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PRODUCT INTRODUCTION

MP1590B

Network Performance Tester

Electrical Differential Interface Version

ANRITSU CORPORATION

MP1590B Product Introduction
electrical differential Interface Version

May 2005

Anritsu Corporation

IP Network Division

What's Differential I/F?

MP1590B Network Performance Tester

Introduction

- XFP (10Gigabit(X) Form-factor Pluggable)
  - As a substitute for XENPAK, R&D for a small 10G band optical transceiver module is progressed around a core of MSA. One of these technologies, XFP is expected to see good future growth in various fields.
- Popularity of XFP

Increasing requests from makers of XFP modules and applications using XFP for BER and Jitter measuring equipment with differential I/F

Anritsu developed differential I/F for MP1590B to meet these needs.

- Pioneering electrical differential I/F Jitter measurements
  - High-level know-how about Jitter measurement of differential I/F obtained from prior R&D
  - Anritsu offers a precise advice and a measurement solution to customers who have problems or questions about the measuring XFP module.

Need for Electrical Differential I/F in Measurement

- When evaluating Jitter at the XFP electrical differential I/F (XFI), the measurement results are greatly impacted by input signal level and polarity. As a result, accurate Jitter measurements cannot be obtained by single-end interface. Moreover, since the measurement results are varied according to the XFI input signal level, it is very important to consider level dependency.
- Measurement results can be very different depending on the relationship between the pattern Jitter characteristics of the CDR in the optical transceiver module and the pattern Jitter characteristics of the measuring instrument.
- In modules such as XFP with a CDR in both the transmitter and receiver unit, crosstalk noise between the CDRs can have a great impact.
  It is not possible to obtain correct Jitter measurements when there is no signal input to the CDRs.

Need for Electrical Differential I/F in Measurement

- **Measuring BER and Jitter of DUT with electrical differential I/F requires these types of measurement instruments**

I. Built-in differential I/F in transmitter and receiver and independent operation — Polarity dependency

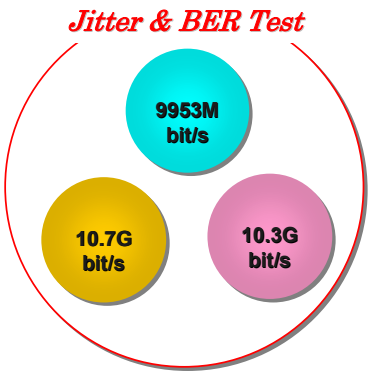
II. Built-in optical and differential I/Fs

III. Jitter measurement with measuring instrument calibrated with established calibration system

IV. Simultaneous signal output at optical and differential I/Fs — Lower crosstalk

V. Creating conditions approximating real conditions at differential I/F (variable output signal level) — Level dependency

MP1590B electrical differential I/F Unit



Features of MP1590B electrical differential I/F Unit

- **Measurement of 3 modes -- OTU2, STM-64/STS-192, 10.3G (Unframed)**
- **Jitter basic measurement (Tolerance, Transfer, Generation)**
- **Built-in variable differential I/F output signal level.**
  Built-in variable H/L evaluation threshold value for electrical input.
  (single end)
- **Support for High-precision Jitter measurement (MP1590B Opt.30).**
  (only optical I/F)
- **Support for MU150121/123A optical related functions.**

The differential I/F solution is targeted at R&D, manufacturing, and quality control sections of manufacturers of transmission equipment, modules, and devices.

Main Functions & Performance of Differential I/F Unit

MU150121B New
10/10.7G Send Optical/Electrical Unit

- **3 mode signal output of OTU2, STM-64 / STS-192, 10.3G**
- **Optical wavelength : 1310/1550 nm, optical output power : -1 to +3 dBm**
- **Variable signal level 150 to 550 mV (single end, Pos./Neg. linked change)**
- **Variable Optical out power Attenuator (VOA)**
- **High-precision Jitter measurement (MP1590B Opt. 30) (only optical I/F)**
- **Operation as E/O device by independent insertion to MP1590B**

Main Functions & Performance of Differential I/F Unit

MU150123B New
10/10.7G Receive Optical/Electrical Unit (Wide)

