ENTRY_MASTER
	LEMChange	LOOPBACK_ENTRY_MASTER_CHANGE (wait)
	LEMaster2	LOOPBACK_ENTRY_MASTER
	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles per step
	1 to 1000000	1 to 1000000 µs Wait time/1 µs Step
Function	Sets a sequence pattern to loopback the DUT (REV2).	

Example	To set the wait for DETECT_QUITE to 100 µs
	`> :LTRaining:SEQuence:DESign:REV2:CONFiguration DQUite,100`
	To set the number of times POLLING_ACTIVE patterns are sent to 1024
	`> :LTRaining:SEQuence:DESign:REV2:CONFiguration PACTive,1024`	

:LTRaining:SEQuence:DESign:REV2:CONFiguration? <numeric>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	LEMaster1	LOOPBACK_ENTRY_MASTER
	LEMChange	LOOPBACK_ENTRY_MASTER_CHANGE (wait)
	LEMaster2	LOOPBACK_ENTRY_MASTER
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles
	1 to 1000000	1 to 1000000 µs Wait time
Function	Queries the sequence pattern to loopback the DUT. (REV2)	

Example	`>:LTRaining:SEQuence:DESign:REV2:CONFiguration? DQU`
	`< 100`
	`>:LTRaining:SEQuence:DESign:REV2:CONFiguration? PACT`
	`< 1024`	

:LTRaining:SEQuence:DESign:REV2:RECovery <type>,<numeric>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	CLIStart	CONFIGURATION_LINKWIDTH_START
	CLIaccept	CONFIGURATION_LINKWIDTH_ACCEPT
	CLAWait	CONFIGURATIONS_LANE_WAIT
	CLAaccept	CONFIGURATIONS_LANE_ACCEPT
	CCOMplete	CONFIGURATION_COMPLETE
	CIDLe	CONFIGURATION_IDLE (wait)
	RRLock1	RECOVERY_RCVR_LOCK
	RRCeqts2	RECOVERY_RCVR_CFG_EQTS2
	RSPeed	RECOVERY_SPEED (wait)
	RRLock2	RECOVERY_RCVR_LOCK
	RRCTs2	RECOVERY_RCVR_CFG_TS2
	LEMaster	LOOPBACK_ENTRY_MASTER
	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles per step
	1 to 1000000	1 to 1000000 µs Wait time/1 µs Step
Function	Sets a sequence pattern to loopback the DUT (REV2).	

Example	To set the wait for DETECT_QUITE to 100 µs
	`> :LTRaining:SEQuence:DESign:REV2:RECovery DQU,100`
	To set the number of times POLLING_ACTIVE patterns are sent to 1024
	`> :LTRaining:SEQuence:DESign:REV2:RECovery PACT,1024`	

:LTRaining:SEQuence:DESign:REV2:RECovery? <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	CLIStart	CONFIGURATION_LINKWIDTH_START
	CLIaccept	CONFIGURATION_LINKWIDTH_ACCEPT
	CLAWait	CONFIGURATIONS_LANE_WAIT
	CLAaccept	CONFIGURATIONS_LANE_ACCEPT
	CCOMplete	CONFIGURATION_COMPLETE
	CIDLe	CONFIGURATION_IDLE (wait)
	RRLock1	RECOVERY_RCVR_LOCK
	RRCeqts2	RECOVERY_RCVR_CFG_EQTS2
	RSPeed	RECOVERY_SPEED (wait)
	RRLock2	RECOVERY_RCVR_LOCK
	RRCTs2	RECOVERY_RCVR_CFG_TS2
	LEMaster	LOOPBACK_ENTRY_MASTER
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles
	1 to 1000000	1 to 1000000 µs Wait time
Function	Queries the sequence pattern to loopback the DUT. (REV2)	

Example	`>:LTRaining:SEQuence:DESign:REV2:RECovery? DQUite`
	`< 100`
	`>:LTRaining:SEQuence:DESign:REV2:RECovery? PACTive`
	`< 1024`	

:LTRaining:SEQuence:DESign:REV3:CONFiguration <type>,<numeric>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	LEMaster1	LOOPBACK_ENTRY_MASTER
	LEMChange	LOOPBACK_ENTRY_MASTER_CHANGE (wait)
	LEMaster2	LOOPBACK_ENTRY_MASTER
	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles per step
	1 to 1000000	1 to 1000000 µs Wait time/1 µs Step
Function	Sets a sequence pattern to loopback the DUT (REV3).	

Example	To set the wait for DETECT_QUITE to 100 µs
	`> :LTRaining:SEQuence:DESign:REV3:CONFiguratuion DQUite,100`
	To set the number of times POLLING_ACTIVE patterns are sent to 1024
	`> :LTRaining:SEQuence:DESign:REV3:CONFiguratuion PACTive,1024`	

:LTRaining:SEQuence:DESign:REV3:CONFiguration? <numeric>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	LEMaster1	LOOPBACK_ENTRY_MASTER
	LEMChange	LOOPBACK_ENTRY_MASTER_CHANGE (wait)
	LEMaster2	LOOPBACK_ENTRY_MASTER
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles
	1 to 1000000	1 to 1000000 µs Wait time
Function	Queries the sequence pattern to loopback the DUT. (REV3)	

Example	`>:LTRaining:SEQuence:DESign:REV3:CONFiguratuion? DQUite`
	`< 100`
	`>:LTRaining:SEQuence:DESign:REV3:CONFiguratuion? PACTive`
	`< 1024`	

:LTRaining:SEQuence:DESign:REV3:RECovery <type>,<numeric>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	CLIStart	CONFIGURATION_LINKWIDTH_START
	CLIaccept	CONFIGURATION_LINKWIDTH_ACCEPT
	CLAWait	CONFIGURATIONS_LANE_WAIT
	CLAaccept	CONFIGURATIONS_LANE_ACCEPT
	CCOMplete	CONFIGURATION_COMPLETE
	CIDLe	CONFIGURATION_IDLE (wait)
	RRLock1	RECOVERY_RCVRLOCK
	RRCeqts2	RECOVERY_RCVRCFG EQTS2
	RSPeed	RECOVERY_SPEED (wait)
	RRLock2	RECOVERY_RCVR_LOCK
	REPHase1	RECOVERY_EQUALIZATION PHASE1
	RRLock3	RECOVERY_RCVRLOCK
	RRCTs2	RECOVERY_RCVRCFG TS2
	LEMaster	LOOPBACK_ENTRY MASTER
	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles per step
	1 to 1000000	1 to 1000000 µs Wait time/1 µs Step
Function	Sets a sequence pattern to loopback the DUT (REV3).	
Example	To set the wait for DETECT_QUITE to 100 µs	
	`> :LTRaining:SEQuence:DESign:REV3:RECovery DQUite,100`	
	To set the number of times POLLING_ACTIVE patterns are sent to 1024	
	`> :LTRaining:SEQuence:DESign:REV3:RECovery PACTive,1024`	

:LTRaining:SEQuence:DESign:REV3:RECovery? <type >

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	CLIStart	CONFIGURATION_LINKWIDTH_START
	CLIaccept	CONFIGURATION_LINKWIDTH_ACCEPT
	CLAWait	CONFIGURATIONS_LANE_WAIT
	CLAaccept	CONFIGURATIONS_LANE_ACCEPT
	CCOMplete	CONFIGURATION_COMPLETE
	CIDLe	CONFIGURATION_IDLE (wait)
	RRLock1	RECOVERY_RCVRLOCK
	RRCeqts2	RECOVERY_RCVRCFG EQTS2
	RSPeed	RECOVERY_SPEED (wait)
	RRLock2	RECOVERY_RCVR_LOCK
	REPHase1	RECOVERY_EQUALIZATION PHASE1
	RRLock3	RECOVERY_RCVRLOCK
	RRCTs2	RECOVERY_RCVRCFG TS2
	LEMaster	LOOPBACK_ENTRY MASTER
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles
	1 to 1000000	1 to 1000000 µs Wait time
Function	Queries the sequence pattern to loopback the DUT. (REV3)	

Example	`>:LTRaining:SEQuence:DESign:REV3:RECovery? DQUite`
	`< 100`
	`>:LTRaining:SEQuence:DESign:REV3:RECovery? PACTive`
	`< 1024`	

:LTRaining:SEQuence:DESign:REV4:RECovery <type>,<numeric>

Parameter

<type>=<CHARACTER PROGRAM DATA >

DQUite	DETECT_QUITE (wait)
DACTive	DETECT_ACTIVE
PACTive	POLLING_ACTIVE
PCONfiguration	POLLING_CONFIGURATION
CLIStart	CONFIGURATION_LINKWIDTH_START
CLIaccept	CONFIGURATION_LINKWIDTH_ACCEPT
CLAWait	CONFIGURATIONS_LANE_WAIT
CLAaccept	CONFIGURATIONS_LANE_ACCEPT
CCOMplete	CONFIGURATION_COMPLETE
CIDLe	CONFIGURATION_IDLE (wait)
RRLock1	RECOVERY_RCVR_LOCK
RRCeqts21	RECOVERY_RCVR_CFG_EQTS2
RSPeed1	RECOVERY_SPEED (wait)
RRLock2	RECOVERY_RCVR_LOCK
REPHase11	RECOVERY_EQUALIZATION_PHASE1
RRLock3	RECOVERY_RCVR_LOCK
RRCTs21	RECOVERY_RCVR_CFG_TS2
RIDLe	RECOVERY_IDLE (wait)
RRLock4	RECOVERY_RCVR_LOCK
RRCeqts22	RECOVERY_RCVR_CFG_EQTS2
RSPeed2	RECOVERY_SPEED (wait)
RRLock5	RECOVERY_RCVR_LOCK
REPHase12	RECOVERY_EQUALIZATION_PHASE1
RRLock6	RECOVERY_RCVR_LOCK
RRCTs22	RECOVERY_RCVR_CFG_TS2
LEMaster	LOOPBACK_ENTRY_MASTER

<numeric>=<DECIMAL NUMERIC PROGRAM DATA>

1 to 1000000	1 to 1000000 cycles TS transmission cycles per step
1 to 1000000	1 to 1000000 µs Wait time/1 µs Step

Function

Sets a sequence pattern to loopback the DUT (REV4).

Example

To set the wait for DETECT_QUITE to 100 µs

```
> :LTRaining:SEQuence:DESign:REV4:RECovery DQUite,100
```

To set the number of times POLLING_ACTIVE patterns are sent to 1024

```
> :LTRaining:SEQuence:DESign:REV4:RECovery PACTive,1024
```

:LTRaining:SEQuence:DESign:REV4:RECovery? <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	DQUite	DETECT_QUITE (wait)
	DACTive	DETECT_ACTIVE
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	CLIStart	CONFIGURATION_LINKWIDTH_START
	CLIaccept	CONFIGURATION_LINKWIDTH_ACCEPT
	CLAWait	CONFIGURATIONS_LANE_WAIT
	CLAaccept	CONFIGURATIONS_LANE_ACCEPT
	CCOMplete	CONFIGURATION_COMPLETE
	CIDLe	CONFIGURATION_IDLE (wait)
	RRLock1	RECOVERY_RCVR_LOCK
	RRCeqts21	RECOVERY_RCVR_CFG_EQTS2
	RSPeed1	RECOVERY_SPEED (wait)
	RRLock2	RECOVERY_RCVR_LOCK
	REPHase11	RECOVERY_EQUALIZATION_PHASE1
	RRLock3	RECOVERY_RCVR_LOCK
	RRCTs21	RECOVERY_RCVR_CFG_TS2
	RIDLe	RECOVERY_IDLE (wait)
	RRLock4	RECOVERY_RCVR_LOCK
	RRCeqts22	RECOVERY_RCVR_CFG_EQTS2
	RSPeed2	RECOVERY_SPEED (wait)
	RRLock5	RECOVERY_RCVR_LOCK
	REPHase12	RECOVERY_EQUALIZATION_PHASE1
	RRLock6	RECOVERY_RCVR_LOCK
	RRCTs22	RECOVERY_RCVR_CFG_TS2
	LEMaster	LOOPBACK_ENTRY_MASTER
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles
	1 to 1000000	1 to 1000000 µs Wait time
Function	Queries the sequence pattern to loopback the DUT. (REV4)	

Example	`>:LTRaining:SEQuence:DESign:REV4:RECovery? DQU`
	`< 100`
	`>:LTRaining:SEQuence:DESign:REV4:RECovery? PACT`
	`< 1024`	

:SENSe:MEASure:BER:STARt

Parameter	None
Function	Starts BER Measurement.
Example	`> :SENSe:MEASure:BER:STARt`

:SENSe:MEASure:BER:STOP

Parameter	None
Function	Stops BER Measurement.
Example	`> :SENSe:MEASure:BER:STOP`

:SENSe:MEASure:BER:STATe?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	0	Stop
	1	Measurement in progress
Function	Queries BER Measurement status.	
Example	`> :SENSe:MEASure:BER:STATe?`	
	`< 1`	

:DISPlay:RESult:BER <boolean>

Parameter	<boolean>=<BOOLEAN PROGRAM DATA>	
	OFF or 0	Monitor hidden
	ON or 1	Monitor displayed
Function	Sets whether the BER Measurement results area is displayed or hidden.	
Example	`> :DISPlay:RESult:BER 1`	

:DISPlay:RESult:BER?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	0	Monitor hidden
	1	Monitor displayed
Function	Queries the BER Measurement results area display status.	
Example	`> :DISPlay:RESult:BER?`	
	`< 1`	

:CALCulate:DATA:EALarm? <result>

Parameter <result>=<STRING PROGRAM DATA>

For details on <result>, refer to Table 5.8-2.

Response <string>=<STRING RESPONSE DATA>

Table 5.8-2 Parameter

Items	<result1>	Format
Error Count	"EC"	Form1
Bit Count	"BITS"	Form1
Bit Error Rate	"BER"	Form2
Pass/fail judgment	"JUDGe"	String("PASS","FAIL","---")

Table 5.8-3 Response Format

Items	Format	Description
Form1 Integer	"XXXXXXX"	For 0 to 9999999
	"X.XXXXEXX"	For 1.0000E07 to 9.9999E17
	"-------"	No data corresponds to a query.
Form2 Decimal	"X.XXXXE–XX"	For 0.0001E–18 to 1.0000E00
	"-------"	No data corresponds to a query.

