

Discover What's Possible™

Anritsu

MD1230A

Data Quality Analyzer



***Complete performance testing and
monitoring with one unit***



The Tolly Group Certifies MD1230A

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

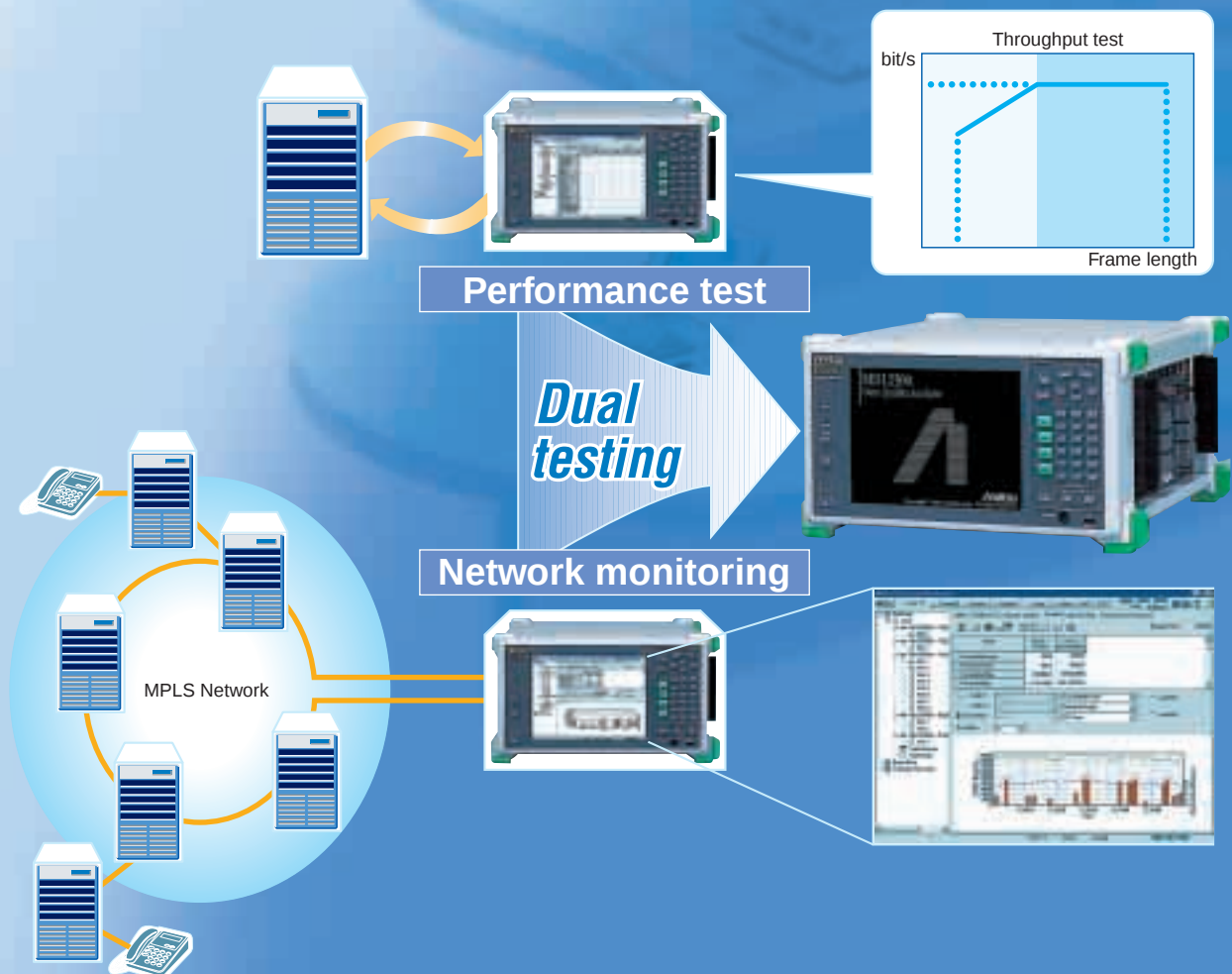


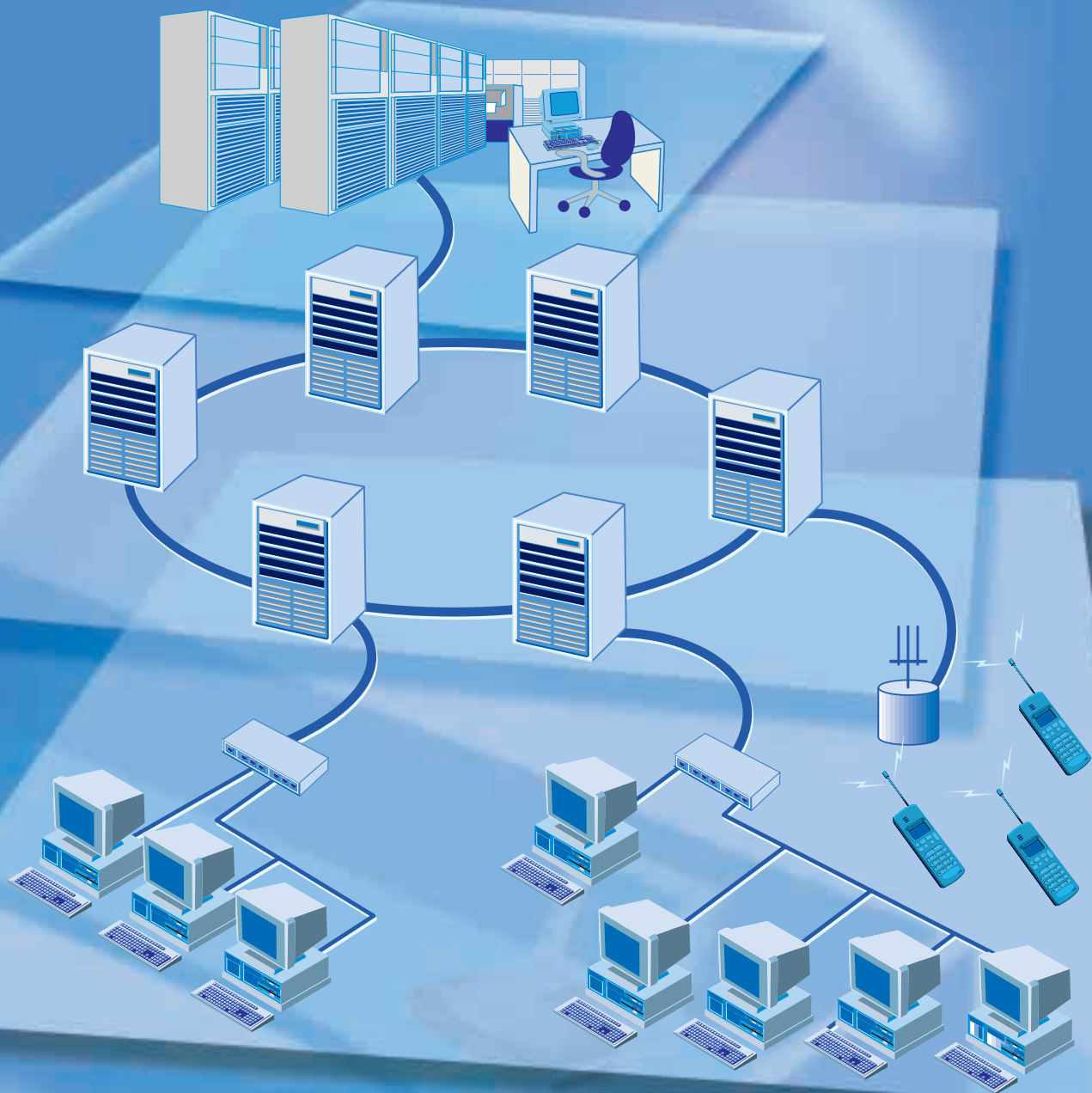
Integrated Performance Testing and Monitoring

IP networks are spreading rapidly throughout society in conjunction with the expansion of networks carrying voice, video, and mission-critical data. And now maintenance of network quality has become an important theme. Development of network equipment and systems requires measuring network performance and evaluating QoS.

In addition, network operations and maintenance requires monitoring in-service traffic, latency, and frame arrival time variation (frame jitter) as well as prompt troubleshooting.

