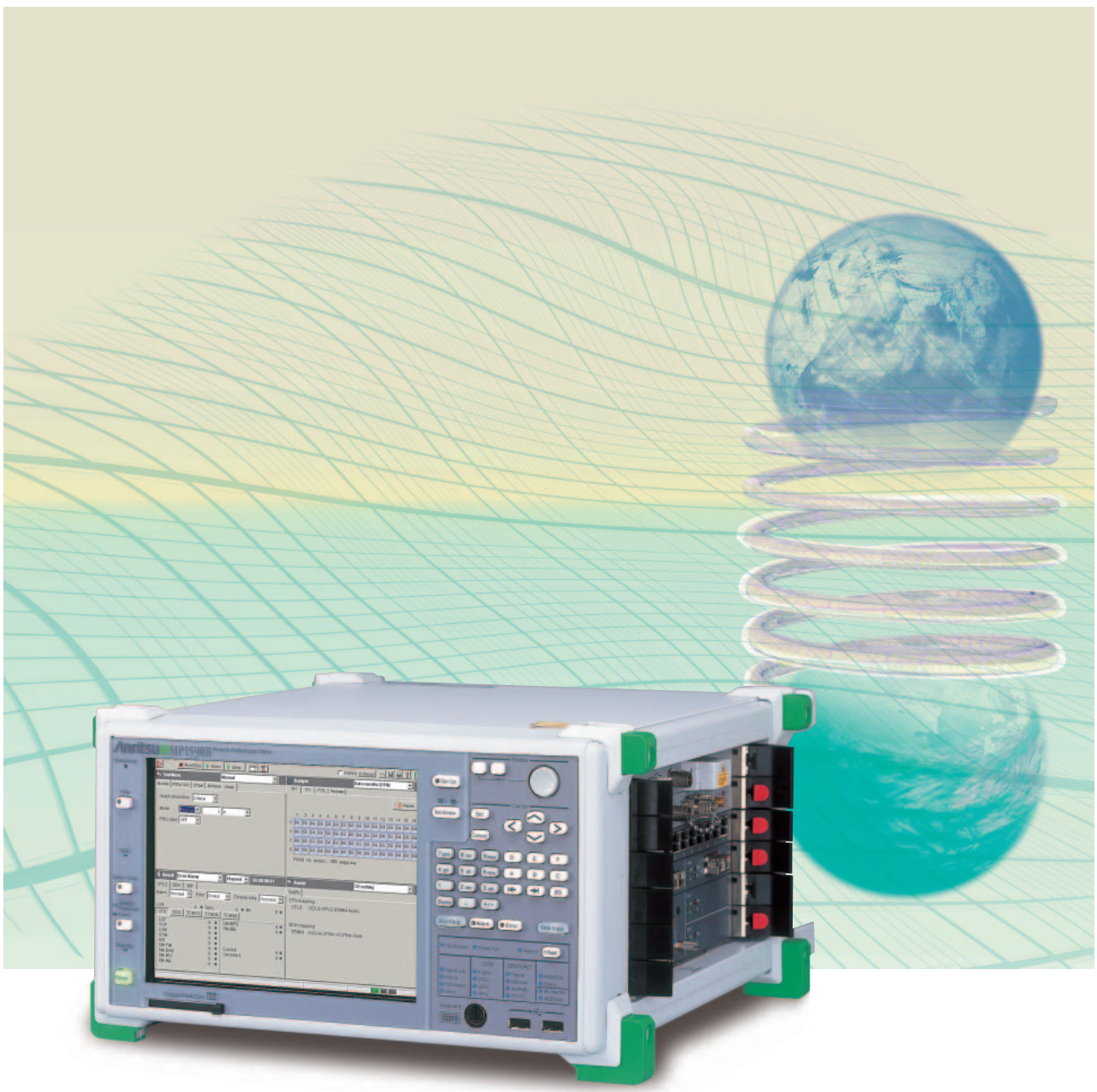
Discover What's Possible™

Anritsu

MP1590B

Network Performance Tester

Applications

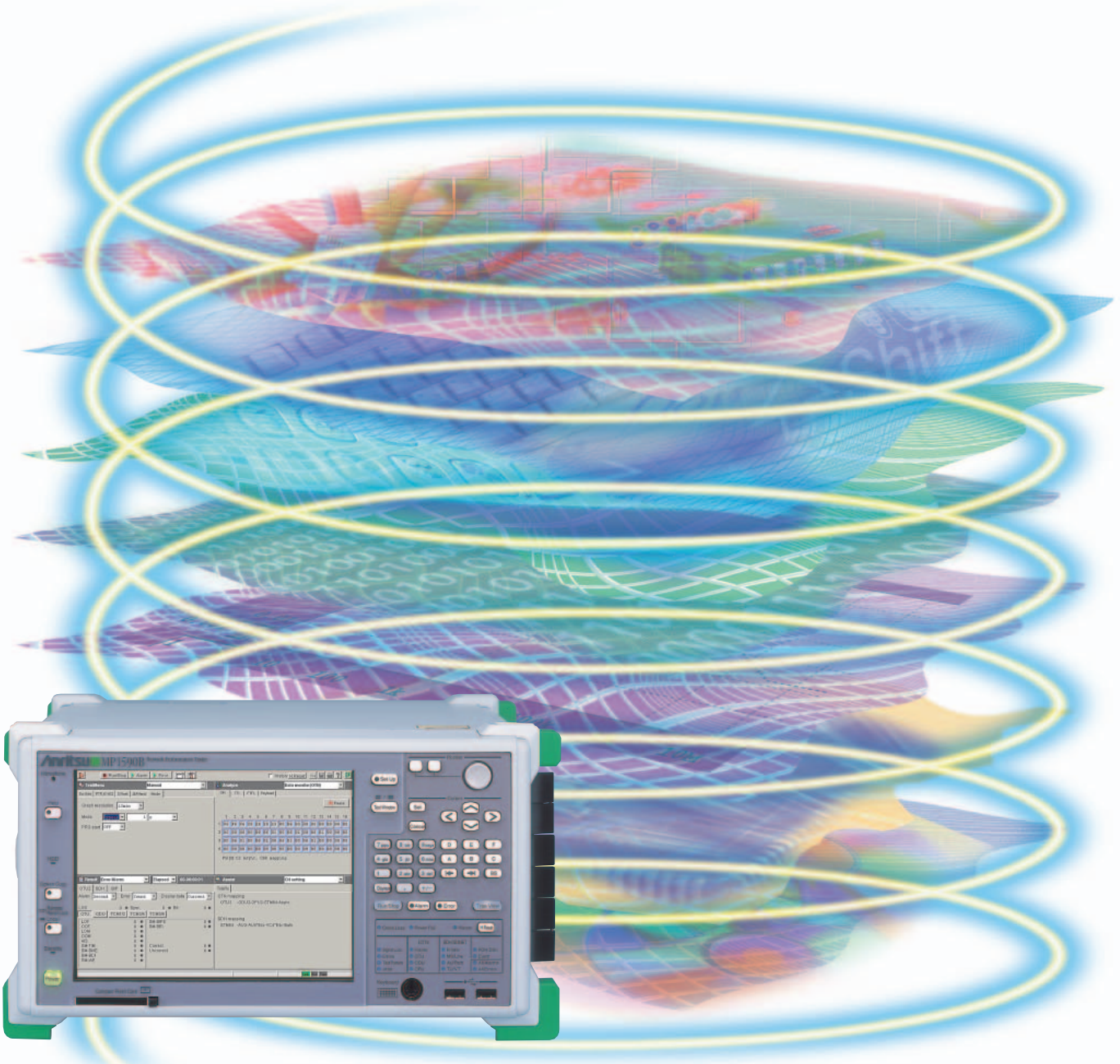


One Box Tester supporting Converged Network

One cabinet for all OTN, SDH/SONET, EoS, Ethernet, and Jitter Measurements

The MP1590B Network Performance Tester can be used to make performance tests and jitter measurements of previous PDH, DSn, SDH/SONET, and OTN-related equipment and devices as well as OTN, EoS, virtual concatenation, and LCAS measurements of so-called next-generation networks. It uses the Ethernet plug-in modules from the Anritsu MD1230 IP Tester series to provide a single- cabinet measurement solution for IP networks. Furthermore, when used by combining the built-in differential electrical interface and the Jitter Measurement Unit, it offers an accurate jitter measurement solution for optical modules, such as XFP.

Depending on the plug-in unit combination, the MP1590B offers OTN, SDH/SONET, EoS, jitter, Ethernet, etc., measurements for converged next-generation networks.



EoS Function Measurement

The MU150101A EoS Unit supports GFP-F, LEX, LAPS (X.86), PPP, CiscoHDLC, and MAPOS encapsulation methods. EoS frame load testing, error and alarm detection using more than 120 real-time counters, as well as protocol analysis, such as Ethernet and EoS using the capture and analysis function, are all supported.

Virtual concatenation

Both virtual concatenation mapping and arbitrary concatenation mapping are supported.
And of course, Differential Delay is supported too; various measurements can be made with a delay on the DUT.
When using low-order virtual concatenation, VCG members can be cross any AUG.

Virtual concatenation member size

SDH	VC-4-Xv (X=1 to 16) VC-3-Xv (X = 1 to 48) AU4-VC-3-Xv (X=1 to 48) VC-12-Xv (X = 1 to 63) VC-11-Xv (X = 1 to 64)
SONET	STS3cSPE-Xv (X = 1 to 16) STS1cSPE-Xv (X=1 to 48) STS3cSPE-VC-3-Xv (X = 1 to 48) VT2SPE-Xv (X = 1 to 63) VT1.5-Xv (X = 1 to 64)

LCAS measurement

EoS-supported units support LCAS measurement. Built-in functions such as the Summary function for quickly finding the status of each member on the Sink and Source sides, the LCAS send function that can generate multiple sequence patterns, and the LCAS capture function that can capture up to 64 sequences are all built-in. Using these functions permits verification of complex LCAS functions using simple operations.

Ethernet/IP measurement

The MP1590B also supports use of the 10M/100M, Gigabit and 10 Gigabit Ethernet modules used by the Anritsu MD1230A without modifications, permitting genuine IP measurements such as QoS under various conditions, multi stack VLAN, and different send clocks. Since each unit/module can be used independently, multiple layers such as OTN, SDH/SONET, Ethernet, IP and TCP/UDP can be measured.

Supports PDH/DSn/SDH/SONET/OTN (1.5 Mbit/s to 10.7 Gbit/s) interfaces with only one unit

A single MP1590B supports PDH (2.048, 8.448, 34.368, 139.264 Mbit/s), DSn (1.554, 44.736 Mbit/s), STM-0/1/64, STS-1/3/192 electrical interfaces, as well as STM-0/1/4/16/64, STS-1/3/12/48/192, OUT-1, and OUT-2 optical interfaces.