Function Queries the BER Measurement results (BITS).

Example
```
> :CALCulate:DATA:EALarm? "BITS"
< "1.0000E12"
```

:CALCulate:RESult:EMONitor?

Response <numeric>=<NR1 NUMERIC RESPONSE DATA>

0	Electrical Idle
1	Error Free
2	Error
3	Sync Loss
4	Clock Loss
5	Loopback Active when the 32G ED was not installed.

Function Queries the status of the 28G/32G ED.

Example
```
> :CALCulate:RESult:EMONitor?
< 1
```

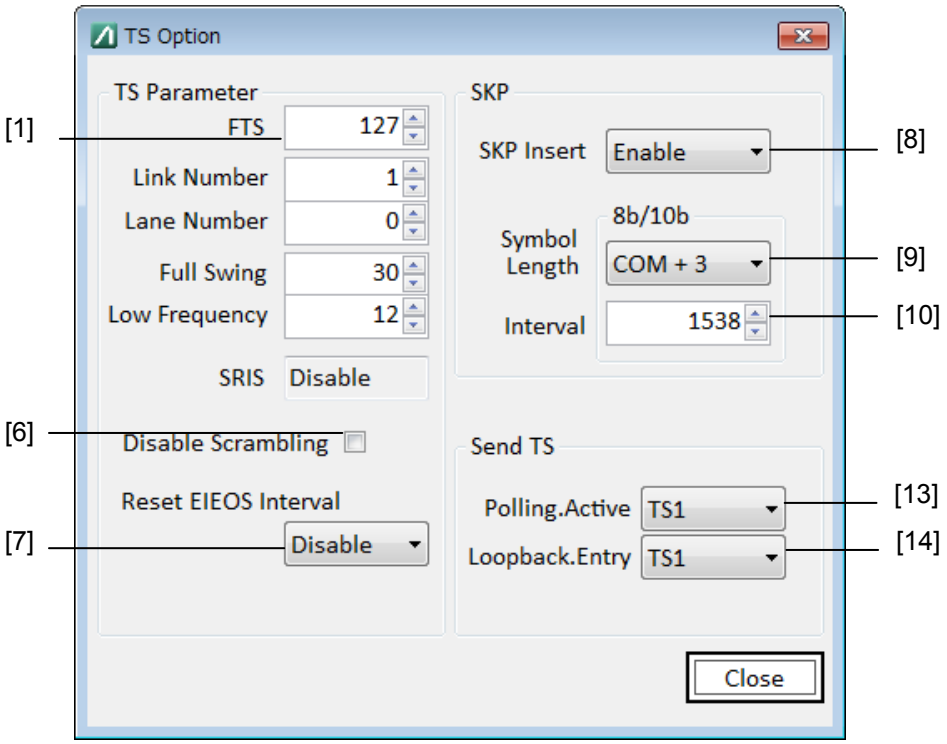


Figure 5.8-3 TS Option Screen (Rev1, Rev2)

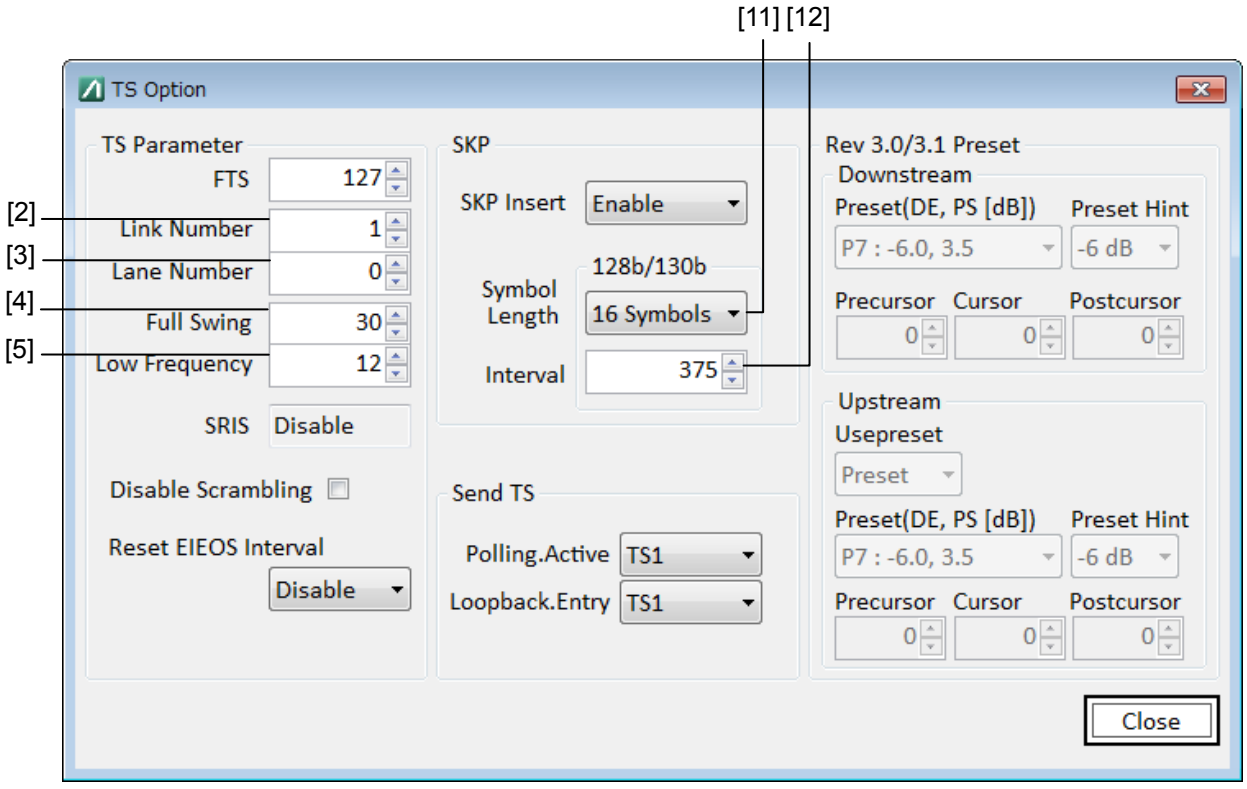


Figure 5.8-4 TS Option Screen (Rev3, Rev4)

Table 5.8-4 Sequence Option Screen Setup Command

No.	Setting Item	Command
[1]	FTS	:LTRaining:SEQuence:FTS
		:LTRaining:SEQuence:FTS?
[2]	Link Number	:LTRaining:SEQuence:LINKnum
		:LTRaining:SEQuence:LINKnum?
[3]	Lane Number	:LTRaining:SEQuence:LANenum
		:LTRaining:SEQuence:LANenum?
[4]	Full Swing	:LTRaining:SEQuence:FSWing
		:LTRaining:SEQuence:FSWing?
[5]	Low Frequency	:LTRaining:SEQuence:LFRequency
		:LTRaining:SEQuence:LFRequency?
[6]	Disable Scrambling	:LTRaining:SEQuence:DSCRamble
		:LTRaining:SEQuence:DSCRamble?
[7]	Reset EIEOS Interval	:LTRaining:SEQuence:REIeos:INTerval
		:LTRaining:SEQuence:REIeos:INTerval?
[8]	SKP Insert	:LTRaining:SEQuence:SKP
		:LTRaining:SEQuence:SKP?
[9]	Symbol Length 8b/10b	:LTRaining:SEQuence:SKP:SLENgth:8B10B
		:LTRaining:SEQuence:SKP:SLENgth:8B10B
[10]	Interval 8b/10b	:LTRaining:SEQuence:SKP:INTerval:8B10B
		:LTRaining:SEQuence:SKP:INTerval:8B10B?
[11]	Symbol Length 128/130	:LTRaining:SEQuence:SKP:SLENgth:128B130B
		:LTRaining:SEQuence:SKP:SLENgth:128B130B?
[12]	Interval 128/130	:LTRaining:SEQuence:SKP:INTerval:128B130B
		:LTRaining:SEQuence:SKP:INTerval:128B130B?
[13]	Send TS Polling.Active	:LTRaining:SEQuence:PACTive:TS
		:LTRaining:SEQuence:PACTive:TS?
[14]	Send TS Loopback.Entry	:LTRaining:SEQuence:LENTry:TS
		:LTRaining:SEQuence:LENTry:TS?

:LTRaining:SEQuence:FTS <numeric>

Parameter <numeric>=<DECIMAL NUMERIC PROGRAM DATA>

0 to 255 0 to 255/1step

Function Sets the TS FTS value.

Example To set the TS FTS value to 127

```
> :LTRaining:SEQuence:FTS 127
```

:LTRaining:SEQuence:FTS?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	0 to 255 0 to 255
Function	Queries the TS FTS setting.
Example	`> :LTRaining:SEQuence:FTS?`
	`< 127`

:LTRaining:SEQuence:LINKnum <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	0 to 255 0 to 255/1 Step
Function	Sets the TS Link Number.
Example	To set the Link Number to 1
	`> :LTRaining:SEQuence:LINKnum 1`

:LTRaining:SEQuence:LINKnum?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	0 to 255 0 to 255
Function	Queries the TS Link Number.
Example	`>:LTRaining:SEQuence:LINKnum?`
	`< 1`

:LTRaining:SEQuence:LANenum <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	0 to 255 0 to 255/1 Step
Function	Sets the TS Lane Number.
Example	To set the Lane Number to 1
	`> :LTRaining:SEQuence:LANenum 100`

:LTRaining:SEQuence:LANenum?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	0 to 255 0 to 255/1
Function	Queries the TS Lane Number.
Example	`> :LTRaining:SEQuence:LANenum?`
	`< 100`

:LTRaining:SEQuence:FSWing <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	12 to 63 12 to 63/1 Step
Function	Sets the TS Full Swing value.
Example	To set the TS Full Swing value to 30
	`> :LTRaining:SEQuence:FSWing 30`

:LTRaining:SEQuence:FSWing?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	12 to 63 12 to 63/1step
Function	Queries the TS Full Swing value.
Example	`> :LTRaining:SEQuence:FSWing?`
	`< 30`

:LTRaining:SEQuence:LFRequency <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	12 to 63 12 to 63/1 Step
Function	Sets the TS Low Frequency value.
Example	To set the Low Frequency value to 30
	`> :LTRaining:SEQuence:LFRequency 30`

:LTRaining:SEQuence:LFRequency?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	12 to 63 12 to 63/1step
Function	Queries the TS Low Frequency value.
Example	`> :LTRaining:SEQuence:LFRequency?`
	`< 30`

:LTRaining:SEQuence:DSCRamble <boolean>

Parameter	<boolean>=<BOOLEAN PROGRAM DATA>
	OFF or 0 De-assert
	ON or 1 Assert
Function	Sets the TS Disable scramble bit.
Example	To set Disable scramble to Asset
	`> :LTRaining:SEQuence:DSCRamble 1`

:LTRaining:SEQuence:DSCRamble?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	0	De-assert
	1	Assert
Function	Queries the TS Disable scramble bit value.	
Example	`> :LTRaining:SEQuence:DSCRamble?`	
	`< 1`	

:LTRaining:SEQuence:REIeos:INTerval <boolean>

Parameter	<boolean>=<BOOLEAN PROGRAM DATA>	
	OFF or 0	Disables the Reset EIEOS Interval Count bit.
	ON or 1	Enables the Reset EIEOS Interval Count bit.
Function	Sets the TS Reset EIEOS Interval Count bit value.	
Example	`> :LTRaining:SEQuence:REIeos:INTerval ON`	

:LTRaining:SEQuence:REIeos:INTerval?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	0	The Reset EIEOS Interval Count bit disabled.
	1	The Reset EIEOS Interval Count bit enabled.
Function	Queries the TS Reset EIEOS Interval Count bit value.	
Example	`> :LTRaining:SEQuence:REIeos:INTerval?`	
	`< 1`	

:LTRaining:SEQuence:SKP <boolean>

Parameter	<boolean>=<BOOLEAN PROGRAM DATA>	
	OFF or 0	SKP OS not inserted
	ON or 1	SKP OS inserted
Function	Selects whether to insert SKP OS while sending a sequence.	
Example	To insert SKP OS	
	`> :LTRaining:SEQuence:SKP ON`	

:LTRaining:SEQuence:SKP?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	0	SKP OS not inserted
	1	SKP OS inserted
Function	Queries whether SKP OS is inserted while sending a sequence.	
Example	`>: LTRaining:SEQuence:SKP?`	
	`< 1`	

:LTRaining:SEQuence:SKP:SLENgth:8B10B <numeric>

Parameter	<numeric>=<NR1 NUMERIC PROGRAM DATA>
	1 COM + 1 symbol
	2 COM + 2 symbols
	3 COM + 3 symbols
	4 COM + 4 symbols
	5 COM + 5 symbols
Function	Sets the number of SKP symbols to be inserted by SKP Ordered Set for 8b/10b Encoding operation.
Example	To set the number of SKP OS SKP symbols to 3.
	`>:LTRaining:SEQuence:SKP:SLENgth:8B10B 3`

:LTRaining:SEQuence:SKP:SLENgth:8B10B?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	1, 2, 3, 4, 5
Function	Queries the number of SKP symbols to be inserted by SKP Ordered Set for 8b/10b Encoding operation.
Example	`> :LTRaining:SEQuence:SKP:SLENgth:8B10B?`
	`< 3`

:LTRaining:SEQuence:SKP:INTerval:8B10B <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	768 to 3076 768 to 3076/2step
Function	Sets the interval for SKP Ordered Set occurring during TS transmission for 8b/10b Encoding operation.
Example	To generate an SKP OS once after every 1538 symbols sent
	`>:LTRaining:SEQuence:SKP:INTerval:8B10B 1538`

