

MP1800A/MP1797A 40G Jitter

Signal Quality Analyzer/Jitter Analyzer

MP1800A / MP1797A 40G Jitter Quick Start Guide

Jan 25th, 2008

Anritsu Corporation
IP Network Measurement Division

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■ Items

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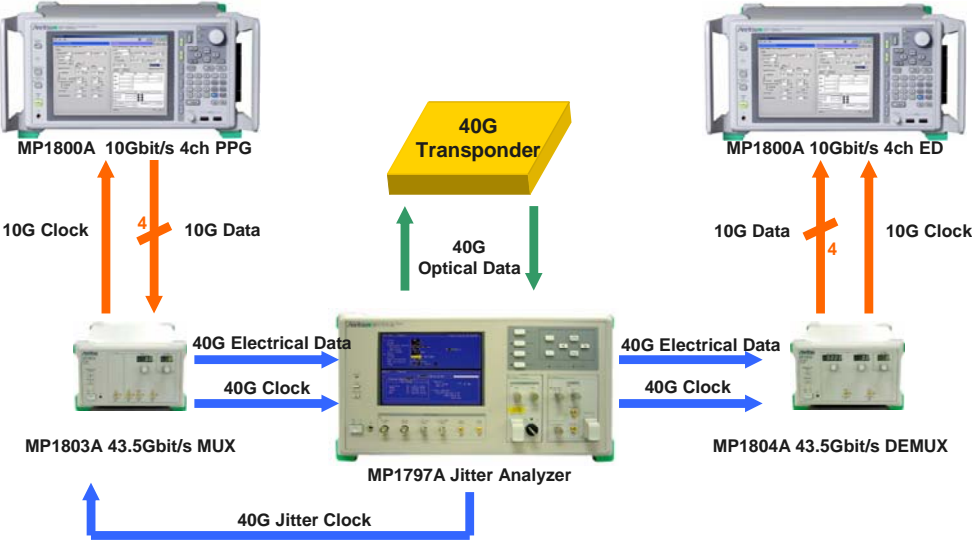
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40G BERTS and Jitter System Configuration

40G Jitter Measurement System Configuration (1/3)



40G Jitter Measurement System Configuration (2/3)

MP1797A Jitter Analyzer



MP1797A 40G Jitter Analyzer

Operation Frequency	: 39.81312G bit/s 43.0184 G bit/s
Jitter modulation frequency:	up to 320MHz
Optical output power	: 0 – 3 dBm (typical)
Optical input sensitivity	: -10 dBm (BER 10⁻¹²)
Measurement items	: Jitter generation, Jitter transfer, Jitter tolerance

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40G BER Measurement System Configuration (3/3)

43.5G bit/s BERT System

Operation Frequency	: 25G to 43.5G bit/s
Data Output level	: 2.0V fix : 1.00 to 2.60V (with option 01)
Input sensitivity	: >=100mV (70mV typical)
Evaluation pattern	: PRGM (512Mbits) : PRBS (2^N-1 : N=7, 9, 11, 15, 20, 23, 31)
other features	: Cross point adjust (with option 01) Burst Signal measurement for optical circulation loop test



10Gbit/s 4ch PPG



43.5Gbit/s MUX / DEMUX



10Gbit/s 4ch ED

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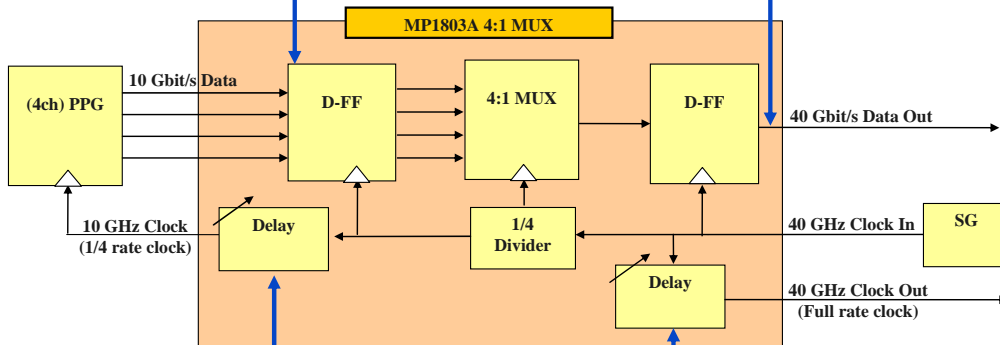
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Block Diagram of Multiplexer

Input stage has 10Gbit/s DFF.
 → Delicate channel skew adjustment is not needed.

40GHz full rate clock, DFF is used.
 → Bit length does not depend on clock's duty cycle like systems using half rate clock system.
 → Jitter modulation function is available with MP1797A Jitter Analyzer.



Full rate clock and 1/4 rate clock output is available within 140ps delay.
 1/4 rate clock is delivered to 10G data generation.
 Full rate clock can be delivered to Error Detector.

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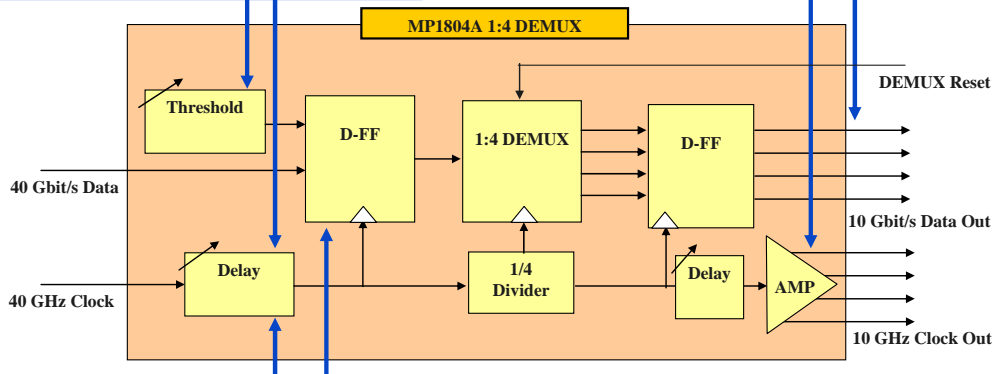
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Block Diagram of Demultiplexer

Data threshold voltage and clock phase adjustment function is available.
 → DC data can be detected.
 → Eye margin measurement is available.

Four of 1/4 rate clocks are output.
 → With MP1800A, All of 10G data's error can be detected simultaneously.



Full rate clock is used at D-FF of the first stage.
 → Phase margin does not depend of input clock's duty cycle.

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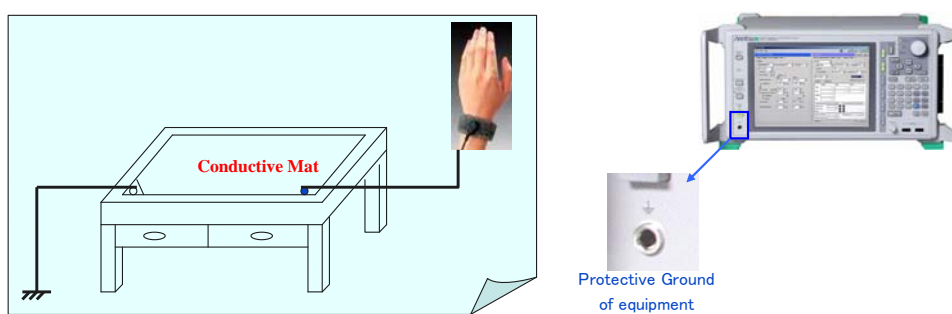
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Before Use or Before Setup

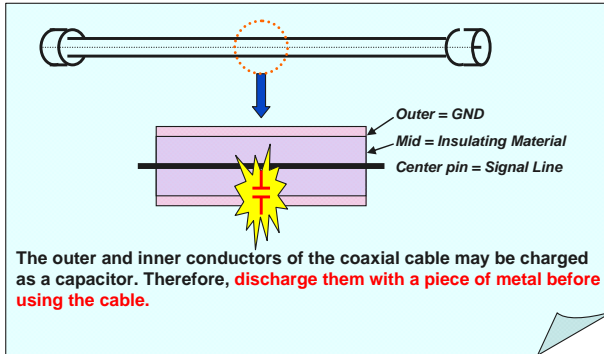
Measuring static electricity Prevention Before Operate-1

To prevent damage caused by static electricity, always put a conductive mat the working table. In addition, the individual who is operating, should wear a wrist strap as shown below. And plug connect it into the protective ground before connecting the coaxial cable to the equipments.

