Product Introduction

New Multirate Unit

MP1590B
Network Performance Tester

New Multirate Unit for MP1590B Product Introduction

June 2009

Anritsu Corporation

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2. Features
3. Comparison with Previous Unit
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Product Outline (1/5)

Outline

Anritsu is rolling out its new MU15011A Multirate Unit for the popular MP1590B Network Performance Tester.

The Multirate Unit has all the functions of its predecessor MU150100A 10/10.7G Unit but also has the following new functions.

- **New Functions**
  - **10G-band XFP Interface**
  - **Full 10G-band Multichannel Measurement (STM-0/OC-1~STM-64/OC-192 SDH/SONET; max. 5,376 x VC11/VT1.5SPE, 4,032 x VC12/VT2SPE)**
  - **11.1G LAN-PHY over OTN Interface (ITU-T G.Sup.43 OTU1e and OTU2e)**
  - **10.3G LAN-PHY Interface (10G Ethernet Interface)**

Product Outline (2/5)

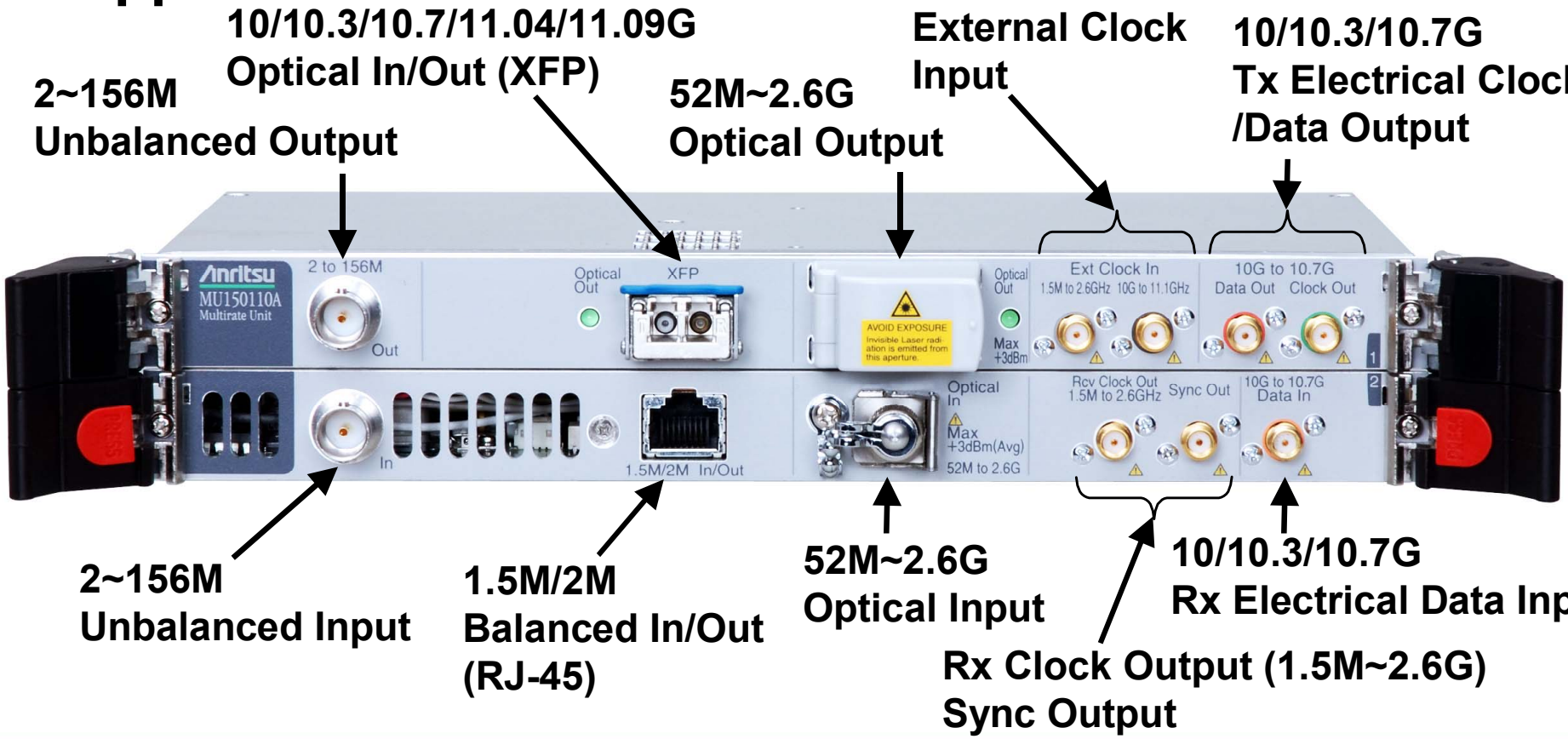
MU150110A Multirate Unit

- Plug-in Module for MP1590B
  - Supports Bit Rates of 1.5M to 11.1G
- Upper Compatible with MU150100A 10/10.7G Unit
  - Inherits All MU150100A Functions
  - Added 10G Optical I/F New
- Multichannel Measurements New
  - Simultaneous measurement of all HO/LO Channels across full 10G band
  - Error/Alarm, BER, APS, Delay Time Measurements
- SDH/SONET/PDH/DSn Measurements
  - STM-0/OC-1 (52M) to STM-64/OC-192 (10G)
- OTN Measurements
  - OTU1 (2.6G), OTU2 (10.7G)
  - OTU1e (11.04G), OTU2e (11.09G) New
  - ITU-T O.182 FEC Performance Test
- 10GbE-LAN Measurements New
  - PCS (Physical Coding Sublayer) Measurement
  - Link Fault Signalling Measurement

Product Outline (3/5)

Model, Name, Appearance

- Model: MU150110A
- Name: Multirate Unit
- Appearance:



Product Outline (4/5)

Ordering Information

Model	Opt.	Name
MP1590B		Network Performance Tester
	01	RS-232C
	02	GPIB
	03	LAN
	30	High Precision Jitter Analysis
MU150110A		Multirate Unit
	004	Optical Output Power Adjustable
	005	OTU1/OTU2
	006	11.1G
	008	10.3G
	009	Insert/Extract
	010	Multichannel Measurement

Model	Opt.	Name
MU150121A/B		10/10.7G Optical Unit (Tx) (121A)
		10/10.7G Optical/Electrical Unit (Tx) (121B)
	01	Wavelength 1.31um
	02	Wavelength 1.55um
	03	Wavelength 1.31/1.55um
	04	Optical Output Power Adjustable
MU150123A/B		10/10.7G Optical Unit (Rx Wide) (123A)
		10/10.7G Optical/Electrical Unit (Rx Wide) (123B)
	05	OTU2
MU150124B		10.3G Optical/Electrical Unit (Rx Wide)
MU150125A		10/10.7G Jitter Unit
	01	Wander Measurement
	05	OTU1/OTU2
	06	10.3G
G0194A		1310nm XFP Module
G0195A		1550nm XFP Module

(Typical example)

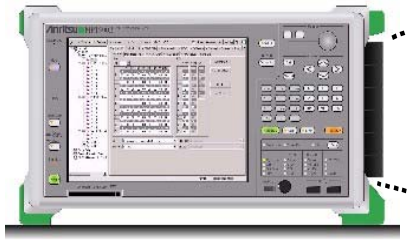
Product Outline (5/5)

Configuration Examples

- **Non-jitter**
  - **10G Optical**

    1.5M~2.6G,
    10G/10.3G/10.7G
    /11.04G/11.09G (optical)

1	MU150110A
2	
3	
4	
5	
6	



MP1590B

1	Slot 1
2	Slot 2
3	Slot 3
4	Slot 4
5	Slot 5
6	Slot 6

Note: OTU1e (11.04G) /OTU2e (11.09G) /PDH/DSn do not support jitter measurement.
10.3G only supports No frame jitter measurement.
Combining MU150110A and interface unit (MU150121A/B, MU150123A/B, MU150124B) requires MU150125A.

- **Jitter**
  - **10G Optical**

    52M~2.6G,
    10G/10.7G (Optical)

1	MU150110A
2	
3	MU150121A
4	MU150123A
5	MU150125A
6	

  - **10G Optical/Elec. Differential**

    52M~2.6G,
    10G/10.7G (Opt/Elec. Diff)

1	MU150110A
2	
3	MU150121B
4	MU150123B
5	MU150125A
6	

  - **10.3G Optical/Elec. Differential**

    52M~2.6G,
    10.3G (Opt/Elec. Diff, No Frame only)

1	MU150110A
2	
3	MU150121B
4	MU150124B
5	MU150125A
6	

1. Product Outline
2. **Features**
3. Comparison with Previous Unit
4. Summary

Features (10G-Band Optical I/F)

10G Optical I/F Outline

- Built-in XFP Interface
- XFP Module exchange to support 1310 and 1550 nm wavelengths
- Full support from 52M to 10G optical I/Fs (non-jitter measurement)

Conventional 10G measurement setup

MU150100A 10/10.7G Unit

MU150135A 10/10.7G Optical Unit (XFP)

New 10G measurement setup New

MU150110A Multirate Unit

Note: MU150110A also supports jitter measurement but requires MU150121A/B, MU150123A/B, MU150124B, and MU150125A in addition.
MU150110A XFP does not support 10Gbps jitter measurement.