Differential Electrical Interface Test Solution

The jitter of optical transceiver modules, such as XFP modules, can be accurately measured by combining units supporting 9953 Mbit/s, 10.3 Gbit/s and 10.7 Gbit/s differential electrical interfaces with the Jitter Unit. This offers ideal information for clarifying various problems and phenomena as well as an established measurement solution for unmeasurable products with a built-in differential electric information having fine characteristics.
In addition to measuring devices and modules, it is also possible to perform jitter measurement (host system evaluation) of electrical differential interfaces (part connected with optical transceiver modules) for transmission equipment and evaluation board with built-in transceiver modules.

High-accuracy Jitter Measurement

Jitter generation to SDH/SONET(52-9953 MHz), OTU-1(2.66 GHz), OTU-2 (10.71 GHz) and 10.3 GHz standards can be measured using the built-in 10/10.7G Jitter Unit.
Jitter Tolerance and Jitter Transfer characteristics can be measured in accordance with ITU-T Rec. G.783, G.825, G.8251, and Telcordia GR-253 recommendations. In addition, by using the high-accuracy jitter measurement option, it is possible to perform jitter generation measurement with high accuracy and high reproducibility. The measurement results are displayed both numerically and graphically for easy pass/fail evaluation.

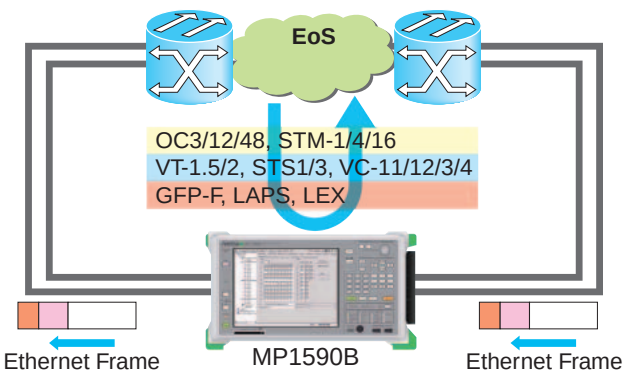
ITU-T G.709 OTN measurement

The MP1590B supports setting/monitoring of all overheads for OTU-1 (2.66 Gbit/s) and OTU-2 (10.71 Gbit/s) conforming to ITU-T G.709. It also supports multi-frame OH. Functions of OTN equipment can be tested by using error/alarm generation/detection functions. In particular, the random error insertion function on the MP1590B enables evaluation of the FEC function on OTN equipment. The built-in optical output power adjustable function allows one MP1590B to test the error correction ratio of OTN equipment based on its input power specification.

EoS, VCAT, LCAS Test Solution

Ethernet is being increasingly adopted by LANs (Local Area Networks) worldwide while Ethernet over SDH/SONET (EoS) is popular for WANs (Wide Area Networks) using SDH/SONET to assure high service reliability. Both technologies are the focus of increasing attention for next-generation networks worldwide. Anritsu has developed the MU150101A Unit supporting EoS, virtual concatenation and LCAS testing to meet increasing requests from customers for systems that can meet the measurement needs of next-generation networks.

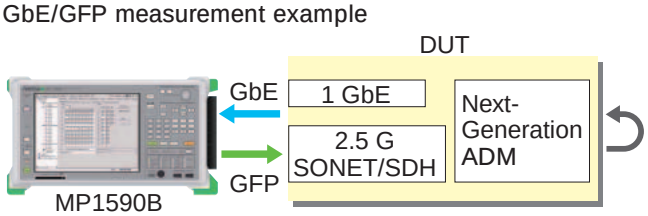
EoS Solution



EoS permits performance measurement such as throughput for GFP-F, LEX, and LAPS (X.86), verification of EoS encapsulation, and error and alarm measurement.
Combining various types of Ethernet modules in a single MP1590B creates a seamless measurement environment for client data and EoS layers.

EoS Measurement (Frame Generation, Counter, Capture)

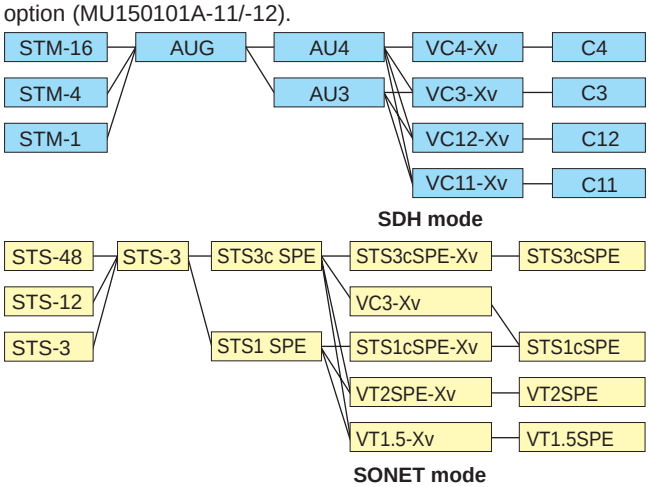
GbE/GFP measurement example



EoS frames can be generated for various protocols, such as GFP-F, VLAN, MPLS, IP, and TCP/UDP, for load measurement. Errors and alarms in the various layers of a live network, such as SDH/SONET, EoS, and Ethernet/IP, etc., can be measured in real-time using more than 120 types of counter functions. Moreover, there is a built-in 256-MB buffer for capturing EoS frames to analyze Ethernet and IP protocol.
These functions assist both performance measurement and efficient troubleshooting.

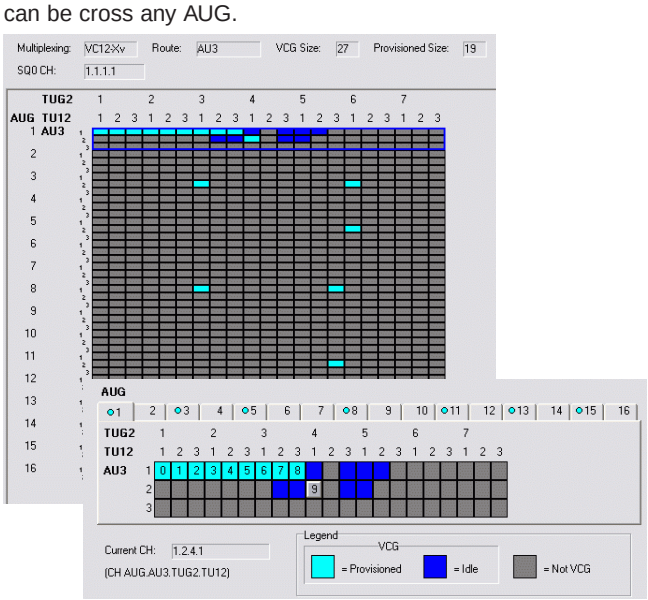
Virtual concatenation

The MP1590B supports virtual concatenation by installing option (MU150101A-11/-12).



Virtual Concatenation Member Setting

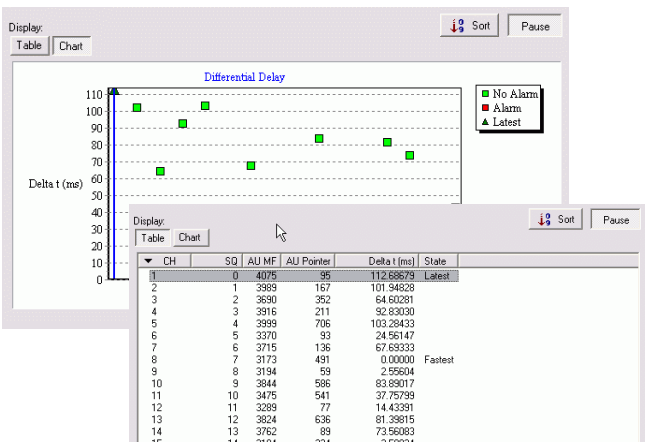
The virtual concatenation group (VCG) member position (Channel) and sequence (SQ) can be set freely by a click. Since a VCG auto-detection function is built-in the VCG settings for the connection destination can be easily captured to the measuring instrument*1.
When using low-order virtual concatenation, VCG members can be cross any AUG.



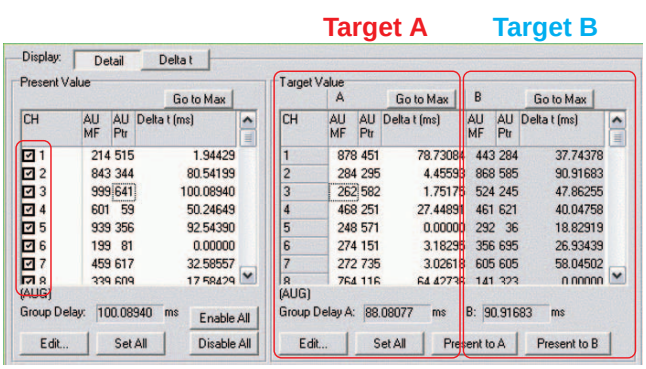
*1 : The auto-detection function requires the LCAS option. In addition, the connection destination must also support LCAS.

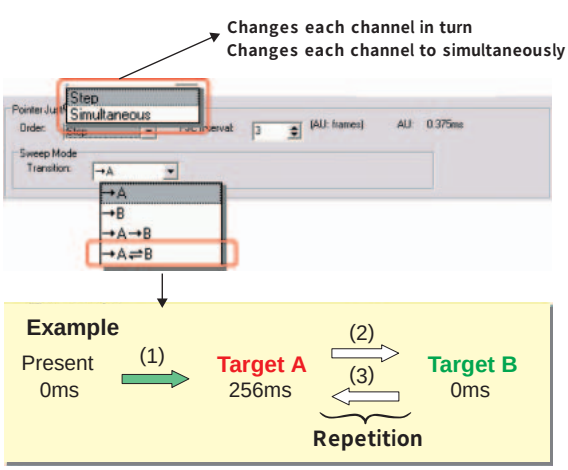
Differential Delay

Installing the MU150101A-14 option offers support for virtual concatenation differential delay measurement.
The delay monitor function can be used to check the correlations and each VCG member delay status at a glance.



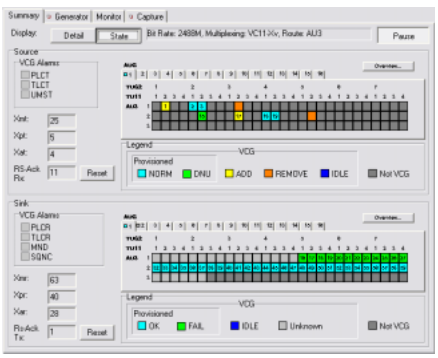
The delay generation function can be used to add a delay of up to 512 ms to each VCG member. In addition to the direct delay insertion method, a Sweep mode for gradually changing the delay is built-in.
By using the Sweep mode, it is possible to verify the device differential delay resistance in a status approximating actual networks that have a constantly changing status.
This function supports both two-way and through-mode connections.



