Discover What's Possible™

Anritsu

MU120103B 2.5G (1.31) Module

MU120103B-01 **EOS Mapping**

MU120103B-02 **Virtual Concatenation**

MU120104B 2.5G (1.55) Module

MU120104B-01 **EOS Mapping**

MU120104B-02 **Virtual Concatenation**

For MD1230A Data Quality Analyzer

IP General Measuring Instrument Now Supports EOS Function

TOLLY TESTED

The Tolly Group Certifies MD1230A
The Tolly Group is an independent test lab in the networking industry.

Anritsu Eco Product
Lightweight
Power saving
Small size

EOS Function

EOS (Ethernet Over SONET/SDH) technology transfers the Ethernet data, which has been increasingly demanded in the Local Area Network (LAN), via the SONET/SDH transmission network with its high reliability in the Wide Area Network (WAN). EOS technology, therefore, is now drawing great attention as one of the next-generation network technologies. To support the measurement of the EOS technology, an EOS-supported 2.5G module is added to the MD1230A modules. This enables one IP general measurement instrument to perform general measurement on several layers including SONET/SDH, EOS, Ethernet and IP.

EOS Mapping Options
F-GFP, LEX, LAPS - Supporting a variety of EOS mapping

- **MU120103B-01 EOS Mapping**
- **MU120104B-01 EOS Mapping**

Frame-mapped GFP, LEX, LAPS (X.86) and the following concatenations are added by installing an EOS mapping software option (MU120103B-01, MU120104B-01). In combination with the standard mappings such as PPP, MAPOS and CiscoHDLC, one IP general measurement instrument can perform a variety of EOS measurement by using these mappings.

Additional Mapping

• Frame-mapped GFP

Supports mapping using the encapsulation technology standardized by ITU-T G.7041. GFP stands for Generic Framing Procedure.

• LEX

Supports mapping using the encapsulation technology standardized by RFC1841. LEX stands for PPP Network Control Protocol for LAN Extension.

• LAPS (X.86)

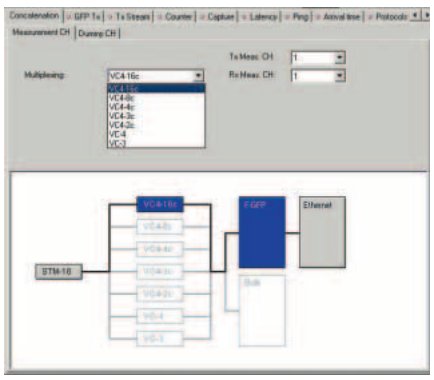
Supports mapping using the encapsulation technology standardized by ITU-T X.86. LAPS stands for Link Access Protocol over SONET/SDH.

Additional contiguous concatenation

SONET	STS-Xc (X = 48, 24, 12, 9, 6, 3) STS-1
SDH	VC-4-Xc (X = 16, 8, 4, 3, 2) VC-4, VC-3

These concatenations are also added when the virtual concatenation option is installed.

Concatenations can be selected from the pull-down menu.



Virtual Concatenation Option

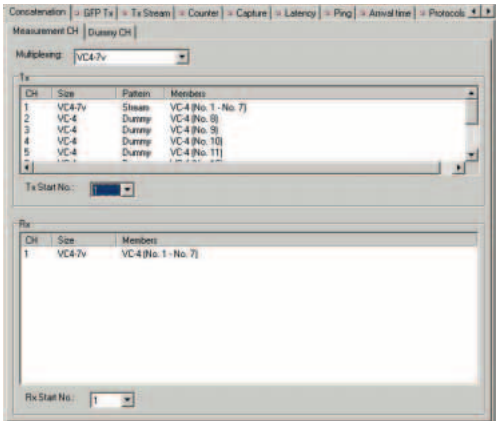
- **MU120103B-02 Virtual Concatenation**
- **MU120104B-02 Virtual Concatenation**

Virtual concatenation is added to the concatenations by installing a virtual concatenation software option (MU120103B-02, MU120104B-02).