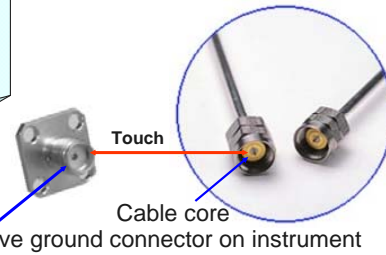


Discharge the operator's static electricity by connecting the cabinet to the operator by using a "WRIST STRAP".

Measuring Static Electricity Prevention Before Operate-2 (Using Long Coaxial Cable)



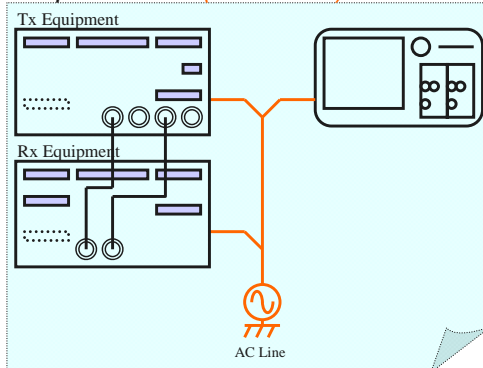
Touch the core of the coaxial cable to be connected to the outside of the protective ground connector, before making the cable connection.



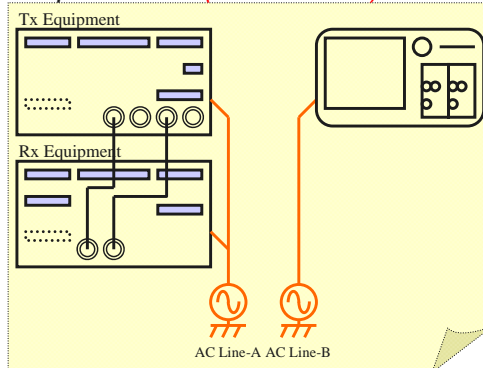
Measuring Static Electricity Prevention Before Operate-3 Safety Measures Between equipment and peripheral equipment

- Use the attached power cord to connect the AC power supply.
- When connect the system equipment, must be connect AC line and common ground signal.
Ground the ground terminal of the power cord or the frame ground terminal on the instrument.

Example Connection-1 (Recommended)



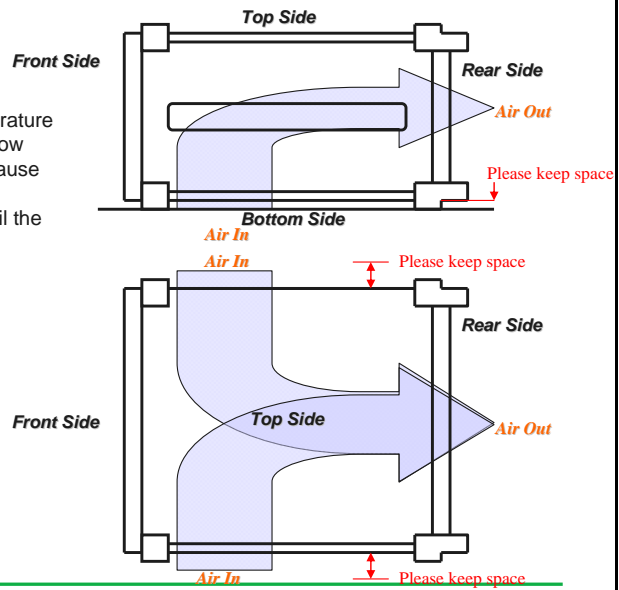
Example Connection-1 (Not recommended)



Note: This connection will be able to voltage potential difference between Line-A and B.

Heat Prevention

- Keep space for the Air In/Out.
- If the instrument is operated at room temperature after being used or stored for a long time at low temperature, condensation may occur and cause short-circuiting. To prevent this, do not turn the power on until the instrument completely dry.



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Quick start guide procedure

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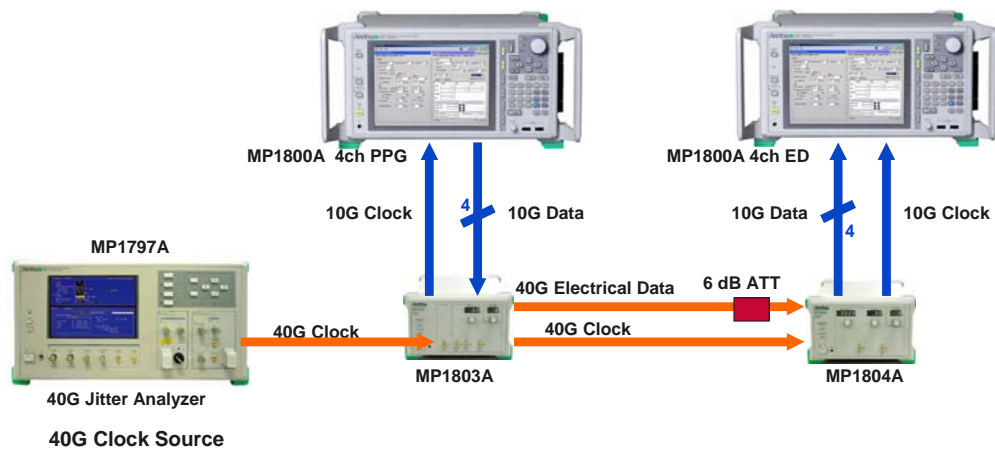
Quick start guide procedure

1. Achieve error free as the electrical signal
2. Achieve error free as the optical signal

- 1. Achieve error free as the electrical signal***

System Setup Information

40G BERT Setup



Cable Connection

How to Connect

Between MP1797A Jitter Analyzer and MP1803A MUX Unit.

Connect MP1797A Clock Output to MP1803A Clock Input by **Short Length V Cable**.

* MP1797A Clock Output and MP1803A Clock input are **V Connector**.

* MP1803A Input Level is **0.7Vp-p to 1.5Vp-p (0.88dBm to 7.5dBm at 50ohm)**.

Between MP1800A 4CH Pulse Pattern Generator (PPG) and MP1803A MUX Unit.

Connect MP1803A 1/4 Clock Output to MP1800A Clock Distributor's Clock Input by **K Cable**.

* MP1800A Clock Distributor Clock Input level is **0.8Vp-p to 2.00Vp-p**.

Connect MP1800A Clock distributor's Clock output (1 to 4) to PPG Clock Input (1 to 4) by **same length cable**

Connect MP1800A PPG DATA (1 to 4) Output to MP1803A 1/4 DATA (1 to 4) Input by **same length cable**.

MP1800A PPG ch 1-4 DATA to MP1803A 1/4 DATA Input 1-4

* MP1800A 4ch PPG DATA Output and MP1803A 1/4 DATA Input are **K Connectors**.

Between MP1803A MUX Unit and MP1804A DEMUX Unit.

Connect MP1803A DATA Output to MP1804A DATA Input by **V Cable and V Type 6dB ATT**.

* MP1803A DATA Output level is **2.00Vp-p (AC coupling) Fixed and V connector**.

* MP1803A w/option 01 DATA Output level is **0.50Vp-p to 2.60Vp-p (AC coupling) variable and V Connector**.

* MP1804A DATA Input level is **0.10Vp-p to 1.00Vp-p (50ohm/GND) and V Connector**.

Connect MP1803A CLOCK Output to MP1804A CLOCK Input by **V cable**.

* MP1803A CLOCK Output level is **1.00Vp-p (AC Coupling) Fixed and V Connector**.

* MP1804A CLOCK Input level is **0.7Vp-p to 1.5Vp-p (50ohm/GND) and V Connector**.

Between MP1804A DEMUX Unit and MP1800A 4CH Error Detector (ED).

Connect MP1804A 1/4 DATA (1 to 4) Output to MP1800A ED DATA (1 to 4) Input.

Connect MP1804A 1/4 CLOCK (1 to 4) Output to MP1800A ED CLOCK (1 to 4) Input.

