Application Note

Ideal Remote-Control Sequences

MP2100A
BERTWave Series

Introduction

The explosive increase in traffic volumes at data centers and on mobile networks is driving rising demand for optical modules supporting these networks, and optical module shipments are expected to achieve a CAGR (Compound Average Growth Rate) of 13% between 2011 and 2105. With the fast ramp-up in mass production, how to reduce production inspection start-up and running costs has become a key theme for makers.

The MP2100A BERTWave (Fig. 1) has been designed with production applications in mind to help cut initial line start-up costs as well as keep running costs low. In addition, support for useful remote commands helps cut measurement time.

This document explains some typical remote sequences making use of the MP2100A functions and speed. Using the remote sequences described in this document and selecting the best commands for optical module production from the MP2100A embedded remote commands will help you configure an easy-to-use efficient optical module test system.

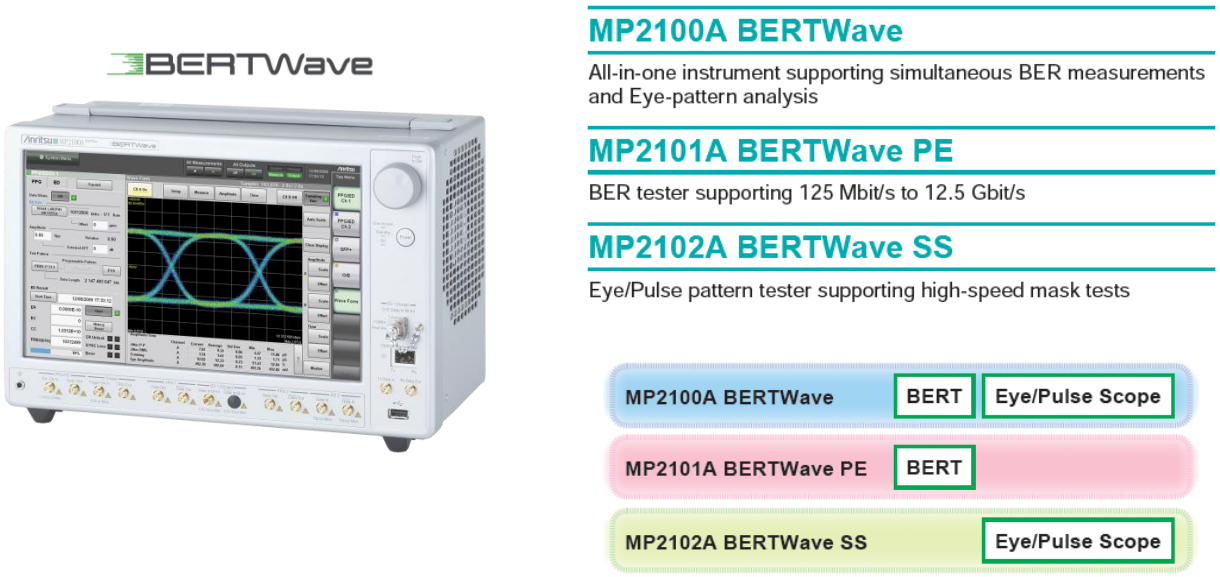


Fig. 1. BERTWave Series

Optical Module Test System

Many optical modules supporting various communications standards have been released recently but this document explains the evaluation method for the common 10GBASE-LR SFP+ module. Fig. 2 and 3 show the measurement setups for evaluating both the optical and electrical characteristics of optical modules (Table 1).