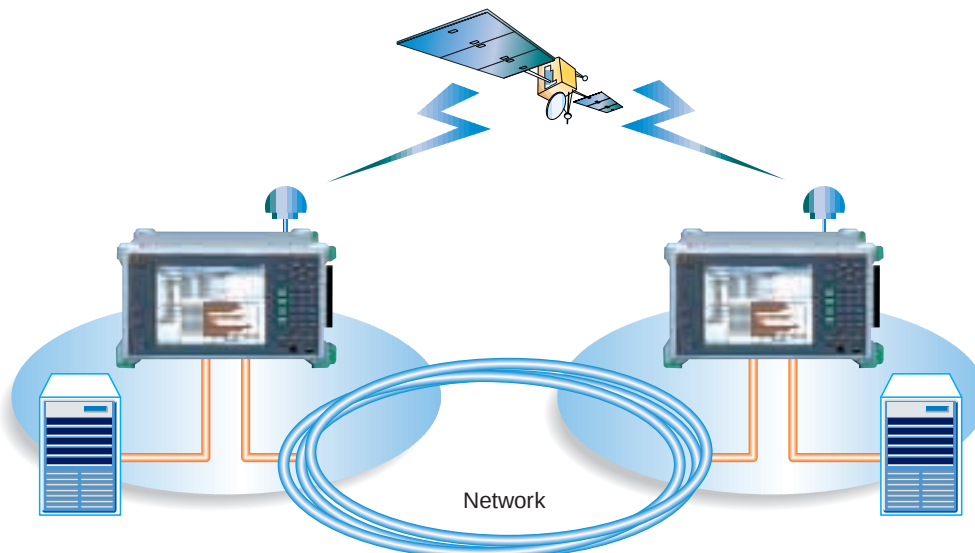
The MD1230A integrates both performance testing and network monitoring into one instrument.





Performance Test & Network Monitoring Applications

Core/Metro Area Network



Troubleshooting Metro Ethernet

Metropolitan area networks are being built using economically efficient 100 Mbit/s and Gigabit Ethernet. Ethernet is easy to operate, but it does not provide a high level of maintenance and monitoring functions like the SONET/SDH lines. Simply inserting a MD1230A into an Ethernet circuit for monitoring and protocol analysis enables easy and correct Ethernet troubleshooting.

VPN QoS Traffic Monitoring

Since traffic can be measured according to 8 priority levels based on the VLAN tag user priority field specified by IEEE802.1D (formerly 802.1p) and the 3 least significant bits of the DSCP field specified by RFC2474, it is also possible to measure QoS traffic for packets not generated by the MD1230A. If user-defined filters are used, VoIP traffic (specified UDP port number) to which specific MPLS labels are appended can be measured in real time.

Remote Latency (MD1230A Option 05)

The MD1230A has a GPS clock input option which can be used to perform time synchronization with remote MD1230A units to measure frame latency over a long distance. Moreover, the capture function can be triggered when a measured frame latency exceeds the user setting. The MD1230A is an effective tool for testing guaranteed latency of VPN services.

BGP-4 Link Flap/Route Flap Test

The MD1230A can emulate BGP-4 (Border Gateway Protocol version 4) speakers for a maximum of 8 devices. It can also perform link flap tests for neighboring routers and route flap

tests for up to 800 routes.

Installing POS (Packet over SONET/SDH) Systems

Taking advantage of experiences and expertise accumulated in the field of SONET/SDH, MD1230A makes a significant contribution to POS system installation.

It enables a wide range of measurements: BER measurement on concatenation mapping; SONET/SDH error alarm measurement; and optical power measurement indispensable to installation operations. Furthermore, error performance evaluation can be supported in accordance with ITU-T G.826.

SONET/SDH APS Switching Test

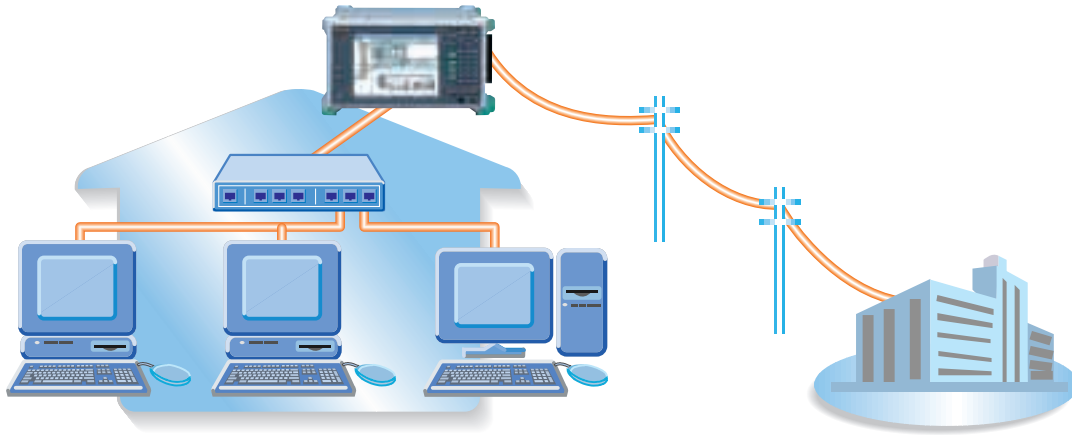
SONET/SDH networks use various redundancy systems to prevent transmission downtime (service loss) due to fiber breaks and equipment failures. When a fault occurs, switching to a standby system is executed in accordance with the APS (Automatic Protection Switching) procedure.

The MD1230A can measure APS switching time, and it can perform in-service capture of the K1/K2 bytes controlling the APS operation to verify the operation.

Monitoring WDM Lines

WDM line function verification and troubleshooting involves monitoring traffic on the WDM line. Using the MN9320A Optical Channel Drop Unit (available optionally) enables any one wavelength to be selected from the WDM line for traffic monitoring and frame capturing.

Access Network



Measuring ADSL Throughput

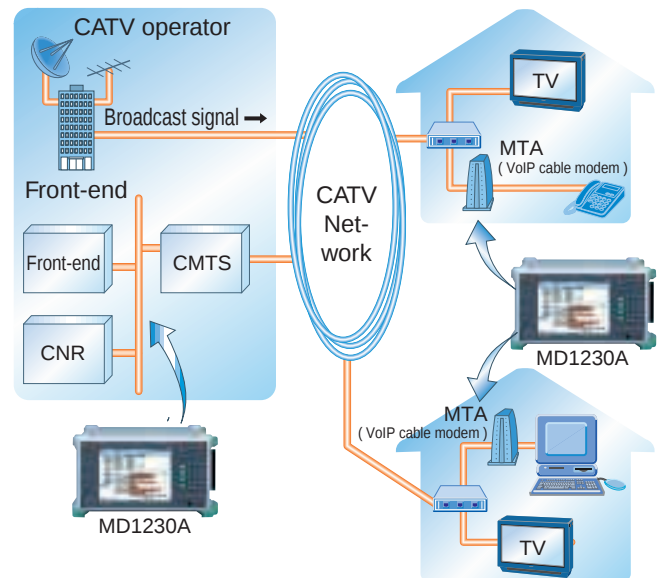
As ADSL becomes more and more widely used, the demand for throughput testing increases. An asymmetric line such as ADSL cannot measure transmission rate at a turning point by loop back. For this reason, the transmission rate is often calculated from the time required for downloading a large file from FTP server. This method, however, doesn't provide reproducible measurements because of the variation in factors such as PC performance and TCP flow control. Since the MD1230A allows traffic to be generated at any transmission rate, upstream and downstream throughput can be measured with higher accuracy.

Measuring PON System Performance

Some PON systems allow one OLT to connect to 32 ONUs. One small MD1230A can provide up to 40 Ethernet ports. With multiple MD1230As connected via network, up to 320 ports may be supported, providing the user with a solution for the problem of measuring performance of multi-port systems such as PONs.

Verifying Conformity to VoIP in CATV

VoIP telephone service via CATV networks requires QoS control, which is indispensable for ensuring the quality of audio signals. With the MD1230A, users can evaluate whether the transmission band for audio signals is acceptable even if a high load is applied to the CATV network. SIP, the call control protocol, can be displayed using the frame capture function to troubleshoot originating call control.



Performance Test & Network Monitoring Applications

Local Area Network



Evaluating Switch and Router Performance

In building an enterprise LAN, the most important requirement is to determine whether the performance of networking devices can support the load placed on the network. RFC1242 and RFC2544 define methods for measuring the performance of networking devices. MD1230A conducts the five types of tests (Throughput, Latency, Frame Loss Rate, Back-to-Back Frames, and System Recovery) defined in these standards and indicates the results in tables or graphs. MD1230A automation and one-button execution makes these tests much more efficient.

Evaluating VoIP Conformance in Extension Telephone Service

In providing VoIP to remote extension telephones, considerations such as headquarter–branch latency and voice data band requirement must be taken into account.

The MD1230A can be used to measure transmission band and latencies between business centers and voice destinations for devising an introduction plan based on the measurements.

In addition, QoS control provided by the networking devices planned for the enterprise may be evaluated by the MD1230A to avoid any trouble after installation.