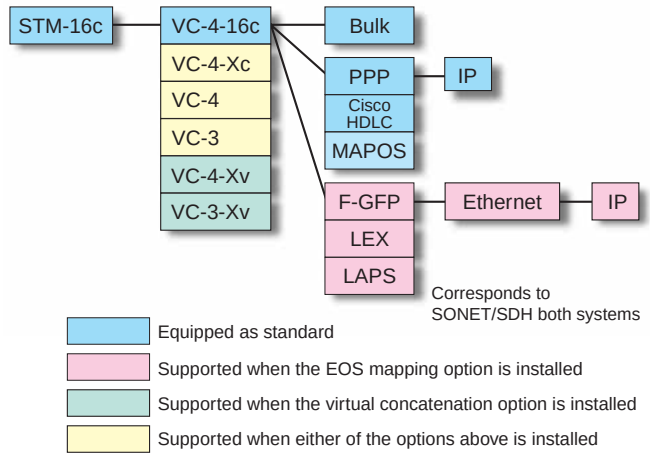
Additional virtual concatenation

SONET	STS3c-Xv (X = 8, 7, 6, 5, 4, 3, 2) STS1-Xv (X = 24, 21, 18, 15, 12, 9, 6, 3)
SDH	VC-4-Xv (X = 8, 7, 6, 5, 4, 3, 2) VC-3-Xv (X = 24, 21, 18, 15, 12, 9, 6, 3)

Virtual concatenation setting screen



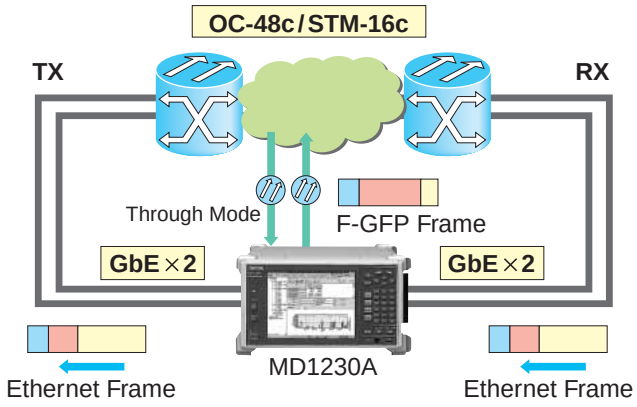
2.5G module supported mapping list



Note:
One arbitrary channel is chosen for the measurement at transmitted or received side in each concatenation. Dummy data is applied to other channels.

GFP Measurement

GFP Measurement Application Example – Simultaneous Measurement of Ethernet Layer and GFP Layer



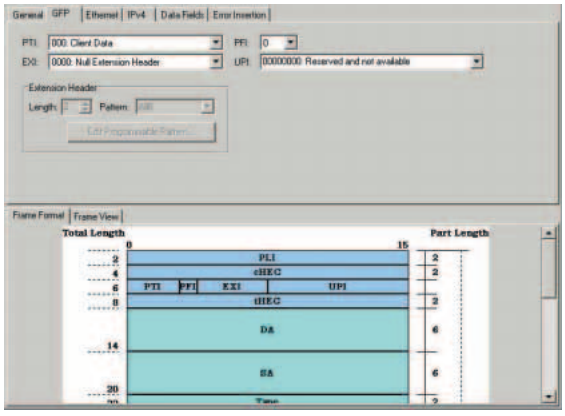
By using in combination with the Gigabit Ethernet module, performance of the Ethernet layer and GFP layer can be measured simultaneously.

Transmission Frame Edition

For transmission frame edition, a user-friendly edit function using the pull-down menu is provided. A frame configuration is displayed on the bottom of the screen, in order to avoid the trouble of having to reference the specifications to check details.