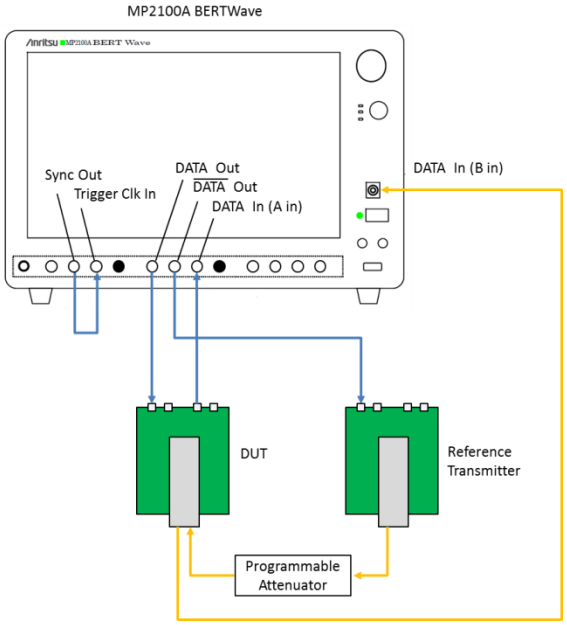


Fig. 2. Measurement Setup using MP2100A

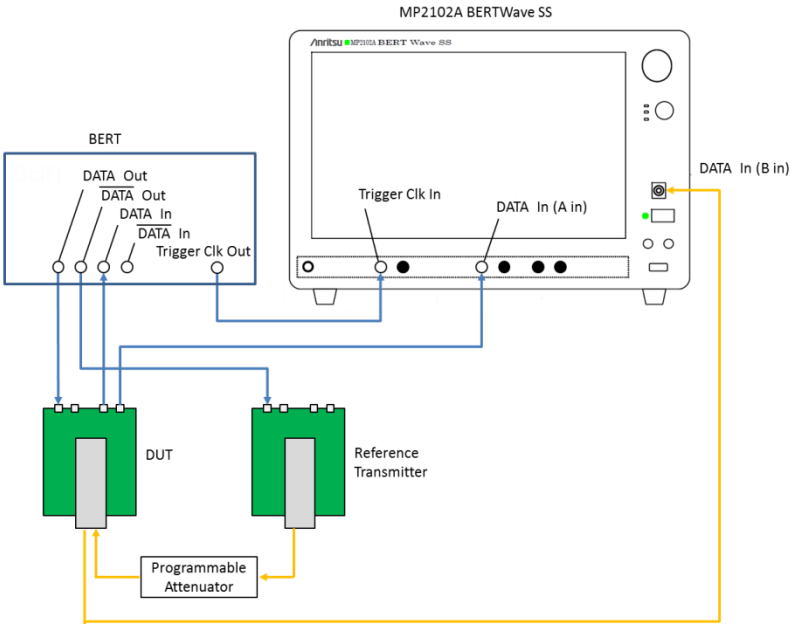


Fig. 3. Measurement Setup using MP2102A

Table 1 Test Items

Interface	Test Items
Electrical IF	Jitter p-p, Jitter rms, Rise Time, Fall Time, etc.
Optical IF	Extinction Ratio, Average Power Adjustment
	Cross Point, Average Power, Extinction Ratio, OMA, etc.
	Mask Margin
Common	Optical RX Sensitivity

Ideal Remote Sequence

To explain the ideal remote sequence, this section presents a block diagram of the evaluation items at measurement of the optical module (Fig. 4). There are MP2100A configuration with an Eye/Pulse Scope plus BERT and MP2102A with only an Eye/pulse Scope. Since the configurations have different settings, the sequence is shown as a flow block diagram.