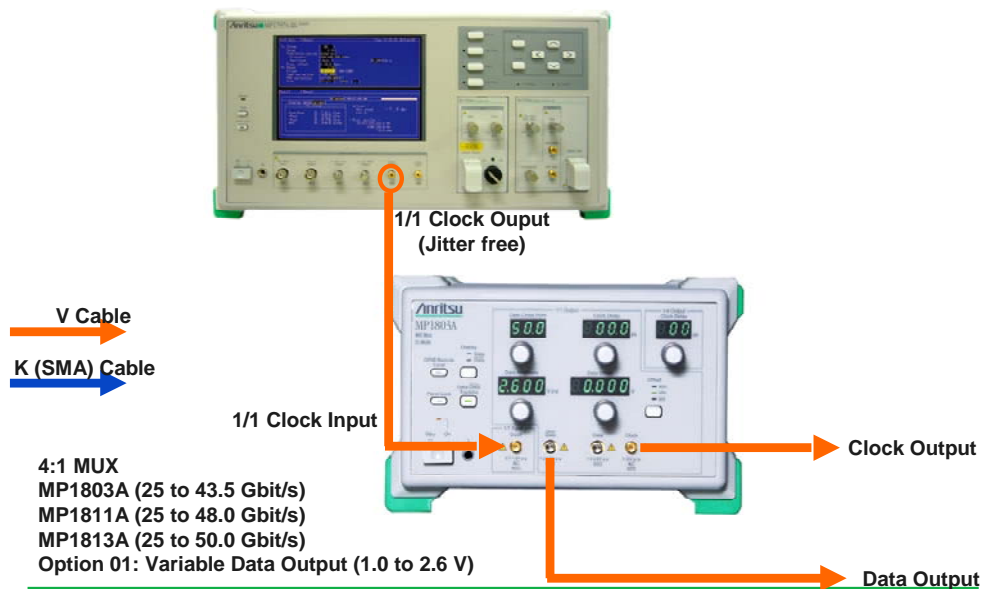
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Cable Connection



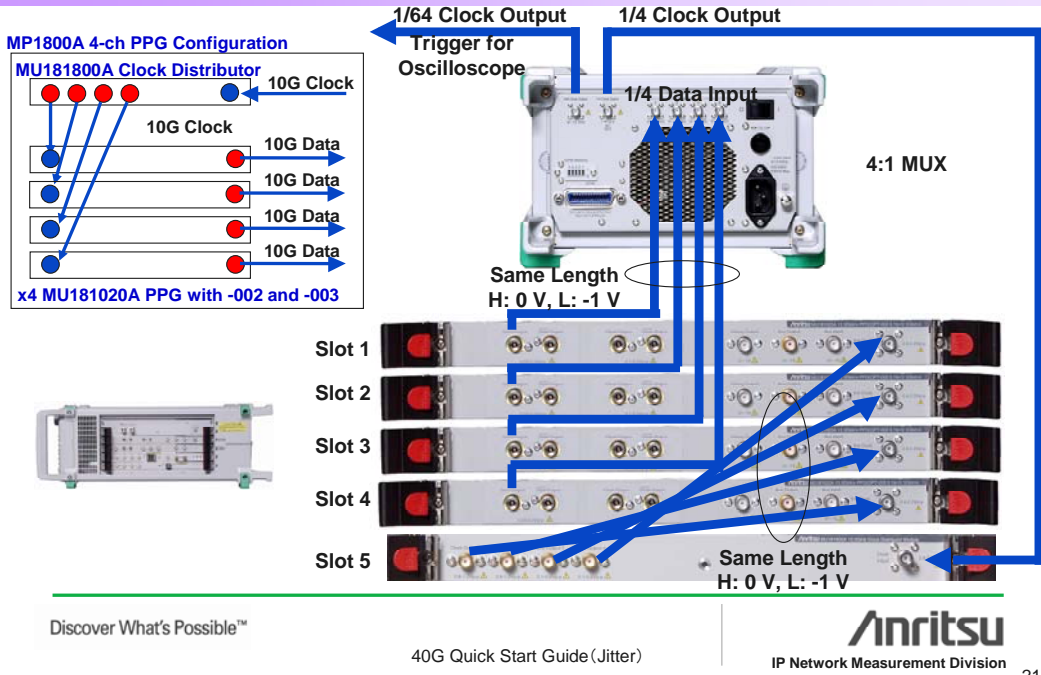
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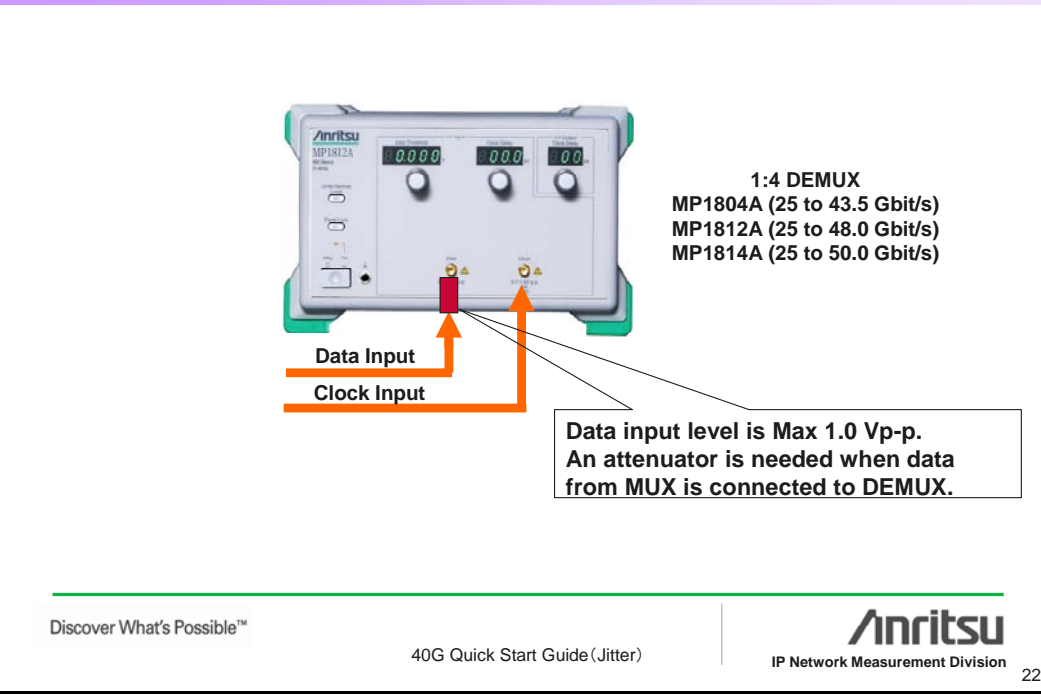
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Cable Connection

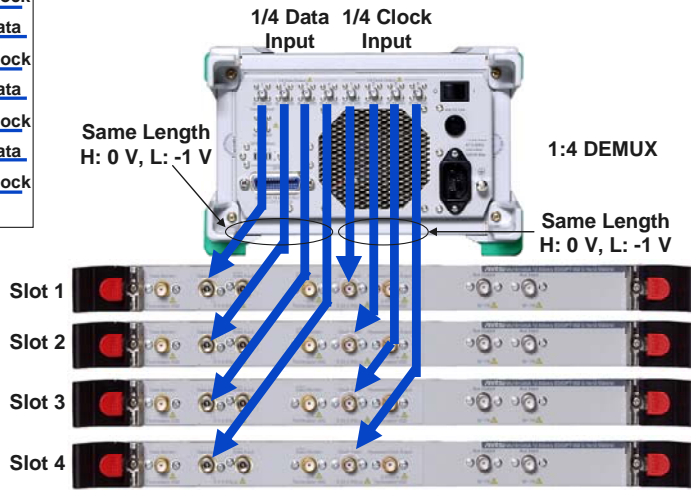
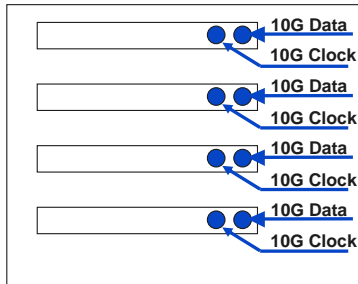


Cable Connection



Cable Connection

MP1800A 4-ch ED Configuration



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Setup and Turn ON/OFF Procedure of the System

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Activation

Starting and Terminating the System

Starting procedure

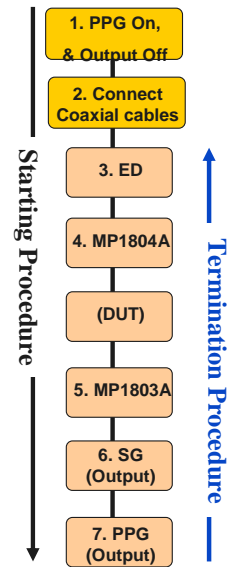
1. Before connecting MP1803A/MP1804A to PPG, SG(MP1797A) and ED, turn ON PPG and turn off output.
2. Connect MP1803A to PPG, SG and MP1804A to ED.
3. Turn ON ED.
4. Turn ON the main power switch on the rear panel of the MP1804A.
* Turn ON the DUT (When connect the DUT).
5. Turn ON the power switch on the front panel of the MP1803A.
The lamp on the front panel of the MP1803A is turned on.
6. Turn ON the SG(MP1797A).
7. Turn ON the Data output of PPG.