Evaluating Video Transmission Services

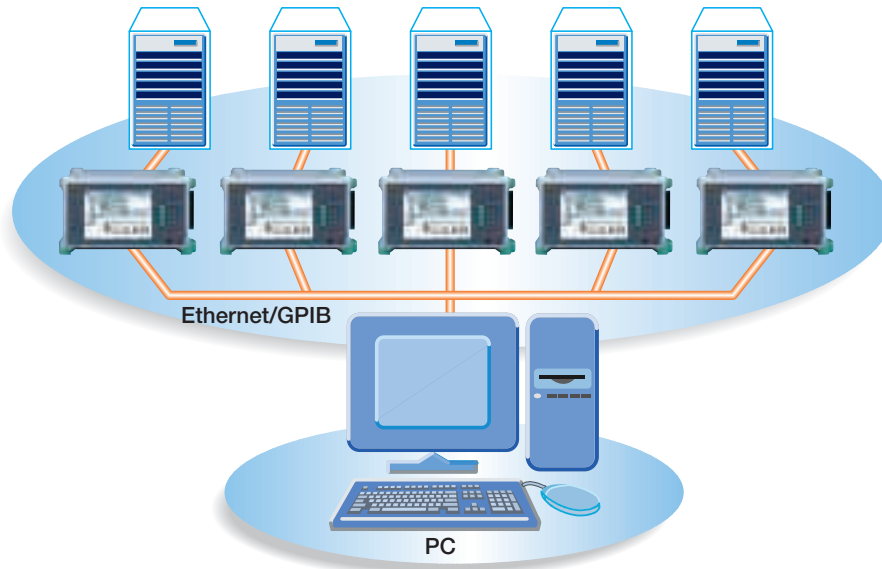
Enterprises are increasingly using their own LANs for video-conferences. Video data requires higher transmission quality than voice data.

Above all, any packet jitter introduced by the network considerably affects video reproduction quality. The MD1230A enables real-time in-service jitter measurements when video data packets arrive. In addition, MD1230A's the IGMP emulator function is compatible with IP multicast, which is used in video distribution.

Troubleshooting in Enterprise LANs

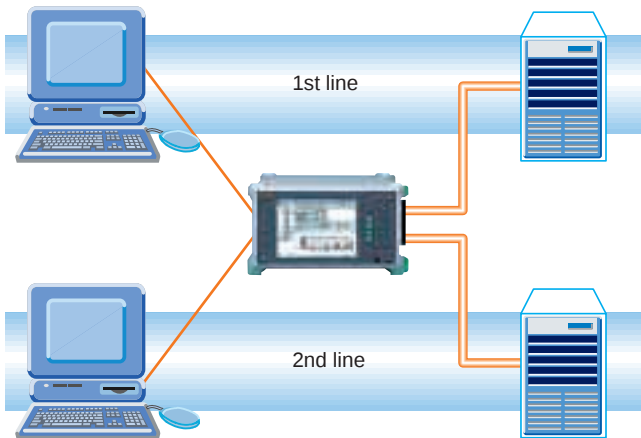
Because of its portability, the MD1230A can be quickly and easily deployed if network problem occur. It can be handled even in small spaces with no difficulty because of its self-contained PC, display, and keypad.

Manufacturing



Support for Multiple Production Lines

With the MD1230A's multi-user function, more than one production line can share one MD1230A. Each line test may be executed via individual PCs that have the optional MX123001A Data Quality Analyzer Control Software installed.



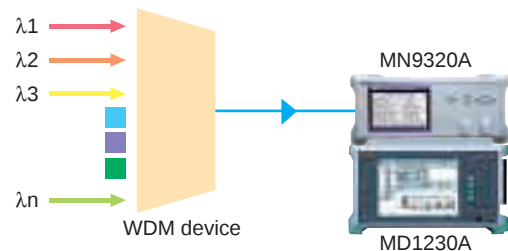
Automated Testing Using Remote Commands (MD1230A Options 01/02/03)

Preset tests for production lines such as network devices can be executed automatically and the measurement results saved. The MD1230A supports GPIB commands and almost all its functions can be executed. In addition, several MD1230As can be controlled from one controller. Since these automated control programs use well-known GPIB commands, the end-user cost of application software development can be reduced. RS-232C, GPIB and Ethernet are available to the interface of GPIB commands.

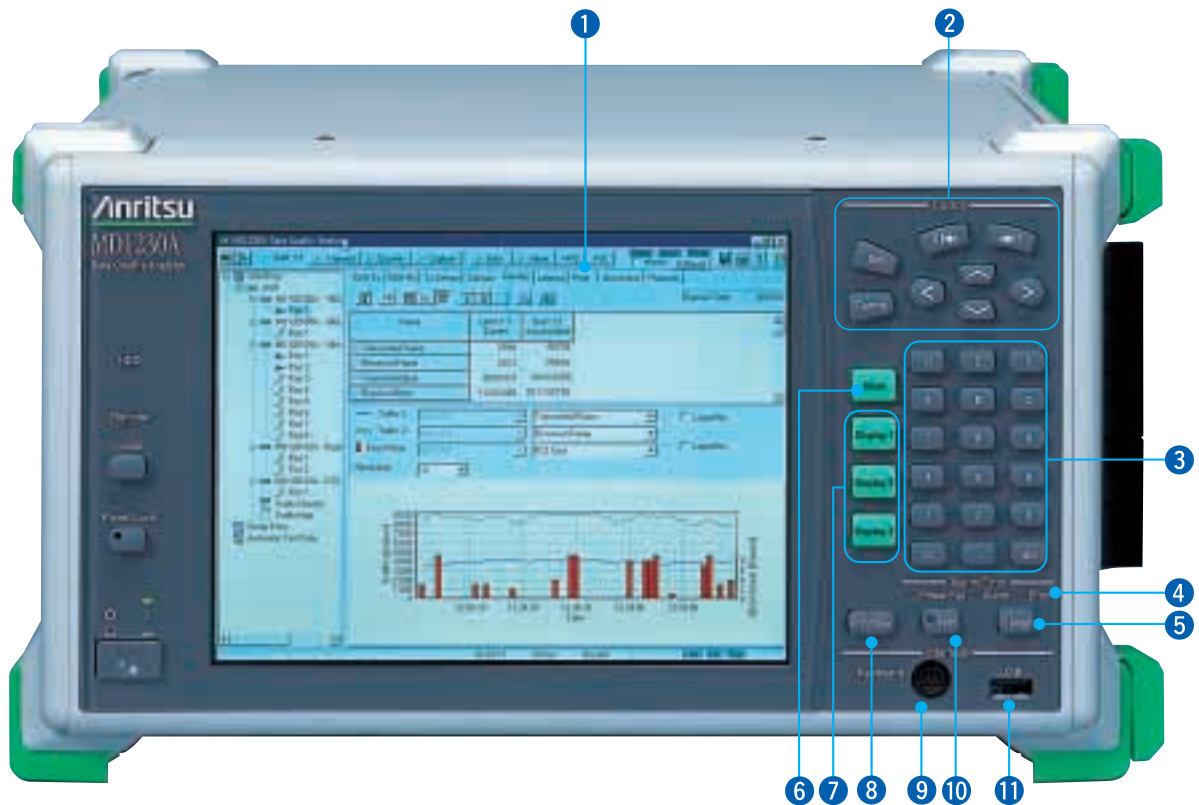
Testing WDM Devices

In testing WDM devices, performance tests must be conducted on all wavelengths.

Using the MN9320A Optical Channel Drop Unit (available optionally) allows any wavelength to be selected from a WDM line for measuring the bit error rate on OC-48c or OC-192c.



MD1230A



- ① **Display:** 8.4-inch TFT-LCD, SVGA (800 x 600)
- ② **Cursor keys**
Set: Sets data
Cancel: Cancel data setting
R| ← → | F: Fetches setting screen
^ V <> : Scrolls screen cursor and setting items
- ③ **Input keys:** Input numeric data
- ④ **Alarm/Error:** Displays receiver alarms, errors and power failure
- ⑤ **H. Reset:** Resets history function
- ⑥ **View:** Switches between tree view (showing ports as a tree) and graphical view (showing interface module panel)
- ⑦ **Display 1 to 3:** A maximum of three screens can be saved. Pressing the Display 1 to 3 keys fetches the pre-set screen composition.
- ⑧ **Print Now:** Prints screen contents at external printer
- ⑨ **Keyboard:** For connecting PS/2 keyboard
- ⑩ **Hist:** When on, each LED lights whenever an alarm or error occurs after power-on. When off, each LED displays current alarm and error conditions.
- ⑪ **Front USB:** For connecting USB devices such as an USB mouse
- ⑫ **Unit Sync Input/Unit Sync Output:** Clock signal I/O for time synchronizing several MD1230As connected in a daisy chain
- ⑬ **Trigger Input, Trigger Output:** External trigger I/O
- ⑭ **GPS Antenna:** For connecting a GPS antenna
- ⑮ **Rear USB:** For connecting any Windows®98-compatible USB devices
- ⑯ **Ethernet:** Ethernet connector for control software, for linking multiple MD1230As, and for GPIB commands
- ⑰ **RS-232C:** RS-232C interface for GPIB Commands
- ⑱ **CRT:** VGA connector for external monitor
- ⑲ **GPIB:** GPIB bus interface when GPIB option installed.
- ⑳ **Module slots:** For installing up to five interface modules
- ㉑ **3.5" Floppy Disk Drive**
- ㉒ **DCS Input:** Input for SONET/SDH sync data and clock



For developing, manufacturing and maintaining network equipment and systems

- Physical interfaces for 10 Mbit/s to 10 Gbit/s
- Expandable up to 40 10G POS ports or 320 10M/100M Ethernet ports
- Powerful and flexible filter and trigger conditions
- Supports protocol decoding including MPLS, IPv6, and BGP-4
- Real-time measurement of in-service traffic
- Full wire rate transmission of user edited data streams
- Compact and lightweight unit with built-in Windows® 98*, display, and keypad

* Windows® 98 is a registered trademark of Microsoft Corporation in the USA and other countries.