:LTRaining:SEQuence:SKP:INTerval:8B10B?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	768 to 3076 768 to 3076/2step
Function	Queries the interval for SKP Ordered Set occurring during TS transmission for 8b/10b Encoding operation.
Example	`>:LTRaining:SEQuence:SKP:INTerval:8B10B?`
	`< 1538`

:LTRaining:SEQuence:SKP:SLENgth:128B130B <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	8	8 Symbols
	12	12 Symbols
	16	16 Symbols
	20	20 Symbols
	24	24 Symbols
Function	Sets the number of SKP symbols to be inserted by SKP Ordered Set for 128b/130b Encoding operation.	
Example	To set the number of SKP OS SKP symbols to 8.	
	`> :LTRaining:SEQuence:SKP:SLENgth:128B130B 8`	

:LTRaining:SEQuence:SKP:SLENgth:128B130B?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	8, 12, 16, 20, 24
Function	Queries the number of SKP symbols to be inserted by SKP Ordered Set for 128b/130b Encoding operation.
Example	`> :LTRaining:SEQuence:SKP:SLENgth:128B130B?`
	`< 8`

:LTRaining:SEQuence:SKP:INTerval:128B130B <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	187 to 750	187 to 750/1step
Function	Sets the interval for SKP Ordered Set occurring during TS transmission for 128b/130b Encoding operation.	
Example	To generate an SKP OS once after every 375 blocks sent	
	`>:LTRaining:SEQuence:SKP:INTerval:128B130B 375`	

:LTRaining:SEQuence:SKP:INTerval:128B130B?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	187 to 750	187 to 750
Function	Queries the interval for SKP Ordered Set occurring during TS transmission for 128b/130b Encoding operation.	
Example	`>:LTRaining:SEQuence:SKP:INTerval:128b130b?`	
	`< 375`	

:LTRaining:SEQuence:PACTive:TS <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	TS1 or 0	Sends TS1 Ordered Set.
	EQTS1 or 1	Sends EQ TS1 Ordered Set.
Function	Selects the type of TS sent for Polling Active State.	
Example	To set the TS to be sent for Polling Active State to TS1 Ordered Set.	
	`> :LTRaining:SEQuence:PACTive:TS TS1`	

:LTRaining:SEQuence:PACTive:TS?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	0	Sends TS1 Ordered Set.
	1	Sends EQ TS1 Ordered Set.
Function	Queries the type of TS sent for Polling Active State.	
Example	`> :LTRaining:SEQuence:PACTive:TS?`	
	`< 0`	

:LTRaining:SEQuence:LENTry:TS <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	0	Sends TS1 Ordered Set.
	1	Sends EQ TS1 Ordered Set.
Function	Selects the type of TS sent for Loopback Entry State.	
Example	To set the TS to be sent for Loopback Entry State to TS1 Ordered Set	
	`> :LTRaining:SEQuence:LENTry:TS TS1`	

:LTRaining:SEQuence:LENTry:TS?

Response	<type>=<CHARACTER RESPONSE DATA>	
	0	Sends TS1 Ordered Set.
	1	Sends EQ TS1 Ordered Set.
Function	Queries the type of TS sent for Polling Active State.	
Example	`> :LTRaining:SEQuence:LENTry:TS?`	
	`< 0`	

5.9 USB Link Sequence Setup Screen (With Option 012 Installed)

This setup screen is available only when Option 012 is installed, when USB Link Sequence is started on the Selector screen, and when the MP1800A has been connected using Equipment Setup.

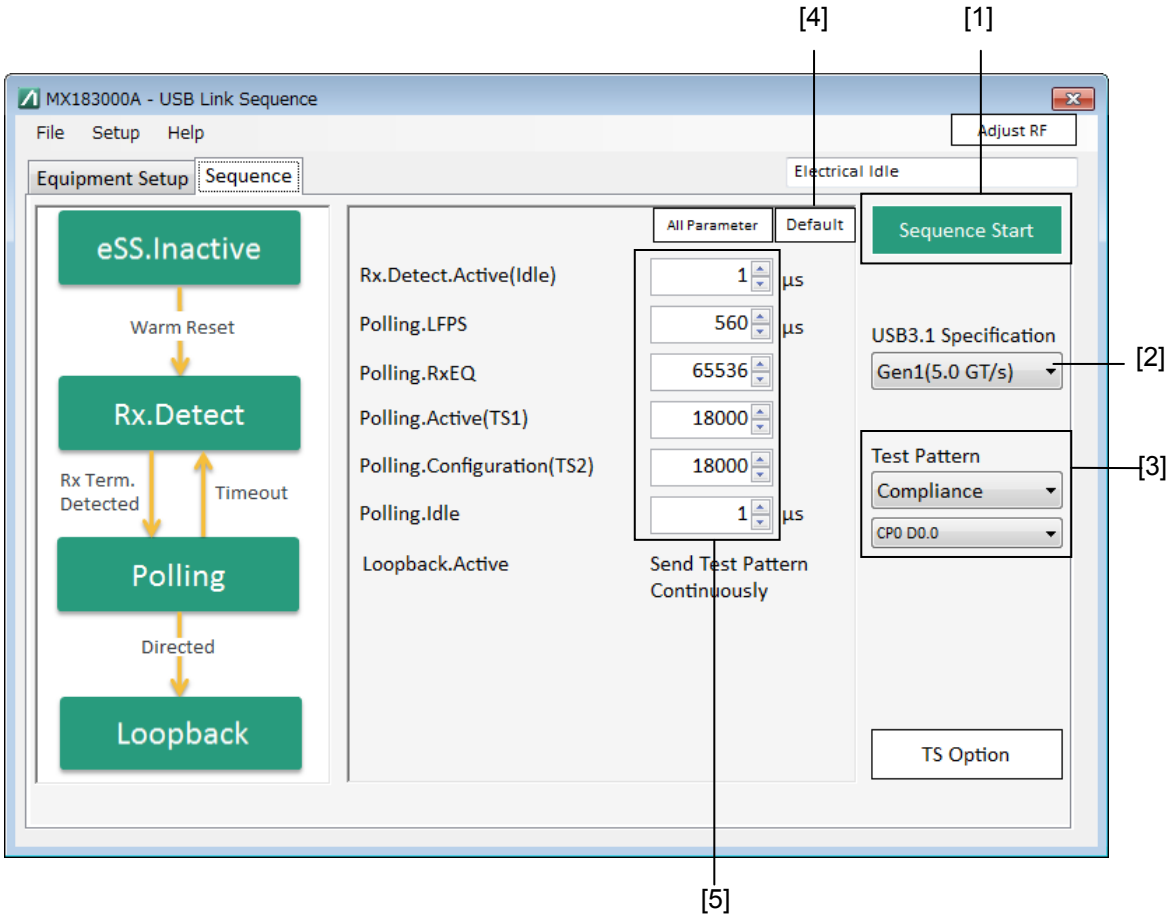


Figure 5.9-1 Sequence Screen

Table 5.9-1 Sequence Screen Setup Commands

No.	Setting Item	Command
[1]	Sequence Start	:LTRaining:SEQuence:STARt
	Sequence Stop	:LTRaining:SEQuence:STOP
	Sequence State	:LTRaining:SEQuence:STATe?
[2]	Specification	:LTRaining:SEQuence:SPECification
		:LTRaining:SEQuence:SPECification?
[3]	Test pattern	:SOURce:PATTern:TYPE
		:SOURce:PATTern:TYPE?
		:LTRaining:SEQuence:TEST:PATTern
		:LTRaining:SEQuence:TEST:PATTern?
[4]	DUT	:LTRaining:SEQuence:DUT
		:LTRaining:SEQuence:DUT?
[5]	Reset	:LTRaining:SEQuence:INITialize
[6]	Sequence	:LTRaining:SEQuence:DESign:GEN1
		:LTRaining:SEQuence:DESign:GEN1?
		:LTRaining:SEQuence:DESign:GEN2
		:LTRaining:SEQuence:DESign:GEN2?

The following commands are the same as with PCIe Link Sequence.
For details refer to the PCIe Link Sequence Setup Screen.
:LTRaining:SEQuence:STARt
:LTRaining:SEQuence:STOP
:LTRaining:SEQuence:STATe?

:LTRaining:SEQuence:SPECification <type>

Parameter <type>=<CHARACTER PROGRAM DATA>

GEN1	SuperSpeed (5.0 GT/s)
GEN2	SuperSpeedPlus (10.0 GT/s)

Function Selects an environment to loopback the DUT supporting USB3.0/3.1.

Example To set a sequence to GEN1(5.0 GT/s)

```
> :LTRaining:SEQuence:SPECification GEN1
```

Note:

The clock frequency input to MU183040A must be changed by the user when MU181000A/B is not installed.

:LTRaining:SEQuence:SPECification?

Response	<type>=<CHARACTER RESPONSE DATA>
	GEN1, GEN 2
Function	Queries the environment to loopback the DUT supporting USB3.0/3.1.
Example	> :LTRaining:SEQuence:SPECification?
	< GEN1

:SOURce:PATTern:TYPE <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>
	COMPliance Compliance pattern
	USER USER pattern
Function	Selects the test pattern to be sent after the sequence has been sent.
	Selecting "USER" outputs the test pattern selected on the MX180000A MU183020A setup screen.
Example	To set the test pattern to Compliance Pattern
	>:SOURce:PATTern:TYPE COMPliance

:SOURce:PATTern:TYPE?

Response	<type>=<CHARACTER RESPONSE DATA>
	COMP, USER
Function	Queries the test pattern to be sent after the sequence has been sent.
Example	> :SOURce:PATTern:TYPE?
	< COMP

:LTRaining:SEQuence:TEST:PATTern <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	When Specification setting is GEN1:
	0 to 6 CP0 to CP6
	When Specification setting is GEN2:
	9 CP9
Function	Selects the type of Compliance Pattern to be sent when test pattern is set to Compliance.
Example	> :LTRaining:SEQuence:TEST:PATTern 0

:LTRaining:SEQuence:TEST:PATTern?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	When Specification setting is GEN1:	
	0 to 6	CP0 to CP6
	When Specification setting is GEN2:	
	9	CP9
Function	Queries the test pattern to be sent.	
Example	`> :LTRaining:SEQuence:TEST:PATTern?`	
	`< CP0`	

:LTRaining:SEQuence:INITialize [<spec>]

Parameter	<spec>=<CHARACTER PROGRAM DATA>	
	GEN1	
	GEN2	
	Note:	
	If <spec> is omitted, all sequence parameters are initialized.	
Function	Sets all specified sequence parameters to their initial values.	
Example	To initialize the parameter set by GEN2	
	`> :LTRaining:SEQuence:INITialize GEN2`	

:LTRaining:SEQuence:DESign:GEN1 <type>,<numeric>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	RDACtive	RX_DETECT_ACTIVE(wait)
	PLFPs	POLLING_LFPS (LFPS transmission time)
	PRXeq	POLLING_RXEQ
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	PIDLe	POLLING_IDLE (wait)
	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles per step
	1 to 1000000	1 to 1000000 µs Wait or signal transmission time/1 µs Step
Function	Sets a sequence pattern to loopback the DUT (GEN1).	
Example	To set the number of times POLLING_ACTIVE patterns are sent to 1024	
	`> :LTRaining:SEQuence:DESign:GEN1 PACTive,1024`	

:LTRaining:SEQuence:DESign:GEN1? <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	RDACtive	RX_DETECT_ACTIVE
	PLFPs	POLLING_LFPS (LFPS transmission time)
	PRXeq	POLLING_RXEQ
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	PIDLe	POLLING_IDLE (wait)
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles
	1 to 1000000	1 to 1000000 µs Wait or signal transmission time
Function	Queries the sequence pattern to loopback the DUT. (GEN1)	
Example	`>:LTRaining:SEQuence:DESign:GEN1? PACTive` `< 1024`	

:LTRaining:SEQuence:DESign:GEN2 <type>,<numeric>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	RDACtive	RX_DETECT_ACTIVE
	PLSCd1	POLLING_LFPS SCD1 (SCD1 transmission time)
	PLSCd2	POLLING_LFPS SCD2 (SCD2 transmission time)
	PPMatch	POLLING_PORTMATCH (LBPM transmission time)
	PRXeq	POLLING_RXEQ (wait)
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	PIDLe	POLLING_IDLE (wait)
	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles per step
	1 to 1000000	1 to 1000000 µs Wait or signal transmission time/1 µs Step
Function	Sets a sequence pattern to loopback the DUT (GEN2).	
Example	To set the number of times POLLING_ACTIVE patterns are sent to 1024 `> :LTRaining:SEQuence:DESign:GEN2 PACTive,1024`	

:LTRaining:SEQuence:DESign:GEN2? <numeric>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	RDACtive	RX_DETECT_ACTIVE
	PLSCd1	POLLING_LFPS SCD1 (SCD1 transmission time)
	PLSCd2	POLLING_LFPS SCD2 (SCD2 transmission time)
	PPMatch	POLLING_PORTMATCH (LBPM transmission time)
	PRXeq	POLLING_RXEQ (wait)
	PACTive	POLLING_ACTIVE
	PCONfiguration	POLLING_CONFIGURATION
	PIDLe	POLLING_IDLE (wait)
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	1 to 1000000	1 to 1000000 cycles TS transmission cycles
	1 to 1000000	1 to 1000000 µs Wait or signal transmission time
Function	Queries the sequence pattern to loopback the DUT. (GEN2)	
Example	`>:LTRaining:SEQuence:DESign:GEN2? PACTive`	
	`< 1024`	

