Product Brochure

Anritsu

MD1230 Family

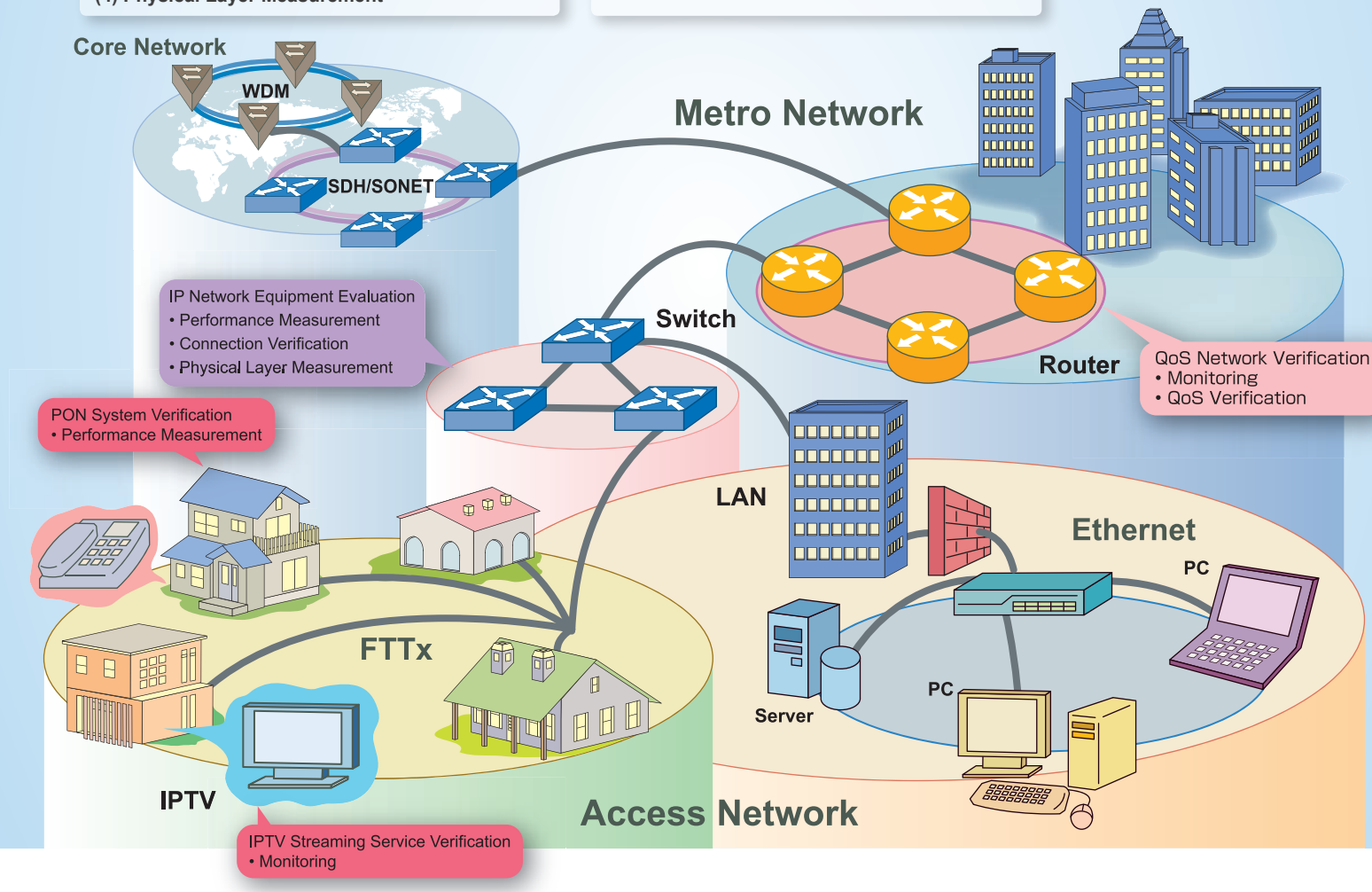
MD1230B Data Quality Analyzer

MP1591A Network Performance Tester

Versatile Applications

1. IP Network Equipment Evaluation
- (1) High-density Switch Performance Evaluation
- (2) Automated Switch Performance Measurement
- (3) Interoperability Verification
- (4) Physical Layer Measurement

2. Network System Verification
- (1) PON System Verification
- (2) IPTV Streaming Service Verification
- (3) Carrier Class Network Service Verification



The MD1230 family is a group of IP/Ethernet measuring instruments covering the increasingly active field of next-generation networks. The family supports the full range of access and metro network applications, including PON system verification, IP network equipment evaluation, network QoS verification, and IPTV streaming service verification. In addition, the products combine all the functions required for performance evaluation of IP network equipment and network systems in all-in-one platform, offering a high-efficiency measurement environment with integrated operations. The MD1230 Family is the Anritsu solution of choice for all your next-generation network measurement needs.

• MD1230 Family

There are two models in the family: the compact and portable MD1230B with integrated screen, and the highly expandable rack-mounted MP1591A with remotely-controlled operation using an external PC.

MD1230B

5-slot Integrated Screen Model
Built-in Windows® XP operating system
Dimensions: 320 (W) x 177 (H) x 350 (D) mm
Mass: 15 kg max. (excl. options and modules)

MP1591A

Rack-mount 16-slot Model
Controlled by external PC
Supports Windows® XP and Windows® 2000 operating systems
Dimensions: 426 (W) x 596 (H) x 350 (D) mm
Mass: 28 kg max. (excl. options and modules)

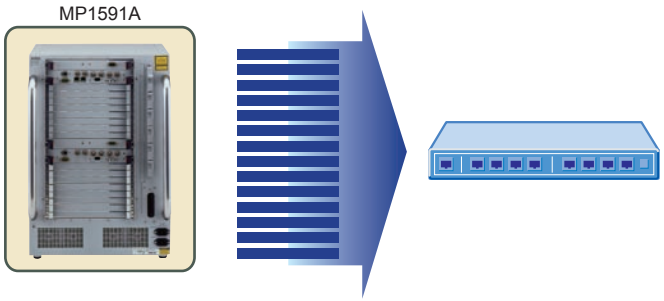
*: Windows® is a registered trademark of Microsoft Corporation in the United States and other countries.

Application Examples

IP Network Equipment Evaluation

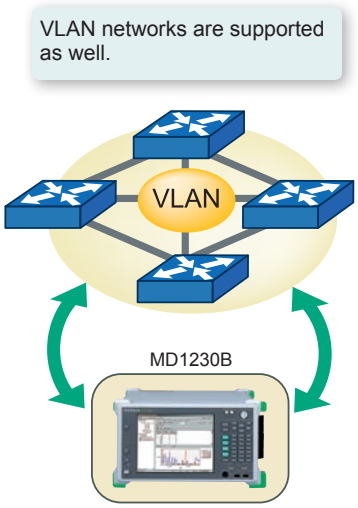
High-Density Switch Performance Measurements

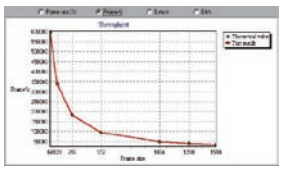
One MD1230B or MP1591A unit supports control and measurement of up to 60 or 128 ports, respectively. Therefore, all 48 ports of the highest-density 1U switch can be load-tested simultaneously, providing a small footprint, cost savings, and effective return on investment.



Automatic Switch Performance Measurement

One-button, IETF RFC2544 and RFC2889-compliant automatic performance testing [Option-10] supports automatic display of measurement results, shortening evaluation times and improving work efficiency.





RFC2544 Throughput Result

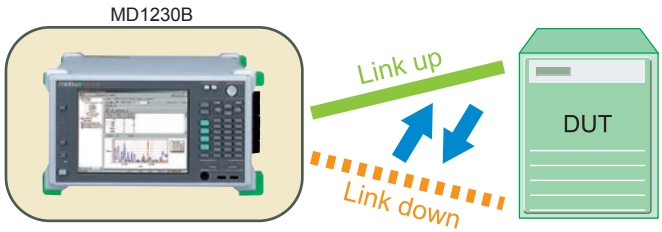
RFC2889 Result

Connection Verification

The following functions make network configuration pre-verification interoperability checks and fault troubleshooting easier, while elimination of link faults improves network connection reliability.

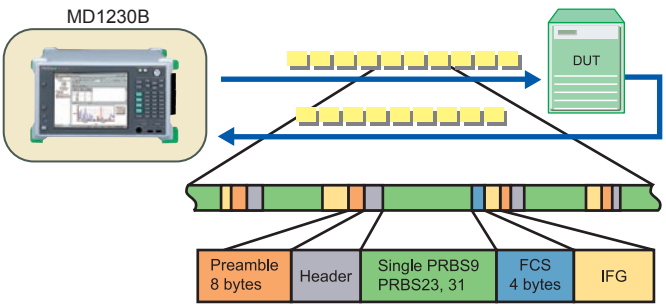
<Link Test>
Repeatedly forcing the link on and off permits verification of equipment operation during a Link Flap situation.

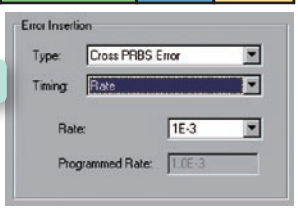
<Auto Negotiation Analysis> [Option-15]
The auto negotiation connection status is easily analyzed using the Sequence Capture and Decode functions to improve the validity of interoperability test verification.



Physical Layer Measurements

Verification of signal transmission quality is key to improving network reliability. The variable measurement clock (±100 ppm) and clock monitoring functions of the Clock Measurement Option [MU120131A/132A/138A-01], as well as the error insertion and error measurement functions of the BER Measurement Option [Option-11], support this verification to assure high-reliability operation at the equipment physical layer.



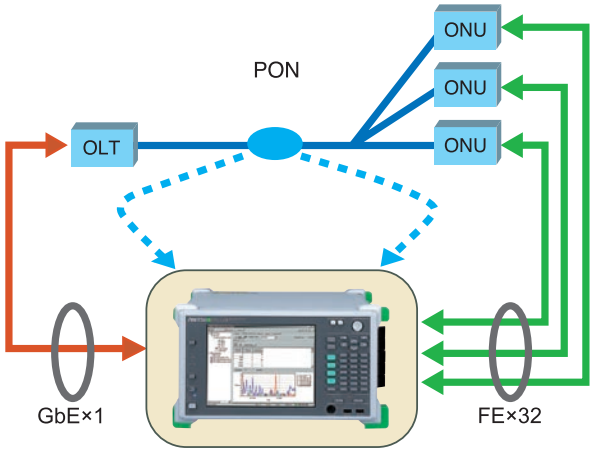


Error Insertion

Network System Verification

PON System Verification

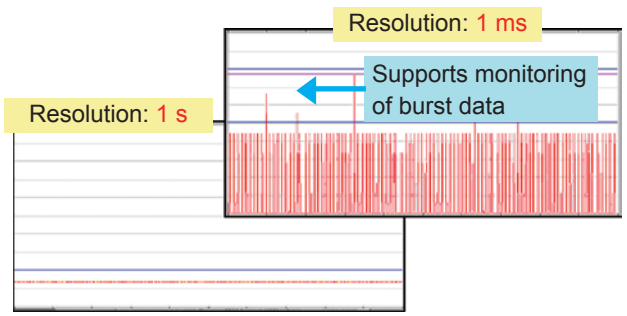
A single MD1230B or MP1591A unit can control a simultaneous end-to-end evaluation of a 32-branch PON system. Each unit also supports OAM analysis by capturing and decoding E-PON system frames for verification of PON functions.



IPTV Streaming Service Verification

• High-Resolution Traffic Monitor

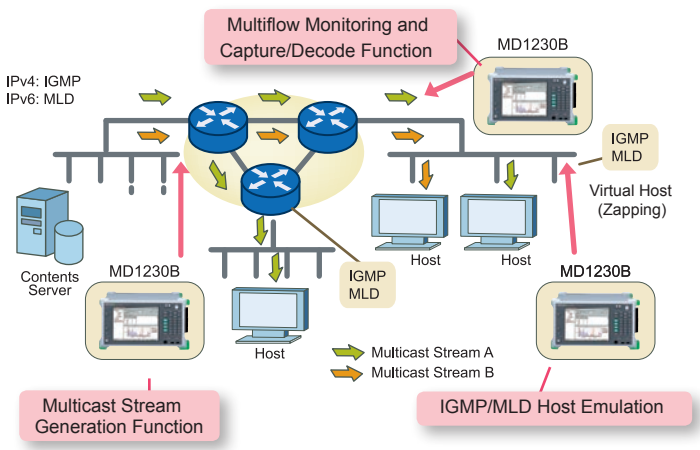
Previous measuring instruments (with 1-s resolution) are inadequate for analyzing burst data that can impact the quality of streaming services. However, the Application Traffic Monitor [Option-20] provides monitoring of burst data with 1 ms resolution for realtime oscilloscope-type analysis that could not be performed previously.

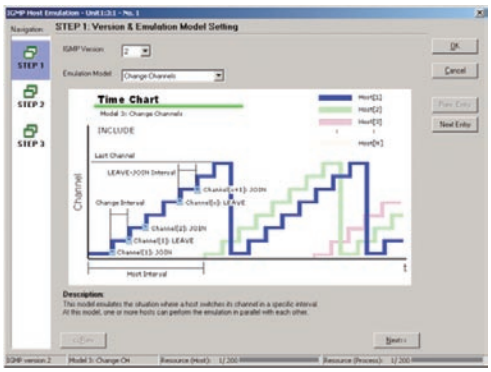


Same Traffic Monitored at Different Resolution

• IP Multicasts (Channel Zapping)

Surfing quickly through IPTV channels (called zapping) puts extremely high loads on the network and its routers. The multicast host emulation feature automatically increases and decreases the number of virtual hosts and channel zapping levels to verify and evaluate IP multicast QoS under high load conditions, which is difficult to achieve intentionally in a real network.

