MP1595A

40G SDH/SONET Analyzer

(Jitter version)

MBP-1SG060368-03

MP1595A 40G SDH/SONET Analyzer Quick Start Guide (Jitter Version)

July 25th, 2007 (Version 3.2)

Anritsu Corporation
IP Network Measurement Division

Contents

MP1595A/MP1797A Configuration Flow-Chart

Start

1. Confirm Test configuration

40G Electrical Test

MP1595A	Slot	40/43G Electrical Config
	1	-
	2	-
	3	MU150142A-OPT
	4	MU150142A
	5	MU150140A
	6	
MP1797A	OPT TX	MU179701A
	OPT RX	MU179704A 40G O/E Converter

43G Electrical Test

MP1595A	Slot	40/43G Electrical Config
	1	-
	2	-
	3	MU150142A-OPT
	4	MU150142A
	5	MU150140A
	6	
MP1797A	OPT TX	MU179701A
	OPT RX	MU179705A 43G O/E Converter

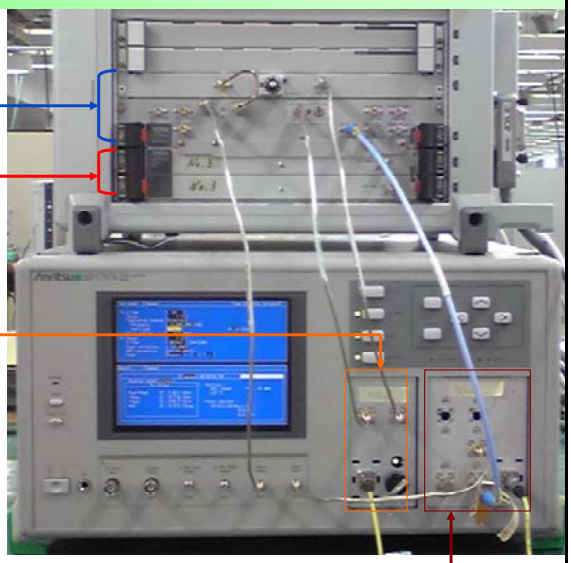
2. Connect Cables (V-SUHNER®) /Bias-T / DC Block / Terminator

Go to **A** – Slide 9

1.0 MP1595A/MP1797A 40/43G Modules

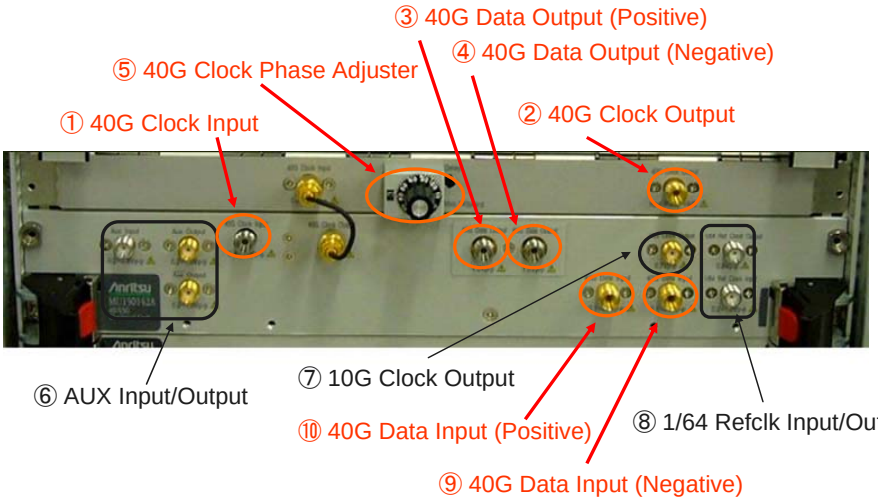
MP1595A	Slot	40/43G Electrical Config
	1	-
	2	-
	3	MU150142A-OPT
	4	MU150142A
	5	MU150140A
	6	
MP1797A	OPT TX	MU179701A
	OPT RX	MU179705A 43G O/E Converter