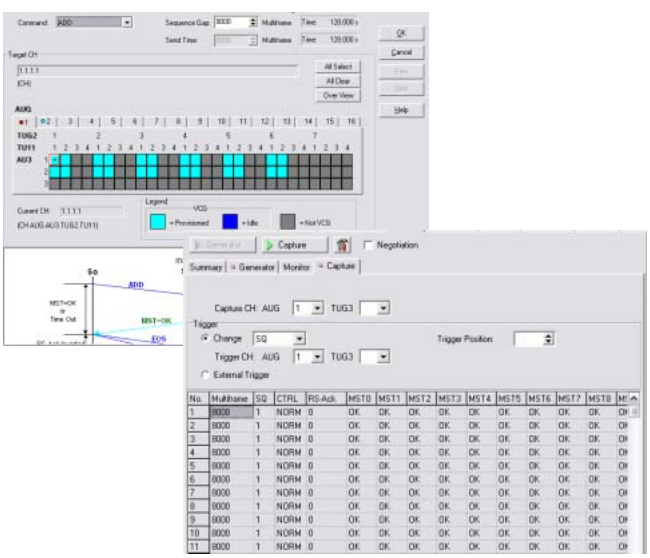


LCAS

Installing the MU150101A-13 option supports LCAS measurement. It offers LCAS emulation, LCAS sequence generation, monitoring, summary, and capture functions.



The LCAS sequence generation function creates up to 64 LCAS sequences that it generates and saves. This makes it possible to perform easy evaluation of functions using multiple LCAS sequences.
The LCAS capture function can capture up to 64 sequences, permitting detailed analysis of LCAS sequence operations.



Path Monitor

The errors and alarms of all VCG members can be measured individually. Error during EoS, virtual concatenation, and LCAS measurement can be checked and, additionally, the member generating the error can be verified, permitting detailed measurement.

Ethernet Test Solution

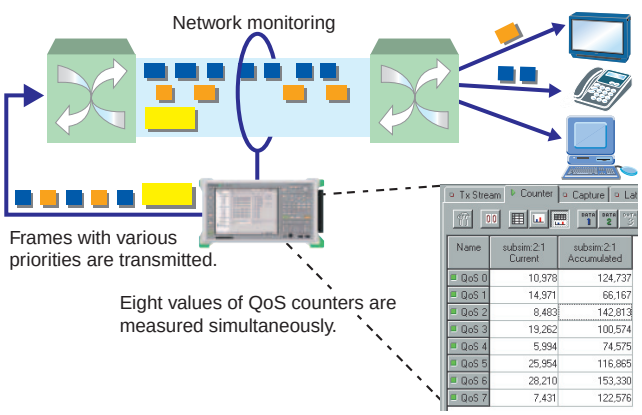
Ethernet Measurement Solution

The 10M/100M, Gigabit and 10 Gigabit Ethernet modules for the Anritsu MD1230 IP Tester can be used as is in the MP1590B*1.
The supported measurements range from basic items like Ethernet performance, traffic measurement and protocol analysis to wide-ranging measurement solutions like IPv6 measurement, RFC2544/RFC2889 auto-measurement, auto-negotiation analysis, etc.

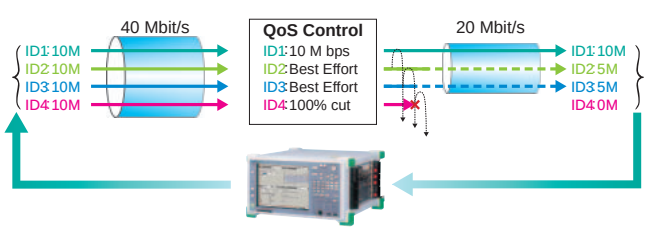
*1: Please refer to the selection guide for the supported Ethernet modules and options.

QoS System verification

The Ethernet module offers a QoS counter as standard. The priority of 8 stages can be verified in real-time as VLAN tag or TOS field IDs.

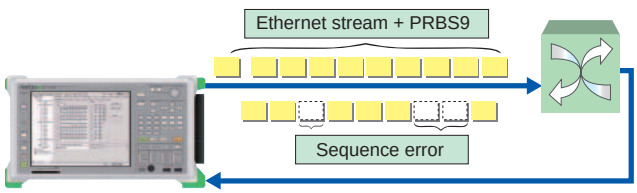


The MU120121A/MU120122A modules support multi-flow counter functions for up to 65536 QoS measurements
Any field can be set as the ID to offer load-tuning functions and verification of intelligent priority control systems.



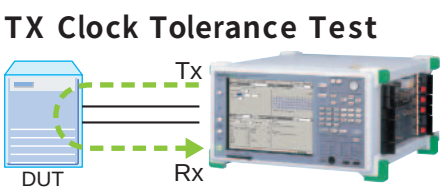
BER measurement on Ethernet frame

Installing the P1590B-11 or 13 option supports packet BER measurement. A measurement pattern and sequence number can be inserted into the frame data field to measure network equipment bit errors, frame loss, and sequence substitution.



Variable Transmitted Clock Function

The MU120121A/MU120122A module has a built-in function for carrying the transmitted signal clock that can be used to measure the DUT clock withstand tolerance.



Frame Transfer Test

Tx-100 ppm Rx-100 ppm
Tx+100 ppm Rx-100 ppm
Tx-100 ppm Rx+100 ppm
Tx+100 ppm Rx+100 ppm

Interface

- 10/100BASE-T
- 1000BASE-X
- 1000BASE-T

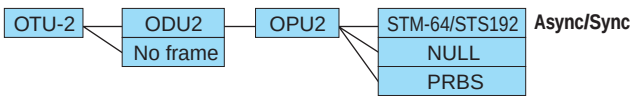
Ethereal®

In addition to the standard built-in analysis functions, protocol analysis using Ethereal® is also offered for supporting the latest protocols*2.

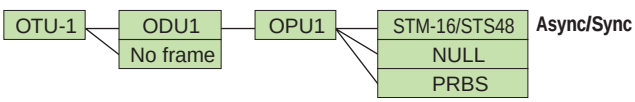
*2: Ethereal® is a registered trademark of Ethereal Inc. in the USA. It is free open source software that may be installed by any user at his or her own risk.

OTN Test Solution

Transmission/reception with OTU-1 (2.66 Gbit/s) and OTU-2 (10.71 Gbit/s) frames conforming to ITU-T G.709 or with 2.66/10.71 Gbit/s “No frame” can be performed. When the mapping client is set to STM-64/STS-192 or STM-16/STS-48, various mappings used for SDH/SONET can be selected.



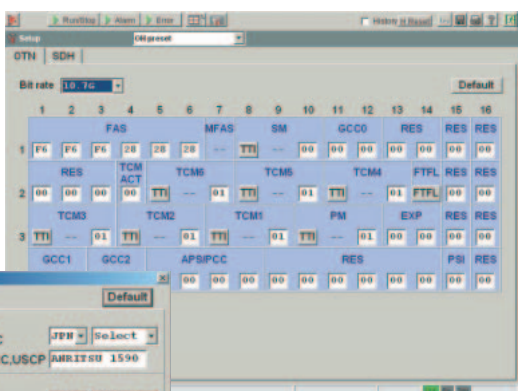
OTU-2 (10.71 Gbit/s) mapping



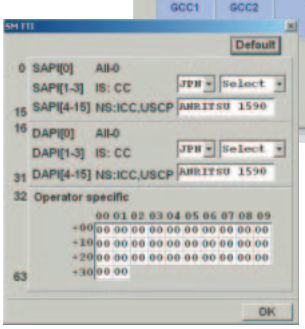
OTU-1 (2.66 Gbit/s) mapping

Overhead setting

All overhead (except for parity, MFAS, and JC) can be set arbitrarily. Moreover, multi-frame overhead such as TTI can also be set up easily.



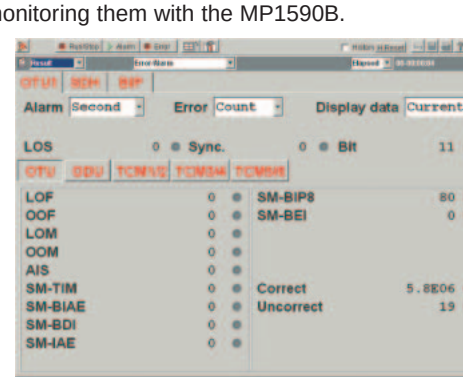
Overhead setting



Overhead monitor

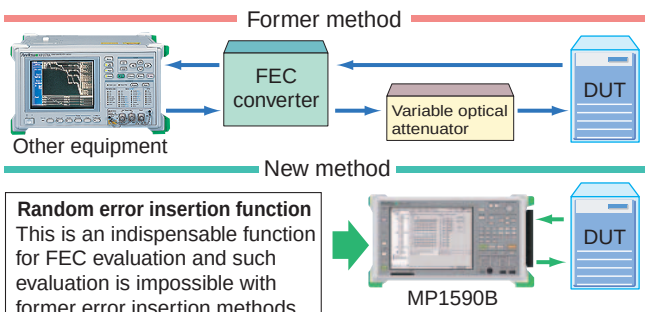
Error/alarm test

A stress test on OTN equipment can be performed by arbitrarily generating FAS, BIP-8 or BEI errors as well as LOF, LOM and AIS alarms and monitoring them with the MP1590B.



Random error insertion and FEC decode test

The MP1590B random error insertion function can evaluate whether the FEC function of the DUT meets the requirements of ITU-T G.709. By using the optional optical output power adjustable function, the error correction ratio vs. optical input power to DUT can be tested by a single MP1590B unit.



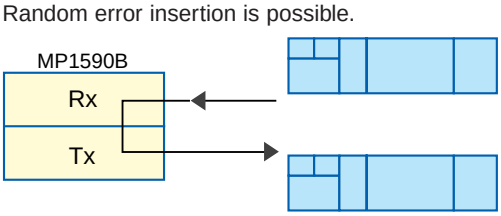
External equipment is not needed to vary the optical output power, and performance testing of the DUT FEC decoder is possible using only the MP1590B.

Through mode

Two types of through mode testing are provided for OTN mapping: transparent mode and overhead overwrite mode. Errors can be inserted and alarms can be added to through signals.

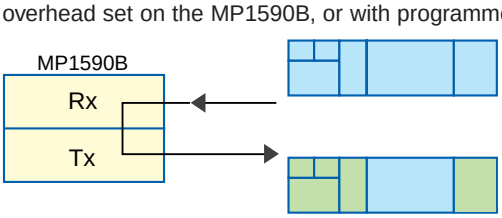
- Transparent

Loops the received signal back and outputs it as is. Random error insertion is possible.