Physical Interfaces for 10 Mbit/s to 10 Gbit/s

The MD1230A supports a variety of interface modules shown in the table below. In the future, new interface modules will be added to those already available. The Gigabit Ethernet Module uses Giga-Bit Interface Converters (GBICs) that can be changed to support 1000BASE-SX/LX/LH/ZX ports.

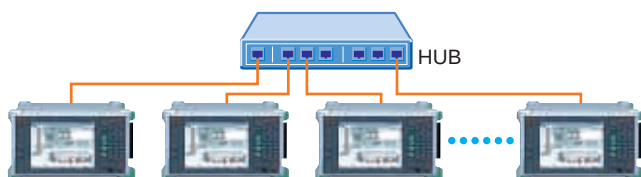
10M/100M Ethernet Module	8 ports
Gigabit Ethernet Module	2 ports
2.5G POS (1310 nm) Module	1 port
2.5G POS (1550 nm) Module	1 port
10G POS (1310 nm) Module	1 port
10G POS (1550 nm) Module	1 port

Expandable up to 40 10G POS or 320 10M/100M Ethernet ports

Any combination of up to five interface modules can be installed in one MD1230A.

A maximum of eight MD1230A units can be networked via Ethernet, with one unit acting as a controller for all units. Time synchronization is performed by connecting a daisy chain clock. Latency between any ports can be measured. The number of ports can be expanded to a maximum of 320 using 10M/100M Ethernet modules.

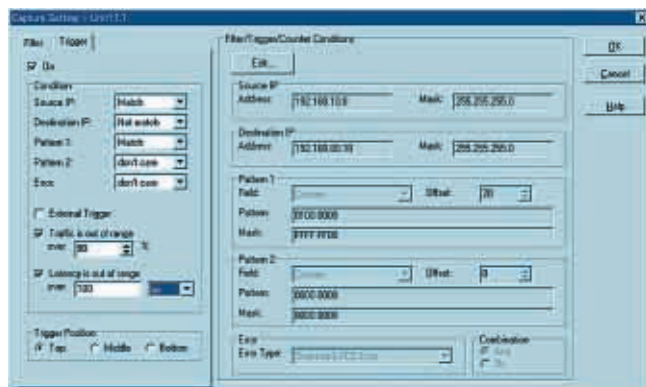
Module	10M/100M Ethernet	Gigabit Ethernet	2.5G POS	10G POS
No. of ports/module	8	2	1	1
No. of modules/unit	5	5	5	5
No. of ports/unit	40	10	5	5
No. of ports for 8 connections	320	80	40	40



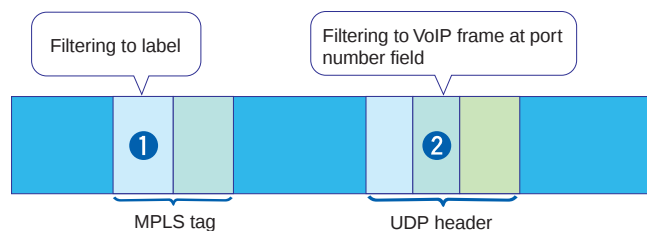
Powerful and Flexible Filter/Trigger Conditions

The MD1230A has powerful and flexible filter and trigger functions that can be set independently for each port as shown in the following table.

Trigger condition	Filter condition	Condition	Remarks
✓	✓	Destination MAC address	10M/100M Ethernet and Gigabit Ethernet support these conditions. MAC address mask permits portion match.
✓	✓	Source MAC address	
✓	✓	Destination IP address	2.5G POS and 10G POS modules support these conditions. IP address mask permits partial match
✓	✓	Source IP address	
✓	✓	User-defined 32 bit pattern	Two sets of user-defined 32 bit pattern conditions per port. Sets offset and pattern match at any frame position. Pattern mask permits partial match.
✓	✓	User-defined 32 bit pattern	
✓	✓	Error condition	Good frame, FCS error, undersize, fragment, oversize, oversize/FCS error, dribble error, alignment error, IP header checksum error, TCP checksum error, UDP checksum error
✓	✓	Ext. trigger input	Rising edge of pulse
✓	—	Traffic over	When traffic setting overflows
✓	—	Latency over	When latency setting overflows



As an example, when filtering only VoIP frames on an MPLS network, the MPLS label is specified as a 32 bit pattern (1), and VoIP frames are specified at the UDP header port number field as a 32 bit pattern (2). As a result, if only VoIP frames are captured on the specified MPLS network, the number of packets can be counted.

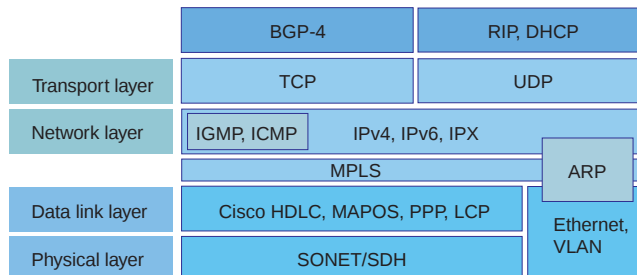
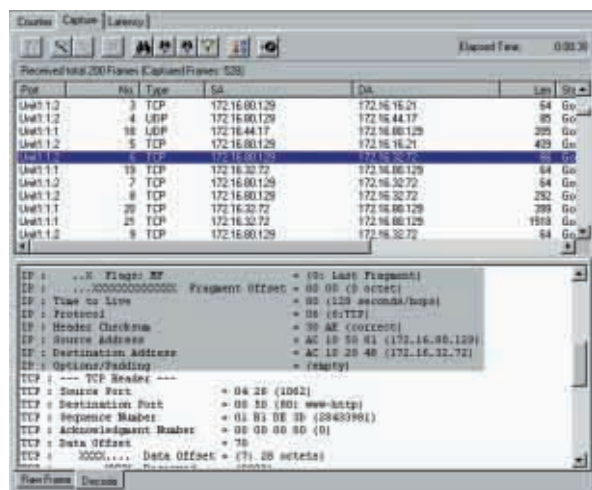


Supports Protocol Decode including MPLS, IPv6, and BGP-4

The MD1230A real-time capture buffers do not drop frames even at the full wire rate of 10 Gbit/s. The in-service capture function is an especially powerful and useful tool for troubleshooting the causes of network faults. Captured frames can be searched on the basis of specified conditions and interesting frames can be selected and displayed. Each port has an independent capture buffer and is unaffected by other ports.

Using the real time capture buffers, Ethernet, Cisco HDLC, MAPOS, PPP, LCP, MPLS, VLAN, ARP, IPv4, ICMP, IPv6, IPX, TCP, UDP, IGMP, RIP, BGP-4 and DHCP protocols can be decoded and displayed for captured frames.

Frames from up to 8 ports may be captured at the same time and displayed simultaneously on the screen. The captured frames are arranged in the order of time received, enabling the protocol exchange to be verified.



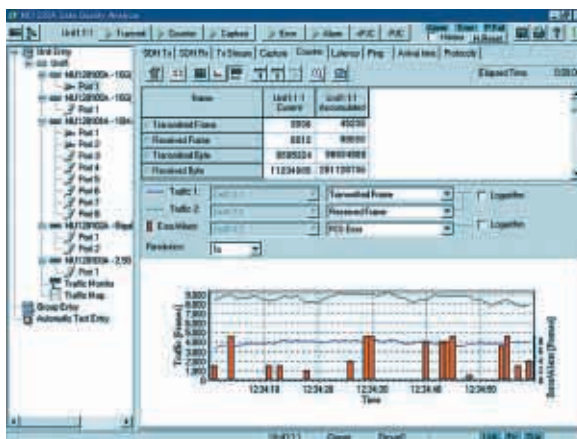
Real-Time Measurement of In-Service Traffic

The MD1230A measurements can be output on a printer in the reports formatted as tables or graphs. CSV-format result files may be transferred to Microsoft® Excel.

The MD1230A provides the pass-through mode functionality in all its interface modules. In pass-through mode, received data is monitored and output directly to the transmit port without change. Inserting the MD1230A into the actual line enables easy in-service monitoring.