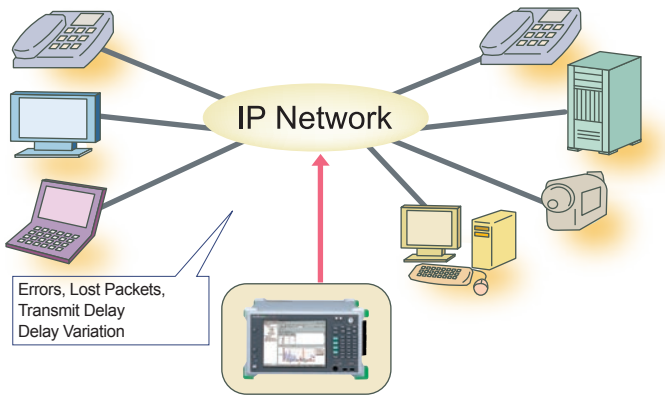




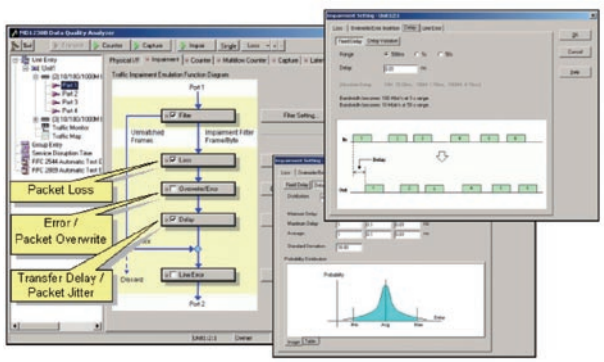
Multicast Host Emulation

<Multicast Host Emulation>
Multicast protocols that can be analyzed and emulated:
• IGMPv2/IGMPv3
• MLDv1/MLDv2 [Option-12]

• Traffic Impairment Emulator



The Traffic Impairment Emulator [Option-17] emulates network faults to evaluate and verify service quality under hypothetical fault conditions.
Service quality can be checked by emulating packet loss, errors, and delays occurring in actual networks, such as IPTV and VoIP streams. In addition, because the effect of network faults can be varied in real time, different networks conditions can be emulated effectively.

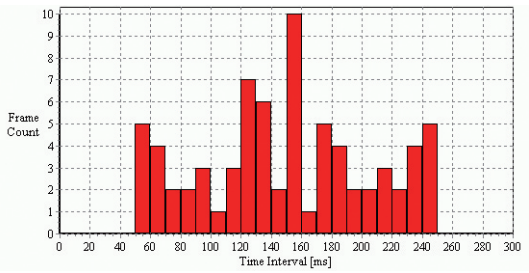


<Traffic Impairment Emulator>[*1]
The following effects can be inserted:
• Packet Loss
• Error/Packet Overwrite
• Delay (Transmission Delay 51.2 s[*2] max.) /Packet Jitter

*1: The Traffic Impairment Emulator uses Ports 1 and 2 of the MU120121A 10/100/1000M Ethernet Module or the MU120122A Gigabit Ethernet Module.
*2: When using 50-s range (guaranteed bandwidth: 10 Mbps)

• Delay Time Distribution (Packet Jitter)

Packet jitter impacting the quality of real-time services can be monitored.



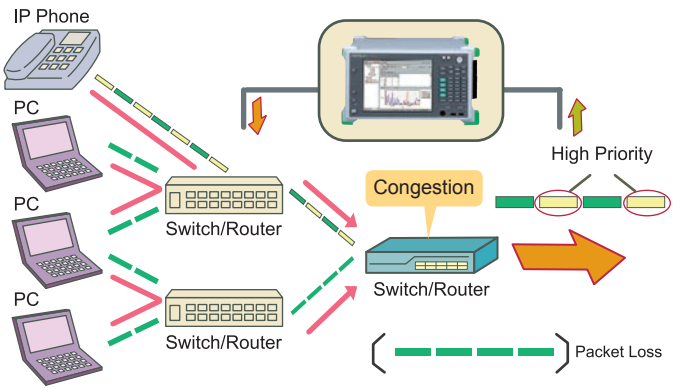
∗ When using test packets

Latency Distribution

Carrier Class Network Service Verification

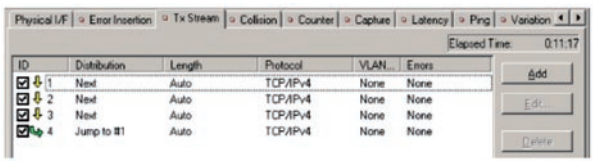
• Multiflow Counter QoS Priority Control Verification

Emulating high-load conditions and monitoring individual traffic flows under these conditions enables pre-commissioning QoS evaluation and verification.



<Stream Generation>

Full-wire-rate, high-load traffic can be generated easily, something that is difficult to do intentionally on a real network. Using the stream editing functions supports flexible setting of QoS-related parameters.

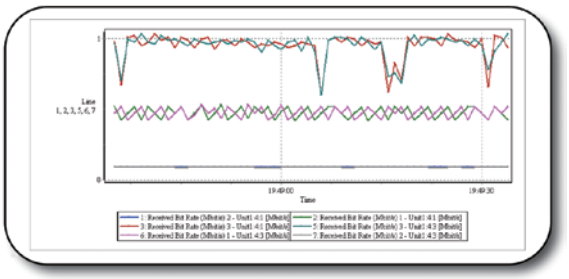


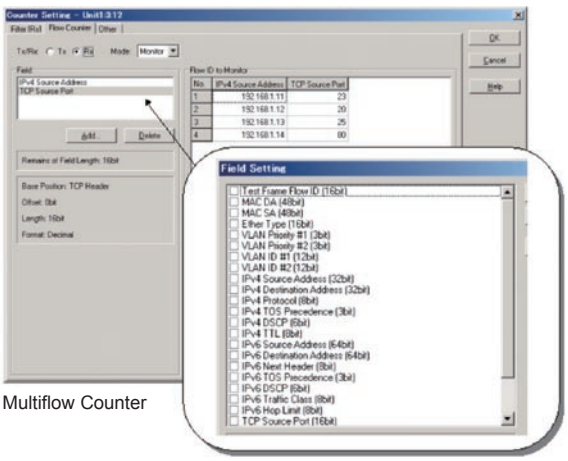
Stream Generation

<Multiflow Counter> ∗1

Simultaneous monitoring of every traffic condition (throughout/delay/frame loss) enables verification of QoS controls and measurement of QoS efficiency. Templates with various priority parameters, including MAC, VLAN, IP, and TCP/UDP port number, are provided.

∗1: Using MU120131A 10/100/1000M Ethernet Module, MU120132A Gigabit Ethernet Module and MU120138A 10 Gigabit Ethernet Module Multiflow Counter



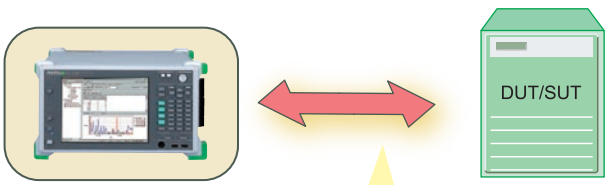


Multiflow Counter

Flow Definitions (Priority Parameters)

• Ethernet OAM Function Verification

The Ethernet OAM Protocol Emulation Function [Option-28] imitates equipment supporting Ethernet OAM (MEP) for evaluation and verification of networks and network equipment.



<Ethernet OAM Protocol Emulation>

Supports ITU-T Y.1731 and IEEE 802.1ag
CCM periodic send∗1; LBM/LTM response∗1; RDI addition∗1; LOC/AIS/RDI detection∗1; and OAM frame send and protocol analysis of captured frame

∗1: Enabled with MU120131A 10/100/1000M Ethernet Module, MU120132A Gigabit Ethernet Module, MU120121A 10/100/1000M Ethernet Module, MU120122A Gigabit Ethernet Module, and MU120138A 10 Gigabit Ethernet Module

• Protocol Analysis

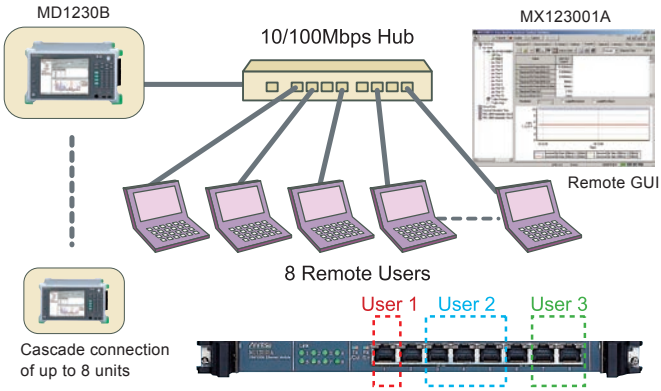
In addition to the standard protocol decoding functions, installing the Ethereal®/Wireshark® and Sniffer® Technologies option [Option-04, MX123002A], supports more detailed analysis of captured data.

∗: Ethereal® is registered trademarks of Ethereal, Inc.
∗: Wireshark® is registered trademarks of Gerald Combs.
∗: Sniffer® is registered trademarks or trademarks of Network General Corporation and/or its affiliates in the US and/or other countries.

Useful Functions

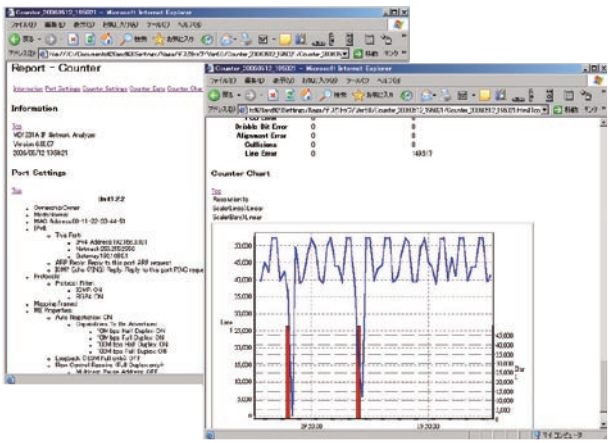
PC Remote Control

Installing the MX123001A or MX159001B Control Software options in an external PC supports remote control of the MD1230B or MP1591A using an identical built-in GUI. Multiple users are supported, allowing up to 8 operators to share a single mainframe by sharing ports. Connecting up to eight MD1230B units in cascade provides expansion to 40 slots, while four cascade-connected MP1591A units can support 64 slots.



Report Function

Reports are output in HTML format. Counter, Multiflow Counter, Latency, RFC2544, and RFC2889 measurement results can be saved with attached graphs and measurement conditions. The Pause function can be used to save results to reports during measurement.



Remote Control Command Interfaces

Using the remote command interface allows automatic control of measuring instruments by sending text-based commands, making it easy to create applications for automatic testing. The RS-232C, GPIB, and Ethernet interfaces [Option-01, -02, and -03] all support remote commands. Additionally, the MD1230B supports the Tcl Interface [Option-06].

Functions

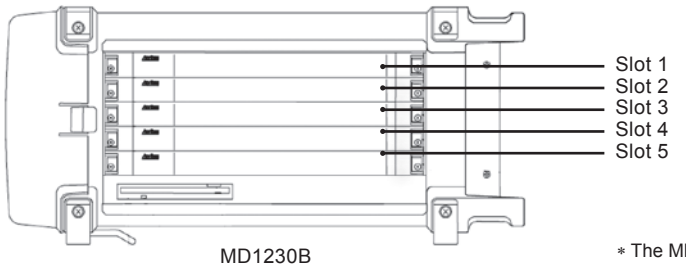
Model	MU120111A	MU120121A	MU120131A	MU120112A	MU120122A	MU120132A	MU120118B/C	MU120138A
Interface	10/100BASE-T	10/100/1000BASE-T		1000BASE-X, T	10/100/1000BASE-T 1000BASE-X	1000BASE-X	10GBASE-R	10GBASE-R
Ports (Connector)	8 (RJ-45)	4 (RJ-45)	12 (RJ-45)	2 (GBIC)	2 (RJ-45) 2 (SFP)	8 (SFP)	2 (XENPAK) / 1 (XENPAK)	4 (SFP+)
Clock Variation		√	√ ∗1		√	√ ∗1	√ ∗2	√ ∗1
Link Flap			√			√		√ ∗11
Auto MDI/MDI-X		√	√		√			
Frame Generation								
Stream Generation (Tx Stream)	√	√	√	√	√	√	√	√
Multi-Layer VLAN		√	√		√	√		√
MAC Address Increment	√	√	√	√	√	√	√	√
IP Address Increment	√	√	√	√	√	√	√	√
TCP/UDP Port Number Increment	√	√	√	√	√	√	√	√
Spanning Tree/Link Aggregation Frame (Option-23)	√	√	√	√	√	√	√	√
Test Frame Addition	√	√	√	√	√	√	√	√
Hardware Random Pattern		√	√		√	√	√	√
Measurement								
Counter	√	√	√	√	√	√	√	√
Multi-Flow Counter		√ ∗8	√		√ ∗8	√		√
Capture	√	√	√	√	√	√	√	√
Decode	√	√	√	√	√	√	√	√
Latency	√	√	√	√	√	√	√	√
Ping	√	√	√	√	√	√	√	√
Ping6 (Option-12)	√	√	√	√	√	√	√	√
Arrival Time Variation/Latency Variation	√ ∗3	√	√	√ ∗3	√	√	√ ∗3	√
Through Mode	√	√	√	√	√	√	√	√
Monitor Mode	√	√	√	√	√	√	√	√
Address Swap Mode	√	√	√	√	√	√		√
Unframe BER Test	√	√	√	√	√	√	√ ∗4	√
Packet BER Test (Option-11)	√	√	√	√	√	√	√	√
Auto Negotiation Analysis (Option-15)∗5				√	√	√		
Application Traffic Monitor (Option-20)		√	√	√	√	√		
Link Fault Signalling (Option-16)							√	
Link Fault Signalling (Module Option-03)								√ ∗10
XENPAK Test (Option-13)							√	
Clock Measurement		√	√ ∗1		√	√ ∗1		√ ∗1
PoE (Module Option-02)			√					
PPPoE (Option-26)		√			√			
Ethernet OAM (Option-28)	√ ∗9	√	√	√ ∗9	√	√	√ ∗9	√
Automatic Test								
RFC2544 with VLAN	√	√	√	√	√	√	√	√
RFC2889 with VLAN (Option-10)	√	√	√	√	√	√	√	√
Protocol Emulation								
ARP	√	√	√	√	√	√	√	√
ICMP	√	√	√	√	√	√	√	√
OSPF (Option-07)	√	√		√	√		√	
BGP-4	√	√		√	√		√	
ICMPv6 (Option-12)	√	√	√	√	√	√	√	√
OSPFv3 (Option-18) ∗6	√	√		√	√		√	
BGP4+ (Option-19) ∗6	√	√		√	√		√	
IGMPv2/IGMPv3	√	√	√	√	√	√	√	√
IGAP (Option-14)	√	√	√	√	√	√	√	√
MLD/MLDv2 (Option-12)	√	√	√	√	√	√	√	√
MLDA (Option-22) ∗6	√	√	√	√	√	√	√	√
PIM-SMv2 (Option-21) ∗7	√	√		√	√		√	
MPLS (LDP/CR-LDP) (Option-08)	√	√		√	√		√	
MPLS (RSVP-TE) (Option-09)	√	√		√	√		√	
Other								
Traffic Impairment Emulator (Option-17)∗8		√			√			