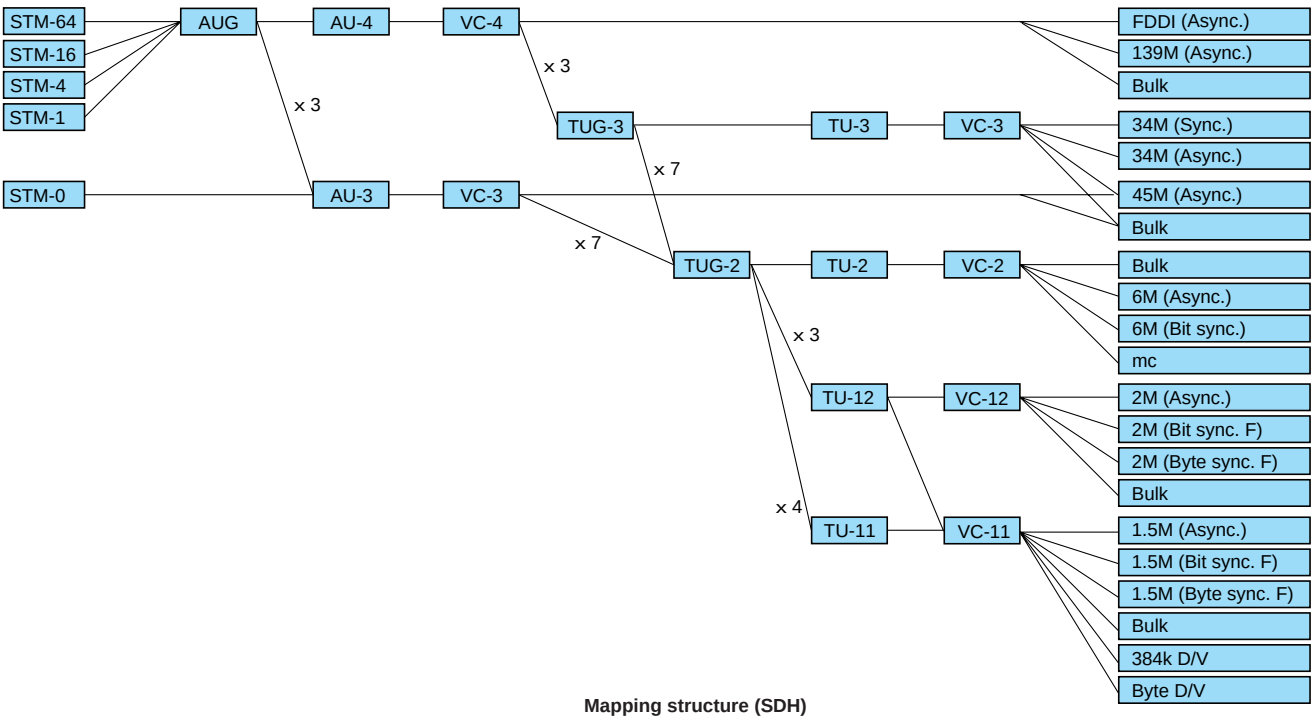


- Overhead overwrite

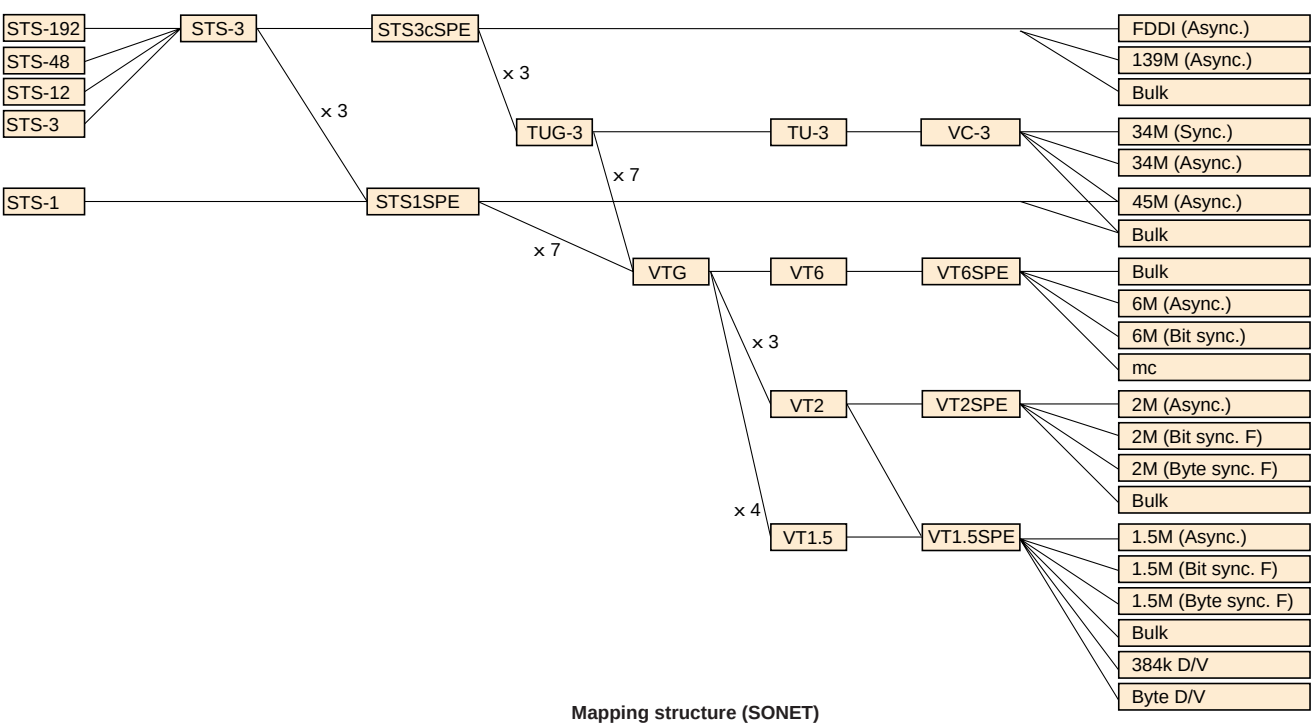
Replaces the overhead part of the received signal with the overhead set on the MP1590B, or with programmed data.



Mapping structures from 1.5 Mbit/s to 10 Gbit/s can be selected.
Mappings for SDH, SONET, Japan, PDH (Europe) and DSn (North America) are supported.



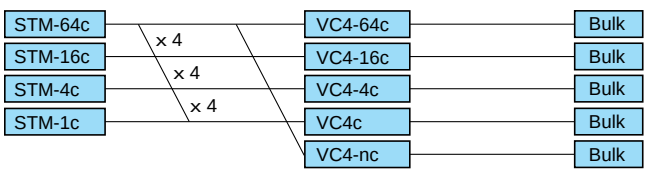
Mapping structure (SDH)



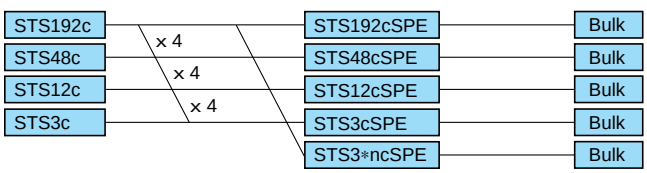
Mapping structure (SONET)

Concatenation mapping

In concatenation mapping, STM-1c to STM-64c/STS-3c to STS-192c can be selected. In addition to traditional concatenation mappings such as VC4-64c/STS-192cSPE and VC4-16c/STS48cSPE, the MP1590B supports VC4-nc/STS3ncSPE arbitrary concatenation.



Concatenation mappings (SDH)



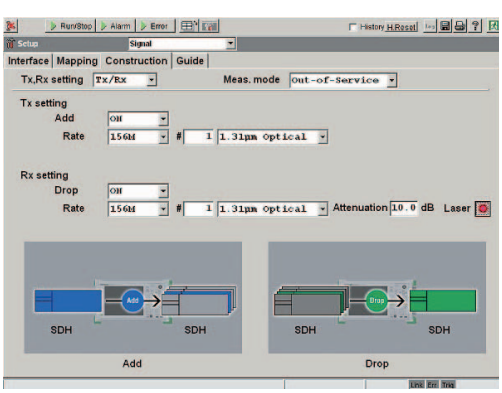
Concatenation mappings (SONET)

Add/Drop function

When PDH/DSn asynchronous mapping is selected for a SDH/SONET bit rate, a PDH/DSn signal can be added to or dropped from the SDH/SONET signal.
It is possible to add an add/drop function into MU150100A by installing option (MU150100A-09).

- Add (Insert) function
  It is able to add (insert) STM-0/1/4/16 or OC-1/3/12/48 signal into STM-64 or OC192 signal.

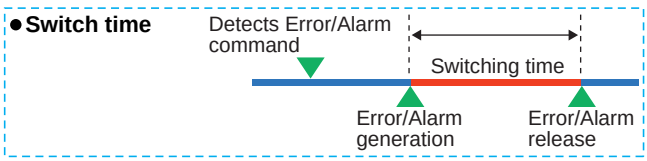
- Drop (Extract) function
  It is able to drop (extract) STM-0/1/4/16 or OC-1/3/12/48 signal from STM-64 or OC-192 signal.

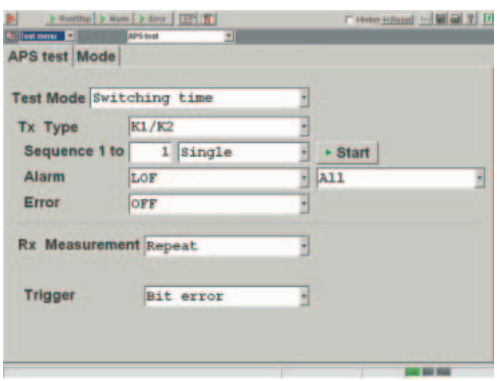


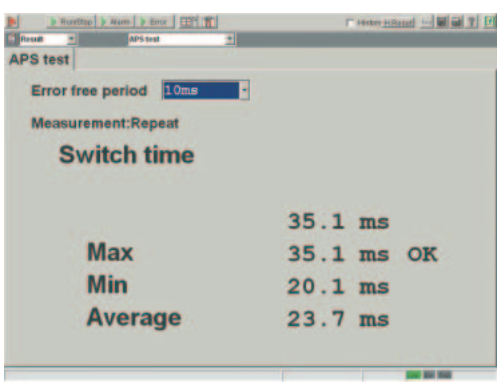
Note 1: This option is available when it is set the same bit rate on both Tx and Rx.
Note 2: The error/alarm generation/detection functions are restricted by installing this option.
Note 3: This option cannot be installed together with MU150100A-07.
Note 4: STM-64/OC192 signal synchronizes with the added signal when it use the add function.

APS Function

Automatic Protection Switch (APS) testing can be performed. The switching time test measures the time from error/alarm occurrence to release.
Switching time is measured with 0.1 msec resolution.







Jitter, Wander Test Solution

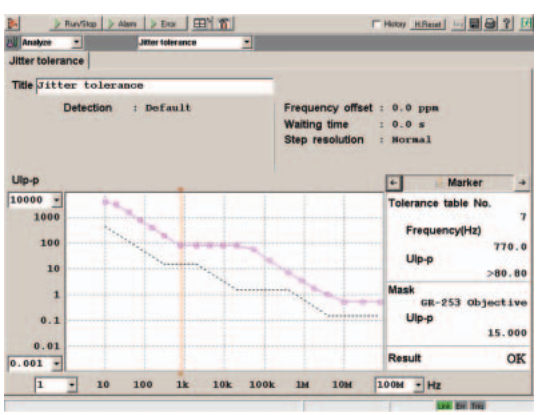
The 10/10.7G Jitter Unit (MU150125A) permits jitter generation and measurement from 52 Mbit/s to 10 Gbit/s supported by SDH/SONET. When Option 05 is installed, OTU-1 (2.66 Gbit/s) and OTU-2 (10.71 Gbit/s) jitter measurement is also possible. Installation of Option 06 supports 10.3 GHz clock jitter measurement.

