TRANSPORT AND ETHERNET TESTING

Selection Guide

Interface

Interface \ Model	MT1040A/MU104014A/MU104015A	MT1000A/MU100010A	MT1000A/MU100011A	MT9090A/MU909060Ax
10M/100M/Gigabit Ethernet	✓	✓	✓	✓
10 Gigabit Ethernet	✓	✓	✓	
25 Gigabit Ethernet	✓		✓	
40 Gigabit Ethernet	✓		✓	
100 Gigabit Ethernet	✓		✓	
400 Gigabit Ethernet	✓			
OTU1, OTU2	✓	✓	✓	
OTU1e, 2e, 1f, 2f	✓	✓	✓	
OTU3, 3e1, 3e2, 4	✓		✓	
STM-1, 4, 16, 64/OC-3, 12, 48, 192	✓	✓	✓	
STM-256/OC-768	✓			
eCPRI/RoE (IEEE1914.3)	✓	✓	✓	
CPRI Option 1, 2, 3, 4, 5, 6, 7, 8	✓	✓	✓	
CPRI Option 9, 10	✓		✓	
OBSAI 1X, 2X, 3X, 4X, 8X	✓	✓	✓	
DS1, DS3, E1, E3, E4		✓		
1G, 2G, 4G, 8G, 10G FC	✓	✓	✓	
16G FC	✓		✓	

Measurement Functions

	Measurement Functions \ Model	MT1040A/MU104014A/MU104015A	MT1000A/MU100010A	MT1000A/MU100011A	MT9090A/MU909060Ax
Ethernet	Packet Capture	✓	✓	✓	
	Protocol Decoding	✓	✓	✓	
	Protocol Emulation	✓	✓	✓	
	RFC 2544 Automatic Test	✓	✓	✓	✓
	Y.1564 Automatic Test	✓	✓	✓	✓
	RFC 6349 Automatic Test (Up to 10G)	✓	✓	✓	
	Through Mode	✓	✓	✓	✓
	Traffic Monitor	✓	✓	✓	✓
	Full Wire Rate Transmission	✓	✓	✓	✓
	Packet BER Measurement	✓	✓	✓	✓
	Latency	✓	✓	✓	✓
	SyncE		✓	✓	
	IEEE 1588 v2		✓	✓	
OTN/SDH/SONET	OTN Frame	✓	✓	✓	
	SDH/SONET Frame	✓	✓	✓	
	Tandem Connection Pattern G.707	✓	✓	✓	
	Automatic Protection Switch	✓	✓	✓	
	PDH Mapping	✓	✓	✓	
	DSn Mapping	✓	✓	✓	
	GMP Mapping	✓	✓	✓	
	Through Mode	✓	✓	✓	
	Optical Power Measurements	✓	✓	✓	
	Frequency Offset	✓	✓	✓	
	Client Signal Test over OTN	✓	✓	✓	
Mobile xHaul/eCPRI/RoE (IEEE1914.3)	Full Wire Rate Transmission	✓	✓	✓	
	Packet BER Measurement	✓	✓	✓	
	Latency	✓	✓	✓	
	SyncE		✓	✓	
	IEEE 1588 v2		✓	✓	
Mobile xHaul/CPRI	BERT	✓	✓	✓	
	Error/Alarm Transmission	✓	✓	✓	
	Passive Link Confirmation Test	✓	✓	✓	
	APS	✓	✓	✓	
	Pass Through	✓	✓	✓	
Mobile xHaul/OBSAI	BERT	✓	✓	✓	
	Error/Alarm Transmission	✓	✓	✓	
	APS	✓	✓	✓	
PDH/DSn	Frequency Measurements		✓		
	Error Measurement (G.821, etc.)		✓		
Fibre Channel	BERT	✓	✓	✓	
	Performance Test	✓	✓	✓	
	Reflector	✓	✓	✓	
Remote Control	GUI	✓	✓	✓	✓
	Command	✓	✓	✓	
	Site Over Remote Access	✓	✓	✓	

Network Master Series

MT1040A Network Master Pro
MU104014A 400G (QSFP-DD) Multirate Module
MU104015A 400G (OSFP) Multirate Module
MU104011A 100G Multirate Module

Remote Control
Cloud | **WLAN** | **Bluetooth** | **Ethernet** | **USB**
OPTION

Redefining Transport Testing

Entire Network I&M

The modular design of the Network Master Pro MT1040A platform makes it easy to support I&M for different network configurations. Furthermore, options for each test function can be selected and added as necessary to match the work schedule, helping cut initial capital costs.

Measurement Modules

	QSFP-DD/ QSFP28/ QSFP+	OSFP	QSFP28/ QSFP+	SFP28/ SFP+/SFP	RJ45
MU104014A	1 port		1 port	2 ports	2 ports
MU104015A		1 port	1 port	2 ports	2 ports
MU104011A			2 ports	2 ports	2 ports

400G (QSFP-DD) Multirate Module
MU104014A

400G (OSFP) Multirate Module
MU104015A

100G Multirate Module
MU104011A

400G Ethernet FEC Analysis

In addition to transmission-path loss margins, 400G Ethernet requires guaranteed loss margins when optical modules are integrated. With a built-in FEC analysis function, the MT1040A graphically displays (as histogram) the approximate number of errors occurring in symbols included in 1 Codeword error-correction units.
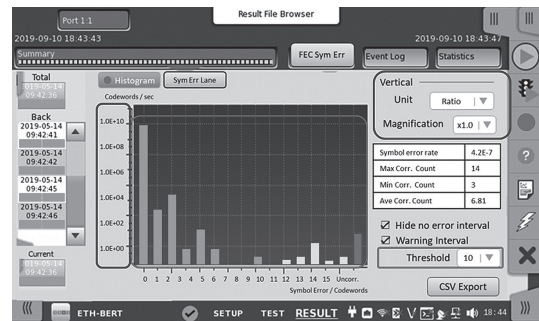

400G Ethernet Dual Port Testing

Adding the Activate for 400G Dual/100G Quad Option MT1040A-020 and two measurement modules to one MT1040A main unit supports dual-port 400G measurements.

400G Port 1
400G Port 2
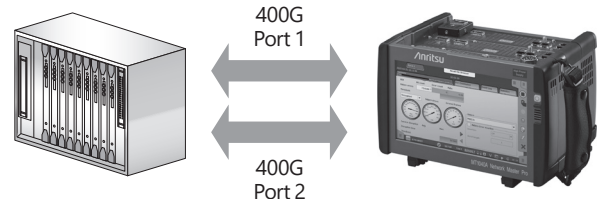
* There are conditions for two-port measurement.

Ethernet Installation and Troubleshooting

Network operators are introducing new carrier-class technologies, such as VLAN, Q-in-Q, Ethernet OAM, etc., to their Ethernet service menus, increasing test complexity and test time for field technicians.
With connectivity, bandwidth, QoS (Quality of Service), and service-related test functions, the MT1040A is ideal for commissioning and troubleshooting Ethernet networks at speeds up to 400 Gbps.


Ethernet Test: End-to-End

WDM Test
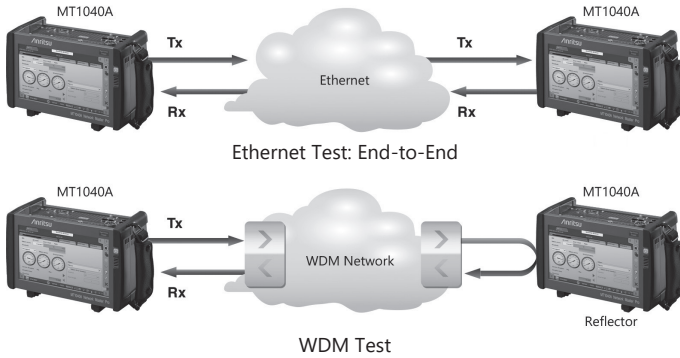
- BER tests . include Frame Loss and Sequence Error tests
- FEC Analysis
- Automated RFC 2544 tests of Throughput, Frame Loss, Latency or Packet Jitter, Burstability
- Filters . to extract relevant parts of traffic
- Separate pass/fail threshold settings
- Multistream Tx/Rx function (QoS/CoS test)
- Stacked VLAN (Q-in-Q)
- Link Fault Signaling (LFS) Emulation (10 Gbps to 400 Gbps)

Mobile xHaul Network Tests

In addition to mobile network speed increases supporting commercial rollout of 5G services, networks must also offer high reliability, low latency, and multiple simultaneous connections, which requires:

- Switching to eCPRI/RoE (IEEE1914.3)
- Improving time synchronization accuracy
- Cutting latency

The MT1040A support these requirements with interface, maximum throughput rate, and latency measurements.
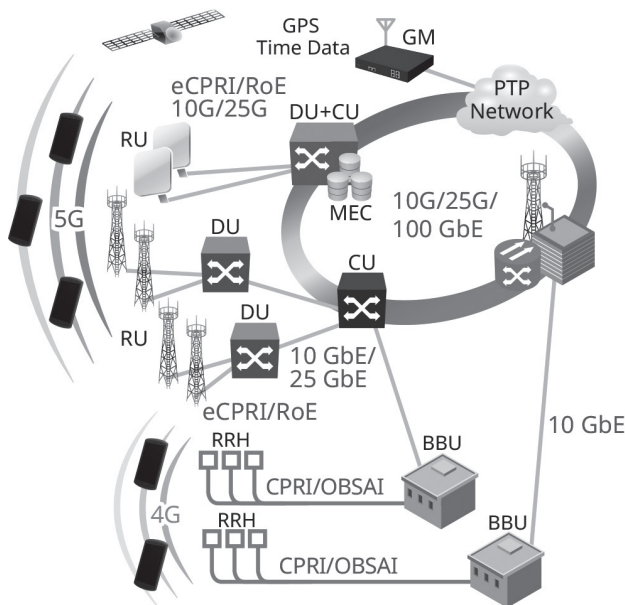
OTN/SDH/SONET Network Tests

Ethernet, CPRI, Fibre Channel, and SDH/SONET can be chosen as the client signal for testing OTN circuits in a live environment. In addition, ODUflex OTN mapping offers strong support for testing OTN equipment featuring new client signals.
Moreover, functions for simulating random signal errors mimicking the live environment as well as for generating errors using the ITU-T O.182 Poisson error distribution are useful for accurate evaluation of high-speed network line quality. And all-in-one support for both new and legacy technologies, including SDH/SONET tests, helps users optimize operation costs by retiring older tester inventory.
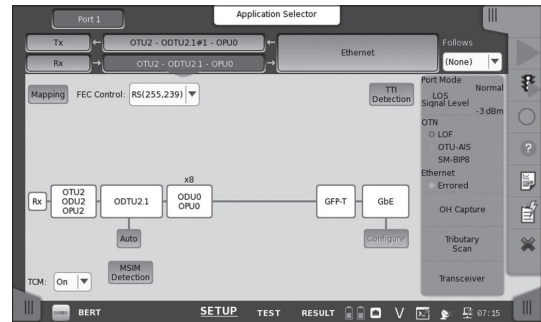
OTN Mapping Setting
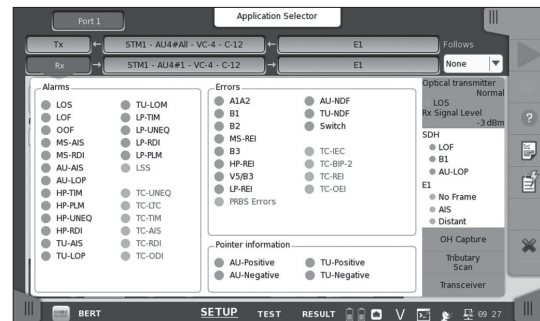
SDH/SONET Line Error/Alarm Status Display

MT1040A 400G Measurements

The MT1040A has a function for monitoring the FEC status in real-time. Periodic network monitoring using this function confirms the network load conditions, helping prevent problems.