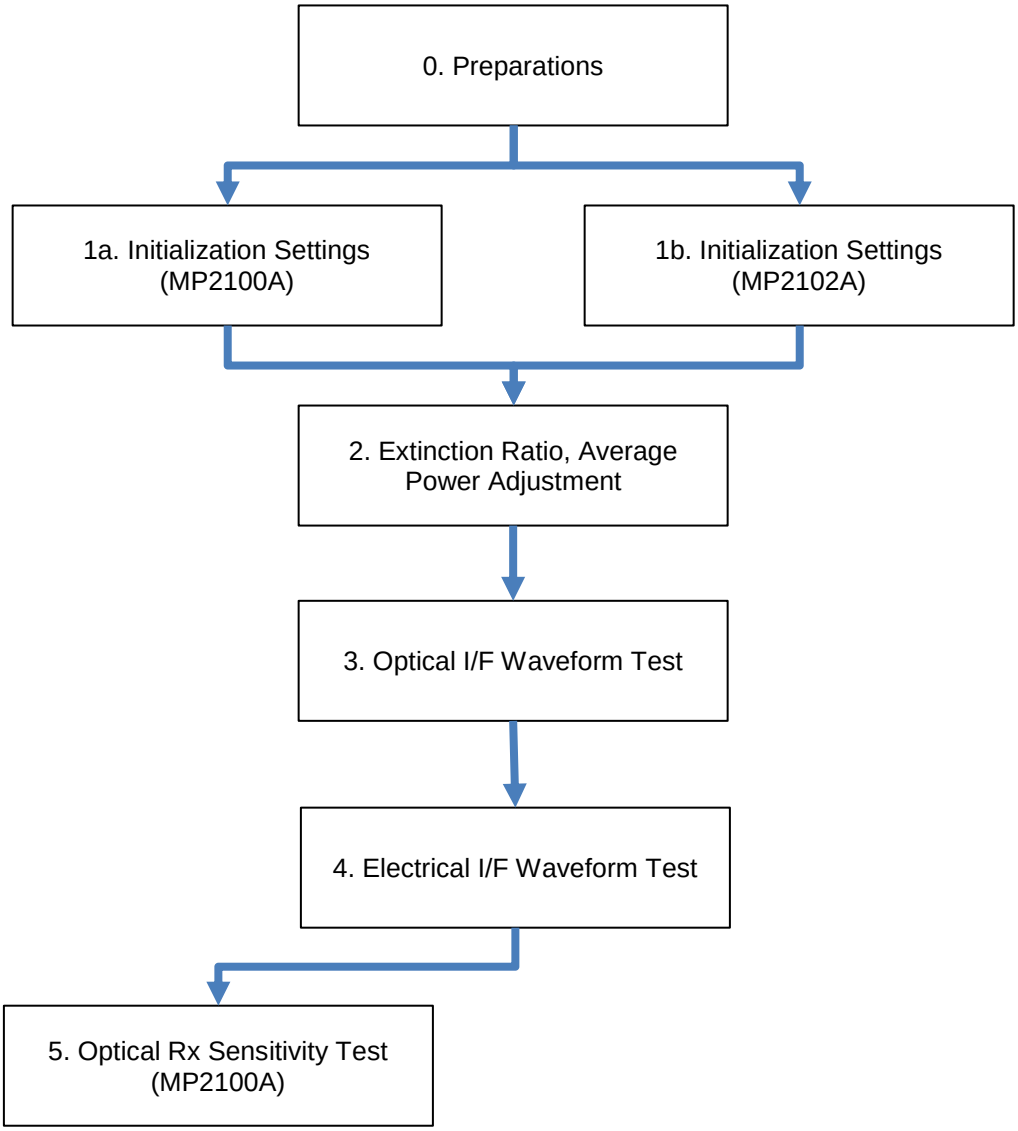


Fig. 4. Optical Module Remote Access Flow Diagram Blocks

Note the following precautions when describing each command.

Note 1:
Use a Line Feed (LF 0A backslash n) as the line terminator.
Note 2:
To prevent communications timeouts between executing messages, set the PC controller interface timeout time to more than 30 seconds. In addition, set it to more than 60 seconds when performing calibration.

0. Preparations

Use the following procedure (Table 2) to initialize and calibrate the system before use.

Table 2 Preparation Setting Sequence

Step	Module	Function	Remote Command	Remarks
0-1	Common	Initialization	:SYSTem:MEMory:INITialize	
0-2	EYE/Pulse Scope	Selects "EYE/Pulse Scope"	:MODule:ID 5	
0-3	EYE/Pulse Scope	Calibrates "EYE/Pulse Scope"	:CALibrate:AMPLitude	Adds 60 s of wait time Checks that no signal input to CHA in, CHB in, and Trigger Clk

1a/1b. Initialization Settings (MP2100A/MP2102A)

These commands initialize the system. They set the bit rates, electrical signal parameters (amplitude and test pattern), optical signal wavelength, filters, etc., used by most modules. Execute the settings according to the following procedures (Tables 3 and 4).

Table 3 Initialization Setting Sequence using MP2100A

Step	Module	Function	Remote Command	Remarks
1a-1	PPG/ED 1ch	Selects "PPG/ED Ch1"	:MODule:ID 1	
1a-2	PPG/ED 1ch	Displays "PPG/ED Ch1" screen	:DISPlay:ACTive 1	
1a-3	PPG/ED 1ch	Sets bit rate, offset, amplitude, and test pattern	:SENSe:PARam:AEXECute 1,0,1,0,¥"10G_LAN¥",10312500,0,PRBS31,0.5	10GbE, PRBS31, 0.5 Vp-p Batch-sets parameter settings to shorten measuring instrument setup time
1a-4	PPG/ED 1ch	Sets Sync Out	:OUTPut:SYNC:SOURce PPG1CLOC8	Sets to PPG1CH 1/8 Clk
1a-5	PPG/ED 1ch	Sets data input conditions	:INPut:DATA:INTerface DATA	Electrical CH (CHA in)
1a-6	O/E	Selects "O/E"	:MODule:ID 4	
1a-7	O/E	Selects filter	:SENSe:INPut:FILTer 5	10 GbE
1a-8	O/E	Selects wavelength	:SENSe:INPut:WAVLength 1310	1310 nm
1a-9	O/E	Enables correction factor	:CONFigure:EXRCorrection 1	Set as necessary Set so that extinction ratio becomes reference value
1a-10	O/E	Sets correction factor value	:CONFigure:EXRCorrection:FACTor 3.00	
1a-11	EYE/Pulse Scope	Selects "EYE/Pulse Scope"	:MODule:ID 5	
1a-12	EYE/Pulse Scope	Displays "EYE/Pulse Scope" screen	:DISPlay:ACTive 5	
1a-13	EYE/Pulse Scope	Sets sample number	:SENSe:OPTion:MAX:SAMPles:NUMber 2039	2039
1a-14	EYE/Pulse Scope	Enables bit rate tracking function	:CONFigure:TRACking:DRATe 1	Tracking ON (sets bit rate and clock rate tracking function)
1a-15	EYE/Pulse Scope	Sets to PPG 1ch	:CONFigure:TRACking:DRATe:MASTer 0	Sets PPG 1ch as tracking target