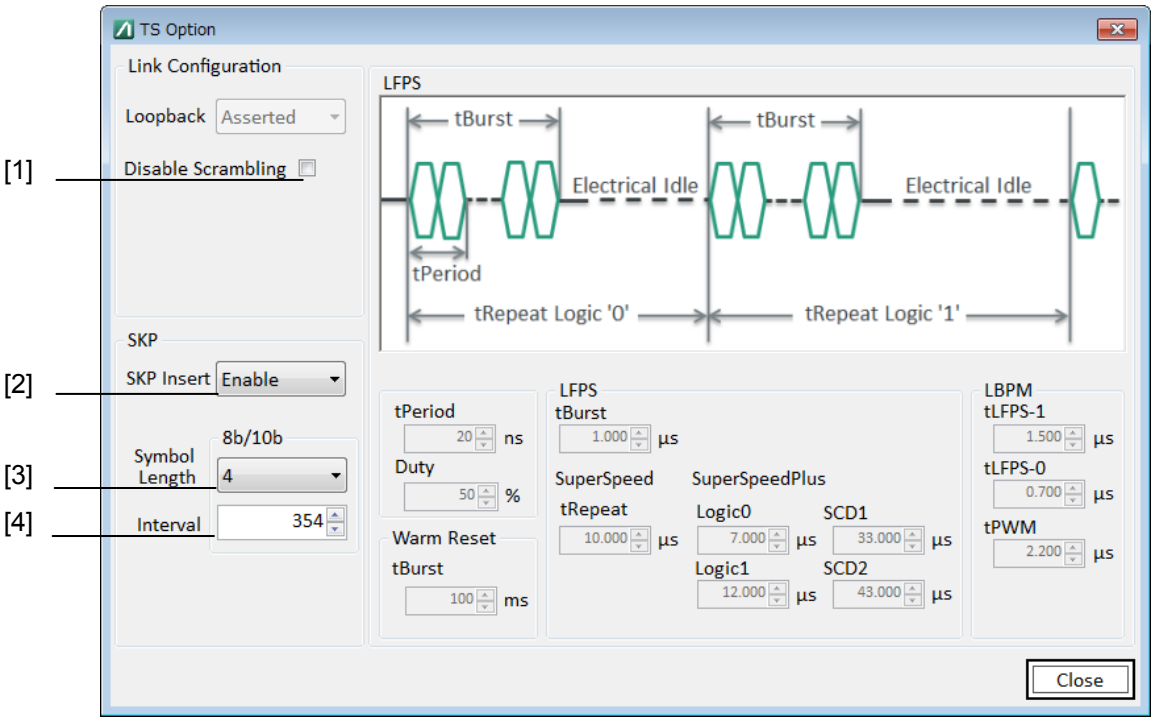


Figure 5.9-2 TS Option Screen (Gen1)

Figure 5.9-3 TS Option Screen (Gen2)

Table 5.9-2 Sequence Screen Setup Commands

No.	Setting Item	Command
[1]	Disable Scrambling	:LTRaining:SEQuence:DSCRamble
		:LTRaining:SEQuence:DSCRamble?
[2]	SKP Insert	:LTRaining:SEQuence:SKP
		:LTRaining:SEQuence:SKP?
[3]	Symbol Length 8b/10b	:LTRaining:SEQuence:SKP:SLENgth:8B10B
		:LTRaining:SEQuence:SKP:SLENgth:8B10B?
[4]	Interval 8b/10b	:LTRaining:SEQuence:SKP:INTerval:8B10B
		:LTRaining:SEQuence:SKP:INTerval:8B10B?
[5]	Symbol Length 128b/132b	:LTRaining:SEQuence:SKP:SLENgth:128B132B
		:LTRaining:SEQuence:SKP:SLENgth:128B132B?
[6]	Interval 128b/132b	:LTRaining:SEQuence:SKP:INTerval:128B132B
		:LTRaining:SEQuence:SKP:INTerval:128B132B?

:LTRaining:SEQuence:DSCRamble <boolean>

Parameter <boolean>=<BOOLEAN PROGRAM DATA>

OFF or 0	Disabled
ON or 1	Enabled

Function Sets the training sequence pattern Disable scramble bit during sequence transmission.

Example To enable Disable scramble

```
> :LTRaining:SEQuence:DSCRamble ON
```

:LTRaining:SEQuence:DSCRamble?

Response <numeric>=<NR1 NUMERIC RESPONSE DATA>

0	Not scrambled
1	Scrambled

Function Queries the training sequence pattern Disable scramble bit during sequence transmission.

Example

```
> :LTRaining:SEQuence:DSCRamble?
< 1
```

:LTRaining:SEQuence:SKP:SLENgth:8B10B <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	2 2 symbols
	4 4 symbols
	6 6 symbols
Function	Sets the number of SKP symbols to be inserted by SKP Ordered Set for 8b/10b Encoding operation.
Example	To set the number of SKP OS SKP symbols to 2
	`>:LTRaining:SEQuence:SKP:SLENgth:8B10B 2`

:LTRaining:SEQuence:SKP:SLENgth:8B10B?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	2, 4, 6
Function	Queries the number of SKP symbols to be inserted by SKP Ordered Set for 8b/10b Encoding operation.
Example	`> :LTRaining:SEQuence:SKP:SLENgth:8B10B?`
	`< 2`

:LTRaining:SEQuence:SKP:INTerval:8B10B <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	176 to 708 176 to 708/2step
Function	Sets the interval for SKP Ordered Set occurring during TS transmission for 8b/10b Encoding operation.
Example	To generate an SKP OS once after every 354 symbols sent
	`>:LTRaining:SEQuence:SKP:INTerval:8B10B 354`

:LTRaining:SEQuence:SKP:INTerval:8B10B?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	176 to 708 176 to 708/2step
Function	Queries the interval for SKP Ordered Set occurring during TS transmission for 8b/10b Encoding operation.
Example	`>:LTRaining:SEQuence:SKP:INTerval:8B10B?`
	`< 354`

:LTRaining:SEQuence:SKP:SLENgth:128B132B <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	8 8 Symbols
	12 12 Symbols
	16 16 Symbols
	20 20 Symbols
	24 24 Symbols
	28 28 Symbols
	32 32 Symbols
	36 36 Symbols
	40 40 Symbols
Function	Sets the number of SKP symbols to be inserted by SKP Ordered Set for 128b/132b Encoding operation.
Example	To set the number of SKP OS SKP symbols to 8 `> :LTRaining:SEQuence:SKP:SLENgth:128B132B 8`

:LTRaining:SEQuence:SKP:SLENgth:128B132B?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA> 8, 12, 16, 20, 24, 28, 32, 26, 40
Function	Queries the number of SKP symbols to be inserted by SKP Ordered Set for 128b/132b Encoding operation.
Example	`> :LTRaining:SEQuence:SKP:SLENgth:128B132B?` `< 8`

:LTRaining:SEQuence:SKP:INTerval:128B132B <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	20 to 80 20 to 80/1step
Function	Sets the interval for SKP Ordered Set occurring during TS transmission for 128b/132b Encoding operation.
Example	To generate an SKP OS once after every 40 blocks sent `>:LTRaining:SEQuence:SKP:INTerval:128B132B 40`

:LTRaining:SEQuence:SKP:INTerval:128B132B?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	20 to 80 20 to 80
Function	Queries the interval for SKP Ordered Set occurring during TS transmission for 128b/132b Encoding operation.
Example	`>:LTRaining:SEQuence:SKP:INTerval:128B132B?` `< 40`

5.10 Jitter Tolerance Setup Screen

This setup screen is available only when Option 001 is installed, when Jitter Tolerance Test or PCIe Link Sequence is started on the Selector screen, and when the MP1800A has been connected using Equipment Setup.

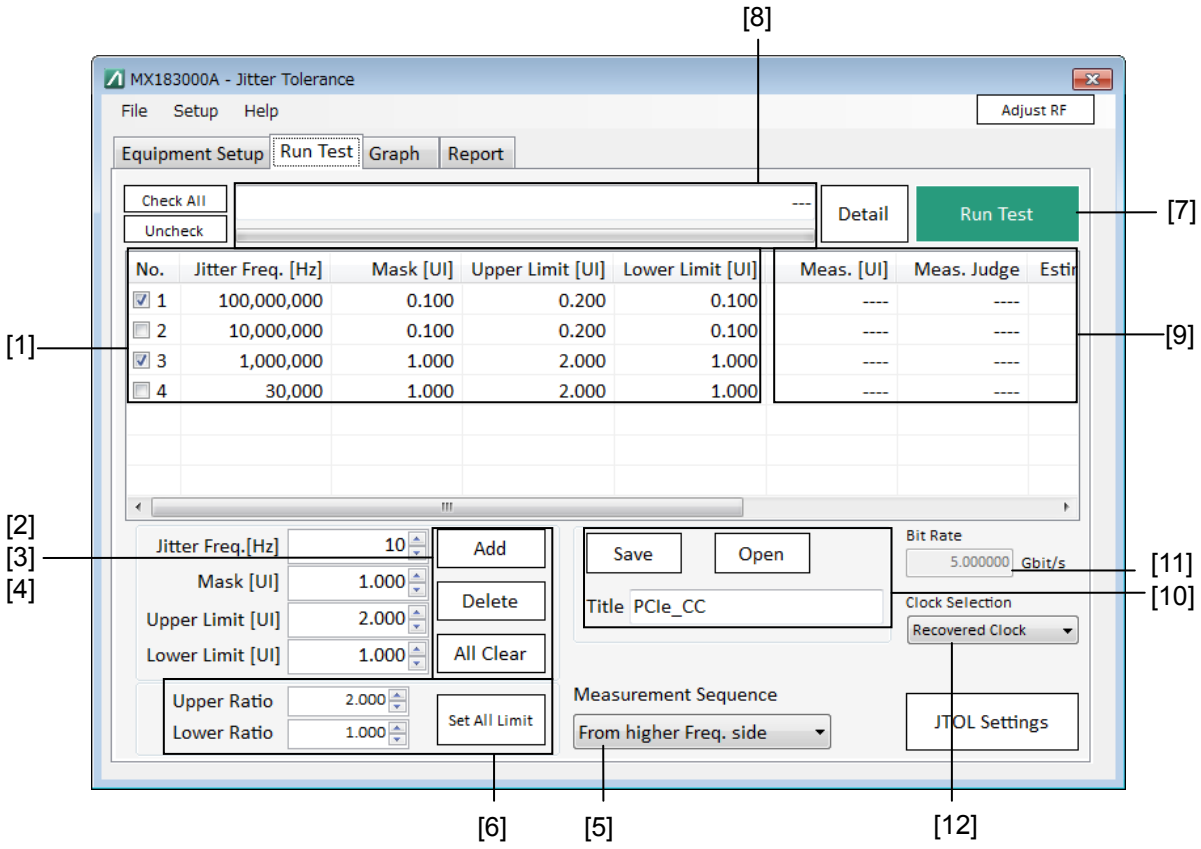


Figure 5.10-1 Run Test Screen

Table 5.10-1 Run Test Screen Setup Commands

No.	Setting Item	Command
[1]	Jitter Tolerance Table	:SENSe:JITTer:TABLe:FREQuency? :SENSe:JITTer:TABLe:INDex?
[2]	Add	:SENSe:JITTer:TABLe:ADD
[3]	Delete	:SENSe:JITTer:TABLe:DELete
[4]	All Clear	:SENSe:JITTer:TABLe:ADELete
[5]	Order	:SENSe:MEASure:BERCond:SEQuence
		:SENSe:MEASure:BERCond:SEQuence?
[6]	Set All Limit	:SENSe:MEASure:BERCond:RATiosetting :SENSe:MEASure:BERCond:RATiosetting?
[7]	Run Test	:SENSe:MEASure:JITTer:STARt :SENSe:MEASure:JITTer:STOP :SENSe:MEASure:JITTer:STATe?
[8]	Status	:CALCulate:RESult:STATus?
[9]	Data	:CALCulate:RESult:DATA?
[10]	Save	:SENSe:MEASure:TABLedata:STORe
	Open	:SENSe:MEASure:TABLedata:RECall
	Title	:SENSe:MEASure:TABLedata:SELect?
[11]	Bit Rate	:SENSe:MEASure:SYSCond:BITRate?
[12]	Clock Selection	:INPut:CLOCk:SELection
		:INPut:CLOCk:SELection?

:SENSe:JITTer:TABLe:FREQuency? <freq>

Parameter

<freq>=<DECIMAL NUMERIC PROGRAM DATA>

10 to 250000000 10 to 250000000Hz/1Hz Step

Response

<string>=<STRING RESPONSE DATA>

<string>="<number>,<freq>,<mask>,<upperlimit><lowerlimit>"

<number>=<NR1 NUMERIC RESPONSE DATA>

1 to 50 Jitter Tolerance Table index No,1 to 50

<freq>=<NR1 NUMERIC RESPONSE DATA>

10 to 250000000 Modulation frequency registered in the Jitter Tolerance Table

<mask>=<NR1 NUMERIC RESPONSE DATA>

0 to 2000 Mask value registered in the Jitter Tolerance Table

<upperlimit>=<NR1 NUMERIC RESPONSE DATA>

0 to 2000 Upper Limit value registered in the Jitter Tolerance Table

<lowerlimit>=<NR1 NUMERIC RESPONSE DATA>

0 to 2000 Lower Limit value registered in the Jitter Tolerance Table

Function

Reads in values registered in the Jitter Tolerance Table by specifying the modulation frequency.

Example

```
> :SENSe:JITTer:TABLe:FREQuency? 150000000
< "1,150000000, 0.100, 0.200, 0.030"
```

:SENSe:JITTer:TABLe:INDex? <number>

Parameter
<number>=<DECIMAL NUMERIC PROGRAM DATA>
1 to 50

Response
<string>=<STRING RESPONSE DATA>
<string>="<number>,<freq>,<mask>,<upperlimit><lowerlimit>"
<number>=<NR1 NUMERIC RESPONSE DATA>
1 to 50 Jitter Tolerance Table index No,1 to 50
<freq>=<NR1 NUMERIC RESPONSE DATA>
10 to 250000000 Modulation frequency registered in the Jitter Tolerance Table
<mask>=<NR1 NUMERIC RESPONSE DATA>
0 to 2000 Mask value registered in the Jitter Tolerance Table
<upperlimit>=<NR1 NUMERIC RESPONSE DATA>
0 to 2000 Upper Limit value registered in the Jitter Tolerance Table
<lowerlimit>=<NR1 NUMERIC RESPONSE DATA>
0 to 2000 Lower Limit value registered in the Jitter Tolerance Table

Function
Reads in values registered in the Jitter Tolerance Table by specifying the Index.