One Button Testing

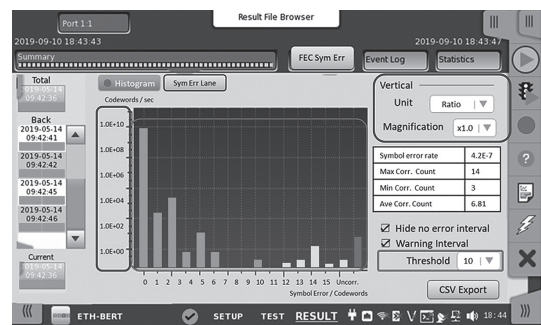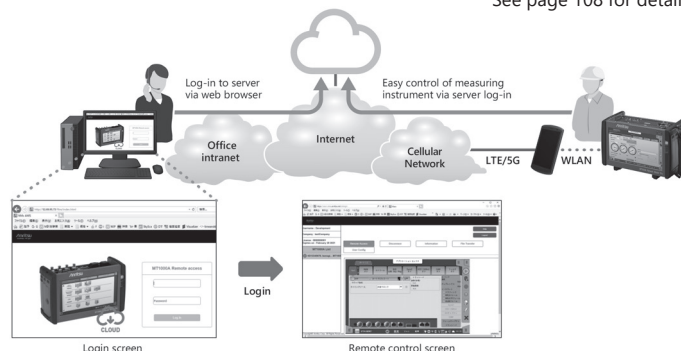The MT1040A has automatic test functions for simple and efficient network commissioning. These MT1040A automated test functions run scenario files created in advance on a PC to perform tests automatically using preset measurement items, procedures, and pass/fail evaluation conditions. Since the scenario also handles report creation, evaluation and results, inexperienced workers can run accurate tests without operation mistakes and re-tests.
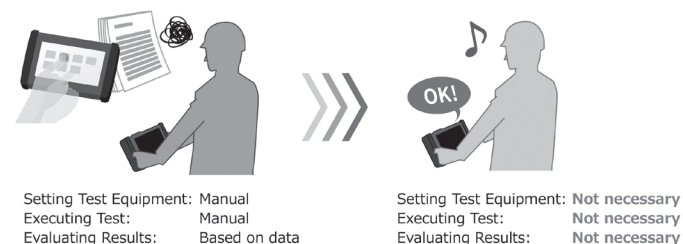
Easy Connections Anywhere Using SORA (Site Over Remote Access)

Using the Site Over Remote Access MX109020A (SORA hereafter) software measuring instruments can be remotely controlled easily anywhere. The SORA cloud-based service allows office users to log-in to an Internet webpage to control the measuring instrument from the office via a smartphone.

See page 108 for details

Setting Test Equipment:	Manual
Executing Test:	Manual
Evaluating Results:	Based on data

Setting Test Equipment:	**Not necessary**
Executing Test:	**Not necessary**
Evaluating Results:	**Not necessary**

Login screen | Remote control screen

Specifications

| Built-in Storage	8 Gbyte	
Battery	11.25 V rechargeable and replaceable intelligent Li-ion battery × 2 Operating time: 1 hours (typ., in case of 400 GbE) Charging time: 9 hours (Max.) (2 pcs) Remaining capacity indication: %	
Mains Adapter	G0418A (MT1040A Standard Accessory)	G0419A (MT1040A-020 Accessory)
	Input: 110 VAC to 240 VAC, 50 Hz/60 Hz Rated output: 19 VDC, 13.2 A max. Power consumption: 250 W max.	Input: 110 VAC to 240 VAC, 50 Hz/60 Hz Rated output 18 VDC, 22.2 A max. Power consumption: 420 W max.
Dimensions and Mass	262 (W) × 167 (H) × 68 (D) mm (Exclude Projection, MT1040A) 262 (W) × 167 (H) × 134 (D) mm (Exclude Projection, MT1040A + MU104014A) 262 (W) × 167 (H) × 154 (D) mm (Exclude Projection, MT1040A + MU104014A + MU100020A) 262 (W) × 167 (H) × 187 (D) mm (Exclude Projection, MT1040A + MU104014A + MU104014A) ≤4.7 kg (including MT1040A, MU104014A and battery) ≤5.5 kg (including MT1040A, MU104014A, MU100020A and battery) ≤6.5 kg (including MT1040A, MU104014A, MU104014A and battery)	

Environmental	Operating
	  Temperature: 0°C to +50°C, Humidity: ≤85% RH (non-condensing)
	Charging
	  Temperature: 0°C to +40°C, Humidity: ≤85% RH (non-condensing)
	Storage
	  Temperature: –30°C to +60°C, Humidity: ≤90% RH (non-condensing, without battery and AC adapter)
	          –20°C to +50°C, Humidity: ≤90% RH (non-condensing, with battery and AC adapter)	

CE	EMC	2014/30/EU, EN61326-1, EN61000-3-2
	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

https://www.anritsu.com

Ordering Information

This table lists the key configurataion part only.
For details, refer to the Product Brochure or consult our sales representative.

MT1040A Mainframe

Model/Order No.	Name	
MT1040A	Network Master Pro	
Standard Accessories		
MT1040A-006	High Power Supply*1:	1 pc
	Line Cord*2:	1 pc
B0745A	Softcase:	1 pc
B0771A*3	MT1040A Rear Panel kit:	1 pc
G0409A	AC Adaptor:	1 pc
G0413A	Li-ion Battery:	2 pcs

Software Options*4

Model/Order No.	Name
MT1040A-003*5	Connectivity for WLAN/Bluetooth
MT1040A-011	Site Over Remote Access Connect

Option for Two Transport Modules*6

Model/Order No.	Name
MT1040A-020	Activate for 400G Dual/100G Quad Option
Standard Accessories	
G0419A	AC Adapter (400 W)

Multirate Module

Model/Order No.	Name
MU104014A	400G (QSFP-DD) Multirate Module
MU104015A	400G (OSFP) Multirate Module
MU104011A	100G Multirate Module

Protocol Options

Model/Order No.	Name
MU104014A-015	Ethernet 100G Single Channel
MU104014A-016	Ethernet 100G Dual Channel
MU104014A-033	Ethernet 400G Single Channel
MU104015A-015	Ethernet 100G Single Channel
MU104015A-033	Ethernet 400G Single Channel
MU104011A-015	Ethernet 100G Single Channel
MU104011A-016	Ethernet 100G Dual Channel

*1: The presence of the MT1040A-006 option can be recognized at the top right of the front panel. To retrofit to the already shipped item, please contact us.

Without MT1040A-006   With in MT1040A-006

*2: One line cord is attached to the area to shipment.
*3: Composed of B0720A, B0730A, B0731A, B740A and B0741A.
*4: These options can be retrofitted. The Model/Order No. of retrofit options is "-3**".
 Example
  MT1040A-003 Connectivity for WLAN/Bluetooth becomes MT1040A-303 Connectivity for WLAN/Bluetooth Retrofit.
  When retrofitting an option, please either specify one of the following media along with the relevant option, or Web download.
   Z1849A: DVD-ROM for Retrofit Options
   Z1850A: USB Stick for Retrofit Options
*5: Available for certified countries and regions including USA, Japan and EU countries. Please visit the Anritsu web site for updated information.
*6: Can be added to main unit in which MT1040A-006 already installed. However, battery operation is not possible when using two transponder modules together.

Optical Transceivers Interface List

MU104014A	MU104015A	Model/Order No.	Name	Form Factor	100M Ethernet	156M STM-1	614M CPRI	622M STM-4	768M OBSAI	1GFC	1.23G CPRI	1.25G Ethernet	1.54G OBSAI	2GFC	2.46G CPRI	2.488G STM-16	2.67G OTU1	3.07G CPRI OBSAI	4GFC	4.92G CPRI	6.14G CPRI OBSAI	8GFC	9.83G CPRI	9.95G STM-64	10.1G CPRI	10.3G Ethernet	10GFC	10.7G OTU2	11.05G OTU1e	11.09G OTU2e	11.27G OTU1f	11.3G OTU2f	16GFC	25G Ethernet	40G Ethernet	40G OTN	100G Ethernet	100G OTN	200G Ethernet	400G Ethernet
✓		G0421A	QSFP56 200GBASE-LR4	QSFP56																																			1310 nm, SM, 10 km	
✓		G0402A	QSFP-DD 400GBASE-DR4	QSFP-DD																																				1310 nm, SM, 0.5 km
✓		G0403A	QSFP-DD 400GBASE-FR4	QSFP-DD																																				1310 nm, SM, 2 km
✓		G0404A	QSFP-DD 400GBASE-LR4	QSFP-DD																																				1310 nm, SM, 10 km
	✓	G0405A	OSFP 400GBASE-DR4	OSFP																																				1310 nm, SM, 0.5 km
	✓	G0406A	OSFP 400GBASE-FR4	OSFP																																				1310 nm, SM, 2 km

Refer to (Optical Modules Selection Guide for MT1000A) on page 103 for optical modules of 100G or less.

Network Master Series

MT1000A Network Master Pro
MU100010A 10G Multirate Module
MU100011A 100G Multirate Module
MU100090B High Performance GNSS Disciplined Oscillator

Remote Control
Cloud OPTION | **WLAN** OPTION | **Bluetooth** OPTION | Ethernet | USB

Redefining Transport Testing

Excellent Eco Product

Network Master Pro
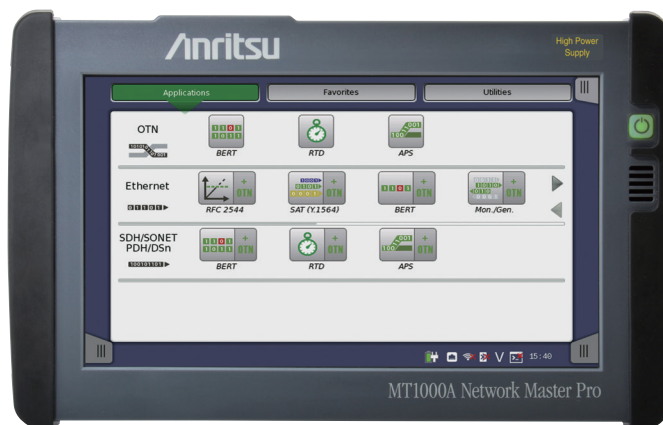
Networks continue to evolve as standards for transport tests, such as Ethernet, OTN, SDH/SONET, eCPRI/RoE/CPRI/OBSAI, PTP, Fibre Channel, etc., become more diverse, and speeds increase with development of 100G/25G Ethernet and 16G Fibre Channel.
With an easily configured modular design to support changing network standards and an easy-to-use GUI, the Network Master Pro MT1000A is perfect for rapid I&M of wide-area networks.

All in One | **I&M** | **Easy to use**

• All transport network field tests in one tester
• Easy-to-read 9-inch touch screen in easy-to-use compact B5-size tester
• Higher work efficiency with multiple tests using one-button automated measurement tools

One Button Testing
The MT1000A has automatic test functions for simple and efficient network commissioning. These MT1000A automated test functions run scenario files created in advance on a PC to perform tests automatically using preset measurement items, procedures, and pass/fail evaluation conditions. Since the scenario also handles report creation, evaluation and results, inexperienced workers can run accurate tests without operation mistakes and re-tests.

Setting Test Equipment: Manual	Setting Test Equipment: **Not necessary**
Executing Test: Manual	Executing Test: **Not necessary**
Evaluating Results: Based on data	Evaluating Results: **Not necessary**

Easy Connections Anywhere Using SORA (Site Over Remote Access)*

Using the MX109020A Site Over Remote Access (SORA hereafter) software measuring instruments can be remotely controlled easily anywhere.
The SORA cloud-based service allows office users to log-in to an Internet webpage to control the measuring instrument from the office via a smartphone.