- Support for OTU2, STM-64/STS-192 signals
- Optical receive wavelength : 1260 to 1610 nm,
  Optical sensitivity : -14 to 0 dBm (at BER measurement)
- Electrical Differential input level : 50 to 550 mVp-p (x2) (at BER measurement)
- Variable H/L evaluation threshold value : +/-50 mV
- High-precision Jitter measurement (MP1590B Opt. 30) (only optical I/F)
- Operation as O/E device by independent insertion to MP1590B

Main Functions & Performance of Differential I/F Unit

MU150124B New
10.3G Receive Optical/Electrical Unit (Wide)

- 3 mode signals of OTU2, STM-64/STS-192, 10.3 Gbit/s
- Optical receive wavelength : 1260 to 1610 nm,
  Optical sensitivity : -14 to 0 dBm (at BER measurement)
- Electrical Differential input level : 50 to 550 mVp-p (x2) (at BER measurement)
- Variable H/L evaluation threshold value : +/- 50 mV
- External output of CDR extracted clock (simultaneous Wide/Narrow)
- Operation as O/E device by independent insertion to MP1590B

Main Functions of MP1590B Differential I/F Solutions

- **Combination with MU150100A 10/10.7G Unit**
  - BER and Jitter measurement of OTN, SDH/SONET signals
    - ✓ Analysis for standardized error/alarm
    - ✓ Monitoring functions, such as Performance, OH, Frequency
    - ✓ Jitter Tolerance measurement
  - BER and Jitter measurement for 10.3 Gbit/s PRBS signal
    - ✓ Combination with MU150100A Opt.08、MU150125A Opt.06
- **High-precision Jitter Measurement**
  - Supports MP1590B Option 30 for **9953 Mbit/s, 2488 Mbit/s optical I/F**

(There are some restrictions on use of the MP1590B Option 30 -- see the data sheet for more details.)

External Appearance of MP1590B

- **Front Panel**

New

OS: Microsoft® Windows® XP Professional Operating System

8.4-inch Color TFT
Compact Flash x 1, USB x 2,
Keyboard PS/2 x 1

Same operation as MP1570A

Control software via LAN
MX1590**A

- **Side panel**

Configuration of 10G Diff. I/F with Jitter

Uses plug-in unit format
Up to 6 units can be installed.

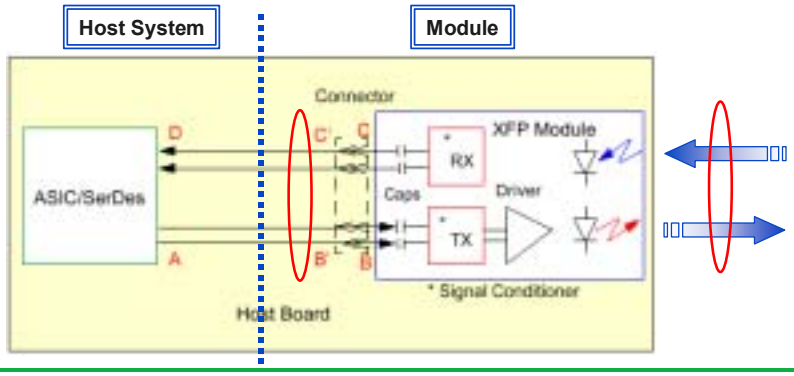
Supports Ethernet module for MD1230 series.

Offering best compatibility with customers' systems.

electrical differential I/F Test Solution

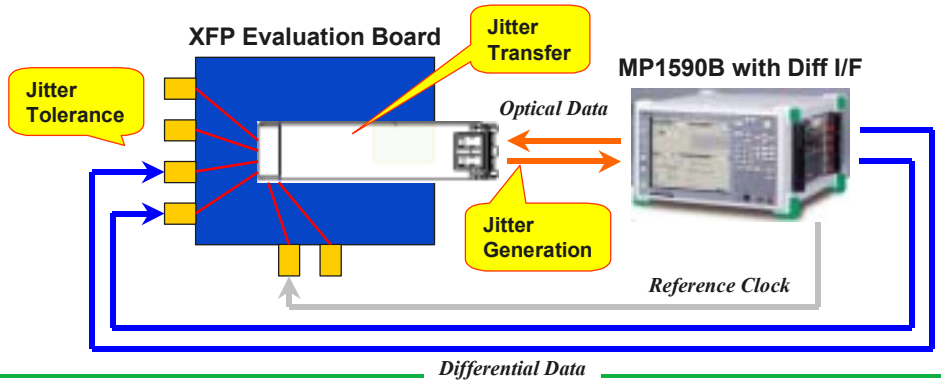
Two XFP Evaluation Methods

- **XFP Module Test**
  - XFP Module electrical differential I/F (XFI) Jitter evaluation
  - Optical I/F evaluation
- **Host System Test**
  - Electrical differential I/F Jitter measurement for a transmission equipment supporting XFP