∗1: Requires MU120131A/32A-01 Clock Measurement option
∗2: Requires XENPAK Test (Option-13). However, the variable clock of this module supports only the XAUI interface.
∗3: Supports only Arrival Time Variation Measurement
∗4: Requires XENPAK Test (Option-13)
∗5: Supports SX/LX/LH/ZX for GPIC or SX/LX/LE/LR for SFP
∗6: Requires IPv6 Expansion (Option-12)
∗7: Requires IPv6 Expansion (Option-12) when using IPv6 addresses.
∗8: Supported by ports 1 and 2. Electrical ports (10/100/1000BASE-T) for MU120121A and Optical ports (1000BASE-X) for MU120122A.
∗9: Supports OAM frame send and protocol analysis of captured frame only
∗10: Requires MU120138A-03 Link Fault Signalling option
∗11: Excludes No/Go Check

Selection Guide

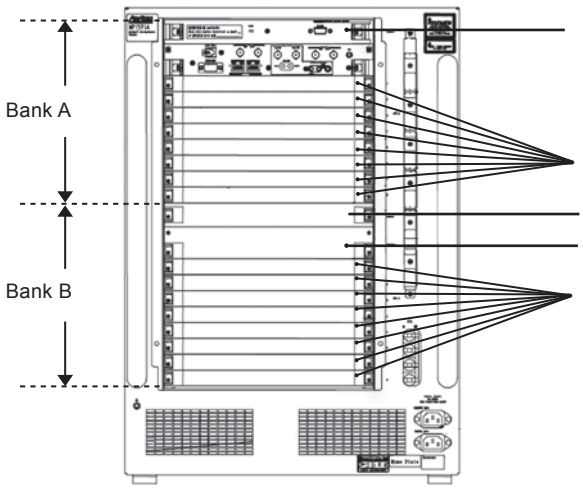
∗ Refer to the MP1590B and MP1591A catalog for the units and options related to the MP1591A SDH/SONET/OTN/PDH/DSn and jitter functions.

Module Slots



MD1230B

∗ The MD1230B is a 5-slot model accepting up to five measurement modules.



MP1591A

∗: MP1591A control requires the MU159101A and MX159001B.
∗: The MP1591A slots are arranged in two banks (Bank A and Bank B) that can accept up to 16 measurement modules.
∗: There are restrictions on the combination of modules in the MP1591A. See the Installed Module Combination table for the possible combinations.
∗1: Dedicated slot for MU159101A Control Module when using Bank A
∗2: Dedicated slot for MU159101A Control Module when using Bank B
∗3: Dedicate slot for MU159103A Expansion Interface Module when using Bank B

Installed Module Combinations

Model/Order No.	Module Name	No. of Slots Required	No. of Ports	Mainframe			
				MD1230B		MP1591A	
				Max. No. Modules	Supported Slots	Max. No. Modules (Bank A/Bank B)	Supported Slots (Bank A/Bank B)
MU120111A	10/100M Ethernet Module	1	8	5	1 to 5	8	1 to 8
MU120112A	Gigabit Ethernet Module	1	2	5	1 to 5	8	1 to 8
MU120121A	10/100/1000M Ethernet Module	1	4	5	1 to 5	4	1 to 4
MU120122A	Gigabit Ethernet Module	1	4	5	1 to 5	4	1 to 4
MU120131A	10/100/1000M Ethernet Module	1	12	5	1 to 5	5	1 to 6
MU120132A	Gigabit Ethernet Module	1	8	5	1 to 5	6	1 to 6
MU120138A	10 Gigabit Ethernet Module	1	4	5	1 to 5	—∗4	— ∗4
MU120118B	10 Gigabit Ethernet Module	2	2	2	1 to 5	4∗1	1 to 8∗2
MU120118C	10 Gigabit Ethernet Module	2	1	2	1 to 5	4∗1	1 to 8∗2
MU159101A	Control Module	1	—	—	—	1	Dedicated Slot
MU159103A	Interface Module for Expansion Slot	1	—	—	—	1∗3	Dedicated Slot

∗: The restrictions on each bank of the MP1591A are as follows:
- Up to 64 ports are supported only when the MU120XXXX and MU159XXXX modules are installed.
- Up to 48 ports are supported only when the MU150XXXX and MU159XXXX module are installed. (Refer to the MP1590B and MP1591A catalog for details of the MU150XXXX module.)

∗1: Up to 4 modules only when MP1591A Option-50 or -51 installed; 2 maximum when not installed
∗2: Restricted to slots 4 to 8 when MP1591A Option-50 or -51 not installed
∗3: MU159103A is for MP1591A Bank B. Not required for Bank A
∗4: The MU120138A cannot be used when installed in the MP1591A

Mainframe Options

Name	Model/Order No.	
	MD1230B	MP1591A
RS-232C Control	MD1230B-01	MX159001B-01
GPIB Control	MD1230B-02	MX159001B-02
Ethernet Control	MD1230B-03	MX159001B-03
Decode Module	MD1230B-04	—
Tcl Interface	MD1230B-06	—
OSPF Protocol	MD1230B-07	MU159101A-07
MPLS (LDP/CR-LDP) Protocol	MD1230B-08	MU159101A-08
MPLS (RSVP) Protocol	MD1230B-09	MU159101A-09
RFC2889 Benchmarking Test	MD1230B-10	MU159101A-10
Packet BER Test	MD1230B-11	MU159101A-11
IPv6 Expansion	MD1230B-12	MU159101A-12
XENPAK Test	MD1230B-13	MU159101A-13
IGAP Protocol	MD1230B-14	MU159101A-14
Auto Negotiation Analysis	MD1230B-15	MU159101A-15
Link Fault Signalling*4	MD1230B-16	MU159101A-16
Traffic Impairment Emulator	MD1230B-17	MU159101A-17
OSPFv3 Protocol*1	MD1230B-18	—
BGP4+ Protocol*1	MD1230B-19	—
Application Traffic Monitor	MD1230B-20	MU159101A-20
PIM-SMv2 Protocol*2	MD1230B-21	—
MLDA Protocol*1	MD1230B-22	—
Spanning Tree/Link Aggregation	MD1230B-23	—
PPPoE	MD1230B-26	—
Ethernet OAM	MD1230B-28	MU159101A-28
Expert Analysis Module*3	MX123002A	—

*1: Requires Option-12 IPv6 Expansion
*2: Requires Option-12 IPv6 Expansion when using IPv6 addresses
*3: Requires Option-04 Decode Module
*4: This option is for the MU120118B/C 10 Gigabit Ethernet Module.
Choose the MU120138A-03 when using the Link Fault Signalling option for the MU120138A 10 Gigabit Ethernet Module.

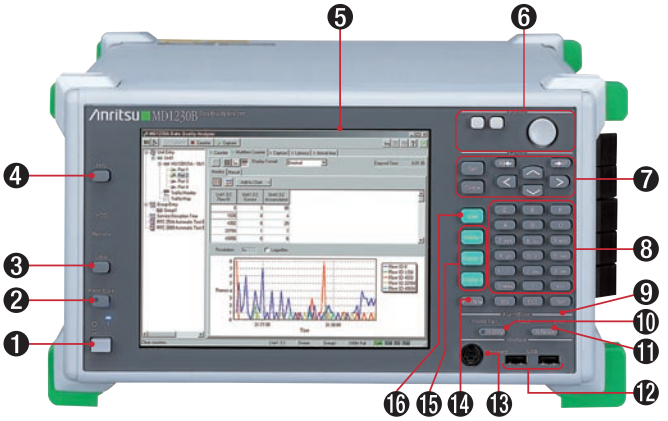
Module Options

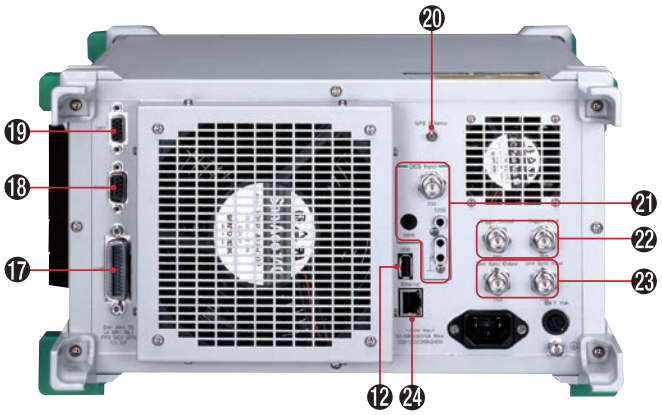
Name	Model/Order No.
Clock Measurement	MU120131A-01, MU120132A-01, MU120138A-01
PoE	MU120131A-02
Link Fault Signalling*1	MU120138A-03

*1: This option is for the MU120138A 10 Gigabit Ethernet Module.
Choose the MD1230B-16 or MU159101A-16 when using the Link Fault Signalling option for the MU120118B/C 10 Gigabit Ethernet Module.

Specifications

MD1230B Data Quality Analyzer





1	Power	Switches power on and off. LED lights at MD1230B power-on
2	Panel Lock	Disables input from keys and mouse
3	Local	Switches from remote control mode to local control mode
4	Help	Displays help information about current screen
5	LCD	8.4" TFT-LCD, SVGA (800 × 600)
6	Pointer	Enables operator to perform same operations as mouse
7	Cursor	Set: Sets data Cancel: Cancels data setting ∨ ∧ < > : Scrolls screen cursor R | ←,→ | F: Scrolls setting items
8	Input Keys	Input numeric values and characters
9	Error/Alarm	Displays receiver errors and alarms
10	History	At on, Error/Alarm LED 9 stays on after error or alarm displayed. At off, LED 9 flashes after error or alarm display
11	H.Reset	Resets history data
12	USB	Ports to connect USB devices (2 ports on front and 1 port on back)
13	Keyboard	Connects PS/2 keyboard
14	Print Now	Prints screen at external printer
15	Display1 to 3	Saves specified screen. Pressing one of these buttons for more than 2 seconds records tab positions on current screen. Pressing for less than 2 seconds displays stored tab positions
16	View*1	Switches between tree view and graphical view
17	GPIB	GPIB interface connector
18	RS-232C	RS-232C interface connector
19	CRT	VGA connector to connect external display
20	GPS Antenna	Connects GPS antenna
21	DCS Input	Connector to input clock or data to synchronize SDH/SONET signals to external clock
22	Trigger	Input: Connector to input external trigger signals to perform APS test and frame capture Output: Connector to output trigger signals generated by frame capture
23	Unit Sync. Input/Output	Unit sync. input/output connector to synchronize time between MD1230 Family equipment
24	Ethernet	Ethernet interface (10BASE-T/100BASE-TX) to connect external controller
25	Module Slots	For installing up to five interface modules
26	FDD	Floppy disk drive

*1: This function is disabled in Ver 7.0 or later.