or MU179704A 40G O/E Converter

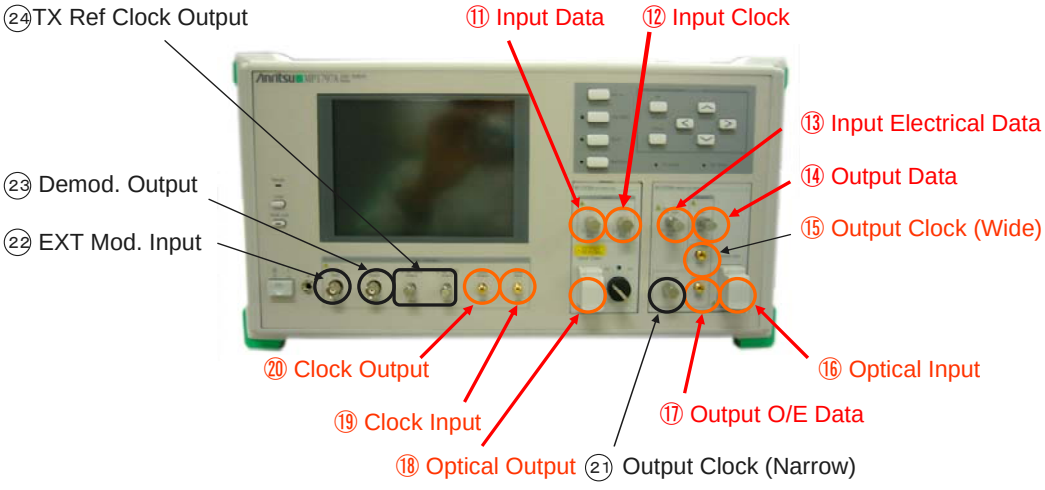


1.1 Connector Locations and Names (MP1595A)

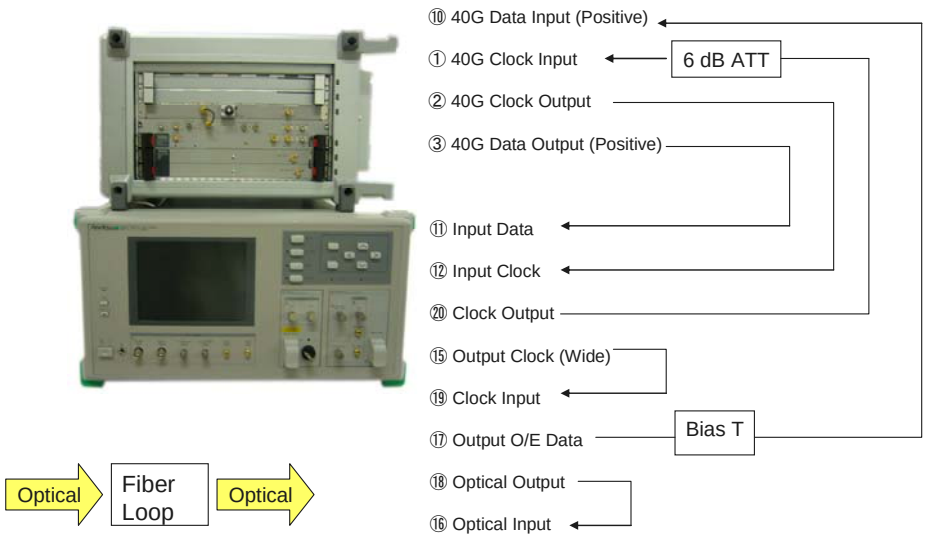
MU150142A : Electrical Unit



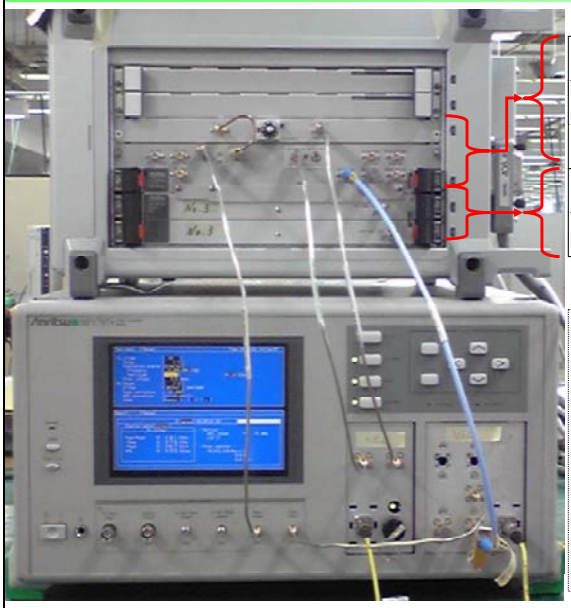
1.2 Connector Locations and Names (MP1797A)

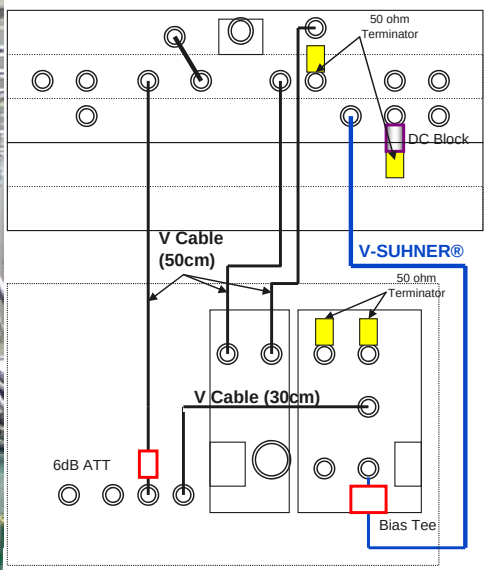


1.3 Loopback for System Verification



1.4 MP1595A/MP1797A 40/43G Electrical Connections





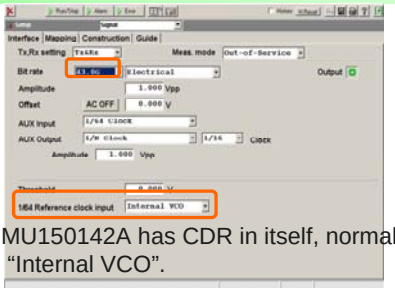
MP1595A/MP1797A Setup Flow-Chart

A

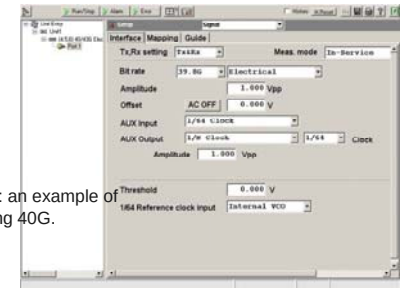
Refer to Section 3. Setting Signal and Interface of this document (Slide 19)

3.1 Set MP1595A

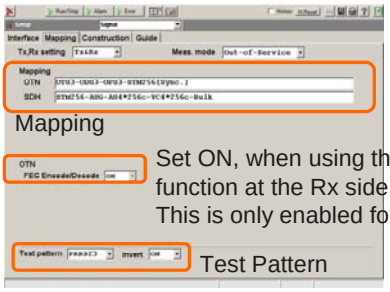
Go to **B**



MU150142A has CDR in itself, normally select "Internal VCO".



Note: an example of testing 40G.



Mapping

Set ON, when using the FEC function at the Rx side.
This is only enabled for 43G.

Test Pattern

MP1595A/MP1797A Setup Flow-Chart

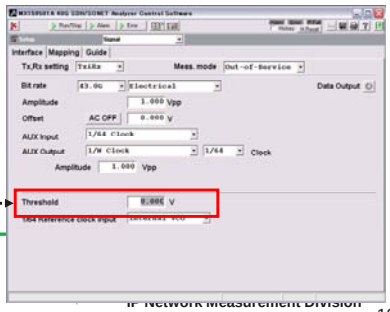
B

4. Set MP1797A
   - a - Bit-Rate
   - b - RX Filter
   - c - Measurement Time: Repeat / 1s
   - d - TX Jitter : "OFF"

5. Confirm the following point of MP1797A
   - a - Jitter Unlock Alarm should be "OFF"
   - b - OPT Power Meter Value: Input Sensitivity 0 to –10dbm
   - c - Frequency Monitor (Setting Bit-Rate)