Features (Multichannel Measurement (1/9))

Multichannel Measurement Outline

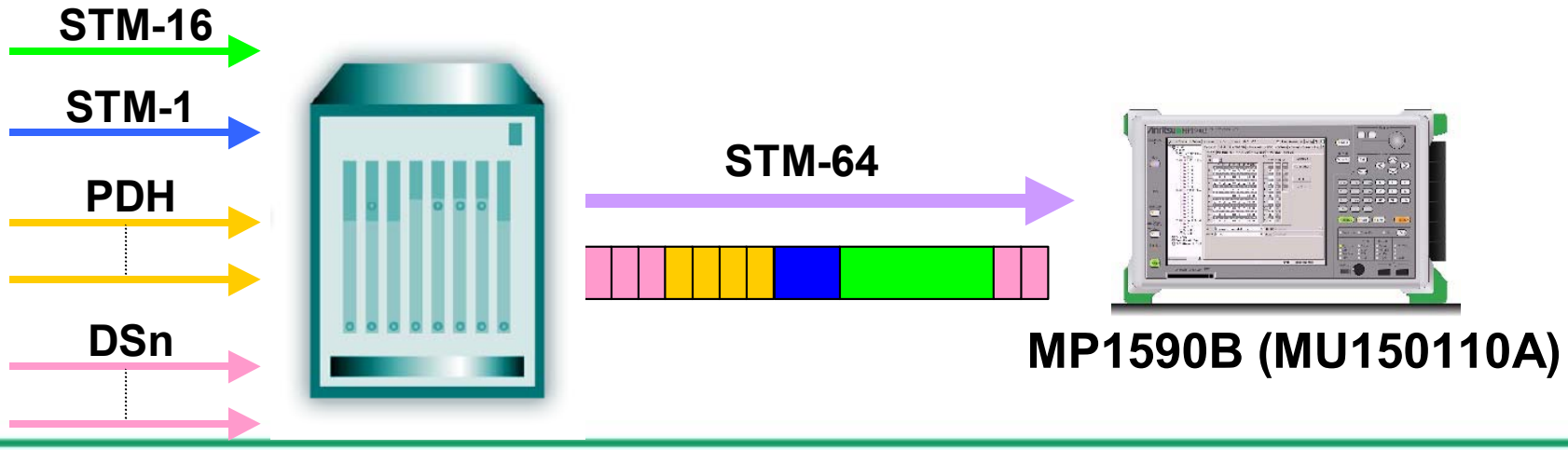
- Supports STM-0/OC-1 to STM-64/OC-192 SDH/SONET Measurements
- Full 10G-band HO/LO Channel Simultaneous Measurement (max. 5,376 VC11/VT1.5SPE and 4,032 VC12/VT2SPE simultaneous measurements)
- Mapping Auto-search Function
- Error/Alarm, BER, APS, Delay Time Measurements
- Confirm Error/Alarm Generation Status for Each Channel using Path Monitor Function
- Event Log Function

Features (Multichannel Measurement (2/9))

What is Multichannel Measurement?

The SDH/SONET signal channel configuration is identified automatically (supports Mixed Mapping) and Errors/Alarms of all channels are measured simultaneously.

Previously, each measurement channel was selected and measured individually, so the new unit greatly reduces the times required for cross-channel correlation checks and testing at multichannel measurement.

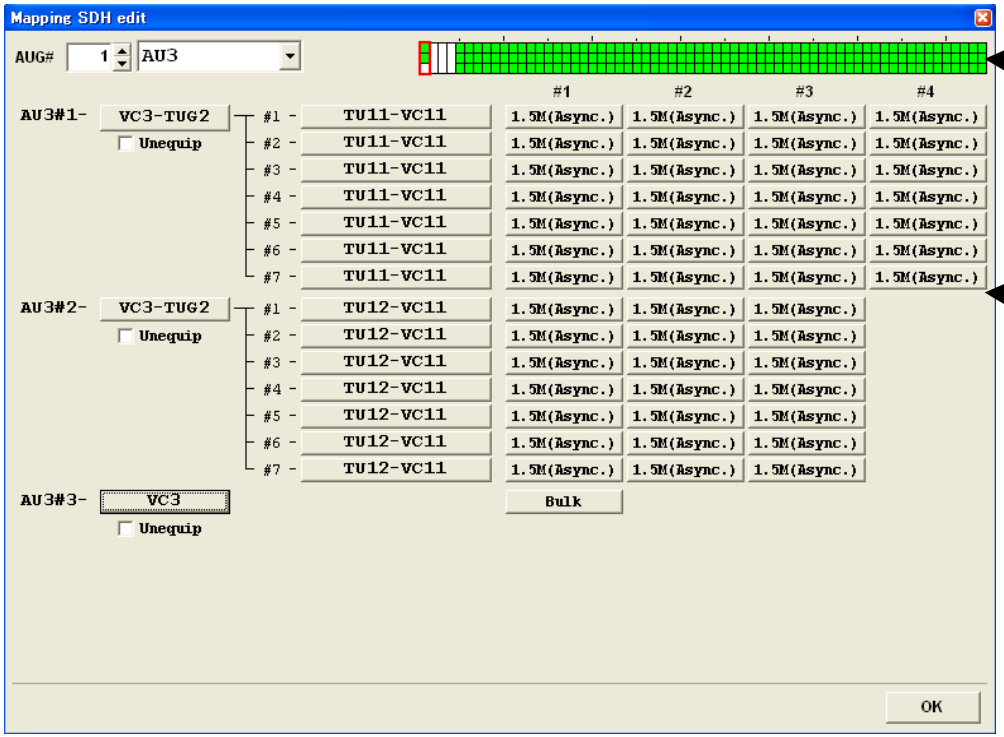


Features (Multichannel Measurement (3/9))

Mapping Setting (Manual Setting)

Each channel is set using the Mapping Edit screen.

Any mapping can be set and setting is easy.



Graphical display of mapping structure

Free setting for each channel

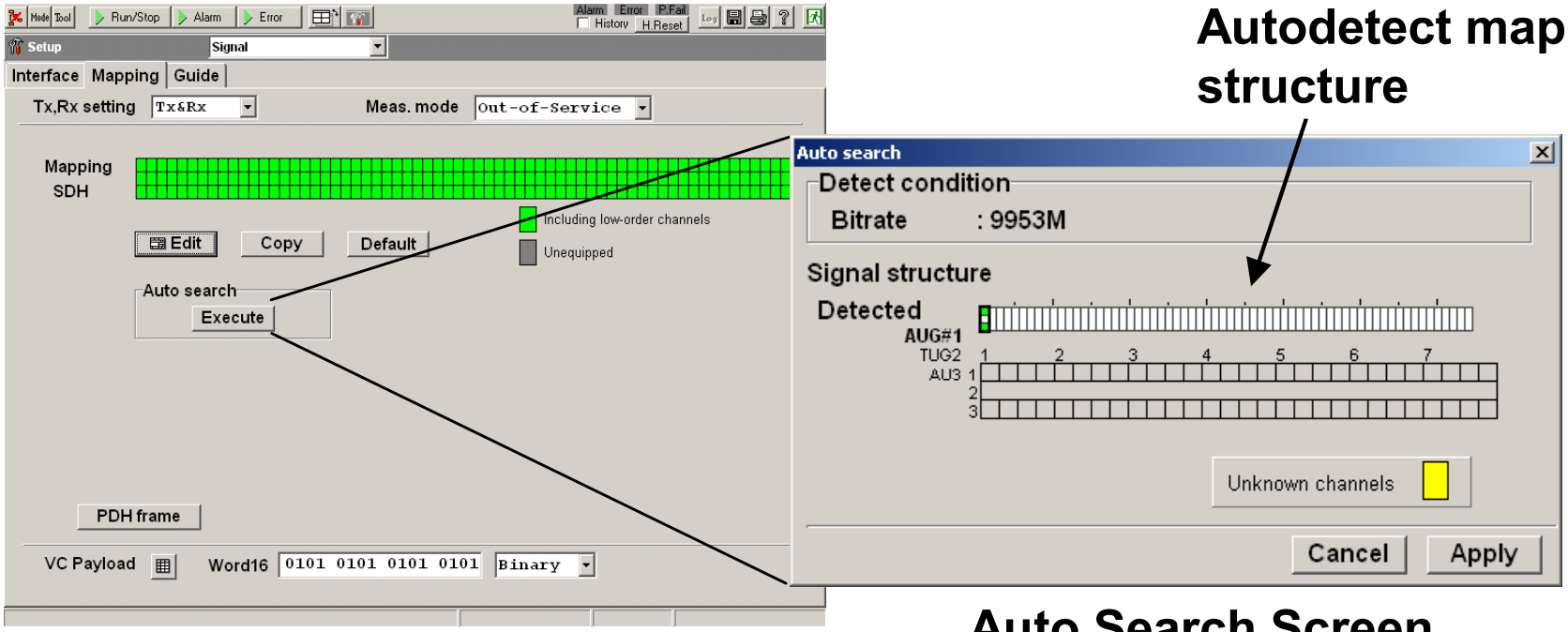
Mapping Edit Screen

Features (Multichannel Measurement (4/9))

Mapping Setting (Autosearch Setting)

The Mapping structure of the Rx signal is detected automatically and multichannel measurement can be performed using detected mappings.

Signals with unknown mapping structure can be measured, eliminating mapping setting work.