MD1230B Mainframe Specifications

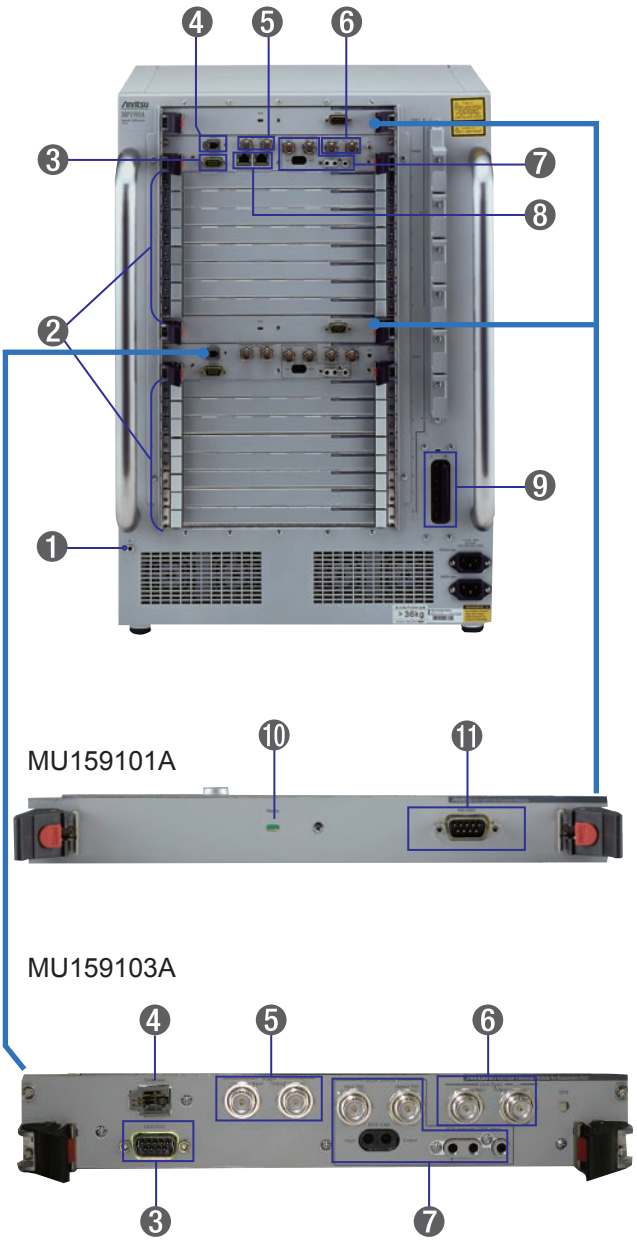
Model		MD1230B Data Quality Analyzer
Indicator	LCD	8.4", Color TFT, SVGA (800 × 600)
	LED	Power, HDD, Remote, Panel Lock, Power Fail, Error, Alarm, History
OS		Windows® XP Professional
Storage Unit		HDD and 3.5" FDD
Interface		RS-232C, GPIB, Ethernet (RJ-45), USB1.1 × 3 ports, Keyboard (PS/2), GPS antenna, CRT (15-pin mini D-sub)
	Trigger	Trigger Input: For APS test and frame capture Trigger Output: Capture trigger Level: TTL (Active High)
		Connector: BNC (75 Ω)
	Unit Sync. Input/Output	Time Synchronization for MD1230 Family Level: TTL
		Connector: BNC (75 Ω)
	DCS Input	Frequency Clock: 1.544 MHz, 2.048 MHz, 64 kHz + 8 kHz Data: 1.544 Mbit/s, 2.048 Mbit/s Input Range: ±50 ppm Level/Code 1.544 M: ANSI T1.403 (B8ZS) 2.048 M: ITU-T G.703 Table 10 (HDB3) 64 kHz + 8 kHz: 0.63 to 1.1 Vo-p (AMI, 8 kHz violation) Connector 2.048 MHz, 2.048 Mbit/s: BNC (75 Ω) 2.048 MHz, 2.048 Mbit/s, 64 kHz + 8 kHz: Siemens (120 Ω balanced) 1.544 MHz, 1.544 Mbit/s: BANTAM (100 Ω balanced)
Remote Control		Remote control using LAN (10BASE-T/100BASE-TX) with MX123001A Remote command control with RS-232C (Option-01) or GPIB (Option-02) or LAN (10BASE-T/100BASE-Tx,Option-03/Option-06)
Input Device		Pointing device, front keys
Power		100 to 120/200 to 240 Vac (autoswitching), 50 Hz to 60 Hz
Power Consumption		≤650 VA
Operational Temperature and Humidity		+5° to +40˚C, +20% to +80%
Dimensions and Mass		320 (W) × 177 (H) × 350 (D) mm, ≤15 kg (excluding options and plug-in modules)
EMC		EN 61326-1, EN 61000-3-2
LVD		EN 61010-1
Laser Safety		Depends on installed module. Refer to the safety standards for each module.
Number of Slots		5

∗: See the selection guide and ordering information for supported modules and options.

∗: Windows® is a registered trademark of Microsoft Corporation in the USA and other countries.

MP1591A Network Performance Tester

∗ Refer to the MP1590B and MP1591A catalog for the units and options related to the MP1591A SDH/SONET/OTN/PDH/DSn and jitter functions.



1	Functional Ground Terminal	For grounding cabinet
2	Module Slots	For installing up to 16 interface modules
3	DCC/GCC∗1	Connector for data/clock input/output for DCC (SDH/SONET), GCC (OTN byte) or add/drop data
4	Order Wire (RJ11)∗1	Connector for order wire interface using SDH/SONET bytes E1 and E2
5	Trigger	Input: Connector for external trigger to control APS test and capture∗1 Output: Connector for error/alarm and capture trigger
6	Unit Sync Input/Output	Connector for inputting clock signals for establishing time synchronization between daisy chained MP1591A and MD1230 units
7	CLK Source∗1	Input: Reference signal input for synchronizing transmission signal with external reference signal Output: Reference signal output for synchronizing transmission signal with external reference signal
8	Ethernet	Ethernet interface connector for remote control (10BASE-T/100BASE-TX) For connecting external controller to MP1591A
9	Power (Main Power)	Switches power on and off
10	LED	Lights green when control board ready
11	RS-232C	RS-232C interface connector For connecting external controller to MP1591A

∗1: Used when using MP1591A SDH/SONET/OTN functions; refer to the MP1590B and MP1591A catalog for details.

MP1591A Mainframe Specifications

Model		MP1591A Network Performance Tester
Interface		Ethernet (RJ-45) × 2
	Reference Clock Input*1	Frequency Clock: 1.544 MHz, 2.048 MHz, 64 kHz + 8 kHz, 5 MHz, 10 MHz Data: 1.544 Mbit/s (BITS), 2.048 Mbit/s Input Range: ±50 ppm Level/Code 1.544 Mbit/s: ANSI T1.403 (B8ZS) 2.048 Mbit/s: ITU-T G.703 Table 10 (HDB3) 1.544 MHz, 2.048 MHz, 5 MHz, 10 MHz TTL (Rectangular, Sine Wave) 64 kHz + 8 kHz: 0.63 to 1.1 Vo-p (AMI, 8 kHz violation) Connector 1.544 MHz, 2.048 MHz, 2.048 Mbit/s, 5 MHz, 10 MHz: BNC (75 Ω) 2.048 MHz, 2.048 Mbit/s, 64 kHz + 8 kHz: Siemens (120 Ω) 1.544 Mbit/s: BANTAM (100 Ω) Effective SDH/SONET/OTN Bit Rate.
	Reference Clock Output*1	Frequency Clock: 1.544 MHz, 2.048 MHz, 5 MHz, 10 MHz Data: 1.544 Mbit/s (BITS), 2.048 Mbit/s Level/Code 1.544 Mbit/s: ANSI T1.403 (B8ZS) 2.048 Mbit/s: ITU-T G.703 Table 10 (HDB3) 1.544 MHz, 2.048 MHz, 5 MHz, 10 MHz: TTL (Rectangular) Connector 1.544 MHz, 2.048 MHz, 2.048 Mbit/s, 5 MHz, 10 MHz: BNC (75 Ω) 1.544 Mbit/s: BANTAM (100 Ω) Effective SDH/SONET/OTN Bit Rate.
	Trigger	Trigger Input: For capture/APS Measurement*1 Trigger Output: Transmit error/alarm*1, Receive error/alarm*1, Capture trigger Level: TTL (Active High) Connector: BNC (75 Ω)
	Unit Sync. Input/Output	Time Synchronization Level: TTL Connector: BNC (75 Ω)
	DCC/GCC*1	Data Input/Output: D1-D3 (192 kbit/s), D4-D12 (576 kbit/s), GCC0-2 (1312.4 kbit/s, 326.7 kbit/s) Clock Output: 192 kHz, 576 kHz, 13124 kHz, 326.7 kHz Level: V.11 Connector: 9-pin D-sub
Remote Control		Remote control using LAN (10BASE-T/100BASE-TX, Auto MDI/MDI-X) with MX159001B*2
Power		100 to 120/200 to 240 Vac (autoswitching), 50 Hz to 60 Hz
Power Consumption		≤2200 VA
Operational Temperature and Humidity		+5° to +40˚C, +20% to +80%
Dimensions and Mass		426 (W) × 596 (H) × 350 (D) mm, ≤ 32 kg (including MU159101A×2, MU159103A×1 and Blank Panel)
EMC		EN61326-1, EN61000-3-2
LVD		EN61010-1
Laser Safety		Depends on installed module. Refer to the safety standards for each module.
Number of Slots		16

MU159101A Control Module

LED	Ready
Interface	RS-232C (Self test, Download)
Number of Support Modules	8

MU159103A Interface Module for Expansion Slot

Interface	Reference Clock Input/Output	Same as MP1591A
	Trigger	
	Unit Sync. Input/Output	
	DCC/GCC	

*: See the selection guide and ordering information for supported modules and options.
*1: Only supported in SDH/SONET/OTN/PDH/DSn mode. (MP1591A: Not supported in EoS/Ethernet mode)
*2: Requires MX159001B to control MP1591A

• Express Flow Module Specifications

Model	MU120131A	MU120132A	MU120138A
Name	10/100/1000M Ethernet Module	Gigabit Ethernet Module	10 Gigabit Ethernet Module
Specification	10BASE-T, 100BASE-TX, 1000BASE-T	1000BASE-SX/LX/LE/LR (depends on SFP Module)	10GBASE-SR/LR (depends on SFP+ Module)
Connector	RJ-45 (Auto MDI/MDI-X)	SFP (LC)	SFP+ (LC)
Number of Ports	12	8	4
Bit Rate	10, 100, 1000 Mbit/s	1000 Mbit/s	10 Gbit/s
Duplex Mode	Full/Half*1	Full	
Auto Negotiation	On/Off		—
Flow Control	On/Off		
LED	Link		
Clock Variation (Module Option-01)	On/Off, Resolution 1 ppm, –100 to +100 ppm Clock Accuracy: MD1230B: ±4 ppm, MP1590B/MP1591A: ±0.1 ppm		
Clock Measurement (Module Option-01)	Without 10BASE-T, Accuracy: MD1230B: ±4 ppm, MP1590B/MP1591A: ±0.1 ppm		
Mode	Normal, Monitor, Through (port 1 and port 2, port 3 and port 4, port 5 and port 6, port 7 and port 8, port 9 and port 10, port 11 and port 12), Address Swap		
PoE (Module Option-02)	Class: Class 0 to 4, off Level: off (0 to 31.7 V)/Under (31.7 to 43.3 V) /Normal (43.3 V and over)	—	
Link Up/Down	On/Off/Flap (Interval On:10 to 3600 s, Off: 1 to 3600 s, Count: 1 to 65535, Infinite), No/Go Check: On/Off		On/Off/Flap (Interval On:10 to 3600 s, Off: 1 to 3600 s, Count: 1 to 65535, Infinite), No/Go Check: None
Frame Generation (Tx Stream)			
Streams	256/Port		
Stream Setting	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), Jump to Stream for Count and Stop (Loop Count: 1 to 16,000,000)		
Frames per Burst	1 to 16,777,215		1 to 1,099,511,627,775
Bursts per Stream	1 to 1,099,511,627,775		
Gap Setting: Inter Frame Gap	1000BASE-T: Resolution of 8 ns, 80 ns to 120 s settable as Fixed or Random 100BASE-TX: Resolution of 80 ns, 800 ns to 1200 s settable as Fixed or Random 10BASE-T: Resolution of 800 ns, 8 µs to 12000 s settable as Fixed or Random	1000BASE-T: Resolution of 8 ns, 64 ns to 120 s settable as Fixed or Random	Resolution of 0.8 ns, 7.2 ns to 120 s settable as Fixed or Random
Gap Setting: Inter Burst Gap	1000BASE-T: Resolution of 8 ns, 80 ns to 120 s settable as Fixed 100BASE-TX: Resolution of 80 ns, 800 ns to 1200 s settable as Fixed 10BASE-T: Resolution of 800 ns, 8 µs to 12000 s settable as Fixed	1000BASE-T: Resolution of 8 ns, 64 ns to 120 s settable as Fixed	Resolution of 0.8 ns, 7.2 ns to 120 s settable as Fixed
Gap Setting: Inter Stream Gap			Resolution of 0.8 ns, 9.6 ns to 120 s settable as Fixed
Frame Setting	Preamble Size: 4 bytes to 255 bytes	Preamble Size: 2 bytes to 255 bytes	
	MAC Address: Fixed, Increment, Decrement, or Random (Changeable part specified in 4-bit units) VLAN tag*2: Up to 10 layer VLAN tags appended. VLAN ID settable to Increment, Decrement, or Random MPLS label*2: Up to 10 MPLS labels appended. Fixed setting Protocol Editing: None, ARP, IPv4, IGMP/IPv4, ICMP/IPv4, TCP/IPv4, UDP/IPv4, RIP/UDP/IPv4, DHCP/UDP/IPv4, IPv6, IPX, IS-IS, MAC Control Frame (Pause Frame) Support by IPv6 Expansion (Option-12): ICMPv6/IPv6, TCP/IPv6, UDP/IPv6, IPv6 over IPv4, ICMPv6/IPv6 over IPv4, TCP/IPv6 over IPv4, UDP/IPv6 over IPv4 Supported by MLDA Protocol (Option-22): ICMPv6 MLDA Type Message Supported by Spanning Tree/Link Aggregation (Option-23): STP Configuration BPDU, STP TCN BPDU, RST BPDU, MST BPDU, LACPDU, Marker PDU, Marker Response PDU IPv4/IPv6: IP Destination/Source Address independently set to Fixed, Increment, Decrement, or Random TCP/UDP: Either Destination Port Number or Source Port Number set to Increment or Random Data Field: Set any parts of data field as All 0, All 1, Alternate1/0 (Each Bit, Each 2 Bits, Each 4 Bits, Each 1 byte, Each 2 bytes), Increment, Decrement, or Random Only Data Field 1 settable to Programmable, Single PRBS9, Time Stamp*3, Sequence Number*3,*9, Hardware Random Pattern*3. Test Frame. settable Flow ID number when Test Frame used Programmable Header Pattern: One user-defined pattern settable Supported by Ethernet OAM (Option-28) : CCM, LBR, LBM, LTR, LTM, AIS, LCK, TST, APS, MCC, LMR, LMM, 1DM, DMR, DMM, EXR, EXM, VSR, VSM Each captured frame can be sent as Tx Stream.		
Frame Size	48 bytes to 10,000 bytes, settable as Auto, Fixed, Increment*4, or Random*4		
Error Insertion: Ethernet	FCS Error, Undersize, Oversize, Fragment, Oversize & FCS Error		
	Dribble Bit Error, Alignment Error, Collision	Line Error (8B/10B Code Error, Running Disparity Error)	Line Error (XGMII)
Error Insertion: IP	IPv4 Header Checksum Error		
Error Insertion: TCP/UDP	TCP/UDP Checksum Error		
Error Insertion: Data (Option-11)	PRBS Error: Single PRBS9, PRBS23 (Cross), PRBS31 (Cross)		
Unframe BER Setting	Test Pattern: All 0, All 1, User 16, PRBS23, PRBS31	Test Pattern: All 0, All 1, User 16, PRBS23, PRBS31, CJPAT, CRPAT	
	Error Insertion: Bit All		
	Insertion Timing: Single, Rate (1.0E-9, 1.0E-8, 1.0E-7, 1.0E-6, 1.0E-5, 1.0E-4, 1.0E-3), Programmable Rate (1.0E-10 to 9.9E-3)		Insertion Timing: Single, Rate (1.0E-9, 1.0E-8, 1.0E-7, 1.0E-6, 1.0E-5, 1.0E-4, 1.0E-3), Programmable Rate (1.0E-10 to 2.0E-3)
Cross PRBS Error Setting	Test Pattern: Single, PRBS23, PRBS31		
	Error Insertion: Cross PRBS Error		
	Insertion Timing: Single, Rate (1.0E-9, 1.0E-8, 1.0E-7, 1.0E-6, 1.0E-5, 1.0E-4, 1.0E-3), Programmable Rate (1.0E-10 to 9.9E-3)		Insertion Timing: Single, Rate (1.0E-9, 1.0E-8, 1.0E-7, 1.0E-6, 1.0E-5, 1.0E-4, 1.0E-3), Programmable Rate (1.0E-10 to 2.0E-3)
Fragment Tool	Stream ID: 1 to 255, All, MTU: 1 byte to 9936 bytes Number of datagrams: 1 to 127 Initial Identification: 0x0000 to 0xffff (IPv4), 0x00000000 to 0xffffffff (IPv6), Increment Identification: On/Off		