6. Adjust MP1797A "Intrinsic Jitter" to smallest point using Phase Adjustment on MU150142A of MP1595A (range of adjustment is +/- 70 ps and period of signal is ~ 25 ps)

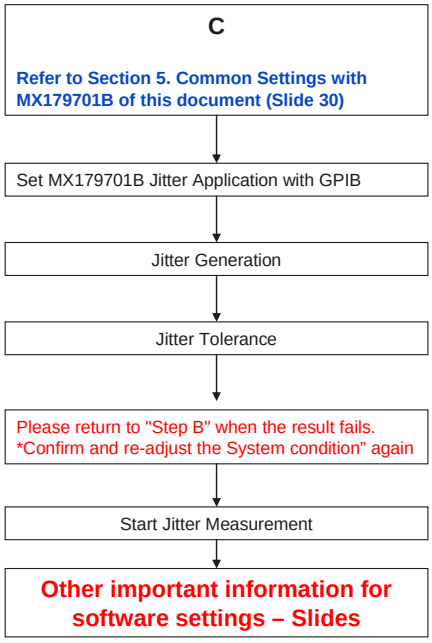
7. Adjust MP1595A condition to "No-Alarm/ No-Error" condition by Threshold to center of working margin. (Should have +/- .1 V with threshold set to 0.0 V)

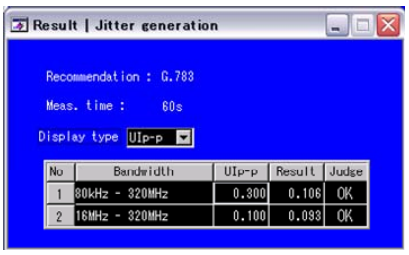


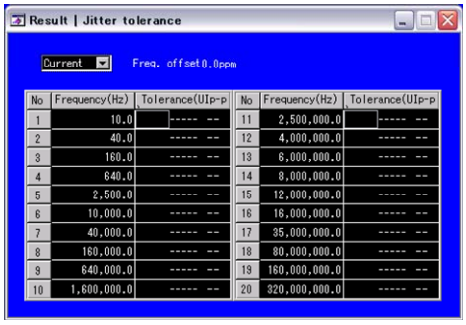
8. Confirm Step-5, 6 and 7
   This Step is important: REPEAT ADJ

Go to **C**

MP1595A/MP1797A Setup Flow-Chart







2.0 Pre-usage Notes

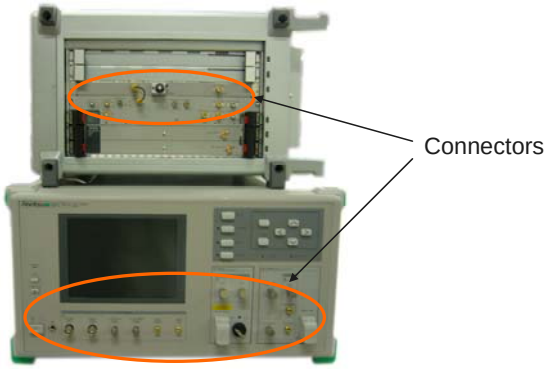
✧ Setting-up Main Frame

- **The MP1595A and MP1797A use internal cooling fans. Leave at least 10 cm around the back and sides to allow sufficient cooling air flows.**

ALWAYS wear a wristband.

2.1 Pre-usage Notes

- **Setting-up Main Frame**
  - **The MP1595A and MP1797A must be connected using cables to make measurements. Keep the cables as short as possible to prevent cable strain and make sure that the connectors on both units are oriented in the same direction as shown below.**



2.2 Pre-usage Notes

- **Checking Optical Output Key**
  - **Insert the key into the optical key switch and Remote Interlock in the MP1797A E/O Module (MU179703A). Set the key switch to the ON position. If it is at the OFF position, the MU179703A will not output the optical signal.**

2.3 Power-on

✧ MP1595A Power Switches

➢ **The MP1595A has two power switches—the main power switch and a switch for the standby status.**

Setting power to ON

(1) After checking that the main power switch is OFF, connect the power cord to the power connector.

(2) Set the main power switch to ON.

(2') To set the power to ON from the standby status, press the standby switch.

Setting power to OFF

(1) Press the standby switch.

(2) Check that the standby status has been entered and then switch off the main power switch.

Standby Switch

Main Power Switch

Supply power at 100–120/200–240 Vac and 50–60 Hz to the MP1595A and MP1797A. Both units have voltage auto-switching.

2.4 Power-on

✧ MP1797A Power Switch

➢ **The MP1595A has one main power switch.**

Setting power to ON

(1) After checking that the main power switch is OFF, connect the power cord to the power connector.

(2) Set the main power switch to ON.

Setting power to OFF

(2) Set the main power switch to OFF.

Main power Switch

There is no special power-on/off sequence for the MP1595A and MP1797A. Switch either unit on or off in any order.

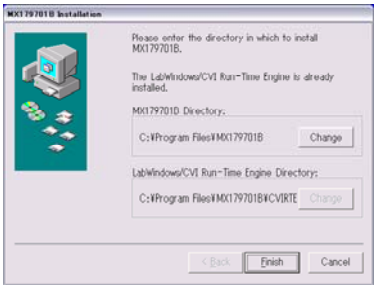
2.5 MX179701B Setup

- **Measurement is performed from a PC in which the MX179701B dedicated control software is installed.**

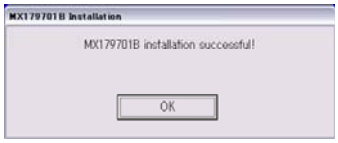
(1) Copy the MX179701B folder on the installation CD-ROM to the PC hard disk.

(2) Open the copied folder and click the setup.exe file.

(3) Specify the destination for the install files if the default path is unsatisfactory for some reason and click the Finish button.



(4) Installation starts automatically and is completed when the following dialog is displayed.



The OS of the PC controller should be Windows98 or later.

2.6 GPIB Setup

- **The MP1595A and MP1797A are controlled using the dedicated MX179701B control software.**

(1) Connect the MP1595A and MP1797A to the PC in which the MX179701B software is installed using a GPIB cable.

(2) Switch on the power of the MP1595A and MP1797A.