In addition to F-GFP and Ethernet, protocols such as IP, TCP and UDP, VLAN tag, MPLS tag, short frame, jumbo frame and other advanced technologies are also supported as editable data.

Up to 256 data streams/port can be combined in a sequence, facilitating settings such as repetition of several data streams for a specified number of times.



Latency Measurement

Latencies can be measured individually for each port. Latencies from the Ethernet layer to the GFP layer and these from the GFP layer to the Ethernet layer can be measured simultaneously. Latencies between remote locations can also be measured by using a GPS antenna (MD1230A-05 option).

Main measurement items

• Measurement to GFP layer from Ethernet layer

F-GFP frame throughput
F-GFP frame latency
F-GFP frame realtime counter
F-GFP layer realtime error counter
F-GFP frame analysis by data capture

• Measurement to Ethernet layer from Ethernet layer

Ethernet frame throughput
Ethernet frame latency
Ethernet frame realtime counter
Ethernet layer realtime error counter
Protocol analysis by data capture

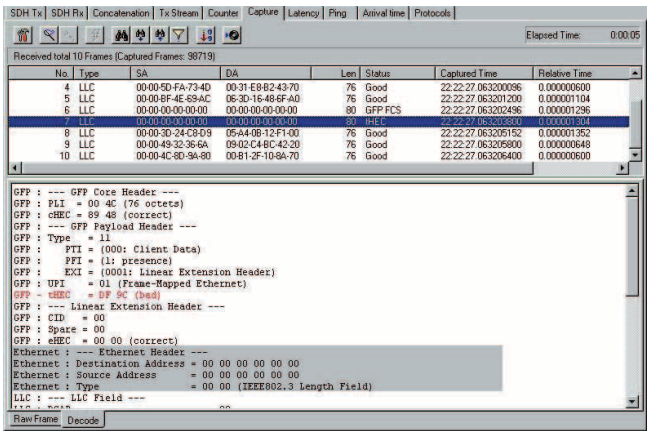
Real-time Counter for More Than 120 Items

The real-time counter function enables measurement of the detailed information on more than 120 items in real-time, including several types of errors and the number of transmitted or received frames in F-GFP, Ethernet and IP.

Name	Unit1:2:1 Current	Unit1:2:1 Accumulated
Correctable cHEC Error	0	0
Uncorrected cHEC Error	2	16
Correctable tHEC Error	1	8
Uncorrected tHEC Error	0	0
eHEC Error	2	6

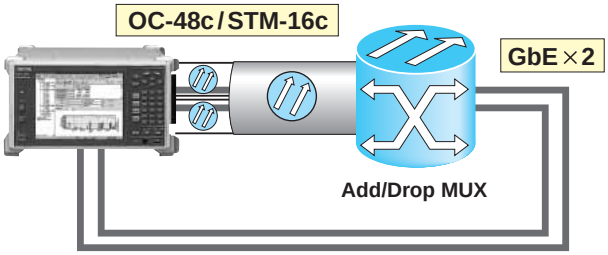
Frame Analysis Function

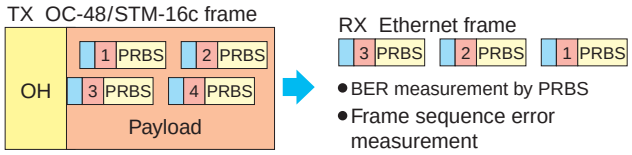
A 256 MB capacity capture buffer is integrated for analyzing the protocol of received frames. The protocol of the frame saved in the capture buffer is analyzed by using the MD1230A decode function. In addition to the information on the GFP layer, the detailed information on the protocol such as Ethernet and IP is also displayed on the screen, providing effective trouble shooting.