Table 4 Initialization Setting Sequence using MP2102A

Step	Module	Function	Remote Command	Remarks
1b-1	O/E	Selects "O/E"	:MODule:ID 4	
1b-2	O/E	Selects filter	:SENSe:INPut:FILTer 5	10 GbE
1b-3	O/E	Selects wavelength	:SENSe:INPut:WAVLength 1310	1310 nm
1b-4	O/E	Enables correction factor	:CONFigure:EXRCorrection 1	Set as necessary
1b-5	O/E	Sets correction factor	:CONFigure:EXRCorrection:FACTor 3.00	Set so that extinction ratio becomes reference value
1b-6	EYE/Pulse Scope	Selects "EYE/Pulse Scope"	:MODule:ID 5	
1b-7	EYE/Pulse Scope	Displays "EYE/Pulse Scope" screen	:DISPlay:ACTive 5	
1b-8	EYE/Pulse Scope	Sets sample number	:SENSe:OPTion:MAX:SAMPles:NUMber 2039	2039
1b-9	EYE/Pulse Scope	Sets bit rate	:SENSe:TIME:DATRate 10.3125 Gbps	10.3125 Gbit/s
1b-10	EYE/Pulse Scope	Sets trigger division ratio	:SENSe:TIME:DIVRatio 16, CLKR	Set division ratio according to external trigger
1b-11	EYE/Pulse Scope	Sets Acquire Clock Rate	:SENSe:TIME:ACQClock?	

2. Extinction Ratio and Average Power Adjustment

These commands adjust the extinction ratio and average power; the ranges of each are determined by each standard. Since the adjustment must be within these ranges, adjust to the optimum position is performed while the extinction ratio and average power are changed quickly. Execute the settings according to the following procedures (Table 5).

Table 5 Extinction Ratio and Average Power Adjustment Sequence

Step	Module	Function	Remote Command	Remarks
2-1	PPG/ED 1ch	Selects "PPG/ED Ch1"	:MODule:ID 1	
2-2	PPG/ED 1ch	Sets PPG output to ON	:OUTPut:DATA:OUTPut ON	
2-3	EYE/Pulse Scope	Selects "EYE/Pulse Scope"	:MODule:ID 5	
2-4	EYE/Pulse Scope	Sets CHA OFF	:SENSe:INPut:CHA OFF	
2-5	EYE/Pulse Scope	Sets CHB ON	:SENSe:INPut:CHB ON	
2-6	EYE/Pulse Scope	Selects accumulation mode	:SENSe:ACCUmulation:TYPe PERSistency	Persistency
2-7	EYE/Pulse Scope	Sets measurement channel	:CONFigure:MEASure:CHANnel B	
2-8	EYE/Pulse Scope	Sets y-axis scale	:DISPlay:WINDow:Y:DIVision:CHB 200	
2-9	EYE/Pulse Scope	Selects test mode	:CONFigure:MEASure:TYPe AMPTIME	Amplitude/Time test
2-10	EYE/Pulse Scope	Displays average power measurement	:CONF:MEAS:AMPTIME1 CHB, 6	Average Power
2-11	EYE/Pulse Scope	Displays extinction ratio	:CONF:MEAS:AMPTIME2 CHB, 8	Extinction Ratio
2-12	EYE/Pulse Scope	Executes EYE/Pulse Scope	:SAMPling:STATus RUN	
2-13	EYE/Pulse Scope	Queries average power	:FETCh:AMPLitude:AVEPower?	Repeat until average power and extinction ratio become expected values
2-14	EYE/Pulse Scope	Queries extinction ratio	:FETCh:AMPLitude:EXTRatio?	
2-15	EYE/Pulse Scope	Clear screen	:DISPlay:WINDow:GRAPhics:CLEar	