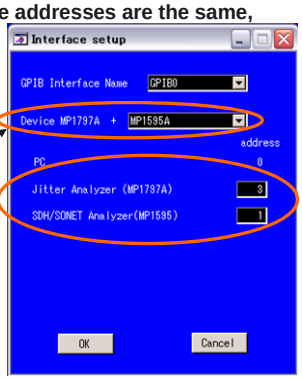
(3) Check the GPIB address of the MP1595A and MP1797A. If the addresses are the same, change the address of one unit.

MP1595A: Selector → Setup Utility → Remote Control

MP1797A: Setup screen → System

(4) Start the MX179701B software and launch the Interface Setup screen from File → Interface.

(5) After changing the Device setting to MP1797A+MP1595A, check the GPIB addresses as described in step (3).



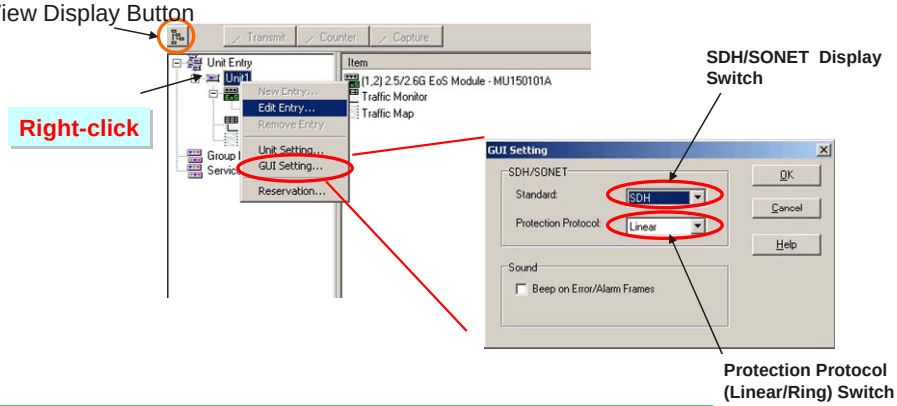
Device

GPIB Address

3.0 Setting Signal and Interface

- **SDH/SONET display is switched at the MP1595A GUI setting window.**
  - **Right-click Unit of Tree view and select GUI Setting… . Choose either SDH or SONET in the Standard: field and click OK.**

Tree View Display Button

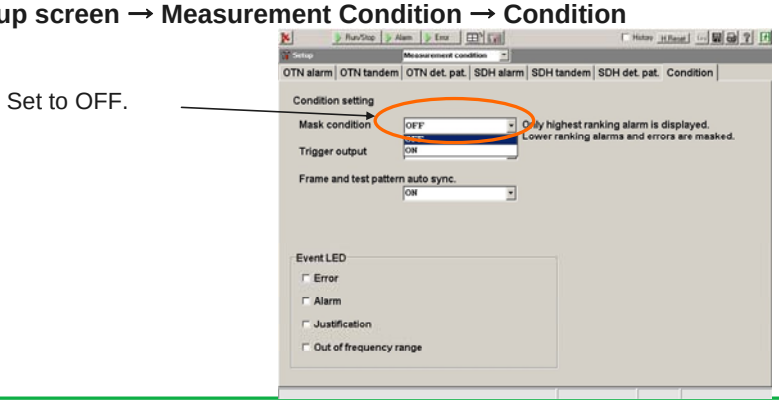


3.1 Setting Signal and Interface

- **At the MP1595A, it is possible to set masking of lower ranking errors and alarms to display only the highest ranking errors and alarms. At Jitter measurement, set masking to OFF.**

Setup screen → Measurement Condition → Condition

Set to OFF.



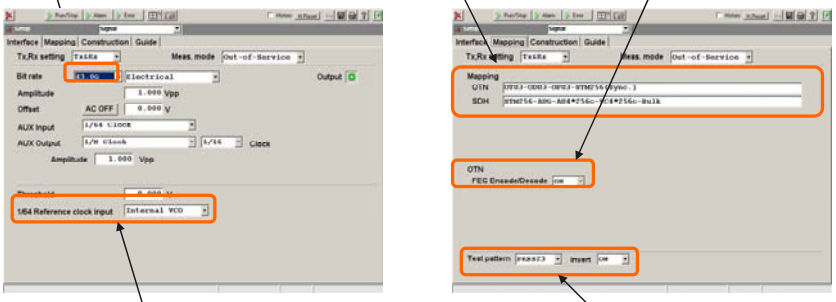
3.2 Setting Signal and Interface

- **Set the Signal rate and Mapping used at measurement from the Setup screen.**

Rate Setting

Mapping Setting

Set ON, when using the FEC function at the Rx side.
This is only enabled for 43G.



So MU150142A has CDR in itself, normally select "Internal VCO". When inputting a Clock to the ⑧ in Slide10 "1/64 Refclk Input/Output", select "Electrical 1/64".

Test Pattern Setting

3.3 Setting Signal and Interface

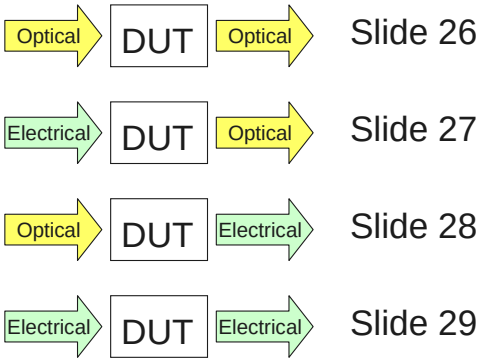
- **About Test Pattern Setting**
  - **The Test Pattern complies with ITU-T O.150.**

Test Pattern	Inverse/Non-inverse
PRBS15	Inverse
PRBS23	Inverse
PRBS31	inverse

  - **When Invert: OFF is set at the MP1595A, the above-specified patterns are sent. Since PRBS15/23/31 are defined as inverse by O.150, the actually sent pattern is a Negative PRBS pattern. Conversely, when Invert: ON is set, the pattern is double-inverse and a Positive PRBS pattern is sent.**

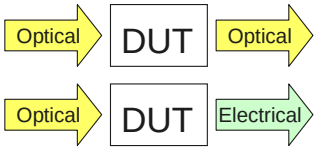
4.0 Connecting DUT

- **There are four methods for connecting the measuring equipment and DUT as listed below. See the relevant slide for each connection method.**



4.1 Adjust clock phase before connecting DUT

- When testing using the following setup, it is necessary to adjust the phase difference between the output clock and the data output from the MP1595A before the connection with the DUT.