Traffic Monitoring

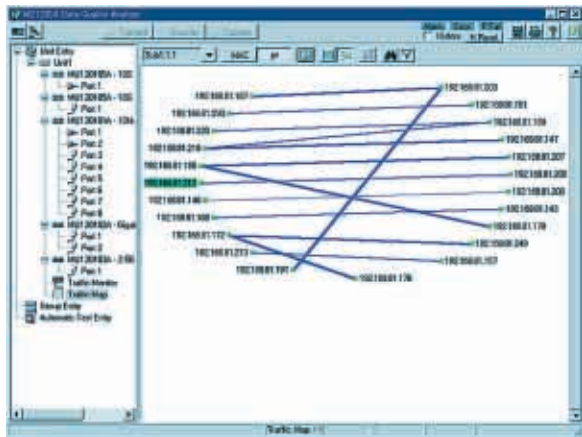
The MD1230A can measure simultaneous real-time counts of send and receive bytes/frames, QoS frames in 8 priority ranks, every error type, SONET/SDH alarms, and many others. In addition, when the above-described filter function is used, specific frame traffic can be measured for each port. The powerful frame filtering operations can be used to capture and verify performance of VPN services where the UDP port number specifies MPLS VoIP frames.



Performance Test & Network Monitoring

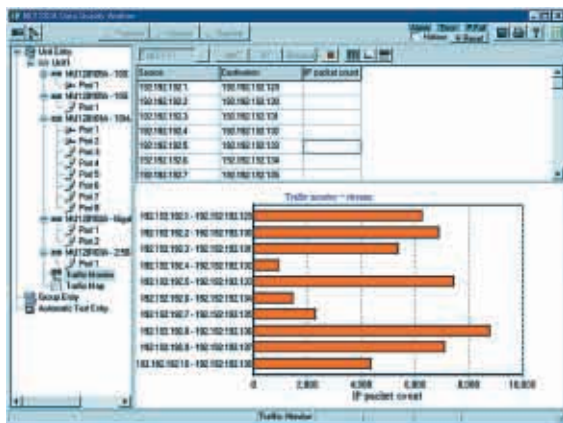
•Traffic Map

Traffic mapping displays Ethernet data flow pairs or IP data flow pairs to visualize the data flow communicating partners.



•Traffic Monitor

Traffic monitoring graphically displays the traffic for Ethernet data flows, IP data flows, or traffic for each protocol in real time. Ethernet or IP data flow frame counts can be displayed for up to 64 communicating partners.

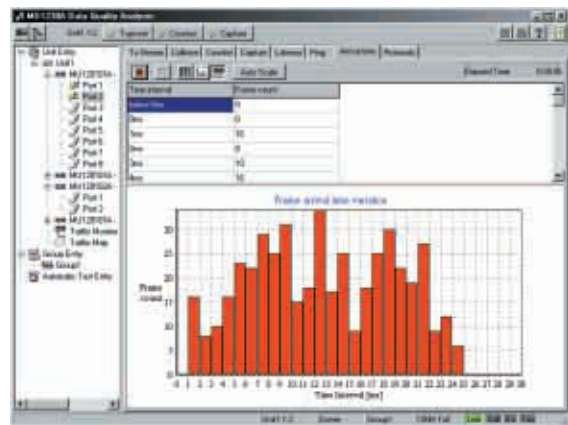


•Latency

The MD1230A is able to measure the latency of simplex data transfer. When up to eight MD1230A units are daisy chained, latency can be measured by interconnecting a clock signal for time synchronization. In addition, when a GPS antenna is connected, latency can be measured between remote locations.

•Frame Arrival Time Variation

In applications like Voice over IP (VoIP) and Video on Demand (VoD), frames must arrive within the correct time slot. In other words, it is important to evaluate variation in the frame arrival time at the receive side. The MD1230A can perform these types of important timing measurements.

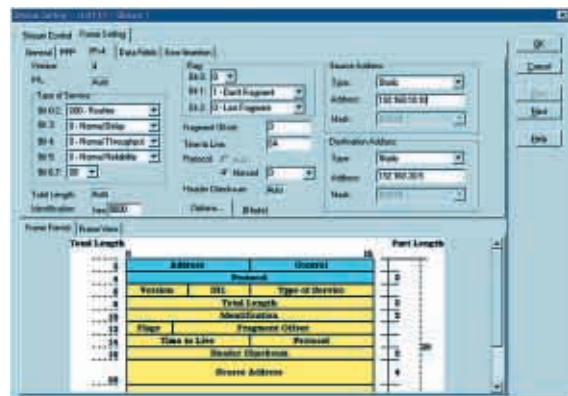


Full Wire Rate Transmission of User Edited Data Streams

The MD1230A can send a up to 256 data streams per port at the full wire rate. Data editing is a simple three-step procedure described below.

•Step 1: Setting Frame Data

The frame editor is used to edit the frame data for any of the Ethernet, PPP, Cisco HDLC, MAPOS, ARP, IPv4, IPv6, IPX, MPLS, VLAN, TCP, UDP, IGMP, RIP and DHCP protocols. When a specific protocol frame header is selected, each frame data field can be edited in accordance with the frame format specifications that are also displayed. The IP and/or MAC address can either be partially or completely set to automatically increment, decrement, or set randomly. When using IPv6, the 32 bits of the address field can be set for automatic random, increment, or decrement operations.

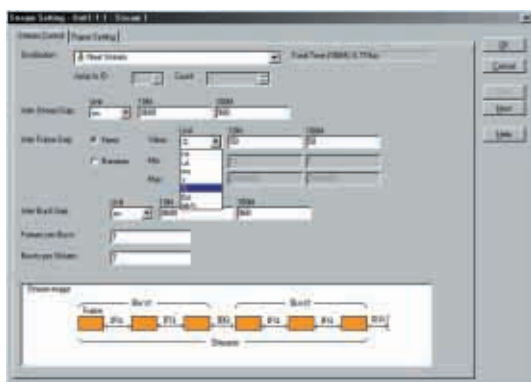


•Step 2: Setting Stream Control

The interframe gaps for the traffic defined in Step 1 is set and the data stream is defined.

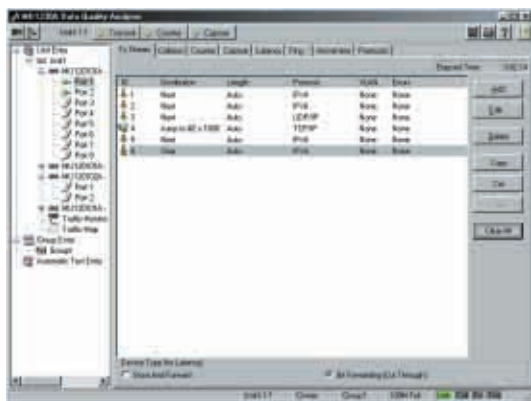
The load may be set based on factors such as frame interval, the percentage of wire rate, or bit/s value. Typically, an actual network load is not static or constant, but rather dynamic or bursty.

To simulate this type of load, the MD1230A has a multi-burst function. In addition, a random frame interval can be simulated by setting the interframe gap to random within a specified packet interval range.



•Step 3: Combining Data Streams

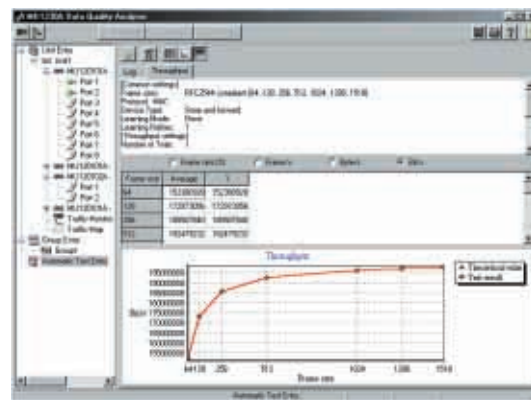
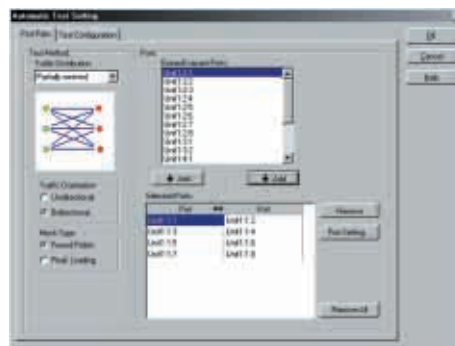
Up to 256 data streams defined in Step 2 can be combined per port. Any number of data streams can also be repeated a specified number of times.



Testing in Conformance to RFC2544

MD1230A implements automatic testing that conforms to RFC2544 test specifications. In five types of tests (Throughput, Latency, Frame Loss Rate, Back-to-Back Frames, and System Recovery) the test conditions are set in advance. After that, all measurements can be made automatically by simply pressing the START button.

The test results may be displayed as table or graph. In the throughput test, which is most important of these tests, partial mesh type and mesh type tests are supported depending on network connection.



Rich SONET/SDH Measurement Functionality

The MD1230A provides a wide range of measurement functions for IP as well as for SONET/SDH. One MD1230A can support both of IP and SONET/SDH measurements.