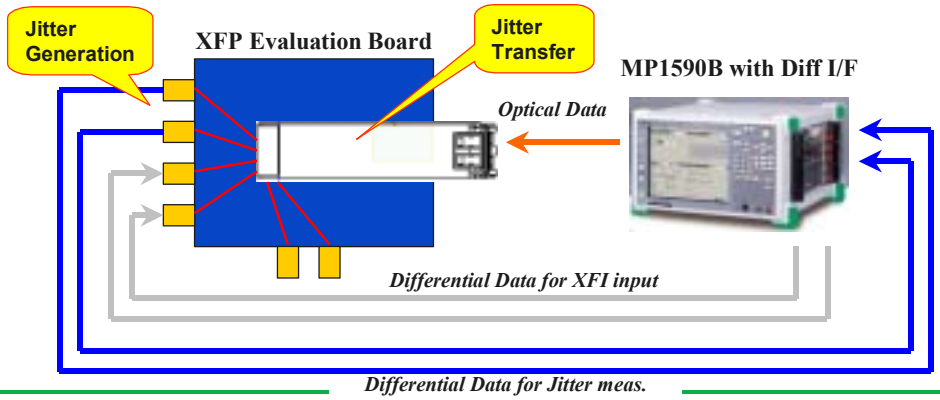
Optical Transceiver Module Transmitter Evaluation

- Basic Jitter measurement of Tx I/F combined with electrical differential I/F
  - Output of data simultaneously from electrical Diff. I/F and optical I/F by inserting noise from receive-side CDR, etc., using no signal input
- Monitoring changes in characteristics due to changes in electrical I/F connection
  - Different characteristics for each of Differential, Single Pos., Single Neg.
  - Evaluation of modules with electrical differential I/F should be based on electrical differential I/F.



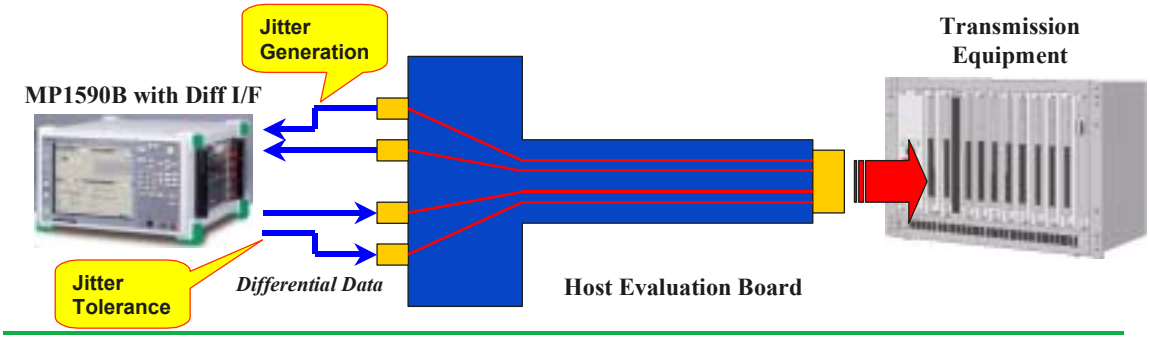
Optical Transceiver Module Receiver Evaluation

- Jitter transfer measurement of Rx I/F in combination with electrical differential I/F
- Monitoring changes in characteristics due to changes in electrical Diff. I/F connection
  - Different characteristics for each of Differential, Single Pos., Single Neg.
  - Evaluation of modules with electrical differential I/F should be based on electrical differential I/F.
- Confirming impact from send-side CDR, etc., using no signal input