Termination procedure

1. Turn OFF the power for PPG.
2. Turn OFF the power for SG.
3. Turn OFF the main power switch on the rear panel of the MP1803A.
* Turn OFF the DUT (When connect the DUT).
4. Turn OFF the main power switch on the rear panel of the MP1804A.
5. Turn OFF ED.

CAUTION

If the MP1803A and its peripheral equipment are started or terminated without going through the above steps, the expensive semiconductors built in the MP1803A could be damaged.



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Activation

Operating the MP1803A

1. Initially, set to Off the DATA outputs of the PPG.
2. Set combination Mode of MP1800A 4ch PPG.
3. Set DATA AMPLITUDE to 1.0 Vpp and OFFSET voltage VOH to 0 V for all the 4 channels of PPG.
4. Turn on SG(MP1797A).
5. Set Bit rate 39.8Gbps or 43.0Gbps and set Tx Jitter off.
6. Turn on PPG output.
7. Turn the 1/4 Output Clock Delay dial of the MP1803A to generate the optimum 40G waveform.
8. Recommendation:
Observing the waveform using the sampling oscilloscope, turn the 1/4 Clock Delay dial of the MP1803A to find a point where the best waveform is obtained with the minimum jitter. The delay can be varied in the range of -70 to +70 ps.

How to make Error Free Condition of MP1800A 4ch ED.

1. Set combination Mode of MP1800A 4ch ED.
2. Select the Single-ended interface of DATA input
3. Start Auto adjust Function of MP1800A 4ch ED.
4. Adjust Threshold Adjust Dial for 1/1 DATA Input of MP1804A. (Search error free point)
5. Adjust Phase Adjust Dial for 1/1 CLOCK Input of MP1804A. (Search error free point)

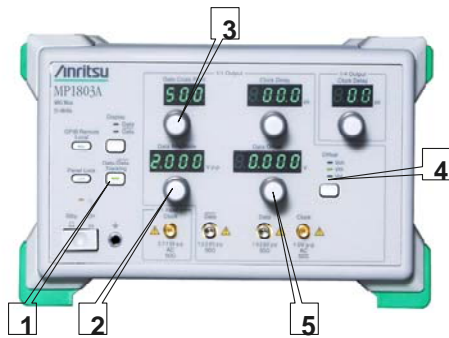
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MP1803A MUX Setting for Data output



In case of MP1803A with option 01

1. Turn "Data/Data Tracking" to ON.
2. Set "Data Amplitude" to 1.000 V.
3. Set "Data Cross Point" to 50.0%.
4. Set "Offset" to Vth.
5. Set "Data Threshold" to 0.000 V.



In case of MP1803A without option 01

No setting for Data output.
Data output is fixed 2.0Vp-p (Add 6dB)

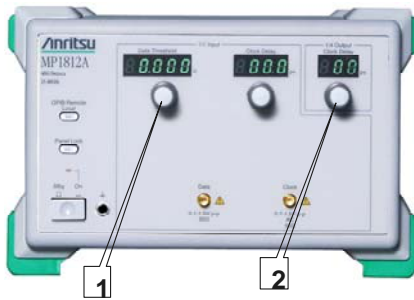
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MP1804A DEMUX Setting for Data input



1. In case connect to MP1797A,
Set "Data Threshold" to 0.000V (-0.130 V typ. In case 6dB added, at 43G)
Need to adjust optimum value.
2. Set "1/4 Output Clock Delay" to 0.0 ps (Fixed).

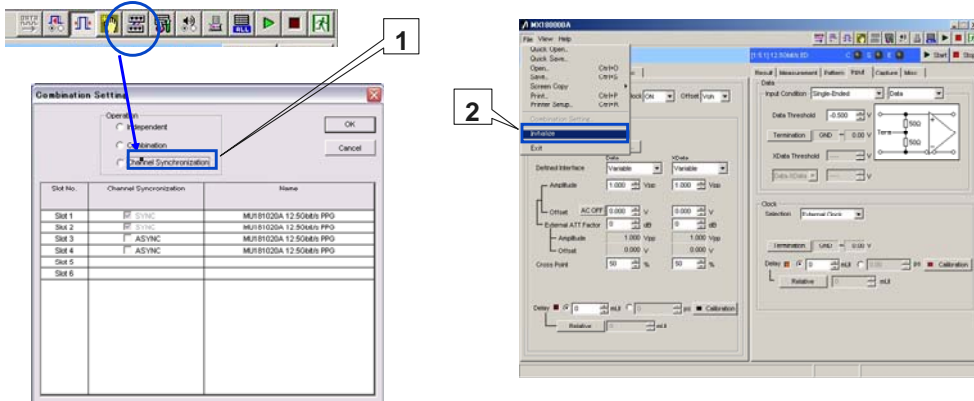
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MP1800A 4-ch PPG Settings



1. If "Combination" is NOT set, select "Combination" and click "OK".
2. Initialize all settings.
3. The default setting values of PPG are as below,
Amplitude: 1.0 Vp-p, Offset: 0V (Voh), Data Delay: 0 mUI, Pattern: PRBS15

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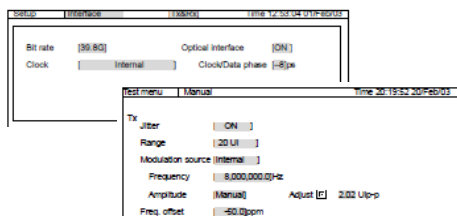
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Turn on SG (MP1797A)

MP1797A 40G Jitter Analyzer



1. Power on.
2. Set Bit rate "39.8G" or "43.0G".
3. Set Tx Jitter "Off".



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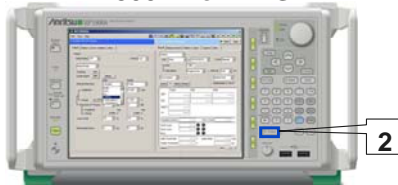
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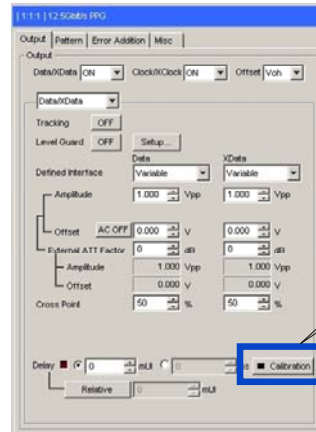
30

Turn on PPG Data signal

MP1800A 4ch PPG



2. Turn on "Output" of Data signals.



3. Calibrate Data delay for all four channels.

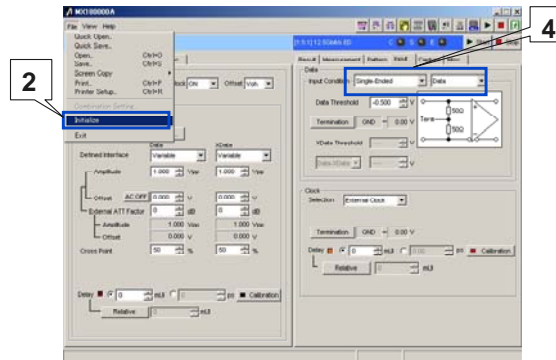
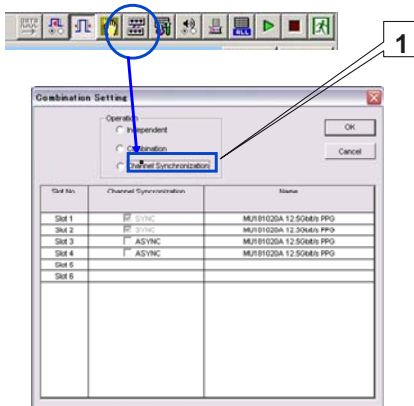
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MP1800A 4-ch ED Settings



1. If "Combination" is NOT set, select "Combination" and click "OK".
2. Initialize all settings.
3. The default setting values of ED are as below,
Input condition: Differential, Data threshold: 0V, Pattern: PRBS15
4. Set "Input Condition" to "Single-Ended" and "Data" for all four channel.