Example
```
>:SENSe:JITTer:TABLe:IND? 1
< "1,150000000, 0.100, 0.200, 0.030"
```

:SENSe:JITTer:TABLe:ADD <freq>,<mask>,<upperlimit><lowerlimit>

Parameter
<freq>=<DECIMAL NUMERIC PROGRAM DATA>
10 to 250000000 Modulation frequency registered in the Jitter Tolerance Table
<mask>=<DECIMAL NUMERIC PROGRAM DATA>
0 to 2000 Mask value registered in the Jitter Tolerance Table
<upperlimit>=<DECIMAL NUMERIC PROGRAM DATA>
0 to 2000 Upper Limit value registered in the Jitter Tolerance Table
<lowerlimit>=<DECIMAL NUMERIC PROGRAM DATA>
0 to 2000 Lower Limit value registered in the Jitter Tolerance Table

Function
Adds modulation frequencies to be measured to the Jitter Tolerance measurement.

Example
```
> :SENSe:JITTer:TABLe:ADD 100000000,0.100,0.5,0.1
```
Note:
In accordance with the SJ specifications in Section 1.3 of

"MU181500B Jitter Modulation Source Instruction Manual."

:SENSe:JITTer:TABLe:DELete <number>

Parameter	<number>=<DECIMAL NUMERIC PROGRAM DATA>
	1 to 50 1 to 50/1step
Function	Deletes those items on the Jitter Tolerance Table specified by number.
Example	`> :SENSe:JITTer:TABLe:DELete 1`

:SENSe:JITTer:TABLe:ADELete

Parameter	None
Function	Deletes all elements on the Jitter Tolerance Table.
Example	`> :SENSe:JITTer:TABLe:ADELete`

:SENSe:MEASure:BERCond:SEQuence <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	LOWerfreq	Measures in sequence from the lower modulation frequency.
	HIGHerfreq	Measures in sequence from the higher modulation frequency.
Function	Selects the tolerance measurement sequence direction.	
Example	To set to measure from the higher modulation frequency side `> :SENSe:MEASure:BERCond:SEQuence HIGHerfreq`	

:SENSe:MEASure:BERCond:SEQuence?

Response	<type>=<CHARACTER PROGRAM DATA>
	LOW,HIGH
Function	Queries the tolerance measurement start point.
Example	`>:SENSe:MEASure:BERCond:SEQuence?` `< HIGH`

:SENSe:MEASure:BERCond:RATiosetting <upper>,<lower>

Parameter	<upper>=<DECIMAL NUMERIC PROGRAM DATA>
	1.000 to 1000.000 1.000 to 1000 times
	<lower>=<DECIMAL NUMERIC PROGRAM DATA>
	0.001 to 1.000 0.001 to 1.000 times
Function	Sets the upper and lower limits of the jitter modulation amplitude on the Jitter Tolerance Table as ratios of the mask.
Example	To set the upper limit to x10 from the mask line and the lower limit to 1/10 from the mask line
	`> :SENSe:MEASure:BERCond:RATiosetting 10,0.1`

:SENSe:MEASure:BERCond:RATiosetting?

Response	<upper>,<lower>
	<upper>=<NR2 NUMERIC RESPONESE DATA>
	1.000 to 1000.000
	<lower>=<NR2 NUMERIC RESPONESE DATA>
	0.001 to 1.000
Function	Queries the upper and lower limits of the jitter modulation amplitude of jitter measurements as ratios of the mask.
Example	`> :SENSe:MEASure:BERCond:RATiosetting?`
	`< 10,0.1`

:SENSe:MEASure:JITTer:STARt

Parameter	None
Function	Starts the tolerance measurement.
Example	`>:SENSe:MEASure:JITTer:STARt`

:SENSe:MEASure:JITTer:STOP

Parameter	None
Function	Stops the tolerance measurement.
Example	`>:SENSe:MEASure:JITTer:STOP`

:SENSe:MEASure:JITTer:STATe?

Response	<numeric>=<NR1 NUMERIC RESPONESE DATA>	
	1	Measurement being executed
	0	Measurement stopped
Function	Queries the state of the Tolerance measurement.	
Example	`> :SENSe:MEASure:JITTer:STATe?`	
	`< 1`	

:CALCulate:RESult:STATus?

Response	<string>=<STRING RESPONSE DATA>	
	"---"	Before measurement start
	"Setting system…"	Setup in progress
	"Auto Search Started. "	Auto Search start
	"Auto Search Completed. "	Auto Search complete
	"Measurement Completed. "	Measurement complete
	"Measurement: <Freq>Hz, <Currval>UIp-p"	Measurement result
Function	Queries the tolerance measurement status.	
Example	`> :CALCulate:RESult:STATus?`	
	`< "---"`	

:CALCulate:RESult:DATA? <type>[,<numeric>]

Parameter

<type>=<CHARACTER PROGRAM DATA>

ALL	All measurement points
POINt	Specified point

<numeric>=<DECIMAL NUMERIC PROGRAM DATA>

1 to 50	Measurement points No.1 to 50

When <type> is ALL, <numeric> can be omitted.

Response

<string>=<STRING RESPONSE DATA>

<string>="<number>,<freq>,<measui>,<measjudge>,<estimateui>,<r2>,<estimatejudge>,<flow>"

<number>=<NR1 NUMERIC RESPONSE DATA>

1 to 50	Measurement point No.1 to 50

<freq>=<NR1 NUMERIC RESPONSE DATA>

10 to 250000000	Hz modulation frequency

<measui>=<NR2 NUMERIC RESPONSE DATA>

0.001 to 2000.000	UIp-p modulation amount

<measjudge>=<NR1 NUMERIC RESPONSE DATA>

1	Pass
0	Fail
–1	Not measured

<estimateui>=<NR2 NUMERIC RESPONSE DATA>

0.000 to 2000.000	UIp-p modulation amount

<r2>=<<NR2 NUMERIC RESPONSE DATA>

0 to 1	Coefficient of determination with degree of freedom determined, no units

<estimatejudge>=<NR1 NUMERIC RESPONSE DATA>

1	Pass
0	Fail
–1	Not measured

<flow>=<NR1 NUMERIC RESPONSE DATA>

1	overflow
0	no overflow
–1	Not measured

Function

Acquires tolerance measurement results.

Example

To acquire all measurement results of the Tolerance measurement.

```
> :CALCulate:RESult:DATA? ALL
< "1,1000,5.000,1,2.000,0.995,1,1", "2,1000,5.000,1, 2.000,
0.995,1,1", "3,1000,5.000,1, 2.000, 0.995,1,1",…
"20,200000000,0.150,1,0.100, 0.995,1,1"
```

To acquire measurement data for tolerance measurement No. 10

```
> :CALCulate:RESult:DATA? POINt,10
< "10,100000,1.000,0,0.600, 0.995,0,0"
```

:SENSe:MEASure:SYSCond:BITRate?

Response	<numeric>=<NR2 NUMERIC RESPONSE DATA>
	2.400000 to 32.100000 2.400000 to 32.100000 Gbit/s
Function	Queries the tolerance measurement bitrate monitor value.
Example	> :SENSe:MEASure:SYSCond:BITRate?
	< 8.000000

:SENSe:MEASure:TABLedata:SAVe <file_name>

Parameter	<file_name>=<STRING PROGRAM DATA>
	"<drv>:\<dir1>\<dir2>\<file>"
	<drv>=C,D,E,F Drive name
	<dir>=xxxxxxxx Directory name
	<file>=xxxxxxxxx File name
Function	Saves the jitter tolerance table contents (measurement points and masks).
Example	> :SENSe:MEASure:TABLedata:SAVe
	"C:\test_folder\test_table"

:SENSe:MEASure:TABLedata:OPEN <file_name>

Parameter	<file_name>=<STRING PROGRAM DATA>
	"<drv>:\<dir1>\<dir2>\<file><extension>"
	<drv>=C,D,E,F Drive name
	<dir>=xxxxxxxx Directory name
	<file>=xxxxxxxxx File name
	<extension>=.umsk,.mask
Function	Reads in jitter tolerance table contents (measurement points and masks).
Example	> :SENSe:MEASure:TABLedata:OPEN
	"C:\test_folder\test_table.umsk"

:SENSe:MEASure:TABLedata:SELect?

Response	<item>=<STRING RESPONSE DATA>
	“xxxxxxxxxx" File name
Function	Queries the selected table data.
Example	> :SENSe:MEASure:TABLedata:SELect?
	< "PCI"

:INPut:CLOCk:SELection <sel>

Parameter
<sel>=<CHARACTER PROGRAM DATA>

RECovered	Recovered Clock
EXTernal	External Clock

Function
Sets the clock input type.

Example
To set the clock input type to the Recovered Clock.

```
> :INPut:CLOCk:SELection RECovered
```

Note:

This command is available when the application is started by PCIe Link Sequence and the MU18304xB with Option 22 or 23 installed is selected for Equipment.
Unavailable when the application is started by Jitter Tolerance Test.

:INPut:CLOCk:SELection?

Response
<sel>=<CHARACTER RESPONSE DATA>

REC	Recovered Clock
EXT	External Clock

Function
Queries the clock input type.

Example

```
> :INPut:CLOCk:SELection?
< EXT
```

Note:

This command is available when the application is started by PCIe Link Sequence and the MU18304xB with Option 22 or 23 installed is selected for Equipment.
Unavailable when the application is started by Jitter Tolerance Test.

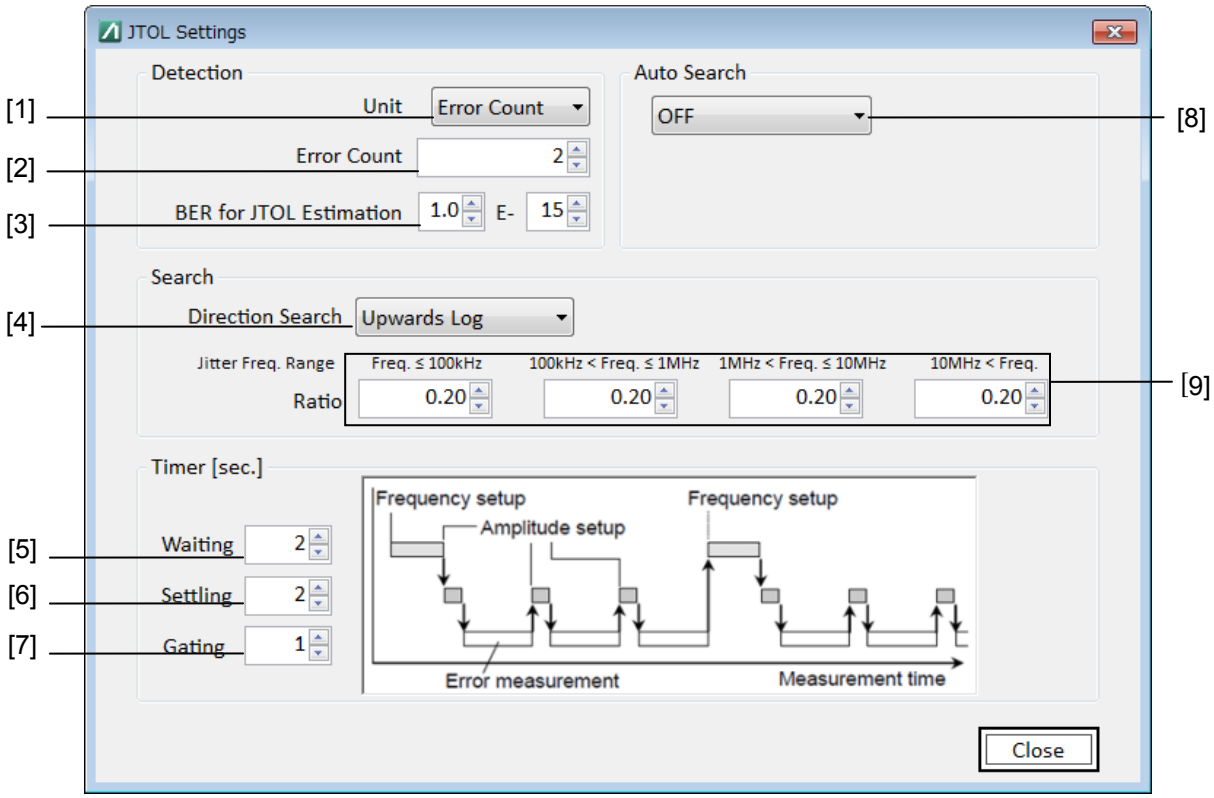


Figure 5.10-2 JTOL Settings Screen

Table 5.10-2 JTOL Settings Screen Setup Commands

No.	Setting Item	Command
[1]	Unit	:SENSe:MEASure:BERCond:UNIT
		:SENSe:MEASure:BERCond:UNIT?
[2]	Error Threshold	:SENSe:MEASure:BERCond:THReshold
		:SENSe:MEASure:BERCond:THReshold?
[3]	Error rate setting of Estimated Error point	:DISPlay:RESult:ESTimate:ERATe
		:DISPlay:RESult:ESTimate:ERATe?
[4]	Direction Search	:SENSe:MEASure:BERCond:SEARch
		:SENSe:MEASure:BERCond:SEARch?
[5]	Waiting Timer	:SENSe:MEASure:BERCond:WTIMe
		:SENSe:MEASure:BERCond:WTIMe?
[6]	Settling Timer	:SENSe:MEASure:BERCond:STIMe
		:SENSe:MEASure:BERCond:STIMe?
[7]	Gaiting Timer	:SENSe:MEASure:BERCond:GTIMe
		:SENSe:MEASure:BERCond:GTIMe?
[8]	Auto Search	:SENSe:MEASure:BERCond:ASEarch
		:SENSe:MEASure:BERCond:ASEarch?
[9]	Step	:SENSe:MEASure:BERCond:SSETting
		:SENSe:MEASure:BERCond:SSETting?

