

**MU120119A**  
**OC-3/12 STM-1/4 (1310 nm) Module**  
**MU120120A**  
**OC-3 STM-1 (1310 nm) Module**  
**Operation Manual**

**12th Edition**

- For safety and warning information, please read this manual before attempting to use the equipment.
- Additional safety and warning information is provided within the MD1230B Data Quality Analyzer Operation Manual or MP1591A Network Performance Tester Operation Manual. Please also refer to this document before using the equipment.
- Keep this manual with the equipment.

**ANRITSU CORPORATION**

# Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Ensure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following symbols may be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

## Symbols used in manual

**DANGER** 

This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

**WARNING** 

This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

**CAUTION** 

This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

## Safety Symbols Used on Equipment and in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.



This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.



This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.



This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.



This indicates a note. The contents are described in the box.



These indicate that the marked part should be recycled.

MU120119A OC-3/12 STM-1/4 (1310 nm) Module  
MU120120A OC-3 STM-1 (1310 nm) Module  
Operation Manual

1 April 2003 (First Edition)  
1 August 2008 (12th Edition)

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Printed in Japan

## Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories, including the National Institute of Advanced Industrial Science and Technology, and the National Institute of Information and Communications Technology, and was found to meet the published specifications.

## Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within one year after shipment due to a manufacturing fault, under the condition that this warranty is void when:

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to mishandling, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding, earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation shall assume no liability for injury or financial loss of the customer due to the use of or a failure to be able to use this equipment.

## Anritsu Corporation Contact

In the event that this equipment malfunctions, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

## Notes On Export Management

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This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.

Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.

When you dispose of export-controlled items, the products/manuals need to be broken/shredded so as not to be unlawfully used for military purpose.

## Notice

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The following actions are strictly prohibited for all of the software installed in this product or otherwise provided by Anritsu:

1. Copying, except for archival purposes,
2. Transferring to a third party apart from this product,
3. Analyzing the incorporated software including but not limited to modifying, decompiling, disassembling, and reverse engineering.

# CE Conformity Marking

Anritsu affixes the CE Conformity marking on the following product(s) in accordance with the Council Directive 93/68/EEC to indicate that they conform to the EMC and LVD directive of the European Union (EU).

## CE marking



### 1. Product Model

Plug-in Modules: MU120119A OC-3/12 STM-1/4 Module (1310 nm),  
MU120120A OC-3 STM-1 Module (1310 nm)

### 2. Applied Directive and Standards

When the above modules are installed in the main frame shown below, the applied directive and standards of these modules conform to those of the main frame.

Main frame: MD1230A/B Data Quality Analyzer,  
MD1231A/A1 IP Network Analyzer,  
MT7407A Multislot Chassis  
MP1591A Network Performance Tester

PS: About main frame

Please contact Anritsu for the latest information on the main frame types that the above modules can be used with.

# C-tick Conformity Marking

Anritsu affixes the C-tick marking on the following product(s) in accordance with the regulation to indicate that they conform to the EMC framework of Australia/New Zealand.

## C-tick marking



### 1. Product Model

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MP1591A Network Performance Tester

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Please contact Anritsu for the latest information on the main frame types that the above modules can be used with.

# About This Manual

This operation manual is for MD1230 and MP1590 families.

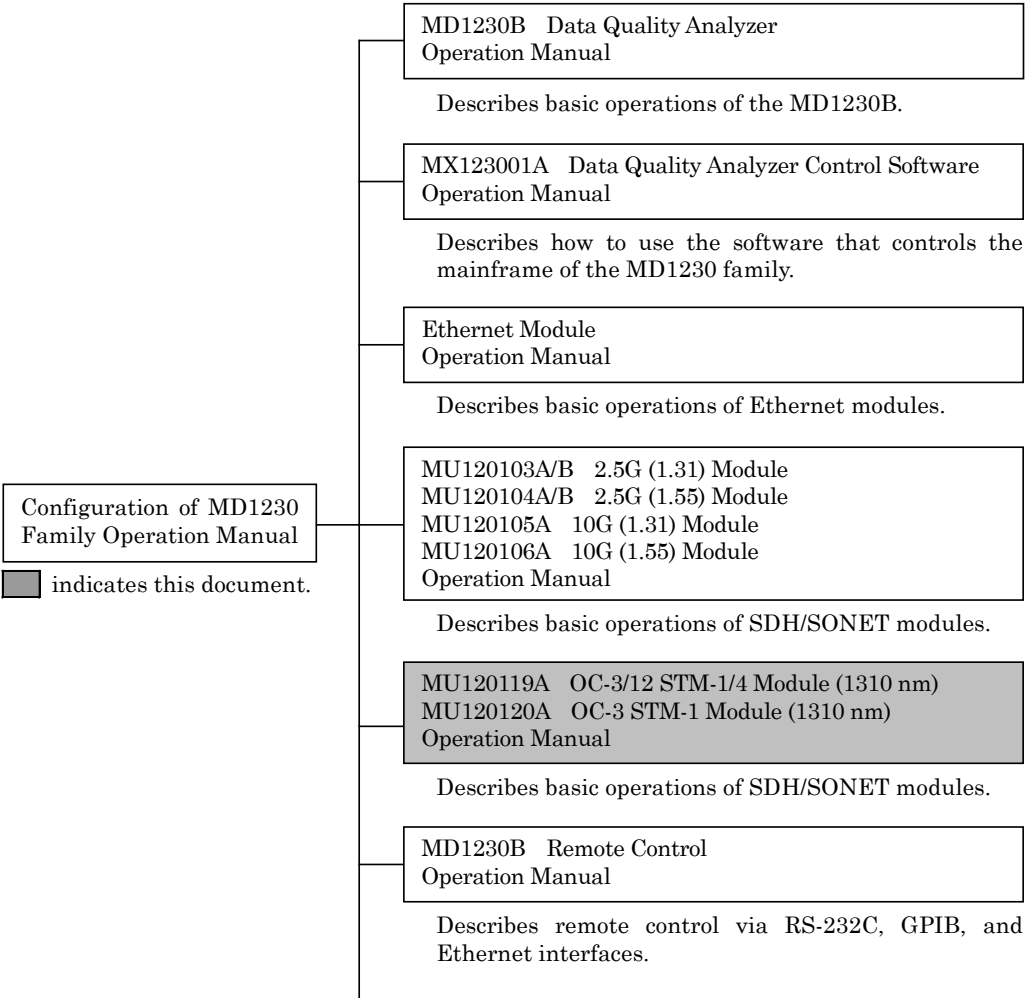
**Note:**

MD1230 family is a general name for the MD1230A/B Data Quality Analyzer, the MD1231A/A1 IP Network Analyzer, and the MT7407A Multislot Chassis.

The MP1590 family is a general name for the MP1590B Network Performance Tester and the MP1591A Network Performance Tester.

Note that the MD1230A, MD1231A/A1, and MT7407A are not supported in Ver. 7.0 and above.