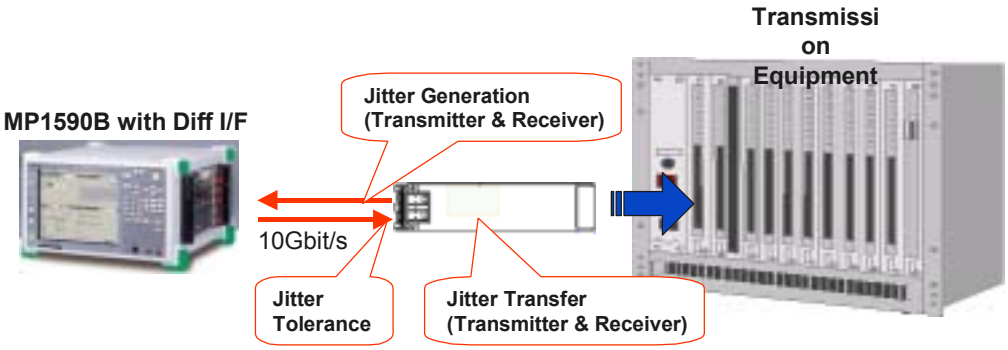
Host System Evaluation

- Evaluation of differential I/F of transmission equipment with built-in optical transceiver module such as XFP, etc.
  - By evaluating Jitter characteristics of transmission equipment becomes possible to evaluate impact of optical module under conditions approximating actual transmission equipment operating conditions without inconvenience
- Monitoring changes in characteristics due to changes in electrical I/F connection
  - Different characteristics for each of Differential, Single Pos., Single Neg.
  - Evaluation of modules with electrical differential I/F should be based on electrical differential I/F



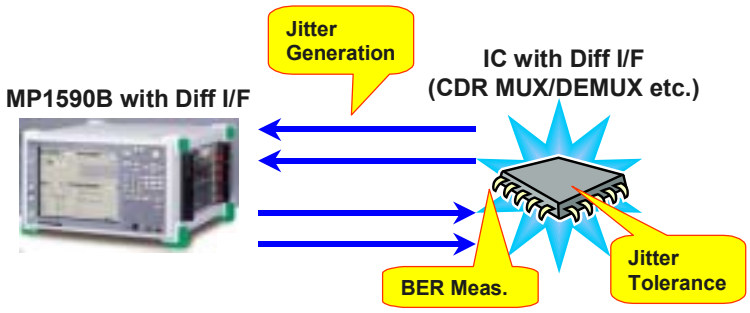
Optical Transceiver Installation Evaluation

- Basic Jitter measurements using tested connection methods
  - Possible to compare the difference of characteristics between the evaluating XFP module installed in transmission equipment and the evaluating XFP module on evaluation board.



Evaluating Devices with Differential I/Fs

- BER and Jitter measurements of ICs with built-in optical module, such as CDR

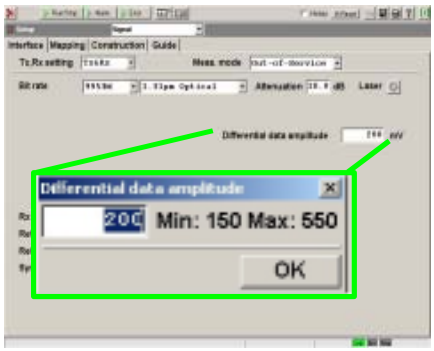


Evaluation of Differential I/F-related Functions

Variable Differential Signal Output Level

- **Functions built-in MU150121B**

Unique!

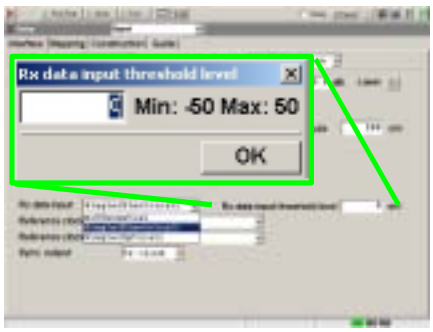


- **Evaluation of electrical differential input I/F level dependency, such as XFI**
  - **Investigating best input level for modules with variable characteristics**
- **Variable range : 150 to 550 mV (@ single end) (Pos./Neg. change simultaneously)**
- **Variable step : 10 mV**
- **Output signal High level : 0 V (typ.)**

Variable Electrical Input Threshold Value

- **Functions built-in MU150123B, MU150124B**

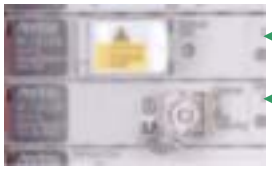
Unique!



