New Multirate Unit

MP1590B
Network Performance Tester
New Multirate Unit for MP1590B
Product Introduction

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Anritsu Corporation
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1. Product Outline
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4. Summary
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)
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
- Multichannel Measurements
  - 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)
  - ITU-T O.182 FEC Performance Test
- 10GbE-LAN Measurements
  - PCS (Physical Coding Sublayer) Measurement
  - Link Fault Signalling Measurement
Model, Name, Appearance

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

  - 10/10.3/10.7/11.04/11.09G Optical In/Out (XFP)
  - 52M~2.6G Optical Input
  - External Clock Input
  - 10/10.3/10.7G Tx Electrical Clock/Data Output
  - 2~156M Unbalanced Output
  - 1.5M/2M Balanced In/Out (RJ-45)
  - 10/10.3/10.7G Rx Electrical Data Input
  - Rx Clock Output (1.5M~2.6G) Sync Output
  - 52M~2.6G Optical Output
  - 10G to 10.7G Data Out/Clock Out
  - 10 to 10.7G Clock Out
  - 10G to 10.7G Data In
  - 10 to 10.7G Data In
## Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Opt.</th>
<th>Name</th>
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<tbody>
<tr>
<td>MP1590B</td>
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<td>RS-232C</td>
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<td>GPIB</td>
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<td>03</td>
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<td>30</td>
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<tr>
<td>MU150110A</td>
<td>004</td>
<td>Optical Output Power Adjustable</td>
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<tr>
<td></td>
<td>005</td>
<td>OTU1/OTU2</td>
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<td></td>
<td>006</td>
<td>11.1G</td>
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<td></td>
<td>008</td>
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<td></td>
<td>009</td>
<td>Insert/Extract</td>
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<td>010</td>
<td>Multichannel Measurement</td>
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<thead>
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<th>Opt.</th>
<th>Name</th>
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<tr>
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<td>10/10.7G Optical Unit (Tx) (121A)</td>
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<td></td>
<td>02</td>
<td>10/10.7G Optical/Electrical Unit (Tx) (121B)</td>
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<tr>
<td></td>
<td>03</td>
<td>Wavelength 1.31um</td>
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<td>04</td>
<td>Wavelength 1.55um</td>
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<td></td>
<td>05</td>
<td>Wavelength 1.31/1.55um</td>
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<td>MU150124B</td>
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<td>OTU2</td>
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<td>MU150125B</td>
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<td>10/10.7G Jitter Unit</td>
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<td>Wander Measurement</td>
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<td>05</td>
<td>OTU1/OTU2</td>
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<td>10.3G</td>
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<td>G0194A</td>
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<td>1310nm XFP Module</td>
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<tr>
<td>G0195A</td>
<td></td>
<td>1550nm XFP Module</td>
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</tbody>
</table>

(Typical example)
**Configuration Examples**

- **Non-jitter**
  - **10G Optical**
    - 1.5M~2.6G, 10G/10.3G/10.7G /11.04G/11.09G (optical)
  - MU150110A

- **Jitter**
  - **10G Optical**
    - 52M~2.6G, 10G/10.7G (Optical)
    - MU150110A, MU150121A, MU150123A, MU150125A
  - **10G Optical/Elec. Differential**
    - 52M~2.6G, 10G/10.7G (Opt/Elec. Diff)
    - MU150110A, MU150121B, MU150123B, MU150125A
  - **10.3G Optical/Elec. Differential**
    - 52M~2.6G, 10.3G (Opt/Elec. Diff, No Frame only)
    - MU150110A, MU150121B, MU150124B, MU150125A

**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.
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)

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.