Auto Search Screen

Features (Multichannel Measurement (5/9))

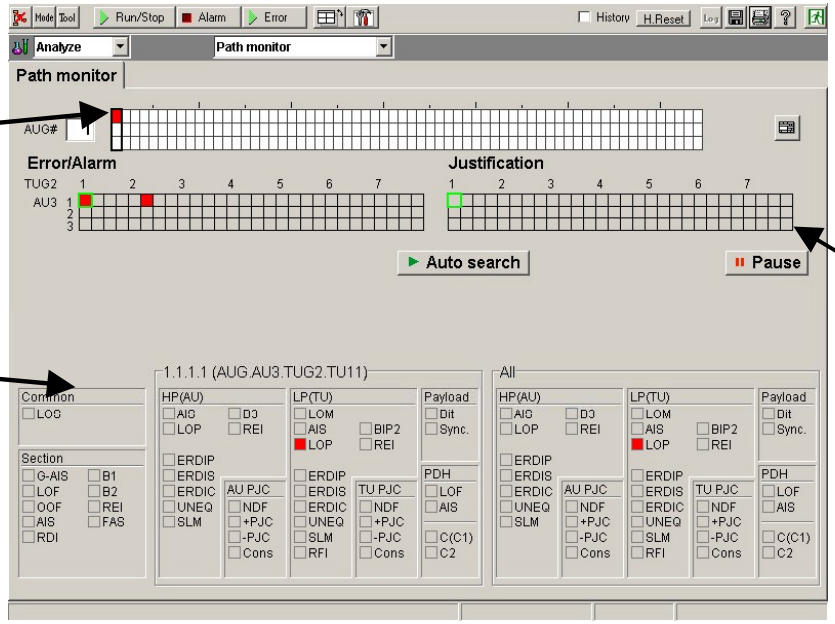
Path Monitor Function

The full AUG Error/Alarm generation status and the Error/Alarm generation status for any specified channel can be monitored in detail.

Since all monitoring results are displayed on one screen, the Error/Alarm status of all channels can be seen at a glance.

Full AUG Error/Alarm status

Details of Error/Alarm status for all channels and specified channels



Error/Alarm status of each channel in specified AUG

Path Monitor Screen

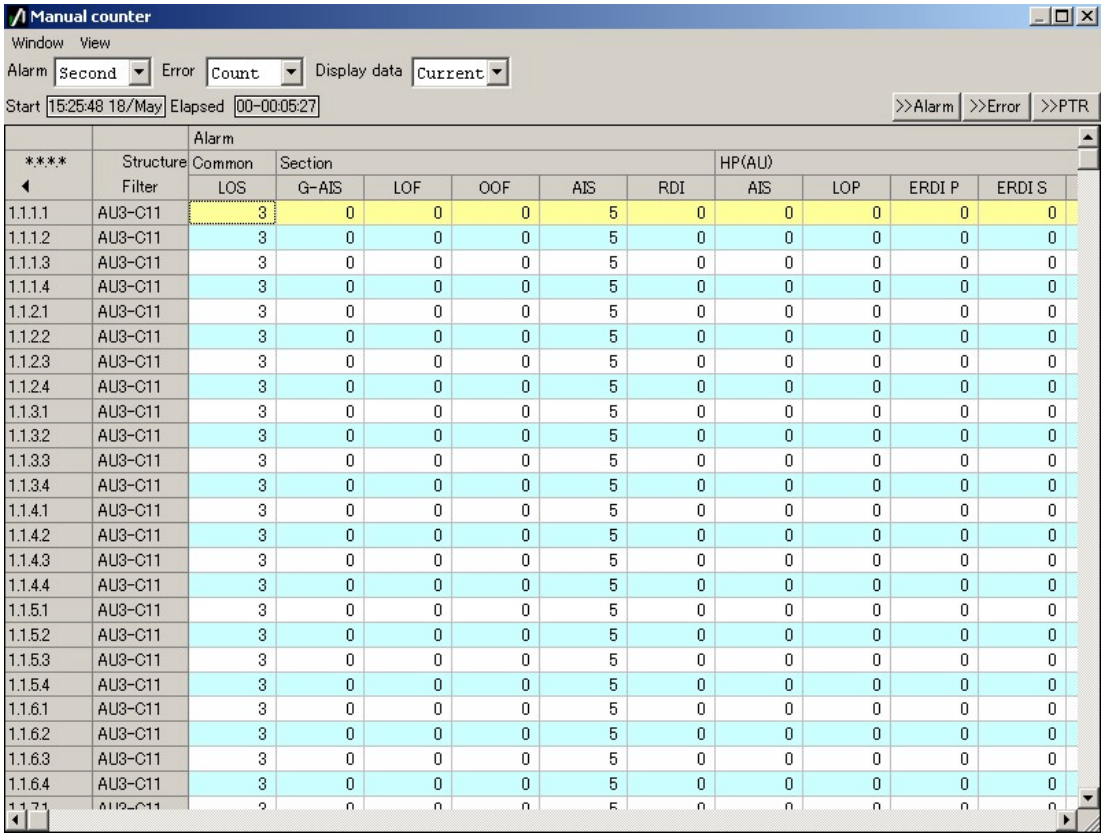
Features (Multichannel Measurement (6/9))

Error/Alarm Measurements

The Errors/Alarms for each channel are measured and the results are displayed as a list.

Measurements

- Alarm (Second/Frame)
  - Common
  - Section
  - HP (AU)
  - LP (TU)
  - Payload
- Error (Count/Rate)
  - Section
  - HP (AU)
  - LP (TU)
  - Payload
- Pointer
  - AU
  - TU



****	Structure	Alarm									
		Common	Section					HP(AU)			
	Filter	LOS	G-AIS	LOF	OOF	AIS	RDI	AIS	LOP	ERDI P	ERDI S
1.1.1.1	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.1.2	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.1.3	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.1.4	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.2.1	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.2.2	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.2.3	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.2.4	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.3.1	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.3.2	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.3.3	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.3.4	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.4.1	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.4.2	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.4.3	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.4.4	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.5.1	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.5.2	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.5.3	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.5.4	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.6.1	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.6.2	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.6.3	AU3-C11	3	0	0	0	5	0	0	0	0	0
1.1.6.4	AU3-C11	3	0	0	0	5	0	0	0	0	0

Manual Counter Screen

Features (Multichannel Measurement (7/9))

APS Measurements

The APS Switching Time for each channel is measured and the results are displayed as a list.

Measurements

- Switch Time (ms)
  - Last: Latest measurement result
  - Judge: OK (Pass) /NG (Fail)
  - Min.: Min. value
  - Max.: Max. value
  - Average: Average value
- Count
  - Total: Counts of total measurements
  - OK: Counts of OK (Pass)
  - NG: Counts of NG (Fail)

APS test result

Window

▲****	Structure	Switch time(ms)					Count		
◀	Filter	Last	Judge	Min.	Max.	Average	Total	OK	NG
All		-----	-----	25.6	1000.6	40.5	394	394	0
1	C4	25.7	OK	25.7	25.7	25.7	6	6	0
2	C4	25.7	OK	25.7	25.7	25.7	6	6	0
3	C4	25.7	OK	25.7	25.7	25.7	6	6	0
4	C4	25.7	OK	25.7	25.7	25.7	6	6	0
5	C4	25.7	OK	25.7	25.7	25.7	6	6	0
6	C4	25.7	OK	25.7	25.7	25.7	6	6	0
7	C4	25.7	OK	25.7	25.7	25.7	6	6	0
8	C4	25.7	OK	25.7	25.7	25.7	6	6	0
9	C4	1000.6	NG	25.7	1000.6	164.9	7	6	1
10	C4	1000.6	NG	25.7	1000.6	164.9	7	6	1
11	C4	25.6	OK	25.6	25.7	25.6	7	7	0
12	C4	25.6	OK	25.6	25.7	25.6	7	7	0
13	C4	25.6	OK	25.6	25.7	25.6	7	7	0
14	C4	25.6	OK	25.6	25.7	25.6	7	7	0
15	C4	25.7	OK	25.7	25.7	25.7	6	6	0

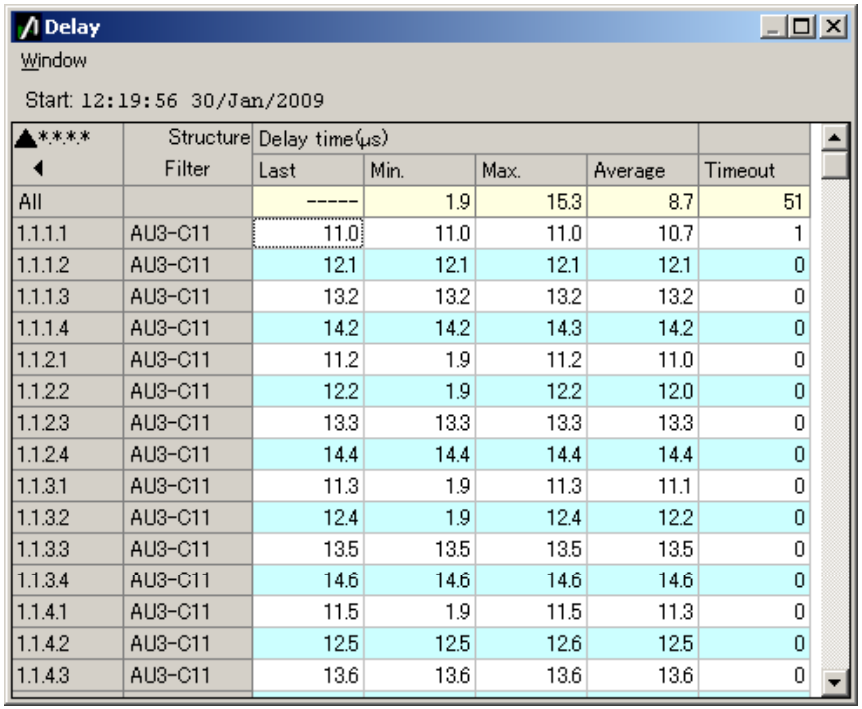
APS Test Result Screen

Delay Time Measurement

The Delay Time for each channel is measured and the results are displayed as a list.