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MP1800A 4-ch ED Settings

The screenshot shows two windows from the MP1800A software. The 'Auto Adjust' dialog box (callout 5) has 'ThresholdPhase' selected in the 'Item' dropdown. The 'Set All' button (callout 6) is highlighted. Below it, the 'Slot Selector' shows Slot1, Slot2, Slot3, and Slot4 all checked. The 'Error/Alarm' window (callout 7) shows various error metrics. The 'Data Threshold' is set to -0.539 and 'Data Delay' is 135 mUI. The 'XData Threshold' is set to 27.01 ps.

- Set Auto adjust function for keeping the optimum Data threshold and Clock phase
5. Click "Auto adjust" and "Set All" for selecting all four channels.
 6. Click "OK".
 7. Start measurement

You can see the optimum Data threshold value and Clock phase automatically.

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MP1800A 4-ch ED Settings

The screenshot shows the 'Selector' dialog box (callout 5) with 'Error Rate', 'Error Count', and 'Sync Loss Alarm' selected. The 'ED Result All' window (callout 7) displays a table of results for all four slots. The 'Error/Alarm' window (callout 6) is also visible, showing the 'Error/Alarm' dropdown menu.

Set Result screen

- Click ALL
- Select the displayed items, Error Rate, Error Count and Sync Loss Alarm.
- click "OK".
- You can see the selected Error/ Alarm items.

Item	Error Rate	Error Count	Sync Loss Alarm
1-Combination1-Total	0.0000E-10	0	-----
Slot1-Total	0.0000E-09	0	-----
Slot2-Total	0.0000E-09	0	-----
Slot3-Total	0.0000E-09	0	-----
Slot4-Total	0.0000E-09	0	-----

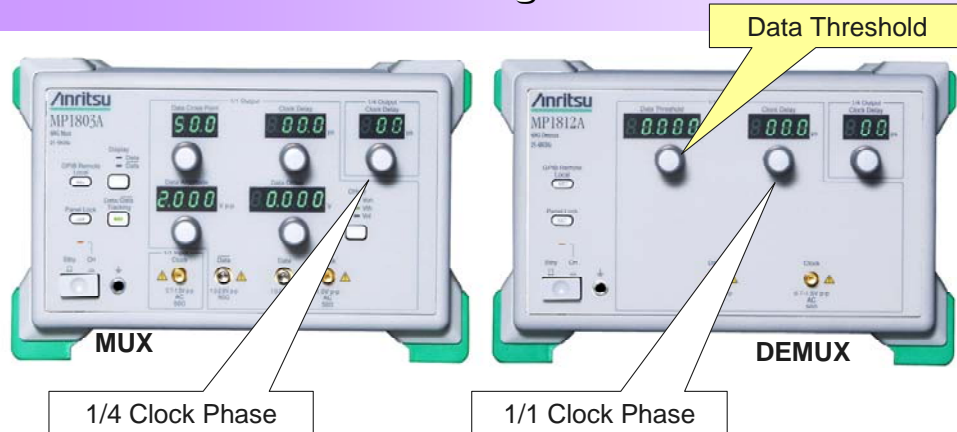
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MUX and DEMUX Phase Alignment



Tune the two volumes for phase alignment to get "Error Free" after changing frequency.

The DUT can be placed between the MUX Data output and DEMUX Data input.
Align the DEMUX 1/1 Clock phase and Data threshold to achieve error free condition.

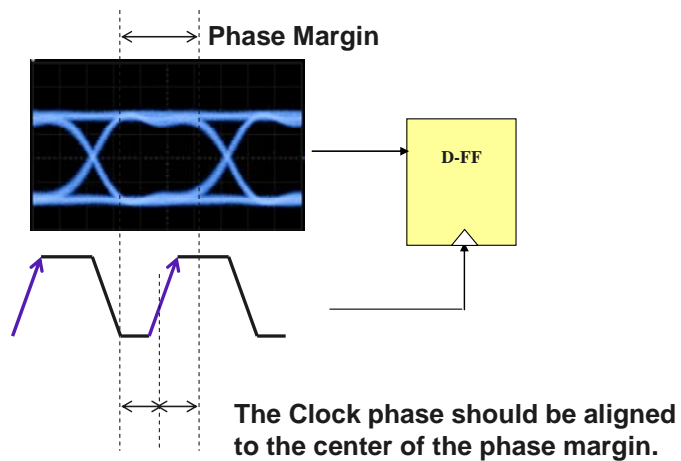
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MUX and DEMUX Phase and Threshold Alignment



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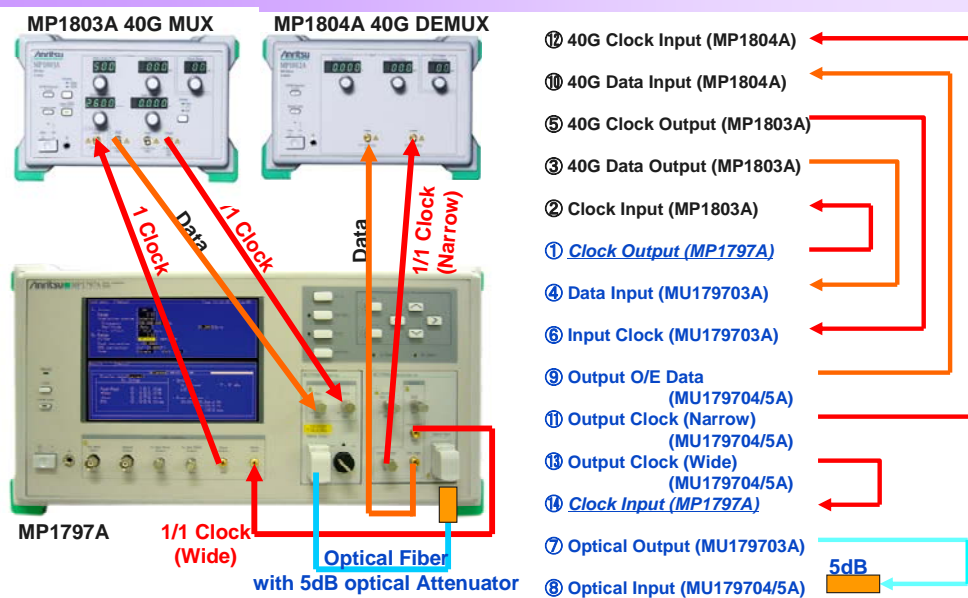
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2. Achieve error free as the optical signal

Cable Connection



40G BERTS / MP1797A Setup Flow-chart

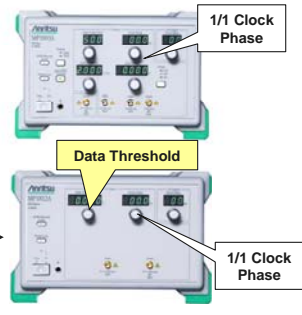
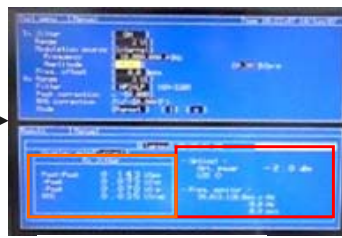
1. Set MP1797A
 - a - Bit-Rate 39.9G or 43.0G (Tx and Rx are same bit rate)
 - b - Optical interface ON
 - c - TX Jitter : "OFF"
 - d - RX Range : 2UI
 - E - Rx Filter : HP1+LP
 - f - Measurement Time: Repeat / 1s
 - g - Optical signal ON by Optical Output Key

2. 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)

3. Adjust MP1797A "Intrinsic Jitter" to smallest point using 1/1 Clock Phase Adjustment on MUX

4. Adjust MP1800A 4ch ED to "No-Alarm / No-Error" condition by adjusting Data Threshold and 1/1 clock phase to center position of margin on DEMUX.