Login screen → Remote control screen
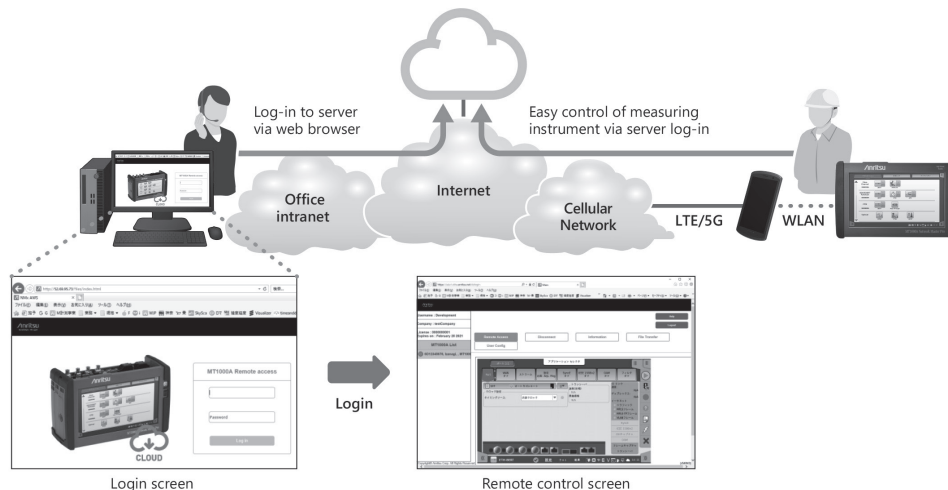
∗ This service can be used in countries and regions where the MT1000A WLAN/Bluetooth option has been approved. For details, contact Anritsu.
∗ To connect using SORA, you must purchase an option license for the main unit as well as a subscription license. Refer to the MX109020A leaflet and product introduction for more details. You must agree to the service contract before purchasing SORA.
  Refer to the service contract at the following URL: https://www.anritsu.com/en-AU/test-measurement/support/downloads/manuals/dwl20059.

https://www.anritsu.com

I&M Support for All Networks

The Network Master supports all types of network I&M.
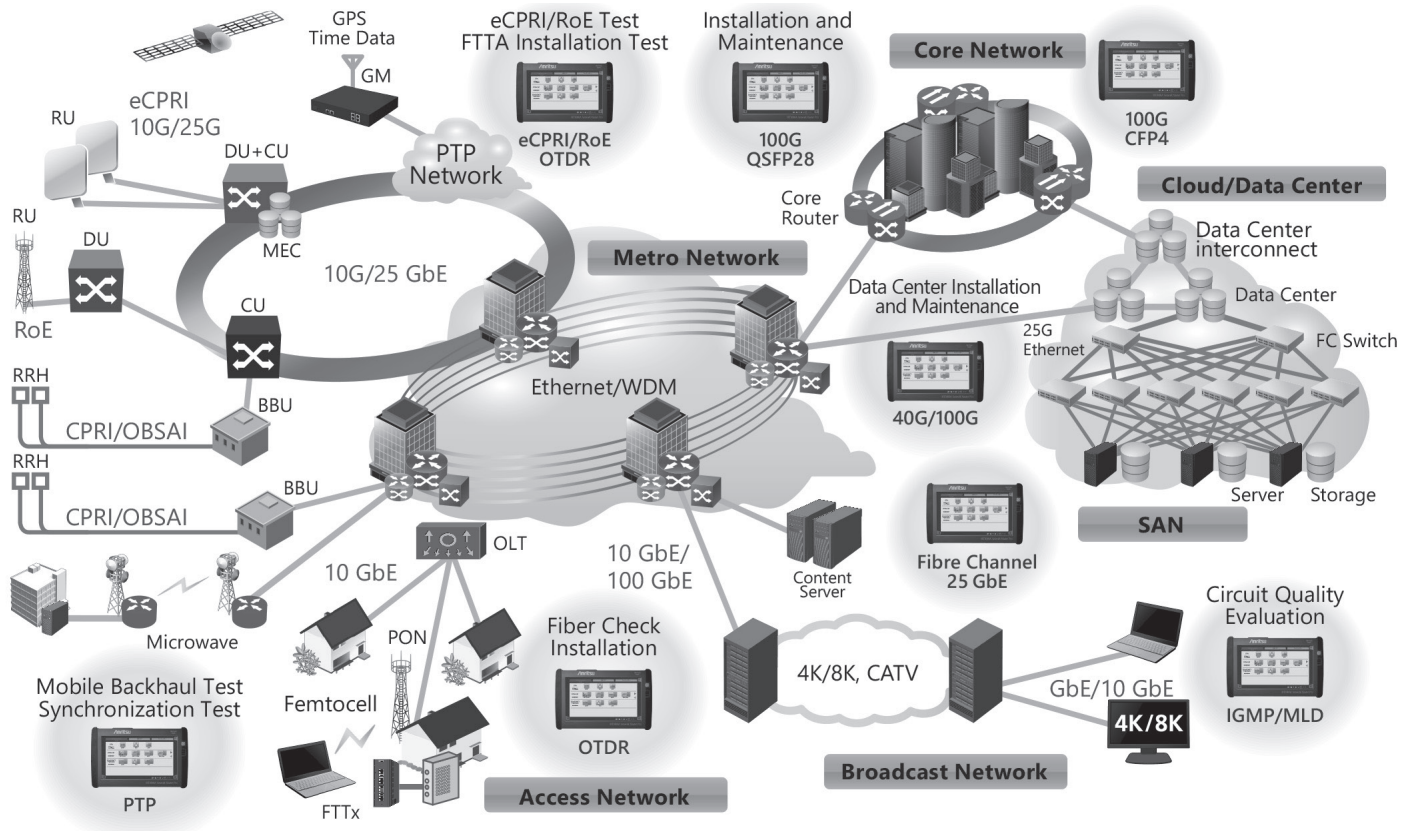
The modular design of the Network Master Pro MT1000A platform makes it easy to support I&M for different network configurations. Combining it with the 10G Multirate Module MU100010A offers the necessary functions for I&M of networks at speeds from 1.5 Mbps to 10 Gbps. Combining with the 100G Multirate Module MU100011A, it supports more interface standards than any other handheld transport tester on the market such as CFP4/QSFP28, QSFP+, SFP28 (25 GbE), SFP+SFP and RJ45.

Coupled with a compact easy-to-use design and long battery operation, plus a large 9" easy-to-see color touch screen, remote GUI operation via Internet connection, and more, the MT1000A is a key factor in increasing I&M test work efficiency.

Furthermore, options for each test function can be selected and added as necessary to match the work schedule, helping cut initial capital costs.

Network Master Pro MT1000A Module Line up

Any modular combination as shown in a figure.

*: Required if the transport modules is not used rear cover (B0720A).

Ethernet Application

Network operators are introducing new carrier-class technologies, such as VLAN, Q-in-Q, Ethernet OAM, MPLS, PBB, MPLS-TP, etc., to their Ethernet service menus, increasing test complexity and test time for field technicians.

The MU100010A/MU100011A Ethernet test functions provide strong support for commissioning and troubleshooting Ethernet networks up to 100G speeds, including connectivity and band tests, QoS tests, and service-related tests.

Ethernet Test: End-to-End

WDM Test

Reflector
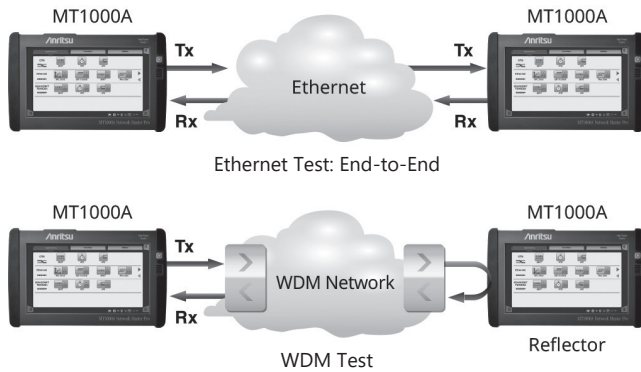
Ethernet Service Activation Test (Y.1564)

With the ability to simultaneously test multiple traffic streams, ITU-T Y.1564 is a new test methodology when deploying Ethernet networks. Today's common RFC 2544 standard completes tests one at the time and does not run all traffic streams simultaneously. ITU-T Y.1564 has the following two test phases.

Service Configuration Test:

This section is completed quickly, within seconds per stream. It confirms the end-to-end configuration while quickly checking the Information Rate (IR), Frame Transfer Delay (FTD), Frame Delay Variation (FDV), Frame Loss Ratio (FLR), Committed Burst Size (CBS) and Excess Burst Size (EBS) sequentially for all configured traffic streams.
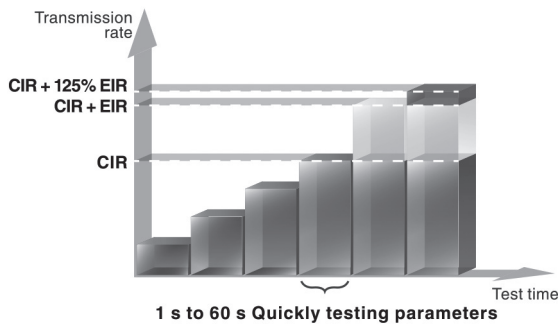
Y.1564 Service Configuration Test

Service Performance Test:

This section is completed based on the M.2110 standard for 15 minutes, 2 hours, 24 hours, or a user-selectable period.

It transmits all configured traffic streams simultaneously at the CIR, confirming that all traffic can traverse the network under full load while checking IR, FTD, FDV, FLR and Availability (AVAIL).
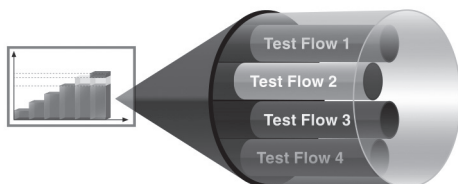
Y.1564 Service Performance Test

Simultaneous testing in the Service Performance Test section greatly reduces the total test time compared to RFC 2544.

RFC 2544 Test

RFC 2544 testing of Throughput, Frame Loss, Latency, Packet Jitter and Burstability is straightforward with the MU100010A/MU100011A. It automates the procedure while still allowing thorough test configuration. For full information on performance at both line sides, the end-to-end test mode allows two MT1000A testers to work together in a local–remote configuration where the user controls both testers and reads results from both locally. Easy to understand tabular screens and bar graph presentations simplifies reading of results. Attractive looking reports can be generated for presentation to end-customers.
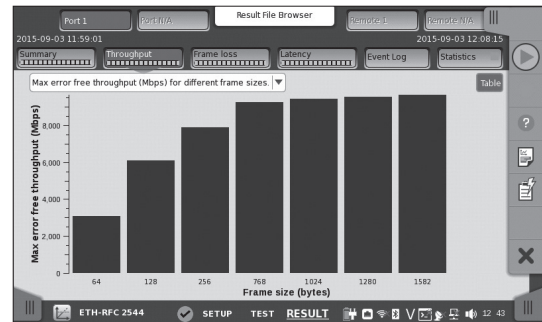
Throughput Graph

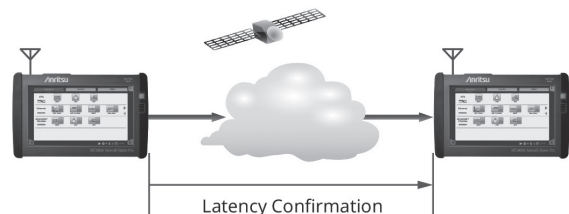### TCP Throughput (RFC 6349, iPerf) [Option]

Normally, IP network operators test their communications equipment in accordance with the RFC 2544 and ITU-T Y.1564 standards, but even when the test results are good, sometimes the expected end-to-end data throughput is not achieved. Although data communications use the TCP protocol for guaranteed data transfers, sometimes throughput drops as a result of network delays, poor circuit quality, etc.

The RFC 6349 standard regulates the test methods for assuring operator throughput over the TCP layer, and the MU100010A/MU100011A modules with built-in TCP throughput option support TCP throughput evaluation and testing in accordance with the RFC 6349 standard. The iperf client function for testing TCP throughput is also supported.
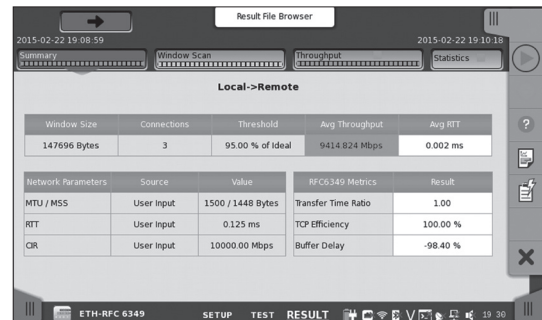
Test Result

### One-way Delay Measurement Using Two MT1000A Units

One-way delay can be measured with high accuracy using two MT1000A/MU100011A units at a distant location with installed MU100090B.


Latency Confirmation

Mobile Backhaul Application

Mobile backhaul networks use IEEE 1588 v2 and synchronous Ethernet (SyncE) technologies. Since in-office base stations generate wireless signals based on a synchronizing signal distributed by the mobile backhaul, any mobile backhaul synchronization fault severely degrades the mobile radio performance. As a result, mobile operators must test that the SyncE and IEEE 1588 v2 technologies are functioning correctly.