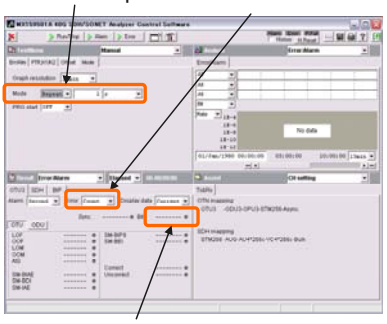
1. At the setup in Slide18, connect without an intermediate DUT.
2. When adjusting at 43G, set the FEC setting in Slide14 to OFF.
3. Set the ⑤ in slide10 “40G Clock phase adjuster” to 0.00.

4.2 Adjust clock phase before connecting DUT

4. On the MP1595A display,
Set Test Menu -> Manual -> Mode -> “Repeat 1s”,
and Result -> Error/Alarm -> Error -> “Count”
5. See the number of error count and increase the adjuster value to which point has no error. -> the value is Min.
6. See the number of error count and continuously increase the adjuster value to which point starts to have some errors again. -> the value is Max.
7. Set the below value to the adjuster.
(Max + Min) / 2

With 0.2UI Jitter on 160MHz, the mid-point can be found easily.

Set the “Repeat 1s”. Set the “Count”.



See the number of error count.

4.3 Connecting DUT

⑩ 40G Data Input (Positive)
① 40G Clock Input
② 40G Clock Output
③ 40G Data Output (Positive)
⑪ Input Data
⑫ Input Clock
⑳ Clock Output
⑮ Output Clock (Wide)
⑲ Clock Input
⑰ Output O/E Data
⑱ Optical Output
⑯ Optical Input

Bias T
6dB
DUT

Optical DUT Optical

4.4 Connecting DUT

⑩ 40G Data Input (Positive)
① 40G Clock Input
③ 40G Data Output (Positive)
⑯ Optical Input
⑳ Clock Output
⑮ Output Clock (Wide)
⑲ Clock Input
⑰ Output O/E Data

Bias T
DUT
6dB

Electrical DUT Optical

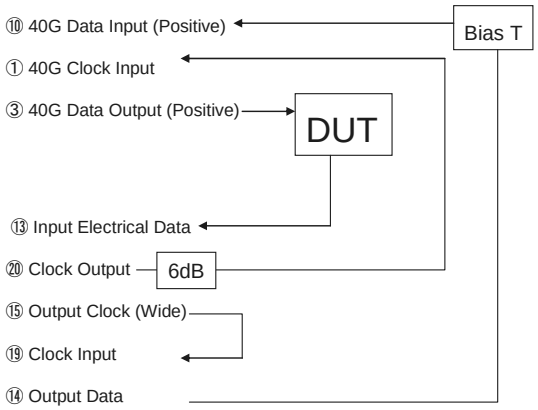
4.5 Connecting DUT

⑩ 40G Data Input (Positive)
① 40G Clock Input
② 40G Clock Output
③ 40G Data Output (Positive)
⑪ Input Data
⑫ Input Clock
⑳ Clock Output
⑮ Output Clock (Wide)
⑲ Clock Input
⑭ Output Data
⑱ Optical Output
⑬ Input Electrical Data

Bias T
6dB
DUT

Optical DUT Electrical

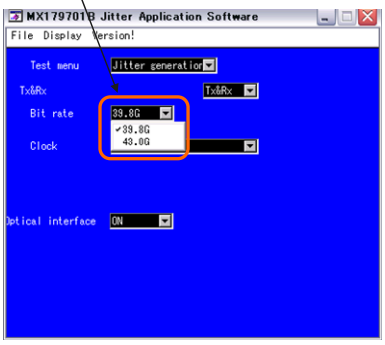
4.6 Connecting DUT



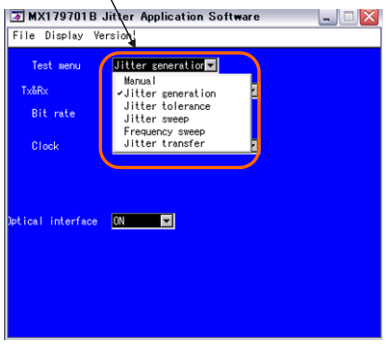
5. Common Settings with MX179701B

✧ **Start the MX179701B and select the Rate setting and measurement items.**

Rate Setting



Measurement Items



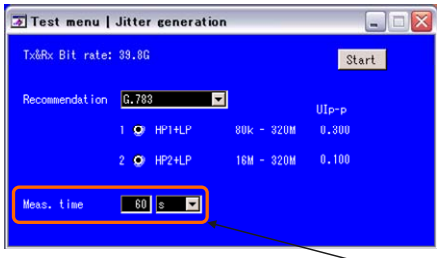
6.0 Jitter Measurements

- There are three types of Jitter measurement as follows:
  - Jitter Generation measurement
    - This measures the residual or intrinsic Jitter at the DUT output
  - Jitter Tolerance measurement
    - This adds Jitter gradually to the DUT and measures the amount of Jitter at which the DUT can operate without generating errors.
  - Jitter Transfer measurement
    - This measures the degree to which Jitter is transferred to the DUT output side.

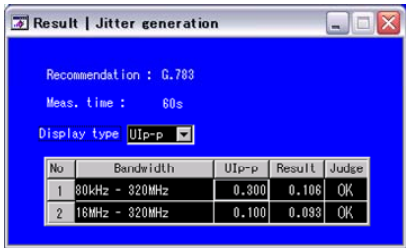
6.1 Jitter Generation Measurement

- Start the MX179701B and select Display → Test Menu and Result.
- After setting the standard and measurement time to be used for measurement at Test Menu, click the Start button to start measurement. The results are displayed on the Result screen.