5. Confirm Step-2,3 and 4
This Step is important: REPEAT ADJ



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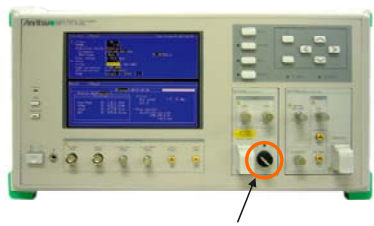
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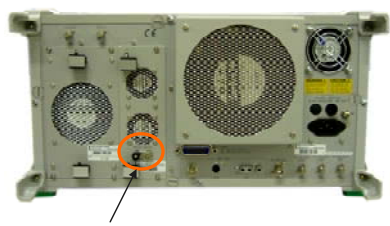
Turn on Optical signal

❖ Checking Optical Output Key

- Insert the key into the optical key switch and Remote Interlock. Set the key switch to the ON for output the optical signal.



Optical Key Switch



Remote Interlock

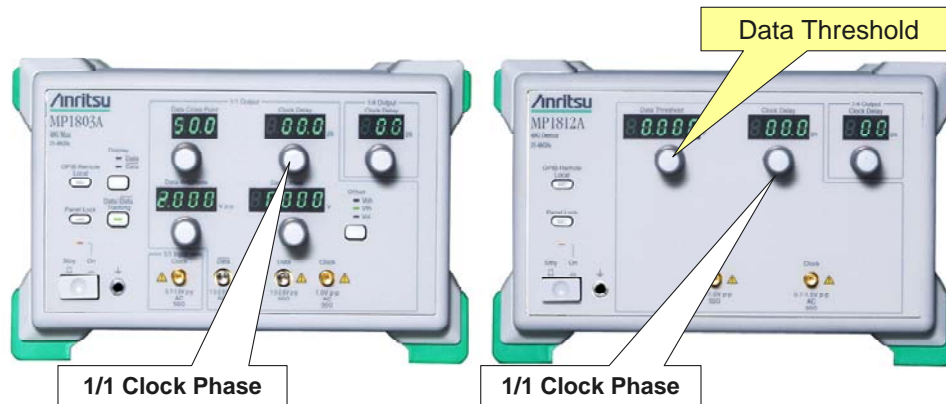
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MUX and DEMUX Phase Alignment

For Optical loop-back, it is necessary for adjust the phase and Data threshold.



Tune the three volumes to get "Error Free".

The optical interface of MP1797A is placed between the MUX and DEMUX.
Align the MP1804A 1/1 Clock phase and Data threshold to achieve error free.

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MUX and DEMUX Phase Alignment

For Jitter measurement, the system needs optimized of the phase and Data threshold.

- ① Turn Off 'Auto Sync' on four EDs.
- ② Adjust the Clock Delay on Mux, to find the mid point of the error-free range.
- ③ Adjust the 1/4 Clock Delay on Mux, to find the mid point of the error-free range.
- ④ Adjust the Clock Delay on Demux, to find the mid point of the error-free range.
- ⑤ Adjust the Data Threshold on Demux, to find the mid point of the error-free range.
- ⑥ Re-adjust the Clock Delay on Demux, to find the mid point of the error-free range.
- ⑦ Turn On 'Auto Sync' on four EDs.

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Jitter Measurement

40G BERTS / MP1797A Setup Flow-chart

Refer to Section 3. Common Settings with MX179701B

Set MX179701B Jitter Application with GPIB

Jitter Generation

Jitter Tolerance

Please re-adjust, when the result fails.
Confirm and re-adjust the System condition again

Start Jitter Measurement

Result | Jitter generation

Recommendation : G.783
Meas. time : 80s
Display type: UIp-p

No	Bandwidth	UIp-p	Result	Judge
1	80kHz - 320MHz	0.300	0.108	OK
2	16MHz - 320MHz	0.100	0.038	OK

Result | Jitter tolerance

Current Freq. offset 0.0ppm

No	Frequency(Hz)	Tolerance(UIp-p)	No	Frequency(Hz)	Tolerance(UIp-p)
1	10.0	-----	11	2,500,000.0	-----
2	40.0	-----	12	4,000,000.0	-----
3	160.0	-----	13	6,000,000.0	-----
4	640.0	-----	14	8,000,000.0	-----
5	2,500.0	-----	15	12,000,000.0	-----
6	10,000.0	-----	16	16,000,000.0	-----
7	40,000.0	-----	17	35,000,000.0	-----
8	160,000.0	-----	18	80,000,000.0	-----
9	640,000.0	-----	19	160,000,000.0	-----
10	1,600,000.0	-----	20	320,000,000.0	-----

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| 2. GPIB Setup | Slide 47 |
| 3. Common Settings with MX179701B | Slide 48 |
| 4. Jitter Measurements | Slides 49-57 |
| 5. Save/Load Method | Slide 57 |

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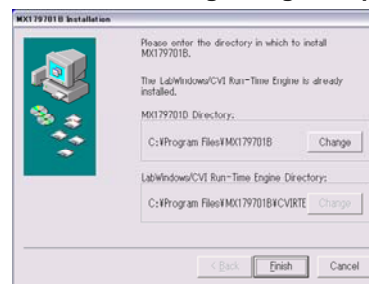
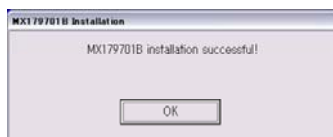
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1. MX179701B install

Measurement is performed from PC which the MX179701B 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.

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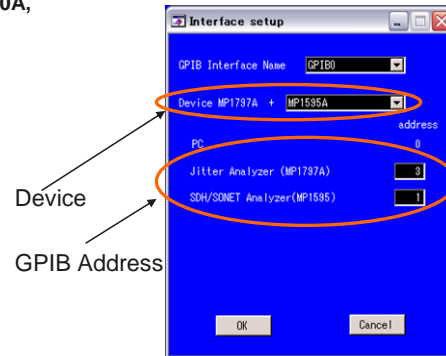
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2. GPIB Setup

MP1800A and MP1797A are controlled using MX179701B control software.

- (1) Connect the MP1800A and MP1797A to the PC in which the MX179701B is installed using a GPIB cable.
- (2) Switch on the power of the MP1800A, MP1803A, MP1804A and MP1797A.
- (3) Check the GPIB address of all equipments. If same GP-IB addresses, change the address of one unit.
MP1800A 4ch PPG and ED: 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+MP1800A, check the GPIB addresses as described in step (3).



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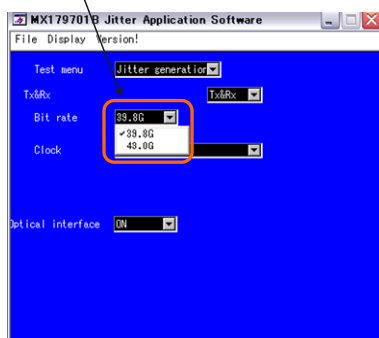
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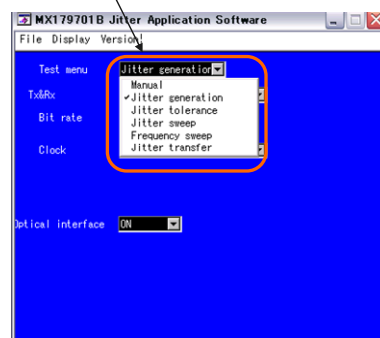
3. Common Settings with MX179701B

- ◆ Start the MX179701B and select the Bit Rate and measurement items.

Bit rate Setting



Measurement Items



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4. Jitter Measurements

There are three types of Jitter measurement as follows:

- **Jitter Generation measurement**
 - 📄 This measures the residual 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.

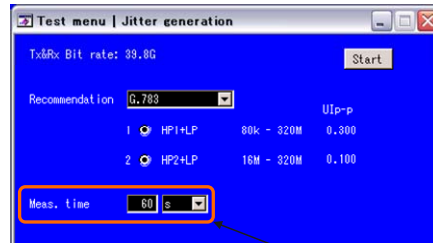
- **Jitter Transfer measurement**
 - 📄 This measures the degree to which Jitter is transferred to the DUT output side.

4-1. Jitter Generation Measurement

❖ Start the MX179701B and select Display → Test Menu and Result.

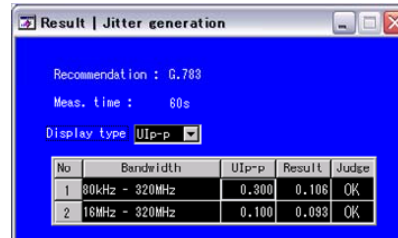
❖ After setting the standard and meas. time to be used for testing at Test Menu, click the Start button to “start”. The results are displayed on the Result screen.

Test Menu



The Measurement time setting is defined 60 s.