Synchronous Ethernet test

The MU100010A/MU100011A support SyncE and IEEE 1588 v2 (G.8265.1, G.8275.1 and G.8275.2) protocol tests and analyses for monitoring SSM messages, and effectively troubleshooting and analyzing network faults, such as interoperability issues caused by abnormal vendor clock devices.

Time/Phase Synchronization Accuracy Tests

Mobile backhaul is starting construction of IEEE 1588 v2 (G.8275.1, G8275.2)-compliant time and phase-synchronized networks.
The High Performance GNSS Disciplined Oscillator MU100090B option measures the time and phase synchronization with high accuracy as a max|TE| (absolute Time Error), cTE (Constant Time Error), and dTE (Dynamic Time Error) matrix.*
Combining it with the MU100010A/MU100011A adds pass/fail evaluation tests for commissioning time and phase-synchronized networks.

*: Peer-to-Peer only supports protocol emulation.

Status of IEEE 1588 v2 Slave Clock

Phase Confirmation using MU100090B

Mobile Fronthaul Application

Operators are supporting the explosive spread of smartphones and tablets by increasing the bandwidth of mobile communications networks, in turn driving a complete change in mobile
So far, mobile front haul has been split into the Base Band Unit (BBU) and Remote Radio Head (RRU) with speed increased and ease of connected supported by using multiple antennas.
However, in addition to faster speeds, the key requirements for next-generation 5G mobile are higher reliability, lower latency, and multiple simultaneous user connections. As a result, mobile front haul requires:

- Change of interface between BBU and RRH from CPRI/OBSAI to eCPRI/ RoE (IEEE1914.3)
- Improved time synchronization accuracy
- Large decreases in latency.

eCPRI/RoE (IEEE1914.3) Test

- BER tests using either eCPRI or RoE frame
- One and two-way latency time measurements*[1]
- Phase/Time synchronization accuracy tests
  - Time synchronization test using IEEE 1588 v2 1 pps TE supporting 1G/10G/25G Ethernet

CPRI Test

- BER tests
- Various error and alarm tests
- Return Time Delay (RTD) tests
- Perform pass-through monitoring*[2] and CPRI APS measurements
- Client signal mapped to OTN.

OBSAI Test

- BER tests
- Various error and alarms tests
- Returen Time Delay (RTD)
- Perform OBSAI APS measurements

*1: Requires MU100011A for high-resolution measurement; requires two MT1000A/MU100011A/MU100090B units for measurement at distant location
*2: CPRI Option 9 and Option 10 not supported

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Interface*	Ethernet	OTN	SDH/SONET	Fibre Channel	CPRI/OBSAI	PDH/DSn
CFP4	100 GbE	OTU4	—	—	—	—
QSFP28	100 GbE	OTU4	—	—	—	—
QSFP+	40 GbE	OTU3	—	—	—	—
SFP28	25 GbE	—	—	—	CPRI 10	—
SFP/SFP+	GbE/10 GbE	OTU1x/OTU2x	STM1-64/OC3-192	1G/2G/4G/8G/10G FC	CPRI 1/2/3/4/5/6/7/8 OBSAI 1x/2x/4x/8x	—
				16G FC	CPRI 9	
RJ45	10/100/1000M	—	—	—	—	—
RJ48	—	—	—	—	—	E1
BNC	—	—	STM-1e/STS-3	—	—	E1/E3/E4/DS3
Bantam	—	—	—	—	—	DS1

☐ : MU100010A Only   ☐ : MU100011A Only   ☐ : Both MU100010A & MU100011A Supported

∗: The interface depends on the module. For details, refer to the following.
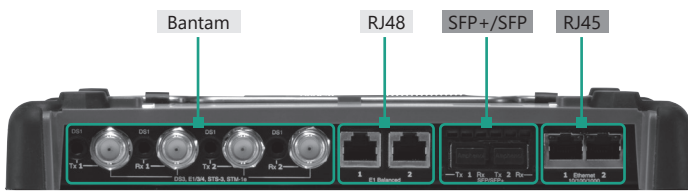
10G Multirate Module MU100010A
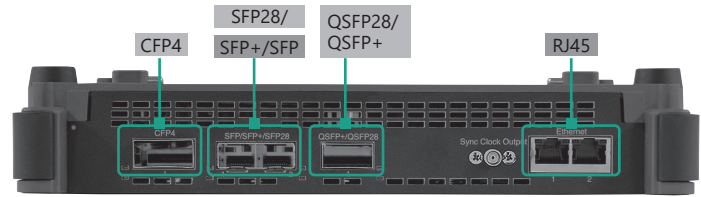
100G Multirate Module MU100011A

Optical Modules Selection Guide

MU100010A	MU100011A	Model/Order No.	Name	Form Factor	100 Meg Ethernet	156 Meg STM-1	614 Meg CPRI	622 Meg STM-4	768 Meg OBSAI	1GFC	1.23 Gig CPRI	1.25 Gig Ethernet	1.54 Gig OBSAI	2GFC	2.46 Gig CPRI	2.488 Gig STM-16	2.67 Gig OTU1	3.07 Gig CPRI OBSAI	4GFC	4.92 Gig CPRI	6.14 Gig CPRI OBSAI	8GFC	9.83 Gig CPRI	9.95 Gig STM-64	10.1 Gig CPRI	10.3 Gig Ethernet	10GFC	10.7 Gig OTU2	11.05 Gig OTU1e	11.09 Gig OTU2e	11.27 Gig OTU1f	11.3 Gig OTU2f	16GFC	25G Ethernet	40G Ethernet	40G OTN	100G Ethernet	100G OTN
✓	✓	G0332A	100M FX 1310 nm MM SFP	SFP	1310 nm, MM, 2 km																																	
✓	✓	G0319A	Up to 2.7G 1310 nm 15 km SFP	SFP		1310 nm, SM, 15 km																																
✓	✓	G0320A	Up to 2.7G 1310 nm 40 km SFP	SFP		1310 nm, SM, 40 km																																
✓	✓	G0321A	Up to 2.7G 1550 nm 80 km SFP	SFP		1550 nm, SM, 80 km																																
✓	✓	G0328A	1G/2G/4G FC 850 nm SFP	SFP						850 nm, MM, 0.5 km																													
✓	✓	G0322A	1G/2G/4G FC 1310 nm SFP	SFP						1310 nm, SM, 10 km																													
✓	✓	G0323A	1G/2G/4G FC 1550 nm SFP	SFP						1550 nm, SM, 40 km																													
✓	✓	G0315A	10G LR/LW 1310 nm SFP+	SFP+																			1310 nm, SM, 10 km															
✓	✓	G0316A	10G ER/EW 1550 nm 40 km SFP+	SFP+																			1550 nm, SM, 40 km															
✓	✓	G0318A	10G ZR/ZW 1550 nm 80 km SFP+	SFP+																			1550 nm, SM, 80 km															
✓	✓	G0329A	10G LR 1310 nm SFP+	SFP+							1310 nm, SM, 10 km																												
✓	✓	G0356A	8G FC/10G SR 850 nm SFP+	SFP+															850 nm, MM, 0.3 km																			
	✓	G0386A	16GFC SR 850 nm SFP+	SFP+																													850 nm, MM, 0.5 km					
	✓	G0387A	16GFC LR 1310 nm SFP+	SFP+																													1310 nm, SM, 10 km					
	✓	G0388A	25G SR 850 nm SFP28	SFP28																														850 nm, MM, 0.5 km				
	✓	G0389A	25G LR 1310 nm SFP28	SFP28																														1310 nm, SM, 10 km				
	✓	G0359A	40G SR4 850 nm QSFP+	QSFP+																															850 nm, MM, 0.1 km			
	✓	G0334A	40G LR4 1310 nm QSFP+	QSFP+																															1310 nm, SM, 10 km			
	✓	G0366A	100G SR4 850 nm QSFP28	QSFP28																																	850 nm, MM, 0.1 km	
	✓	G0364A	100G LR4 1310 nm QSFP28	QSFP28																																	1310 nm, SM, 10 km	
	✓	G0365A	100G LR4 Dual Rate 1310 nm QSFP28	QSFP28																																	1310 nm, SM, 10 km	
	✓	G0369A	100G LR4 Dual Rate 1310 nm CFP4	CFP4																																	1310 nm, SM, 10 km	

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OTN Application

Using the MU100010A/MU100011A, OTN lines can be tested at the client signal level with signals like Ethernet, CPRI, Fibre Channel and SDH/SONET, because the OTN mapping function is mandatory for modern OTN transponders. The MT1000A can also test OTN lines at the line rate with bulk signals.

The user can identify problems at all levels in the OTN signal, solving OTN issues efficiently, reducing system downtime, and reducing operating expenses for network operators.
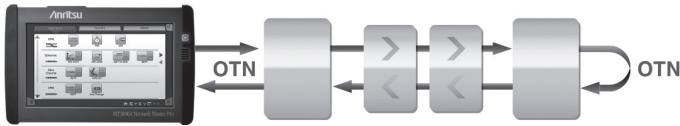

Looping-back test signal from MT1000A at far end supports easy OTN line quality tests

Out-of-service OTN Error and Alarm Statistics

The MU100010A/MU100011A supports powerful statistical measurements for BER tests as well as OTN level alarms and errors for installing/commissioning and troubleshooting out-of-service OTN lines. G.8201 or M.2401 error-performance parameters are calculated during measurement. Stress testing of network elements is supported by inserting errors and alarms, and adjusting overhead bytes in the signal transmitted by the instrument.

Testing Ethernet, CPRI, Fibre Channel, or SDH/SONET Client Signals Mapped onto OTN Signal
(Part of ODU Multiplexing Option)

The MU100010A/MU100011A tests OTN links carrying Ethernet, CPRI, Fibre Channel or SDH/SONET client signals, allowing the operator to test embedded client signals.

For example, an RFC 2544 or Y.1564 test can be performed with an Ethernet signal carried over the OTN signal, allowing the service engineer to run tests emulating the real-world requirements of end users.
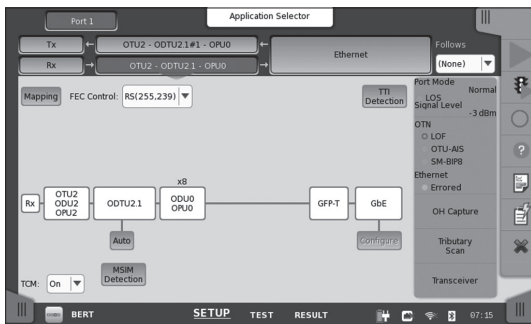
OTN Mapping Setting

ODUflex Test (with ODU Flex Option)

ODUflex is a new feature of OTN supporting flexible allocation of client-signal bandwidth to make best use of OTN capacity.
The MU100010A/MU100011A with ODU Flex option supports ODUflex tests, allowing operators to verify this new technology on their networks.
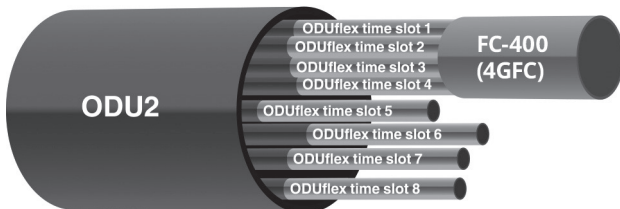
ODU Flex Option divides capacity of ODU2 into eight 1.25G ODUflex time slots.
In the above example, an FC-400 (4GFC) Fibre Channel signal occupies four ODUflex time slots.

Fibre Channel Application

The multi-protocol MU100010A/MU100011A with Fibre Channel option is the perfect tool for deploying Fibre Channel with support for testing links at rates up to 10 Gbps. The all-in-one MT1000A gives the user less equipment to maintain and learn, helping reduce operating expenses.

Latency

High latency is a problem for many applications, including SAN, and network operators and service providers urgently need a tool like the MU100010A/MU100011A with Fibre Channel option to test latency on Fibre Channel lines and equipment.