Packet BER Test

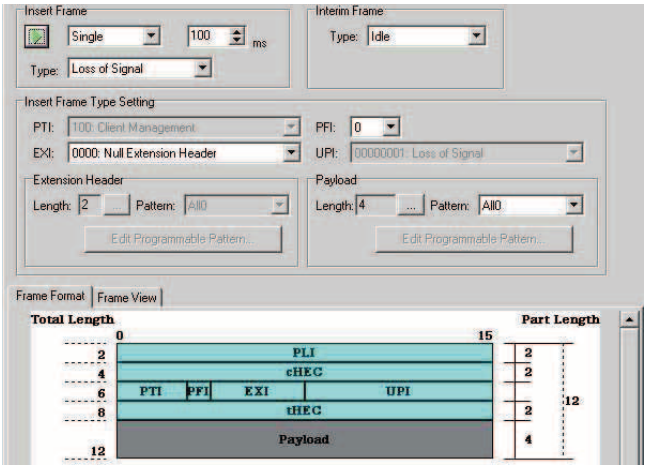
When the packet BER test option (MD1230A-11) is used, a single PRBS pattern is inserted into the data field of the Ethernet frame or IP packet at the transmitting side, enabling measurement of the PRBS bit error rate and the PRBS error frame rate for the data field at the receiving side.
BER measurement can be performed by receiving the single PRBS pattern, inserted at the SONET/SDH side, at the Ethernet side.
The number of frame order changes at the receiving side can also be counted by using a sequence number.





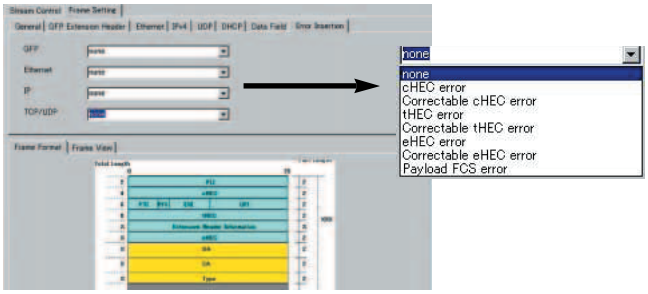
Client Management Frame Insertion Function

When the GFP mapping is selected, a client management frame can be inserted at arbitrary timing.



Error Insertion Function

An error frame can be inserted at arbitrary position as a part of a transmission stream. It is also impossible to insert an error frame for a specified number of times as a part of a repetition pattern, and to insert several error frames in combination.
An error frame can be created by selecting the type of error to be created from the pull-down menu on the transmission frame edit screen.
Error frames can be created to correspond to each EOS layer, Ethernet layer, IP layer or TCP/UDP layer.



Service Disruption Time Measurement

Time during which network communication is down can be measured as service disruption time. When communication is down due to switching the network, etc., how long frame losses have occurred can be checked by measuring the service disruption time.
The service disruption time is calculated from the transmitted frame rate and the ratio between the number of transmitted frames and that of received frames.

Various Interfaces Supported for Enabling General Measurement

The following interface modules are provided for the MD1230A, and more modules are scheduled to be added in the future.
The MD1230A has five slots for installing modules, and these slots can be used for any module types.
Multi-port measurement can be performed by using several of the same modules.

MD1230A modules support list

10M/100M Ethernet module	8 ports
Advanced protocol 10M/100M Ethernet module	8 ports
Gigabit Ethernet module	2 ports
Advanced protocol Gigabit Ethernet module	2 ports
10 gigabit Ethernet module	2 ports
OC3 STM-1 module	2 ports
OC3/12 STM1/4 module	2 ports
2.5G module	1 port
10G module	1 port

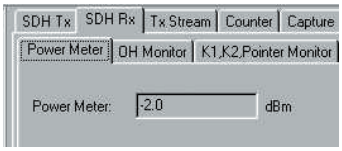
The Gigabit Ethernet Module uses Gigabit Interface Converters (GBICs) that can be changed to support 1000BASE-SX/LX/LH/ZX ports.
The Advanced protocol Gigabit Ethernet Module uses Giga-Bit Interface Converters (GBICs) that can be changed to support 1000BASE-SX/LX/LH/ZX/T ports.