Test Menu



Result

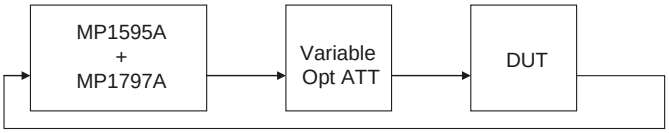


The Measurement time setting is defined 60 s.

6.2 Jitter Tolerance Measurement

- **Perform 1dB penalty measurement before Jitter Tolerance measurement.*** see note

1. Insert an optical attenuator between the measuring equipment and DUT.

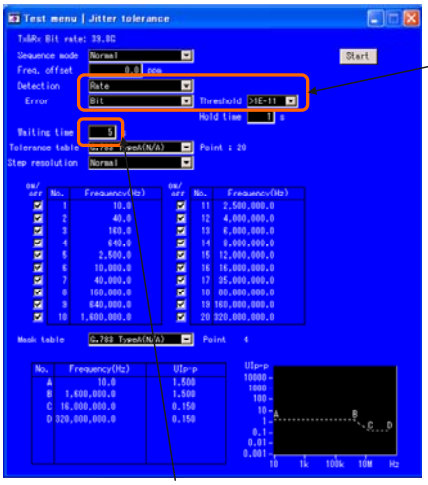


2. Attenuate the optical signal with the variable optical attenuator and set the attenuation amount (dB) so that the Error/Alarm rate monitored by the MP1595A becomes the threshold value used at Jitter Tolerance measurement. We recommend 1E-11 at Bit error for the threshold value.
3. Set the optical attenuator to a value 1 dB larger than the attenuation measured in step (2) and start the Jitter Tolerance measurement.

The 1dB penalty setting is not required when the DUT input is electrical.

6.3 Jitter Tolerance Measurement

- **Start the MX179701B and select Display → Test Menu, Result and Analysis.**
- **After setting the standard, mask and Error/Alarm measurement targets, etc., click the Start button to start measurement.**

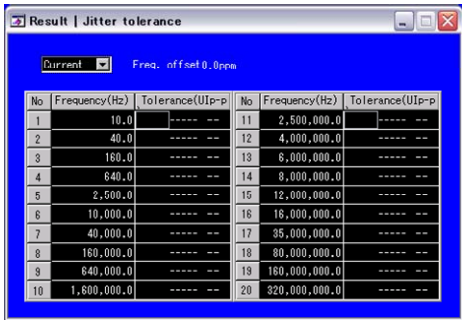


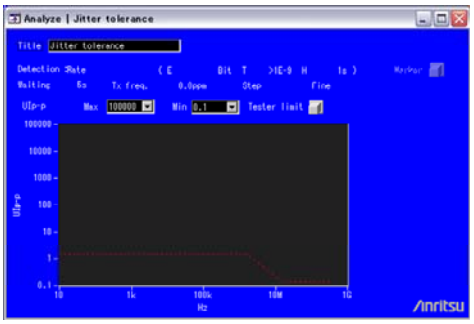
Measurement Target
Error/Alarm
Settings

The Waiting time setting is normally 5s.
If you know the DUT makes functional recovery less than 5s, you can set the less time to the waiting time.

6.4 Jitter Tolerance Measurement

- The measurement results are displayed on the Result and Analysis screens.

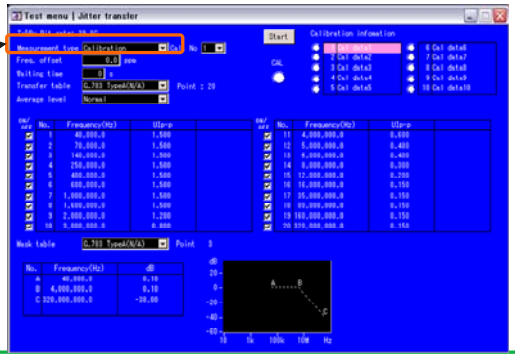




6.5 Jitter Transfer Measurement

- Start the MX179701B and select Display → Test Menu, Result, and Analysis.
- Before performing Calibration, only Calibration can be selected for Measurement type. After Calibration, connect the DUT, switch Measurement type to Measurement and perform measurement.

Measurement type



6.6 Jitter Transfer Measurement

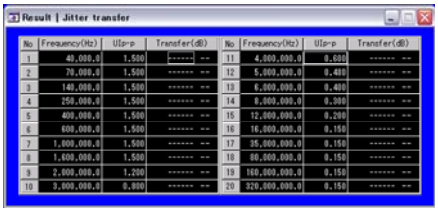
- **After performing Calibration measurement with the measuring equipment looped-back, connect the DUT and perform the Jitter Transfer measurement.**
- **To perform Calibration for the receive side of the measuring equipment, make the following connections.**

Optical	DUT	Optical	Short cut the DUT as shown in slide 26, and perform Calibration.
Electrical	DUT	Optical	Short cut the DUT as shown in slide 26, and perform Calibration.
Optical	DUT	Electrical	Short cut the DUT as shown in slide 29, and perform Calibration.
Electrical	DUT	Electrical	Short cut the DUT as shown in slide 29, and perform Calibration.

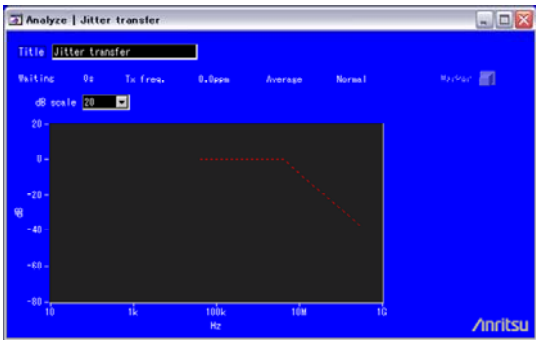
6.7 Jitter Transfer Measurement

- **The measurement results are displayed on the Results and Analysis screens.**

Result

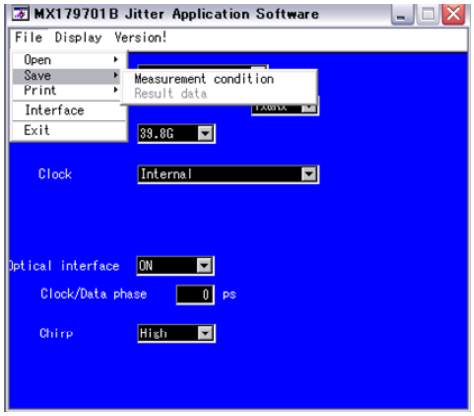


Analysis



7. Save/Load Method

- Save/Load is performed from the MX179701B File Menu.
- Save “Result data” as file type – “all.” This saves results in the MX179701B file format, as well as text and bmp (if applicable).