Measurements

- **Delay Time (µs)**
  - **Last: Last measurement result**
  - **Min: Min. value**
  - **Max: Max. value**
  - **Average: Average value**
  - **Timeout: Counts that was not able to be measured within measured period**



▲**** / ◀	Structure / Filter	Delay time(µs) Last	Min.	Max.	Average	Timeout
All		-----	1.9	15.3	8.7	51
1.1.1.1	AU3-C11	11.0	11.0	11.0	10.7	1
1.1.1.2	AU3-C11	12.1	12.1	12.1	12.1	0
1.1.1.3	AU3-C11	13.2	13.2	13.2	13.2	0
1.1.1.4	AU3-C11	14.2	14.2	14.3	14.2	0
1.1.2.1	AU3-C11	11.2	1.9	11.2	11.0	0
1.1.2.2	AU3-C11	12.2	1.9	12.2	12.0	0
1.1.2.3	AU3-C11	13.3	13.3	13.3	13.3	0
1.1.2.4	AU3-C11	14.4	14.4	14.4	14.4	0
1.1.3.1	AU3-C11	11.3	1.9	11.3	11.1	0
1.1.3.2	AU3-C11	12.4	1.9	12.4	12.2	0
1.1.3.3	AU3-C11	13.5	13.5	13.5	13.5	0
1.1.3.4	AU3-C11	14.6	14.6	14.6	14.6	0
1.1.4.1	AU3-C11	11.5	1.9	11.5	11.3	0
1.1.4.2	AU3-C11	12.5	12.5	12.6	12.5	0
1.1.4.3	AU3-C11	13.6	13.6	13.6	13.6	0

Delay Screen

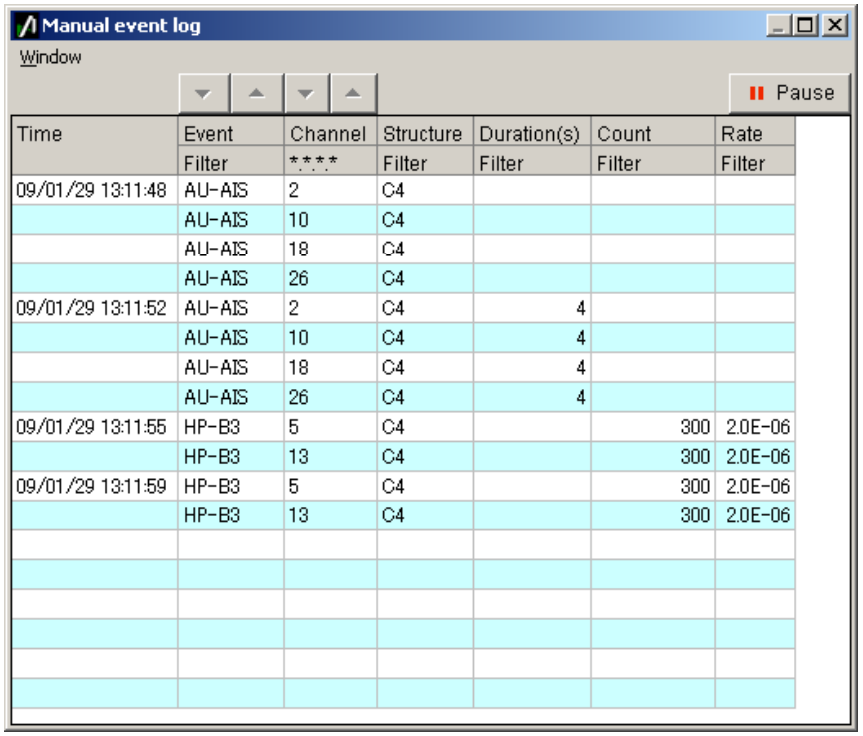
Features (Multichannel Measurement (9/9))

Event Log Function

The Error/Alarm occurrence status is displayed as a list of up to 300,000 events.

Measurements

- Time: Occurrence/recovery time
- Event: Event name
- Channel: Occurrence/recovery channel
- Structure: Mapping structure
- Duration (s): Alarm duration
- Count: Error count
- Rate: Error rate



Time	Event	Channel	Structure	Duration(s)	Count	Rate
	Filter	*.*.*.*	Filter	Filter	Filter	Filter
09/01/29 13:11:48	AU-AIS	2	C4			
	AU-AIS	10	C4			
	AU-AIS	18	C4			
	AU-AIS	26	C4			
09/01/29 13:11:52	AU-AIS	2	C4	4		
	AU-AIS	10	C4	4		
	AU-AIS	18	C4	4		
	AU-AIS	26	C4	4		
09/01/29 13:11:55	HP-B3	5	C4		300	2.0E-06
	HP-B3	13	C4		300	2.0E-06
09/01/29 13:11:59	HP-B3	5	C4		300	2.0E-06
	HP-B3	13	C4		300	2.0E-06

Manual Event Log Screen

Features (LAN-PHY over OTN (1/6))

LAN-PHY over OTN (11.1Gbps) Functions

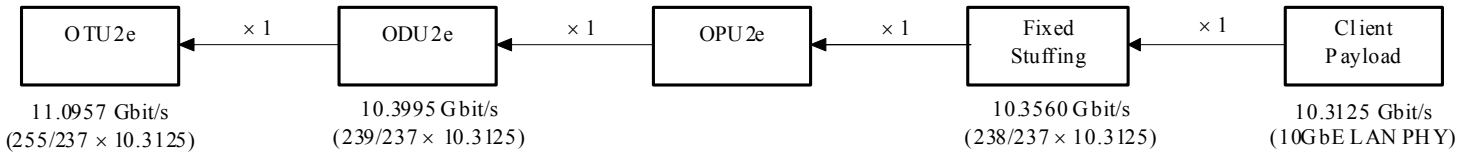
- Supports OTU1e (11.04 Gbps) and OTU2e (11.09 Gbps)
- Supports ITU-T O.182 FEC Performance Test
- Wrapping Test from 10GbE LAN-PHY (10.3 Gbps) to LAN-PHY over OTN (11.1 Gbps)
- Overhead Editing/Monitoring (OUT, ODU, OPU, FAS, TTI, FTFL)

Features (LAN-PHY over OTN (2/6))

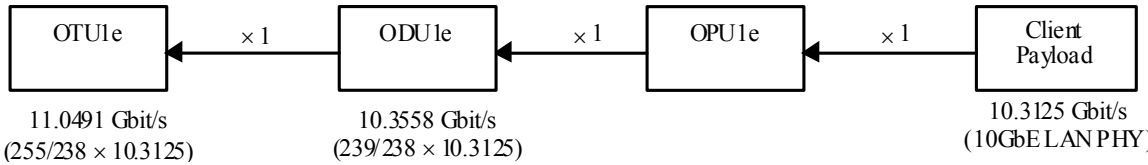
What is LAN-PHY over OTN (11.1 Gbps)?

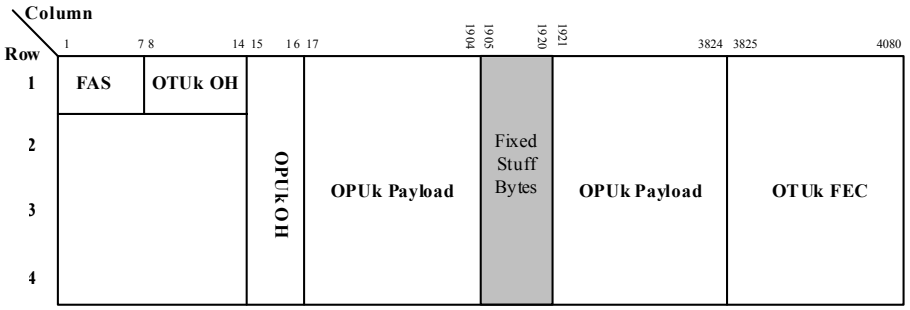
ITU-T G.Sup.43 specifies LAN-PHY over OTN for bit-transparent 10GbE transfers. The MU150110A supports the following two 11.1 Gbps methods.