Fibre Channel BER Tests

The MU100010A/MU100011A with Fibre Channel option supports BER tests to measure the performance of Fibre Channel lines and equipment. Service disruption measurement is also supported.
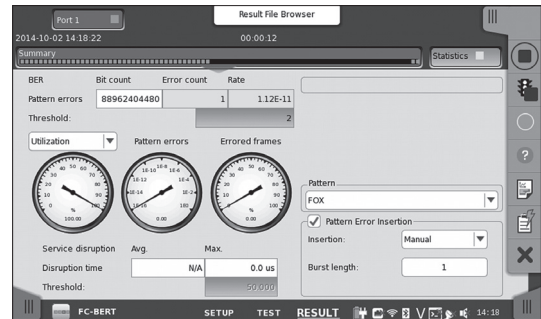
FC BER Test

Performance Tests

The MU100010A/MU100011A measures the buffer size needed to achieve the required throughput and can play a key role in the following aspects of network I&M.

- Adjusting local parameters at commissioning testing
- Troubleshooting whether buffer size setting or network settings are causing lower throughput than the network design specification
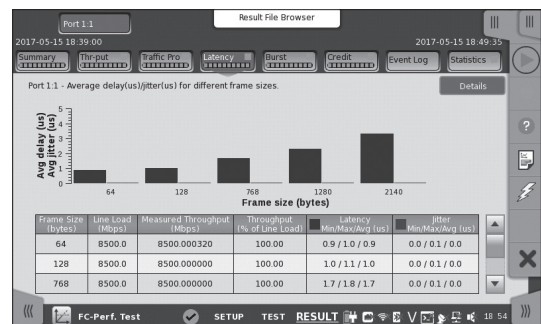
FC Performance Test

SDH/SONET, PDH/DSn Application

Legacy technologies in transport networks can't just be eliminated because of the huge capital investment, but keeping legacy technologies operational can require several testers.
With its SDH/SONET and PDH/DSn test options, the MU100010A/MU100011A is a powerful and easy-to-use tool for testing SDH/SONET up to STM-64/OC-192. PDH/DSn systems (E1, E3, E4, DS1 and DS3) can be tested directly or embedded into SDH/SONET. The MT1000A can support new and legacy technologies, leaving the user less equipment to maintain and learn, and reducing operating expenses.

SDH/SONET and PDH/DSn test features include:

- Powerful testing of SDH (STM-64, STM-16, STM-4, STM-1), SONET (OC-192, OC-48, OC-12, OC-3, STS-3) systems and embedded PDH (E1, E3, E4) and DSn (DS1, DS3) systems
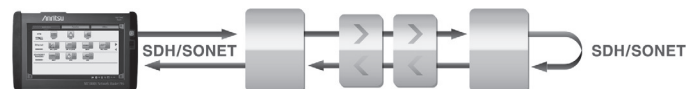
Looping-back test signal from MT1000A at far end supports SDH/SONET line quality tests

Network Master Pro MT1000A Mainframe Specifications

User Interfaces	
Display	9-inch active TFT display (800 × 480 pixels) and touch screen
Supported Languages	English, Chinese, Japanese, French, Russian, Spanish, Finnish, Korean, German

Miscellaneous		
Battery	10.8 V rechargeable and replaceable intelligent Li-ion battery Operating time: 1.5 hours (typ., in case of 100 GbE) Charging time: 6 hours (Max.) Remaining capacity indication: %	
Mains Adapter	Input: 100 VAC to 240 VAC, 50 Hz/60 Hz Output: 18 V(dc), 3.62 A (max.) Power Consumption: ≤65 W With MT1000A-006[2] Input: 100 VAC to 240 VAC, 50 Hz/60 Hz Output: 18 V(dc), 6.6 A (max.) Power Consumption: ≤120 W	
Dimensions and Mass	257 (W) × 164 (H) × 82 (D) mm (excluding projections, MT1000A + MU100010A) 257 (W) × 164 (H) × 89 (D) mm (excluding projections, MT1000A + MU100011A) 2.7 kg (including MT1000A, MU100010A and battery) 2.7 kg (including MT1000A, MU100011A and battery)	

Environmental	Temperature
	    Operating : 0°C to +50°C (non-condensing)
	    Charging: 0°C to +40°C (non-condensing)
	    Storage: −30°C to +60°C (non-condensing, without battery or AC adapter)
	            −20°C to +50°C (non-condensing, with battery and AC adapter)
	Humidity
	    Operating: ≤85% RH (non-condensing)
	    Storage and Transportation: ≤90% RH (non-condensing, without battery and AC adapter)
	    Storage and Transportation: ≤85% RH (non-condensing, with battery and AC adapter)	

CE	EMC	2014/30/EU, EN61326-1, EN61000-3-2
	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

Laser Safety[3]	IEC 60825-1:2007 Class 1M
	    CFP4: 100GBASE-SR4 QSFP28: 100GBASE-SR4
	    QSFP+: 40GBASE-SR4 SFP28: 25GBASE-SR
	IEC 60825-1:2007 Class 1
	    CFP4: 100GBASE-LR4 QSFP28: 100GBASE-LR4
	    QSFP+: 40GBASE-LR4 SFP28: 25GBASE-LR
	    SFP+: 1000BASE-SX/LX/ZX, 10GBASE-LR/ER/ZR
	    SFP: 4G FC (SX), 4G FC (LX), 4G FC (EX), OC-48 LR-1/STM L-16.1, OC-48 LR-2/STM L-16.2, 100BASE-FX/LX
	FDA 21CFR1040.10 and 1040.11[4]	

*2: MT1000A-006 is required for MU100011A.
*3: Safety measures for laser products
    This product complies with optical safety standards in 21CFR1040.10, 1040.11 and IEC 60825-1; the following descriptive labels are affixed to the product.
*4: Excludes deviations caused by conformance to Laser Notice No. 50 dated June 24, 2007

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Ordering Information

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

Mainframe

Model/Order No.	Name	
MT1000A	Network Master Pro	
Standard Accessories		
MT1000A-006*1	High Power Supply:	Installed
	Line Cord*2:	1 pc
B0745A	Softcase:	1 pc
B0728A*3	Rear Panel kit:	1 pc
G0385A*4	High Power AC Adaptor:	1 pc
G0310A	Li-ion Battery:	1 pc
Z1746A	Stylus:	1 pc
Z1747A*5	Carrying Strap:	1 pc
Z1748A*6	Handle:	1 pc
Z1817A*7	Utilities ROM:	1 pc
Options		
MT1000A-003*8	Connectivity for WLAN/Bluetooth	
MT1000A-005*9	AUX I/O	
MT1000A-011*10	Site Over Remote Access Connect	
Optional Accessories		
B0691B*11	Hard Case	
B0720A	Rear Panel	
B0729A*12	Screw 1U	
B0730A*12	Screw 2U	
B0731A*12	Screw 3U	
B0732A*13	Screw Kit	
G0382A*14	Autofocus Video Inspection Probe	
G0306C*14	Video Inspection Probe	
G0309A*4	AC Adapter	
G0324A	Battery Charger	
G0325A	GPS Receiver	
J1569B	Car 12 Vdc Adapter	
Z1821A*15	Utilities in USB Stick	

*1: The presence of the MT1000A-006 option can be recognized at the top right of the front panel. To retrofit to the already shipped item, please contact us.

Without MT1000A-006   With in MT1000A-006

*2: One line cord is attached to the area to shipment.
*3: Composed of B0720A, B0729A, B0730A and B0731A. Refer to Module Composition for the module combination.
*4: The MT1000A with MT1000A-006 can be used. Use the AC adapter when using the MT1000A without MT1000A-006 installed.
*5: Shoulder strap for MT1000A.
*6: Hand strap for MT1000A.
*7: This DVD includes PDF files and formatting tools of each product's instruction manual (such as W3933AE, W3810AE, W3736AE, W3946AE).
*8: Available for certified countries and regions including USA, Canada, Japan and EU countries. Please visit the Anritsu web site for updated information.
*9: MT1000A-005 is required for MU100090B. To retrofit to the already shipped item, please contact us.
*10: See page 108 for details
*11: Can use module 1 to 2 in combination
*12: Includes 4 bolts of same length
*13: Includes B0729A, B0730A and B0731A
*14: This fiberscope uses the VIP function in the MT1000A Utility menu. Different tip types are used by the G0382A and G0306C.

G0382A   G0306C

*15: Include MT1000A Operation Manual and the Remote Script Manual.

Transport Module

10G Multirate Module MU100010A

Model/Order No.	Name	
MU100010A	10G Multirate Module	
Standard Accessories		
W3935AE	MT1000A Transport Module Quick Reference Guide:	1 pc
B0692A*16	ESD Box (for optical modules):	1 pc

*16: Up to four SFP+/SFPs can be stored.

Options*17

Model/Order No.	Name
Low Rate	
MU100010A-001*18	Up to 2.7G Dual Channel
Ethernet	
MU100010A-011	Ethernet 10G Single Channel
MU100010A-012	Ethernet 10G Dual Channel
MU100010A-020*19	TCP Throughput
OTN	
MU100010A-051	OTN 10G Single Channel
MU100010A-052	OTN 10G Dual Channel
MU100010A-061*20	ODU Multiplexing
MU100010A-062*20	ODU Flex
CPRI/OBSAI	
MU100010A-071	CPRI/OBSAI Up to 5G Dual Channel
MU100010A-072	CPRI/OBSAI 6G to 10G Single Channel
MU100010A-073	CPRI/OBSAI 6G to 10G Dual Channel
Fiber Channel	
MU100010A-002	FC 1G 2G 4G Dual Channel
MU100010A-091	FC 8G 10G Single Channel
MU100010A-092	FC 8G 10G Dual Channel
SDH/SONET	
MU100010A-081	STM-64 OC-192 Single Channel
MU100010A-082	STM-64 OC-192 Dual Channel

*17: This option can be retrofitted.
The Model/Order No. of retrofit option is "-3** ".
Example
As a retrofit, MU100010A-001 Up to 2.7G Dual Channel becomes MU100010A-301 Up to 2.7G Dual Channel Retrofit. When retrofitting an option, please either specify one of the following media along with the relevant option, or Web download.

Model/Order No.	Name
Z1849A	DVD-ROM for Retrofit Options
Z1850A	USB Stick for Retrofit Options

*18: Includes OTN (OTU1), Ethernet (10 Mbps, 100 Mbps, 1 Gbps), SDH up to STM-16, SONET up to OC-48, PDH (E1, E3, E4), and DSn (DS1, DS3)
*19: Requires that at least one of the following options is installed: MU100010A-001, MU100010A-011, MU100010A-012
*20: Requires that at least one of the following options is installed: MU100010A-001, MU100010A-051, MU100010A-052

100G Multirate Module MU100011A

Model/Order No.	Name	
MU100011A*1	100G Multirate Module	
Standard Accessories		
W3935AE	MT1000A Transport Module Quick Reference Guide:	1 pc
B0763A*2	ESD Box (for Optical modules):	1 pc

*1: MT1000A-006 is required for MU100011A.
*2: One CFP4 plus either up to two QSFP28s or up to four SFP/SFP+s can be stored.

Options*3

Model/Order No.	Name
Standard	
MU100011A-001*4	Up to 10G Single Channel
MU100011A-003*4	Up to 10G Dual Channel
Ethernet	
MU100011A-013	Ethernet 40G Single Channel
MU100011A-015	Ethernet 100G Single Channel
MU100011A-017*5	Ethernet 25G Single Channel
MU100011A-020*6	TCP Throughput
MU100011A-023*7	RS-FEC for 100GBASE-SR4

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Model/Order No.	Name
OTN	
MU100011A-053	OTN 40G Single Channel
MU100011A-055	OTN 100G Single Channel
MU100011A-062*8	ODU Flex
MU100011A-063*8	ODU Multiplexing/Multi Stage
Fibre Channel	
MU100011A-004	Up to 10G FC Single Channel
MU100011A-005	Up to 10G FC Dual Channel
MU100011A-091	FC 16G Single Channel
eCPRI/RoE/CPRI/OBSAI	
MU100011A-071	CPRI/OBSAI Up to 10G Single Channel
MU100011A-072	CPRI/OBSAI Up to 10G Dual Channel
MU100011A-073	CPRI 12/25G Single Channel
MU100011A-074	CPRI 12/25G Dual Channel
MU100011A-075*5, *9	eCPRI/RoE 25G Dual Channel
SDH/SONET	
MU100011A-083*10	STM-256/OC-768 Client Signal

*3: This option can be retrofitted. The Model/Order No. of retrofit option is "-3** ".
   Example
   As a retrofit, MU100011A-001 Up to 10G Single Channel becomes MU100011A-301 Up to 10G Single Channel Retrofit. When retrofitting an option, please either specify one of the following media along with the relevant option, or Web download.