•Measuring BER on Concatenation Mapping

On STM-16c/OC-48c and STM-64c/OC-192c interfaces, PRBS patterns can be embedded into the SONET/SDH payload to measure bit error rate.

Compact and Lightweight Unit with Built-in Windows® 98, display, and keypad

For easy and familiar operation, the MD1230A uses built-in Windows® 98. It has a rear panel a USB port for connecting a printer or external storage media. A PS/2 keyboard connector and USB connector on the front panel support a keyboard and USB mouse.

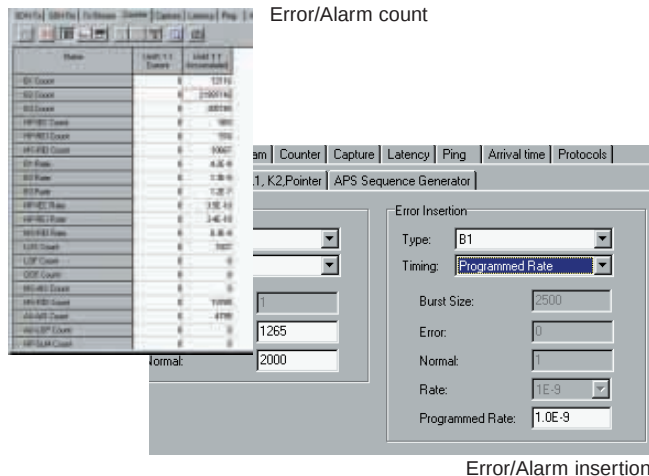
The MD1230A's easy operability, compact size, and light weight provide the perfect solution for convenient on-site network troubleshooting.

Performance Test & Network Monitoring

•Error/Alarm Analysis Functions

Generally, POS (Packet Over SONET/SDH) requires concatenation mapping.

The MD1230A provides error/alarm measurement and tests the signals required for concatenation.

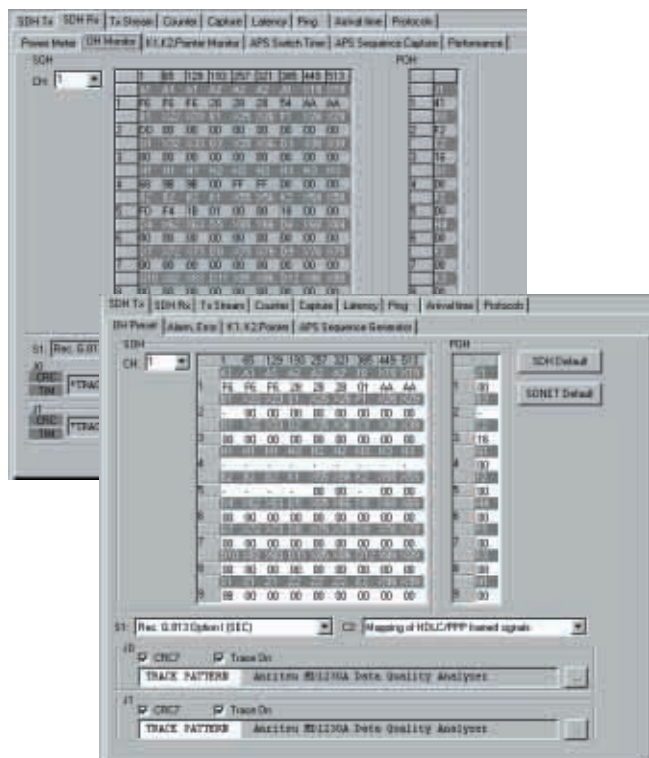


Error/Alarm insertion

•Overhead Monitor and Preset

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

OH monitor

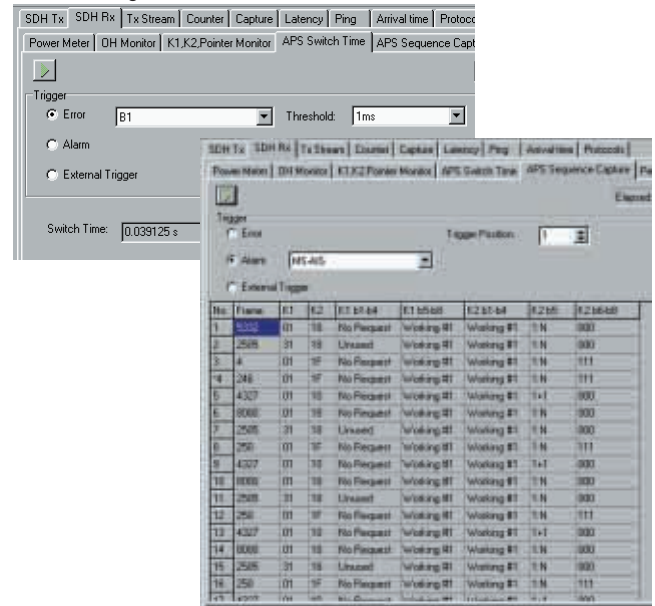


OH preset

•APS (Automatic Protection Switch) Measurement

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

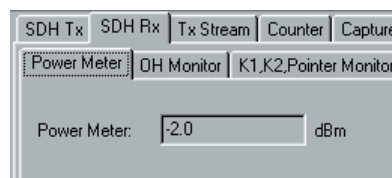
APS switching time measurement



K1/K2 sequence captured

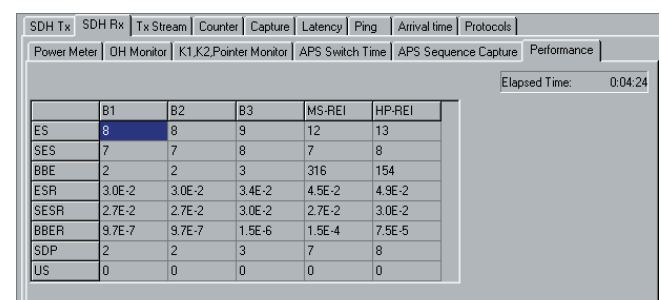
•Optical Power

All POS modules (MU120103A/04A/05A/06A) incorporate an optical power meter as a standard function. This enables quick measurements without moving fiber optics connections.



•Performance Measurement (ITU-T G.826)

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



Protocol Emulation

•PPP

Link establishment is performed using LCP. IP address notification is also supported by using MRU (Max Receive Unit) negotiation and IPCP.

•ARP

The MD1230A can send each port's MAC address in response to appropriate ARP requests. It is also possible to select either a mode that allow a port to respond to all ARP requests regardless of IP address, or a mode that does not respond to any ARP request. Furthermore, the ARP request and response packets can both be counted.

•PING (ICMP for IPv4)

The MD1230A supports PING for port IP addresses. In addition, the number of ping request frames and the number of ping response frames can both be counted.

•IGMP

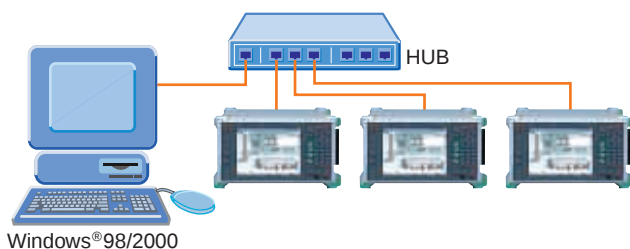
The MD1230A sends the user-set host group address via a host membership report in response to host membership queries from routers. MD1230A will reports up to 255 consecutive host group addresses. Even if there is no host membership query, the user-set host group address can be sent periodically via the host membership report.

•BGP-4

The MD1230A can emulate up to 8 BGP speakers, advertising up to 100 routes per BGP speaker. Link flaps and route flaps can be generated at any user-specified frequency (However, it cannot use routes advertised by the DUT in the route flap test.)

Remote PC Control

With the Windows®98/2000-compatible MX123001A Data Quality Analyzer Control Software (sold separately) installed, up to eight remote PCs can control up to 8 linked MD1230A units over an Ethernet network.



Multi-User Functions

The MD1230A supports multi-user functions. Multiple users can reserve their own individual ports, preventing any interference from other users. On network equipment production lines, the MD1230A supports reserving ports for each manufacturing process step, permitting system sharing.

In addition, when the MX123001A Data Quality Analyzer Control Software (sold separately) is installed on several computers within a product engineering environment, multiple designers and researchers can use the same MD1230A, increasing engineering efficiency.

Automated Measurement Using Remote Commands (Option)

Almost all MD1230A functions can be executed by remote commands. An automated test system can be configured by operating the MD1230A from the user's application software. In addition, the interface for sending and receiving GPIB commands can be selected from any of the optional GPIB (MD1230A Option 02), RS-232C (MD1230A Option 01) and Ethernet interfaces (MD1230A Option 03).