3. Optical IF Waveform Test

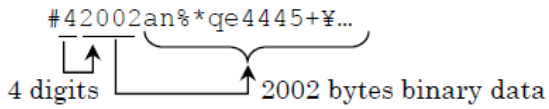
These commands execute the waveform test of the optical signal output from the optical module. This is a key test for confirming the optical module characteristics and is an index indicating the interoperability of transceivers in the network and the performance superiority. To confirm that the output optical signal quality meets the standards, the crosspoint, average power, extinction ratio, and OMA are evaluated, and a mask margin test is performed to evaluate the margin of the mask determined by the standard. Execute the settings according to the following procedures (Table 6).

Table 6 Optical IF Waveform Test Sequence

Step	Module	Function	Remote Command	Remarks
3-1	PPG/ED 1ch	Select "PPG/ED Ch1"	:MODule:ID 1	
3-2	PPG/ED 1ch	Sets PPG Ch1 output to ON	:OUTPut:DATA:OUTPut ON	
3-3	Eye/Pulse Scope	Selects "Eye/Pulse Scope"	:MODule:ID 5	
3-4	Eye/Pulse Scope	Selects “Limited”	:SENSe:ACCUmulation:TYPe LIMited	Limited
3-5	Eye/Pulse Scope	Sets number of captured waveforms	:SENSe:ACCUmulation:LIMit WAVeform, 1000	1000
3-6	Eye/Pulse Scope	Sets CHA ON	:SENSe:INPut:CHA OFF	
3-7	Eye/Pulse Scope	Sets CHB OFF	:SENSe:INPut:CHB ON	
3-8	Eye/Pulse Scope	Sets measurement channel	:CONFigure:MEASure:CHANnel B	
3-9	Eye/Pulse Scope	Selects test mode	:CONFigure:MEASure:TYPe AMPMask	Amplitude/Time & Mask test
3-10	Eye/Pulse Scope	Opens mask file	:CONFigure:MASK:TYPe 11	10GbE LAN/PHY
3-11	Eye/Pulse Scope	Displays crosspoint	:CONFigure:MEASure:AMPTIME 1 CHA, 4	Crosspoint
3-12	Eye/Pulse Scope	Displays average power (dBm) measurement	:CONFigure:MEASure:AMPTIME 2 CHA, 6	Average power (dBm)
3-13	Eye/Pulse Scope	Displays extinction ratio measurement	:CONFigure:MEASure:AMPTIME 3 CHA, 8	Extinction ratio
3-14	Eye/Pulse Scope	Displays OMA (mW) measurement	:CONFigure:MEASure:AMPTIME 4 CHA, 15	OMA (mW)
3-15	Eye/Pulse Scope	Executes auto-scale （high-speed mode)	:DISPlay:WINDow:SCALe:AUTOscale BOTH	Execution time: 1 s approx. Sets fast auto-scale for adjusting horizontal-axis offset and vertical-axis scale only

3-16	Eye/Pulse Scope	Executes Eye/Pulse Scope	:SENSe:SAMPling:STATus RUN	
3-17	Eye/Pulse Scope	Queries status	:SAMPling:STATus?	Queries until "HOLD" returned
3-18	Eye/Pulse Scope	Updates mask position	:CONFigure:MASK:UPDate	
3-19	Eye/Pulse Scope	Executes mask test	:MEASure:MASK:MARGin?	
3-20	Eye/Pulse Scope	Queries crosspoint value	:FETCh:AMPLitude:CROSsing?	Crosspoint
3-21	Eye/Pulse Scope	Queries measured average power (dBm)	:FETCh:AMPLitude:AVEPower?	Average power (dBm)
3-22	Eye/Pulse Scope	Queries measured extinction ratio	:FETCh:AMPLitude:EXTRatio?	Extinction ratio
3-23	Eye/Pulse Scope	Queries measured OMA (mW)	:FETCh:AMPLitude:OMA:MW?	OMA (mW)
3-24	Eye/Pulse Scope	Copies screen data	:SENSe:EYEPulse:PRINt:COPY "10G_SN1234_O", "D:¥User¥10G", JPEG	
3-25	Common	Transfers copied screen data	:SYSTem:DISPlay:DATA?	(Note 1)

(Note 1) Binary data starts at the header number symbol (#) and continues until after the numeric indicating the data length. When the character after the number symbol (#) is not 0, it indicates the number of figures in the data length; the binary data continues after the numeric indicating the data length.