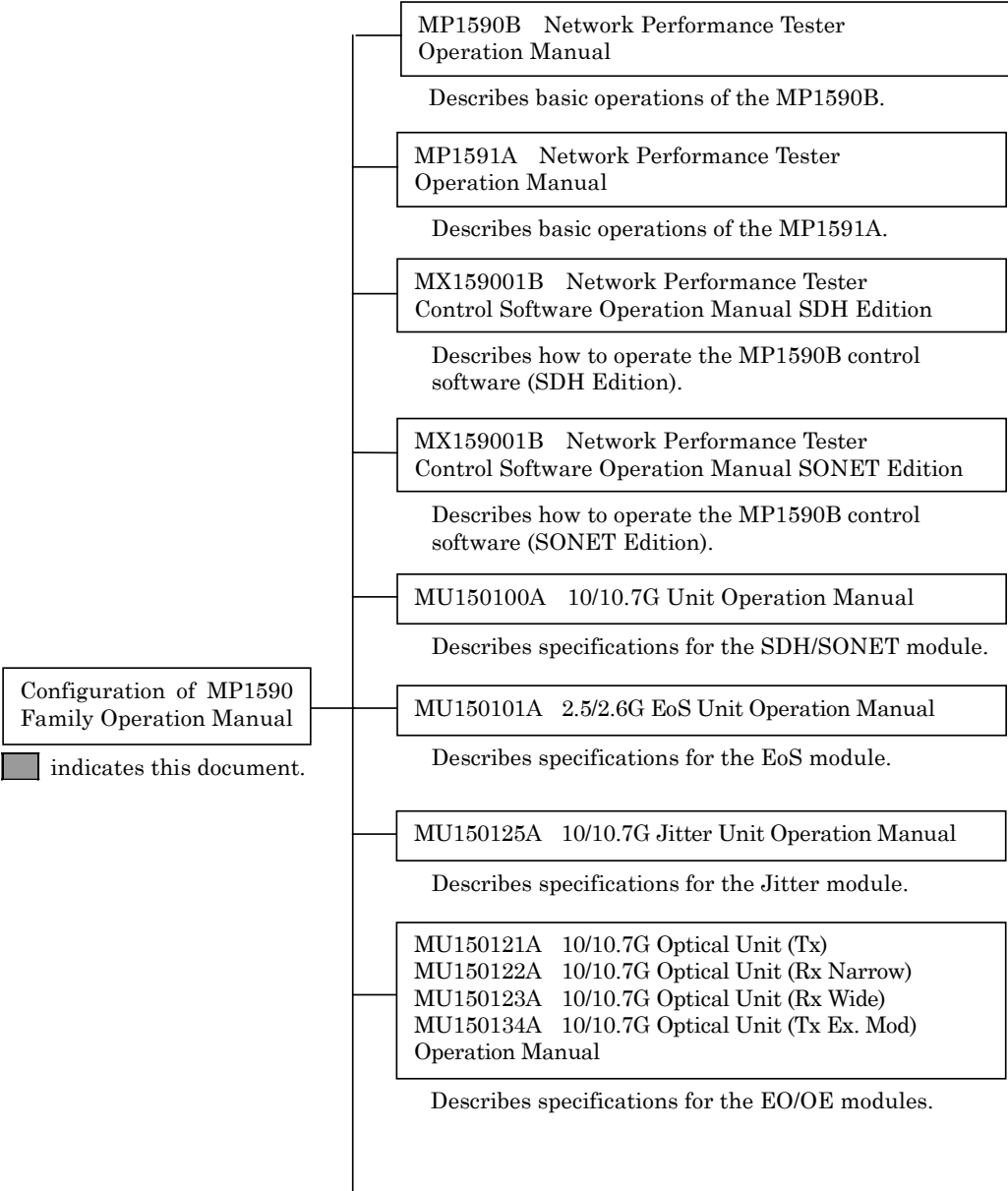
The MD1230 family operation manuals consist of separate documents for the main unit, control software, module(s), remote control operation, and options, as shown below.



	<div>Decode Module Operation Manual</div> <div>Describes basic operations of Decode modules.</div>
	<div>Tcl Interface Operation Manual</div> <div>Describes basic operations of Tcl Interface.</div>
	<div>Expert Analysis Module Operation Manual</div> <div>Describes basic operations of Expert Analysis modules.</div>
	<div>Application Traffic Monitor Operation Manual</div> <div>Describes how to operate the software for monitoring Ethernet traffic.</div>



The MP1590 family operation manuals consist of separate documents for the mainframe, module(s), control software, remote control operation, and options, as shown below.



	<p>MU150121B 10/10.7G Optical/Electrical Unit (Tx )  MU150123B 10/10.7G Optical/Electrical Unit (Rx Wide)  Operation Manual</p> <p>Describes specifications for the MU150121B/23B.</p>
	<p>MU150124B 10.3G Optical/Electrical Unit (Rx Wide)  Operation Manual</p> <p>Describes specifications for the MU150124B.</p>
	<p>Ethernet Module  Operation Manual</p> <p>Describes basic operations of Ethernet modules.</p>
	<p>MU120103A/B 2.5G (1.31) Module  MU120104A/B 2.5G (1.55) Module  MU120105A 10G (1.31) Module  MU120106A 10G (1.55) Module  Operation Manual</p> <p>Describes basic operations of SDH/SONET modules.</p>
	<p>MU120119A OC-3/12 STM-1/4 Module (1310 nm)  MU120120A OC-3 STM-1 Module (1310 nm)  Operation Manual</p>
	<p>MP1590B/MP1591A Network Performance Tester  Remote Control Operation Manual</p> <p>Describes remote control via RS-232C, GPIB, and Ethernet Interfaces.</p>
	<p>MP1590A/B-30 High Precision Jitter Analysis  Operation Manual</p> <p>Describes specifications for the MP1590A/B-30.</p>
	<p>Application Traffic Monitor  Operation Manual</p> <p>Describes how to operate the software for monitoring Ethernet traffic.</p>

This manual uses the following notations.

(1) Notation on equipment name

This manual uses the following abbreviations for the equipment names.

Full Name	Abbreviated Name
MD1230B Data Quality Analyzer	MD1230B
MP1591A Network Performance Tester	MP1591A
MU120119A OC-3/12 STM-1/4 Module (1310 nm)	156/622M Module
MU120120A OC-3 STM-1 Module (1310 nm)	156M Module

**Note:**

Note that the MD1230A, MD1231A/A1 and MT7407A are not supported in Ver. 7.0 and above.

Description in this manual shows the case of using the MD1230B.

(2) Notation on reference page

This manual indicates a related page, as below.



For details on specifications and functions, refer to the Appendix “Specifications.”

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# Section 1 Overview

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This section describes an overview of the 156/622M POS module functions.

 For specifications, refer to the Appendix “Specifications.”

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## 1.1 Product Outline

An MD1230B equipped with a 156/622M POS module can generate packets and transmit them over SONET/SDH, as well as analyze the incoming packets. Each port operates at 156M or 622M individually.

(1) Available interfaces

The modules and their available interfaces are given below.

Modules	Available interfaces (wave-length band)
MU120119A	OC-3/12, 1310 nm, single mode
MU120120A	OC-3, 1310 nm, single mode

(2) Number of ports

Each POS module has the number of ports listed below.

Modules	Number of ports/module	Max. number of modules/unit	Max. number of ports/unit	Max. number of ports for 8-unit connection
MU120119A	2	5	10	80
MU120120A	2	5	10	80



# *Section 2    Precautions Before Use*

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This section provides information to be understood before using the 156/622M POS modules. It also covers safety precautions and steps to avoid malfunctioning of the device in use. Read through this section before using the POS modules.

2.1	Installation Site Environmental Conditions .....	2-2
2.2	Connection with Device Under Test .....	2-2

## 2.1 Installation Site Environmental Conditions

The 156/622M POS modules operate normally within a temperature range of 0 to 40°C. Avoid using them under the following conditions to prevent malfunctioning:

- Excessive vibration
- Excessive moisture or dust
- Direct sunlight
- Possible influence of active gas
- Severe temperature fluctuation

### **CAUTION**

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**After using the 156/622 POS module for a long time in low temperatures, moving them to a location with higher temperatures may create dew inside the module. In this event, sufficiently dehumidify the module before turning the power On. Turning the power On when dew is present inside may cause a short circuit and damage the module.**

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## 2.2 Connection with Device Under Test

When connecting a device being tested (Device Under Test: DUT), be sure to check the input/output signal power level. Inputting a signal exceeding the ratings may destroy the internal devices resulting in a failure. Also avoid connecting output connectors to each other because it may cause failure.

# *Section 3 Description of Panel*

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This section describes the 156/622M POS module panel controls.

3.1 Description of Panel..... 3-2

### 3.1 Description of Panel

(1) MU120119A 156/622M Module (1310 nm)

The figure below shows the front panel of the 156/622M POS Module.