Appendix

- MU150142A　Connectors (1/2)

Item	Specification	Note
40G Clock Input		
Frequency	39.813120GHz, 43.018413GHz	
Amplitude	0.4 to 1.0Vp-p	
Termination	AC/50ohm	
Connector	V	
40G Data Input		Fit a 50 Ω terminator when storing the equipment or not using it for measurement.
Number of Input	2 (Data/XData)	
Input Amplitude	100 to 800mV pp	
Threshold	+0.1 to −0.1V, in 1mV steps at single-ended only	
Termination	AC/50ohm (connect DC Block externally)	
Connector	V	
40G Data Output		Fit a 50 Ω terminator when storing the equipment or not using it for measurement.
Number of Output	2 (Data/XData (Non-Independent))	
Amplitude	0.4 to 1.0Vp-p / 2mV Step	
Offset	−2.0 to +3.3Voh / 1mV Step	
Output	ON/OFF	
Connector	V	
40G Clock Output		
Frequency	39.813120GHz, 43.018413GHz	
Amplitude	1.0Vp-p(AC)±250mVp-p	
Termination	AC/50ohm	
Connector	V	

Appendix

✧ MU150142A　Connectors (2/2)

Item	Specification	Note
10G Clock Output		Trigger of Oscilloscope For MU150100A sync
Frequency	9.95328GHz, 10.75460339GHz	
Amplitude	0.7Vp-p(AC)±350mVp-p	
Termination	AC/50ohm	
Connector	SMA	
1/64 Ref Clock Output		
Frequency	622.08MHz, 672.1627MHz	
Amplitude	0.8Vp-p(AC)±250mVp-p	
Termination	AC/50ohm	
Connector	SMA	
AUX Input		From MP1797A Reference Clock
Frequency	622.08MHz, 672.1627MHz	
Amplitude	200mVp-p to 800mVp-p	
Termination	+1.3V/50ohm or AC/50ohm	
Connector	SMA	
AUX Output		Reference Clock for Transponder/Serdes Oscilloscope trigger
Number of Output	2 (AUX/XAUX (Non-Independent))	
Variation	1/n Clock(n=16,32,64,128,256), Pattern Sync., AUX Input Through	
Amplitude	0.2 to 1.0Vp-p / 10mV Step	
Termination	AC/50ohm	
Connector	SMA	

Appendix

✧ MP1797A　Connectors (1/5)

Item	Specification	Note
Clock Input		
Frequency	39.81312GHz +/- 100ppm, 43.01841GHz +/- 100ppm	
Level	+4dbm +/- 3db	
Termination	AC/50ohm	
Connector	V	
Clock Output		
Frequency	39.81312GHz, 43.01841GHz	
Level	+7dbm +/- 3db	
Termination	AC/50ohm	
Connector	V	
Electrical Clock Input		On the MU179703A
Bit Rate	25.0 to 43.5 Gbit/s	
Input Voltage	0.7 to 1.4 V(p-p)	
Waveform	Sine wave or rectangular wave	
Duty Cycle	45 to 55 %	
Waveform Distortion	10 % or less	
Connector	V	

Appendix

✧ MP1797A　Connectors (2/5)

Item	Specification	Note
Electrical Data Input		On the MU179703A
Bit Rate	25.0 to 43.5 Gbit/s	
Input Voltage	1.0 to 2.0 V(p-p)	
Code	NRZ	
Connector	V	
Optical Output		On the MU179703A
Modulator	LN	
Mean Launched Power	0dbm +/- 3db	
Extinction Rate	More than 10db	
Code	NRZ	
Connector	FC	
Center Wavelength	1530 to 1565 nm	
Optical Input		On the MU179704A
Bit Rate	39.81312 Gbit/s +/- 50ppm	Sensitivity
Wavelength	1530 to 1565 nm	0 to –8dbm : 10E-15 guaranteed
Sensitivity	0 to –10dbm	-8 to –10dbm : 10E-12 guaranteed
Overload	+3dbm	Non-frame PRBS31
Reflectance	Less than –27db	/ SDH VC4*256c-bulk(Scramble : ON)
Code	NRZ	
Connector	FC	

Appendix

✧ MP1797A　Connectors (3/5)

Item	Specification	Note
O/E Data Output		On the MU179704A
Bit Rate	39.81312 Gbit/s	Fit a 50 Ω terminator when storing the equipment or not using it for measurement.
Output Voltage	0.4 to 0.8 V(p-p) (Voh : 0V)	
Connector	V	
Narrow Clock Output		On the MU179704A
Bit Rate	39.81312 Gbit/s	
Output Voltage	0.7 to 1.3 V(p-p) (Voh : 0V)	
Connector	V	
Wide Clock Output		On the MU179704A
Bit Rate	39.81312 Gbit/s	
Output Voltage	0.7 to 1.3 V(p-p) (Voh : 0V)	
Connector	V	
Electrical Data Input		On the MU179704A
Bit Rate	39.81312 Gbit/s +/- 50ppm	Fit a 50 Ω terminator when storing the equipment or not using it for measurement.
Input Voltage	0.5 to 1.0 V(p-p)	
Code	NRZ	
Connector	V	
Data Output		On the MU179704A
Bit Rate	39.81312 Gbit/s +/- 50ppm	Fit a 50 Ω terminator when storing the equipment or not using it for measurement.
Output Voltage	0.4 to 0.8 V(p-p) (Voh : 0V)	
Connector	V	

Appendix

✧ MP1797A　Connectors (4/5)