Performance Test & Network Monitoring Specifications

• MD1230A (Main Frame)

Sync clock input	Frequency: 64 kHz + 8 kHz ± 50 ppm, 2.048 MHz ± 50 ppm, 1.544 MHz ± 50 ppm, 2.048 Mbit/s ± 50 ppm, 1.544 Mbit/s ± 50 ppm Interface 2M: ITU-T G.703 Table 10, HDB3 1.5M: B8ZS, AMI ANSI T1.403 Level (64k): 0.63 to 1.1 V _{o-p} Code (64k): AMI with 8 kHz violation Connector BNC (75 Ω): 2 MHz, 2 Mbit/s Siemens (120 Ω , balanced): 2 MHz, 2 Mbit/s, 64 kHz + 8 kHz Bantam (100 Ω , balanced): 1.5 MHz, 1.5 Mbit/s
Trigger output	Level: TTL (active high), impedance: 75 Ω (BNC)
Trigger input	Usable as capture buffer trigger Level: TTL (Active high), connector: 75 Ω (BNC)
Sync I/O	MD1230A time sync signal, impedance: 75 Ω (BNC)
Interfaces	RS-232C, GPIB (Option 02), Ethernet (10BASE-T/100BASE-TX), USB port x 2, PS/2 keyboard connector, GPS antenna (option 05), video output (VGA)
Built-in memory	Measurement conditions: 10 sets, Measurement results: 10 sets
External storage	3.5" FDD
OS	Windows® 98 Second Edition
Auto test	RFC2544 Tests (throughput, latency, frame loss rate, back-to-back frame, system recovery, reset)
Traffic monitor	Ethernet frame count for up to 64 flows, IP packet count for up to 64 flows, frame count for each protocol
Traffic map	Ethernet data flow for up to 256 flows, IP data flow for up to 256 flows
LEDs	Power fail, errors, alarms, remote, local, HDD, power
Dimensions and mass	320 (W) x 177 (H) x 350 (D) mm, ≤ 15 kg (excluding options and modules)
Power supply	85 to 132 Vac/170 to 250 Vac (auto switching), 47.5 to 63 Hz, ≤ 530 VA
Operating temperature	0° to +40°C (except when HDD or FDD are active.)
Storage temperature	-20° to +60°C
EMC	EN61326: 1997/A1: 1998 (Class A), EN61000-3-2: 1995/A2: 1998 (Class A), EN61326: 1997/A1: 1998 (Annex A)
LVD	EN61010-1: 1993/A2: 1995 (Installation Category II, Pollution degree 2)

• Ethernet Module

Model	MU120101A	MU120102A
Ports	10BASE-T/100BASE-TX Number of ports: 8 Connector: RJ-45 Link speed: 10 Mbit/s, 100 Mbit/s Duplex mode: Full, half Auto negotiation: On/off Flow control: On/off	1000BASE-SX/LX/LH/ZX *1 Number of ports: 2 Connector: SC Link speed: 1000 Mbit/s Duplex mode: Full Auto negotiation: On/off Flow control: On/off
LEDs	Link, Tx/collision, Rx/error	Link, Tx, Rx, error
Frame settings	MAC address: Fixed, increment, decrement, random (changeable portions specified in 4 bits units) VLAN tag *2: Fixed, increment, decrement, random MPLS label *2: Up to 10 MPLS labels can be appended. Fixed setting Protocol editing: IPv4, IPv6, TCP, UDP, IGMP, ICMP for IPv4, RIP, DHCP, IPX, ARP, pause control Data field: Can set any 4 portions of data field All 1s, all 0s, alternate 1/0 (each bit, each 2 bits, each 4 bit/s, each byte, each 2 bytes), increment, decrement, random, user programmed, single PRBS 9, time stamp, sequence number, test frame	
Frame length	18 bytes to 10000 bytes (settable as auto, fixed, increment, or random)	48 bytes to 64 kbytes (settable as auto, fixed, increment, or random)
Stream settings	Stream transport mode: Continuous, continuous burst, stop after this stream, next stream, jump to stream. Jump to stream for count (loop count: 1 to 16777215, frame count per burst: 1 to 16777215, burst count per stream: 1 to 1 x 10 ¹²)	

Model	MU120101A	MU120102A
Stream settings	Interframe gap 10BASE-T: 8000 ns to 1700 s, resolution of 800 ns, settable as fixed, random 100BASE-TX: 800 ns to 170 s, resolution of 80 ns, settable as fixed, random Interburst gap 10BASE-T: 8000 ns to 1700 s, resolution of 800 ns, settable as fixed 100BASE-TX: 800 ns to 170 s, resolution of 80 ns, settable as fixed Interstream gap 10BASE-T: 8000 ns to 1700 s, resolution of 800 ns, settable as fixed 100BASE-TX: 800 ns to 170 s, resolution fixed of 80 ns, settable as fixed	Interframe gap: 64 ns to 120 s, resolution of 16 ns, settable as fixed, random Interburst gap: 64 ns to 120 s, resolution of 16 ns, settable as fixed Interstream gap: 64 ns to 120 s, resolution of 16 ns, settable as fixed
Number of streams	256 streams/port	
Error insertion	Collision, FCS error, alignment error, dribble bit error, undersize error, oversize error, Fragments error, oversize & FCS error, IP header checksum error, TCP/UDP checksum error	FCS error, undersize error, oversize error, Fragments error, oversize & FCS error, IP header checksum error, TCP/UDP checksum error
Counter	Transmitted frame* ³ , received frame* ³ , transmitted bytes, received bytes, transmitted data rate, received data rate, fragments, undersize, oversize, oversize & FCS error, FCS error, line error, flow control, alignment error, dribble bit error, collision, capture trigger, capture filter, transmitted ARP reply, transmitted ARP request, transmitted ping reply, transmitted ping request, received ARP reply, received ARP request, received ping reply, received ping request, QoS 0 to 7* ⁴ , user defined 1* ⁴ , user defined 2* ⁴ , transmitted IP* ⁴ , received IP* ⁴ , IP header checksum error, TCP checksum error, UDP checksum error	Transmitted frame* ³ , received frame* ³ , transmitted bytes, received bytes, transmitted data rate, received data rate, fragments, undersize, oversize, oversize & FCS error, FCS error, line error, flow control, byte alignment error, capture trigger, capture filter, transmitted ARP reply, transmitted ARP request, transmitted ping reply, transmitted ping request, received ARP reply, received ARP request, received ping reply, received ping request, QoS 0 to 7* ⁴ , user defined 1* ⁴ , user defined 2* ⁴ , transmitted IP* ⁴ , received IP* ⁴ , IP header checksum error, TCP checksum error, UDP checksum error
Latency	Maximum, minimum, average measure	
Frame arrival time variation measurement	Time resolution: 1 μ s, 10 μ s, 100 μ s, 1 ms, 10 ms, 100 ms, 1 s	
QoS counter setting	Using QoS described below, 8-level priority frame count: IEEE802.1D VLAN tag user priority field, 3 LSB of RFC2474 DSCP field	
Capture buffer	8 Mbytes/port	32 Mbytes/port
Capture filter	At following conditions for each port, capture filter condition settings: Destination MAC address, source MAC address, 32-bit pattern (settable bit length and offset) x 2, error conditions	
Capture trigger	At following conditions for each port, capture trigger condition settings: Destination MAC address, source MAC address, 32-bit pattern (settable bit length and offset) x 2, error conditions, traffic over, latency over, external trigger input	
Protocol decode	Ethernet, MPLS, VLAN, ARP, IPX, IPv4, ICMP for IPv4, IPv6, TCP, UDP, IGMP, RIP, BGP-4, DHCP	
Protocol emulation	ARP, PING, IGMP, BGP-4	

★1: 1000BASE-SX/LX/LH/ZX can be chosen by exchanging GBIC that is an optional accessories.

★2: VLAN tag and MPLS labels cannot both be used simultaneously.

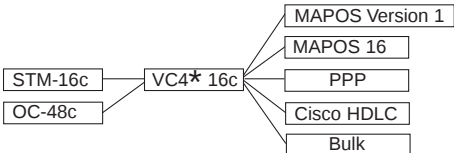
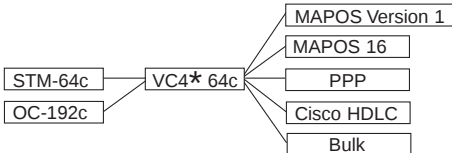
★3: Frame number and frame rate (fps) are counted.

★4: Packet number and packet rate (pps) are counted.