- **11.09 Gbps (OTU2e: With fixed stuff)**

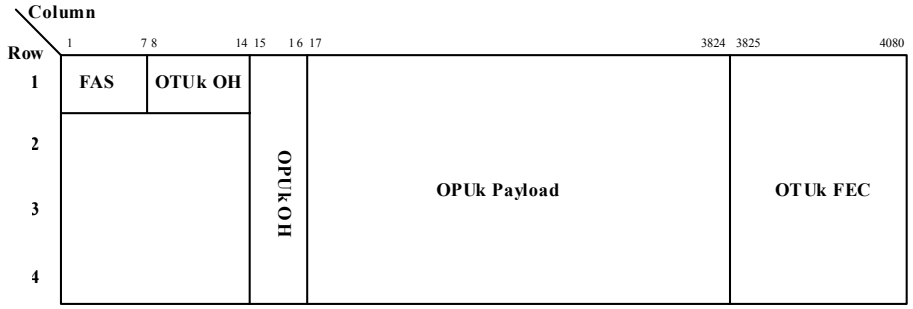


- **11.04 Gbps (OTU1e: Without fixed stuff)**





Mapping frame with fixed stuff bytes



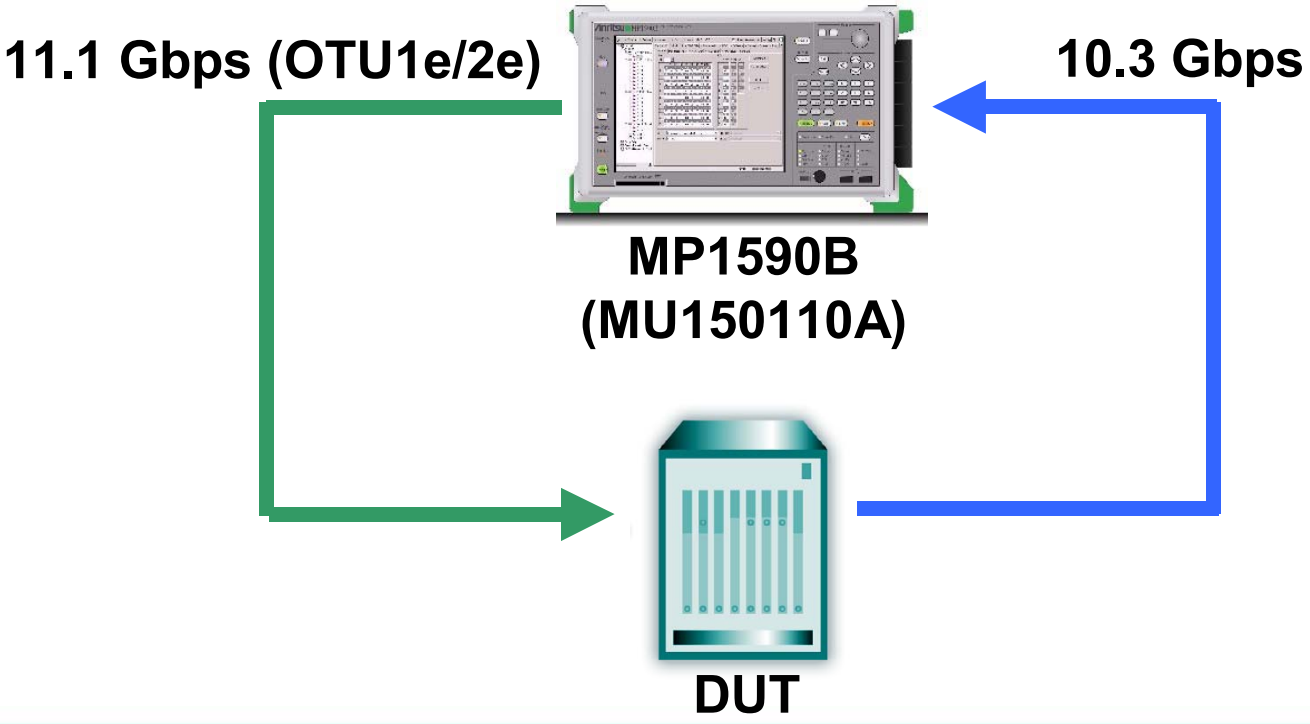
Mapping frame without fixed stuff bytes

Features (LAN-PHY over OTN (3/6))

LAN-PHY over OTN Measurement Application

The MU150110A can send and receive 11.1 Gbps and 10GbE independently.

Because one unit supports both OTU1e/OTU2e wrapping and de-wrapping tests, the equipment investment is cut.

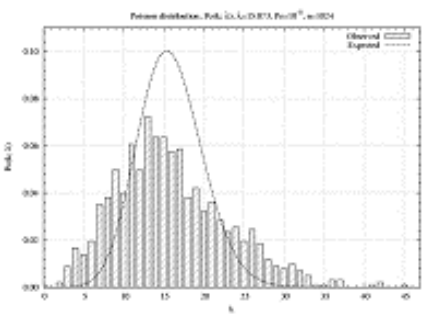


Features (LAN-PHY over OTN (4/6))

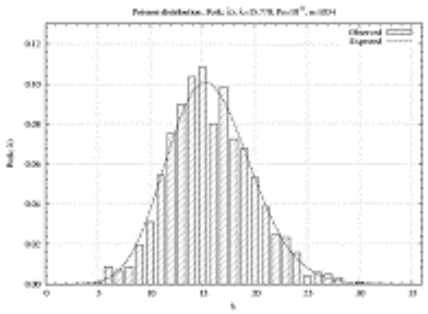
ITU-T O.182-Compliant FEC Test

Anritsu's proposed FEC performance tests using Poisson distribution random errors were adopted by ITU-T O.182 in July 2007.

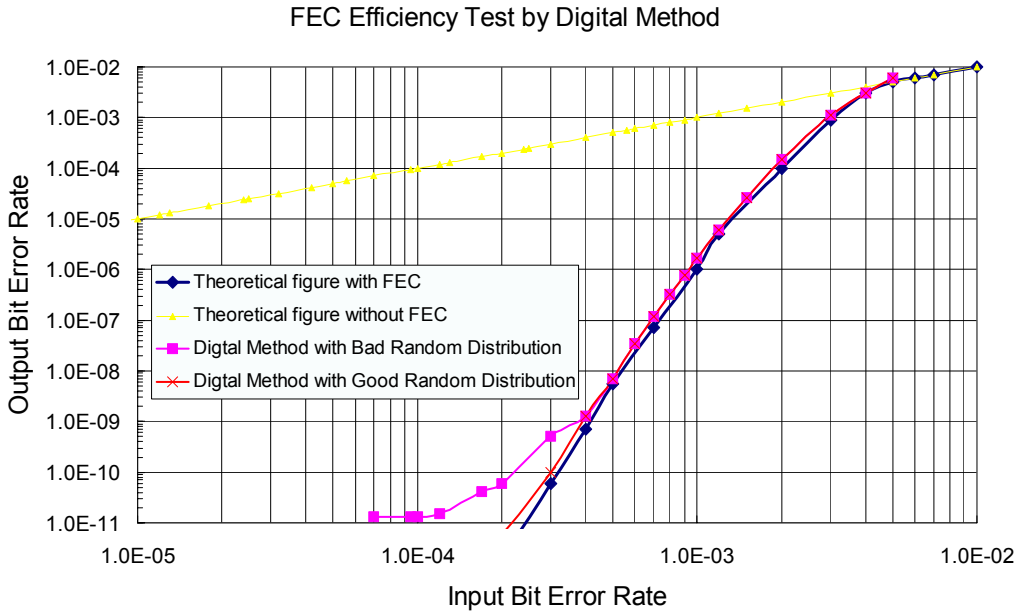
Reproducible/accurate FEC error correction tests are performed by generating random signal errors (Poisson distribution).



Bad Random Distribution



Good Random Distribution

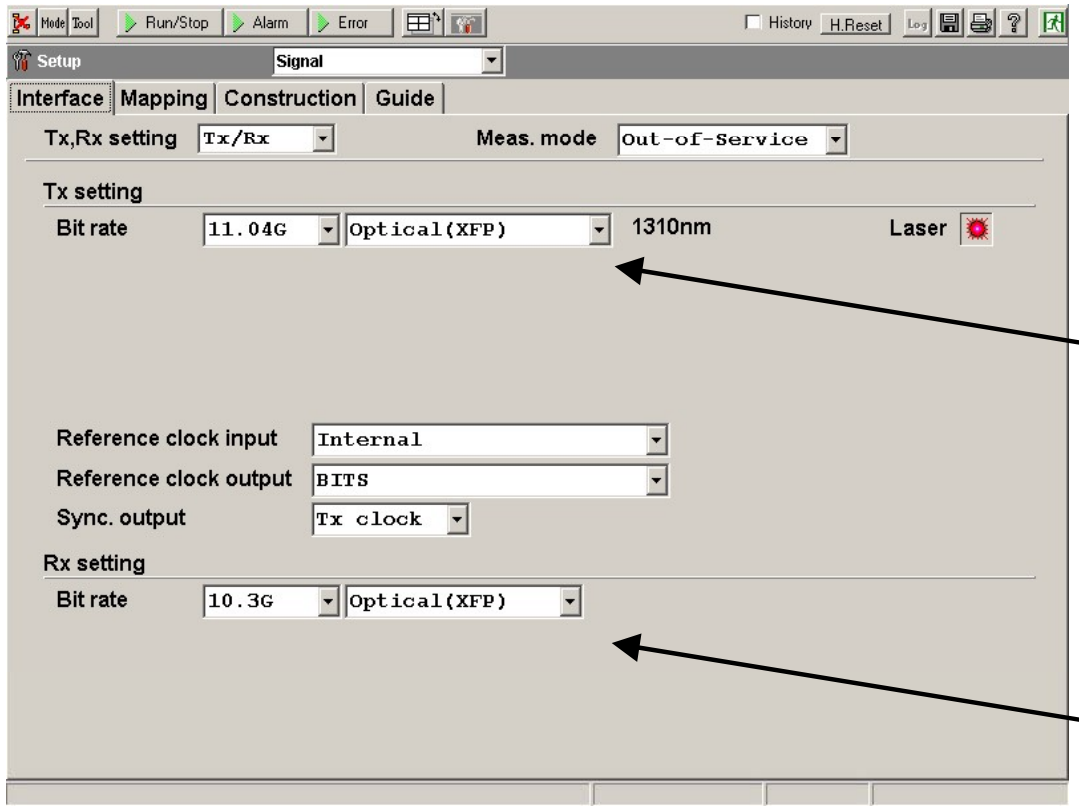


Error Correction Curve

Features (LAN-PHY over OTN (5/6))

Interface Setting

The Rx and Tx interfaces can be set independently.