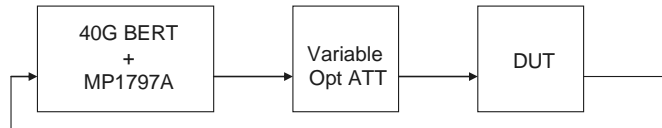
Result



4-2. Jitter Tolerance Measurement

Perform 1dB penalty test before Jitter Tolerance measurement.

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



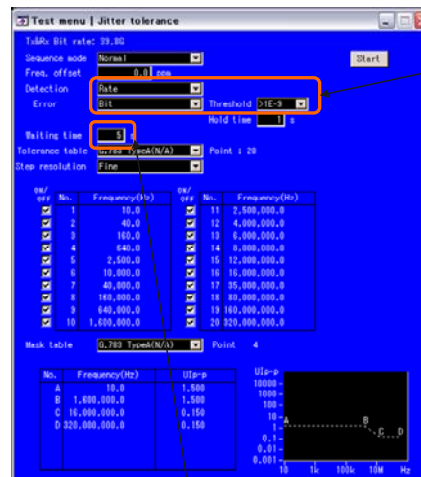
2. Attenuate the optical signal with the variable optical attenuator and set the attenuation amount (dB) so that the Error rate monitored by the 40G BERT becomes the threshold value used at Jitter Tolerance measurement. We recommend 10E-09 at Bit error for the threshold value.
3. Set the optical attenuator 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.

4-3. 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

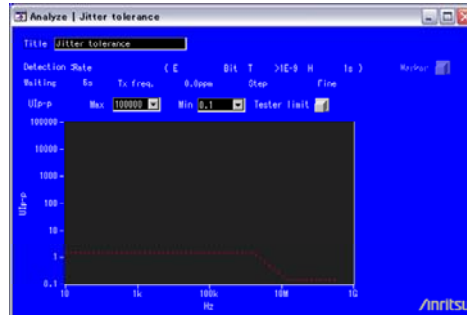
The Waiting time setting is normally 5s.

If you know the DUT makes functional recovery less than 5s, you can set the less time to the waiting time.

4-4. Jitter Tolerance Measurement

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

No.	Frequency(Hz)	Tolerance(UIp-p)	No.	Frequency(Hz)	Tolerance(UIp-p)
1	10.0	-----	11	2,500,000.0	-----
2	40.0	-----	12	4,000,000.0	-----
3	160.0	-----	13	6,000,000.0	-----
4	640.0	-----	14	8,000,000.0	-----
5	2,500.0	-----	15	12,000,000.0	-----
6	10,000.0	-----	16	16,000,000.0	-----
7	40,000.0	-----	17	35,000,000.0	-----
8	160,000.0	-----	18	80,000,000.0	-----
9	640,000.0	-----	19	160,000,000.0	-----
10	1,600,000.0	-----	20	320,000,000.0	-----



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4-5. 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



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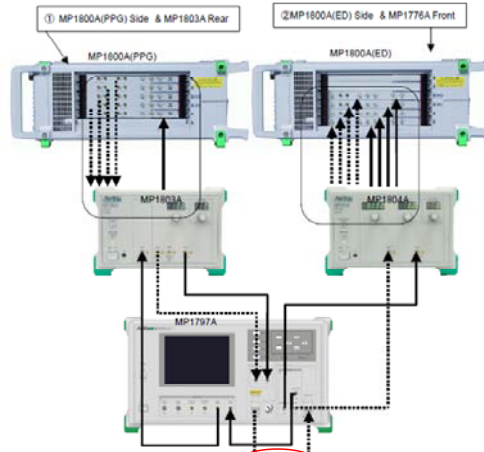
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4-6. Jitter Transfer Measurement

- ❖ After Calibration as Tx/Rx loop-back, connect the DUT.
- ❖ Perform the Jitter Transfer measurement.



In Calibration, Loop-back between Tx and Rx

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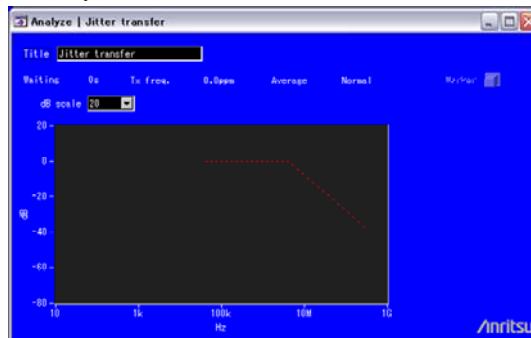
4-8. Jitter Transfer Measurement

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

Result

No	Frequency(Hz)	Utr-p	Transfer(dB)	No	Frequency(Hz)	Utr-p	Transfer(dB)
11	40,000.0	1.500	-----	11	4,000,000.0	0.500	-----
12	70,000.0	1.500	-----	12	5,000,000.0	0.400	-----
13	140,000.0	1.500	-----	13	6,000,000.0	0.400	-----
14	250,000.0	1.500	-----	14	8,000,000.0	0.300	-----
15	400,000.0	1.500	-----	15	12,000,000.0	0.200	-----
16	600,000.0	1.500	-----	16	18,000,000.0	0.150	-----
17	1,000,000.0	1.500	-----	17	25,000,000.0	0.150	-----
18	1,600,000.0	1.500	-----	18	30,000,000.0	0.150	-----
19	2,000,000.0	1.200	-----	19	100,000,000.0	0.150	-----
19	3,000,000.0	0.900	-----	20	220,000,000.0	0.150	-----

Analysis



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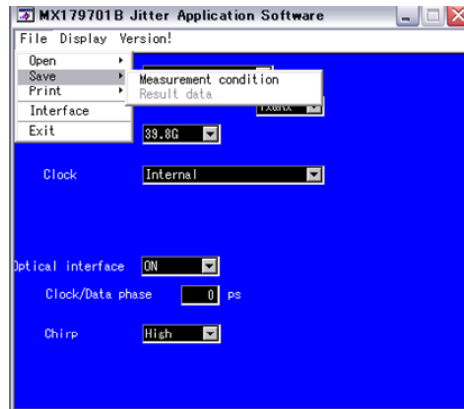
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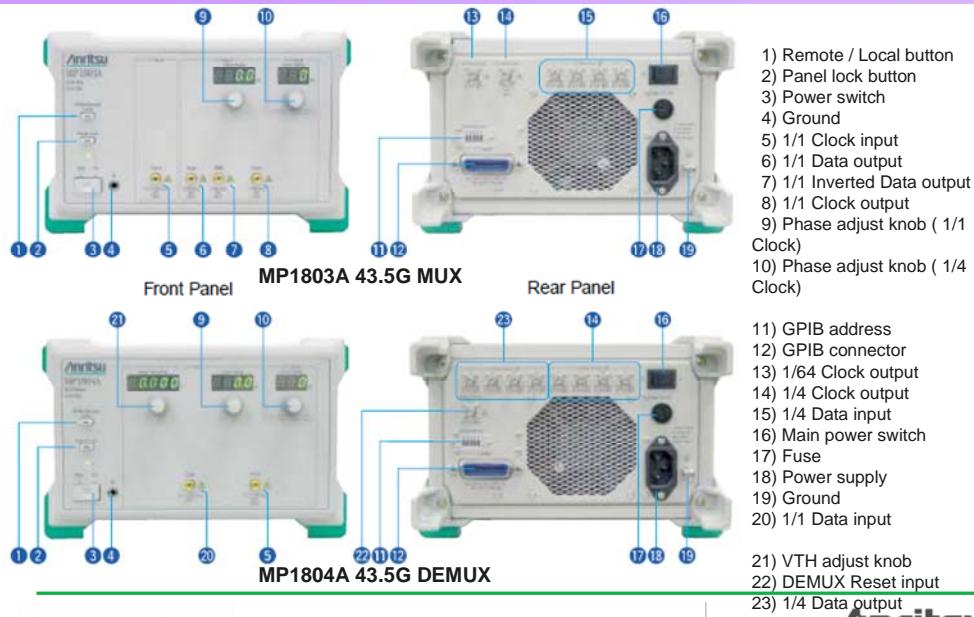
5. Save/Load Method