MU150125A 10/10.7G Jitter Unit

Bit rate	Tx range	Modulation frequency
9953M/10.7G/ 10.3G	4000 UI	0.1 to 600 Hz
	80 UI	0.1 to 1 MHz
	8 UI	0.1 to 4 MHz
	0.5 UI	500 kHz to 80 MHz
2488M/2666M	1000 UI	0.1 to 600 Hz
	20 UI	0.1 to 1 MHz
	2 UI	0.1 to 4 MHz
	0.5 UI	500 kHz to 20 MHz
622M	250 UI	0.1 to 15 kHz
	80 UI	0.1 to 60 kHz
	20 UI	0.1 to 600 kHz
	2 UI	0.1 to 5 MHz
156M	80 UI	0.1 to 150 kHz
	20 UI	0.1 to 1.5 MHz
	2 UI	0.1 to 3.8 MHz
52M	20 UI	0.1 to 500 kHz
	2 UI	0.1 to 1.3 MHz

Jitter tolerance and Jitter transfer tests can be performed automatically. Masks conforming to ITU-T Rec. G.783/G.825/ G.8251, and Telcordia GR-253* are provided. This means that standard measurements can be performed by just pressing the Start key. In addition, users can freely set customized masks via on-screen editing.

*: The maximum value of a jitter transfer tests mask is 100 times as much as the modulation frequency as a break point (fc).



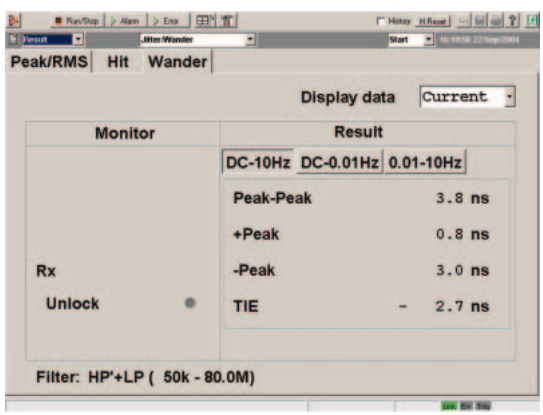
Re-evaluation setting function

After performing Jitter Tolerance and Jitter Transfer characteristics measurements, the mask setting can be changed to permit objective comparison of results with the mask. Detailed jitter measurement results can be obtained by changing the mask and table with reference to the comparative results.

Wander Measurement

Wander up to 400,000 UIp-p can be generated. Measured results in three bands can be displayed: DC to 10 Hz, DC to 0.01 Hz and 0.01 to 10 Hz Wander measurement is an Option (MU150125A-01).

MTIE and TDEV testing can be performed when the MP1590B is used in combination with the MP1580A Portable 2.5G/10G Analyzer



Electric Differential Interface Test Solution

When installing the MU150121B, MU150123 or MU150124B with the electrical differential interface for 9953M/10.3G/10.7G in combination with the MU150125A Jitter Unit, the jitter of the electrical differential interface of optical transceiver modules, such as the XFP (10Gigabit(X) Form-factor Pluggable) can be measured using a single MP1590B.

For Measuring Actual Jitter of Electrical Differential I/F

Until now, jitter measurement of electrical I/Fs using framed signals was performed by measuring the electrical I/F at one end. However, evaluating jitter of the electrical differential interface of an optical transceiver module, such as XFP, using the electrical I/F at one end makes measurement very susceptible to the effects of polarity, test pattern, etc., causing large variations in jitter value and making accurate jitter measurement impossible.
For this reason, jitter measurement of electrical differential I/Fs, such as XFP, requires as is measurement.

Basic Measurement of Electrical Differential I/F Jitter and Built-in Unique Functions

The basic jitter measurements (Jitter Tolerance, Jitter Transfer, Jitter Generation) can be performed using the Electrical Differential I/F Unit and Jitter Unit. Furthermore, various unique functions, such as variable electrical output level, O/E simultaneous output, variable electrical input threshold (single end), etc., are built-in.
This permits efficient and accurate evaluation of interface functions of devices and modules using a single MP1590B—measurements that had previously required multiple measuring instruments.

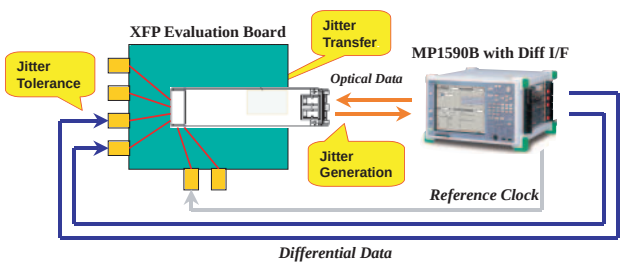
Pioneering Differential I/F Jitter Measurement

Creating a electrical differential I/F measurement solution permits a full range of tests and evaluations and offers users the accurate data they need for analyzing and solving various problems and phenomena..

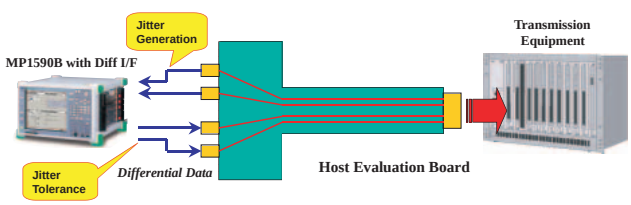
Full Line of Measurement Solutions

In addition to providing solutions for evaluating optical transceiver modules, such as XFP and devices such as CDR (module evaluation), it is also possible to perform jitter evaluation (host system evaluation) of electrical differential interfaces of transmission equipment and evaluation boards (connection with optical transceiver module). Moreover, evaluation can be performed without impact by unmeasurable internal signal interference using the E/O simultaneous output function.

<Examples of measurement solutions>
Transmitter evaluation

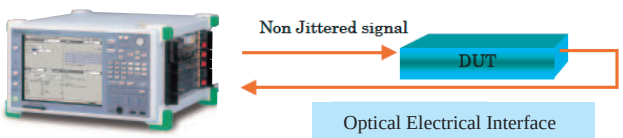


Host board evaluation



High-Precision Jitter Analysis

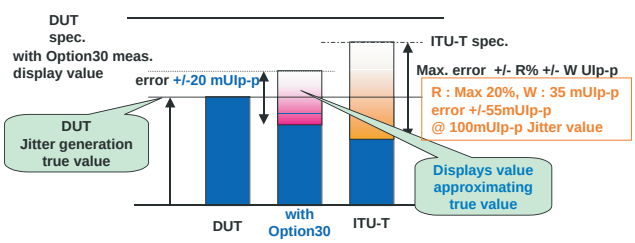
By using the built-in high-accuracy jitter measurement option (MP1590B Option 30), jitter generation measurement can be performed with both high accuracy and high repeatability.
The MU50125A 10/10.7G Jitter Unit has the functions and accuracy recommended by ITU-T O.172 published in April 2005 and building-in this option offers the high-accuracy jitter measurement functions needed for precision tuning.



Jitter Generation Measurement

±20 mUIp-p accuracy in the Jitter generation measurement

The present ITU-T O.172 Recommendations specify that the fixed error at 20 kHz + 80 MHz filter bandwidth may be within ±150 mUIp-p. But MP1590B can guarantee the accuracy within ±20 mUIp-p with this option.



±5 mUIp-p guaranteed repeatability of Jitter generation measurement

The repeatability of jitter measurements is a very important factor.
To provide customers with stable measurement results, the MP1590B specification guarantees ±5 mUIp-p jitter generation measurement repeatability.

Guarantee the transmitter's Jitter

This features guarantees the Jitter Generation of the tester's transmitter.
Anritsu documents the transmitter's Jitter as a characterized known value so the transmitter can be used as a "Golden" or reference Tx.

Note 1:
This option guarantees the performance for instruments configured when option 30 is installed. When units from other instruments are exchanged of other units after installing option 30 (including the situation where a module is exchanged for another of the same type with a different serial number), the performance of option 30 is not guaranteed. Other MP1590B functions can still be operated normally, however.

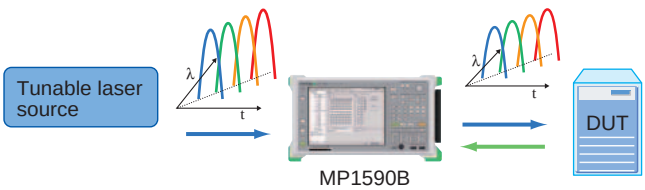
Note 2:
The guarantee period of option 30 performance is one year after shipping or after calibration. Therefore MP1590B-90 (Extended three years warranty service) is not applied to the specifications or calibration cycle of MP1590B-30.

Note 3:
Periodic calibration is required to guarantee the functions of this option. The recommended recalibration interval is 1 year after shipment and annually thereafter.

Additional Functions

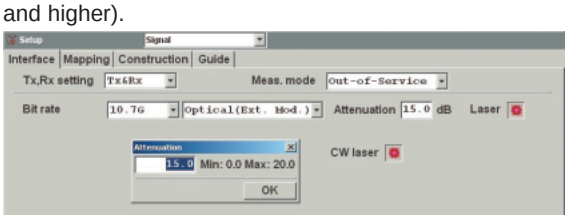
External optical input function

By using the MU150134A 10/10.7G Optical Unit (Tx External Modulation), OTN and SDH/SONET tests can be performed based on externally generated wavelengths.
This is best suited to provide the reference optical source for jitter measurement because of its very fine waveform quality and low jitter characteristics.



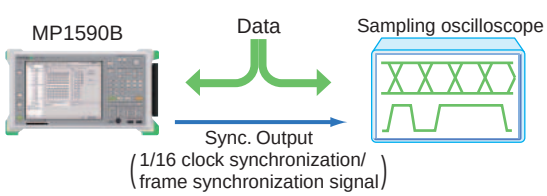
Optical power measurement and optical attenuation functions

When using an optical interface, the average power of the input optical signal can be measured. With the optical output power adjustment option it is possible to attenuate the optical output level up to 30 dB (for 2.6 Gbit/s or lower) or 20 dB (for 10 Gbit/s and higher).



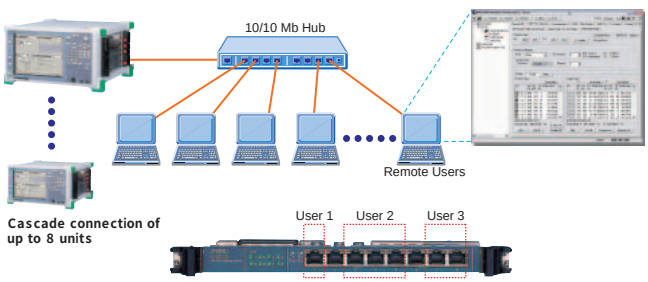
Trigger output

The MP1590B can output a trigger derived from the received signal to external units. The trigger output can be clock output, clock-divided output, or frame-synchronized output.
For example, connecting the trigger output to an external oscilloscope allows the MP1590B to evaluate errors/alarms and the oscilloscope to evaluate the input waveform at the same time.