Example: 

4. Electrical IF Waveform Test

These commands execute the waveform test of the signal output from the electrical interface of the optical module. The jitter, rise and fall times are evaluated to confirm that the quality of the output electrical signal meets the standards. Execute the settings according to the following procedures (Table 7).

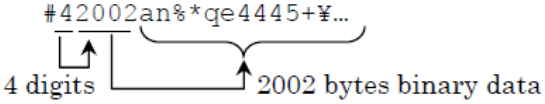
Table 7 Electrical IF Waveform Test Sequence

Step	Module	Function	Remote Command	Remarks
4-1	PPG/ED 1ch	Selects "PPG/ED Ch1"	:MODule:ID 1	
4-2	PPG/ED 1ch	Sets PPG Ch1 output to ON	:OUTPut:DATA:OUTPut ON	
4-3	Eye/Pulse Scope	Selects "Eye/Pulse Scope"	:MODule:ID 5	
4-4	Eye/Pulse Scope	Selects “Limited”	:SENSe:ACCUmulation:TYPe LIMited	Limited
4-5	Eye/Pulse Scope	Sets number of captured waveforms	:SENSe:ACCUmulation:LIMit WAVeform, 100	100 waveforms
4-6	Eye/Pulse Scope	Sets CHA ON	:SENSe:INPut:CHA ON	
4-7	Eye/Pulse Scope	Sets CHB OFF	:SENSe:INPut:CHB OFF	
4-8	Eye/Pulse Scope	Sets measurement channel	:CONFigure:MEASure:CHANnel A	
4-9	Eye/Pulse Scope	Selects test mode	:CONFigure:MEASure:TYPe AMPTIME	Amplitude/Time test
4-10	Eye/Pulse Scope	Displays jitter (p-p) measurement	:CONFigure:MEASure:AMPTIME 1 CHA, 9	Jitter (p-p)
4-11	Eye/Pulse Scope	Displays jitter (RMS) measurement	:CONFigure:MEASure:AMPTIME 2 CHA, 10	Jitter (RMS)
4-12	Eye/Pulse Scope	Displays rise time	:CONFigure:MEASure:AMPTIME 3 CHA, 11	Rise time
4-13	Eye/Pulse Scope	Displays fall time	:CONFigure:MEASure:AMPTIME 4 CHA, 12	Fall time
4-14	Eye/Pulse Scope	Executes auto-scale sequence (high-speed mode)	:DISPlay:WINDow:SCALe:AUTOscale BOTH	Execution time: 1 s approx. Sets fast auto-scale for adjusting horizontal-axis offset and vertical-axis scale only
4-15	Eye/Pulse Scope	Executes Eye/Pulse Scope	:SENSe:SAMPling:STATus RUN	
4-16	Eye/Pulse Scope	Queries status	:SAMPling:STATus?	Queries until "HOLD" returned

4-17	Eye/Pulse Scope	Queries jitter (p-p) value	:FETCh:TIME:JITTer:PPeak?	Jitter (p-p)
4-18	Eye/Pulse Scope	Queries jitter (RMS) value	:FETCh:TIME:JITTer:RMS?	Jitter (RMS)
4-19	Eye/Pulse Scope	Queries measured rise time	:FETCh:TIME:TRISe?	Rise time
4-20	Eye/Pulse Scope	Queries measured fall time	:FETCh:TIME:FTIMe?	Fall time
4-21	Eye/Pulse Scope	Copies screen data	:SENSe:EYEPulse:PRINt:COPY "10G_SN1234_E", "D:¥User¥10G", JPEG	
4-22	Common	Transfers copied screen data	:SYSTem:DISPlay:DATA?	(Note 1)

(Note 1) Binary data starts at the header number symbol (#) and continues until after the numeric indicating the data length. When the character after the number symbol (#) is not 0, it indicates the number of figures in the data length; the binary data continues after the numeric indicating the data length.

Example: #42002an%*qe4445+¥...



5. Optical RX Sensitivity Test (MP2100A)

These commands execute the optical RX sensitivity test. The optical RX sensitivity test is a key test item for quantifying the load bearing capacity of the optical receiver and confirms the minimum optical power recognized as a signal. In concrete terms, the bit error rate is measured using an optical attenuator to reduce the optical power and a BERT. Generally, it is the optical power when there are no errors in 1 x 10^{-12} bits. Execute the settings according to the following procedures (Table 8).