Rich SONET/SDH Measurement Functionality

Both the MU120103B and MU120104B have a wealth of measurement functions for the SONET/SDH layer. One MU120103B or 120104B functions as an EOS measuring instrument, an IP measuring instrument and a SONET/SDH measuring instrument.

Optical Power Meter

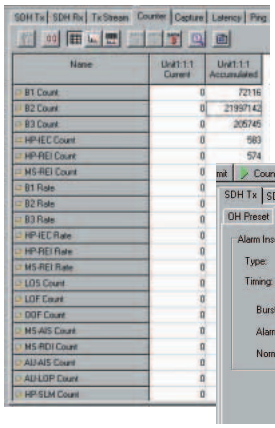
Optical power meter is equipped as standard. Optical power can be measured without moving fiber optics connections during measurement.



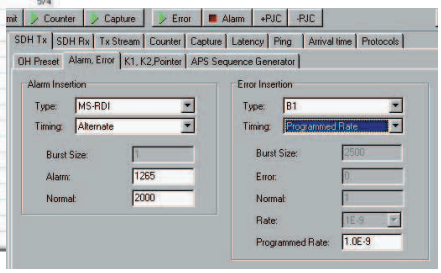
Error/Alarm Analysis Functions

The MU120103B/120104B provides error/alarm measurement and tests the signals required for concatenation.

Error/alarm count



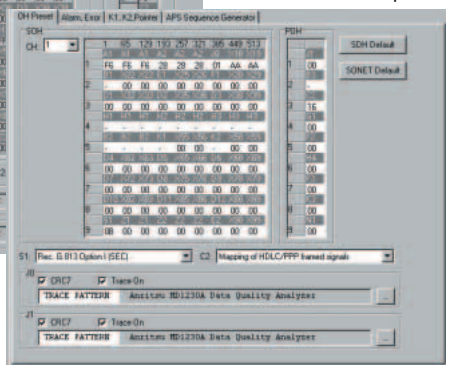
Error/alarm insertion



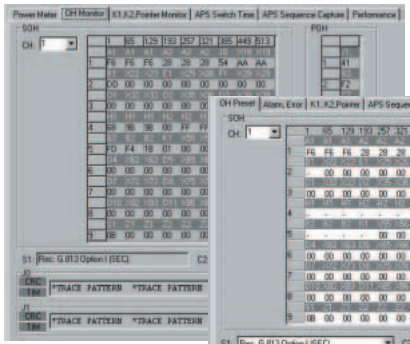
Overhead Monitor and Preset

The MD1230A can set the SONET/SDH overhead bytes in transmitted data and can monitor the overhead in received signals in real-time. Using pass-through mode, the MD1230A can overwrite overhead value using a preset value.

OH preset



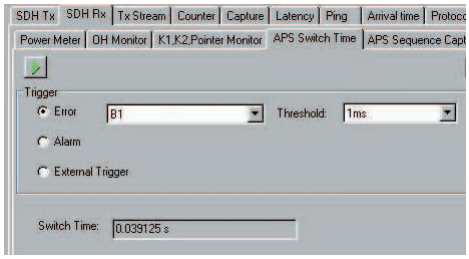
OH monitor



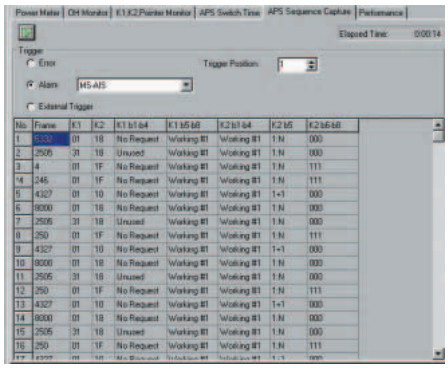
APS (Automatic Protection Switch) Measurement

The MD1230A can measure SONET/SDH APS switching time. In addition, the associated K1/K2 sequence and received K1/K2 bytes may be captured.