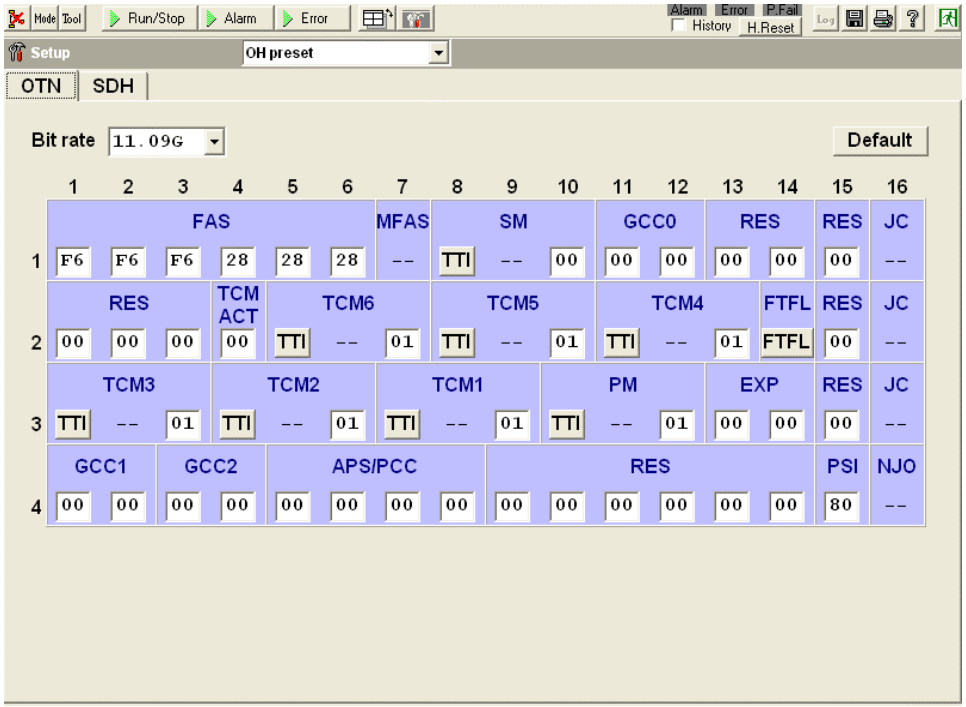
Interface Screen

Features (LAN-PHY over OTN (6/6))

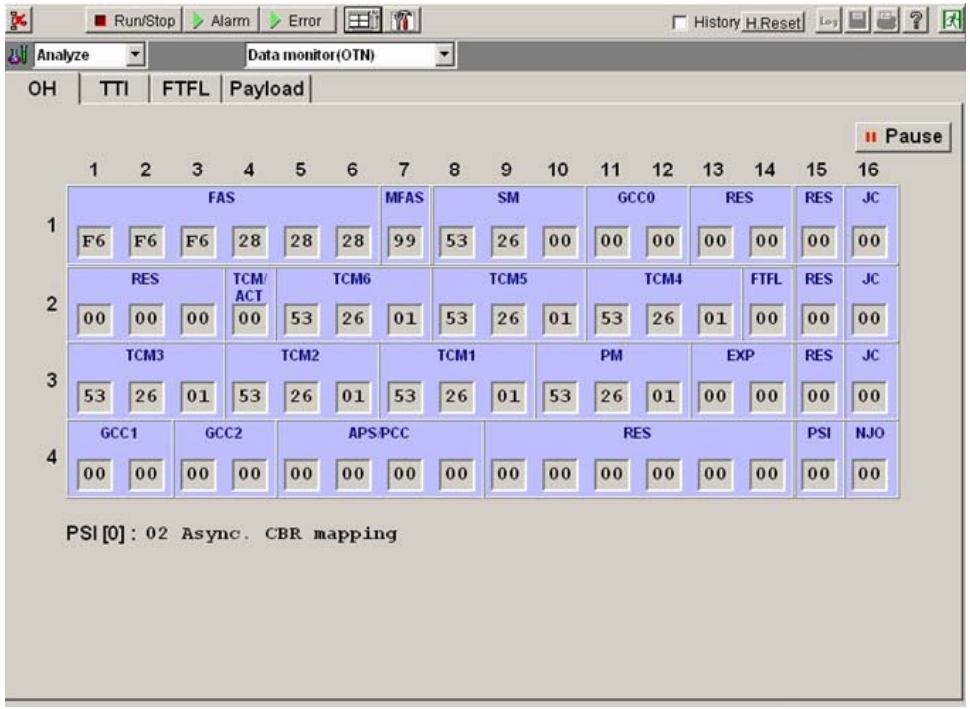
Overhead Editing/Monitoring

The OTN overhead can be edited freely and sent.

The overhead and payload of received signals can be monitored.



OH Preset Screen



OH Monitor Screen

Features (10GbE LAN-PHY (1/8))

10GbE LAN-PHY (10.3Gbps) Function Outline

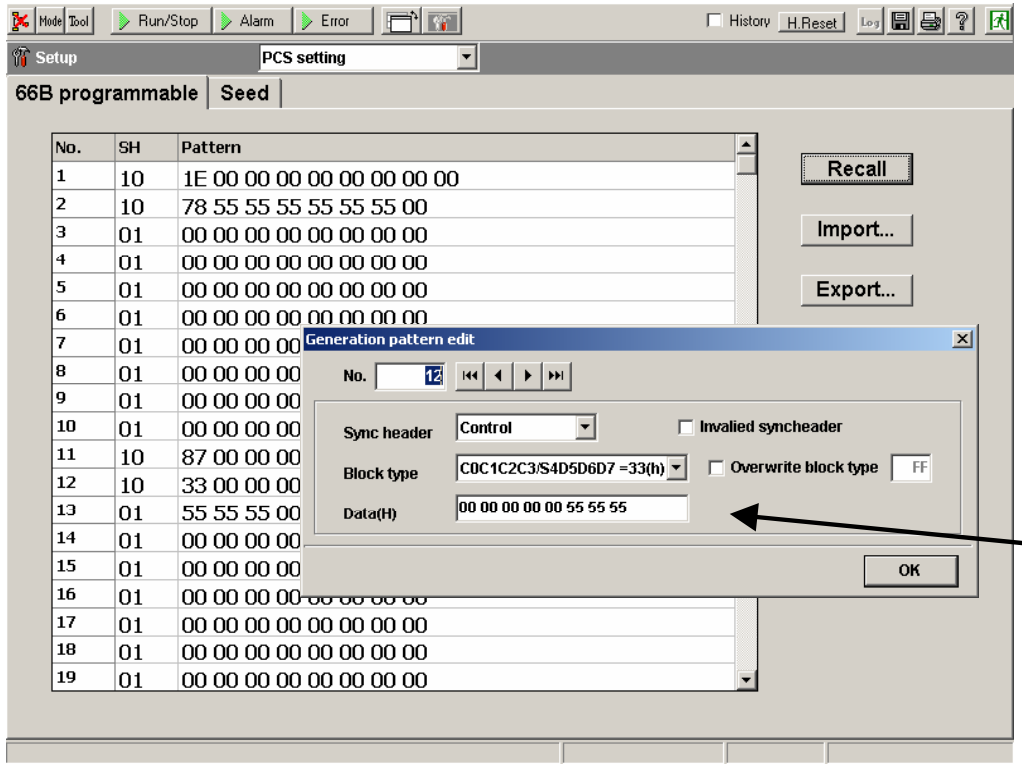
- PCS (Physical Coding Sublayer) Measurements
  - 66B Pattern Editing
  - 66B Pattern Capture
  - Error/Alarm Measurements using Test Patterns (Square Wave, Pseudo-random, PRBS31) Specified by IEEE 802.3
- Stream Sending
- Throughput Measurement
- BER Measurement
- Sequence Error Measurement
- Latency Measurement
- LFS (Link Fault Signaling) Measurement
  - LFS Auto-response
  - LFS (Remote/Local Fault Signal, Edit Signal) Editing/Sending
  - LFS Capture

Features (10GbE LAN-PHY (2/8))

PCS Measurements (66B Pattern Editing)

The 66B pattern at the 64B/66B encoding used by the 10GbE PCS layer can be edited for 256 blocks max. and sent.

Edit 66B pattern for 256 blocks max.