Remote Control

Remote control software (MX159001B) is also separately available. Installing this software permits remote control of the MP1590B using the same GUI from a connected PC.
Multi-users is supported and up to eight people can operate the MP1590B simultaneously using port sharing.



Selection Guide

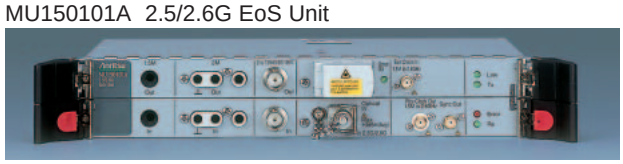
Main Frame

MP1590B Network Performance Tester	Main Specifications
	OS : Windows ® XP Interface for remote command : Ethernet, RS-232C, GPIB Interface : Keyboard, USB (Front, 2ports), Compact Flash, External VGA output Number of Slots : 6 Slots

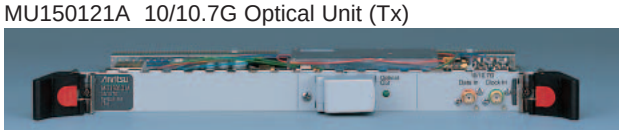
Units / Modules

MU150100A 10/10.7G Unit

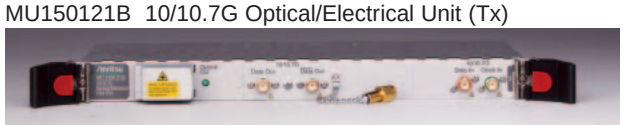
MU150101A 2.5/2.6G EoS Unit



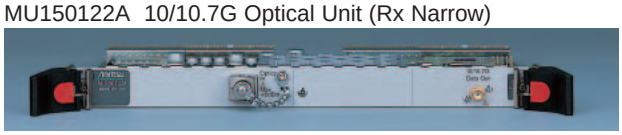
MU150121A 10/10.7G Optical Unit (Tx)



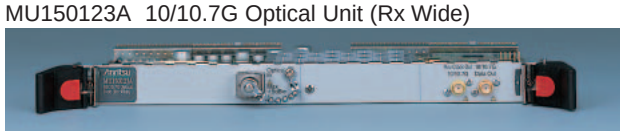
MU150121B 10/10.7G Optical/Electrical Unit (Tx)



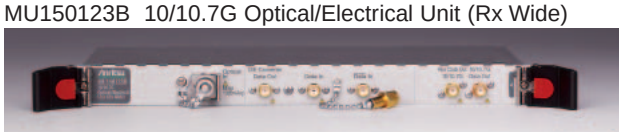
MU150122A 10/10.7G Optical Unit (Rx Narrow)



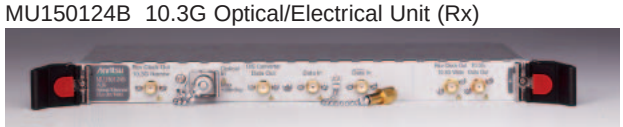
MU150123A 10/10.7G Optical Unit (Rx Wide)



MU150123B 10/10.7G Optical/Electrical Unit (Rx Wide)

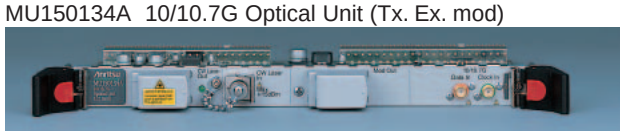


MU150124B 10.3G Optical/Electrical Unit (Rx)

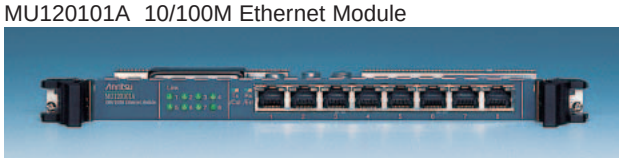


MU150125A 10/10.7G Jitter Unit

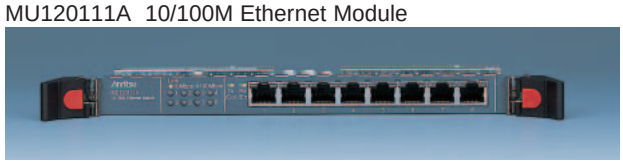
MU150134A 10/10.7G Optical Unit (Tx. Ex. mod)



MU120101A 10/100M Ethernet Module

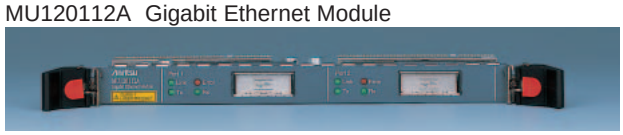


MU120111A 10/100M Ethernet Module

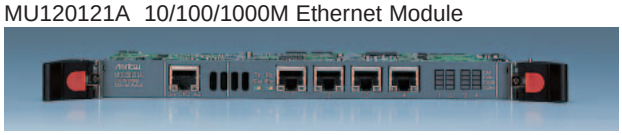


MU120102A Gigabit Ethernet Module

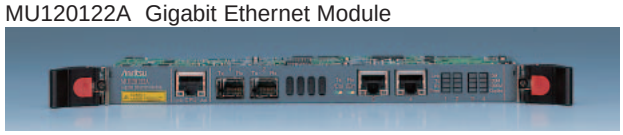
MU120112A Gigabit Ethernet Module



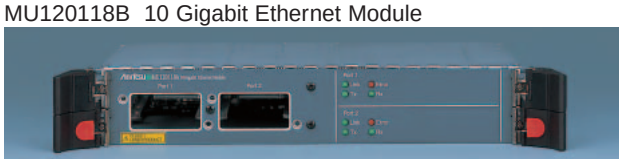
MU120121A 10/100/1000M Ethernet Module



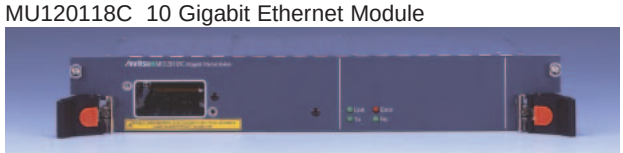
MU120122A Gigabit Ethernet Module



MU120118B 10 Gigabit Ethernet Module



MU120118C 10 Gigabit Ethernet Module



Interface Unit Function

	Bitrate	Compliance Test			EoS Test	Jitter Test	Interface		
		PDH/DSn	SDH/SONET	OTN			Optical	Electrical Diff. I/F	Ex. Modulation
MU150100A	1.5M to 10.7G	√	√	√			√ (up to 2.6G)		
MU150101A	1.5M to 2.6G	√	√	√	√*1		√		
MU150121A	10/10.7G						√		
MU150121B	10/10.7G						√	√	
MU150122A	10/10.7G						√		
MU150123A	10/10.7G						√	√	
MU150123B	10/10.7G						√	√	
MU150124B	10.3G						√		
MU150125A	156M to 10.7G					√			
MU150134A	10/10.7G								√

*1 : EoS Test is available at 156M, 622M and 2.4G (optical) only.

For Compliance Test

Bitrate	1.5M to 2.66G
Slot1	MU150101A
Slot2	
Slot3	Blank or Ethernet Module
Slot4	Blank or Ethernet Module
Slot5	Blank or Ethernet Module
Slot6	Blank or Ethernet Module

Bitrate	1.5M to 10.7G
Slot1	MU150100A
Slot2	
Slot3	MU150121A or 121B or 134A
Slot4	MU150122A or 123A or 123B
Slot5	Blank or Ethernet Module
Slot6	Blank or Ethernet Module

For 1.5M to 2.66G
Only MU150101A is must. The other slots 3 to 6 are available for Ethernet modules.

For 1.5M to 10.7G
MU150100A, E/O unit and O/E unit are must.
The other slots 5 and 6 are available for Ethernet modules.

Choose E/O unit from the following units.
- MU150121A : 10/10.7G optical Tx unit
- MU150121B : 10/10.7G differential electrical and optical Tx unit
- MU150134A : 10/10.7G external wevlength modulation Tx unit

Choose O/E unit from the following units.
- MU150122A : 10/10.7G optical Rx unit
- MU150123A : 10/10.7G optical Rx unit (for both Jitter Test and Compliance Test)
- MU150123B : 10/10.7G differential electrical and optical Rx unit

For Eos Test

Bitrate	1.5M to 2.66G
Slot1	MU150101A
Slot2	
Slot3	Blank or Ethernet Module
Slot4	Blank or Ethernet Module
Slot5	Blank or Ethernet Module
Slot6	Blank or Ethernet Module

For 156M, 622M, 2.4G
Only MU150101A is must. The other slots 3 to 6 are available for Ethernet modules.

For Jitter Test

Bitrate	1.5M to 2.66G
Slot1	MU150101A
Slot2	
Slot3	Blank or Ethernet Module
Slot4	Blank or Ethernet Module
Slot5	MU150125A
Slot6	

Bitrate	156M to 10.7G
Slot1	MU150100A
Slot2	
Slot3	MU150121A or 121B or 134A
Slot4	MU150123A or 123B or 124B
Slot5	MU150125A
Slot6	

For 156M to 2.66G
MU150101A and MU150125A are must. Slot 3 and 4 are available for Ethernet modules.

For 156M to 10.7G
MU150100A, MU150125A, E/O unit and O/E unit are must.

Choose E/O unit from the following units.
- MU150121A : 10/10.7G optical Tx unit
- MU150121B : 10/10.7G differential electrical and optical Tx unit
- MU150134A : 10/10.7G external wevlength modulation Tx unit

Choose O/E unit from the following units.
- MU150123A : 10/10.7G optical Rx unit
- MU150123B : 10/10.7G differential electrical and optical Rx unit
- MU150124B: 10.3G differential electrical and optical Rx unit
  (Require MU150100A-08, MU150125A-06 option)

■ Restrictions on the number of modules

Case1 : Ethernet test only
(Don't use MU150100A/101A/125A)
(1) Only one MU120118A/B/C module is available.
(2) MU120121A, 122A and MU120118A/B/C can be used to two in all.
(3) The other Ethernet modules are not available when it use 2 MU120121A or 122A or MU120118A/B/C.
The other modules have no restriction when it use no or only 1 MU120121A or 122A or MU120118A/B/C.

Case2 : Jitter test and Ethernet test
(Use MU150100A or 101A and MU150125A)
(1) MU120121A/122A and MU120118A/B/C modules are not available.
(2) Only one MU120112A Module is available.
(3) Only one MU120121A or MU120122A module is available.
The other Ethernet modules don't have any restriction when it doesn't use MU120121A/122A.