- **Variable measuring instrument <u>electrical input H/L threshold value</u> (only single end)**
  - **For investigating best error rate and Jitter values**
- **Variable range : +/- 50 mV**
- **Variable step : 1 mV**

Optical I/F and Single-End I/F

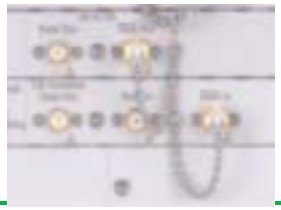
- **Supports MU150121A, MU150123A optical interface functions and performance**
  - **Supports MP1590B Option 30, and supports VOA, O/E independent operation, E/O independent operation, input wavelengths of 1260 to 1610nm, Changing connector types, etc.**

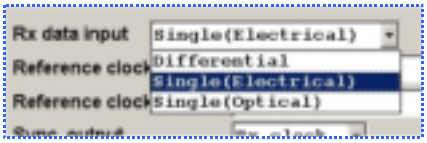


- **By installing accessory 50 ohm terminator in unit, each function also supports single end I/F**
  - **Variable electrical input threshold value, basic Jitter measurements, BER measurements, etc.**

Termination installed
Tx electrical single end

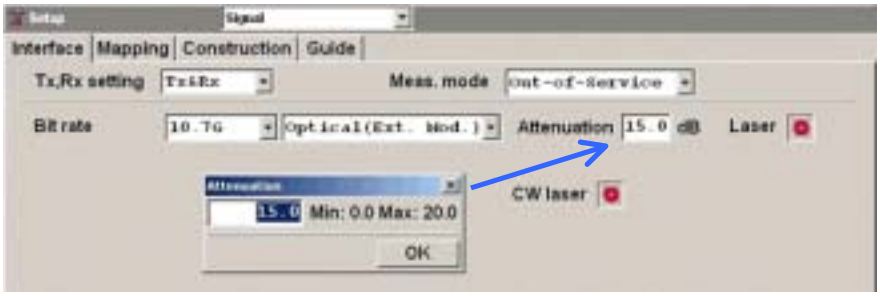
Termination installed
Rx electrical single end





MP1590B Variable Optical Output Power

- **VOA (Variable Optical output power Attenuator)**
  - **Variable optical output power attenuator function for each optical output of MU150100A, MU150101A, MU150121A, *MU150121B*, MU150134A (MU15**** Option 04)**
  - **Attenuation : 0~20 dB (10G/10.7G),**
    0~30 dB (2.5/2.6G max.)



MP1590B Jitter Solution Features

- **High-precision Jitter measurement and excellent measurement reproducibility**
  - *MP1590B Option 30* High-precision Jitter Option
    - Generation measurement accuracy : +/-20 mUIp-p
    - Measurement reproducibility : +/- 5 mUIp-p
    - Stable measurement with no optical input level or optical wavelength dependency
- **ITU-T Recommended Jitter measurement**
  - Measurement to ITU-T O.172 (April 2005) recommendation (for Jitter measuring equipment)
- **Supported I/F**
  - Optical I/F (1310 nm, 1550 nm)
    - SDH/SONET : STM-0 to STM-64; OC-1 to OC-192
    - OTN : OTU1 (2.66 G), OTU2 (10.7G)
    - 10.3G <PRBS> (ITU-T method)
  - electrical differential I/F
    - STM-64/STS-192 (9953M), 10.3G (PRBS), OTU2 (10.7G)

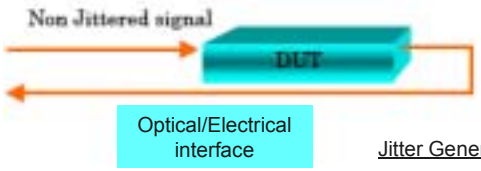
MP1590B Jitter Measurement Functions

- **Basic Measurements**
  - Jitter Transfer
    - Supported mask patterns: Telcordia GR-253, ANSI T1.105.03, ITU-T G.783, G.8251, ETSI 300 417-1-1, user
  - Jitter Tolerance
    - Supported mask patterns: Telcordia GR-253, ANSI T1.105.03, ITU-T G.783, G.825, G.813, G.8251, ETSI EN 302 084, user
  - Jitter Generation
  - Output Jitter
  - Wander generation / measurement (P-P, +P, -P, TIE)