Model		MU120131A	MU120132A	MU120138A
Measurement Function				
Counter	Ethernet	Transmitted/Received Frame Count, Transmitted/Received Frame Rate, Transmitted/Received Bit Rate, Transmitted/Received Byte Count, Transmitted/Received Rate, FCS Error, Undersize, Fragment, Oversize, Oversize & FCS Error, Line Error, MAC Control Frame, Transmitted/Received ARP Request, Transmitted/Received ARP Reply, Frequency, Frequency Difference, Link Failed		
		Dribble Bit Error, Alignment Error, Collision, PoE Alarm (Module Option-02)	Byte Alignment Error, Preamble CRC Error	—
	Ethernet OAM (Option-28)	LOC, AIS, RDI (shared resolution: 0.1 ms)		
	IPv4	Transmitted/Received IPv4 Packet Count, Transmitted/Received IPv4 Packet Rate, Transmitted/Received Ping Request, Transmitted/Received Ping Reply, IP Header Checksum Error		
	IPv6 (Option-12)	Transmitted/Received IPv6 Packet Count, Transmitted/ Received IPv6 Packet Rate, Transmitted/Received ICMPv6 (NS) Count, Transmitted/Received ICMPv6 (NA) Count, Transmitted/Received ICMPv6 (Echo Request) Count, Transmitted/Received ICMPv6 (Echo Reply) Count		
	TCP/UDP	Received TCP Packet Count, Received TCP Packet Rate, Received UDP Packet Count, Received UDP Packet Rate, TCP Checksum Error *5, UDP Checksum Error*5		
	Data	Capture Trigger, Capture Filter, User-Defined 1 Count/Rate, User-Defined 2 Count/Rate, QoS 0 to 7 Frame Count/Rate QoS Counter Setting: QoS target is IPv4 (ToS) or VLAN tag (Priority) .		
	Packet BER Test (Option-11)	Transmitted/Received Test Frame Count, Sequence Error, Received PRBS Error Frame Count/Rate, Received PRBS Error Bit Count/Rate		
	Unframed BER Test	Bit Error Count/Rate, Pattern Sync. Loss Count/Second		
	LFS (Module Option-03)	—		Transmitted/Received RF Signal Transmitted/Received LF Signal
	Multi-flow Counter	(All Ports) settable as up to 16 bits 4 filters to count each value at a special bit in frames. (Max 255 values) 255 flow/unit counters are supported for real time count. Flow count item: Transmitted/Received Frame Count, Transmitted/Received Frame Rate, Transmitted/Received Bit Rate, Transmitted/Received Byte Count, Transmitted/Received Rate, Latency, Sequence Error		
Latency		Displayed when Test Frames received. Result includes 1s sampling value, max, min, avg. and number of samples		
Frame Arrival Time/ Latency Distribution		32 counters display result. Resolution: Frame Arrival Time: 1 µs, 10 µs, 100 µs, 1 ms, 10 ms, 100 ms, 1 s Latency Distribution: 50 ns, 100 ns, 1 µs, 10 µs, 100 µs, 1 ms, 10 ms, 100 ms		
Custom Counter		Frame Loss, Frame Loss Rate, Received bit Rate, Received Average Frame Size (byte), Service Disruption Time		
Capture	Capture Buffer*6	16 Mbytes/port		256 Mbytes/port
	Preamble Capture	On/Off		
	Capture Filter/Trigger*6	At following conditions for each port, Capture Filter/Trigger condition settings: Condition: 128-bit pattern 1 to 4, Error Only capture trigger set to following: Traffic Over, Latency Over, External Trigger, Manual Trigger		
	Decode Protocol	Ethernet (Type II, IEEE802.3, Mac Control), VLAN, MPLS, LLC, LACP, BPDU (STP, RST, MST), ARP, Ethernet OAM, IP, IPv6 (include Extended Header), IPX, OSINL, IS-IS, IGMP (include IGAP), ICMP, ICMPv6 (include NDP, MLD, MLDA) TCP, UDP, OSPF, OSPFv3,DVMRP, LDP (CR-LDP), BGP4, RIP, DHCP, RSVP (RSVP-TE), BGP4+, PIM-SMv2, PPP (include LCP, IPCP, IPV6CP, OSINLCP, MPLSCP), CiscoHDLC, MAPOS, NSP, SSP, Test Frame, Preamble (include E-PON frame), OAM (IEEE802.3), MPCP, EoPMLS		
	Extended Decode Protocol	Sniffer® Technologies (Option-04) or MX123002A Expert Analysis Module increases number of decode protocols Decode Protocol to 400 MD1230 Family includes Ethereal® Convert Function		
Protocol Emulation		Ethernet OAM (Option-28) *7, ARP, ICMP, ICMPv6 (Option-12), IGMPv2, IGMPv3, IGAP (Option-14), MLD (Option-12), MLDv2 (Option-12), MLDA (Option-22)*8		
Auto Negotiation Analysis (Option-15)		—	10B Code Data Transmitted, Auto Negotiation Sequence Capture, Link Timer Value Variable functions	—
Link Fault Signalling (Module Option-03)		—		LF, RF, User-Defined Signal Tx XGMII Signal Capture
Application Traffic Monitor (Option-20)		Support 1 ms traffic monitoring at 4 ports (4 flows max.)		—
RFC2544 Automatic Test		Following 6 types of tests supported with one layer VLAN tags. (MD1230 Family supports continuous tests [1] to [5]) [1] Throughput, [2] Latency, [3] Frame loss rate, [4] Back-to-back frames, [5] System recovery, [6] Reset		
RFC2889 Automatic Test (Option-10)		Following 10 types of tests supported.with one layer VLAN tags: [1] Fully meshed throughput, frame loss, and forwarding rate [2] Partially meshed one-to-many/many-to-one [3] Partially meshed multiple devices [4] Partially meshed unidirectional traffic [5] Congestion control [6] Forward pressure and maximum forwarding rate [7] Address caching capacity [8] Address learning rate [9] Error-frame filtering [10] Broadcast frame forwarding and latency		
Laser Safety		—	IEC60825-1: 2001: CLASS 1	IEC60825-1: 2001: CLASS 1M (10GBASE-SR)*10 IEC60825-1: 2001: CLASS 1 (10GBASE-LR)

*1: Supports link test only in 1000BASE-T half-duplex mode
*2: VLAN tag and MPLS labels cannot both be used simultaneously.
*3: When a sequence number or time stamp or hardware random pattern is used, the checksum field of the TCP/UDP packet contains an error code.
*4: Increment and Random settings can be specified for the frame size only when none is selected as the protocol.
*5: Packet fragments in the IP layer are not counted as error packets.
*6: Sometimes, when using the capture filter, captured data may be smaller than the memory buffer, depending on the frame size.
*7: Possible at port setting screen
*8: Requires IPv6 Expansion (Option-12)
*9: Sequence number is continuous in each Flow ID.
*10: Warning: It may be dangerous to look directly into the laser light when monitoring laser output using optical equipment from a distance of less than 100 mm.

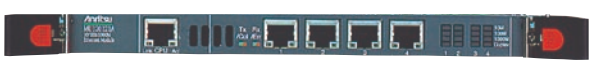
MU120131A 10/100/1000BASE-T 12 Ports

MU120132A 1000BASE-X(SFP) 8 Ports

MU120138A 10GBASE-R (SFP+) 4 Ports

• Power Protocol Module Specifications

Model		MU120121A	MU120122A
Name		10/100/1000M Ethernet Module	Gigabit Ethernet Module
Specification		Electrical: 10BASE-T, 100BASE-TX, 1000BASE-T	Electrical: 10BASE-T, 100BASE-TX, 1000BASE-T Optical: 1000BASE-SX/LX/LE/LR (depends on SFP Module)
Connector		RJ-45 (Auto MDI/MDI-X)	SFP (LC), RJ-45 (Auto MDI/MDI-X)
Number of Ports		4	SFP: 2, RJ-45: 2
Bit Rate		10, 100, 1000 Mbit/s	
Duplex Mode		Full/Half*1	Electrical: Full/Half *1, Optical: Full
Auto Negotiation		On/Off	
Flow Control		On/Off	
LED		Tx/Collision, Rx/Error, 10M, 100M, 1000M, Duplex	Electrical: Tx/Collision, Rx/Error, 10M, 100M, 1000M, Duplex Optical: Link, Tx, Rx, Error
Clock Variation		On/Off, Resolution 1 ppm, –100 to +100 ppm Clock Accuracy: ±4 ppm	
Clock Measurement		Without 10BASE-T, Accuracy: ±4 ppm	
Mode		Normal, Monitor, Through (port 1 and port 2, port 3 and port 4), Address Swap, Traffic Impairment Emulator (Option-17)*2	
Link Up/Down		Manual On/Off	
Frame Generation (Tx Stream)			
Streams		256/Port	
	Stream Setting	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)	
	Frames per Burst	1 to 16,777,215	
	Bursts per Stream	1 to 1,099,511,627,775	
Gap Setting	Inter Frame Gap	Electrical: 1000BASE-T: Resolution of 8 ns, 80 ns to 120 s settable as Fixed or Random 100BASE-TX: Resolution of 80 ns, 800 ns to 1200 s settable as Fixed or Random 10BASE-T: Resolution of 800 ns, 8 µs to 12000 s settable as Fixed or Random Optical: Resolution of 8 ns, 64 ns to 120 s settable as Fixed or Random	
	Inter Burst Gap	Electrical: 1000BASE-T: Resolution of 8 ns, 80 ns to 120 s settable as Fixed, 100BASE-TX: Resolution of 80 ns, 800 ns to 1200 s settable as Fixed, 10BASE-T: Resolution of 800 ns, 8 µs to 12000 s settable as Fixed Optical: Resolution of 8 ns, 64 ns to 120 s settable as Fixed	
	Inter Stream Gap		
Frame Setting		Preamble Size: 4 bytes to 255 bytes	Preamble Size: Electrical: 4 bytes to 255 bytes, Optical: 2 bytes to 255 bytes
		MAC Address: Fixed, Increment, Decrement, or Random (Changeable part specified in 4-bit units) VLAN tag*3 Up to 10 layer VLAN tags appended. VLAN ID settable to Increment, Decrement, or Random MPLS label*3 Up to 10 MPLS labels appended. Fixed setting Protocol Editing: None, ARP, IPv4, IGMP/IPv4, ICMP/IPv4, TCP/IPv4, UDP/IPv4, RIP/UDP/IPv4, DHCP/UDP/IPv4, IPv6, IPX, IS-IS, MAC Control Frame (Pause Frame) Support by IPv6 Expansion (Option-12): ICMPv6/IPv6, TCP/IPv6, UDP/IPv6, IPv6 over IPv4, ICMPv6/IPv6 over IPv4, TCP/IPv6 over IPv4, UDP/IPv6 over IPv4 Supported by PIM-SMv2 Protocol (Option-21): PIM Register Message Supported by MLDA Protocol (Option-22): ICMPv6 MLDA Type Message Supported by Spanning Tree/Link Aggregation (Option-23): STP Configuration BPDU, STP TCN BPDU, RST BPDU, MST BPDU, LACPDU, Marker PDU, Marker Response PDU IPv4/IPv6: IP Destination/Source Address independently set to Fixed, Increment, Decrement, or Random TCP/UDP: Either Destination Port Number or Source Port Number set to Increment or Random Data Field: Set any parts of data field as All 0, All 1, Alternate1/0 (Each Bit, Each 2 Bits, Each 4 Bits, Each 1 byte, Each 2 bytes), Increment, Decrement, or Random Only Data Field 1 settable to Programmable, Single PRBS9, Time Stamp*4, Sequence Number*4, Hardware Random Pattern*4, Test Frame. settable Flow ID number when Test Frame used. Programmable Header Pattern: One user-defined pattern settable Supported by Ethernet OAM (Option-28): CCM, LBR, LBM, LTR, LTM, AIS, LCK, TST, APS, MCC, LMR, LMM, 1DM, DMR, DMM, EXR, EXM, VSR, VSM Each captured frame can be sent as Tx Stream.	
Frame Size		48 bytes to 10,000 bytes, settable as Auto, Fixed, Increment*5, or Random*5	
Error Insertion	Ethernet	FCS Error, Undersize, Oversize, Fragment, Oversize & FCS Error Electrical: Dribble Bit Error, Alignment Error, Collision, Optical: Line Error (8B/10B Code Error, Running Disparity Error)	
	IP	IPv4 Header Checksum Error	
	TCP/UDP	TCP/UDP Checksum Error	
	Data (Option-11)	PRBS Error	
Unframed BER Setting		Test Pattern (Electrical): All 0, All 1, User 16, PRBS23, PRBS31 Test Pattern (Optical): All 0, All 1, User 16, PRBS23, PRBS31, CJPAT, CRPAT Error Insertion: Bit All Insertion Timing: Single, Rate (1.0E-9, 1.0E-8, 1.0E-7, 1.0E-6, 1.0E-5, 1.0E-4, 1.0E-3), Programmable Rate (1.0E-10 to 9.9E-3)	
Fragment Tool		Stream ID: 1 to 255, All, MTU: 1 byte to 9936 bytes Number of datagrams: 1 to 127 Initial Identification: 0x0000 to 0xffff (IPv4), 0x00000000 to 0xffffffff (IPv6) Increment Identification: On/Off	