APS switching time measurement

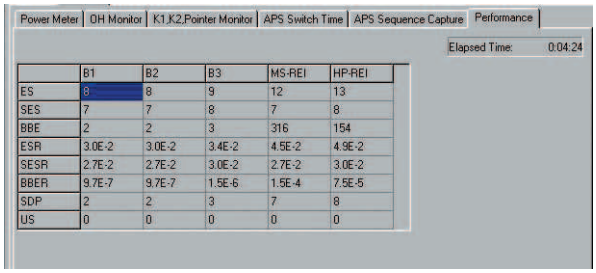


APS sequence capture



Performance Measurement (ITU-T G.826)

The MD1230A can evaluate SONET/SDH layer error performance in conformity to the ITU-T Performance Measurement Standard (G.826).



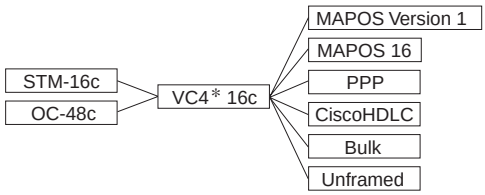
	B1	B2	B3	MS-REI	HP-REI
ES	8	8	9	12	13
SES	7	7	8	7	8
BBE	2	2	3	316	154
ESR	3.0E-2	3.0E-2	3.4E-2	4.5E-2	4.9E-2
SESR	2.7E-2	2.7E-2	3.0E-2	2.7E-2	3.0E-2
BBER	9.7E-7	9.7E-7	1.5E-6	1.5E-4	7.5E-5
SDP	2	2	3	7	8
US	0	0	0	0	0

BER Measurement in Concatenation Mapping

When the EOS mapping option or the virtual concatenation option is installed, bit error rate can be measured by inserting a PRBS pattern into the payload part of the SONET/SDH frame for one arbitrary channel of virtual concatenation or contiguous concatenation.