Model/Order No.	Name
Z1849A	DVD-ROM for Retrofit Options
Z1850A	USB Stick for Retrofit Options

*4: Only one of these option can be installed.
   Included OTN(OTU1, OTU1e, OTU1f, OTU2, OTU2e, OTU2f), Ethernet up to 10 Gbps, SDH up to STM-64 and SONET up to OC-192.
*5: FEC selectable On/Off.
*6: Requires that at least one of the following option is installed:
   MU100011A-001, MU100011A-003
*7: Requires to MU100011A-015
*8: Requires that at least one of the following option is installed:
   MU100011A-001, MU100011A-003, MU100011A-053, MU100011A-055
*9: Option supports eCPRI RoE protocol test only.
*10: MU100011A does not have a physical interface of the option.
   The option is required for client signal mapped in the OTN.

High Performance GNSS Disciplined Oscillator MU100090B

Model/Order No.	Name
MU100090B*11	High Performance GNSS Disciplined Oscillator
MU100090B-001	High Stability/Multi-Band
MU100090B-002	Multi-GNSS
Standard Accessories	
J1705A	AUX Conversion Adaptor
J1886A*12	GNSS Antenna
J1710A	BNC Cable (20 cm) × 2
Z2122A	Tripod for GNSS Antenna

*11: Excellent Eco Product non-compliant.
*12: With 5 m cable, IP67 Ingress protection.
   MT1000A-005 is required for MU100090B.

Subscription Option License

Model/Order No.	Name
MX109020A*13, *15, *16, *17	Site Over Remote Access Basic License
MX109020A-TL001*13, *14	Site Over Remote Access 1 Year License
MX109020A-001*15	Site Over Remote Access 8 Units
MX109020A-002*15	Site Over Remote Access Unlimited Units
MX109020A-003*18	Centralized Data Management

*13: We recommend purchasing a 1-year license in addition to the basic license.
*14: When extending the usage period, we recommend purchasing in 1-year license periods
*15: Up to two measuring instruments can be remotely controlled simultaneously with the basic license.
   This number can be increased to up to 8 units by purchasing the MX109020A-001 option, and up to 100 units by purchasing the MX109020A-002 option.
*16: You must agree to the service terms before purchasing SORA.
   Refer to the service terms at the following URL: https://www.anritsu.com/en-AU/test-measurement/support/downloads/manuals/dwl20059
*17: This product cannot be used in some regions and countries; please read the service terms for more details.
*18: Users must provide their own storage at the upload destination.

Optional Accessories for Transport Module

Model/Order No.	Name
Operation Manuals	
W3933AE	MT1000A Transport Module Operation Manual
W3736AE	MT1000A/MT1100A Remote Scripting Operation Manual
Optical Module	
G0332A	100M FX 1310 nm MM SFP
G0319A	Up to 2.7G 1310 nm 15 km SFP
G0320A	Up to 2.7G 1310 nm 40 km SFP
G0321A	Up to 2.7G 1550 nm 80 km SFP
G0328A	1G/2G/4G FC 850 nm SFP
G0322A	1G/2G/4G FC 1310 nm SFP
G0323A	1G/2G/4G FC 1550 nm SFP
G0315A	10G LR/LW 1310 nm SFP+
G0316A	10G ER/EW 1550 nm 40 km SFP+
G0318A	10G ZR/ZW 1550 nm 80 km SFP+
G0329A	10G LR 1310 nm SFP+
G0356A	8G FC/10G SR 850 nm SFP+
G0386A	16GFC SR 850 nm SFP+
G0387A	16GFC LR 1310 nm SFP+
G0388A	25G SR 850 nm SFP28
G0389A	25G LR 1310 nm SFP28
G0359A	40G SR4 850 nm QSFP+
G0334A	40G LR4 1310 nm QSFP+
G0366A	100G SR4 850 nm QSFP28
G0364A	100G LR4 1310 nm QSFP28
G0365A	100G LR4 Dual Rate 1310 nm QSFP28
G0369A	100G LR4 Dual Rate 1310 nm CFP4
Electrical Module	
G0397A*19	10GBASE-T SFP+ (OCD)
Cables	
J1571A	Optical Cable SM LC/PC to SC/PC 3 m
J1575A	Optical Cable SM LC/PC to FC/PC 3 m
J1579A	Optical Cable SM LC/PC to LC/PC 3 m
J1581A	Optical Cable MM LC/PC to LC/PC 3 m
J1583A	Optical Attenuator 10 dB LC/PC to LC/PC
J1584A	RJ45 Cable 3 m
J1586A*20	RJ48 to Crocodile Clips Cable 20 dB ATT 3 m
J1589A*21	BNC to 1.6/5.6 Cable 2.5 m
J1710A*22	BNC Cable 0.2 m
J0127B*22	COAXIAL CORD, 2.0 M

*19: It may not work with the MT1000A.
   Contact your our company sales representative for more information.
*20: E1 interface cable.
*21: E1, E3, E4, DS3, STM-1e, STS-3 interface cable. Impedance: 75Ω
*22: 50Ω impedance cable for MU100090B and main-frame external clock input connector

Maintenance Service

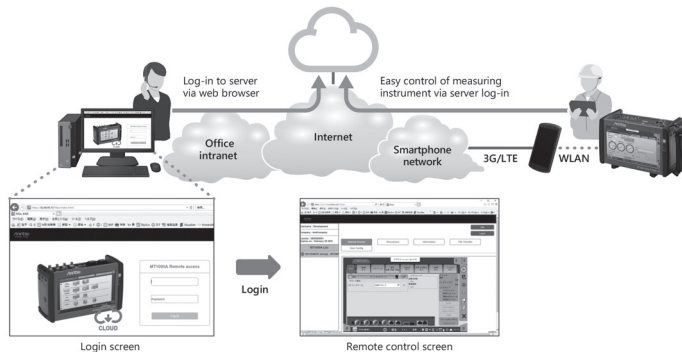| Model/Order No.	Name
MT1000A-ES210	2 Years Extended Warranty Service
MT1000A-ES310	3 Years Extended Warranty Service
MT1000A-ES510	5 Years Extended Warranty Service
MU100010A-ES210	2 Years Extended Warranty Service
MU100010A-ES310	3 Years Extended Warranty Service
MU100010A-ES510	5 Years Extended Warranty Service
MU100011A-ES210	2 Years Extended Warranty Service
MU100011A-ES310	3 Years Extended Warranty Service
MU100011A-ES510	5 Years Extended Warranty Service
MU100090B-ES210	2 Years Extended Warranty Service
MU100090B-ES310	3 Years Extended Warranty Service
MU100090B-ES510	5 Years Extended Warranty Service

Site Over Remote Access

MX109020A

*Remote Control Over the Cloud, Easy Connections Anywhere*
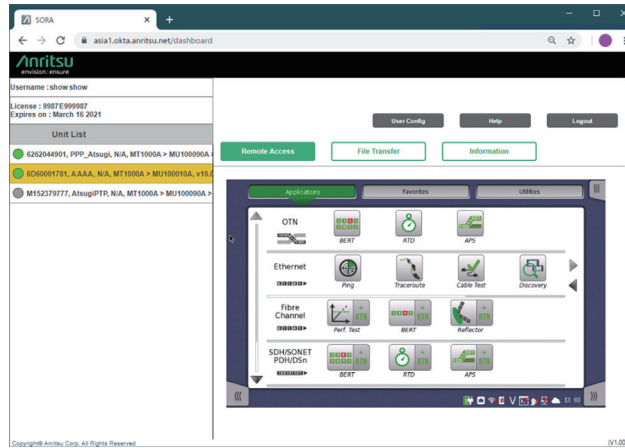
Using the Site Over Remote Access MX109020A (SORA hereafter) software measuring instruments can be remotely controlled easily anywhere. The SORA cloud-based service allows office users to log-in to an Internet webpage to control the measuring instrument from the office via a smartphone.
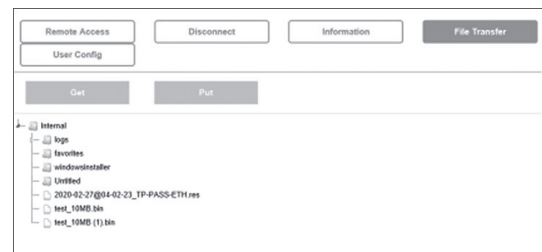

Login screen — Remote control screen

Remote Operation Function

Measuring-instrument screens are displayed as is by the web browser. The PC keyboard and mouse are used to perform instrument operations. PC operations are displayed on the remote instrument screen. Several measuring instruments can be operated on one PC desktop.

Administration Functions

The serial number, firmware version, and available options of measuring instruments at each site can be listed on the PC screen.
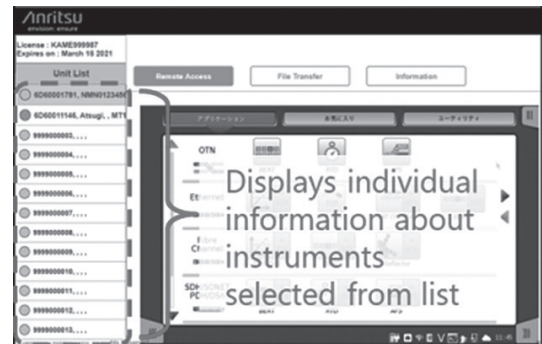
File Transfer Function

Measurement results, etc., saved in the instrument internal storage can be transferred as a file to the office PC (GET), and files on the PC can be copied to the measuring instrument (PUT).
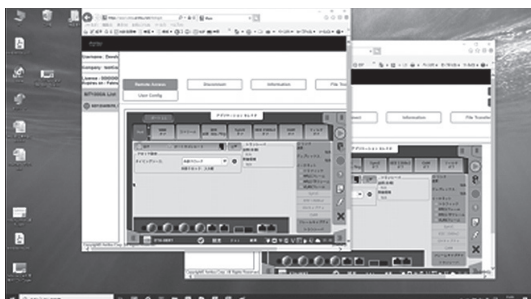
Remote Software Service
The following licenses must be purchased to use the MX109020A Site Over Remote Access.

Mainframe Option License

Model/Order No.	Name
MT1000A-003*[1]	WLAN/Bluetooth Connect
MT1000A-011*[2]	Site Over Remote Access Connect
MT1040A-003*[1]	WLAN/Bluetooth Connect
MT1040A-011*[2]	Site Over Remote Access Connect

*1: Available for certified countries and regions including USA, Canada, Japan and EU countries. Please visit the Anritsu web site for updated information.
    The Bluetooth® mark and logos are registered trademarks of Bluetooth SIG, Inc.
*2: Validity period is unlimited. An open TCP port may be required to allow the MT1000A/MT1040A to be connected from an in-company LAN to MX109020A, depending on the LAN security policy.

Subscription Option License

Model/Order No.	Name
MX109020A*[3], *[5], *[6], *[7]	Site Over Remote Access Basic License
MX109020A-TL001*[3], *[4]	Site Over Remote Access 1 Year License
MX109020A-001*[5]	Site Over Remote Access 8 Units
MX109020A-002*[5]	Site Over Remote Access Unlimited Units
MX109020A-003*[8]	Centralized Data Management

*3: We recommend purchasing a 1-year license in addition to the basic license.
*4: When extending the usage period, we recommend purchasing in 1-year license periods
*5: Up to two measuring instruments can be remotely controlled simultaneously with the basic license.
    This number can be increased to up to 8 units by purchasing the MX109020A-001 option, and up to 100 units by purchasing the MX109020A-002 option.
*6: You must agree to the service terms before purchasing SORA.
    Refer to the service terms at the following URL: https://www.anritsu.com/en-AU/test-measurement/support/downloads/manuals/dwl20059
*7: This product cannot be used in some regions and countries; please read the service terms for more details.
*8: Users must provide their own storage at the upload destination.

Network Master Series

MT9090A Mainframe
MU909060A1/A2/A3 Gigabit Ethernet Modules

Gigabit Ethernet Testing Redefined!