Item	Specification	Note
Optical Input		On the MU179705A
Bit Rate	43.01841 Gbit/s +/- 50ppm	Sensitivity
Wavelength	1530 to 1565 nm	0 to –8dbm : 10E-15 guaranteed
Sensitivity	0 to –10dbm	-8 to –10dbm : 10E-12 guaranteed
Overload	+3dbm	Non-frame PRBS31
Reflectance	Less than –27db	/ SDH VC4*256c-bulk(Scramble : ON)
Code	NRZ	
Connector	FC	

Appendix

✧ MP1797A　Connectors (5/5)

Item	Specification	Note
O/E Data Output		On the MU179705A
Bit Rate	43.01841 Gbit/s	Fit a 50 Ω terminator when storing the equipment or not using it for measurement.
Output Voltage	0.4 to 0.8 V(p-p) (Voh : 0V)	
Connector	V	
Narrow Clock Output		On the MU179705A
Bit Rate	43.01841 Gbit/s	
Output Voltage	0.7 to 1.3 V(p-p) (Voh : 0V)	
Connector	V	
Wide Clock Output		On the MU179705A
Bit Rate	43.01841 Gbit/s	
Output Voltage	0.7 to 1.3 V(p-p) (Voh : 0V)	
Connector	V	
Electrical Data Input		On the MU179705A
Bit Rate	43.01841 Gbit/s +/- 50ppm	Fit a 50 Ω terminator when storing the equipment or not using it for measurement.
Input Voltage	0.5 to 1.0 V(p-p)	
Code	NRZ	
Connector	V	
Data Output		On the MU179705A
Bit Rate	39.81312 Gbit/s	Fit a 50 Ω terminator when storing the equipment or not using it for measurement.
Output Voltage	0.4 to 0.8 V(p-p) (Voh : 0V)	
Connector	V	

Anritsu

Specifications are subject to change without notice.

Anritsu Corporation
5-1-1 Onna, Atsugi-shi, Kanagawa, 243-8555 Japan
Phone: +81-46-223-1111
Fax: +81-46-296-1264

● **U.S.A.**
Anritsu Company
1155 East Collins Blvd., Suite 100, Richardson,
TX 75081, U.S.A.
Toll Free: 1-800-267-4878
Phone: +1-972-644-1777
Fax: +1-972-671-1877

● **Canada**
Anritsu Electronics Ltd.
700 Silver Seven Road, Suite 120, Kanata,
Ontario K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

● **Brazil**
Anritsu Eletrônica Ltda.
Praca Amadeu Amaral, 27 - 1 Andar
01327-010-Paraiso-São Paulo-Brazil
Phone: +55-11-3283-2511
Fax: +55-11-3288-6940

● **U.K.**
Anritsu EMEA Ltd.
200 Capability Green, Luton, Bedfordshire, LU1 3LU, U.K.
Phone: +44-1582-433200
Fax: +44-1582-731303

● **France**
Anritsu S.A.
16/18 avenue du Québec-SILIC 720
91961 COURTABOEUF CEDEX, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

● **Germany**
Anritsu GmbH
Nemetschek Haus, Konrad-Zuse-Platz 1
81829 München, Germany
Phone: +49-89-442308-0
Fax: +49-89-442308-55

● **Italy**
Anritsu S.p.A.
Via Elio Vittorini 129, 00144 Roma, Italy
Phone: +39-6-509-9711
Fax: +39-6-502-2425

● **Sweden**
Anritsu AB
Borgafjordsgatan 13, 164 40 KISTA, Sweden
Phone: +46-8-534-707-00
Fax: +46-8-534-707-30

● **Finland**
Anritsu AB
Teknobulevardi 3-5, FI-01530 VANTAA, Finland
Phone: +358-20-741-8100
Fax: +358-20-741-8111

● **Denmark**
Anritsu A/S
Kirkebjerg Allé 90, DK-2605 Brøndby, Denmark
Phone: +45-72112200
Fax: +45-72112210

● **Spain**
Anritsu EMEA Ltd.
Oficina de Representación en España
Edificio Veganova
Avda de la Vega, n° 1 (edf 8, pl 1, of 8)
28108 ALCOBENDAS - Madrid, Spain
Phone: +34-914905761
Fax: +34-914905762

● **United Arab Emirates**
Anritsu EMEA Ltd.
Dubai Liaison Office
P O Box 500413 - Dubai Internet City
Al Thuraya Building, Tower 1, Suit 701, 7th Floor
Dubai, United Arab Emirates
Phone: +971-4-3670352
Fax: +971-4-3688460

● **Singapore**
Anritsu Pte. Ltd.
60 Alexandra Terrace, #02-08, The Comtech (Lobby A)
Singapore 118502
Phone: +65-6282-2400
Fax: +65-6282-2533

● **India**
Anritsu Pte. Ltd.
India Branch Office
Unit No. S-3, Second Floor, Esteem Red Cross Bhavan,
No. 26, Race Course Road, Bangalore 560 001, India
Phone: +91-80-32944707
Fax: +91-80-22356648

● **P.R. China (Hong Kong)**
Anritsu Company Ltd.
Units 4 & 5, 28th Floor, Greenfield Tower, Concordia Plaza,
No. 1 Science Museum Road, Tsim Sha Tsui East,
Kowloon, Hong Kong
Phone: +852-2301-4980
Fax: +852-2301-3545

● **P.R. China (Beijing)**
Anritsu Company Ltd.
Beijing Representative Office
Room 1515, Beijing Fortune Building,
No. 5, Dong-San-Huan Bei Road,
Chao-Yang District, Beijing 10004, P.R. China
Phone: +86-10-6590-9230
Fax: +86-10-6590-9235

● **Korea**
Anritsu Corporation, Ltd.
8F Hyunjuk Building, 832-41, Yeoksam Dong,
Kangnam-ku, Seoul, 135-080, Korea
Phone: +82-2-553-6603
Fax: +82-2-553-6604

● **Australia**
Anritsu Pty. Ltd.
Unit 21/270 Ferntree Gully Road, Notting Hill,
Victoria 3168, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

● **Taiwan**
Anritsu Company Inc.
7F, No. 316, Sec. 1, Neihu Rd., Taipei 114, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817

Please Contact:

070801

R70 Printed on 70% Recycled Paper

No. MP1595A_Jitter-E-T-1-(3.00) 公知 Printed in Japan 2007-9 AKD