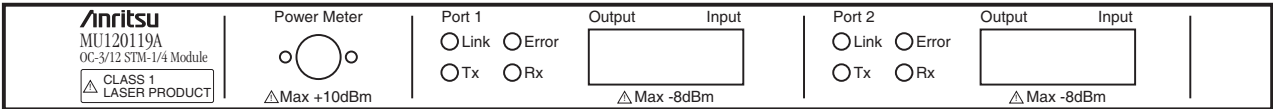


Fig. 3.1-1 156/622M POS Module

(2) MU120120A 156 Module (1310 nm)

The figure below shows the front panel of the 156 POS Module.

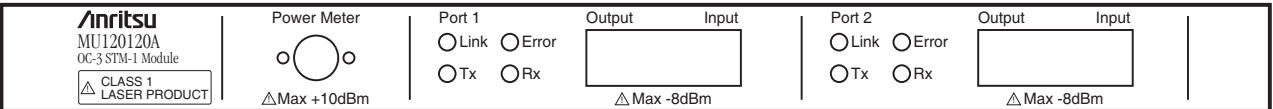



Fig. 3.1-2 156M POS Module

LED	Color	Description
Link	Green	Lit when an SDH/SONET frame has been received and LOS, LOF, or AIS alarms have not been detected. Also lit when PPP Negotiation (PPP) has succeeded.
Tx	Green	Lit when a PPP, Cisco HDLC or MAPOS frame, or a bulk pattern is being sent.
Error	Orange	Lit when an error has been detected.  For the error item detected, refer to the table on the next page.
Rx	Green	Lit when a PPP, Cisco HDLC or MAPOS frame, or a bulk pattern is being received.

The error items are listed in the table below.

Error items	PPP/Cisco HDLC/MAPOS			Bulk
	SDH/ SONET	PPP/ Cisco HDLC/ MAPOS	High Layer	SDH/SONET
FAS	○			○
Bit all	○			○
B1	○			○
B2	○			○
B3	○			○
MS-REI	○			○
HP-REI	○			○
HP IEC	○			○
Bit info. Error				○
Oversize/Undersize Error		○		
FCS Error		○		
Oversize & FCS Error		○		
Fragments		○		
IP Header checksum Error			○	
TCP/UDP checksum Error			○	



Appendix A   Specifications .....   A-1





## Appendix A Specifications

### A. Specifications

MU120119A

Item	Specifications
Model name	MU120119A
Apparatus name	OC-3/12 STM-1/4 Module (1310 nm)
Composition	Module×1
Options	MU120119A-01: Optical Power Meter
Interface	
Corresponding Specification	OC-3/STM-1 OC-12/STM-4
Connector	SC
Number of Ports	2
Bit Rate	155.52 Mbit/s (NRZ) / 622.08 Mbit/s (NRZ)
Clock	Internal ( $\pm 50$ ppm Variable), Receive, Lock (64 kHz +8 kHz, 1.5 MHz, 2MHz, 1.5 Mbit/s, 2 Mbit/s)
Wavelength	1,274 to 1,356 nm
Output Level (PRBS23 average power)	-15 to -8 dBm
Extinction Ratio	8.2 dB over
Pulse Mask	Compliant with Bellcore TR-NWT-000253 and ITU-T recommendation G.957
Input Sensitivity	-28 to -8 dBm
Laser Safety	21 CFR 1040.10:1995 CLASS I IEC60825-1:2001 CLASS 1
LED	Link, Tx, Rx, Error

MU120119A(Cont'd)

Item	Specifications
SONET/SDH Setting	
Frame Mapping	SONET/SDH OC-12c/STM-4c - VC4*4c - PPP OC-12c/STM-4c - VC4*4c - CiscoHDLc OC-12c/STM-4c - VC4*4c - MAPOS Version1 OC-12c/STM-4c - VC4*4c - MAPOS 16 OC-12c/STM-4c - VC4*4c - Bulk OC-3c/STM-1 - VC4 - PPP OC-3c/STM-1 - VC4 - CiscoHDLc OC-3c/STM-1 - VC4 - MAPOS Version1 OC-3c/STM-1 - VC4 - MAPOS 16 OC-3c/STM-1 - VC4 - Bulk Unframed
OH Preset	SOH: All byte except B1, B2, H1, H2, H3, K1, K2 POH: All byte except B3 Path Trace: J0, J1 (CRC7, Trace on)
Alarm Addition	LOS, LOF, AIS-L/MS-AIS, RDI-L/MS-RDI, TIM-L/MS-TIM, AIS-P/AU-AIS, LOP-P/AU-LOP, RDI-P/HP-RDI, PLM-P/HP-SLM, TIM-P/HP-TIM, UNEQ-P/HP-UNEQ
Alarm Addition Timing	Single, Single Burst Frame (Burst Size: 1 to 64,000), Alternative (Alarm Frame: 0 to 8,000, Normal Frame: 1 to 8,000), All
Error Insertion	FAS, B1, B2, B3 REI-P/MS-REI, REI-P/HP-REI, HP-IEC, Bit All, Bit Info
Error Insertion Timing	Single, Single Burst Bit (Burst Size: 1 to 64,000), Rate (1.0E-9, 1.0E-8, 1.0E-7, 1.0E-6, 1.0E-5, 1.0E-4, 1.0E-3), Programmed Rate (A*B   A: 1.0 to 9.9, B: 3 to 10), All
K1, K2	Conform to G.783 or G.841
Pointer	AU pointer NDF: 0000 to 1111 SS: 00 to 11 Pointer: 0 to 1023 +Justification, -Justification
APS Sequence Generation	K1/K2: 2 to 64 Words, Repeat 1 to 8000 Frame/Word, Single or Repeat Generation.

## MU120119A(Cont'd)

Item	Specifications
Port Setting	
IPv4	IPv4 Address, Netmask, Gateway
This port	
ICMP Echo(PING) Reply	Not send, Reply to this port ping request
PPP	Scramble: On/Off Descramble: On/Off Minimum Flag Length: 1 byte/2 byte FCS: 32bit Negotiation: On/Off, Restart, Retry, Abort, Max-Receive-Unit(default1500), Magic-number (random) , IPCP(Send this port IP address), Default, Time out
Mode	Normal, Monitor, Through(with or without OH Overwrite)
Stream	
Number of Streams	256 Streams/Port
Stream Setting	
Distribution	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 per Burst	1 to 1,099,511,627,775
Burst per Stream	1 to 1,099,511,627,775
Frame View	Raw Frame, Decoded
Gap Setting	
Inter Frame Gap	155M: Resolution of 53.4 ns, 53.4 ns to 120 s Settable as Fixed or Random* <sup>1</sup> 622M: Resolution of 13.4 ns, 13.4 ns to 120 s Settable as Fixed or Random* <sup>1</sup>
Inter Burst Gap	155M: Resolution of 53.4 ns, 53.4 ns to 120 s Settable as Fixed. 622M: Resolution of 13.4 ns, 13.4 ns to 120 s Settable as Fixed.
Inter Stream Gap	155M: Resolution of 53.4 ns, 427.4 ns to 120 s Settable as Fixed. 622M: Resolution of 13.4 ns, 106.8 ns to 120 s Settable as Fixed.

\*1: To select the Random setting for the inter-frame gap, the frame length must be 64 bytes or more.

MU120119A(Cont'd)

Item	Specifications
Frame Setting	<p>FCS: CRC32</p> <p>MPLS label: Up to 10 MPLS labels can be appended. Fixed setting.</p> <p>Protocol Editing: None, IPv4, TCP/IPv4, UDP/IPv4, IGMP/IPv4, ICMP/IPv4, RIP/UDP/IPv4, DHCP/UDP/IPv4, IPv6, IS-IS</p> <p>IPv4/IPv6: IP Destination/Source Address can be set Fixed, Increment, Decrement, Random Independently. <sup>*2</sup></p> <p>TCP/UDP: Either Destination Port Number or Source Port Number can be set Increment, Random.</p> <p>Data Field: Can set any portions of Data Field as All 0, All 1, Alternate1/0 (Each bit, Each 2bit, Each 4bits, Each 1 byte, Each 2 bytes), Increment, Decrement, Random, Single PRBS9.</p> <p>Only Data Field 1 can set Programmable, Time Stamp<sup>*3</sup>, Sequence Number<sup>*3</sup>Test Frame.</p> <p>Programmable Header Pattern: 1 user defined Pattern can be set.</p>
Frame Size	<p>8 to 65,535 byte</p> <p>Settable as Auto, Fixed, Increment<sup>*4</sup> or Random<sup>*4</sup></p>

<sup>\*2</sup>: For IPv6, any Increment, Decrement, or Random setting can be specified for bit widths 1 to 32. Also, only either the destination or Source Address can be selected.