Specifications

• 2.5G Module

Model	MU120103B	MU120104B
Ports	OC-48/STM-16 Wavelength: 1260 to 1360 nm Number of ports: 1 Connector: SC Bit rate: 2488.320 Mbit/s (NRZ) Output level: –5 to 0 dBm Input sensitivity: –18 to 0 dBm	OC-48/STM-16 Wavelength: 1500 to 1580 nm Number of ports: 1 Connector: SC Bit rate: 2488.320 Mbit/s (NRZ) Output level: –2 to +3 dBm Input sensitivity: –28 to –9 dBm
LED	Link, Tx, Rx, error, optical send	
Clocks	Internal, receive signal, lock (64 kHz + 8 kHz, 1.5 MHz, 2 MHz, 1.5 Mbit/s, 2 Mbit/s)	
SDH/SONET settings	Frame: SDH/SONET Alarm addition: LOS, LOF, MS-AIS, MS-RDI, MS-TIM, AU-AIS, AU-LOP, HP-SLM, HP-TIM, HP-RDI, HP-UNEQ Timing: Single, single burst frame (1 to 64000), alternative [Alarm frame (0 to 8000), Normal frame (1 to 8000)], all Error insertion: FAS, bits all, B1, B2, B3, MS-REI, HP-REI, HP-IEC Timing: Single, single burst bit (1 to 64000), rate (1E-3, 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, 1E-9), programmed rate [AE-B A: 1.0 to 9.9 (0.1 steps), B: 3 to 10], all APS (K1/K2) Sequence generation: 2 to 64 words, repeat (8000 frames)	
Mapping		
Frame settings	MAC address: Settable as fixed, increment, decrement, random IP address: Settable as fixed, increment, decrement, random VLAN tag*1: Settable as fixed, increment, decrement, random MPLS label*1: Up to 10 MPLS labels can be appended. Fixed setting Protocol editing: Ethernet, IPv4, IPv6, TCP/IP, UDP/IP, IGMP/IP, ICMP/IP, RIP/UDP/IP, DHCP, IPX, ARP, IS-IS, MAC Control Frame, None, LEX Control Packet*2 Data field Can set any 4 parts in data field: All 1s, all 0s, alternate 1/0 (each bit, each 2 bits, each 4 bits, each byte, each 2 bytes), increment (each byte), decrement (each byte), random (each byte), single PRBS9, Settable as data field 1 only: Time stamp, sequence number, test frame, user programmed	
Frame length	8 to 65535 byte (settable as auto, fixed, increment*3, or random*3)	
Stream settings	Stream transport mode: Continuous, continuous burst, stop after this stream, next stream, jump to stream, jump to stream for count (loop count: 1 to 16,000,000, frame count per burst: 1 to 16,000,000, burst count per stream: 1 to 16,000,000) Interframe gap: (GFP) 0 ns to 120 s, resolution of 13.4 ns, settable as fixed, random*4 (53.5 ns to 120 s) (PPP/LEX/LAPS) 3.3 ns to 120 s, resolution of 3.3 ns, settable as fixed, random*4 (53.5 ns to 120 s) Interburst gap: (GFP) 53.5 ns to 120 s, resolution of 13.4 ns, settable as fixed (PPP/LEX/LAPS) 3.3 ns to 120 s, resolution of 3.3 ns, settable as fixed Interstream gap: (GFP) 267.1 ns to 120 s, resolution of 13.4 ns, settable as fixed (PPP/LEX/LAPS) 267.1 ns to 120 s, resolution of 3.3 ns, settable as fixed	
Number of streams	256 streams/port	
Error insertion	GFP*5: cHEC error, correctable cHEC error, tHEC error, correctable tHEC error, eHEC error, FCS error LAPS*5: FCS error, fragments error, undersize error, abort sequence LEX*5: FCS error, fragments error, undersize error, oversize error, oversize & FCS error, aborted sequence PPP: FCS error, undersize error, oversize error, fragments error, oversize & FCS error, aborted frame Ethernet: FCS error, fragments error, undersize error, oversize error, oversize & FCS error Network layer: IP header checksum error, TCP checksum error, UDP checksum error	