MT9090A with MU909060A1/A2/A3 Overview

The Ethernet technology is widely deployed, and used for carrier class Ethernet and Mobile backhaul. Therefore easy testing of Ethernet links is very important. When outfitted with the Gigabit Ethernet Module, the very compact battery-powered, easy-to-use Anritsu Network Master is a comprehensive solution for Gigabit Ethernet testing and for installation and troubleshooting Ethernet communication lines. The instrument gives the user facilities for easy bandwidth verification, connectivity testing and service availability verification. The small size and low weight of the instrument makes it very easy to carry around for the field technician working with the Ethernet lines and despite the small size the instrument is equipped with a large display. The user can easily read and interpret information from the tested lines off the large color display with easy-to-understand colors and graphical symbols.

And the graphical user interface makes it a simple task to configure and operate the instrument.

Key Features

• RJ45 and SFP optical interface are selectable for two ports
• Newly released ITU-T standard for End-to-End Ethernet testing ITU-T Y.1564 testing, simultaneously testing of multiple traffic streams emulating real world networks
• Stacked VLAN (Q-in-Q), MPLS, IPv4, IPv6 supported
• Test Automator simplify operation and ensure proper set-up
• Ping, Traceroute, Ramp data generation, RFC 2544 testing
• Upstream/Downstream individual and simultaneous testing with End-to-End RFC 2544
• Service Disruption Time measurement for VoIP and IPTV
• Shorter testing time of multiple port networks by utilizing MT9090-ports
• Optical power level check and electrical cable test for physical layer testing
• In-band pass through and bidirectional monitoring using two ports
• Channel Stats for identifying error streams, top talkers, network attacks
• PDF and CSV report generation for documentation of test results
• Modular platform ensures maximum return on investment
• Compact and lightweight design for maximum portability in the field

Designed for Field Operations

The Network Master Gigabit Ethernet tester (MT9090A with MU909060A) is purpose built for testing Ethernet links in the field. Its hardware and user interface are optimized for simplicity, making it easy to use for any skill level, and it is rugged enough to function in harsh environments.

Quick Startup
The Network Master Gigabit Ethernet tester is ready for measurement in about 15 seconds so productive work can start immediately.

Long Battery Life
Since AC power is not always available where you need it, the Network Master Gigabit Ethernet tester provides up to 3 hours of testing on a single charge, depending on configuration and setup. This coupled with an optional car cigarette lighter cord guarantees the instrument is ready when you are.

Portable
With its lightweight design and user friendly dimensions, the Network Master Gigabit Ethernet tester is perfect for the outside plant environment and can easily be managed with one hand.
The standard softcase with shoulder strap further increases portability when traveling from the truck to the testing site.

Rugged
With no fans or vents to allow dust and moisture to enter the unit, the Network Master Gigabit Ethernet tester was designed for the challenging outside plant environment.
The protector included as standard equipment absorbs the shock to the tester.

4.3-inch Wide Screen Display for Easy Viewing

The high resolution, full color, 4.3-inch wide screen display is the perfect format for viewing Ethernet measurement results. It also provides excellent readability both indoors and outdoors.

MU909060A1

MU909060A2

MU909060A3

No Experience Required

The expertise is built into the Network Master Gigabit Ethernet tester. With its Test Automator and PASS/FAIL indicators the instrument makes it easy to test and troubleshoot Ethernet connections.

Designed for Network Activation

For installation, commissioning and QoS verification the Network Master Gigabit Ethernet tester provides powerful and flexible traffic generation capabilities, allowing you to easily test the network under various conditions, including generation of VLAN tagged traffic. The instrument also provides facilities for BER testing of the lines, performance statistics and QoS statistics.

Single end test with Loopback or Using a Ethernet Reflector, Two ports simultaneous testing for multiple ports installation.

Bidirectional performance test with End-to-End RFC 2544, Two ports simultaneous testing for multiple ports installation.

Installation and Maintenance Simplified

Since the Network Master Gigabit Ethernet tester is purposely built for easy testing of Ethernet links in the field, its hardware and user interface are optimized for simplicity. The instrument is easy to setup using its keys and screen. The user can also store setups relevant for a given application and via a USB port distribute the setup to other instruments with the Gigabit Ethernet tester. A Test Automator is provided making it easy to set up a sequence of tests.

The Test Automator makes it easy to set up a sequence of tests

Report Generation

With the powerful and flexible report generator you can create .pdf or .csv files for selected measurement results. With these files you can provide professional documentation of test results to your customers.

Pass/Fail Indication, Graphical Display

The result can be checked not only value but also PASS/FAIL indicator and graphical display.
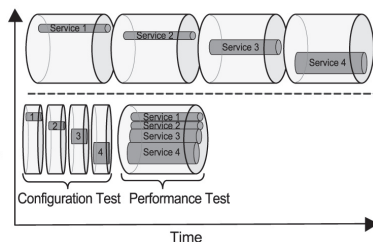

Y.1564 Test Option

ITU-T Y.1564 is a new test methodology for bring Ethernet networks into service, simultaneously completing multiple traffic streams. RFC 2544 commonly use today completes tests in a serial manner never running all traffic streams at the same time. ITU-T Y.1564 completes this testing in two phases:

- Service Configuration Test, confirms the end to end configuration while quickly checking the Information Rate (IR), Frame Delay Variation (FDV), Frame Loss Ratio (FLR), Frame Loss Ration at the Service Acceptance Criteria (FLRSAC), Committed Burst Size (CBS) and Excess Burst Size (EBS) sequentially for all configured traffic streams.

- Service Performance Test transmits all configured traffic streams simultaneously at the CIR confirming all traffic is able to transverse the network under full load while checking the following IR, FDV, FLR and Availability (AVAIL).

This two phase approach reduces total testing time.

RFC 2544 completes tests one after another

Y.1564 completes a quick per service test followed by the performance test

RFC 2544 Test Option

With the RFC 2544 test option, testing of throughput and frame loss, latency, packet jitter and burstability is straightforward.
The Network Master Gigabit Ethernet tester automates the testing procedure while still allowing you to configure the test to be as thorough as needed.
To get full information on the performance of both sides of a line, the end-to-end test mode allows two Network Master Gigabit Ethernet testers to work together in an in-band control setup whereby the user can control both units and inspect the results of the test from both units on the master instrument.

Multistream Option

The Ethernet Multistream option for the Network Master Gigabit Ethernet tester allows testing a congested networks ability to transport high priority traffic rather than lower priority traffic.
The user can activate up to 8 streams with different priority settings on the Ethernet line and detect how they are affected by frame loss through the network.

Simplifying Maintenance and Troubleshooting

The Network Master Gigabit Ethernet tester has maintenance and troubleshooting application in 800 g pocketable package.

Pass through monitoring by inserting the tester in a network. Tx and Rx of two ports are used for this application.
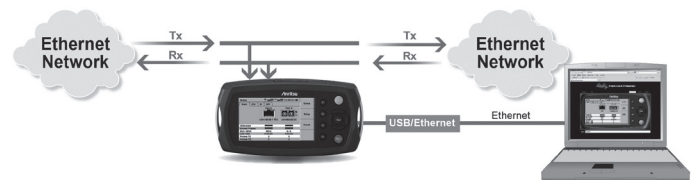
Bidirectional monitoring by dividing both signals and put them into the tester. Two Rxs are used for this application.

Channel Stats (Option)

Up to 63 streams can be selected by the filter of Source/Destination addresses, VLAN, MPLS. Those streams can be monitored and displayed in detailed information. It's useful to identify the error streams, top talkers and network attack.

Simultaneous Two Ports Monitoring

Network Master Gigabit Ethernet tester has two ports and they can be used simultaneously. It saves the test time for multiple ports deployment. It is possible to support identification of issues in the network by pass through monitoring and bidirectional monitoring.

Remote GUI Option

Network Master Gigabit Ethernet tester can be operated remotely from the far end operation center using a Web browser. USB-Ethernet Converter (option) connects the Network Master Gigabit Ethernet tester with Ethernet for remote control.
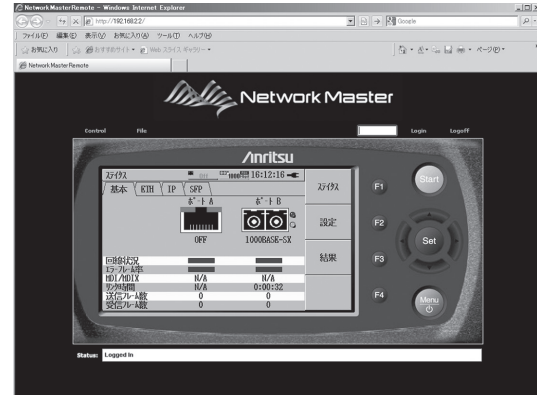
Specifications

The specification table below applies to the Network Master Mainframe equipped with the Gigabit Ethernet Module.

Ethernet Interfaces	Interfaces	• Electrical interfaces: 10/100/1000 Mbps RJ45 (10BASE-T, 100BASE-TX, 1000BASE-T) • Optical interfaces: 100 or 1000 Mbps LC connector (100BASE-FX, 100BASE-LX, 1000BASE-SX, 1000BASE-LX or 1000BASE-ZX)			

	Interface Configurations	• MU909060A1: Gigabit Ethernet Module with one SFP port and 1 electrical RJ45 port.
		    One optical module can be installed
		• MU909060A2: Gigabit Ethernet Module with 2 electrical RJ45 ports.
		• MU909060A3: Gigabit Ethernet Module with two SFP ports.
		    Two electrical or optical modules can be installed			

	Duplex Modes	Full duplex. Electrical 10 Mbps/100 Mbps also half duplex			
	Test Configurations	Monitor/Generate, Pass through, Reflector			
Optical Modules[1]	Description	Min. input sensitivity and wavelength		Output power and wavelength	
	1000BASE-SX 850 nm Multimode	−17 dBm	770 nm to 860 nm	−9.5 to −1.5 dBm	830 nm to 860 nm
	1000BASE-LX 1310 nm Singlemode	−20 dBm	1260 nm to 1580 nm	−10 to −3 dBm	1285 nm to 1343 nm
	1000BASE-ZX 1550 nm Singlemode	−22 dBm	1260 nm to 1580 nm	−3 to +5 dBm	1480 nm to 1580 nm
	100BASE-FX 1310 nm Multimode	−31 dBm	1260 nm to 1570 nm	−20 to −14 dBm	1270 nm to 1335 nm
	100BASE-LX 1310 nm Singlemode	−28 dBm	1260 nm to 1570 nm	−15 to −8 dBm	1261 nm to 1360 nm
Generate	Supported Encapsulations	EtherType II (DIX v.2), IEEE 802.3 with 802.2 (LLC1), IEEE 802.3 with SNAP			

	Traffic Generation/Monitor	• Variable line rate traffic generation, up to full line rate
		• Traffic shaping: Constant, Burst, Ramped
		• Frame sizes can be set to Constant, Stepped or Random length
		• Configurable MAC/IP source and destination addresses (supports IPv4 and IPv6), UDP/TCP address and DSCP/TOS byte
		• Request IP source address from a DHCP server (On/Off)
		• Adjustable frame size from 46 bytes to 10000 bytes
		• User defined up to 3 level VLAN ID and VLAN priority (Option)
		• User defined up to 3 level MPLS label (Option)
		• User defined traffic mix of unicast and broadcast frames
		• Generate and respond to pause frames
		• Answer incoming ARP request (On/Off)
		• MAC/IP address swapping (reflector configuration)
		
		Test Result
		    Current/Cumulative: Total frame, Total bit, Utilization, Throughput, Broadcast frame, Error frame,
		        Frame loss, Frame loss rate
		    Graph: Tx utilization, Tx throughput, Rx utilization, Rx throughput, Error frame
		    Service Disruption Time: Min., Max., Average, Count, Total time, Total SDT (%),
		        Last frame received (interval) timestamp
		    Channel Stats: Total frame, Total bit, Error, Frame size distribution of up to 63 filtered streams			