MU120121A 10/100/1000BASE-T 4 Ports

MU120122A 10/100/1000BASE-T, X (SFP) -2 pairs of ports

Model		MU120121A	MU120122A
Measurement Function			
Counter	Ethernet	Transmitted/Received Frame Count, Transmitted/Received Frame Rate, Transmitted/Received Bit Rate, Transmitted/Received Byte Count, Transmitted/Received Rate, FCS Error, Undersize, Fragment, Oversize, Oversize & FCS Error, Line Error, MAC Control Frame, Transmitted/Received ARP Request, Transmitted/Received ARP Reply, Transmitted/Received Protocol Frame	
		Dribble Bit Error, Alignment Error, Collision	Electrical: Dribble Bit Error, Alignment Error, Collision Optical: Byte Alignment Error
	Ethernet OAM (Option-28)	LOC, AIS, RDI (shared resolution: 0.1 ms)	
	IPv4	Transmitted/Received IPv4 Packet Count, Transmitted/Received IPv4 Packet Rate, Transmitted/Received Ping Request, Transmitted/Received Ping Reply, IP Header Checksum Error	
	IPv6 (Option-12)	Transmitted/Received IPv6 Packet Count, Transmitted/ Received IPv6 Packet Rate, Transmitted/Received ICMPv6 (NS) Count, Transmitted/Received ICMPv6 (NA) Count, Transmitted/Received ICMPv6 (Echo Request) Count, Transmitted/Received ICMPv6 (Echo Reply) Count	
	TCP/UDP	Received TCP Packet Count, Received TCP Packet Rate, Received UDP Packet Count, Received UDP Packet Rate, TCP Checksum Error*6, UDP Checksum Error*6	
	Data	Capture Trigger, Capture Filter, User-Defined 1 Count/Rate, User-Defined 2 Count/Rate, QoS 0 to 7 Frame Count/Rate QoS Counter Setting: QoS target is IPv4 (ToS) or VLAN tag (Priority) .	
	Packet BER Test (Option-11)	Transmitted/Received Test Frame Count, Sequence Error, Received PRBS Error Frame Count/Rate, Received PRBS Error Bit Count/Rate	
	Unframed BER Test	Bit Error Count/Rate, Pattern Sync. Loss Count/Second	
	Traffic Impairment Emulator (Option-17)	(Ports 1 and 2 only) Impairment Filter Frame/Byte, Lost Frame, Unavoidably Dropped Frame, Passage Delay (0.001 ms units)	
	Multi-flow Counter	(Port 1, 2 only) settable as up to 16 bits filter to count each value at a special bit in frames. (Max 65,536 values) 32 of 65,536 counters are supported for real time count. Flow count item: Transmitted/Received Frame Count	
Latency		Displayed when Test Frames received. Result includes 1s sampling value, max, min, avg. and number of samples	
Frame Arrival Time/ Latency Distribution		32 counters display result Resolution: Frame Arrival Time: 1 µs, 10 µs, 100 µs, 1 ms, 10 ms, 100 ms, 1 s Latency Distribution: 50 ns, 100 ns, 1 µs, 10 µs, 100 µs, 1 ms, 10 ms, 100 ms	
Custom Counter		Frame Loss, Frame Loss Rate, Received bit Rate, Received Average Frame Size (byte), Service Disruption Time	
Capture	Capture Buffer*7	64 Mbytes/port	
	Preamble Capture	On/Off	
	Capture Filter/Trigger*7	At following conditions for each port, Capture Filter/Trigger condition settings: Condition: 128-bit pattern × 4, Error Only capture trigger set to following: Traffic Over, Latency Over, External Trigger, Manual Trigger	
	Decode Protocol	Ethernet (Type II, IEEE802.3, Mac Control), VLAN, MPLS, LLC, LACP, BPDU (STP, RST, MST), ARP, Ethernet OAM, IP, IPv6 (include Extended Header), IPX, OSINL, IS-IS, IGMP (include IGAP), ICMP, ICMPv6 (include NDP, MLD, MLDA) TCP, UDP, OSPF, OSPFv3, DVMRP, LDP (CR-LDP), BGP4, RIP, DHCP, RSVP (RSVP-TE), BGP4+, PIM-SMv2, PPP (include LCP, IPCP, IPV6CP, OSINLCP, MPLSCP), CiscoHDLC, MAPOS, NSP, SSP, Test Frame	
	Extended Decode Protocol	Sniffer ® Technologies (Option-04) or MX123002A Expert Analysis Module increases number of decode protocols to 400 MD1230 Family includes Ethereal ® Convert Function	
Protocol Emulation		Ethernet OAM (Option-28)*8, ARP, ICMP, OSPF (Option-07), BGP-4, ICMPv6 (Option-12), OSPFv3 (Option-18)*9, BGP4+ (Option-19)*9, IGMPv2, IGMPv3, IGAP (Option-14), MLD (Option-12), MLDv2 (Option-12), MLDA (Option-22)*9, PIM-SMv2 (Option-21)*10, MPLS (LDP/CR-LDP) (Option-08), MPLS (RSVP-TE) (Option-09), PPPoE (Option-26)	
Auto Negotiation Analysis (Option-15)		—	10B Code Data Transmitted, Auto Negotiation Sequence Capture, Link Timer Value Variable functions
Application Traffic Monitor (Option-20)		Support 1 ms traffic monitoring at 4 ports (4 flows max.)	
Traffic Impairment Emulator (Option-17)		Following effects can be added (only using full duplex mode) Frame Loss, Overwrite/Error*11, Delay, Line Error Delay: Fixed Delay: 500-ms range: 0.01 ms to 512 ms (Step: 0.01 ms), ±256 ns (guaranteed bandwidth: 1000 Mbps) 5-s range: 0.1 ms to 5120.0 ms (Step: 0.1 ms), ±2560 ns (guaranteed bandwidth: 100 Mbps) 50-s range: 1 ms to 51200 ms (Step: 1 ms), ±25600 ns (guaranteed bandwidth: 10 Mbps) Delay Variation: Uniform, Normal, Exponential, User defined	
RFC2544 Automatic Test		Following 6 types of tests supported with one layer VLAN tags. (MD1230 Family supports continuous tests [1] to [5]) [1] Throughput, [2] Latency, [3] Frame loss rate, [4] Back-to-back frames, [5] System recovery, [6] Reset	
RFC2889 Automatic Test (Option-10)		Following 10 types of tests supported.with one layer VLAN tags: [1] Fully meshed throughput, frame loss, and forwarding rate [2] Partially meshed one-to-many/many-to-one [3] Partially meshed multiple devices [4] Partially meshed unidirectional traffic [5] Congestion control [6] Forward pressure and maximum forwarding rate [7] Address caching capacity [8] Address learning rate [9] Error-frame filtering [10] Broadcast frame forwarding and latency	
Laser Safety		—	IEC60825-1: 2001: CLASS 1

∗1: Supports link test only in 1000BASE-T half-duplex mode.
∗2: Port 1 and 2 can be selected only for the Traffic Impairment Mode when Impairment is chosen at the Setup Utility.
∗3: VLAN tag and MPLS labels cannot be used simultaneously.
∗4: When a sequence number or time stamp or hardware random pattern is used, the checksum field of the TCP/UDP packet contains an error code.
∗5: Increment and Random settings can be specified for the frame size only when none is selected as the protocol.
∗6: Fragmented packets in the IP layer are not counted as error packets.
∗7: Sometimes, when using the capture filter, captured data may be smaller than the memory buffer, depending on the Frame size.
∗8: Possible at port setting screen
∗9: Requires IPv6 Expansion (Option-12)
∗10: Requires IPv6 Expansion (Option-12) when using IPv6 addresses. Option-21 only supports IPv4 addresses.
∗11: Overwrite and Error cannot be used simultaneously.