Table 8 RX Sensitivity Test Sequence

Step	Module	Function	Remote Command	Remarks
5-1	PPG/ED 1ch	Selects "PPG/ED Ch1"	:MODule:ID 1	
5-2	ED 1ch	Set pattern logic	SENSe:PATTern:LOGic NEG	
5-3	PPG/ED 1ch	Sets PPG output to ON	:OUTPut:DATA:OUTPut ON	
5-4	PPG/ED 1ch	Sets ED 1ch to Single measurement	:SENSe:MEASure:EALarm:MODE SINGle	Single
5-5	PPG/ED 1ch	Sets single measurement time (100 s, or 1 minute 40 seconds, here)	:SENSe:MEASure:EALarm:PERiod 0,0,1,40	Ex.100 s (1 minute 40 seconds)
5-6	PPG/ED 1ch	Starts BER measurement	:SENSe:MEASure:STARt	Reduces ATT value until no errors and repeats BER measurement over Can quickly detect presence/absence of errors using :STAT:OPER:ENAB 16 and :STATus:OPERation:CONDition?
5-7	PPG/ED 1ch	Checks error count	:STAT:OPER:ENAB 16 :STATus:OPERation:CONDition? :CALCulate:DATA:EALarm? “CURRent:ER:TOTal”	

Sample Sequence

```
private void Sequence_MP210xA_Measurement()
 {
      Boolean Flg = true; //True:MP2100A,False:MP2102A

      //0. Berfore Use
      Send(":SYSTem:MEMory:INITialize");
      Send(":MODule:ID 5");
      Send(":CALibrate:AMPLitude");

      //1a. Initial Setting (MP2100A)
      if (Flg == true)
      {
           Send(":MODule:ID 1");
           Send(":DISPlay:ACTive 1");
           Send(":SENSe:PARam:AEXECute 1,0,1,0,¥"10G_LAN¥",10312500,0,PRBS31,0.5");
           Send(":OUTPut:SYNC:SOURce PPG1CLOC8");
           Send(":INPut:DATA:INTerface DATA");
           Send(":MODule:ID 4");
           Send(":SENSe:INPut:FILTer 5");
           Send(":SENSe:INPut:WAVLength 1310");
           Send(":CONFigure:EXRCorrection 1");
           Send(":CONFigure:EXRCorrection:FACTor 3.00");
           Send(":MODule:ID 5");
           Send(":DISPlay:ACTive 5");
           Send(":SENSe:OPTion:MAX:SAMPles:NUMber 2039");
           Send(":CONFigure:TRACking:DRATe 1");
           Send(":CONF:TRAC:DRAT:MAST 0");
      }

      //1b. Initial Setting (MP2102A)
      else {
           Send(":MODule:ID 4");
           Send(":SENSe:INPut:FILTer 5");
           Send(":SENSe:INPut:WAVLength 1310");
           Send(":CONFigure:EXRCorrection 1");
           Send(":CONFigure:EXRCorrection:FACTor 3.00");
           Send(":MODule:ID 5");
           Send(":DISPlay:ACTive 5");
           Send(":SENSe:OPTion:MAX:SAMPles:NUMber 2039");
           Send(":SENSe:TIME:DATRate 10.3125Gbps");
           Send(":SENSe:TIME:DIVRatio 16,CLKR");
           Send(":SENSe:TIME:ACQClock?");
      }

      //2. ExR Adjustment
      Send(":MODule:ID 1");
      Send(":OUTP:DATA:OUTP ON");
      Send(":MODule:ID 5");
      Send(":DISPlay:ACTive 5");
      Send(":SENSe:INPut:CHA OFF");
      Send(":SENSe:INPut:CHB ON");
      Send(":ACCUmulation:TYPe PERSistency");

      Send(":CONFigure:MEASure:CHANnel B");
      Send(":DISPlay:WINDow:Y:DIVision:CHB 200");
      Send(":CONFigure:MEASure:TYPe AMPTIME");
      Send(":CONF:MEAS:AMPTIME1 CHB,6");
      Send(":CONF:MEAS:AMPTIME2 CHB,8");
      Send(":SAMPling:STATus RUN");

      int count = 0;
      while (true)
      {
           Send(":FETCh:AMPLitude:AVEPower?");
           Send(":FETCh:AMPLitude:EXTRatio?");
           Send(":DISPlay:WINDow:GRAPhics:CLEar");
           count++;
           if (count == 10) {
```

```
            break;
        }
    }

    //3. Waveform Test on Optical
    Send(":MODule:ID 1");
    Send(":OUTP:DATA:OUTP ON");
    Send(":MODule:ID 5");
    Send(":DISPlay:ACTive 5");