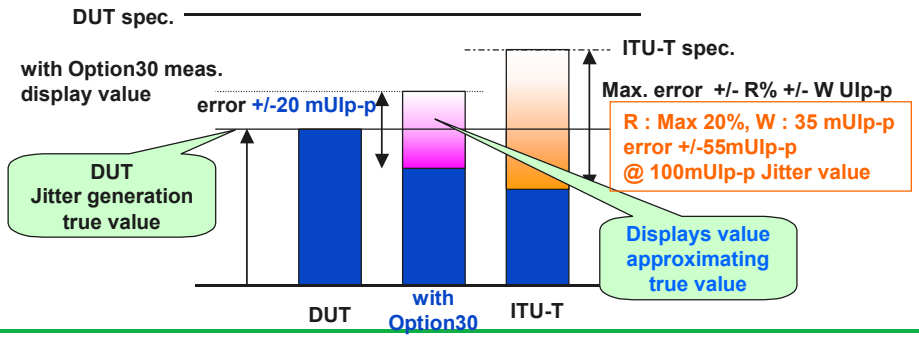
MP1590B Option 30

Option 30 Effect

Improved Jitter Generation Measurement Accuracy



Jitter Generation Meas.



Setup

MP1590B Unit Configuration Units

MP1590B

Recommended combination between optical units

	Diff. IF with Jitter	Diff. IF without Jitter	Optical IF with Jitter	Optical IF without Jitter
Tx	MU150121B	MU150121B	MU150121A / MU150134A	MU150121A / MU150134A
Rx	MU150123B / MU150124B	MU150124B	MU150123A	MU150122A

O/E,E/O Configuration Example

1010.7G O/E, E/O

Slot1	
Slot2	
Slot3	Opt./Ele.Tx Unit
Slot4	Opt./Ele.Rx Unit
Slot5	
Slot6	

Ethernet module supported in slots 5 and 6

Electrical Differential I/F Configuration Example

10/10.7G with Jitter

Slot1	MU150100A
Slot2	
Slot3	Opt./Ele.Tx Unit
Slot4	Opt./Ele.Rx Unit
Slot5	Jitter Unit
Slot6	

Ethernet module not used

10/10.7G, 10.3G

Slot1	MU150100A
Slot2	
Slot3	Opt./Ele. x Unit
Slot4	Opt./Ele.Rx Unit
Slot5	
Slot6	

Ethernet module supported in slots 5 and 6

Selection Guide

		MU150121B	MU150123B	MU150124B	MU150121A	MU150122A	MU150123A	MU150134A
Tx/Rx		Tx	Rx	Rx	Tx	Rx	Rx	Tx (1550nm)
Electrical Diff. I/F		X	X	X				
Ext. modulation								X
BER	9953Mbit/s	X	X	X	X	X	X	X
	10.3Gbit/s	X		X	X			X
	10.7Git/s	X	X (Op05)	X	X	X	X (Op05)	X
Jitter meas.	9953Mbit/s	X	X		X		X	X
	10.3Gbit/s	X		X	X			X
	10.7Git/s	X	X (Op05)		X		X (Op05)	X
MP1590B-30		X (Optical)	X (Optical)		X (Optical)		X (Optical)	X (Optical)
VOA		X (Op04)			X (Op04)			X (Op04)
Electrical diff. I/F variable output level		X						
Variable electrical input threshold			X	X				
O/E, E/O		X	X	X	X	X	X	X

X : Available

MU150121A/B Shared	Must select any one of Option 01 (1.31 µm), Option 02 (1.55 µm), Option 03 (1.31/1.55 µm).
Tx/Rx Shared	Option 38 (ST connector), Option 39 (DIN connector), Option 40 (SC connector), Option 43 (HMS-10/A connector) installed at factory shipment The standard connector installation is FC connector.

(There are some restrictions on use of the MP1590B Option 30 -- see the data sheet for more details.)

Anritsu

Specifications are subject to change without notice.

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