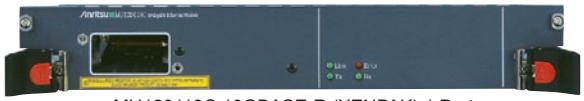
• Basic Module Specifications

Model		MU120111A	MU120112A	MU120118B/C
Name		10/100M Ethernet Module	Gigabit Ethernet Module	10 Gigabit Ethernet Module
Specification		10BASE-T, 100BASE-TX	1000BASE-SX/LX/LH/ZX/T (depends on GBIC Module)	10GBASE-SR/LR/ER (depends on XENPAK Module)
Connector		RJ-45	GBIC (SC, RJ-45)	XENPAK (SC)
Number of Ports		8	2	2 (MU120118B), 1 (MU120118C)
Bit Rate		10, 100 Mbit/s	1000 Mbit/s	10 Gbit/s
Duplex Mode		Full/Half	Full	
Auto Negotiation		On/Off		—
Flow Control		On/Off		
LED		Link, Tx/Collision, Rx/Error	Link, Tx, Rx, Error	
Mode		Normal, Monitor, Through*1, Address Swap*2		Normal, Monitor, Through
Optical Output		—	On/Off	
Frame Generation (Tx Stream)				
Streams		256/Port		
	Stream Setting	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)		
	Frames per Burst	1 to 16,777,215		1 to 1,099,511,627,775
	Bursts per Stream	1 to 1,099,511,627,775		
Gap Setting	Inter Frame Gap	10BASE-T: Resolution of 800 ns, 8 µs to 1700s settable as Fixed or Random. 100BASE-TX: Resolution of 80 ns, 800 ns to 170 s settable as Fixed or Random.	Resolution of 8 ns, 64 ns to 120 s settable as Fixed or Random	Resolution of 0.8 ns, 7.2 ns to 120 s settable as Fixed or Random
	Inter Burst Gap	10BASE-T: Resolution of 800 ns, 8 µs to 1700s settable as Fixed. 100BASE-TX: Resolution of 80 ns, 800 ns to 170 s settable as Fixed.	Resolution of 8 ns, 64 ns to 120 s settable as Fixed	Resolution of 0.8 ns, 7.2 ns to 120 s settable as Fixed
	Inter Stream Gap			Resolution of 0.8 ns, 9.6 ns to 120 s settable as Fixed
Frame Setting		Preamble Size: 4 bytes to 255 bytes	Electrical: Preamble Size: 2 bytes to 255 bytes, Optical: Preamble Size: 3 bytes to 255 bytes	Preamble Size: 2 bytes to 255 bytes
		MAC Address: Fixed, Increment, Decrement, Random (Changeable part specified in 4-bit units) VLAN tag*3: 1 layer VLAN tag appended. VLAN ID set to Increment, Decrement, or Random MPLS label*3 Up to 10 MPLS labels appended. Fixed setting Protocol Editing: None, ARP, IPv4, IGMP/IPv4, ICMP/IPv4, TCP/IPv4, UDP/IPv4, RIP/UDP/IPv4, DHCP/UDP/IPv4, IPv6, IPX, IS-IS, MAC Control Frame (Pause Frame) Supported by IPv6 Expansion (Option-12) : ICMPv6/IPv6, TCP/IPv6, UDP/IPv6, IPv6 over IPv4, ICMPv6/IPv6 over IPv4, TCP/IPv6 over IPv4, UDP/IPv6 over IPv4 Supported by PIM-SMv2 Protocol (Option-21) : PIM Register Message Supported by MLDA Protocol (Option-22) : ICMPv6 MLDA Type Message Supported by Spanning Tree/Link Aggregation (Option-23) : STP Configuration BPDU, STP TCN BPDU, RST BPDU, MST BPDU, LACPDU, Marker PDU, Marker Response PDU IPv4/IPv6: IP Destination/Source Address independently set to Fixed, Increment, Decrement, or Random TCP/UDP: Either Destination Port Number or Source Port Number set Increment, or Random Data Field: Set any parts of data field as All 0, All 1, Alternate1/0 (Each Bit, Each 2 Bits, Each 4 Bits, Each 1 byte, Each 2 bytes), Increment, Decrement, or Random Only Data Field 1 settable to Programmable, Single PRBS9, Hardware Random Pattern*4, *5, Time Stamp*5, Sequence Number*5 or Test Frame Programmable Header Pattern: One user defined pattern settable Supported by Ethernet OAM (Option-28) : CCM, LBR, LBM, LTR, LTM, AIS, LCK, TST, APS, MCC, LMR, LMM, 1DM, DMR, DMM, EXR, EXM, VSR, VSM Each captured frame can be sent as Tx Stream.		
Frame Size		18 bytes to 10,000 bytes (settable as Auto, Fixed, Increment*6, or Random*6)	48 bytes to 65,280 bytes (settable as Auto, Fixed, Increment*6, or Random*6)	
Error Insertion	Ethernet	FCS Error, Undersize, Oversize, Fragment, Oversize & FCS Error		
		Dribble Bit Error, Alignment Error, Collision	—	
	IP	IPv4 Header Checksum Error		
	TCP/UDP	TCP/UDP Checksum Error		
	Data (Option-11)	PRBS Error		
Unframed BER Setting*7		Test Pattern: All 0, All 1, User 16, PRBS23, PRBS31	Test Pattern: All 0, All 1, User 16, PRBS23, PRBS31, CJPAT, CRPAT	
		Error Insertion: Bit All		Error Insertion: Bit All, Bit All Lane 0 to 3
		Insertion Timing: Single, Rate (1.0E-9,1.0E-8, 1.0E-7, 1.0E-6, 1.0E-5, 1.0E-4, 1.0E-3), Programmable Rate (1.0E-10 to 9.9E-3)		
Fragment Tool		Stream ID: 1 to 255, All, MTU: 1 byte to 9936 bytes Number of datagrams: 1 to 127 Initial Identification: 0x0000 to 0xffff (IPv4), 0x00000000 to 0xffffffff (IPv6), Increment Identification: On/Off		

MU120111A 10/100BASE-T 8 Ports

MU120112A 1000BASE-X(GBIC) 2 Ports

MU120118B 10GBASE-R (XENPAK) 2 Ports



MU120118C 10GBASE-R (XENPAK) 1 Port

Model		MU120111A	MU120112A	MU120118B/C
Measurement Function				
Counter	Ethernet	Transmitted/Received Frame Count, Transmitted/Received Frame Rate, Transmitted/Received Bit Rate, Transmitted/Received Byte Count, Transmitted/Received Rate, FCS Error, Undersize, Fragment, Oversize, Oversize & FCS Error, MAC Control Frame, Transmitted/Received ARP Request, Transmitted/Received ARP Reply		
		Dribble Bit Error, Alignment Error, Line Error, Collision	Byte Alignment Error, Line Error	—
	IPv4	Transmitted/Received IPv4 Packet Count, Transmitted/Received IPv4 Packet Rate, Transmitted/Received Ping Request, Transmitted/Received Ping Reply, IP Header Checksum Error		
	IPv6 (Option-12)	Transmitted/Received IPv6 Packet Count, Transmitted/ Received IPv6 Packet Rate, Transmitted/Received ICMPv6 (NS) Count, Transmitted/Received ICMPv6 (NA) Count, Transmitted/Received ICMPv6 (Echo Request) Count, Transmitted/Received ICMPv6 (Echo Reply) Count		
	TCP/UDP	Received TCP Packet Count, Received TCP Packet Rate, Received UDP Packet Count, Received UDP Packet Rate, TCP Checksum Error*8, UDP Checksum Error*8		
	Data	Capture Trigger, Capture Filter, User-Defined 1 Count/Rate, User-Defined 2 Count/Rate, QoS 0 to 7 Frame Count/Rate QoS Counter Setting: QoS target is IPv4 (ToS) or VLAN tag (Priority) .		
	Packet BER Test (Option-11)	Transmitted/Received Test Frame Count, Sequence Error, Received PRBS Error Frame Count/Rate, Received PRBS Error Bit Count/Rate		
	Unframed BER Test*7	Bit Error Count/Rate, Pattern Sync. Loss Count/Second		When XENPAK Test (Option-13) is installed: Bit Error Count/Rate, Pattern Sync. Loss Count/Second, Lane 0 to 3 Bit Error Count/Rate, Lane 0 to 3 Pattern Sync. Loss Count/Second
	LFS (Option-16)	—		Transmitted/Received RF Signal Transmitted/Received LF Signal
Latency		Displayed when Test Frames received. Result includes 1s sampling value, max, min, avg. and number of samples		
Frame Arrival Time		32 counters indicate results. Resolution: 1 µs, 10 µs, 100 µs, 1 ms, 10 ms, 100 ms, 1 s		
Custom Counter		Frame Loss, Frame Loss Rate, Received bit Rate, Received Average Frame Size (byte), Service Disruption Time		
Capture	Capture Buffer*9	8 Mbytes/port	32 Mbytes/port	256 Mbytes/port
	Capture Filter/Trigger*9	At following conditions for each port, Capture Filter/Trigger condition settings: Condition: Destination MAC Address, Source MAC Address, 128-bit pattern × 2, Error Only capture trigger set to following: Traffic Over, Latency Over, External Trigger, Manual Trigger		
	Decode Protocol	Ethernet (Type II, IEEE802.3, Mac Control), VLAN, MPLS, LLC, LACP, BPDU (STP, RST, MST), ARP, Ethernet OAM, IP, IPv6 (include Extended Header), IPX, OSINL, IS-IS, IGMP (include IGAP), ICMP, ICMPv6 (include NDP, MLD, MLDA) TCP, UDP, OSPF, OSPFv3, DVMRP, LDP (CR-LDP), BGP4, RIP, DHCP, RSVP (RSVP-TE), BGP4+, PIM-SMv2, PPP (include LCP, IPCP, IPV6CP, OSINLCP,MPLSCP), CiscoHDLC, MAPOS, NSP, SSP, Test Frame		
	Extended Decode Protocol	Sniffer® Technologies (Option-04) or MX123002A Expert Analysis Module increases number of decode protocols to 400 MD1230 Family includes Ethereal® Convert Function		
Protocol Emulation		ARP, ICMP, OSPF (Option-07), BGP-4, ICMPv6 (Option-12), OSPFv3 (Option-18)*10, BGP4+ (Option-19)*10, IGMPv2, IGMPv3, IGAP (Option-14), MLD (Option-12), MLDv2 (Option-12), MLDA (Option-22)*10, PIM-SMv2 (Option-21)*11, MPLS (LDP/CR-LDP) (Option-08), MPLS (RSVP-TE) (Option-09)		
Auto Negotiation Analysis (Option-15)		—	10B Code data transmitted function, Auto negotiation sequence capture function, Link timer value variable function	—
Link Fault Signalling (Option-16)		—		LF, RF, User-Defined Signal Tx XGMII Signal Capture
Application Traffic Monitor (Option-20)		—	Supports received bit rate analysis at 1-ms resolution for up to 2 flows per port *12	—
RFC2544 Automatic Test		Following 6 types of tests supported with one layer VLAN tag. (MD1230 Family supports continuous tests [1] to [5]) [1] Throughput, [2] Latency, [3] Frame loss rate, [4] Back-to-back frames, [5] System recovery, [6] Reset		
RFC2889 Automatic Test (Option-10)		Following 10 types of tests supported with one layer VLAN tag. [1] Fully meshed throughput, frame loss, and forwarding rate [2] Partially meshed one-to-many/many-to-one [3] Partially meshed multiple devices [4] Partially meshed unidirectional traffic [5] Congestion control [6] Forward pressure and maximum forwarding rate [7] Address caching capacity [8] Address learning rate [9] Error-frame filtering [10] Broadcast frame forwarding and latency		
Laser Safety		—	IEC60825-1: 2001: CLASS 1	IEC60825-1: 2001: CLASS 1M (10GBASE-SR)*13 IEC60825-1: 2001: CLASS 1 (10GBASE-LR/ER)

∗1: With the MU120111A, the Through mode can be used with ports 1 and 2, and with ports 5 and 6.
∗2: With the MU120111A, the Address Swap mode can be used with ports 1 and 5.
∗3: VLAN tag and MPLS labels cannot be used simultaneously.
∗4: Requires MU120118B/C
∗5: When a sequence number or time stamp or hardware random pattern is used, the checksum field of the TCP/UDP packet contains an error code.
∗6: Increment and Random settings can be specified for the frame size only when none is selected for the protocol
∗7: Only port 1 or 5 can be used for the unframed BER test on the MU120111A.
∗8: With the MU120111A, fragmented packets in the IP layer are counted as error packets. With the MU120102A and MU120118B/C, they are not counted as error packets.
∗9: Sometimes, when using the capture filter, captured data may be smaller than the memory buffer, depending on the frame size.
∗10: Requires IPv6 Expansion Option-12
∗11: Requires IPv6 Expansion Option-12 when IPv6 addresses used. Option-21 only supports IPv4 addresses.
∗12: Can measure up to 4 flows per mainframe
∗13: Warning: It may be dangerous to look directly into the laser light when monitoring laser output using optical equipment from a distance of less than 100 mm.

Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

MD1230B

Model/Order No.	Name	
	Main Frame	
MD1230B	Data Quality Analyzer	
	Standard Accessories	
J0017	Power Cord, 2.5 m*1:	1 pc
F0113	Fuse, 15 A*1:	1 pc
B0329G	Front Cover (for 3/4MW4U)*1:	1 pc
B0500A	Side Cover*1:	1 pc
Z0847A	MD1230/MP1590 Family Software CD*1, *2:	1 pc
	Plug-in Modules	
MU120111A	10/100M Ethernet Module	
MU120112A	Gigabit Ethernet Module*3	
MU120118B	10 Gigabit Ethernet Module*4	
MU120118C	10 Gigabit Ethernet Module*4	
MU120121A	10/100/1000M Ethernet Module	
MU120122A	Gigabit Ethernet Module*5	
MU120131A	10/100/1000M Ethernet Module	
MU120132A	Gigabit Ethernet Module*5	
MU120138A	10 Gigabit Ethernet Module*18	
	Options	
MD1230B-01	RS-232C Control	
MD1230B-02	GPIB Control	
MD1230B-03	Ethernet Control	
MD1230B-04	MD1230B Decode Module	
MD1230B-06	Tcl Interface*6	
MD1230B-07	OSPF Protocol	
MD1230B-08	MPLS (LDP/CR-LDP) Protocol	
MD1230B-09	MPLS (RSVP) Protocol	
MD1230B-10	RFC2889 Benchmarking Test	
MD1230B-11	Packet BER Test	
MD1230B-12	IPv6 Expansion	
MD1230B-13	XENPAK Test	
MD1230B-14	IGAP Protocol	
MD1230B-15	Auto Negotiation Analysis	
MD1230B-16	Link Fault Signalling*19	
MD1230B-17	Traffic Impairment Emulator*7	
MD1230B-18	OSPFv3 Protocol*8	
MD1230B-19	BGP4+ Protocol*8	
MD1230B-20	Application Traffic Monitor	
MD1230B-21	PIM-SMv2 Protocol	
MD1230B-22	MLDA Protocol*8	
MD1230B-23	Spanning Tree/Link Aggregation	
MD1230B-26	PPPoE	
MD1230B-28	Ethernet OAM	
MU120131A-01	Clock Measurement	
MU120131A-02	PoE	
MU120132A-01	Clock Measurement	
MU120138A-01	Clock Measurement	
MU120138A-03	Link Fault Signalling*19	
	Software	
MX123001A	Data Quality Analyzer Control Software*6	
MX123001A-05	Data Quality Analyzer Control Software (5 licenses)*6	
MX123001A-08	Data Quality Analyzer Control Software (8 licenses)*6	
MX123001A-01	Remote Control Software for MD1230A-04*9	
MX123001A-15	Remote Control Software for MD1230A-04 (5 licenses)*9	
MX123001A-18	Remote Control Software for MD1230A-04 (8 licenses)*9	
MX123002A	MD1230A Expert Analysis Module*10	
MX123003A	Remote Control Software for MX123002A*11	
MX123003A-05	Remote Control Software for MX123002A (5 licenses)*11	
MX123003A-08	Remote Control Software for MX123002A (8 licenses)*11	
	Software Options	
MX123001A-06	Tcl Interface*6	
MX123001A-07	RS-232C Control	
MX123001A-09	GPIB Control	
MX123001A-10	Ethernet Control	
	Optional Accessories	
G0105A	GBIC SX 850 nm*12	
G0106A	GBIC LX 1310 nm*12	
G0107A	GBIC LH 1310 nm*12	
G0108A	GBIC ZX 1550 nm*12	
G0124A	GBIC T(1000 BASE-T)*12	
G0181A	SFP SX 850 nm*13	
G0182A	SFP LX 1310 nm*13	
G0183A	SFP LE 1310 nm*13	
G0184A	SFP LR 1550 nm*13	
G0132	XENPAK (10GBASE-SR)*14	
G0192A	XENPAK (10GBASE-LR)*14	
G0193A	XENPAK (10GBASE-ER)*14	
G0238A	SFP+ SR 850 nm*20	
G0239A	SFP+ LR 1310 nm*20	
J1049A	Fixed Optical Attenuator (SC, 5 dB)	
J1049B	Fixed Optical Attenuator (SC, 10 dB)	
J1049C	Fixed Optical Attenuator (SC, 15 dB)	
MZ1221A	XAUI Extender *15	
MZ1222A	XENPAK Interface *16	
J1163A	XAUI Cable, 0.5 m	
J1164A	MDIO Cable, 0.5 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	
J0775B	Coaxial Cable (BNC-P620 • 3C-2WS • BNC-P620, 75 Ω), 0.5 m*17	
J0775D	Coaxial Cable (BNC-P620 • 3C-2WS • BNC-P620, 75 Ω), 2 m*17	
J0008	GPIB Cable, 2 m	
J1109B	LAN Cable (CAT5, cross), 5 m	
J1110B	LAN Cable (CAT5, straight), 5 m	
J1275	LAN Cable (CAT5E, straight), 1 m	
J1275B	LAN Cable (CAT5E, straight), 5 m	
J1275C	LAN Cable (CAT5E, cross), 1 m	
J1275D	LAN Cable (CAT5E, cross), 5 m	
Z0321A	Keyboard (PS/2)	
Z0541A	USB Mouse	
B0336C	Carrying Case (3/4MW4U, 350D)	
B0530	Carrying Case caster for B0336C	
B0533	Carrying Case	
B0448	Soft Case	
B0593A	Blank Panel	
Z0849A	MD1230 /MP1590 Family Manual CD	
W1927AE	MD1230A/B Operation Manual	
W1928AE	MX123001A Control Software Operation Manual	
W1929AE	MD1230A Remote Control Operation Manual	
W2107AE	MD1230A-04/MX123001A-01 Operation Manual	
W2122AE	MD1230A-06 Tcl Interface Operation Manual	
W2134AE	Application Traffic Monitor Operation Manual	
W2906AE	PPPoE Operation Manual	
W2108AE	MX123002A/MX123003A Operation Manual	
W1931AE	Ethernet Module Operation Manual	