Set any 66B pattern

66B Programmable Screen

Features (10GbE LAN-PHY (3/8))

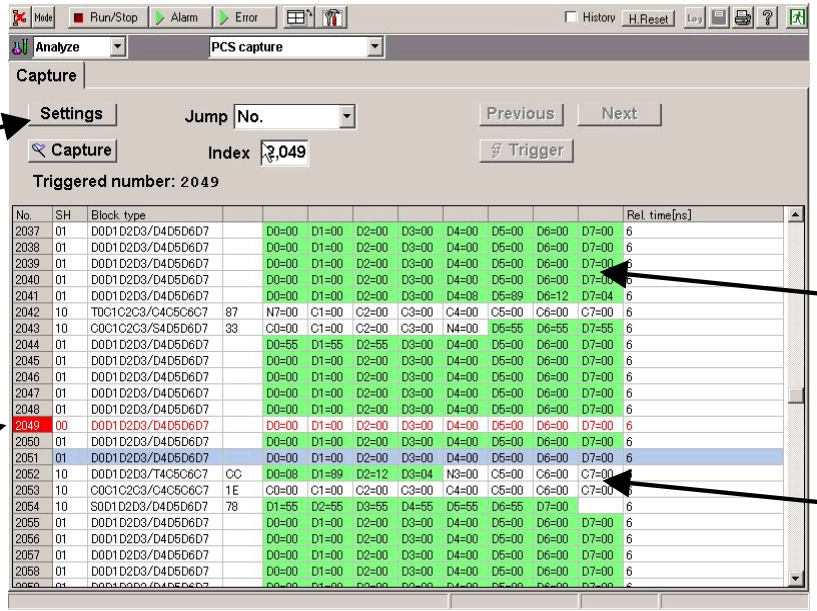
PCS Measurements (66B Pattern Capture)

Up to 4,096 blocks of the 66B pattern matching the specified filter conditions at the specified trigger conditions can be captured to memory and decoded and displayed.

This makes initial troubleshooting of 10GbE problems very easy.

Set filter and trigger conditions

Display PCS layer errors (red)



PCS Capture Screen

Display frames including preamble (green)

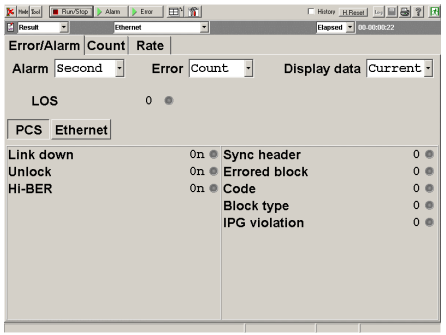
Display control data such as gap (white)

Features (10GbE LAN-PHY (4/8))

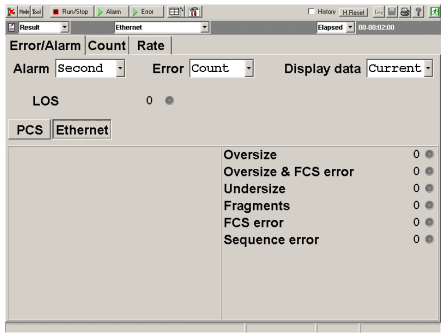
10GbE Error Alarm Measurements

The 10GbE throughput, BER, PCS errors, sequence errors, etc., can be counted.

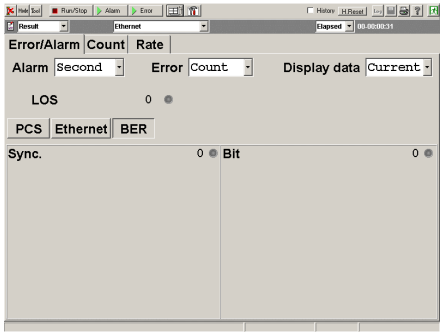
Detailed 10GbE L1/L2 quality-related measurements are supported.



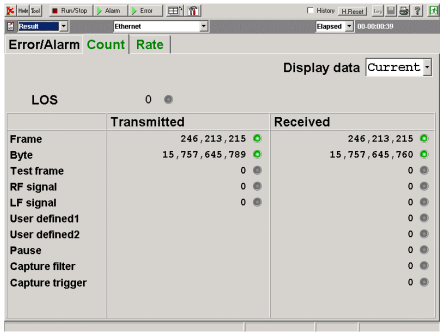
Error/Alarm (PCS) Screen



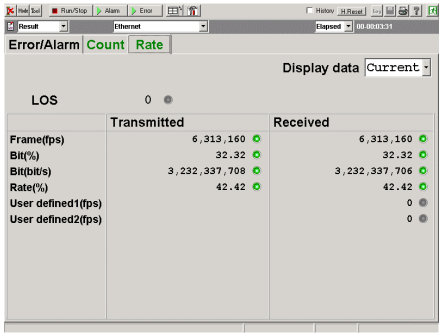
Error/Alarm (Ethernet) Screen



Error/Alarm (BER) Screen



Ethernet (Count) Screen



Ethernet (Rate) Screen

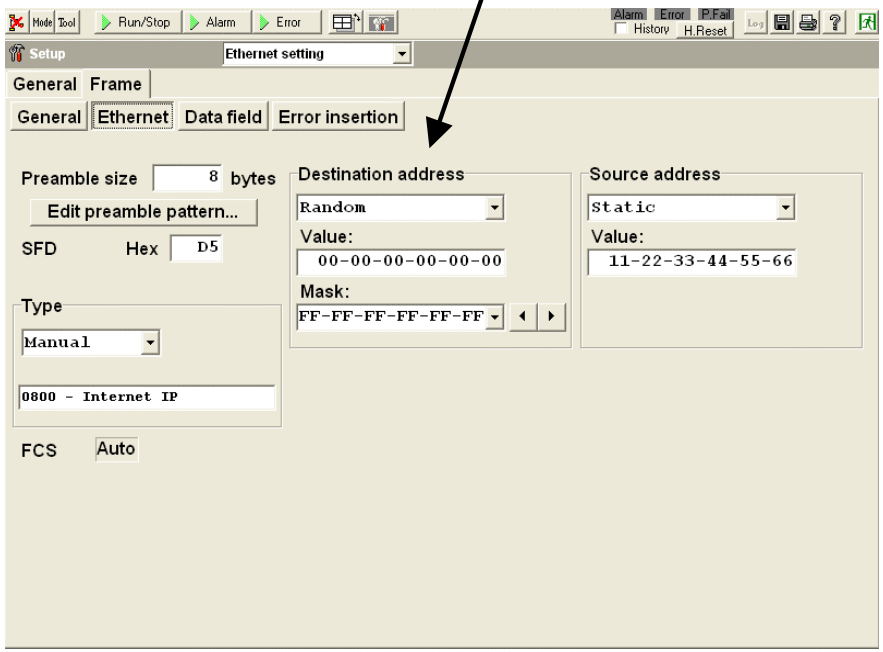
Features (10GbE LAN-PHY (5/8))

10GbE Stream Send Function

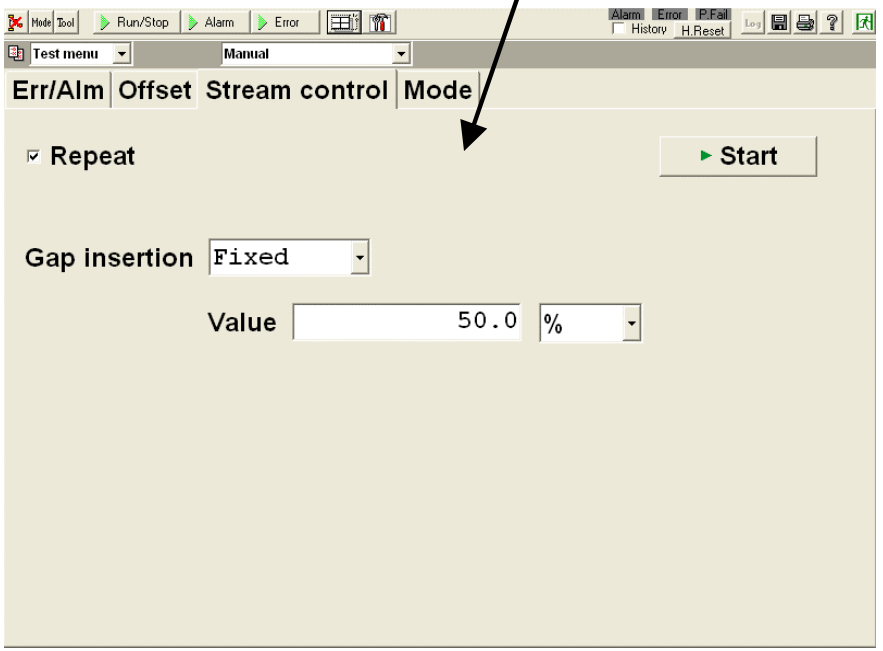
The contents of 10GbE frames can be set freely and sent at the specified rate.