    Send(":SENSe:ACCUmulation:TYPe LIMited");
    Send(":SENSe:ACCUmulation:LIMit WAVeform,100");
    Send(":SENSe:INPut:CHA OFF");
    Send(":SENSe:INPut:CHB ON");
    Send(":CONFigure:MEASure:CHANnel B");
    Send(":CONFigure:MEASure:TYPe AMPMask");
    Send(":CONFigure:MASK:TYPe 11");
    Send(":CONFigure:MEASure:AMPTIME1 CHB,4");
    Send(":CONFigure:MEASure:AMPTIME2 CHB,6");
    Send(":CONFigure:MEASure:AMPTIME3 CHB,8");
    Send(":CONFigure:MEASure:AMPTIME4 CHB,15");
    Send(":DISPlay:WINDow:SCALe:AUTOscale BOTH");
    Send(":SENSe:SAMPling:STATus RUN");
    while (true)
    {
        if (Check(Send(":SENS:SAMP:STATUS?"), "HOLD") == true)
        {
            break;
        }
        Thread.Sleep(200);
    }
    Send(":CONFigure:MASK:UPDate");
    Send(":MEASure:MASK:MARGin?");
    Send(":FETCh:AMPLitude:CROSsing?");
    Send(":FETCh:AMPLitude:AVEPower?");
    Send(":FETCh:AMPLitude:EXTRatio?");
    Send(":FETCh:AMPLitude:OMA:MW?");
    Send(":SENSe:EYEPulse:PRINt:COPY ¥"10G_SN1234_O¥",¥"C:/User/10G¥",JPEG");
    Send(":SYSTem:DISPlay:DATA?");

    //4. Waveform Test on Electrical
    Send(":MODule:ID 1");
    Send(":OUTP:DATA:OUTP ON");
    Send(":MODule:ID 5");
    Send(":SENSe:ACCUmulation:TYPe LIMited");
    Send(":SENSe:ACCUmulation:LIMit WAVeform,100");
    Send(":SENSe:INPut:CHA ON");
    Send(":SENSe:INPut:CHB OFF");
    Send(":CONFigure:MEASure:CHANnel A");
    Send(":CONFigure:MEASure:TYPe AMPTIME");
    Send(":CONFigure:MEASure:AMPTIME1 CHA,9");
    Send(":CONFigure:MEASure:AMPTIME2 CHA,10");
    Send(":CONFigure:MEASure:AMPTIME3 CHA,11");
    Send(":CONFigure:MEASure:AMPTIME4 CHA,12");
    Send(":DISPlay:WINDow:SCALe:AUTOscale BOTH");
    Send(":SENSe:SAMPling:STATus RUN");
    while (true)
    {
        if (Check(Send(":SENS:SAMP:STATUS?"), "HOLD") == true)
        {
            break;
        }
        Thread.Sleep(200);
    }
    Send(":FETCh:TIME:JITTer:PPeak?");
    Send(":FETCh:TIME:JITTer:RMS?");
    Send(":FETCh:TIME:TRISe?");
    Send(":FETCh:TIME:FTIMe?");
    Send(":SENSe:EYEPulse:PRINt:COPY ¥"10G_SN1234_E¥",¥"C:/User/10G¥",JPEG");
    Send(":SYSTem:DISPlay:DATA?");
```

```
        //5. Input Sensitivity
        Send(":MODule:ID 1");
        Send(":DISPlay:ACTive 1");
        Send(":SENSe:PATTern:LOGic NEG");
        Send(":OUTP:DATA:OUTP ON");
        Send(":SYSTem:DISPlay:RESult OFF");
        Send(":SENSe:MEASure:EALarm:MODE SINgle");
        Send(":SENSe:MEASure:EALarm:period 0, 0, 1, 40");     //100sec Measurement
        Send(":STAT:OPER:ENAB 16");
        Send(":SENSe:MEASure:STARt");
        Send(":CALCulate:DATA:EALarm? ¥"CURRent:ER:TOTal¥"");
        //Error Check
        if (ER_str != 0) //Error occur
        {
            //Change ATT value
        }

        while (true)
        {
            if (Check(Send(":STATus:OPERation:CONDition?"), "0") == true)
         {
                Send(":CALCulate:DATA:EALarm? ¥"CURRent:ER:TOTal¥"");
                break;
            }
            Thread.Sleep(200);
        }


}
```

Conclusion

This document introduces the ideal measurement sequence using the MP2100A/MP2102A to support fast and stable production of optical modules. Anritsu suports the best measurement procedures for improving customers' production quality assurance and increasing product competitiveness.

Anritsu

Specifications are subject to change without notice.

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