- ✧ 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

Appendix 1 43.5G MUX / DEMUX



- 1) Remote / Local button
- 2) Panel lock button
- 3) Power switch
- 4) Ground
- 5) 1/1 Clock input
- 6) 1/1 Data output
- 7) 1/1 Inverted Data output
- 8) 1/1 Clock output
- 9) Phase adjust knob (1/1 Clock)
- 10) Phase adjust knob (1/4 Clock)
- 11) GPIB address
- 12) GPIB connector
- 13) 1/64 Clock output
- 14) 1/4 Clock output
- 15) 1/4 Data input
- 16) Main power switch
- 17) Fuse
- 18) Power supply
- 19) Ground
- 20) 1/1 Data input
- 21) VTH adjust knob
- 22) DEMUX Reset input
- 23) 1/4 Data output

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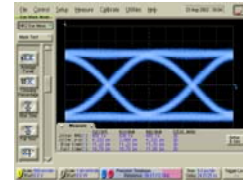
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Appendix 1 43.5G MUX / DEMUX

MP1803A 43.5G MUX

Operation frequency	25 to 43.5GHz (External clock)
Clock Input	Input amplitude : 0.7 to 1.5 Vp-p, Waveform: Sine or rectangular wave (duty : 50 %), Input connector: V
Data output (25 to 43.5 Gbit/s)	Output waveform : NRZ, Number of Outputs : 2(DATA, DATA) Output amplitude : 2.0±0.2 Vp-p(AC coupled), Jitter : Less than 10ps Tr/Tf (20 to 80 %, >36Gbit/s) : 10 ps(typ.), Impedance : 50 Ω, Connector : V
Clock output (25 to 43.5 GHz)	Number of input : 1 (CLOCK), Output amplitude: 0.7 to 1.5 Vp-p (AC coupled) Clock delay : from -70.0 to +70.0 ps (0.1ps step), Impedance : 50 Ω, Connector : V
1/4 Data input (6.25 to 10.875 Gbit/s)	Number of input : 4 (D1,D2,D3,D4), Input Voltage : V _{OH} = 0 V±0.07 V, V _{OL} = -1 V± 0.07 V Impedance : 50 Ω, Connector : SMA
1/4 Clock output (6.25 to 10.875 GHz)	Number of output : 1(CLOCK), Output Voltage : V _{OH} = 0 V±0.04 V, V _{OL} =-1.40 V±0.40 V Clock delay : from -70 to +70 ps (1ps/div), Impedance : 50 Ω, Connector : SMA
Sync. Output	Number of output : 1 (1/64 Clock Output), Output Voltage : V _{OH} = 0 V±0.2 V, V _{OL} = -1 V±0.2 V Impedance : 50 Ω/GND, Connector : SMA
Control Interface	GPIB
Dimensions, mass and power	213 (W) X 132.5 (H) X 450 (D) mm, Less than 10 kg, AC100 to 240 V, Frequency : 47 to 63 Hz, Less than 100 VA
Operation temperature	20 to 30 centigrade



39.81312G bit/s
PRBS 23
2.0Vp-p @ Cable:30cm

MP1804A 43.5G DEMUX

Operation frequency	25 - 43.5 GHz
Data Input (25 to 43.5 Gbit/s)	Number of input : 1 (DATA), Input amplitude : from 0.1 V to 1.0 Vp-p Threshold Voltage : from - 0.75 to + 0.25 V (0.001 V step), Impedance: 50 Ω, Connector : V
Clock Input (25 to 43.5 GHz)	Number of input : 1 (CLOCK), Input amplitude : from 0.7 V to 1.5 Vp-p(AC coupled) Clock delay : from -70 to +70 ps (0.1 ps step), Impedance : 50 Ω/GND, Connector : V
1/4 Data output (6.25 to 10.875 Gbit/s)	Number of output : 4 (D1,D2,D3,D4), Output Voltage : V _{OH} = 0 ± 0.2 V, V _{OL} = -1 ± 0.2 V Impedance : 50 Ω, Connector : SMA
1/4 Clock output (6.25 to 10.875 GHz)	Number of output : 4 (CLOCK), Output Voltage : V _{OH} = 0 ± 0.25V, V _{OL} = -1 ± 0.25 V Clock delay : from -70 to +70ps (1 ps step), Impedance : 50 Ω, Connector : SMA
DEMUX Reset Input	Number of input : 1 (1/64 Clock Output), Input Voltage : V _{OH} = 0 ± 0.1 V, V _{OL} = -1 ± 0.1 V Impedance : 50 Ω/GND, Connector : SMA
Control Interface	GPIB
Dimensions, mass and power	213 (W) X 132.5 (H) X 450 (D) mm, Less than 10 kg, AC100 to 240 V, Frequency : 47 to 63 Hz, Less than 100 VA
Operation temperature	20 to 30 centigrade

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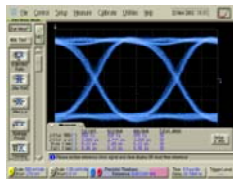
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Appendix 1 43.5G MUX / DEMUX



MP1803A 43.5G MUX with option 01

Data output (25 to 43.5 Gbit/s) with Option 01	Output waveform : NRZ, Number of Outputs : 2(DATA, DATA), Output amplitude : 1.0 to 2.6Vp-p (AC Coupled) , 2mV step (AC coupled), Offset : -2.0 to 2.6V (VOH), 1mV step, Cross point : 30% to 70% Jitter : Less than 5ps Tr/Tf (20 to 80 % , >38Gbit/s) : 9 ps(typ.), Impedance : 50 Ω, Connector : V
--	---



40G bit/s
PRBS 7
2.6Vp-p
Eye Pattern



40G bit/s
PRBS 7
2.6Vp-p
Pattern Sync.

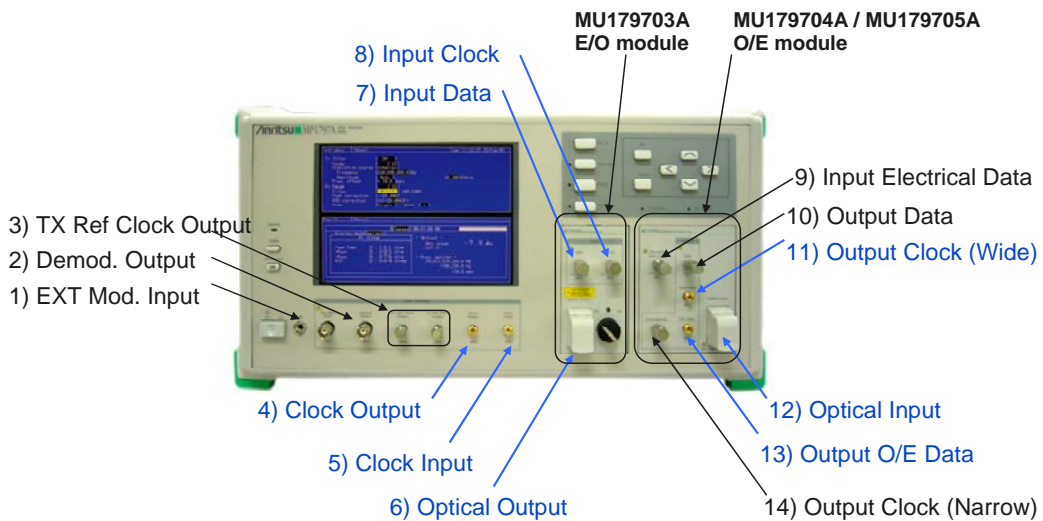
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Appendix 2 MP1797A 40G Jitter Analyzer



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Appendix 2 MP1797A 40G Jitter Analyzer

✧ 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		
Bit Rate	25.0 to 43.5 Gbit/s	On the MU179703A
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	

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Appendix 2 MP1797A 40G Jitter Analyzer

✧ MP1797A Connectors (2/5)

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

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Appendix 2 MP1797A 40G Jitter Analyzer

✧ 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	

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Appendix 2 MP1797A 40G Jitter Analyzer

✧ MP1797A Connectors (4/5)

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

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Appendix 2 MP1797A 40G Jitter Analyzer

✧ 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	

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Appendix 3 Coaxial Connector

Connector	Operating Frequency	Impedance	Type	Comment
SMA	DC-18.5GHz	50 Ω	3.5mm	
APC-3.5	DC-26.5GHz	50 Ω	3.5mm	Compatible with SMA
K	DC-40GHz	50 Ω	2.92mm	Compatible with SMA
APC-2.4	DC-50GHz	50 Ω	2.4mm	
V	DC-65GHz	50 Ω	1.85mm	Compatible with APC-2.4
W1	DC-110GHz	50 Ω	1.0mm	

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End

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