STM-16
STM-1
PDH
DSn
STM-64
MP1590B (MU150110A)
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
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

Autodetect mapping structure
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.
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
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)
Features (Multichannel Measurement (8/9))

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

[Image: Delay Screen]
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

Manual Event Log Screen

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Channel</th>
<th>Structure</th>
<th>Duration (s)</th>
<th>Count</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>05/01/29 13:11:40</td>
<td>AU-AB</td>
<td>2</td>
<td>C4</td>
<td></td>
<td>2</td>
<td>2.0E-01</td>
</tr>
<tr>
<td></td>
<td>AU-AB</td>
<td>10</td>
<td>C4</td>
<td></td>
<td>2</td>
<td>2.0E-01</td>
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<td></td>
<td>AU-AB</td>
<td>19</td>
<td>C4</td>
<td></td>
<td>2</td>
<td>2.0E-01</td>
</tr>
<tr>
<td></td>
<td>AU-AB</td>
<td>26</td>
<td>C4</td>
<td></td>
<td>2</td>
<td>2.0E-01</td>
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<tr>
<td>05/01/29 13:11:52</td>
<td>AU-AB</td>
<td>2</td>
<td>C4</td>
<td></td>
<td>4</td>
<td>2.0E-01</td>
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<tr>
<td></td>
<td>AU-AB</td>
<td>10</td>
<td>C4</td>
<td></td>
<td>4</td>
<td>2.0E-01</td>
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<td></td>
<td>AU-AB</td>
<td>19</td>
<td>C4</td>
<td></td>
<td>4</td>
<td>2.0E-01</td>
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<td></td>
<td>AU-AB</td>
<td>26</td>
<td>C4</td>
<td></td>
<td>4</td>
<td>2.0E-01</td>
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<tr>
<td>05/01/29 13:11:55</td>
<td>HP-BB</td>
<td>5</td>
<td>C4</td>
<td>300</td>
<td>300</td>
<td>2.0E-06</td>
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<td></td>
<td>HP-BB</td>
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<td>C4</td>
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<td>2.0E-06</td>
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<td>5</td>
<td>C4</td>
<td>300</td>
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<td>2.0E-06</td>
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<td></td>
<td>HP-BB</td>
<td>13</td>
<td>C4</td>
<td>300</td>
<td>300</td>
<td>2.0E-06</td>
</tr>
</tbody>
</table>
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.
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).
Features (LAN-PHY over OTN (5/6))

Interface Setting

The Rx and Tx interfaces can be set independently.

Interface Screen

**Tx Interface Setting**

- Bit rate: 11.04G
- Optical
- 1310nm
- Laser

**Rx Interface Setting**

- Bit rate: 10.3G
- Optical
- 1310nm

Reference clock input: Internal
Reference clock output: BITS
Sync. output: Tx clock
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.
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.

Set any 66B pattern

Edit 66B pattern for 256 blocks max.

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)

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
Latency Measurement

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

![Latency Screen]

- **Current**: 0.010 001 186s
- **Max**: 0.010 001 199s
- **Min**: 0.010 001 173s
- **Average**: 0.010 001 192s
- **Frames**: 84

Measure current, max., min., average latency values and Rx frame count.
Features (10GbE LAN-PHY (7/8))

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.

Send Data (LFS) Screen

XGMII Data signal pattern specification
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).

LFS Capture Screen

Set filter display conditions

Set trigger conditions

XGMII Data decode display (512 columns max.)
1. Product Outline
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## Function Comparison (1/2)

### MU150110A & MU150100A Functions (1/2)

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<th>MU150110A</th>
<th>MU150100A</th>
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<tbody>
<tr>
<td><strong>Interface</strong></td>
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<tr>
<td>STM-0~STM-64</td>
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<tr>
<td>OC-1~OC-192</td>
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<td>OTU1(2.6G)/OTU2(10.7G)</td>
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<td>OTU1e(11.04G)/OTU2e(11.09G)</td>
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<td>10GbE LAN-PHY</td>
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<td>10G Optical (XFP)</td>
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<td>Through Mode</td>
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<tr>
<td>Error/Alarm Generation and Analysis</td>
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<td>Overhead Preset and Monitoring</td>
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<td>Pointer Test</td>
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<td>Delay Measurement</td>
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<td><strong>OTN</strong></td>
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<td>Through Mode</td>
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## Function Comparison (2/2)
### MU150110A & MU150100A Functions (2/2)

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

(*) 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

- Multichannel Measurement
  - Greatly reduced measurement times

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

- Configure cost-efficient measurement environment.
- Cut measurement costs.
- Save space, cut testing costs, and cut additional investment costs for extending conventional functions.