<sup>\*3</sup>: When a sequence number or Time Stamp is used, the checksum field of the TCP/UDP packet contains an error code.

<sup>\*4</sup>: Increment and Random settings can be specified for the Frame Size only when None is selected for the protocol.

## MU120119A(Cont'd)

Item	Specifications
OH Setting PPP/Cisco HDLC /MAPOS Version 1 /MAPOS 16	Address: FFh (User defined) Cisco HDLC: 0Fh MAPOS Version 1: 03h Control: 03h (User defined) Cisco HDLC: 00h MAPOS Version 1: 03h Address MAPOS16: 00003h When MAPOS16 then Address field is 16 bit and Control field is 0 bit Protocol: 16 bit User defined (default 0021) FCS: Auto
Protocol Setting IPv4 (RFC0791)	Version: 4 (DEC) IHL: Auto Type of service: User defined (initial 00(hex)) Bit0 to 2 (Precedence): 111-Network control 110-Internetwork control 101-CRITIC/ECP 100-Flash override 011-Flash 010-Immediate 001-Priority 000-Routine Bit3: 0 = Normal delay, 1 = Low delay Bit4: 0 = Normal throughput, 1 = High throughput Bit5: 0 = Normal Reliability, 1= High Reliability Bit6 to 7: 2 bit User defined Total Length: Auto Identification: User defined (4 byte) Flag: User defined (initial 010(b)) Bit0: User defined Bit1: (DF) 0 = May Fragment, 1= Don't Fragment Bit2: (MF) 0 = Last Fragment, 1= More Fragment Fragment offset: 0 to 8191(DEC) user defined (initial 0) Time to Live: from 0 to 255 (DEC) user defined (initial 64) Protocol: 0 to 255 (DEC) user defined (initial 0) Automatically set if TCP or UDP is selected. Header Checksum: Auto Source Address: Static, Increment, Decrement, Random with class and mask setting Destination Address: Static, Increment, Decrement, Random with class and mask setting Option: 0 to 40byte

MU120119A(Cont'd)

Item	Specifications
IPv6 (RFC2460)	<p>Version (4 bit): 6</p> <p>Traffic class (8 bit): 0-uncharacterized traffic 1-"filler" traffic 2-unattended data transfer 3-reserved 4-attended bulk transfer 5-reserved 6-interactive traffic 7-internet control traffic</p> <p>Flow Label (20 bit): 20 bit user defined (initial all 0)</p> <p>Payload Length (16 bit): Auto</p> <p>Next Header (8 bit): 0 to 255 (DEC) user defined (initial 59)</p> <p>Hop Limit (8 bit): 0 to 255 user defined (initial 0)</p> <p>Source Address (128 bit): Static, Increment, Decrement, Random with class and mask setting (byte mask)</p> <p>Destination Address (128 bit): Static, Increment, Decrement, Random with class and mask setting (byte mask)</p>
TCP (RFC0793)	<p>Source Port (16 bit): User defined, 0 to 65535</p> <p>Destination Port (16 bit): User defined, 0 to 65535</p> <p>Sequence Number (32 bit): User defined</p> <p>Acknowledgement Number(32 bit): User defined, 0000 to FFFF</p> <p>Data offset (4 bit): Set to 5</p> <p>Reserved (6 bit): User defined, 0 to 63</p> <p>Control bit (6 bit): User Defined, Setting by bit</p> <p>Window (16 bit): User defined, 0 to 65535</p> <p>Checksum (16 bit): Auto</p> <p>Urgent pointer (16 bit): User defined, 0 to 65535</p> <p>Option: 0 to 40 byte</p> <p>Padding: All 0</p>
UDP (RFC0768)	<p>Source Port (16 bit): User defined, 0 to 65535</p> <p>Destination Port (16 bit): User defined, 0 to 65535</p> <p>Length (16 bit): Auto</p> <p>Checksum (16bit): Auto</p>
IGMP (RFC2236)	<p>Type (4 bit): 11- Membership Query 12- Version1 Membership Report 16- Version2 Membership Report 17- Leave Group</p> <p>Max Response Time (8 bit): User defined, 0 to 255</p> <p>Checksum (16 bit): Automatically calculated</p> <p>Group address (32 bit): User defined</p> <p>Version: set to 2</p>

## MU120119A(Cont'd)

Item	Specifications
ICMP (RFC792, 950, 1256)	Type (8 bit): 0 = Reply 3 = Destination Unreachable 4 = Source Quench 5 = Redirect 8 = Echo 9 = Router Advertisement 10 = Router Selection 11 = Time Exceeded 12 = Parameter Program 13 = Time Stamp 14 = Time Stamp Reply 15 = Information Request 16 = Information Reply 17 = Address Mask Request 18 = Address Mask Reply Code (8 bit): User defined 0 to 255 Checksum (16 bit): Automatically calculated (Soft) Data: For Echo Request/Response Identifier (16 bit): User defined Sequence Number (16 bit): User defined
RIP (RFC2453)	Command (8 bit): 1 = Request 2 = Response Version (8 bit):  1 = RIP version1 2 = RIP version2 Address Family Identifier (16 bit): 0000 0002 = IP protocol FFFF = Authentication entry see next Route tag: User defined IP Address: User defined Subnet Mask: User defined for Version2 Next hop: User defined for Version2 Metric: 0 to 4294967295 (DEC) Authentication type (16 bit): 1-IP Route 2-Password 3-Keyed Message Digest Algorithm Authentication Data: ASCII 16 byte entry

MU120119A(Cont'd)

Item	Specifications
DHCP (RFC2131)	<p>Op Code (8 bit): User defined  1 = Boot request  2 = Boot reply</p> <p>Hardware type (8 bit): User defined  1 = 10 MB Ethernet</p> <p>Hardware address length (8 bit): User defined  6 = for MAC address</p> <p>Hops (8bit): User defined (0 to 255)</p> <p>Transaction ID (32 bit): User defined  (0 to 4294967295(DEC))</p> <p>Seconds (16 bit): User defined (0 to 65535(DEC))</p> <p>Flag (16 bit) : User defined  0000 = Nobroadcast  8000 = Broadcast</p> <p>Client IP address (32 bit): User defined</p> <p>Your IP address (32 bit): User defined</p> <p>Server IP address (32 bit): User defined</p> <p>Relay Agent IP address (32 bit): User defined</p> <p>Client Hardware address (16 byte): User defined</p> <p>Server Host Name (64 byte): User defined</p> <p>Boot File Name (128 byte): User defined</p> <p>Option (0 to 64 byte): User defined</p>
MPLS (RFC3031, 3032)	<p>Label (20 bit): User defined  0 = IPv4 explicit null label  1 = Router alert label  2 = IPv6 explicit null label  3 = Implicit null label  4 to 15 = Reserved</p> <p>EXP (3 bit): User defined</p> <p>S (1 bit): Bottom of stack</p> <p>TTL (8 bit): User defined</p> <p>10 kinds of MPLS can set.</p>
Error Insertion	
PPP	FCS Error, Undersize, Oversize, Fragments, Oversize & FCS Error, Aborted Frame
IP	IPv4 Header Checksum Error
TCP/UDP	TCP/UDP Checksum Error
Data	Supported by Option 11 Packet BER Test: PRBS Error
Unframed BER Setting	<p>Test Pattern: PRBS11, PRBS15, PRBS20, PRBS23, PRBS31</p> <p>Error Insertion: Bit All</p> <p>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)</p>