:SENSe:MEASure:BERCond:UNIT <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	RATE	Error rate
	COUNt	Error count
	ESTimate	Estimate
Function	Sets whether error rate, error count, or Estimate is used for pass/fail judgment.	
Example	To set the error rate for the Pass/Fail judgment.	
	`> :SENSe:MEASure:BERCond:UNIT RATE`	

:SENSe:MEASure:BERCond:UNIT?

Response	<type>=<CHARACTER RESPONSE DATA>
	RATE,COUN,EST
Function	Queries the setting of the Pass/Fail judgement
Example	`> :SENSe:MEASure:BERCond:UNIT?`
	`< RATE`

:SENSe:MEASure:BERCond:THReshold <value>

Parameter	<value>=<DECIMAL NUMERIC PROGRAM DATA>	
	When Unit is set to Error Rate:	
	3 to 12	Error Rate E–3 to E–12/E–1 Step
	When Unit is set to Error Count:	
	0 to 10000000	Number of Error Count 0 to 10000000/1Step
Function	Sets the evaluation threshold value.	
Example	Sets the error rate threshold to 1E-9 when Unit is set to Error Rate.	
	`> :SENSe:MEASure:BERCond:THReshold 9`	
	Sets the error rate threshold to 100 when Unit is set to Error Count.	
	`> :SENSe:MEASure:BERCond:THReshold 100`	

:SENSe:MEASure:BERCond:THReshold?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	When Unit is set to Error Rate:	
	3 to 12	Error Rate E–3 to E–12/E–1
	When Unit is set to Error Count:	
	0 to 10000000	Error count 0 to 10000000
Function	Queries the evaluation threshold value of error rate	
Example	`> :SENSe:MEASure:BERCond:THReshold?`	
	`< 9`	

:DISPlay:RESult:ESTimate:ERATe <numeric1>,<numeric2>

Parameter	<numeric1>=<DECIMAL PROGRAM DATA>
	1.0 to 9.9 XX:XXE-YY
	<numeric2>=<DECIMAL PROGRAM DATA>
	9 to 20 YY:XXE-YY
Function	Sets the BER for JTOL Estimation.
Example	To set the BER for JTOL Estimation to 5.5E–15
	`> :DISPlay:RESult:ESTimate:ERATe 5.5,15`
Compatibility	Incompatible with existing models.

:DISPlay:RESult:ESTimate:ERATe?

Response	<numeric1>,<numeric2>
	<numeric1>=<DECIMAL RESPONSE DATA>
	1.0 to 9.9 XX:XXE-YY
	<numeric2>=<DECIMAL RESPONSE DATA>
	9 to 20 YY:XXE-YY
Function	Queries the error rate setting set for BER for JTOL Estimation.
Example	`> :DISPlay:RESult:ESTimate:ERATe?`
	`< 5.5,15`
Compatibility	Incompatible with existing models.

:SENSe:MEASure:BERCond:SEARch <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>
	BINary Binary
	DLINear Downwards Linear
	DLOG Downwards Log
	ULINear Upwards Linear
	ULOG Upwards Log
	BINLinear Binary+Linear
Function	Sets the tolerance measurement method.
Example	To set the tolerance measurement method to Binary.
	`> :SENSe:MEASure:BERCond:SEARch BIN`

:SENSe:MEASure:BERCond:SEARch?

Response	<type>=<CHARACTER RESPONSE DATA>
	BIN,DLIN,DLOG,ULIN,ULOG,BINL
Function	Queries the tolerance measurement method.
Example	`> :SENSe:MEASure:BERCond:SEARch?`
	`< BIN`

:SENSe:MEASure:BERCond:WTIMe <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	1 to 99 1 to 99 s/1s Step
Function	Sets the Waiting Time for the Tolerance measurement.
Example	To set the Waiting Time to 5 sec.
	`> :SENSe:MEASure:BERCond:WTIMe 5`

:SENSe:MEASure:BERCond:WTIMe?

Parameter	None
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	1 to 99 1 to 99 s
Function	Queries the Waiting Time of the Tolerance measurement.
Example	`> :SENSe:MEASure:BERCond:WTIMe?`
	`< 5`

:SENSe:MEASure:BERCond:STIMe <numeric>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	1 to 99 1 to 99 s/1s step
Function	Set the Settling Time for the Tolerance measurement.
Example	To set the Settling Time to 5 sec.
	`> :SENSe:MEASure:BERCond:STIMe 5`

:SENSe:MEASure:BERCond:STIMe?

Parameter	None
Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	1 to 99 1 to 99 s
Function	Queries the Settling Time of the Tolerance measurement.
Example	`> :SENSe:MEASure:BERCond:STIMe?`
	`< 5`

:SENSe:MEASure:BERCond:GTIMe <time>

Parameter	<numeric>=<DECIMAL NUMERIC PROGRAM DATA>
	1 to 86400 1 to 86400 s/1s step
Function	Set the Gating Time for the bit errors measurement.
Example	To set the Gating Time to 5 s.
	`> :SENSe:MEASure:BERCond:GTIMe 5`

:SENSe:MEASure:BERCond:GTIMe?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>
	0 to 86400
Function	Queries the Gating Time.
Example	> :SENSe:MEASure:BERCond:GTIMe?
	< 30

:SENSe:MEASure:BERCond:ASEarch <type>

Parameter	<type>=<CHARACTER PROGRAM DATA>	
	OFF	Auto Search Setting off
	FINE	Auto Search Setting on (Fine mode)
	COARse	Auto Search Setting on (Coarse mode)
Function	Sets Auto Search on and off for tolerance measurement.	
	Sets Auto Search On/Off of the tolerance measurement.	
Example	To set Auto Search to On (Fine mode).	
	> :SENSe:MEASure:BERCond:ASEarch FINE	

:SENSe:MEASure:BERCond:ASEarch?

Response	<type>=<CHARACTER RESPONSE DATA>
	OFF,FINE,COAR
Function	Queries the Auto Search On/Off of the tolerance measurement.
Example	> :SENSe:MEASure:BERCond:ASEarch?
	< FINE

:SENSe:MEASure:BERCond:SSETting <range>,<step/ratio>

Parameter

<range>=<CHARACTER NUMERIC PROGRAM DATA>

VERYlow	Range Low:	10 Hz<Jitter Freq.≤100 kHz
LOW	Range Low:	100 kHz<Jitter Freq.≤1 MHz
MIDDle	Range Middle:	1 MHz<Jitter Freq.≤10 MHz
HIGH	Range High:	10 MHz<Jitter Freq.

<step>=<DECIMAL NUMERIC PROGRAM DATA>

0.001 to 2000.000 0.001 to 2000 UIp-p

<ratio>=<DECIMAL NUMERIC PROGRAM DATA>

0.01 to 1.00

The resolution for the <step> setting will depend on the value set.

Note:

The step and ratio setting ranges are in accordance with the SJ specifications in Section 1.3 of "MU181500B Jitter Modulation Source Instruction Manual."

Function

Sets the measurement range, including upper and lower limits for tolerance measurement modulation for each modulation frequency band.

Example

To set the modulation steps to UI for the modulation frequency band 10 Hz to 1 MHz when the tolerance measurement method is "Downwards Linear"

```
> :SENSe:MEASure:BERCond:SSETting LOW,0.2
```

:SENSe:MEASure:BERCond:SSETting? <range>

Parameter

<range>=<CHARACTER NUMERIC PROGRAM DATA>

VERYlow	Range Low:	10 Hz<Jitter Freq.≤100 kHz
LOW	Range Low:	100 kHz<Jitter Freq.≤1 MHz
MIDDle	Range Middle:	1 MHz<Jitter Freq.≤10 MHz
HIGH	Range High:	10 MHz<Jitter Freq.

Response

<step/ratio>

<step>=<NR2 NUMERIC RESPONSE DATA>

0.001 to 2000.000 0.001 to 2000 UIp-p

<ratio>=<NR2 NUMERIC RESPONSE DATA>

0.01 to 1.00

Function

Queries the measurement range such as jitter modulation amplitude upper and lower limits of the Tolerance measurement for each modulation frequency band.

Example

```
> :SENSe:MEASure:BERCond:SSETting? LOW
< 0.200
```

5.11 Graph Screen

This setup screen is available only when Option 001 is installed, when Jitter Tolerance Test or PCIe Link Sequence is started on the Selector screen, and when the MP1800A has been connected using Equipment Setup.

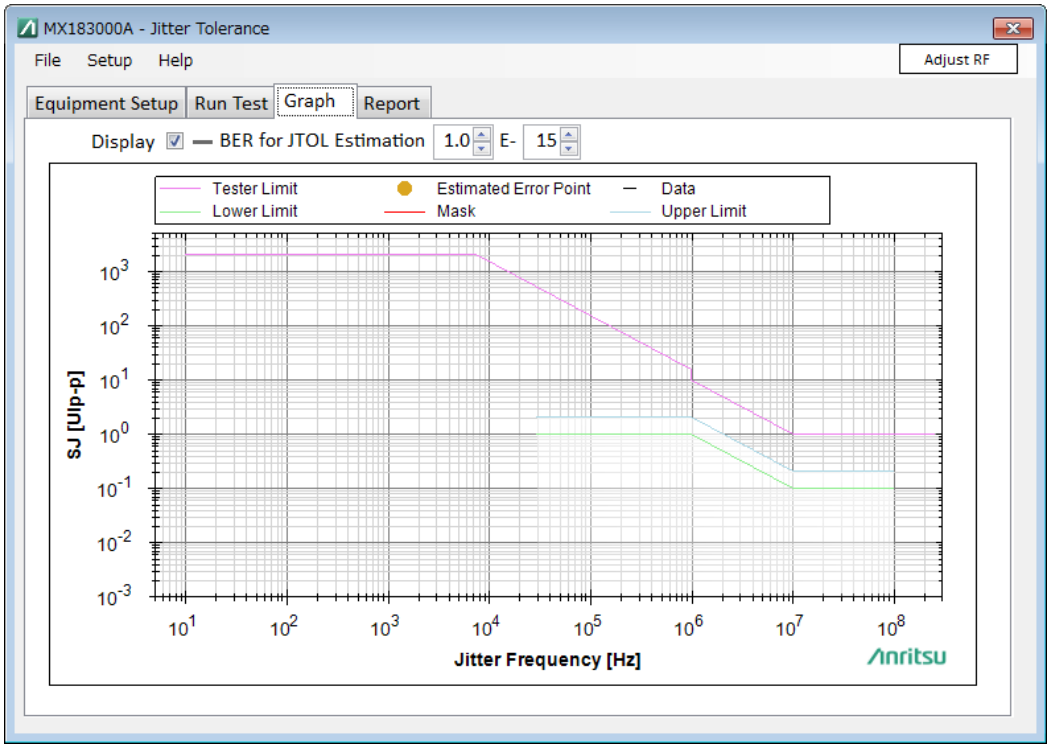


Figure 5.11-1 Graph Screen

The following commands are the same as with JTOL Setting.
For details refer to the JTOL Settings Setup Screen.
:DISPlay:RESult:ESTimate:ERATe
:DISPlay:RESult:ESTimate:ERATe?

Table 5.11-1 Graph Screen Setup Commands

No.	Setting Item	Command
[1]	Estimation result display on/off	:DISPlay:RESult:ESTimate
		:DISPlay:RESult:ESTimate?

:DISPlay:RESult:ESTimate <boolean>

Parameter	<boolean>=<BOOLEAN PROGRAM DATA>	
	ON or 1	Display selection on
	OFF or 0	Display selection off
Function	Sets whether the Estimation results are displayed on the graph.	
Example	To display the Estimation results are displayed on the graph	
	`> :DISPlay:RESult:ESTimate 1`	
Compatibility	Incompatible with existing models.	

:DISPlay:RESult:ESTimate?

Response	<numeric>=<NR1 NUMERIC RESPONSE DATA>	
	1	Displayed
	0	Not displayed
Function	Queries whether Estimation is displayed or not.	
Example	`> :DISPlay:RESult:ESTimate?`	
	`< 1`	
Compatibility	Incompatible with existing models.	

5.12 Result Screen

This setup screen is available only when Option 001 is installed, when Jitter Tolerance Test or PCIe Link Sequence is started on the Selector screen, and when the MP1800A has been connected using Equipment Setup.