Measurements	Status	Link status, Signal and Frames present (utilization), Errored frames, Rx/Tx frame count, Link time, Remote fault, Speed, Full/Half duplex, MDI/MDIX, Interface type, Link partner abilities (Pause capable and Asymmetric pause capable), Local clock (1000 Mbps), DHCP lease time, Optical level for optical interfaces
	Frame Statistics	Link status, Signal and Frames present (utilization), Error frames, Rx/Tx frame count, Link time, Remote fault, Speed, Full/Half duplex, MDI/MDIX, Interface type, Link partner abilities (Pause capable and Asymmetric pause capable), Local clock (1000 Mbps), DHCP lease time, Optical level for optical interfaces
	Event Log	The instrument logs major events during a test with a 1 sec. resolution time stamp. Logged events include: Link/No link and Test Start/Stop
	Report Generation	Generation of test result reports as pdf-files. The report may be customized with a user logo and comments.
Dedicated Tests	Electrical Cable Test (MU909060A1/A2)	• Detection of MDI/MDIX mode, Link speed and status, Cable status and distance to fault (if any), Polarity. For 1000 Mbps also skew • Pin mapping: Tx/Rx for 10/100 Mbps, DA, DB, DC, DD for 1000 Mbps
	BER Test	Generation and detection of test patterns. Count of errors in received test pattern. Pattern generation: Unframed, Framed with IP header or Framed with IP and TCP/UDP header Test patterns supported: FOX, all 0, all 1, 0101, PING, PRBS 9, PRBS 11, PRBS 15, PRBS 20, PRBS 23, PRBS 29, PRBS 31, HF test pattern, CRPAT, JTPAT, SPAT Detection of sequence errors and loss of sequence synchronization.
	Ping Test	For connectivity and configuration check • Round Trip Time (RTT) • Supports IPv4 and IPv6 addressing • Answer incoming Ping requests (On/Off)
	Traceroute Test	Setup: Number of Attempts, Max number of hops, Number of ping each host, Timeout Result: Number of hop, Host IP address, Number of Received/Lost replies, Min/Max/Average time
	ITU-T Y.1564 Test (Option)	Test mode: Single Ended test, Switch/Router test, End-to-End test Configuration Test: Up to 32 services, Up to 6 steps with CBS, EBS Test result: Pass/Fail, IR (Information Rate), FL (Frame Loss), FTD (Frame Transfer Delay), FDV (Frame Delay Variation) Service Performance Test: Up to 32 services Test result: Pass/Fail, IR (Information Rate), FL (Frame Loss), FTD (Frame Transfer Delay), FDV (Frame Delay Variation), AVAIL (Availability), UN-AVAIL (Unavailable seconds), SEQ ERR (Sequence Errors) Test report: Y.1564 Appendix II compliant (CSV or PDF) Parameters: Configurable with MT9090A's Test Automator or the standalone PC application (MX909060A)
	RFC 2544 Installation and Commissioning Tests (Option)	Single ended network test and Switch/Router test mode: Throughput and utilization, Frame loss, Latency, Packet jitter, Back-to-back frames (burstability) End-to-End network test mode (two Network Master Gigabit Ethernet testers in an in-band control setup): Throughput and utilization, Frame loss, Back-to-back frames (burstability) Router latency test mode: IP ping based latency, IP ping based packet jitter
	Multistream Test (Option)	Number of streams: Up to 8 streams can be activated on the Ethernet line available information per stream: Frame loss count/rate, Frames and bytes received, Frames and bytes transmitted
	HTTP/FTP Test	Test mode: HTTP, FTP Setup: Target directory, Download file name, Authentication Result: Received/Total file size, Min/Max/Average throughput
	Reflector Delay	Maximum internal delay when instrument is in reflector configuration: 2.44 μs (1000 Mbps), 5.16 μs (100 Mbps), 31.93 μs (10 Mbps)
General	Internal Memory	Internal memory for storage of results, setups and screen shots: 40 MB
	Stored Configurations	The user can save a number of configuration files for later recall. The configuration files can be transferred to other instruments via the instruments USB port.
	Test Automator	The user can create a macro to run several tests in sequence. The user can also load, save, import and export test macros
	Service Interface	Two USB 1.1 (One type A for USB memory stick, One type B for USB mass storage)
	Display	4.3-inch color LCD (480 × 272 pixels), with LED back light, transmissive
	Language	English, Japanese, Chinese (Simplified, Traditional), Spanish, German, Korean, French, Italian, Portuguese
	Battery	Dedicated battery pack or 4 AA Ni-MH Operating time: Up to 3 hours, depending on configuration and test setup Charging time: 4 hours while power off (typ.), Temperature: +10°C to +30°C Indicator for battery level in display when the unit is turned on
	Power Supply	AC adapter: 9 V(dc), 100 VAC to 240 VAC, Frequency: 50 Hz/60 Hz
	Dimensions and Mass	MT9090A: 190 (W) × 96 (H) × 18 (D) mm, <200 g MU909060A1/A2/A3: 190 (W) × 96 (H) × 30 (D) mm, <600 g
	Environmental	Operational Temperature Range: 0°C to +40°C, Humidity ≤85%, No condensation Storage Temperature Range: −25°C to +60°C, Humidity ≤80%, No condensation Vibration: IEC 60 068-2-6 Fc and IEC 60 068-2-64 Fh, Dust and Drip proof: IP 51
	CE — EMC	2014/30/EU, EN61326-1, EN61000-3-2
	CE — LVD	2014/35/EU, EN61010-1
	CE — RoHS	2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018
	Laser Safety*3	IEC 60825-1: 2007 CLASS 1 21CFR1040.10*2: MU909060A1/A3 with optical modules

*1: Correct functioning can only be guaranteed with optical modules from Anritsu for the Network Master Gigabit Ethernet tester.
   Modules with extended temperature range (up to +85°C) must be used.
*2: Excludes deviations caused by conformance to Laser Notice No. 50 dated June 24, 2007
*3: Safety measures for laser products
   This product complies with optical safety standards in 21CFR1040.10 and IEC 60825-1; the following descriptive labels are affixed to the product.

IEC 60825-1:2007
CLASS 1 LASER PRODUCT

THIS PRODUCT COMPLIES WITH 21 CFR 1040.10 AND 1040.11 EXCEPT FOR DEVIATIONS PURSUANT TO LASER NOTICE NO. 50, DATED JUNE 24, 2007

https://www.anritsu.com

Ordering Information

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

Select Mainframe

Model/Order No.	Description
MT9090A	Mainframe (with color LCD)
	Standard Accessories
G0203A	AC Adapter
G0202A	NiMH Battery Pack
Z1023A	Strap
B0601B	Standard Soft Case
B0663A*1	Protector

*1: The shoulder strap can be used to hang the instrument around the neck while working.

Select Base Model*2

Model/Order No.	Description
MU909060A1	Gigabit Ethernet Module (with one SFP slot and one RJ-45 port)
MU909060A2	Gigabit Ethernet Module (with two RJ-45 ports)
MU909060A3	Gigabit Ethernet Module (with two SFP slots)
	Standard Accessories
W3173AE	Gigabit Ethernet Tester Quick Start Guide
Z1234A	Network Master Gigabit Ethernet Tester CD

*2: Not support MT9090A with MT9090A-001.

Select Module Option

One module can be installed in MU909060A1.
Two modules can be installed in MU909060A3

Model/Order No.	Description
G0240A	1000 Mbps SX SFP [850 nm multimode, LC connector (optical)]
G0241A	1000 Mbps LX SFP [1310 nm single mode, LC connector (optical)]
G0242A	1000 Mbps ZX SFP [1550 nm single mode, LC connector (optical)]
G0243A	100 Mbps FX SFP [1310 nm multimode, LC connector (optical)]
G0244A	100 Mbps LX SFP [1310 nm single mode, LC connector (optical)]
G0246A	10/100/1000 Mbps RJ-45 SFP (electrical)

Select Software Option

Model/Order No.	Description
MU909060A1-001	RFC 2544 Test (for MU909060A1)
MU909060A2-001	RFC 2544 Test (for MU909060A2)
MU909060A3-001	RFC 2544 Test (for MU909060A3)
MU909060A1-002	Multistream (for MU909060A1)
MU909060A2-002	Multistream (for MU909060A2)
MU909060A3-002	Multistream (for MU909060A3)
MU909060A1-003	Stacked VLAN (for MU909060A1)
MU909060A2-003	Stacked VLAN (for MU909060A2)
MU909060A3-003	Stacked VLAN (for MU909060A3)
MU909060A1-004	MPLS (for MU909060A1)
MU909060A2-004	MPLS (for MU909060A2)
MU909060A3-004	MPLS (for MU909060A3)
MU909060A1-005*3	Remote GUI (for MU909060A1)
MU909060A2-005*3	Remote GUI (for MU909060A2)
MU909060A3-005*3	Remote GUI (for MU909060A3)
MU909060A1-006	Channel Stats (for MU909060A1)
MU909060A2-006	Channel Stats (for MU909060A2)
MU909060A3-006	Channel Stats (for MU909060A3)
MU909060A1-007	Y.1564 Test (for MU909060A1)
MU909060A2-007	Y.1564 Test (for MU909060A2)
MU909060A3-007	Y.1564 Test (for MU909060A3)

Select Accessories

Must be added as separate line items

Model/Order No.	Description
Z1580A*4	Protector & Soft Case
B0600B	Hard Case
B0602B	Deluxe Soft Case (for MT9090A)
J1402A	Car Plug Cord
W3166AE	MU909060A1/A2/A3 Operation Manual (Hardcopy – English version)
J1480A*5	USB-Ethernet Converter

*3: Requires J1480A USB-Ethernet Converter (sold separately)
*4: The protector (B0663A) and standard soft case (B0601B) from a set. The protector includes a shoulder strap.
*5: Requires MU909060Ax-y05 Remote GUI (sold separately)

Warranty Service

Model/Order No.	Description
MT9090A-ES210	2 Years Extended Warranty Service (for MT9090A)
MT9090A-ES310	3 Years Extended Warranty Service (for MT9090A)
MU909060A1-ES210	2 Years Extended Warranty Service (for MU909060A1)
MU909060A2-ES210	2 Years Extended Warranty Service (for MU909060A2)
MU909060A3-ES210	2 Years Extended Warranty Service (for MU909060A3)
MU909060A1-ES310	3 Years Extended Warranty Service (for MU909060A1)
MU909060A2-ES310	3 Years Extended Warranty Service (for MU909060A2)
MU909060A3-ES310	3 Years Extended Warranty Service (for MU909060A3)

Installed Software Option (Retrofit)

The following software options can be field installed by the customer in already purchased Network Master Gigabit Ethernet testers.

Model/Order No.	Description
MU909060A1-301	RFC 2544 Test Retrofit (for MU909060A1)
MU909060A2-301	RFC 2544 Test Retrofit (for MU909060A2)
MU909060A3-301	RFC 2544 Test Retrofit (for MU909060A3)
MU909060A1-302	Multistream Retrofit (for MU909060A1)
MU909060A2-302	Multistream Retrofit (for MU909060A2)
MU909060A3-302	Multistream Retrofit (for MU909060A3)
MU909060A1-303	Stacked VLAN Retrofit (for MU909060A1)
MU909060A2-303	Stacked VLAN Retrofit (for MU909060A2)
MU909060A3-303	Stacked VLAN Retrofit (for MU909060A3)
MU909060A1-304	MPLS Retrofit (for MU909060A1)
MU909060A2-304	MPLS Retrofit (for MU909060A2)
MU909060A3-304	MPLS Retrofit (for MU909060A3)
MU909060A1-305*3	Remote GUI Retrofit (for MU909060A1)
MU909060A2-305*3	Remote GUI Retrofit (for MU909060A2)
MU909060A3-305*3	Remote GUI Retrofit (for MU909060A3)
MU909060A1-306	Channel Stats Retrofit (for MU909060A1)
MU909060A2-306	Channel Stats Retrofit (for MU909060A2)
MU909060A3-306	Channel Stats Retrofit (for MU909060A3)
MU909060A1-307	Y.1564 Test Retrofit (for MU909060A1)
MU909060A2-307	Y.1564 Test Retrofit (for MU909060A2)
MU909060A3-307	Y.1564 Test Retrofit (for MU909060A3)

Standard Soft Case B0601B
This standard accessory accommodates the mainframe with fitted protector.

Deluxe Soft Case B0602B
Full Network Master operation without removal from the case.
Provides excellent protection for use in hash conditions.
This does not accommodate the mainframe if the protector is fitted.

Hard Case B0600B
This accommodates two mainframes (with or without fitted protector), accessories (light source or power meter, backup battery, fiber cleaner, etc.).

Mainframe with Protector

Protector B0663A (Standard accessory)

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