Case3 : OTN, SDH/SONET test and Ethernet test
(Use MU150100A or MU150101A)
(1) MU120121A, 122A and MU120118A/B/C can be used to only one in all.
(2) Two MU120101A modules are available.
(3) Two MU120102A modules are available.
(4) Two MU120111A modules are available.
(5) Two MU120112A modules are available.
(6) A combination of two MU120101A modules and two MU120102A modules is prohibited.

■ Restrictions on module insertion slots

Module	Unit name	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot6
MU150100A*1	10/10.7G Unit	√		–	–	–	–
MU150101A*1	2.5/2.6G EoS Unit	√		–	–	–	–
MU150121A	10/10.7G Optical Unit (Tx)	–	–	√	–	–	–
MU150121B	10/10.7G Optical/Electrical Unit (Tx)	–	–	√	–	–	–
MU150122A	10/10.7G Optical Unit (Rx Narrow)	–	–	–	√	–	–
MU150123A	10/10.7G Optical Unit (Rx Wide)	–	–	–	√	–	–
MU150123B/24B	10/10.7G Optical/Electrical Unit (Rx Wide)	–	–	–	√	–	–
MU150125A*1	10/10.7G Jitter Unit	–	–	–	–	√	
MU150134A	10/10.7G Optical Unit (Tx Ex. MOD)	–	–	√	–	–	–
MU120101A	10/100M Ethernet Module	–	–	√	√	√	√
MU120102A	Giga-bit Ethernet Module	–	–	√	√	√	√
MU120111A	10/100M Ethernet Module	–	–	√	√	√	√
MU120112A	Giga-bit Ethernet Module	–	–	√	√	√	√
MU120118A/B/C*1	10 Giga-bit Ethernet Module	–	–	–	–	√	
					√		–
MU120121A	10/100/1000M Ethernet Module	–	–	√	√	√	√
MU120122A	Giga-bit Ethernet Module	–	–	√	√	√	√

√……Slots in which the target module can be inserted
–……Slots in which the target module cannot be inserted
*1……This module uses a pair of slots for insertion.

Interface List for Ethernet Modules

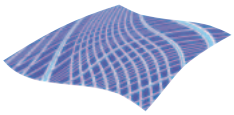
	Port	10BASE-T	100BASE-TX	1000BASE-T	1000BASE-X	10G BASE-X
MU120101A	8	√	√			
MU120111A	8	√	√			
MU120102A	2				√	
MU120112A	2			√	√	
MU120121A	4	√	√	√		
MU120122A	2/2*1	√	√	√	√	
MU120118A/B	2					√
MU120118C	1					√

*1 : 2 ports for 10BASE-T/100BASE-TX/1000BASE-T, the other 2 ports for 1000BASE-X

Ethernet / EoS Functions

Model	MU120101A	MU120111A	MU120121A	MU120102A	MU120112A	MU120122A	MU120118B/C	MU150101A
Clock Variation			√			√	√*1	
Auto MDI/MDI-X Detection			√			√		
Frame Generation								
Stream Generation (Tx Stream)	√	√	√	√	√	√	√	√
Multi-Layer VLAN			√			√		
MAC Address Increment	√	√	√	√	√	√	√	√
IP Address Increment	√	√	√	√	√	√	√	√
TCP/UDP Port Number Increment		√	√	√	√	√	√	
Test Frame Addition	√*2	√	√	√	√	√	√	√
Hardware Random Pattern			√			√		
Measurement								
Counter	√	√	√	√	√	√	√	√
Multi-Flow Counter			√			√		
Capture	√	√	√	√	√	√	√	√
Decode	√	√	√	√	√	√	√	√
Latency	√	√	√	√	√	√	√	
Ping	√	√	√	√	√	√	√	√
Ping6 (opt12)		√	√		√	√	√	
Arrival Time Variation	√	√	√	√	√	√	√	√
Through Mode	√	√	√	√	√	√	√	√
Monitor Mode	√	√	√	√	√	√	√	√
Address Swap Mode		√	√		√	√		
Unframe BER Test		√	√	√	√	√	√*3	√
Packet BER Test (opt11)		√	√	√	√	√	√	√
Auto Negotiation Analysis (opt15)					√	√		
Link Fault Signaling (opt16)							√	
XENPAK Test (opt13)							√	
Automatic Test								
RFC2544	√	√	√	√	√	√	√	
RFC2889 (opt10)		√	√	√	√	√		
Protocol Emulation								
ARP	√	√	√	√	√	√	√	
ICMP	√	√	√	√	√	√	√	√
OSPF (opt07)		√	√		√	√	√	
BGP-4	√*4	√	√	√*4	√	√	√	
ICMPv6 (opt12)		√	√		√	√	√	
IGMP	√	√	√	√	√	√	√	√
IGAP (opt14)		√	√		√	√	√	
MLD (opt12)		√	√		√	√	√	
MPLS (LDP/CR-LDP) (opt08)		√	√		√	√	√	
MPLS (RSVP-TE) (opt09)		√	√		√	√	√	

*1: Option 13 provides its clock only to the XAUI interface of the XENPAK module.
*2: Packet BER Test is disabled when a test frame is sent to another module.
*3: Option 13 XENPAK Test is required.
*4: Only up to eight virtual routers can be emulated.



Ordering Information

Please specify model/order number, name and quantity when ordering.

Model/Order No.	Name	
	Main frame	
MP1590B	Network Performance Tester	
	Standard accessories	
	Shield power cord, 2.6 m:	1 pc*1
	Power cord L type (C7), 2.5 m:	1 pc*1
F0105	Fuse, 10 A:	2 pcs
E0010	Side cover:	1 pc
B0329G	Front cover (3/4MW4U):	1 pc
J0907Q	Remote inter lock cord:	1 pc
J0908	Remote inter lock terminator:	1 pc
E0008A	Optical output control key:	2 pcs
W2428AE	MP1590B operation manual CD-ROM:	1 copy
J0617B*2, *3	Replaceable optical connector (FC-PC):	1 pc/2 pcs
J0635A*5	Optical fiber cable (FC · PC-FC · PC-1M-SM), 1 m:	1 pc
J0739G*4	Optical adapter FC PANDA:	2 pcs
J1200*6	Pmoptical fiber cord, 0.5 m:	1 pc
J0747B*7	Fixed optical attenuator (10 dB, FC connector):	1 pc
J0747C*8	Fixed optical attenuator (15 dB, FC connector):	1 pc
J1003N*9	Semi-rigid cable (136.6 mm):	2 pcs
J1003P*9	Semi-rigid cable (96 mm):	1 pc
J1003Q*10, *11	Semi-rigid cable (75.6 mm):	1 pc/2 pcs
J1003R*9	Semi-rigid cable (55.3 mm):	1 pc
J1003S*8	Semi-rigid cable (56.5 mm):	1 pc
J0994*12	Terminator (50 Ohm)	
	Units/Modules	
MU150100A*13	10/10.7G Unit	
MU150101A*13	2.5/2.6G EoS Unit	
MU150121A*13	10/10.7G Optical Unit (Tx)	
MU150121B*13	10/10.7G Optical/Electrical Unit (Tx)	
MU150122A	10/10.7G Optical Unit (Rx Narrow)	
MU150123A	10/10.7G Optical Unit (Rx Wide)	
MU150123B	10/10.7G Optical/Electrical Unit (Rx Wide)	
MU150124B	10.3G Optical/Electrical Unit (Rx Wide)	
MU150125A	10/10.7G Jitter Unit	
MU150134A	10/10.7G Optical Unit (Tx. Ex. mod)	
MU120101A	10M/100M Ethernet Module	
MU120102A*14	Gigabit Ethernet Module	
MU120111A	10/100M Ethernet Module	
MU120112A*14	Gigabit Ethernet Module	
MU120118B*16	10 Gigabit Ethernet Module	
MU120118C*16	10 Gigabit Ethernet Module	
MU120121A	10/100/1000 M Ethernet Module	
MU120122A*15	Gigabit Ethernet Module	
	Software	
MP159001B	Network Performance Tester Control Software	
MX159001B-05	5 Licenses	
MX159001B-08	8 Licenses	
	Options	
MP1590B-01	RS-232C	
MP1590B-02	GPIB	
MP1590B-03	LAN	
MP1590B-07	OSPF Protocol	
MP1590B-08	MPLS (LDP/CR-LDP) Protocol	
MP1590B-09	MPLS (RSVP) Protocol	
MP1590B-10	RFC2889 Benchmarking Test	
MP1590B-11	Packet BER Test	
MP1590B-12	IPv6 Expansion	

Model/Order No.	Name
MP1590B-13	XENPAK Test
MP1590B-14	IGAP Protocol
MP1590B-15	Auto negotiation Analysis
MP1590B-16	Link Fault Signaling
MP1590B-30*17	High precision Jitter analysis
MU150100A-01	Wavelength 1.31 µm
MU150100A-02	Wavelength 1.55 µm
MU150100A-03	Wavelength 1.31/1.55 µm
MU150100A-04	Optical output power adjustable
MU150100A-05	OTU1/OTU2
MU150100A-07*18	10/10.7G Minus Option
MU150100A-08	10.3G
MU150100A-09*18	Insert/Extract
MU150100A-38*19	ST connector
MU150100A-39*19	DIN connector
MU150100A-40*19	SC connector
MU150100A-43*19	HMS-10/A connector
MU150101A-01	Wavelength 1.31 µm
MU150101A-02	Wavelength 1.55 µm
MU150101A-03	Wavelength 1.31/1.55 µm
MU150101A-04	Optical output power adjustable
MU150101A-05	OTU1
MU150101A-06	GFP-F/LEX/LAPS
MU150101A-07	POS
MU150101A-11	HO Virtual Concatenation
MU150101A-12	LO Virtual Concatenation
MU150101A-13*20	LCAS
MU150101A-14*20	Differential delay
MU150101A-38*19	ST connector
MU150101A-39*19	DIN connector
MU150101A-40*19	SC connector
MU150101A-43*19	HMS-10/A connector
MU150121A-01	Wavelength 1.31 µm
MU150121A-02	Wavelength 1.55 µm
MU150121A-03	Wavelength 1.31/1.55 µm
MU150121A-04	Optical output power adjustable
MU150121A-38*19	ST connector
MU150121A-39*19	DIN connector
MU150121A-40*19	SC connector
MU150121A-43*19	HMS-10/A connector
MU150121B-01	Wavelength 1.31 µm
MU150121B-02	Wavelength 1.55 µm
MU150121B-03	Wavelength 1.31/1.55 µm
MU150121B-04	Optical output power adjustable
MU150121B-38*19	ST connector
MU150121B-39*19	DIN connector
MU150121B-40*19	SC connector
MU150121B-43*19	HMS-10/A connector
MU150122A-38*19	ST connector
MU150122A-39*19	DIN connector
MU150122A-40*19	SC connector
MU150122A-43*19	HMS-10/A connector
MU150123A-05	OTU2
MU150123A-38*19	ST connector
MU150123A-39*19	DIN connector
MU150123A-40*19	SC connector
MU150123A-43*19	HMS-10/A connector
MU150123B-05	OTU2
MU150123B-38*19	ST connector
MU150123B-39*19	DIN connector
MU150123B-40*19	SC connector
MU150123B-43*19	HMS-10/A connector
MU150124B-38*19	ST connector
MU150124B-39*19	DIN connector
MU150124B-40*19	SC connector
MU150124B-43*19	HMS-10/A connector
MU150125A-01	Wander measurement
MU150125A-05	OTU1/OTU2