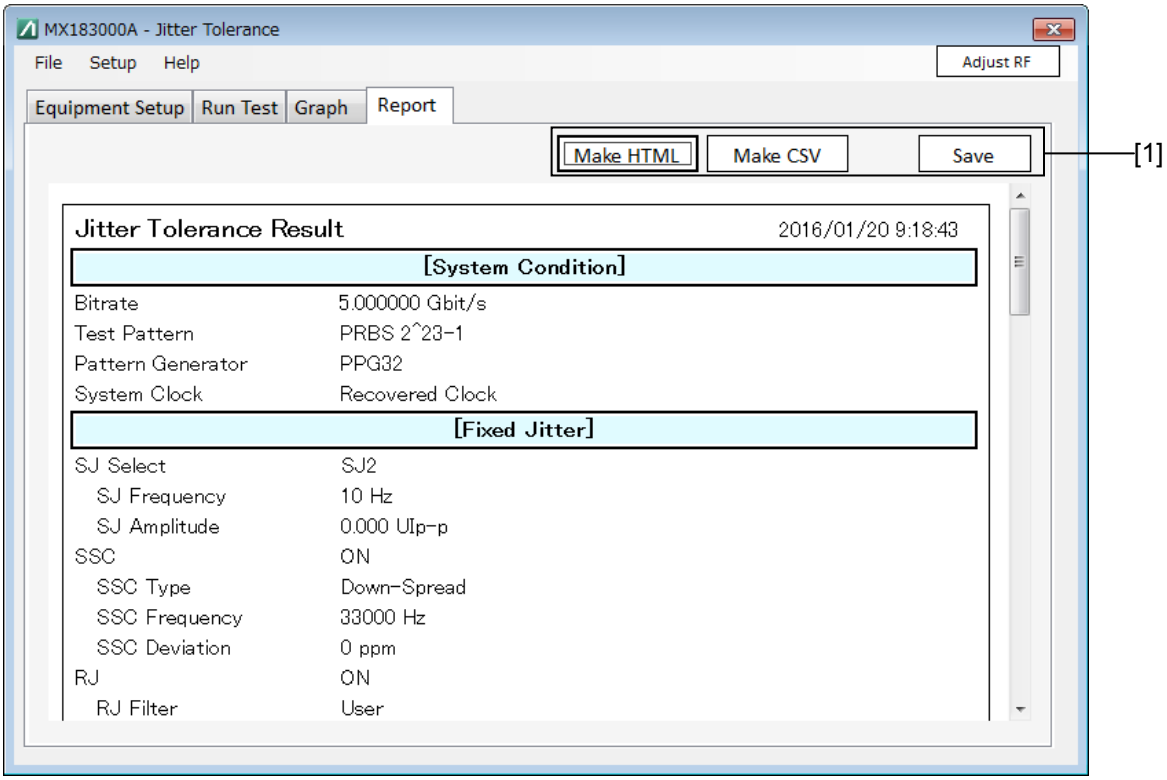


Figure 5.12-1 Result Screen

Table 5.12-1 Result Screen Setup Commands

No.	Setting Item	Command
[1]	Save Result	:SYSTem:MMEMory:RESult:STORe

:SYSTem:MMEMory:RESult:STORe <file_name>,<type>

Parameter	<file_name>=<STRING PROGRAM DATA>	
	"<drv>:\<dir1>\<dir2>\<file>"	
	<drv>=C,D,E,F	Drive name
	<dir>=xxxxxxxx	Directory name
	<file>=xxxxxxxxx	File name
	<type>=<CHARACTER PROGRAM DATA>	
	HTML	HTML format
	CSV	CSV format
Function	Stores the Tolerance measurement result with specification of file name and file format.	
Example	Saves the measurement results in HTML format.	
	`> :SYSTem:MMEMory:RESult:STORe "D:\test_folder\test",HTML`	

5.13 MX181500A Remote Command Compatibility

MX181500A support for remote commands is as follows.

✓: Compatible

†: Partial compatibility

–: Not compatible (new MX183000A function)

Table 5.13-1 MX183000A Command Tree

No.	Command Header 1	Command Header 2	Command Header 3	Command Header 4	Command Header 5	MX181500A Compatibility
1	:CALCulate	:DATA	:EALarm			–
2		:RESult	:EMONitor			–
3			:DATA			✓
4			:STATus			✓
5	:DISPlay	:MEASure	:CHANge			✓
6		:RESult	:BER			–
7			:ESTimate			–
8				:ERATe		–
9	:INPut	:CLOCk	:SELection			– *1
10	:LTRaining	:SEQuence	:DESign	:GEN1		–
11				:GEN2		–
12				:REV1	:CONFiguration	–
13				:REV2	:CONFiguration	–
14					:RECovery	–
15				:REV3	:CONFiguration	–
16					:RECovery	–
17				:REV4	:RECovery	–
18			:DSCRamble			–
19			:DSYMbol			–
20			:FSWing			–
21			:FTS			–
22			:INITialize			–
23			:LANenum			–
24			:LENTry	:TS		–
25			:LFRequency			–
26			:LINKnum			–
27			:LTHRough			–
28			:PACTive	:TS		–

Table 5.13-1 MX183000A Command Tree (Cont'd)

No.	Command Header 1	Command Header 2	Command Header 3	Command Header 4	Command Header 5	MX181500A Compatibility
29	:LTRaining	:SEQuence	:REIeos	:INTerval		–
30			:SKP			–
31				:SLENgth	:8B10B	–
32					:128B130B	–
33					:128B132B	–
34				:INTerval	:8B10B	–
35					:128B130B	–
36					:128B132B	–
37			:SPECification			–
38			:STARt			–
39			:STATe			–
40			:STOP			–
41			:TEST	:PATTern		–
42	:SENSe	:JITTer	:TABLe	:ADD		–
43				:ADELete		–
44				:DELete		–
45				:FREQuency		–
46				:INDex		–
47		:MEASure	:BER	:STARt		–
48				:STATe		–
49				:STOP		–
50			:BERCond	:ASEarch		✓
51				:GTIMe		†
52				:RATiosetting		†
53				:RESolution		✓
54				:SEARch		✓
55				:SEQuence		✓
56				:SSETing		✓
57				:STIMe		✓
58				:THReshold		✓
59				:UNIT		✓
60				:WTIMe		✓
61			:JITTer	:STARt		✓
62				:STATe		✓
63				:STOP		✓
64			:SYSCond	:BITRate		✓
65			:TABLedata	:OPEN		✓
66				:SELect		✓
67				:SAVe		–

Table 5.13-1 MX183000A Command Tree (Cont'd)

No.	Command Header 1	Command Header 2	Command Header 3	Command Header 4	Command Header 5	MX181500A Compatibility
68	:SOURce	:PATTern	:TYPe			–*2
69			:PRBS	:LENGth		–*2
70	:SYSTem	:ERRor				✓
71		:EQUipment	:CONNect			–
72			:DCONnect			–
73			:LFPS			–
74			:SEARch	:ENABle		✓
75				:SETTing		✓
76				:STARt		✓
77			:SETTing			✓
78				:MODule		✓
79		:MEASure	:EXIT			–
80			:INITialize			✓
81			:SELect			✓
82		:MMEMory	:RESult	:STORe		✓
83			:SETTing	:RECall		✓
84				:STORe		✓
85		:TERMination				✓

*1: Compatible with MU183040A and MU183041A remote commands.

*2: Compatible with MU183020A and MU183021A remote commands.

Appendix A Specifications

Table A-1 Configuration

Item	Model	Name	Quantity
Standard Configuration	P0031A	USB Memory (MX183000A/MX180000A Installer, Operation manual)	1
Application Parts	W3813AE	MX183000A Operation Manual (Printed, English)	
	41KC-3	3dB ATT	
	41KC-6	6dB ATT	
	41KC-20	20dB ATT	
	K241C	Splitter	
	J1510A	Pick Off Tee	
	Z1927A	USB measurement kit*	
	J1508A	BNC-SMA connector cable	
	J1615A	Cable Set	
	J1627A	GND connection cable	

*: For the USB measurement kit configuration, refer to Table 3.1-3 "USB Measurement Kit Configuration" in Chapter 3 "Connecting Equipment".

Table A-2 Operation Environment

Item	Specifications
Installation target	MP1800A or a personal computer
PC specifications	
OS	Windows 7 Professional/Enterprise/Ultimate English or Japanese version
CPU	1 GHz or higher
Memory	1 GB or more (For Windows 7, 32-bit) 2 GB or more (For Windows 7, 64-bit)
Hard Disk	Free space 2 GB or more
Remote interface	Ethernet (10BASE-T, 100BASE-TX)
Display	Resolution 800 × 600 or more, Display color 32 bits
Target Equipment	MP1800A or MT1810A
Required accessory	MP1800A-02 LAN option MP1800A -07 OS Upgrade to Windows7 (MP1800A only) MP1800A -32 32Gbit/s PPG and/or ED Support
Number of Target Equipment	Three or less
Version	MX180000A Installer: Version 8.02.00 or later

Table A-3 Selector Screen Settings

Item	Specifications
Application Selector	PCIe Link Sequence (default), USB Link Sequence, Jitter Tolerance Test

Table A-4 Equipment Setup Tab

Item	Specifications
MP1800A	Selects whether to execute search on the selected network device.
No.1:	OFF/ON
No.2:	OFF/ON
No.3:	OFF/ON
MP1800A/MT1810A Connection Setting	Selects a network device to connect. ***Example:*** TCPIP::127.0.0.1::5001::SOCKET,TCPIP::192.168.2.100::5001::SOCKET
Search Start	Click the button to start search and to display the discovered equipment.
Equipment	Display the discovered equipment and select a desired one.
Jitter:	***Example:*** MU181500B(No.1:Unit1:Slot2)
PPG:	***Example:*** MU183020A Data1(No.1:Unit1:Slot3)
ED:	***Example:*** MU183040A Data1(No.1:Unit1:Slot4)
Connect/Disconnect	Click the button to connect/disconnect the equipment.
Connection Guide	Displays connection diagram.

Table A-5 Sequence Tab (PCIe)

Item	Specifications
Sequence Start/Stop/Unlink	Sends the sequence set by Editor. Continues sending test patterns after a link sequence is sent.
BER Measurement	Click the button after a sequence is sent to execute the BER measurement.
BER Monitor	OFF/ON
LTSSM State	Detect, Polling, Configuration, Recovery, Loopback
Specification Rev.	1.0/1.1(2.5 GT/s), 2.0(5 GT/s), 3.0/3.1(8 GT/s), 4.0(16 GT/s)
Loopback Through	Configuration /Recovery
Test Pattern	Compliance/PRBS
Compliance	MCP/CP
PRBS	PRBS7, PRBS9, PRBS10, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Inset Delay Symbol	Disable/Enable
All parameter	Displays all the sequence setup parameters.
Default	Initialize the sequence setting.
Sequence Editor	Sets a pattern number to send in each state or sets idle time. Can set each parameter for setting the Specification Rev.

Table A-5 Sequence Tab (PCIe) (Cont'd)

Item	Specifications
Rev1.0/1.1 Configuration	
Detect.Quite	1 to 1000000, 1 step
Detect.Active	1 to 1000000, 1 step
Polling.Active	1 to 1000000, 1 step
Polling.Configuration	1 to 1000000, 1 step
Loopback.Entry	1 to 1000000, 1 step
Rev2.0 Configuration	
Detect.Quite	1 to 1000000, 1 step
Detect.Active	1 to 1000000, 1 step
Polling.Active	1 to 1000000, 1 step
Polling.Configuration	1 to 1000000, 1 step
Loopback.Entry(2.5G)	1 to 1000000, 1 step
Loopback.Entry (Electrical Idle)	1 to 1000000, 1 step
Loopback.Entry(5G)	1 to 1000000, 1 step
Rev2.0 Recovery	
Detect.Quite	1 to 1000000, 1 step
Detect.Active	1 to 1000000, 1 step
Polling.Active	1 to 1000000, 1 step
Polling.Configuration	1 to 1000000, 1 step
Configuration Linkwidth.Start	1 to 1000000, 1 step
Configuration Linkwidth.Accept	1 to 1000000, 1 step
Configuration Lane.Wait	1 to 1000000, 1 step
Configuration Lane.Accept	1 to 1000000, 1 step
Configuration Complete	1 to 1000000, 1 step
Configuration Idle	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery RcvrCfg(EQTS2)	1 to 1000000, 1 step
Recovery Speed	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery RcvrCfg(TS2)	1 to 1000000, 1 step
Loopback.Entry(5G)	1 to 1000000, 1 step

Table A-5 Sequence Tab (PCIe) (Cont'd)

Item	Specifications
Rev3.0/3.1 Configuration	
Detect.Quite	1 to 1000000, 1 step
Detect.Active	1 to 1000000, 1 step
Polling.Active	1 to 1000000, 1 step
Polling.Configuration	1 to 1000000, 1 step
Loopback.Entry(2.5G)	1 to 1000000, 1 step
Loopback.Entry (Electrical Idle)	1 to 1000000, 1 step
Loopback.Entry(8G)	1 to 1000000, 1 step
Rev3.0/3.1 Recovery	
Detect.Quite	1 to 1000000, 1 step
Detect.Active	1 to 1000000, 1 step
Polling.Active	1 to 1000000, 1 step
Polling.Configuration	1 to 1000000, 1 step
Configuration Linkwidth.Start	1 to 1000000, 1 step
Configuration Linkwidth.Accept	1 to 1000000, 1 step
Configuration Lane.Wait	1 to 1000000, 1 step
Configuration Lane.Accept	1 to 1000000, 1 step
Configuration Complete	1 to 1000000, 1 step
Configuration Idle	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery RcvrCfg(EQTS2)	1 to 1000000, 1 step
Recovery Speed(8G)	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery Equalization Phase1	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery RcvrCfg(TS2)	1 to 1000000, 1 step
Loopback.Entry(8G)	1 to 1000000, 1 step

Table A-5 Sequence Tab (PCIe) (Cont'd)

Item	Specifications
Rev4.0 Recovery	
Detect.Quite	1 to 1000000, 1 step
Detect.Active	1 to 1000000, 1 step
Polling.Active	1 to 1000000, 1 step
Polling.Configuration	1 to 1000000, 1 step
Configuration Linkwidth.Start	1 to 1000000, 1 step
Configuration Linkwidth.Accept	1 to 1000000, 1 step
Configuration Lane.Wait	1 to 1000000, 1 step
Configuration Lane.Accept	1 to 1000000, 1 step
Configuration Complete	1 to 1000000, 1 step
Configuration Idle	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery RcvrCfg(EQTS2)	1 to 1000000, 1 step
Recovery Speed(8G)	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery Equalization Phase1	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery RcvrCfg(TS2)	1 to 1000000, 1 step
Recovery Idle	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery RcvrCfg(EQTS2)	1 to 1000000, 1 step
Recovery Speed(16G)	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery Equalization Phase1	1 to 1000000, 1 step
Recovery RcvrLock	1 to 1000000, 1 step
Recovery RcvrCfg(TS2)	1 to 1000000, 1 step
Loopback.Entry(16G)	1 to 1000000, 1 step

Table A-5 Sequence Tab (PCIe) (Cont'd)