## MU120119A(Cont'd)

Item	Specifications
Measurement Function	
SONET/SDH Test	
Performance	G. 826
K1, K2 Monitor	Conform to G.783 or G.841
Pointer Monitor	AU Pointer Graph: Pointer value, Pointer Inc/Dec Resolution: 1 s, 1 min, 15 min, 60 min
OH Monitor	SOH, POH, J0, J1 Display: CRC, TIM S1, C2: Received octet value are decoded for display
APS Switch Time	Trigger: Error, Alarm, External Trigger Resolution: 125 us Threshold: 1 ms, 10 ms, 100 ms Start → Waiting Trigger → Trigger detect → Stop
APS Sequence Capture	Trigger: Error, Alarm, External Trigger Trigger Position: 1 to 64 64 word (1 word: 1 to 8000 Frame)
Counter	
Mode	Accumulated, 1 s current
SONET/SDH	NDF Count/Rate, +PJC Count/Rate, -PJC Count/Rate, Consecutive Count/Rate, PPM, HP-IEC Count/Rate, REI-P/HP-REI Count/Rate, B3 Count/Rate, UNEQ-P/HP-UNEQ Count/Second, PLM-P/HP-SLM Count/Second, RDI-P/HP-RDI Count/Second, LOP-P/AU-LOP Count/Second, AIS-P/AU-AIS Count/Second, REI-L/MS-REI Count/Second, B2 Count/Rate, B1 Count/Rate, RDI-L/MS-RDI Count/Second, AIS-L/MS-AIS Count/Second, OOF Count/Second, LOF Count/Second, Bit Info. Count/Rate* <sup>5</sup> , Pattern Sync. Loss Count/Second* <sup>5</sup>
PPP	Transmitted/Received Frame Count, Transmitted/Received Frame Rate, Transmitted/Received Bit Count, Transmitted/Received Bit Rate, Transmitted/Received byte Count, Transmitted/Received Rate, FCS Error, Undersize, Fragment, Oversize, Oversize & FCS Error, Transmitted bytes After Stuffing, Received bytes Before Destuffing, Aborted Frame
IPv4	Transmitted/Received IPv4 Packet Count, Transmitted/Received IPv4 Packet Rate, Transmitted/Received Ping Request, Transmitted/Received Ping Reply, IP Header Checksum Error

\*5: Measurement is enabled only when the Bulk setting is specified for mapping.

MU120119A(Cont'd)

Item	Specifications
TCP/UDP	Received TCP Packet Count, Received TCP Packet Rate, Received UDP Packet Count, Received UDP Packet Rate, TCP Checksum Error* <sup>6</sup> , UDP Checksum Error* <sup>6</sup>
Data	Capture Trigger, Capture Filter, User Defined 1 Count/Rate, User Defined 2 Count/Rate, QoS 0 to 7 Frame Count/Rate. User Defined counter conditions; Destination IP Address: don't care, Match, Not match Source IP Address: don't care, Match, Not match Pattern1: don't care, Match, Not match Pattern2: don't care, Match, Not match Error: don't care, Match, Not match Refer to Pattern and Error conditions of Capture.
Packet BER Test (Opt11)	Transmitted/Received Test Frame Count, Sequence Error, Received PRBS Frame Error Count/Rate, Received PRBS Bit Error Count/Rate
Unframed BER Test Graph	Bit Error Count/Rate, Pattern Sync. Loss Count/Second 8 kinds of graph are displayed simultaneously. 1 s, 1 min, 15 min, 60 min resolution

\*6: The packets fragmented in the IP layer are counted as error packets.

## MU120119A(Cont'd)

Item	Specifications
Capture	
Capture Buffer	256 Mbytes/Port
Capture Filter/Trigger	Filter condition settings: Destination IP Address: don't care, Match, Not match Source IP Address: don't care, Match, Not match Pattern1: don't care, Match, Not match Pattern2: don't care, Match, Not match Error: don't care, Match, Not match Trigger condition settings: Destination IP Address: don't care, Match, Not match Source IP Address: don't care, Match, Not match Pattern1: don't care, Match, Not match Pattern2: don't care, Match, Not match Error: don't care, Match, Not match External Trigger: Traffic is out of range:0 to 100% Latency is out of range:1 ns to 59 s Manual Trigger: Trigger Position Settings: Top, Middle, Bottom
Pattern and Error Conditions	Destination IP Address:32 bit Mask:bit mask Source IP Address:32 bit Mask:bit mask Pattern1,2 Pattern:32 bit Mask:byte mask Field:Source IP, Destination IP, TCP, UDP, Custom(Offset:0 to 65535) Error; Error type: Good Frame,FCS Error,Undersize, Fragments, Oversize,Oversize&FCS Error, IP Header checksum Error, TCP checksum Error, UDP checksum Error, Sequence Error <sup>*7</sup> , PRBS Frame Error <sup>*7</sup> Combination: And,Or

\*7: Option 11 Packet BER Test is required.

MU120119A(Cont'd)

Item		Specifications
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 Protocol	Decode	By Sniffer® Technologies (Opt04) or MX123002A Expert Analysis Module, the number of decode protocols can be increased up to 400. MD1230 Family includes Ethereal® Convert Function.
Replay		Capture frames are converted to Tx streams.
Latency		When Test Frames are received, the latency is indicated. The result includes 1s sampling value, max, min, avg. and number of samples.
Protocol Emulation		PPP (LCP, IPCP), ICMP, BGP-4, IGMP
Ping		Destination: User defined Send: 4 times Result: Reply, bytes, time, TTL

## MU120119A(Cont'd)

Item	Specifications
Frame Arrival Time Variation(Packet Jitter) Resolution Offset Graph	32 counters indicate the results. Resolution: 1 us, 10 us, 100 us, 1 ms, 10 ms, 100 ms, 1 s. Depend on resolution, Max. 3 min. Frame Count vs. Time Interval Auto scale: On/Off
Traffic Monitor	Traffic Monitor can measure up to 64 streams in real-time. Target: IPv4 Address, Protocol Number (IP Protocol)
Traffic Map	Traffic Map can measure up to 64 streams in real-time. Target: IPv4 Address
Service Disruption Time	Time of Frame Disruption.
Power Meter	Supported by MU120119A-01 Optical Power Meter Maximum Input Range: +10 dBm Range: -40 to +5 dBm Accuracy: $\pm 0.5$ dB
Automatic Test RFC2544 Automatic Test	Following 6 types of tests can be supported. (MD1230 Family supports continuous test [1] to [5]). [1] Throughput [2] Latency [3] Frame Loss Rate [4] Back-to-back Frames [5] System Recovery [6] Reset
Port Pairs	Traffic Distribution: One to one, Partially meshed, Fully meshed Traffic Orientation: Unidirectional, Bidirectional Mesh Type: Round Robin, Peak Loading VLAN Tag: On/Off VLAN ID: 1 to 4095
Test Setting	Frame Size: 64, 128, 256, 512, 1024, 1280, 1518 byte Custom: 1 to 25 point Step: Start form 64 to 65535 Step Size 1 to 65471 Count 1 to 25 Test Frame Protocol: MAC, IP Device Type: Store and forward, Bit forward Leaning Frame: Leaning Mode: Never, Once, Every Trial Retries: 1 to 999
Throughput	Duration: 2 to 999 s Number of Trials: 1 to 50 Burst Size: 1 to 1000 Rate (%): Initial Rate, Minimum Rate, Maximum Rate, Resolution, 0.01% step Loss Tolerance: 0 to 100%, 0.0001% step Result: Frame Rate (%), Frame/s, Bit/s, byte/s Graph: Frame Rate (%), Frame/s, Bit/s, byte/s vs. frame size, Theoretical value

MU120119A(Cont'd)