Set Tx 10GbE frame contents

Set 10GbE frame Tx rate



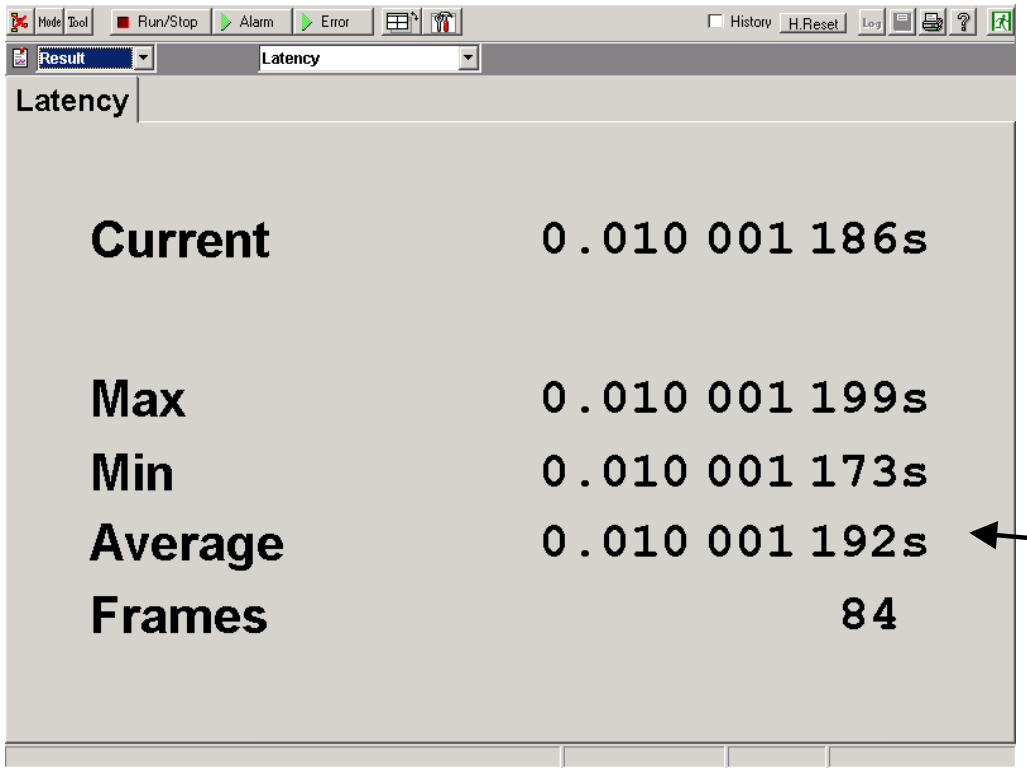
Ethernet Setting Screen



Stream Control Screen

Latency Measurement

The 10GbE latency (delay time) can be measured to display the current, max., min., average values, and the Rx frame count.



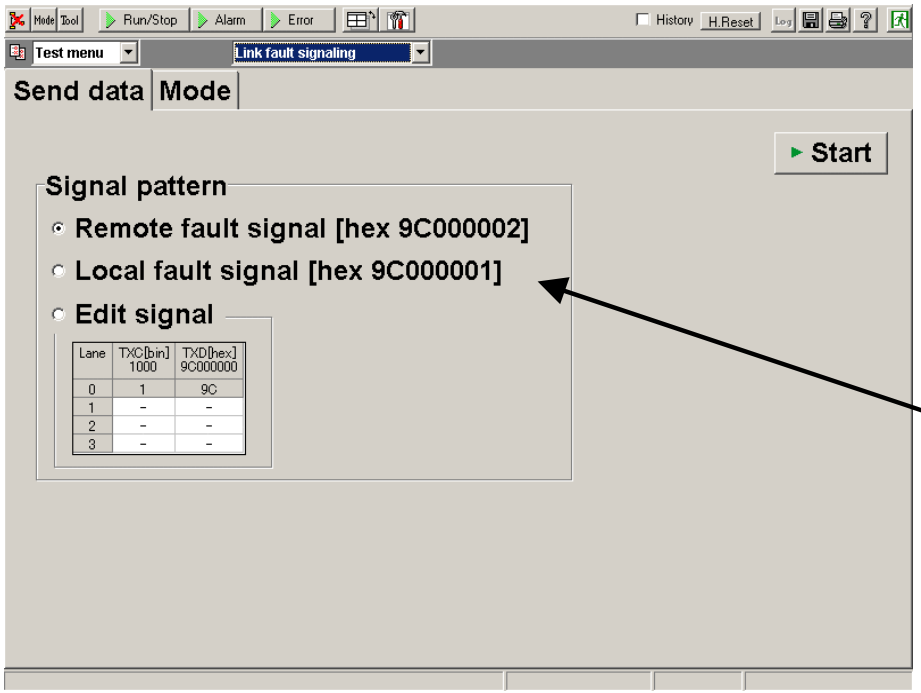
Measure current, max., min., average latency values and Rx frame count

Latency Screen

LFS Measurement (LFS Edit/Send)

XGMII data can be edited and sent.

The LF (Local Fault)/RF (Remote Fault) Signal and any XGMII data (Value fixed for Lane 0) can be sent.



XGMII Data signal pattern specification

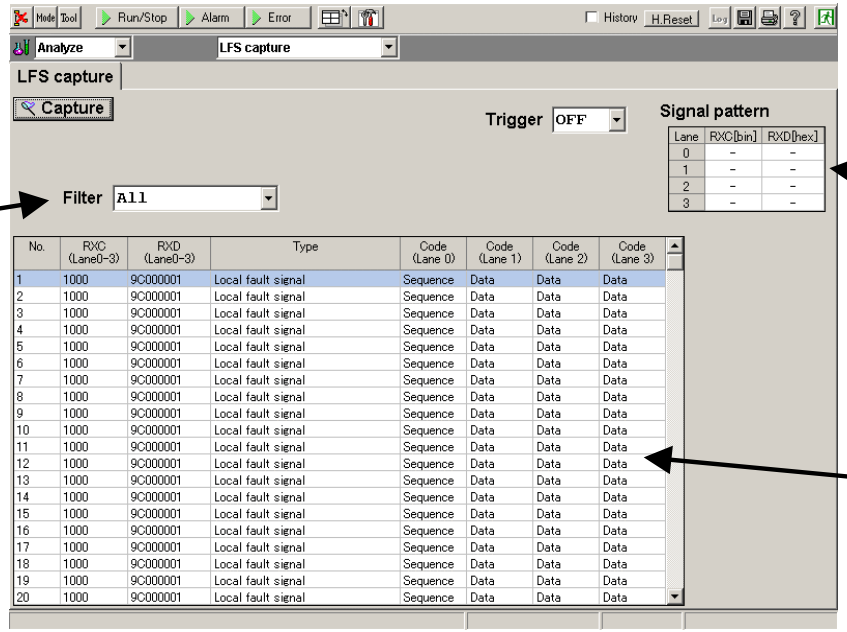
Send Data (LFS) Screen

Features (10GbE LAN-PHY (8/8))

LFS Measurement (LFS Capture)

A maximum of 512 columns of received XGMII data can be captured to memory, decoded and displayed.

The filtered LF/RF signal can be displayed by stopping capture that is triggered by the specified XGMII data (column).



Set filter display conditions

Set trigger conditions

XGMII Data decode display (512 columns max.)

LFS Capture Screen

1. Product Outline
2. Features
3. **Comparison with Previous Unit**
4. Summary

Function Comparison (1/2)

MU150110A & MU150100A Functions (1/2)

Function		MU150110A	MU150100A
Interface	STM-0～STM-64	v	v
	OC-1～OC-192	v	v
	OTU1(2.6G)/OTU2(10.7G)	v	v
	OTU1e(11.04G)/OTU2e(11.09G)	v	
	PDH/DSn	v	v
	10GbE LAN-PHY	v	
	10G Optical (XFP)	v	
SDH/SONET	No Frame	v	v
	LO Mapping	v	v
	Through Mode	v	v
	Error/Alarm Generation and Analysis	v	v
	Overhead Preset and Monitoring	v	v
	Pointer Test	v	v
	Delay Measurement	v	v
	APS Test	v	v
	Path Trace	v	v
OTN	No Frame	v	v
	Through Mode	v	v
	Error/Alarm Generation and Analysis	v	v
	Overhead Preset and Monitoring	v	v
	Pointer Test	v	v
	Delay Measurement	v	v
	APS Test	v	v

Function Comparison (2/2)

MU150110A & MU150100A Functions (2/2)

Function		MU150110A	MU150100A
10GbE	No Frame	v	v Electrical I/F Only
	Through Mode	v	
	Transmitted Frame Size	v 48 to 16,384 bytes	
	Transmitted IFG	v 7.2 ns to 120 s	
	VLAN Support	v	
	PCS Error/Alarm Generation and Analysis	v	
	66B Programmable Data Sending	v Up to 256 Blocks	
	66B Capture	v Up to 4,096 Blocks	
	BER Test	v	
	Latency	v	
	LFS Auto Reply	v	
	LFS Sending	v	
	LFS Capture	v Up to 512 Columns	
Multichannel Measurement	Interface	v STM-0/OC-1 to STM-64/OC192	
	# of Channel	v Up to 5,376	
	Auto Detect Mapping	v	
	Error/Alarm Measurement	v	
	APS Test	v	
	Delay Measurement	v	
	Event Log	v	
Jitter (*)	Jitter Generation Measurement	v	v
	Jitter Tolerance Measurement	v	v
	Jitter Transfer Measurement	v	v
Other	Frequency Offset	v +/-100 ppm (+/-0.1 ppm Step)	v +/-100 ppm (+/-0.1 ppm Step)
	Frequency Monitor	v +/-100 ppm (0.1 ppm Resolution)	v +/-100 ppm (0.1 ppm Resolution)
	Optical Output Power Adjustable	v Exclude XFP Interface	v
	Optical Power Meter	v	v
	Differential Interface between Tx and Rx	v	v

(*) Requires MU150121A/B, MU150123A/B, MU150124B, MU150125A
OTU1e (11.04G) /OTU2e (11.09G) /PDH/DSn do not support jitter measurement.
10.3G only supports No frame jitter measurement.

1. Product Outline
2. Features
3. Comparison with Previous Unit
4. **Summary**

Summary

MU150110A Multirate Unit

- **Built-in 10G Optical Interface**
  - **Easy and low-cost setup**

Configure cost-efficient measurement environment.

- **Multichannel Measurement**
  - **Greatly reduced measurement times**

Cut measurement costs.

- **11.1Gbps and 10GbE (10.3G) Measurements**
  - **One unit supports SDH/SONET/OTN, LAN-PHY over OTN and 10GbE**

Save space, cut testing costs, and cut additional investment costs for extending conventional functions.

Anritsu

Specifications are subject to change without notice.

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