Model/Order No.	Name
MU150125A-06	10.3G
MU150134A-04	Optical output power adjustable
MU150134A-38*19	ST connector
MU150134A-39*19	DIN connector
MU150134A-40*19	SC connector
MU150134A-43*19	HMS-10/A connector
	Maintenance service
MP1590B-90	Extended three year warranty service
MU150100A-90	Extended three year warranty service
MU150101A-90	Extended three year warranty service
MU150121A-90	Extended three year warranty service
MU150121B-90	Extended three year warranty service
MU150122A-90	Extended three year warranty service
MU150123A-90	Extended three year warranty service
MU150123B-90	Extended three year warranty service
MU150124B-90	Extended three year warranty service
MU150125A-90	Extended three year warranty service
MU150134A-90	Extended three year warranty service
MU120101A-90	Extended three year warranty service
MU120102A-90	Extended three year warranty service
MU120111A-90	Extended three year warranty service
MU120112A-90	Extended three year warranty service
MU120118B-90	Extended three year warranty service
MU120118C-90	Extended three year warranty service
MU120121A-90	Extended three year warranty service
MU120122A-90	Extended three year warranty service
	Optional accessories
J0796A	ST connector (replaceable, with protective caps, 1 set)
J0796B	DIN connector (replaceable, with protective caps, 1 set)
J0796C	SC connector (replaceable, with protective caps, 1 set)
J0796D	HMS-10/A connector (replaceable, with protective caps, 1 set)
J0796E	FC connector (replaceable, with protective caps, 1 set)
J0617B	Replaceable optical connector (FC-PC)
J1200	Pmoptical fiber cord (both-end SFC-SP connector), 0.5 m
J0747B	Fixed optical attenuator (10 dB, FC connector)
J0747C	Fixed optical attenuator (15 dB, FC connector)
J0747D	Fixed optical attenuator (20 dB, FC connector)
J1049A	Fixed optical attenuator (SC, 5 dB)
J1049B	Fixed optical attenuator (SC, 10 dB)
J1049C	Fixed optical attenuator (SC, 15 dB)
J0635A	Optical fiber cable (SM, FC-SPC connector both ends), 1 m
J0635B	Optical fiber cable (SM, FC-SPC connector both ends), 2 m
J0635C	Optical fiber cable (SM, FC-SPC connector both ends), 3 m
J0660B	Optical fiber cord (SM, SC-SC connector), 2 m
J0773B	Optical fiber cord (GI, SC-SC connector), 2 m
J1119B	Optical fiber cord (Duplex, MM), 2 m
J1271	Optical fiber cord (Duplex, SM, LC-LC connector), 2 m
J1272	Optical fiber cord (Duplex, SM, LC-SC connector), 2 m
J1273	Optical fiber cord (Duplex, GI, LC-LC connector), 2 m
J1274	Optical fiber cord (Duplex, GI, LC-SC connector), 2 m
Z0478	Polarization rotating module (for MU150134A)
J1003N	Semi-rigid cable (136.6 mm)
J1003P	Semi-rigid cable (96 mm)
J1003Q	Semi-rigid cable (75.6 mm)
J1003R	Semi-rigid cable (55.3 mm)
J1003S	Semi-rigid cable (56.5 mm)
J0775D	Coaxial cable (BNC-P620 · 3C-2WS · BNC-P620, 75 Ω), 2 m
J0776D	Coaxial cable (BNC-P-3W · 3D-2W · BNC-P-3W, 50 Ω), 2 m
J0322B	Coaxial cable (11SMA · SUCOFLEX104 · 11SMA), 1 m
J0162A	Balanced cable (Siemens 3P- Siemens 3P), 1 m
J0162B	Balanced cable (Siemens 3P- Siemens 3P), 2 m
J0845A	Balanced cable (BANTAM 3P/BANTAM 3P), 6 ft
J0008	GPIB cable, 2 m
G0105A	GBIC SX 850 nm : 1 pc

Model/Order No.	Name
G0106A	GBIC LX 1310 nm : 1 pc
G0107A	GBIC LH 1310 nm : 1 pc
G0108A	GBIC ZX 1550 nm : 1 pc
G0124A	GBIC T (1000BASE-T) : 1 pc
G0136	SFP SX 850 nm : 1 pc
G0137	SFP LX 1310 nm : 1 pc
G0138	SFP LE 1550 nm : 1 pc
G0139	SFP LR 1310 nm : 1 pc
G0126A	XENPAK (10GBASE-LR) : 1 pc
G0131	XENPAK (10GBASE-ER) : 1 pc
G0132	XENPAK (10GBASE-SR) : 1 pc
MZ1221A	XAUI Extender
MZ1222A	XENPAK Interface
J1163A	XAUI cable, 0.5 m
J1164A	MDIO cable, 0.5 m
J1109B	LAN cable (Cross), 5 m
J1110B	LAN cable (Straight), 5 m
B0336C	Carrying case
B0448	Soft case
B0501B	Blank Panel
Z0321A	Keyboard (PS/2)
Z0541A	USB mouse
W2420AE	MP1590B operation manual
W2421AE	MX159001B operation SDH edition manual
W2422AE	MX159001B operation SONET edition manual
W2423AE	MP1590B remote control operation manual
W2424AE	MU150100A specifications operation manual
W2425AE	MU150101A specifications operation manual
W2426AE	MU150125A specifications operation manual
W2427AE	MU150121/2/3/34A specifications operation manual
W2589AE	MU150121B/123B specifications operation manual
W2590AE	MU150124B specifications operation manual
W1931AE	MU120101A/11A 10M/100M Ethernet Module MU120102A/12A Gigabit Ethernet Module MU120118A 10 Gigabit Ethernet Module operation manual

*1: J0491 or J0670A is attached.
*2: Supplied with MU150100A, MU150121A, MU150122A, MU150123A/B, MU150134A.
*3: In MU150100A, MU150101A, 2 pcs are supplied.
*4: Supplied with MU150134A.
*5: Supplied with MU150100A, MU150101A, MU150122A, MU150123A. SM, FC-SPC connector both ends.
*6: Supplied with MU150134A, FC · PANDA fiber.
*7: Supplied with MU150122A, MU150123A/B.
*8: Supplied with MU150100A, MU150101A.
*9: Supplied with MU150125A.
*10: Supplied with MU150121A/B, MU150122A, MU150123A/B, MU150134A.
*11: MU150122A, MU150123A/B: 1 pc
MU150121A/B, MU150134A: 2 pcs are supplied.
*12: Supplied with MU150121B.
*13: Requires Option 01, 02 or 03.
*14: MU120102A/12A require GBIC modules (sold separately).
*15: MU120122A requires SFP modules (sold separately).
*16: MU120118B/C requires XENPAK modules (sold separately).
*17: Unit composition has restriction. For details, please refer to a MP1590B specifications.
*18: This Option must be installed in the factory. MU150100A-07 and MU150101A-09 cannot be installed simultaneously.
*19: Replaceable.
*20: This option requires the MU150101A-11 and/or MU150101A-12.

Anritsu

Specifications are subject to change without notice.

ANRITSU CORPORATION
1800 Onna, Atsugi-shi, Kanagawa, 243-8555 Japan
Phone: +81-46-223-1111
Fax: +81-46-296-1264

● **U.S.A.**
ANRITSU COMPANY
TX OFFICE SALES AND SERVICE
1155 East Collins Blvd., Richardson, TX 75081, U.S.A.
Toll Free: 1-800-ANRITSU (267-4878)
Phone: +1-972-644-1777
Fax: +1-972-644-3416

● **Canada**
ANRITSU ELECTRONICS LTD.
700 Silver Seven Road, Suite 120, Kanata,
ON K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

● **Brasil**
ANRITSU ELETRÔNICA LTDA.
Praca Amadeu Amaral, 27 - 1 andar
01327-010 - Paraiso, Sao Paulo, Brazil
Phone: +55-11-3283-2511
Fax: +55-11-3886940

● **U.K.**
ANRITSU LTD.
200 Capability Green, Luton, Bedfordshire LU1 3LU, U.K.
Phone: +44-1582-433280
Fax: +44-1582-731303

● **Germany**
ANRITSU GmbH
Grafenberger Allee 54-56, 40237 Düsseldorf, Germany
Phone: +49-211-96855-0
Fax: +49-211-96855-55

● **France**
ANRITSU S.A.
9, Avenue du Québec Z.A. de Courtabœuf 91951 Les Ulis Cedex, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

● **Italy**
ANRITSU S.p.A.
Via Elio Vittorini, 129, 00144 Roma EUR, Italy
Phone: +39-06-509-9711
Fax: +39-06-502-2425

● **Sweden**
ANRITSU AB
Borgafjordsgatan 13 164 40 Kista, Sweden
Phone: +46-853470700
Fax: +46-853470730

● **Finland**
ANRITSU AB
Teknobulevardi 3-5, FI-01530 Vantaa, Finland
Phone: +358-9-4355-220
Fax: +358-9-4355-2250

● **Denmark**
Anritsu AB Danmark
Korskildelund 6 DK - 2670 Greve, Denmark
Phone: +45-36915035
Fax: +45-43909371

● **Singapore**
ANRITSU PTE LTD.
10, Hoe Chiang Road #07-01/02, Keppel Towers,
Singapore 089315
Phone: +65-6282-2400
Fax: +65-6282-2533

● **Hong Kong**
ANRITSU COMPANY LTD.
Suite 923, 9/F., Chinachem Golden Plaza, 77 Mody Road, Tsimshatsui East, Kowloon, Hong Kong, China
Phone: +852-2301-4980
Fax: +852-2301-3545

● **P. R. China**
ANRITSU COMPANY LTD.
Beijing Representative Office
Room 1515, Beijing Fortune Building, No. 5 North Road, the East 3rd Ring Road, Chao-Yang District
Beijing 100004, P.R. China
Phone: +86-10-6590-9230

● **Korea**
ANRITSU CORPORATION
8F Hyun Juk Bldg. 832-41, Yeoksam-dong,
Kangnam-ku, Seoul, 135-080, Korea
Phone: +82-2-553-6603
Fax: +82-2-553-6604

● **Australia**
ANRITSU PTY LTD.
Unit 3/170 Forster Road Mt. Waverley, Victoria, 3149, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

● **Taiwan**
ANRITSU COMPANY INC.
7F, No. 316, Sec. 1, NeiHu Rd., Taipei, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817

050203

PRINTED WITH SOY INK Printed with environment-friendly vegetable soybean oil ink.

R100 Printed on 100% Recycled Paper

Catalog No. MP1590B_Appli-E-A-1-(1.00) Printed in Japan 2005-7 20W/M