Item	Specifications
Latency	Duration: 2 to 999 s Number of Trials: 1 to 50 Rate (%): Initial Rate, Step Rate, Step Count, 0.01% step, Result of Throughput Rate Burst Size: 1 to 1000 Result: Latency (0.01 us resolution) Graph: Latency vs. Frame Size
Frame Loss Rate	Duration: 2 to 999 s Number of Trials: 1 to 50 Rate (%): Initial Rate, Step Rate, Step Count, 0.01% step Burst Size: 1 to 1000 Result: Frame Loss Rate (%) Graph: Frame Rate vs. Frame Loss Rate
Back-to-back Frames	Duration: 2 to 999 s Number of Trials: 1 to 50 Rate (%): Initial Rate, Step Rate, Step Count, 0.01% step Burst Size: 1 to 1000 Loss Tolerance: 0 to 100%, 0.0001% step Result: Number of frames Graph: Number of frames vs. Frame Size
System Recovery	Duration: 2 to 999 s Number of Trials: 1 to 50 Threshold Time: 0 to 999 s Rate (%): Overload Rate (110% of the Throughput Rate User defined), Moderate Rate Burst Size: 1 to 1000 Result: Recovery time (1 us resolution, Accuracy 1 us) Graph: Recovery time vs. Frame Size
Reset	Rate (%): User defined Burst Size: 1 to 1000 Sequence: Start → Waiting trigger → Triggered → Stop Graph: Reset time (1 us resolution, Accuracy 1 us)
Environmental Performacen Temperature range	Operation: 0 to +40°C Storage: -20 to +60°C
Power Consumption Size	Less than 15 W Based on PICMG2.0 R2.1 262.0 (W) ×20.0 (H) ×174.5 (D) mm It doesn't contain protuberance.
Weight	Less than 1.0 kg

**MU120120A**

Item	Specifications
Model name	MU120120A
Apparatus name	OC-3/STM-1 Module (1310 nm)
Composition	Module×1
Options	MU120120A-01: Optical Power Meter
Interface	
Corresponding Specification	OC-3/STM-1
Connector	SC
Number of Ports	2
Bit Rate	155.52 Mbit/s (NRZ)
Clock	Internal ( $\pm 50$ ppm Variable), Receive, Lock (64 kHz+8 kHz, 1.5 MHz, 2MHz, 1.5 Mbit/s, 2 Mbit/s)
Wavelength	1,274 to 1,356 nm
Output Level (PRBS23 average power)	-15 to -8 dBm
Extinction Ratio	8.2 dB over
Pulse Mask	Compliant with Bellcore TR-NWT-000253 and ITU-T recommendation G.957
Input Sensitivity	-28 to -8 dBm
Laser Safety	21 CFR 1040.10:1995 CLASS I IEC60825-1:2001 CLASS 1
LED	Link, Tx, Rx, Error

## Appendix A Specifications

### MU120120A (Cont'd)

Item	Specifications
SONET/SDH Setting	
Frame Mapping	SONET/SDH OC-12c/STM-4c - VC4*4c - PPP OC-12c/STM-4c - VC4*4c - CiscoHDLC OC-12c/STM-4c - VC4*4c - MAPOS Version1 OC-12c/STM-4c - VC4*4c - MAPOS 16 OC-12c/STM-4c - VC4*4c - Bulk Unframed
OH Preset	SOH: All byte except B1, B2, H1, H2, H3, K1, K2 POH: All byte except B3 Path Trace: J0, J1 (CRC7, Trace on)
Alarm Addition	LOS, LOF, AIS-L/MS-AIS, RDI-L/MS-RDI, TIM-L/MS-TIM, AIS-P/AU-AIS, LOP-P/AU-LOP, RDI-P/HP-RDI, PLM-P/HP-SLM, TIM-P/HP-TIM, UNEQ-P/HP-UNEQ
Alarm Addition Timing	Single, Single Burst Frame (Burst Size: 1 to 64,000), Alternative (Alarm Frame: 0 to 8,000, Normal Frame: 1 to 8,000), All
Error Insertion	FAS, B1, B2, B3 REI-P/MS-REI, REI-P/HP-REI, HP-IEC, Bit All, Bit Info
Error Insertion Timing	Single, Single Burst Bit (Burst Size: 1 to 64,000), Rate (1.0E-9, 1.0E-8, 1.0E-7, 1.0E-6, 1.0E-5, 1.0E-4, 1.0E-3), Programmed Rate (A*E-B   A: 1.0 to 9.9, B: 3 to 10), All
K1, K2	Conform to G.783 or G.841
Pointer	AU pointer NDF: 0000 to 1111 SS: 00 to 11 Pointer: 0 to 1023 +Justification, -Justification
APS Sequence Generation	K1/K2: 2 to 64 Words, Repeat 1 to 8000 Frame/Word, Single or Repeat Generation.



## MU120120A (Cont'd)

Item	Specifications
Port Setting	
IPv4	IPv4 Address, Netmask, Gateway
This port	Not send, Reply to this port ping request
ICMP Echo(PING) Reply	
PPP	Scramble: On/Off Descramble: On/Off Minimum Flag Length: 1 byte/2 byte FCS: 32 bit Negotiation: On/Off, Restart, Retry, Abort, Max-Receive-Unit(default1500), Magic-number (random) , IPCP(Send this port IP address), Default, Time out
Mode	Normal, Monitor, Through(with or without OH Overwrite)
Stream	
Number of Streams	256 Streams/Port
Stream Setting	
Distribution	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 per Burst	1 to 1,099,511,627,775
Burst per Stream	1 to 1,099,511,627,775
Frame View	Raw Frame, Decoded
Gap Setting	
Inter Frame Gap	155M: Resolution of 53.4 ns, 53.4 ns to 120 s Settable as Fixed or Random*1.
Inter Burst Gap	155M: Resolution of 53.4 ns, 53.4 ns to 120 s Settable as Fixed.
Inter Stream Gap	155M: Resolution of 53.4 ns, 427.4 ns to 120 s Settable as Fixed.

\*1: To select the Random setting for the inter-frame gap, the Frame Length must be 64 bytes or more.

MU120120A (Cont'd)

Item	Specifications
Frame Setting	<p>FCS: CRC32</p> <p>MPLS label: Up to 10 MPLS labels can be appended. Fixed setting.</p> <p>Protocol Editing: None, IPv4, TCP/IPv4, UDP/IPv4, IGMP/IPv4, ICMP/IPv4, RIP/UDP/IPv4, DHCP/UDP/IPv4, IPv6, IS-IS</p> <p>IPv4/IPv6: IP Destination/Source Address can be set Fixed, Increment, Decrement, Random Independently.*2</p> <p>TCP/UDP: Destination Port Number or Source Port Number can be set Increment, Random.</p> <p>Data Field: Can set any portions of Data Field as All 0, All1, Alternate1/0 (Each bit, Each 2 bit, Each 4 bits, Each 1 byte, Each 2 bytes), Increment, Decrement, Random, Single PRBS9.</p> <p>Only Data Field 1 can set Programmable, Time Stamp*3, Sequence Number*3 Test Frame.</p> <p>Programmable Header Pattern: 1 user defined Pattern can be set.</p>
Frame Size	<p>8 to 65,535 byte</p> <p>Settable as Auto, Fixed, Increment*4 or Random*4</p>

\*2: For IPv6, any Increment, Decrement, or Random setting can be specified for bit widths 1 to 32. Also, only either the destination or Source Address can be selected.

\*3: When a sequence number or Time Stamp 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 for the protocol.