Performance Test & Network Monitoring

• POS Module

Model	MU120103A	MU120104A	MU120105A	MU120106A
Ports	OC-48/STM-16 Wavelength: 1260 to 1360 nm Number of ports: 1 Connector: SC Bit rate: 2488.320 Mb/s (NRZ) Output level: -5 to 0 dBm Input sensitivity: -18 to 0 dBm	OC-48/STM-16 Wavelength: 1500 to 1580 nm Number of ports: 1 Connector: SC Bit rate: 2488.320 Mb/s (NRZ) Output level: -1.0 to +2.0 dBm Input sensitivity: -28 to -9 dBm	OC-192/STM-64 Wavelength: 1290 to 1330 nm Number of ports: 1 Connector: SC Bit rate: 9953.280 Mbit/s (NRZ) Output level: -6 to 0 dBm Input sensitivity: -11 to -1.0 dBm	OC-192/STM-64 Wavelength: 1530 to 1565 nm Number of ports: 1 Connector: SC Bit rate: 9953.280 Mbit/s (NRZ) Output level: -1.0 to +2.0 dBm Input sensitivity: -14 to -3.0 dBm
LEDs	Link, Tx, Rx, error, optical send			
Clocks	Internal (MU120103A/MU120104A: ±50 ppm variable, MU120105A/MU120106A: ±100 ppm), receive signal, lock (64 kHz +8 kHz, 1.5 MHz, 2 MHz, 1.5 Mbit/s, 2 Mbit/s)			
SDH/SONET settings	Frame: SDH/SONET Alarm addition: LOS, LOF, MS-AIS, MS-RDI, MS-TIM, AU-AIS, AU-LOP, HP-SLM, HP-TIM, HP-RDI, HP-UNEQ Timing: Single, single burst frame, alternative [Alarm frame (0 to 8000), Normal frame (0 to 8000)], all Error insertion: FAS, bits all, B1, B2, B3, MS-REI, HP-REI, HP-IEC Timing: Single, single burst bit (1 to 64000), rate (1E-3, 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, 1E-9), programmed rate [AE-B ★A: 1.0 to 9.9 (0.1 steps), B: 3 to 10] APS (K1/K2) Sequence generation: 2 to 64 words, repeat (8000 frames)			
Mapping				
Frame settings	PPP scramble: On/off PPP FCS: CRC32 MPLS label: Up to 10 MPLS labels can be appended. Fixed setting Protocol editing: IPv4, IPv6, TCP, UDP, IGMP, ICMP for IPv4, RIP, DHCP Data field: Can set any 4 parts in data field. All 1s, all 0s, alternate 1/0 (each bit, each 2 bits, each 4 bits, each byte, each 2 bytes), increment, decrement, random, programmable, single PRBS 9, time stamp, sequence number, test frame			
Frame length	8 bytes to 64 kbytes (settable as auto, fixed, increment, or random)			
Stream settings	Stream transport mode: Continuous, continuous burst, stop after this stream, next stream, jump to stream. Jump to stream for count (loop count: 1 to 16777215, frame count per burst: 1 to 1 × 10 ¹² , burst count per stream: 1 to 1 × 10 ¹²)			
	Interframe gap: 3.3 ns to 120 s, resolution of 3.2 ns, settable as fixed, random Interburst gap: 53.4 ns to 120 s, resolution of 3.2 ns, settable as fixed Interstream gap: 427.5 ns to 120 s, resolution of 3.2 ns, settable as fixed		Interframe gap: 0.8 ns to 120 s, resolution of 0.8 ns, settable as fixed, random Interburst gap: 13.4 ns to 120 s, resolution of 0.8 ns, settable as fixed Interstream gap: 106.8 ns to 120 s, resolution of 0.8 ns, settable as fixed	
Number of streams	256 streams/port			
Error insertion	FCS error, abort frame, fragment, undersize, oversize, oversize & FCS error, IP header checksum error, TCP/UDP checksum error			
Counter	SONET/SDH: B1, B2, B3, HP-IEC, MS-REI, HP-REI, LOS, LOF, OOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-SLM, HP-RDI, HP-UNEQ, Justification: NDF, +PJC, -PJC, Cons, PPM PPP/IP/TCP/UDP: Transmitted frame* ¹ , received frame* ¹ , transmitted bytes, received bytes, transmitted data rate, received data rate, received bytes before stuffing, transmitted bytes after stuffing, fragment, undersize, oversize, oversize & FCS error, FCS error, abort frame, capture trigger, capture filter, transmitted ping reply, transmitted ping request, received ping reply, received ping request, QoS 0 to 7* ² , user defined 1* ² , user defined 2* ² , transmitted IP* ² , received IP* ² , IP checksum error, TCP checksum error, UDP checksum error			
Latency	Maximum, minimum, average			
Alarm arrival time variation measurement	Time resolution: 1 μs, 10 μs, 100 μs, 1 ms, 10 ms, 100 ms, 1 s			
QoS counter settings	Using 3 LSB bits of RFC2474 DSCP field, 8-level priority packet count			
Capture buffer	256 Mbytes			
Capture filter	At following conditions for each port, capture filter condition settings: Destination IP address, source IP address, 32-bit pattern (settable bit length and offset) x 2, error conditions			
Capture trigger	At following conditions for each port, capture trigger condition settings: Destination IP address, source IP address, 32-bit pattern (settable bit length and offset) x 2, error conditions, traffic over, latency over, external trigger input			
Protocol decode	PPP, LCP, IPCP, MPLS, IPv4, ICMP for v4, IPv6, IPX, TCP, UDP, IGMP, RIP, BGP-4, DHCP			
Protocol emulate	PING, IGMP, BGP-4			

★1: Frame number and frame rate (fps) are counted.

★2: Packet number and packet rate (pps) are counted.



MU120103A



MU120105A



MU120104A



MU120106A

Ordering Information

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

Model/Order No.	Name	Model/Order No.	Name
Main frame		Optional accessories	
MD1230A	Data Quality Analyzer	G0105A	GBIC SX 850 nm ^{*5}
Standard accessories		G0106A	GBIC LX 1310 nm ^{*5}
		G0107A	GBIC LH 1310 nm ^{*5}
F0079	Power cord: 1 pc	G0108A	GBIC ZX 1550 nm ^{*5}
B0329G	Fuse, 10 A: 1 pc	J0660B	Optical fiber cord
B0500A	Front cover (for 3/4MW4U): 1 pc		(SM, SC·PC-SC·PC connector both ends), 2 m
W1930AE	Side cover: 1 pc	J0773B	Optical fiber cord (GI, SC-SC connector both ends), 2 m
	MD1230A operation manual CD-ROM ^{*1} : 1 pc	J1119B	Optical fiber cable (duplex, MM), 2 m
Options		J1110B	LAN cable (Straight), 5 m
MD1230A-01	RS-232C controller ^{*2}	J1109B	LAN cable (Cross), 5 m
MD1230A-02	GPIO controller ^{*2}	J0755D	Coaxial cord (BNC-P620-3C-2WS-BNC-P620, 75 Ω), 2 m
MD1230A-03	Ethernet controller ^{*2}	J1165	Coaxial cord (27CP-P-1.5-BNC-P-1.5C-CR10)
MD1230A-05	GPS module	J0162B	Balanced cable (Siemens 3p-Siemens 3p), 2 m
Plug-in modules		J0845A	Balanced cable (BANTAM 3P/BANTAM 3P), 6 ft
MU120101A	10M/100M Ethernet Module	J0008	GPIO cable, 2 m
MU120102A	Gigabit Ethernet Module ^{*3}	B0448	Soft case
MU120103A	2.5G (1.31) Module	B0336C	Carrying case (for 3/4MW4U, 350D)
MU120104A	2.5G (1.55) Module	Z0321A	Keyboard (PS/2)
MU120105A	10G (1.31) Module	Z0541A	Mouse
MU120106A	10G (1.55) Module	J1049A	Fixed optical attenuator (SC, 5 dB)
Software		J1049B	Fixed optical attenuator (SC, 10 dB)
MX123001A	Data Quality Analyzer Control Software	J1049C	Fixed optical attenuator (SC, 15 dB)
MX123001A-05	Data Quality Analyzer Control Software 5 licenses	B0501B	Blank panel
MX123001A-08	Data Quality Analyzer Control Software 8 licenses	W1927AE	MD1230A operation manual
Maintenance service ^{*4}		W1928AE	MX123001A software operation manual
MD1230A-90	Extended three year warranty service	W1929AE	MD1230A remote control operation manual
MU120101A-90	Extended three year warranty service		
MU120102A-90	Extended three year warranty service		
MU120103A-90	Extended three year warranty service		
MU120104A-90	Extended three year warranty service		
MU120105A-90	Extended three year warranty service		
MU120106A-90	Extended three year warranty service		

^{*1}: Includes W1927AE, W1928AE and W1929AE operation manuals. Printed versions sold separately.

^{*2}: The MD1230A-01/02/03 options are required only for remote control using GPIO commands. Note that these options may be implemented together, although all of them cannot be used at the same time because one of them must be selected when actually applied.

^{*3}: MU120102A requires two GBIC modules (sold separately).

^{*4}: Please ask your local Anritsu Field Office or Sales Representative for price and availability.

^{*5}: GBIC module is sold per one piece. MU120102A has two GBIC interfaces.

Anritsu

ЗАО "ЭлекТрейд-М"
121248, Россия, Москва,
Кутузовский проспект, д. 7/4, корп. 6, офис 50
Телефон/факс: +7-(095)-974-14-80
E-mail: info@eltm.ru
<http://www.eltm.ru>

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