Counter	SONET/SDH: B1, B2, B3, HP-IEC, MS-REI, HP-REI, LOS, LOF, OOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-SLM, HP-RDI, HP-UNEQ, Bit Info, MFI alignment Error, sequence error Justification: NDF, +PJC, –PJC, Cons, PPM GFP/LEX/LAPS/PPP: Transmitted frame*6, received frame*6, transmitted bytes, received bytes before adaptation, transmitted byte after adaptation, transmitted byte after stuffing, received bytes, received bytes before destuffing, transmitted bit rate*8, received bit rate*8, cHEC error, correctable cHEC error, tHEC error, correctable tHEC error, eHEC error, GFP FCS error, Server Signal Fail interval, Client Loss of Sync frame, Client Loss of Sync interval, Client Loss of Signal frame, Client Loss of Signal interval, fragments, undersize, oversize, FCS error, oversize & FCS error, aborted frame Ethernet: Transmitted Ethernet frame*6, transmitted Ethernet bytes, received Ethernet frame*6, received Ethernet bytes, Ethernet FCS error, Ethernet fragments error, Ethernet undersize error, Ethernet oversize error, Ethernet oversize & FCS error, transmitted ARP request, transmitted APR reply, received ARP request, received ARP reply IP/TCP/UDP: Transmitted IPv4 packet*7, received IPv4 packet*7, received TCP packet*7, received UDP packet*7, transmitted test frame, received test frame, capture trigger, capture filter, transmitted PING reply, transmitted PING request, received PING reply, received PING request, QoS 0 to 7*7, user defined1*7, user defined 2*7, IPv4 checksum error, TCP checksum error, UDP checksum error Bulk/Unframe/Packet Error*9: Bit Error, Pattern Sync Loss, Bit Info count, Bit Info rate, sequence error, PRBS frame error*6, PRBS bit error
Latency	Maximum, minimum, average
Frame arrival time variation measurement	Time resolution: 1 µs, 10 µs, 100 µs, 1 ms, 10 ms, 100 ms, 1 s
QoS counter setting	Using Qos described below, 8-level priority frame count: IEEE802.1D VLAN tag user priority field, 3 LSB of RFC2474 DSCP field
Capture buffer	256 Mbyte/port
Capture filter	At following conditions for each port, capture filter condition settings: Destination MAC address*10, source MAC address*10, destination IP address*11, source IP address*11, 32-bit pattern (settable as bit length and offset) x 2, error conditions
Capture trigger	At following conditions for each port, capture trigger condition settings: Destination MAC address*10, source MAC address*10, destination IP address*11, source IP address*11, 32-bit pattern (settable as bit length and offset) x 2, error conditions, traffic over, latency over, external trigger input
Protocol decode	GFP, LAPS (X.86), LEX, Ethernet, LCP, IPCP, PPP-LEX, MPLS, VLAN, IPv4, IPv6, UDP, TCP, IGMP, ICMP, RIP, DHCP, ARP, BGP-4, DVMRP, ICMPv6, IPX
Protocol emulation	ARP, PING, IGMP, BGP-4
Options	Option 01 Mapping: F-GFP (ITU-T G.7041 recommended), LAPS (ITU-T X.86 recommended), LEX (RFC1841 recommended) Concatenation: [SDH] VC-4-Xc (X = 16, 8, 4, 3, 2) VC-4, VC-3/[SONET] STS-Xc (X = 48, 24, 12, 9, 6, 3), STS-1 Option 02 Virtual concatenation: [SDH] VC-4-Xv (X = 8, 7, 6, 5, 4, 3, 2), VC-3-Xv (X = 24, 21, 18, 15, 12, 9, 6, 3) [SONET] STS3c-Xv (X = 8, 7, 6, 5, 4, 3, 2), STS1-Xv (X = 24, 21, 18, 15, 12, 9, 6, 3)

∗1: VLAN tag and MPLS labels cannot be used simultaneously.
∗2: LEX Control Packet can be chosen only when choosing LEX mapping.
∗3: Increment and random of frame length can be used only when choosing None as a protocol.
∗4: Random setting is effective only when frame length is more than 64 bytes.
∗5: Settable only while using the option 01.
∗6: Frame number and frame rate (fps) are counted.
∗7: Packet number and packet rate (pps) are counted.
∗8: bit/s and % are counted.
∗9: Packet BER measurement can be measured only while using MD1230A-11.
∗10: Settable as only GFP/LAPS/LEX mapping.
∗11: Settable as only PPP/MAPOS/CiscoHDLC mapping.

Ordering Information

The MD1230A family includes these newly added products and options.
Refer to the separate MD1230A datasheet regarding existing MD1230A family products.

Model/Order No.	Name
	– **Plug-in modules** –
MU120103B	2.5G (1.31) Module*1
MU120104B	2.5G (1.55) Module*2
	– **Options** –
MU120103B-01	EOS mapping
MU120103B-02	Virtual concatenation
MU120104B-01	EOS mapping
MU120104B-02	Virtual concatenation
	– **Maintenance service** –
MU120103B-90	Extended three year warranty service
MU120104B-90	Extended three year warranty service

∗1: For using this module, MU120103B-01 or MU120103B-02 is required.
∗2: For using this module, MU120104B-01 or MU120104B-02 is required.

Anritsu

Specifications are subject to change without notice.

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