∗1: Supplied with main frame
∗2: CD includes installer, release notes and operation manual and cannot be purchased separately
∗3: Requires GBIC module (sold separately) . In addition, operation with non-Anritsu modules not guaranteed.
∗4: Requires XENPAK module (sold separately) . In addition, operation with non-Anritsu modules not guaranteed.
∗5: Requires SFP modules (sold separately). In addition, operation with non-Anritsu modules not guaranteed.
∗6: MD1230B-03 not required
∗7: Only ports 1 and 2 of the MU120121A/122A support the MD1230B-17 Traffic Impairment Emulator option. Moreover, only MU120121A/122A models shipped after March 7, 2008 with the "Supports Opt.17" sticker support the option.
∗8: Requires separate MD1230B-12
∗9: Requires MD1230B-04 for main frame control. In addition, requires MX123001A for installing this software in PC.
∗10: Requires separate MD1230B-04
∗11: Requires MD1230B-04 and MX123002A for main frame control. In addition, requires MX123001A and MX123001A-01 for installing this software in PC.
∗12: GBIC modules sold as single units. Two can be mounted in MU120112A.
∗13: SFP modules sold as single units. Two can be mounted in MU120122A and eight in MU120132A.
∗14: XENPAK modules sold as single units. Two can be mounted in MU120118B and one in MU120118C.
G0192A and G0193A only supported by MU120118A/B/C units with "With APS" sticker. DO NOT install in MU120118A/B/C units without “With APS” sticker. G0192A and G0193A have “Only for APS” stickers attached.
∗15: When using XAUI extender, MZ1222A XENPAK interface, J1163A XAUI cable, and J1164A MDIO cable required along with separate external power supply (5 V, 4 A)
∗16: MZ1222A supplied by a 1.8-V APS.
∗17: Required for synchronizing time between several units. MD1230B and MP1591A use BNC connectors; J0775B/D is required for connecting BNC connectors.
∗18: Requires SFP+ module (sold separately). In addition, operation with non-Anritsu modules not guaranteed
∗19: The MD1230B-16 is supported by the MU120118B/C.
The MD120138A-03 is supported by the MU120138A.
∗20: SFP+ modules sold as single units. Four can be mounted in MU120138A.

MP1591A

∗ There are restrictions on the combination of modules in the MP1591A. See the Installed Module Combination table for the possible combinations.

Model/Order No.	Name	
	Main Frame	
MP1591A	Network Performance Tester∗1	
	Standard Accessories	
J1211	Shielded Power Cord, 3 m∗2:	2 pcs
Z0917A	LAN Cable (Shielded CAT5e), 5 m∗2:	1 pc
J1221B	RS-232C Crossover Cable∗2:	1 pc
Z0847A	MD1230/MP1590 Family Software CD∗2, ∗3:	1 pc
	Plug-in Modules	
MU159101A	Control Module	
MU159103A	Interface Module for Expansion Slot	
MU120111A	10/100M Ethernet Module	
MU120112A	Gigabit Ethernet Module∗4	
MU120118B	10 Gigabit Ethernet Module∗5	
MU120118C	10 Gigabit Ethernet Module∗5	
MU120121A	10/100/1000M Ethernet Module	
MU120122A	Gigabit Ethernet Module∗6	
MU120131A	10/100/1000M Ethernet Module	
MU120132A	Gigabit Ethernet Module∗6	
	Options	
MP1591A-50	10GbE Slot Expansion for Bank A	
MP1591A-51	10GbE Slot Expansion for Bank B	
MU159101A-07	OSPF Protocol	
MU159101A-08	MPLS (LDP/CR-LDP) Protocol	
MU159101A-09	MPLS (RSVP) Protocol	
MU159101A-10	RFC2889 Benchmarking Test	
MU159101A-11	Packet BER Test	
MU159101A-12	IPv6 Expansion	
MU159101A-13	XENPAK Test	
MU159101A-14	IGAP Protocol	
MU159101A-15	Auto Negotiation Analysis	
MU159101A-16	Link Fault Signalling	
MU159101A-17	Traffic Impairment Emulator∗7	
MU159101A-20	Application Traffic Monitor	
MU159101A-28	Ethernet OAM	
MU120131A-01	Clock Measurement	
MU120131A-02	PoE	
MU120132A-01	Clock Measurement	
	Software	
MX159001B	Network Performance Tester Control Software	
MX159001B-05	Network Performance Tester Control Software (5 licenses)	
MX159001B-08	Network Performance Tester Control Software (8 licenses)	
	Software Options	
MX159001B-01	RS-232C Control	
MX159001B-02	GPIB Control	
MX159001B-03	Ethernet Control	
	Optional Accessories	
G0105A	GBIC SX 850 nm∗8	
G0106A	GBIC LX 1310 nm∗8	
G0107A	GBIC LH 1310 nm∗8	
G0108A	GBIC ZX 1550 nm∗8	
G0124A	GBIC T (1000 BASE-T)∗8	
G0181A	SFP SX 850 nm∗9	
G0182A	SFP LX 1310 nm∗9	
G0183A	SFP LE 1310 nm∗9	
G0184A	SFP LR 1550 nm∗9	
G0132	XENPAK (10GBASE-SR)∗10	
G0192A	XENPAK (10GBASE-LR)∗10	
G0193A	XENPAK (10GBASE-ER)∗10	
J1049A	Fixed Optical Attenuator (SC, 5 dB)	
J1049B	Fixed Optical Attenuator (SC, 10 dB)	
J1049C	Fixed Optical Attenuator (SC, 15 dB)	
MZ1221A	XAUI Extender∗11	
MZ1222A	XENPAK Interface∗12	
J1163A	XAUI Cable, 0.5 m	
J1164A	MDIO Cable, 0.5 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	
J0775B	Coaxial Cable (BNC-P620 • 3C-2WS • BNC-P620, 75 Ω), 0.5 m∗13	
J0775D	Coaxial Cable (BNC-P620 • 3C-2WS • BNC-P620, 75 Ω), 2 m∗13	

Model/Order No.	Name
J0845A	Balanced Cable (BANTAM 3P/BANTAM 3P), 6 ft
J0162A	Balanced Cable (Siemens 3P- Siemens 3P), 1 m
J0162B	Balanced Cable (Siemens 3P- Siemens 3P), 2 m
J0008	GPIB Cable, 2 m
J1109B	LAN Cable (CAT5, cross), 5 m
J1110B	LAN Cable (CAT5, straight), 5 m
J1275	LAN Cable (CAT5E, straight), 1 m
J1275B	LAN Cable (CAT5E, straight), 5 m
J1275C	LAN Cable (CAT5E, cross), 1 m
J1275D	LAN Cable (CAT5E, cross), 5 m
B0571A	Blank Panel∗14
B0572A	Blank Panel∗15
B0593A	Blank Panel∗16
B0590A	Rack Flange∗17
Z0849A	MD1230 /MP1590 Family Manual CD
W2735AE	MP1591A Operation Manual
W2421AE	MX159001B Operation SDH Edition Manual
W2422AE	MX159001B Operation SONET Edition Manual
W2423AE	MP1590B/MP1591A Remote Control Operation Manual
W1928AE	MX123001A Control Software Operation Manual
W1929AE	MD1230A Remote Control Operation Manual
W1931AE	Ethernet Module Operation Manual

∗1: MU159101A and MX159001B required to control MP1591A.
∗2: Supplied with main frame
∗3: CD includes installer, release notes and operation manual and cannot be purchased separately
∗4: Requires GBIC module (sold separately). In addition, operation with non-Anritsu modules not guaranteed.
∗5: Requires XENPAK module (sold separately) . In addition, operation with non-Anritsu modules not guaranteed.
∗6: Requires SFP modules (sold separately. In addition, operation with non-Anritsu modules not guaranteed.
∗7: Only ports 1 and 2 of the MU120121A/122A support the MU159101A-17 Traffic Impairment Emulator option. Moreover, only MU120121A/122A models shipped after March 7, 2008 with the "Supports Opt.17" sticker support the option.
∗8: GBIC modules are sold as single units. Two can be mounted in MU120112A.
∗9: SFP modules are sold as single units. Two can be mounted in MU120122A and eight in MU120132A.
∗10: XENPAK modules sold as single units. Two can be mounted in MU120118B and one in MU120118C.
G0192A and G0193A only supported by MU120118A/B/C units with "With APS" sticker. DO NOT install in MU120118A/B/C units without “With APS” sticker. G0192A and G0193A have “Only for APS” stickers attached.
∗11: When using XAUI extender, MZ1222A XENPAK interface, J1163A XAUI cable, and J1164A MDIO cable required along with separate external power supply (5 V, 4 A)
∗12: MZ1222A supplied by a 1.8-V APS.
∗13: Required for synchronizing time between several units. MD1230B and MP1591A use BNC connectors; J0775B/D is required for connecting BNC connectors.
∗14: Blanking panel for MP1591A CPU slot
∗15: Blanking panel for MP1591A DCS slot
∗16: Blanking panel for MP1591A Slot 1 to Slot 16
∗17: Rack-mount kit for MP1591A

Other

• Software Upgrade Service

Model/Order No.	Name
	Software Upgrade Service
MD1230B-40	Annual Software Upgrade Service
MP1591A-40	Annual Software Upgrade Service

∗: Option for latest version of the MD1230 Family's modules and software.
MD1230B-40 must be purchased separately to use software upgrade service in second year following bundled free 1-year period from MD1230B purchase.
MP1591A-40 must be purchased separately to use software upgrade service for the first year. (MP1591A-40 not bundled free with MP1591A.)
Available for 1-year periods only and no combinations of several multi-year contracts.

• Maintenance Service

Model/Order No	Name
	Maintenance Service
***-ES210	2 Years Extended Warranty Service
***-ES310	3 Years Extended Warranty Service
***-ES510	5 Years Extended Warranty Service

∗: Extends standard 1-year warranty at purchase to 2, 3, or 5 years. Must be purchased separately when purchasing new Anritsu product.
(Cannot be purchased midway through standard 1-year warranty, at standard warranty expiry, or as combination of several multi-year contracts.)

***-ES210: MD1230B-ES210, MP1591A-ES210, MU120111A-ES210, MU120112A-ES210, MU120118B-ES210, MU120118C-ES210, MU120121A-ES210, MU120122A-ES210, MU120131A-ES210, MU120132A-ES210, MU120138A-ES210, MU159101A-ES210, MU159103A-ES210

***-ES310: MD1230B-ES310, MP1591A-ES310, MU120111A-ES310, MU120112A-ES310, MU120118B-ES310, MU120118C-ES310, MU120121A-ES310, MU120122A-ES310, MU120131A-ES310, MU120132A-ES310, MU120138A-ES310, MU159101A-ES310, MU159103A-ES310

***-ES510: MD1230B-ES510, MP1591A-ES510, MU120111A-ES510, MU120112A-ES510, MU120118B-ES510, MU120118C-ES510, MU120121A-ES510, MU120122A-ES510, MU120131A-ES510, MU120132A-ES510, MU120138A-ES510, MU159101A-ES510, MU159103A-ES510

B0336C Carrying Case

B0533 Carrying Case

B0448 Soft Case

Note

Anritsu

Specifications are subject to change without notice.

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