## MU120120A (Cont'd)

Item	Specifications
OH Setting PPP/Cisco HDLC /MAPOS Version 1 /MAPOS 16	Address: FFh (User defined) Cisco HDLC: 0Fh MAPOS Version 1: 03h Control: 03h (User defined) Cisco HDLC: 00h MAPOS Version 1: 03h Address MAPOS16: 00003h When MAPOS16 then Address field is 16 bit and Control field is 0 bit Protocol: 16 bit User defined (default 0021) FCS: Auto
Protocol Setting IPv4 (RFC0791)	Version: 4 (DEC) IHL: Auto Type of service: User defined (initial 00(hex)) Bit0 to 2 (Precedence): 111-Network control 110-Internetwork control 101-CRITIC/ECP 100-Flash override 011-Flash 010-Immediate 001-Priority 000-Routine Bit3: 0 = Normal delay, 1 = Low delay Bit4: 0 = Normal throughput, 1 = High throughput Bit5: 0 = Normal Reliability, 1= High Reliability Bit6 to 7: 2 bit User defined Total Length: Auto Identification: User defined (4 byte) Flag: User defined (initial 010(b)) Bit0: User defined Bit1: (DF) 0 = May Fragment, 1= Don't Fragment Bit2: (MF) 0 = Last Fragment, 1= More Fragment Fragment offset: 0 to 8191(DEC) user defined (initial 0) Time to Live: from 0 to 255 (DEC) user defined (initial 64) Protocol: 0 to 255 (DEC) user defined (initial 0) Automatically set if TCP or UDP is selected. Header Checksum: Auto Source Address: Static, Increment, Decrement, Random with class and mask setting Destination Address: Static, Increment, Decrement, Random with class and mask setting Option: 0 to 40 byte

MU120120A (Cont'd)

Item	Specifications
IPv6 (RFC2460)	<p>Version (4 bit): 6</p> <p>Traffic class (8 bit): 0-uncharacterized traffic 1-"filler" traffic 2-unattended data transfer 3-reserved 4-attended bulk transfer 5-reserved 6-interactive traffic 7-internet control traffic</p> <p>Flow Label (20 bit): 20 bit user defined (initial all 0)</p> <p>Payload Length (16 bit): Auto</p> <p>Next Header (8 bit): 0 to 255 (DEC) user defined (initial 59)</p> <p>Hop Limit (8 bit): 0 to 255 user defined (initial 0)</p> <p>Source Address (128 bit): Static, Increment, Decrement, Random with class and mask setting (byte mask)</p> <p>Destination Address (128 bit): Static, Increment, Decrement, Random with class and mask setting (bytemask)</p>
TCP (RFC0793)	<p>Source Port (16 bit): User defined, 0 to 65535</p> <p>Destination Port (16 bit): User defined, 0 to 65535</p> <p>Sequence Number (32 bit): User defined</p> <p>Acknowledgement Number(32 bit): User defined, 0000 to FFFF</p> <p>Data offset (4 bit): Set to 5</p> <p>Reserved (6 bit): User defined, 0 to 63</p> <p>Control bit (6 bit): User Defined, Setting by bit</p> <p>Window (16 bit): User defined, 0 to 65535</p> <p>Checksum (16 bit): Auto</p> <p>Urgent pointer (16 bit): User defined, 0 to 65535</p> <p>Option: 0 to 40 byte</p> <p>Padding: All 0</p>
UDP (RFC0768)	<p>Source Port (16 bit): User defined, 0 to 65535</p> <p>Destination Port (16 bit): User defined, 0 to 65535</p> <p>Length (16 bit): Auto</p> <p>Checksum (16 bit): Auto</p>
IGMP (RFC2236)	<p>Type (4 bit): 11- Membership Query 12- Version1 Membership Report 16- Version2 Membership Report 17- Leave Group</p> <p>Max Response Time (8 bit): User defined, 0 to 255</p> <p>Checksum (16 bit): Automatically calculated</p> <p>Group Address (32 bit): User defined</p> <p>Version: set to 2</p>

MU120120A (Cont'd)

Item	Specifications
ICMP (RFC792, 950, 1256)	Type (8 bit): 0 = Reply 3 = Destination Unreachable 4 = Source Quench 5 = Redirect 8 = Echo 9 = Router Advertisement 10 = Router Selection 11 = Time Exceeded 12 = Parameter Program 13 = Time Stamp 14 = Time Stamp Reply 15 = Information Request 16 = Information Reply 17 = Address Mask Request 18 = Address Mask Reply Code (8 bit): User defined 0 to 255 Checksum (16 bit): Automatically calculated (Soft) Data: For Echo Request/Response Identifier (16 bit): User defined Sequence Number (16 bit): User defined Command (8 bit): 1 = Request 2 = Response Version (8 bit): 1 = RIP version1 2 = RIP version2 Address Family Identifier (16 bit): 0000 0002 = IP protocol FFFF = Authentication entry see next Route tag: User defined IP Address: User defined Subnet Mask: User defined for Version2 Next hop: User defined for Version2 Metric: 0 to 4294967295 (DEC) Authentication type (16 bit): 1-IP Route 2-Password 3-Keyed Message Digest Algorithm Authentication Data: ASCII 16 byte entry
RIP (RFC2453)	

MU120120A (Cont'd)

Item	Specifications
DHCP (RFC2131)	<p>Op Code (8 bit): User defined  1 = Boot request  2 = Boot reply</p> <p>Hardware Type (8 bit): User defined  1 = 10 MB Ethernet</p> <p>Hardware Address Length (8 bit): User defined  6 = for MAC address</p> <p>Hops (8 bit): User defined (0 to 255)</p> <p>Transaction ID (32 bit): User defined  (0 to 4294967295(DEC))</p> <p>Seconds (16 bit): User defined (0 to 65535(DEC))</p> <p>Flag (16 bit): User defined  0000 = Nobroadcast  8000 = Broadcast</p> <p>Client IP Address (32 bit): User defined</p> <p>Your IP Address (32 bit): User defined</p> <p>Server IP Address (32 bit): User defined</p> <p>Relay Agent IP Address (32bit): User defined</p> <p>Client Hardware Address (16 byte): User defined</p> <p>Server Host Name (64 byte): User defined</p> <p>Boot File Name (128 byte): User defined</p> <p>Option (0 to 64 byte): User defined</p>
MPLS (RFC3031, 3032)	<p>Label (20 bit): User defined  0 = IPv4 explicit null label  1 = Router alert label  2 = IPv6 explicit null label  3 = Implicit null label  4 to 15 = Reserved</p> <p>EXP (3 bit): User defined</p> <p>S (1 bit): Bottom of stack</p> <p>TTL (8 bit): User defined</p> <p>10 kinds of MPLS can set.</p>
Error Insertion	
PPP	FCS Error, Undersize, Oversize, Fragments, Oversize & FCS Error, Aborted Frame
IP	IPv4 Header Checksum Error
TCP/UDP	TCP/UDP Checksum Error
Data	Supported by Option 11 Packet BER Test: PRBS Error
Unframed BER Setting	<p>Test Pattern: PRBS11, PRBS15, PRBS20, PRBS23, PRBS31</p> <p>Error Insertion: Bit All</p> <p>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)</p>

## MU120120A (Cont'd)

Item	Specifications
Measurement Function	
SONET/SDH Test	
Performance	G. 826
K1, K2 Monitor	Conform to G.783 or G.841
Pointer Monitor	AU Pointer Graph: Pointer value, Pointer Inc/Dec Resolution: 1 s, 1 min, 15 min, 60 min
OH Monitor	SOH, POH, J0, J1 Display: CRC, TIM S1, C2: Received octet value are decoded for display
APS Switch Time	Trigger: Error, Alarm, External Trigger Resolution: 125 us Threshold: 1 ms, 10 ms, 100 ms Start → Waiting Trigger → Trigger detect → Stop
APS Sequence Capture	Trigger: Error, Alarm, External Trigger Trigger Position: 1 to 64 64 word (1 word: 1 to 8000 Frame)
Counter	
Mode	Accumulated, 1 s current
SONET/SDH	NDF Count/Rate, +PJC Count/Rate, -PJC Count/Rate, Consecutive Count/Rate, PPM, HP-IEC Count/Rate, REI-P/HP-REI Count/Rate, B3 Count/Rate, UNEQ-P/HP-UNEQ Count/Second, PLM-P/HP-SLM Count/Second, RDI-P/HP-RDI Count/Second, LOP-P/AU-LOP Count/Second, AIS-P/AU-AIS Count/Second, REI-L/MS-REI Count/Second, B2 Count/Rate, B1 Count/Rate, RDI-L/MS-RDI Count/Second, AIS-L/MS-AIS Count/Second, OOF Count/Second, LOF Count/Second, Bit Info. Count/Rate*5, Pattern Sync. Loss Count/Second*5
PPP	Transmitted/Received Frame Count, Transmitted/Received Frame Rate, Transmitted/Received Bit Count, Transmitted/Received Bit Rate, Transmitted/Received byte Count, Transmitted/Received Rate, FCS Error, Undersize, Fragment, Oversize, Oversize & FCS Error, Transmitted bytes After Stuffing, Received bytes Before Destuffing, Aborted Frame
IPv4	Transmitted/Received IPv4 Packet Count, Transmitted/Received IPv4 Packet Rate, Transmitted/Received Ping Request, Transmitted/Received Ping Reply, IP Header Checksum Error

\*5: Measurement is enabled only when the Bulk setting is specified for mapping.