Item	Specifications
TS Option	
TS Parameter	
FTS	0 to 255, 1 step
Link Number	0 to 255, 1 step
Lane Number	0 to 255, 1 step
Full Swing	12 to 63, 1 step
Low Frequency	12 to 63, 1 step
SRIS	Disable
Disable Scrambling	OFF/ON
Reset EIEOS Interval	Disable/Enable
SKP	
SKP Insert	Enable/Disable
SKP Length(128b/130b)	8 to 24 Symbol, 4 step
SKP Length(8b/10b)	COM+1 to 5, 1 step
SKP Interval(128b/130b)	187 to 750, 1 step
SKP Interval(8b/10b)	768 to 3076, 2 step
Send TS	
Polling.Active	TS1/EQTS1
Loopback.Ectry	TS1/EQTS1
Rev3.x/Rev4.0 Preset	
Donwstream	
Preset(DE, PS [dB])	P7: –6.0, 3.5
Preset Hint	–6 dB
Precursor	0
Cursor	0
Postcursor	0
Upstream	
Usepreset	Preset
Preset(DE, PS [dB])	P7: –6.0, 3.5
Preset Hint	–6 dB
Precursor	0
Cursor	0
Postcursor	0

Table A-6 Sequence Tab (USB)

Item	Specifications
LTSSM State	eSS.Inactive, Rx.Detect, Polling, Loopback
Sequence Start/Stop/Unlink	Sends the sequence set by Editor. Starts sending a sequence when a trigger is detected by Aux Input of the MU183020A. Continues sending test patterns after a link sequence is sent.
USB3.1 Specification	Gen1(5 GT/s), Gen2(10 GT/s)
Test Pattern	Compliance/USER
CPx	Gen1: CP0 D0.0, CP1 D10.2, CP2 D24.3, CP4 LFPS, CP5 K28.7 * , CP6 K28.7 *
	Gen2: CP9
All parameter	Displays all sequence setup parameters.
Default	Initialize sequence setting.
Sequence Editor	Sets a pattern number to send in each state or sets idle time.
Gen1	
Rx.Detect.Active(Idle)	
Polling.LFPS	1 to 000000, 1 step
Polling.RxEQ	100 to 000000, 10 step
Polling.Active(TS1)	1 to 1000000, 1 step
Polling.Configuration(TS2)	1 to 1000000, 1 step
Polling.Idle	1 to 1000000, 1 step
Gen2	
Rx.Detect.Active(Idle)	1 to 1000000, 1 step
Polling.LFPS(SCD1)	162 to 1000000, 1 step
Polling.LFPSPlus(SCD2)	172 to 1000000, 1 step
Polling.PortMatch (PHY Capability LBPM)	2 to 1000000, 1 step
Polling.PortConfig (PHY Ready LBPM)	2 to 1000000, 1 step
Polling.RxEQ	1 to 1000000, 1 step
Polling.Active(TS1)	1 to 1000000, 1 step
Polling.Configuration(TS2)	1 to 1000000, 1 step
Polling.Idle	1 to 1000000, 1 step

*: Selecting CP5 or CP6 does not change de-emphasis setting that is actually output.

Table A-6 Sequence Tab (USB) (Cont'd)

Item	Specifications
Option	
Loopback	Asserted
Disable Scrambling	OFF/ON
SKP	
SKP Insert	Enable/Disable
Symbol Length(128b/132b)	8 to 40, 2 step
Symbol Length(8b/10b)	2 to 6, 2 step
SKP Interval(128b/132b)	20 to 80, 1 step
SKP Interval(8b/10b)	176 to 708, 2 step
tPeriod	20 ns
Duty	50%
WarmReset	
tBurst	100 ms
LFPS	
tBurst	1.000 µs
SuperSpeed	
tRepeat	10.000 µs
SuperSpeedPlus	
Logic0	7.000 µs
Logic1	12.000 µs
SCD1	33.000 µs
SCD2	43.000 µs
LBPM	
tLFPS-1	1.500 µs
tLFPS-0	0.700 µs
tPWM	2.200 µs

Table A-7 Run Test Tab

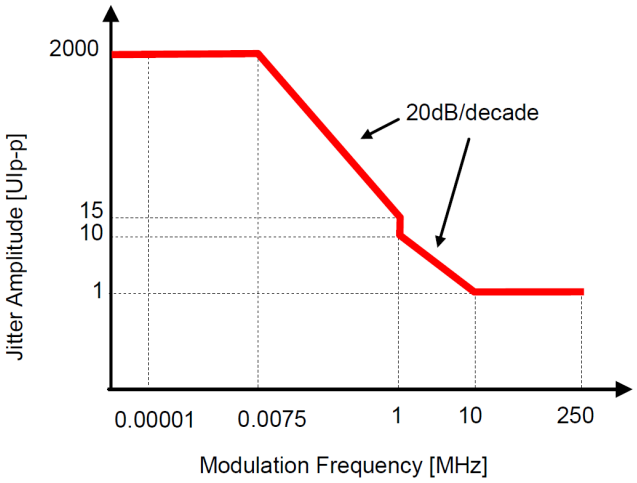
Item	Specifications
Run Test/Stop Test	Starts or stops Jitter Tolerance Test.
Detail	Displays settings and results of Jitter Tolerance Table.
Check All	Select the Jitter Tolerance Table checkbox.
Uncheck	Deselect the Jitter Tolerance Table checkbox.
Jitter Tolerance Table	Sets SJ modulation frequency to perform measurement, modulation amount (UI) for pass/fail judgement, and range of modulation amount to search.
Jitter frequency setup range	Sets Jitter Freq. [Hz], Mask[UI], Upper Limit [UI], Lower Limit [UI], Upper Ratio, and Lower Ratio. Click the **Add** button to add points. Click **Delete** > **All Clear** to delete points. For setting range, refer to the sinusoidal jitter (SJ or SJ2) modulation frequency setup range shown in Table 1.3-2 "Jitter Modulation Performance" in the *MU181500B Jitter Modulation Source Operation Manual*.
Jitter amplitude setup range	 Note that available jitter frequency and jitter amplitude for jitter measurement depend on the clock frequency set by controller and MU181500B.
Set All Limit	Resets the Upper Limit and Lower Limit values at the ratio set for Mask. Set the ratio to reset for Upper Ratio and Lower Ratio.
Upper Ratio	1.000 to 1000, 0.001 step
Lower Ratio	0.001 to 1.000, 0.001 step
Measurement Sequence	From higher Freq. side, From lower Freq. side
Mask file Save/Open	Saves and opens the mask file for JTOL test.

Table A-7 Run Test Tab (Cont'd)

Item	Specifications
JOTL Setting	
Detection	
Unit	Error Rate, Error Count, Estimate
Error Threshold	1E–3 to 10E–12, E–1 step
Error Count	0 to 10000000, 1 step
BER for JTOL Estimation	1.0E–20 to 9.9E–9
Auto Search	OFF/FINE/COARSE
Search	
Direction Search	Binary, Downwards Linear, Downwards Log, Upwards Linear, Upwards Log, Binary + Linear
Step	When Downwards/Upwards Linear is selected:
≤100kHz	0.001 to 2000.000 0.001 step
100k to 1MHz	0.001 to 200.000 0.001 step
1M to 10MHz	0.001 to 15.000 0.001 step
10MHz<	0.001 to 1.000 0.001 step
Ratio	When Downwards/Upwards Log is selected:
≤100kHz	0.01 to 1.00 0.01 step
100k to 1MHz	0.01 to 1.00 0.01 step
1M to 10MHz	0.01 to 1.00 0.01 step
10MHz<	0.01 to 1.00 0.01 step
Timer[sec.]	
Waiting	1 to 99 seconds, in steps of one second
Setting	1 to 99 seconds, in steps of one second
Gating	1 to 86400 seconds, in steps of one second

Table A-8 Graph Tab

Item	Specifications
Display	OFF/ON
BER for JTOL Estimation	1.0E–20 to 9.9E–9

Table A-9 Report Tab

Item	Specifications
Make HTML	Displays the Jitter Tolerance results in HTML.
Make CSV	Displays the Jitter Tolerance results in CSV.
Save	Saves the Jitter Tolerance results in the format displayed on the screen.

Appendix B Default Settings

Table B-1 Selector

Item	Default
Application Selector	PCIe Link Sequence

Table B-2 Equipment Setup Tab

Item	Default
MP1800A Check box	 No.1: ON No.2: OFF No.3: OFF
Equipment Jitter PPG ED	 None None None

Table B-3 Sequence Tab (PCIe)

Item	Default
BER Monitor	OFF
LTSSM State	-
Specification Rev.	3.0/3.1(8.0 GT/s)
Loopback through	Configuration
Test pattern	Compliance
Compliance	MCP
PRBS	PRBS23
Insert Delay symbol	
Sequence Editor	Disable
Rev1.0/1.1 Configuration	
Detect.Quite	1000 μs
Detect.Active	12000 μs
Polling.Active	1100
Polling.Configuration	49152
Loopback.Entry	20
Rev2.0 Configuration	
Detect.Quite	1000 μs
Detect.Active	12000 μs
Polling.Active	1100
Polling.Configuration	49152
Loopback.Entry(2.5G)	20
Loopback.Entry (Electrical Idle)	1000
Loopback.Entry(5G)	35000

Table B-3 Sequence Tab (PCIe) (Cont'd)

Item	Default
Rev2.0 Recovery	
Detect.Quite	1000 μs
Detect.Active	12000 μs
Polling.Active	4000
Polling.Configuration	49152
Configuration Linkwidth.Start	40
Configuration Linkwidth.Accept	2
Configuration Lane.Wait	40
Configuration Lane.Accept	2
Configuration Complete	48
Configuration Idle	5
Recovery RcvrLock	60
Recovery RcvrCfg(EQTS2)	60
Recovery Speed	363
Recovery RcvrLock	40960
Recovery RcvrCfg(TS2)	32
Loopback.Entry(5G)	35000
Rev3.0/3.1 Configuration	
Detect.Quite	1000 μs
Detect.Active	12000 μs
Polling.Active	1100
Polling.Configuration	49152
Loopback.Entry(2.5G)	20
Loopback.Entry (Electrical Idle)	1000
Loopback.Entry(8G)	200000

Table B-3 Sequence Tab (PCIe) (Cont'd)

Item	Default
Rev3.0/3.1 Recovery	
Detect.Quite	1000 µs
Detect.Active	12000 µs
Polling.Active	4000
Polling.Configuration	49152
Configuration Linkwidth.Start	40
Configuration Linkwidth.Accept	2
Configuration Lane.Wait	40
Configuration Lane.Accept	2
Configuration Complete	48
Configuration Idle	5
Recovery RcvrLock	60
Recovery RcvrCfg(EQTS2)	60
Recovery Speed(8G)	363
Recovery RcvrLock	32
Recovery Equalization Phase1	131072
Recovery RcvrLock	80
Recovery RcvrCfg(TS2)	32
Loopback.Entry(8G)	32000
Rev4.0 Recovery	
Detect.Quite	1000 µs
Detect.Active	12000 µs
Polling.Active	4000
Polling.Configuration	49152
Configuration Linkwidth.Start	40
Configuration Linkwidth.Accept	2
Configuration Lane.Wait	40
Configuration Lane.Accept	2
Configuration Complete	48
Configuration Idle	5
Recovery RcvrLock	60
Recovery RcvrCfg(EQTS2)	60
Recovery Speed(8G)	363
Recovery RcvrLock	32
Recovery Equalization Phase1	131072
Recovery RcvrLock	80

Table B-4 Sequence Tab (USB)

Item	Default
LTSSM State	
USB3.1 Specification	Gen1(5.0 GT/s)
Test pattern	Compliance
CPx(Gen1)	CP0 D0.0
CPx(Gen2)	CP9
Sequence Editor	
Gen1	
Rx.Detect.Active(Idle)	1 μs
Polling.LFPS	560 μs
Polling.RxEQ	65536 μs
Polling.Active(TS1)	18000
Polling.Configuration (TS2)	18000
Polling.Idle	1 μs
Gen2	
Rx.Detect.Active(Idle)	1 μs
Polling.LFPS(SCD1)	162 μs
Polling.LFPSPlus(SCD2)	172 μs
Polling.PortMatch (PHY Capability LBPM)	132 μs
Polling.PortConfig (PHY Ready LBPM)	343 μs
Polling.RxEQ	524288
Polling.Active(TS1)	18000
Polling.Configuration(TS2)	1100
Polling.Idle	1 μs

Table B-4 Sequence Tab (USB) (Cont'd)

Item	Default
Option	
Loopback	Asserted
Disable Scrambling	OFF
SKP	
SKP Insert	Enable
Symbol Length(128b/132b)	16 Symbols
Symbol Length(8b/10b)	4 Symbols
SKP Interval(128b/132b)	40
SKP Interval(8b/10b)	354
tPeriod	20 ns
Duty	50%
WarmReset	
tBurst	100 ms
LFPS	
tBurst	1.000 µs
SuperSpeed	
tRepeat	10.000 µs
SuperSpeedPlus	
Logic0	7.000 µs
Logic1	12.000 µs
SCD1	33.000 µs
SCD2	43.000 µs
LBPM	
tLFPS-1	1.500 µs
tLFPS-0	0.700 µs
tPWM	2.200 µs

Table B-5 Run Test Tab

Item	Default
Jitter Freq [Hz]	10
Mask[UI]	1.000
Upper Limit[UI]	2.000
Lower Limit[UI]	1.000
Upper Ratio	2.000
Lower Ratio	1.000
Title	PCIe_CC
Measurement Sequence	From higher Freq. side
JTOL Settings	
Detection	
Unit	Error Count
Error Threshold	1E–12
Error Count	2
BER for JTOL Estimation	1.0E–15
Auto Search	OFF
Direction Search	Upwards Log
Step	
Jitter Freq. ≤ 100 kHz	1.000
100k < Jitter Freq. ≤ 1 MHz	1.000
1M < Jitter Freq. ≤ 10 MHz	0.100
10 MHz < Jitter Freq.	0.100
Ratio	
Jitter Freq. ≤ 100 kHz	0.20
100k < Jitter Freq. ≤ 1 MHz	0.20
1M < Jitter Freq. ≤ 10 MHz	0.20
10 MHz < Jitter Freq.	0.20
Timer[sec.]	
Waiting	2
Setting	2
Gating	1

Table B-6 Graph Tab

Item	Default
Display	ON
BER for JTOL Estimation	1.0E–15