MU120120A (Cont'd)

Item	Specifications
TCP/UDP	Received TCP Packet Count, Received TCP Packet Rate, Received UDP Packet Count, Received UDP Packet Rate, TCP Checksum Error* <sup>6</sup> , UDP Checksum Error* <sup>6</sup>
Data	Capture Trigger, Capture Filter, User Defined 1 Count/Rate, User Defined 2 Count/Rate, QoS 0 to 7 Frame Count/Rate. User Defined counter conditions; Destination IP Address: don't care, Match, Not match Source IP Address: don't care, Match, Not match Pattern1: don't care, Match, Not match Pattern2: don't care, Match, Not match Error: don't care, Match, Not match Refer to Pattern and Error conditions of Capture.
Packet BER Test (Opt11)	Transmitted/Received Test Frame Count, Sequence Error, Received PRBS Frame Error Count/Rate, Received PRBS Bit Error Count/Rate
Unframed BER Test Graph	Bit Error Count/Rate, Pattern Sync. Loss Count/Second 8 kinds of graph are displayed simultaneously. 1 s, 1 min, 15 min, 60 min resolution

\*6: The packets fragmented in the IP layer are counted as error packets.



## MU120120A (Cont'd)

Item	Specifications
Capture	
Capture Buffer	256 Mbytes/Port
Capture Filter/Trigger	Filter condition settings: Destination IP Address: don't care, Match, Not match Source IP Address: don't care, Match, Not match Pattern1: don't care, Match, Not match Pattern2: don't care, Match, Not match Error: don't care, Match, Not match Trigger condition settings: Destination IP Address: don't care, Match, Not match Source IP Address: don't care, Match, Not match Pattern1: don't care, Match, Not match Pattern2: don't care, Match, Not match Error: don't care, Match, Not match External Trigger: Traffic is out of range:0 to 100% Latency is out of range:1 ns to 59 s Manual Trigger: Trigger Position Settings: Top, Middle, Bottom
Pattern and Error Conditions	Destination IP Address:32 bit Mask:bit mask Source IP Address:32 bit Mask:bit mask Pattern1,2; Pattern:32 bit Mask:byte mask Field:Source IP, Destination IP, TCP, UDP, Custom(Offset:0 to 65535) Error; Error type: Good Frame,FCS Error,Undersize, Fragments, Oversize,Oversize&FCS Error, IP Header checksum Error, TCP checksum Error, UDP checksum Error, Sequence Error <sup>*7</sup> , PRBS Frame Error <sup>*7</sup> Combination: And, Or

<sup>\*7</sup>: Option 11 Packet BER Test is required.

MU120120A (Cont'd)

Item		Specifications
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 Protocol	Decode	By Sniffer® Technologies (Opt04) or MX123002A Expert Analysis Module, the number of decode protocols can be increased up to 400. MD1230 Family includes Ethereal® Convert Function.
Replay		Capture frames are converted to Tx streams.
Latency		When Test Frames are received, the latency is indicated. The result includes 1s sampling value, max, min, avg. and number of samples.
Protocol Emulation		PPP (LCP, IPCP), ICMP, BGP-4, IGMP
Ping		Destination: User defined Send: 4 times Result: Reply, bytes, time, TTL

## MU120120A (Cont'd)

Item	Specifications
Frame Arrival Time Variation(Packet Jitter) Resolution Offset Graph	32 counters indicate the results. Resolution: 1 us, 10 us, 100 us, 1 ms, 10 ms, 100 ms, 1 s. Depend on resolution, Max. 3 min. Frame Count vs. Time Interval Auto scale: On/Off
Traffic Monitor	Traffic Monitor can measure up to 64 streams in real-time. Target: IPv4 Address, Protocol Number (IP Protocol)
Traffic Map	Traffic Map can measure up to 64 streams in real-time. Target: IPv4 Address
Service Disruption Time	Time of Frame Disruption.
Power Meter	Supported by MU120120A-01Optical Power Meter Maximum Input Range: +10 dBm Range: -40 to +5 dBm Accuracy: $\pm 0.5$ dB
Automatic Test RFC2544 Automatic Test	Following 6 types of tests can be supported. (MD1230 Family supports continuous test [1] to [5]). [1] Throughput [2] Latency [3] Frame Loss Rate [4] Back-to-back Frames [5] System Recovery [6] Reset
Port Pairs	Traffic Distribution: One to one, Partially meshed, Fully meshed Traffic Orientation: Unidirectional, Bidirectional Mesh Type: Round Robin, Peak Loading VLAN Tag: On/Off VLAN ID: 1 to 4095
Test Setting	Frame Size: 64, 128, 256, 512, 1024, 1280, 1518 byte Custom: 1 to 25 point Step: Start form 64 to 65535 Step Size 1 to 65471 Count 1 to 25 Test Frame Protocol: MAC, IP Device Type: Store and forward, Bit forward Leaning Frame: Leaning Mode: Never, Once, Every Trial Retries: 1 to 999
Throughput	Duration: 2 to 999 s Number of Trials: 1 to 50 Burst Size: 1 to 1000 Rate (%): Initial Rate, Minimum Rate, Maximum Rate, Resolution, 0.01% step Loss Tolerance: 0 to 100%, 0.0001% step Result: Frame Rate (%), Frame/s, Bit/s, byte/s Graph: Frame Rate (%), or Frame/s or Bit/s or byte/s vs. frame size, Theoretical value

## Appendix A Specifications

### MU120120A (Cont'd)

Item	Specifications
Latency	Duration: 2 to 999 s Number of Trials: 1 to 50 Rate (%): Initial Rate, Step Rate, Step Count, 0.01% step, Result of Throughput Rate Burst Size: 1 to 1000 Result: Latency (0.01 us resolution) Graph: Latency vs. Frame Size
Frame Loss Rate	Duration: 2 to 999 s Number of Trials: 1 to 50 Rate (%): Initial Rate, Step Rate, Step Count, 0.01% step Burst Size: 1 to 1000 Result: Frame Loss Rate (%) Graph: Frame Rate vs. Frame Loss Rate
Back-to-back Frames	Duration: 2 to 999 s Number of Trials: 1 to 50 Rate (%): Initial Rate, Step Rate, Step Count, 0.01% step Burst Size: 1 to 1000 Loss Tolerance: 0 to 100%, 0.0001% step Result: Number of Frames Graph: Number of frames vs. Frame Size
System Recovery	Duration: 2 to 999 s Number of Trials: 1 to 50 Threshold Time: 0 to 999 s Rate (%): Overload Rate (110% of the Throughput Rate User defined), Moderate Rate Burst Size: 1 to 1000 Result: Recovery time (1 us resolution, Accuracy 1 us) Graph: Recovery time vs. Frame Size
Reset	Rate (%): User defined Burst Size: 1 to 1000 Sequence: Start → Waiting trigger → Triggered → Stop Graph: Reset time (1 us resolution, Accuracy 1 us)
Environmental Performacene	
Temperature range	Operation: 0 to +40°C Storage: -20 to +60°C
Power Consumption	Less than 15 W
Size	Based on PICMG2.0 R2.1 262.0 (W) × 20.0 (H) × 174.5 (D) mm It doesn't contain protuberance.
Weight	Less than 1.0 kg

**A**

AIS 3-2

**C**

Cisco HDLC 3-2

**L**

LOF 3-2

LOS 3-2

**M**

MAPOS 3-2, 3-3

**P**

POS 1-1, 1-2, 2-1, 2-2, 3-1,  
3-2

PPP 3-2, 3-3

**T**

TCP 3-3

**U**

UDP 3-3

